The University of Toronto
Chemical Library

Presented
to
The University of Toronto Library
by
William Lash Miller, B.A., Ph.D., C.B.E.
Professor Emeritus of Physical Chemistry
for
A Departmental Library to be under
the control of the Professor of
Chemistry according to the conditions
set out in a letter from the Librarian
of the University dated March 21st
1938.

Digitized by the Internet Archive
in 2011 with funding from
University of Toronto

http://www.archive.org/details/journals21soci

Chem & Phys
S

THE JOURNAL

OF THE

Society of Chemical Industry.

111

VOL. XXI.—1902.

373652
11.12.39

LONDON:

EYRE AND SPOTTISWOODE, H'S MAJESTY'S PRINTERS,

EAST HARDING STREET, FLEET STREET, E.C.

The Society of Chemical Industry.

LIST OF PAPERS READ BEFORE SECTIONS OF THE SOCIETY DURING THE YEAR 1902.

N.B.—The words within ( ) indicate the Journal in which the Paper appears and the Section before which it was read.

PAGE

Ackroyd, W. On the Marsh-Berzelius Arsenic Deposit. (15 July. Yorkshire) 900

Anderson, W. Carrick, and J. A Russell Henderson. The Coals of Bengal and Japan. (28 Feb. Scottish) 237

Archbold, G. The Manufacture of Maize Starch. (15 Jan. Liverpool) 4

Aspinwall, H. C. Stability Tests for Smokeless Powder and Nitro-Explosives. (31 May. New York) 687

Bailey, T. Lewis. Bronze Containing Lead: Its Corrosion, Erosion, and Structure. (30 April. Liverpool) 531

Baskerville, C. Process for Rendering Phosphoric Acid Available. (31 Dec. New York) ... 1519

Bedford, J. E. Address to Yorkshire Section. (31 Dec. Yorkshire) 1520

Blockey, A. The Analysis of Some New Tanning Materials. (15 Feb. Yorkshire) 158

Blount, B. *See* Stanger, W. H. (15 Oct. New York) 1216

Bradburn, J. A. Some Parts of the Ammonia Soda Process open for Improvement. (31 May. New York) 689

Brakes, J. The Volumetric Determination of Molybdenum in Molybdenum Steel and Ferro-Molybdenum. (30 June. New York)..... 832

Brame, J. S. S., and Lewes, V. B. The Production of Mixed Carbides of Manganese and Calcium. (16 June. London) 755

Byrom, T. H. The Solvent Power of Phosphoric Acid. (28 Feb. Liverpool) 214

Carey, A. Water Carriage within Great Britain. (16 June. Liverpool) 749

Carey, E. Some Observations on the Factory and Workshops Act and the Alkali, &c. Works Regulation Bill of 1901. (28 Feb. Liverpool) 214

Carpenter, F. B. Analysis of Crude Sulphur. (30 June. New York) 832

Carpenter, R. Forbes, and Linder, E. Examination of Methods Employed in Estimating the Total Acidity of Gases escaping from the Chamber Process for Manufacture of Sulphuric Acid, with Suggestions arising from the Study of the Interaction of Nitrous and Sulphurous Acids, or their Salts, in Aqueous Solution. (31 Dec. London) 1490

Carson, C. M. *See* Lang, W. R. (16 June. Canadian) 748

See Lang, W. R. (15 Aug. Canadian) 1018

Carulla, F. J. R. Emergencies in Vitriol Works. (28 Feb. Nottingham) 226

Chick, H. *See* Ramsay, Sir W. (29 Nov. London) 1367

Clayton, E. G. The Technical Examination of Glue. (31 May. London) 670

PAGE

Clowes, F. The New Table Photometer and Standard Pentane Burner, Prescribed by the Gas Referees for use in the London Gas Testing Stations. (15 March. London) 313

Coblentz, V. Purity of So-called Standard Drugs and Chemicals. (15 Dec. New York) ... 1431

Cohn, A. I. Blue-Print and Black-Print Photographic Papers, and their Preparation. (15 May. New York)..... 582

Collingridge, F. *See* Ramsay, Sir W. (29 Nov. London) 1367

Collins, S. H. Composition of Milk in the North of England. (31 Dec. Newcastle)..... 1512

Sugar in Swedes. Part II. Variation in the Amount of Sugar under Different Conditions of Growth. (31 Dec. Newcastle)... 1513

Conroy, J. T. Catalysis and its Applications. (15 March. Liverpool) 302

Curtis, M., and Tompkins, P. W. Notes on the Determination of Water in California Crude Oils. (31 Dec. New York) 1519

Dakin, H. D. Note on the Use of Persulphates in Analyses. (30 June. Yorkshire)..... 848

Dunn, J. T. The Density of Aqueous Solutions of Ferrous Chloride. (31 March. Newcastle) 390

Dupré, A. The Determination of Perchlorate in Saltpetre. (30 June. London)... 825

The Explosion of Potassium Chlorate by Heat. (28 Feb. London)..... 217

Eddy, H. P. The Effect of Pickling Liquids upon Sewage Treatment. (30 April. New York) 534

Fawsitt, C. A. Peroxide of Hydrogen: Its Manufacture, Properties, and Uses. (28 Feb. Scottish) 229

Gane, E. H. The Presence of Copper in Powdered Drugs and Chemicals. (28 Feb. New York)..... 224

Garry, H. Stanley. Factory Costs. (15 Dec. Nottingham) 1439

Gill, A. H., and Miller, S. B. The Specific Heat of Glycerin Waste Lyes, and Crude Glycerin. (30 June. New York)..... 833

Golding, J. A Modified Argand Burner for the First Process in the "Kjeldahl" Estimation of Nitrogen. (31 May. Nottingham) 694

Goodwin, W. L. The Manufacture of Charcoal and By-Products in Ontario. (16 June. Canadian) 743

Gray, T. The Phenols from Shale Oil. (30 June. Scottish)..... 845

Greig-Smith, R., and Steel, T. Levan: A New Bacterial Gum from Sugar. (29 Nov. Scottish) 1381

Harvey, T. F. The Wijs Method of Determining the Iodine Value of Oils and Fats. (15 Dec. Nottingham) 1437

PAGE

Hehner, O. The Preparation of Arsenic-free Zinc. (31 May. London) 675
And others. Detection and Approximate Estimation of Minute Quantities of Arsenic in Beer, Brewing Materials, Foodstuffs, and Fuels. (31 Jan. London)..... 94
Henderson, J. A. Russell. *See* Anderson, W. Carrick. (28 Feb. Scottish)..... 237
Hewitt, J. T. The Retarding Influence of Aldehydes on the Maturation of Potable Spirits. (31 Jan. London)..... 96
Hinchley, J. W. On the Separation of Solids which differ in Specific Gravity. (15 Jan. London)..... 10
Hunt, F. W. A Comparison of Methods used to Determine the Iodine Values of Oils. (15 April. Yorkshire) 454
Ingle, H. The Origin and Nature of the Free Acid formed during Hübl's Reaction with Unsaturated Compounds. (15 May. Scottish) ... 587
Irwin, W. The Soot deposited on Manchester Snow. (30 April. Manchester) 533
Jackson, D. D. The Precipitation of Iron, Manganese, and Aluminium by Bacterial Action. (31 May. New York) 681
Jacobs, C. B. The Manufacture of Soluble Barium Compounds from Barytes in the Electric Furnace. (31 March. New York) 391
Job, R., and Young, J. B. Arsenic Contents of Certain Pennsylvania Anthracites. (31 May. New York) 693
Kenrick, E. B. The Artesian Water Supply of the City of Winnipeg. (16 June. Canadian)... 746
Lamb, M. C. The Fastness to Light of Leathers Dyed with Coal Tar Colours. (15 Feb. Yorkshire) 156
Lang, W. R., and Carson, C. M. Solubility of the Sulphides of Arsenic, Antimony, and Tin. (15 Aug. Canadian) 1018
And others. The Separation of Arsenic, Tin, and Antimony. (16 June. Canadian)..... 748
Law, H. D. Some Experiments with the Kjeldahl Method of Nitrogen Estimation. (30 June. Yorkshire) 847
Leather, J. P. *See* Ross, R. (31 May. Manchester) 676
Lester, J. H. An Improved Gas-Sampler. (31 March. Manchester) 386
A Strength Testing Machine for Fine Yarns. (31 March. Manchester) 387
Moisture Tests of Wood Pulp. (31 March. Manchester) 380
The Hygroscopic Nature of Cotton. (31 March. Manchester) 388
Levinstein, I. Address to Manchester Section. (29 Nov. Manchester) 1377
Presidential Address. (15 July. General Meeting) 893
Report on the Patent Law Amendment Bill. (28 Feb.)..... 212
Report on the Patent Law Amendment Bill. (15 March)... 301
Lewes, V. B. *See* Brame, J. S. S. (16 June. London) 755
Lewis, E. A. A New Form of Recording Apparatus for a Roberts-Austen Electrical Pyrometer. (30 June. Nottingham) 844
The Alloys of Copper and Manganese. (30 June. Nottingham) 842
Linder, E. *See* R. Forbes Carpenter. (31 Dec. London) 1490
Lovett, W. J. An Easily Made, and Safe Dephlegmator for Kjeldahl Distillations. (30 June. Yorkshire) 849

PAGE

Mackintosh, J. C. *See* Lang, W. R. (16 June. Canadian) 748
Marshall, A. The Determination of the Strength of Sulphuric Acid. (31 Dec. London)..... 1511
The Influence of Impurities on the Specific Gravity of Sulphuric Acid. (31 Dec. London)..... 1508
Matos, L. J. Sulphur Blacks, and their Action upon Cellulose. (28 Feb. New York) 224
Matthews, J. Merritt. On the Influence of Indigo-Red in Indigo Dyeing. (28 Feb. New York) 222
Some Phases of Textile Chemistry. (31 Dec. New York) 1516
The Action of Caustic Soda on Wool. (31 May. New York) 685
Meggitt, L. A New Viscometer. (31 Jan. Nottingham)..... 106
The Sampling and Preparation of Shoddy, Wool Dust, and Similar Materials for Analysis. (31 Jan. Nottingham)..... 105
Micklethwait, F. M. G. *See* Morgan, G. T. (29 Nov. London) 1373
Miller, S. B. *See* Gill, A. H. (30 June. New York) 833
Moore, Russell W. The Composition of Commercial Cyanide of Potassium. (31 March. New York) 392
Morgan, G. T., and Micklethwait, F. M. G. Reduction of Ammoniacal Silver Solutions by Organic Substances. (29 Nov. London) .. 1373
Murphy, A. J. Two Possible Causes of Discrepancy in Arsenic Analysis. (31 July. Yorkshire) 957
Myers, H. C. The Sugar-Beet as a Reclaimer of Arid and Alkali Regions. II. (30 June. New York) 834
Nagel, O. Ricinus Oilcake. (15 Jan. New York) 30
Nicholson, J. T. Mechanical and Engineering Departments of the Municipal School of Technology. (31 Dec. Manchester) 1512
Norris, G. L. The Determination of Arsenic in Iron and Steel. (31 March. New York) 393
The Determination of Silicon in Ferro-Silicon. (30 April. New York) 537
North, B., and Lee, W. C. On the Estimation of Alkaline Hydrate or Bicarbonate in the Presence of Monocarbonate. (15 March. Yorkshire) 322
O'Shaughnessy, F. R. Birmingham Sewage and its Treatment. (31 May. London) 665
Parker, J. Gordon. The Application of Kjeldahl's Method of Estimating Nitrogen in the Tan-yard as a Means of Controlling the Tanning and Finishing of Sole Leather. (30 June. Nottingham) 838
Patterson, T. L. Address to the Scottish Section. (29 Nov. Scottish) 1380
Patterson, T. S. Modified Forms of Thermo-Regulator and Adapter for Vacuum Distillation. (15 April. Yorkshire)..... 456
Peckham, S. F. Further Notes on Cement Testing. (30 June. New York)..... 831
Perkin, F. Mollwo. Simple Qualitative Test for Bromides and Iodides, and a Test for Bicarbonates. (29 Nov. London) 1375
Peters, H. *See* Trotman, S. R. (31 May. Nottingham) 693, 694
Ramsay, Sir W., and others. Experiments on the Chemical Behaviour of Gutta-Percha. (29 Nov. London) 1367
Reed, H. C. Analysis of Tanning Materials: Filter Papers and Soluble Solids. (31 May. New York) 691
Rennoldson, W. L. Address to Newcastle Section. (29 Nov. Newcastle) 1379

PAGE

Rhodin, B E. F. Electrolytic Manufacture of Caustic Soda and Bleaching Powder at Sault Ste. Marie, Ontario. (15 April. Canadian) 449

Richardson, C. The Determination of Paraffin in Petroleum Residues, Asphaltic Oils, and Asphalts fluxed with Paraffin Oils. (31 May. New York) 690

And Wallace, E. C. On the Occurrence of Free Sulphur in Beaumont Petroleum. (15 March. New York) 316

And others. Report of the Sub-Committee on Uniformity in Analysis of Materials for the Portland Cement Industry. (15 Jan. New York) 12

Richardson, F. W. Methods for Arsenic Determination in Malt Liquors, &c. (15 July. Yorkshire) 901

Rix, W. P. The Preparation and Behaviour of Insoluble Frits for Pottery Glazes. (15 March. Nottingham) 317

Robertson, R. On the Will Test for Nitrocellulose. (30 June. London) 819

Ross, R., and Leather, J. P. The Constitution of Gas Oils. (31 May. Manchester) 676

Schidrowitz, P. Chemistry of Whisky. I. (30 June. London) 814

Silberrad, O. Effect of the Alcohol Duty on Chemical Industry. (30 June. London)... 827

Stanger, W. H., and Blount, B. The Proposed Standardisation of Cement Analysis. (15 Oct. New York) 1216

PAGE

Steel, T. *See* Greig-Smith, R. (29 Nov. Scottish) 1381

Stillwell, A. G. Graphite in Ores. (16 June. New York) 759

Stocks, H. B. On the Formation of Carbonate of Lime under Various Conditions. (30 April. Liverpool) 527

Sutherst, W. F. The Chemical Changes in the Ripening of Cheese. (28 Feb. Manchester) 219

Tate, F. Technical Teaching in Lancashire. (29 Nov. Liverpool) 1364

Toch, M. The Composition of Paints and Pigments. (31 Jan. New York) 102

Tompkins, P. W. *See* Curtis, M. (31 Dec. New York) 1519

Traver, A. F. *See* White, A. H. (15 Aug. New York) 1012

Trotman, S. R., and Peters, H. The Analysis of Cod-Oils for Tanning Purposes. (31 May. Nottingham) 693

And Peters, H. The Determination of Nitrates in Water by the Indigo Carmine Method. (31 May. Nottingham) 694

Wallace, E. C. *See* Richardson, C. (15 March. New York)..... 316

Ward, G. J. The Rôle of Alumina in Blast Furnace Slags. (15 April. Nottingham) 452

White, A. H., and Traver, A. F. Theory of the Incandescent Mantle. (15 Aug. New York) 1012

Williams, D. T. The Estimation of Vanadium. (31 March. Manchester) 389

Young, J. B. *See* Job, R. (31 May. Nottingham) 693

Journal of the Society of Chemical Industry.

INDEX OF VOL. XXI.—1902.

INDEX OF AUTHORS' NAMES.

N.B.—In this Index (P) indicates that the matter referred to is an abstract of a Patent.
The titles of new books are given in quotation marks.

A

PAGE

Aarts, J. G. *See* Kramers, J. C. H. 331
Abbot, M. S., and others. Matches: Machines for Making —— (P) 723
Abegg, F. *See* Kuester, F. W. 1557
Abegg, R. Electrical Liquid Resistance 277
And Herz, W. "Practical Chemistry." Translation by H. T. Calvert 77
And Riesenfeld, H. Ammonia: Solubility of —— in Saline Solutions 547
Abendroth, H. A. Ammonia: Apparatus for Freeing —— from Gas-Liquor (P) 1526
Aberg, A. Paper Pulp; Apparatus for Purifying —— (P) 272
Abraham, F. Gas Burners and the like (P) 697
Scale in Boilers; Preventing the Formation of —— (P) .. 695
Abrey, R. Plastic Compositions applicable as Insulating and Acid-proof Materials (P) 1282
Abwarme-Kraftmaschinen-ges. Evaporating Apparatus (P) . 1267
Gases; Utilising Heat from Waste Furnace —— (P) 1127
Heating Liquids of Low Boiling-Points (P) 1267
Acetylene Manufacturing Co. *See* Montel, L. 1069
Ach, F. Alkoxy-Caffeine, and Manufacture thereof (P) 1194
Dinitroso-diamine, and Manufacture of same (P) 1245
Paramethyl-Aminophenyl-Glyoxylic Acid, and Manufacture thereof (P) 1245
Thioxanthine, and Manufacture thereof (P) 1245
Triphenylmethane Dye, and Manufacture thereof (P) 1182
Acheson, E. G. Electrodes; Graphitising —— (P) 979
Furnaces; Terminal for Electric —— (P) 962
Graphite; Manufacture of —— (P) 1336
Metal Reduction in the Electrical Furnace (P) 486
Ackermann, E. Mangaba Rubber; Characteristics of —— 56
Ackroyd, W. Marsh-Berzelius Arsenic Deposit; On the —— .. 900
And Buckley, F. Malt Kilns (P) 1547
Acme Gas Co. *See* Steele, W. F. 1526
Actiengesellschaft für Anilinfabrikation. Colouring Matters; Black —— (P) 111
Colouring Matters directly Dyeing Cotton (P) 46
Colouring Matters, Disazo; Manufacture of —— (P) 45
Colouring Matters, Mono-azo; Manufacture of —— (P) ... 46
Colouring Matters, Monazo; Production of —— (P) 45
Cotton; Treatment of Colours Produced on —— (P) 49
Dyestuff; Black —— for Cotton (P) 45
Dyestuff; Blue Sulphide —— (P) 170
Dyestuffs; Acridine —— (P) 249, 338
Dyestuffs; Azo —— (P) 112
Dyestuffs; Azo ——, and Intermediate Compounds (P)... 1452
Dyestuffs, Azo; Manufacture of —— (P) 45
Dyestuffs, Blue-Black and Blue, for Cotton; Production of —— (P) 45
Dyestuffs, Blue, of the Diphenylnaphthylmethane Series; Manufacture of —— (P) 45
Dyestuffs, Blue, of the Triphenylmethane Series (P)..... 113

PAGE

Actiengesellschaft für Anilinfabrikation—*cont.*
Dyestuffs, Blue, of the Triphenyl- or Diphenylnaphthylmethane Series (P) 113
Dyestuffs, Orange, of the Acridine Series; Manufacture of —— (P) 45
Dyestuffs; Production of Sulphide —— (P) 543, 701
Dyestuffs; Red Azo —— (P) 1073
Dyestuffs; Triphenylmethane —— (P) 911
Nitrophenylene Diamine; Production of 4.1.3- —— (P) .. 402
Para-chlor-*o*-aminophenol Sulphonic Acid; Production of a —— (P) 45, 46
Photographic Developer Stable in the Dry State (P) 365
Photographic Developers (P) 872
Photographic Prints (P) 366
Photographic Roll-Films; Coverings for —— (P) 1195
Red Shades on Wool; Production of —— (P) 45
Silver Haloid Layers; Rendering —— Sensitive to Rays of Different Refrangibility (P) 792
Actiengesellschaft für Theer- und Erdol-Industrie. Phenols; Rendering —— Soluble (P) 63
Actiengesellschaft vorm. Grillo und Schroeder. *See* Grillo und Schroeder 344
Actiengesellschaft vorm. Hornung und Rabe. *See* Hornung und Rabe 60
Adams and Westlake Co. *See* Hamm and Mosher 1069
See Mosher, J. A. 1069
Adams, C. Lard; Substitute for —— (P) 1291
Adams, C. W. *See* Hoffman, E. J. 1179
Adams, M. J. Kilns for Fireclay, &c. (P) 1233
See Rowley, W. B. 477
Adams, S. H. Filters for Sewage and Liquids (P) 1149
And Creer, A. Filters for Sewage or Water (P)..... 925
Adams, T. H. Kjeldahl's Method Applied in the Tanyard; Discussion on —— 842
Adelsberger, J., and Friedmann, H. Printing Colour (P) 1337
Adeney, W. E. *See* Parry, W. K. 1035
Aders, R. H. *See* Fischer, E. 713
Adolfsson, A. E. Acetylene Gas Generator (P) 765
Adrian and Trillat. Sodium Methylarsenate; Composition and Volumetric Determination of —— 874
Adrianee, B. Metal Vessels; Rendering —— Hermetically Tight (P) 1064
Affleck, J. Manures: Gases Evolved in Manufacture of Superphosphate —— 1413
Agron. *See* Truchot 1407
Ahlin, A. Cellulose; Oxygen Bleach for —— 134
Paper-pulp; Bleaching of —— 718
Ahrens, F. B. Conium Alkaloids 636
Ahrle, C. P. H., and the Metalline Platten Ges. Bronze-coated Plates for Photographic Printing, &c. (P) 1038
And Metalline Platten Ges. Photographs; Application of Metallic Coating to —— (P) 139
Aitken. Hides and Skins: Treatment of —— (P)..... 1405

PAGE

Akester, W. H. *See* Tapp, H. 1127
Akron Paper Co. *See* Hodge, G. L. 1409
Aktieselskabet "Progress." Matches: Manufacture of Wood —— (P) 502
Albee, W. I. Skins: Preparing ——, for Tanning (P) 982
Albert, R., and others. Yeast: Preparation of Permanent —— 1033
And W. Yeast Co. Chemical Processes in Dead —— .. 60
Albrecht, K. Furnaces: Promoting Combustion in —— (P) .. 1268
Albright, G. S. *See* Bessitor, E. C. 173, 345
See Smith, H. W. 1077
Alcock, F. H. Cinchona Bark: Assay of the Tincture of ——. 368
Alessandri, P. E. Phosphorus: Detection of ——, in Cases of Poisoning 640
Allaire, T. Acetylene Generator (P) 1390
Allan, F. B. Bismuth Sulphates of —— 720
Allard, G. Persulphates, Alkali: Determination of —— 140
Allen, A. H. Arsenic: Determination in Malt Liquors: Discussion on 903
Cider: Chemistry of —— 922
Proceedings of Annual Meeting 954
And Scott-Smith, G. E. Ipecacuanha: Reactions of the Alkaloids of 1475
Allen, B., and Allen, B., Jun. Tanning: Process of —— (P) .. 265
Allen, J. F., and Brooke, R. G. Anticorrosion Paint (P) 1285
Alliot, H. Cidet: Use of Sugar-Cane Yeasts for Fermentation of —— 923
Saccharomyces: Proof of Cellular Resistance of ——, and Application thereof 1240
Aloy, J. Bismuth Oxide: Reactions of ——, with Metallic Salts Uranium Salts and Hydrogen Peroxide; Colour Reaction of —— 559
..... 1098
Alpers, W. C. Sodium Sulphoguaiacolate: Production of —— (P) 364
Alt, H. Wool: Mordanting of —— 1132
See Fischer, E. 1132
Alt, M. Paranitraniline Red: Discharging — with Aluminium Powder 546
Althausse, M. C. L. *See* Fabrik Chem. Praeparate von R. Sthamer 356
Alves, J., and others. Smoke-consuming Apparatus (P) 329
Alvisi, U. Detonating Compound (P) 1195
Sulphides: Chlorinating Natural or Artificial —— (P) ... 176
Alway, F. J. Azoxybenzylidene Bases 1022
Alzugaray, J. B. de. Metals: Extraction of ——, from their Ores (P) 1140
Metals: Extraction of Precious —— (P) 863
Amend, O. P. Mordanting Animal Fibre (P) 858
Tanning Process (P) 1544
Amenomiya, T. Atropine: Conversion of ——, into *d*- and *l*-Hyoscyamine 1409
American Alkali Co., The. Electrolytic Apparatus (P) 1143
American Amalgamating Co. *See* Knappe, P. A. 1334
American By-Products Co. Dyestuff, &c., from Cotton Pods (P) 402
Oil for Sulphonating: Manufacture of ——, from Cotton Seeds (P) 711
American Copper Mining and Extraction Co. Copper: Obtainment of ——, from Ores (P) 1457
American Cotton-Oil Co. *See* Phillips, C. C. 1084
American Furnace Co. Furnaces: Promoting Combustion in — (P 1020
American Mineral Metal Extraction Co. *See* Dolbear, C. E. 1285
American Patent Kid Co. *See* McKay, H. C. 1033
American Tin-Plate Co. *See* Phillips, J. R. 1235, 1235
Amiot. Liquids: Sterilisation and Preservation of —— (P) .. 1408
Amos, E. C. *See* Wilkheur, E. 361
Ampère Electro-Chemical Co. Camphor: Manufacture of —— (P) 1469
Pinene Derivatives: Production of —— (P) 722
See Jacobs, C. B. 1077
Ampola, G., and Jovino, S. Tobacco: Influence of Iron on the Inflammability of —— 997
Amwake, H. S. Generator: Electro-Chemical —— (P). 1143, 1335
Anders, H. and H. Paper: Marbling ——, and Apparatus therefor (P) 1150
Paper: Production of Marbled —— (P) 1467
Andersen, C. A. L. Separating Apparatus: Centrifugal —— (P) 850
Anderson and Dibdin. Peat: Calorific Power of —— 159
Anderson, A. Acetylene Gas Generators (P) 1524
Anderson, A. P. Starch and Starchy Materials: Treatment of —— (P) 1189
Anderson, E. Acetylene Gas: Apparatus for Generating and Storing — (P) 163
Anderson, G. H., and others. Sewage: Plant for Disposal of —— (P) 985
Anderson, L. Electricity: Chemical Generator of —— (P) ... 1143
Anderson, L. C. *See* Weeks, J. B. 408
Anderson, O. H. Stone or Brick: Manufacture of Artificial —— (P) 974

PAGE

Anderson, W. Carrick, and Henderson, J. A. Russell. Coals of Bengal and Japan 237
Andés, L. E. Body-Colour Oils: Use of Tung Oil in Manufacture of —— 56
Glue: Improvements in Production of —— 57
Paints for Iron 178
Andogne, H. A. d'. *See* Senderens, J. B. 169
Andouard, A. and P. "White Spirit": Research on —— 366
André. Caffeine: Determination of —— 1250
Andrew, T., and Bellis, T. K. Steel: Manufacture of —— (P) 619
Andrews, J. and S. Flour: Ageing and Bleaching —— (P) 421, 717
Andrews, T. Platinum: Micro-Crystalline Structure of ——.. 551
Andrlik, K. Diffusion Process: The Alkaline Lime —— 416
Molasses: Amine-Ammonia Liquor from Distillation of Waste Lyes of Desugarised —— 1339
Saccharine Solutions: Behaviour of Ammonium Salts of Amino Acids in Hot Aqueous and —— 1339
Syrups: Filtration of First Jet ——, and Composition of the Deposits 713
Waste Liquors from Desaccharification of Molasses: Transformation of Nitrogen into Ammonia in the —— 1339
And others. Syrups: Filtration of —— 920
And Stanek, V. Syrups: Nitrites, and the Foaming of —— 256
Angel, Dr. Effluents: Discussion on Manchester Bill for Discharge of —— 582
Angelico, F. Fulminates; Preparation of —— 276
Angell, A. and A. F. Arsenic in Crops 566
Angus, W. Wood: Means for Impregnating —— (P) 1331
Aniline Colour and Extract Works, formerly J. R. Geigy. *See* Ris, C. 610, 769
Anstey, H. C. Evaporators for Salt Water (P) 107
Anthony, E. Paper: Apparatus for Drying —— (P) 1193
Antiaqua Co. *See* Mann, H. A. 1074
Antony, U. Sulphur and Phosphorus in Ironworks Products; Determination of —— 71
And Magri, G. Brown Colour of Solution obtained by Precipitating Nickel by Ammonium Polysulphide 429
Appelius, W. *See* Paessler, J. 1461
Appert, L. Glass Plates; Machine for Making —— (P) 1350
Appleyard, T. R., and Deakin, T. B. Cotton: Action of Inorganic Sulphur Compounds on —— 702
Apsey, J. Furnaces; Apparatus for Increasing Combustion in —— (P) 460
Arachequesne, G. Alcohol: Industrial Uses of —— in Germany 108
Arbogast, J. L., &c. Glassware; Manufacture of Hollow —— (P) 773
Arbuckle, J. W. *See* Meyer, J. W. 1148
Archbold, G. Maize Starch: The Manufacture of —— 4
Archbutt, L. Alloys of Copper and Manganese; Discussion on —— 844
Bronze containing Lead; Discussion on —— 532, 533
Cod-Oil Analysis; Discussion on —— 694
Emergencies in Vitriol Works; Discussion on —— 229
Kjeldahl's Method Applied in the Tanyard; Discussion on —— 841
Nitrates in Water; Discussion on Determination of —— 694, 695
Sampling Shoddy, &c.; Discussion on —— 106
Wijs' Method of Determining Iodine Values; Discussion on —— 1439
Arrenson, G. Alcohol in Dilute Solutions; Determination of —— 1352
Arleiter, F. Resin Size; Manufacture of —— (P) 870
Resins, Fats, and Oils; Purifying and Decolorising —— (P) 1338
Resins, Oils, or Fats; Refining of —— (P) 625
And H. Resin Size; Manufacture of —— (P) 870
Armingeat, P. *See* Darzens, G. 112
Armstrong, E. F. *See* Fischer, E. 1302, 1302, 1302, 1302
Armstrong, H. E., and Lowry, T. M. Persulphuric Acids..... 913
Armstrong, J. Metals; Smelting and Refining Volatile —— (P) 1538
Zinc and other Volatile Metals; Obtaining —— (P) 917
Zinc, Cadmium, or Antimony; Smelting or Refining —— (P) 1281
Armstrong, W. T. Ores; Apparatus for Assaying —— (P) ... 710
Arnaud. Tartaric Acid: Constitution of —— 413
Arndt, K. Calcium: Extraction of Metallic —— 1459
Arndt, L. Free Alkali in Presence of Nitrites: Titration of —— 1099
Arnu, McKenzie. Granite: Artificial —— (P) 257
Arnold, C. Kipp's Apparatus: Modification of —— 498
And Mentzel, C. Formaldehyde; Detection of —— 725
And Mentzel, C. Ozone; Old and New Reactions of ——. 640
And Mentzel, C. Ozone: Reactions and Preparation of —— 1297
Arnold, J. Disinfecting Apparatus for Drains, &c. (P) 925
Arnold, J. O., and M'William, A. Steel: Microstructure of Hardened —— 861
Arntzenius, R. H. *See* Verheggen, W. J. H. 717
Arper, G. W. Oil-Burner (P) 1227

PAGE

Arpin, M. Gluten in Flour; Determination of Moist... 1417, 1560
Arzt, H. *See* Tourle, A. B. ... 907
And Wilding, E. Yeast Powder (P) ... 924
Aschman, C. Phosphoric Acid in Thomas Slag: Determination of Total — ... 929
Phosphorus in Thomas Slags; Determination of Total — ... 1196
Aschner, F. H. *See* Christen, F. ... 1226
Ash, A. J. Spelter-Furnace (P) ... 978
Ashcroft, E. A. *See* Swinburne, J. ... 349, 351, 411, 482
Ashley, H. E. *See* Fay, H. ... 617
Ashton, N. T., and others. Cement: Manufacture of Portland or Hydraulic — (P) ... 915
Ashwell, J. H. Yarn: Treatment or Finishing of — (P) ... 1393
Ashworth, A. Starch; Production of Soluble — (P) ... 1288
Ashworth, E. *See* Lindley, J. ... 340
Ashworth, J. R. Drawn Steel; Researches on — ... 774
Aspinwall, H. C. *See* Wilkins, M. P. ... 498
Stability Tests for Smokeless Powder and Nitro-Explosives 687
Astruc, A. Sodium Methylarsenite; Alkalimetric Titration of — ... 500
And Murco, H. Perchloric and Periodic Acids ... 1352
Atherton, T. *See* Bleckly, H. S. ... 1226
Atkins, G. J. Electrolytic Apparatus (P) ... 779
Atkinson, J. *See* Crossley, W. J. ... 1388
Atmospheric Products Co. Gases; Subjecting — to High Tension Electrical Discharges (P) ... 1282
See Bradley and Lovejoy ... 1335, 1335
Atwater, S. I. *See* Harris, C. B. ... 1270
Atwood, L. Hydro-Extractor; Continuous — (P) ... 761
Paper or Pulp-Board Making Machine (P) ... 788
Aubert, A. B. Milfoil; Essential Oil of — ... 1552
Auchy, G. Molybdenum in Steel: Determination of — ... 562
Silicon in Steel: Determination of — ... 71
Auerbach, J., and Gubing, F. Lamp: Enclosed Electric Arc — (P) ... 964
Aufort, A. Kilns for Ceramic Articles; Tunnel — (P) ... 1139
Aufsberg, C. Eggs; Preservation of — (P) ... 492
Auger, V. Glycerosarsenic Acid ... 272
Auman, H. E. Furnaces; Smelting — (P) ... 775
Auwers, K., and Huber, L. Pseudophenols from Salicylaldehyde and Salicylic Acid ... 286
Aynsley, J. and H. *See* Critchlow, J. ... 347
Ayres, E. W. Alimentary Product; Production of — (P) ... 492

B

Babé, J. L., and Tricart, A. Zinc; Extraction of — (P) ... 1142
Bach, A. Hydrogen Peroxide: Behaviour of Chromic Acid towards — ... 502
Hydroperoxides; Existence of Higher — ... 285
Hydrotetroxide and Ozonic Acid ... 1417
See Chodat, R. ... 1561
Bach, C. von. Bronze: Influence of Temperature on Strength of — ... 348
Bachelard, A. *See* Grenet, P. ... 48, 171
Bacher, P. Cupola Furnace (P) ... 1538
Bachrach, D. Nitrocellulose; Protected — (P) ... 366
Back, J. Paper and Cardboard: Method and Composition for Impregnating — (P) ... 493
Badische Anilin und Soda Fabrik. Alkali Hydrosulphites; Solid — (P) From Bazlen ... 1393
Aromatic Hydrocarbons and their Derivatives; Oxidation of — (P) ... 35
Aromatic Radicles in Fatty Amines: Substitution of — (P) ... 1452
Chloro-amino Phenolsulphonic Acid, and Colouring Matters therefrom (P) ... 43
p-Chloro-*o*-Salicylic Acid, and Disazo Dyestuff Derived therefrom (P) ... 402
Colouring Matter, Anthracene Blue to Green; Production of — (P) ... 42
Colouring Matter, Black, for Cotton; Manufacture of — (P) ... 43
Colouring Matters, Black and Blue; Products for Manufacture of — (P) ... 37
Colouring Matters, Blue; Production of — (P) ... 42
Colouring Matters; Production of —, on the Fibre (P) ... 37
Contact Bodies for Use in Catalysis (P) ... 548
Contact Bodies; Manufacture of — (P) ... 344
ω-Cyanomethylaniline and its Derivatives; Production of — (P) ... 170
ω-Cyanomethylanthranilic Acid Esters (P) ... 542, 542
Degumming Raw Silk in Textile Materials, with Mercerisation of the Cotton (P) ... 49
Dyeing Blue Shades with Sulphur Dyestuffs (P) ... 703
Dyestuff; Azo — (P) ... 338, 338
Dyestuff, Azo; Production of — (P) ... 402
Dyestuff; Azo Red — (P) ... 112
Dyestuff; Black Sulphide — (P) ... 249
Dyestuff, Black Sulphide; Production of — (P) ... 169
Dyestuff, Black Sulphur; Production of — (P) ... 170

PAGE

Badische Anilin und Soda Fabrik—*cont.*
Dyestuff, Blue, of the Anthracene Series; Manufacture of — (P) ... 42, 111
Dyestuff, Brown Substantive; Manufacture of — (P) ... 43
Dyestuff; Disazo — (P) ... 112
Dyestuff, Green Cotton; Production of — (P) ... 43
Dyestuff; Orange Lakes from a New Monazo — (P) ... 544
Dyestuffs, and Materials therefor; Manufacture of Sulphonated — (P) ... 42
Dyestuffs; Anthracene — (P) ... 1451
Dyestuffs, Anthracene, and Intermediate Products; Sulphonated — (P) ... 42
Dyestuffs; Anthracene —, and Manufacture thereof (P) From Bally ... 1182
Dyestuffs; Azo — (P) ... 701
Dyestuffs; Azo —, Capable of being Chromed on the Fibre (P) ... 1392
Dyestuffs; Azo —, for the Production of Lakes (P) ... 911
Dyestuffs; Azo —, for Wool (P) ... 1529
Dyestuffs; Azo — (P) From Schraube and Bucherer ... 856
Dyestuffs; Azo Mordant Dyeing — (P) ... 337
Dyestuffs, Azo; Production of — (P) ... 169
Dyestuffs; Azo Substantive — (P) ... 337
Dyestuffs; Azo Yellowish-Red — (P) ... 1529
Dyestuffs; Black Substantive — (P) ... 1529
Dyestuffs, Black Substantive, for Cotton; Manufacture of — (P) ... 43
Dyestuffs; Blue —, for Unmordanted Cotton (P) ... 43
Dyestuffs; Blue Sulphide — ... 856
Dyestuffs; Blue to Green Acid Anthracene — (P) ... 37
Dyestuffs; Brown Mordant — (P) ... 1451
Dyestuffs, Brown, Violet, and Blue Disazo; Production of — (P) ... 43
Dyestuffs; Brown-Violet Azo — (P) From Julius ... 1328
Dyestuffs, Brownish-Yellow Sulphide; Manufacture of (P) ... 967
Dyestuffs; Compound for Azo — (P) From Julius and Gunther ... 1530
Dyestuffs, Halogen Indigo; Manufacture of — (P) ... 401
Dyestuffs; Indigo —, for Transport (P) ... 1072
Dyestuffs of the Anthracene Series (P) ... 43
Dyestuffs of the Anthracene Series; Blue — (P) ... 911
Dyestuffs of the Anthracene Series; Production and Use of — (P) ... 910
Dyestuffs of the Anthracene Series; Production of — (P) ... 42
Dyestuffs of the Anthracene Series, Soluble in Water (P) ... 42
Dyestuffs on Vegetable Fibre; Printing of — (P) ... 342
Dyestuffs; Production of Sulphide — (P) ... 769
Dyestuffs; Red Azo — (P) ... 1451
Dyestuffs; Red Azo — (P) From Julius and Gunther ... 610
Dyestuffs; Red Disazo — (P) From Schraube and Voigtlander-Tetzner ... 1530
Dyestuffs, Red Mordant; Manufacture of — (P) ... 43
Dyestuffs; Substantive (Thiazine) — (P) ... 1529
Dyestuffs; Sulphide — (P) ... 249, 1391, 1392
Dyestuffs; Sulphide —, and Manufacture thereof (P) From Reubold ... 610
Dyestuffs, Sulphur; Production of — (P) ... 1327
Dyestuffs, Violet and Blue Disazo; Production of — (P) ... 43
Fibre; Reducing the Dyeing Properties of Animal — (P) ... 1532
Fibres; Printing Vegetable — (P) ... 1025
Indigo-diacetic Acid (P) From Seidel ... 769
Indigo; Halogen Compounds of Indoxyl and Bromine Derivatives of — (P) ... 38
Indigo; Manufacture of — (P) ... 38
Indigo; Manufacture of — (P) From Seidel ... 701
Indigo Printing on Wool, Silk, and Cotton (P) ... 50
Indigo; White Resist under — (P) From Stiegelmann ... 769
Indoxyl and its Derivatives (P) ... 1528
Indoxylic Acid and Indoxyl; Production of Mono Acid Derivatives of — (P) ... 38
Orange Lakes from a New Mono-Azo Dyestuff (P) ... 1451
Printing on Vegetable Fibres (P) ... 969
Raw Silk and Fabrics; Treatment of — (P) ... 473
Resists; Application of Hydrosulphites as — (P) ... 704
Scouring Raw Silk in Mixed Goods, with Mercerisation of the Cotton (P) ... 49
Sulphuric Acid; Manufacture of —, by the Contact Process (P) ... 146, 344, 772
Sulphuryl Chloride; Manufacture of — (P) ... 782
Tetra- and Poly-hydroxynaphthalenes; Production and Application of — (P) ... 42
White Reserve under Indigo on Unbleached Tissues (P) ... 342
Wool; Discharging Indigo-Dyed — (P) ... 342
Baechler, G. Filtering Apparatus for Milk (P) ... 1408
Baechlin, P. Acetone Oil: Manufacture of — ... 1271
Baermann, A. Sugar Juice: Obtaining Pure Concentrated — &c. (P) ... 59, 59, 1545
Sugar; Recovery of —, from Saturation and Defecation Muds (P) ... 59
Baese, C. Photo-Reliefs: Production of —, and Apparatus therefor (P) ... 1469
Baeyer, A., and Knorr, E. Methyl Esters of the True Nitrosophenols and ω-Nitrosophenol ... 1273
And Villiger, V. Dibenzalacetone and Triphenylmethane ... 607
And Villiger, V. Dibenzylideneacetone and Triphenylmethane ... 1326
And Villiger, V. Oxonic Acid: Characteristics of — ... 1301
And Villiger, V. Triphenylmethane and Concentrated Sulphuric Acid ... 853
Bagasse Pulp Co. *See* Lee, C. H. ... 1092

PAGE

Bahlsen, E. Alloys of Titanium and Iron 623
Baier. Lignite Gas; Firing with ——, for Pottery and Earthenware Kilns 244
Bailer, O. A. Rubber Substitute (P) 1239
Bailey, Dr. Effluents; Discussion on Manchester Bill for Discharge of —— 582
Bailey, G. H. Bronze containing Lead: Discussion on —— 532
Bailey, H. S. *See* Beam, A. M. 483
Bailey, J. W. White Lead; Apparatus and Method for Making —— (P) 1337, 1337
Bailey, T. Lewis. Bronze containing Lead: Its Corrosion, Erosion, and Structure 531
Proceedings of Annual Meeting 957
Bailly and Chauvin. Acetylene Generator (P) 1147
Bain. Caustic Soda and Bleaching Powder; Discussion on Electrolytic —— 451
Bain, J. A. *See* Quist, J. 909
Bain, J. W., and Hannay, C. Fruit and Vegetables; Preservation of —— (P) 786
Bain, T. F., and Hunt, J. O. Battery: Electric —— (P) 353
Bainville, A. H. Electrode for Secondary Batteries (P) 621
Baker, B. F. *See* Young, R. F. 1298
Baker, H. B. Hydrogen and Oxygen; Union of —— 428
Baker, J. H. Paper Mill Machinery; Blow-off Nozzle for —— (P) 870
Baker, J. L. Diastase: Action of Barley —— on Starch 1087
Sugar; Preparation of Invert —— in the Brewery 867
Baker, L. S. Furnaces; Heating —— (P) 852
Baker, T. T. Toning Bromide and Chloro-Bromide Papers ... 1195
Baker, W. D. Food Products: Preserving —— (P) 1291, 1291
Baker, W. J. Grease; Apparatus for Separating —— from Steam (P) 625
Balbiano, L. Petroleum: Examination of Italian —— 1229
And Paolini, V. Mercuric Acetate; Oxidations with —— .. 1293
Balcke, H. Cooling or Evaporating Apparatus (P) 904
Ball, W. C. Hydroxylamine; New Colour Reaction of —— ... 190
Ballardie, D. Lamps for Burning Paraffin Wax, &c. (P) 334
Bally, O. Anthracene Dye, and Manufacture thereof (P) 1182
Balthazard, V. *See* Desgrez, A. 185
Bamberg, G. Detergents; Manufacture of —— (P) 864
Bamberg, P. *See* Freund, M. 871
Bamberger, E. Azoxy Benzenes; Hydroxylated —— 854
And Witter, H. Formazylphenylketone; Obtainment of —— 467
Bamberger, M., and Landsiedl, A. Hops; Chemistry of —— .. 1190
Bamme, G., and Kahl, H. Coking Ovens; Turf —— 960
Banks, W. C. Battery; Construction of a —— (P) 621
Electric Battery (P) 979
Banning. Oxalic Acid; Formation of —— by Bacteria 1151
Barbet, E. Vinasses; Concentration of ——, in the Triple Effect 716
Barboutau, P. Printing Colours in Graduation on Paper, &c. (P) 341
Bardwell, A. F. Carburetter for Explosion Engines (P) 601
Bargellini, G. *See* Francesconi, L. 1327
Barger, G. Saponarin: a New Glucoside from Saponaria 637
Barham, H. K. P. Batteries: Storage —— (P) 1082
Barillé, A. Calcium Carbophosphate; Preparation of —— 406
Kissi Pepper; Analysis of —— 984
Barker, B. T. P. Saccharomycetes: Spore-Formation among the —— 556
Samsu; Preparation of —— 1289
Barker, J. H. and F. H., and Sheolin, G. F. Pulp-Screen; Centrifugal —— (P) 362
Barlow, E. H. Eggs; Preservation of —— (P) 1090
Barnard, D. Acetylene Gas Generator (P) 1527
Barnard, T. J. Sewage Sludge; Profitable Disposition of —— (P) 787
Barnes, A. *See* Brockes, J. W. 549
Barnes, J. *See* Riley, J. E. 1533
Barnes, W. H. *See* Pakes, W. C. C. 1344
Baroni, E. Creolin; Ordinary and Solid —— 1242
Barr, J., and Wilkinson, J. P. Bacteria Beds, Filters, &c.; Apparatus for Charging and Discharging —— (P) 717
Barraclough, A. and H. Textile Fabrics; Manufacture of —— (P) 546
Barratt, S. H. H., and The United Asbestos Co. Purifier for Waste Oil (P) 1336
Barreto, Baron V. Building Blocks, &c.; Manufacture of ——, and Apparatus therefor (P) 52
Barratt, C. E., and Horne, J. E. Paper-making Machine (P) . 272
Barrett, W. F. Iron; Increase of Electrical Resistivity caused by Alloying —— with various Elements, &c. 621
And others. Iron Alloys; Electrical Conductivity and Magnetic Properties of —— 411
Barrick, C. C. *See* Harris, C. R. 1233, 1233
Barry, T. J. *See* Busch, A. A. 1548
Barschall, H. *See* Sachs, F. 700
Bartlett, C. C. *See* Kellond, R. A. 152

PAGE

Bartlett, F. L. Furnace for Refining Lead and Zinc Fume (P) 351
Bartlett, H. *See* Wood, W. 264
Bartlett, J. F. Fuel; Waterproof Artificial —— (P) 1526
Baseler Chem. Fabrik. Anthranilic Acid; Preparation of —— (P) 790, 791
Baskerville, C. Hydrochlorated Sulphates 272
Phosphoric Acid; Rendering —— Available 1519
Basle Chemical Works. Azo-dyestuffs; Manufacture of Substantive —— (P) 855
Dyeing Fibres and Textiles with Sulphur Dyestuffs (P) .. 50
Dyestuffs; Azo Substantive —— (P) 1529
Dyestuffs; Disazo-, Trisazo-, and Polyazo-: Manufacture of —— (P) 39
Dyestuffs; Green Sulphurised —— (P) 542
Dyestuffs of the Phthalein Series (P) 338
Dyestuffs; Yellowish-Orange Basic —— (P) 1528, 1529, 1529, 1529
Fibre; Developing Sulphur Dyestuffs on the —— (P) 50
Indophenols; Manufacture of Sulphurised —— (P) .. 1024, 1024
Sulphonic Acids, and Azo Colouring Matters therefrom (P) 1274
Basse, E. Antimony; Metallurgical Treatment of ——, and Apparatus therefor (P) 1537
Bastian Meter Co. and Bastian, C. O. Electrodes and Electrolytic Apparatus (P) 352
Bataille, E. Extraction Apparatus (P) 1460
Batchelder, C. S. Muffle Furnace for Assaying (P) 1557
Bate, W. Explosive Compounds for Blasting Purposes (P) ... 562
Bateman, A. E. Industry and Commerce; Comparative Statistics of —— 1107
Bates, D., and Peard, G. W. Metals; Annealing of —— (P) .. 482, 976
Battandier. Thymol; New Source of —— 1551
Battistini, Orengo, and Co. Fuel for Furnaces; Treatment of —— (P) 762
Battistini, T. Combustion; Fluid for Promoting —— (P) 908
Bau, A. Beer; Chemical Diagnosis of Pasteurised —— 207
Melibiose; Research on —— 286
Baud, E. Aluminium Chloride: Compounds of —— with Alkali Chlorides 51
Aluminium Chloride; Compounds of —— with Hydrogen Sulphide 995
Baudet, C. J. Elevator Buckets: Openwork —— (P) 921
Baudoin and Schribaux. Wines; Concentration of —— 1089
Baudry, A. Sugar Juice; Purification of —— (P) 1406
Baudry d'Asson, A. de. *See* Brandel, F. de 782
Bauer, E. Molasses; Manufacture of Alcohol from —— 1290
Bauermeister, A. Colour Filters for Photography (P) 1038
Bauke, F., and Fuchs, C. Gas; Apparatus for Use in Generating —— (P) 1446
Baumann, A. Boilers for Asphalt, &c. (P) 1139
Baumert, P. *See* Wollheim, H. 1390
Baur, A. Orthotoluene Sulphochloride; Separation of —— (P) 864
Baur, E. Cerium Peroxide 720
Oxygen: Report on Means for Rendering —— Active 195
Bauschlicher. *See* Juergensen 540
Baxter, G. P. Phosphoric Acid; Determination of —— 1351
Bay, I. *See* Vignon, L. 1503
Bayer, F., and Co. Anhydrides of Organic Acids; Manufacture of —— (P) 51
Anthracene Derivatives containing Nitrogen; Manufacture of —— (P) 40
Anthracene Dyestuffs; Production of —— (P) 471
Anthracene Series; Derivatives of the —— (P) 40, 40
Anthraquinone Derivatives (P) 1451
Anthraquinone Derivatives containing Nitrogen (P) 609
Atropinium Alkyl Nitrate (P) From Dreser and Callsen . 1194
Bath; Photographic Fixing —— (P) 1554
Carbamic Ethers; Production of —— (P) 364
Celluloid-like Compositions and Photographic Films (P).. 873
Celluloid-like Substances (P) 1469
Cellulose; New Derivatives of —— (P) 870
Colouring Matters, Azo; Production of —— (P) 41
Cotton Fibre; Preventing the Weakening of Dyed —— (P) 349
Discharges on Cotton Dyed with Sulphurised Dyestuffs; Production of (P) 968
Discharges upon Sulphur Colours; White and Coloured —— (P) 114
Dyes, Fast Ingrain; Production of —— (P) 50
Dyestuffs and Intermediate Products; Manufacture of —— (P) 41
Dyestuffs and Intermediate Products; Manufacture of New Azo —— (P) 41
Dyestuffs; Anthracene —— (P) 401, 544, 701
Dyestuffs; Basic Indole —— (P) 112
Dyestuffs, Blue, derived from Anthraquinone; Manufacture of —— (P) 40
Dyestuffs Derived from Anthraquinone (P) 402
Dyestuffs, Green, derived from Anthraquinone; Sulphonic Acids of New —— (P) 40
Dyestuffs, Green, of the Anthraquinone Series (P) 40
Dyestuffs, Sulphide; Production of —— (P) 402
Dyestuffs, Sulphur; Printing with —— (P) 406
Dyestuffs, Violet; New Basic —— (P) 41
Fibres Dyed with Cotton Colours; Preventing the Tendering of —— (P) 50
Flash Lights for Photography (P) 792

PAGE

Bayer, F., and Co.—*cont.*
Glycollic Menthyl Ester (P) From Hofmann and Callsen. 1195
Halogen Derivatives of the Anthracene Series (P)..... 112
Pharmaceutical Compounds; Production of —— (P)..... 1153, 1410, 1468
Photographic Developer (P) From Eichengrun..... 1349
Photographic Developers (P)..... 872
Photographic Developers; Preparation and Employment of —— (P)..... 723, 872
Photographic Developers; Production of —— (P)..... 68
Photographic Pictures; Development of —— (P)..... 872
Photographic Plates or Papers (P)..... 1411
Pyrotechnic Compound (P) From Eichengrun..... 1349
Resist on Tissues Dyed with Sulphur Colours (P)..... 969
Salicylic Acid; Alkyloxymethyl Ester of —— (P) From Callsen..... 1154
Soil Bacteria; Inoculating the Earth with —— 179
Bayldon, O. H., and Morriss, H. E. Generators for Oil-Gas (P) 161
Bazlen, M. Alkali Hydrosulphites; Manufacture of Solid —— (P)..... 1393
Aromatic Aldehyde and Acid; Manufacture of —— (P) .. 722
Hydrosulphites; Manufacture of —— (P)..... 346
Bazley, W. H. Acetylene Gas Generator (P) 765
Beadle, A. A. Copper; Deposition of —— from Various Electrodes..... 178
Beadle, C. Beating; Theory and Practice of —..... 1036
Rags for Paper-making; Treatment of —— 63
Beam, A. M. Ore-roasting Apparatus (P) 1400
And Bailey, H. S. Furnace for Treating Ores (P)..... 483
Beaven, E. S. Drying Malt, Hops, &c., and Apparatus therefor (P)..... 182
Furnace Gases; Purification of —— (P)..... 268
Beck, C. W., and Homan, W. G. Acetylene Gas Generator (P) 1325
Beck, N., and Dior, R. Carburetted Air; Preparing and Utilising —— (P)..... 1021
And Dior, R. Vapour Burners for Lighting and Heating (P) 1067
Beck, P. Cement; Modification of Schumann's Apparatus for Determining Specific Gravity of —..... 69
Portland Cement and Slag; Experiments on Mixtures of —..... 72
Becker. Electrolyser for Extraction of Light Metals (P)..... 1539
Becker and Co. *See* Brown, J. 1232
Becker, A. *See* Renard, R. 1333
Becker, F. H. Glass-Gall; Utilisation of —— (P)..... 1077
Becker, W. *See* Eck, T. 516
Beckmann, E. Fusel Oil in Alcoholic Liquids; Determination of —..... 193
Honey-Dextrin; Characteristics of —..... 189
Beckstroem, R. *See* Thoms, H. 1295, 1295
Becquerel, H. Uranium; Radio-Activity of —..... 143
Bedall. Cod-Liver Oil; Kremel's Test for —— 1099
Bedford, J. E. Address to Yorkshire Section..... 1520
Bedford, R., jun. *See* Smith, J. L. 351
Bednarski, B. *See* Wróblewski, A. 266
Beebe, D. Racking Apparatus (P) 1343
Beebe, M. C. Lamps; System of Distribution for Nernst Electric —— (P) 606
Begeer, B. W. Metals; Cyanide Process for Extracting Precious —— (P) 482
Behaghel, W., and Buchner, E. 4-Pyrazole Carboxylic Acid from 4-Phenylpyrazole..... 248
Behm, J. Oil- and Air-mixing and Gas-generating Apparatus (P)..... 1068
Behrend. Alcohol as a Source of Motive Power..... 1019
Behrend, P. Maize Mashes; Removal of Husks from —— 131
Behrend, P., and Wolfs, H. Butter Fat; Relation between Constants of —..... 1148
Behrend, S. K. Steel-Convertor (P) 977
Behrens, H. Anthracene; Detection of Chief Impurities of —..... 1250
Metals of the Cerium Group; Characteristics of —..... 368
Beissel, C. W. Water; Apparatus for Softening and Purifying —— (P)..... 1242
Beitter. Caffeine; Occurrence of —— 135
Bell, A. E. Turmeric; Detection of —— 1559
Bell, A. J. and P. A. G. Water; Apparatus for Use in Purifying —— (P)..... 1292
Bell, G. *See* Hollings, A. 904
Bell, G. W. Electrolytic Cells or Apparatus (P) 778
Belledin, V. E. Puncture-proof Elastic Material (P)..... 1189
Bellis, T. K. *See* Andrew, T. 619
Belloc, G. Iron and Steel; Thermo-Electricity of —— 177
Steels and Ferro-Nickels; Thermo-Electricity of —..... 177
Beltzer, F. Aniline Black; Dyeing Cottons with —— 770
Mercerising Cotton Yarns under Tension 493
Belzer, F. Tanning Materials; Commercial Valuation of —. 643
Bemont, G. Alchohol, Amyl-; Fermentation of —— 182
Benade, C. *See* Ulrich, A. 1452
Bender, W. Evaporating Apparatus (P)..... 1267
Benedicks, K. Steel and Iron; Electrical Resistance of —— . 1031

PAGE

Benjamin, A. A. *See* Bleachers' Association..... 1328
Benjamin, G. H. Diethyl Ether; Preparation of —— (P).... 364
Benjamin, O. C. *See* Clawson, F. E. 698
Bennett, C. T. *See* Umney, J. C. 1151, 1152
Bennett, F. E. Heat; Apparatus for Effecting Exchange of —— between Fluids (P) 326
Bennett, J. F., and Moorwood, H. S. Carburettor for Oil-Gas Engines (P)..... 1068
Bennett, W. R. Steel; Hardening and Tempering of —— (P) 259
Bentley, H. A. Composition for Coating Surfaces other than Canvas (P) 488
Benz, E. Thorium in Monazite Sand; Determination of —. 563
Béranger, L. *See* Freundler (P) 429
Berendes, R. *See* Eichengrun, A. 791
Berg, E. von. Phosphates of Rubidium and Cæsium..... 116
Berg, R. Beeswax; Influence of Bleaching upon —— 1032
Berges, M. Papers; Photographic Printing (P)..... 139
Berget, A. Paper Pulp from Crude Plants..... 64
Bergfleth, H. Furnaces; Arrangements in —— (P)..... 1226
Berhenke, C. Bricks and Earthenware; Drying —, and Apparatus therefor (P)..... 1028
Bermont, V. Zinc; Direct Extraction of —— (P)..... 1457
Bernfeld, J. Asbestos Diaphragms; Treatment of —— (P)... 1148
Bernheimer, O., and Schiff, F. Japan Wax; Abnormal Constants of —..... 55
And Schiff, F. Potassium Ferrocyanide in Spent Gas-Purification Material; Determination of —— 500
Bernholt. Ammonium Persulphate "Reducer" 791
Bermeck, R. M. von. *See* Kranss, C. 859
Bernstein, M. Milk; Optical Examination of —— (P) 1475
Berntrop, J. C., and Hulsebosch, M. L. Q. van L. Solid Combustible; Manufacture of —— (P) 1323
Berrigan, J. J. Centrifugal Machine (P) 597
Extraction Apparatus; Centrifugal —— (P) 244, 244, 244
Berry, A. Tank for Precipitating —— (P) 482
Berry, A. E., and Roberts, A. B. Finings; Improvement in —— (P) 1343
Berry, C. H. Lubricating Compound (P) 712
Berry, G. F., and Lawes, J. B. Heat Non-conducting Compositions (P) 1064
And Lawes, J. B., and Co. Carbonic Acid Gas; Recovery and Utilisation of Waste —— (P) 548
And Lawes, J. B., and Co. Cements, Bricks, and Artificial Stone (P) 550
Berry, W. Soap; Apparatus for Inserting Floats in Cakes of —— (P) 555
Soap Mould (P) 555, 555
Bersch, W. Peat; Determining the Value of —— 1445
Berthelot. Pottery; Old Egyptian —— 1139
Radium; Studies on —— 143
Bertolo. Artemisin; Characteristics of —..... 926
Bertram, D. N., and Milne, S. Gutta-Percha; Manufacture of —..... 1188
Bertram, W. Di-*o*-dinitrodiphenylmethane and Di-*o*-dinitrobenzophenone..... 766
Bertrand, E. Blast-Furnace (P)..... 977
Bertrand, E. G. Paint; "Asol"— (P) 1146
Bertrand, G. Arsenic; Existence of —, in the Organism.... 995
Boletol; Extraction of — from Mushrooms 182
Bertrand, H. V. Iron; Coating —— with Tin and other Metals (P) 354
Bertrand, L. Coke; Apparatus for Quenching —— (P) 1179
Beschorner, A. *See* Duflek, A. 697
Besemfelder, E. R. Ammonia; Manufacture of —— from Sugar Waste (P) 254
Gas from Cellulose Factory Waste-Liquors 1192
Besson. Sugar Juices; Concentration of —..... 1239
Sugar Juices; Treating —— with Aluminium Powder and Ammonium Sulphite 173
Sugar Juices; Treatment of —..... 416, 866
Besson, A. Sugar Juices; Defecating and Decolorising —— (P) 1545
Besson, J. Sugar Juices; Decolorising and Purifying —— (P) 58
Besson, J. R. Sugar Juice; Defecation of —— (P)..... 1406
Best, C. J. Ores; Treatment of —— (P)..... 916
Best, D. Carburetter (P)..... 754
Best, W. N. *See* Cooper, W. A. 1227
Bethmann, G. Wool and other Fibres; Production of Aniline Black on —— (P)..... 50
Bettink, H. Wefers. *See under* Wefers.
Betts, A. G. Anode Residues; Treatment of —— (P) 1541
Lead; Electrolytic Refining and Depositing of —— (P)... 980
Betzel, W. F. Carburetting Apparatus (P) 1180
Bevois Patent Lighting Co., The. *See* Powers, V. 34
Beythien, A. Cocoa and Milk; Sterilised —..... 420
And Bohrisch, P. Fruits; Presence of Sulphites in Dried —..... 786
Bezognard de la Plante. Unbreakable Incandescence Mantle (P) 1448

PAGE

Bial, M. Hydrogen Ions of Dilute Acids; Antiseptic Function of the —— 1034
Biedermann, R. "Technisch-Chemisches Jahrbuch, 1899"... 729
"Technisch-Chemisches Jahrbuch, 1900"..... 1477
Biehringer, J., and Busch, A. *p*-Tolnidine; Colour Reaction for —— 1539
And Topaloff, W. Thiopyromne: Characteristics of —— . 966
Bielefeldt, M. Detonating or Priming Compositions (P) 639
Detonators: Priming Compositions for (P) 1246
Biewend, R. Cadmium and Zinc: Detection of —..... 1319
Bigelow, L. G. Photographic Flash-light Machine (P) 699
Biggart, Levan. Discussion on —— 1385
Biheller, S. Burner for Use with Incandescence Mantles (P). 698
Bijvoet, A. F. J. S. Verheggen, W. J. H. 717
Bildt, C. W. Iron: Cementation of Wrought —— 708
Billet, Alcide. Production of ——, and Apparatus therefor (P) 1547
Billington, C. S. Newton, O. B. J. 1457
Billitzer, J. Acetylene: Acid Nature of —— 995
Acetylene: Electro-Chemical Studies on —— 796
Carbon: Formation of Ions of —— 986
Mercury, &c.: Electrical Preparation of Colloidal —— 932
Billon. *See* Mathieu 1247
Biltz, H. Phototropy: New Investigations in —— 1348
Binder, F., and Frossard, J. Reserves on Prud'homme's Aniline Black 1453
And Frossard, J. Resists under Aniline Black 1182
Bindschedler, E. Mercury: Electrolytic Determination of —— 873
See Le Blanc, M. 776
Bing, A., and Rung, F. Indigo Dyeing: Theory of —..... 1229
And Rung, F. Indigo on Vat-dyed Fibres; Determination of —— 930
Biot. *See* Seyewetz 766, 1071
Birchmore, W. H. Liquids; Preservation of —— (P).. 1548, 1548
Bird, C. S. Paper: Manufacture of —— (P) 1243
Roofing Fabric, and Preparation of same (P)..... 257
And Hanscom, J. B. Paper; Waterproofing of —— (P).. 1345
Bischler, A. Phthalic and Benzoic Acids: Manufacture of —— (P) 988
Bischoff, F. Iron: Analysis of —— 1299
Bishop, D. W. Acetylene Gas Generators (P) 762, 763
Bishop, F. J. Fireworks: Sparkling —— (P)..... 276
Bisseuil. Oils: Apparatus for Emulsifying Pharmaceutical —— 1553
Bjoerckner, C. H. Blast-furnace Stoves: Air Mixer and Heater for Gas-Burners for —— (P) 865
Bjornrud, E. Acetylene Gas Generator (P)..... 604
Blachier, J. Molasses and Sugar Juices; Purification of —— (P) 629, 920
And Rouilloux, L. Animal Black; Revivification of —— (P 60
Blackmore, H. S. Alloys: Reducing Metals and Producing —— 776
Gas-purifying Agents; Manufacture of —— (P) 603
Sulphuric Anhydride: Manufacture of —— (P) 914
Blair, H. T. Lamp; Incandescence —— (P)..... 852
Blake, F. Matches, Machines for Making —— (P) 366
Blake, F. C. Carburetting Apparatus (P) 460
Blake, J. C. *See* Gooch, F. A. 1474
Blake, M. *See* Lang, J. 1189
And Smart, R. H. Vacuum Pans Heated by Steam Worms (P)..... 416
Blakely, H., and Wright, J. M. Roofing Material: Chemical —— P)..... 348
Blakeman, W. N., jun. Oils; Drying and Treating Non-drying —— (P) 681
Blakey, J. W. Gas-Burners; Incandescence —— (P) 333
Blanchard, A. Burners: Hydrocarbon Vapour —— (P)..... 1227
Blanitza, L. F. de, and Herard, J. Gas; Apparatus for Manufacture of —— (P)..... 961
Blanksma, J. J. Trinitroxylenol: The Symmetrical —..... 505
Blau, F., and others. Lamps; Manufacture and Repair of Electrical Glow —— (P) 34
Bleachers' Association and others. Oxycellulose in Textiles: Reducing —— and Removing Stains from — —(P) ... 1528
Bleakly, H. G. *See* Clark, C. C. 1322
Bleckly, H. S., and others. Furnaces: Apparatus for Charging and Distributing (P) 1226
Blitz, A. B. Artificial Marble; Manufacture of —— (P) 1078
Blockey, T. Aubergin. Tanning Materials: Analysis of some New —— 158
See Procter, H. R. 1100
Blondeau. *See* Collignon 1534
Blossier, A. C. India-Rubber: Manufacture of Sheet —— (P) 1188
Bloume, L. Refrigerating Process and Apparatus (P) 760
Blount, B. Steel: Determination of Carbon in —— by Direct Combustion 278
See Stanger, H. 1216
Bluhm, C. A. Gas Burner: Incandescence —— (P)..... 464

PAGE

Blum, E. Ammonia Liquor Distillation: Use of Lime in —— 167
Blum, F. Glycosuria Antidote, and Production thereof (P).. 1154
Blum, G. *See* Lefèvre, C. 1525
Blum, L. Blast-Furnace Slags: Composition of —— 118
Blyth, M. Wynter. Milk: Detection of Colouring Matters in Fresh and Sour —— 794
Boas, F. Stone; Artificial —— (P)..... 1233
Bock, C. J. A. de. Milk and Butter: Sterilising and Pasteurising —— (P)..... 492
Bock, J. Sulphate of Alumina; Manufacture of —— (P)..... 1027
Bocks, E. Dyeing Yarns, &c.: Process and Apparatus for —— (P) 1532
Bocuze, A. Mould for Glass-Works (P)..... 1330
Bodart, A. Heptacetylchlorlactose: Preparation of —— 506
Bodin, E., and Pailheret, F. Alcoholic Fermentation; Action of —— on Typhoid Bacillus and B. Coli Commune.... 1147
Bodländer, G. Hydrochloric Acid and Nitric Acid: Relative Strengths of —— 251
And Storbeck, O. Cuprous and Cupric Ions..... 1282
Boecker, T. *See* Stephani, O. 1097
Boegel. Tanning Materials: Apparatus for Extraction of —— (P) 1405
Boehm, C. R. Carbons for Arc Lamps (P)..... 1129
Rare Earths: Production of —— from "Cerium Oxalicum Medicinale" 719
Boehm, F. "Olive Oil: Its Source, Production, Character and Uses" 145
Boehringer, C. F., und Soehne. Alkoxy-Caffeine (P) From Ach 1194
Aromatic Nitro-Compounds: Reduction of —— to Amines (P) 169, 260
Camphoric Acid Derivatives; Manufacture of —— (P)... 872
Diacetyldiamine (P) From Ach..... 1245
Dyestuff; Triphenylmethane —— (P) From Ach 1182
Hydroxylamine; Electrolytic Preparation of —— (P).... 1458
p-Methylaminophenylglyoxylic Acid (P) From Ach..... 1245
Thioxanthine; Preparation of —— (P)..... 424
Thioxanthines: Production of —— (P)..... 188
Xanthine Homologues: Preparation of —— (P)..... 68, 424
Boemer, A. Oils, Vegetable, in Animal Fats: Detection of —— 192
Boeniger, M. Dyestuff: Brown Sulphur —— (P)..... 1530
Boerner, F. *See* Nicolai, O. 1081
Boes, J. Indole: Occurrence of —— in Molasses Tar..... 429
Naphthofurfurane in Coal-Tar..... 964
Methylindenes from Coal-Tar..... 853
Boesch, B. W. Cellulose Acetate; Manufacture of —— (P).. 1243
Cellulose Esters; Purification of —— (P) 1243
Bohrisch, P. *See* Beythien, A. 786
Boisse. Oil of the Atlas Cedar: Constitution of —..... 1153
Boistelle. Gases: Device for Measuring and Mixing —— (P) 1445
Boivie, G. C. F. Artificial Stone; Manufacture of —— (P)... 257
Boivin. Lamp; Incandescence Spirit —— (P). 1390
Bokoroy, T. Yeast Invertase: Experiments on ——..... 1086
Bolio, C. Manganese in Ferro-Manganese and Spiegel: Determination of —— 1414
Bolton, T. B., and McNeil, J. Soap Frames or Moulds (P)... 1032
Bolton, W. v. Chlorine: Direct Combination of — — with Carbon..... 483
Bolze, H. *See* Nathan, L. 191
Bommarius, F. Filter for Water (P) 1345
Bonati, A. Dyestuff; Sulphide —, and Manufacture thereof (P) 610, 610
Bondi, S. Sericin (Silk Glue); Preparation of —— 610
Bonds, G. W. Gas-Generator for Gas-Engines (P)..... 600
Bone, G. *See* Clark, W. W. 109
Bonelli, G. A. Burner: Hydrocarbon Luminous Flame —— (P) 603
Bonna. *See* Reynaud..... 1406
Bonnaud, J. B. G. Nitrocellulose Compounds (P)..... 487
Bonnefis. Acetylene Generator (P) 1447
Bonnet, G. A. Burners: Hydrocarbon —— (P)..... 330
Bonnet, J. Explosives: Production of —— (P)..... 639
See Mueller, J. L. 461
Boorsma, M. G. Strychnicine: Preparation and Properties of — 1095
Boot, T. C. Syrups and Molasses: Decoloration of —— (P) .. 358
Booth, W. Oil-Burner for Furnaces (P) 698
Borchers, W. Zinc Ores and Waste Products; Treatment of —— 975
See Nernst, W. 1477
And Stockem, L. Calcium: Production of Metallic —.. 1284
And Stockem, L. Strontium: Electrolytic Separation of Pure —— 1284
Bordas, F., and Raczkowski, S. de. Lecithin in Milk; Determination of —— 1041
Borgnino, G. C. Tyrosin and Tyrosinase..... 180
Bormann, J. G. L. Fuel: Combustion of —— in Furnaces (P) 1126
Water-Gas; Production of —— (P) 163

PAGE

Born, A. Oil and Fat; Removal of —— from Wool, Hair, &c. (P) 405
Borner, J. Wood: Apparatus for Impregnating —— (P) 1028
Borntraeger, H. Peat; Rapid Technical Analysis of ——..... 75
Saccharine Syrup, &c., from Light-coloured Peat; Composition of —— 265
Borrelly, A. Acetylene Gas; Apparatus for Generating —— (P) 1323
Borrowe, W., and Lumley, J. Plastic Materials; Machine for Moulding —— (P) 348
Bose, J. C. Photographic Action: The Strain Theory of ——. 988
Boss, M. P. Iron Blast Furnace (P) 1400
Bosshardt, E. Furnace for Melting Metals (P) 915
Bottum, E. H. *See* Walker, J. H. 776
Bouchardt, G. India-Rubber; Artificial ——, from Isoprene. 56
Bouchaud-Praceiq, E. Carburetting Apparatus (P) 1324
Boudouard, O. Alloys of Aluminium and Magnesium 258
Alloys of Cadmium with Magnesium 976
Alloys of Copper and Magnesium. 1456
Bouffard, A. Wine; Action of Sulphurous Acid upon Oxydase and Colouring Matter of Red —— 922
Bougault, J. Morphine; Oxidation of ——, by Juice of Russula delica 926, 1095
Boulanger, H. Leather; Examination of Chrome —— 919
Leather for Industrial Purposes; Examination of —— 783
Boullier. Threads for Making Incandescence Mantles (P) ... 1448
Bounaud, J. B. G. Pyroxylin Compound (P) 625
Bourcart, P. Mercerising; Conditions of —— 403
Mercerising Vegetable Fibres, and Apparatus therefor (P) 171
Bourgoin, G. E. *See* Lavolay, J. H. 190
Bouriou, F. Manganese and Cobalt Chlorides; Compounds of Alcohol with —— 505
Bourn, A. O. India-Rubber; Vulcanising —— (P) 626
Bournonville, E. Acetylene Gas Apparatus (P) 1526, 1526
Bourquelot, E., and Hérissey, H. Gentian Root; Sugars Present in —— 1553
And Hérissey, H. Gentiobiose; Action of Soluble Ferments and Top-Fermentation Beer Yeast on —— 1251
And Hérissey, H. Gentiobiose; Preparation and Properties of Crystallised —— 1159
And Hérissey, H. Gentiobiose; Preparation of —— 1553
Boutellier, G. Diffusion Apparatus (P) 920
Bouton, G. *See* De Dion, A. 260
Bouvier, M. Oxides; Production of Alkali and Alkaline Earth —— (P) 1458
Sulphides; Production of Alkali and Alkaline Earth —— (P) 1458
Bouzat. Ammoniacal Cupric Oxide; Displacement of Strong Bases by —— 970
Copper Oxide; Ammoniacal —— 932
Cupric-Ammonium Chlorides; Anhydrous —— 1158
Bowen, W. R. Soap Cake (P) 981
Bower, C. J. *See* Steele, E. 1155
Bowman, C. M. Matches; Rendering —— Safer (P) 1195
Bowman, D. W. Gas or Vapour Heating Devices (P) 599
Bowman, F. E. *See* Oswald, T. R. 34
Boyden, C. I. Maltose and Lactose; Quantitative Separation of —— 1416
Boyen, E. von. Wax; Manufacture of Mineral —— (P).. 246, 246
Boyer, E. Ores; Concentration for Enrichment of —— (P)... 1333
Boyle, L. C. Furnaces for Burning Liquid Fuel (P) 905
Boyne, T. A. Paper-making Machine (P) 1550
Brabrook, G. H. Soft Metal Castings; Production of —— (P) 977
Bradburn, J. A. Ammonia Soda Process; Some Parts of —— Open to Improvement (P) 689
Bradbury, S. Washing Calico Printers' Blanketing, and Means therefor (P) 250
Bradford, E. T. Furnace; Hot Blast —— (P) 1141
Bradley, C. S., and Lovejoy, D. R. Gases; Apparatus for Subjecting —— to High-Tension Discharges (P) 1335
Nitrogen Compounds; Manufacture of —— (P) 1335
Bradley, F. E. Malt; Drying —. Preventing Contamination with Arsenic (P) 868
Bradley, P. B. Fuel; Apparatus for Using Dust —— (P).... 1524
Fuel; Furnaces for Burning Pulverulent or Dust —— (P) 1126
Brakes, J. Molybdenum; Volumetric Determination of —— in Molybdenum Steel and Ferro-Molybdenum 832
Brame, J. S. S., and Lewes, V. B. Carbides of Manganese and Calcium: Production of Mixed —— 755
Bramson, M. Petroleum Incandescence-Light Burner (P)... 1271
Branch, J. G. Lamp; Incandescence Hydrocarbon —— (P). 964
Lamps; Apparatus for Distributing Hydrocarbon under Pressure to —— (P) 698
Brand, J. C. *See* Lockerbie and Wilkinson, Ltd. 961
Brand, K. *See* Elbs, K. 1334, 1334
Brandel, F. de, and Baudry d'Asson, A. de. Colours and Inks; Manufacture of ——, and Product therefor (P) 782
Brandenburg, H. Metals and Metallic Compounds; Recovery of —— (P) 976
Brandon. Pseudocymopterus anisatus; Essential Oil of ——. 1552

PAGE

Brandt, C. Tanning; Rapid —— (P) 57
Brandt, W. S., and Root, F. J. Wood-Alcohol Manufacture of —— (P) 1527
Braugier, P. A. *See* Magnier, P. 632, 1411
Branson. Arsenic Determination in Malt Liquors. Discussion on 903
Brasington, W. W. Paint: Composition of —— (P) 1544
Braucke, W. von. Galvanising Wire (P) 1537
Braun, C. *See* Lang, A. 1034
Braun, F. W., and Co. *See* Calkins, A. C. 1538
Braunfels, L. Zinc Ores; Reduction of —— (P) 1281
Braunstein, J. Incandescence Gas-Burners (P) 1446
Bray, J. W. Burners for Acetylene Gas (P) 164, 1179
Breakell, T. Grinding and Pulverising Mill (P) 596
Brearley, H., and Ibbotson, F. "The Analysis of Steel Works Materials" 1251
Brearley, J. H. Furnaces; Regenerative —— (P) 331
Bredel, F. Retort Gas-Furnace (P) 1324
Breedon, J. Metals; Extraction of Precious ——, and Apparatus therefor (P) 552
Bremer, H. Electrodes for Arc Lamps (P) 245
Lamp; Electric Arc —— (P) 964
Thermo-Electric Material (P) 1458
Brenans, P. Di-iodophenol: A New 1094
Brenner, J. von. *See* Pfister, J. 1231
Brett, C. G., and Henneberger, F. Gas-Lamps. Incandescence —— (P) 164, 697
Breuer, C. Air of Rooms: Purification of —— (P) 635
Brewer, H. J. Batteries; Zinc Element for Primary —— (P). 411
Briant, L. Mashing Operations; Modern —— 1240
And Rigaud, H. C. Beer; Manufacture of —— (P) 491
And Vaux, C. Drum Malting 180
Brice, E. C. Kiln for Burning Bricks, &c. (P) 860
Brieger, L., and Diesselhorst, G. Arrow Poison from German E Africa 1094
Briegleb, H. Sulphuric Anhydride; Manufacture of —— (P) 706
Briggs, L. J. *See* Cameron, F. K. 252, 406
Briggs, S. Brewers' Vats; Rouser Apparatus for —— (P).... 558
Brinell, J. A. Iron and Steel; Influence of Heating and Quenching on Tensile Strength of 1331
Bris, E. K. Crystal Glazes; Nature of —— 707
British Fuel Economiser and Smoke Preventer, Ltd. *See* Alves, J. 329
British Xylonite Co. *See* Goldsmith, J. N. 1292
Britzke, O. Gas Battery (P) 1539
Broca and Pellin. Carbons; Photogenic or Photographic —— (P) 1448
Brochet, A., and Ranson, G. Alkaline Earths, Electrolytic Preparation of the Bases of —— (P) 352
And Ranson, G. Baryta: Electrolytic Manufacture of Hydrated —— (P) 34
And Ranson, G. Caustic Alkalis: Electrolytic Production of —— (P) 408
Brock, E. *See* Wittenberg, W. W. 1286
Brocklebank, J. C. *See* Holmes, T. 1093
Brode, J. Sulphuric Acid Manufacture; Chemical Laws relating to —— 1393
See Le Blanc, M. 1235, 1401
Brodin, C. F., and Schepeler, H. A. Acetylene Gas Generators; Device for Feeding —— (P) 907
Broichgans, S. Gas and Air: Apparatus for Mixing —— (P). 1324
Broodsky, A. Plaster of Paris; Indurating —— (P)..... 708
Brooke, H. Glass Furnaces, and Means for Pouring Material therefrom (P) 914
Brooke, N., and Glossop, W. Artificial Stone, and Manufacture thereof (P) 479
Brooke, R. G. *See* Allen, J. F. 1285
Brookes, J. W., and Barnes, A. Kilns for Drying Earthenware. (P) 549
Broomel, A. P. Limekiln (P) 1523
Brothers, W. Refrigeration, and Apparatus therefor (P)..... 244
Brough, Bennett H. Coal; Scarcity of —— 162
"The Scarcity of Coal" 197
Brown, A. J. Enzyme Action 419
Brown, C. A., jun. Apples and their Products; Analysis of —— 282
Brown, C. P. Paper; Machine for making Compound —— (P) 635
Brown, G. B. Crucibles; Shield and Funnel for Recharging (P) 1537
Smelters' Crucibles; Recharging —— (P) 1537
Brown, H. *See* Nicholson, J. R. 1445
Brown, H. E. Sandstone; Manufacture of Dolomitic —— (P) 708
Brown, H. T., and Glendinning, T. A. Enzyme Action 419
And Glendinning, T. A. Starch; Velocity of Hydrolysis of —— by Diastase 419

PAGE

Brown, J. Bleaching and Dyeing Wool, Hair, &c. (P) 857
Glass; Manufacture of —— by Electricity (P) 1232
Brown, J. Campbell. Proceedings of Annual Meeting 951
Water Carriage in Great Britain; Discussion on —— 755
Brown, L. A. Fusible Composition for Production of Articles by Moulding (P) 973
Brown, R. Furnaces; Using Waste Heat in connection with Smelting —— 1185
Smelting Furnaces; Utilising Waste Heat of —— (P) 1460
Brown, R. T. *See* Montgomery, J. H. 1544
Brown, S. H. Grease; Extraction of ——, from Garbage (P). 263
Brown, W. *See* Barrett, W. F. 411
Browne C. A., jun., and Tollens, B. Araban and Xylan; Simultaneous Occurrence of —— in Plants 728
And Tollens, B. Maize Pith and Elder Pith; Constituents of —— 728
Browne, D. H., and Neil, J. M. Tin; Recovery of Metallic —— (P) 1088
Brownie Soap Co. *See* Gottschalk, L. 1543, 1543
Browning, K. C. Phosphorus Suboxide 68
Browning, P. E. Cæsium and Rubidium; Determination of —— 71
Potassium and Sodium; Determination of —— 71
Brueckner, C. O. Water; Purification of —— (P) 422
Bruehl, J. W. Camphor Carboxylic Acid; Further Investigations on —— 1409, 1467
Bruenjes, F. Sulphide of Zinc; Obtainment of —— (P) 1286
Brunck, O. Bismuth; Electrolytic Determination of —— 874
Brunn, A. Mazut or Oil Spray: Heating Boilers with —— (P) 1127
Brunt, C. E. Yeast, Manufacture of —— (P) 1464
Bryan, G. Furnace; Combined Metallurgic ——, and Precipitating Water Tank (P) 1401
Bryan, T. A. Acetylene Gas Generator (P) 465
Bryan-Marsh Co. *See* Doane, S. L. 1325, 1325
Buchenau, C. H. Grain and Hulled Products; Sterilising and Bleaching Cleaned —— (P) 269
Bucher, P. Acetylene Gas Generator (P) 853
Bucherer, H. Dyestuffs, Azo; Classification of —— 400
o-Hydroxycarboxylic Acids; Action of Sulphites on Aromatic —— 1272
Nitriles, Acid; New Preparation of —— 399
Bucherer, H. T. *See* Schraube, C. 856
Buchholz, K. L. G. Mineral Water; Apparatus for Drawing off (P) 985
Buchmann, E. A. *See* Goetze, P. C. E. 1083
Buchner, E. *See* Albert R. 1033
See Behagbel, W. 248
And Hachmuman, C. 5(3)-Pyrazole Carboxylic Acid from 5(3)-Phenylpyrazole 248
And Heide, C. v. d. Pyrazole Derivatives 248
And Lehmann, L. Phenylacetylene and Diazoacetic Ethyl Ester 248
And Spitta, A. Yeast; Zymase Formation in —— 784
Buchner, M. Azo Compounds; Reduction of —— (P) 856
Ceramic Products; Manufacture of —— (P) 859
Nitro or other Compounds; Electrolytic Reduction of —— (P) 856
Buckley, F. *See* Ackroyd, W. 1547
Buckley, J. D., and Phinney, E. D. Acetylene Gas Generator (P) 963
Budger, G. L. Oil; Method of Burning —— (P) 698
Bueb, J. *See* Deutsche Continental Gas Gesellschaft 851
Buechelen, W. Sterilised Ointments, &c.; Production of —— (P) 917
Buecka, H. J., and others. Milk Preparation; Production of a —— (P) 717
Buell, C. E. Explosive Fire-Alarm (P) 639
Buelow, C., and Schlotterbeck, F. Acetylacetone; Azo Compounds of —— 965
Buettner, A. Liquid Substances; Vessel permitting Drawing off —— by Air Pressure (P) 1267
And Meyer, C. Vegetable Matter; Drying ——, and Apparatus therefor (P) 133
Bugg, H. D. Acetylene Gas Generator (P) 1129
Buhlmann, G. Mantles; Manufacture of Incandescence —— (P) 763
Buisine, A. and P. Acetone Oil; Manufacture of —— (P) ... 164
Buisson, M. Cane-Sugar Works; Decolorisation of Concentrated Products in —— 866
Bull, H. C., and Sendey, W. Sugar Juice; Extraction of Soluble Ash from —— (P) 130
And Watling, A. Gold; Extraction of —— from Sea-Water (P) 349
Bull, I. C. Lead in Ores; Determination of —— 1350
Bullas, S. W. *See* Doman, W. 1067, 1127
Bullier, L. M., and Maquenne, L. G. Gases; Apparatus for Purification of —— (P) 1388
And Maquenne, L. G. Gases; Compound for Purification of —— (P) 1388
Bumby, H. Ores; Utilisation of Small —— 550

PAGE

Bunge, G. "Text-Book of Physiological and Pathological Chemistry" 797
Bunte, H. Gas; Explosive Mixtures of —— 32
Burbank, W. H. Gelatino-Bromide Plates sensitive to Red.. 1245
Burcey, C. J. T. Charcoal; Apparatus for Manufacturing —— (P) 908
Burchinal, C. H. *See* Wilkinson, W. S. 1139
Burdon, C. B. Mixing Apparatus (P) 1019
Burfeind, J. H. *See* Neill, J. W. 978
See Officer, R. H. 1141
Burford, S. F. Cod-Oil Analysis; Discussion on —— 694
Nitrates in Water; Discussion on Determination of — .. 694
Burgess, J. A. Acetylene Gas Generators (P) 109
Acetylene Gas; Purification of —— (P) 245, 963
Burgess, T. P. Wood-Pulp; Apparatus for Use in Manufacture of —— (P) 494
Burgess, W. T. Birmingham Sewage; Discussion on —— 670
Reduction of Silver Solutions; Discussion on —— 1374
Burk, W. E. Fluorine in Fluorides; Quantitative Determination of —— 72
Burkaemper, H. Vapour Burners (P) 906
Burkhalter, C. Hides; Depilation of —— (P) 265
Burn, J. Clay; Treatment of Impure —— (P) 1455
Burnard, R. Alkaline Superphosphate; Manufacture of —— (P) 408
Burns, R. H. Smoke-preventing Apparatus (P) 329
Burrell, E. R. *See* Strange, E. H. 1239
Burrow, E. A. Oil Heater, Strainer, and Separator (P) 1227
Burrows, G. H. Gas and Air Mixing Apparatus (P) 603
Burrows, H. *See* Tilden, W. A. 1037
Burstyn, W. Pressure Regulator for Vacuum Distillations .. 640
Burton, G. D. Metal-working Apparatus; Electric —— (P) . 623
Busch, A. *See* Biehringer, J. 1559
Busch, A. A., and others. Pasteurising Apparatus (P) 1548
Busch, M. Methyl Determinations by Herzig and Meyer 725
Buss, O. Casein Photographic Film, and Manufacture thereof (P) 1155
Photographic Plates and Papers (P) 139
Bussian, H. A. *See* Krieger, H. G. 1554
Butchard, G. W., A. A., and J. A., and Gibson, H. Cement; Apparatus for Manufacture of —— (P) 550
Butler, W. A., and Kunze, A. Kiln; Continuous —— for Bricks (P) 1140
Butt, T. H. Solids Deposited in Liquid-purifying Apparatus; Collecting of —— (P) 1267
Butterfield, J. C. Ores containing Zinc; Treatment of —— (P) 862
Ores; Obtaining Antimony, and Separating Gold from Antimony —— (P) 123
Byers, H. G., and Hopkins, P. Oil of Red Elderberry; Examination of —— 1238
And Hopkins, P. Wood Tar from the Douglas Fir; Examination of —— 1228
Byrom, T. H. Phosphoric Acid; Solvent Power of —— 214

C

Cabot, J. W. *See* Prest, S. F. 258
Caille, C. Fire Extinguishers (P) 1019
Cailletet, L. Gelatin; Mechanical Action of —— on Solids ... 408
Caines, C. M. *See* Squire, P. W. 929
Cairns, A. *See* Weber, C. O. 264
Cajo, A. Briekwork; Destruction of —— by Alkali Sulphates 469
Calder, W. A. S. Emergeneies in Vitriol Works: Discussion on —— 229
Caldwell, C. W. Acetylene Gas Generator (P) 604, 1227
Caldwell, J. Leather for Belting; Preparation of —— (P) ... 1189
Calico Printers' Association, The. *See* Costobadie, H. A. 250
And Higginbotham, G. Printing Machines for Calico, &c. (P) 857
And Wilson, W. W. Calico-printing Machines (P) 703
Calkins, A. C. Assayers' Furnaces (P) 618, 1538
See Lonergan, J. J. 618
Callsen, J. Salicylic Acid; Akylcxymethyl Ester of —— (P) . 1154
See Dreser, H. 1194
See Hofmann, F. 1195
Calmant, F. Distilling; Process and Apparatus for —— (P) . 1523
Calmette, L. C. A. Indigo; Extraction of —— (P) 38
Calvert, H. T. Translation of Abegg and Herz's "Practical Chemistry" 77
Cameron, D. Grease; Extraction of —— (P) 1084
Rendering Apparatus (P) 1084
And others. Sewage, &c.; Apparatus for Treating —— (P) 185

PAGE

Cameron, E. G. *See* Holmes, P. F. 1524
Cameron, F. K. Gypsum; Solubility of —— in Solutions of Sodium Chloride 257
And Briggs, L. J. Carbonates and Bicarbonates in Aqueous Solution; Equilibrium between —— 252, 406
And Seidell, A. Calcium Carbonate; Solubility of —— in Aqueous Solutions of certain Electrolytes 773
And Seidell, A. Gypsum; Solubility of —— in certain Aqueous Solutions..... 549
Campbell, E. D. Portland Cement; Experiments on the Clinkering of —— 1396
And Kennedy, M. B. Iron Carbide; Probable Existence of a New —— 1398
Campbell, F. *See* Neild, E. E. 976
Campbell, H. Asphalt and other Material; Heating of —— (P) 599
Campbell, H. S. Gas-Burner (P) 602
Campbell, J. H. and C. H. Milk; Manufacture of Condensed or Desiccated —— (P) 269
Campbell, W., and Matthews, J. A. Alloys of Aluminium 551
Campetti, A. Magnesium in Electrolytic Rectifiers 259
Camps, R. Indigo Blue from o-Nitro-acetophenone 1273
Nitro- and Amino-Acetophenone (Hypnone)..... 495
Candy, F. Sewage; Treatment of ——, and Apparatus therefor (P) 133
Candy, F. P. Sewage and Polluted Waters; Apparatus for Purifying —— (P) 1550
Cannon, M. J., and Foll, E. Brewing; Higher Yields in —— . 632
Cantu, F., and others. Waterproof Fabrics and Imitation Linen Goods from Casein (P) 113
Cappeau, J. P. Furnace for Roasting Ores (P) 483
Capron, G. G. Velvet; Mercerisation of Cotton —— (P) 49
Carborundum Co., The. *See* Tone, F. J. 1234, 1279
Cardoso-Pereira, A. Brandies; Coefficient of Impurity of —— 923
Carey, A. Water Carriage within Great Britain 749
Carey, E. Alkali Works Regulation Bill; Observations on —— 214
Bronze containing Lead; Discussion on —— 532
Factory and Workshops Act; Observations on —— 214
Proceedings of Annual Meeting..... 951
Water Carriage in Great Britain; Discussion on —— 755
Cari-Mantrand. Wine; Analysis of Natural and Artificial —— 1148
Carles, P. Mineral Waters containing Sulphates; Baryta in —— 717
Tartrates; Influence of Temperature in Determining —. 875
Carlson, S. Lamps; Petroleum —— (P) 697
Carman, R. W., and Lawrence, F. M. Formaldehyde Gas Generator (P) 870
Carmichael, A. D. Sulphide Ores; Desulphurising —— (P)... 349
Carmichael, H. Liquids; Apparatus for Carbonating —— (P) 1191
Carmody, P. Volcanic Dust from St. Vincent; Analysis of —— 993
Carpenter, C. C. Gas Condensers (P) 1524
Carpenter, F. B. Sulphur; Analysis of Crude —— 832
Carpenter, R. Forbes, and Linder, E. Gases Escaping from Chamber Process for Manufacture of Sulphuric Acid; Methods Employed in Estimating —— 1490
Carpenter Steel Co. *See* Brown, G. B. 1537, 1537
Carpet Yarn Printing Co. *See* Formander, A. 1393
Carr, W. M. Furnace; Electric Combustion —— (P)..... 792
Carré, P. Phosphorous Acid; Esterification of —..... 65
Carroll, C. G. *See* Jones, H. C. 1352
Carson, C. M. *See* Lang, W. R. 748, 1018
Carson, G. C. Metals; Apparatus for Treating —— (P) 619
Carson, J. C. *See* Clark, C. C. 1036, 1143, 1230, 1322, 1407
Carstairs, J. Proteids; Separation of —— from Non-Nitrogenous Bodies (P) 1549
Carter, F. W. Photometer; Construction of a New —— (P) . 334
Carter, H. E. Stone; Artificial —— (P) 708
Carter, H. L. Plaster; Elastic —— (P) 550
Plaster for Walls and Ceilings; Elastic —— (P) 257
Carter, R. A. Iron; Art of Puddling —— (P)..... 916
Carter, T. L. Cyanide Solutions; Determining Gold in —— .. 1558
Cyanide Solution; Notes on —— 409
Cartland, F. H. Furnaces; Melting —— (P) 350
Cartter, R. W. Sterilising Apparatus (P)..... 556
Carulla, F. J. R. Alloys of Copper and Manganese; Discussion on —— 844
Alumina in Blast-Furnace Slags; Discussion on —— 453
Recording Apparatus for Electrical Pyrometer; Discussion on —— 845
Sampling Shoddy, &c.; Discussion on —— 106
Vitriol Works; Emergencies in —— 226
Casali, A. Wines; Detection of Vinoline and Bordeaux Red in —— 74
Case, A. W. Beating Engines (Scrap Leather) (P)..... 265
Caspari, C. E. Fatty Oil of Lindera Benzoin..... 711
Lauric Acid and some of its Derivatives 711
Cassel, H. R. Gold Recovery of —— from Refractory Ores (P) 485
Metals, Precious; Apparatus for Recovery of —— from Refractory Ores (P) 486

PAGE

Cassella, L., and Co. Acridines; Manufacture of Hydroxylated —— (P)..... 37
Dyestuffs, Azo; Manufacture of —— (P) 1451
Dyestuffs; Blue Azo ——. (P) From Weinberg 968
Dyestuffs; Blue Sulphide ——. (P) From Herz 1275
Dyestuffs; Brown-Violet Sulphide ——. (P) From Weinberg..... 911
Dyestuffs; Dyeing with Sulphide ——. (P) From Kertesz 471
Dyestuffs; Sulphide —— (P)..... 249
Dyestuffs, Sulphide, and *p*-Monoalkylamido-*p*-oxydiphenylamines (P)..... 471
Dyestuffs, Sulphur; Production of —— (P) 1274
Dyestuffs; Yellow Sulphide ——. (P) From Weinberg and Lauge 1530
Sulphur Colours; Dyeing and Printing with —— (P)..... 1453
Castelnau, M., and Thialon, C. Vapour Generator (P)..... 851
Castle Brook Carbon Black Co. *See* Mann, J. L. 1337, 1337
Castro, O. F. de. Tanning Process; Rapid —— (P) 1032
Catelin. Lead Smelting without Fuel..... 1535
Catford, J. P. *See* Cowley, R. C. 1156
Cathelineau and Hausser. Cade Oil; Investigation of —. .. 67
Caton's Foundry and Machine Co. *See* Caton and Warring .. 1021
Catton and Yaraguiac. Vegetable Matters; Preservation of —— (P)..... 1466
Caubet. Liquids; Apparatus for Filtering —— in Absence of Air (P) 1547
Causse, H. Nitrogen in Waters; Determination of Organic—— 992
Water; Characteristic Reaction for Pure 642
Waters, Fatty Acids in Polluted; Detection of —..... 127
Caussin de Perceval, P. *See* Woussen, H. 60
Cuven. Wijs' Method of Determining Iodine Values; Discussion on —— 1439
Caven, R. M. Alloys of Copper and Manganese; Discussion on —— 844
Alumina in Blast-Furnace Slags; Discussion on —— 453
Insoluble Frits for Pottery Glazes; Discussion on —.... 322
Cavenaugh, R. W. Soap; Apparatus for Granulating —— (P) 355
Celestre, L., and Gondrand, F. Batteries; Secondary —— (P) 916
Cellulose Products Co. *See* Little, A. D. 362, 362
Cereal Sugar Co. Glucose Refining, and Apparatus therefor (P)..... 359
Cerf, L. Gum; Manufacture of an Artificial —— (P) 1406
Starch; Manufacture of Modified —— (P) 784
Cerny, F. Malt; Analysis and Valuation of —— 281
Cerny, K. Sugar; Theory of Production of Granulated —.. 1287
Chablay. *See* Genvresse 1347
Chailly, F. Fuel Block and Briquet (P) 600
Challenger, G. *See* Kinsey, H. 397
Chamberlain, C. E. Filters; Construction of —— (P)..... 458
Chamberlain, E. N. Accumulator Plates; Peroxidising —— (P) 1540
Chamberlain, J. Light from Gases of Low Calorific Value (P) 1021
Chamberlain, R. N. Plates of Storage Batteries; Cleaning Spongy Lead —— (P)..... 779
Plates for Storage Batteries; Forming —— (P)..... 778
Chambers, J. A. Glass Articles; Apparatus for Manufacture of —— (P) 477
Chandler, S. S. and S. B. Gas-purifying Apparatus (P) 906
Chantepie. *See* Le Chatelier, H. 459
Chaplin, E. D., and Halloran, H. G. Chlorine and Alkaline Hydrates; Electrolytic Production of —— (P) 476
Chapman, A. C. Spirits; Discussion on Maturing of —..... 101
Chapman, E. F. *See* Wilkinson, J. 764
Chapman, E. J. Fire Extinguishers; Chemical —— (P)..... 850
Chapman, J. *See* Webb, J. F. 485
Chapman, W. B. Retort for Wood Distillation (P)..... 1129, 1129
Chappell, G. P. Stone; Manufacture of Artificial —— 1028
Chappell, H. F. Rosin Soap for Paper Size (P)..... 494
Charabot, E. Methylanthranilate in the Vegetable Organism. 1348
And Hébert, A. Esterification in Plants 136
And Hébert, A. Peppermint Plants; Influence of Salt on —..... 561
And Hébert, A. Peppermint Plants; Influence of Sodium Nitrate on —..... 987
Charbeneau, J. C. Acetylene Gas Generator (P)..... 1270
Charitschkow, K. W. Petroleum from Grosny; Characteristics and Constituents of —..... 964
Naphtha from Baku and Grosny; Decomposition Products of —..... 246
Petroleum; Crude —— from Fergana, Turkestan..... 699
Charles. Adhesive Composition for Making Fuel Briquettes (P) 1525
Charlier, A. C. J. Gaseous Liquids; Apparatus for Supplying —— (P) 558
Pigments and Metallic Compounds; Manufacture of —— (P) 1285
Charlier, H. J. J. Furnaces; Melting —— (P) 350
Charlon, C. Acetylene Generator without Cocks (P)..... 1389
Charlopin, C. Oxygen; Production of Pure —— (P) 1534

PAGE

Charon, A. Bog-Peat. Preparation of —— for Fuel (P)..... 1270
Charon, J. *See* Prost, E..... 874
Charpy, G., and Grenet, L. Iron-Carbon Systems: Equilibrium of ——..... 616
And Grenet, L. Steel: Study of the Transformations of —— 480
And Grenet, L. Steels; Expansion of —— at High Temperature..... 481
Chase, A. J. Water: Apparatus for Distilling —— (P)..... 635
Chase, A. W. Ores, &c., containing Sulphur and Iron: Treating —— (P)..... 1281
Chassy, A. Ozone; Influence of Voltage on Formation of —— 916
Chatillon. Antimony Ores; Treatment of —— (P)..... 1399
Chaudier, J. Daniell's Cell; Variations of Electromotive Force, &c., in ——..... 352
Chaumeille. Glycerin: Determining —— by Iodic Acid..... 874
Chaumet. Light: Action of —— on Precious Stones..... 876
Chauvin. *See* Bailly..... 1447
Chavanne, G. Arabinose; Derivatives of —— 506
Chavanon, F. Gas Generators (P)..... 598
Checkley, E. J. *See* Merrifield, L. L. 1020, 1021
Cheeseman, L., sen. Natural Phosphates: Treatment of —— (P) 265
Phosphates; Making Water-soluble —— (P) 265

Chemical and Electrical Ore Reducing Co. *See* Dorr, A. M., and Spang, J. 775

Chem. Fabrik auf Actien vorm. E. Schering. *See* Schering, E.
Chem. Fabrik Bettenhausen, Marqnart und Schulz. Ammonia, Solid: Production of —— (P) 115
Chem. Fabrik Brugg. Dyestuffs: Sulphide ——. (P) From Pfenniger 701
Chem. Fab. Griesheim-Elektron. Chromium Compounds and Alkalis: Production of —— (P)..... 548
Lead Dioxide: Electrolytic Production of —— (P) 620
See Moeser and Eidmann..... 1333
Chem. Fabrik Rhenania. Nitric Acid; Manufacture of ——, and Apparatus therefor (P)..... 173
Chem. Fabrik von Heyden. *See* von Heyden, Chem. Fabrik.
Chem. Fabrik vorm. E. Schering. *See* Schering, E., Chem. Fab.
Acetenalkamins; Acidyl Derivatives of ——. (P) From Harries 364
Camphene; Manufacture of ——. (P) From Stephan 1194, 1194
Dimethylene Tartrate. (P) From Sternberg 791
Methylene Citric Acid. (P) From Sternberg 791

Chem. Fabrik vorm. Zimmermann and Co. *See* Zimmermann and Co., Chem. Fab. vorm.
Chem. Fabriken vorm. Weiler-ter Meer. *See* Weiler-ter Meer, Chem. Fab.
Chemical Products Co. *See* Mork and others 1345
Chemical Works vorm. Sandoz. *See* Sandoz, Chemical Works vorm.
Dyestuffs; Brown Sulphide ——. (P) From Boniger..... 1530
Chesterman, R. E. Intensification: Mercurial —— 723
Chevalier, A. India-Rubber; Species of Landolphia yielding —— 1286
Chick, H. *See* Ramsay, Sir W. 1367
Chikashigé, M. *See* Kuhara, M. 247
Childs, J. G. Liquid in Closed Vessel; Ascertaining Depth of —— (P)..... 458
Chipman, W. F. Electrode for Purifying Liquids (P) 485
Chippier, C. Fabrics; Printing ——, and Apparatus for (P) .. 912
Chlopin, G. W. Dyestuffs, Coal Tar; Poisonous Effect of Certain —— 492
Ozone; New Reagent for Detection of —— 928
Chodat, R., and Bach, A. Peroxides; Function of —— in Chemistry of Living Cells..... 1561
Christen, F., and Aschner, F. H. Burner for Incandescent Spirit Light (P)..... 1226
Christensen, A. Cinchona Alkaloids: Bromine Derivatives of —— 721
Christian, G. H. Plates for Secondary Batteries (P) 1237
Christy, S. B. Cyanide; Electromotive Force of Metals in Solutions of —— 779
Chuit, Naef, and Co. α-Ionone; Obtainment of —— (P)..... 137
Church, H. W. Dyeing Machines (P)..... 113
Ciamician, G., and Silber, P. Light: Chemical Action of —— 876, 1477
Ciantar, V., and Ross, F. W. F. Meat Extracts, and Manufacture thereof (P)..... 269
Ciapetti, G. "L'Alcool Industriale"..... 1561
Claassen, H. Sugar and Molasses; Separation of —— from Massecuites (P) 1463
Sugar; Destruction of —— in Working up Low Syrups .. 489
Sugar; Separation of —— from Syrup, &c. (P) 1288
Claes, P. Sulphuric Acid; Concentrated Solid and Transportable —— (P) 1453
Clamer, G. H. Metals; Eliminating —— from Mixtures (P) . 1185
Metals; Production of —— (P) 619
Clamond, C. Mantles; Incandescence Gas —— (P) 598

PAGE

Claremont, E. A. Cables; Manufacture of Vulcanized Electric (P) 626
Clark, C. C. Alcoholic Liquid Purifier (P) 1407
Bleaching Apparatus; Electrolytic —— (P) 1230
Electrochemical Apparatus (P) 1143
Water Purifier (P) 1936
And others. Liquids: Apparatus for Purifying —— (P).. 1322
Clark, E. B. Steel; Manufacture of Crucible —— (P) .. 552, 1030
Clark, G. A. Pulp-refining Engine (P) 635
Clark, J. G., and Cothran, G. Carburetter (P)..... 463
Clark, W. W., and Bone, G. Acetylene Gas; Apparatus for Generating —— (P) 109
Clarke, J. Filters: Improvements in —— (P) 1192
Clarke, J. S., and M. J. Salt-making Apparatus (P)..... 1077
See Panse, T. O. 975
Clarke, S. G. *See* Hussey, C. A. 411
Clarke, W. C. Water: Apparatus for Purifying —— (P) 869
Clarkson, T. Oil; Separation of —— (P) 625
Classen, A. Sugar; Converting Cellulose into —— (P) .. 630, 630
Sugar; Converting Cellulose into Fermentable —— (P) .. 867
Sugar; Converting Wood and other Cellulose into —— (P) 358
Sugar; Converting Wood into —— (P) 1190
Classen, A. M. D. Elastic Material; Production of —— (P) . 1407
Classen, H. Sugar; Crystallisation of —— (P) 266
Clandel. *See* Pet 1447
Claudel, C. H. *See* Liet, J. P. E. 1067
Clausen, W. F. *See* Russell, J. K. 166
Clausen-Kaas, A. V. H. F. C. Compositions for Coating Surfaces (P) 973
Woodwork, &c.; Plastic Composition for —— (P) 707
Clawson, B. B. Hydrocarbon Composition. (Cements, &c.) (P) 615
Clawson, F. E., and Benjamin, O. C. Burner; Incandescence Gas —— (P) 698
Clayton Aniline Co., The. Discharges upon Paranitraniline Red, &c. (P) 342
See Meyenberg, A. 609
Clayton, C. W. *See* Henderson, J. F. 132
Clayton, E. G. Cocoa Essences; Analyses of —— 1090
Glue: Technical Examination of —— 670
Phosphorus Sesquisulphide; Behaviour of —— with Mitscherlich's Test 1042
Clemang, A. Blast-Furnace Gases; Process and Apparatus for Cleaning (P) 905
Clément. *See* Wehrlin, A. 1038
Clemm, A. Sulphates and Chlorine: Manufacture of —— (P) 254
And Hasenbach, W. Sulphuric Anhydride; Manufacture of —— (P) 254
See Verein Chemischer Fab. 255
Clerici and Co. *See* Société Edison 333
Clifford, H. Furnaces and Analogous Structures (P) 1396
Cloez. *See* Grimaux 1449
Clopton, J. B. Acetylene Gas Generator (P) 605
Clough, E. F. *See* Towne, A. L. 604
Clowes, F. Lead; Chemical Change Produced by Immersion of —— in Distilled Water 421
Photometer: New Table —— and Pentane Burner Prescribed by Gas Referees for London 313
Sewage; Bacterial Treatment of Crude —— 1549
Clubbe, E. J., and Southey, A. W. Condensing and Cooling Apparatus (P) 326
And Southey, A. W. Furnaces for Liquid Hydrocarbons (P) 33
Clymer, W. R. *See* Fishell, E. M. 917
Coates, T. *See* Smith-Rewse, H. S. 762
Cobenzl, A. *See* Mies, A. H., jun. 1554
Coblentz, V. Purity of so-called Standard Drugs and Chemicals 1431
Cocking, A. T., and Kynoch, Ltd. Explosives; Hardening Smokeless —— (P) 1412
And Kynoch, Ltd. Explosives; Improvements in —— (P) 1556
Coehn, A. Alloys; Electrolytic Production of New —— 1144
Coeln-Muesener Bergwerks-Aktien-Verein. Flame-Jet; Fusion of Hardened Masses by —— in Furnaces (P) 1029
Coffignier, C. Prussian Blue; Solubility of —— 1032
Resins; Solubility of some Soft —— 918
Lithopone; Analysis of —— 1146, 1337
Coffignon and Blondeau. Mural Glass, &c.; Composition for Making —— (P) 1534
Coffill, V. K. Burner; Combination Illuminating and Heating —— (P) 462
Cohn, A. Textile Fabrics; Glossing —— (P) 1189
Cohn, A. I. Photographic Papers; Blue-Print and Black-Print —— 582
Cohn, M. Antiseptic containing Iodine; Manufacture of —— (P) 985
Iodine Preparations; Manufacture of —— (P)..... 497
Cohn, P. Chloro-*m*-diaminobenzene and Triaminobenzene Carboxylic Acids 965
o-Chloro-*p*-Nitraniline..... 400
Cohnen, B. Textiles; Apparatus for Treating —— with Liquids (P)..... 1453

PAGE

Colborn, E. F. Gas from Hydrocarbon Oil; Production of —— (P) 397
Colburn, J. W. Glass-working Machine (P) 615
Colby, A. L. "Review and Text of the American Standard Specifications for Steel adopted in 1901" 568
Colby, H. W. Beer: Apparatus for Racking —— (P) 1035
Cole, Grenville A. J. "Aids to Practical Geology" 77
Coleman, N. *See* Hammer, J. 473
Colletas, M. J. B. A. Electrodes for Batteries (P) 1282
Colls. Azo Resists under a Steam Indigo Blue 1453
Collignon, G. Sugar Juice: Third Carbonating of —— 1339
Collin, F. J. Coke Ovens (P) 1020
Collin, G. W., and Nicholls, W. S. Carbide Feed Mechanism for Acetylene Gas-Generators (P) 539
Collingridge, F. *See* Ramsay, Sir W. 1367
Collins, C. A. *See* Birchmore, W. H. 1548, 1548
Collins, C. G. Sulphides: Rendering Metallic —— Soluble (P) 978
Collins, C. L. Graphite Electrodes in Electro-Metallurgical Processes 1186
Collins, H. F. Gold-Copper Ores: Concentration and Smelting of —— at Santa Fé 1299
Collins, S. H. Barley: Absorption of Arsenic by —— 221
Milk: Composition of —— in the North of England 1512
Sugar in Swedes: Variation in Amount of ——. II. 1513
Colliver, G. V. *See* Howfield, A. J. 1085
Colman, H. G. Coal-Gas: Condensation of —— 905
Colomy, C. E. Acetylene Gas-Generator (P) 461
Colson, A. Sodium Sulphate: Heat of Dilution of —— 995
Comanducci, E. *See* Piutti, A. 1037
Comaille-naive, A., and Fresnaye, J. de la. Gutta-Percha: Purification of —— (P) 1085
And Fresnaye, J. de la. Gutta-Percha: Purification of —— and Apparatus therefor (P) 357
Combes, C. Carbon Tetrachloride: Manufactur of —— 272
Carbon Tetrachloride: Manufacture of —— (P) 1169
Comines, F. B. Textiles: Machines for Moistening —— (P) ... 473
Commun, J. *See* Cameron, D. 185
Comp. des Forges de Chatillon. Armour Plates: Manufacture of —— (P) 618
Comp. des Récipients et Lampes Inexplosibles. Vessels for Holding Volatile Inflammable Liquids (P) 1126
Comp. Française de Chemins de Fer au Dahomey. Indigo: Extraction of —— from Lonchocarpus Cyanescens (P). 38
Comp. Française de la Soie Parisienne. Cellulose Fibres for Replacing Silk (P) 49
Comp. Gen. de Travaux Sanitaires. Furnace for Incinerating Refuse (P) 361
Comp. Gen. d'Incandescence par le Pétrole. Burners: Incandescence Oil or Spirit —— (P) 338
Comp. l'Industrie Verrieres et ses Derivés. *See* Voelker, A. .. 1139
Comp. Parisienne de Couleurs d'Aniline. *See* Meister, Lucius und Bruning.
Comp. Universelle d'Acetylene. Acetylene Gas: Apparatus for Manufacture of —— (P) 962
Compin, A. P. Mantles: Apparatus for Automatically Incinerating (P) 907
Composite Board Co. *See* Huntington, W. S. 1351
Compton, M. D. Acetylene Gas Generator Locking Device (P) 704
Comstock, E. Y. Hydrocarbon Vapour: Apparatus for Impregnating Gas with —— (P) 1066
Concentrated Beer Co. *See* Hobson, H. A. 558
Condiet, N. W. Refrigerating Apparatus: Absorption —— (P) 1126
Still for Absorption Refrigerating Apparatus (P) 1126
Conley, M. R. Furnace: Electric —— (P) 623
Connstein, W., and others. Fat: Enzymic Decomposition of —— 1541
Conradty, M. Carbon Electrodes for Arc Lamps (P) 1447
Conroy, J. T. Carbonate of Lime: Discussion on —— 531
Catalysis and its Applications 302
Electricity: Chemical Applications of —— 1401
Consoli, A. A. Sulphur: Apparatus for Subliming and Refining —— (P) 970
Cousonno, F. *See* Ullmann, F. 1272
Contardo, R. C. Furnaces: Electric Arc —— (P) 261
Metals: Electric Reduction of —— (P) 1083
Conte, A. *See* Levrat, D. 1392
Conti, V., and others. Artificial Stone (P) 1140
Convers, G. G., and Saulles, A. E. de. Muffle-Furnace (P) ... 1525
And Saulles, A. E. de. Zinc Dust: Production of —— (P) 620
And Saulles, A. E. de. Zinc Furnace (P) 620
Cook, E. R. Acetylene Gas Generator (P) 1227
Cooke, A. *See* Taylor, F. 1074
Cooley, J. F. Fluids: Apparatus for Electrically Dispersing —— (P) 341
Cooper, C. F. *See* Hermite, E. 125
Cooper, E. W. Vegetable Charcoal: Manufacture of —— (P) 421

PAGE

Cooper, H. C. Translation of Holleman's "Text-Book of Inorganic Chemistry" 798
Cooper, W. Carburetters for Oil or Spirit Engines (P) 851
Cooper, W. A. Hydrocarbon Burner for Boilers, &c. (P) 1227
Cooper, W. R. "Primary Batteries: Their Theory, Construction, and Use" 197
Copeland, L. D. *See* Mitchell, G. 1401
Coppadoro, A. Catalytic Reactions; Mutual Influence of Two —— in the same Medium 284
Iron Salts; Influence of Separation of Sulphur on Precipitation of —— 77
Coppalle, A. Zinc: Determination of —— by Sodium Sulphide 724
Corbett, F. J. White-Lead: Apparatus for Manufacture of (P) 356, 414
White-lead: Manufacture of —— (P) 414
Corbin, P. E. C. Chlorates, &c.: Production of —— by Electrolysis (P) 970
Cordier, V. von. Iron and Steel: Remarkable Carbamine) Reaction of ——. 792
Cormimbœuf, H. Vanadium: Determination of —— 1249
Cornelson, R. W. *See* Osborne, T. B. 358
Corrigan, P. Furnace: Metallurgical —— (P) 1030
Corron, C. Dyeing Apparatus (P) 1134
Yarns: Apparatus for Dyeing, Washing, &c. —— (P) 1533
Cory, C. *See* Tucker, A. E. 159
Cosgrave, S. V. Ingot: Compound —— (P) 618
Ingots: Compound ——, and Moulds therefor (P) 618, 618
Cosmopolitan Power Co. Condensing Steam and Cooling Fluids, and Apparatus therefor (P) 326
Cossan. Camphorosma monspeliaca: Essential Oil of —— ... 1552
Coste, J. H. *See* Parry, E. J. 145
Costerton, H. A. Fuels or Briquettes (P) 330
Costobadie, H. A., and others. Calico Printing (Imitation Indigo Prints) (P) 250
Cothran, G. *See* Clark, J. G. 463
Cottrell, F. G. *See* J. H. van't Hoff 1277
Coughlin, P. Bromoform: Electrolytic Preparation of —— .. 186
Coulson, S. G. Fuel: Manufacture of Artificial —— (P) 1388
Coulson, W. A. *See* Thuersant, H. de 461
Counelier, C. Flax Shives: Are they to be called Woody Fibre? 63
Coupe, T. E. Casks and Tanks: Apparatus for Filling —— (P) 1126
Courant, E. Triple Salt, and Manufacture thereof (P) 177
Courts, W. C. Furnaces for Vertical Boilers (P) 1324
Cousin, H. Aristol: Preparation and Derivatives of —— 1346
Di-iodothymol: Presence of Chlorine Compounds in —— 560
Veratrol; Action of Nitric Acid on Trihalogen Derivatives of —— 369
Coustall, E. Ozonising Apparatus; Portable —— (P) 1150
Cowley, R. C., and Catford, J. P. Lead Salts: Volumetric Determination of —— 1156
Cowley, A. J. *See* Paul, B. H. 1294, 1299
Cowper-Coles, S. Metals: Depositing —— on Metallic Surfaces (P) 917
Cowper-Coles and Co., and Cowper-Coles, S. Metals or Compounds; Deposition of —— (P) 917
Cozins, W. W. Acetylene Gas Generator (P) 465
Crabtree, L., and Mason, H. China: Photographic Decoration on —— (P) 1245
Craig, G., and Paterson, R. M. Alkaline Cyanides: Production or Purification of —— (P) 117
Craig, T. J. I. *See* Spence, F. M. 253
Crampton, C. A. Oleomargarine and Butter: Influence of Growth of Mould upon Chemical Composition of ——. 1241
Crane, J., jun. Gas-Burner (P) 602
Craniger, J. C. Lamp: Vapour-burning Street —— (P) 464
Cranston, T. J. Lamps: Incandescence Oil —— (P) 539
Cranstone, W. H. Mill for Grinding Paint, &c. (P) 1404
Crass, F. H. Paint; Composition of —— (P) 1188
Craven, J. Effluents: Discussion on Manchester Bill for Discharge of —— 581
Crean, F. C. Iron and Iron Alloys: Manufacture of —— (P). 619
Crease, J. F. Mantles: Manufacture of Incandescence —— (P) 763
Creer, E. A. *See* Adams, S. H. 925
Crewe, H. T. *See* Gwynne, J. 906
Crispo, D., and Mols, A. Alkaline Metasilicate: Manufacture of —— (P) 408
Critchlow, J., and Aynsley, J. and H. Filters Presses for Potters (P) 347
Crofts, J. M. *See* Morrell, R. S. 596
Croizier, H., and Co. Fire-bricks, &c.: Apparatus for Hardening —— (P) 1396
And Thomine, E. Artificial Stone: Compounding of —— (P) 1397
And Thomine, E. Powders: Apparatus for Drying —— (P) 1178
Crompton, J. *See* Ashton, N. T. 915
Crompton, W. H., and Horrocks, W. Mercerising Apparatus (P) 405

PAGE

Crook, W. A., and Mines, E. Electric Lamps with Rare Earth Filaments (P) 1525
Crooke, J. J. and R. Fertilisers: Electrical Manufacture of —— (P) 1545
Crosland, F. Kilns or Ovens: Application of Gaseous Fuel in —— (P) 707
Crossley, W. J., and Atkinson, J. Gas Producers (P) 1388
Crossman, J. G. Filter and Extractor Presses (P) 959
Liquids: Apparatus for Measuring and Filling —— (P) ... 1290
Spraying Apparatus (P) 596
Crotogino, F. *See* Nissenson, H. 1248, 1350
Crouzel, E. Tannin Determination of —— 992, 1560
Crown Paper Co. Carbon-Paper: Machine for Making —— (P) 1550
Crowther, H. W. *See* Rossiter, E. C. 173, 345
Cudaby Packing Co. *See* Cameron, D. 1081, 1084
Cuel, G. Conglomerates for Building Purposes (P) 257
Cuénod, H. Cotton: Liquid for Bleaching —— 1132
Cullen, W. Dynamite Factory: Residual Products of the —— 1296
Culmann, E. Dyestuffs: Dark Sulphide —— (P) 1392
Cummer, A. E. Hydrous Compounds: Dehydrating —— (P) 52
Curie, P., and Debierne, A. Radio-Activity: Induced —— 112
Curran, J. J. Kiln: Dry —— (P) 459
Curran, P. B. Lamp: Hydrocarbon Incandescence —— (P) .. 1069
Currie, A. D. Malting: Practical —— 982
Currie, S. G. C. Ores: Treatment of Metallic —— (P) 350
Curtis, M., and Tompkins, P. W. Oils, Californian Crude ——: Determination of Water in 1519
Curtius, Th. Diamide: Derivatives of —— with Closed Atomic Groups. III. Pyrazolone-3-Acetic Acid 66
Cussen, R. Paint: Distemper Wash or Water —— (P) 1146
Custodis, A. Coke: Manufacture of —— (P) 33
Cutler, H. A. Water Level: Apparatus for Indicating and Recording —— (P) 538
Cyanid Gesellschaft, Berlin. Artificial Manures: Manufacture of —— (P) 1462
Cyanide Co., The. Manures: Manufacture of Artificial —— (P) 1338
Czapikowski, J. Sugar: Means for Boiling —— (P) 1545
Czermak, J. Marble: Manufacture of Artificial —— (P) 1079
Czerweny, F. Match-making Machines (P) 639

D

Daeschner, C. Mineral Oils; Separating Undecomposed, Resinous Matters from —— 168
Mineral Oils; Separating the Resinous Parts from —— (P) 765
Dahlqvist, J. A., and Holm, C. L. Separating Apparatus (P). 1464
Dahmen, H. von. Blasting Agents (P) 276
Detonating Composition (P) 989
Dailey, C. W. *See* Devoe, B. G. 462
Dakin, H. D. Persulphates: Notes on Use of —— in Analysis 818
Dale, A. W. W. Proceedings of Annual Meeting 949
Dalén, G., and Wisbar. Jute, Manilla, and Andansonia Fibres: Differentiation of —— 1456
Dallas, G. M. Fuel: Artificial —— (P) 1128
Dallmann, G. *See* Schuetz, O. 275
Dally, C. A. Fuel-Burner (P) 1128
Daly, J. A. Lace: Electro-Deposition of Metal on —— (P) 912, 1187
Metal; Covering Textiles, &c., with —— (P) 474
Damgaard. Photographic Developer (P) 1554
Dammer, O. "Handbuch der Anorganischen Chemie" 729, 877, 1165, 1562
D'Andrimont, M. Anodes for Electrolytic Operations (P) 553
Danilevsky, C. and A. and others. Metallising Fabrics (P) ... 341
Danoise, G., and La Société Belge de Déglycerination. Glycerin: Separation of —— from Oils and Fatty Matters (P) 355
Danziger, J. L. Cobalt: Qualitative Test for —— 928
See Sherman, H. S. 564
Darby, J. H. Coke: Manufacture of —— from Compressed Fuel 761
Fuel: Apparatus for Compressing —— (P) 1226
Gas: Utilisation of —— for Industrial Purposes (P) 1178
Dargie, J. Acetylene Gas Generators and Holders (P). 1146, 1524
Dargue, W. H. Acetylene Gas: Apparatus for Production of (P) 34
Darier, G., and Mauss ewitch, E. Nitrobenzyl Chlorides: Condensation of —— with the Naphthylamines 1449
Darling, C. R. Fuel Calorimeter: Simple Form of —— 927
Darling, J. D. Cyanides: Manufacture of Alkaline (P) 773, 773, 773

PAGE

Darling, L. B. Metals: Extraction of Precious —— from Ores (P) 1141
Darvas, A. Separating and Packetting Equal Quantities of Substances: Machines for —— (P) 904
Darzens, G. Ylang-ylang: Essence of —— 364
And Arminget, P. Terpene Alcohols and their Esters; Determination of —— 142
Daub, C., and Denther, J. C. Sulphuric Acid; Apparatus for Making Anhydrous —— (P) 1138
Daube, O. Organic Materials: Carbonising of —— (P) 1070
Daubenbus, W. J. *See* Wehmeier, H. C. 959
Dauvé. Sulphuric Acid Solutions: Electrolytic Preparation of Standard 1098
Davenport, H. A. *See* Lane, O. A. 463, 852
Davey, R. Furnace, Rotary —— for Calcining Ores (P) 122
David. Tartars and Lees of Wine: Enrichment of —— (P) .. 1547
David, E., and St. v. Kostanecki. 2-Hydroxychromone: Preparation of —— 1130
Davidson, G. M. Water Purifier (P) 1550, 1550
Davies, D. Iron, Steel, and Wrought Iron; Manufacture of —— (P) 349
Davies, H. E. Bronze containing Lead; Discussion on —— .. 533
Davies, M. P., and Wilding, E. Yeast: Preparation of —— (P) 786
Davies, S. Zinc: Smelting of —— (P) 483
Davis, A. Acetylene Gas Generator (P) 963
And P. L. Acetylene Gas Generator (P) 1128
Davis, A. C. Cement; Machine for Damping and Mixing, &c. —— (P) 860
Davis, B. F. *See* Ling, A. R. 1088
Davis, C. Iron and Steel: Electrical Cementation of —— (P) 354
Steel: Hardening —— Electrothermally (P) 354
Davis, D. J. Fat: Apparatus for Washing —— (P) 1145
Davis, F. Solanum Dulcamara; Chemistry of —— 1153
Taps: Laboratory and other —— (P) 394
Davis, H. Precious Metals: Extraction of —— from their Ores (P) 351
Davis, J. Sewerage Systems of Sydney, N.S.W., and its Suburbs 1091
Water: Apparatus for Purifying —— (P) 1036
Davis, J. T. Fuel: Artificial —— (P) 1067
Davis, W. C. Ores: Apparatus for Roasting and Cooling —— (P) 977
Dawson, H. M., and Grant, F. E. Distribution of a Base between Two Acids: Determining the Ratio of —— ... 504
Day, D. T. "Mineral Resources of the United States" 507
Day, J. *See* Harrison, H. C. 354
Deacon, H. Wade. Proceedings of Annual Meeting 957
Deakin, T. B. *See* Appleyard, T. R. 702
De Alzugary. *See under* Alzugary.
Dean, W. T. Arc-Lamps, and Electrodes therefor (P) 462
Debierne, A. *See* Curie, P. 142
De Brevans, J. Benzoic Acid and Alkali Benzoates in Foodstuffs; Determination of —— 75
De Castro, A. *See* Schlomann, H. W. 260
De Cew, J. A. Charcoal Manufacture: Discussion on —— 746
Decker, H., and Solonina, B. Nitrosophenol Dyestuffs 1274
Deckert, H. *See* Thiele, H. 140
De Dion, A., and Bouton G. Battery: Secondary —— (P) ... 260
De Forcrand. Zinc Oxide: Action of Hydrogen Peroxide on —— 505
Zinc Oxide: Polymerisation and Heat of Formation of —— 995
Zinc Peroxides: Constitution and Properties of —— 1041
And Fonzes-Diacon. Hydrogen Selenide and Hydrogen Sulphide: Comparison of Properties of —— 369
And Massol. Ammonia: Heat of Solidification of —— 705
De Geofroy, G. *See* Conti, V. 1140
Degner, O. Iodine and Sulphur; Manufacture of a Fatty Compound of —— (P) 637
Deguide, C. Butter: Separation of Margarine from —— 1352
Deiss. Glycerin in Commercial Glycerin; Determination of —— 874
Deissler, R. Metal: Welding of —— (P) 977
Dejey, J. Rollers for Printing: Engraving of —— (P) 51
De Jong, R. Stannous Chloride in Ether Solution as a Reagent 1473
De Karazodine. Ebonitine: a New Insulating Material (P) .. 1539
Delafon, P. Electric Battery: Dry —— (P) 979
Delafond and Horsin-Deon. Crystallisation of Syrups, &c. (P) 1463
De Laire and Co. Pseudo-ionone; Production and Application of —— (P) 68
Delamare. *See* Pellett 193
Delarue, H. Fats; Saponification of —— (P) 262
Delattre, J. H. P. M. Fish and Refuse; Treatment of —, and Apparatus therefor (P) 555
Delbrueck. Yeast and Changes in Enzyme Content; Connection between —— 490
Yeast, Oleolytic Enzymes in —— 266

PAGE

Delbrueck, M. Attenuation in the Brewery 1088
Barley; Tendency of —— to get hot during Malting 556
Hops; Heating Tendency of —— 1342
Delgrande, A. Fire-Cracker; Production of a —— (P)..... 366
Pyrotechnic Compound (P) 366
Deltour, E., and Mist, L. Sugar Diffusion Vessels (P)..... 1147
Demantke, F. L., and Salentey, L. Tanning and Tawing Apparatus (P) 919
Demeler, K. *See* Eichengruen, A. 639, 873
Dementjeff, K., and Ousnikoff, J. Water-Glass, &c.; Means for Production of —— (P) 173
De Meuelemeester, E. Filtering Apparatus (P)..... 1118
Demichel, A. Sugar: Density of Dissolved —— 57
Dempster, R. Oil-Gas; Apparatus for Making —— (P).. 600, 1128
Demyrouze, L. Alcohol as an Illuminant 1268
Lamps; Incandescence —— (P) 908
Denison R. B. *See* Steele, B. D. 352
Dennhardt. *See* Schoenfeld..... 1343
Dennis, L. M. Translation of Hempel's "Methods of Gas Analysis" 1159
Dennison, C. H. *See* Gill, A. H. 643
Denso, P. Platin-Iridium Anodes; Chemical Resisting Power of —— 484
Denton, J. A., and Preas, J. H. Gunpowder; Smokeless —— (P) 927
Denton, J. E. Petroleum as Fuel; Tests of ——..... 326
Depetro, E. Ramie or Similar Fibre; Retting of —— (P).... 1185
Depierre, J. Calico Printing; Photography Applied in Engraving Rollers for —— 47
Resists under Steam Colours upon Woollen Tissues..... 703
Steam Chlorinating Machine 544
De Rochebrune. Xylopia Ethiopica; Constituents of —— 186
De Saint Seine, B. *See* Thofehrn, H. G. C. 862
Desaulles, G. Liquids; Separation of —— from Solid Matters (P) 556
Sugar; Apparatus for Purging —— (P) 922
Sugar; Apparatus for Separating —— from Massecuites (P) 59
Descamps, L. Calcium Compounds; Preparation of —— (P) . 1533
Desgrez, A., and Balthazard, V. Air; Means for Regenerating (P) 285
Desmaroux, J. Temperature Exchanging Apparatus (Water Sterilisation) (P) 1092
De Smet. Froth Remover, applicable to Carbonation Apparatus (P) 920
Desmots, H. *See* Monreu, C. 429
Desmoulière, A. Gelatin and Gelose in Preserves; Detection of —— 1157
See Portes, L. 182
Desurmont, F. Slubbing; Apparatus for Dyeing —— (P).... 50
Deussen, E. Sandal Oil; West Indian —— 1037
Deuther, J. C. *See* Daub, C. 1158
Dentsch Celluloidfabrik. Celluloid-like Products; Manufacture of —— (P) 494
Deutsch-Luxenburgische Bergwerks und Hutten Actienges. Blast-Furnace Gases; Means for Purifying —— (P) .. 1333
Deutsche Continental Gas Gesellschaft. *See* Sauer, A. 1543
And Bueb, J. Gas and Coke; Manufacture of —— (P)... 851
Deutsche Gold- und Silber-Scheide Anstalt vorm. Roessler. *See* Roessler, Deutsche, &c.
Deval, L. Calcium Sulphaluminate; Composition of —..... 1026
Cements; Action of Sulphate of Lime on —..... 257, 971
Devoe, B. G., and Dailey, C. W. Oil Burner (P) 462
Dewar, J. L., and Tripp, E. J. Beer; Treatment of —— for Bottling (P) 1191
Dibdin, W. J., and Grimwood, R. G. Sulphuretted Hydrogen in Coal-Gas; Detection and Determination of —— 1040
And Woltereck, H. C. Gas; Production of —— (P)..... 1127
Dickerson, E. N. Acetylene Gas; Apparatus for Generating —— (P)..... 605
Acetylene Gas Generator (P) 604
Dickhuth, M. *See* Moll, F. 49, 546
Dickson, W. K. L. Mantles for Incandescent Gas (P)..... 461
Didier, L. Rotary Filter (P) 905
Diederichs, C. Sizings; Apparatus for Boiling —— (P) 546
Diedrich. Drying Apparatus; Continuous —— (P)..... 1523
Diesler, C. Cement; Manufacture of —— (P)..... 175
Metals; Smelting and Reducing —— (P) 261
Diesselhorst, G. *See* Brieger, L. 1094
Dieterich, K. Apricot Kernels; Fatty Oil obtained from —— 178
Testing-Paper, and Manufacture of same (P) 277
Dietrich, R. Paper; Treatment of Waste Material for Making —— (P) 925
Dill, T. Alloys for Dental Purposes (P)..... 350
Dillner. *See* Anderson..... 459
Dilthey, W. *See* Moissan, H. 504, 566
Dimmick, A. M. Acetylene Gas Generator (P)..... 465

PAGE

Dimroth, O., and Zoppritz, R. Aromatic Aldehydes and Amines; Condensations between ——..... 467
Dinesman, M. Thymol; Manufacture of —— (P) 722
D'Infreville, L. M. G. Rosce. *See under* Rosce.
Dior, R. *See* Beck, N. 1021, 1067
Ditmar, K. India-Rubber; Behaviour of —— with Concentrated Nitric Acid..... 626
Ditte, A. Chromic Oxide; Crystallisation of ——..... 407
Ferric Oxide; Crystallisation of —— 505
Dittler, F. W. Fecal Matter; Apparatus for Clarifying —— (P)..... 270
Dittmar, E. Dyeing Apparatus; Mechanical —— (P)..... 547
Dittrich, M., and Hassel, C. Persulphates; Quantitative Separations by Means of —— 1414
Ditz, H. Bleaching Powder; Constitution of —— 1074
Divers, E. Birmingham Sewage; Discussion on —— 669
Reduction of Silver Solutions; Discussion on 1375
Dixon, C. W. Nickel in Nickeliferous Pyrrhotite from Sudbury; Condition of ——..... 775
See under Kendrick, W. J. and W. T. 925
Djavachoff, A. Borates of Hydrazine..... 646
Donne, S. E. Lamps; Exhausting Incandescence Electric —— (P) 1325, 1325
Dobbie, J. J., and Lauder, A. Berberine; Oxidation of —— .. 137
And Lauder, A. Corydaline VII. 137
And Lauder, A. Corydaline; Relation of —— to Berberine 137
Dobbs, A. E. *See* Johnston, J. 1067
Dodwell, C. J. D. and R. Soap-stamping Machinery (P) 413
Doering, T. Chromium Produced by Alumino-thermic Method; Chemical Properties of —..... 1158
Doerr, C. Colliery Waste; Utilisation of Carboniferous — (P) 1021
Doersch, C. *See* Young, J. A. 1278
Doht, W. *See* Stock, A. 995
Dolan, E. J. Acetylene Gas Generator (P)..... 605
Dolbear, C. E. Ores; Electrolytic Treatment of —— (P) 1285
Dolder, J. Yarn Mercerising Machines (P)..... 342
Dolezalek, F. *See* Kohlrausch, F. 429
Dolle, G. E. Manure; Manufacture of Artificial —— (P).... 1085
Dolfus, W. Dyestuff; Blue Sulphur —— (P)..... 1328
Dolphin, H. E. Agitating Apparatus (P)..... 959
Liquids; Apparatus for Aërating or Agitating —— (P) ... 779
Doman, W., and Ballas, S. W. Acetylene Gas Generating Apparatus (P) 1067
And Ballas, S. W. Gases; Apparatus for Purifying —— (P) 1127
Donard and Labbe. Maize; Extraction of Albuminoid Compound from —— (P) 1548
And Labbe. Maize; Albuminoid Substance from —— 1464
Donath, E. Ferrocyanide; Formation of —— from Gas Liquor 51
Dongier. *See* Lesage..... 496
Donohue, J. S. Gas Purifier (P) 852
Doolan, H. J. "Carburetter" (P)..... 600
D'Orlowsky, J. *See* Vuhtech, D. de 909
Dormeyer, C. *See* Rueckforth, R. 716
Dornfeld, J. F. Malt Kiln (P)..... 360
Dorr, A. M., and Spang, J. Ores; Treatment of —— (P)..... 775
Dorsemagen, A. Zinc and Substances containing Silicic Acid; Working —— in Electric Furnaces (P)..... 917
Zinc-bearing and Siliceous Materials; Treatment of —— (P) 775
Dougall, J. *See* Godwin, A. H. 907
Douge, J. Silk; Preparing Collodion for Manufacture of Artificial —— (P) 771
Douglas, J. Gas from Wood for Use in Manufacture of Steel. 860
Douillet, E. Fatty Matters, &c.; Refining ——, and Extracting Perfumes from Flowers (P) 711
See Pravicha, E. ..... 413.
Doulton, H. L., and Manger, A. W. Water; Apparatus for Softening —— (P) 1242
Douschan de Vulitch. *See under* Vulitch.
Dow, H. H. Counter Electro-Motive Force; Generation of (P) 1237
Down, J. R., and Godfrey, J. Furnaces; Mechanical Calcining or Roasting —— (P) 1029
Downer, W. R. *See* Schreiner, O. 274
Downs, E. S. Carbonometer; Construction of —— (P)..... 422
Downs, W. F. Lubricant; and Manufacture of same (P)..... 712
Metals; Treating Rebellious Ores of Precious —— (P).... 1185
Dowzard, E. Essential Oils; Commercial —— 1244
Strychnine and Brucine in Nux Vomica; Determination of —— 1500
Drake, B. M., and Gorham, J. M. Electric Accumulators (P) 621
And Gorham, P. M. Casks; Apparatus for Cleansing —— (P)..... 63
And others. Glow Bodies for Nernst Electric Lamps (P). 245
And others. Lamps of the Nernst Type; Incandescent —— (P)..... 1226

PAGE

Drake, C. E. Acetylene Gas Generator (P) 605
Drake, J. A. Furnaces and Kilns Regenerative and other —— (P) 1388
Dralle, R. and C. Glass Industry. Improvements in the ——. 52
Dramnski, A. Reheater for Sugar Juices, &c.; Quick Current —— (P) 1463
Drapier, J., and Dubois, P. Spirit; Solidified —— (P) 1524
Drawe, P. "Lithopone": Analysis of ——..... 427
Dreher, C. Leather; Producing Fast Shades on —— by Use of Titanium Salts, &c. (P)..... 1533
Salts of certain Acids; Manufacture of —— (P) 988
Titanium Lactate; Manufacture of —— (P)..... 988, 1245
Titanium Mordanting Compounds in Leather Dyeing..... 1329
Titanium Salts; Use of —— in Dyeing Leather, &c. (P)... 771
Dresser, H. Aristoquinine; Characteristics of ——..... 789
And Callsen, J. Atropinium Alkyl Nitrate (P) 1194
Drew, S. J. *See* Howell, J. 1538
Dreyfus. Effluents; Discussion on Manchester Bill for Discharge of —— 582
Driedger, A. *See* Sadler and Co. 1072
Driessen. Turkey-Red Dyeing; Action of Oil in the Ancient Process for —— 612
Turkey-Red Dyeing; Old Process of 545
Drory. Offtake for Hydraulic Gas-Mains..... 108
Gas Retorts; Comparison between Inclined and Horizontal —— 459
Drown, C. W. *See* Gearing, C. M. 963
Drummond, W. and G. W. Water; Apparatus for Softening (P) 717
Dry Air Refrigerator Co. Refrigeration; Artificial ——, and Apparatus therefor (P)..... 458
Dubbs, J. A. Oil; Distilling —— (P) 466, 966
Dubois. Chromium Sesquioxide; Compounds of Alumina with —— (P)..... 727
Dubois, A. N. Oxidising Apparatus (P) 969
Dubois, P. *See* Drapier, J. 1524
Dubos, A. Sugar Diffusers; Gases in the ——..... 416
Dubuque Enamelling Co. Enamelled Vessels; Manufacture of —— (P) 477
Ducatte, F. Halogen Thiobismuthite of Copper..... 877
Lead; Chloro-, Bromo-, and Iodo-Sulphobismuthites of —— 796
Ducellier, G. Acetylene Lanterns or Lamps (P) 698
Duckworth, C. Mixing Apparatus (P) 1224
Duclos, A. *See* Charon, A 1270
Dudderidge, F. R., and Hill, J. S. Sodium Phosphate and Arsenate; Volumetric Determination of —— 1156
Duderstadt, F. *See* Steinbach, J. 1078
Duering, F. Lactic Acid: Use of —— in Mordanting Wool with Alumina 911
Dufau, E. Mercuric Oxide; Preparation of Pure Red —— ... 1467
Duff, E. J. Gas-Producer (P)..... 600
And The United Alkali Co. Evaporating Apparatus (P).. 344
And The United Alkali Co. Electric Furnaces (P)..... 697
And The United Alkali Co. Gas Furnaces (P) 905
And The United Alkali Co. Producer Gases; Treatment of —— (P) 33
Duffek, A. Lithographic Printing; Surfaces for Transferred —— (P) 565
And others. Lamps; Incandescence Gas —— (P)..... 697
Duffy, J. F. Alcoholic Liquors; Apparatus for Treating (P). 716
Alcoholic Liquors; Refining, &c. —— (P)..... 716
Liquors; Apparatus for Refining, Ageing, &c. —— (P ... 558
Liquors, Malt and Spirituous; Refining and Ageing ——, (P)..... 558
Dufossez, P. *See* Nihoul, E. 850
Dufour. Casks; Disinfection of —— (P) 1547
Dufour Brothers. Tanning Extracts; Treatment of —— (P). 1146
Dufty, L. Manganese; Volumetric Determination of —— ... 70
Duke, J. F. Alloys; Production of —— (P)..... 1457
Dumont and Vottel, B. Briquetting; Binder for ——..... 696
Dunbar. Effluents from Sugar Works; Purification of —— ... 185
Duncan, A. D., and Wafer, W. H. Hydrocarbon Burner; Retort —— (P) 963
Duncan, H., and others. Separating Apparatus (P)..... 478
Duncan, W. Bismuth Citrate..... 1151
Bismuth Citrate; Characteristics of —— 874
Dunecombe, T. H. Acetylene Gas Generator (P) 1527
Dungern, E. von. Milk; Rendering —— easily Digestible (P) 869
Dunlop, H. V. Casein; Production of Insoluble —— (P) ... 747
Milk Albumin; Production of Soluble —— (P) 1291
Durkeisbühler, M. *See* Wachsmuth, H. 176
Dunn, E. W. Burner, Oil —— (P 909
Dunn, J. T. Ferrous Chloride; Density of Aqueous Solutions of —— 380
Milk; Discussion on Coagulation of —— 1513
Dunstan, W. R., and Henry, T. A. Coarctogenesis in Plants ... 996
Duprez, L. J. P. M. V. Earth Fuel; Manufacture of —— (P) 1569
Du Pont, F. G. Solvents Separation of —— from Substances (P)..... 1576

PAGE

Dupont, J. "L'Industrie des Matières Colorantes" 78
Perfumes; Lecture on —— 1245
Dupre, A. Potassium Chlorate; Explosion of —— by Heat .. 217
Saltpetre; Determination of Perchlorate in —— 825
Dupre, jun., and Korn, W. Sodium Thiosulphate, Sulphite, and Sulphide; Determination of —— 500
Dupré, L. W. *See* Williamson, J. A. 1477
Durand, Huguenin and Co., Dyeworks formerly. Dyestuffs; Blue Oxazine —. (P) From de la Harpe 1182
Dyestuffs; Oxazine —— (P)..... 1452
Dyestuffs, Oxazine; Manufacture of New —— (P)..... 669
Gallocyanines; Leuco Derivatives of —— (P)..... 835
Gallocyanines; Manufacture of New Derivatives of —— (P) 769
Leucogallocyanine. (P) From de la Harpe 1073
Durban, W. L. Gas Burners (P) 397
Durrin, W. A. Fabrics; Waterproof and Air-tight —— (P) .. 341
Duryea, C. B. Starch; Thin-Boiling —— (P)..... 630
Duryea, J. F. Carburetter for Explosive Engines (P)..... 764
Dutilleul, G. Fabrics; Rendering —— Impermeable to Liquids (P)..... 1025
Dutordoir, C. Water in Steam Generators; Purifying the —— (P)..... 394
Duttenhofer, C. Explosive Materials; Production of Easily Ignitible —— (P)..... 927
Duwez, O. F. J. India-Rubber; Devulcanisation of —— (P) . 488
Duyk. Formaldehyde, Methyl Alcohol in; Detection and Determination of —— 283
Nickel Salts as Reagents for Reducing Sugars 74
Sewage Purification in Belgium by the Chemo-Biological Method 1192
Dye, F. "Lighting by Acetylene"..... 568
Dye, W. H. Oil-Fuel Generator (P) 1068
Dyeworks formerly Durand, Huguenin and Co. *See* Durand, Huguenin and Co.
Dyson, E. Furnaces; Means for Burning Liquid Fuel in —— (P) 762
Dyson, H. W. C. K. Artificial Stones, &c.; Material for —— (P) 1139

E

Eagle Chemical Works. *See* Schwarz, L. 1154
Earp, T. Kilns for Drying Malt, &c. (P) 1191
Eastern Powder Co., The. Explosive Powder; Manufacture of —— (P)..... 189
Eaton, A. E. Iron or Steel; Removing Scale Oxide from —— (P) 977
Ebel. Concrete for Use in Salt Mines 175
Eberhard, O. Milk Extract; Manufacture of —— (P)..... 1548
See Mierisch, O. 183
Eck, T., and Becker, W. Hanks; Apparatus for Washing —— Mechanically (P)..... 545
Eckenstein, W. A. von, and Lobry de Bruyn, C. A. Sugars; Isomers of β-Naphthyl Hydrazones of the —— 1302
See Lobry de Bruyn, C. A. 286
Eckert, C. F., jun. Chrome Iron; Manufacture of —— (P)... 1080
Eckstein, O. 1.1-Dinitronaphthalene; Sulphonation of —— .. 1390
Ecob, J. R. Cotton Fabrics; Mercerising ——, and Apparatus therefor (P)..... 49
Eddy, H. P. Sewage Treatment; Effect on —— of Pickling Liquids 534
See Kinnicut, L. P. 1092
Edelmann, A. *See* Froelich, O. 351
Edler, J. M., and Valenta, E. Photographic Chemicals..... 1348
Edinger, A., and Ekeley, J. B. Sulphur; Basic Properties of —— 285
Edison. Cement; Apparatus for Calcining —— (P)..... 1455
Edison, E. R. Oil-yieldable Material; Drying of —— (P) 1083
Edison, S. O. Fibres; Manufacture of Fuel from —— (P) ... 1067
Edison Storage Battery Co. *See* Edison, T. A. 1031
Edison, T. A. Batteries; Secondary —— (P) 125
Battery; Reversible Galvanic —— (P) 778, 778, 917, 1031, 1031, 1031
Bricking Pulverised Material; Apparatus for —— (P) 1030
Electrode for Secondary Batteries (P)..... 1031
Phonograph Records; Coating of —— (P) 1541
Edmunds, J. Sulphurous Acid; Apparatus for Manufacturing (P)..... 1554
Elser, E., and Wilderman, M. Electrolytic Methods and Apparatus (P) 125
Edson, E. R. Fish; Reducing or Rendering —— (P)..... 1238
Gelatin-yieldable Liquids; Obtaining —— (P) 982
Glue- or Gelatin-yielding Material from Fish (P)..... 357
Naphtha, Apparatus for Separation of —— from Oil (P) . 1032
Oil; Extraction of —— (P)..... 263
Rendering Apparatus (P 267, 1238

PAGE

Edwards, A. W. Acetylene Gas Apparatus (P) 965
Edwards, T. Chlorine Gas; Generator for —— (P) 1278
Effront, J. Albuminoid Substances; Value of Fractional Precipitation for Differentiating —— 642
"Enzymes and their Applications" 369
Efrem, S. Supple Protective Coating (P) 1469
Egli, J. Copper Extraction; Theory of Electrolytic Methods of —— 623
Ehlert, F. G. Guaiaform; Preparation of —— 382
Ehmann, C. P. Gas Burners; Incandescent —— (P) 109
Ehrenfeld, R. Protein Substances; Action of Nascent Chlorine on —— 846
See Habermann, J. 1158
Ehrhart, G. Paper-making Machine (P) 1037
Ehrlich, E. Malt; Albumin-dissolving Enzyme in —— 180
Ehrmann, C., and Lovat, H. Tartaric Acid in Pressed Grape Skins; Determination of —— 726
And Slaus-Kantschieder, J. Mercury Ores and their Chemical Examination 501
Ehrmann, E. Acrylic Aldehyde; Action of —— on Metadiamines 1023
Dimethylaniline; Action of —— on Sulphur Chloride 1023
Dyestuffs, Sulphide; Obtainment of —— 1023
Indulines; Obtainment of Soluble —— 1023
Nitrosodimethylaniline; Action of —— on Aromatic Alcohols 1023
Nitrosodimethylaniline; Action of —— on β-Napthoquinone 1023
Paranitroso Derivatives of Secondary and Tertiary Amines; Action of —— on Aromatic Alcohols 1023
Eichelbaum, G. Food Extracts; Obtainment of —— (P) 1242
Milk Compound resembling Meat Extract (P) 1548
Eichengruen, A. Acetono Bisulphite; Applications of —— in Photography 1411
Photographic Developer 1349
Pyrotechnic Compound (P) 1349
And Berendes, R. Zinc-Gelatose Compound (P) 791
And Demeler, K. Amido-Oxybenzyl Compound, and Manufacture of same (P) 639
And Demeler, K. Photographic Pictures; Development of —— (P) 873
Eidmann, W. E. *See* Moeser, L. T. 368, 1333
Einstein, A. C. Acetylene Gas Generator (P) 605, 909, 1270
Eisenmann, E. *See* Rignon, J. A. 908
Eitner, P. Explosion Limits of Gases and Vapours with Air .. 395
Eitner, W. Leather; Effect of Lactic Acid, &c., in Manufacture of —— 627
Ekeley, J. B. *See* Edinger, A. 285
Ekenberg, M. Vacuum Pan (P) 1548
Ekman, C. D. Gum Arabic and other Soluble Gums; Substitute for —— (P) 358
Elb, M. Yeast Extract; Preparation of an Alimentary —— (P) 924
Elber, E. *See* Knoevenagel, E. 1296
Elbers, A. D. Iron Ores; Treatment of Fine —— (P) 1400
Elbers, W. Fibres Dyed with Sulphide Colours; Causes of Tendering of —— 405
Indigo; Fixing —— by Steaming 1024
Elbs, K. Carbides and Artificial Graphite Manufacture by Electrical Fusion 1419
And Brand, K. Ketones; Electro-Chemical Reduction of —— 1334
And Brand, K. Nitro Compounds; Reduction of Aromatic —— 1334
And Forssell, J. Lead; Behaviour of —— as Anode in Sodium Hydroxide Solutions 1281
And Wohlfahrt, T. *o*- and *p*-Nitrobenzene Sulphonic Acids; Electro-Chemical Reduction of —— 1335
Eldred, B. E. Flame or Combustion; Control of —— (P) 696
Lime; Calcining of —— (P) 615
Eldridge, H. Gas-Burner; Incandescence —— (P) 964
Electric Furnace Co. Steel; Direct Manufacture of —— (P) .. 915
Electric Ozone Syndicate, and Smith, R. F. W. Ozonisers (P) 553
Electric Storage Battery Co. *See* Entz, J. B. 1082
See Lloyd, H. H. 1540
See Martin, H. M. 1082
See Steinmetz, E. G. 1082
Elias, F. Magnesium Peroxide; Manufacture of —— (P) 1278
Elias, L. *See* Raphael, M. 353
Ellershausen, F. Ores, Complex and Refractory; Treatment of —— (P) 862, 978
Elliott, G. R. Burner for Hydrocarbons (P) 909
Ellis, A. W. Cleansing Compositions; Liquid —— (P) 869
Ellis, M. D. Foods; Apparatus for Preserving —— (P) 1149
Ellis, P. B. *See* Werner, A. Y. 626
Ellis, S. H., and Holt, T. Ceramic Glass, &c.; Dipping —— (P) 1535
Ellis, W. H. Caustic Soda and Bleaching-Powder; Discussion on Electrolytic —— 451
Elmore, A. S. Mineral Substances; Separation of —— (P) 349
Minerals; Apparatus for Separating —— (P) 618, 862

PAGE

Elsner, H. T. W., and Latta, P. Photographic Films, Developing, Fixing, and Toning ——, and Apparatus therefor (P) 276
Elsner, J. A. Gases; Removing Dust from —— (P) 177
And Knox, G. F. Refrigerating Apparatus (P) 394
Emerson, E. Metal Tubes; Electro-deposition of —— (P) ... 624
Emerson, F. M. Stone; Artificial ——, and Manufacture thereof (P) 348
Emich, F. Litmus-Silk; Notes on —— 428
Emilewicz, T. *See* Lange, M. 968
Emmerling, O. Amino-Acids as Foods for the Lower Plants .. 996
Ammonia in Water; Determination of —— 990
Butyl Alcohol; Occurrence of Normal —— in Corn Fusel Oil 419
Enzymes; Action of Sunlight upon —— 61
Papayotin; Digestion of Albumin by —— 421
Yeast Maltase; Synthetic Action of —— 60
And Reiser, O. Albumin-digesting Bacteria 429
Emmet, W. le R. Electric Insulating Material, and Application thereof (P) 259
Emszt, K. Silver Sub-Haloids 137
Endemann. Phenols; Formaldehyde as a Reagent for —— ... 74
Engbert, H. Sandstone; Artificial —— (P) 915
Engelhardt, V. "Die Elektrolyse des Wassers, ihre Durchführung und Anwendung" 729
Engels, W. Fireproof Articles for Metallurgical Uses (P) 1081
England, J. W. Formaldehyde Vaporiser (P) 1550
Engler, C., and Woehler, L. Pseudo-Catalytic Oxidation Processes 257
Englert, L. K. *See* Wolfe, J. S. 350, 411
Enoch, C. Sodium Silicofluoride; Production of —— (P) 344
Ensminger. Casein Product; Production of a —— (P) 1462
Entz, J. B. Battery; Secondary —— (P) 1082
Enzinger, K. Filter Presses (P) 458
Epstein, S. Beet Slices; Acid Fermentation of —— 1241
Epstein, W., and Rosenthal, E. Colouring Matters, Sulphur; Production of —— (P) 39
Equitable Auto-Truck Power-Burner Co. Vaporising Hydrocarbons (P) 1446
Erdmann. Aldehydes; New Reagent for —— 192
Erdmann, E. Coffee Oil; Research on —— 871
Jasmine Flowers; Essential Oil of —— 274
Methyl Anthranilate; Detection and Determination of —— 283
Erdmann, H. Indigo; Production of —— (P) 38
Ericson-Aurén, T., and Palmaer, W. Metals; Solution of —— 125
Erisman, C. Oil; Apparatus for Separating Solvents from —— (P) 712
Erk, M. J. Acetylene Gas Generator (P) 605
Erlwein, G., and Frank, A. Cyanide Compound, and Manufacture of Same (P) 1232
Escande and Philippet. Sugar; Extraction of —— (P) 130
Ettli, G. S. *See* Jacobs, C. B. 1397
Evans, H. *See* Behrend, S. K. 977
See Wills, E. C. 977
Evans, J. J. Proceedings of Annual Meeting 957
Evans, R. C. T. Lamps; Electric Arc ——, and Means for Stopping Heat Radiation (P) 957
Evans, T. W. *See* Weil, E. L. 604
Evans, W. C. B., and Nelson, C. P. Carburetter and Vaporiser for Internal Combustion Engines (P) 696
Evans, W. J., and Klepetko, F. Gas-Producer (P) 1068
See Klepetko, F. 1185
Everett, J. D., and Everett, Alice. Translation of Hovestadt's "Jena Glass and its Scientific and Industrial Applications" 1562
Everhart, E. Alum; Manufacture of —— (P) 255
Ewart, A. J. Nitric Acid; Action of —— on Metals 368
Exportbier-Brauerei H. Siemens and Co. Nicotine; Preparations for Counteracting —— (P) 872
Eyermann, P. Iron or Steel; Production of Malleable ——, and Apparatus therefor (P) 709
Eyre, J. V. *See* Meldola, R. 1028
Eyre, J. W. H. Centrifugal Machines for Laboratory Use (P) 1039

F

Fabrik Chem. Praeparate von R. Sthamer. *See* Sthamer, R.
Fabrique Baloise de Prod. Chim. Phthalic and Benzoic Acids; Manufacture of —— (P) 137
Fabrique ci-devant J. R. Geigy. *See* Geigy and Co.
Fabrique des Produits Chimiques de Thann et de Mulhouse. Ortho-Toluene Chlorosulphonic Acid (P) 112
Fabry, R., and Linard, F. Coke Ovens (P) 906

PAGE

Fages, J. Nitroprussides: Action of Sulphites on —— 877
Fahrion, W. Colophony: Research on —— 127, 127
Fairley, T. Alkaline Hydrate or Bicarbonate: Discussion on Estimation of —— 325
Arsenic Determination in Malt Liquors: Discussion on —— 903
Iodine Value of Oils: Discussion on —— 456
Thermo-Regulator: Discussion on New Form of —— 457
Falk, Stadelmann and Co., and Thurnauer, L. Gas-Burners: Incandescence —— (P) 161
Falkenwalde, O. Acetylene Gas Generator (P) 764
Fanta, F. Filaments of Glow Lamps: Apparatus for Reinforcing, &c. (P) 1524
Vacuum: Process and Means for Producing a —— (P) ... 1523
Fanto, R. *See* Zeisel, S. 992
Farbenfabriken of Elberfeld Co. *See* Bayer and Co., F.
Farbwerke Hoechst. *See* Meister, Lucius und Brüning.
Farb. vorm. A. Leonhardt and Co. *See* Leonhardt and Co., A., Farb. vorm.
Farb. vorm. F. Bayer and Co. *See* Bayer and Co., F.
Farbwerke vorm. Meister, Lucius und Brüning. *See* Meister, Lucius und Brüning.
Farkas, Lamp: Incandescence Spirit —— (P) 1390
Farnsteiner, K. Boric Acid: Titration of —— 277
Farnsworth, W. *See* Mountany, C. 1408
Farraday, S. E., and Goss, J. H. Burner: Hydrocarbon Incandescence —— (P) 602
Fattelay, V. Steel: Manufacture of —— (P) 409
Fauconn, A. Caffeine: The Iodides of —— 636
Faulkner, W. J. Gas: Apparatus for Generating —— (P) 1128, 1128
Faust, E. S. Acecantherin: A Source of African Arrow Poison 1168
Faustin, H. Sugar, Crystallisable: Obtaining the Whole of —— (P) 59
Fawley, T. C. Hides: Preparing and Tanning —— (P) 555
Fawsitt, C. A. Hydrogen Peroxide: Its Manufacture, Properties, and Uses 229
Fay, H., and Ashley, H. E. Alloys of Antimony and Tellurium 617
And Gillson, C. B. Alloys of Lead and Tellurium 617
Federlin, W. Catalysis: A Model for —— 1417
Federmann. *See* Noelting, E. 400
Fee, E. L. Lamp: Incandescence Vapour —— (P) 853
Feld, W. Hydrocyanic Acid: Production of —— (P) 1553
Feldkamp, F. A. Carbonic Acid Gas: Apparatus for Generating —— (P) 1330
Feldmann, A. Ammonium Sulphate: Manufacture of —— (P) 1027
Feldmeier, H. Pasteurising Apparatus (P) 1149
Fellner and Ziegler. Cement: Apparatus for Manufacture of —— (P) 550
And Ziegler. Kilns: Rotary Burning or Roasting —— (P) 479
And Ziegler. Slag Cement: Apparatus for Manufacture of —— (P) 1535
Felt, F. B. Retort for Generating Oxygen (P) 971
Fendler, G. Mucosol; Characteristics of —— 1466
Fenner, W. H. Fine-Fuel Combustion (P) 962
Furnace: Fine-Fuel —— (P) 962
Ferreira, G. Sugar in Lumps of Desired Form: Apparatus for Making —— (P) 1085
Feret, R. Mortars: Testing Adhesive Power of —— 256
Fernbach, A. Malt Extract: Some Causes Diminishing the Yield of —— 470
Ferraris, E. Ores: Treatment of Mixed Sulphide —— (P) ... 1185
Ferreira, E. G. Fabrics: Finishing Textile —— (P) 1132
Ferrell, J. L. Wood-fireproofing Compound (P) 615
Wood: Impregnation of —— (P) 550
Wood: Preservation of —— (P) 1455, 1535
Feurt, W. A., and Martin, H. H. Gases: Apparatus for Generating —— (P) 332
Feval, L. Tubes: Collapsible Pyroxylin —— (P) 1151
Feyerabendt, G. Wood: Preserving and Colouring —— (P) . 1331
Fieber, R. Tungsten in Tungsten-Steel: Determination of —— 140
Fiedler, M. Explosive: Composition of an —— (P) 723
Fielding, A. Viscose: Manufacture of —— (P) 1193, 1243
Viscose on Textiles: Fixing of —— (P) 1230
Fiesselmann, G. *See* Heller, G. 1181
Fièvet, H. E. L. *See* Germot, A. 176
Fillet, J. Carburetter for Explosion Engines (P) 601
Findlay, A. Mannitol, Picric Acid, and Anthracene: Solubility of —— 1043
Finck, A. *See* Rupp, E. 1473
Finke, J. F. *See* Thiele, F. C. 110
Finke, R. Mantles for Incandescence Lighting (P) 1389
Finkelstein, A. Iron: Passive —— 175
Firth Sterling Steel Co. *See* Clarke, E. B. 1030
Fischer, A. Copper Cyanide Baths: Substitution of Sodium Sulphite for Sodium Bisulphite in —— 710

PAGE

Fischer, E. Casein: Formation of α-Pyrrolidinecarbonic Acid on the Hydrolysis of —— by Alkali 1158
And Alt, H. Indigo Printing by Kalle's Process 1132
And Armstrong, E. F. Disaccharides: Synthesis of New —— 1302
And Armstrong, E. F. Glucosides: Synthesis of —— 1302
And Armstrong, E. F. Osones: Preparation of —— 1302
And Armstrong, E. F. Sugars: Acetohalogen Derivatives of —— 1302
And Harries, C. Vacuum Distillations 990
And others. Gelatin: Hydrolysis of —— 713
And Skita, A. Silk: Fibroin and Glue of —— 968
And Skita, A. Silk: Fibroin of —— 472
Fischer, F. Phosphoric Acid: Behaviour of Lead Anodes in —— 978
Fischer, L. *See* Hinck, A. 1554
Fischer, O., and Hepp, E. Dimethylnaphthosafranine: Preparation of —— 1130
And Hepp, E. Indulines of the Aminoazobenzene Melt... 1274
And Weiss, K. Carbinols: Esterification of —— 400
Fischer, R. Sulphur Dyestuffs: Printing with —— 857
Fischer, T., and Wartinberg, H. von. Mercury Oxybromide.. 1345
Fishell, E. M., and Clymer, W. R. Primary Battery (P) 917
Fiske, J. P. B. Kilns for Bricks, &c. (P) 708
Fitzgerald, C. Furnace: Quicksilver Separating and Continuous Ore —— (P) 620
Flachs, A. Petroleum Spirit: Sumatra —— 1022
Flachslaender, J. *See* Schultz, G. 1022
Flamache, A. Wood: Preservation of —— (P) 1535
Flandrak. Glycerin: Method and Apparatus for Recovery of —— (P) 1460
Fleischer, E. Water-Gas: Manufacture of —— (P) 909
Fleming, J. Candle: Fumigating or Antiseptic —— (P) 985
Fleming, J. C. Toilet Cream (P) 263
Fletcher, W. H. Dyeing Machine (P) 1134
Fleurent, E. Wheats: Composition of Hard —— and Constitution of their Gluten 133
Fleury, G. Morphine: Characteristic Reaction for —— 192
Fliegel, J. Sterilising Apparatus (P) 1149
Flogel, A., and Koller, R. Wool: Influence of Assistant Mordants on Spinning of —— 339
Flor, F., and Murmann, E. Metallic Articles: Preventing Tarnishing of —— (P) 1225
Flora, E. E. Lamp: Incandescence Oil —— (P) 1325
Floyd, F. H. Liquids: Apparatus for Raising or Lowering Temperature of —— (P) 1291
Foelsch, H., and Co. Saltpetre: Purification of Chili —— (P) 51
Foerg, R. Heptacetylchlormaltose: Preparation of —— 506
Foerster, F. Anode Materials: Artificial Graphite and Platinum-Iridium as —— 184
And Friessner, A. Dithionates: Electrolytic Production of —— 1030
And Mueller, E. Alkali Hypochlorite and Chlorate: Attainable Current, &c., in Manufacture of —— 252
And Mueller, E. Electrolysis with Platinised Electrodes . 1235
And Mueller, E. Hypochlorous Acid and its Salts: Behaviour of —— during Electrolysis 1235
Foidart, M. Carburettors for Hydrocarbon Motors (P) 331
Fokin, S. Linseed Oil: Characteristics of —— 1285
Foll, E. *See* Cannon, M. J. 632
Fontaine, H. Copper Plating: Dessolle's Process of —— 1144
Vaillard-Desmaroux Apparatus for Sterilisation of Water; Report on —— 634
Fonzes-Diacon. *See* De Forcrand 369
Foote, H. W. Silver Chlorate and Sodium Chlorate: Mixed Crystals of —— 796
Forbes, C. S. Acetylene Gas: Manufacture of —— (P) 599
Forde, T. J. Vapour-generating Apparatus for Hydrocarbon Burners (P) 1180
Forell, C. von. Cement: Manufacture of —— (P) 347
Portland Cement from Blast Furnace Slag (P) 257
Formenti, C. Acetic Acid in Lead Accumulators; Determination of —— 127
And Levi, M. Aluminium: Action of —— on Salt Solutions and Fused Salts 116
Fornander, A. Yarns: Apparatus for Colouring —— (P) 1393
Forrest, J. H. *See* Heal, W. E. 1330
Forssell, J. *See* Elbs, K. 1281
Forster, J. J., and Murdock, R. L. Soap Press (P) 1145
Forster, M. O. Gutta-Percha: Discussion on —— 1373
Fortey, E. C. *See* Young, S. 720, 721, 726
Fortun, R., and Semprun, E. Batteries; Secondary —— (P). 777
Foster, C. W. Glass; Apparatus for Delivering Melted —— (P) 971
Foster, G. V., and Mackusick, E. F. Acetylene Gas: Apparatus for Generating —— (P) 461, 1447
Foster, W. J. Blast-Furnace: Properties of Carbon in the Hearth of the —— 774
Iron: Introduction of Carbon and Fluxes in the Manufacture of —— (P) 349

PAGE

Fourcy, E. Sugar Juices; Depulping Sieve for Clarification of —— (P) 921
Fourneau, E. *See* Willstaetter, R. 871, 1193
Fournier, E. Disinfecting and Preserving Process (P) 1345
Disinfecting Apparatus (P) 718
Fowler, A. J. Burner for Liquid Fuel and Air (P) 462
Fowler, G. J. "Sewage Works Analyses" 877
Fox, A. H. Burners for Oil (P) 1022
Fraenkel, S., and Wogrinz, A. Tobacco: Aroma of ——..... 797
Francesconi, L., and Bargellini, G. Fluorescence: Influence of Substituting Groups on —— 1327
Franchot, R. Paris Green; Manufacture of —— (P) 782
Francis, W. H. Disinfecting Apparatus (P) 1036
Francke, O. Non-conducting Material for Coating Steam-pipes (P) 107
Frank, A. *See* Erlwein, G. 1232
Frank, A. R. Hyposulphites of the Alkaline Earths and of Magnesium; Electrolytic Preparation of —— (P)..... 51
Frank, F., and Marckwald, E. India-Rubber Goods: Analysis of —— 726
And Marckwald, E. India-Rubber; Regenerated —— ... 1085
See Marckwald, E. 1188, 1351
Frankel, E. Hat Manufacture; Material and Dyes used in the —— 113
Frankenburg. *See* Weber, C. O. 968
Frankland, P. F. Air of Birmingham Art Gallery: Influence of Illuminant on —— 1091
Franquet, E. Celluloid; A New —— (P)..... 134
Compositions for Imitation of Shell, Ivory, &c. (P)..... 134
Nitrocellulose and Insoluble Caseinates; Composition containing —— (P) 1408
Fraps, G. S. Barium Sulphate: Solubility of —— in Presence of certain Chlorides..... 727
Sulphur in Plants; Determination of —— 642
Frasch, G. *See* Zaloziecki, A. 335
Frasch, H. A. Alkalis, Production of —— (P) 970
Caustic Alkali; Manufacture of —— (P)..... 615
Cobalt Hydroxide, &c.; Preparation of —— (P)..... 862
Metals; Recovering —— by Electrolysis (P)..... 624
Nickel Ammonium Compound; Production of a —— (P) . 253
Fraser, S. L. Stock Food containing Molasses (P)..... 1090
Freelandt, C. L. F. Gelatin Films for Photographic Purposes (P)..... 1097
Freeman, D. O. Acetylene Gas Purifier (P)..... 1128
Freer. Resists; White and Coloured —— under Steam Indigo..... 1452
Freer, P. C., and Novy, F. G. Benzoyl-Acetyl and Diacetyl Peroxides; Formation, Decomposition, and Germicidal Action of —— 495
Frees, J. W. Battery; Primary —— (P)..... 354
Fremery, M., and Urban, J. Cellulose Products; Manufacture of —— (P) 1150
Frenay, H. N. Carburetters for Explosion Motors (P) 539
Frerichs, G. Tellurium: Determination of —— 1299
And Fuentes Tapis, N. de. Ipecacuanha Root: Determination of Alkaloidal Constituents of —— 1299
Fresenius, C. Residues from Vegetable Oils; Treating —— for Use as Forage (P)..... 1403
Fresnaye, J. de la. *See* Combanaire, A. 357, 1085
Freund, H. H. *See* Wallerstein, M. 360, 632
Freund, M., and Bamberg, P. Cotarnine; Research on ——... 871
And Mai, L. Artemisin: Characteristics of ——..... 136
And Schander, A. Thiosemicarbazide as a Reagent for Aldehydes and Ketones..... 1160
And Wulff, G. Cotarnine; Research on —— 871
Freundler, P., and Béranger, L. Azobenzene and Hydrazobenzene; Properties of —— 429
Freundlich, J. Fats: Indicator in the Titration of Dark-coloured —— 75
Steam Superheater for Laboratory Use 1472
Frew, Levan: Discussion on —— 1385
Frew, W. Hydrogen Peroxide; Discussion on —— 236
Freymann, O., and Tolman, C. Gas- (or Smoke and Gas-) Detector (P) 603
Freyss, G., and Paira, A. 5-Nitro-8-methoxyquinoline and its Derivatives..... 1449
Friedberger, O. *See* Mueller, E. 706, 1142
Friedheim, C., and Hoffmann, M. K. Molybdenum Lower Oxides and Metallic Molybdenum: Analysis of ——... 426
Friedlaender, J. Liquids: Partly Miscible —— near the Critical Point..... 284
Friedlaender, P., and Silberstern, L. Naphthoquinone; Hydroxy Derivatives of —— 1272
Friedman, C. S. Wood; Creosoting of —— (P)..... 479
Friedmann, H. *See* Adelsberger, J. 1337
Friedrich, K. Selenium: Volumetric Determination of ——.. 1195
Frier, G. W. *See* Johnson, H. 410
Fries Bros. *See* Trillat, J. J. A. 1036
Fries, J. W. Textiles: Apparatus for Steaming, &c., —— (P). 1392
Yarn; Machine for Oxidising —— (P)..... 613

PAGE

Friesleben, C. Centrifugal Separator (P) 1064
Friessner, A. *See* Foerster, F. 1030
Frings, M. Mercerising Apparatus (P) 171
Fritz, C. P. Vulcaniser (P) 626
Friz, O. Cement: Manufacture of —— (P) 708
Frolich, O., and others. Ores; Separating Process for —— (P)..... 851
Froemsdorff, G. *See* Kostanecki, St. v. 470
Fromme, O. Liquids; Pasteurisation of —— (P)..... 268
Frossard, J. *See* Binder, F. 1182, 1455
Frost, W. Matches; Machines for Dipping and Heading —— (P) 1471
Froyer-Delapierre. *See* Langot, W. 722
Fuchs, C. *See* Bauke, F. 1446
Fuchs, G. Cinnamylquinine Hydrochloride; Production of —— (P)..... 364
Fuchs, L. Osmosis; Apparatus for —— (P) 1147, 1147
Fuehrer, J. Detonating Composition (P) 189
Fuehrer, M. Explosives; Manufacture of —— (P)..... 1472
Fuellner, E. Filtering Liquids, and Apparatus therefor (P).. 243
Fuentes Tapis, N. de. *See* Frerichs, G. 1299
Fuerstenheim, F. Sterilising Apparatus (P)..... 717
Fuerth. Printing Velvets and Velveteens..... 47
Turkey-Red Oil: Treatment of —— 857
Velvet and Allied Materials..... 46
Fuhrmann, F. Magnesium Peroxide Compound (P) 706
Funcke, R. *See* Krafft, F. 1301
Fussgaenger, V. α-Naphthylamine Derivatives..... 467
See Ullrich, E. 1182
Fyfe, W. W. Furnaces for Converting Oxides into Metal (P). 1333

G

Gabel, H. M., and Kearns, T. E. Furnace for Red Lead (P) .. 356
Gabler, M. *See* Wichmann, G. 27
Gabriel, R. Osmium Lamp of Auer von Welsbach..... 396
Gadamer, B. Canadine and Berberine; Relationships between —— 186
Gadamer, J. Calumba Root; Alkaloids of —— 1294
Corydalis Alkaloids; Research on —— 423, 496
Hyoscine and Atroscine..... 186
Gaertner, F. W. Albumin; Extracting Vegetable —— (P)... 1344
Gaff, T. T., and Gent, J. F. Maize; Treatment of —— (P) ... 1149
Gagedois, A. Fibres and Fabrics; Bleaching Vegetable —— (P) 48
Gailhat, J. Glycerins; Analyses of Commercial —..... 280
Galecki, W. *See* Lopatin, P. and J. 174
Gales, N. W. Liner for Centrifugal Separators (P) 493
Galkin, G. Lamp; Incandescent Vapour-burning —— (P)... 34
Gallagher, G. S. Furnace (P) 962
Gamlen, R. L. Incrustation of Boilers: Prevention and Removal of —— (P) 1445
Ganassini, D. Sulphuretted Hydrogen: Detection of ——.... 1246
Gane, E. H. Copper; Presence of —— in Powdered Drugs and Chemicals..... 224
Purity of Standard Drugs, &c.; Discussion on —— 1436
Gans, L. W. Yeast Cells; Obtaining the Contents of —— (P) 491
See Lubberger, H. 1340
Gans, R. E. Matches; Ignition Material for —— (P) 792
Gansser. *See* Lepetit Dollfus 114
Gantt, H. L. Furnace for Heating and Melting Iron, &c. (P) 1400
Garber, F. M. Matches; Manufacture of Wind-proof —— 366
Garchey, L. A. Glass-Stone; Manufacture of —— (P) 914
Gardner, E. S. Lamp; Incandescence Electric —— (P)..... 1186
Gardner, W. M. Proceedings of General Meeting 95
Garelli, F. *See* Levi, G. 629
Garnier. Carbon Dioxide in Furnace Gases; Determination of —— 1246
Garrard, C. C., and The Nernst Electric Light Co. Lamps: Nernst Incandescent Electric —— (P) 462
And Nernst Electric Light, Ltd. Nernst Conductors (P) 398
Garrett, F. C., and Smythe, J. A. Shale Oil; Bases contained in Scottish —— 39
Garrett, P. Wines; Preparation of Sparkling —— (P)..... 1099
Garrigan, T. J. Candles; Improvements in —— (F)..... 91
Garrigou, F. Wine; Concentration of —— 1241
Garry, H. Stanley. Factory Costs 1439
Garuti, P., and Pompili, R. Soldering with Oxy-hydrogen Gas (P) 259
And Pompili, R. Water: Apparatus for Electrolysis of —— (P) 778

PAGE

Garwood, H. Lamp: Incandescence Electric —— (P) 606
Gary, M. Building Materials: Report on Testing of ——..... 477
Garzarolli-Thurnlackh, K. Ozone and Potassium Iodide Solutions: Reactions between —— 143
Gaster, L. Hydrocarbon Mixtures; Distillation or Utilisation of —— (P) 699
Gate. Leathers Dyed with Coal-Tar Colours: Discussion on ——..... 158
Gatecliff, J. Water: Softening of —— (P) 985
Gates, W. T. Coke-Oven (P) 1179
Gathmann, E. Nitro-Compounds: Separating Solvents from —— (P)..... 1097
Gaton, F. E., and Warring, F. B. Gas Generator (P) 1021
Gaud, F. Acetylene: Decomposition of —— during its Combustion 396
Gautier, A. Marsh Apparatus: Improvements in Use of ——. 1472
Gautier, G. Artificial Leather: Manufacture of —— (P)..... 1405
Gautier, H. Alkaline Earth Metals; Conditions of Formation and Stability of Hydrides and Nitrides of the —— 796
Alloys of Barium and Calcium with Cadmium 796
Alloys of Strontium with Zinc and Cadmium 121
Strontium Hydride; Preparation and Properties of —.. 285
Gauzentès, C. N. Batteries; Primary —— (P)..... 164
Gawalowski. Alkanet-Root; Colouring Matters of ——..... 1327
Tobacco-Camphor 1348
Gawalowski, A. Platinum: Deposition of —— on Aluminium Apparatus..... 1472
Gaynor, T., jun. Soap Cutting and Spreading Machine (P) .. 1084
Gearing, C. M. Furnace; Oil-Gas Generating and Burning —— (P) 963
Gebauer, J. Textiles; Apparatus for Bleaching, &c. —— (P). 612
Gebhard, L. G., and Rowley, J. M. Burner: Hydrocarbon —— (P)..... 603
Gebr. Siemens and Co., and Viertel, H. *See under* Siemens and Co.
Geerligs, H., and Hamakers, R. *See under* Prinsen-Geerligs.
Geiger, T. J. *See* Wolfe, J. S. 350
Geigy, J. R., and Co. Dyestuffs: Sulphide —— (P) 248
Dyestuffs, Blue —— containing Sulphur (P)..... 1451
Dyestuffs, Brown and Green; Manufacture of —— (P)... 44
Dyestuffs, Brown: Manufacture of—— (P)..... 44
Dyestuffs containing Sulphur: Manufacture of —— and of Sulphonic Acids (P) 44, 44
Dyestuffs, Sulphide —— and New Sulpho Acids (P)..... 471
α-Thio-isatin and Indigo; Manufacture of —— (P) 38
Geidle, E. Glass; Utilising Waste —— for Making Ornaments (P) 117
Muffle Furnaces for Glass-making (P)..... 1330
Geipert, R. *See* Haber, F. 260
Geissler, M. Dyeing Apparatus (P) 771
Geldard, G. R. Butter; Appliance for Testing —— for Water (P) 1472
Genequand, P. *See* Pictet, A. 1250
General Chemical Co., The. Hydrochloric Acid: Manufacture of —— (P)..... 1138
General Electric Co. Lamps: Luminous-Gas Electric —— (P) 908
Gent, J. F. *See* Gaff, T. T. 1149
Genty, L., and Société Gén. des Industries Economiques Moteurs, Charon. Gas Producers (P)..... 697
Gentzsch, A. Gutta-Percha: Substitute for —— (P)..... 188
Insulating Composition, and Production thereof (L)..... 783
Genvresse and Chablay. Marjoram Oil..... 1347
Genvresse, P. Pinene: Action of Crystallised Arsenic Acid on ——..... 124
Genzmer, R. Steel Rails and Plate; Influence of Copper on —— 119
Geoffroy, E. Paints; Compositions for Removing —— (P) ... 356
Georgievics, G. von. Hydroxyanthraquinones; Mordant-dyeing Properties of the ——..... 1530
Gerber, M. India-Rubber and Gutta-Percha: Extraction of —— 414
Gerland, B. W. Vanadium: Discussion on Estimation of —— 390
Germot, A. Lead Ores; Obtaining Metallic Lead from —— (P) 351
And Prevet, H. E. L. Sulphides; Treatment of Metallic ——, and Apparatus therefor (P) 176
Gerngross, A. *See* Roques, F. 1138, 1193
Gesner, G. W. Alloy of Iron, Hydrogen, and Copper (P) 352
Getzmann, F. H. *See* Hultgren, J. P. 1291
Giantureo, E. Starch: Determination of —— 1416
Gibbes, J. D. Burners for Liquid Hydrocarbons (P) 34
Gibbons, W. P., and G. B. A. *See* Irving, D. 1445
Gibson, H. *See* Butchard, G. W. 550
Gibson, H. W. *See* Vurle, H. T. 554
Gibson, W. H., and Wesshug, H. Bricks; Production of Silica —— (P)..... 915, 915
Gidden, W. T. *See* Smith, H. W. 1077

PAGE

Giesel, F. Lead: Radio-Active —— 284
Radio-active Substances 76
Rays; Becquerel —— and Radio-active Substances..... 1157
Giesler, A. Digester for Extraction of Oils (P) 1543
Giles, G. F. L. Acetylene Gas Purifiers (P)..... 332
Gilgau, P. Acetylene Gas Generator (P) 1179
Gill, A. H. Lubricating Oils: Test for "Gumming" Quality of —— 789
And Dennison, C. H. Becchi's Test for Cotton-Seed Oil: Investigation of —— 643
And Miller, S. B. Glycerin Waste Lyes and Crude Glycerin: Specific Heat of —— 833
And Rowe, A. W. Neat's Foot, Tallow, and Horse Oils: Analytical Values of —..... 780
Gillet, M. Machine-Belting: Waterproof —— (P)..... 1150
Gillett, E. H. J. C. Burners for Liquid Hydrocarbons (P)... 162
Gilliland, A. W. Fume Arrester (Smelting Furnaces) (P) ... 1334
Gillson, C. B. *See* Fay H. 617
Gilmer, J. T. Turpentine Still (P) 1286
Gilmour, J. D. Alkaline Salts; Apparatus for Electrolytic Decomposition of —— (P)..... 615
Gin, G. Alloys of Iron: Electrical Manufacture of —— (P).. 1541
Calcium Carbide Formation: Reactions in —..... 960
Ferro-Silicon and Silicon-Spiegel: Manufacture of —— (P)..... 1541
See Société La Metallurgie Nouvelle 1537
Gintl, W. Alkali Chlorides: Continuous Electrolysis of —— (P) 260, 260
Giran, H. Pyrophosphoric Acid: Acidity of —— 969
Sodium Orthophosphate; An Acid Monazo —— 547
Girandeau, G. L. *See* Rochet, L. L. 405
Giroux, L. D. *See* Seddon, L. E. 924
And Seddon, L. E. Receptacles for Liquids to be Preserved (P) 1035
And Seddon, L. E. Sterilising and Preserving Apparatus (P)..... 924
Ginssani, T. Wood; Apparatus for Impregnating —— (P) .. 1535
Wood: Preserving —— (P)..... 1233
Givaudan, L. Saccharin: New Derivatives of —— (P)..... 1553
Gladbach, W. Plate Cooler (Parobeck's System)..... 1084
Glaessner, A. Formaldehyde; Formation of —— from Methyl Alcohol 1346
Glass and Hydraulic Cements: Studies on Zulkowski's Theory of ——. II..... 1395
Glass and Hydraulic Cements; Zulkowski's Theory of —— 706
Glaser, F. Chlorine and Alkali; Electrolytic Production of —— 1142
Glatz, J. Rendering and Drying Apparatus (P)..... 782
Gleason, W. Lime-kiln using Oil as Fuel (P) 615
Glendinning, T. A. *See* Brown, H. T. 419
Glenn, W. Chromite as a Hearth Lining..... 52
Glock, G. Acetic Acid: Manufacture of —— (P)..... 721
Glossop, W. *See* Brooke, N. 479
Gloystein, C. F. Tobacco Extract and Nicotine: Obtaining —— (P)..... 1553
Gluecksmann, C. Iodeosine as an Indicator in Volumetric Analysis..... 795, 1246
Gmeiner, M. H. *See* Seitert, B. R..... 1530
Gnehm, R. Aminohydroxydiphenylamines and Analogous Substances..... 1273
Mill for use in the Laboratory..... 139
Reflux Condenser; Apparatus for Heating under ——, with Introduction of New Material..... 139
And Kaufler, F. Dyeing; The Theory of —— 611
And others. Silk; Defects in Weighted —— 968
And Rnebel, E. A. *p*-Tolyl-α-Naphthylamine: Derivatives of —— 168
And Veillon, L. *m*-Hydroxyphenyl-*p*-tolylamine Derivatives 336
And Wright, R. G. Sym-dimethyldiamino di-*o*-tolyl-ketone..... 466
Goble, E. Furnace for Glass-making (P)..... 773
Gobiet, A. Coke Kilns (P)..... 329
Goddard, R. W. Dyeing Warps for Weaving (P) 1182
Godden, H. L. *See* Phillips, H. B. 466
Goddyn, M. *See* Wilmotte, C. 976
Godfrey, J. *See* Down, J. R. 1029
Godwin, A. H., and Keid, F. A. Cyanogen Group; Treating Spent Gases for Recovery of the —— (P)..... 1278
And others. Coal-Gas; Manufacture of —— (P)..... 907
Goeckel, H. Condenser; New Form of —— 1039
Goessmann, G. J. Paper and Fibrous Material; Treatment of —— (P) 362
Goetze, P. C. E., and others. Lubricants used in Cylinders; Recording Quantity, Efficacy, &c., of —— (P)..... 1083
Gold Recovery from Slimes Syndicate. *See* Duncan, H. 458
Goldberg, A. Sulphocyanogen and Yellow Dyestuff..... 110
Goldberg, E. Morphine; Quantitative Determination of —— 135
Opium; Russian —— 135
Quinine; Oxidation of —— by Chromic Acid..... 1095
Goldberg, J. *See* Ullmann, F. 1293

PAGE

Golding, J. Burner, Modified Argand — for First Process in the "Kjeldahl" Estimation of Nitrogen 694
Insoluble Frits for Pottery Glazes: Discussion on —— 322
Nitrates in Water: Discussion on Determination of —— 694
Goldmann, M. *See* Sachs, F. 1326
Goldschmid, J. E. Gas: Manufacture of — (P) 961
Goldschmidt, C. Anæsthetics; Preparation of —— 1151
Goldschmidt, H. Aluminium: Determining the Silicon Content of —— 724
Metals; Welding of — (P) 53, 915
And Keller, H. Dyestuffs; Dynamical Investigations on Formation of Azo —— 1391
Goldsmith, J. N., and others. Celluloid: Manufacture of —— 1295
Goldthwaite, A. G. *See* Tollhurst, C. H. 1190, 1190
Gondrand, F. *See* Celestre, L. 916
Gooch, F. A., and Blake, J. C. Bromic Acid: Determination of —— 1474
Gooding, C. S. *See* Lincoln, L. 977
See Lincoln, L. and D. B. 553
Goodlett, N. M. Egg Contents: Preservation of (P) —— 361
Goodrich, W. F. Town Refuse Disposal in Great Britain 1405
Goodridge, A. S. Sewage from Houses: Purification and Utilisation of —— (P) 634
Goodwin, W. L. Charcoal and By-Products: Manufacture of —— in Ontario 743
Gordin, H. M. Alkaloids, Di-Acid: Alkalimetric Factors of certain —— 786
Berberine: Determination of —— 142
Berberine: Occurrence and Detection of —— in Plants... 503
Strychnine: Determination of —— 1300
And Merrill, C. G. Podophyllum Resin, Determination of —— 1352
Gordon, Dr. *See* Klein, Dr. 718
Gorham, T. M. *See* Drake, B. M. 62, 621
Goske, A. Oatmeal in Oat-Cocoa: Determination of —— 595
Goss, J. H. *See* Farraday, S. E. 602
Goss, W. F. M. Distilling Apparatus (P) 1523
Liquids: Distillation of —— (P) 1523
Gosso, B. Arsenic Fungi 77
Gostling, C. R. Portland Cement: Production of —— (P)... 973
Gottschalk, L. Soap Boiling and Finishing Machine (P) 1543
Soap-plotting Machine (P) 1543
Gould Storage Battery Co. *See* Chamberlain, E. N. 1540
Goulding, W. and H. M. *See* Milne, J. 715
And H. M., and Ostersetzer, J. Manures, Artificial: Manufacture of —— (P) 358
Goutal, M. Coal: Calorific Power of —— 1267
Gouthière, H. Sugar Juices: Purification of —— (P) 1086
And Jumien, G. E. Sugar Juices: Purification of Crude —— (P) 59
Gove, W. N. Gravity Battery (P) 1540
Goyaud. Pectic Fermentation 1333
Graber, J. D. Fabrics: Composition for Stiffening —— (P).. 341
Graebe, C. Auramine and the Salts of Phenyliminobenzophenone: Constitution of —— 1130
Chlorine: Preparation of —— by Means of Permanganates 284
Hypochlorites and Hypobromites: Stability of —— 1076
And Rostovzeff, S. Hofmann's Conversion of Amides into Amines 1070
Graessle, L. C. Burner: Hydrocarbon —— (P) 602
Graf, J. J. Acetylene Gas (Heating) Burner (P) 1128
Graham, C. H., and Boufon, G. D. *See* Amwake, H. S. 1335
Graham, C. K. Stone: Manufacture of Artificial —— (P) ... 915
Graham, E. *See* Strange, H. 1239
Graham, E. L. Ores or Minerals: Disintegrating —— (P) ... 350
Graham, J. Liquids: Apparatus for Controlling Discharge of —— on Bacteria Beds, &c. (P) 1405
Granderye, M. *See* Guyot, A. 466
Grange. Iron Ores: Electrical Treatment of —— (P) 1541
Grange, S. de la. Varnish for Waterproofing Paper, &c. 179
Granger, A. Aluminium: Pasty State of —— 1110
Silicates and Borates used in Ceramics and Glass: Fusibility of —— 255
Granger, M. A. Photographic Progress 988
Grant, F. E. *See* Dawson, H. M. 504
Grantzdorfer, A. Sugar and Saline Solutions: Apparatus for Crystallisation of —— (P) 1147
Grardel, J. *See* Pilat, L. 924
Graves, F. "Diphenyl" as a Photographic Developer..... 638
Gray, A., and Wood, A. Wires of Nickel and Iron: Effect of Longitudinal Magnetic Field on Internal Viscosity of —— 1184
Gray, G. F. and H. N., and South, R. Kiln-burning Apparatus (P) 1397
Gray, S. F. Tanning Agents from the Saw Palmetto: Producing —— (P) 982
Gray, T. Hydrogen Peroxide; Discussion on —— 236
Phenols from Shale Oil 845
Greatorex, A. D. Sewage Purification by the Bacterial System 1291

PAGE

Green, A. G. Dyestuffs: Ionic Phenomena in —— 1071
Green, J. J. Cotton Seeds: Removing Fibre from —— 1336
Green, J. O., and Martin, H. T. Peat; Conversion of — into Fuel (P) 851
Green, W. Gas-Burners: Incandescence —— (P) 164
Greene, S. P., and Evans, J. A. T. *See* Ricker, J. H. 1180
Greening, F. Insulating and Waterproofing Materials (P) .. 919
Greenish, H. G., and Upsher Smith, F. A. Mercuric Chloride Solution; Preservation of —— 559
Greenley, C. J. Enamelling: Designs or Surfaces for —— (P) 1183
Gregor, D. J. *See* Quimby, W. C. 725
Gregoire, A. Sugars: Analysis of a Mixture of —— 875
Greig-Smith, R., and Steel, T. Levan: a New Bacterial Gum from Sugar 1381
Greiner, W. Sugar Juices; Evaporating —— without forming Fine Grains (P) 920
Grend, P., and Bachelard, A. Textile Fabrics: Waterproofing of —— (P) 48
Grenet, L. *See* Charpy, G. 480, 481, 616
Grenet, P., and Bachelard, A. Waterproofing Fabrics, Fibres, &c. (P) 171
Grenier, P. M. C. Photographic Fabric, and Preparing same (P) 873
Grether, E. *See* Ullmann, F. 337
Grey, R. Yeasts; A Study of English —— 417
Griesser, W. Vat for Brewers (P) 632
Griffin, M. L. Spent Alkaline Liquor from Poplar-Wood Paper Stock: Composition of —— 559
Griffith, H. B. *See* Way, H. E. 1030
Griffith, W. Plating Metal (P) 1334
Griffiths, W. S. *See* Young, F. S. 872
Grignard, V., and Tissier, L. Organo-Magnesium Compounds: Action of —— on Trioxymethylene 286
Grillo und Schroeder, Actiengesellschaft vorm. Porous Contact Bodies: Production of —— (P) 344
Grimal, E. Oil of Cedrus Atlantica 1347
Grimaux and Cloez. Nitrosomethyldiphenylamine and its Derivatives 1449
Grimshaw. Effluents: Discussion on Manchester Bill for Discharge of —— 582
Grimwood, R. G. *See* Dibdin, W. J. 1040
Grivot, A. *See* Gearing, C. M. 963
Grobert, J. *See* Prangey, L. 417
Grobert, S. de. *See* Pellet, H. 1416
Grobet, A. Electric Furnaces for Heating (P) 460
Groeger, M. Aluminium Chromate; Characterisaics of —— .. 1394
Cuprous Oxide; Characteristics of Yellow —— 1138
Groendal, G. Furnace for Burning Ore Blocks (P) 1081
Groeschner, C. F. M. *See* Wiese, C. C. A. E. 540
Grohn, A. Barley; Cause of Large Deficiency in Malting Heavy —— 1087
Gropp, G. Defecation Scums; Drying of —— (P) 58
Groppler, R. Formaldehyde; Manufacture of Solid —— (P). 63
Formaldehyde: Solid Composition Containing —— (P)... 1036
Grosheintz, H. Indigo: Reduction of —— 545
Mercerising Cotton Tissues; Tension Exerted in —— 403
Paranitraniline Red; Sodium Sulphite as a Resist under —— 545
Grossmann, J. Cheese; Discussion on Ripening of —— 221
Grote, L. Cement for Binding Pigments, &c. (P) 1279
Grove, D. Water: Apparatus for Sterilising —— (P) 1150
Grubb, G. R. *See* Reynolds, J. E. 386
Gruenhut, M. Timber; Dyeing of —— (P) 1135
Gruess, J. Hemicelluloses: Action of Enzymes upon —— 715
Gructzner, B. Potassium Ferrocyanide; Titration of —— with Potassium Permanganate 426
Gubing, F. *See* Auerbach, J. 964
Gudeman, E. Glucose Syrups: Corn or —— 714
Gluten Tailings; Utilising —— (P) 633
Guédras, M. Copal Resin: Chemical Composition of —— 1460
Guenther, F. *See* Julius, P. 610, 1530
Guerbet, M. Alcohols: Action of Butyl, Propyl, and Methyl —— on their Sodium Derivatives 984
Ethyl Alcohol: Action of —— on Barium Ethylate..... 984
Mercury Lactates; Preparation of —— 986
Guess, H. A. Copper: Determination of —— 1247
Gueugnon, F. *See* Sales, G. de R. de 621
Guggenheim, B. Indigo Blue and its Derivatives; Manufacture of —— (P) 38
Guidé, D. Wood: Treatment of Green —— Electrically (P).. 1397
Guignard, G. P. *See* Pereire, G. 541, 541, 558, 1090, 1096
Guillaume, E. Alcoholic Liquids; Purification of ——, and Apparatus therefor 1343
Guillet, L. Alloys of Aluminium 128
Alloys of Aluminium with Iron and with Manganese..... 258
Alloys; Tin-Aluminium —— 121
Guillet, M. Ammonia in Tar 1022
Cyanides: Extraction of —— from Gas 1026

PAGE

Guillon, J. M. Vine: Remedies for Mildew and Oidium of the —— ... 1089
Guinchant, J. Metallic Sulphides: Electrical Resistance of —— ... 863
Guiraud, G. Ores containing Silica or Silicates: Treatment of —— (P) ... 978
Gull, R. *See* Busch, A. A. ... 1548
Guili, S. Citron Oil: Statistics of —— ... 187
Oil of Bergamot Leaves ... 987
Gundlach, A. F. *See* Paul, F. ... 332
Guntrum, C. *See* Selg, O. ... 492, 492
Guntz. Barium: Preparation of —— ... 54
Metallic Nitrides: Preparation of —— ... 1476
Strontium; Metallic —— and its Hydride ... 258
Gusdorf, S. M. *See* Gavnor, T., jun. ... 1084
Gustafsson, K. G. Acetylene Gas Generator (P) ... 604
Guthner, A. Gold: Liquid Hydrosol of —— ... 1250
Tellurium: Gravimetric Determination of —— ... 1558
Tellurium; Quantitative Separation of —— from Antimony ... 1558
And Hueller, G. Zirconium: Separation of —— from Iron 1350
Guteusohn, A. Sulphide Ores: Eliminating the Sulphur from —— (P) ... 1281
Guthmann, F. *See* Markovits, E. ... 1549
Gutierrez, F. P. Salt; Manufacture of Common —— (P) ... 858
Guttmann, O. Impurities in Sulphuric Acid: Discussion on —— ... 1310
Nitrocellulose: Discussion on Will Test for —— ... 824
Potassium Chlorate: Discussion on Explosion of —— by Heat ... 218
Guyot, A. *See* Haller, A. ... 1450
And Granderye, M. Tetramethyldiaminodiphenylcarbinol; Condensation Products of —— ... 466
Gwynne, J., and Crewe, H. T. Carburetting Apparatus (P) .. 906
And Sargeant, E. W. Liquids, Means for Aerating —— (P) ... 1322

H

Haag, F. Molasses Spirit: Manufacture of —— ... 1089
Haagen, A. Ferro-Chrome Colour, and Manufacture thereof (P) ... 471
Haarmann and Reimer. Ionone: Preparation of —— ... 1318
Haas, H. L. Nickel: Melting of —— (P) ... 1281
Haber, C., and Savelsberg, A. Metals; Apparatus for Treatment of Molten —— (P) ... 177
Haber, F. Alloys; Potentials of —— ... 1143
Aluminium; Extraction of —— ... 1186
Textiles; Printing of —— ... 495
And Geipert, R. Aluminium; Experments in Manufacture of —— ... 260
And Sack, M. Cathodes: Disintegration and Conversion into Dust of —— ... 777
Habermann, J., and Ehrenfeld, R. Casein; Action of Dilute Nitric Acid on —— ... 1158
And Oesterreicher, A. Methyl Alcohol in Alcoholic Liquids; Detection of —— ... 192
And Oesterreicher, A. Phosphorus; Mitscherlich's Test for —— ... 189
Hachmuian, C. *See* Buchner, E. ... 284
Hadfield, R. A. Armour Plates; Manufacture of —— (P) 1536
Projectiles; Hardening —— (P) ... 1296
Projectiles; Manufacture of —— (P) ... 410
Steel; Annealing —— (P) ... 1280
Steel; Manufacture of —— (P) ... 532, 1280
Steel Projectiles, &c.; Production of Hardened —— (P) .. 410
See Barrett, W. F. ... 111
See Hibbard, H. D. ... 410
Haehle. Guaiacolsulphonic Acid: Preparation of —— ... 362
Haen, E. de. Sulphuric Anhydride: Catalytic Bodies and the Manufacture of —— (P) ... 475
Haensel, H. Rhamnus Purshianus: Essential Oil of —— ... 187
Haff, M. M. Ores; Separating Constituents of Complex Sulphide —— (P) ... 709
Hafner, A. *See* Kreis, H. ... 1542
Haines, C. J. Lime from By-Products; Treatment of —— (P) 787
Waters; Softening and Purifying Waste —— (P) ... 925
Hale, F. E. Starch and Sugar; Action of Iodine, &c., in Hydrolysis of —— ... 1040
Tartar Emetic; Stable Form of Crystallised —— ... 1302
Hale, W. K., and Kuersteiner, C. W. *See* Rotke, J. S. ... 165
Hall, A. D. *See* Irish, F. L. ... 1529
Hall, B. J. Batteries; Thermo-Electric —— (P) ... 1537
Hall, C. M. Alumina, Electric Manufacture of —— (P) 549
Carbon Electrodes, Manufacture of (P) ... 1031
Paint; Composition of —— (P) ... 918
Hall, R. D., and Lenher, V. Tellurium and Selenium; Action of —— on Gold and Silver Salts ... 1417

PAGE

Hall, S. Proceedings of Annual Meeting ... 950
Reduction of Silver Solutions; Discussion on —— ... 1375
Hall, W. A. Casein Solution (P) ... 636
Liquid Glue, &c. (P) ... 627
Milk; Production of Dry Condensed (P) ... 493
Hallberg, J. H. Lamps; Electric Arc —— (P) ... 334
Haller, A., and Guyot, A. Phthalic Green ... 1450
Haller, J. C., and Machell, R. H. Filters; Bacteriological ——, and Apparatus for Delivering thereto (P) ... 787
Sewage; Treatment of —— (P) ... 1345
Halley, R. Burner for Liquid Fuel in Rotary Furnaces (P).. 1180
Halliwell, E. D. *See* Wilson, H. Maclean ... 702
Halloran, H. G. *See* Chaplin, E. D. ... 476
Halphen, G. Oils: Differentiation of Drying and Marine Animal —— ... 74
Rosin Oil in Mineral Oil; Detection of —— ... 1474
Halsall, W. H. A., and Lapham, S. Cooling Tower (P) ... 971
Haltenhoff, O. India-Rubber Residues; Regeneration of —— (P) ... 1404
Hamakers, K. R. *See* Prinsen-Geerligs, H. C. ... 628, 921
Hamer, J. C. Dyeing Apparatus (P) ... 912, 969
Fibrous Material; Apparatus for Dyeing and Treating —— (P) ... 171
Yarn; Apparatus for Dyeing and Treating —— (P) ... 171
Hamilton, A. S. Oil; Extraction of ——, from Fish-Livers (P) 1403
Hamilton, J. Furnaces; Consumption of Smoke in ——, &c. (P) ... 460
Hamm, W. S., and Mosher, J. A. Acetylene Gas-Generator (P) 1069
See Mosher, J. A. ... 465
Hammer, J., and Coleman, N. Rust; Compound for Removing —— (P) ... 473
Hammill, M. J. Potassium Chlorate; Discussion on Explosion of —— by Heat ... 219
Hampson, F. G., and Swales, H. Aeration of Liquids (P) 984, 1191
Hancock, T. Diastase; Obtainment and Preparation of —— . 558
Hancock, W. Gas-Burners; Atmospheric —— (P) ... 598
Handoll, H. Separation of Solids; Discussion on —— ... 12
Hanks, M. W. Lamps; Removable Heater for Nernst Electric —— (P) ... 606
Hanna, B. M. Bunsen Gas-Burner (P) ... 463
Hannach, O., and Kostanecki, St. v. 3-Hydroxy-β-benzylchromone; Synthesis of —— ... 470
Hannan, W. I. "The Textile Fibres of Commerce" ... 797
Hannay, C. *See* Bain, J. W. ... 786
Hannay, J. B. Sulphate of Lead Pigment; Production of a White —— (P) ... 356
Hannes, W. F. Smelting; Process and Apparatus for —— (P) 1141
Hannetelle-Chapuis. A. Concentrating Apparatus (P) ... 52
Hanow, H. *See* Saare, O. ... 367, 367
Hanscom, J. B. *See* Bird, C. S. ... 1345
Hansen, C., and others. Milk Preparation; Production of a —— (P) ... 717
Hansen, W. Fats; Vegeto-fatty Acid Glycerides in Animal —— ... 353
Hanson, C. M. Dyeing Slivers; Apparatus for —— (P) ... 1231
Hanssen, F. Haemoglobin; Medicinal Preparations of —— (P) 1410
Hantzsch, A. Diazo Bodies; Quinoid ——, and the so-called Triazolenes ... 470
Metallic Hydroxides; Modifications of —— ... 877
Harding, G. Cement; Composition of a New —— (P) ... 915
Metal and other Surfaces; Composition for Covering —— (P) ... 1628
Hardinghaus, G. G. M. Metals, &c.; Means for Separation of Volatile from Non-Volatile ... 1399
Hardt, J. Gas-Burner; Incandescence —— (P) ... 1389
Hardy, J. F. Burner for Hydrocarbons (P) ... 909
Reservoirs; Safety Device for Filling Fluid —— (P) ... 599
Hargreaves, J. Borax; Manufacture of —— (P) ... 1329
Iron Chloride; Treatment of —— (P) ... 548
Iron Oxide and Calcium and Magnesium Chlorides; Obtainment of —— (P) ... 548
Harmel, L. Yarn and Textile Fabric; Metallic —— (P) ... 1134
Harmer, T. India-Rubber Scrap; Utilising —— (P) ... 626
Harmet, M. Furnace for Electro metallurgy of Iron, &c. (P). 1459
Harms, G. H. *See* Sherman, J. S. ... 602
Harpe, C. de la. Dyestuffs; Oxazine —— (P) ... 1182
Leucogallocyanine, and Manufacture thereof (P) ... 1073
Harries, C. Acetonalkamins; Acidyl Derivatives of Unsymmetrical ——, and Manufacture thereof (P) ... 364
India-Rubber; Chemistry of Para —— ... 1404
See Fischer, E. ... 990
Harrington, E. B. *See* Raker, W. D. ... 1291
Harris. Gas; Manufacture of —— (P) ... 1447
Harris, A. F. Anodes; Nickel —— (P) ... 352
Harris, B. W. Gas-Filter (P) ... 1324
Harris, C. B. Fuel; Artificial —— (P) ... 1270
Harris, C. D. Phosphoric Acid; Determination of Citrate Insoluble —— ... 427

PAGE

Harris, C. R., and Barrick, C. C. Plaster: Composition of Fireproof (P) 1233, 1233
Harris, G. T. Albuminised Paper Printing: Essentials for Success in —— 188
Harris, J. Acetylene Gas-Generator (P) 465
And Vogel, L. H. Acetylene Gas Heating-Burners 1269
Harris, J. L. Acetylene Gas-Generators (P) 332, 1069
Harris, J. N. Oils; Refining of —— (P) 355
Harris, J. W. Ether: Manufacture of —— (P) 1553
Harris, L. G. Gas: Manufacture of —— (P) 334, 598
Harris, N. G. "Carburetter" for Bicycle Motors, &c. (P) 601
Harrison, A. W. Electrode Separator for Batteries (P) 1237
Harrison, H. C., and Day, J. Metals: Electrolytic Deposition of —— (P) 354
Harrison, J. B. P. *See* Richmond, H. D. 929
Harseim, R. G. *See* Gaynor, T., jun. 1084
Hart, B. *See* Winsloe, R. H. 1183, 1183
Hart, E. Hydrochloric Acid: Manufacture of —— (P) 772
Hart, E. B. *See* Van Slyke, L. L. 1290
Hartley, W. N. Platinum: Composition of Brittle —— 319
Proceedings of Annual Meeting 950
Hartmann, C. Dyestuffs: Anthracene —— (P) 1073
Hartmann, G. Peat Blocks: Manufacture of —— (P) 330
Hartmann, W. C. Centrifugal Cream Separator (P) 269
Hartridge, J. H. Carburetting Air and Enriching Gas, and Apparatus therefor (P) 163
Hartwich, C., and Uhlmann, W. Oils: Recognition and Formation of Fatty —— 1285
Harvey, J. *See* Melvin, T. 869
Harvey, L. W. Kiln for Drying Brewers' Grains, &c. (P) 557
Harvey, R. Defecators, Continuous, for Clarification of Liquids (P) 58
Harvey, T. F. Cod-Oil Analysis: Discussion on —— 694, 760
Wijs' Method of Determining the Iodine Value of Oils and Fats 1437
Harvie, W. C. *See* Potter, J. A. 1333
Hasenbach, W. *See* Clemm, A. 254
Hasenclever, R. Position of the German Soda Industry in 1901 290
Hashimoto. Lactic Acid; New Micrococci capable of Forming —— 506
Hasse, R. *See* Windisch, R. 557, 983, 1340
Hassel, C. *See* Dittrich, M. 1114
Hasslinger, R. von. Diamonds: Formation of Artificial ——. 1476
Electrolytes; Potential Difference in Vapours and Solid —— 54
Hassreidter. Ores; Magnetic Concentration of —— by the Mechernich System 1154
Hatch, A. F. *See* Koeneman, W. A. 1538
Hatcher, R. A. Alkaloids: Determination of Solubility of —— 789
Hatfield, H. S. Gas Thermometers and Pyrometers (P) 326
Hatfield, W. H. *See* M'William, A. 774
Hatmaker. Phosphoric Acid; Obtaining —— (P) 1533
Hatschek, L. Stone, Artificial; Slabs and Plates of —— (P) . 118
Hatton, G. Iron and Steel: Manufacture of —— (P) 552
Hatton, J. E. Defecation of Liquids; Apparatus for —— (P) 629
Defecating Apparatus (P) 1288
Hauberg, S. C. Liquid Separator (P) 1065
Hauberrisser, G. Mercuric Thiocyanate: Intensification with —— 424
Photographic Image Intensified with Mercury and Sodium Sulphite; Nature of —— 638
Haucnschild, F. Cement, Portland: Influence of Chloride of Lime on the Setting of —— 175
Haughton, T. W. *See* Lishman, W. W. L. 969
Haultain, H. E. T., and Stovel, H. R. Ores: Concentration of —— (P) 916
Hausan, M. Dyeing Apparatus for Slivers (P) 1531
Hauser, F. *See* Vilim, J. 1596
Hauser, O. *See* Vanino, L. 65, 66, 422
Hauserman, T. Metal Ornamentation: Method of —— (P) .. 1541
Hausser. *See* Cathelineau 67
Havemann, C. H. T. Lead and Zinc: Treatment of Mixed Minerals of —— (P) 1457
Ores and Compounds; Treatment of Mixed ——, for Extraction of Lead and Zinc 862
Haviland, T. Ceramic Decorations; Apparatus for Preparing Designs for —— (P) 914
Hawkridge, J. *See* Knight, E. M. 458
Hawley Down-Draught Furnace Co. Metal; Melting and Treating ——, and Apparatus therefor (P) 553
See E. H. Schwartz 1234
Hawley, R. H. *See* Skinner, L. B. 1156
Hawliczek, J. L. Acetone; Manufacture of —— (P) 246
Hayes, A. Gas or Vapour: Production of —— (P) 109

PAGE

Hayne, W. P. *See* Zoder, G. W. 487
Haynes, E., jun. Malt-Kilns (P) 1148
Haynes, T., jun. Malt-Kilns (P) 923
Haywood, W. F. Soap: Means or Apparatus for Manufacture of —— (P) 127
Heal, W. E. Glass: Manufacture of Window- and Plate- —— (P) 1330
Heany, J. A. Asbestos; Insulating Metallic Surfaces with —— (P) 979
Fireproof, Waterproof, and Acid-proof Composition (P) ... 979
Insulating Compositions (P) 1282
Heap, C., and Oddy, T. Portland Slag Cement and Hydraulic Lime: Manufacture of —— (P) 550
Heath, T. E. *See* Star Patent Fuel Co. 1323
Heathfield, R. Galvanising Machine (P) 1187
Metal Sheets: Apparatus for Coating —— with Metals (P) 1029
Heaton, J., and Worthley, N. T. Acetylene Gas: Apparatus for Generating —— (P) 164
Hebden, J. C. Ageing Apparatus (P) 474
Hebebrand, A. Boric Acid: Determination of 278
Yeast; Potato Starch in ——; Determination of —— 281
Hekerlein, F. Separating Apparatus for Metalliferous Bodies (P) 862
Heberlein, M. *See* Kahn, A. 330
Hébert, A. Civet: Notes on —— 1347
See Charabot, E. 136, 561
Hébert, H. *See* Charabot, E. 987
Hecht, E., and Poulenc, G. Lacquers and Varnishes; Manufacture of —— (P) 487
Hecking, M. Fuel; Manufacture of Artificial —— (P) 1126
Heenan, H. Refuse; Furnaces for Burning —— (P) 460, 493
Hegemann, H. Biscuit Bodies for Pottery 477, 859
Hegland, A. Calcium Sulphe-Ichthyolate: Preparation of —— 788
Hehner, O. Arsenic Acid: Action of Boiling Hydrochloric Acid on —— 1250
Photometer and Pentane Burner; Discussion on New —— 315
Potassium Chlorate; Discussion on Explosion of —— by Heat 218, 219
Reduction of Silver Solutions; Discussion on —— 1374
Separation of Solids; Discussion on —— 12
Spirits; Discussion on Maturing of —— 101
Tests for Bromide, Iodides, and Bicarbonates; Discussion on —— 1376
Whisky; Discussion on the Chemistry of —— 818
Zinc; Preparation of Arsenic-free —— 676
And Hehner, C. W. Fluorides as Butter Preservatives... 923
Heide, C. v. d. *See* Buchner, E. 248
Heidenhain, M. Aniline Dyestuffs and Albuminoids; Chemical Reactions between —— 966
Dyestuffs; Aniline —— as Precipitants of Albumin 1072
Heilenman, G. Yeast for Bread-making (P) 269
Heilmeier, V. *See* Hirschmann, M. 1140
Heim, M. Stoneware Glaze; Formation of Sediment in ——. 1278
Heine and Co. Artificial Lemon Oil; Preparation of —— (P). 1409
Jasmine Flowers; Artificial Essential Oil of —— (P) 1096
Heinemann, A. Ellagic Acid; Extraction of —— from Tanning Materials (P) 415
Gallic Acid; Manufacture of —— (P) 415
Heintz, A. India-Rubber Goods; Analysis of —— 50
Heinze, M. *See* Moehlau, R. 336
Heinzelmann, G. Mashes: Higher Pitching Temperatures for Fermenting —— 984
Seed-Yeast; Buecheler's Process for Acidification of —— (P) 359
Heinzerling, C. Hot Gases from Furnaces; Direct Utilisation of —— (P) 1020
Heist, L. G. Burner for Hydrocarbon Vapour (P) 963
Heizmann, J. Gases, Vapours, and Liquids; Apparatus for Treating —— (P) 107
Helbing, E. Peat Briquettes; Manufacture of —— (P) 851
Wood; Production of Artificial —— (P) 479
Hele-Shaw, H. S. Proceedings of Annual Meeting 952
Helios-Upton Co. *See* Morrison, W. 979, 1540
Helle, J. *See* Stephan, K. 987
Heller, G., and Fiesselmann, G. Anthranilic Acid; Action of Formaldehyde on —— 1181
Helm, W. Milk: Preserving —— (P) 924
Helmers, L. O. Sulphonic Acids and their Salts; Production of —— (P) 364
Sulphonic Acids; Separation of —— 1296
Helt. *See* Moissan, H. 1301
Hemingway, H. W. Sulphuretted Hydrogen; Separation of —— (P) 906
Hemingway, J. Coal; Continuous Process of Coking —— (P). 1067
Hemmelmayr, F. von. Omonin; Characteristics of —— 637
Tartar Emetic; Electrolysis of —— 796
Hempel, W. *See* Dennis, L. M. 1159

PAGE

Hemptinne, A. de. Ozone: Formation of —— ... 175
Radio-Active Substances: Influence of —— on Luminescence of Gases ... 143
Henderson, J. A. Russell. *See* Anderson, W. Carrick ... 237
Henderson, J. F., and Clayton, C. W. Carbonic Acid Gas-Generator and Holder (P) ... 132
Hendler, J. J. Acetylene and other Gases; Apparatus for Producing —— (P) ... 109
Acetylene Gas-Generator (P) ... 465
Hengst, C. F. Explosive Material: Smokeless —— (P) ... 1155
Henle. *See* Von Soden ... 424
Henley, H. and H. H. Acetylene Gas-Generator (P) ... 1527
Henneberg, W. Amylomyces, β-: Behaviour of —— in Starchy Liquids ... 1086
Glycogen: Occurrence of —— in Distillery Yeasts, &c. ... 1289
Henneberg, W. S., and Pape, E. C. H. Metals; Electrolytic Precipitation and Amalgamation of —— (P) ... 55
Henneberger, F. *See* Brett, C. G. ... 164, 697
Henning, F. *See* Holborn, L. ... 1332
Henri, V. Enzymes: Theory of the Action of Certain —— ... 1546
Invertase: Action of —— ... 268
Henrich, F., and Meyer, W. Amino-orcinol: Oxidation Products of —— ... 1450
Litmus: Similarity of —— to Insoluble Oxidation Product of Amino-orcinol ... 1450
Henriot, A. Photographic Plates for Producing Ink Impressions (P) ... 68
Henriot, L. C. Photographic Plate for Reproducing Ink Impressions (P) ... 1154
Henry, A. Chinese Wood Oil; Characteristics of —— ... 881
Henry, T. A. *See* Dunstan, W. R. ... 996
Hentschel, W. Phenylglycine: Preparation of —— (P) ... 1554
Hepburn, G. G. Azo Colours: Possible Methods for Producing —— on the Fibre ... 404
Hepp, E. Polyaminoanthraquinone Sulpho-Acids; Manufacture of —— (P) ... 1392, 1530
See Fischer, O. ... 1130, 1274
Heraeus, W. C. Manganese, Fusing Point of Metallic: Determination of —— ... 552
Herard, J. *See* Bianitzi, L. F. de ... 961
Herbig, W. Turkey-Red Oil; Analysis of —— ... 367
Turkey-Red Oil: Research on —— ... 1275
Herdman, G. A. Non-conducting Composition for Steam-Boilers (P) ... 1064
Herfs, H. Paper: Water-proof and Fat-proof —— (P) ... 635
Hérissey, H. *See* Bourquelot, E. ... 1159, 1251, 1553
Herkommer and Bangerter. *See* Wuensch, A. ... 1544
Hermian, J. Ores, Cupreous Sulphide: Treatment of —— (P) ... 1185
Hermes, R. Asphalt: Production of Artificial —— (P) ... 1326
Hermite, E., and Cooper, C. F. Thermo-Electric Couples (P) ... 125
Heron, J. Vegetable Extract: Manufacture of a —— (P) ... 360
And Riley, W. A. Beer: Bottling of —— with Simultaneous Carbonation ... 868
Héroult, P. L. T. Furnace: Oscillating Electric —— (P) ... 1237
Herrick, G. P. Blast Furnaces (P) ... 916
Herrick, J. A. Gas-Producer (P) ... 1068, 1128, 1128
Herring, W. H. Gas-Producers (P) ... 1020
Retort Settings combined with Gas-Producer (P) ... 1127
Hersey, F. C. *See* Winton, H. D. ... 1549, 1549
Hertkorn, J. Ether Explosions: Investigation of —— ... 789
Wood-Pulp; Colour Reaction for —— ... 1041
Hervey, J. J. Cyanide Tank (P) ... 977
Herz, R. Dyestuffs: Blue Sulphur —— (P) ... 1275
See Wemberg, A. ... 471
Herz, W. Chromates and Manganates: Analysis of —— ... 500
Zinc Hydroxide: Solubility of —— in Ammonia and Ammonium Bases ... 727
Herzberg, R. Furnace for Fine Fuel (P) ... 962
Herzberg, W. Paper for Wrapping Metals; Freedom from Chlorine and Acid of —— ... 718
And Siebert, O. Dyestuff: Red Azo —— (P) ... 1073
Herzfeld. Beetroot Chips; Pressing —— before Drying ... 1287
Herzfeld, A. Diffusion Residues: Compression of —— ... 1189
Herzig, J., and Pollak, J. Brasilin and Hæmatoxylin ... 608
Hess, E. J. Air, Liquid; Production of ——, and Apparatus therefor (P) ... 345
Hess, F. Detonators: Treatment and Use of —— (P) ... 562
Hesse, A. Bucheler's Process for Acidification of Seed-Yeast ... 632
Jasmine Perfume; Formation of —— ... 187
Yeast; Bucheler's Sulphuric Acid Process for Preparation of Distillery Seed —— ... 267
And Zatscheck, O. Methyl Anthranilate in Essential Oils: Determination of ... 1102
Hesse, O. Coca Leaves; Yellow Colouring Matters of —— ... 1551
Ecgonine: Addition Product of —— ... 363
Laudanine: Characteristics of —— ... 272
Heuberger, K. *See* Tschirch, A. ... 1153, 1551
Heusner & F. *See* Cook, E. R. ... 1227
Hewitt Dr. Whisky; Discussion on the Chemistry of —— ... 818

PAGE

Hewitt, D. B. Cheese: Discussion on Ripening of —— ... 221
Water Carriage in Great Britain: Discussion on —— ... 754
Hewitt, H. H. Furnaces for Heating and Smelting Metals (P) ... 770
Hewitt, J. T. Aldehydes: Retarding Influence of —— on the Maturation of Potable Spirits ... 96
And Moore, T. S. Methoxyl Groups; Apparatus for Determining the —— ... 195
Hewitt, P. C. Electric Lighting: Method of —— (P) ... 466
Lamp: Incandescence Electrode Vapour Electric —— (P) ... 465
Hewitt, W. W. Cement Kilns and Drying Chambers (P) ... 118
Heydemann, C. L. J. J. *See* Reichert, F. J. ... 1344
Heyl-Daa, G. E. Electric Conductors: Covering —— with Insulating Material (P) ... 626
Insulating Material (P) ... 357
Rubber Scrap: Devulcanising —— (P) ... 264
Heyn, E. Mild Steel: The Overheating of —— ... 1398
Heywood, H. W. *See* Welch, J. W. ... 787
Hibbard, H. D. Furnaces for Treating Manganese Steel, &c. (P) ... 410
Hickman, A., and Hutchinson, W. Steel and Ingot Iron; Manufacture of —— (P) ... 409
Hickman, F. *See* Merrill, F. H. ... 764
Hicks, L. Mantle for Incandescence Gas-Lighting (P) ... 1129
Higgmbotham, G. *See* Calico Printers' Association ... 857
Higgins, C. Louguet. Carbonate of Lime: Discussion on —— ... 530
Proceedings of Annual Meeting ... 957
Higgins, H. Wood; Apparatus for Drying and Impregnating —— (P) ... 914
Wood: Apparatus for Impregnating and Seasoning —— (P) ... 550
Higgins, J. F. Burner: Hydrocarbon —— (P) ... 1069
Hilbert, H. Glue and Gelatine; Manufacture of —— from Bones (P) ... 1405
Hilde and Koegler. Glass Articles of Uniform Weight and Capacity (P) ... 1395
Hildreth, T. F. Manganese in Spiegel; Determination of —— ... 279
Hill, A. J. Cellulose Fabrics (P) ... 1074
Hill, A. J. E. Cotton Fabrics: Coating —— with Celluloid, &c. (P) ... 912
Hill, J. H., and Rivett, J. Evaporating-Pan (P) ... 597
Hill, J. S. *See* Dudderidge, F. R. ... 1156
Hill, L. M. Woods of British Guiana; The Constructional —— ... 1027
Hill, R. T. Petroleum Oil-Field: The Beaumont —— ... 1228, 1326
Hillebrand, W. F. Cement Analysis; Discussion on Standardisation of —— ... 1221
Cement Testing; Discussion on —— ... 832
Silica; Common Errors in Determination of —— ... 641
Hillig, O. M., and Mueller W. Drying Apparatus; Continuous Vacuum —— (P) ... 696
Hills, H. F. "Gas and Gas Fittings" ... 877
Hills, R. Electrode: Aluminium —— (P) ... 259
Hilt, W., and Lane, C. E. Precious Metals; Extraction of —— (P) ... 1185
Hinchley, J. W. Carburetters for Explosion Motors (P) ... 539
Separation of Solids which Differ in Specific Gravity ... 10
Separators for Dry Granular Substances; Centrifugal —— (P) ... 326
Hinckley, H. Gas-Burners Self-extinguishing —— (P) ... 332
Hindley, E., and others. Yarn: Apparatus for Dyeing and Treating —— (P) ... 473
And others. Yarns; Apparatus for Dyeing, &c. (P) ... 613
Hindshaw, J. Plaster of Paris: Treatment of —— (P) ... 1079
Hinzke, A. Pulp Washing Apparatus (P) ... 986
Hippe, E. E., and Holm, T. Stones and Cement; Coloured Designs on —— (P) ... 1078
Hipple, A. H. Waterproofing of Materials (P) ... 474
Hirsch, R. Phenolphthalein in Alcoholic Solution: Titrations with —— ... 1298
Hirschmann, M., and Heilmeier, V. Burnt Steel; Restoration of —— (P) ... 1140
Hirt, L. Centrifugal Machine for Sugar Manufacture (P) ... 783
Hirtenberger Patronen Zündhütchen, &c., vorm. Keller and Co. Fulminate Compositions (P) ... 1472
Hirzel, H. Distilling Apparatus (P) ... 1386
Hlavati, F. Sugar: Extraction of —— (P) ... 1462
Hobson, H. A., and the Concentrated Beer Co. Brewing (P) ... 558
Hochstetter, H. von. Acetic Acid and other Acids of the Fatty Group; Obtainment of —— (P) ... 1469
Hodge, G. L. Mixer for Paper-making Machine (P) ... 1409
Hodge, M. A. Hydrocarbon Burner (P) ... 1270
Hodgson, R., and Holt, W. T. Salt: Appliance for Manufacture of Broad —— (P) ... 548
Hoenig, M. Starch Syrups; Composition and Analysis of —— ... 1100
Tanning Extracts: Manufacture of —— (P) ... 488
Hoepfner, C. Alkali-Metal Sulphates; Separation of —— from Solutions (P) ... 1027
Copper and Nickel; Extraction of —— from Sulphide Compounds (P) ... 1081
Metals; Extraction of —— from their Ores (P) ... 1081
Metals; Leaching and Extraction of —— (P) ... 1081

PAGE

Hoerisch, C. Stone; Hardening of Artificial —— (P) 175
Hoert, R., and Marxsohn, L. Barley; Apparatus for Washing and Aerating —— (P) 984
Hofer, H. *See* Muthmann, W. 412
And Moest, M. Alcohols; Electrolytic Formation of —— (P) 1237
Hoff, J. H. van't, and others. Oceanic Salt Deposits: Formation of Langbeinite 1277
Hoffman, E. J. Fuel; Manufacture of Artificial —— (P) 1179
Hoffmann, C. Dyestuff, Pyrone: Production of —— (P) 401
Hoffmann, M. K. *See* Friedheim, C. 426
Hoffmann la Roche, F., and Co. Salicyiide or Salicylic Aldehyde; Manufacture of —— (P) 1194
Hofmann, C. Wood-Pulp: Determination of Moisture in —— 502
Hofmann, F., and Callsen, J. Glycollic Menthyl Ester (P) ... 1195
Hofmann, G. Dyestuffs, Basic: Discharging —— 170
Hofmann, K. A., and Strauss, E. Radio-active Substances.... 143
And others. Radio-active Substances. I. 726
And Zerban, F. Thorium; Radio-active —— 368
Hogarth, J. Alimentary Substances and Beverages: Treatment of —— (P) 558
Hohenemser, W. *See* Liebermann, C. 855
Holborn. Electric Furnace for the Laboratory 792
Holborn, L., and Uenning, F. Metals of the Platinum Group; Disintegration and Recrystallisation of —— 1331, 1332
Holde, D. Datura Oil 1459
Olive Oil; Solid Fatty Acids of —— 126
And Marcusson. Rosin in Fats, &c.; Determination of —— 930
Holden, E. *See* Lones, J. and J. 555
Holland, A. Centrifugal Machine for Sugar (P) 628, 1086
Holland, C. E. Water Purifier and Filter; Portable —— (P) 270
Holleman, A. F. "Text-Book of Inorganic Chemistry" 798
Hollings, A. Guncotton: Press for —— (P) 276
And others. Evaporating and Distilling Apparatus (P) .. 904
Holm, C. L. *See* Dahlqvist, J. A. 1464
Holm, T. *See* Hippe, E. E. 1078
Holmboe, L. C. B. *See* McCullough, C. H. jun. 957
Holmes, Milk; Discussion on Composition of —— 1513
Holmes, C. J. Artificial Fuel: Manufacture of —— (P) 1323
Holmes, I. V. Centrifugal Separator (P) 959
Holmes, P. F. and E. D., and Cameron, F. G. Gases; Apparatus for Washing —— (P) 1524
Holmes, T. Fibrous Substances. Treatment of —— (P) 1093
Holmes, W. P., and Hodge, L. M. *See* Hodge, M. A. 1270
Holt, T. *See* Ellis, S. H. 1535
Holt, W. T. *See* Hodgson, R. 548
Holzmann, G. Invertase of Yeast 1310
Homan, W. C. Acetylene Gas-Generator (P) 1527
See Beck, C. W. 1325
Homolka, B., and Liebknecht, O. Dyestuffs; Indoxyl —— (P) 1073
Honiball, C. R. Evaporating and Heating Apparatus (P) 596
Honts, G. W. Carburetter (P 764
Hood, J. J. *See* Spence, F. M. 253
Hooker, J. H. Food Products (P) 269
Hooper, E. Grant. Alcohol Duty; Discussion on —— 830
Spirits; Discussion on Maturing of —— 101
Whisky; Discussion on the Chemistry of —— 818
Hopfelt, R. Carbide Electrodes for Arc Lamps (P) 1270
Electrodes for Arc Lamps; Forming —— (P) 1525
Electrodes for Arc Lamps (P) 964, 964, 1179
Hopkins, E. H. Zinc; Obtainment of —— (P) 1401
Zinc free from Lead; Obtainment of —— (P) 54
Hopkins, P. *See* Byers, H. G. 1228, 1238
Hopp, J. *See* Moehrer, P. F. V. 699
Hopper, J. L. Ore-Roaster (P) 1142
Horak, J. Bricks; Manufacture of Highly Fire-proof —— (P) 1078
Hornby, J. "The Gas Engineers' Laboratory Handbook," 2nd Edition 567
Horne, J. E. *See* Barrett, C. E. 272
Hornung und Rabe, Actienges. vorm. Sugar, Raw: Manufacture of —— (P) 60
Horrocks, W. *See* Crompton, W. H. 405
Horsin-Déon, P. Sugar-Works; Compression and Utilisation of Steam in —— (P) 629
See Delafond 1463
Horst, P. Cevadine: Decomposition of —— 722
Cocaine Hydrochloride: Decomposition of —— 186
Polygonum Persicaria: Essential Oil of —— 790
Hosea, L. K. Carbon-Oil Heater (P) 763
Houben, J. Methylnonylketoxime: Isomerisation of —— 1498
Rue: German Oil of —— 1498
Hough, A. Explosives; Manufacture of —— (P) 1451
Houston, Dr. *See* Klein, Dr. 718
Hovestadt, H. "Jena Glass and its Scientific and Industrial Applications" 1562

PAGE

Howe, H. M. Crucible Furnace for Laboratory Use: Electric-Resistance Magnesia —— 69
Howell, J., and Brew, S. J. Tinplate Manufacture (P) 1538
Howfield, A. J., and Colliver, G. V. Superheated Steam Pan (P) 1085
Hoyer, E. *See* Comstein, W. 1541
Hoyermann, G. Phosphoric Acid: Rendering —— Soluble in Citric Acid (P) 1140
Hoyermann, H. Ammonia: Conversion of Atmospheric Nitrogen into —— 169
Hydrocyanic Acid: Preparation of 176
Hoyt, A. S. Adhesive Substance (P) 1288
Hoz, A. Colours for Chemical Printing (P) 50
Printing Designs on Endless Bands of Textiles (P) 50
Hua, H. Landolphia Pierrei: A Rubber Plant from Gabon .. 1544
Huber, L. *See* Anwers, K. 286
Huberson, R. Vaillard-Desmarowx Apparatus for Sterilisation of Water 634
Hubert, A. Absinthe: Examination of —— 131,
Tartaric Acid in Lees and Tartar; Determination of Total —— 194
Huck, A., and Fischer, L. Printing Surfaces for Photographic Pictures (P) 1554
Huebl, A. von. Sepia Platinum Paper, with Cold Development 138
Platinotypes (Sepia) by Cold Development 68
Huebner, J. Ignition Strips for Use with Miners' Safety Lamps (P) 1246
Huebner, R. *See* Bleachers' Association 1328
Hueller, G. *See* Gutbier, A. 1350
Huelsberg and Co. Wood, &c.; Impregnation of —— (P).... 1028
Huething, O. *See* Walbaum, H. 1095
Hufferath, A. Diamide; Derivatives of —— with Closed Atomic Groups. III. Pyrazolone-3-Acetic Acid 63
Hughes, G. H. Cattle Food; Production of —— (P) 1191
Oil-Gas; Production of —— (P) 1260
Hughes, H. A. Bottle-Wax; Composition of —— (P) 264
Hughes, J. Superphosphate: Treatment of —— for Fertilising Purposes 129
Hughes, J. S. Wood-Pulp: Forming of —— (P) 362
Wood-Pulp Press (P) 362
Hughes, W. B. Kilns for Burning Bricks and Pottery (P) ... 708
Steel; Manufacture of —— by the Open-Hearth Process (P) 182
Hughes, W. G. Incandescence Gas-lighting and Gas-heating Appliances (P) 962
Huillard, A. Drying Apparatus (P) 1386
Huldschinsky, E. *See* Rosenheim, A. 141, 1351
Hulin, P. L. Hydrogen Dioxide; Production of —— (P)..... 364
Hulsebosch, M. L. O. van L. *See* Berntrop, J. C. 1328
Hulst, N. P. Moisture in Lake Superior Iron Ores..... 1279
Hult, C. A. and O. W. Centrifugal Separators for Milk (P) .. 492
Hultgren, J. P. Cream Separator: Centrifugal —— (P)..... 1291
Humfrey, J. C. W. Lead. Effects of Strain on Crystalline Structure of —— 1234
Humphrey, E. E. *See* Senderson, H. W. 1231
Humphrey, H. A. Gases: Centrifugal Apparatus for Purifying —— (P) 1322
Gases: Purification of —— (P) 1226
Humphrey, R. L. Cements: Inspection and Testing of —— .. 1279
Hunker, J. M. Coke-Oven (P) 1526
Hunt. Leathers Dyed with Coal-Tar Colours; Discussion on —— 158
Hunt, R. Metals; Extraction of —— (P) 776
Hunt, T. W. Iodine Value of Oils; Comparison of Methods for Determining —— 454
Hunt, J. O. *See* Bain, T. F. 353
Hunter, J. A. Furnace; Metallurgical —— (P)..... 977
Hunter, R. M. Electric Welding (P)..... 486
Huntington, A. K. Metals; Apparatus for Squirting Heated —— (P) 350
Huntington, W. S. Lumber: Manufacture of —— from Wood-Pulp (P) 1331
Hurry, E. H., and Seaman, H. J. Portland Cement; Manufacture of —— and Apparatus therefor (P) 1079
Hurst, P. Polygonum Persicaria 66
Hussey, C. A., and Clarke, S. G. Batteries; Primary —— (P) 411
Hussong, J. Dyeing Apparatus (P) 614
Hutchinson Acoustic Co. Cells of Electric Batteries; Dry or Semi-Dry —— (P) 978
Hutchinson, E. S. Sawdust; Apparatus for Distilling —— (P) 246
Hutchinson, W. *See* Hickman, A. 409
Huth, M. *See* Froelich, O. 351
Huth, P., and Lippert, W. Rosin Oil; Production and Uses of —— 1336
Hyatt, H. Gas-Producer (P) 245
Hydrocarbon Smelting Co. *See* Boss, M. P. 1400
Hyros and Ras. Beetroots, &c., Extraction of Juice from —— (P) 1402

I

PAGE

Ibbotson, F. *See* Brearley, H. 1251
Ichthyol-Ges. Cordes Hermanni and Co. *See* Helmers, L. O. 1296
Ievers, E. F. *See* Pearse, H. 1234
Iles, M. W. *See* Sheedy, D. 1401
Illingworth, R., and others. Dyeing Apparatus (P) 1025
Ilmer, R. Molasses: Action of Potassium Lactate in Forming —— 1189
Iltz, J. Photographic Baths (P) 561
Imbert. Cocaine Hydrochloride: Rotatory Power of —— 1346
Ingham, T. Agglutinating Material for Making Briquettes (P) 163
Alginates; Manufacture of Alkaline —— (P) 638
Briquettes: Manufacture of —— (P) 600
Ingham, W., and Langton, B. Kiln: Improved Bottom for Hoffmann —— (P) 550
Ingle, H. Hubl's Reaction: Origin and Nature of the Free Acid formed during —— 587
"Manual of Agricultural Chemistry" 729
Inman, E. R. Carburetter (P) 908
International Chemical Co. Composition for Use as a White Pigment, and Manufacture thereof (P) 356
International Fuel Co. *See* Koeneman, W. A. 1323, 1523
International Leather Co. *See* Walter, C. M. 1544
International Oil Furnace Co. *See* Ward, J. 461
International Smoke Prevention Co. Smoke from Boiler Fires; Apparatus for Preventing —— (P) 697
Intze, O. Tanks for Liquids (P) 1125
Ipatiew, W. Pyrogenetic Contact Reactions of Organic Compounds. II. 567, 567
Irish, F. L. Acetylene Gas-Generator (P) 1527
Irvine, T. A. Copper Extraction by the Wet Method (P) ... 54, 776
Irving, D., and others. Gas-Producers (P) 1445
Irwin, A. I. Ore: Apparatus for Extracting Metal from —— (P) 355
Irwin, W. Soot Deposited on Manchester Snow 533
Isbell, C. W. Gas; Apparatus for Manufacture of —— (P) ... 334
Gas: Manufacture of Illuminating —— (P) 1180
Gas Retort; Vertical —— (P) 963
Iscovesco, M. Butter: Refining and Preserving of —— (P).. 1408
Isserlis, I. Kiln for Lime, Cement, &c. (P) 480
Istrati, C. I. Aniline: Products of Oxidation of —— by Atmospheric Oxygen 1448
Ittner, M. H. Purity of Standard Drugs, &c.; Discussion on —— 1436
Itzig, H. Potassium Cyanide and Cuprous Sulphocyanide: Interaction of —— 286
Ives, F. D. *See* Abbot, M. S. 723
Izart, I. Antimony: Electrolytic Production of —— 1237
And Thomas. Antimony; Electric Separation of —— (P). 1541

J

Jablin-Gonnet. Hydrogen Peroxide as a Milk-Food Preservative 420
Jack, T. B. Acetylene Gas; Apparatus for Generating and Storing —— (P) 397
Jackling, D. C. Furnace: Ore-Roasting —— (P) 1142
Jacks, F. S. and W. D. "Carburetter" (P) 601
Jackson, D. D. Bacterial Action; Precipitation of Iron, Manganese, and Aluminium by —— 681
Jackson, H. D. *See* Pursall, A. J. 463
Jackson, J. M., and Kiesel, O. Solder for Aluminium, &c. (P) 1537
Jackson, P. G. Cod Oil Analysis: Discussion on —— 694
Jackson, W. B. Smoke, Fumes, and Gases: Apparatus for Condensing —— (P) 905
Jacob, M. C. H. Silk: Machine for Sizing Raw —— (P) 546
Jacob, O. Barley: Influence of Duration of Steeping on Germination of —— 784
Jacobs, C. B. Barium Compounds: Manufacture of Soluble —— from Barytes in the Electric Furnace 391
Pigment, and Manufacture thereof (P) 263
Refractory Material; Manufacture of —— (P) 1397
Sulphuric Acid: Electrolytic Manufacture of —— (P) ... 1077
Jacobs, P. Powdered Materials: Machine for Mingling —— (P) 959
Jacobsen. *See* Paas 1405
Jacolliot, M. Steel: Use of the Electric Arc in Manufacture of —— (P) 1459
Jacquemin. Hæmatein: Manufacture of —— (P) 1529
Jacquemin, G. Tissues: Printing of —— (P) 704
Yeasts; Preparing and Using Low Fermentation —— (P) 786

PAGE

Jahr, R. "Paramol": a New Developer 188
Jahrmarkt, F. M. *See* Julius, P. 610
Jukubhazy. Rhubarbs: European and Chinese —— 1153
Jalowetz, E. Beer; Sulphur Dioxide in —— 1088
James, A. "Cyanide Practice" 78
James, D. P. Alloy as a Substitute for Gold (P) 1281
James, R. H. Casein Phosphate: Manufacture of —— (P) 717, 71
Jamieson, B. K. Armour Plates: Tempering of —— (P). 482, 483
Solutions for Tempering Steel (P) 483
Jandus Arc Lamp and Electric Co. and Jones, A. D. Lamps; Electric Arc —— (P) 1226
Jankowsky, W. Enamelling Metal Ware (P) 256
Jansen, B. Rotary Cutters; Manufacture of —— (P) 1039
Janz, J. Mantles, Incandescence: Apparatus for Burning Down —— (P) 598
Jaquet. Discharges on Aniline Black, Marine Blue, and Wool Bordeaux 1453
Jarvis, G. A. *See* Hollings, A. 904
Jaubert, G. F. Alloys of the Alkali Metals; Manufacture of —— (P) 1281
Oxygen Gas; Pastile for Making —— (P) 408
Oxygen: New Method of Preparing —— 614
Sodium Peroxide; Compression of —— (P) 1278
Jean. Casein: Use of —— in Sizing and Finishing Textiles (P) 1533
Jean, F. Carbon Monoxide and Dioxide: Determination of —— 1473
Chestnut Extract in Oak Extract: Detection and Determination of —— 1476
Resin in Beeswax: Determination of —— 428
Jeancard, P., and Satie, C. Néroli and Petit Grain: Essential Oils of —— 67
Jeanmaire, P. Indanthrene Blue: Printing with —— 545
Jeffers, E. H. *See* Thorne, L. T. 792
Jefferson, A. M. Rare Earth Metals: Aromatic Bases as Precipitants for —— 929
Jegler, T. Fibres; Producing Patterns on —— by Carbonising (P) 1531
Jenks, C. C. Paper of Variable Thickness (P) 925
Jensen, O. Butter: Rancidity of —— 786
Jewell, J. H. Distilling Apparatus (P) 326, 718
Job, A. Glucose and Cerium Carbonates 795
Oxidation; New Method of Induced —— 795
Job, R. Metal of Railway Bearings; Investigation of —— ... 974
And Young, J. B. Arsenic Contents of certain Pennsylvania Anthracites 693
Joel, C. J. *See* Hemingway, J. 1067
Johnson, A. Filters; Construction of —— (P) 597
Oil-Burner (P) 963
Johnson, B. L. Soap; and Method of Making same (P) 1543
Johnson, E. L. Cotton-seed Oil; Extraction of —— (P) 263
Johnson, H., and Frier, G. W. Steel: Manufacture of —— (P) 410
Johnson, P. Sampling; Automatic System of —— 724
Johnson, S. H. Lamps; Electric Arc —— (P) 540
Johnson, W. McA. Anodes; Electrolytic Solution of Soluble Metallic —— 1540
Cell; Voltaic Dry —— (P) 354
Johnston, J. Burner; Hydrocarbon-vapour —— (P) 1022
And Dobbs, A. E. Vapour-Burners (P) 1067
Jolles, A. Albuminous Substances; Obtainment of —— from Blood (P) 1191
Proteins; Digestibility of —— 132
Joly, B. Carbonation and Sulphitation: Vessels for —— (P). 921
Joly, C. Gases; Compression, Expansion, &c. of —— (P) 904
And Richardson, E. J. Air and other Gases; Liquefaction of —— (P) 1386
Jones, A. D. *See* Jandus Electric Co. 1226
Jones, C. *See* Shepherd, E. S. 497
Jones, E. A. Pulp-Beating Engine (P) 635
Jones, F. J. C. Metals; Adding Carbon to —— (P) 915
Jones, F. W. Explosives; Manufacture of New —— (P) 1097
Gunpowder (P) 498
Gunpowder; Treatment of —— (P) 366
Jones, H. C. "The Elements of Physical Chemistry" 433
And Carroll, C. G. Hydrogen Peroxide; Lowering the Freezing Point of Aqueous Solutions of —— 1352
Jones, J. L., jun. Burner: Oil —— (P) 1324
Jones, L. B. and E. R. *See* Irish, F. L. 1527
Jones, L. E. Disinfecting Device (P) 925
Jones, R. H. H. Glazes: Crimson —— 1454
Jones, W. G. Refuse and Garbage: Treatment of —— (P) .. 634
Jorat, P. Acetylene Generator (P) 1447
Jordan, F. G. Portland Cement: Manufacture of —— (P) ... 978
Jordan, H. W. Aluminium Hydrate; Manufacture of —— (P) 254
Jorgensen, C. J. Colour Scale (P) 1275
Jorissen, A. Naphthol; Distinction between α- and β- —— .. 1157
Joslin, O. T. *See* Schmidt, H. B. 1084
Josse, A. Sugar Crystals Coloured throughout 714
Joulie, H. Sodium Phosphate; A New —— 494

PAGE

Jousset, C., and McKay, W. R. Fuel, Artificial; Manufacture of —— (P) 696
Jovino, S. *See* Ampola, G. 997
Jowett, H. A. D., and Potter, C. E. Salicin and Salmigrin: Variations in Occurrence of —— 1153
Joyce, T. G. Quinine Camphorate 636
See Lorimer and Co. 1096
Jueptner, H. von. Slags and Smelting Products: Sulphur Content of —— 709
Juergens, J. F. C. *See* Sieverts, W. H. A. 464
Juergensen and Bauschlicher. Olives: Utilisation of Expressed Residue of —— 510
Juhász, F. Gas Lighters (P) 332
Julien. Acetylene Generator (P) 1447
Julien, M. Milk Rich in Cream: Production of —— (P) 1035
Julius, P. Dye: Brown-Violet Azo —— (P) 1328
See Schultz, Von G. 997
And Günther, F. Dyestuffs: Compound for Producing Azo —— (P) 1539
And Günther, F. Dyestuff: Red Azo —— (P 610
And Jahrmarkt, F. M. Chloranisidine: Manufacture of —— (P) 610
And Tkatsch, A. *See* Badische Anilin und Soda Fabrik .. 338
Jung, C. Glass: Defects in —— 174
Junghahn, A. 1.3.4.5-Xylidine Sulphonic Acid 1418
Jungner, E. W. Electrodes for Accumulators (P) 1082
Positive Electrode for Accumulators (P) 353
Junius, G. E. *See* Gouthière, H. 59, 1086
Juritz, C. F. Quinine Tree: South African 1294
Jurschina, F. Stone: Manufacture of Artificial —— (P) 973
Stone: Manufacture of Artificial Acid-proof —— (P) 915
Just, A. Incandescent Bodies for Electric Glow Lamps (P). 333
Just, F. Fluorine Salt; Use of Effront's —— in the Distillery 131
Just, J. A. Baking-Powder: Production of —— (P) 360, 360, 361, 787, 1191
Casein: Manufacture of Adhesive —— P) 357
Casein: Obtaining Pure Solutions of —— (P) 271
Casein Phosphate: Preparation of —— P) 361
Insoluble Composition for Coating —— (P) 1544
Milk: Preserving —— in Dry Form P) 1548
Justin-Mueller, E. Aniline Black. Immedial Blacks as Grey Reserves under —— 250

K

Kaczorowski, A. Centrifugal Machine for Sugar (P) 630
Sugar Loaves: Apparatus for Covering and Liquoring —— (P) 783
Kahl, H. *See* Bamme, G. 960
Kahl, L. Para-cresol Oxalic Ester: Preparation of —— (P) . 1553
Kahlbaum, G. W. A. Metals: Distillation of —— in Vacuo .. 118
And others. Metals: Distillation of —— 480
Kahn, A., and Heberlein, M. Combustibles: Increasing the Heat of —— (P) 330
Kahn, P. Mercerising Apparatus (P) 1133
Kaiser, A. Starch: Determination of Potato —— 428
Wood-pulp; Colour Reaction for —— 725
Kalle and Co. Colouring Matter; Production of Black Sulphur —— (P) 39
Dyestuff, Blue: Production of —— (P) 170
Dyestuff, Sulphide; Manufacture and Purification of —— (P) 402
Dyestuffs; Black —— containing Sulphur (P) 543
Dyestuffs: Brown Sulphur —— P) 543
Dyestuffs, Sulphide ——, and Material for Manufacture of —— (P) 1131
Dyestuffs; Sulphide —— (P) From Benati 610, 610
Mono-alphyl-a¹-Naphthylamine-a³-Sulphonic Acid; Production of —— (P) 40
Kalmann, A. Peat-fibre Pulp; Manufacture of —— (P) 422
Kalmann, W. Mould in Sheep's Wool; Origin of —— 1132
Kaltenback, M. Vacuum Filter Presses with Rotary Drums (P) 32
Kamm, L. Oxygen Generators (P) 1077
Kapferer, C. A. *See* Friz, O. 708
Kapff, S. Wool; Influence of Mordanting Assistants on Spinning Property of —— 612
Kappel, W. Bunsen Burners (P) 331
Karavodine, V. Minerals: Treating —— by Heat and Pressure (P) 1534
Karg, A. Acetylene Gas-Generator (P) 1129
Karutz, P. Soap; Mixing Apparatus for Manufacture of —— (P) 1238
Kaserer, H. Fluids containing Free Acids or Acid Salts; Clearing —— (P) 1548
Kassler, F. Fatty Acids; Distillation of —— 486, 553

PAGE

Kastle, J. H., and Loevenhart, A. S. Ferments. Nature of Oxidising —— 196
And Reed, J. V. Mercuric Iodide in Solution; Nature of —— 504
And Shedd, O. M. Phenolphthalin as a Reagent for Oxidising Ferments 280
Katsuyama, K. Lactic Acid; Formation of —— 423
Katz, J. Caffeine; Quantitative Determination of —— 1309
Kauffman, W. H. Silver; Losses of —— in Cupelling 991
Kaufler, F. Methoxyl in Bodies containing Sulphur; Determination of —— 283
See Gnehm, R. 611
Kaufmann, L. *See* Sachse, O. 548
Kaufmann, O. Mantle for Incandescence Gas Lamps (P) 1326
Kauschke, P. Leather Dyeing 705
Kayser, A. Alumina; Separation of —— from Silica (P) 1232
Kayser, E. C. Calico Printing: Novel Effects in —— 968
Calico Printing: Producing Naphthylamine Bordeaux in —— 1276
Dyestuffs, Azo; Printing with —— 1073
"Indigo Salt T": Application of —— 170
Primuline Red: Dyeing Reserve Effects on —— 770
Kaysser, O. Water; Sterilising and Maintaining Sterilised —— (P) 1408
Kazakowski, S. *See* Kowalski, M. 921
Kazanczky, P. Carbonates: Action of Hydrogen Peroxide on —— 645
Kearns, T. E. White-Lead Drier (P) 625
See Gabel, H. M. 356
Keay, J. A. Reservoirs for Inflammable Liquids (P) 1445
Kebler, Lyman F. Linseed; Ground —— adulterated with Mineral Oil 262
Keeble, A. J. Bricks and Tiles, &c.: Manufacture of —— (P) 257
Kehrmann, F. Dyestuffs: Constitution of Oxazine and Thiazine —— 707
Dyestuffs, Thiazine, and Intermediate Products; Preparation of —— (P) 37
And Saager, A. Azoxone; The Simplest —— 337
Keil, F. A. *See* Godwin, A. H. 907, 1278
Kemer, F. W. *See* Walter, S. L. 916
Keith, D. S. Generators for Acetylene and other Gases P) .. 1269
Keith, J., and G. High-Pressure Burners for Incandescent Lamps (P) 1446
Keith, N. S. Ores: Treatment of Copper and other —— (P). 864
Keller, C. A. Alloys; Manufacture and Treatment of —— (P) 410
Metals and Alloys: Obtainment of ——, and Furnaces therefor (P) 354
Keller, E. Alloys; Production of —— (P) 620
Keller, H., and Knappich, J. Acetylene Gas-Generators (P). 851
See Goldschmidt, H. 1391
Kellner, C. Zinc; Extraction of ——, from Waste Products (P) 351
Kelland, R. A. Peat Fuel; Manufacture of —— (P) 1526
Kelly, G. Heat-Insulating Board, &c. (P) 347
Kelly, J. D. *See* Ashton, N. T. 915
Kelly, W. T. Gas-Producer (P) 1526
Kelsey, L. L. Glue; Apparatus for Manufacture of —— (P). 1189
Kemp, C. M. Carburetters: Construction of —— (P) 599
Kemp, J. F. Platinum and its Associated Metals 709
Kemp-Welch, J. S. Producer-Gas Apparatus (P) 1446
Kempf, R. *See* Sachs, F. 541
Kendall, E. D. Gold: Electrolytic Precipitation of —— 863
Metals: Extraction of Precious —— (P) 977
Metals; Recovery of —— (P) 711
Kendrick, W. J., and W. T. Disinfectants; Manufacture of —— (P) 925
Kennedy, H. Coke Ovens (P) 1526
Kennedy, M. B. *See* Campbell, E. D. 1398
Kennedy, W. Coke-making: Plant for —— (P) 245
Kennicott, C. L. Water; Apparatus for Purifying —— (P) 1036, 1192
Kenrick, E. B. Artesian Water Supply of Winnipeg City 746
And F. B. Tartaric Acid: Application of Polarimetry to the Determination of —— 1417
Keppeler, G. Acetylene: Impurities in, and Purification of —— 1386
Sulphuric Acid Manufacture; The Contact Process of —— 1135
Keppich, P. Tin; Electrolytic Separation of —— from Waste 621
Kern, A. *See* Lundquist, I. 538
Kern, C. A. *See* Spreckels, C. A. 715, 784, 784, 982
Kershaw, J. B. C. Chlorates; Niagara Falls Process for Electrolytic —— 115
Electro-Chemical and Electro-Metallurgical Industries ... 565
Kertesz, A. Sulfur Colours; Process of Dyeing —— (P) 471
Kessler, F. Sugar Diffusion Process: Continuous —— (P) ... 1147
Kessler, H. Acetyl Chloride and the Anhydrides of the Fatty Acids; Production of —— (P) 561
Caoutchouc; Regeneration of Old Vulcanised —— 357
Kessler, J. C. Insect-Repellant (P) 1243

PAGE

Kesztler, E. Starch Manufacture: Treatment of Lower Grade Products in —— ... 982
Ketcham, G. W. Enamelling Metal-Ware (P) ... 1232
Kenkelaere, G. de. Dyeing Machines for Textiles (P) ... 48
Dyeing Textiles in the Cop (P) ... 857
Keyes, W. D. Glass: Apparatus for Refining and Delivering —— (P) ... 859
Kiesel, O. *See* Jackson, J. M. ... 1537
Kilby, F. Kiln for Cement, Lime, &c. (P) ... 973
Kiliani, H., and Nacgell, H. Saccharin: Meta- and Para- —— ... 1418
Killian, J. S. Gas from Crude Petroleum; Device for Generating —— (P) ... 600
Killing, C. Gas-Burners: Incandescence —— (P) ... 34
Killon, H. B. Sewage: Apparatus for Automatic Discharge of —— (P) ... 559
Kilner, F. B. Purity of Standard Drugs, &c.: Discussion on —— ... 1436
Kimball, P. L. Centrifugal Separator for Milk (P) ... 1548
Separating Apparatus: Centrifugal —— (P) ... 985
Kimoto, C. Cryptomeria Japonica: Essential Oil of —— ... 1552
Kincaid, F. L. Acetylene Gas-Generator (P) ... 1069
Kindermann, P. Level-Indicators for Liquid Containers (P) ... 596
King, A. J. Effluents; Discussion on Manchester Bill for Discharge of —— ... 582
King, C. A. Sterilising Machine for Bottled Beer (P) ... 1344
King, F. G. Ore-Separators: Magnetic —— (P) ... 1399
Kinnicut, L. P., and Eddy, H. B. Sewage containing Acid Iron Salts ... 1092
Kinsey, H., and others. Acetylene Gas: Apparatus for Generating and Storing —— (P) ... 397
Kinsey, J. P. Water: Apparatus for Purifying —— (P) ... 634
Kionka, H. Sulphurous Acid and its Salts: Poisonous Action of —— ... 633
Kipping. Insoluble Frits for Pottery Glazes: Discussion on —— ... 322
Kipping, F. Stanley. Alloys of Copper and Manganese: Discussion on —— ... 844
Kjeldahl's Method Applied in the Tanyard; Discussion on —— ... 841
Sampling Shoddy, &c.: Discussion on —— ... 106
Kirkland, R. R. *See* Vrooman, N. L. ... 271, 1036, 1036
Kirkpatrick, J. J. *See* Lishman, W. W. L. ... 969
Kirkpatrick-Picard, H. F. Zinc: Extraction of —— from Sulphide Ores (P) ... 351
Zinc; Recovery of —— from Sulphide Ores (P) ... 124
See Sulman, H. L. ... 1081, 1234
Kirsanow, W. Blasting Cartridges (P) ... 561
Kirsten, A. Milk: Decrease in the Acidity of —— ... 360
Kiss, E. J. Amalgamator for Refractory Ores (P) ... 863
Kissling, R. Tobacco; Chemistry of —— ... 1104
Kistiakowsky, W. A. Double Salts: Electro-Chemistry of —— ... 124
Kitsée, I. Sugar-Juices; Decolorising —— (P) ... 57
Kitsee, J. Pyroxylin Compound (P) ... 925
Kitson Hydrocarbon Heating Co. *See* Curran, P. B. ... 1069
Kitson, A. Lamps; Incandescence Vapour —— (P) ... 1179
Vapour; Apparatus for Burning Incandescent —— (P) ... 1388, 1388, 1389
Vapour-burning Apparatus (P) ... 530, 961
Klages, A. Pyrazoles from 1.3-Diketones and Diazo-acetic Ester; Synthesis of —— ... 768
Klahn, E. *See* Miller, T. and E. ... 961
Klappert, E. *m*-Nitrophenol; Electro-Chemical Reduction of —— ... 1334
Klauder, J. H. A. Mercerising Apparatus (P) ... 1531
Kleemann, W. Ether Explosions; Cause of —— ... 789
Klein, Dr. Disinfection Experiments; Report on —— ... 718
Klein, E., and Workman, O. P. Antiseptic Soap Cake (P) ... 1408
Klein, L. *See* Pellet, H. ... 179
Kleine, A. Flask for Determination of Carbon in Iron and Steel ... 1097
Kleinewefers, W. Mercerising Process (P) ... 771
Kleinschmidt, C. Wood: Compound for Preserving —— (P) ... 708
Klenk, G. Tannin Extracts; Manufacture of —— (P) ... 1462
Klepetko, F. *See* Evans, W. J. ... 1068
And Evans, W. J. Roasting Furnaces (P) ... 1185
Klett, C. L., and Potel, A. P. Organic Substances; Preservation of —— (P) ... 1464
Klie, K., and Poppe, O. Linoleum: Manufacture of Inlaid —— (P) ... 625
Klimont, J. Cacao Butter; Composition of —— ... 486
Fatty Acids: Action of the Higher —— on Normal Alkali Carbonates ... 126
Glycerides of Fatty Acids: Action of Superheated Steam on —— ... 126
Klinger, R. Acetylene Gas-Generators (P) ... 1067
Knappe, P. A. Amalgamator, and Method of Amalgamating Metals (P) ... 1334
Knappich, J. *See* Selle, H. ... 851

PAGE

Knapstein, C. Dyeing with Alizarin Dyestuffs; New Method of —— ... 1328
Knecht, E. Basic Dyes; Behaviour of —— to Wool and Silk ... 611
Dyeing; Theory of —— ... 544
Hydrosulphites; Production of —— (P) ... 771
Soot Deposited on Manchester Snow; Discussion on —— ... 534
Textile Fabrics, Resist and Discharge on —— (P) ... 969
And others. Textiles; Preventing Local Production of Colour during Printing of —— (P) ... 1531
And P., Spence and Sons. Textiles: Discharging Dyed —— (P) ... 1025
Knietsch, R. Sulphuric Acid: Manufacture of —— by Contact Process ... 172, 343
Sulphuric Anhydride; Apparatus for Manufacture of —— (P) ... 345
Sulphuric Anhydride; Production of —— (P) ... 253
Knight, E. M., and Hawkridge, J. Filters; Construction of (P) ... 438
Knight, H. Bituminous Compounds; Apparatus and Method for Working —— (P) ... 1507
Knight, W. C. Platinum; Discovery of —— in Wyoming ... 200
And Slosson, E. E. Oil-Field; The Newcastle —— ... 1070
Knoesel, C. Alcoholic Fermentation; Action of Some Antiseptics on —— ... 785
Knoesel, T. Manure; Utilising Waste Liquors from Sulphite Cellulose Manufacture as —— ... 489
Knoespel, H. E. Glass; Opaque and Coloured —— (P) ... 347
Knoevenagel, E., and Elber, E. Hydroxylamine and Hydrazine Salts; Use of —— in Qualitative Analysis ... 1296
Knoll and Co. Anthrapurpurin Diacetate; Manufacture of —— (P) ... 67
Knorr, E. *See* Baeyer, A. ... 1273
See Koenigs, W. ... 196
Knorre, G. von. Manganese; Determination of —— ... 72
And Schaefer, E. Potassium Tungsten Bronze ... 1403
Knoth, H. Steel: Manufacture of —— (P) ... 1537
Knox, G. F. *See* Elsner, J. A. ... 394
Knox, J., and others. Brewing and Distilling Apparatus (P) ... 632
Knox, W. J. Gas; Manufacture of ——, and Apparatus therefor (P) ... 1066
Lining for Furnaces or Converters (P) ... 1400
Ovens for Coking, Annealing, &c. (P) ... 1066
Knox, W. R. Cement; Hydraulic Fireproof —— (P) ... 1140
Knudsen, E. Ores, Furnaced Sulphide: Treatment of ——, and Apparatus therefor (P) ... 123
Knudsen, I. P. B. Cream Separator (P) ... 1549
Knuettel, F. Malt Drum (P) ... 208, 491
Knutsen, H. Diehl's Cyanide Cold Process ... 1020
Koale Sava Manufacturing Co. Coal; Composition for Increasing Efficiency of —— (P) ... 330
Koch, E. *See* Wittenberg, W. W. ... 1286
Koch, H. Copper in Iron; Electrolytic Determination of —— ... 503
Koch, M. *See* Tschirch, A. ... 712
Koch, R., and Rothenberg, L. Incandescence Gas Lamps (P) ... 1269
Kochs, E., and Seyfert, F. Lithopone; Characteristics of —— ... 1145
Koechlin, E. Dyestuff, Black; Manufacture of a —— (P) ... 40, 40
Koechlin, H. Wool; Printing Coloured Grounds on —— ... 47
Koechlin, R. Resists under Steam Colours upon Woollen Tissues ... 703
Koegler. *See* Hilde ... 1395
Koehler, A. Fuel; Apparatus for Spraying and Burning Liquid —— (P) ... 1270
Koehler Akkumulatoren-Werks. India-Rubber Tubes; Manufacture of Long —— (P) ... 857
Koeneman, W. A. Artificial Fuel Briquettes (P) ... 1323, 1323
Furnace for Ores (P) ... 1538
Koenig, J. *See* Skraup, Z. H. ... 144
Koenigs, W., and Knorr, E. Heptacetylmaltose Nitrate and Heptacetyl-*b*-methylmaltoside; Research on —— ... 196
Koenigsdorf, H. Cores for Castings; Preparation of —— (P) ... 1080
Koenitzer, F. F. Dyeing Apparatus; Centrifugal —— (P) ... 473
Koens, J. H. Saponaceous Product for Horticulture, &c. (P) ... 1345
Koerting, E. Furnaces for Liquid Fuel (P) ... 331
Koerting, E. Furnaces for Liquid Fuel (P) ... 331
Koester, E. J. A. Leather; Production of Chrome —— (P) ... 1189
Koetschet, J. Dyestuffs; Triphenylmethane —— (P) ... 1275
Orthosulphonated Tolnylne Aldehydes (P) ... 1275
Sulphamide; Substituted ——, and Manufacture thereof (P) ... 364
Kohlrausch, F., and Dolezalek, F. Silver Bromide and Iodide; Solubility of —— in Water ... 429
Kohn, C. A. Photometer and Pentane Burner; Discussion on New —— ... 315
Proceedings of Annual Meeting ... 951
Kohnke, Q. *See* Mims, J. C. ... 1528
Kohnstamm, L. S. *See* Sherman, H. S. ... 564
Kolb, A. Thoria Earths; Precipitating and Separating —— ... 1093
Kolb, G. Steel; Composition for Hardening —— (P) ... 532
Kolbe, Dr. T. "Utilisation of Waste Products" ... 1159
Koller, R. *See* Pleissner, M. ... 239

PAGE

Kollrepp, A., and Wohl, A. Juices; Electrolytic Purification of —— (P) 1545
See Wohl, A. 630

Kondakow, J. Hydro-aromatic Series: Synthesis in the —— under Action of Zinc Chloride 646
Thujone: Constitution of —— 1152
Thujyl Series; Isomeric Transformations in the —— 1152

Koninck, L. L. de. Ferric Oxide; Potassium Thiocyanate as an Indicator in the Reduction of —— 71
Manganese; New Reaction for —— 873
Nitrates, Chlorates, &c.; New Reaction for —— 873
Perchlorides of Lead and Manganese; Composition of —— 873

Koning, J. Textiles; Washing ——, with Recovery of Reagent (P) 1183

Konold, O. *See* Krieger, H. G. 1554

Kopp, F. T. Molybdenum Steel; Volumetric Determination of —— 502

Koppers, H. Coke-Ovens and Retorts; Preventing Leakage of Gases from —— (P) 1127
Coke-Ovens; Regenerative —— (P) 762
Gas-Water; Continuous Apparatus for Treating —— (P). 765

Koro, A. Photographic Images; Method and Apparatus for Producing —— (P) 989

Korn, W. *See* Dupré, jun. 500

Koss, M. *See* Meyer, R. J. 422, 1093

Kostalek, J. Filters for Sugar Juices, &c. (P) 982, 1146
Filters; Improvements in —— (P) 1267

Kostanecki, St. V., and Froemsdorff, G. α-Naphthochromone. 470
And Rozycki, A. α-Ethylluteolin 35
And Rozycki, A. 3.3*-Trihydroxyflavone 36
And Ruijter de Wildt, J. C. de. 1.3-Dihydroxychromone.. 497
See Hannach, O. 470

Kovács, J. Asphalt: Investigations on —— 1077

Kovar, J. Degrees, Balling: Determination of the —— 75

Kowalski, M. Syrups, Drainings, and Molasses; Purifying —— by Extraction 1033
And Kozakowski, S. Sugar Juices; Defecation of Crude —— (P) 921
And Kazakowski, S. Syrups and Molasses; Purification of —— (P) 921

Kozakowski, S. *See* Kowalski, M. 921

Kraemer, G., and Spilker, A. Petroleum; Diatom Wax and its connection with —— 540

Krafft, F., and Funcke, R. Colloidal Hollow Bodies from Heptylamine Soaps and Water 1301

Krafft, R. *See* Sander, E. 362

Krais, P. Dyestuffs; Increasing Fastness of —— to Light 404

Kramers, J. C. H., and Aarts, J. G. Gas; Manufacture of Water- and Semi-Water-, and Apparatus therefor (P). 331

Krastin, A. Vaporiser for Hydrocarbon Engines (P) 462

Krauch, C. "The Testing of Chemical Reagents for Purity". 1477

Krause, A. Magnesium Peroxide; Preparation of Substances containing —— (P) 706
Magnesium Peroxide with Proportion of Oxygen; Preparation of —— (P) 1395

Krause, A. E. Oil; Removal of —— from Water (P) 1065

Krauss, C., and Bernneck, R. M. von. Sulphuric Acid and Sulphuric Anhydride; Manufacture of —— (P)..... 859

Krebs, G. Flash-Light Cartridge (P) 1348

Krebs, J. F. Paint-Oil, and Manufacture thereof (P)..... 1146

Kreis, H. Glycerides of Fatty Acids; Double Melting Points of —— 711
Thiophen; New Colour Reaction of —— 930
And Hafner, A. Fatty Glycerides having Double Melting-Points 1542

Kreitling. Floats in Burettes; Use of —— 277

Krell, G. Formaldehyde; Disinfecting by Means of ——, and Apparatus therefor (P)..... 133

Kremann, R. Acetates, Monose- and Biose-; Velocity of Saponification of —— 996
See Skraup, Z. H. 144

Kremer, C., and Schilling, R. Fats; Recovery of ——, and Apparatus therefor (P)..... 917

Kremers, E. Cade Oil..... 1410
Cajuput Oil; Characteristics of —— 1410
Methyl Salicylate; Natural and Synthetic —— 1410

Kressel, E. C. L. Yeast Extracts; Preparation of —— (P) ... 493

Kretschmer, F. Manures, Artificial; Analysis of —— 74

Kreutzer, G. *See* Schmitz..... 359

Krieger, H. G. Reducer for Over-exposed Photographic Plates (P)..... 1554

Kries, P. Gas-Burner (P) 602

Kroeber, E., and Rimbach, C. *See* Tollens, B. 875

Kronstein, A. Wood-Oil, Chinese; Thickening of ——, and Producing Hard Resin Substitutes therefrom (P)..... 264

Kroupa, G. Copper; Extraction of —— by New Wet Method (P)..... 1233
Peat for Briquettes; Treatment of —— 395

Krull, F. Glass for Water-Gauge Tubes..... 549

PAGE

Krutwig, J. Chrome-Tanning; Researches on —— 1239

Kudisch, D. Kerosenes from Kieff; Commercial —— 607

Kueckenhoener, H. Drying Apparatus and Process (P)..... 1019

Kuegelgen, F. von. Reduction with Calcium Carbide; Equation of Reaction in —— 1332

Kuehling, O. Hydrochloric Acid and Nitric Acid; Relative Strengths of —— 115
Metallic Oxides; Action of Carbon Dioxide and Alkali Salts on —— 115

Kuespert, F. Colloidal Silver: Experiments on Formation of —— 1301

Kuester, F. W., and Abegg, F. Zinc: Volumetric Determination of —— 1557

Kufferath, A. Indigo Reduction with Zinc Dust and Ammonia 1273

Kuhara, M., and Chikashige, M. Indigo; Methyl Derivatives of —— 247

Kuhn, R. Coke-Ovens; Making —— tight (P)..... 1067

Kuhn, R. P. Formaldehyde Lamp (P)..... 870

Kukla, A. Malt; Sulphuring of —— 61

Kull, A. L. Carburetter or Mixing Valve (P)..... 463

Kullgren, C. Inversion; Studies on —— 1339

Kummer, R. A. Gas-Generator (P)..... 600

Kuny, B. Photographic Pictures; Production of Coloured —— (P)..... 365

Kunz-Krause, H. Atroscine; Spontaneous Transformation of —— into *l*-Scopolamine 186

Kunze, A. *See* Butler, W. A. 1140

Kurnakoff, N. S., and Pushin, N. A. Thallium; Alloys of —— 143

Kurz, C. Mercerising Cotton; Use of Refrigeration in —— ... 250
Oxycellulose in Calico Printing..... 405
Tannindigotine and its Application..... 545

Kynaston, J. W. Potassium Chlorate; Discussion on Explosion of —— by Heat..... 218

Kynoch, Ltd. *See* Cocking, A. T. 1112, 1556

L

Labbé, H. *See* Donard, E. 1464, 1548

Labhardt, H., and Zschocke, R. *p*-Toluic Acid; Electrolytic Oxidation of —— 484

Laborde, J. "Casse" of Wines; Prevention of —— by Sulphurous Acid..... 557
Wine; Cure for "la Casse" in —— 1035

Lacey, T. S. Photometer and Petane Burner; Discussion on New —— 315

Lach, B. Petroleum: Fractional Distillation of —— 1129

Lacomme, J. M. A. Water; Device for Purifying —— (P).... 718

La Cour, P. Alkali Chloride; Electrolysing ——, and Apparatus therefor (P)..... 125
And Rink, J. J. Alkaline Chloride Solutions; Electrolysis of —— (P) 913
And Rink, J. J. Mercury Cathodes; Forming and Reforming —— (P)..... 1539

Lacroix, A. Mount Pelée; Ashes from Eruptions of —— in 1851 and 1902 931

Lacroix, L. E. Batteries; Planté Secondary —— (P) 124

Ladenburg, A. Ozone; Production of —— 134
Tropine from Tropidine, and Synthesis of Atropine 560

Laessig, H. Milk-Albumin Preparation (P) 1464
Milk; Manufacture of Preservable —— (P)..... 1191

La Fayette Denton Vorce. Oil; Extraction of —— (P)..... 1084
Oils; Apparatus for Separating Solvent from —— (P) 1084

Lafeuille, J. Molasses; Utilisation of —— (P) 416
Sugar in Dried Beetroot; Direct Refining of —— (P) 416

Lafferty, W. P. Centrifugal Machine (P) 538

Laffont, M. Toxic Intensity; Variations in —— 728

Lallin and Rand Powder Co. Powder-granulating Machine (P) 1155

Lafontaine, L. M. Sugars, Raw; Purifying, Bleaching, and Refining —— (P)..... 921

Lagerwall, R. E. M. *See* Wallis, C. 107

Lagrange, J. V. P. Sugar; Refining Raw —— (P) 1085

Laird, D. Cupellation Furnace (P) 1030
Furnace for Treating Ores and Precious Metals (P)..... 123
Furnaces for Heating Drills, &c. (P)..... 350
Furnaces; Smelting —— (P) 175
Heating and Evaporating Apparatus (P) 108
Retort Furnace (P) 122, 618

Lamb, M. C. Leathers Dyed with Coal-Tar Colours; Fastness to Light of —— 156
And Spence and Sons. Leather Manufacture and Preservation of Skins (P)..... 1286

Lambert, J. Biscuits; Granular Malted (P) 924

Lambert, M. Sugar; Crystallisation of —— (P) 58

PAGE

Lamborn, L. L. "The Soap Brand Record and Trade Mark Manual" 433
Lambourne, W. T., and Wood, J. C. Acetylene Gas-Generators (P) 599
Lancaster, E. W. Drying and Washing Apparatus for Casks, &c. (P) 183
Mash Tun, Hop Brick and Cooler combined (P) 182
Sterilising Apparatus for Treatment of Casks, &c. (P) 183
Landauer. Acetylene Generator (P) 1389
Lands, T. Lamps: Incandescence Vapour —— (P) 338
Landin, J. *See* Rudolphs, J. 977
Landry, A. C. *See* Gearing, C. M. 963
Landsberg, L. Acetylcellulose; Manufacture of —— (P) 719
Landsiedl, A. *See* Bamberger, M. 1190
Lane, C. E. *See* Hilt, W. 1185
Lane, O. A., and Davenport, H. A. Carburetter for Oil-Gas (P) 463, 852
Lang, A., and Braun, C. Beer Concentrated by Freezing; Examination of a —— 1034
Lang, J., and others. Sugar Crystals; Apparatus for Use in Manufacture of —— (P) 1189
Lang, W. R. Caustic Soda and Bleaching Powder; Discussion on Electrolytic —— 451
Proceedings of Annual Meeting 951, 957
And Carson, C. M. Sulphides of Arsenic, Antimony, and Tin; Solubility of the —— 1018
And others. Arsenic, Tin, and Antimony; Separation of —— 748
Langlein, G., and Co. Electrolysis; Production of Metallic Deposits by —— (P) 917
Langhein, H. Graphite; Chemical Purification of —— (P) .. 408
Lange, A. Gases; Receptacles for Compressed or Liquefied —— (P) 1322
Lange, M., and Emilewicz, T. Mordant Colours; Manufacture of —— (P) 968
Lange, O. *See* Weinberg, A. 1530
Lange, W. Acidimetry; Electrolysis of Copper Sulphate as the Basis of —— 1473
Langenbeck, K. *See* Mueller, H. C. 477
Langer, Logwood Black; Production of —— on Tissues 46
Langer, J. Paranitraniline Red; Coloured Resists under 472
Langhans, R. Metals; Metallising with Precious —— 123
Langlois, J. R. Sugar; Apparatus for Moulding —— (P) 1546
Sugar; Recovery of Refined —— from Raw Sugar (P) ... 130
Langot, W., and Frover-Delapierre. Vanillin; Preparation of —— (P) 722
Langton, B. *See* Ingham, W. 550
Langville, L. S. *See* Thwing, C. B. 1335
Lapham, S. *See* Halsall, W. H. A. 971
Lapp, V. Beer; Manufacture of Non-Alcoholic —— (P) 1290
Larkin, G. H. Oil-Burners; Vaporizer, Mixer, and Regulator for —— (P) 603
Larkin, T. Kilns for Drying Malt and Hops (P) 923
Larsen, E. Drying and Distilling Apparatus for Wood, &c. (P) 1070
Larsen, J. A. Centrifugal Apparatus (P) 1125
Lary, M. Powders; Machines for Packeting and Filling —— (P) 1125
Lasne, H. Ammonio-Calcium Phosphate 566
Lasswell, M. Amalgamator for Fine Gold (P) 619
Laszczynski, S. von. Accumulators of Metals other than Lead 1030
Latta, P. *See* Elsner, H. T. W. 276
Latzko, R. *See* Blau, F. 34
Lauder, A. *See* Dobbie, J. J. 137, 137
Laughlin, C. Furnace; Smelting —— (P) 1334
Laurenius, C. E. Charcoal Retorts and Furnaces (P) 1388
Laurent. Furnace for Vaporising Combustible Liquids (P).. 1525
Laval, C. Glass; Apparatus for Silvering —— (P) 256
Glass; Trough for Silvering —— (P) 1278
Lavolay, J. H., and Bourgoin, G. E. Sugar; Manufacture of —— (P) 490
Law, H. D. Kjeldahl's Method of Nitrogen Estimation; Experiments with —— 847
Lawes, J. B., and Co. *See* Berry, G. F. 548, 550, 1064
Lawrence, F. M. *See* Carman, R. W. 870
Lawrence, J. E. Tempering Bath (P) 1141
Lawton, E. P. Copying Ink; Production of —— (P) 250
Lawton's Patents, Ltd., and Lawton, A. W. Gases or Gaseous Mixtures; Dehydrating ——, and Means therefor (P) 183
Laxa, O. Butter Fat; Decomposition of —— by Micro-organisms 268
Laxton, J. Acetylene Gas-Generators (P) 1226
Laxton, J. W. R. Amalgamator (P) 619
Laybourn, G. W. Earthenware; Deposition of Metals on —— (P 174
Leahy, L. K. Hydrocarbon Burner (P) 1270
Lean, Bevan. *See* Perkin, W. H., jun. 369
Leather, J. P. *See* Ross, R. 676

PAGE

Leaver, J. R. and H. A. Tinning Residues containing Chlorine; Treatment of —— (P) 915
Lebeau, P. Alloys of Lithium 261
Cast Iron and Ferro-Silicon; Condition of Silicon in ——. 119
Cobalt; Compounds of Silicon with —— 1301
Iron and Silicon; Compounds of —— 861
Iron; Cementation of —— by Silicon 318
Lithium and Antimony; Compound of —— 261
Lithium Antimonide; Properties of —— 369
Le Blanc, Max. "Die Darstellung des Chroms und seiner Verbindungen mit Hilfe des Elektrischen Stromes" .. 1354
And Bindschedler, E. Electrolysis with Soluble Anodes; Formation of Precipitates Difficultly Soluble by —— . 776
And Brode, J. Caustic Potash; Electrolysis of Molten —— 1401
And Brode, J. Caustic Soda and Potash; Electrolysis of Molten —— (P) 1235
Lebret, A. *See* Vosmaer, A. 1292, 1523
Le Chatelier, H. Cement; Chemical Decomposition of —— in Sea-Water 409
Rails; Recent Studies on Manufacture of —— 1331
And Chantepie. Fuels; Fusibility of the Ashes of —— ... 459
Leclerc. *See* Mabille 1409
Leclerc de Pulligny. Lead Chromate Dyeing; Disadvantages of —— 1452
Leclerq. Fibres; Process and Apparatus for Ungumming, &c. (P) 1531
Leclercq, J. Textiles; Colouring and Waterproofing —— (P) 1532
Textile Fabrics; Waterproofing of —— (P) 48
Lecloux, O. Textile Fabrics; Printing-Machines for —— (P) 1074
Lecocq, E. Martin Slag 861
See Prost, E. 861
And Vandervoort, H. Petroleum; Sulphur Content of Commercial —— 1180
Leconte, A. Coal-Gas; Some Modern Competitors with ——. 959
Gas; Enrichment of —— with Benzol 1020
Vapour-Burner (P) 1022
Vapour-Burners for Lighting and Heating (P) 1021
Le Comte, O. Iodoform; Preparation of —— 1293
Leconte et Cie. Rice Starch, &c.; Manufacture of —— (P) .. 130
Leconte, E., and Loiselet, J. Rice Starch; Manufacture of —— (P) 1033
Ledebur, A. Iron; Calcium and Magnesium in —— 1140
Lederer. Cellulose; Process for Acetylating —— (P) 1550
Elastic Horny Substances; Preparation of —— (P) 1550
Lederlin, P. L. E. Chlorates and Perchlorates; Electrolytic Manufacture of —— (P) 346, 1282
Ledru, J. Acetylene Gas-Generating Plant (P) 962
Acetylene Gas-Generator (P) 1324
Leduc, A. Salts; Electrolysis of Mixtures of —— 1236
Lee, C. A. Lamps; Electric Arc —— and Electrodes (P) 763
Lee, C. H. Pulp; Reducing Fibrous Material to —— (P) 1092
Lee, T. L. Paint; Composition of —— (P) 918
Lee, W. C. *See* North, B. 322
Lee, W. R. Fumes from Smelting Furnaces; Recovering Materials from —— (P) 1030
Lees, F. H. *See* Power, F. B. 1468
Lefèvre, C., and Blum, G. Combustible Briquettes (P) 1525
Lefèvre, L. Mercerising; Conditions of —— 403
Mercerising Cotton; Use of Refrigeration in —— 250
Lefranc, L. Sugar Solutions; Purification of —— (P) 130
Le Gall Du Tertre, G. *See* Conti, V. 1140
Léger, E. Aloes in Pharmaceutical Preparations; Identification and Detection of —— 645
Aloins; Constitution of the —— 1037
Anthraquinone; Derivatives of —— 1094, 1094
Legge, J. St. C. Carburetter (P) 463
Lehmann, L. *See* Buchner, E. 248
Lehmann, L. B. Soap; Apparatus for Manufacture or Treatment of —— (P) 487
Lehmann, P., and Scheele, T. A. Gas-Igniters; Automatic —— (P) 332
Lehmkuhl, J. N. Beetroot Juices; Purification of —— (P) .. 921
Saccharine Juices; Treatment of —— with Sulphurous Acid (P) 921
Lehner, V. Tellurium Tetrachloride; Characteristics of —— 505
Leidié and Quinnessen. Platinum Metals; Detection of the —— 499
And Quinnessen. Platinum Metals; Identification of —— 640
Leidié, M. Ink of the Ancients; Nature of the —— 196
Leimbach, R. Pyknometer 1557
Leiningen-Westerburg, Count. Fluorine; Determination of —— 1349
Lemaire-Destombes, J. B. Feed-Water; Purification of —— (P) 493
Lencauchez, J. A. Gases; Purification of —— (P) 1066
Lenher, V. Gold; Action of Selinic Acid on —— 646
Gold Telluride; Investigation of —— 646
See Hall, R. D. 1417
Lennard-Foote, W. Paint; Composition of —— (P) 1084

PAGE

Leonard, N. Relation between Specific Gravity; Fat and Solids not Fat in —— ... 133
Sulphur: Acidity of Sublimed —— ... 135
Leonhardt and Co., A., Farb. vorm. Dyestuffs; Triphenylmethane —— (P) ... 338
Lepetit, Dollfus and Gansser. Dyeing and Tanning Baths combined (P) ... 1146
Lepetit, R., and Taglıani, E. Dyes; Manufacture of Extract —— (P) ... 1073
Lepine, C. D. Acetylene Gas: Apparatus for Generating —— (P) ... 397
Lepoutre, L. Beer Yeast; Influence of Concentrated Salt Solutions on —— ... 867
Lermer, J. C. Barley, and Malt Preparation therefrom; Comparative Chemical Examination of —— ... 784
Le Roy. Cobalt and Nickel; Electrolytic Extraction of —— .. 54
Leroy. Gas; Manufacture of Combustible —— under Pressure (P) ... 1525
Le Roy de Lenchères, G. Cement "Matter"; Composition of —— (P) ... 973
Lesage and Dongier. Lactic Fermentation: Study of the —— 496
Le Seuer, E. A. Cell; Electrolytic —— (P) ... 353
Separation of Fluids rich in Oxygen from Air, and Apparatus therefor (P) ... 476
Lester, J. H. Cotton; Hygroscopic Nature of —— ... 388
Gas-Sampler; An Improved —— ... 386
Moisture Tests of Wood Pulp ... 389
Strength-Testing Machines for Fine Yarns ... 387
Leuba, A. F. Iodine and Bromine; Detection of —— ... 1349
Leuchter, A. Negative Plates for Bichromated Gelatin Processes (P) ... 1195
Leuscher, E. Arrowroot; Preparation of —— ... 420
Cassava; Products from —— ... 492
Levene, P. A. Glucophosphoric Acid: Characteristics of —— 505
See Fischer, E. ... 713
Lever Brothers and Phillips, J. F. Soap: Apparatus for Enclosing Tablets of —— in Wrappers (P) ... 487
Lever, J. Towers: Cooling —— (P) ... 1224
Lever, W. H. Proceedings of Annual Meeting ... 954
Levi, G., and others. Molasses: Utilising Residues from Defecation of —— (P) ... 629
Levi, M. *See* Formenti, C. ... 116
Levinstein, Ltd. Dyestuffs; Black Substantive —— (P) ... 911
See Levinstein, I. ... 967
Levinstein, I. Address to Manchester Section ... 1377
Patent Law Amendment Bill: Additional Report on ——. 301
Presidential Address ... 893
Proceedings of Annual Meeting ... 956
Report on Patent Law Amendment Bill Presented by —— 212
And Levinstein, Ltd. Dyestuffs, Sulphide: Production of —— (P) ... 1182
And Mensching, C. Dyestuffs; Black Sulphide —— (P).. 1131
And others. Dyestuffs, Azo; Manufacture of —— (P).... 967
Levites, S. J. Oils from Destructive Distillation of Animal Matters ... 35
Levrat, D., and Conte, A. Silks of Lepidoptera; Origin of Natural Coloration of —— ... 1392
Lévy, R. J. *See* Meyenberg, A. ... 609
Lewellen, J. W. Burner for Oil (P) ... 1068
Oven or Furnace (P) ... 1324
Lewes, V. B. Oil-Gas and Oil Incandescent Lighting ... 696
See Brame, J. S. S. ... 755
Lewin, W. *See* Sachs, F. ... 1449
Lewis, E. A. Alloys of Copper and Manganese ... 842
Muntz's Metal Sheathing; Effect of Sea-Water on —... 551
Pyrometer; Recording Arparatus for a Roberts-Austin Electrical —— ... 844
Zinc: Micro-Structure of —— ... 1456
Lewis, T. E., and others. Burner for Crude Oil (P) ... 902
Lewis, T. H. Acetylene Gas-Generator; "Cartridge" for —— (P) ... 764
Lewites, S. J. *See* Sokolow, N. W. ... 420
Lewkowitsch, J. Oils, Oxidised: Analytical Values of —— ... 780
Reduction of Silver Solutions; Discussion on —— ... 1375
Lewy. Candles; Material for —— (P) ... 1448
Lewy, P. Oils and Liquids for Medicinal Use; Preparation of —— (P) ... 1096
Leybold, W. Gas; Explosive —— for Exterminating Vermin (P) ... 270
Leydendecker, H. Lead; Diminishing the Solubility of —— (P) ... 124
Liais, L. Lamps; Incandescence Vapour —— (P) ... 908
Lichtenberg-Madsen, D. Celluloid Printing Blocks; Production of —— (P) ... 134
Lieberknecht, R. Naphthalene Extraction; Cost of —— ... 696
Liebermann, C. Mordant Dyeing ... 768
Mordant Dyestuffs of the Benzaldehyde Green and the Rosamine Groups ... 965
Silver Benzoate: Solubility of —— ... 506
And Hohenemser, W. Hystazarin; Research on —— 855
And Lindenbaum, S. Dyestuffs of the Aesculetin Series.. 1274
And Woelbling, F. Dihydroxyfluoresceines and Dihydroxyeosins ... 859

PAGE

Liebermann, F. von. Electrolytic Baths; Addition of Glycerin to —— (P) ... 1031
Liebknecht, O. *See* Homolka, B. ... 1073
Liebrecht, A. Isovaleramide Derivative, and Manufacture thereof (P) ... 638
Liesegang, H. and R. E. Developer for Silver Chloride Gelatin ... 137
Liet, J. P. E., and Claudel, C. H. Combustible Liquids; Volatilisation of ——, and Addition of Steam (P) 1066
Lietz, O. Starch: Determination of —— ... 930
Lieussou, G. Bronze; Production of —— (P) ... 977
Lieven, O. Cement; The Hydraulic Modulus of Portland ... 1028
Lihme, I. P. Lithopone; Manufacture of —— (P) ... 625
Lilienfeld, L. Printing Tissues with Pigments ... 771
Lilley, J. E. *See* Webb, J. F. ... 485
Limpricht, O., and Masch. Actienges. vorm. Forstreuter. Sugar; Crystallisation with Motion in the Manufacture of —— (P) ... 920
Linard, F. *See* Fabry, R. ... 906
Lincoln, J. C. Meat; Apparatus for Curing —— (P) ... 1091
Lincoln, L. Metal; Drawing Molten —— from Receptacles (P) ... 977
And D. B., and Gooding, C. S. Metal; Drawing off Molten ——, and Apparatus therefor (P) ... 553
Lindberg, P. W. Centrifugal Separators (P) ... 326
Linde, Van der. Charcoal Manufacture; Discussion on —.. 746
Lindenbaum, S. *See* Liebermann, C. ... 1274
Linder, E. *See* Carpenter, R. Forbes ... 1490
Lindet, L. Flour from Millstones and Rollers; Comparative Composition of —— ... 62
Starch in Cereals; Determination of —— ... 75
Lindley, J., and Ashworth, E. Dyeing and Bleaching Apparatus (P) ... 340
Lindner. Barley and Malt; Detection of Parasites in —— ... 130
Lindner, P. Cellars or Tun Rooms; Infection and Ventilation of —— ... 785
Wooden Plugs; Danger of Infection from —— ... 868
Lindsay, W. G. Sulphur in Pig Iron; Colorimetric Method for Determination of —— ... 279
Ling, A. R. Malt Analysis ... 983
Reduction of Silver Solutions: Discussion on —— ... 1374
Spirits: Discussion on Maturing of —— ... 100
And Davis, B. F. Malt Diastase; Experiments with ——. 1088
Lingner, K. A. F. Menthol Derivative; Manufacture of a —— (P) ... 722
Linn, A. F. Lead from a Phosphoric Acid Solution; Electrolytic Deposition of —— ... 793
Lintner, C. J. Brewing: Role of Nitrogenous Substances in —— ... 1546
Malt Enzymes; Isolation of —— ... 1034
Lion. Naphthalene Vapours: Utilising —— for Heating, &c. (P) ... 1525
Lipman, J. G. Nitrification: Studies in —— ... 488
Lippen, J. K. Food; Malted Cereal —— (P) ... 985
Lippert, W. Copals: Fusion of —— under Pressure ... 1460
See Huth, P. ... 1336
Lippmann, E., and Pollak, J. Aromatic Hydrocarbons; Colour Reactions of —— ... 1271
And Pollak, J. Benzene: Action of Sulphur Chloride on —— ... 1271
Lippmann, E. O. von. Boric Acid in Fruits; Natural Occurrence of —— ... 869
Sugar of Mahwa Flower ... 713
Lippmann, F. Dextrins; Examination and Analysis of Commercial —— ... 1101
Lippold, G. L. Leather Substitute, and Manufacture thereof. (P) ... 357
Lipscautz, A. *See* Toltz, M. ... 397
Lishman Process Bleaching Co. *See* Lishman and others ... 969
See Taylor and others ... 1074
Lishman, W. W. L., and others. Kier for Bleaching (P) ... 969
Lister, J. T. Textiles; Apparatus for Steaming, &c. —— (P) 1453
Lithium-ammonium: Action of —— on Antimony ... 369
Litterscheid, F. M. Copper; Volumetric Determination of — 874
Little, A. D. Paper; Water- and Grease-proof —— (P) ... 362
Paper; Waxed —— (P) ... 362
See Mork, H. S. ... 1345
Littlefield, R. D. *See* Rawson, W. S. ... 52
Litty, L. Clarifier for Sugar Juices (P) ... 490
Livingstone, E. L., and Vandercook, W. A. Liquid for Sprinkling over Fuel (P) ... 1227
Ljamin, N. Cement: Abnormalities in the Initial Setting of —— ... 972
Ljubavin, N. N. Tannin and Tartar Emetic; Interaction between —— ... 128
Lloyd, H. H. Batteries; Non-Active Metal for Use in Storage —— (P) ... 1540
Lobeck, A. Kousso Flowers; Constituents of —— ... 187

PAGE

Lobry de Bruyn, C. A. Colloidal and Cane Sugar Solutions of Insoluble Inorganic Bodies 1301
And Eckenstein, W. A. van. Hydroxy Acids; New Class of Aldehyde Derivatives of the —— 286
See Eckenstein, W. A. von 1302
Locke, C. W. Gas Jets; High-Power Oxyhydrogen Mixed ——. (P) 1388
Locke, F. M. Filter-Press for Porcelain Slip (P) 1330
Lockerbie and Wilkinson, Ltd., and Brand, J. C. Acetylene Gas-Generators (P) 961
Lode, A. Aspergillus; Conditions for Destruction of Spores of —— 788
Loeb, W. Anthranilic Acid: Electro-Thermal Formation of —— 1272
Aromatic Nitro-Compounds: Influence of Cathode Material on Electrolytic Reduction of —— 1282
Diphenyl: Pyrogenetic Production of —— 1271
Loeser, C. Kilns or Furnaces (P) 1524
Loeti, I. and S. *See* Blou, F. 34
Loevenhart, A. S. *See* Kastle, J. H. 196
Loewenthal, J. Composition for Making Stones or Mortar (P) 1233
Loewenthal, R. Cotton in Dyed Union Fabrics; Preserving —— 339
Lohoefer, W. *See* Lunge, G. 70
Loiselet, J. Starch; Manufacture of —— (P) 982
See Leconte, E. 1033
Lomax, C. S. Oxides of Tin and Lead; Manufacture of —— (P) 624
Lombard, L. W. Electrodes for Storage Batteries (P) 863
Londe, A. Magnesium Flashlight; Velocity of Combustion and Chronophctography of the —— 926
Lonergan, J. J., and Calkins, A. C. Assayer's Furnace (P) ... 618
Lones, J. and J., and Holden, E. White Pigment from Zinc; Manufacture of —— (P) 555
Long, D. N. Acetylene Gas-Generator (P) 765
Long, F. H. Converter; Electrolytic —— (P) 780
Paper-Pulp; Bleaching of —— (P) 986, 1092
Long, J. H. Tartrates in Glycerin: Optical Rotations of Certain —— 77
Loomis, F. A. H. *See* Abbot, M. S. 723
Loose, W. A. R. Metals; Apparatus for Separating —— from their Ores (P) 1401
Lopatin, P. and J., and Galecki, W. Bricks of Lime and Sand 174
Lorenz, J. Polish for Leather, &c., and Production thereof (P) 414
Lorenz, R. Salts; Electrolysis of Fused —— 777
Lorimer and Co., and Joyce, T. G. Quinine; Camphorate of —— (P) 1096
Lorne, C. E. Eggs; Compound for Preserving — (P) 1242
Losfeld, D. Acetylene Gas; Apparatus for Generating —— (P) 907
Lott, F. E. Emergencies in Vitriol Works; Discussion on —— 229
See Matthews, C. G. 867
Lottier, E. Plastic Articles; Production of —— (P) 1338
Louguinine, W., and Schukareff, A. Alloys of Zinc and Aluminium; Thermal Investigation of —— 481
Louis, D. A. Photometer and Pentane Burner; Discussion on New —— 315
Louis, P. Sugar; Filtration of —— (P) 416
Loumeau, E. Sugar Juice; Concentration and Extraction of —— (P) 130
Lovat, H. *See* Ehrmann, C. 726
Lovejoy, D. R. *See* Bradley, C. S. 1335, 1335
Lovett, T. J. *See* Flora, E. E. 1325
Lovett, W. J. Dephlegmator for Kjeldahl Estimations 849
Lowe, J. Filters for Sewage, &c. (P) 1408
Lowe, J. T. Gas-Tar Residuum: Treatment of —— (P) 1227
Lowe, T. S. C. Coke and Gas; Manufacture of ——, and Apparatus therefor (P) 906
Lowe, V. H., and Parrott, P. J. Insecticides: Experiments with —— 559
Lowry, T. M. *See* Armstrong, H. E. 913
Lowther, T. Incrustation; Material for Removing and Preventing —— (P) 32
Lowy, J. Lamp for Incandescence Gas (P) 1129
Lovett. Arsenic Determination in Malt Liquors; Discussion on —— 903
Loyer, W. J. Acetylene Gas-Generator (P) 1325
Lubberger, H. Liquids; Clarifying of —— (P) 1340
Lucchini, V. Iron; Stassano's Electric Furnace for —— 1143
Ludwig. Carbon; Process and Apparatus for Fusing —— (P) 1458
Ludwig, A. Vessel for High-Pressure Gases (P) 761
Ludwig, J. N. Photographs; Developing —— in Daylight (P) 639
Ludwig, T. Portland Cement: Constitution of —— 256
Luehne, J. Glass; Electric Furnace for Making —— (P) 773
Glass, &c.; Apparatus for Manufacture of —— (P) 773
Luehrig, H. Prussian Blue in Spent Oxide; Determination of —— 1415

PAGE

Lueppo-Cramer. Developers: Action of Oxidation Products on —— 365
Developers for Incorrect Exposure 365
Latent Image: Constitution of the —— 138
Printing-out Process: Theory of the —— 138
Solarisation-like Phenomena in Photography 1111
Thiosulphate and Ferrocyanide; Action of —— on the Latent Photographic Image 138
Luettke, H. Printing Emulsions; Chloride of Silver —— (P) 425
Luettringhaus, P. Hydrogen Peroxide Solutions; Action of Metals on —— 46
Sodium Peroxide Baths; Heating of —— 856
Luety, F., and Niedenfuehr, H. H. Sulphuric Acid Manufacture; Comparison of "Chamber" and "Contact" Processes for 475
Luff. Yeast Washing by Ordinary Method and by Levigation 922
Luft, A. Plastic Compounds (P) 1085
Luhmann, E. Carbonic Acid Gas: Apparatus for Production of Pure —— (P) 1330
Magnesia Cement 118
Lumière, A. and L. Antiseptics; Organo-Metallic Compounds of Mercury —— (P) 1153
Et Fils. Ammonium Persulphate as a "Hypo" Eliminator 1554
See also under Société des Plaques, &c.
Lumière and Seyewetz. Alums; Acid Reaction of ——, and its Influence on Formation of Insoluble Compounds of Gelatin with Chrome Alum 1544
And Seyewetz. Fading of Silver-Chloride Citrate Prints.. 1469
And Seyewetz. Toning with Thionates of Lead 1469
And Seyewetz. Toning and Fixing Bath; Theory of the Combined —— 561
And Seyewetz. Lead Thionates as Toning Agents 1154
And Seyewetz, A. Oxidising Agents for Destruction of Sodium Thiosulphate 989
Lumley, J. *See* Borrowe, W. 348
Lumsden, J. S. Calcium Salts of Acids of the Acetic Acid Series; Solubilities of the —— 343
Equilibrium between a Solid and its Saturated Solution at various Temperatures 344
Lundeberg, A. F. Carpets; Apparatus for Printing —— (P) 474
Oils; Extraction of —— (P) 1238
Lundholm, C. O. Gunpowder; Smokeless —— (P) 927
Lundquist, I., and Kern, A. Spray-Producers or Nebulizers (P) 538
Lunge, G. Nitric and Nitrous Acids; The Brucine Reaction for —— 499
Nitrous Acid; Alleged Reaction of Brucine with —— 190
Sodium Arsenite Solution: Preparation of —— 140
And Lohoefer, W. Sodium Carbonate, Crude Fused; Examination of —— 70
And Pollitt, G. P. Sulphur Trioxide; Production of —— by Contact Action 1329
Lurati, E. Indigo; Fixing Dyes on —— (P) 858
Luther, C. J. Gas Generator (P) 1270
Lutz, A. *See* Anderson, G. H. 985
Lux, H. Gas-Burners; Incandescence —— (P) 598
Lamps; Extinguishing Incandescence Vapour —— (P)... 1179
Lamps; Incandescence Vapour —— (P) 1179
Luynes, V. de. Caramel; Determination of Fermentable Matter in —— 428
Glazes; Analysis of Porcelain —— 426
Lyle, W. G., and Stewart, J. E. Liquids; Apparatus for Vaporising —— (P) 493
Lynch, T. A. Soap Tablets (P) 782
Lyons. Strychnine and Brucine; Separation of —— 1300
Lytle, H. H. Burner; Gas or Vapour —— (P) 602

M

Mabery, C. F. Petroleum; Composition of —— 1271
Mabille and Leclerc. Celluloid; Rendering —— incombustible (P) 1400
McA. Johnson, W. *See under* Johnson.
McBride, H. J. and H. W. Combustion; Composition for Promoting ——. (P) 1323
McCallum, T. S. Sewage and other Liquids; Apparatus for Application of —— to Land, &c. (P) 717
McClave, W. Furnaces; Construction of ——. (P) 905
McCloy, W. R. Glassware; Finishing Machine for ——. (P) 707
McConnell, N. Steel; Manufacture of ——. (P) 1536
McCormack, H. Centrifugal Cream Separator. (P) 1149
McCormick, T., and Miller, A. D. Carburetter for Explosion Engines (P) 601
McCrae, J. Translation of Arrhenius's "Text Book of Electro-Chemistry" 1159
McCullough, C. H., jun., and Holmboe, L. C. B. Bessemer Steel Plant (P) 977

PAGE

MeDonald, F. Electrolytic Apparatus (P) 710
Macdonald, L. W. *See* Playne, L. W. 1132, 1532
McDonald, S. Steel; Manufacture of Basic Bessemer —— (P) 1141
MacDonell, J. D. Cement; Composition of Matter for —— (P) 479
McDonnell, M. E. *See* Pease, F. N. 263
McDougall, H. Carbonate of Lime; Discussion on —— ... 531, 533
McDougall, J. S. Grease and Oil; Apparatus for Extracting —— from Exhaust Steam (P) 625
Mace, G. A. Lime; Apparatus for Burning —— (P) 1397
McFarlane, J., and Reinohl, D. C. Cotton-seed; Extracting Oil from —— (P) 918, 1084
And Reinohl, D. C. Cotton-seed; Hulling —— (P) 1084
And Sterne, E. D. Burner for Oil Lamps; Incandescence —— (P) 464
Macfarlane, J. W., and Robertson, A. R. Centrifugal Machines (P) 1224
McGinn, J. St. S. Acetylene Gas Apparatus (P) 695
Machell, R. H. *See* Haller, J. C. 787, 1345
Maschinenbau Actienges. vorm. Beck and Henkel. Sewage Water; Treatment of Deposits from —— (P) 1149
Machlet, G., jun. Carburetting Apparatus and Burner (P) ... 460
McIlhiney, P. C. Oils; Bromine Absorption of —— 1542
McIntosh, A. Acetylene Gas; Apparatus for Generating and Storing —— (P) 333
Ferments; Inorganic —— 797
McKay, H. C. Varnish for making Enamel and Patent Leathers (P) 1033
McKay, W. R. *See* Jousset, C. 696
Mackean, W. Mantles, Incandescence; Apparatus for Burning and Seasoning —— (P) 598
McKechnie, D., and The United Alkali Co. Copper; Recovery of —— from Precipitate (P) 350
McKenna, W. S., and Whiteley, H. Furnaces for Heating Annealing Boxes, &c. (P) 460
Mackensen, A. Vegetable Parchment free from Germs (P) .. 1150
Mackenzie, A. W. *See* Ross, J. 1019
Mackenzie, C. W. Acetylene Gas Generator (P) 1527
McKerrow, C. A. Fuller's Earth, Silicates, &c.; Preparation of —— (P) 555
Mackie, M. D. Gas-detecting Attachment for Miners' Safety Lamps (P) 603
McKim, J. T. Cement; Composition of —— (P) 1398
Mackintosh, J. C. *See* Lang, W. R. 748
Macklin, A. B. Hydrocarbon-Vapour Burner (P) 1180
McKnight, R. Carbonaceous Ores; Reduction of —— (P) 411
Ores; Treatment of —— (P) 619
See Guirand, G. 978
Mackusick, E. F. Acetylene Gas; Apparatus for Generating —— (P) 604
Carbide Cartridge for Acetylene Generators (P) 604
See Foster, G. V. 461, 1447
McLaughlin, A. C. Ammonium Ichthyol Sulphonate; Preparation of —— (P) 1553
McLaughlin, J. K. Pulp-Separator (P) 1150
McLaughlin, M. P. *See* Lowe, J. T. 1227
McLay, J. C. S. Heat Non-conducting Materials (P) 118
McNab. Potassium Chlorate; Discussion on Explosion of —— by Heat 219
McNally, J. Gas; Apparatus for Purifying Acetylene and other —— (P) 1388
MacNaughton, J. *See* Rossi, A. J. 1537
McNeil, J. *See* Bolton, J. B. 1032
McPhail, H. Mineral Oils and their Distillates; Distillates of —— (P) 765
Superheating or Drying Steam; Apparatus for —— (P) ... 538
Waste or By-Products of Breweries: Treatment of —— (P) 185
Water; Apparatus for Heating, Softening, &c. (P) 787
Macpherson, F. H. Vapour Generators for Incandescence Lighting (P) 397
Macquet, J. B. Acetylene Gas Generator (P) 1067
Macredy, J. Evaporating Apparatus for Eggs (P) 361
Macrorie, R. B. H. *See* Thibodo, F. H. 1155
Mactear, J. Chlorine and Alkali; Electrolytic Apparatus for Production of —— (P) 1077
McVean, D. *See* Irvine, T. A. 776
M'William, A. *See* Arnold, J. O. 861
And Hatfield, W. H. Steel; Elimination of Silicon in the Acid Open-Hearth —— 774
Made, P. R. van der. Carburetting Apparatus (P) 463
Maeckler. Clay; Influence of Magnesia on the Behaviour of —— 914
Maertens, E. Hides and Skins; Tanning and Tawing —— (P) 865
Wool; Cleaning of —— (P) 858
Maffei, G. *See* Cantu, F. 113
See Miglioretti, M. G. 264
Magnetic Ore Separating Co., Melborne. Ores; Magnetic Separation of Pulverised —— (P) 54

PAGE

Magnier, P., and Brangier, P. A. Camphor Substitute; Manufacture of —— (P) 1411
Wood; Conversion of —— into Dextrine, Glucose and Alcohol (P) 632
Magri, C. *See* Antony, U. 429
Mahoudeau, F. Sugar; Apparatus for Drying —— (P) 630
Mai, J. Arsenious Acid; Colorimetric Determination of —— . 1098
Diazo Compounds; Action of Hypophosphorous Acid on —— 247
Dyestuffs, Azo-, from Methylphenylglycine 337
Nitrogen; Preparation of ——, from Ammonium Nitrate .. 76
Mai, L. *See* Freund, M. 136
Maiden, J. H. Cork Production 1478
Maignen, P. J. A. Water Supplies; Purifying Municipal —— (P) 1550
Mailhe, A. Cupric Hydroxide; Action of —— on Aqueous Solutions of Metallic Salts 285
Cupric Hydroxide; Action of ——, on Solutions of Metallic Salts 173
Maillard, L. Indigotin; Polymerised Condition of Ordinary ——, and Isomeric Conversion of Indigotin into Indirubin 398
Maisch, G. H. Incandescence Mantles; Manufacture of —— (P) 1527
Major, J., and Wood, T. J. Dyeing and Bleaching Apparatus (P) 340
Makin, E. Hops and Hop Seeds; Cattle Food from —— (P). 1344
Malabar, R. Sewage and Foul Liquids; Purification of —— (P) 1408
Malard, G. Wool; Apparatus for Scouring, &c. (P) 1133
Mallet, P. Gaseous Currents; Apparatus for Generation of —— (P) 394
Mallmann. Distilling and Evaporating Apparatus (P) 1445
Mally, J. R. Soap Tablets and Bars (P) 864
Malmendier, C., and Stuehler, M. Liquids; Apparatus for Saturating ——, with Gases (P) 1224
Manasse, W. Foods; Preservation of —— (P) 558
Manby, C. E. Phosphorus in Shot or Chilled Iron; Effect of Annealing on Determination of —— 873
Mance, Sir H. C., and The Nernst Electric Light Co. Lamps; Incandescence Electric —— (P) 461
Manger, A. W. *See* Doulton, H. L. 1242
Manget and Marion. Formaldehyde in Foods; Reaction for Detecting —— 1351
Mangin, A. L. Carburetter (P) 764
Manlove, Alliott, and Co. *See* Ransom, H. B. 1465
Mann, C. Essential Oils in Spices and Perfumery; Quantitative Determination of —— 794
Liqueurs; Determination of Ethereal Oils in —— 726
Soaps; Determination of Ethereal Oils in —— 726
Mann, H. A. Starch-filled Articles; Rendering ——, Impervious to Water (P) 1074
Mann, H. H. Tea-leaf; Enzymes of the —— 716
Mann, J. H. Carbon-Black; Apparatus for Making —— 1337
Mann, J. L. Lampblack Apparatus (P) 1337
Mannassewitch, E. *See* Darier, G. 1449
Mannich, C. Kino, from Eucalyptus Drepanophylla 1347
Mannich, F. Gums of German East Africa 1337
Manoury, H. A. J. Raw Sugars; Refining Low Quality —— (P) 867
And Naudet, L. Bagasse; Improved Production of —— (P) 628
And Naudet, L. Bagasse; Diffusion or Rapid Lixiviation of —— (P) 59
Mansier. Filter-Paper a Cause of Error in Analysis 1155
Filter-Paper a Cause of Error in Analytical Chemistry 1098
Paper and Cotton; Fixation of Compounds on —— 1098
Solutions; Irregular Spreading of —— 1155
Manufacture Lyonnaise de Matières Colorantes. *p*-Ammotolyl-*p*-hydroxyphenylamine and Blue Sulphide Dyestuffs (P) 967
Colouring Matter, Blue; Manufacture of —— (P) 41
Cotton; Preventing the Tendering of Dyed —— (P) 50
Dyeing Tissues with Sulphur Dyestuffs (P) 704
Dyestuff; Azo Blue —— for Wool (P) 112
Dyestuff, Blue Cotton; Manufacture of —— (P) 42, 42
Dyestuff, Blue, for Cotton (P) 41
Dyestuff, Sulphide —— (P) 402
Dyestuffs, Acridine —— (P) 402, 544
Dyestuffs; Blue Azo —— for Cotton (P) 544, 856
Dyestuffs; Blue Azo —— for Wool (P) 856
Dyestuffs, Blue, containing Sulphur; Manufacture of —— (P) 42
Dyestuffs; Brown Sulphide —— (P) 1392
Dyestuffs; Fast Azo —— for Wool (P) 911
Dyestuffs; Greenish-Blue Sulphide —— (P) 112
Dyestuffs of the Acridine Series (P) 113
Dyestuffs, Violet and Blue 41
Indophenol, and a Violet Sulphur Dyestuff therefrom (P) 1451
Reserves on Textiles Dyed with Sulphur Dyestuffs; Production of —— (P) 51
Sulphonic Acid; Manufacture of 2.2'-Aminonaphthol (P) 41

PAGE

Manzella, E. Mortars; Influence of Chemical Composition and Granular Condition of the Sand 1139
Maquenne, L. G. *See* Bullier, L. M. 1388, 1388
Marbach, A. Yeast; Pressed Grain —, and Bottom Fermentation Yeast; Differentiation of — 417
Marc, R. Chlorine; Apparatus for Determination of — 928
Lanthanum containing Didymium, &c.; Influence of Cerium on — 1093
Marchand, D. Acetylene Generator (P) 1390
Marcher, F. A. *See* Harrison, A. W. 1237
Marchéville, M. de. Centrifugal Machines (P) 326
Marchlewski, L. Dyestuffs produced by Action of Isatin on Extracts of Isatis tinctoria 1071
Marckwald, E., and Frank, F. Gutta-percha; Methods for Determining — 1351
And Frank, F. Rubber-like Latexes from the Congo 1188
See Frank, F. 726, 1085
Marckwald, W. Bismuth · Radio-Active — 1301
Bismuth; Radio-Active —, Polonium 994
Fusel Oil; Separation of the Amyl Alcohols of — 785
Marcusson, J. Cholesterol and Phytosterol in Mixtures; Separation of —. II. 725
See Holde 930
Margosches, B. M. Sewage and Effluents; Bayer's Method for Purification of — 183
Margulies. Beetroot Mare; Purification of Gummy Matter from — (P) 59
Marie, C. Hydroxyisopropylhypophosphoreus Acid; Preparation of — 369
Marine Torch Co. Projectiles for Illuminating or Signalling (P) 139
Marino, P. Q. and G. Electrical Batteries and Electrolytical Apparatus (P) 1335
And Ratchkowsky, A. Metals and Alloys; Electrolytic Deposition of — (P) 1082
Marion. *See* Manget 1351
Marissal, M. *See* Prost, E. 874
Markovits, E., and Guthmann, F. Meat; Preparation for Preserving — (P) 1549
Markownikoff, W. Benzene in Grosny Naphtha; and Chem. Character of the latter 1148
Hydrocarbons; Action of Nitro-Sulphuric Acid on Saturated — 855
Maron, D. Dyestuff, Blue —, derived from Triphenylmethane (P) 542
Marquand, Société G. C. and A. Agglutinant Composition (P) 1446
Marsden, M. W. Building Material (P) 1139
Marshall, A. Sulphuric Acid; Determination of Strength of — 1511
Sulphuric Acid; Influence of Impurities on Specific Gravity of — 1508
Marshall, C. P. *See* Miller, A. J. F. 905
Marshall, C. R. Ceriarieæ; Toxic Principles of the — 1153
Marshall, H. Persulphates as Photographic Reagents 723
Marshall, W. C. Tank for Rendering Lard (P) 263
Martenette, F. "Carburetter" (P) 600
Marter. Tanning; Rapid Process of — (P) 1544
Martin, A. J. *See* Cameron, D. 185
Martin, C. Bleaching Apparatus; Electrolytic — (P) 342
Martin, F. M. *See* Moore, J. D. 870, 870
Martin, H. C. Borner; Hydrocarbon — (P) 1068
Martin, H. H. *See* Feurt, W. A. 332
Martin, H. M. Plates for Secondary Batteries (P) 1082
Martin, H. T. *See* Green, J. O. 851
Martin, P. L. Baryta, Anhydrous Caustic; Manufacture of — (P) 117
Martin, R. D. Coke-Ovens; Improved Working of — (P) . 245
Martin, W. Disinfecting Compound (P) 271
Sewer-Vaults; Apparatus for Disinfecting — (P) 270
Martin, W. H., and others. Gold; Extraction of —, from Sea Water (P) 1536
Martino, F. W. Metals; Application of Barium Compound for Precipitation of — (P) 976
Ores containing Noble Metals; Treatment of — (P) ... 1141
Martinson, H. M. Agitator for Wood-Pulp, &c. (P) 1243
Marx, F. Stone; Apparatus for Manufacture of Artificial — (P) 973
Marxsohn, L. *See* Hoert, R. 984
Maschinenbau Actienges. vorm. Beck and Henkel. Fecal Substances; Obtaining Fatty and Fertilising Substances from — (P) 627
Masch. Actienges. vorm. Forstreuter. *See* Limpricht, O. 920
Masecar, J. R. Soap Press (P) 782
Maskrey, A. J. Gas-Producer and Recuperative Furnace Combined (P) 1333
Mason, A. Carbonate of Lime; Utilisation of Recovered — (P) 1278
Mason, H. *See* Crabtree, L. 1245
Mason, J. A., and Wilson, C. J. Hydrocarbon Burners for Heating (P) 244

PAGE

Massey, E. *See* Bleckly, H. S. 1226
Massie, J. G. Illuminant; Compound to be used as an — (P) 1524
Massol. *See* De Forcrand 705
Masson and Sansoumet. Skins; Tawing of — (P) 1405
Masthaum, H. Wax; Determination of Specific Gravity of — 1285
Matheeuwissen, W. T. Centrifugal Separators (P) 489
Mathieu and Billon. Sulphurous Acid in Fermented Liquids; Determination of Free — 1247
Mathieu, L. Sulphurous Acid in Wines; Detection and Determination of — 1559
Mathisen, J. *See* Newlin, S. L. 1180
Matignon, C. Hydrochloric Acid and Oxygen Mixture; Chlorinating Properties of — 970
Neodymium and Praseodymium; Acid and Basic Sulphates of — 994
Matos, L. J. Sulphur Blacks and their Action upon Cellulose 224
Mattei, D. Dyeing Apparatus (P) 1134
Matthews, C. G., and Lott, F. E. Fermentation from the Point of View of Yeast Crop 867
Matthews, J. A. *See* Campbell, W. 551
Matthews, J. Merritt. Caustic Soda; Action of — on Wool. 685
Indigo Dyeing; Influence of Indigo-Red in — 222
Textile Chemistry: Some Phases of — 1516
Matuschek, J. Nitrites; Preparation of — 705
Petroleum; Influence of Water present on Flash-Point and Combustion-Point of — 909
Prussian Blue Soluble in Water; Preparation of a — ... 355
Maussion. Food; Sterilisation of — (P) 1465
Maxim, H. Furnace; Revolving Electrical — (P) 1069
Maxim, Sir H. S. Coffee Substitutes; Obtainment of — (P) 492
Coffee; Treatment of —, and Production of Substitutes (P) 269
Fuses for Armour-piercing Projectiles (P) 1155
Mayer, J. Tea Extract; Production of an Alcoholic — (P). 633
Mayer, K. Primuline and Similar Colours; Developing Diazotised — 46
Mayo, Caswell A. Purity of Standard Drugs, &c.; Discussion on — 1436
Mazé, P. Fatty Matters; Transformation of — into Sugars during Germination of Seeds 869
Lactic Acid and Glycerin; Assimilation of — by Eurotyopsis Gayoni 287
Mazey, J. T. *See* Illingworth, R. 1025
Mazza, E. N. Centrifugal Separator for Gaseous Mixtures (P) 1126
Meade, E. S. Briquette, and Production of same (P) 908
Mehold, C. *See* Medicus, L. 1248
Medicus, L., and Mehold, C. Foodstuffs; Electrolytic Determination of Traces of Metals in — 1248
Meencn, A. Lamp; Incandescence — (P) 1323
Meggitt, L. Sampling and Preparation of Shoddy, &c. for Analysis 105
Viscometer; A New — 106
Mehner, H. Tolindines; Coupling of — with Diazo Compounds 706
Meikle, J. Tar; Continuous Distillation of —, and Apparatus therefor 109
Meillère, G. Iodoform; Determination of — 1196
Organic Matter; Destruction of — in testing for Phosphorus, Arsenic and Toxic Metals 366
Meininghaus, E. Iron and Steel Manufacture, and Apparatus used therein (P) 617
Meinl, J. Cocoa Substitutes; Manufacture of — 1344
Meisenheimer, J. Aromatic Nitro-Compounds; Reactions of — 1158
Meissner, O., and Richter, M. Fuel; Apparatus for Heating by Liquid — (P) 762
Meister, Lucius und Bruning. Alkyl-Auramines; Manufacture of — (P) 856
Anthracene Dyestuffs; Production of — (P) 471
Anthranilic Acid; Manufacture of — (P) 1392
Auramines; Manufacture of New Substituted — (P) ... 1528
Azo Components and Azo Dyestuffs; Manufacture of — (P) 43
Black Colour; Production of — on the Fibre (P) 114
Black Direct Cotton Dyestuffs; Sulphurated — (P) 44
Bromindigo; Manufacture of — (P) 1131
Colour Lakes; Manufacture of Fast Double — (P) 249
Dialkylrhodamines; Conversion of — into their Alkyl Esters (P) 337, 337
Dimethylamidodimethylphenylpyrazolone; Compounds of — with Camphoric Acid (P) 67
Disazo Colour for Wool; Production of — (P) 109
Dyeing with Indigo. (P) From Peterhanser 1393
Dyestuff; Blue — from Para-amido-para-oxydiphenylamine (P) 855
Dyestuff, Blue-Grey; Manufacture of — (P) 37, 37
Dyestuff, Brown Sulphurised; Manufacture of a — (P) 44
Dyestuffs; Acridine — (P) 701, 911
Dyestuffs; Anthracene —. (P) From Hartmann 1073
Dyestuffs; Anthracene —. (P) From Hepp 1392, 1530
Dyestuffs; Anthracene Blue — (P) 1392
Dyestuffs, Blue and Grey; Manufacture of — (P) 44

PAGE

Meister, Lucius und Brüning—*cont.*
Dyestuffs, Blue, of the Anthracene Series; Manufacture of —— (P) 44
Dyestuffs; Blue Sulphide ——. (P) From Dollfus 1328
Dyestuffs, Brown and Black Disazo; Manufacture of —— (P) 44
Dyestuffs for Cotton; Manufacture of Sulphurated —— (P) 44
Dyestuffs of the Acridine Series; Yellow to Orange-Yellow —— (P) 701
Dyestuffs; Indigo ——. (P) From Homolka and Liebknecht 1073
Dyestuffs, Orange to Red Mordant; Production of —— (P) 169, 169
Dyestuffs; Orange-Red Azo. (P) From Scholl 610
Dyestuffs; Pyrone ——. (P) From Hoffmann 401
Dyestuffs, Sulphide; Manufacture of —— (P) 608
Dyestuffs; Yellow to Red Acridine ——. (P) From Sohst 1530
Dyestuffs; Yellow to Yellowish-Orange —— (P) 1529
Formylmethylanthranilic Acid; Manufacture of —— (P) 967, 1528
Hydrosulphite; Manufacture of a —— (P) 704
Indigo and its Homologues; Production of —— (P) 401
Indigo; Purification of Crude —— (P) 401
Indigo; Reduction of —— (P) 1528
Indigo Reduction Product; Manufacture of —— (P) 38
Indoxyl; Manufacture of —— (P) 967, 967, 967
Indoxyl or its Homologues; Manufacture of —— (P) 608, 1024
Isovaleramide Derivative. (P) From Liebrecht 638
Paper Fibres; Dyeing of —— (P) 114
Phenylamido-acetonitrile, &c.; Preparation of —— (P) .. 1131
Phenylamino-acetonitrile, its Homologues and Substitution Products (P) 543, 543
Phenyldimethylpyrazolone; Compounds of —— with Camphoric Acid (P) 67
Phenylglycine, its Homologues and their Salts (P) 543
Phenylglycine-o-carboxylic Acid; Manufacture of —— (P) 36
Plantinum used as Contact Material; Revivifying —— (P) 1454
Rhodamine Derivatives; Production of —— (P) 44
Silver Compounds of the Gelatoses; Neutral Soluble —— (P) 67
Sulphonic Acids of Alkyl Derivatives; Manufacture of —— (P) 967
Sulphuric Acid and Sulphuric Anhydride; Manufacture of —— (P) 1454
Sulphuric Anhydride; Manufacture of —— by Contact Process (P) 117, 1453
Trimethylhexahydrooxy benzylaniline. (P) From Merling 364

Meldola, R., and Eyre, J. V. Diazotisation; Elimination of a Nitro Group on —— 1023

Melikoff, P. G. Hydrogen Peroxide; Behaviour of —— with certain Salts 645

Melland and Waldron. Aluminium; Influence of —— on the Carbon in Cast Iron 861

Mellor, J. W. Cyanides and Cyanates; Reciprocal Determination of —— 71
"Higher Mathematics for Students of Chemistry and Physics, with Special Reference to Practical Work". 1043

Mellor, P. H. Insoluble Frits for Pottery Glazes; Discussion on —— 322

Mellor, R. Yarns; Means for Dyeing —— (P) 1073

Melotte, J. Centrifugal Separator for Liquids (Milk) (P) ... 1407

Melvin, T., and Harvey, J. Sewage; Valve Gear for Bacteriological Treatment of —— (P) 869

Mende, A. Hydrocarbon Burner: Incandescence —— (P) ... 964

Mendham, C. F. Viscous Liquids; Apparatus for Controlling Delivery of —— (P) 1225

Menne, H. A. E. Burner for Removal of Hardened Masses in Furnaces (P) 1068

Mennicke, H. Tin-plate Scrap; Electro-Chemical Stripping of —— (P) 980

Mensching, C. *See* Levinstein, I. 967, 1131, 1131

Mentrel. Barium-Ammonium and Barium Amide 1476

Mentzel, C. *See* Arnold, C. 640, 725, 1297

Menzel. Offtake for Hydraulic Gas-Mains 108

Menzies, A. W. C. Thermo-Regulator; The Sensitiveness of a —— 189

Menzies, J. Fabrics; Waterproof —— (P) 341
Fabrics; Waterproofing of —— (P) 1133

Menzies, W. J. Grains and Hops; Pressing Machinery for Treatment of —— (P) 868

Méran, J. E. G. Accumulators; Electric —— (P) 710

Merchant, E. F. Aerated Water; Apparatus for Manufacture of —— (P) 1407

Merck, E. Benzoyl-lupinin; Production of —— (P) 560
Eucalyptol; Preparation of —— (P) 1096
Morphine; Preparing Alkyl Ethers of —— (P) 926
And Co. *See* Smith, Watson 1096
And Co. *See* Blum, F. 1154

Merck, H. J., and Co. Superphosphates; Apparatus for Comminuting —— (P) 713

Merling, G. Trimethylhexahydrooxybenzylaniline, and Manufacture thereof (P) 364

Merrell, C. G. *See* Gordin, H. M. 1352

Merrick, S. G. Smoke or Vapour Condenser (P) 245

PAGE

Merrifield, L. L., and Checkley, E. J. Gas from Peat, &c.; Machines for Production of —— (P) 1020
And Checkley, E. J. Gas from Peat, &c.; Production of —— (P) 1021

Merrill, F. H., and Hickman, F. Acetylene Gas Generator (P) 764

Merton, T. D. Furnace for Ore Roasting (P) 977

Meslans, M. Fluorine; Apparatus for Producing —— by Electrolysis (P) 353

Messel, R. Sulphuric Acid Process; Discussion on —— 1507

Messenger, A. H., and Popper, V. Beetroots, &c.; Apparatus for Treating Exhausted Raspings of —— (P) 629

Metalline-Platten-Gesellschaft. *See* Ahrle, C. P. H. 139, 1038

Metcalf, C. W. Acetylene Gas Generator (P) 1270

Meteorit Gesellschaft, The. Aluminium; Improving the Quality of —— (P) 124

Metzger, F. J. Thorium Determination of 363
Thorium; Separation of —— from Cerium, Lanthanum, &c. 1415

Meulemeester, E. de. Wort; Rapid Separation of —— from Dregs (P) 1241

Meunier, E. Magnesium Amalgam; Some Reactions of ——. 429

Meura, P. Brewing, and Appliances therefor (P) 491
Filter-Presses (P) 1586

Meurant, J. Metals; Coating of —— by Electrolysis (P) 486

Meusser, A. Chlorates; Metallic —— 705

Meydenbauer, A. Acetylene Gas; Apparatus for Generating —— (P) 397

Meyenberg, A., and others. Dyestuffs, Sulphide; Production of —— (P) 609

Meyer, C. *See* Buettner, A. 133

Meyer, F. Gold; Compounds of —— with Chlorine 52
Multi-coloured Fabrics (P) 342

Meyer, J. Ammoniacal Cuprous Oxide; Oxidation of —— 1561
Polyhalogen Compounds of the Alkaline Earths 720

Meyer, J. A. Burner for Crude-Oil (P) 1022

Meyer, J. W., and Arbuckle, J. W. Stills for Distillation of Spirits (P) 1148

Meyer, O. Electrolytic Solution for Galvanising (P) 262

Meyer, R. "Jahrbuch der Chemie" 1196

Meyer, R. J., and Koss, M. Ceria; Separation of —— from Mixtures 422
And Koss, M. Cerite Earths; Action of Alcoholic Hydrochloric Acid on —— 1093

Meyer, S. M. Lamp; Electric Arc —— (P) 606

Meyer, T. Hydrogen Chloride and Sodium Sulphate; Manufacture of —— (P) 971
Lead Chamber Process; Reforms in the —— 114

Meyer, W. *See* Henrich, F. 1450, 1450

Meyerhoffer, W. *See* J. H. van't Hoff 1277

Meygret, A. Plates for Storage Batteries (P) 710

Michaelis, A. Thio- and Seleno-antipyrine, and Constitution of Antipyrine 363

Michaelis, W. Cement; Hydraulic —— (P) 175
Slaked Lime: Preparation of —— (P) 479

Michell, H. C. Mica; Apparatus for Manufacture of Flake —— (P) 971
Non-conducting Coverings for Steam-pipes, &c. (P) 959

Micheroux, A. D. de. Fuel Blocks; Manufacture of Artificial —— (P) 1526

Michireff, W. *See* Schaposchnikoff, W. G. 1276

Mickle, P. Fibre Crosser (Paper-making Machine) (P) 719

Micklethwaite, F. M. G. *See* Morgan, G. T. 1373

Mielck, H. Artificial Stone; Composition for —— (P) 1397
Artificial Stone; Production of —— (P) 1397

Mierisch, O., and Eberhard, O. Milk Extracts; Manufacture of —— (P) 183

Mies, A. H., jun., and Cobenzl, A. Photographic Sensitised Material (P) 1554

Mies, E. and A. H. Metal Coatings or Deposits; Obtainment of —— (P) 262

Mietzschke. Gold and Iridium; Separation of —— 279

Miglioretti, G. *See* Cantu, F. 113
And Maffei, G. Casein; Manufacture of Articles from —— (P) 264

Migula, W. *See* Sander, E. 362

Milbourne, R. J. Gas-Purifiers (P) 599

Miley Colour Photograph Co. Photographs in Colour (P) 1411

Miller, A. D. Fluxing and Separating Compound (P) 862
Ores; Treatment of —— (P) 978
See McCormick, T. 601

Miller, A. J. F. Furnace; Construction of a —— (P). 852
And Marshall, C. P. Furnaces (P) 905

Miller, A. K. Lamp for Acetylene Gas (P) 1325, 1325

Miller, C. J. Leather; Finishing —— (P) 982

Miller, E., and others. *See* Beck and Homan 1325

Miller, E. H., and Page, R. W. Cadmium; Quantitative Determination of —— 71

Miller, E. R. Asarum arifolium; Essential Oil of —— .. 1193, 1552

PAGE

Miller, J. H. Distillation: Process and Apparatus for Fractional —— (P) 765
Gas-producing Apparatus (P) 1021
Miller, L., and others. Glass; Extracting Definite Quantities of Molten —— from Furnaces (P) 1232
Miller, S. B. *See* Gill, A. H. 833
Miller, T. and E., and Klahn, E. Liquid Hydrocarbons: Burning of —— (P) 961
Miller, W. H. and R. W. Incandescence Burner Cap (P) ... 1069
Miller, W. Lash. Caustic Soda and Bleaching-Powder: Discussion on Electrolytic —— 451
Millet, L. Clay Hydraulic Pipes, Vases, &c.; Strengthening —— (P) 707
Mills, E. J. Spirits; Discussion on Maturing of —— 101
Mills, Prof. Birmingham Sewage; Discussion on —— 670
Milne, J. and Goulding, W. and H. M. Disintegrating Machines (P) 713
Milne, S. *See* Bertram, D. N. 1188
Milne, W. A. Peat Blocks; Composite —— (P) 330
Peat-Press (P) 1227
Mills, C. W. Digestors; Gas Separator for —— (P) 362
Mims, J. C. Oils; Refining Asphaltic Mineral —— (P) 1528
Minder, J. Rubber-coated Materials: Preparing and Treating —— (P) 1239
Mines, E. *See* Crook, W. A. 1525
Minet, A. Ferric Oxide in Alcoholic Solution 1346
"Monographien über angewandte Elektrochemie" 1159
Miniat, K. Mono-hydroxy-benzalbromindanone; Preparation of —— 336
Minozzi, A. "Fosfati, Perfosfati et Concimi Fosfati, Fabricazione ed Analisi" 1561
Miskolczy, J. Metals; Hardening and Tempering —— (P) .. 976
Missire, F. and M. L. Mantles for Incandescence Gas-Lighting (P) 763
Mist, L. *See* Deltour, E. 1147
Mitchell, F. A. Roofing Compound (P) 1233
Mitchell, G. Copper Matte; Reduction of —— to Refined Copper (P) 1081
Furnace for Smelting Copper (P) 483
Furnaces; Smelting —— (P) 775
Gutta-Percha, &c.; Extraction of —— (P) 626
Slag Steam Generator (P) 1401
And Copeland, L. D. Steam; Generating —— from Hot Slag (P) 1401
Mitchell, J. *See* Norcross, F. C. 977
Mitchell, J. A. Gas-Producer (P) 1526
Mittelman, B. Syrups; Purification and Filtration of Centrifugal —— 919
Mjoen, J. A. Wood-Tar; Chemical Composition of Norwegian —— 335
Mobberley, J. A. Floors for Drying Bricks, Pottery, &c. (P) . 1279
Mochlau, R. Leucauramines; New Reactions of —— 336
And Heinze, M. Leucauramines; Synthesis of Arylated —— 336
Moehrer, P. F. V., and Hopp, J. Acetylene Gas; Apparatus for Generating —— (P) 699
Moerner, C. T. Arsenic; Determination of Small Quantities of —— 1195
Moeser, L. T., and Eidmann, W. E. Boron Nitride: Production of —— 368
Metals of the Alkalis; Production of —— (P) 1333
Moeslinger. Wines; Acids in ——, and Retrogression of Acidity of Wine 181
Moest, M. *See* Hofer, H. 1237
Mohr, D. Carbohydrates: Thermal Effects in the Building-up and Breaking-down of —— 77
Mohr, O. Beer-Wort; Contraction of ——, on Cooling 983
Diastase; Influence of Carbonic Acid on Action of —— 359
Diastatic Power, according to Lintner's Method; Determination of —— 931
Lipase in Animal Organs; and Reversibility of its Action.. 1353
Mohr, W. T. Bone-Black Kiln (P) 1239
Moir, J. Di-indigotin; Preparation of —— 1451
Moissan, H. Ammonium Amalgam 121, 1162
Carbides that are Decomposed by Water 329
Formic Acid; Synthesis of —— 562
Gases, Liquefied; Manipulating —— in Sealed Tubes..... 876
Hyposulphites of Alkali Metals and Alkaline Earths; Synthesis of Anhydrous —— 1394
Iodine Pentafluoride; Properties of —— 1353
Lime in State of Fusion; Some Properties of —— ... 406, 1041
Petroleum; Theory of the Formation of —— 335
Potassium Hydride; Characteristics of —— 285
Sodium Hydride; Preparation and Properties of —— 285
Sulphammonium; Preparation and Properties of —— 1042
And Dilthey, W. Calcium Silicide 566
And Dilthey, W. Calcium Silicide; Characteristics of —— 504
And Helt. Vanadium Silicide; Preparation of —— 1301
And Smiles, S. Silicon Hydride; Preparation and Properties of a New —— 504
And Smiles, S. Silicon; New Properties of Amorphous —— 1041

PAGE

Molisch, H. Coumarin: Production of —— 561
Moll, F., and Dickbuth, M. Washing and Bleaching Processes (P) 49, 546
Moll-van-Charante, J. Methylglucosides: Acetyl Derivatives of the Two —— 728
Mols, A. *See* Crispo, D. 403
Mond, L. Gas-Producers (P) 460, 600
Zinc; Obtainment of —— by Electrolysis, and Apparatus therefor (P) 354
Monin. Gypsum Sludge from Bones; Utilisation of —— (P). 1408
Monteith, F. W. Furnaces; Improvements in Working —— (P) 1268
Montel, L. Acetylene Gas Generator (P) 765, 1069
Montgomery, B. W. *See* Taylor, F. 1074
Montgomery, J. H. White Lead; Apparatus for Manufacture of —— (P) 1544
Montgomery, W. Carpet; Washable and Waterproof —— (P) 1276
Montupet, A. Furnaces for Heating Asphalt, &c. (P) 1390
Moody, S. E. *See* Peters, C. A. 140
Moore, D. McF. Lamp; Electric-Tube —— (P) 964
Moore, E. H. *See* Shade, A. A. 1541
Moore, G. H. Ogston. Oils, Lemon, Orange, and Bergamot; Physical Properties of —— 363
Moore, H. K. Caustic Alkali; Production of —— (P) 971
Moore, J. D., and Martin, F. M. Compartments; Charging —— with Gas (P) 870
And Martin, F. M. Sulphur Dioxide; Apparatus for Generating —— (P) 870
Moore, J. W., and White, J. A. Paper-making Machine (P) .. 494
And White, J. A. Paper-making Machine; Fourdrinier —— (P) 635
Moore, O. H. Pulp Screen (P) 635
Moore, Russell W. Potassium Cyanide; Composition of Commercial —— 392
Moore, T. S. *See* Hewitt, J. T. 195
Moore, W. H. Leather Colouring Machine (P) 614
Moorman. Tar Coating for Damp Walls 1279
Moorwood, H. S. *See* Bennett, J. F. 1068
Morani, F. Furnace; Electric —— (P) 852
Morel, L. A. Gluten; Manufacture of —— 787
Morgan, G. T. Diazo-amines and Amino-azo Compounds; Influence of Substitution on the Formation of —— ... 36
Reduction of Silver Solutions; Discussion on —— 1375
Tests for Bromide, &c.; Discussion on —— 1376
And Micklethwait, F. M. G. Silver Solutions; Reduction of Ammoniacal —— by Organic Substances 1373
Morgan, J. J. "Aids to the Analysis and Assay of Ores, Metals, and Fuels, &c." 1303
Morgan, J. Livingstone, R. "The Elements of Physical Chemistry" 798
Morgan, M. W. Burner; Hydrocarbon —— (P) 1069
Morison, D. B. Evaporating and Condensing Apparatus (P) . 1267
Moritz, E. Yeast; Buchler's Method of Preparing Distillery Seed —— 417
Mork, H. S., and others. Cellulose Esters (P) 1345
Morrell, J. A. Sugar; Apparatus for Manufacture of —— (P) 1086
Morrell, R. S., and Crofts, J. M. Carbohydrates; Action of Hydrogen Peroxide on —— 506
Morris, J. L. Condenser for Ammonia Gas (P) 1534
Morrison, W. Accumulators; Process of Forming —— (P)... 1540
Electrodes for Secondary Batteries; Forming —— (P) ... 979
Morriss, H. E. *See* Rayldon, O. H. 461
Morse, G. E. *See* Wiederhold, O. 908
Morss, S. B. Hydrocarbon Lamp (P) 464
Morton, W. J. Fluids for Artificial Fibres; Dispersing —— (P) 1074
Morun. Gaseous Fuel for Explosion Motors (P) 1447
Mosher, J. A. Acetylene Gas Generator (P) 909, 1069
See Hamm, W. S. 1069
And Hamm, W. S. Acetylene Gas Generator (P) 465
Mott, S. D. Burner; Hydrocarbon —— (P) 602
Motter, W. H. Ore-roasting and Fume-saving Apparatus (P). 1400
Mountany, C., and Farnsworth, W. Sewage; Means for Distributing —— (P) 1408
Mouraux, L. *See* Woestelandt, F. 358
Moureu, C. Acids from Heptine, Octine, and their Derivatives (P) 1410
Heptine and Octine; Useful Products from —— (P) 188
And Desmots, H. Acetylene Hydrocarbons; Condensation of —— 429
And Desmots, H. Secondary Alcohols; Synthesis of Acetylenic —— 429
Mourlot. Wood; Apparatus for Carbonising —— (P) 1448
Moussette, O. J. Acetylene Gas; Apparatus for Generating —— (P) 699
Muehlhaeuser, O. Sulphuric Acid Manufacture; The Fan in —— 1026
Zinc Sulphide: Turbidity in Filtrates from —— 1099

PAGE

Muehlhauser, B. *See* Ullmann, F. 337
Mueller. Half-Silk Tissues; Production of Lustrous — (P) 1134
Mueller, A. Glue and Gelatin; Analysis of — 874
Mueller, E. Iodine; Quantitative Estimation of — in Presence of Bromine or Chlorine 499
And Friedberger, O. Periodic Acid; Preparation of Free — 1142
And Friedberger, O. Persulphates; Production of — by Electrolysis without Diaphragm 703
See Foerster, F. 252, 1235, 1235
Mueller, H. C., and Langenbeck, K. Tiles; Glazing of — (P) 477
Mueller, J. A. Tin. Lenssen's Method for Determination of — 141
Tin Ores; Analysis of — 141
Mueller, J. L., and Bonnet, J. Mantles; Machines for Manufacture of Incandescence — (P) 461
Mueller, T. H. Gas; Apparatus for Production of — (P) .. 1138
Mueller, Von Gustav. "Die Chemische Industrie in der Deutschen Zoll- und Handelsgesetzgebung des neunzehnten, &c." 1252
Mueller, W. *See* Hillig, O. M. 96
Mueller-Rau, B. *See* De Meulemeester 1148
Muentz, A. Casein as a Fining Agent for Wines 359
Muffly, S. T. Ores; Treatment of Gold and Silver — (P) .. 1333
Mugnier, J. Textile Fabrics; Manufacture of — (P) 341
Muir, J. Metals; Changes in — produced by Sudden Cooling 1455
Mullay, T. S. Antifouling and Preservative Composition (P). 1149
Mullen, J. A., and Pope, E. J. Paper Stock; Machine for Treating — (P) 1551
Mumford, F. T. Ores or Slimes; Apparatus for Electrolytic Treatment of — (P) 1144
Mumford, J. B., and Newlands, P. R. Washing and Disinfecting Powder (P) 1092
Mummé, P. Beer; Brewing Two Kinds of — in One Operation 181
Munson, L. S. *See* Tolman, L. M. 1238
Murco, H. *See* Astruc, A. 1352
Murdock, R. L. *See* Forster, J. J. 1145
Murmann, E. Aluminium Alloy (P) 776
See Flor, F. 1225
Murphy. Thermo-Regulator; Discussion on New Form of — 457
Murphy, A. J. Arsenic Analysis; Two Possible Causes of Discrepancy in — 957
Murphy, E. E. Water; Apparatus for Distilling — (P) 787
Murphy, J. Composition for Building Material, &c. (P) 1233
Murphy, T. Furnaces; Inclined Grate — (P) 1524
Murray, T. R. Pumps for Gases or Vapours (P) 326
Muskett, E. A. *See* Scammell, J. B. 1461
Muspratt, E. K. Proceedings of Annual Meeting..... 951, 955, 956
Muspratt, M. Water Carriage in Great Britain; Discussion on — 754
Muthmann, W., and others. Cerium Metals; Electrolytic Production of — 412
Myers, A. Acetylene Gas Generator (P) 604
Myers, H. C. Sugar-Beet as a Reclaimer of Arid and Alkali Regions. II. 834
Mynders, A. P. Viscid Substances; Apparatus for Drawing off — (P) 1225
Mysik, B. *See* Andrlik, K. 920
Mytteneare, F. de. Cinchona Bark, &c.; Determination of the Alkaloids in — 721
Cinchona Bark; Testing of — 931

N

Naccari, A. Aluminium: Polarisation of — 259
Nadeau, T. *See* Phelps, E. W. 697
Naef, P. Air or Gas; Apparatus for Compressing, &c. (P) 1126
Catalytical Reactions; Treating Solid Material with Gas, applicable to — (P) 33
Coke; Apparatus for Manufacture of — (P) 908
Coke; Manufacture of (P) 1128
Cooling and Refrigerating, and Apparatus therefor (P) ... 1064
Fuel; Apparatus for Injecting Fluid into — (P) 33
Fuel; Treatment of Bituminous (P) 459
Fuel; Treatment of —, with Recovery of By-Products (P) 33
Furnaces, Gas Engines, &c.; Utilising Waste Heat from — (P) 1066
Furnaces; Heating Blast for — (P) 1029

PAGE

Naef, P.—*cont.*
Gas-Producers (P) 109
Gas; Production and Utilisation of — (P) 244
Gas; Treating Solids with — in Catalytical Reactions (P) 1027, 1076
Gases or Liquids; Means for subjecting Matter to the Action of — (P) 173
Gases; Purification of Heating — (P) 1021
Gases; Treatment of Materials with — (P) 961
Heat from Furnaces, &c.; Utilising — (P) 1020
Liquids; Evaporation of — (P) 1019
Liquids; Treatment of — for Precipitation, &c. (P) 1232
Ores; Apparatus for Lixiviating — (P) 916
Ores; Treatment of — with Liquids or Gases (P) 1234
Solids, Liquids and Gaseous Fluids; Treatment of — (P) 1232
Naegeli, H. *See* Kiliani, H. 1418
Nagel, O. Ricinus Oilcake 30
Spelter; Manufacture of — (P) 776
Name, R. G. van. Copper; Determination of — as Sulphocyanide 1099
Namias, R. Gelatin; Action of Chromium Compounds on — 1338
Naske, T. Sulphur in Pig-Iron; Determination of — 562
Nastjukoff, A. M. Benzene and Cellulose; Reaction between — 1302
Oxycelluloses; Notes on the — 63
Nathan. Non-Alcoholic Beverages; Manufacture of — (P) 1408
Nathan, F. L., and others. Nitroglycerin; Apparatus for Manufacture of — (P) 927
Nathan, L., and Bolze, H. Beer; Brewing of —, and Apparatus therefor (P) 491
National Steel Refining Co. *See* Jamieson, B. K.
Naudet, L. *See* Manoury, H. 59, 628
Naubardt, P. Tin; Electrolytic Treatment of — 281
Tin; Electrolytic Treatment of —, and Apparatus therefor (P) 864
Naylor, G. *See* Illingworth, R. 1025
Naylor, W. Trades Waste; Bacterial Treatment of — 1091
"Trades Waste: Its Treatment and Utilisation" 877
Neander, E. von. Ether Explosions 789
Neeley, C. E. *See* Montgomery, J. H. 1544
Neely, I. L. Separator: Gas and Water — (P) 933
Neil, J. M. *See* Browne, D. H. 1083
Neild, E. E., and Campbell, F. Solder for Aluminium (P) ... 976
Neill, J. W. *See* Officer, R. H.
And Burfeind, J. H. Metals; Recovery of — from Ores (P) 978
Nelson, A. W. Disinfectant (P) 635
Nelson, C. P. *See* Evans, W. C. B. 696
Nernst Electric Light Co. *See* Drake, B. M. 245, 1226
See Garrard, C. C. 398, 462
See Mance, Sir H. C. 461
See Ram, G. S. 540
Nernst, W., and Borchers, W. "Jahrbuch der Elektrochemie" 1477
Nesbitt, B. Charcoal Manufacture; Discussion on — 745
Nettleton, C. Boiler-cleaning Composition (P) 1523
Neubaecker, P. Vaporising Apparatus (P) 108
Neubauer, H. Phosphoric Acid in Ground Thomas Slag; Determination of Citric Soluble — 1415
Neuberg, C. Carbohydrate Groups in Egg Albumin..... 136
Ketoses; Isolation of — 506, 1103
And Wohlgemuth, J. *d*-Arabinose, *d*-Arabonic Acid, and Quantitative Determination of Arabinose 1103
Neuhaus, C. Hide; Manufacture of Waterproof Objects from Raw — (P) 488
Neumann, A. Press for Beet Slices (P) 921
Neumann, B. Calcium Carbide; Equation representing Reaction during Reduction by — 1302
Metals; Extraction of — by Calcium Carbide..... 1140
Neumann, J. W. Burner for Liquid Fuel (P)..... 698
Neuray, T. Oil Filter (P) 1145
Nevegold, F. Furnace; Reverberatory Smelting — (P) ... 863
New Jersey Zinc Co. *See* Stone, G. C. 1395, 1395
New Process Manufacturing Co. *See* Ray, S. W. 1129
Newlands, P. R. *See* Mumford, J. B. 1092
Newlin, S. L., and Mathisen, J. Acetylene Gas Generator (P) 1180
Newsome, T. Cellulose from Cotton of the Cotton-Seed Husk (P) 63
Newton, C. R. Oxidising Enzymes 182
Newton, G. A. Artificial Stone and Marble (P)..... 1455
Newton, O. B. J., and Billington, C. Alloys; Improved — (P) 1457
Newton, W. J. Sewage; Apparatus for Treatment of — (P) 1149
Niblett, J. T. Batteries; Secondary — (P) 125
Nicholls, W. S. *See* Colin, G. W. 539
Nichols, C. H. Photographic Flash-Light Apparatus (P).... 1245
Nicholson, J. R., and Brown, H. Coke Ovens (P) 1445
Nicholson, J. T. School of Technology; Mechanical and Engineering Departments of the — 1512

PAGE

Nicolai, H. Coffee free from Caffeine; Manufacture of —— (P) 1035
Nicolai, O., and Boerner, F. Solders for Aluminium and its Alloys (P) 1081
Nicolaysen, C. Sublimation Apparatus: A Simple ——..... 69
Nicolle, M. Vital Colorations by Means of Coal-Tar Dyestuffs 1042
Niedenfuehr, H. H. *See* Luety, F. 475
Nielsen, A. N. Oil, Whale and Seal; Bleaching of —— (P) .. 262
Nielsen, L. C. Burner for Incandescence Oil Lamps (P) 602
Nietzki, R., and Slacoszewicz, J. Fluorindines; Synthesis of —— 35
Nowerth, H. Ores: Reduction of —— (P) 351
Niloul, E. Tannin in Plants; Origin and Role of —— 865
And Dufossez, P. Portland Cement; Retardation of Setting of —— 859
Nikaido, Y. Sulphuric Acid in Soluble Sulphates; Volumetric Determination of —— 1247
Nikiforoff, A. Benzenes and their Homologues; Production of —— (P) 541
Nilson, O. M. Evaporating Apparatus (P) 783
Nilsson, F. O. Separator Drum; Centrifugal —— (P) 244
Nissel, A. Guaiacol, Cinnamic Acid and Tannin: Compound of —— (P) 1096
Nissen, L. *See* Buecka, H. J. 717
Nissenson, H., and Crotogino, F. Sulphuric Acid: Decomposition with —— for Analytical Purposes 1248
Tin Alloys: Concentrated Sulphuric Acid a Solvent for —— 1350
Nobis, L., and Wenzel, A. Concrete; Composition for Use as —— (P) 1079
Nodon and Piettre. Oxidation by the Electric Current (P).. 1539
Sugar Juice: Purification of —— (P) 1288
Sugar Juices; Electrolytic Purification of —— (P)..... 629
Noelting, E. 2.3-Dihydroxyphenazine; Tinctorial Properties of —— 542
Dyestuffs derived from Naphthyldiphenyl-, Dinaphthylphenyl-, and Trinaphthyl-methane..... 1450
Gallocyanines..... 469
Indogenides with Tinctorial Properties 1450
Naphthalene; peri-Derivatives of ——, and Ring Formation from —— 247
Report on Communications 677—682 of Société de St. Denis 1023
And Federmann. Azo- and Azoxybenzene; *m*-Hydroxy Derivatives of —— 400
And Thesmar, G. Nitro- and Amino-Xylene Derivatives.. 398
Norcross, F. C., and Mitchell, J. Blast Furnace (P)..... 977
Norman, L. I. N. Brewing Syrup; Manufacture of —— (P) . 1191
Norris, G. L. Arsenic in Iron and Steel; Determination of —— 393
Silicon in Ferro-Silicon; Determination of —— 537
Norris, J. F., and MacLeod, G. Triphenylmethane; Preparation of —— 168
North American Fuel Co. Fuel; Briquettes of Artificial —— (P) 1020
North, B., and Lee, W. C. Alkaline Hydrate or Bicarbonate in Presence of Monocarbonate; Estimation of —— ... 322
Norton, J. T., jun. Sodium Thiosulphate; Action of —— on Solutions of Metallic Salts 51
Notkin, N. Air; Carburetting ——, and Apparatus therefor (P) 163
Notkin Syndicate, The. *See* Purves, W. T..... 163, 163
Nott, J. H. *See* Kinsey, H. 397
Nouzaret, J. Acetylene Gas; Apparatus for Generating —— (P) 699
Novak, F. Toning Baths 276
Novy, F. G. *See* Freer, P. C..... 495
Nycander, O. E. Fermentation: Apparatus for Alcoholic —— (P) 984

O

Oberwalder, W. C. Metals; Composition for Cleaning —— (P) 1084
O'Brien, A. P. Nitre Oven: Construction of —— (P) 408
O'Brien, J. Flowers; Dual Odours of —— 1244
Ochs, M. T. J. Plaster; Composition of —— (P)..... 1079
Oddy, T. *See* Heap, C..... 550
Oderuheimer, E. Calcium Carbide: Sampling of —— 1065
Oehler, K. Colouring Matters and Intermediate Products; Manufacture of —— (P)..... 87
Sulphonic Acids, and Colouring Matters therefrom (P).... 111
Oesiner, A., and Co. *See* Wuensch, A..... 1514
Oesterreicher, A. *See* Habermann, J. 189, 192
Oetling, C. Lubricants and Lubricating Apparatus (P) 851
Officer, R. H. and F. H., and others. Ores; Cyanide Process of Working —— (P 1141
Oftedal, S. Cement Testing, and Manufacture of Cement Ware 1078
Ogden, A. W. *See* Winton, A. L. 1290, 1295, 1295
Ogden, J. A. Ores; Apparatus for Roasting —— (P) 1400
Oger. Wines; Making Champagne —— (P)..... 1547
Ogilvie, D. J. Paint; Manufacture of —— (P) 918
Pigments; Producing Black and Dark Carbonaceous —— (P) 1460
Ogilvy, D. J. Lampblack: Production of —— (P) 1084
Paint Drier (P)..... 782
Ohlsson, O. Centrifugal Machine (P) 761
Ohly, J. Citric Acid; Manufacture of —— 871
Okun, M. S. Lamp; Electric Arc —— (P) 606
Omeliansky, W. L. Cellulose; Hydrogen and Methane Fermentation of —— 418
O'Neill, E. C. *See* Stillman, J. M..... 1336
Ouslow, A. W. *See* Sale, M. T..... 851
Oppermann, C. T. J. Active Material for Secondary Batteries (P) 1282
Batteries; Composition for Use in Secondary —— (P).. . 1145
Oppermann, H. Milk-Albumin; Production of Oxidised —— (P) 1091
Oram, E. Distilleries and Breweries; Apparatus for Treating Liquid Bye-Products of —— (P) 1035
Ordody, L. von. Fibres; Production of —— from Reeds, &c. (P) 1025
Ordway, C. Vacuum Evaporating Apparatus (P) 1267
Orengo. *See* Battistini 762
Orloff, N. A. Sulphur; Existence of Blue or Green Modification of —— 876
Orth, H., jun. *See* Hoepfner, C. 1027
Osann, B. Cast-Iron; Testing, Examining and Classifying —— 551
Osborne, T. B. Edestin; Reactions of —— with Acids and Alkalis..... 420
Protein Bodies; Sulphur in —— 505
Protein Molecule; Basic Character of the —— 420
And Cornelison, R. W. Zein; Extraction of —— (P) 358
Osbourn, M. P. Feed-Water Heaters, Filters, and Purifiers (P) 1267
Oschatz, H. Enamelling Metal Articles (P) 1139
Osenbrueck, A. Absorber for Refrigerating Machines, &c. (P) 1224
O'Shaughnessy, F. R. Birmingham Sewage, and its Treatment 665
Oshima, K. Yeast, Gum, and Invertase 1340
Osius, G. *See* Stroh, G. 1326
Osmond, F. Nickel Steels; Magnetostriction of —— 485
Ost, H. Magnesium Chloride; Behaviour of —— in Steam Boilers 1177
Salt Solutions; Behaviour of —— towards Copper, &c. ... 1177
Oster, V. Filter for Water (P) 1150
Ostersetzer, J. *See* Golding, W..... 358
Ostrejko, R. Charcoal of Great Decolorising Power (P) 58
Ostwald, W. Nitric Acid and Nitrogen Oxides; Manufacture of —— (P) 548
O'Sullivan, J. Emergencies in Vitrol Works; Discussion on —— 229
Oswald, A. M. *See* Rogers, C. 124
Oswald, T. H., and Bowman, F. E. Gas-producing Plant (P) 34
Otfinowski, W. J. Sugar Juice; Diffusion for Obtaining Concentrated ——. Protess (P) 358
Ottensoser, D. *See* Kaufmann, O. 1326
Ottermann, G. Cyanides; Manufacture of —— (P) 914
Ousihoff, J. *See* Dementjeff, K. 173
Outerson, A. Paper-Making (P) 1093
Oving. Gaseous Mixtures; Measuring the Constituents in Preparing —— (P) 1447
Oxford, A. J. Yeast; Treatment for Utilisation of —— (P) .. 421
Oxygen; Separation of —— from Nitrogen (P) 345
Oxylin-Werke Actien-Ges. *See* Minder, J. 1239
Ozon Maatschappy System. *See* Vosmaer 1292

P

Paal, C. Albumin; Action of Caustic Alkalis upon —— 996
Gold; Colloidal Form of —— 994
Gold; Manufacture of Colloidal —— (P) 916
Mercuric Oxide; Colloidal Form of —— 995
Silver; Colloidal Form of —— 994
Silver; Manufacture of Colloidal —— (P) 916
Silver Oxide; Colloidal Form of —— 994
Paas and Jacobsen. Leather; Preservation of —— (P) 1405
Pacific Acetylene Gas Co. *See* Kincaid, F. L. 1069
Packard, G. A. Gold Precipitation by Zinc Dust 1280

PAGE

Paessler, J., and Appelius, W. Hide Powder and Hides: Action of Various Acids, &c. on —— 1461
Pagan, J. T. Metal Borings and Turnings: Treatment of —— (P) 976
Page. Antiseptic Compounds: Manufacture of —— (P) 1466
Page, A. D., and Wood, G. Oil Atomizer and Mixer (P) 852
Page R. H. Organic Peroxides: Manufacture of —— (P) 137, 1348
Page, R. W. *See* Miller, E. H. 71
Paillheret, F. *See* Bodin, E 1147
Paira, A. *See* Freyss, G. 1449
Pakes, W. C. C., and Barnes, W. H. Sterilising Apparatus (P) 1344
Palmaer, W. Tetramethyl Ammonium; Electrolytic Production of —— 1251
See Ericson-Aurén, T. 125
See Wiborgh, J. G. 1189
Palmer, N. F. Stone; Machine for Moulding Artificial —— (P) 550
Palomica, M. H. Receiver for Fractional Distillation 724
Pampe and Trolle. Combustible Emulsion for Explosion Motors (P) 1389
Gas for Heating, Lighting, and Power (P) 1447
Pan-American Light Co. *See* Mende, A. 964
Panaotovic, J. P. Chlorine, Bromine, and Iodine; Spectroscopic Detection of —— 1557
Panchaud de Botteus, A. Hydrogen Electrode; Depolarisation of ——, by Aromatic Bodies 877
Naphthalene; Electrolytic oxidation of —— 1237
Pannertz, F. Gas; Modification of Schilling's Apparatus for Determining Specific Gravity of —— 139
Pantjuchow, N. Benzene; Manufacture of —— in Russia ... 1448
Panzer, T. Alkaloids, Vegetable; Resistance of —— to Decay 274
Casein Derivative containing Sulphur Chlorine 145
Paolini, V. *See* Balbiano, L. 1293
Pape, E. C. H. *See* Henneberg, W. S. 55
Parfitt, F. W. Regulator for Oil Burning Furnaces (P) 462
Parker, A. Electric Furnace (P) 1129
Parker, H. Paper; Machine for Making —— (P) ... 271, 494, 494
Paper-making Machines; Paper-making Wire for —— (P) 1293
Paper-Pulp; Machinery for Forming —— into Sheets (P) 870
Pulp- and Paper-making Machine (P) 494
Parker, J. Gordon. Leather for Bookbinding 128
Tanyard; Application of Kjeldahl's Method of Estimating Nitrogen in the —— 838
Parker, J. M. *See* Thiele, F. C. 110
Parker, T. J. Purity of Standard Drugs and Chemicals; Discussion on —— 1436
Parker, W. H. Matches; Manufacture of —— (P) 1155
Parkin, W. C. *See* Williams, A. 719
Parnell, E. B. Ores of Gold and Silver; Treatment of —— (P) 351
Parone, E. Gardenia Oil; Properties and Composition of Essential —— 1295
Parr, S. W. Copper; Volumetric Determination of —— 929
Parrott, P. J. *See* Lowe, V. H. 559
Parry, E. J. Camphor Oil as an Adulterant 1244
Civet; Commercial —— 1553
Lavender Oil; Valuation of 1153
Otto of Rose 561
Shellac; Adulteration of 782
And Coste, J. H. "The Chemistry of Pigments" 145
Parry, W. K., and Adeney, W. E. Sewage; Discharge of —— into a Tidal Estuary 1035
Parsons, C. L. *a*- and *b*-Eucaine; Identification and Properties of —— 273
And Stewart, M. A. Arsenic; Retention of —— by Iron in the Marsh-Berzilius Method 1414
Partridge, G. M. G. Sweetening Substance, and Manufacture thereof (P) 1154
Partridge, H. *See* Harris, I. L. 1069
Partridge, J. A. Hops, Malt, &c.; Treating and Drying —— (P) 786
Parziale, T. Soap; Manufacture of —— (P) 864
Passburg, E. Drying Apparatus; Vacuum —— (P) 458
Passburg, H. Sugar Loaves; Production of —— (P) 1546
Passmore, F. B. Atmospheric Gas-Burners (P) 1446
Passow, H. Cement; Production of —— (P) 860
Pataky, C. Acetylene Gas Generators (P) 1024
Acetylene Generator (P) 1389
Pate, J. Sizing Preparation (P) 271
Paterson, D. Compound Dye Shades; Influence of Absorption Spectrum on Gaslight Appearance of —— 611
Paterson, R. M. *See* Craig, G. 117
Paterson, W. *See* Scott, R. 493
Paterson, T. L. Address to Scottish Section 1389
Patterson, T. S. Adaptor for Vacuum Distillation 456
Thermo-Regulator; Modified Form of —— 456
Patton, W. F. Floats for Steam or Water Traps (P) 326

PAGE

Paul, A. Dyestuffs; Dyeing with Sulphur —— 856
Paul, B. H., and Cownley, A. J. Ipecacuanha; Indian —— .. 1294
And Cownley, A. J. Ipecacuanha; Valuation and Determination of Alkaloids of —— 1299
Paul, F., and Gundack, A. F. Gas; Generation of —— (P) .. 332
Pauli, R. *See* Singer, L. 1181
Panse, T. O. Cement for Floors, &c.; Composition of —— (P) 973
Paweck, M. Zinc; Galvano-technical and Electro-metallurgical, Extraction and Refining of —— (P) 1403
Peake, E. Sewage; Purification of —— (P) 1149
Peakes, W. R. Fuel; Artificial —— (P) 763
Pearce, J. H. India-Rubber; Machine for Working (P) 626
Plastic Compositions; Machines for Mixing —— (P) . 264, 1188
Peard, G. W. *See* Bates, D. 482, 976
Pearse, H., and Ievers, E. F. Antifriction Metal Alloy (P) ... 1234
Pearson, J. T. Abrasive Materials; Manufacture of ——, and Apparatus therefor (P) 1224
Pease, F. N., and McDonnell, M.E. Detergent, and Manufacture thereof (P) 263
Peasley, W. W. Furnace; Construction of —— (P) 962
Peck, J. Bricks; Burning of —— (P) 1397
Peckham, S. F. Cement Testing; Further Notes on —— 831
Peckinpaugh, S. S. *See* Thibodo, F. H. 1155
Pedersen, J. T. Soap and Candles; Machines for Wrapping —— (P) 918
Peffer, H. C. Soap containing Hydrated Alumina (P) 1032
Pellet and Delamere. Calcium Oxalate; Gases Evolved on Decomposition of ——, by Heating 193
Pellet, H. Beetroot Juice; Calcium Salts in —— 866
Beetroot; Mineral Constituents of the —— 628
Beetroot; Relation between Phosphoric Acid and Ammonia in the —— 628
Colorimeter; Use of the —— 865
Molasses; Analysis of Cane —— 428
Reducing Sugars of the Cane 416
Salicylic Acid in Wines; Determination of —— 1416
Sugar Cane and Beetroot; Phosphoric Acid per 100 of Sugar in —— 628
Sulphurous Acid Solutions; Specific Gravity of —— 171
And Klein, L. Sugar Juice; Preservation of Samples of —— 179
And S. de Grobert. Salicylic Acid in Wine; Determination of —— 1416
Pelletier, E. le. Burner; Hydrocarbon-Vapour —— (P) 1068
Pellin. *See* Broca 1448
Peltzer and Son. Steaming Tissues; Apparatus for —— (P) .. 1134
Peniakoff, D. A. Ores; Purification of Aluminous —— (P) ... 615
Pentecost. Kjeldahl's Method Applied in the Tanyard: Discussion on —— 842
Pereda, M. Pineapple Beverage; Manufacture of —— (P) .. 634
Péreire, G., and Guignard, G. P. Acetone; Distilling Wood for Manufacture of —— (P) 541
And Guignard, G. P. Acetone from Saccharine Substances (P) 541
And Guignard, G. P. Acetone; Manufacture of —— (P) 1096
And Guignard, G. P. Alcohol, Denatured; Manufacture of —— (P) 558, 1090
Perfect Gas Machine Co. *See* Broichgans, S. 1324
Pergami, A. *See* Tortelli, M. 1187
Pergeline, S. Coal Blocks; Smokeless —— (P) 459
Perkin, A. G. Luteolin and Apigenin 1450
Perkin, F. Mollwo. Bicarbonates; Test for —— 1375
Bromide and Iodides; Simple Qualitative Test for —— ... 1375
Reduction of Silver Solutions; Discussion on —— 1375
Perkin, W. H., jun. Brasilin and Hæmatoxylin. Part VI... 110
And Bevan Lean. "An Introduction to Chemistry and Physics" 369
And others. Cotton and Cotton Goods; Fireproofing of —— (P) 1531
And Whipp Bros. Cotton and Cotton Goods; Reducing the Inflammability of —— (P) 857
Perkin, W. H., sen. Hexoses, Disaccharoses, and Polyhydric Alcohols; Magnetic Rotation of some —— 144
Perkins, F. J. Hides; Machine for Treating —— (P) 713
Perkins, J. B. Acetylene Gas Generator (P) 1069
Perman, E. P. Ammonia Solution; Influence of Salts, &c. on Vapour Pressure of Aqueous —— 116
Perrin, H. Beetroot Juice; Apparatus for Extracting Ammonia from —— (P) 58
Enamels and Photographic Plates; Application of Colours to —— (P) 1455
Photographs; Production of Enamelled Polychrome —— (P) 1245
Perron, C. Nickel and Copper-Nickel Ores; Treatment of —— (P) 1281
Persichetti, S. Broom; Use of —— in Paper-Manufacture (P) 1467
Pet and Claudel. Gasifier for Combustible Liquids (P) 1447
Peterhanser, F. Dyeing with Indigo (P) 1393

PAGE

Peters. Yeast for Food Preparations; Washing —— with Acetic Acid (P) 132
Peters, C. A., and Moody, S. E. Persulphates; Determination of —— 140
Peters, H. *See* Trotman, S. R. 693, 694
Peterson, H. A. Sugar; Centrifugal Extractor for —— (P) .. 1406
Pethybridge, W. Telluride Gold Ores; Treatment of —— (P) 123, 350
Petit, P. Saccharose; Heat of Inversion of —— 195
Petrenko, G. I. Phosphates; Action of Hydrogen Peroxide on —— 615
Petriccioli, O., and Reuter, M. Antimony; Volumetric Determination of —— 73
Pettibone, H. Gas; Apparatus for Proportioning and Mixing (P) 852
Peyrusson. Tannic and Tinctorial Extracts; Treatment of —— (P) 1462
Peyton, E. P. Metals; Pickling Iron and other ——, and Utilising the Waste Products (P) 976
Pfaff, R. Formaldehyde; Determination of —— 1102
Pfanhauser, W. Tin, Spongy and Crystalline; Electrolytic Formation of —— 261
Pfaudler Vacuum Fermentation Co. Fermentation of Liquids; Mechanism for Use in —— (P) 1191
Pfenniger, A. Dyestuffs; Sulphide ——, and Manufacture thereof (P) 701
Pfister, J. Timber; Apparatus for Impregnating —— (P) ... 1231
Wood; Apparatus for Impregnating and Dyeing —— (P) 1455
Wood Staining, in Pattern (P) 1231, 1393
Phelps, E. W., and Nadeau, T. Gas-Burners; Incandescence —— (P) 697
Phelps, W. J. Lamps; Incandescence Electric —— (P) 1179
Philip, A. "The Electro-Plating and Electro-Refining of Metals," being a New Edition of Watts' "Electro-Deposition" 1251
Philipp, C. *See* Seifert, B. R. 1530
Philippet. *See* Escande 130
Philippi, W. H. Tanning of Hides and Skins (P) 1286
Phillippe, L. Kapok Oil: Variation of Mean Molecular Weight of the Fixed Fatty Acids 1336
Phillips, C. B. Cream Separator (P) 1291
Phillips, C. O. Cotton-seed Oil: Production of —— (P) 1084
Phillips, H. B. Timber; Drying Red-Wood —— (P) 708
And Goddeo, H. L. Furnace Gases and Smoke; Apparatus for Combustion of —— (P) 460
Phillips, J. F. *See* Lever Brothers 487
Phillips, J. R. Plates; Apparatus for Tinning and Treating —— (P) 1235
Pickling and Swilling Apparatus (P) 1235
Phillips, W. B. Zinc Blende; Removal of Iron from —— 120
Phinney, E. D. *See* Buckley, J. D. 963
Pianko, M. Leather; Manufacture of Grain and Pebbled —— (P) 1085
Picard, H. K. *See* Sulman, H. L. 975
Picard, L., and Co. Azo Dyestuffs derived from Picramic Acid (P) 39
Pich, F. Flux for Brazing (P) 410
Pickles, T. Mercerising Cotton Fabrics (P) 704
Pictet, A., and Genequand, P. Acetic Acid; Compound of —— with Nitric Acid 1250
Pictet, R. P. Liquid Air; Apparatus for Industrial Production of —— (P) 407
Piettre, J. *See* Nodon, A. 629, 1288, 1539
Pilat, L., and Grardel, J. Food for Cattle from Molasses (P) . 924
Pinner, A., and Schwarz, R. Pilocarpine; Research on —— . 272
Pinnow, J. Aromatic Nitro Compounds; Reduction of —— . 965
Organic Compounds; Sensibility of Colourless —— to Light 1353
Pitoy, H. F. Alimentary Substance; Manufacture of —— (P) 716
Pittsburgh Blue-Print Co. *See* Whinery, S. B. 1349
Piutti, A., and Comanducci, E. Bignonia catalpa; The Acids of —— 1037
Place, J. F. Air and Gases; Liquefaction of —— (P) 1322
Air and Gases; Receptacles for Liquefied —— (P) 1322
Plaissetty, A. M. Filaments and Mantles; Incandescence —— (P) 1389
Plante. *See* under Bezognard 1448
Plantinga, P. Tar; Apparatus for Extracting —— from Gas (P) 965
Plath, G. Nitric Acid; Apparatus for Distillation of —— (P) 772
Plato, W. *See* Ruff, O. 1458
Plattner, E. *See* St. v. Kostanecki 1130
Playne, A. W., and Macdonald, L. W. Indigo Vat Dyeing, and Substances therefor (P) 1132
Indigo Vats; Preparation of —— (P) 1532
Pleus, B. Quinizarin and Anthrarufin; Reduction of —— with Hydriodic Acid 1273

PAGE

Plews, A. S. Antimony Ores containing Gold; Treatment of —— (P) 259
Antimony Oxide; Manufacture of White —— (P) 1027
Ploeg, J. van der. Antimony; Extraction of —— from Ores, &c. (P) 552
Plotts, W. Burner; Oil Injector —— (P) 852
Plummer, C. H., and Stare, F. T. Vegetables; Method of Canning —— (P) 787
Podmore, A. E. *See* Thomas, J. 962
Poehlman, H. E. *See* Steele, L. 1155
Poerscke, R. Electrodes for Galvanic Batteries (P) 1082
Poetter, H. Safety Blasting Composition (P) 1471
Pohl, E. Carbon Electrodes and Coke; Manufacture of —— (P) 906
Metals; Production of —— in Finely-divided State (P) ... 1334
Pourrier, A. F. Dyestuff; Blue Sulphur —— (P) 1229
Pokorný, J. Dyestuffs; Qualitative Analysis of Artificial —— 1299
Polenske, E. Borax Distilled with Methyl Alcohol; Behaviour of —— 195
Pollaczek, E. Furnace Gases; Desulphurising —— (P). 1270, 1446
Pollak, J. Cotoïne; Examination of —— 136
See Herzig, J. 608
See Lippmann, E. 1271, 1271
Pollatschek, P. Cotton-Seed Oil; Chilled —— 1032
Margarine in Russia 882
Saponification; Method of —— 487
Pollitt, G. P. *See* Lunge, G. 1329
Polmeteer, A. J. Copper-Mine Water; Precipitant for Treatment of —— (P) 978
Copper; Precipitation of —— from Water (P) 787
Pomeranz, C. Maltose and Glucose; Equilibrium between —— 1353
Pommerhanz, G. *See* Ulbrich, C. 1543
Pompili, R. *See* Garuti, P. 259, 778
Pompino, R. y. Sugar; Extraction of —— from Dried Saccharine Matters (P) 358
Pond, F. J. Translation of Heusler's "The Chemistry of the Terpenes" 1251
Pontio. Metals; Separation of certain —— 929
Poole, C. W. Burner; Hydrocarbon —— (P) 602
Pope, E. J. *See* Mullen, J. A. 1551
Popp. Zinc and Iron Plates; Covering —— with Copper or Brass by Electrolysis (P) 485
Poppe, O. *See* Klic, K. 625
Popper, H. Food-stuffs; Manufacture of —— from Molasses (P) 492
Popper, V. *See* Messenger, A. H. 629
Porchère aîné. Ortho-Benzoic Sulphamide and its Salts; Obtainment of —— (P) 67
Port, G. M. Leather and Fabrics; Composition for Preserving —— (P) 1239
Portemont. Sugar-boiling; Apparatus for —— (P) 1545
Porter, H. Effluents; Discussion on Manchester Bill for Discharge of —— 582
Portes, L., and Desmoulieres, A. Salicylic Acid; a Normal Constituent of Strawberries 182
Portland Cement Fabrik Hemmoor and Valeur, P. F. Fireproof Lining for Kilns (P) 1279
Posno, V. Liquids; Vessels for holding Volatile Inflammable —— (P) 700
Possetto, G. "Vegetable Butter" 55
Postemak. Vegetables; Preparation of the Phospho-Organic Matter of —— (P) 1464
Postranecky, C. Stirring and Mixing Apparatus (P) 1386
Potel, A. P. *See* Klett, C. L. 1464
Potter, C. E. *See* Jowett, H. A. D. 11, 1153
Potter, C. V. Solution for Separating Metals from Sulphide Ores (P) 410
Potter, H. N. Lamp; Electric Glower —— (P) 607
Lamp; Mercury Vapour —— (P) 1325, 1325
Lamps; Treating Ballast Wires for Electric —— (P) 852
Potter, H. W. Insulating Compound (P) 553
Potter, J. A. Pig-Iron; Manufacture of —— (P) 351
And Harvie, W. C. Mattes; Treatment of ——(P) 1333
Potut, J. Sulphuric Acid; Manufacture of —— (P) 706
Pouget, J. Olives; Determination of Oil in —— 1196
Poulenc, C. "Les Nouveautés Chimiques pour 1902" 797
Poulenc, G. *See* Hecht, E. 487
Pouteaux, A. and Wolff, A. Battery; Secondary —— (P) 260
Power, E. H. Fuel; Apparatus for Spraying Liquid —— (P). 961
Power, F. B., and Lees, F. H. Rue Oil; Constituents of Essential —— 1468
Powers, V., and The Bevois Patent Lighting Co. Gases; Apparatus for Generating, Storing, and Purifying —— (P) 34

PAGE

Pozzi-Escot, M. E. Diastases; Cause of Error in Investigating —— 418
Enzymes; Failure of the Test for —— 867
Eurotium oriza; Diastatic Ferments in —— 1353
Molybdenum Salts, &c.; Producing Fast Shades on Leather by —— 1533
Praag, D. J. van. Acetylene Gas Generator (P) 1069
Praetorius, H. Fuels; Mixing Liquid —, and Apparatus therefor (P) 109
Prampolini, W. India-Rubber Substitute; Preparation of —— (P) 981
Prangey, L., and Grobert, J. Sugar Juices; Apparatus for Carbonation of —— (P) 417
Pratt, A. Heating Liquids or Gases under Pressure; Apparatus for —— (P) 1523
Pratt, F. M. Deodorising Process (P) 1188
Meal; Deodorising —— (P) 1084
Pravicha, E., and Douillet, E. Separating Apparatus for Liquids (P) 413
Preas, J. H. *See* Denton, J. A. 927
Precht, H. Potassium Magnesium Carbonate; Production of —— (P) 117
Precht, J. Acetone Sulphite; Characteristics of —— 1245
Pregl, F. Extraction Apparatus 195
Soluble Starch; Acetylation of —— 129
Preiss, L. E. Hydrocyanic Acid; Detection of —— 1297
Prescott, A. B., and Sullivan, E. C. "First Book of Qualitative Chemistry. For Studies of Water Solution and Mass Action" 932
Prescott, S. C. Translation of Effront's "Enzymes and their Applications" 369
Prest, S. F., and Cabot, J. W. Iron and Steel; Treatment of Slag from —— (P) 258
Prestwich, J. E. Yarns and Threads; Treatment of —— with Liquids (P) 113
Pretzl, A. D. Potassium Ammonium Chromate 638
Preussner, L. Cement; Magnesia —— 257
Prevost, A. J., jun. Sewage; Apparatus for Treatment of —— (P) 985
Price, R. B. India-Rubber; Recovery of —— from Waste (P) 865
Rubber Waste; Reclaiming Rubber from Vulcanised —— (P) 357
Price, T. S. Persulphuric Acid and its Salts; Action of Colloidal Platinum upon —— 343
Priestman, F. Paint or Varnish; Composition for Removing —— (P) 1084
Prinsen-Geerligs, H. C. "Cane Sugar, and the Process of its Manufacture in Java" 1159
Sugar Extracted by Maceration; Determination of ——, and the Crushing of Canes 714
And Hamakers, K. R. Sugar; Extraction of —— (P) 628, 921
Prior, E. Beer Wort; Caramelising —— during Mashing 715
Malt; Analysis and Valuation of Kilned —— 784
Procter, H. R. Leathers Dyed with Coal-Tar Colours; Discussion on —— 158
Spirits; Discussion on —— 101
And Blockey, F. A. Tannin; Absorption of —— by Filter-Paper 1100
Proelss, H. Cocaïne: Detection of —— 142
Proescher, F. Methylrubazonic Acid; New Synthesis of ——. 700
Prosser, D. W. *See* Thomas, J. L. 163
Prost, E. Hydrofluoric Acid: Action of —— upon Lead 250
And Lecocq, E. Blendes containing Fluorine; Roasting —— 861
And others. Zinc Furnace Cinder; Metallic Lead in Crude —— 874
Prothière, E. Zinc; Volumetric Determination of —— 724
And Revaud, A. Sodium Sulphide; Preservation of Standard Solutions of —— 1473
Prudent, D. Sugar Runnings; Treatment of —— (P) 130
Prunier. Bismuth Compounds of Organic Acids 135
Pruskowski, W. Alloy of Aluminium (P) 978
Steel, Manufacture of —— (P) 349
Przibylla, C. Potash Industry: Disposal of Waste Liquors from the —— 261
Pschorr, R. 9-Amino-10-Hydroxyphenanthrene and 9.10-Diamino-phenanthrene 1094
Pucknell, W. A. Chloroform; Determination of —— 76
Pueschel, C. *See* Viertel, H. 1446
Puran Sing. Cantharides; Japanese —— 1295
Pure Food Co. *See* Taylor, P. B. 1090
Purgotti, A. and L. Matches; Manufacture of Non-Poisonous Mixture for —— (P) 498
Porsall, A. J., and Jackson, H. D. Lamp; Wax-burning —— (P) 463
Purves, W. T., and The Notkin Syndicate. Carburetting Apparatus; Automatic —— (P) 163, 163
Pushin, N. A. *See* Kurnakoff, N. S. 143
Putallaz, J. P. Glass-Furnace (P) 971
Putnam, C. H. Cupola-Furnace Slag; Recovery and Value of Iron in —— 119

PAGE

Putzeys, J. E. C. I. Water; Means and Apparatus for Purifying —— (P) 1408
Water; Purification of —— (P) 1466
Pyatt, R. *See* Mullly, S. T. 1333
Pyrisolith Isolating Material Co. Insulating Bodies; Electric —— (P) 1282

Q

Quain, J. R., and Turnbull, T. T. Lamps; Electrolytic Incandescence —— (P) 907
Quarzitol Co. *See* Loewenthal, J. 1233
Quennessen. *See* Leidié 499, 640
Quiman, W. R. Sulphuric Acid; Apparatus for Manufacture of Concentrated —— (P) 772
Quinby, W. C., and others. Explosive Compounds; Manufacture of —— (P) 723
Quinn, B. B. *See* Lincoln, J. C. 1091
Quintaine, E. Tin; Obtainment of —— by Electrolysis (P) 779
Quintaret, G. Caoutchouc; Two Indo-Chinese Lianas yielding —— 415
Quist, J., and Bain, J. A. Acetylene Gas Generator (P) 909

R

Raabe, F. V. M. Textile Fibres; Treatment of —— (P) 48
Raasloff, H. de. Centrifugal Machine (P) 1234
Rabe, H. Sulphuric Acid, Anhydrous: Production of —— (P) 407
Raben, F., and Wrede, F. Beer Yeast for Bakers; Purification of —— (P) 715
Rabinowitsch, A. M. Benzines; Commercial —— 607
Rabs, V. Water; Sterilisation of —— with Chlorine 361
Raczkowski, S. de. *See* Bordas, F. 1041
Radcliffe, J. Gas, Combustible; Apparatus for Production of —— (P) 109
Gas, Combustible; Production of —— (P) 109
Rader, C. L., and Smeeth, E. E. Blast Furnaces (P) 482
Raff, J. E. Lighting; Air-Pressure System of —— (P) 601
Ragosine, A. Lubricating Oil; Manufacture of —— in Baku Petroleum Industry in Japan, during 1902 1228
Rahn, O. *See* Wallach, O. 1193
Rahtjen, A. Indigo, Mono- and Di-brom- and Mono- and Di-chlor-; Manufacture of —— (P) 543
Raikow, P. N. Alcohols, Monovalent Fatty; Flashing Points of ——, and of their Aqueous Solutions 796
Formaldehyde; Investigation of —— 422
Halphen's Reaction for Cotton-Seed Oil; Chemistry of —— 279
Sublimation in the Sun's Rays; Orientating Influence of Light in —— 1418
Railroad Gas Lighting Co. *See* Caldwell, C. W. 1227
Rak, A. Batteries for the Diffusion Process (P) 783
See Hyros. 1462
Ralston, J. C. Ores of the Republic District; Treatment of —— (P) 1079
Ram, G. S., and Nernst Electric Light Co. Lamps; Incandescence Electric —— (P) 540
See Drake, B. M. 1226
Ramage, A. S. Ferric Oxide Pigment stained with various Dyestuffs (P) 1238
Ferrous Liquors; Treatment of —— (P) 1235
Terpene Peroxide; Production of —— (P) 188
Ramorino, K. Phosphorus in Iron: Rapid Determination of —— 641
Phosphorus; Separation of —— in the Martin Furnace .. 1233
Ramorino, C. Manganese in Steel; Rapid Determination of —— 991
Silicon in Ferro-Silicons; Determination of —— 191
Ramsay, Sir W. Preface to Morris W. Travers' "The Experimental Study of Gases" 78
And others. Gutta-Percha; Experiments on the Chemical Behaviour of —— 1367
Ramstedt, C. W. Heat; Apparatus for effecting Exchange of —— between Liquids or Fluids (P) 458
Randolph, L. M. Insulating Compound, and Manufacture thereof (P) 916
Paint; Insulating —— (P) 918
Plastic Compound, and Manufacture of same (P) 782
Ranger, R. R. *See* Knox 632

PAGE

Rauk, J., and Trantom, W. Oils, Vegetable: Separation of —— from Ground Seeds (P) 413
Ransom, G. *See* Brochet, A. 54, 352, 408
Ransom, H. B., and others. Liquids: Apparatus for Discharging —— over Filter-Beds (P) 1465
Ransome, E. L. Concrete Joint (P) 479
Ranwez, F. Sesamé Oil: Detection of —— 141
Raoult, F. M. "Cryoscopie" 567
Raphael, M., and Elias, L. Insulating and Packing Material (P) 353
Rapp, R. Platinum Process: Use of Glycerin in the —— 68
See Albert, R. 1033
Raschen, J., and The United Alkali Co. Electrolytic Cells (P) 979
Ratchkowsky, A. *See* Marmo 1082
Ratner, C. Tin: Determination and Separation of —— 1249
Raupenstrauch, G. A. Metallic Soaps; Preparation of Solutions of —— (P) 1550
Rauschenbach, A. R. *See* Weber, P. C. R. 549
Rauter, G. Glass: Oxidation and Reduction in Melting —— 174
Rauthmell, T. Acetylene Gas: Apparatus for Generating —— (P) 34, 245
Raworth, J. S. Smoke: Prevention of —— 1268
Rawson, W. S. Sterilising Apparatus (P) 634
And Littlefield, R. D. Crucibles, &c.; Refractory Impervious —— (P) 52
Ray, A. J. *See* Lewis, T. E. 962
Ray, S. W. Acetylene Gas Generator (P) 1129
Raymond, E. B. Oil-Burner (P) 1068
Read Holliday and Sons, and others. Dyestuffs: Black ——, and Intermediate Compound (P) 1528
And others. Dyestuffs: Sulphide ——, and Intermediate Products (P) 1451
Read, H. V. R. Containers for Compressed or Liquefied Gas (P) 914
Read, R. H. Electrodes for Electric Arc Light (P) 334
Reagan, J. Furnaces; Improvements in —— (P) 1324, 1324
Rebuffat, O. Calcium-Sulpho-Aluminate, and Action of Sea-Water on Portland Cement 1535
Waters containing Silicon and Magnesium; Purification of —— 1549
Reeklinghausen, M. von. *See* Vogt, A. 458
Recoura, A. Aluminium Chloridesulphate: Preparation of —— 1453
Chromic Sulphate; Action of Hydrochloric Acid on —— .. 1076
Reed, C. J. Electrolytic Apparatus (P) 778
Salts; Treatment of Solutions of —— (P) 778
Metals; Electro-deposition of —— (P) 1541
Reed, H. C. Analysis of Tanning Materials: Filter-Papers and Soluble Solids 691
Reed, J. V. *See* Kastle, J. H. 504
Reeves, W. Thermometers for Brewers' Use (P) 632
Refineria de San Luis. Sugar: Extraction of —— from Dry Materials (P) 1406
Reichard, C. Morphine in Opium: Determination of 1476
Potassium; Quantitative Determination of 140
Reichenbach, C. O.: Mercerised Cotton Yarn (P) 1183
Reichert, F. J., and Heydemann, C. L. J. J.: Coffee Extract (P) 1344
Reid, W. F. Alcohol Duty: Discussion on —— 830
Gutta-Percha: Discussion on —— 1373
Impurities in Sulphuric Acid: Discussion on —— 1510
Nitrocellulose: Discussion on Will Test for —— 824
Proceedings of Annual Meeting 952, 955
Reduction of Silver Solutions: Discussion on —— 1375
Sulphuric Acid: Discussion on Determination of Strength of —— 1512
Sulphuric Acid Process: Discussion on —— 1507
Tests for Bromine, &c.: Discussion on —— 1376
Reimann, C. Tobacco and its Products; Improvement of —— (P) 728
Reimer. *See* Haarmann 1348
Reinhardt, G. Raffinose; Determination of —— 504
Reinhardt, H. Bismuthose; Preparation of —— 1244
Reinman, A. L. Lamps: Incandescence Electric —— (P) 540
Reinohl, D. C. *See* McFarlane, J. 918, 1084, 1084
Reiser, O. *See* Emmerling, O. 429
Reisert, H. Water; Removing Sulphuric Acid from —— (P) 1550
Reiss, R. A. Mercury Bichloride; Action of —— on the Unfixed Silver Bromide Gelatin Plate 872
Reithoffer, J. W. Rubber Sponge; Manufacture of —— (P).. 127
Reitlinger, A. Sulphur in Coal and Pyrites: Determination of —— 1298
Remane, H. Lamp; The Osmium —— 1445
Remsen, I. "A College Text-Book of Chemistry" 145
Remy, T. Hops; Aroma and Bitter Principles of —— 1341
Renard, R., and Becker, A. Iron Ore; Treatment of —— (P) 1333
Renault, B. Fuels: Micro-organisms from the Fossil —— 727
Rendschmidt, K. Flash light Cartridge (P) 873
René. *See* Senderens, J. B. 169

PAGE

Rennoldson, W. L. Address to Newcastle Section 1379
Renny, A. Oil Fuel; Apparatus for Burning —— (P) 1269
Renstrom, C. Copper; Hardening of —— (P) 620, 1458
Copper or its Alloys; Hardening of —— (P) 1030
Renwick. Tests for Bromide, &c.; Discussion on —— 1376
Renz, C. Thallium Compounds of the Alkaloids 1409
Repiton, F. Copper; Volumetric Determination of —— 641
Retort Coke Oven Co. *See* Wilcox and Wagener 1323
Reubold, F. Dyestuff: Sulphide ——, and Manufacture thereof (P) 610
Reusch, P. Sulphur: Removal of —— from Coke and Pig-Iron 861
Reuter, M. *See* Petriccioli, O. 73
Revaud, A. *See* Prothière, E. 1473
Rex Acetylene Generator Co. *See* Freeman, D. O. 1128
Reychler, A. Antipyrine; Salts of —— 987
Reynaud and Bonna. Cellulose; Conversion of —— into Glucose, &c. (P) 1406
Reynaud, G. Dextrin and Alcohol: Manufacture of —— (P) . 1290
Reynolds, D. Steel: Production of —— direct from Oxide Ore (P) 1185
Wrought Iron and Steel: Direct Production of —— (P) .. 976
Reynolds, F. A. Burners: Fuel-Feed for —— (P) 602
Reynolds, J. E. Acetylene Gas Generator (P) 605
And Grubb, G. R. Films on Plate Glass; Production of —— (P) 366
Reynolds, P. P. and J. J. Acetylene Gas Generator (P) 1325
Rhead, E. L., and Sexton, A. H. "Assaying and Metallurgical Analysis for Students, Chemists, and Assayers" 567
Rhodes, J. Dyeing Apparatus (P) 474
Rhodin, B. E. F. Caustic Soda and Bleaching Powder: Electrolytic Manufacture of —— at Sault Ste. Marie, Ontario . 449
Rhodin, J. G. A. Electrolytic Apparatus (P) 916
Soda and Bleaching Powder: Production of —— by Electrolysis 705
Ribaud, G. L. Vacuum Pan for Brine, &c. (P) 614
Rice, W. P. Grain: Steeping of —— (P) 1547
Richard, E. Iodo Derivatives of Phenols: Preparation of —— 123
Resorcinol: Determination of —— 123
Richards, J. W. Alloys: Aluminium-Zinc —— 121
Richards, P. A. E. Alloys: Determination of Platinum, Gold, and Silver in —— 1249
Richards, T. W. Phase Rule: Application of —— to the Melting Points of Copper, Silver, and Gold 975
And Singer, S. K. Hydrochloric Acid: Quantitative Separation of —— from Hydrocyanic Acid 499
Richardson, C. Cement Analysis: Discussion on Standardisation of —— 1222
Paraffin in Petroleum Residues, Asphaltic Oils, and Asphalts Fluxed with Paraffin Oils: Determination of —— 650
And Wallace, E. C. Sulphur: Occurrence of Free —— in Beaumont Petroleum 316
Richardson, E. J. *See* Joly, C. 1386
Richardson, F. W. Arsenic Determination in Malt Liquors: Methods for —— 901
Richmond, H. D. Milk: Composition of —— 133
And Harrison, J. B. P. Boric Acid in Butter: Rapid Determination of —— 929
Richter, A. Fermentation; Theory of —— 1239
Richter, G. Air: Apparatus for Moistening —— (P) 362
Richter, H. Nitrocellulose; Denitration of —— (P) 1038
Richter, M. *See* Meissner, O. 702
Richter, P. G. Foods: Preparation of Preserved —— (P) ... 360
Ricker, J. H. Fuel Compound (P) 1180
Ridder, G. de. Water: Determination of Organic Matter in —— 368
Rideal, S. Birmingham Sewage; Discussion on —— 669
Spirits; Discussion on Maturing of —— 101
Water; Purification and Sterilisation of —— 1149
Riechelmann and Leuscher. Sandal-Wood in Cocoa; Detection of —— 1157
Rieck, M. Chocolate; Manufacture of —— (P) 492
Rieder, J. Copper Sulphide; Electrolytically Produced —. 978
Riedler. Leather Dyeing; Improvements in —— (P) 1533
Rieger, F. Phosphoric Acid in Organic Substances; Determination of —— 277, 503
Riegler, E. Chlorides, HCl, Silver and Phosphates: Gasometric Determination of —— 73
Riemer, A. Steel: Want of Homogeneity of Soft Basic Martin —— 480
Riensch, H. Straining Apparatus for Waste Liquids (P) 1064
Riesberg, Van V. W. Carbonic Acid Gas, &c.; Apparatus for Making —— (P) 1138
Riesenfeld, H. *See* Abegg, R. 547
Rigaud, A. Hides; Apparatus for Colouring —— (P) 475
Rigaud, H. C. *See* Briant, L. 491
Rigby, J. S. Kilns for Portland Cement or Lime (P) 118
Portland Cement; Manuring —— (P) 1184
Whiting; Manufacture of ——, and Apparatus therefor (P) 178

PAGE
Rigby, T. Ammonia and Tar from Furnace Gases, &c. (P) .. 1268
Rignon, J. A., and Eisenmann, E. Arc Lamp with Inclined Carbons; Continuous — (P) 908
Rigolot. White Lead and Zinc White; Report on Comparative Painting Experiments with — 1543
Riley, A. J., and Strathy, F. R. L. Liquid Combustibles; Vaporisation of — (P) 1127
See Strathy, F. R. L. 763
Riley, F. G. Mash Tuns for Brewing Purposes (P) 558
Riley, J. C. Liquors; Ageing of Alcoholic — (P) 132
Riley, J. E., and Barnes, J. Arsenic and Sulphur; Recovery of — (P) 1533
Riley, W. A. *See* Heron, J. 868
Riley, W. C. Cocaine; Sterilising and Preserving — (P) .. 1096
Rimbach, C. *See* Kroeber, E. 875
Rindell, A. Calcium Hydrogen Phosphate; Solubility of — in Water 195
Rink, J. J. *See* La Cour, P. 913, 1539
Rintoul, W. *See* Nathan, F. L. 927
Riotte, C. C. and E. A. Mixing or Spraying Device (P) 597
Ripley, D. C. Glass-gathering Machine (P) 707
Glass-Ware; Apparatus for Manufacture of — (P) 1330
Ris, C. Dyestuff; Blue Sulphide — (P) 610
Dyestuff; Green Sulphur —, and Manufacture thereof (P) 769
Ritter, E. Cholesterol and Phytosterol in Fats; Quantitative Determination of — 643
Rivers, W. E. Kiln for Ceramic Ware (P) 615
Rivett, J. *See* Hill, J. H. 507
Rivière, L. Sugar Juices; Purification of — (P) 58
Rix, W. P. Pottery Glazes; Preparation and Behaviour of Insoluble Frits for — 317
Pottery; Vapourous Method of Glazing — 1454
Roach, W. G. and A. C. Marble and Stone; Colouring — (P) 858
Roach, W. L. Sewage; Apparatus for Distributing —, &c. (P) 1149
Roake, J. S. Distilling Apparatus (P) 246, 853, 965
Roan, J. Water; Apparatus for Purifying — (P) 1150
Roberts, T. *See* Societe Buffand 49
Roberts, A. B. *See* Berry, A. E. 1343
Roberts, C. P. and G. P. Furnaces; Construction of — (P) 1226
Roberts, F. C. Hot Blast Stoves (P) 762
Ore Roasters (P) 1081
Roberts, I. L. Calcium Carbide; Manufacture of — (P) ... 1227
Roberts, J. L. Carbides; Electric Production of — (P) 353
Roberts, W. L. H. Kiln; Continuous Cement and Lime — (P) 973
Robertshaw, C. D. *See* Walker, J. H. 1157
Robertson, Dr. Nitrocellulose; Discussion on Will Test for — 825
Robertson, A. R. *See* Macfarlane, J. W. 1224
Robertson, J. K. *See* Strachan, R. P. 904
Robertson, R. Nitrocellulose; The Will Test for —— 819
Robin-Langlois, J. Sugar; Apparatus for Refining — (P) . 1288
Sugars; Rapid Refining of White — (P) 59
Robinson, M. W. Battery; Bichromate — (P) 1082
Robinson, W. E. Soap Cake (P) 355
Rocca, E. Oil; Apparatus for Refining — (P) 782
Oil; Refining of — (P) 782
Roche, D. A. Hydrogen Peroxide; Oxalic Acid in — 190
Rochet, L. L., and Giraudeau, G. L. Stiffening Material for Fabrics (P) 405
Rock, W. S. Pigment; Production of Oxide of Iron — (P). 178
Rocques, X. Wine Modified by Mycoderma vini; Composition of a — 1148
And Sellier, G. Wine, Volatile Acids in; Determination of — 193
Rodger, W. Yarns or Fabrics; Producing Variegated Effects on — (P) 1328
Roemer, A. Cotton Yarns; Mercerising —, and Apparatus therefor (P) 48
Roemer, M., and Schmidheiny, J. Glass-melting Furnaces (P) 347
Roepper, C. W., and Scholl, G. P. Electrolysis; Apparatus for Fused-Bath — (P) 778
Roesch, C., and Co. Bleaching and Dyeing Apparatus (P) 342, 473
Dyeing Apparatus (P) 1532
Fibres and Fabrics; Apparatus for Treating — (P) 473
Roeser. Allyl Iso-sulphocyanate; Determination of — 645
Roessing, A. Alloys; Separation of Copper, Lead, Antimony, and Tin in — 191
Copper Sulphide; Solubility of — in Alkaline Sulphides 191
Roessler and Hasslacher Chemical Co. *See* Roessler, F. 1232
Roessler, Deutsche Gold- und Silber-Scheide-Anstalt vorm. Alkali Cyanides; Manufacture of — (P) 345
Cyanamide and its Compounds; Manufacture of — (P) 275
Indoxyl Derivatives and Homologues; Manufacture of — (P) 169
Indoxyl Derivatives from Aromatic Glycines (P) 111
Indoxyl Derivatives; Manufacture of — (P) 169
PAGE
Roessler, F. Sodium Cyanide; Manufacture of — — (P) 1232, 1534
Rogers, C., and Oswald, A. M. Zinc; Extraction and Recovery of — (P) 124
Rogow, M. Vanillin Action of Benzaldehyde on — 136
Rohland, P. Hydration; Influence of Catalytic Agents on Velocity of — 1233
Rojahn, W. *See* Soden, H. von 66, 1410
Rojat, D. Filtering Apparatus (P) 1126
Rolland, E. Dyeing Machine (P) 1133
Rommel, W. *See* Schoenfeld, F. 1342
Rooney, J. J. Lamp; Incandescence Electric — (P) 1527
Rooper, W. O. Grindstones; Artificial — (P) 347
Root, F. J. *See* Brandt, W. S. 1527
Roques, F., and Gerngross, A. Iodoform and Di-iodothymol; Examination of the Mother Liquors of — 1193
And Gerngross, A. Periodates; Preparation of — 1138
Rose Gold Reclamation Co. Gold and other Precious Metals; Separation of "Precious Particles" of — (P) 915
Rose, M. *See* Hindley, E. 473, 613
Rose T K. Alloys; Phase Rule and Establishment of Equilibrium in Solid — 53
Rosebrugh, Prof. Caustic Soda and Bleaching-Powder; Discussion on Electrolytic — 451
Rosee D'Infreville, L. G. M. Batteries; Lead-zinc — (P) .. 260
Rosenberg, H. Leather; Imitation —, and Production thereof (P) 627
Rosenberg, L. B. Quartzite; Applicability of South Russian —, for Manufacture of Dinas Brick 117
Rosenbluth, E. M. Carbide Cartridges (P) 963
Lamp; Acetylene Gas Generating — (P) 606
Rosenfeld, A., and Silber, J. Rubrescin; A New Indicator .. 723
Rosenhain, A., and Huldschinsky E. Zinc and Cobalt; Quantitative Separation of 1351
Rosenhain, W. Calorimeter for Coal 1472
Platinum; Recrystallisation of — 1042
Rosenheim, A., and Huldschinsky, E. Nickel and Zinc; Quantitative Separation of 141
Rosenheim, O. Arsenic; Decomposition of Compounds of Selenium and Tellurium by Moulds; Its Influence on Test for — 1039
Rosenthal. Gasifier for Liquid Fuel (P) 1525
Rosenthal, E. *See* Epstein, W. 39
Rosenstiehl, A. Grape Musts; Bouquet of Wines from Sterile Yeasts; Action of Tannins and Colouring Matters on Activity of — 922
And Suais, E. Azo-Dyestuffs; Action of Sulphides, Sulphites, and Hyposulphites on — 181
And Suais, E. Azo-Dyestuffs; Reduction of Nitrated — 470
Ross, A. *See* Shackleton, J. 470
Ross, F. W. F. *See* Ciantar, C. 109
Ross, J., and Mackenzie, A. W. Bungs or Stoppers for Casks, &c. (P) 269
Ross, J. H. Acetylene Gas Generators (P) 1019
Ross, R., and Leather, J. P. Gas-Oils; The Constitution of — 1269
Ross, W. L. Furnace for Sterilising Air (P) 676
Rosset, G. Batteries; Primary or Secondary — (P) 1150
Batteries; Self-regenerating Depolariser for — (P) 1539
Rossi, A. J. Alloys of Copper and Titanium; Production of — (P) 125
Titanium; Combination of — with Iron (P) 863
Titanium; Metallurgy of — 1537
Rossi, C. Diazo Compounds; Action of Silk on — 1332
Rossing, A. Calcium Sulphide in Bone-Charcoal; Determination of — 250
Rossiter, E. C., and others. Cyanides; Manufacture of — (P) 1474
Cyanides of the Alkalis; Manufacture of — (P) 173
Rostovzeff, S. *See* Graebe, C. 345
Roth, K. *See* Kahlbaum G. W. A. 1070
Roth, O. *See* Guehm, R. 480
Rothberg, M. E. Coke Oven (P) 968
Rothenberg, L. *See* Koch, R. 1067
Rother, J. Disinfectant Powder; Manufacture of — (P) ... 1269
Medicinal Compounds containing Mercury Compound; Manufacture of — (P) 925
Rothermel, W. E. *See* Heuningway, J. 872
Rothmund, V. Calcium Carbide; Formation of — 1067
Rothwell, R. P. "The Mineral Industry; its Statistics, Technology, &c." 761
Rott, E. Stone and Tiles; Manufacture of Artificial — (P) 1354
Roubleff, A. Lamps for Disinfecting, &c.; Slow Combustion — (P) 479
Rouillon, L. *See* Blachier, J. 788
Roupioz, C. Acetylene Generator (P) 60
..... 1389

PAGE

Rousseau, L. Crucibles: Construction of —— (P) 959
Roussel, E. Tissues: Printing of —— (P) 704
Fabric; Decorated ——, and Production thereof (P) 473
Roux. Joint: a Metallic Hermetical —— (P) 1458
Roux E. Galactose: New Base Derived from —— 1418
Rowe, A. W. *See* Gill, A. H. 780
Rowley, J. M. *See* Geblard, L. G. 603
Rowley, W. B. and S. H., and others. Clay; Apparatus for Moulding Articles in —— (P) 477
Rowley, W. H. White Lead; Manufacture of —— (P) 1543
Roy. *See under* St. O. Roy.
Royle, J. J., and Royles, Ltd. Sterilising Apparatus (P) 1192
Royle, T. Potassium Chlorate; Discussion on Explosion of —— by Heat 219
Rozenband, M. *See* Ullmann, F. 337
Rozycki, A. *See* Kostanecki 35, 36
Rubands. Wood-charcoal from Aromatic Plants (P) 1466
Rubel, W. Alloy of Aluminium (P) 710
Rubeobauer, J. Hydroxides of the Heavy Metals: Solubility of —— in Caustic Soda 876
Rubsch, G., jun. Cyaniding; Agitating Machine for —— (P) 411
Rudolphs, J., and Landin, J. Metals: Extraction of —— from Oxide Ores (P) 977
Ruebel, E. A. *See* Gnehm, R. 168
Ruecker, K. Wood; Fireproofing of —— (P) 347
Rueckforth, R., and Dormeyer, C. Filter-Presses; Employment of —— in the Brewery 716
Rueff, E. Magnesia; Compounds of —— (P) 479
Rueping, M. Wood; Impregnation of —— (P) 1331
Ruesager, H. E. Portland Cement; Manufacture of —— (P). 118
Ruetgers Chem. Fabrik. Cresols; Separation of Para- and Meta- (P) 1410
Para-cresol Oxalic Ester; Preparation of —— (P) 1410
Ruff, O., and Plato, W. Calcium; Preparation of Metallic —— 1458
Ruff, W. J. Pasteurizer for Beer (P) 923
Ruijter de Wildt, J. C. de. *See* Kostanecki, V. 497
Rulf, A. Gas-Pumps; Automatic —— (P) 539
Rumney, W., and Co., and Young, A. S. Textile Fabrics; printing of —— (P) 340
Rong, F. *See* Binz, A. 930, 1229
Rupp, E. Sulphurous Acid; Iodometry of —— 1473
And Finck, A. Phosphorous Acid; Iodometry of —— 1473
And Finck, A. Phosphorous Trihalides 1473
And Schaumann, G. Bismuth; Iodometric Determination of —— 1558
And Schiedt, A. Ferrocyanides and Ferricyanides; Iodometric Method for —— 1099
And Schiedt, A. Thiocyanates; Determination of —— ... 990
Rushworth, F. Textiles; Method and Apparatus for Waterproofing —— (P) 1276
Russell, E. J., and Smith, N. Deninger's Carbon Sulphide; Non-existence of —— 1476
Russell, H., and White, A. H. Incandescent Mantles; Relation of Heating to Lighting Power of Gas, with Reference to —— 1020
Russell, J. K., and Clausen, W. F. Lamp; Incandescence Gas Arc —— (P) 466
Russell, W. H. and G. E. Incandescence Burner for Hydrocarbons (P) 1227
Rust, C. Potassium Permanganate; Titration of —— 1473
Ruthenberg, M. Iron Ores; Electric Concentration of —— ... 1102
Ores; Magnetic Concentration of Low-Grade —— in Electric Furnace 621
Rutherford, E., and Soddy, F. Thorium Compounds; Radioactivity of —— 196, 795
Rutten, J. Ferrocyanide Manufacture at the Hague Gas-Works 1277
Růžička, S. Lead; Action of Water on —— 270
Rylander, J. A. Eggs; Preservation of —— (P) 183
Ryn, J. J. L. van. "On the Composition of Dutch Butter" .. 78

S

Saager, A. *See* Kehrmann, F. 337
Saare, D. Wheat and Maize Starches of Commerce 129
Saare, O. Malt; Conversion of Percentages of Extract in ——, from Windisch's to Balling's Tables 556
Malt; Purchase of ——, on Analysis 556
Starch Syrup; Density of —— 556
Starch Syrup; Strength and Acidity of —— 265
And Hanow, H. Benzene and Alcohol in Denatured Spirit; Determination of —— 1405
And Hanow, H. Ethyl Alcohol in Fusel Oil; Determination of —— 367
Saatmann, F. W. Drying and Absorbing Apparatus (P) 695
Sabatier, P., and Senderens, J. B. Methane; New Synthesis of —— 504
And Senderens, J. B. Nitro-Derivatives; Direct Reduction of —— 1070
And Senderens, J. B. Nitrogen; Direct Reduction of the Oxides of —— 1157
And Senderens, J. B. Oxides of Carbon; Hydrogenation of —— 566
And Senderens, J. B. Petroleum; Synthesis of —— 853
Sabeck, A. Clay; Rational Analysis of —— 426
Sachs, F., and Barschall, H. Ketopyrazolones 700
And Goldmann, M. α-Cyanobenzylanilines and μ-Cyanazomethines; Substituted —— 1326
And Kempf, R. Nitrobenzaldehydes; Preparation of —— 541
And Lewin, W. p-Dimethylaminobenzaldehyde 1449
Sachse, J. H. Petroleum in N.W. Germany; Production of —— 699
Sachse, O., and Kaufmann, L. Brine Evaporators (P) 548
Sachsenroeder, G. H. Paper, Wrapping-, or Packing, Material- (P) 1193
Sack, M. *See* Haber, F. 777
Sackur, O. Sulphuric Acid; Physical Chemistry of —— 475
Sackville, J. A. Bleaching and Dyeing Apparatus (P) 474
Sadler and Co., and Driedger, A. Anthraquinone; Manufacture of Pure —— (P) 1072
Sadtler, S. S. Metals; Extraction of ——, from Ores and Scrap (P) 864
Saefstroem, F. Matches; Ignition Composition for —— (P).. 562
Safety Explosives Co., Ltd., and Phiersch, H. A. Explosives (P) 1349
Saget, G. Benzidine Blue 1023
Benzidine Blue, and some Reactions of Benzidine 1181
St. C. Legge, J. *See under* Legge.
St. Denis, Soc. Anon. de. Colouring Matters; Black Substantive —— (P) 111
Dyestuffs; Black Substantive —— (P) 40, 40
Dyestuffs; Blue Sulphide —— (P) 111
See Poirrier, A. F. 1229
St. Niementowski. Dyestuffs; Azo ——, and Limits of Formation of Diazomino Compounds 1390
St. O. Roy, F. M. Incandescent Light; Apparatus for Producing —— (P) 763
St. Plews, A. Antimony; Preparation of White Oxide of —— (P) 1458
St. v. Kostanecki. *See* David, E. 1130
And Plattner, E. Tetrahydroxyflavone; Preparation of —— 1130
And Tambor, J. Catechin; Formula of —— 854
Salamon A. G. Malt-making; Experiments in —— 418
See Smith, H. W. 1077
Sale, M. T., and Onslow, A. W. Gas; Obtaiment of High-Pressure —— (P) 851
Salentey, L. *See* Demanthé, F. L. 919
Sales, G. de R. de, and Gueugnon, F. Accumulator (P) 621
Salisbury, H. L. Acetylene Gas Generator (P) 604
Salkowski, E. Araban; Behaviour of ——, to Fehling's Solution 1159
Salom, P. G. Lead; Electrical Reduction of —— 1187
Salt, J. Pottery Fusible Tell-tales 255
Saltar, J. Gases; Purification of ——, and Apparatus therefor (P) 332
Sand, J., and Singer, F. Mercuric Compounds from Terpineol and Dimethylheptenol —— 1293
Sandberg, G. Tallow Substitute from Fish Oil (P) 1403
Train Oil; Obtaining an Odourless Product from —— (P) 413
Sander, C. Silver; Loss of ——, in Roasting Zinc Blendes 616
Sander, E., and others. Stereotyping; Turf Matrix Pulp for —— (P) 362
Sander, K. Silver in Muffle Residues; Determination of ——. 191
Sanders, C. F. *See* Goetze, P. C. E. 1083
Sanders, J. A. *See* Goetze, P. C. E. 1083
Sanders, R. D. Metals; Electro-Deposition of —— (P) 485
Sanderson, H. W., and Humphrey, E. E. Paper Printed with Water Colours; Rendering ——, washable (P) 1231
Sanderson, T. C. Antimony Ores; Smelting of —— (P) 1457
Sandmann, O. Calcium Carbide and Acetylene; Some Reactions of —— 932
Sandoz, Chemical Works vorm. Dyestuffs, Sulphide; Manufacture of —— (P) 1451
Saniter, F. L., and Smith, J. L. Furnaces; Open-Hearth Steel —— (P) 1141
Sankey, J. W. Insulating Composition, and Application of same (P) 1282
Sanson, L. H. M. Carburetter for Explosion Engines (P).... 601
Sansonnet. *See* Masson 1405
Sarcoli, L. *See* Ulpiani, C. 268, 1283, 1547
Sargeant, E. W. *See* Gwynne, J. 1322
Sargent, G. W. Metals; Heating of —— (P) 1081
Satie, C. *See* Jeancard, P. 67

PAGE

Satow. Coals of Bengal and Japan; Discussion on —— 242
Sattler, L. *See* Wachwitz, H. 176
Saubermann, S. Asbestos; Behaviour of ——, in Non-luminous Flames 396
Mantles; Incandescence —— (P) 962
Sauer, A. Prussian Blue; Obtainment of —— (P) 1543
Sauerstoffe Fabrik, Berlin. Inhalable Gases; Apparatus for Supplying Pure —— (P) 361
Saulles, A. B. de. *See* Convers, G. G. 620, 620, 1525
Saunders, A. G. Absorbent Mineral Preparation (P) 1159
Savage, E. L. Beating Engine (P) 1345
Savelsberg, A. *See* Haber, C. 177
Savery, T. H. Paper-making Machine (P) 494
Sawamura, S. Mannan; Liquefaction of ——, by Microbes 1547
Saxe, S. Plumping and Tanning Process (P) 627
Scammell, J. B., and Muskett, E. A. Oils; Solidifying and Toughening —— (P) 1461
Scattergood, H. W. Glass; Framing ——, by Electro-deposition (P) 1350
See Talman, J. 1027, 1027
Schaal, E. and M. Rosin; Hardening of —— 782
Schaefer, E. Fish-Powder; Manufacture of —— (P) 924
See Knorre, G. von 1403
Schaefer, W. Bunsen and Similar Burners (P) 331
Incandescence Gas Lamps (P) 962
Schaer, E. Oxidising Compounds; "Activating" Actions of Various Substances on —— 1102
Schaertler, C. Parobeck's Plate-Cooler; Theory and Practice of —— 1444
Schaudler, A. *See* Freund, M. 1100
Schaposchnikoff, W. G., and Michieff, W. Oxalic Acid; Function of ——, in the Chromic Acid Indigo Discharge Process 1276
Scharf, A. *See* Blau, F. 34
Scharffe, A. Vapour; Generation of —— (P) 1322
Schaumann, G. *See* Rupp, E. 1558
Scheele, T. A. *See* Lehmann, F. 332
Scheele, W. T. Soup Material; Manufacture of —— (P) 1192
Scheibler, F. Sugar Cubes; Removing Dust from Faces of —— (P) 922
Sugar; Manufacture of Cube —— (P) 1146
Scheidel, A. Metals; Extraction of ——, from their Ores (P) 775
Schell, O. Beer-coolers; Attachment for —— (P) 1090
Schenck, R. Red Phosphorus; Experiments on —— 368
Schepeler, H. A. *See* Brodin, C. F. 907
Scherding, A. R. Heating Devices for Use with Liquid Fuel (P) 330
Scherhag, F. Glass; Colouring —— (P) 409
Schering, E. Chem. Fab. auf Actien. Camphene; Manufacture of —— (P) 1552
Hydroxy-Carboxylic Acids; Manufacture of Ortho —— (P) 68
Schestakoff, P. Free Fatty Acids in Fats and Oils 1187
Scheurer, A. Cotton Tissues; Influence of the Hygrometric State of ——, upon their Tenacity 701
Cotton Tissues; Influence of Various Operations on the Tenacity of —— 702
Tissue Printing; Use of Formic Acid and Formates in —— 472
Schidrowitz, P. Morphine in Opium; Reichard's Method for Determining —— 644
Spirits; Discussion on Maturing of —— 100
Whisky; Chemistry of —— 814
Schiedt, A. *See* Rupp, E. 990, 1099
Schiele, J. Silver Plating and Gilding (P) 917
Schierz, F. A. *See* Tays, A. H. 480
Schiff, F. *See* Bernheimer, O. 55, 500
Schiff, S. Carburetted Air Apparatus 162
Schild, H. Fuel-Cakes; Manufacture of —— (P) 1323
Schill, C. H. Gas; Manufacture of ——, and Apparatus therefor (P) 1323
Schiller, H. Centrifugal Sizing Apparatus for Wood Pulp, &c. (P) 271
Schilling, J. Thoria; Occurrence of ——, in Minerals 1243
Thorite and Ormugite 1293
Schilling, R. *See* Kremer, C. 917
Schilz, E. Ores; Cyanide Process for Treating —— (P) 619
Schimmel and Co. Artificial Cinnamon Oil; Preparation of —— (P) 1410
Schindler, J. Citric Acid in Wine; Detection of —— 1415
Schirmer, B. F. Pasteurising Apparatus (P) 1291
Schirp, P. Dyeing and Bleaching Apparatus (P) 1132
Dyeing and Bleaching Machinery (P) 406
Schlag, B. *See* Ulmann, M. 553
Schlarb, L. M. Meats; Process for Curing —— (P) 269
Schleuning, W. *See* Friz, O. 708
Schlomann, H. W., and Le Castro, A. Textile Fabrics; Electrical Treatment of —— (P) 269

PAGE

Schlotterbeck, F. *See* Buelow, C 965
Schlotterbeck, J. O. Argemone Mexicana; Alkaloidal Constituents of —— 560
And Watkins, H. C. Alkaloids of Adhatoda Cirrhosa 1346
And Watkins, H. C. Stylophorum, Diphyllum; Chemistry of —— 273, 423
Schmalfuss, G. Adhesive Mediums; Manufacture of —— (P) 416, 1405
Schmatolla, O. Phenolphthalein as an Indicator 1557
Schmelling, N. W. *See* Sokolow, N.W. 420
Schmidhammer, W. Ore Process in the Martin Furnace; Special Modification of the —— 1184
Schmidheiny, J. *See* Roemer, M. 347
Schmidt, A. Casein Films; Waterproof —— 64
Schmidt, C. Liquids; Apparatus for Supplying Reagents for Purifying —— (P) 925
Schmidt, H. B., and Joslin, O. T. Glycerin; Apparatus for Refining —— (P) 1084
Schmidt, W. Warp Yarns; Printing of —— (P) 1132
Schmiedel, F. R. Paper; Producing Darker Shades on Coloured —— (P) 969
Schmitz and Kreutzer, G. Beer Brewing; Wet Bruising Mill for —— (P) 359
Schmitz, C. Beer; Continuous Production of —— 1343
Schmitz, H. *See* Tafel, J. 790
Schmitz, W. Textiles; Making Non-shrinkable, &c. (P) 1025
Schneible, J. Fermented Liquors; Manufacture of —— (P) .. 868
Malt Liquors; Manufacture of —— (P) 716, 1290
Schneider, L. Furnace Dust; Examination of —— 1474
Schnetzer, K. Soap; Machine for Moulding —— (P) 1543
Schniewind, F. W. C. Gas; Manufacture of —— (P) 331
Gas; Plant for Manufacturing —— (P) 698
Schoelkopf and Co. *See* Albee, W. L. 982
Schoelkopf, Hartford, and Hanna Co. *See* Culmann, E. 1392
Schoen, C., and Schweitzer, E. Resists under Azo Dyestuffs . 1182, 1453
Schoenfeld, F. Yeasts, Bottom-Fermentation; Separation of High and Low Attenuating —— 267
Yeasts of the Saaz and Frohberg Types; Observations on Behaviour of —— 359
And Rommel, W. Lager Beer; Rodlet Bacterium causing Cloudiness in a —— 1342
Schoenfeldt and Dennhardt. Weissbier; Causes of Red Discoloration of —— 1343
Scholl, A. Gas Densifying and Exhausting Apparatus (P) ... 329
Scholl, F. Dyestuff; Orange Red Azo —— (P) 610
Scholl, G. P. *See* Roepper, C. W. 778
Schollmeyer, G. Sugar-Juices; Purification of —— (P) 57
Schomburg, Von. Air; Disinfecting Power of Hot —— 1466
Schott, H. *p*-Nitrosocarbazole; Preparation of —— (P) 1118
Schrader. Foodstuff containing Molasses (P) 1548
Schraube, C., and Buehrer, H. T. Dyestuff, Azo; Manufacture of —— (P) 856
And Voigtlaender-Tetzner, W. Dyestuff; Red Disazo —— (P) 1550
Schrefeld, O. Cane Sugar in Preserved Fruit containing Glucose; Determination of —— 644
Schreiber, C. Printing Plates for Autotype Tone Printing (P) 1469
Schreiber, K. Fats; Decomposition of —— by Micro-organisms 728
Schreiner, O., and Downer, W. R. Volatile Oils; Specific Gravities and Coefficients of Expansion for —— 274
Schribaux. *See* Baudoin 1089
Schrieck, H. van der. Filter-Presses for Brewery Mashes 716
Schronsdorff, H. Chrysazin; Reduction of —— with Hydriodic Acid 1273
Schroeder, P. von. Quick Tanning from the Physico-Chemical Point of View 627
Schroeder, R. Yeast Albumin; Preparation of —— 1418
Schrottky, E. C. Rice; Malting of —— (P) 132, 492
Schuchard, E. *See* Stavenhagen 481
Schueder. Water; Huenermann's Method for Sterilising —— 985
Schuemann, H. Spirit and Liquid Hydrocarbons; Vaporising —— (P) 1127
Schuetz, O., and Dallmann, G. Urea Quinate (P) 275
Schukareff, A. *See* Longuinine, W. 481
Schulte. Zinc; Obtainment of —— from the Oxide (P) 1457
Schulte im Hofe, A. Indigo; Preparation of —— from Indigofera Tinctoria 607
Schulte-Steinberg, H. Thomas-Powder; Manufacture of —— (P) 1338
Schultess. Building Materials; Colouring of —— (P) 1535
Schultz, C. B. *See* Deissler, R. 977
Schultz, G. Diamond Yellow G; Preparation of —— 248
And Flachslaender, J. Methylanthranilic Acid 1022
And Tichomiroff, M. Erica Base; Some Isomerides of —— 469
Schultz, von G. and Julius, P. "Tabellarische Uebersicht der in Handel befindlichen künstlichen organischen Farbstoffe" 997

PAGE

Schulze, E. Carbohydrates; Drying —, and Determining Water of Crystallisation of —— ... 281
Schulze, F. A. Alloys; Behaviour of some —— to Law of Wiedemann and Franz ... 1535
Schulze, J. H. Malt; Determination of Water in —— ... 1088
Schuppman, C. A. Kilns or Furnaces (P) ... 1536
Schuyten, M. C. Antipyrine; Ferric Haloid Compounds of —— ... 187
Antipyrine Nitroprusside, Ferrocyanide, and Ferricyanide; Preparation of ... 186
Schwalbe, C. Ice Mill ... 498
Schwartz, E. H. Melting Furnace and Treating Metals therein (P) ... 1234
Schwartz, R. Prussian Blue in Gas-purifying Materials; Deteroination of ... 1249
Sulphite Lyes containing Soda; Determination of Alkali in —— ... 1298
Schwarz. Sand Bricks ... 1183
Schwarz, C. L. A. Packing Material for Articles Sensitive to Light (P) ... 980
Schwarz, H. Coking Badly-caking Coal, and Apparatus therefor (P) ... 597
Schwarz, L. Ethyl Chloride; Receptacle for —— (P) ... 1154
Schwarz, R. *See* Pitner, A. ... 272
Schwarz, W. Artificial Stone; Apparatus for Preparing Materials for —— (P) ... 479
Schwechler, J. Soap Granulator (P) ... 981
Schwede. Tanning; Rapid Method of —— ... 1404
Schweitzer, E. *See* Seboen C. ... 1182, 1453
Schweitzer, G. Tannin; Determination of —— ... 1250
Schweitzer, J. Sugar; Manufacture and Refining of —— (P). 416
Schweitzer, J. O. Sugar; Manufacture and Refining of —— (P) ... 1033
Schwerin, B. Sugar; Extraction of —— (P) ... 556
Schwerin, Count. Sugar; Extraction of —— (P) ... 59
Schwerin, G. B. Water; Apparatus for Extracting —— from Mineral and other Substances (P) ... 1335
Scofield, W. E. Carbide-Feeding Device for Acetylene Generators (P) ... 606
Scott, C. H. Linoleum; Press for Pressing —— (P) ... 625
Scott, E. G. Ammoniacal and other Liquors; Distillation of ——, and Apparatus therefor (P) ... 706
Fat; Extraction of —— (P) ... 487
Liquids; Treatment of —— for Crystallisation or Deposition of Substances therein (P) ... 913
Tallow and other Fatty Bodies; Melting of —— (P) ... 731
Scott, G. C. Amalgamating Machine (P) ... 619, 1141
Scott, G. L. Filtering Devices (P) ... 1036
Scott, R. Furnace for Quicksilver (P) ... 977
And Paterson, W. Water Softening and Liquid Purifying Apparatus (P) ... 493
Scott, R. C. Spirits; Ageing or Treating —— (P) ... 1035
Scott, R. W. Charges for Guns; Explosive —— (P) ... 1246
Scott-Moncrieff, W. D. Liquids; Apparatus for Distributing —— over Large Areas (P) ... 361, 1165
Scott-Smith, G. E. *See* Allen, A. H. ... 1475
Scott-Snell, C. Gas Lighting; Pressure System for Incandescent —— (P) ... 1179
Scoville, W. L. Cinchona Alkaloids Soluble in Ether ... 66
Scudder, F. Effluents; Discussion on Manchester Bill for Discharge of —— ... 582
Seaman, H. J. *See* Hurry, E. H. ... 1079
Seaver, J. W. Coke; Manufacture of —— (P) ... 1179
Sebelle, C. Acetylene Gas Generator (P) ... 464
Sébillot, A. M. G. Copper Ores; Treatment of —— (P) ... 1399
Furnace for Separating Zinc from Ores (P) ... 1333
Sulphuric Acid; Apparatus for Making (P) ... 859
Seddon, L. E., and Giroux, L. D. Sterilising and Preserving Processes (P) ... 924, 924
See Giroux, L. D. ... 1035
Sedlaczek, K. Liquor from Diffusion Vessels; Drawing off and Measuring —— (P) ... 630
Seeger, J. B. Burner for Crude Oil (P) ... 1324
Seel, E. Aloin Derivative, and Manufacture of Same (P) ... 791
Seeman, R. Ores; Apparatus for Treating Copper —— (P) .. 1142
Seemen, R. J. E. von. Evaporating Apparatus (P) ... 1386
Seibert, H., and Tempel, G. Liquor and Caustic Alkali Lye; Electrolytic Production of a —— (P) ... 970
Seidel, P. Indigo-diacetic Acid; and Manufacture thereof (P) ... 769
Indigo; Manufacture of —— from Indole (P) ... 701
Seidell, A. Sodium Sulphate and Sodium Chloride; Solubility of Mixtures of —— ... 252
See Cameron, F. K. ... 549, 773
Seidler. Leathers Dyed with Coal-Tar Colours; Discussion on —— ... 158
Seifert, B. R. and others. Indigo and Intermediate Products (P) ... 1380
Seige. Alcohol Vapour; Disinfecting Action of —— ... 270
"Selas" Ges. mit beschr. Haftung. Gas and Air; Producing a Mixture of —— (P) ... 361

PAGE

Seldner, J. J. Grease-containing Material; Treatment of —— (P) ... 413
Selg, O. and Guntrum, C. Beer; Apparatus for Converting Wort into —— (P) ... 492
And Guntrum, C. Beer; Converting Yeast into —— (P). 492
Sella, C. Fibres and Tissues; Fulling and Oiling —— (P) ... 704
Sellars, J. C. Building Blocks and Artificial Stone (P) ... 1233
Sellier, G. Wine; Apparatus for Determining Volatile Acids in —— ... 367
See Rocques, X. ... 193
Semprun, E. *See* Fortun, R. ... 777
Senderens, J. B. Aniline, Toluidines and their Analogues; Manufacture of —— (P) ... 967, 1529
Sesquirodium Phosphate ... 548
And others. Anilines, Toluidines, and Analogous Bases; Manufacture of —— (P) ... 169
See Sabatier, P. ... 504, 506, 853, 1070, 1157
Sendy, W. *See* Bull, H. C. ... 130
Senger, E. Water in Tar; Determination of ——.?. ... 1475
Serviss, G. F. "Other Worlds; their Nature, Possibilities, and Habitability in the Light of the Latest Discoveries" ... 568
Settergren, B. Mixer or Vaporizer for Hydrocarbon Engines (P) ... 603
Settlik, B. 2·7-Dihydroxynaphthalene; Dyeing Artificial Silk with —— ... 472
Seumnicht, J. A. F. C. Cement; Shaft Furnace for Burning —— (P) ... 869
Sexton, A. H. *See* Rhead, E. L. ... 567
Seyewetz, A., and Biot. Sodium Tetrazoditolylsulphite; Compounds of —— with Aromatic Amines and Phenols, and Dyestuffs therefrom ... 766
And Biot. Dyestuffs; Azo —— from Compounds of Sodium Tetrazoditolyl Sulphite ... 1071
Seyewetz. *See* Lumière Brothers ... 561, 989, 1469, 1469, 1544
Seyfert, F. *See* Kocks, E. ... 1145
Seyler, H. Sage Oil, German; New Constituent of —— ... 365
Seymour, J. Gas and Air; Apparatus for Mixing —— (P). 906, 1178
Shackleton, J., and Ross, A. Acetylene Gas Generators (P).. 109
Shade, A. A. Furnace; Electric —— (P) ... 1541
Shadforth, J. T. Furnace for Treating Metals, Minerals, &c. (P) ... 1586
Sharpe, D. Paper-Pulp; Screen Apparatus for —— (P) ... 494
Sharples, P. M. Centrifugal Liquid-Separator (P) ... 270
Sharpneck, E. L. Ores; Apparatus for Treatment of Copper (P) ... 1141
Sharps, H. B. *See* Quinby, W. C. ... 723
Shaw, C. H. "Sulphur Candle" (P) ... 788
Shaw, J. Dyeing Apparatus (P) ... 1393
Shearer, A. Emergencies in Vitriol Works; Discussion on —— ... 229
Shedd, O. M. *See* Kastle, J. H. ... 280
Sheedy, D., and Iles, M. W. Roasting Furnace (P) ... 1401
Sheelin, G. F. *See* Barker, J. H. ... 562
Shepard, C. U. Tea Leaves; Method of Withering —— (P) .. 493
Shepherd, E. S., and Jones, C. Photographic Plates and Films; Devices for Testing —— (P) ... 497
Sherman, H. C., and Snell, J. F. Oils; Relation of Heat of Combustion to Sp. Gr. of —— ... 624
Sherman, H. S., and others. Oils; Temperature Reaction of —— with Sulphuric Acid ... 564
Sherman, J. S., and Harms, G. H. Vapour-Burner (P) ... 602
Sherriff, R. R. *See* Duncan, H. ... 458
Shinn, J. A. Artificial Sand, and Production of Same (P) 1397
Shirasawa, H. *See* Tschirch, A. ... 1037
Shoening, W. Eggs; Preserving —— (P) ... 1291
Shooter, W. L. Shellac; Dissolving —— and Obtaining Varnish (P) ... 981
Shortt, F. E. Lamp Gasoline —— (P) ... 464
Shukoff, A. A. Oil and Fat Industries in Russia ... 81
Tallows and Oils; Constants of Russian —— ... 55
Shuler, D. P. Ores; Treating Copper-Nickel-Sulphide —— (P) ... 620
Sieber, B. Disinfecting Media; Classification of —— (P) 1036
Siebert, O. *See* Herzberg, W. ... 1072
Siedel, J. E. Separator; Centrifugal —— for Milk (P) ... 717
Siedler, P. Opium; Characteristics of Persian —— ... 1316
See Kahlbaum, G. W. A. ... 480
Siemens and Co. Carbon for Arc Lamps; Encased —— (P).. 1525
And Viertel, H. Electrodes for Arc Lamps (P) ... 962
Siemens and Halske Actienges. Asbestos Fibre Objects; Impregnating —— with Silica (P) ... 707
Carbon for Electric Arc Lamps (P) ... 1448
Cells; Electrolytic Polarisation —— (P) ... 125
Electric Lamp Filaments; Material for —— (P) ... 1389
Electric Lighting; Incandescence Bodies for —— (P) 851

PAGE

Siemens and Halske Actiengesellschaft *cont.*
Liquids: Apparatus for Filtering —— and Treating them with Gases (P) 696
Metals in their Ores; Conversion of —— into Sulphates (P) 914
Ores: Dry Sulphating of —— (P) 617
Thorium: Manufacture of —— (P) 872
Water: Filter-sterilising of —— (P) 1466
Ytterite Group: Manufacture of Elements of the —— (P) 872
Zirconium: Manufacture of —— (P) 872

Siermann, E. Wood Refuse: Distillation of —— 164

Sievert, P. T. Glass Articles: Manufacture of Hollow (P) 477

Sieverts, W. H. A., and Juergens, J. F. C. Gas-Burner: Incandescence —— (P) 464

Sigoyer, S. de. Sucrose: Extraction of —— from Sugar Liquors (P) 629

Silber, J. *See* Rosenfeld, A. 723

Silber, P. *See* Ciamician, G. 876, 1457

Silbermann, H. Light and Colouring Matters 466
Silk; Weighting —— with Tin Compounds 1275

Silberrad, O. Alcohol Duty: Effect of —— on Chemical Industry 827

Silberstern, L. *See* Friedlaender, P. 1272

Silicate Brick Syndicate. *See* Anderson, O. H. 974

Silverman, M. *See* Winton, A. L. 1500

Simon, A. Metals and Alloys: Electrical Manufacture of —— (P) 3110

Simon, G. Albuminoids of Cows' Milk: Research on —— 132

Simon, R. Drying Apparatus for Brewers' Grains (P) 1148

Simons, J. Fuel Briquette (P) 1526

Simonson, F. Acetylene Gas Generator (P) 605
Carbide Holder 1270

Sims, F. L. H. Acetylene Gas Generator (P) 1067

Sims, H. Filter: Oil —— (P) 625

Sinclair, D. Copper or Bronze Surfaces: Iridescent Coating of —— (P) 1083

Singer, F. *See* Sand, J. 1293

Singer, L., and Pauli, R. Paraffin Wax and Lubricating Oil from Mineral Oils, &c. (P) 1181

Singer, S. K. *See* Richards, T. W. 499

Sisley, P. Carmine Blue 468
Dyeing Animal Fibres with Acid Dyestuffs 770, 1230
Silk Fabrics: Spontaneously Developed Stains on —— 1328

Sjollema, B., and Tulleken, J. E. Butter: Halphen's Test for Cotton-Seed Oil in —— 1344

Skinner, L. B., and Hawley, R. H. Arsenic and Antimony in Ores; Determination of —— 1156

Skita, A. *See* Fischer, E. 472, 968

Skoupil, J. Textiles and Fibres; Dyeing, &c. and Apparatus therefor (P) 48
Textiles; Apparatus for Dyeing, &c. —— (P) 50

Skrabal, A. Iron; Electrolytic Preparation of Pure —— 1402

Skraup, Z. H., and Koenig, J. Cellobiose 144
And Kremann, R. Acetochloroglucose and Acetochlorogalactose; Synthetic Researches with —— 114

Slaboszewicz, J. *See* Nietzki, R. 35

Slaus-Kantschieder, J. Limestone; Dalmatian Bituminous —— 178
See Ehrmann, C. 501

Slavicek, V. Condenser; Fractional —— (P) 633

Sleeman, J. Grain: Apparatus for Malting —— &c. (P) 1148

Slosson, E. E. *See* Knight, W. C. 1070

Slough, J. T. Adhesive Cement (P) 1286

Sly, M. L. Iron Scrap; Treatment of —— (P) 483

Smallwood, A. Muffles or Furnaces for Annealing (P) 411

Smart, E. B. Sodium Amalgam: Manufacture of —— (P) ... 351

Smart, R. H. *See* Blake, M. 416
See Lang, J. 1189

Smart, W. J. Burner; Vapour —— (P) 1068

Smeeth, E. E. *See* Rader, C. I. 482

Smetham, A. Carbonate of Lime; Discussion on —— 530

Smethurst, W. Borax and Boracic Acid: Treating Substances for Production of —— (P) 970

Smidin, R. Antiseptics; Manufacture of —— (P) 63

Smiles, S. *See* Moissan, H. 504, 1041

Smith, Keene, and French Co. *See* England, J. W. 1550

Smith, E. F. Tan Bark; Apparatus for Leaching —— (P) ... 488
Zinc and Copper; Electrolytic Precipitation of —— 1558

Smith, F. A. Upsher. *See* Greenish, H. C. 559

Smith, G. G. Acetylene Gas Generator (P) 1324
Acetylene Gas Generators (P) 1269
Carbide Holders (P) 1269

Smith, G. H. Eucalyptus Oils; Sesquiterpene of —— 363
Fertiliser, and Manufacture thereof (P) 1085

Smith, G. R. Cotton Yarns; Effect of Moisture, Acids and Alkalis on —— 471

Smith, H. Malting Drum; Pneumatic —— (P) 868
Milk: Discussion on Composition of —— 1513

PAGE

Smith, H. F. Lamps; Incandescence Vapour —— (P) 1021
Vapour-Burner (P) 464

Smith, H. G. Eucalyptus Macarthuri Oil; Constituents of —— 1295
Eucalyptus Oils: Peppermint Odour in —— 187

Smith, H. W., and others. Sulphocyanides; Treating Coal-Gas for Manufacture of —— (P) 1077

Smith, J. and J. R. Oil and other Liquids; Filtering and Cleansing —— (P) 1144

Smith, J. B., and Wincott, G. P. Gas-Producers (P) 762

Smith, J. F. Naphthalene: Solubility of —— 1

Smith, J. L. *See* Saniter, F. L. 1141
And Bedford, R., jun. Steel; Open-Hearth Process of Manufacturing —— (P) 351

Smith, J. N. *See* Lowe, J. T. 1227

Smith, J. W. Alloys of Copper and Manganese; Discussion on —— 844
Recording Apparatus for Electrical Pyrometer; Discussion on —— 845

Smith, L. Volcanic Dust in St. Vincent; Analysis of —— 951

Smith, M. A. Filter-Presses (P) 1464

Smith, N. *See* Russell, E. J. 1476

Smith, P. J. *See* Stiens, P. 1682

Smith, R. F. W. *See* Electric Ozone Syndicate 553

Smith, R. G. White Wine: Clouding of —— 1034

Smith, W. A. Varnish Oils; Production of —— (P) 1238

Smith, Watson. Cineol (Eucalyptol) Arsenate (P) 1096
Eucalyptol Arsenate and Eucalyptol from Eucalyptus Oils (P) 1194

Smith-Rewse, H. S., and Coates, T. Gas-Purifiers, &c. (P) ... 762

Smoke Exterminator and Fume Condenser Co. Smoke, Fumes, and Gases; Means for Condensing —— (P) 1228

Smythe, J. A. *See* Garrett, F. C. 398

Snell, J. F. *See* Sherman, H. C. 624

Snelus, G. J. Iron and Steel and Alloys thereof; Manufacture of —— (P) 1333

Soar, A. B. Filtering Apparatus (P) 904

Societe Anon. de Carbonisation. Coke-Ovens (P) 330

Société Anon. de St. Denis. *See* St. Denis.

Societe Anon. Prod. F. Bayer and Co. *See* Bayer and Co., F.

Societe B. Buffaud and T. Robatel. Mercerising Apparatus (P) 49

Société Bayerische Eggenfabrik. Cast-iron Resembling Steel; Production of —— (P) 1537

Societe Belge de Deglycerination. *See* Damoise, G. 355

Societe Belge pour la Fabrication des Émaux Artistiques. Glass or Mirrors; Manufacture of —— (P) 347

Societe Chim. des Usines du Rhône. Indigo Production on the Fibre (P) 704
Meta-Tolnic-aldehyde-*o*-Sulphonic Acid: Preparation of (P) 39
Substituted Sulphimides (P) 67
See Koetschet, J. 1275, 1275

Société de Construction Mécanique de St. Quentin. Sugar Juice; Continuous Carbonation and Sulphuration of —— (P) 130

Societe de Laire et Cie. α- and β-Ionone: Manufacture of Homologues of —— (P) 794

Société de l'Indust. Chim. à Basle. *See* Basle.

Société de l'Industrie Verrière. Glass; Manufacture of —— by Electricity (P) 1027

Société de Prod. Chim. de Droogenbosch. Yarns; Treating Nitrocellulose for Manufacture of Lustrous —— (P).. 546

Societe Derepas Frères. Photographic Paper 1296

Societe des Brûleurs Roger. Burners for Hydrocarbon Vapours (P) 851

Société des Engrais Complets. Town Refuse; Quick Removal of —— and Conversion into Manure (P) 361

Société des Etablissements A. Maguin. Beetroot Washer and Stoner (P) 921

Société des Industries Economiques Moteuro Charon. *See* Gentz, L. 697

Société des Matières Colorantes de St. Denis. *See* St. Denis.

Société des Plaques et Papiers Photographiques. Hydrosulphurous Acid or Hydrosulphites; Powder for Producing —— (P) 1395

Societe des Produits Amylacés. Rice Starch; Manufacture of —— (P) 1545

Société des Produits F. Bayer and Co. *See* Bayer and Co., F.

Societe dites Englische Wollenwaaren Manufaktur. Fixing Pigments in Calico Printing (P) 704

Societe Edison and others. Electric Lamps: Sealing Wires into —— (P) 333

Société Electro-Metallurgique Française. Electric Furnace with Moving Electrode (P) 1459
Electric Furnace Arranged for being Tipped (P) 915
Iron and Steel: Manufacture of —— by Electric Heating (P) 917
Metallurgical Operations: Utilising the Waste Heat of —— (P) 1029

Societe formerly Durand, Huguenin et Cie. *See* Durand, Huguenin and Co.

PAGE

Société G. and P. de Mestral. Arc Lamps and Electrodes therefor (P) 962
Société G. Charles and A. Marquand. *See* Marquand, Soc. G. C. and A. 1446
Société Geneste, Herscher et Cie. Disinfecting Apparatus (P) 133
Société Gouvy et Cie. and Marthelot, M. Steel: Direct Transformation of Iron Scrap and Waste into —— (P) 1399
Société Indust. de Cellulose. Cellulose Material for Combs, &c. (P) 1550
Société Italiania dei Forni Electrici. *See* Levi, G. 629
Société K. Oehler. Sodium Sulphate and Concentrated Hydrochloric Acid Gas: Preparation of —— (P) 1454
Société la Métallurgie Nouvelle et Gin. Sulphide Ores: Treatment of —— (P) 1537
Société "Le Lait." Milk Preserving (P) 1035
Société L. Prangey and J. de Grobert. Vacuum Pans (P) 1406
Société Ozon-Maatschappij. Ozonisers; Silent Discharge in —— (P) 1539
Société Paul Chapuy and Co. Batteries: Electric —— (P) ... 54
Société pour la Production de la Vapeur Surchauffée. Gas Producer (P) 851
Steam: Generating and Superheating —— (P) 904
Société pour l'Ind. Chim. a Basle. *See* Basle Chemical Works.
Société Salinen-Direction Luneberg. Common Salt; Manufacture of Pure —— (P) 1395
Société Sucriere de Toury. Molasses; Manufacture of Cattle Food from —— (P) 924
Société "Trust Chimique." Starch: Manufacture of Soluble —— (P) 1288
See Partridge 1154
Society of Chemical Industry, Basle. *See* Basle Chemical Works.
Soddy, F. Uranium: Radio-Activity of —— 796
See Rutherford, E. 196
Sodeau, W. H. Nitrocellulose; Discussion on Will Test for —— 825
Soden, H. von, and Rojahn, W. Bergamot: New Crystalline Compound from Essence of —— 66
Napthalene in some Essential Oils 1410
Soederberg, C. W. Acetylene Gas Generator (P) 1069
Soerensen, C. P. Aluminium: Rendering —— capable of being Welded or Soldered (P) 1235
Sohst, O. Dyestuff: Yellow to Red Acridine —— (P) 1530
Sokolow, N. W., and others. Agar-Agar; Industrial Use of —— in Russia 420
Solomon, M. *See* Drake, B. M. 245
Soloniua, B. *See* Decker, H. 1274
Solvay and Co. Soda Crystals in Blocks: Production of —— (P) 1395
Sodium Carbonate and other Salts: Manufacture of —— (P) 1076
Somer, A. Cell: Electrolytic —— (P) 1237
Somer, W. K. F. G. Tanning: Rapid Process of —— (P) 415
Sorel, A. Ferments and Fermentations: Testing —— 1240
Molasses Distillery: Abnormal Fermentations in the —— . 632
Sorel, E. "La Grande Industrie Chimique Minerale" 963
Sorge, A., jun. Water: Purification of Feed —— (P) 1386
South, R. *See* Gray, G. F. and H. N. 1397
South Western Rubber Co. *See* Thane, J. 188
Southby, A. G. Beers; Brewing Barley Malt —— (P) 120
Southey, A. W. *See* Clubbe, E. J. 33, 326
Spang, J. *See* Dorr, A. M. 775
Spelue, F. V. Oil: Extraction of —— from Fish, and Obtaining Dried Residues for Use as Guano (P) 113
Spence, F. M., and others. Sodium Bichromate: Manufacture of —— (P) 253
Spence, P., and Sons. *See* Knecht, P. 1025
See Knecht, E. 1531
See Lamb, M. C. 1286
Spengler, C. Disinfectant (Formaldehyde); Manufacture of —— (P) 1150
Sperry, E. A. Electrodes: Envelope for Battery —— (P) 621
Elements for Secondary Batteries (P) 1540
Ore and Like Concentrators (P) 773
Sperry, E. S. Alloys containing Copper and Zinc: Improving Casting of —— (P) 482
Spica, M. Gallic Acid in Tanning Materials: Detection and Determination of —— 281
Spiegel, C. Furnaces for Burning Naphtha Residue (P) 330
Spies, A. Furnaces; Smelting —— (P) 350
Spilker, A. *See* Kraemer, G. 540
Spiller, J. Gutta-Percha: Discussion on —— 1372
Spillern-Spitzer. Saccharine Liquids: Purification and Decoloration of —— (P) 1406
Spitta, A. *See* Buchner, E. 784

PAGE

Spooner, H. J. Fuel: Apparatus for Preparing Peat, &c. for Use as —— (P) 162
Spooner, J. E. G. and J. C. Liquid or Vapour: Means for Preventing Escape of —— from Vessels (P) 696
Sprague, I. B. Wood: Preservation of —— (P) 479
Spreckels, C. A., and Kern, C. A. Sugar and Sugar Solutions; Purification of —— (P) 715
And Kern, C. A. Sugar-bearing Material; Purifying Fluid —— (P) 784
And Kern, C. A. Sugar Crystals: Treatment of —— (P) .. 784
And Kern, C. A. Sugar Products; Intermediate —— (P) 982
Spring, W. Water: Filtration of —— through Sand and Loam 869
Springborn, E. Fuel, Artificial: Manufacture of —— (P) 245
Sprosser, L. Carbon Anodes: Electrolysis of Alkali Chloride Solutions with —— 124
Squire, P. W., and Caines, C. M. Oil of Turpentine; Acetic Acid Test for —— (P) 929
Ssergejew. Alkaloids; Lactates of certain —— 496
Stack, T. L. F. Milk; Pasteurising and Separating —— (P).. 633
Stackpole, M. D. Slime Problem in Cyaniding Talcose Ores.. 1080
Staedel, W. Hydrogen Peroxide; Crystallised —— 986
Stalker, R. J. Wood, Composition for Preserving —— (P).... 707
Standard Steel Car Wheel Co.; Furnace for Steel-making —— (P) 976
Stanek, V. Betaine; Preparation of —— 960
See Andrlik, K. 265, 929
Stang, C. Yeast and Spirit; Use of certain Materials in making —— (P) 1290
Stanger, H., and Blount, B. Cement Analysis; Proposed Standardisation of —— 1216
Stanley Electric Manufacturing Co. *See* Auerbach and Gubine 964
Stanley, J. C. W. Brewers' Grains: Apparatus for Expressing —— (P) 869
Rendering Apparatus (P) 712
Stanley, L. W. Hydrocarburetted Air for Motor Engines, &c. (P) 1056
Stansfield, E. Barium; Preparation of —— 258
Stapf, T. Blast Furnaces (P) 482
Star Patent Fuel Co., and Heath, T. E. Fuel; Apparatus for Manufacture of Artificial —— (P) 1323
Stare, F. T. *See* Plummer, C. H. 787
Starke, J. Albuminoids: Influence of the Medium on the Properties of —— 132
Solanine in Tobacco Seeds 136
Starling, H. A., and E. H. Translation of Bunge's "Text-Book of Physiological and Pathological Chemistry" ... 797
Stassano, E. Furnace; Electric Revolving —— (P) 1284, 1540
Ores; Electrical Smelting of —— (P) 1284
Stassfurter Chem. Fab. vorm. Vorster and Grueneberg. Potassium Cyanide; Purification of —— (P) 476
Potassium and Sodium Cyanide; Briquettes of a Mixture of —— (P) 253
Sodium and Potassium Cyanides; Production of Anhydrous —— (P) 253
Stauber, E. Drying Apparatus (P) 32
Stauss, C. W. Furnace: Construction of a —— (P) 852
Stavenhagen, A., and Schuchard, E. Alloys of Tungsten, Molybdenum, Uranium, and Titanium with other Metals 481
Stead, J. E. Efficiency of Wilson Gas Producers 79
Stearns, J. S. Smoke, Products of Combustion, &c.: Apparatus for Treatment of —— (P) 1524
Steel, T. *See* Greig-Smith, R. 1381
Steele, B. D., and Denison, R. B. Solutions; Transport Number of Very Dilute —— (P) 352
Steele, E., and others. Explosives; Improvements in —— (P) 1155
Steele, W. F. Gas-making Apparatus (P) 1526
Steenbergh, B. van. Carburetted-Hydrogen Gas; Apparatus for Manufacture of —— (P) 764
Steffen. Fodder Rich in Sugar; Manufacture of a —— (P)... 1465
Steffen, C. Saccharine Juices; Obtaining Pure Concentrated —— (P) 266
Sugar Boiling; Process of —— (P) 1086
Sugar Diffusion Apparatus (P) 1406
Steiger, J. Cement; Manufacture of —— (P) 109, 480
Stein, G. Cotton: New Discharge Effects on —— 339
Stein, L., and Storr, W. Glass or Porcelain Plates (P) 1535
Steinau, C. R. P. Ores: Purification of Zinc-bearing —— (P). 710
Steinbach, J., and Duderstadt, F. Asphalt Mixture; Blocks from —— (P) 1078
Steiner, R. Fuel, Artificial: Manufacture of —— (P) 600
Steinmtzer, F. Centrifugal Apparatus for Quantitative Analysis 562
Steinmetz, C. P. Glowers for Pyro-electric Lamps (P) 462
Steinmetz, E. G. Battery: Secondary —— (P) 1082
Steinweg, C. E. Metals and Compounds: Hollow Bodies from —— (P) 177
Stelzer, L. A. India-Rubber: Apparatus for Devulcanising —— (P) 626

PAGE
Stephan, A. Medicinal Compounds; Preparation of —— (P). 722
Stephan, K. Camphene; Manufacture of —— (P) 1194
And Helle, J. Terpineol; Preparation of a New —— 987
Stephani, O., and Boecker, T. Extraction Apparatus 1097
Stephenson, J. H. Compositions; Antifouling —— for Ships (P) 179
Stephenson, L. T. Acetylene Gas Generator (P) 465
Sternau, S., and Strassburger, L. Lamp; Alcohol —— (P) 852
Sternberg, W. Dimethylene Tartrate, and Manufacture of same (P) 791
Methylene Citric Acid, and Manufacture of same (P) 791
Sterne, E. D. *See* McFarlane, J. 464
Sterrett, F. O. Pump for Handling Heavy Oils (P) 625
Steuart, D. S. S. Pulverising, Crushing, and Grinding Machines (P) 904
Stevens, C. W. Stove; Manufacture of Artificial —— (P) 774
Stevens, J. W. *See* Anderson, G. H. 985
Stevens, M. T. Acetylene Gas Generator (P) 605
Stevens, P. Glass; Composition for use as a Backing for Articles of —— (P) 707
Stewart, J. E. *See* Lyle, W. G. 493
Stewart, M. A. *See* Parsons, C. L. 1114
Stewart-Wallace, J. S. Mineral Oils, or Distillates and Residues; Treatment of —— (P) 639
Sthamer, R., Fabrik Chem. Praeparate vorm. Cellulose Lakes, and Manufacture thereof (P) 356
Hydrocellulose; Acetylated —— (P) 64
Hydrocellulose; Manufacture of —— (P) 65
Stiasny, E. Leather Dyeing; Application of Salts of Heavy Metals in —— 1329
Stiegelmann, A. J. Indigo; Resist White under —— (P) 769
Stiens, P., and Smith, P. J. Batteries; Storage —— and Electrolytes (P) 1082
Stiepel, C. Sugar Beetroots; Analytical Diffusion Apparatus for Valuation of —— 866
Still. Coke-Ovens; Bye-Product Recovery —— (P) 1446
Still, C. Distilling Apparatus; Continuous —— (P) 699
Stillman, J. M., and O'Neill, E. C. Fatty Acids of Fat of the Californian Bay Tree 1336
Stillman, T. B. Cements; Determination of Alkalis in Portland and Natural —— 191
Stillwell, A. G. Graphite in Ores 759
Stilwell-Bierce and Smith-Vaile Co. *See* Giesler, A. 1543
Stire, P. G. Powder; Semi-smokeless —— (P) 366
Stirling, R. Petroleum Oil; Appliance for Raising —— 1223
Stock, A., and Doht, W. Antimony Hydride; Preparation of —— 995
Stockem, L. *See* Borchers, W. 1284, 1284
Stocks, H. B. Carbonate of Lime; Formation of —— under Various Conditions 527
Stoddart, C. W. Sulphur in Coal; Determination of —— 1298
Stoddart, F. W. Sewage Filter; Continuous —— 183
Stoeckmann, L. Fuel; Increasing the Heating Value of —— (P) 33
Stoeder, W. Digitoxin in Digitalis Leaves; Determination of —— 283
Opium and its Preparations; Determination of Morphine in —— 194
Stoermer, M. Glass; Dulling of Window —— 174
Stokes, H. N. Petroleum from Cuba 541
Stollé, R. Hydrazine; Volumetric Determination of —— 1351
Stone, G. C. Arsenic Fumes; Apparatus for Separating —— from Furnace Gases (P) 1395
Sulphuric Acid; Apparatus for Production of —— by the Contact Process (P) 1395
Sulphuric Anhydride; Apparatus for Cooling and Absorbing —— (P) 476
Stone, H. Wood; Identification of —— 117
Storbeck, O. *See* Bodlaender, G. 1282
Storch, C. Caseinogen of Asses Milk 1344
Storer, F. H. Mannose; Detection of —— 1474
Storr, W. *See* Stein, L. 1535
Stovel, H. R. *See* Haultain, H. E. T. 916
Strachan, R. P., and Robertson, J. K. Storage and Discharge of Inflammable and Volatile Solutions (P) 904
Strache, H. Water-Gas; Apparatus for Generating —— (P) . 1021
Strange, E. H., and Graham, E. Varnishes; Manufacture of —— (P) 1239
Strassburger, L. *See* Sternau, S. 852
Strathy, F. R. L., and Riley, A. J. Acetylene Gas Lighting (P) 763
See Riley, A. J. 1127
Straup, J. F. Lubricants and Lubricating Oils (P) 1032
Straus, A. Sponge Substitutes; Forming —— (P) 981
Straus, E. Flour from Sweet Potatoes (P) 633
Strauss, E. *See* Hofmann, K. A. 143
Strecker, O. C. Lithographic Printing Plates of Heavy Metals or Alloys (P) 775
Lithographic Printing Plates; Preparation of —— (P) ... 1135
PAGE
Street, E. A. G. Battery; Electric —— (P) 1237
Strehlenert, R. W. Silk Filaments; Apparatus for Spinning Artificial —— (P) 969
And Westergren, Silk; Artificial —— 113
Stritar, M. J. *See* Zeisel, M. J. 642
Stroemholm, D. Double Salts; A Class of —— 1561
Stroh, G. Ammonia Still (P) 1326
Strong, H. A. Gases, Cooling and Liquefaction of —— (P) .. 345
Struebing, M. Heat Non-conducting Material for Building Purposes (P) 1078
Struthers, J. *See* Rothwell, R. P. 1354
Struve, H. Cognac; Test for Choline in —— 1040
Stuart, C. Lustreing Machine (P) 1135
Silk Fibre; Intensifying the Lustre of —— (P) 1134
Silk; Intensifying the Lustre of —— (P) 1276
Stubblebine, W. Furnaces; Metallurgical —— (P) 977
Furnaces (P) 1445
Stubbs, G. *See* Thorpe, T. E. 1037
Stuehler, M. *See* Malmendier, C. 1224
Suenden, C. Sodium Hypochlorite; Instability of —— in Solution 1183
Stuerler, A. L. de. Fruits and Foods; Preservation of —— (P) 493
Stukes, J. M. Eggs; Compound for Preservation of —— (P) . 493
Eggs, &c., Packing Compound for —— (P) 787
Stute, C. Drying Apparatus; Centrifugal —— (P) 1267
Suais, E. *See* Rosenstiehl, A. 470, 470
Sudre, C. G. White Lead; Substitute for —— (P) 1404
And Thierry, C. V. Distillers' Spent Residues; Apparatus for Treating —— (P) 1548
Sue, H. Carbonic Acid Gas; Apparatus for Charging Liquids with —— (P) 869
Suevern, K. Horsehair; Artificial —— 249
Sugiyama, N. Camphor, Camphor Oil, and Manufacture of Safrol 1551
Sullivan, E. C. *See* Prescott, A. B. 932
Sulman, H. L., and Kirkpatrick-Picard, H. F. Ore Slimes; Treatment of —— (P) 1081, 1234
And Pickard, H. K. Sulphide Ores; Treatment of —— .. 975
Sulphides Reduction, Lim. *See* Ellershausen, F. 978
Sulphur Elimination Syndicate. *See* Gutensohn, A. 1281
Summers, B. S. Fibres; Retting Vegetable —— (P) 613
Summers, S. L. Acetsalicylphenetidine, and Production thereof (P) 1154, 1154
Bismuth Oxyiodide Methylenedigallate (P) 275, 275
Methylene Di-aceto Disalicylic Acid (P) 1194
Methylene Di-guaiacol; Camphoric Acid Ester of —— (P) 1194
Methylenedisalicylic Acid, and Production thereof —— (P) 1154
Sussman. Active Material for Manufacture of Accumulator Plates (P) 1539
Sutherst, W. F. Cheese; Chemical Changes in the Ripening of —— 219
Swager, J. Sugar Juice; Purification of —— (P) 130
Swales, H. *See* Hampson, F. G. 984, 1191
Swan, J. W. Proceedings of Annual Meeting 950, 951
Swift, F. E. Furnace; Brick and Kiln —— (P) 860
Kiln; Continuous —— for Bricks (P) 1140
Swift, T. B. Copper Bullion; Determination of Gold and Silver in —— 1559
Swinburne, J., and Ashcroft, E. A. Metals; Extraction of —— (P) 351
And Ashcroft, E. A. Metals; Extraction of —— from Sulphide Ores (P) 482
And Ashcroft, E. A. Sulphides Ores; Treatment of —— (P) 349
And Ashcroft, E. A. Zinc Chloride for Electrotytic Purposes; Treatment of —— (P) 411
Swindell, W. Gas Producer (P) 245
Syniewski, V. Amylodextrin; Iodine Compound of —— 1341
Starch; Action of Formaldehyde on —— 1341
Starch; Constitution of —— 1341
Szalay, E. von. Lamps for Acetylene Gas (P) 961
Szczepanik, J. Photographs in Natural Colours (P) 1097
Szterkhers, S. Red Lead; Technical Analysis of —— 1156

T

Tafel, J. Cathodic Polarisation in Dilute Sulphuric Acid 1185
And Schmutz, K. Lead and Mercury Cathodes in Sulphuric Acid Solutions; Reducing Action of —— 790
Taffe, H. Salicylic Acid in Foods; Detection of —— 1040
Tagliani, E. *See* Lepetit, R. 1073
Tailfer, L. Bleaching Apparatus; Electrolytic —— 611
Talbot, B. Ammonia; Production of —— (P) 1183
Talcott, F. D. Milk-Heater (P) 1548

PAGE

Tahuau, J. Stained-Glass Windows (P) 1027
And Scattergood, H. W. Glass; Method of Framing —— (P) 1027, 1027
Tambor, J. *See* St. v. Kostanecki 854
Tanatar, S. Hydrogen Peroxide: Molecular Compounds of —— with Salts 65
Tanret, C. Mannoetetrose and Mannotriose: Characteristics of —— 1033
Tapp, H., and Akester, W. H. Liquid Hydrocarbons: Utilisation of ——, for Heating Purposes (P) 1127
Taquet, H. M. Zinc Ores; Treatment of —— (P) 410
Tarbouriech, M. Hydrogen Peroxide: Titration of —— 725
Tardy, E. Badiana: Chinese Oil of —— 1347
Badiana: Japanese Oil of —— 1346
Bitter Fennel: Oil of 1347
Tate, F. Technical Teaching in Lancashire 1364
Taylor, C. H. *See* Christian, G. H. 1237
Taylor, C. W. Bunsen Burner (P) 463
Gas-Burner; Incandescence —— (P) 964
Taylor, E. D. Co. Formald-hyde Gas; Apparatus for Producing —— (P) 133
Taylor, E. M. Bleaching and Scouring Compound (P) 340
Taylor, E. R. Carbon Bisulphide: Manufacture of ——, in the Electric Furnace (P) 1236
Chemicals; Production of ——, in Electric Furnaces (P) .. 979
Electric Furnaces and Production of Chemicals therein (P) 353, 1288
Furnace; Electric —— (P) 1143
Taylor, F., and others. Bleaching Vat (P) 1074
Taylor, H. B. Voltaic Cell (P) 1540
Taylor, J. Furnaces; Construction of —— (P) 597
Taylor, J. B. Gas-Burner; Incandescence —— (P) 909
Paper applicable for Electric Insulation (P) 1193
Taylor, J. R. Producer-Gas; Generation of ——, and Apparatus therefor (P) 539
Taylor, M. T. Charcoal Manufacture; Discussion on —— 745
Taylor, P. B. Coating Tray for Use in Desiccation of Eggs (P) 1090
Taylor, R. L. Cobalt and Nickel: Modification of Rose's Method of Separating —— 426
Hypoiodous Acid 503
Taylor, T. F. Electro-plating Apparatus (P) 1031
Tays, A. H., and Schierz, F. A. Clay Slimes: Treatment of ——, by the Cyanide Process, with Agitation 480
Tedeseo. Oils used in Painting; Decolorising Vegetable —— (P) 1460
Varnish; Manufacture of —— (P) 1461
Tei, B. Pyrazolonephenyldimethylsalicylate: Preparation of —— 272
Teisler, E. Eggs; Preservation of —— (P) 269
Tejada, J. de D. Acetylene Gas Generators and Portable Lamps (P) 907
Tellier. Alcoholic Liquors: Concentration of —— (P) 1497
Tempel, G. *See* Seibert, H. 970
Terne, B. Fertilisers: Manufacture of —— (P) 1287
Terrancon, E. Gas-Burners; Atmospheric —— (P) 598
Tervooren, H. Reducing Sugar in Syrups: Determination of —— 1560
Teter-Heany Developing Co. *See* Heany, J. A. 979, 979
Tétry, L. Mentha Pulegium Essence: Proximate Analysis of —— 496
Thame, J. Waterproof Composition for Floors, Walls, &c. (P) 1286
And The South Western Rubber Co. India-Rubber; Treatment of Crude —— (P) 488
Thames Mining Machinery Co. *See* Martin, W. H. 1536
Theilgaard, A. E. J. V. J. Caoutchouc, &c.; Devulcanising —— (P) 1461
Theisen, E. Gases and Vapours: Means for Causing ——, to Move in Contact with Liquids (P) 904
Gases; Apparatus for Washing —— (P) 1322
Thesmar, G. *See* Noelting, E. 398
Theulier, E. Orange Flowers: Essential Oil of Sweet ——, or Portuguese Neroli Oil 722
Sweet Orange Flower Essence 636
Verbena Oil: Preparation of —— 1468
Thiadon, C. *See* Castelnau, M. 851
Thibault, P. Basic Bismuth Gallate of the Codex: The Supposed —— 135
Bismuth Oxyiodogallate: Preparation of —— 1244
Thibodo, F. H., and Peckinpaugh, S. S. Photo-Etching (P) .. 1155
Thiel, A. Thiocyanates: Idometric Determination of —— 1298
Thiel, G. Iron: Partial Elimination of Impurities from —— (P) 1457
Iron: Production of —— (P) 1281
Thomas and Bertrand-Thiel Processes Compared 119
Thiele, E. Filaments: Manufacture of —— from Cellulose Solutions (P) 1393

PAGE

Thiele, F. C. Petroleum from Beaumont: Free Sulphur in —— 1271
And others. Mineral Oils and Distillates; Refining —— (P) 110
Thiele, H., and Deckert, H. Potassium Permanganate Solution: Standardisation of —— 140
Thierry, C. V. *See* Sudre, C. G. 1548
Thierry, J. M. J. Distillers' Spent Residue or Wash: Treatment of ——, and Apparatus therefor (P) 360
Thiersant, H. de. Acetylene Gas Generators (P) 1226
And Coulson, W. A. Acetylene Gas; Apparatus for Generating —— (P) 461
Thiersch, H. A. *See* Safety Explosives Co. 1349
Thilmany, A. Pigments and Colouring Matters: Composite —— (P) 56
Thiriot, L. Lead Glazes with Golden Yellow Sheen 1252
Thiry, J. Coke-making: Recovery of By-Products in —— 761
Thoems, B. Evaporating Apparatus; Multiple Effect —— (P) 783
Thoerner, W. Wood Pulp: Sampling ——, and Estimating Moisture of 641
Thofehrn, H. G. C., and De Saint Seine, B. Copper and Nickel: Extraction of —— 862
Thomann, G. *See* Gnehm, R. 968
Thomas. *See* Izart 1541
Thomas, B. M. Artificial Fuel and Preparation of same (P) . 1067
Thomas, J., and Podmore, A. E. Lamps; Incandescent Gas —— (P) 962
Thomas, J. L., and Prosser, D. W. Gas Producer (P) 163
Thomas, P. Galactose; Separation of —— from Glucose 491
Starch: Preparation of Soluble —— 1033
Thomas, V. Iodides; Volumetric Determination of —— 873
Thallium; Volumetric Determination of —— 501
Thominc, E. *See* Croizier, H. 1178, 1397
Thompson, A. Tannin; Volumetric Determination of —— ... 1416
Woods and Extracts containing Tannin; Analysis of ——. 1416
Thompson, C. W. Separating or Filtering Apparatus (P) 1524
Thompson, G. Filters for Liquids containing Copper, &c. (P) 54
Thompson, L. McGregor. Gas-Lighters (P) 697
Thompson, W. P. Furnaces for Use of Gas (P) 597
Hydrocarburetted Air; Obtainment and Use of —— (P).. 339
Separating Apparatus (P) 244
Thoms, H., and Beckstroem, R. Calamus Oil: Constituents of —— 1295
And Beckstroem, R. Calamus Oil; the Calameon of ——. 1295
Thomson, G. Manganese Alloys; Production of —— (P) 1399
Steel and Steel Alloys; Manufacture of ——(P) 349
Thomson, J. M. *See* Nathan, F. L. 927
Thorn, J. H. Fruits: Composition for Preserving —— (P)... 634
Thorne, L. T., and Jeffers, E. H. Hydrochloric Acid; Purification of —— from Arsenic 792
Thornley, G. *See* Knox, J. 632
Thornton, H. *See* Wilkinson, J. 764
Thorpe, T. E. "Essays in Historical Chemistry" 797
And Stubbs, G. Taxine; the Alkaloid of Yew 1037
Thovert, J. Electrolytes; Retrograde Diffusion of —— 710
Thron, H. Anisic Acid Ethers of Cinchona Alkaloids (P) ... 637
Cinchona Alkaloid Carbonic Acids: Making Alkyl Ethers of —— (P) 926
Cinnamic Ether of Cinchona Alkaloids (P) 638
Salicylquinine, &c.: Salicylate of —— (P) 722
Succinic Acid Ether of Cinchona Alkaloids (P) 638
Thurlow, N. Camphor: Production of —— (P) 791
Thurnaeur, L. *See* Falk, Stadelmann and Co. 164
Thurston, S. H. Metal on Metal; Impacting —— (P) . 1142, 1142
Thwaite, B. H. Blast-Furnace Gases: Apparatus for Cooling and Cleansing —— (P) 352
Thwing, C. B. Thermo-Electric Element (P) 1333
Thermo-Electric Generator (P) 1333
Tice, W. Gas-Lamp Incandescence —— (P) 46
Tichomiroff, M. *See* Schultz, G. 469
Tiemann. Citral Series; Isomerisation of Members of the —— 1553
Tiemann, H. P. Graphite: Temperature Limits for Separation of —— from Martensite in Cast Iron 258
Tiesenholt, W. von. Bleaching-Powder; Composition of ——. 913
Tiffeneau, M. Metho-ethenylbenzene 728
Tigerstedt, A. Discharge for Tannic Acid Mordants; Indanthrene Blue —— 912
Paranitraniline Red: Sodium Sulphite as a Resist under —— 545
Resist under Indanthrene Blue 912
Tilden, W. A., and Burrows, H. Pinene and other Terpenes; New Derivatives of —— 1637
Till, T. *See* Rowley, W. B. 477
Timar, J. Tap, Socks or Stoppers; Safety —— (P) 326
Timmans, W. G. Emergencies in Vitrol Works; Discussion on —— 229
Timoneff, V. *See* Danilevsky, C. and A. 341
Tiemann, H. and H. Priming Caps; Manufacture of —— (P) 562

PAGE
Tissier, L. *See* Grignard, V. ... 286
Titus, J. C. Carburetter and Gasoline Regulator; Combined —— (P) ... 601
Tkatsch, A. *See* Badische Anilin und Soda Fabrik ... 338
Toch, M. Barium Compounds; Discussion on Manufacture of —— ... 392
Paints and Pigments; The Composition of —— ... 102, 452
Toenjes, C. Dyeing Apparatus for Linoleum, Paper, &c. (P) ... 124
Toernell, V. Tubular Dust-filter for Breweries ... 631
Tolhurst, C. H., and Goldthwaite, A. G. Starch; Apparatus for Treating —— (P) ... 1190
And Goldthwaite, A. G. Starch; Manufacture of Laundry —— (P) ... 1190
Tollens, B. Pentosan Determination Method; Application of the —— ... 875
Pentoses and Pentosans; Determination of —— ... 875
See Browne, C. A., jun. ... 728
Tolman, L. M. Cotton Seed Oil; Modification for Beechi's Test for —— ... 643
And Munson, L. S. Oils; Refractive Indices of certain Vegetable —— ... 1238
Tolmann, C. *See* Freymann, O. ... 603
Toltz, M., and Lipschutz, A. Acetylene Gas (Compressed) Lighting System (P) ... 397
Tomlinson, F. Sewage and Foul Water; Purification of —— (P) ... 361
Tomlinson, T. Hydrocarbon Oils; Apparatus for Treatment and Utilisation of —— (P) ... 462
Tompkins, H. S. Burner for Lamps (P) ... 602
Tompkins, P. W. *See* Curtis, M. ... 1319
Tone, F. J. Carborundum Articles, and Making same (P) ... 1279
Iron and Steel; Manufacture of —— (P) ... 1234
Topaloff, W. *See* Bichringer, J. ... 966
Topham, C. F. Cellulose; Regulating Flow of Solutions of —— (P) ... 870
Textile Fibres from Solutions of Cellulose; Apparatus for Producing and Twisting —— (P) ... 969
Tortelli, M., and Pergami, A. Fatty Acids; Mean Molecular Weight of Insoluble —— ... 1187
Tossizza, C. J. Ores; Electrometallurgical Treatment of (P) ... 775, 1336
Zinc Ores and Blende; Electro-Metallurgical Treatment of —— (P) ... 980, 1031
Tourchaninoff, S. *See* Danilevsky, C. and A. ... 341
Tourle, A. B., and Arzt, H. Marine Signal Lights (P) ... 907
Towle Manufacturing Co. *See* Walker, W. H. ... 1538
Towne, A. L., and Clough, E. F. Acetylene Gas Generator (P) ... 604
Townsend, C. P. Aluminium; Metallurgy of —— ... 55
Trades Progress Co. *See* Miller, L. ... 1232
Tralls, L. Sewage; Purification of —— (P) ... 422
Transparent Cellulose Products Co. *See* Feval, L. ... 1151
Trantom, W. *See* Rank, J. ... 413
Trapp, S. M. Burner; Oil —— (P) ... 1324
Traver, A. F. *See* White, A. H. ... 1012
Travers, Morris W. "The Experimental Study of Gases" ... 78
Treadwell, F. G. Potassium Percarbonate as a Substitute for Hydrogen Peroxide in Analysis ... 72
Treichler, D. H. Acetylene Gas Generators (P) ... 907
Trenckmann and Co. Leather; Manufacture of Waterproof —— (P) ... 415
Tricart, A. *See* Babé, J. L. ... 1142
Trillat, A. Glycerin in Wine; Determination of —— ... 1560
Vanillin; Production of —— ... 66
See Adrian ... 874
Trillat, J. J. A. Formic Aldehyde Vapours; Composition for Production of —— (P) ... 1036
Tripp, E. J. *See* Dewar, J. L. ... 1191
Trivick, S. Ores; Treatment of Gold and Silver —— (P) ... 1141
Trollé. *See* Pampe ... 1389, 1417
Trotman, S. R. Kjeldahl's Method applied in the Tanyard; Discussion on —— ... 842
Wijs' Method of Determining Iodine Value of Oils and Fats; Discussion on —— ... 1439
And Peters, H. Cod Oils; Analysis of —— for Tanning Purposes ... 693
And Peters, H. Nitrates in Water; Determination of —— by the Indigo Carmine Method ... 694
Truchot, P. Copper; Analysis of Industrial —— ... 501
Vanadium; Electrolytic Determination of —— ... 991
Vanadium; Separation of —— from Molybdenum ... 991
Truchot and Agron. Alcoholic Liquids; Apparatus for Treating —— with Gases (P) ... 1407
Truesdell, A. E. Electrolytic Cell (P) ... 1540
Tschirch, A., and Heuberger, K. Rhubarb; Chinese —— 1153, 1551
And Koch, M. Manila Copal; Characteristics of —— ... 712
And Shirasawa, H. Camphor; Formation of —— in the Tree ... 1037
Tschugaeff, L. Organo-Magnesium Compounds as Reagents for the Hydroxyl Group ... 1559
Tucker A. E., and Cory, C. Fuel; Artificial —— (P) ... 459
Tucker, H. G. Burner for Crude Oil (P) ... 1068
Tucker, W. A. Moisture-proof Coating for Brick or Stone (P) 1079
Tueschel, G. Paint for Renovating Cane and other Furniture (P) ... 263
Varnishing; Process of —— (P) ... 1084
Tugendhat, B. *See* Ulrich, G. ... 769
Tulleken, J. E. *See* Sjollema, B. ... 1344
Tully, A. P. T. Electric Primary Cells (P) ... 1458
Tully, C. B. Methane-Hydrogen Water-Gas Plant at Sligo ... 1178
Turnbull, Dr. Thermo-Regulator; Discussion on New Form of —— ... 457
Turnbull, A. Leather Industry; Bacteria in the —— ... 179
Turnbull, T. T. *See* Quain, J. R. ... 907
Turner, C. Rendering Apparatus (P) ... 1238
Twyman, T. Tin; Separation of —— from Metals (P) ... 978
Tylaikow, N. Safflower Oil; Investigation of —— ... 864
Tyms, J. C. Bleaching Kier (P) ... 341
Bleaching Kier, with Circular Valves (P) ... 612
Tyrer, T. Alcohol Duty; Discussion on Effect of ——, on Chemical Industry ... 830
Nitrocellulose; Discussion on Will Test for —— ... 824
Proceedings of Annual Meeting ... 952, 954, 956

U

Ueberroth, W. W. *See* Young, F. S. ... 1126
Uhlmann, W. *See* Hartwich, C. ... 1285
Ulbrich, C., and Pommerhanz, G. Lubricant of Good Electrical Conductivity (P) ... 1543
Ulke, T. Metals; Electrolytic Separation of —— (P) ... 779
Metals; Refining of Composite —— (P) ... 486
Ullmann, F. Diphenyl Derivatives; Manufacture of —— (P) ... 38
Triphenylmethane; Properties of —— ... 853
And Consonno, P. Halogen Dinitronaphthalenes; Characteristics of —— ... 1272
And Goldberg, J. Monohydroxybenzophenones; Preparation of —— ... 1293
And others. 3'-Alkylammo-9-phenyl-1,2-naphthacridines ... 337
Ullrich, E., and Fussgaenger, V. Black Colour from Amino- and Hydroxy-amino-diphenylamine Compounds ... 1182
Ulmann, M., and Schlag, B. Aluminium; Soldering ——, and Material therefor (P) ... 553
Ulpiani, C., and Sarcoli, L. Prickly Pear Juice; Alcoholic Fermentation of —— ... 1288
And Sarcoli, L. Fig-Must; Alcoholic Fermentation of Indian —— ... 268, 1547
Ulrich, A., and Benade, C. Cotton Padded with β-Naphthol; Action of Heat, Moisture, and Steam on —— ... 1452
Ulrich, G., and Tugendhat, B. Wool; Mordanting —— with Chrome ... 769
Umney, J. C. Medicines; Standards for —— ... 1467
And Bennett, C. T. Neroli Oil; Chinese —— ... 1152
And Bennett, C. T. Olive Oil; Varieties and Tests of —— 1151
Underwood, W. J. Torch and Rocket; A Combined Marine —— (P) ... 927
Union Lead and Oil Co. *See* Bailey, J. W. ... 1337, 1337
Union Light and Heat Co. *See* Graf, J. J. ... 1128
United Alkali Co., The. *See* Duff, E. J. ... 33, 344, 697, 905
See McKechnie, D. ... 350
See Raschen, J. ... 979
United Asbestos Co. *See* Barratt, S. H. H. ... 1336
United States Distillation Co. *See* Goss, W. F. M. ... 1523, 1523
United States Glass Co. *See* Ripley, D. C. ... 1330
United States Indurated Fibre Co. Fibre-ware; Indurating —— (P) ... 636
Untiedt, H. Boiling, Evaporating, and Distilling Apparatus (P) ... 1322
Urbain, A. E. Carbon Tetrachloride; Manufacture of —— (P) ... 926
Urban, J. *See* Fremery, M. ... 1150
Utz. Cod-Liver Oils; Examination of —— ... 1403
Milk; Test for Boiled and Unboiled —— ... 280
Sesamé Oil in Chocolate; Detection of —— ... 642
Sesame Oil; Tests for —— ... 1196

V

Vahlen, E. Morphigenine and Episine ... 1294
Morphine; Relation of Chemical Constitution to Action of —— ... 926
Valenta, E. Printing-Colours; Determination of Covering Power of —— ... 339
Sensitisers for Gelatino-Bromide ... 638
Silver Images Bleached by Corrosive Sublimate; Blackening of ... 1469
See Eder, J. M. ... 1348

PAGE

Valerius, T. L. Pasteurising Apparatus (P) 869
Valeur, P. F. *See* Portland Cement Fabrik Hemmoor 1279
Vamosey, Z. von. Antiseptic, Disinfectant, and Purgative Preparations (P) 1154
Van Laer, H. Yeast; Special —— common in High-Fermentation Beers 1190
Van Slyke, L. L., and Hart, E. B. Cheese: Relation of certain Salts to American Cheddar —— 1290
Vandercook, W. A. *See* Livingstone, E. L. 1227
Vandervoort, H. *See* Lecocq, E. 1180
Vanino, L. Barium Sulphate as a Reagent for Solutions of Colloidal Metals 426
Formaldehyde in Solution: Gravimetric Determination of —— 193
And Hauser, O. Bismuth Nitrate; Action of Mannitol on —— 65
And Hauser, O. Bismuth Sulphocyanide; Double Compounds of —— with Potassium Sulphocyanide 66
And Hauser, O. Bismuth Trichloride and Tri-Iodide; New Compounds of —— 422
Varagniac. *See* Catton 1466
Varry, E. C. Photographic Prints; Apparatus for Producing —— by Artificial Light (P) 989
Vathis, S. Photographic Prints; Polychromatic —— (P) 1412
Photographic Prints; Production of Multicolour —— (P). 733
Vaubel, W. Dyestuffs, Azo: Presence of Diazo-amino and Diazohydroxy Compounds in —— 401
Vaucher, C. Gallocyanines 468
Vaughan, G. C. Tan-Bark: Apparatus for Leaching —— (P). 783
Vaupel, H. Cattle-Food containing Molasses; Manufacture of —— (P) 984
Vaux, C. *See* Briant, L. 180
Veillon, L. *See* Gnehm, R. 336
Velna, G. de. Coke; Manufacture of —— (P) 1178
Venter, O. Dyeing Loose Material, and Apparatus therefor (P) 310
Ventre Pacha. Sugar; Colorimetric Detection of Traces of —— 1040
Venuleth, W. Liquids; Apparatus for Concentrating —— (P) 439
Verbièse, F. Sucrase or Invertase in Industrial Fermentations 180
Verein Chemischer Fabr. and Clemm, A. Sulphuric Anhydride; Production of —— (P) 253
Verein Spiritus-Fabr. Yeast; Production of Artificial —— (P) 715
Vereinigte Chininfabr. Zimmer and Co. Cinchona Alkaloids; Carbonic Acid Ethers of —— (P) 988
Cinchona Alkaloids; Acidyl Derivatives of ——, and Manufacture thereof (P) 275
Di-Cinchona Alkaloid Carbonic Acid Esters; Manufacture of —— (P) 1204
Vereinigte Gummiwaaren-Fabrike Harburg-Wein. *See* Reithoffer, J. W.
Vereinigte Kunstseide Fabriken. Artificial Silk Threads and Ribbons (P) 968
Verheggen, W. J. H., and others. Eggs, &c.; Preservation of —— (P) 717
Vermont Farm Machine Co. *See* Kimball, P. L. 1548
Vernay, J. and J. B. Acid-resisting Lining (P) 1386
Verschoore, P. Vacuum Pump which cannot become Unsealed (P) 905
Vial, E. Sewage; Treatment of —— (P) 925
Viard, G. Cadmium, Mercury, and Tin; Precipitation of Chlorides and Bromides of —— 1076
Cuprie Chloride and Bromide; Precipitation of —— 1076
Vickerman, C. H. White Lead; Manufacture of —— (P) 1543
Vidal, H. R. Amino-hydroxyl Derivatives; Production of —— (P) 28
Dyestuffs, Sulphide; Production of —— (P) 471
Metallic Nitroso Derivatives of Phenols, Cresol, and Naphthol (P) 543
Paints and Dyes; Manufacture of —— (P) 1188
Phenol, Cresol, or Naphthol; Di- and Trinitro Derivatives of —— (P) 544
Vierdag, P. J. H. *See* Verheggen, W. J. H. 717
Viertel, H. *See* Gebr. Siemens and Co. 162
And Pueschel, C. Carbons for Arc Lights (P) 1446
Vigne, G. Vanillin; Manufacture of —— (P) 68
Vignon, L., and Bay, I. Nitric Esters; Saponification of —— . 1303
Vildorola, L. V. L. R. T. Copper; Production of —— (P) 739
Vilim, J., and Hanser, F. Photographic Half-Tones in Printing, &c. (P) 1296
Ville, J. Dyestuffs of the Triphenylmethane Series; New Red —— (P) 39
Dyestuffs, Triphenylmethane —— (P) 911
Villiger, V. *See* Bayer A. 607, 853, 1301, 1526
Vincent, C. Silver; Tellurium in Ingots of American —— 409
Virgoe, W. H. Cyanide Solutions containing Copper: Titration, Use, and Precipitation of —— 348

PAGE

Vis, G. N. Brine; Purification of —— (P) 913
Brine; Treatment of —— (P) 706
Brine; Vacuum Apparatus for Boiling (P) 914, 971
Vacuum Evaporating Apparatus (P) 761
Viscose Syndicate. Viscose; Treatment of —— (P) 65
Visser, L. E. O. de. Phosphorescence of Sulphides of the Alkaline Earths 565
Voelker, A. Glass Furnace; Electric —— (P) 1139
Glass; Manufacture of —— (P) 773
Glass; Manufacture of —— by Electrical Heating (P) 971
Voelker, R. Wall Coverings; Washable Embossed —— (P) .. 1277
Voelker, W. L. Filaments for Electric Lamps (P) 333
Voetter, E. Dyestuffs; Printing with Sulphide —— (P) 1231
Vogel, H. F. *See* Bramson, M. 1271
Vogel, L. H. *See* Harris, J. 1269
Vogelsang, A. Bleaching Linen Yarn or Thread (P) 1328
Bleaching Textiles; Electrolytic Method and Apparatus for —— (P) 612
Electrolytic Cells, and Electrodes therefor (P) 620
Vogt, A., and Recklinghausen, M. von. Liquid under Pressure; Apparatus for Production of —— (P) 458
Voigtlaender-Tetzner, W. *See* Schraube, C. 1530
Voll, C. H. de. Lamp; Hydrocarbon —— (P) 764
Vollmann, P. Malt for Beer to be Quickly Tapped; Production of —— (P) 359
Malt for Rapid Production of Matured Beer (P) 62
Volney, C. W. Sodium Nitrate; Decomposition of —— by Sulphuric Acid. III. 547
Volpert, F. Explosives; Manufacture of —— (P) 1039
Von Heyden, Chem. Fabrik. Acetyl-Quinine; Manufacture of —— (P) 1294
Acetyl-Salicylic Acid; Manufacture of Salts of —— 1296
Alkaline Salts of Aromatic Substances containing Hydroxyl Radicles (P) 39
Indoxyl or Indigo; Production of —— (P) 1181
See Hentschel, W. 1554
See Seifert, B. R. 1530
Von Soden and Henle. Oil of Rue; Algerian —— 424
Vongerichten, E. Apiose, a β-Hydroxymethylerythrose 566
Vorlaender, D. *See* Waugerin, A. 991, 1156
Vosburgh, H. E. Furnace; Reduction —— (P) 1538
Vosmaer, A. Ozonising Apparatus (P) 353
And Lebret, A. Liquids and Gases: Apparatus for Treating one with the other (P) 1292, 1523
Votoček, E. Rhodeose: Oxidation Products of —— 1353
Vozárik, A. Guanidine; Determination of —— 1041
Vreeland, C. D. Pigment; Production of a —— (P) 263
Pigment (White) and Paint Composition (P) 264
Pigment (White); Production of a —— (P) 264
Vrooman, N. L., and Kirkland, R. R. Paper-Pulp Screener (P) 1036, 1036
And Kirkland, R. R. Paper-Pulp Strainer (P) 271
Vulitch, Douschan de. Cementing Agent for Fuels and Minerals (P) 1446
And D'Orlowsky, J. Calcium Carbide; Manufacture of —— (P) 909
Vulté, H. T., and Gibson, H. W. Metallic Soaps from Linseed Oil; Solubility of —— in Hydrocarbons 551

W

Wachwitz, H., and others. Metals; Welding of —— (P) 176
Wacker, L. Anthraquinones; Hydroxyamino and Nitroso —— 400
Diazo Group; Replacement of the —— by the Amino Group 1129, 1528
Nitronaphthalenes; Reduction Products of the —— 542
Waddell, J. Nitrite; Determination of —— 641
Wafer, W. H. *See* Duncan, A. D. 963
Wagener, D. E. *See* Wilcox, J. F. 1323
Wagg, S. R. Paper Manufacture; Refining or Pulping Engines for —— (P) 986
Wagner, M. Acetylene Gas Apparatus (P) 34
Wagoner, L. Gold and Silver; Detection and Determination of —— 501
Wahl, A. Amines, Aromatic; Thiosulphates of —— 287
Wahlberg, A. Steel Ingots; Influence of Chemical Composition on Soundness of —— 774
Waite, C. N. Films; Manufacture of Cellulose —— (P) 272
Waite, T. Water; Apparatus for Softening, &c. —— (P) 1292
Wakely, W. Furnaces; Construction of —— (P) 599
Walbaum, H., and Huething, O. Cinnamon Oil from Ceylon . 1095
Walbinger, M. Pasteboard and Paper; Impregnation of —— (P) 1243
Waldbauer, J. Barium Chloride; Production of —— (P) 858

PAGE

Waldron. *See* Melland 861
Walker, J., and Warburton, G. Hexabromides of Glycerides and Fatty Acids 1144
Walker, J. H. Metals; Preventing Oxidation of Molten —— (P) 776
And Robertshaw, C. D. Rosin Oil; Determination of Mineral Oil in —— 1157
Walker, M. S. Gas Burner (P) 1180, 1180
Walker, S. *See* Hindley, E. 473, 613
Walker, W. H. Alloy of Silver (P) 1538
See Mork, H. S. 1345
Wallace, E. C. *See* Richardson, C. 316
Wallach, O. Terpenes and Essential Oils. 65, 1152, 1244, 1296
(Rahn, O.) Terpineol; Research on —— 1193
Wallerstein, M., and Freund, H. H. Wort and Yeast; Apparatus for Mixing and Aerating —— (P) 632
And Freund, H. H. Wort; Apparatus for Aerating —— (P) 360
Wallis, C., and Lagerwall, R. E. M. Roller Mills (P) 107
Wallis, H. W. Ores; Treatment of —— (P) 481
Walsh, G. E. Copper; Electrolytic Refining of —— 177
Walsh, T. Textiles; Apparatus for Steaming, Ageing, &c. —— (P) 613
Walter, C. M. Tanning and Leaching Apparatus (P) 1544
Walter, S. L., and Keiner, F. W. Copper; Hardening of —— (P) 916
Walter, W. Syrups; Apparatus for Cooling —— (P) 982
Walther, J. A. C. Carbonic Acid; Obtaining Organic Substances from —— (P) 988
Walther, R. E. Lamps; Incandescence Vapour —— (P) .. 333, 559
Walz, C. J. Disinfecting Apparatus (P) 985
Wangerin, A., and Vorlaender, P. Indigo; Volumetric Determination of —— 991
And Vorlaender, P. Oxygen Dissolved in Water; Titration of —— 1156
Wanklyn, J. Alfred. "Arsenic." Second Edition, revised 1043
Warburg, E. Ozone; Spontaneous Decomposition of —— 772
Warburton, G. *See* Walker, J. 1144
Ward. Alkaline Hydrate or Bicarbonate; Discussion on Estimation of —— 325
Ward, G. Iodine Value of Oils; Discussion on Determination of —— 456
Proceedings of Annual Meeting 951
Thermo-Regulator; Discussion on New Form of —— 457
Ward, G. J. Alumina; The Rôle of —— in Blast Furnace Slags 452
Insoluble Fruits for Pottery Glazes; Discussion on —— .. 322
Ward, J. Furnace; Portable Oil —— (P) 462
Furnaces; Construction of —— (P) 599
And International Oil Furnace Co. Furnace for Manufacture of Calcium Carbide, &c. (P) 461
Ward, J. W. Burners for Incandescence Gas Lighting (P) ... 333
Ward, W. Paint for Submerged Surfaces; Quick-Drying —— (P) 56
Wardle, W. Yeast; Preparation of —— for Manufacture of Food or Manure (P) 183
Wardwell, S. W. Yarn; Preparation of —— for Dyeing, &c. (P) 1025
Warin. Alkaloids in Kola Preparations; Determination of —— 1352
Cinchona succirubra Bark; Fluid Extract of —— 1467
Kola Nut and its Fluid Extract; Determination of the Alkaloids of —— 645
Warr, G. C., and Wright, W. T. Vegetable Fat; Manufacture of Edible —— (P) 262
Warren, F. J. Asphalt Cements, &c.; Manufacture and Use of —— (P) 1233
Cement Compositions; Making and Laying —— (P) 915
Warren, J. W. Hydrocarbon Oils; Purification of —— (P) .. 1070
Warring, F. B. *See* Caton, F. E. 1021
Wartenberg, H. *See* Comstein, W. 1541
See Fischer, T. 1345
Warth, H. Alumina and Ferric Oxide; Mutual Action of —— at Incipient White Heat 285
Washburn, G. P. Acetylene Gas; Apparatus for Generating —— (P) 638
Washington, G. Lamp; Incandescence Hydrocarbon —— (P) 1129
Wass, A. G. Printers' Varnish and Ink (P) 1032
Waterbury, G. H. Copper; Extraction of —— from Ores (P) 351
Watkins, H. C. *See* Schlotterbeck, J. O. 273, 423, 1346
Watling, A. *See* Bull, H. C. 349
Watson, W. S. Soap Press (P) 864
Watts, F. Citrate of Lime and Concentrated Lime Juice in the West Indies 442
Waxin, C. Cement or Artificial Stone (P) 1184
Way, H. E. Ore-testing Tablet (P) 1030
Weatherhead, A. J. and E. H. Furnace; Brass-founders' Melting —— (P) 483

PAGE

Weaver, B. Insulators; Material Suitable for —— (P) 64
Webb, J. F., and others. Metals; Recovery of Precious —— by Electrolysis (P) 485
Webb, T. G., and others. Concentrating Apparatus (P) 253
And others. Noxious Vapours, &c.; Apparatus for Exhausting and Condensing —— (P) 253
Webb's Patent, Ltd. *See* Webb, T. G. 253, 253
Webber, W. O. Compressed Air and Gases; Preheating and Moistening —— (P) 1020
Weber, A. Glass Tanks or Vessels for Fermenting, &c. (P) ... 1343
Weber, C. O. Antimony Sulphide; Analysis of Golden —— ... 1559
India-Rubber; Theory of Vulcanisation of —— 712
Latex and Rubber from Castilloa Elastica 1461
Sulphur in India-Rubber; Determination of —— 1560
And Cairns, A. India Rubber; Manufacture of Compounded —— (P) 264
And Frankenburg, Ltd. Textile Fabrics; Recovery of Volatile Solvents used in Treatment of —— (P) 968
Weber, F. C. Furnace; Electric Smelting —— (P) 1083
Metallic Oxides; Treatment of —— (P) 1142
Weber, F. C. R., and Rauschenbach, A. B. Earthenware; Drying ——, and Apparatus therefor (P) 549
Weber, F., jun. Furnaces; Construction of —— (P) 331
Weber, G. Stone; Production of Imitations of —— (P) 549
Weber, J. E. Lavender Oil; Adulteration of —— with Salicylic Acid 1244
Weber, W. Aseptic Preparation from Pancreas, and Production thereof (P) 271
Pancreas Preparation and Production thereof (P) 637
Webster, J. C. Solder for Aluminium (P) 1185
Wechsler, S. Colours for Printing; Preparation of —— (P) .. 782
See Adelsberger and Friedmann 1337
Weck, J. Sterilising Apparatus (P) 869
Weeks, J. W. Acetylene Gas; Apparatus for Generating —— (P) 1127
Weddell, G. Table Salt; Manufacture of —— (P) 421
Wedderburn, G. Lamp; Incandescence Carburetting —— (P) 1325
Wedekind, E. Monopersulphuric Acid; Action of Hydrochloric, Hydrobromic, and Hydrofluoric Acids on —— 1074
Zirconia; Reduction of —— 1561
Wedekind, R., and Co. Dyestuffs, Anthracene; Production of —— (P) 402
Weeks, J. W. Acetylene Gas Generator (P) 909
Wefers Bettink, H. Mannitol; Detection of —— 142
Wegelin, G. Soot; Manufacture of ——, and Apparatus therefor (P) 1022
Wegerer, H. Wood; Grinding Machine for —— (P) 788
Wehmeier, H. C., and Danbenbis, W. J. Mixing Apparatus (P) 959
Wehmer, C. Textile Fabrics; Spots on —— caused by Aspergillus Fumigatus 472
Wehrlin, A., and others. Photographic Printing Paper; Manufacture of —— in Alsace 1038
Weightman, A. T. Cathodic Reduction 1538
Weigl, J. Ethyl Alcohol; Bactericidal Action of —— 1466
Weigmann, H. Lactic Acid; Indirect Determination of —— . 428
Weil, E. L., and Evans, T. W. Acetylene Gas Generator (P) . 604
Weil, F. Stannous Chloride; Volumetric Determinations of Copper, &c., by means of —— 191
Weiler-ter Meer, Chem. Fabriken vorm. Dyeing Piece Goods with Sulphur Dyestuffs (P) 1328
Dyeing Process for Sulphide Dyestuffs (P) 547
Dyestuff; Sulphide, Black —— (P) 112
Dyestuff; Sulphide —— for Cotton (P) 112
Dyestuffs; Blue-Black; Manufacture of —— (P) 39
Dyestuffs, Sulphide; Manufacture of —— (P) 966, 967
Reduction by Means of Iron and an Alkali (P) 402
Weiß, S. Marble; Manufacture of Imitation —— (P) 1078
Wein, H. *See* Duflek, A. 697
Weinberg, A. Dyestuffs; Blue Azo —— for Wool (P) 968
Dyestuff; Brown-Violet Sulphur —— (P) 911
And Herz, R. Dyestuffs, Sulphide; Production of Blue —— (P) 471
And Lange, O. Dyestuff; Yellow Sulphur —— (P) 1530
Weinrich, M. Massecuite; Apparatus for Purifying —— (P) . 630
Massecuites, &c.; Apparatus and Process for Treating —— (P) 1463
Raw Sugar; Purifying and Preserving —— (P) 1545
Weintraub, N. Acetone Sulphite; Use of —— in Photographic Laboratories 1154
Weisberg. Saccharine Juices; Purification of —— (P) 1496
Weisenfeld, M. Malt Grain; Germinating —— in the Steeping Trough (P) 131
Weiss. Printing with Sulphur Dyestuffs (P) 1533
Weiss, J. B., and Anderson, L. C. Liquids; Apparatus for Saturating —— with Gases (P) 408
Weiss, K. *See* Fischer, O. 400
Weiss, L. *See* Muthmann, W. 412
Weiss, R. Discharges with Powdered Aluminium and Magnesium 473
Dyeing and Bleaching Apparatus (P) 1393
Dyeing Apparatus (P) 1074

PAGE

Weissberg, I. Dyestuff, Black, containing Sulphur; Manufacture of —— (P) 39
Welch, E. K. Mortar Composition (P) 1140
Welch, J. W., and others. Sewage: Apparatus for Treatment of —— (P) 787
Wellman-Seaver-Morgan Engineering Co. *See* Seaver, J. W. . 1179
Wellman, S. T. and C. H. Coke Ovens (P) 397
Welmans, P. Theobromine in Cocoa; Determination of —— . 1476
Welsbach, C. F. Auer von. Anodes; Manufacture of Carbon —— (P) 1282
Batteries; Secondary —— (P) 124
Wenck, A. Molasses; Manufacture of Spirit from —— 1289
Wenghoeffer, L. Picric Acid; Manufacture of —— (P) 68
Wennmackers, E. Sulphuric Acid; Manufacture of —— by Contact Process (P) 1394
Wenzel, A. *See* Nobis, L. 1079
Wenzel, W. Sulphurous Acid; Apparatus for Making —— (P) 1027
Wernecke, E. Filter-Press; Rotary —— (P) 459
Werner, A. Y., and Ellis, P. B. Rubber-like Gum from Greasewood; Extraction of —— (P) 626
Werner, J. Syrup Cooler (P) 781
Werner, W. A. P. Filaments: Apparatus for Producing Fibreless —— (P) 614
Wernicke, O. H. L. *See* Roach, W. G. and A. C. 858
Wesener, J. A. Nitrogen (Kjeldahl) Apparatus 639
Wessell, C. Spelter; Refining —— (P) 710
Wessling, H. *See* Gibson, W. H. 915, 915
Wesson, M. B. *See* Lewis, T. E. 962
Westergren, J. Silk: Properties of Artificial —— 1452
See Strehlenert 113
Westfalisch-Anhaltische-Sprengstoff-Actienges. Blasting Compositions (P) 1471, 1171
Westinghouse. Copper; Treatment of Minerals of —— (P) .. 1457
Westinghouse, G. Gas; Production and Utilisation of —— (P) 851
See Knox, W. J. 1400
See Potter, H. N. 1325, 1325
Wetherhill, W. C. Furnace for Zinc Production (P) 1401
Weyermann, M. Roasted Malt Decoctions; Production of Tasteless —— (P) 923
Weygang, C. Oils, Fats, &c.; Treatment of —— (P) 1403
Weyl, T. Ozone; Manufacture of Compounds of Fatty Acids and their Derivatives with —— (P) 637
Wezel, J. Paper; Preparation of Coated Printing (P) ... 114
Wharton, F. M. Fibres and Textiles; Waterproofing and Preserving —— (P) 912
Wharton, J. M. *See* Dye, W. H. 1068
Wheelwright, C. S. Garbage; Apparatus for Cooking —— (P) 1285
Sulphate of Lime; Apparatus for Draining —— (P) 1534
Whinery, S. B. Blue-printing Apparatus (P) 1349
Whipp Bros. *See* Perkin, W. H., jun. 857
And Todd. *See* Perkin, W. H., jun. 1531
White, A. H. Alums; Aluminium and Sulphuric Acid in; Determination of —— 793
See Russell, H. 1029
And Traver, A. F. Incandescent Mantle; Theory of the —— 1012
White, B. C. Briquettes; Machine for Moulding —— (P) 599
White, F. R. Hydrocarbon Oils; Apparatus for Burning —— (P) 906
White, H. Resists under Indigo on Textile Fibres (P) 1230
White, J. Emergencies in Vitriol Works; Discussion on —— 229
Paper-Pulp; Apparatus for Straining —— (P) 493
Wijs' Method of Determining Iodine Values; Discussion on —— 1439
White, J. A. *See* Moore, J. W. 494, 635
White, J. H. and E. L. Match-making Machinery (P) 125
White, W. G. Indigo; Producing Discharge and Resist Effects on and under —— 702
White, W., jun. Steel; Manufacture of —— (P) 619
Whiteley, H. *See* McKenna, W. S. 460
Whitfield, C. Gas; Apparatus for Generating, Purifying, and Storing Combustible —— (P) 961
Whitham, F. E. Grinding Apparatus for Reducing Minerals, &c. (P) 1455
Whitney, F. L. Wool and Fibre; Apparatus for Scouring —— (P) 1551
Whittaker, C. M. Black-dyed Cotton: Examination of —— .. 1021
Wiborgh, J. G., and Palmaer, W. Manure: Manufacture of from Apatite (P) 1189
Wichelhaus, H. Sulphur Trioxide; Apparatus for Experiments with —— 276
Wichmann, G., and Gabler, M. Hexamethylenetetramine Quinate (P) 275
Wickham, D. Beer; Apparatus for Cooling and Aerating —— (P) 1407
Widmar, W. Hydroxycinchotine 135

PAGE

Wiederhold, O. Gas-Burners for Use with Incandescence Mantles (P) 1269
And Morse, G. E. Mantles; Machine for Saturating Incandescence (P) 908
Wiese, C. C. A. E., and Groeschner, C. F. M. Buoys or Signals; Illuminating —— (P) 540
Wijs, J. J. A. Iodine Monochloride; Use of —— in Iodine Absorptions 930
Wilbert, M. I. Photographic Image; Reversal of the ——, and Subsequent Development in Actinic Light 638
Wilcox, C. L. Evaporator for Sugar Juice (P) 650
Wilcox, J. F., and Wagener, D. E. Retort Coke Oven (P) 1323
Wild, R. C. Solidified Spirit (P) 241, 1226
Wilderman, M. *See* Edser, E. 125
Wilding, E. *See* Arzt, H. 924
See Davies, M. P. 786
Wildt. *See under* Ruijter de Wildt.
Wilhelm, P. Indigo: Reduction of —— 545
Wilkes, M. Hydraulic Presses; Swinging Table for —— (P) . 1286
Wilkins, M. P., and Aspinwall, H. C. Powder: Machine for Granulating —— (P) 498
Wilkinson, C. R. Malted Grain: Drying of —— (P) 360
Wilkinson, J. Building Materials; Slabs or Plates for Use as —— (P) 118
And others. Carburetter (P) 764
Wilkinson, J. P. *See* Barr, J. 717
Wilkinson, W. S. Paving Material; Manufacture of —— (P) 1397
And Burchinal, C. H. Asphaltic Paving Composition (P) 1139
Will. Beer; Pasteurised —— 1464
Will, W. Nitrocellulose; Researches on the Stability of ——. 1470, 1554
Willame. Copper; Electrolytic Determination of —— 502
Williams, A., and Parkin, W. C. Celluloid; Rendering —— Non-inflammable (P) 719
Williams, D. T. Vanadium: Estimation of —— 389
Williams, E. B. Sugar Cane Diffusion Process (P) 266
Williams, J. Textile Fabrics; Water-Proofing and Rot-proofing —— (P) 1132
Williams, J. H. Coating Metal Plates; Apparatus for —— (P) 710
Williamson, A. D. Acetylene Gas Generator (P) 765
Acetylene Gas Purifier (P) 606
Williamson, J. A., and Dupré, L. W. Translation of Krauch's "The Testing of Chemical Reagents" 1477
Willis, G. M. Separator for Storage Battery (Glass Wool) (P) 485
Willis, R. H. Cement; Adhesive ——, and Manufacture thereof (P) 415
Wills, E. C. Steel; Apparatus for making —— (P) 977
Willshear, E., and Amos, E. C. Furnaces; Refuse Destructor —— (P) 361
Willstaetter, R. Tropidine; Conversion of —— into Tropine . 871
And Fourneau, E. Lupinine; Characteristics of —— 1193
And Fourneau, E. Lupinine; Investigation of —— 871
Wilmotte, C., and Goddyn, M. Iron and Steel. Manufacture of —— (P) 976
Wilson Filter Syndicate, The. *See* Wilson, J. 1224
Wilson, C. J. *See* Heist, L. G. 963
See Mason, J. A. 244
Wilson, E. Aluminium Alloys; Electrical Conductivity of certain —— 1283
Aluminium; Progress in the Manufacture of —— 175
Wilson, G. M. Chlorine and Caustic Soda; Electrolytic Apparatus for Production of —— (P) 476
Wilson, H. Maclean, and Halliwell, E. D. Indigo Waste Waters 702
Wilson, J. Filter-Press (P) 761
Filter-Presses, &c. (P) 904
Mantles for Incandescence Gas-Lighting (P) 698
And others. Filter Presses (P) 1224
Wilson, S. E. Garbage: Method and Apparatus for Treating —— (P) 1292
Wilson, T. M. Brick-kiln (P) 1397
Wilson, W. W. *See* Calico Printers' Association 703
Wilton, T. Liquids: Apparatus for Raising and Forcing —— (P) 967
Wimmer, O. B. *See* Buecka, H. J. 717
Winand, P. Gas for Driving Engines; Rapid Production of —— (P) 1178
Liquids, Vapours, and Gases; Apparatus for Purifying —— (P) 1523
Winch, A. Acetylene Gas Generator (P) 1069
Winckler, F. Soda; Obtaining —— in Small Crystals (P) ... 1533
Wincott, G. P. *See* Smith, J. B. 762
Windham, F. Acetylene Gas Generators (P) 1067
See Woodhall, J. W. 245
Windhausen, F., sen. and jun. Refrigerating Machines (P) .. 760
Windisch. Malt Analysis 1240
Malt; Sulphuring of —— 61
Windisch, K. Fluorine in Musts and Wines 62
Wines; Natural Occurrence of Salicylic Acid in —— 089

PAGE

Windisch, W. Barley; Nature of the Proteolytic Enzyme of Germinated —— ... 1463
Barley; Steeping of —— by Alternate Water and Air ... 418
Filter-Presses for Brewery Mashes ... 716
Filter Presses instead of Mash Tun in the Brewery ... 785
Lager Beer; The Cellarage of —— ... 1463
Malt; Advantages of Aerating and Steeping Alternately ... 61
Malt; Sulphuring of —— ... 1190
Malt; Yield of Extract in —— ... 631
And Hasse, R. Brew-house Work; Sources of Error in Control of —— ... 983
And Hasse, R. Malting; Studies on —— ... 1340
And Hasse, R. Mashing Process; Course of Transformation of Starch and Albumin in the —— ... 557
Wing, H. H. Alum; Obtaining —— (P) ... 1534
Calcium Sulphate and Bye-Products; Obtaining —— (P) 1534
Hydrogen Sulphide; Manufacture of —— (P) ... 254
Magnesium Sulphite; Manufacture of —— (P) ... 254
Wingate, H. Ores; Direct Cyaniding of Wet Crushed —— in New Zealand ... 1456
Zinc Precipitate obtained by Cyaniding Ores; Treatment of —— ... 1456
Winkelmann, A. Palladium; Diffusion of Hydrogen through —— ... 77
Winkle, E. van. Oil; Extraction of —— from Cotton-Seed (P) 263
Winkler, C. "Handbook of Technical Gas Analysis" ... 729
Winkler, L. W. Albuminoid and Proteid-Ammonia; Determination of ... 1041
Sulphuretted Hydrogen in Mineral Waters; Determination of —— ... 190
Winkler, O. Paper; New Zealand Flax as Raw Material for —— ... 1192
Winship, W. E. Batteries; Active Material for Secondary —— (P) ... 1031
Winsloe, R. H., and Hart, B. Sulphuric Acid; Apparatus for Manufacture of —— (P) ... 1183, 1183
Winteler, F. Bleaching Powder; Formation of —— ... 1075
Hydrofluoric Acid, Aqueous; Determination of Strength of —— ... 277
Winter, J. L. Matrix; Paste-board —— (P) ... 636
Winter, K. Beer; Influence of Different Malting on Character of —— ... 1342
Wintgen, M. Food Preparations from Vegetable Protein ... 633
Winton, A. L. Foods; Use of Coal-Tar Dyestuffs in —— ... 1291
And Ogden, A. W. Lemon Extract ... 1295
And Ogden, A. W. Macaroni, Spaghetti, Vermicelli, and Noodles ... 1290
And Ogden, A. W. Orange Extract ... 1295
And Silverman, M. Vanilla Extract ... 1300
Winton, H. D. Cereal Food; Preparation of —— (P) ... 1549
Cereal Foods; Preserving —— (P) ... 1549
Wirth, E. Nitro Compounds; Reduction of Aromatic —— (P) 1181
Wisbar. *See* Dalén, G. ... 1466
Witt, G. E. Burner for Crude Oil (P) ... 462
Witt, Dr. O. N. "Die Chemische Industrie des Deutschen Reiches im Beginne des zwanzigsten Jahrhunderts" ... 1252
Wittenberg, W. W., and others. Rubber; Vulcanising, &c. —— (P) ... 1286
Witter, H. *See* Bamberger, E. ... 467
Woch, O. G. Malt Analysis; Limits of Applicability of Results of —— ... 1240
Wodicka, G. W. Wall Finish, and Making same (P) ... 1279
Woehler, L. *See* Engler, C. ... 257
Wochlk, A. Citric Acid in Milk; Detection of —— ... 564
Citric Acid; Reaction of —— with Bromine and Potassium Permanganate ... 564
Woelbling, F. *See* Liebermann, C. ... 854
Woestelandt, F., and Monraux, L. Saccharine Juices; Decoloration and Defecation of —— (P) ... 558
Wogrinz, A. *See* Fraenkel, S. ... 797
Wohl, A. Acetyl Chloride; Manufacture of —— (P) ... 1411
Gas Analysis by means of Flasks ... 1412, 1413
Sugar; Extraction of —— from its Solutions (P) ... 1190
And Kollrepp, A. Sugar; Recovery of —— (P) ... 630
Wohlfahrt, T. *See* Elbs, K. ... 1335
Wohlgemuth, J. *See* Neuberg, C. ... 1103
Wojczynski, M. *See* Wróblewski, A. ... 266
Wolf, A. Composition for Coating Surfaces (P) ... 56
Wolf, C. Dyeing Apparatus for Yarn (P) ... 912
Fibre; Apparatus for Dyeing, &c. —— (P) ... 50
Textiles; Apparatus for Dyeing and Bleaching —— (P) ... 771
Wolf, H. Incandescence Mantles; Incinerating, &c., and Apparatus (P) ... 1127
Wolfe, J. S., and Englert, L. K. Alloys; Production of —— (P) ... 411
And others. Copper Alloy (P) ... 350
Wolff, A. *See* Pouteaux, A. ... 260
Wolff, H. R. Centrifugal Machine for Sugar (P) ... 1546
Wolffenstein, R. Peroxide Preparations; Manufacture of —— (P) ... 51
Wolfs, H. *See* Behrend, P. ... 1148
Wollaston, J. R. *See* Welch, J. W ... 787

PAGE

Wollaston, T. R. Water; Apparatus for Softening —— (P) ... 559
Wollheim, H., and Baumert, P. Lamp; Incandescence Spirit —— ... 1390
Wolskel, A. Asphalt; Preparation of —— (P) ... 347
Woltereck, H. C. *See* Dibdin, W. J. ... 1127
Wood. Alumina in Blast Furnace Slags; Discussion on —— ... 453
Wood, A. *See* Gray, A. ... 1184
Wood, G. *See* Page, A. D. ... 852
Wood, H. E. China; Use of Bone in English —— ... 1454
Wood, J. C. *See* Lambourne, W. T. ... 599
Wood, J. S. Acetylene Gas Generator (P) ... 765
Wood, J. T. Kjeldahl's Method Applied in the Tanyard; Discussion on —— ... 841
Wood, T. J. *See* Major, J. ... 310
Wood, W., and Bartlett, H. "Woodite"; Manufacture of —— (P) ... 264
Woodhall, J. W., and Windham, F. Calcium Carbide; Use of Naphthalene with —— ... 245
Woodman, A. G. Waters; Significance of Phosphates in Natural —— ... 1242
Woolcock, W. J. Phenazone, Sodium Salicylate, and Magnesium Sulphate; Interaction between ... 422
Worel, K. Colour Photography ... 1097
Workman, O. P. *See* Klein, E. ... 1408
Worms, R. Lamp; Incandescence Vapour —— (P) ... 1269
Worms, W. W. Albumin; Crystalline —— from White of Crows' Eggs ... 144
Worthley, N. T. *See* Heaton, J. ... 164
Wousseu, H., and Caussin de Perceval, P. Glucose and Maltose; Production of —— (P) ... 60
Wrana, J. Brewers' Pitch; Causes of Greyness in Cask —— ... 868
Wrede, F. *See* Rabien, F. ... 715
Wright, C. M. P. Concentrates; Cyaniding —— by Percolation 1456
Wright, J. Casks; Detection of Abstraction of Contents from —— (P) ... 1224
Wright, J. M. *See* Blakely, H. ... 348
Wright, R. Aerated Liquids; Manufacture and Supply of —— (P) ... 924
Wright, R. G. *See* Guehin, R. ... 466
Wright, W. Feed-Water Heater (P) ... 596
Wright, W. T. *See* Warr, G. C. ... 262
Wrightson, W. P. Printing Machine for Carpets and Linoleum (P) ... 1133
Wroblewski, A., and others. Enzymes; Action of —— one on another ... 266
Wuensch, A. Chrome-Tanning; Process of —— (P) ... 1544
Wuerster, C. Paper; Sizing of —— (P) ... 636
Wulff, G. *See* Freund, M. ... 871
Wulkan, H. Starch and Zein; Obtainment of —— (P) ... 630
Wurster, C. Paper, &c.; Machine for Tearing up —— (P) ... 271
Pulping Machine (P) ... 271
Wyman, H. B. Filter; Oil —— (P) ... 625
Wyrouboff. Prussian Blue; Solubility of ... 1337
Wyss, G. Carbonylferrocyanides; Action of Light on —— ... 932
Thionyl Chloride; Use of —— in Manufacture of Acetic Anhydride ... 1467

Y

Yancey, A. Acetylene Gas; Apparatus for Generating —— (P) ... 699
Yeiser, H. C. *See* Roach, W. G. and A. C. ... 858
Young, A. S. *See* Rumney, W., and Co. ... 340
Young, F. S., and Griffiths, W. S. Magnesium Carbonate; Manufacture of —— (P) ... 872
And Uehlroth, W. W. Filter (P) ... 1123
Young, J. A. Ammonia Generator (P) ... 1278
Young, J. B. *See* Job, R. ... 693
Young, J. H. Metals; Compound for Cleaning and Soldering —— (P) ... 1538
Young, R. F., and Baker, B. F. Cement Analysis ... 1298
Young, S. Alcohol, Absolute; Preparation of —— ... 721
Mixtures of Constant Boiling Point ... 1560
And Fortey, E. C. Alcohols; Properties of Mixtures of the Lower —— with Benzene, &c. ... 721
And Fortey, E. C. Alcohols; Properties of Mixtures of the Lower —— with Water ... 720
And Fortey, E. C. Fractional Distillation as a Method of Quantitative Analysis ... 726
Young, W. L. Fire extinguishing Apparatus; Chemical —— (P) ... 761
Yousbasheff, L. Ore or Fuel; Manufacture of Artificial Blocks of —— (P) ... 410

Z

PAGE

Zaloziecki, A., and Frasch, G. Petroleum; Investigation of Galician —— 335
Zamaron, J. Beet-Juice: Defecation of —— with Minimum of Lime 1239
Zanner, A. Sulphuric Acid; Apparatus for Concentrating —— (P) 476
Zdarek, E. Mercury Tannate of Constant Composition: Preparation of —— 789
Thymol, Volumetric Determination of —— 875
Zdvihal, F. *See* Andrlik, K. 920
Zega, A. Fungi; Composition of Edible —— 268
Lubricating Oils; Determining the Viscosity of —— 1083
Ziegenbein, H. Digitalis Leaves; Valuation of —— 1294
Ziegler. *See* Fellner 1535
Zeisel, S., and Fanto, R. Glycerin; Determination of —— ... 992
And Stritar, M. J. Cellulose; Determination of —— 642
Zeitschel, O. *See* Hesse, A. 1102
Zelinsky, N. D. Petroleum; Aromatic Hydrocarbons from —— 166
Zerban, F. *See* Hofmann, K. A. 368
Ziegler. *See* Fellner 479, 550
Ziegler, M. Furnaces for Coking Peat, &c. (P) 1127
Zikes, H. Brewing Water; Value of Analysis of —— 1147

PAGE

Zilles, H. Wool-Paper; Manufacture of —— (P) 494
Zimmer, C. L. V. Insulating or Protective Compounds (P) ... 1540
Zimmermann and Co., Chem. Fabrik vorm. Colouring Matters; Green-Black —— containing Sulphur (P) 169
Zingg, E. K. Paint Oil; Composition of —— (P) 414
Zinno, S. Tartaric Acid: Synthesis of —— from Scientific and Industrial Points of View 986
Zoder, G. W., and Hayne, W. P. Press for Oleaginous Substances (P) 487
Zoeppritz, R. *See* Dimroth, O. 467
Zolnlen, O. Auramine: Action of Dimethylsulphate on Michler's Ketone and —— 1390
Zschiedrich, G. E. Covering for Floors, Walls, &c. (P) 918
Zschocke, R. *See* Labhardt, H. 484
Zsigmondy, R. Ceramic Objects; Producing Coating of Metallic Lustre on —— (P) 707
Colloids: Deep Red Gold Solution as a Reagent for —— .. 192
Glass; Composition for Ruby —— (P) 1027
Solutions; Colloidal —— 1250
Zuber, E. *See* Wehrlin, A. 1038
Zucker and others. *See* Haas, H. L. 1281
Zuckschwerdt, S. Bricks; Treatment of Refractory —— (P) . 1233
Potassium Cyanate; Production of —— (P) 1278
Zuehl, E. Caoutchouc; Regeneration of —— (P) 865
Celluloid; Composition Resembling —— (P) .. 65, 65, 65, 65, 65
Celluloid-like Substance; Manufacture of —— (P) 719
Pyroxylin Compound (P) 870
Zweek, J. L. Photographic Flash-Light Lamp (P) 497
Zwermann, C. H. Enamel-sifting Apparatus (P) 1232

INDEX OF SUBJECTS.

N.B.—In this Index, (P) indicates that the matter referred to is an abstract of a patent; (T.R.) indicates that the matter referred to is in the Trade Report.

A

PAGE

Abrasive Materials: Production of ——. (P) Pearson 1224
Absinthe; Examination of ——. (Hubert) 131
Absorbing Apparatus. (P) Sastmann 695
Abyssinia; Wax Exports of ——. (T.R.) 200
Accumulator Industry in Germany. (T.R.) 1422
Accumulators. *See under* Batteries.
Acetate of Soda and of Lime Duty-free in the Netherlands. (T.R.) 199
Acetates: Velocity of Saponification of Monose- and Biose- ——. (Kremann) 906
Acetic Acid, Anhydrous: United States Customs' Decision on ——. (T.R.) 199
Duty-free —— in the Netherlands. (T.R.) 1208
In Lead Accumulators. Determination of ——. (Formenti) 427
Manufacture of ——. (P) Glock 721
With Nitric Acid: Compound of ——. (Pictet and Genequand) 1250
Production of ——. (P) von Hoelstetter 1469
Acetic Anhydride: Manufacture of ——. (P) Kessler 561
Use of Thionyl Chloride in the Manufacture of ——. (Wyss) 1497
Acetochloroglucose and Acetochlorogalactose; Synthetic Researches with ——. (Skraup and Kremann) 144
Acetonalkamins; Acidyl Derivatives of Unsymmetrical ——. (P) Harries 364
Acetone Bisulphite; Applications of —— in Photography. (Eichengrun) 1411
Aze Compounds of Acetyl. *See under* Dyestuffs.
Distilling Wood for Manufacture of ——. (P) Péreire and Guignard 541
Manufacture of ——:
(P) Hawliczek 246
(P) Péreire and Guignard 1096
Manufacture of —— from Saccharine Substances. (P) Péreire and Guignard 541
Oil. *See under* Oils.
Sulphite; Use of —— in Photography:
(Precht) 1245
(Weintraub) 1154
Acetonitriles: Phenylamino-. *See under* Dyestuffs.
Acetonitromaltose. *See under* Heptacetylmaltose.
Acetophenone; Nitro- and Amino-. (Camps) 495
Acetsalicylphenetidine, and Manufacture of same. (P) Summers 1154, 1154
Acetyl-cellulose; Manufacture of ——. (P) Landsberg 719
Chloride; Manufacture of ——. (P) Kessler 561
Chloride; Preparation of ——. (P) Wohl 1411
Derivatives of the Two Methylglucosides. (Moll van Charante) 728
Salicylic Acid; Manufacture of Salts of ——. (P) Ellis. From Chem. Fab. von Heyden 1296
Acetylene; Acid Nature of ——. Billitzer) 995
And Calcium Carbide; Some Reactions of ——. (Sandmann) 932
Electro-chemical Studies on ——. (Billitzer) 796
Gas. *See under* Gas.
Hydrocarbons; Condensation of —— with Aldehydes. (Moreu and Desmots) 429
Achroodextrine. *See under* Dextrin.
Acidimetry; Use of Electrolysis of Copper Sulphate as Basis of ——. (Lange) 1473
Acids, Alkalis, and Salts. (Class VII.) 51, 114, 171, 250, 343, 406, 475, 547, 614, 705, 772, 858, 913, 969, 1026, 1074, 1135, 1183, 1231, 1277, 1329, 1393, 1453, 1553
Amino-, as Foods for the Lower Plants. (Emmerling) ... 996
Free, formed during Hubl's Reaction: Origin and Nature of ——. (Ingle) 587
Of the Acetic Acid Series; Solubilities of Calcium Salts of the ——. (Lumsden) 343
Acid-proof Materials. (P) Abrey 1282
Acid-proofing Composition: Production of —— (P) Henney .. 979
Acocantherin; A Contribution to the Knowledge of African Arrow Poisons. (Faust) 1468
Acridines. *See under* Dyestuffs.
Hydroxylated: Manufacture of ——. (P) Ransford. From Cassella and Co. 37
Acrolein. *See under* Dyestuffs.
"Activating" Actions of Reducing Substances, &c. on Oxidising Compounds. (Schaer) 1102
Adaptor for Vacuum Distillation. (Patterson) 456
Address; Changes of —— 3, 92, 155, 212, 300, 380, 448, 526, 581, 664, 743, 814, 891, 949, 1012, 1063, 1124, 1175, 1216, 1256, 1329, 1364, 1451, 1490
Presidential —— 803
Adhesive Composition. (P) Hall 627
Material from Residues of Starch Manufacture. (P) Hoyt 1288
Material; Manufacture of ——. (P) Ekman 358
Mediums; Manufacture of ——. (P) Schmalfuss ... 416, 1405
Adhesives: Preparation of ——. (Andés) 57
Adluma Cirrhosa; Alkaloids of ——. (Schlotterbeck and Watkins) 1346
Aerating Apparatus. (P) Gwynne and Sargeaunt 1322
Aerogen Gas. *See under* Gas.
Aesculetin Derivatives. *See under* Dyestuffs.
Africa, British Central; Export Duty on Rubber from ——. (T.R.) 1115
Congo Free State; India-Rubber in the ——. (T.R.) 937
East; Earth-Nuts capable of Growth in ——. (T.R.) ... 651
East; Rubber and Mangrove Bark in ——. (T.R.) 1311
German East; Gums of ——. (Mannich) 1337
German New Guinea; Gutta-Percha and Rubber in ——. (T.R.) 733
Gold Coast; Rubber Exports of the ——. (T.R.) 652
Natal; Excise Duty on Spirits in ——. (T.R.) 734
Orange River Colony; Trade of ——. (T.R.) 1110, 1478
Portuguese East; Alcohol in Quilimane ——. (T.R.) 1208
Portuguese East; Brick Manufacture of Quilimane ——. (T.R.) 1206
Portuguese; Exports from ——. (T.R.) 507
Soudan; Rubber Forest in the ——. (T.R.) 652
South; Chemical Imports of ——. (T.R.) 145
South; Chemicals in ——. (T.R.) 1421
South; Coal and Coalfields of ——. (T.R.) 1256
South; Cyanide Treatment of Slimes on the Rand ——. (T.R.) 1421
South; Dynamite in ——. (T.R.) 1118
South; Imports of Drugs and Chemicals by ——. (T.R.) 568
West; New Pepper from ——. (T.R.) 1355
West; Sugar in ——. (T.R.) 1115
Agar-Agar; Industrial Use of —— in Russia. (Sokotow and others) 420
Agave Fibre Industry; The —— 185
Ageing Apparatus. (P) Hebden 474
Agglutinating Material. (P) Ingham 163
Agitating Apparatus. (P) Dolphin 959
Apparatus for Wood-Pulp. (P) Martinson 1263
Air and Gas; Apparatus for Mixing ——. (P) Broichgans ... 1324
Apparatus for Compressing, Cooling, &c. (P) Naef 1126
Apparatus for Moistening ——. (P) Richter 362
Carburetted-; Preparing and Utilising ——. (P) Beck and Dior 1021
Carburetting ——, and Apparatus therefor. (P) Notkin.. 163
Carburetting ——, and Means therefor. (P) Hartridge .. 163
Carburetted ——. *See under* Gas, Aerogen.
Compressed; Pre-Heating and Moistening of ——. (P) Webber 1020
Disinfecting Power of Hot ——. (Von Schoumburg) 1466
From Room of Museum and Art Gallery, Birmingham; Examination of ——. (Frankland) 1091
Hydro-carburetted —— for Motor Car Engines. (P) Stanley 1066
Hydrocarburetted-; Obtaining and Utilising ——. (P) Thompson 539
Liquid; Apparatus for Industrial Production of ——. (P) Pictet 407
Liquid; Production of ——, and Apparatus therefor. (P) Hess 345

PAGE

Air—*cont.*
Means for Regenerating and Purifying —. (P) Desgrez and Balthazard 185
Of Rooms; Device for Removing Impurities from —. (P) Breuer 655
Separating Fluids Rich in Oxygen from —. (P) Le Sueur 476
Vitiated; Determination of Carbon Monoxide and Dioxide in —. (Jean) 1473

Albumin: Action of Caustic Alkalis on —. (Paal) 996
Digestion of — by Papayotin. (Emmerling) 421
From Egg; Carbohydrate Groups in —. (Neuberg) ... 136
From White of Crows' Eggs; Crystalline —. (Worms) 144
Milk-; Preparation of Soluble —. (P) Denham 1291
Transformation of — during the Mashing Process. (Windisch and Hasse) 557
Vegetable: Extraction of —. (P) Gaertner 1344
Yeast; Preparation of —. (Schroeder) 1418

Albuminoids; Influence of the Medium on the Properties of —. (Starke) 132
Of Cows' Milk; Research on —. (Simon) 132

Albuminoid Substances: Differentiating — by Fractional Precipitation. (Effront) 642
Substances; Obtainment of — from Carbonic Acid. (P) Walther 988
Substances: Obtainment of — from Blood. (P) Jolles . 1191

Alcohol, Absolute: Preparation of —. (Young) 721
Acetone Oil for Denaturing —. (Baechlin) 1271
As a Source of Motive Power. (Behrend) 1019
As an Illuminant. (Denayrouze) 1268
Butyl; Occurrence of Normal — in Corn Fusel Oil. (Emmerling) 419
Compounds of — with Manganese and Cobalt Chlorides. (Bourion) 505
Conversion of Wood into —. (P) Marmier and Brangier 632
Denatured: Manufacture of —. Pereire and Guignard 1090
Denatured with Benzene: Colouring of — 1322
Drawback of Duty on Industrial — in Belgium. (T.R.) 882
Duty; Effect of — on Chemical Industry. (Silberrad). 827
Duty-free — for Research. (T.R.) 1562
Ethyl; Action of — on Barium Ethylate. (Guerbet)... 984
Ethyl; Bactericidal Action of —. (Wegl) 1466
Ethyl, in Fusel Oil; Determination of —. (Saare and Hanow) 367
Exhibition of Apparatus for Use of — in Peru. (T.R.) . 513
Fermentation Amyl —. (Bemont) 182
For Fire-Engines in Hanover. (T.R.) 1160
For Manufacture of Vinegar in Belgium. (T.R.) 654
Free — for Chemical Industries. (T.R.) 878
From Molasses; Manufacture of —. (Bauer) 1290
Imports of Japan in 1901. (T.R.) 1309
In Chloroform: Detection of — 642
In Denatured Spirit; Determination of —. (Saare and Hanow) 367
In Dilute Solutions: Determination of —. (Argenson) 1352
In Quilimane: Portuguese East Africa —. (T.R.) 1208
"Industrial"; French Tax on Products with a Base of —. (T.R.) 202
Industrial Uses of — in Germany. (Arachequesne) 108
Industry in Austria-Hungary. (T.R.) 572
Methyl; Action of — on its Sodium Derivative. (Guerbet) 984
Methyl-; Detection and Determination of — in Formaldehyde. (Duyk) 283
Methyl, in Alcoholic Liquids; Detection of —. (Habermann and Oesterreicher) 192
Production of —, and Apparatus therefor. (P) Billet ... 1547
Production of — from Yams 1089
Production of — in Peru. (T.R.) 882
Production of —. (P) Reynaud 1290
Production of Denatured —. (P) Pereire and Guignard) 558
Tax on — in Germany. (T.R.) 1312
Technical Uses of — in Germany ..... 538. (T.R.) 572
-Trust in Germany. (T.R.) 940
Vapour; Disinfecting Action of —. (Seize) 270
Wood-; Production of —. (P) Brandt and Root 1527
See also under Spirit.

Alcohols, Acetylenic Secondary: Synthesis of —. (Moreu and Desmots) 429
Esterification of Carbinols by —. (Fischer and Weiss) 400
Formation of — by Electrolysis. (Hofer and Moest) ... 1237
Monovalent Fatty: Flashing Points of —, and their Aqueous Solutions. (Raikow) 796
Normal Propyl and Butyl; Action of — on Sodium Derivatives. (Guerbet) 984
Oxidation of Unsaturated —. (Trillat) 66
Polyhydric; Magnetic Rotation of —. (Perkin, sen.)... 144
Properties of Mixtures of the Lower — with Benzene, &c. (Young and Fortey) 721
Properties of Mixtures of the Lower — with Water (Young and Fortey) 720
Research on —. (Guerbet) 984

Alcoholic Liquors: Ageing —. (P) Huddan. From Riley. 132
Liquors: Manufacture of — in Japan. (T.R.) 148

Alcohol-consuming Apparatus. (T.R.) 80

Alcohol Motors in Germany. (T.R.) 1120

Aldehyde and Acid; Manufacture of Aromatic —. (P) Bazlen 722

PAGE

Aldehydes, Aromatic. *See under* Dyestuffs.
And Ketones: Thiosemicarbazide as a Reagent for —. (Freund and Schander) 1100
Dimethylhydroresorcinol a Reagent for —. (Erdmann) 192
Retarding Influence of — on Maturation of Spirits. (Hewitt) 96

Algeria, Phosphate Industry in —. (T.R.) 1207
Sulphate of Copper in —. (T.R.) 1162

Alginates, Alkaline: Manufacture of —. (P) Ingram..... 638

Alimentary Matters. *See also* Foods.
Products: Preservation of —. (P) Verheggen and others 717
Products. *See also under* Foods.
Substance: Manufacture of an —. (P) Pitoy..... 716
Substances: Treatment of —. (P) Hogarth 558

Alkalis. (Class VII.) 51, 114, 171, 250, 343, 406, 475, 547, 614, 705, 772, 898, 913, 969, 1026, 1074, 1135, 1183, 1231, 1277, 1329, 1393, 1453, 1533

Alkali: Apparatus for Electrolytic Production of —. (P) Mactear..... 1077
Benzoates in Foodstuffs; Detection of —. (De Brevans)..... 75
Carbonates: Action of Fatty Acids on —. (Klimont) .. 126
Caustic: Electrolytic Production of —. (P) Brochet and Ranson 408
Caustic: Manufacture of —:
(P) Frasch 615
(P) Moore 971
Chlorate and Hypochlorite; Attainable Current and Energy during Electrolytic Manufacture of —. (Foerster and Muller)..... 252
Chlorides; Apparatus for Continuous Electrolysis of —. (P) Gintl..... 260, 260
Chlorides; Compounds of — with Aluminium Chloride. (Baud) 51
Chloride; Electrolysis of — with Mercury Cathodes. (P) La Cour 125
Chloride Solutions; Electrolysis of — with Carbon Anodes. (Sprosser)..... 124
Cyanides; Manufacture of —. (P) Johnson. From the Deutsche Gold- und Silber-Scheideanstalt..... 345
Cyanides; Manufacture of —. (P) Rossiter and others 345
Electrolytic Production of — by Solvay-Kellner Process. (Glaser) 1142
Hypochlorite and Chlorate; Attainable Current and Energy during Electrolytic Manufacture of —. (Foerster and Muller)..... 252
In Sulphite Lyes containing Soda; Determination of —. (Schwartz)..... 1298
Production of —:
(P) Frasch..... 970
(P) Johnson. From the Chem. Fab. Griesheim-Elektron 548
Production of — in the Electric Furnace. (P) Bouvier 1458
Salts; Action of — on Metallic Oxides. (Kühling) 115
Titration of Free — in Presence of Nitrites. (Arndt) .. 1099
Works: Annual Report on — by Chief Inspector 1135
Works Regulation Bill, 1901; Observations on —. (Carey) 214
-Metal Sulphates; Separation of — from Mixed Solutions. (P) Hoepfner and Orth 1027

Alkaline Chloride Solutions; Electrolysis of —, and Apparatus therefor. (P) La Cour and Rink..... 913
Hydrate or Bicarbonate; Estimation of — in Presence of Monocarbonate. (North and Lee)..... 322
Liquor from Reduction of Poplar Wood; Composition of Spent —. (Griffin) 559
Salts; Electrolytic Apparatus for Decomposing —. (P) Gilmour 615

Alkaloids. (Class XX.) 65, 131, 186, 272, 362, 422, 494, 559, 636, 719, 789, 871, 926, 986, 1037, 1093, 1151, 1193, 1243, 1293, 1345, 1409, 1467, 1551
Acidyl Derivatives of Cinchona —. (P) Johnson. From Vereinigte Chininfab. Zimmer and Co. 275
Alkalimetric Factors of Certain Di-Acid —. (Gordin).. 186
Cinchona; Anisic Acid Ethers of —. (P) Thron..... 637
Cinchona; Cinnamic Ether of —. (P) Thron 638
Cinchona —, Soluble in Ether. (Scoville)..... 66
Cinchona; Succinic Acid Ether of —. (P) Tiron..... 638
Conium; Characteristics of —. (Ahrens)..... 636
Corydalis —. (Gadamer) 423, 496
In Cinchona Bark, &c. Determination of —. (de Myttenaire)..... 721
In Kola Compounds. (Warin) 1352
Lactates of certain —. (Ssergejew) 496
Of Adlumia Cirrhosa. (Schlotterbeck and Watkins)..... 1346
Of Argemone Mexicana. (Schlotterbeck)..... 560
Of Calumba Root. (Gadamer)..... 1294
Of Kola Nut and its Fluid Extract. (Warin) 645
Salicylic Esters of Quinine —. (P) Newton. From The Farb. vorm. F. Bayer and Co..... 1152
Solubility of —; Determination of. (Hatcher)..... 789
Thallium Compounds of the —. (Renz)..... 1409
Vegetable; Resistance of — to Decay. (Panzer) 274

Alkaloid, Xylopia Ethiopica; Constituents of —. (De Rochebrune)..... 186

Alkaloidal Reactions; New —..... 1416

Alkanet Root. *See under* Dyestuffs.

Alkoxy-Caffeine, and Manufacture of same. (P) Aeh 1194

PAGE

Alkyl Ethers of Cinchona Alkaloid Carbonic Acids. (P) Thron ... 926
Ethers of Morphine: Preparation of ——. (P) Boehm. From Merck ... 926

Alloy and Alloys:
Aluminium-Zinc: Properties of ——. (Richards) ... 121
Antifriction Metal ——. (P) Pearse and Ievers ... 1234
Behaviour of —— to Law of Wiedemann and Franz. (Schulze) ... 1535
Composition of ——. (P) Rubel ... 710
Containing Copper and Zinc: Improving Castings of ——. (P) Sperry ... 482
Containing Steel: Manufacture of ——. (P) Lorrain. From Thomson ... 349
Electrical Conductivity of certain Aluminium ——. (Wilson) ... 1283
Electrolytic Deposition of ——. (P) Marino and Ratchkowsky ... 1082
Electrolytic Production of New ——. (Coehn) ... 1144
For Thermo-Electric Use. (P) Bremer ... 1458
For Use as Substitute for Gold. (P) James ... 1281
Iron: Electrical Manufacture of ——. (P) Gin ... 1541
Manufacture and Treatment of ——. (P) Keller ... 410
Manufacture of ——:
(P) Keller ... 620
(P) Wolfe and Englert ... 411
Manufacture of —— by Electricity. (P) Simon ... 1031
Metallic —— for Dental Purposes. (P) Dill ... 350
Of Aluminium:
(Guillet) ... 1280
(P) Murmann ... 776
(P) Pruskowski ... 978
„ Aluminium and Magnesium. (Boudouard) ... 258
„ Aluminium with Iron and with Manganese. (Guillet) ... 258
„ Aluminium with various other Metals. (Campbell and Matthews) ... 551
„ Antimony and Tellurium. (Fay and Ashley) ... 617
„ Barium and Calcium with Cadmium. (Gautier) ... 796
„ Cadmium with Magnesium. (Boudouard) ... 976
„ Copper, &c. (P) Wolfe and others ... 350
„ Copper, Aluminium, and Silver. (P) Duke ... 1457
„ Copper and Manganese. (Lewis) ... 842
„ Copper and Magnesium. (Boudouard) ... 1456
„ Copper and Titanium. (P) Rossi ... 863
„ Copper; Hardening of ——. (P) Renstrom ... 1030
„ Iron, Copper, and Hydrogen. (P) Gesner ... 352
„ Iron; Electric Conductivity and Magnetic Properties of ——. (Barrett, Brown, and Hadfield) ... 411
„ Iron; Manufacture of ——. (P) Crean ... 619
„ Lead and Tellurium. (Fay and Gillson) ... 617
„ Lithium: Preparation of ——. (Lebeau) ... 261
„ Manganese-Copper and Manganese-Iron. (P) Lorrain. From Thompson ... 1399
„ Silver. (P) Walker ... 1588
„ Strontium with Zinc and Cadmium. (Gautier) ... 121
„ Thallium. (Kurnakoff and Pushin) ... 143
„ the Alkali Metals: Manufacture of ——. (P) Janbert ... 1281
„ Titanium and Iron. (Bahlsen) ... 623
„ Tungsten, Molybdenum, Uranium, and Titanium. (Stavenhagen and Schuchard) ... 481
„ Zinc and Aluminium: Thermal Investigation of ——. (Louguinine and Schukareff) ... 481
Phase Rule and Establishment of Equilibrium in Solid ——. (Rose) ... 33
Platinum, Gold, and Silver in ——; Determination of ——. (Richards) ... 1249
Potentials of ——, and Formation of Covering Films. (Haber) ... 1143
Production of ——:
(P) Blackmore ... 776
(P) Newton and Billington ... 1457
Production of ——, and Furnaces therefor. (P) Keller ... 354
Separation of Copper, Lead, Antimony, and Tin in ——. (Rössing) ... 191
Tin-Aluminium: Research on ——. (Guillet) ... 121
Treating Metallic Oxides for Production of ——. (P) Weber ... 1142
Tin: Sulphuric Acid as a Solvent for ——. (Nissenson and Crotogino) ... 1550

Allyl Iso-Sulphocyanate in Commercial Products; Determination of ——. (Roeser) ... 645

Aloes in Pharmaceutical Preparations: Detection of ——. (Leger) ... 645

Aloins: Constitution of the ——. (Léger) ... 1037
Derivative of ——, and Manufacture of same. (P) Seel ... 791

Alsace; Manufacture of Photographic Paper in ——. (Wehrlin and others) ... 1038

Alums; Acid Reaction of the ——. (Lumière and Seyewetz) ... 1544
Manufacture of ——. (P) Everhart ... 255
Obtaining: (P) Wing ... 1534
Volumetric Determination of Aluminium and Free and Combined Sulphuric Acid in ——. (White) ... 793

Alumina and Ferric Oxide; Mutual Action of —— at Incipient White Heat. (Warth) ... 285
Compounds of —— with Chromium Sesquioxide. (Dubois) ... 727
Manufacture of —— Electrically. (P) Hall ... 549
Role of —— in Blast-Furnace Slags. (Ward) ... 452, 537
Separation of —— from Silica. (P) Kayser ... 1232
Sulphate: Production of ——. (P) Bock ... 1027

PAGE

Aluminium; Action of —— on Salt Solutions and Fused Salts. (Formenti and Levi) ... 116
Apparatus, Deposition of Platinum on ——. (Gawalowski) ... 1472
Chromate. (Groger) ... 1394
Determining Silicon Content of ——. (Goldschmidt) ... 724
Electrical Production of ——. (Kershaw) ... 565
Experiments on Manufacture of ——. (Haber and Geipert) ... 260
Extraction of ——. (Haber) ... 1186
Improving the Quality of ——. (P) Haddan. From The Meteorit Gesellschaft ... 124
In the United States. (T.R.) ... 936
Influence of —— on the Carbon in Cast Iron. (Melland and Waldron) ... 861
Metallurgy of ——. (Townsend) ... 53
Pasty State of —— Utilised. (Granger) ... 1140
Polarisation of ——. (Naccari) ... 259
Powder as a Discharge for Paranitraniline Red. (Alt) ... 546
Precipitation of —— by Bacterial Action. (Jackson) ... 681
Progress in Manufacture of ——. (Wilson) ... 175
Rendering —— capable of being Welded or Soldered. (P) Sorensen ... 1235
Solder for ——:
(P) Neild and Campbell ... 976
(P) Webster ... 1185
Soldering ——, and Material therefor. (P) Ulmann and Schlag ... 553
Use of Powdered —— in Tissue Printing. (Weiss) ... 476
Aluminium Chloride: Compounds of —— with Alkali Chlorides. (Baud) ... 51
Compounds of —— with Hydrogen Sulphide. (Baud) ... 995
Aluminium Chloridosulphate: Preparation of ——. (Recoura) 1453
Aluminium Hydrate; Manufacture of ——. (P) Jordan ... 254
Amalgam, Ammonium: Properties of ——. (Moissan) ... 121
Amalgamating Apparatus:
(P) Kiss ... 863
(P) Knappe ... 1334
(P) Laxton ... 619
(P) Scott ... 619, 1141
Apparatus for Fine Gold. (P) Lasswell ... 619
Ambrette Seeds: Essential Oil of ——. (Schimmel's Report) 1552
America. *See under* United States.
Amido-Oxybenzyl-Compound, and Manufacture thereof. (P) Eichengrun and Deneker ... 639
Amido. *See under* Amino.
Amines, Aromatic: Thiosulphates of ——. (Wahl) ... 287
Diazo ——. *See under* Dyestuffs.
Amino- and Hydroxy-amino-diphenylamine Compounds; Improved Black from ——. (Ullrich and Fussganger) ... 1182
Amino-azo Compounds. *See under* Dyestuffs.
Amino-hydroxyl Derivatives: Production of ——. (P) Vidal ... 38
Derivatives. *See under* Dyestuffs.
9-Amino-10-hydroxyphenanthrene and 9,10-Diamino-phenanthrene. (Pschorr) ... 1094
2,2-Aminonaphthol Sulphuric Acid. *See under* Dyestuffs.
Aminonitrosalicylic Acid; Dyestuffs derived from ——. *See under* Dyestuffs.
Amines: Diazo ——. *See under* Dyestuffs.

Ammonia, Albuminoid- and Proteid-: Determination of ——. (Winkler) ... 1041
And Nitrate of Potash in Germany ——. (T.R.) ... 1046
And Phosphoric Acid in the Beetroot: Relation between ——. (Pellet) ... 628
Apparatus for Freeing —— from Gas Liquor. (P) Abendroth ... 1526
Apparatus for Generating ——. (P) Young ... 1278
Conversion of Atmospheric Nitrogen into ——. (Hoyermann) ... 106
Extraction of —— from Tar. (Guillet) ... 1022
From Beet-Sugar Waste: Manufacture of ——. (P) Besemfelder ... 254
Gaseous: Apparatus for Condensing ——. (P) Morris ... 1534
Heat of Solidification of ——. (De Forerand and Massol) 765
In Water: Determination of ——. (Emmerling) ... 990
Liquor: Use of Lime in Distillation of ——. (Blum) ... 167
Obtaining —— from Furnace Gases, &c., and Apparatus therefor. (P) Rigby ... 1268
Production of ——. (P) Talbot ... 1183
Production of —— in Treating Molasses Waste Liquors. (Andrlik) ... 1339
Production of "Solid" ——. (P) Chem. Fab. Bettenhausen, Marquart und Schulz ... 115
Solubility of —— in Saline Solutions. (Abegg and Riesenfeld) ... 547
Solution: Influence of Salts, &c. on Vapour Pressure of Aqueous ——. (Perman) ... 116
Still for Production of ——. (P) Stroh ... 1326
Ammoniacal Cupric Oxide; Displacement of Strong Bases by ——. (Bouzat) ... 970
Liquors: Distillation of ——, and Apparatus therefor. (P) Scott ... 706
Ammonio-Calcium Phosphate. (Lasne) ... 566
Ammonium Amalgam. (Moissan) ... 121, 1102
Ichthyol Sulphonate: Preparation of ——. (P) McLaughlin 1553
Nitrate: Preparation of Nitrogen from ——. (Mau) ... 76
Persulphate as a "Hypo" Eliminator. (P) Lumière ... 1554
Persulphate as a Photographic Reducer ... 989

PAGE

Ammonium—*cont.*
Persulphate "Reducer" 791
Phosphomolybdate: Determination of Phosphoric Acid by —. (Baxter) 1351
Saccharinate: Preparation of —. (P) Partridge. From "The Trust Chimique" 1154
Salts: Behaviour of — in Saccharine Solutions. (Andrlik) 1339
Sulphate: Production of —. (P) Feldmann 1027
Sulphate: Production of — in Spain. (T.R.) 733
Sulphate: Statistics of —. (T.R.) 146
Tetramethyl: Electrolytic Production of —. (Palmaer) 1251
Amylaceous Bodies; Soluble Products from —. (P) Ashworth 1288
Substances; Manufacture of —. (P) Johnson. From Lecorte 130
See also Starch.
Amyl-Alcohols. *See under* Alcohols.
Amylodextrin: Action of Iodine on —. (Suniewski) 1341
Anæsthetics: Preparation of —:
(Goldschmidt) 1151
(P) Harries 864
Analysis: Filter-Paper a Cause of Error in —. (Mansier) .. 1098
Use of Persulphates in —. (Dakin) 848
Analytical Chemistry and Apparatus. (Class XXIII.) 69, 139, 189, 276, 366, 426, 498, 562, 639, 723, 792, 873, 927, 990, 1039, 1097, 1155, 1195, 1246, 1296, 1349, 1412, 1472, 1557
Andansonia Fibres. *See under* Fibres.
Anethol. (Balbiano and Paolini) 1293
Anhydrides of Organic Acids: Manufacture of —. (P) Newton. From The Farb. vorm. F. Bayer and Co 51
Aniline: Manufacture of —. (P) Senderens and others 169
Products of Oxidation of — by Atmospheric Oxygen. (Istrati) 1448
See also under Dyestuffs.
Aniline-Black: Dyeing Cottons with —. (Beltzer) 770
Immedial Blacks as Grey Reserves under —. (Justin-Müller) 250
Animal Black: Revivification of —. (P) Blachier and Ronillon 69
See also Bone Black.
Anise Camphor. *See under* Anethol.
Anisidine, Chlor. *See under* Dyestuffs.
Annam; Dye-Plants in —. (T.R.) 370
Anodes for Electrolytic Operations. (P) D'Andrimont 553
Artificial Graphite and Platin-iridium as Materials for —. (Foerster) 484
Metallic; Electrolytic Solution of Soluble —. McA. Johnson 1540
Platin-iridium: Chemical Resisting Power of —. (Denso) 484
Residues of: Treatment of —. (P) Betts 1541
Anthracene Derivatives. *See under* Dyestuffs.
Impurities of —; Detection of. (Behrens) 1250
Solubility of —. (Findlay) 1043
Anthracites: Arsenic Contents of Pennsylvanian —. (Job and Young) 693
Anthranilate, Methyl, in Essential Oils: Determination of —. (Hesse and Zeitschel) 1102
Anthranilic Acid. *See under* Dyestuffs.
Anthranol and Oxanthranol. *See under* Phenylanthranol.
Anthrapurpurin Biacetate: Manufacture of —. (P) Wise. From Knoll and Co 67
Anthraquinone Derivatives. *See under* Dyestuffs.
Anthraquinones: Hydroxyamino- and Nitroso- —. (Wacker) 400
Antifouling Composition for Ships' Bottoms:
(P) Mallay 1149
(P) Stephenson 179
Anti-Incrustants: Production of —. (P) Lowther 32
Antimony; Action of Lithium-ammonium on —. (Lebeau) 369
And Lithium: Compound of —. (Lebeau) 261
Electrolytic Production of —. (Izart) 1237
Electrolytic Separation of —. (P) Izart und Thomas ... 1541
Extraction of — from Ores and Residues. (P) van der Ploeg 552
In Ores: Determination of —. (Skinner and Hawley) .. 1156
Metallurgical Treatment of —, and Apparatus therefor. (P) Basse 1537
Minerals: Production of Antimony Compounds from —. (P) St. Plews 1458
Separation of — from Arsenic and Tin. (Lang and others) 748
Separation of — from other Metals. (Pontio) 929
Separation of — from Tin. (Ratner) 1248
Smelting or Refining. (P) Armstrong 1281
Volumetric Determination of —. (Petriccioli and Reuter) 73
Antimony Hydride. Preparation of —. (Stock and Doht) .. 995
Oxide: Manufacture of White —. (P) Plews 1027
Sulphide: Analysis of Golden —. (Weber) 1559
Sulphide: Duty on — in United States. (T.R.) 732
Sulphide; Solubility of —. (Lang and Carson) 1018
Sulphide; United States Customs' Decision on —. (T.R.) 800, 1047
Antipyrine: Constitution of —. (Michaelis) 363
Ferric Haloid Compounds of —. (Schuyten) 187

PAGE

Antipyrine—*cont.*
Ferricyanide: Preparation of —. (Schuyten) 186
Ferrocyanide; Preparation of —. (Schuyten) 186
Nitroprusside: Preparation of —. (Schuyten) 186
Salts of —. (Reychler) 987
Thio- and Seleno- —. (Michaelis) 363
Antiseptics; Manufacture of —. (P) Page 1466
Containing Iodine; Manufacture of —. (P) Cohn 985
Fumigator for Diffusing —. (P) Fleming 985
Manufacture of —. (P) Smidlin 63
Organo-Metallic Compounds of Mercury —. (P) Mills. From Lumière 1153
Apigenin. *See under* Dyestuffs.
Apiose; β hydroxymethylerythrose —. (Vongerichten) 566
Apparatus. (Class I.) 32, 107, 243, 326, 394, 458, 538, 596, 695, 760, 850, 904, 959, 1019, 1064, 1125, 1177, 1224, 1267, 1322, 1386, 1444, 1523
Apples and their Products: Analysis of —. (Brown, jun.) .. 282
Apricot Kernels; Fatty Oil from —. (Dieterich) 178, 1403
Aqueous Solutions. *See under* Solutions.
Arabin: Behaviour of — to Fehling's Solution. (Salkowski) 1159
Arabinose: Derivatives of —. (Chavanne) 506
Determination of —. (Neuberg and Wohlgemuth) 1103
d-Arabinose; Preparation of —. (Neuberg and Wohlgemuth) 1103
d-Arabonic Acid; Preparation of —. (Neuberg and Wohlgemuth) 1103
Arc Lamps. *See under* Lamps.
Argemone Mexicana; Alkaloidal Constituents of —. (Schlotterbeck) 560
Argentina: Acetylene Gas in Buenos Ayres. (T.R.) 648
Linseed Crop of —. (T.R.) 733
Soap and Candle Material Imports of —. (T.R.) 651
Aristol; Preparation and Derivatives of —. (Cousin) 1346
See also under Di-iododithymol.
Aristoquinine; Characteristics of —. (Dreser) 789
Arizona; Bismuth discovered in —. (T.R.) 1355
Arkansas: Asphalt Deposit in —. (T.R.) 569
Armour Plates: Manufacture of —. (P) Bloxam. From La Comp. des Forges de Chatillon, and G. Charpy 618
Plates: Manufacture of —. (P) Hadfield 1536
Plates; Tempering —. (P) Jamieson 182, 482
Aromatic Hydrocarbons. *See under* Hydrocarbons.
Arrhenal. *See under* Sodium Methylarsenate.
Arrow Poisons; African —. (Faust) 1468
Poison from German East Africa; Investigation of —. (Brieger and Diesselhorst) 1094
Arrowroot: Preparation of —. (Leuscher) 420
Arsenic: Absorption of — by Barley. (Collins) 221
Analysis: Two Causes of Discrepancy in —. (Murphy) 957
And Galena Mines in the Pyrenees. (T.R.) 936
Biological Test for —. (Rosenheim) 1039
Contents of Pennsylvania Anthracites. (Job and Young) 693
Deposit: The Marsh-Berzelius —. (Ackroyd) 900
Detection of — by Marsh Apparatus. (Gautier) 1472
Determination of Small Quantities of —. (Morner) 1195
Existence of — in the Organism. (Bertrand) 995
Fumes; Apparatus for Separating and Recovering —. (P) Stone 1395
Fungi: Examination of —. (Gosso) 77
In Beer, &c.; Report of Committee on — 94
In Crops. (Angeli) 566
In Iron and Steel: Determination of —. (Norris) 393
In Malt Liquors: Determination of —. (Richardson) .. 901
In Ores; Determination of —. (Skinner and Hawley) . 1156
Manufacture of — in the United States. (T.R.) 935
Manufacture of — in Portugal. (T.R.) 509
Recovery of — from Precipitated Sulphide of Arsenic. (P) Riley and Barnes 1533
Retention of — by Iron in Marsh-Berzelius Method. (Parsons and Stewart) 1414
Separation of — from Tin and Antimony. (Lang and others) 748
Toxic Intensity of —. (Lalfont) 728
Treatment of Substances containing — for Analysis. (Nissenson and Crotogino) 1248
White; Production of — in Ontario, Canada. (T.R.) ... 1420
Arsenic Acid; Action of Boiling Hydrochloric Acid upon —. (Hehner) 1250
Action of Crystallised — on Pinene. (Genvresse) 424
Atoxyl (Anilide of Met-) 789
Arsenic Sulphide; Solubility of —. (Lang and Carson) 1018
Arsenious Acid; Colorimetric Determination of —. (Mai) .. 1098
Artemisin; Characteristics of —:
(Bertolo) 926
(Freund and Mai) 136
Asarum arifolium; Essential Oil of —. (Miller) 1193, 1552
Asbestos; Behaviour of — in Non-luminous Flames. (Saubermann) 396
Deposits in Russia. (T.R.) 570
Goods; Treatment of — to Resist Liquids. (P) Bernfeld 1143
Fibre Objects; Impregnating — with Silica. (P) Abel. From Siemens and Halske Actiengesellschaft 767
In the United States. (T.R.) 936
Insulating Metallic Surfaces with —. (P) Heaney 979
Aseptic Preparation from Pancreas. (P) Weber 271

PAGE

Ashes from Eruptions of Mount Pelée. (Lacroix) 931
Aspergillus; Conditions for Destruction of Spores of ——. (Lode) 788
Asphalt, Artificial; Production of ——. (P) Hermes 1326
Boiler for ——. (P) Boult. From Baumann 1139
Deposit of —— in Arkansas. (T.R.) 569
Exports of Sicily. (T.R.) 1204
Fluxed with Paraffin Oils; Determination of Paraffin in ——. (Richardson) 630
Industry in Hanover. (T.R.) 1046
Investigations on ——. (Kovács) 1077
Production of ——. (P) Wolskel 347
Production of Blocks of ——. (P) Steinbach and Duderstadt 1078
Trade of Trinidad. (T.R.) 145
Asphaltic Paving Composition. (P) Wilkinson and Burchinal 1139
Asphaltum; Employment of —— in Rubber Manufacture 919
In the United States; Production of ——. (T.R.) 1204
Assayer's Furnace. (P) Lonergan and Calkins 618
Atlas Cedar Oil. *See under* Oils.
Atoxyl (Anilide of Metarsenic Acid): Characteristics of —— . 789
Atropine; Conversion of —— into *d*- and *l*-Hyoscyamine. (Amenomiya) 1409
Synthesis of ——. (Ladenburg) 560
Atropinium Alkyl Nitrate; Preparation of ——. (P) Dreser and Callsen 1194
Atroscine; Identification of ——. (Gadamer) 186
Transformation of —— into *l*-Scopolamine. (Kunz-Krause) 186
Attenuation in the Brewery. (Delbruck) 1088
Auramines. *See under* Dyestuffs.
Australia; Amended Tariff on Case Spirits in ——. (T.R.) ... 138
Cane-Sugar Cultivation in ——. (T.R.) 83
Change of Tariff for Drugs and Chemicals. (T.R.) 730
Coal Deposits of ——. (T.R.) 1478
Customs Law on Rice for Starch-making. (T.R.) 202
Federal Tariff Changes in ——. (T.R.) 145, 197
Linseed for Manufacture of Linseed Oil Duty-free. (T.R.) 1207
Methylation of Cotton-Seed Oil in ——. (T.R.) 200
Manures in ——. (T.R.) 1423
Oil Industry for Queensland ——. (T.R.) 147
South; Mineral Production of ——. (T.R.) 936
South; Petroleum Discovered in ——. (T.R.) 1160
South; Salt Industry of ——. (T.R.) 880
Sugar Production of Queensland ——. (T.R.) 202
Tariff Decisions in ——. (T.R.) 568
Western; Discoveries of Mineral Oil in ——. (T.R.) 648
Western; Mineral Industry of ——. (T.R.) 81
Western; Mineral Production of ——. (T.R.) 1257
Western; Mineral Output of ——. (T.R.) 570
Western; Oil Prospecting Regulations in ——. (T.R.) ... 508
Austria; Blast-Furnace Gases Utilised in ——. (T.R.) 730
Margarine Trade of ——. (T.R.) 1052
Mercury Discovered in ——. (T.R.) 650
Petroleum Industry of ——. (T.R.) 1420
Austria-Hungary; Alcohol Industry in ——. (T.R.) 572
Carbonic Acid Syndicate in ——. (T.R.) 569
Copper Deposits in ——. (T.R.) 200
Essential Oils in Dalmatia ——. (T.R.) 1117
Sugar Campaign in ——. (T.R.) 1208
Sugar Production of ——. (T.R.) 147
Azine Derivatives. *See under* Dyestuffs.
Azobenzene. *See under* Dyestuffs.
Azo-Dyestuffs. *See under* Dyestuffs.
Azoxone. *See under* Dyestuffs.
Azoxybenzylidine Bases. *See under* Dyestuffs.

B

Bacteria; Albumin-digesting ——. (Emmerling and Reiser). 429
In the Leather Industry. (Turnbull) 179
Inoculating the Earth with Soil ——. (F. Bayer and Co.) 179
Baden: Trade of ——. (T.R.) 933
Badiana Oil. *See under* Oils.
Bagasse and Sugar; Production of ——. (P) Manoury and Naudet 628
Diffusion or Rapid Lixiviation of ——. (P) Manoury and Naudet 59
Bakers' Yeast. *See under* Yeast.
Baking-Powder; Composition of ——. (P) Just 787
Manufacture of ——:
(P) Hatmaker. From Just 1191
(P) Just 360, 360, 361
Baku: Naphtha Production of ——. (T.R.) 569
Balata Gum in Brazil. (T.R.) 1164
In Dutch Guiana. (T.R.) 293
United States Customs Decision on ——. (T.R.) 652
Bamboo for Pulp in Trinidad. (T.R.) 1208
Barium-Ammonium and Barium Amide; Characteristics of ——. (Mentrel) 1476
Compound; Precipitation of Metals by a ——. (P) Martino 976
Manufacture of Soluble Compounds of —— in the Electric Furnace. (Jacobs) 391
Barium: Preparation of ——:
(Guntz) 54
(Stansfield) 258

PAGE

Barium Chloride: Production of ——. (P) Waldbauer 858
Nitrite: Preparation of ——. (Matuschek) 705
Sulphate a Reagent for Solutions of Colloidal Metals. (Vanino) 426
Sulphate: Solubility of ——. (Fraps) 727
Barley: Absorption of Arsenic by ——. (Collins) 221
Apparatus for Washing, &c. —— for Malting. (P) Hort and Marxsohn 984
Cause of Deficiency of Yield in Malting Heavy ——. (Gro n) 1087
Chemical Examination of ——, and the Malt therefrom. (Lermer) 784
Germinated; Nature of the Proteolytic Enzyme of ——. (Windisch) 1403
Influence of Duration of Steeping of ——. (Jacob) 784
Observations in Steeping of —— alternately with Water and Air. (Windisch) 418
Parasites in; Detection of ——. (Lindner) 130
Rich and Poor in Protein; Experience with —— 131
Tendency of —— to get Hot during Malting. (Delbruck) 556
Barrels. *See* Casks.
Baryta, Anhydrous Caustic; Manufacture of ——. (P) Martin 117
Hydrated; Manufacture of —— by Electrolysis. (P) Brochet and Ranson 54
In Mineral Waters containing Sulphates 717
Barytes in United States; Production of ——. (T.R.) 1001
Base between Two Acids; Determining Ratio of Distribution of ——. (Dawson and Grant) 504
Basic Superphosphate. *See under* Superphosphate.
Baths: Dyeing and Tanning —— Combined. (P) Lepetit, Dellfus, and Gansser 1146
Electrolytic ——. (P) von Liebermann 1031
For Use in Photography. (P) Ilitz 561
Heating of Sodium Peroxide ——. (Luttringhaus) 856
Photographic Fixing ——. (P) Bayer and Co. 1554
Photographic Toning ——. (Novak) 276
Tempering ——. (P) Lawrence 1141
Toning and Fixing: Theory of the Combined ——. (Lumière and Seyewetz) 581
Batteries: Various —— :
Electric —— :
(P) Allison. From Banks 979
(P) Bam and Hunt 353
(P) Banks 621
(P) Street 1237
Electric —— (Bichromate). (P) Robinson 1082
Electric Dry ——. (P) Delafon 979
Electric Lead-Zinc ——. (P) Rosee d'Infreville 260
Electric —— (Porous Wood Vessels). (P) Marino 1335
Electro-Chemical Single-Fluid ——. (P) Amwake 1335
Galvanic Reversible ——. (P) Edison. 778, 778, 917, 1031, 1031
Gas ——. (P) Britzke 1539
Gravity —— (Babbitt Metal). (P) Gove 1540
Primary ——. (P) Frees 354
Primary Cells or ——. (P) Tully 1458
Primary —— (Constant Current). (P) Hussey and Clarke) 354, 411
Primary —— (Copper Oxide). (P) Fishell and Clymer ... 917
Primary —— for Production of Light. (P) Gauzentes 164
Primary or Secondary ——. (P) Rossel 1539
Secondary —— :
(P) Barham 1082
(P) Blanc 1402
(P) Celestre and Gondrand 916
(P) De Dion and Bouton 260
(P) de Sales and Gneugnon 621
(P) Fortun and Semprun 777
(P) Lombard 863
(P) Mathias 1462
(P) Meran 710
(P) Morrison 1540
(P) Niblett 125
(P) Oppermann 1402
(P) Pouteaux and Wolff 260
(P) Stiens and Smith 1082
Secondary —— (Aluminium Electrode). (P) Hills 259
Secondary —— (Antimonious Lead Grid). (P) Entz 1082
Secondary —— (Cerium Electrolyte). (P) von Welsbach. 124
Secondary —— (Crystalline Lead). (P) Steinmetz 1082
Secondary —— (Metallic Magnesium). (P) Edison 125
Secondary; Non-Active Metal for Use in ——. (P) Lloyd 1540
Secondary —— of other Metals than Lead. (von Laszczynski) 1030
Secondary —— (Planté). (P) Lacroix 124
Secondary —— (Planté Plates). (P) Drake and Gorham. 621
Thermo-Electric:
(P) Hall 1539
(P) Thwing 1335
Voltaic Dry ——. (P) McA. Johnson 354
With Electrode-retaining Blocks. (P) Johnson. From Société Paul Chapny et Cie. 54
With Self-Regenerating Depolariser. (P) Rosset 125
Battery Cells, Plates, Elements, Solutions, &c.:
Active Material for Accumulator Plates. (P) Sussman ... 1539
Active Material for Secondary Batteries:
(P) Oppermann 1282
(P) Winship 1031
Anodes; Manufacture of Soot Carbon ——. (P) von Welsbach 1282
Anodes; Nickel ——. (P) Harris 352
Cathodes; Forming and Regenerating Mercury ——. (P) La Cour and Rink 1539

PAGE

Battery Cells, Plates, Elements, Solutions, &c.—*cont.*
Cells; Electrolytic —:
(P) Bell ... 778
(P) Le Sueur ... 353
(P) Sommer ... 1237
Cells; Electrolytic —— (Fluid Metal Cathode). (P) Tmesdell ... 1540
Cells; Electrolytic —— (Fused Salts). (P) Raschen and others ... 979
Cells; Electrolytic Polarisation ——. (P) Siemens Bros. From Siemens and Halske Actienges ... 125
Cells for Primary or Secondary Batteries. (P) Heys. From The Hutchison Acoustic Co. ... 979
Cells; Voltaic —— (Solid Depolariser). (P) Taylor ... 1540
Composition for Use in Secondary Batteries. (P) Oppermann ... 1143
Electrode; Aluminium ——. (P) Anderson ... 1143
Electrodes (Copper Hydride). (P) Colletas ... 1282
Electrodes for Electrolytic Cells. (P) Vogelsang ... 620
Electrodes for Galvanic Batteries. (P) Porske ... 1082
Electrode for Secondary Batteries:
(P) Bainville ... 621
(P) Edison ... 1031
(P) Jungner ... 1082
(P) Morrison ... 979
Electrodes; Graphitising of ——. (P) Acheson ... 979
Electrode; Positive —— for Accumulators. (P) Jungner 353
Electrode Separator. (P) Harrison ... 1237
Elements for Secondary Batteries. (P) Sperry ... 1540
Elements; Thermo-Electric ——. (P) Thwing ... 1335
Element; Zinc —— for Primary Batteries. (P) Brewer .. 411
Envelope for Battery Electrodes. (P) Sperry ... 621
Plates; Cleaning Spongy-Lead Accumulator ——. (P) Chamberlain ... 778
Plates for Secondary Batteries:
(P) Chamberlain ... 778
(P) Christian ... 1237, 1237
(P) Martin ... 1082
(P) Meygret ... 710
Plates for Secondary Batteries; Peroxidising ——. (P) Chamberlain ... 1540
Separator for Storage Batteries (Glass Wool). (P) Willis 485
Bauxite at Marseilles and Toulon. (T.R.) ... 1114
Bayer's Method for Purification of Sewage and Effluents. (Margosches) ... 183
Beans, Bean-Cake, and Bean-Oil of Newchwang, China. (T.R.) 1003
Beating Engines for Leather Scrap. (P) Case ... 265
Becchi's Test for Cotton-Seed Oil; Investigation of ——. (Gill and Dennison) ... 643
Test for Cotton-Seed Oil: Modification of ——. (Tolman) 645
Beer; Apparatus for Bottling ——. (P) Crossman ... 1290
Apparatus for Converting Wort into ——. (P) Selg and Guntrum ... 492
Apparatus for Cooling ——. (P) Schell ... 1090
Apparatus for Cooling or Aerating ——. (P) Wickham .. 1406
Apparatus for Pasteurising ——:
(P) Busch and others ... 1548
(P) Ruff ... 923
Apparatus for Racking ——:
(P) Beebe ... 1343
(P) Colby ... 1035
Apparatus for Sterilising Bottled ——. (P) King ... 1344
Arsenic in; Report of Committee on —— ... 94
Bottling of —— with Simultaneous Carbonation. (Heron and Riley) ... 868
Brewing Barley Malt ——. (P) Southby ... 420
Brewing of ——, and Apparatus therefor, (P) Clarke. From Nathan and Bolze ... 491
Brewing Two Kinds of —— in One Operation. (Mumme) 181
Chemical Diagnosis of Pasteurised ——. (Bau) ... 267
Continuous Production of ——. (P) Schmitz ... 1343
Converting Yeast into ——. (P) Selg and Guntrum ... 492
Examination of an Old —— Concentrated by Freezing. (Lang and Braun) ... 1034
Influence of Different Malting on Character of ——. (Winter) ... 1342
Lager; Cellarage of ——. (Windisch) ... 1463
Lager; Rodlet Bacterium, causing Cloudiness in ——. (Schonfeld and Rommel) ... 1342
Manufacture of ——. (P) Briant and Rigaud ... 491
Non-Alcoholic; Manufacture of ——. (P) Lapp ... 1290
Pasteurisation of ——. (P) Clark. From Fromme ... 268
Pasteurised; Characteristics of ——. (Will) ... 1464
Sterilisation and Preservation of ——. (P) Amiot ... 1108
Sulphur Dioxide in ——. (Jalowetz) ... 1088
To be Quickly Tapped; Producing Malt for ——. (P) Vollmann ... 359
Treatment of —— for Bottling. (P) Dewar and Tripp ... 1191
Wet Bruising Mill for Brewing ——. (Schmitz and Kreutzer) ... 359
-Wort; Contraction of —— on Cooling. (Mohr) ... 983
See also under Bier.
Beeswax; Influence of Bleaching upon ——. (Berg) ... 1032
Resin in; Determination of ——. (Jean) ... 428
Beetroot; Apparatus for Disintegrating, &c. ——. (P) Messenger and Popper ... 629
Apparatus for Washing and Stoning ——. (P) Maguin ... 921
Chips; Pressing —— before Drying. (Herzfold) ... 1287
Cultivation of —— in Poland. (T.R.) ... 940
Extraction of Sugar from ——. (P) Prinsen Geerligs and Hamakers ... 628
Extraction of Sugar Juice from ——. (P) Hyros and Rak. 1462

PAGE

Beetroot—*cont.*
Juice; Apparatus for Extracting Ammonia from ——. (P) Perrin ... 58
Juice; Calcium Salts in ——. (Pellet) ... 866
Juice; Defecation of —— with Minimum of Lime. (Zamaron) ... 1239
Juices; Purification of ——. (P) Lehmkuhl ... 921
Leaves for Fodder in Germany. (T.R.) ... 1117
Marc; Purification of Gummy Matter from ——. (P) Margulies ... 59
Mineral Constituents of ——. (Pellet) ... 628
Phosphoric Acid per 100 of Sugar in ——. (Pellet) ... 628
Pulp; Press for Preparing —— for Analysis (P) ... 1412
Relation between Phosphoric Acid and Ammonia in ——. (Pellet) ... 628
Slices; Acid Fermentation of ——. (Epstein) ... 1241
Slices; Press for ——. (P) Neumann ... 921
Sugar; Diffusion Apparatus for Valuation of ——. (Stiepel) 866
Beirut (Turkey), Importation of Cement into ——. (T.R.) 1002
Paint and Linseed Oil at ——. (T.R.) ... 1003
Belgium; Alcohol for Manufacture of Vinegar in ——. (T.R.). 654
Drawback of Duty on Industrial Alcohol in ——. (T.R.) . 882
Royal Commission on River Pollution in ——. (T.R.) 1565
Sewage Purification in —— by the Chemico-Biological Method. (Duyk) ... 1192
Spirits in ——. (T.R.) ... 1116
Sugar Bounties for the 1902-3 Campaign in ——. (T.R.) .. 294
Sugar Exports of ——. (T.R.) ... 1257
Sulphuric and Acetic Ethers in ——. (T.R.) ... 148
Tariff Modifications on Essences and Essential Oils in ——. (T.R.) ... 373
Belting; Waterproof Paper ——. (P) Gillet ... 1150
Bengal; Coals of ——. (Anderson and Henderson) ... 237
Benzaldehyde; Action of —— on Vanillin. (Rogow) ... 136
Benzaldehydes. *See under* Dyestuffs.
Nitro-; Preparation of ——. (Sachs and Kempf) ... 541
Benzene; Action of Sulphur Chloride on. (Lippmann and Pollak) ... 1271
And Cellulose, Reaction between ——. (Nastjukow) 1302
Benzenes and their Homologues; Production of ——. (P) Nikiforoff) ... 541
Benzene; Azo- and Hydrazo-; Properties of ——. (Freundler and Béranger) ... 429
Colouring of Alcohol Denatured with ——. ... 1322
In Denatured Spirit; Determination of ——. (Saare and Hanow) ... 367
In Grosny Naphtha; Characteristics of ——. (Markownikoff) ... 1448
Manufacture of —— in Russia ——. (Pantjuchow) ... 1448
m-Hydroxy Derivatives of Azo- and Azoxy- ——. (Noelting and Federmann) ... 400
Metho-ethenyl; Preparation of ——. (Tiffeneau) ... 728
See also under Benzol *and* Dyestuffs.
Benzidine. *See under* Dyestuffs.
Benzimidazole Derivatives. *See under* Dyestuffs.
Benzines; Commercial ——. (Rabinowitsch) ... 607
Benzoic Acid in Foodstuffs; Detection of ——. (De Brevans) 75
Acid; Manufacture of ——:
(P) Bischler ... 988
(P) Fabrique Baloise de Produits Chimiques ... 137
Benzol; Enrichment of Gas with ——. (Lecomte) ... 1020
See also under Benzene.
Benzophenone; Di-*o*-dinitro ——. *See under* Dyestuffs.
Benzoyl-Acetyl and Diacetyl Peroxides; Formation, Decomposition, and Germicidal Action of ——. (Freer and Novy) ... 495
Benzoyl-lupinin; Production of ——. (P) Merck ... 560
Berberine and Canadine; Relations between ——. (Gadamer) 186
Determination of ——. (Gordin) ... 142
In Plants; Occurrence and Detection of ——. (Gordin) .. 503
Oxidation of —— with Nitric Acid. (Dobbie and Lauder) 137
Bergamot; Crystalline Compound from Essence of ——. (Soden and Rojohn) ... 66
Oil. *See under* Oils.
Bessemer Converters in Great Britain. (T.R.) ... 1113
Practice; Alterations in American —— ... 1456
Betaine; Preparation of ——. (Stanĕk) ... 560
Beverage; Pineapple ——. (P) Perida ... 634
Beverages; Brazilian Customs Regulations as to —. (T.R.) 441
Manufacture and Supply of Aerated ——. (P) Wright ... 924
In Brazil. (T.R.) ... 573, 801
Treatment of ——. (P) Hogarth ... 558
Bicarbonates and Carbonates in Aqueous Solution; Equilibrium between ——. (Cameron and Briggs) ... 252
Test for ——. (Perkin) ... 1375
Bier, "Weiss"; Causes of Red Discoloration in ——. (Schonfeld and Dennhardt) ... 1343
See also Beer.
Bignonia catalpa; The Acids of ——. (Piutti and Comanducci) 1037
Birmingham; Sewage Treatment in ——. (O'Shaughnessy) .. 665
Biscuits; Manufacture of Malted ——. (P) Lambert ... 924
Bismuth; Deposit of ——, in Arizona. (T.R.) ... 1355
Electrolytic Determination of ——. (Branck) ... 874
Iodometric Determination of ——. (Rupp and Schaumann) 1558
Production of the United States. (T.R.) ... 1047
Radio-active —— (Polonium). (Marckwald) ... 991 1301

PAGE

Bismuth Citrate; Characteristics of ——. (Duncan)..... 1151
Citrate; Preparation of ——. (Duncan)..... 871
Compounds of Organic Acids used in Pharmacy. (Prunier) 135
Gallate; The Supposed Basic —— of the Codex. (Thibault) 135
Nitrate; Action of Mannitol on ——. (Vanino and Hauser)..... 65
Oxide; Reactions of —— with Metallic Salts..... 559
Oxyiodide Methylenedigallate. (P) Summers..... 275, 275
Oxyiodogallate; Preparation of ——. (Thibault)..... 1244
Sulphates; Research on ——. (Allan)..... 720
Sulphocyanide; Double Compounds of —— with Potassium Sulphocyanide. (Vanino and Hauser)..... 66
Trichloride and Tri-Iodide; New Compounds of ——. (Vanino and Hauser)..... 422

Bismuthose (Bismuth-Albumin Compound); Characteristics of ——. (Reinhardt)..... 1244

Bitter Fennel Oil. *See under* Oils.

Bitumen; Source of —— in Madagascar. (T.R.)..... 569

Bituminous and other Compounds; Treatment of ——, and Apparatus therefor. (P) Torkington. From Knight. 1397

Black, Animal-; Revivification of ——. (P) Blachier and Roullon..... 60
See also under Bone-Black.

Blanketing; Washing Calico-Printers' ——, and Means therefor. (P) Bradbury..... 250

last-Furnace Gases. *See under* Gases.

Blast Furnaces in France. (T.R.)..... 1113
See also under Furnaces.

Blasting Agents. (P) Von Dahmen..... 276
Cartridges. (P) Kirsanow..... 561
Compositions. (P) Wetter. From Westfalisch-Anhaltische Sprengstoff Aktiengesellschaft..... 1471, 1471
See also under Explosives.

Bleaching and Finishing Apparatus. (P) Skoupil..... 50
Apparatus:
(P) Crompton and Horrocks..... 405
(P) Gebauer..... 612
(P) Imray. From Roesch and Co..... 473
(P) Lishman and others..... 969
(P) Roesch and Co..... 342
(P) Scharp..... 405
(P) Taylor and others..... 1074
Apparatus; Electrolytic ——:
(P) Clark..... 1239
(P) Martin..... 342
(Tailfer)..... 611
Apparatus. *See also under* Dyeing.
Compound for ——. (P) Taylor..... 340
Electrolytic —— in the United States. (T.R.)..... 145
Electrolytic Process, and Apparatus for ——. (P) Vogelsang..... 612
Improvements in ——:
(P) Moll and Dickhuth..... 546
(P) Superofabrik Aolt and Dickhuth..... 49
Kier. (P) Tyms..... 341
Kier with Circulation Valves. (P) Tyms..... 612
Linen Yarn or Thread. (P) Boult. From Vogelsang..... 1328
Liquid for ——. (Cuenod)..... 1132
Steam Chlorinating Machine for ——. (Dépierre)..... 544

Bleaching-Powder; Composition of ——. (von Tiesenholt)... 913
Constitution of ——. (Ditz)..... 1074
Electrolytic Manufacture of —— at Sault Ste. Marie, Ontario. (Rhodin)..... 449
Formation of ——. Law of Mass Action. (Winteler).... 1075
Production of —— by Electrolysis. (Rhodin)..... 705
See also under Chloride-of-Lime.

Blendes containing Fluorine; Roasting ——. (Prost and Lecocq)..... 861

Board of Trade Notices. (T.R.)..... 370, 1562

Boedeker's Reaction. (Fazes)..... 877

Bohemia: Paper Industry of ——. (T.R.)..... 1117
Spirit, Malting, and Brewing Industries in ——. (T.R.).. 1116
Sugar Industry in ——. (T.R.)..... 1115

Boilers; Preventing Explosions and Formation of Scale in ——. (P) Abraham..... 625
Prevention and Removal of Incrustation in ——. (P) Gamlen..... 1445

Boiler-cleaning Composition. (P) Nettleton..... 1523

Boiling Point; Mixtures of Constant ——. (Young)..... 1560

Bois de rose femelle. *See under* Licari canali.

Boletol; Extraction of —— from Mushrooms. (Bertrand)... 182

Bolivia: Borate of Lime Deposit in ——. (T.R.)..... 570
Drugs and Medicinal Preparations in ——. (T.R.)..... 801
Exports of —— during 1900. (T.R.)..... 289

Bone-Black; Kiln for Revivifying ——. (P) Mohr..... 1239
See also under Animal Black.

Bone Glue. *See under* Glue.

Bones at La Rochelle. (T.R.)..... 938
Manufacture of Glue and Gelatin from ——. (P) Hilbert 1405
Manufacture of Imitation ——. (P) Franquet..... 134
Utilisation of Gypsum Sludge from ——. (P) Monin..... 1408

Books; New. *See* Special List of ——.

Boracic Acid; Treating Substances for Production of ——. (P) Smethurst..... 970
See also under Boric Acid.

PAGE

Borates of Hydrazine; Preparation of ——. (Djavachoff)... 646
Of Lime in Peru. (T.R.)..... 935
Used in Ceramic and Glass Manufacture. Fusibility of ——. (Granger)..... 255

Borax as a Meat Preservative. (T.R.)..... 940
Distilled with Methyl Alcohol; Behaviour of ——. (Polenske)..... 195
Manufacture of ——. (P) Hargreaves..... 1329
Treating Substances for Production of ——. (P) Smethurst..... 970

Bordeaux-Red in Wines; Detection of ——. (Casali)..... 74

Bore-holes; Tamping of ——..... 425

Boric Acid: Determination of ——. (Hebebrand)..... 278
In Butter; Rapid Determination of ——. (Richmond and Harrison)..... 929
In Fruits: Natural Occurrence of ——. (von Lippmann) 869
Titration of ——. (Farnsteiner..... 277
See also under Boracic Acid.

Boron Nitride: Characteristics of ——. (Moeses and Eidmann) 368

Bottle-wax; Composition of ——. (P) Hughes..... 264

Brandies; Coefficients of Impurity of ——. (Cardoso-Pereira) 923

Brandy. *See under* Cognac.

Brasilic Acid: Constitution of ——. (Perkin, jun.)..... 110

Brasilin. *See under* Dyestuffs.

Brazil; Balata Gum in ——. (T.R.)..... 1164
Beverages and Foodstuffs in ——. (T.R.)..... 801
Customs Regulations as to Beverages and Foodstuffs in ——. (T.R.)..... 441
Foodstuffs in ——. (T.R.)..... 573
India-Rubber Crop of ——. (T.R.)..... 938
India-Rubber Exports from Para, ——. (T.R.)..... 1049, 1164
India-Rubber Trade of ——. (T.R.)..... 371
Iron Ore Deposits of ——. (T.R.)..... 880
Monazite Deposits of —— Developed. (T.R.)..... 799
Sugar Industry of Bahia, ——. (T.R.)..... 1003
Sugar Production at Sergipe, ——. (T.R.)..... 939
Sugar Production at Pernambuco, ——. (T.R.)..... 939
Trade of Pernambuco, ——. (T.R.)..... 134

Brazing; Flux for ——. (P) Huth. From Pich..... 110

Brew-house Work; Sources of Error in Control of ——. (Windisch and Hasse)..... 983

Brewers' Grains; Apparatus for Drying ——. (P) Simon.... 1148
Grains; Kiln for Drying ——. (P) Harvey..... 557
Vat. (P) Griesser..... 632
Vats; Rouser Apparatus for ——. (P) Briggs..... 558

Breweries; Apparatus for Disposing of Liquid By-Products of ——. (P)..... 1035
Attenuation in ——. (Delbrück)..... 1088
Mashes; Filter-Presses for ——. (van der Schrieck and Windisch)..... 716

Brewing. (Class XVII.)..... 60, 130, 180, 266, 359, 417, 556, 631, 715, 784, 867, 922, 982, 1033, 1086, 1117, 1190, 1239, 1288, 1349, 1407, 1463, 1546
And Appliances therefor. (P) Meura..... 491
Apparatus for Use in ——. (P) Knox and others..... 632
Higher Yields in ——. (Cannon and Foll)..... 632
Industry in Bohemia. (T.R.)..... 1116
Industry of India. (T.R.)..... 1004
Mash-Tun, Hop-Back and Cooler, combined, for Use in ——. (P) Lancaster..... 182
Mash-Tuns for ——. (P) Riley..... 558
Processes of ——. (P) Hobson and others..... 558
Role of Nitrogenous Substances in ——. (Lintner)..... 1546
-Water: Value of Analysis of ——. (Zikes)..... 1147

Brewing-Syrup; Manufacture of ——. (P) Norman..... 1191

Bricks and Briquettes; Apparatus for Making ——. (P) Davis..... 860
And Building Blocks. (P) Barrett..... 52
And Tiles, Fire-; Apparatus for Hardening ——. (P) Thompson. From Croizier and Co..... 1393
Clinker —— from Fusible Clay..... 174
Drying of ——, and Apparatus therefor. (P) Berhenke.. 1028
In Quilimane (Portuguese East Africa); Manufacture of ——. (T.R.)..... 1206
Manufacture of —— from Refractory Material. (P) Jacobs..... 1397
Manufacture of Highly Fireproof ——. (P) Horak..... 1078
Moisture-proof Coating for ——. (P) Tucker..... 1079
Of Lime and Sand; Production of ——. (P) Lopatin and Galecki..... 174
Process of Burning ——. (P) Peck..... 1397
Production of ——:
(P) Berry and Lawes and Co..... 550
(P) Keeble..... 257
Refractory Impervious ——. (P) Rawson and Littlefield 52
Sand ——. (Schwarz)..... 1183
Scouring-; United States Customs Decision on ——. (T.R.) 292
Silica; Production of ——. (P) Gibson and Wessling.... 915
Treatment of Refractory ——. (P) Zuckschwerdt..... 1233

Brick-Kiln; Improved ——. (P) Wilson..... 1397

Brickwork; Destruction of —— by Alkali Sulphates. (Cajo). 409

Brine; Apparatus for Evaporation of ——. (P) Duff and others..... 344
Containing Salts of Calcium; Purification of ——. (P) Vis..... 913
Treatment of ——. (P) Vis..... 706
Vacuum Apparatus for Boiling ——. (P) Vis..... 914, 971

PAGE

Briquettes. Binding —. (Dumont du Voitel) ... 696
For Fuel, and Manufacture of same. (P) Meade ... 908
Machine for Moulding —. (P) White ... 599
Manufacture of —. (P) Ingham ... 600
Of Coal, Ore, &c.; Manufacture of —. (P) Ingham ... 163
Of Iron Ore, &c.; Apparatus for Making —. (P) Edison 1030
Peat; Analysis of — ... 1065
Peat; Manufacture of — by Electric Power ... 1065
See also under Fuel.

British Columbia; Lead Bounties in —. (T.R.) ... 936
Columbia; Mineral Production of —. (T.R.) ... 1163
Columbia; Mining in —. (T.R.) ... 1311
Columbia; Platinum Mining in —. (T.R.) ... 799
Guiana; New By-Product of Sugar in —. (T.R.) ... 512
Honduras, Cohune Palm-Nut used in —. (T.R.) ... 1163

British Insulated Wire Co.; Visit to — ... 952

Bromates; Electrolytic Production of —. (P) Corbin ... 970

Bromelin from Pineapple; Properties of — ... 1347

Bromic Acid; Determination of —. (Gooch and Blake) ... 1474

Bromides; Simple Qualitative Test for —. (Perkin) ... 1375

Bromine Derivatives of Cinchona Alkaloids. (Christensen) .. 721
In presence of Thiosulphates; Detection of —. (Leuba) 1319
Production in the United States. (T.R.) ... 1310
Spectroscopic Detection of —. (Panaotovic) ... 1557

Bromoform; Preparation of — by Electrolysis. (Coughlin) 186

Bromomethylheptenone; Preparation of —. (Wallach) ... 66

Bronze containing Lead; Corrosion, Erosion, and Structure of —. (Bailey) ... 531
Influence of Temperature on the Strength of —. (von Bach) ... 848
Iridescent Coating of —. (P) Sinclair ... 1083
Potassium-Tungsten —. (von Knorre and Schafer) ... 1403
Production of —. (P) Liensson ... 977

Broom; Utilisation of — for Manufacture of Paper Pulp. (P) Persichetti ... 1467

Broughton Copper Co.'s Works, Ditton; Visit to — ... 955

Brucine; Alleged Reaction of — with Nitrous Acid. (Lunge) 190
In Nux Vomica; Determination of —. (Dowzard) ... 1560
Reaction for Nitric and Nitrous Acids. (Lunge) ... 499
Separation of Strychnine from —. (Lyons) ... 1300

Brussels; Sugar Conference at —. (T.R.) ... 439, 653

Bucheler's Process for Acidification of Seed-Yeast:
(Heinzelmann) ... 359
(Hesse) ... 632
Sulphuric-Acid Process Tried for Preparation of Celery Seed Yeast. (Hesse) ... 267

Building Blocks and Bricks. (P) Barreto ... 52
Blocks; Conglomerates for —. (P) Cuel ... 257
Blocks; Manufacture of —. (P) Sellars ... 1233
Materials. (Class IX.) ... 52, 117, 174, 256, 347, 409, 549, 615, 707, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1233, 1279, 1331, 1395, 1455, 1535
Materials; Colouring of —. (P) Schultess ... 1535
Materials; Composition of —. (P) Murphy ... 1233
Material; Production of —. (P) Marsden ... 1139
Material; Slabs or Plates for —. (P) Wilkinson ... 118
Materials; Testing of —. (Gary) ... 477
See also under Roofing Material, Timber, *and* Wood.

Bulbocapnine; Preparation of —. (Gadamer) ... 496

Bulgaria; Sugar Industry in —. (T.R.) ... 513

Bungs for Casks, &c. (P) Ross and Mackenzie ... 1019

Bunsen Burners. *See under* Burners *and* Gas-Burners.

Burettes; Use of Floats in —. (Kreutling) ... 277

Burners; Atmospheric Gas — :
(P) Hancock ... 598
(P) Passmore ... 1446
(P) Terrineau ... 598
Bunsen — :
(P) Hanna ... 463
(P) Kappel ... 331
(P) Taylor ... 463
Bunsen and similar —. (P) Schaefer ... 331
Cap for Incandescence —. (P) Miller ... 1069
Combination Illuminating and Heating —. (P) Collill. 162
For Acetylene Gas:
(P) Bray ... 164, 1179
(P) Graf ... 1128
(P) Harris and Vogel ... 1269
For Crude Oil:
(P) Lewis, Ray, and Wesson ... 962
(P) Meyer ... 1022
Furnaces; Oil —. (P) Booth ... 698
Incandescence Spirit Light. (P) Christen and Aschner ... 1226
Incandescence Vapour. (P) Beck and Dior ... 1067
Hydrocarbons, with Luminous Flame. (P) Bonelli .. 603
Lamps. (P) Tompkins ... 602
Liquid Fuel —. (P) Halley ... 1180
Liquid Fuel and Air. (P) Fowler ... 962
Liquid Hydrocarbons. (P) Gibbes ... 34
Liquid Hydrocarbons; Atmospheric —. (P) Gillett 162
Oil Lamps with Incandescence Mantles. (P) Nielsen 602
Petroleum and like Vapours. (P) Johnston and Dobbs 1067
Fuel —. (P) Dally ... 1128
Fuel Feed for —. (P) Reynolds ... 602
Gas — :
(P) Campbell ... 602
(P) Crane, jun. ... 602

PAGE

Burners—*cont.*
Gas *cont.*
(P) Durban ... 397
(P) Kries ... 602
(P) Walker ... 1180
Gas and other —. (P) Abraham ... 697
Gas or Vapour — :
(P) Lytle ... 602
(P) Menne ... 1068
High-Pressure — for Incandescence Lamps. (P) Keith 1446
Hydrocarbon — :
(P) Bonnelli ... 539
(P) Elliott ... 909
(P) Gebhard and Rowley ... 603
(P) Graessle ... 602
(P) Hardy ... 909
(P) Higgins ... 1069
(P) Hodge ... 1270
(P) Leahy ... 1270
(P) Morgan ... 1069
(P) Mott ... 602
(P) Poole ... 602
(P) Tucker ... 1068
Hydrocarbon — for Boilers. (P) Best ... 1227
Hydrocarbon — for Heating Purposes. (P) Mason and Wilson ... 244
Hydrocarbon Vapour — :
(P) Blanchard ... 1227
(P) Bousfield. From La Société des Bruleurs Roger 851
(P) Heist ... 963
(P) Johnston ... 1022
(P) le Pelletier ... 1068
(P) Mackim ... 1180
Incandescence — for Hydrocarbons. (P) Farraday and Goss ... 602
Incandescence — for Liquid Hydrocarbons. (P) Russell 1227
Incandescence — for Oil Lamps. (P) McFarlane and Sterne ... 464
Incandescence Gas — :
(P) Blake. From Hardt ... 1389
(P) Blakey ... 333
(P) Bluhm ... 464
(P) Boult. From Braunstein ... 1446
(P) Clawson and Benjamin ... 698
(P) Ehmann ... 109
(P) Eldridge ... 964
(P) Falk, Stadelmann, and Co., and Thurnauer ... 164
(P) Green ... 164
(P) Filling ... 34
(P) Lux ... 538
(P) Phelps and Nadeau ... 697
(P) Sieverts and Juergens ... 464
(P) Taylor ... 909, 964
(P) Ward ... 333
(P) Wiederhold ... 1269
Incandescence Hydrocarbon —. (P) Mende ... 964
Incandescence Oil or Spirit —. (P) Thompson. From Comp. d'Incandescence par le Petrole ... 333
Liquid-Fuel —. (P) Neumann ... 698
Modified Argand — for First Part of Kjeldahl's Nitrogen Process. (Golding) ... 994
Oil — :
(P) Arper ... 1227
(P) Devoe and Dailey ... 462
(P) Dunn ... 909
(P) Fox ... 1022
(P) Johnson ... 963
(P) Jones, jun. ... 1324
(P) Lewellen ... 1068
(P) Raymond ... 1068
(P) Seeger ... 1324
(P) Trapp ... 1324
(P) Tucker ... 1068
(P) Witt ... 462
Oil-Injector —. (P) Plotts ... 852
Petroleum Incandescence —. (P) Bramson ... 1271
Retort Hydrocarbon —. (P) Duncan and Wafer ... 963
Self-extinguishing —. (P) Hinckley ... 332
Vaporiser, Mixer, and Regulator for Oil —. (P) Larkin .. 603
Vapour — :
(P) Burkamper ... 906
(P) Lecomte ... 1021, 1022
(P) Sherman and Harms ... 602
(P) Smart ... 1068
(P) Smith ... 464
Vapour-Generating Apparatus for Hydrocarbon —. (P) Forde ... 1180

Butter; Appliance for Testing — for Water. (P) Geldard .. 1472
Boric Acid in —; Rapid Determination of —. (Richmond and Harrison) ... 929
Halphen's Test for Cotton-Seed Oil in —. (Sjollema and Tullekin) ... 1344
Influence of Growth of Mould on Chemical Composition of —. (Crampton) ... 1241
Rancidity of —. (Jensen) ... 785
Refining and Preservation of —. (P) Iscovesco ... 1408
Separation of Margarine from —. (Deguide) 1352
Sterilisation of —. (P) de Bock ... 492

Butter-Fat. Decomposition of — by Micro-Organisms. (Laxa) 268
Relation between Various Constants of —. (Behrend and Wolfs) ... 1148

C

PAGE

Cables, Vulcanised Electric; Manufacture of ——. (P) Claremont 626
Cacao-Butter; Composition of ——. (Klimont) 486
Cadinene; Preparation of ——. (Cathelineau and Hausser) .. 67
Cadmium; Detection of ——. (Biewend) 1349
Quantitative Determination of ——. (Miller and Page)... 71
Smelting or Refining ——. (P) Armstrong 1281
Cadmium Chloride and Bromide; Precipitation of ——. (Viard) 1076
Cæsium; Determination of —— as Acid Sulphate. (Browning) 71
Phosphate; Properties of ——. (von Berg) 116
Caffeine; Determination of ——. (André) 1250
Determination of ——. (Katz) 1300
Iodides; Properties of ——. (Faucon) 636
Occurrence of ——. (Beitter) 135
Calamus Oil. *See under* Oils.
Cajuput Oil. *See under* Oils.
Calcining Apparatus. (P) Edison 1455
Method of ——. (P) Eldred 615
Calcium and Manganese Carbides; Production of Mixed ——. (Brame and Lewes) 755
Carbide and Acetylene; Some Reactions of ——. (Sandmann) 932
Carbide and Manganese Carbide; Simultaneous Manufacture of —— 597
Carbide Cartridges. (P) Rosenbluth 963
Carbide; Electric Production of ——. (Kershaw) 565
Carbide; Equation representing the Reaction during Reduction by ——. (Neumann) 1302
Carbide Feed Mechanism for Acetylene Machines. (P) Collin and Nicholls 539
Carbide; Formation of ——. (Rothmund) 761
Carbide; Furnaces for Manufacture of ——. (P) Ward, and The International Oil Furnace Co. 461
Carbide; Holder for ——. (P) Simonson 1270
Carbide; Holders for ——. (P) Smith 1269
Carbide; Manufacture of:
(P) de Vulitch and D'Orlowsky 909
(P) Roberts 1227
Carbide; Production of ——. (P) Diesler 261
Carbide; Reactions in Formation of ——. (Gin) 960
Carbide, Reduction with; Equation of Reaction in ——. (von Kugelgen) 1332
Carbide; Sampling of ——. (Odernheimer) 1065
Carbide; Treatment of ——. (P) Woodhall and Windham 245
See also under Carbide.
Carbonate; Solubility of —— in certain Solutions. (Cameron and Seidell) 773
Carbophosphate; Characteristics of ——. Barille) 406
Chloride; Electrolytic Production of —— in Italy. (T.R.) 509
Compounds; Preparation of —— for Use as Reducing Agent. (P) Hughes. From Descamps 1533
Oxalate; Gases from Decomposition of —— by Heating. (Pellett and Delamare) 193
Salts in Beetroot Juice. (Pellet) 866
Salts of Acids of the Acetic-Acid Series; Solubilities of ——. (Lumsden) 343
Silicide. (Moissan and Dilthey) 504
Silicide; Production of ——. (Moissan and Dilthey) 566
Sulphaluminate; Composition of ——. (Deval) 1026
Sulphate and By-Products; Manufacture of ——. (P) (Wing) 1534
Sulphate. *See also under* Gypsum *and* Plaster-of-Paris.
Sulphide in Bone Charcoal; Determination of ——. (Rossing) 1474
Sulpho-Aluminate and the Action of Sea Water on Portland Cement. (Rebuffat) 1535
Sulpho-Ichthyolate; Preparation of ——. (Hegland) 788
Calcium; Electrolytical Production of ——. (Borchers and Stocken) 1284
Hydrogen Phosphate; Solubility of —— in Water. (Rindell) 195
In Iron. (Ledebur) 1140
Metallic; Extraction of ——. (Arndt) 1459
Metallic; Preparation of ——. (Ruff and Plato) 1458
Calico-Printing; Application of Indigo Salt T in ——. (Kayser) 170
Improvements in ——. (P) Costobadie and others 250
Machines for ——. (P) The Calico Printers' Association and Wilson 703
Novel Effects in ——. (Kayser) 968
Oxycellulose in ——. (Kurz) 405
Photography for Engraving Rollers used in ——. (Depierre) 47
Production of Naphthylamine Bordeaux in ——. (Kayser) 1276
Resist under Indanthrene Blue. (Tigerstedt) 912
California; Nitrate Deposits of ——. (T.R.) 1479
Oil Fields of ——. (T.R.) 1001
Crude Oil. *See under* Oils.
Uses of Petroleum in ——. (T.R.) 1000
Calorimeter for Coal. (Rosenhain) 1472
Simple Form of ——. (Darling) 927
Calumba Root (Jateorhiza Calumba); Alkaloids of ——. (Gadamer) 1294
Camphene; Manufacture of ——. (P) Stephan 1194, 1194
Production of ——. (P) Zimmermann. From Chem. Fab. vorm. E. Schering 1553
Camphidine; New Derivative of Camphoric Acid 1409
Camphidone; New Derivative of Camphoric Acid 1409

PAGE

Camphor; Anise ——. *See under* Anethol.
Carboxylic Acid; Investigations on ——. (Bruhl) .. 1409, 1467
Growth of —— in Ceylon. (T.R.) 84
Japanese ——. (Sugiyama) 1551
Manufacture of ——. (P) The Ampere Electro-Chemical Co. 1469
Manufacture of a Substitute for ——. (P) Magnier and Brangier 1411
Oil. *See under* Oils.
Production of ——. (P Thurlow 791
Supply of —— from Formosa. (T.R.) 801
Tobacco-; Constitution of ——. (Gawalowski) 1348
Camphoric Acid and Derivatives; Manufacture of ——. (P) Johnson. From Boehringer und Soehne 872
Acid; Compounds of —— with Phenyldimethylpyrazolone, &c. (P) Imray. From The Farb. vorm. Meister, Lucius und Bruning 67
Canada; Charcoal and By-Product Manufacture in Ontario. (Goodwin) 743
Company for Working Corundum in ——. (T.R.) 80
Cotton-Seed Oil in ——. (T.R.) 1003
Hemp-Bleaching Compound Duty-free in ——. (T.R.) ... 509
Mineral Production of —— for 1901. (T.R.) 292, 570
Mineral Production of ——. (T.R.) 798
Molybdenite Deposits in British Columbia. (T.R.) 200
Paper-Pulp Production of —— (T.R.) 84
Peat Development in Ontario. (T.R.) 1309
Platinum in British Columbia. (T.R.) 146
Printing Paper in ——. (T.R.) 442
White Arsenic Production of Ontario. (T.R.) 1120
Canadine and Berberine; Relations between ——. (Gadamer) 186
Canarine; Characteristics of ——. (Goldberg) 110
Canary Islands; Imports of the ——. (T.R.) 1043
Candles; Addition of Alcohol to Fat for Manufacture of ——. (P) Lewy 1448
British —— for Stettin, Germany. (T.R.) 733
Imports of —— by China. (T.R.) 1479
Imports of —— into Cyprus, Diarbekir, and Persia. (T.R.) 1311
Imports of —— into Salonica, Turkey. (T.R.) 292
Improved ——. (P) Garrigan 918
Machines for Wrapping ——. (P) Pedersen 918
Manufacture of —— in Kansas. (T.R.) 82
Manufacture of —— in New Zealand. (T.R.) 200
Material Imports by Argentina. (T.R.) 651
Sulphur ——. (P) Shaw 788
Cantharides; Japanese ——. (Puran Sing) 1295
Canton (China); Trade of. (T.R.) 1109
Caoutchouc and similar Bodies; Devulcanising ——. (P) Theilgaard 1461
Regenerating Old Vulcanised ——. (P) Kessler 357
Regeneration of ——. (P) Zühl 865
Two Indo-Chinese Lianas yielding ——. (Quintaret) 415
See also under India-Rubber *and* Rubber.
Cape Colony; Copper Industry of ——. (T.R.) 650
Capsules for Compressed or Liquefied Gas. (P) Read 914
Caramel; Determination of Fermentable Matter in ——. (De Luynes) 128
Carbamic Ethers (Urethanes); Preparation of ——. (P) Newton. From The Farb. vorm. F. Bayer and Co. 364
Carbide Cartridge for Acetylene Gas Generators. (P) Macknsick 604
Device for Feeding —— to Acetylene Generators. (P) Schofield 606
See also under Calcium Carbide.
Carbides; Electric Production of ——. (P) Roberts 353
Manufacture of —— by Electrical Fusion. (T.R.) 1419
Of Manganese and Calcium; Production of Mixed ——. (Brame and Lewes) 755
That are decomposed by Water. (Moissan) 329
Carbinol, Tetramethyldiaminodiphenyl ——; Condensation Products of ——. (Guyot and Granderye) 466
Carbinols; Esterification of —— by means of Alcohols. (Fischer and Weiss) 400
See also under Dyestuffs.
Carbohydrates; Action of Hydrogen Peroxide on ——. (Morrell and Crofts) 506
Drying ——, and Determining the Water of Crystallisation of ——. (Schulze) 281
Obtainment of —— from Carbonic Acid. (P) Walther ... 988
Thermal Effects in Building up and Breaking down ——. (Mohr) 77
Carbolic Acid; Imports of —— by Wurtemburg. (T.R.) 84
Carbon; Addition of —— to Metals. (P) Jones 915
Anodes; Electrolysis of Alkali Chloride Solutions with ——. (Sprosser) 124
Articles; Manufacture of ——. (P) Hall 1031
Dioxide. *See also* Carbonic Acid.
Direct Combination of —— with Chlorine. (von Bolton) . 483
Electrodes for Arc Lamps. (P) Conradty 1447
Electrodes; Manufacture of ——. (P) Pohl 906
For Arc Lamps, Encased ——. (P) Siemens Bros. and Co. 1525
For Arc Lamps; Manufacture of ——. (P) Boehm 1129
For Arc Lights. (P) Viertel and Pueschel 1446
For Electric Arc Lamps. (P) Siemens Halske Aktienges. 1448
For Manufacture of Electrodes, &c.; Extraction of ——. (P) Gaster 699
Formation of Ions of ——. (Billitzer) 936
Fusion of —— and Apparatus therefor. (P) Ludwig 1458

PAGE

Carbon—*cont.*
Hydrogenation of Oxides of ——. (Sabatier and Senderens) 566
In Iron and Steel: Flask for Determination of ——. (Kleine) 1097
In Steel; Determination of ——. (Blount) 278
Photogenic or Photographic ——. (P) Broca and Pellin 1448
Properties of —— in the Hearth of the Blast-Furnace. (Foster) 774

Carbon Bisulphide at Catania, Sicily; Production of ——. (T.R.) 1207
Bisulphide; Manufacture of —— in Electric Furnace. (Taylor) 1236
Bisulphide; Production of —— in Electric Furnace. (P) Taylor 979
Dioxide; Action of —— on Metallic Oxides. (Kühling)... 115
In Furnace Gases; Determination of ——. (Garnier).... 1246
Liquid; Duty on —— in France. (T.R.) 1563
Monoxide and Dioxide in Vitiated Air; Determination of ——. (Jean) 1473
Monoxide; Toxicity of —— 1465
Sulphide; Non-existence of Gaseous ——. (Russell and Smith) 1476
Tetrachloride; Manufacture of ——:
(Combes) 272
(P) Urbain 926
Tetrachloride; Manufacture of ——, and Apparatus for. (P) Combes 1469
Vegetable; Manufacture of ——. (P) Cooper..... 421
See also under Charcoal.

Carbon-Black; Apparatus for Manufacture of ——. (P) Mann 1337
See also under Lampblack *and* Soot.

Carbon-Oil Heater. (P) Hosea 763

Carbonates; Action of Hydrogen Peroxide on ——. (Kazanezky) 645
And Bicarbonates in Aqueous Solution; Equilibrium between ——. (Cameron and Briggs) 252, 406

Carbonate of Lime. *See under* Lime *and* Calcium Carbonate.
Of Soda. *See under* Sodium Carbonate.

Carbonating Apparatus. (P) Carmichael 1191

Carbonation Vessels. (P) Joly..... 921

Carbonic Acid Gas; Apparatus for Charging Liquids with ——. (P) Sne 869
Gas; Apparatus for Generating ——:
(P) Feldkamp 1330
(P) Luhmann 1330
(P) Müller..... 1138
(P) Riesberg..... 1138
Gas in the Bars of Passenger Steamers. (T.R.) 1161
Generator and Holder. (P) Henderson and Clayton 132
Recovery and Utilisation of Waste ——. (P) Berry and others 548
Syndicate in Austria-Hungary. (T.R.)..... 509
See also under Carbon Dioxide.

Carbonising Organic Materials. (P) Daube..... 1070

Carbonometer; Construction of ——. (P) Downs 422

Carbonylferrocyanides; Action of Light on ——. (Wyss)..... 932

Carborundum; Manufacture of Articles of ——. (P) Tone ... 1279

Carboxylic Acids, *o*-Hydroxy; Manufacture of ——. (P) Chem. Fab. vorm. E. Schering 68

Carburetted-Air Apparatus. (Schiff)..... 162

Carburetting Apparatus:
(P) Bardwell 601
(P) Bennett and Moorwood 1068
(P) Best 764
(P) Betzel 1189
(P) Blake 460
(P) Bouchaud-Praceiq 1324
(P) Clark and Cothran 463
(P) Cooper..... 851
(P) Doolan 600
(P) Duryea..... 764
(P) Evans and Nelson 696
(P) Fillet 601
(P) Frenay 539
(P) Foidart..... 381
(P) Gwynne and Crewe 906
(P) Harris 601
(P) Hinchley 539
(P) Honts..... 764
(P) Inman 908
(P) Jacks..... 601
(P) Kemp 599
(P) Kull..... 463
(P) Lane and Davenport..... 852, 463
(P) Mangin..... 764
(P) Martenette 600
(P) McCormick and Miller..... 601
(P) Notkin 163, 163
(P) Purves and The Notkin Syndicate..... 163
(P) St. C. Legge..... 463
(P) Sanson..... 601
(P) van der Made 463
(P) Wilkinson and others 764

Carburetting Apparatus and Burner for Liquid Hydrocarbons. (P) Machlet, jun. 460
Apparatus and Gasoline Regulator Combined. (P) Titus 601

Carburetors. *See under* Carburetting Apparatus.

PAGE

Cardboard; German Customs Decision on Blue-straw ——. (T.R.)..... 202
Method and Composition for Impregnating ——. (P) Back 494

Carmine. *See under* Dyestuffs.

Carpets; Apparatus for Printing ——. (P) Lundeberg..... 474
Producing Coloured Patterns on ——. (P) Tonjes 114

Carpet; Washable and Waterproof ——. (P) Montgomery... 1276

Carriage; Water —— within Great Britain. (Carey)..... 749

Carthagena; Mineral Production of ——. (T.R.) 1002

Casein; Action of Dilute Nitric Acid on ——. (Habermann and Ehrenfeld) 1158
As a Fining Agent for Wines. (Muntz)..... 369
Derivative containing Sulphur and Chlorine. (Panzer) .. 145
Films; Waterproof ——. (P) Schmidt 64
Formation of α-Pyrroludinecarbonic Acid on Hydrolysis of —— by Alkali. (Fischer) 1158
Manufacture of Adhesive ——. (P) Jost..... 357
Manufacture of Articles from ——. (P) Dymond. From Miglioretti and Maffei..... 264
Manufacture of —— in Hungary. (T.R.) 654
Phosphate; Preparation of ——.
(P) James..... 717, 717
(P) Just..... 361
Photographic Film, and Manufacture of same. (P) Buss. 1155
Product; Manufacture of a ——. (P) Ensminger..... 1462
Production of Insoluble ——. (P) Dunham..... 547
Pure Solutions of ——. (P) Hatmaker. From Jost 271
Solution. (P) Hall..... 636
Use of —— in Manufacture of Coloured Paper..... 618
Use of —— in Sizing and Finishing Textiles. (P) Jean .. 1533
Use of —— for Waterproofing Fabrics. (P) Bousfield. From Cantu and others 113

Caseinates, Insoluble; Composition containing ——. (P) Franquet..... 1408

Caseinogen of Asses' Milk. (Storch) 1344

Casks; Apparatus for Cleansing ——. (P) Drake and Gorham..... 62
Apparatus for Filling ——. (P) Coupe..... 1126
Apparatus for Spraying Liquids into ——. (P) Crossman 596
Apparatus for Sterilising and Lining ——. (P) Lancaster 183
Apparatus for Washing and Drying ——. (P) Lancaster. 183
Bungs or Stoppers for ——. (P) Ross and Mackenzie 1019
Disinfection of ——. (P) Dufour..... 1547
Protecting Contents of —— from Robbery. (P) Wright . 1224
Union —— used in Brewing Operations. (P) Cutler 268

Cass Technical Institute; Opening of the —— 287

Cassava; Characteristics of ——. (Leuscher) 492

Casse of Wines; Action of Sulphurous Acid in Preventing ——. (Laborde) 557

Catalysis; A Model for ——. (Federlin) 1417
And its Applications. (Conroy)..... 302
Contact Bodies for Use in ——. (P) Johnson. From The Badische Anilin und Soda Fabrik..... 548
Porous Bodies for Use in ——:
(P) Actienges. für Zink-Industrie and Schroeder ... 344
(P) Johnson. From the Badische Anilin und Soda Fabrik 344
Reactions; Mutual Influence of Two —— in same Medium. (Coppadoro) 284
Treatment of Solids with Gases for Producing ——. (P) Naef..... 1076

Cast Iron. *See under* Iron

Catechin. *See under* Dyestuffs.

Cathodes; Disintegration of ——. (Haber and Sack)..... 777

Cattle-Food at Pau. (T.R.) 939
From Hops and Hop-seeds. (P) Makin 1344
From Molasses. (P) Pilat and Grardel..... 924
In Germany; Preparation of New ——. (T.R.)..... 1479
Manufacture of ——:
(P) Dupire..... 1549
(P) Hughes 1191
(P) Vaupel 984
Manufacture of —— from Molasses. (P) La Société Sucrière Anon. de Toury 924

Caucasus; Manganese Ore Production of the ——. (T.R.)... 732

Caustic Soda. *See under* Soda, Sodium Hydroxide, *and* Alkali.

Cedrus Atlantica; Oil of ——. *See under* Oils.

Cellars (Tun Rooms); Infection and Ventilation of ——. (Ludner) 785

Cellobiose; Characteristics of ——. (Skraup and König)..... 144

Celluloid; A New ——. (P) Franquet..... 134
Coating Cotton Fabrics with ——. (P) Hill 912
Composition resembling ——. (P) Zuhl 65
Manufacture of ——. (P) Goldsmith and others..... 1293
Printing Blocks. (P) Lichtenberg-Madsen 134
Products of Germany. (T.R.) 801
Rendering —— Incombustible. (P) Mabilie and Leclerc. 1408
Rendering —— Non-inflammable. (P) Williams and Parkin..... 719
Risk of Fire from —— 134

Celluloid-like Compositions:
(P) Johnson. From Deutsch. Celluloidfab. 494
(P) Soc. Anon. F. Bayer and Co..... 873
(P) Zuhl 719

Cellulose Acetate; Manufacture of ——. (P) Boesch..... 1243
Preparation of ——. (P) Lederer..... 1550

PAGE

Cellulose; Acetylating ——. (P) Lederer 1550
Action of Sulphur Blacks on ——. (Matos) 224
An Oxygen Bleach for ——. (Ahlin) 134
And Benzene; Reaction between ——. (Nastjukow) 1302
Conversion of —— into Glucose, &c. (Reynaud and Bonner) 1406
Conversion of —— into Sugar:
(P) 630
(P) Classes 630
Derivatives; Preparation of ——. (P) F. Bayer and Co. . 870
Determination of ——. (Zeisel and Stritar) 642
Esters; Manufacture of ——. (P) Mork and others 1345
Esters; Purification of ——. (P) Boesch 1243
Fabrics; Improved ——. (P) Hill 1074
Factories; Gas from Waste-Liquors of ——. (Boseofelder 1192
Fibres for replacing Silk. (P) Comp. Française de la Soie Parisienne 49
Films of ——. (P) Waite 272
From Cotton of Cotton-Seed Husk. (P) Newsone 63
Hydrogen and Methane Fermentation of ——. (Omeliansky) 418
In Norway. (T.R.) 1166
Lakes, and Manufacture of same. (P) Althausse 356
Manure from Waste-Liquors of Sulphite ——. (Knosel) .. 489
Material for making Combs. (P) Soc. Indust. de Cellulose 1550
Products: Manufacture of ——. (P) Fremery and Urban 1150
Regulating Flow of Solutions of —— through Nozzles (P) 870
Solutions: Filaments from ——. (P) Thiele 1393
Threads of ——. (P) Fremery and Urban 272
Cement, Portland; Action of Sea-Water on ——. (Rebuffat). 1535
Portland, and Slag; Experiments on Mixtures of ——. (Beck) 72
Portland; Behaviour of Magnesia in ——. (Glaessner) 1395
Portland; Clinkering of ——. (Campbell) 1396
Portland; Constitution of ——. (Ludwig) 256
Portland; Hydraulic Modulus of ——. (Lieven) 1028
Portland; Imports of —— by the United States. (T.R.). 732
Portland; Industry of the United States. (T.R.) 371
Portland; Influence of Chloride of Lime on Setting of ——. (Hauenschild) 175
Portland; Manufacture of ——:
(P) Gostling 973
(P) Jordan 973
(P) Rusager 118
Portland; Manufacture of ——, and Apparatus. (P) Hurry and Seaman 1079
Portland; Maturing of ——. (P) Rigby 1184
Portland or Hydraulic; Manufacture of ——. (P) Ashton and others 915
Portland; Preparation of —— from Slag or Cinder. (P) von Forell 257
Portland; Report of Committee on Analysis of Materials for Making —— 12
Portland; Retardation of Setting of ——. (Niboul and Dufossez) 859
Portland Slag; Manufacture of ——. (P) Heap and Oddy 550
Proposed Standardisation of Analysis of ——. (Stanger and Blount) 1216
Report of Sub-Committee on Uniformity of Analysis of —— 1223
Schumann's Apparatus for Determining Specific Gravity of —— Modified. (Beck) 69
Slag; Apparatus for the Manufacture of ——. (P) Clark. From Fellner and Ziegler 1535
Slag-; Production of —— in Europe. (T.R.) 1112
Testing —— in Germany. (T.R.) 1206
Testing of ——:
(Oftedal) 1078
(Peckham) 831
Trade of Germany. (T.R.) 437
Ware; Manufacture of ——. (Oftedal) 1078
Zulkowski's Theory of Glass and Hydraulic ——. (Glaessner) 706

Cements. (Class IX.) 52, 117, 174, 256, 347, 409, 549, 615, 707, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1233, 1279, 1331, 1395, 1455, 1535
Abnormalities in Initial Setting of ——. (Ljamin) 972
Action of Sulphate of Lime on ——. (Deval) 257
Adhesive ——. (P) Slough 1286
Adhesive ——, and Manufacture of same. (P) Willis 415
Alkalis in Portland and Natural; Determination of ——. (Stillman) 191
Analysis of ——. (Young and Baker) 1298
Apparatus for Calcining ——. (P) Edison 1455
Apparatus for Damping and Mixing ——. (P) Davis 860
Apparatus for Manufacture of ——:
(P) Butchard and Gibson 550
(P) Clark. From Fellner and Ziegler 550
Asphalt; Manufacture and Use of ——. (P) Lake. From Warren 1233
At San Francisco ——. (T.R.) 1002
Chemical Decomposition of —— in Sea-Water. (le Chatelier) 409
Composition of ——. (P) Pause 973
Composition of Hydraulic Fireproof ——. (P) Knox 1140
Composition of Matter for ——. (P) MacDonell 479
Compositions for Roads, &c.; Making and Laying ——. (P) Lake. From Warren 915
Consumption of —— in Paraguay. (T.R.) 649
Consumption of —— in Poland. (T.R.) 935
Exports of —— from Great Britain. (T.R.) 199
For Binding Pigments, &c. (P) Grote 1279

PAGE

Cements—*cont.*
For Casting or Moulding. (P) Brown 973
Gypsum; Hardening of —— 347
Hydraulic ——. (P) Michaelis 175
Hydraulic; Studies on Zulkowski's Theory of ——. (Glaessner) 1395
Hydrocarbon Composition for Making ——. (P) Clawson 615
Importation of —— at Beirut (Turkey). (T.R.) 1002
Imports of the United States. (T.R.) 1162
Industry in Hanover ——. (T.R.) 1046
Industry of Germany ——. (T.R.) 1112
Influence of Calcium Sulphate on ——. (Deval) 971
Inspection and Testing of ——. (Humphrey) 1279
Kilns and Drying Chambers for ——. (P) Hewitt 118
Magnesia ——. (Preussner) 257
Magnesia; Characteristics of ——. (Luhmann) 118
Manufacture of ——:
(P) Berry and Lawes and Co. 550
(P) Diesler 175
(P) Friz 708
(P) Harding 915
(P) Le Roy de Lenchères 973
(P) McKim 1398
(P) Passow 860
(P) Steiger 409, 480
(P) von Forell 347
Manufacture of —— in the Central United States. (T.R.) 649
Manufacture of —— in the United States. (T.R.) 292
Modifications of Standards in Testing —— 860
Centrifugal Apparatus:
(P) Berrigan 597
(P) de Marchéville 326
(P) Hirt 783
(P) Holland 628
(P) Kaczorowski 630
(P) Larsen 1125
(P) Macfarlane and Robertson 1224
(P) Ohlsson 764
Apparatus for Laboratories. (P) Eyre 1039
Apparatus for Quantitative Analysis. (Steinitzer) 562
Separator Drum. (P) Nilsson 244
Ceramic Decoration; Apparatus for Preparing Coloured Designs for ——. (P) Haviland 914
Ceramics; Drying of ——, and Apparatus. (P) Berbenke 1028
Fusibility of Silicates and Borates used in ——. (Granger) 255
Manufacture of ——. (P) Buchner 859
Producing Metallic Lustre on ——. (P) Zsigmondy 707
See also under China *and* Porcelain.
Ceria; Separation of —— from Mixtures of Rare Earths. (Meyer and Koss) 422
Cerium Carbonates; Glucose and ——. (Jeh) 795
Oxalicum Medicinale; Composition of ——. (Bohm) 720
Peroxide; Formation of ——. (Baur) 720
Cerium Group; Metals of the ——. (Behrens) 368
Influence of —— on Lanthanum containing Didymium, &c. (Marc) 1093
Metals; Electrolytic Production of —— from Fused Salts. (Muthmann, Hofer, and Weiss) 412
Separation of ——. (Bohm) 719
Separation of Thorium from ——. (Metzger) 1115
Cerite Earths; Action of Alcoholic Hydrochloric Acid on ——. (Meyer and Koss) 1093
Cevadine; Decomposition of ——. (Horst) 722
Ceylon; Growth of Camphor in ——. (T.R.) 84
India-Rubber in ——. (T.R.) 511
Liquid Fuel exempt from Duty in ——. (T.R.) 1110
Plumbago Mining in ——. (T.R.) 80
Poisons; Ordinance on ——. (T.R.) 514
Chamois Leather; Manufacture of ——. 56
Champagne. *See under* Wines.
"Chance Mud;" Utilisation of ——. (P) Mason 1278
Changes of Address 3, 92, 155, 212, 300, 380, 448, 526, 581, 664, 743, 814, 891, 949, 1012, 1063, 1124, 1175, 1216, 1266, 1320, 1364, 1431, 1490
Charcoal and By-Products; Manufacture of —— in Ontario. (Goodwin) 743
Apparatus for Manufacturing ——. (P) Barcev 908
Briquettes of ——. (P) Ingham 163
Of Great Decolorising Power. (P) Ostrejko 58
Retort and Furnaces. (P) Laurenius 1388
Vegetable; Manufacture of ——. (P) Cooper 421
Wood-; Production of —— from Aromatic Plants. (P) Rubauds 1466
See also under Carbon.
Cheese; Chemical Changes in the Ripening of ——. (Sutherst) 219
Salts formed by Casein and Paracasein with Acids, and their Relation to American ——. (Van Slyke and Hart) 1290
Chelidonine; Characteristics of ——. (Schotterbeck and Watkins) 274
Chemical Industry of Germany. (T.R.) 1060
Products at Hamburg. (T.R.) 1043
Chemicals; Import of —— into Turkey. (T.R.) 1197
In South Africa. (T.R.) 1421
Production of —— in Electric Furnace. (P) Taylor 979
Chestnut Extract in Oak Extract; Detection and Determination of —— 1476
Chicle Gum in Mexico. (T.R.) 438

PAGE

Chile; Bounty on Sulphuric Acid in ——. (T.R.) 1354
Increase of Duty on Sodium Nitrate in ——. (T.R.) 509
Iodine in ——. (T.R.) 1046
Iodine Production of ——. (T.R.) 880
Nitrate at Junin, ——. (T.R.) 1205
Nitrate at Taltal, ——. (T.R.) 1205
Nitrate Industry of ——. (T.R.) 1002, 1112
Sulphuric Acid in ——. (T.R.) 1162
Imports and Exports of ——. (T.R.) 289
Sodium Hyposulphite exempt from Duty in ——. (T.R.) 291

Chilled-Iron Shot; Production of ——. (P) Pearson 1224

China; Beans, Bean-Cake, &c. at Newchwang, ——. (T.R.) .. 1003
Exports of Wuchow, ——. (T.R.) 1044
Imports and Exports of Hankow, ——. (T.R.) 799
Import Duty on Morphia in ——. (T.R.) 1312
Imports of Soap and Candles into ——. (T.R.) 1479
Indigo in ——. (T.R.) 1420
Industrial Outlook in ——. (T.R.) 507
Match Imports of Chinkiang. ——. (T.R.) 802
Match Manufacture at Foochow, ——. (T.R.) 294
Mining Industry of Wuchow, ——. (T.R.) 1047
Rape-Seed and Earth-Nuts in Wuhu, ——. (T.R.) 881
Trade of Canton, ——. (T.R.) 1109
Trade of Chinkiang, ——. (T.R.) 798
Trade of Ningpo, ——. (T.R.) 879
Trade of Swatow, ——. (T.R.) 1044

China (Porcelain); Bone in English ——. (Wood) 1454
Draft Rules for Manufacture of ——. (T.R.) 649
Trade of Chicago. (T.R.) 649
Trade of Smyrna, Turkey. (T.R.) 291
Works; Lead Poisoning in ——. (T.R.) 371
See also Porcelain *and* Ceramic.

Chinese Wood Oil. *See under* Oils.

Chloranisidine. *See under* Dyestuffs.

Chlorates; Electrical Manufacture of —— :
(P) Corbin 970
(P) Lederlin 346, 1282
Electrolytic Production of —— at Niagara Falls. (Kershaw) 115
Metallic; Research on ——. (Meusser) 705
New Reaction for ——. (de Koninck) 873

Chloride, Acetyl; Manufacture of ——. (P) Wohl 1411
Ethyl; Receptacle for ——. (P) Schwarz 1154

Chlorides; Anhydrous Cupric-Ammonium ——. (Bouzat) 1158
Gasometric Method for Determining ——. (Riegler) 73

Chloride-of-Lime; Influence of —— on Setting of Portland Cement. (Hauenschild) 175
See also Bleaching Powder.

Chlorine; Action of Nascent —— on Proteiu Substances. (Ehrenfeld) 646
And Sulphates; Production of ——. (P) Clemm 254
Apparatus for Determination of ——. (Mare) 928
Apparatus for Electrolytic Production of —— :
(P) Mactear 1077
(P) Wilson 476
Apparatus for Generating ——. (P) Edwards 1278
Compounds of —— with Gold. (Meyer) 52
Direct Combination of —— with Carbon. (von Bolton) ... 483
Electrolytic Production of ——. (P) Chaplin and Halloran 476
Electrolytic Production of —— by Solvay-Kellner Process. (Glaser) 1142
Laboratory Preparation of ——. (Graebe) 284
Spectroscopic Detection of ——. (Pansotovic) 1557

Chloro-amino Phenolsulphonic Acid, 1.3.4.5; Production of ——. (P) Badische Anilin und Soda Fabrik 43

Chloroform, Alcohol in ——; Detection of 642
Customs Duties on —— in United Kingdom. (T.R.) 1167
Determination of ——. (Pucknell) 76

Chlorosulphonic Acid; *o*-Toluene ——. *See under* Dyestuffs.

Chocolate; Manufacture of ——. (P) Rieck 492
Sesamé Oil in ——; Detection of. (Utz) 642

Cholesterol and Phytosterol in Mixtures; Separation of ——. (Marcusson) 725
In Fats; Quantitative Determination of ——. (Ritter) .. 643

Choline in Cognac; Test for ——. (Struve) 1040

Chromates; Analysis of ——. (Herz) 500

Chrome; Mordanting Wool with ——. (Ulrich and Tugendhat) 769
Ore; Production of —— in Greece. (T.R.) 650
-Tanning Process. (P) Thompson. From Wunsch) 1544

Chromic Acid; Behaviour of —— towards Hydrogen Peroxide. (Bach) 502
Oxide; Crystallisation of ——. (Ditte) 407
Sulphate; Action of Hydrochloric Acid on ——. (Recoura) 1076

Chromite as Hearth Lining for Smelting Furnace. (Glenn) .. 52

Chromium Compounds; Action of —— on Gelatin. (Namias) 1338
Compounds; Production of ——. (P) Johnson. From The Chem. Fab. Griesheim-Elektron 548
Produced by the Alumino-thermic Method; Chemical Properties of ——. (Doring) 1158
Sesquioxide; Compounds of Alumina with ——. (Dubois) 727

Chromone, 1.3-Dihydroxy-; Preparation of ——. (Kostanecki and de Wildt) 497
α-Naphtho ——. *See under* Dyestuffs.
Dihydroxy ——. *See under* Dyestuffs.

PAGE

Chromone—*cont.*
Group of Dyestuffs. *See* Hydroxychromone.
3-Hydroxy-β-benzyl ——. *See under* Dyestuffs.

Chrysazin. *See under* Dyestuffs.

Cider; Chemistry of ——. (Allen) 922
Yeasts from Sugar-Canes for Fermentation of ——. (Alliot) 923

Cinchona Alkaloids; Anisic Acid Ethers of ——. (P) Thron . 637
Alkaloids; Acidyl Derivatives of ——. (P) Johnson. From Vereinigte Chininfab. Zimmer and Co. 275
Alkaloids; Bromine Derivatives of ——. (Christensen) ... 721
Alkaloids; Carbonic Acid Ethers of ——. (P) Johnson. From Vereinigte Chininfab. Zimmer and Co. 988
Alkaloid Carbonic Acids; Alkyl Ethers of ——. (P) Thron 926
Alkaloids; Cinnamic Ether of ——. (P) Thron 638
Alkaloids Soluble in Ether. (Scoville) 66
Alkaloids; Succinic Acid Ether of. (P) Thron 638
Bark and its Preparations; Determination of the Alkaloids in ——. (de Myttenaere) 721
Bark; Importation of —— by the Netherlands. (T.R.) ... 654
Bark in Java ——. (T.R.) 1118
Bark; Testing of ——. (Myttenaere) 931
Bark Tincture; Assay of ——. (Alcock) 368
Succirubra Bark; Fluid Extracts of ——. (Warin) 1467

Cinchotine; Hydroxy ——. (Widmar) 135

Cineol (Eucalyptol) Arsenate; Preparation of ——. (P) Smith 1096

Cinnamon Oil. *See under* Oils.

Cinnamylquinine Hydrochloride; Preparation of ——. (P) Fuchs 364

Citral Series; Isomerisation of Members of the ——. (P) Tiemann 1553

Citrate of Lime Exported by Palermo. (T.R.) Watts 442
Of Limes from Messina, Sicily. (T.R.) 1209
Citric Acid from Messina, Sicily. (T.R.) 1209
In Milk; Detection of ——. (Wohlk) 564
In Sicily. (T.R.) 1355
In Wine; Detection of ——. (Schindler) 1415
Industry of Lyons, France. (T.R.) 1311
Manufacture of ——. (Ohly) 871
Methylene ——, and Manufacture of same. (P) Sternberg 791
Reaction of —— with Bromine and Potassium Permanganate. (Wöhlk) 564

Citron Oil; Characteristics of ——. (Gulli) 187

Citronella Oil. *See under* Oils.

Civet; Characteristics of ——. (Hebert) 1347
Commercial ——. (Parry) 1553

Clarifying Apparatus. (P) Litty 490

Clays. (Class IX.) 52, 117, 174, 256, 347, 409, 477, 549, 615, 707, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1233, 1279, 1331, 1395, 1455, 1535

Clay; Apparatus for Moulding Articles in ——. (P) Rowley and others 477
Artificial —— in Germany. (T.R.) 371
Drying ——, and Apparatus therefor. (P) Kuckenhöner . 1019
Influence of Magnesia on Behaviour of ——. (Maeckler) . 914
Pipes, &c.; Strengthening of ——. (P) Millet 707
Production of —— in the United States. (T.R.) 649
Rational Analysis of ——. (Sabeck) 426
Slimes; Treatment of —— by Cyanide Process. (Tays and Schierz) 480
Treatment of Impure ——. (P) Burn 1455

Clay-working Industries in the United States. (T.R.) 1206
Industries of France. (T.R.) 731

Cleansing Compositions; Liquid ——. (P) Ellis 869

Clove Oil. *See under* Oils.

Coal and Coalfields of South Africa. (T.R.) 1256
Blocks; Smokeless ——. (P) Pergeline 459
Briquettes of ——. (P) Ingham 163
Calorific Power of ——. (Goutal) 1267
Calorimeter. (Rosenhain) 1472
Coking of Badly-caking ——. (P) Schwarz 597
Composition for Increasing the Efficiency of ——. (P) Lake. From Koalo Sava Manufacturing Co. 330
Composition for Promoting the Combustion of ——. (P) McBride 1323
Continuous Coking of ——. (P) Hemingway 1067
Deposits of Australia ——. (T.R.) 1478
Of Bengal and Japan. (Anderson and Henderson) 237
Resources of India. (T.R.) 568
Scarcity of ——. (Brough) 162
Sulphur in ——; Determination of :
(Reitlinger) 1298
(Stoddart) 1298

Coal-Tar Production in the United States. (T.R.) 1310
Imports of La Rochelle. (T.R.) 934
Methylindenes from ——. (Boes) 853
Naphthofurfurane in ——. (Boes) 964
See also under Tar.

Coating Compositions :
(P) Bentley 488
(P) Just 1544
For Steam-Pipes, &c. (P) Franeke 107
For Surfaces. (P) Lean. From Wolf 56
For Wooden Surfaces and Walls. (P) Clauson-Kaas 973

PAGE

Cobalt and Nickel; Modification of Rose's Method of Separating ——. (Taylor) 426
And Zinc; Separation of ——. (Rosenhain and Huldschinsky) 1351
Compounds of Silicon with ——. (Lebeau) 1301
Extraction of —— by Electrolysis. (P) Le Roy 54
Ore in New Caledonia ——. (T.R.) 1207
Qualitative Test for ——. (Danziger) 928
Cobalt Chloride; Compound of —— with Alcohol. (Bourion). 505
Hydroxide; Preparation of ——. (P) Frasch 862
Coca; Exportation of —— from Salaverry. (T.R.) 940
Leaves from Perené (Peru) ——. (T.R.) 1005
Leaves; Yellow Colouring Matters of ——. (Hesse) 1551
Cocaine; Detection of ——. (Proelss) 142
Ether for the Manufacture of —— exempt from Duty in Holland. (T.R.) 1479
Hydrochloride; Decomposition of —— by Hydrochloric Acid. (Horst) 186
Hydrochloride; Rotatory Power of ——. (Imbert) 1346
Sterilising and Preserving ——. (P) Riley 1096
Cocoa and Milk Food; Sterilised ——. (Beythien) 420
Essences; Analyses of ——. (Clayton) 1090
Sandal Wood in; Detection of ——. (Riechelmann and Leuscher) 1157
Substitutes for ——. (P) Menl 1344
Theobromine in ——; Determination of. (Welmans) 1476
Cocoa-nut Oil Imported by the Straits Settlements. (T.R.) 292
Cod-liver Oil. *See under* Oils.
Coffee Extract; Preparation of ——, and Apparatus therefor. (P) Reichert and Heydemann 1344
Free from Caffeine; Manufacture of ——. (P) Zimmermann. From Nicolai 1035
Substitute for ——. (P) Maxim 492
Treatment of ——, and Production of Substitutes. (P) Maxim 269
Cognac, Choline in ——; Test for. (Struve) 1040
Cohune Palm-Nut; Use of —— in British Honduras. (T.R.). 1163
Coke; Apparatus for Manufacture of ——. (P) Naef 908
Apparatus for Quenching ——. (P) Bertrand 1179
From By-Products in the United States. (T.R.) 1203
Manufacture of ——:
(P) Custodis 33
(P) Evans. From de Velna 1178
(P) Johnson. From The Deutsche Continental Gas Ges. and Bueb 851
(P) Naef 1128
(P) Pohl 906
(P) Seaver 1179
Manufacture of ——, and Apparatus therefor. (P) Lowe. 906
Manufacture of —— from Compressed Fuel. (Darby) 761
Manufacture of —— in Great Britain. (T.R.) 1110
Manufacture of —— in the United States. (T.R.) 1110
Plant for Manufacture of ——. (P) Kennedy 245
Plant for Production of —— in Maryland. (T.R.) 568
Recovery of By-Products in Manufacture of ——. (Thiry) 761
Coke-Ovens. *See under* Ovens *and* Kilns.
Coking Badly-caking Coal, and Apparatus therefor. (P) Schwarz 597
Colliery Waste; Utilisation of Carboniferous ——. (P) Dorr. 1021
Collodio-Chloride Paper for Platinum Toning 365
Collodion; Preparation of ——. (P) Donge 771
Colloidal Hollow Bodies; Formation of ——. (Krafft and Funcke) 1301
Colloids; Deep-Red Gold Solution a Reagent for ——. (Zsigmondy) 192
Colombia; Match Imports of ——. (T.R.) 515
Colophony; Research on ——. (Fahrion) 127
See also under Rosin.
Colorado; Mineral Production of ——. (T.R.) 732
Colorimeter; Use of the ——. (Pellet) 865
Colouring Matters and Dyestuffs. (Class IV.) 35, 110, 168, 247, 336, 398, 466, 541, 607, 700, 766, 853, 910, 965, 1022, 1070, 1129, 1181, 1229, 1272, 1326, 1390, 1448, 1528
Colouring Matters, Various. *See under* Dyestuffs.
Colouring Wood, Paper, Leather, &c. (Class VI.) 114, 250, 475, 614, 705, 771, 858, 969, 1135, 1231, 1276, 1329, 1393, 1533
Colour, Black; Production of —— on the Fibre. (P) Comp. Parisienne des Couleurs d'Amline 114
Colours, Azo; Production of —— on the Fibre. (Hepburn) .. 404
Determining the Covering Power of Printing ——. (Valenta) 336
For Chemical Printing. (P) Hoz 50
For Lithographic and other Printing. (P) Lake. From Wechsler 782
Material for Use in Manufacture of ——. (P) de Brandel and de Baudry d'Asson 782
Painters' —— in Russia. (T.R.) 1115
Colour Photography. *See under* Photography.
Combustibles; Increasing the Heating Power of ——. (P) Kahn and Heberlein 330
Storage of —— in New York City. (T.R.) 941
Vaporisation of Liquid ——. (P) Riley and Strathy 1127
See also under Fuel.
Combustion; Control of Temperature, Volume, &c. of ——. (P) Eldred 696
Fluid for Promoting ——. (P) Battistini 908

PAGE

Compressing Apparatus. (P) Thompson. From Darby. 1226
Concentrating Apparatus:
(P) Marks. From Hannetelle-Chapnis 52
(P) Webb and others 253
Apparatus for Ores, &c. (P) Sperry 775
Apparatus. *See also under* Cooling, Condensing, Heating, *and* Evaporating.
Concrete; Composition for Use as ——. (P) Nobis and Wenzel 1079
For Use in Salt Mines. (Ebel) 175
Joints. (P) Ransome 479
Condenser for Smoke or Vapour. (P) Merrick 246
Fractional —— for Alcohol Distillation. (P) Slavicek 633
Condensing and Cooling Apparatus:
(P) Allison. From the Fume Condenser Co. 1226
(P) Clubbe and Southey 326
(Goeckel) 1039
(P) Jackson 965
(P) Morris 1534
Apparatus and Method. (P) Lake. From the Cosmopolitan Power Co. 326
Conductors; Covering Electric —— with Insulating Material. (P) Heyl-Dia 626
Conglomerates for Building Purposes. (P) Cuel 257
Congress of Applied Chemistry; International —— 1367
Conium Alkaloids; Characteristics of ——. (Ahrens) 636
Contact Bodies for Use in Catalysis. (P) Johnson. From The Badische Anilin und Soda Fabrik 548
Bodies; Manufacture of Porous ——. (P) Actienges. für Zink-Industrie and Schroeder 344
Bodies; Manufacture of Porous —— for Chemical Operations. (P) Johnson. From The Badische Anilin und Soda Fabrik 344
Convallaria Leaf Oil. *See under* Oils.
Conversazione at University College, Liverpool 952
Converter; Electrolytic ——. (P) Long 780
Cooling Apparatus:
(P) Balcke 904
(P) Naef 1126
(P) Werner 784
Apparatus and Process for ——. (P) Naef 1064
Apparatus; Parobek's System. (Gladbach) 1064
Towers:
(P) Halsall and Lapham 970
(P) Lever 1224
Copal, Manila; Research on ——. Tschirch and Koch 712
Resin; Chemical Composition of ——. (Guédras) 1460
See also under Resin.
Copals; Fusion of —— under Pressure. (Lippert) 1460
Copper; Analysis of Industrial ——. (Truchot) 501
And its Alloys; Refining —— with Magnesium 258
Application of Phase Rule to Melting Point of ——. (Richards) 975
Bullion; Gold and Silver in ——; Determination of ——. (Swift) 1551
Deposition of —— from various Electrodes. (Beadle) 178
Deposits of —— in Asiatic Turkey. (T.R.) 732
Deposits of —— in Bohemia. (T.R.) 200
Determination of —— in Presence of Bismuth, &c. (van Name) 1099
Determination of —— with Potassium Permanganate. (Guess) 1247
Electrolytic Determination of ——. (Williams) 502
Electrolytic Precipitation of ——. (Smith) 1558
Exports of Huelva, Spain. (T.R.) 732
Extraction of —— by the Wet Method:
(P) Irvine 54, 776
(Kroupa) 1233
Extraction of —— from Ores:
(P) Neill and Burfeind 978
(P) Thofehrn and De Saint Seine 862
(P) Waterbury 351
Extraction of —— from Sulphide Compounds. (P) Hoepfner 1081
Extraction; Theory of Electrolytic Methods of ——. (Egli) 623
Hardening of:
(P) Renstrom 620, 1030, 1458
(P) Walter and Keiner 916
In Foodstuffs, Traces of ——. (Medicus and Mehold) 1248
In India; Production of ——. (T.R.) 1421
In Iron; Electrolytic Determination of ——. (Koch) 563
In Rhodesia; Discovery of ——. (T.R.) 1112
In the United States; Production of ——. (T.R.) 1478
In the Urals. (T.R.) 510
Industry of Cape Colony. (T.R.) 650
Influence of —— on Steel Rails and Plate. (Genzmer) 119
Iridescent Coating of ——. (P) Sinclair 1083
Matte, Tariff Classification in Spain ——. (T.R.) 1163
Minerals; Treatment of ——. (P) Westinghouse 1457
Mines of Roumania. (T.R.) 1047
Mining in Trans-Caucasia. (T.R.) 147
Obtaining Metallic —— from Ores. (P) Cranston. From The American Copper Mining Co. 1457
Obtainment of Refined —— from Matte. (P) Mitchell 1081
Ores. *See under* Ores.
Precipitation of —— from Water. (P) Polmeteer 787
Presence of —— in Powdered Drugs and Chemicals. (Gane) 224
Production of ——. (P) Vildorola 709

PAGE

Copper—*cont.*
Recovery of —— from Copper Precipitate. (P) McKechnie and others ... 350
Refining —— Electrolytically:
(Kershaw) ... 565
(Walsh) ... 177
Refining of —— with Magnesium ... 1080
Separation of —— from other Metals. (Pontio) ... 929
Volumetric Determination of ——:
(Litterscheid) ... 874
(Parr) ... 929
(Repiton) ... 641

Copper-Mine Water; Precipitate for Treatment of ——. (P) Polmeteer ... 978

Copper-Plating; Dessolle's Process of ——. (Fontaine) ... 1144

Copper, Halogen-thiobismuthites of ——. (Ducatte) ... 877
Oxide, Ammoniacal; Characteristics of ——. (Bonzat) ... 982
Sulphate at Leghorn. (T.R.) ... 935
Sulphate; Demand for —— in Algeria. (T.R.) ... 1162
Sulphate Exports from Great Britain. (T.R.) ... 370
Sulphate Imports of Bordeaux. (T.R.) ... 935
Sulphate Imports of Messina, Sicily. (T.R.) ... 1205
Sulphate in Germany. (T.R.) ... 1112
Sulphate; Use of Electrolysis of —— as Basis of Acidimetry. (Lange) ... 1473
Sulphate; Use of —— in Corfu. (T.R.) ... 880
Sulphide; Electrolytic ——. (Rieder) ... 978

Copper. *See also under* Cupric *and* Cuprous.

Copra Imported by the Straits Settlements. (T.R.) ... 292
In East Prussia; Use of ——. (T.R.) ... 1114
Trade in ——, in Holland. (T.R.) ... 651

Cordite M.D.: a New Explosive. (T.R.) ... 294

Cores for Castings from Potatoes and Sand. (P) Königsdorf. 1080

Corfu; Use of Copper Sulphate in ——. (T.R.) ... 880

Coriariere; Toxic Principles of the ——. (Marshall) ... 1153

Cork; Production of —— in the British Colonies. (Maiden.) (T.R.) ... 1478

Corrosive Sublimate. *See under* Mercuric Chloride.

Corundum: Company for Working —— in Canada. (T.R.) ... 80
See also under Emery.

Corycavine: Preparation of ——. (Gadamer) ... 496

Corycavamine; Preparation of ——. (Gadamer) ... 496

Corydaline. Part VII. Constitution of Corydaline. (Dobbie and Lauder) ... 137
Relation of —— to Berberine. (Dobbie and Lauder) ... 137

Corydalis Alkaloids. (Gadamer) ... 423, 496

Corydine: Preparation of ——. (Gadamer) ... 497

Corytuberine: Characteristics of ——. (Gadamer) ... 497

Cotarnine; Preparation of ——. (Freund and Wulff) ... 871
Research on ——. (Freund and Bamberg) ... 871

Cotoine; Preparation of ——. (Pollak) ... 136

Cotton; Action of Inorganic Sulphur Compounds of ——. (Appleyard and Deakin) ... 702
Black-dyed; Examination of ——. (Whittaker) ... 1024
Dyed with Sulphur Dyestuffs; Producing Discharges on ——. (P) Newton. From The Farb. vorm. F. Bayer and Co. ... 968
Fabrics; Coating —— with Celluloid, &c. (P) Hill ... 912
Fabrics; Mercerising ——, and Apparatus therefor. (P) Ecob ... 49
Fibre; Preventing the Weakening of Dyed ——. (P) Newton. From The Farb. vorm. F. Bayer and Co. ... 340
Final Treatment of Colours Produced on ——. (P) Actiengesellschaft für Anilin Fab. ... 49
Hygroscopic Nature of ——. (Lester) ... 388
In Dyed Union Fabrics; Preserving ——. (Loewenthal). 339
Liquid for Bleaching ——. (Cuénod) ... 1132
Mercerisation of ——. (P) Badische Anilin und Soda Fabrik ... 49, 49
New Discharge Effects on ——. (Stein) ... 339
Of Cotton-Seed Husk; Cellulose from ——. (P) Newsome ... 63
Padded with β-Naphthol; Action of Heat, Moisture, and Steam on ——. (Ulrich and Beinde) ... 1452
Preventing the Tendering of Dyed ——. (P) Manufacture Lyonnaise de Matières Colorantes ... 50
Raw, and Cotton Goods; Reducing Inflammability of ——. (P) Perkin, jun., and others ... 857
Refrigeration employed in Mercerising ——:
(Lefèvre) ... 250
(Kurz) ... 250
Rendering —— Fireproof. (P) Perkin and others ... 1231, 1531
Seeds; Removing Fibre from ——. (P) Green ... 1336
Sliver; Apparatus for Dyeing ——. (P) Mattei ... 1134
Tissues; Influence of the Hygrometric State of —— on their Tenacity. (Scheurer) ... 701
Tissues; Influence of Various Operations on the Tenacity of ——. (Scheurer) ... 702
Tissues; Tension exerted in Mercerising ——. (Grosheintz) ... 403
Yarns; Mercerising ——, and Apparatus therefor. (P) Romer ... 48
Yarns; Mercerising —— under Tension. (Beltzer) ... 403

Cotton-Seed; Hulling of ——. (P) McFarlane and Reinohl. 1084, 1084
In Egypt. (T.R.) ... 1207

Cotton-Seed Oil. *See under* Oils.

PAGE

Coumarin; Production of —— from Peristrophe augustifolia. (Molisch) ... 561

Council; Report of —— ... 891

Covering for Walls, Floors, &c. (P) Zschiedrich ... 918

Cream-separating Apparatus:
(P) Hartmann ... 289
(P) Knudsen ... 1549
(P) Phillips ... 1291

Creolin; Ordinary and Solid ——. (Baroni) ... 1242

Creosote Imported by Bayonne. (T.R.) ... 934

Cresol Derivatives. *See under* Dyestuffs.

Cresols: Separation of Para- and Meta- ——. (P) Rutgers Chem. Fab. ... 1410

Crucibles and Furnaces; Refractory Impervious ——. (P) Rawson and Littlefield ... 52
Construction of ——. (P) Rousseau ... 959
Manufacture of ——. (P) Engels ... 1081
Shield and Funnel for Recharging ——. (P) Brown ... 1537
Smelters'; Recharging of ——. (P) Brown ... 1537
See also under Furnaces.

Crucible-Furnace for Laboratory Use; Electric-Resistance Magnesia ——. (Howe) ... 69

Crushing. *See under* Pulverising *and* Grinding.

Cuba; Deposit of Petroleum in ——. (T.R.) ... 569
Imports of ——. (T.R.) ... 1419
Petroleum from ——: Characteristics of. (Stokes) ... 541

Cupric-Ammonium Chlorides; Anhydrous ——. (Bonzart) ... 1158
Bromide; Precipitation of —— by Sulphuric Acid. (Viard) ... 167
Chloride; Precipitation of —— by Sulphuric Acid. (Viard) 1076
Hydroxide; Action of —— on Aqueous Solutions of Metallic Salts. (Mailho) ... 173, 285
See also under Copper.

Cuprous and Cupric Ions. (Bodländer and Storbeck) ... 1282
Oxide, Ammoniacal; Oxidation of ——. (Meyer) ... 1561
Oxide; Yellow ——. (Gröger) ... 1138
Sulphocyanide and Potassium Cyanide; Interaction of ——. (Itzig) ... 286
See also under Copper.

Customs Decisions in Madagascar. (T.R.) ... 437
Decisions in New Zealand. (T.R.) ... 508, 879
Decisions in Switzerland. (T.R.) ... 437
Decisions in the Netherlands. (T.R.) ... 507
Tariff in Germany, New ——. (T.R.) ... 1044

Cutters, Rotary; Manufacture of ——. (P) Jansen ... 1030

Cyanamide and its Compounds; Manufacture of ——. (P) Johnson. From Deutsche Gold- und Silber Scheide-Anstalt ... 275

Cyanates and Cyanides; Reciprocal Determination of ——. (Mellor) ... 71

Cyanide Plant; West Crushing —— at Ely, Nevada ... 119
Poisoning by ——. (T.R.) ... 935
Process; Diehl's ——. (Knutsen) ... 1029
Process of Working Ores. (P) Officer and others ... 1141
Solutions containing Copper; Titration, &c. of ——. (Virgoe) ... 348
Solutions; Notes on ——. (Carter) ... 409
Treatment of Slimes on the Rand. (T.R.) ... 1421

Cyaniding; Agitating Apparatus for Use in ——. (P) Rubsch, jun. ... 411

Cyanides, Alkali; Manufacture of ——:
(P) Darling ... 773, 773, 773
(P) Johnson. From The Deutsche Gold- und Silber Scheide-Anstalt ... 345
(P) Rossiter and others ... 345
Alkaline; Production or Purification of ——. (P) Craig and Paterson ... 117
And Cyanates: Reciprocal Determination of ——. (Mellor) ... 71
Compound of ——, and Manufacture of same. (P) Erlwein and Frank ... 1232
Electromotive Force of Metals in Solutions of ——. (Christy) ... 779
Extraction of —— from Gas. (Guillet) ... 1026
Gold in Solutions of; Determination of ——. (Carter) ... 1558
Manufacture of——:
(P) Ottermann ... 914
(P) Rossitter and others ... 173
Of Potassium and Sodium; Briquettes of a Mixture of ——. (P) Thompson. From Chem. Fab. vorm. Vorster and Grüneberg ... 253

α-Cyanobenzylanilines. *See under* Dyestuffs.

Cyanogen Group; Treating Spent Gases for Recovery of ——. (P) Godwin and Keil ... 1278

Cyanogenesis in Plants. (Dunstan and Henry) ... 996

Cyanomethines. *See under* Dyestuffs.

Cyanomethylaniline and its Derivatives; Production of ——. (P) Badische Anilin und Soda Fabrik ... 170

ω-Cyanomethylaniline. *See under* Dyestuffs.

ω-Cyanomethylanthranilic Acid Esters. *See under* Dyestuffs.

Cyprus, Production of Essential Oils in ——. (T.R.) ... 1565
Use of Olive Oil-Cake in ——. (T.R.) ... 1479

D

PAGE

Dairy Utensils; Apparatus for Sterilising and Lining ——. (P) Lancaster 183
Apparatus for Washing and Drying ——. (P) Lancaster. 183
Damascus; Glue Manufacture of ——. (T.R.) 1003
Indigo at ——. (T.R.) 1001
Starch Manufacture of ——. (T.R.) 1004
Damell's Cell; Variations of E.M.F., &c. in ——. (Chaudier) 352
Deaths; Lists of 4, 93, 156, 212, 380, 449, 581, 665, 743, 814, 1012, 1068, 1124, 1175, 1216, 1321, 1364, 1431, 1490
Defecating Apparatus. (P) Hatton 629
Degree Balling; Determination of the ——. (Kovar) 75
Denmark; Beet-Sugar Industry of ——. (T.R.) 372
Distilleries in ——. (T.R.) 1423
Malt Industry of ——. (T.R.) 441
Sugar Production of ——. (T.R.) 654
Deodorisers. *See under* Disinfectants.
Dentists' Cement; Customs Decision on —— in United States. (T.R.) 442
Dephlegmator for Kjeldahl Distillations. (Lovett) 849
Designs and Trade Marks; Amended International Convention Rules on 1197
Dessolle's Process of Copper-Plating. (Fontaine) 1144
Destructive Distillation. (Class III.) 35, 109, 164, 246, 335, 398, 466, 540, 607, 699, 765, 853, 909, 964, 1022, 1070, 1129, 1180, 1228, 1271, 1326, 1390, 1448, 1527
Detergent, and Manufacture thereof. (P) Pease and MacDonnell 263
Manufacture of ——. (P) Bamberg 864
Detonator; Safety ——. A Substituto for Mercury Fulminate. (P) Fuhrer 189
Detonating Compositions:
(P) Alvisi 1195
(P) Bielefeldt 639
(P) von Dahmen 989
Compositions; Treatment and Use of ——. (P) Hess 562
Detonators. *See also under* Explosives.
Developers. *See under* Photographic *and* Photography.
Dextrin (Achroodextrin); Manufacture of ——. (P) Reymaud 1290
Dextrine; Conversion of Wood into ——. (P) Magnier and Grangier 632
Detection of so-called Honey ——. (Beckmann) 180
Examination and Analysis of Commercial ——. (Lippmann) 1101
Import Duty on —— in United Kingdom. (T.R.) 1423
Diacetyl-diamine, and Manufacture of same. (P) Ach 1245
Diamide; Derivatives of —— with Closed Atomic Groups. (Curtius) 66
Diamond Match Co., Seaforth; Visit to —— 954
Diamonds, Artificial; Formation of ——. (von Hasslinger) ... 1476
Diastase; Action of Barley —— on Starch. (Baker) 1087
Cause of Error in Investigating ——. (Pozzi-Escot) 418
Experiments with Malt ——. (Ling and Davis) 1088
Influence of Carbonic Acid on the Action of ——. (Mohr) 359
Obtaining —— and Preparing for Use. (P) Hancock 558
Diastatic Power according to Lintner's Method; Determination of ——. (Mohr) 951
Diazo-amines and Amino-azo Compounds; Influence of Substitution on Formation of ——. (Morgan) 36
Diazo Compounds; Action of Salt on ——. Rossi) 250
Compounds. *See also under* Dyestuffs.
Dibenzylacetone. *See under* Dyestuffs.
Dicinchona Alkaloid Carbonic Acid Esters; Manufacture of ——. (P) Vereinigte Chininfab. Zimmer and Co. 1294, 1294
Didymium; Separation of ——. (Böhm) 719
Separation of Thorium from ——. (Metzger) 1415
Diehl's Process for Cyanide Treatment of Gold. (Knutsen) .. 1029
Diethyl-ether; Preparation of ——. (P) Benjamin 364
Diffusers (Sugar); Gases in the ——. (Dubos) 416
Diffusion Apparatus:
(P) Deltour and Mist 1147
(P) Steffen 1406
Apparatus for Valuation of Beetroots. (Stiepel) 866
Processes. *See under* Sugar.
Digesters; Gas-Separator for Wood-Pulp ——. (P) Milts 362
Digesting Apparatus for Oil Extraction. (P) Giesler 1543
Digitalis Leaves; Valuation of ——. (Ziegenbein) 1294
Digitoxin in Digitalis Leaves; Determination of ——. (Stoeder) 283
1.3-Dihydroxychromone; Preparation of ——. (Kostanecki and de Wildt) 497
Di-indigotin. *See under* Dyestuffs.
Di-iododithymol; Chlorine Compounds in Commercial ——. (Cousin) 560
Examination of Mother-Liquors from Making ——. (Roques and Gerngross) 1193
Di-iodophenol; A New ——. (Prenans) 1094

PAGE

Dimethylaniline. *See under* Dyestuffs.
Dimethylamiddodimethylphenylpyrazolone; Compounds of —— with Camphoric Acid. (Imray.) From The Farb. vorm. Meister, Lucius und Brüning 67
Dimethylene Tartrate, and Manufacture of same. (P) Sternberg 791
Dimethylheptenol and Terpineol; Mercuric Compounds from ——. (Sand and Singer) 1293
Dimethylsulphate. *See under* Dyestuffs.
Dinas Brick; Use of S. Russian Quartzite for Making ——. (Rosenberg) 117
Dinner; The Annual —— 955
Dipentene; Preparation of ——. (P) Mills. From The Atopère and Camphor Electro-Chemical Co. 722
Diphenyl as a Photographic Developer. (P) Graves 638
Derivatives; Manufacture of ——. (P) Ullmann 38
Derivatives. *See under* Dyestuffs.
Pyrogenetic Production of ——. (Loh) 1271
Diphenylamine, Aminohydroxy ——. *See under* Dyestuffs.
Nitrosomethyl. *See under* Dyestuffs.
Diphenylmethane, Di-*o*-dinitro-. *See under* Dyestuffs.
Diphylline; Characteristics of ——. (Schlotterbeck and Watkins) 274
Disaccharides; Synthesis of some New ——. (Fischer and Armstrong) 1302
Disaccharoses; Magnetic Rotation of ——. (Perkin, sen.) 144
Disazo Dyestuffs. *See under* Dyestuffs.
Discharge for Tannic Acid Mordants. (Tigerstedt) 912
Discharges on Aniline Black, &c. (Jaquet) 1453
Upon Paranitraniline Red, &c.; White and Coloured ——. (P) Clayton Aniline Co. 342
Upon Sulphur Colours; Production of ——. (P) Farb. vorm. F. Bayer and Co. 114
With Powdered Aluminium and Magnesium. (Weiss) ... 473
Disinfectants. (Class XVIII.) 62, 132, 182, 268, 360, 420, 492, 558, 633, 716, 786, 869, 923, 984, 1035, 1090, 1148, 1191, 1241, 1290, 1344, 1497, 1464, 1548
Composition of ——. (P) Martin 271
Manufacture of ——:
(P) Kendrick 925
(P) Nelson 635
(P) Rother 925
(P) von Vamossy 1154
Preparation of Formaldehyde ——. (P) Spengler 1150
Disinfecting Apparatus:
(P) Arnold 925
(P) Fournier 718
(P) Francis 1036
(P) Jones 925
(P) Walz 985
Media; Gasification of ——, and Apparatus. (P) Sieber .. 1036
Powder; Preparation of ——. (P) Mumford and Newlands 1092
Saponaceous Product for ——. (P) Koens 1345
Disinfecting and Preserving Process. (P) Fournier 1345
Disinfection; Charging Compartments with Gas for ——. (P) Moure and Martin 870
Experiments on —— 718
Disintegrating Machine:
(P) Brookes. From Merck and Co. 713
(P) Milne and Goulding 713
Distillation, Destructive ——. (Class III.).....35, 109, 164, 246, 335, 398, 466, 540, 607, 699, 765, 853, 909, 964, 1022, 1070, 1129, 1180, 1228, 1271, 1326, 1390, 1448, 1527
Fractional ——, and Apparatus therefor. (P) Miller 765
Fractional —— as a Means of Quantitative Analysis. (Young and Fortey) 726
Receiver for Fractional ——. (Palomaa) 724
Distillations; Vacuum ——. (Fischer and Harries) 990
Distilleries; Apparatus for Disposing of Liquid By-Products of ——. (P) Oram 1035
In Denmark. (T.R.) 1423
Distillers' Residue. *See under* Wash.
Distilling Apparatus:
(P) Calmant 1523
(P) Goss 1523
(P) Hirzel 1386
(P) Jewell 326, 718
(P) Knox and others 632
(P) Mallman 1445
(P) Roake 246, 853, 965
(P) Scott 706
(P) Still 699
Dithionates; Electrolytic Production of ——. (Foerster and Friessner) 1030
Drier for Paint. (P) Ogilvy 782
Drory's Tar Exit for Hydraulic Mains; Adjustable —— 108
Drugs and Chemicals; Change of Australian Tariff for ——. (T.R.) 730
And Chemicals; Purity of Standard ——. (Coblentz) 1431
And Medicines Consumed in Bolivia. (T.R.) 891
Copper in Powdered ——. (Gane) 224
In Venezuela; Duties on ——. (T.R.) 198
Drums and Tanks for Sulphuric in Acid in Spain. (T.R.) 80
Drum; Centrifugal Separator —— (P) Nilsson 244

PAGE

Drying and Distilling Apparatus. (P) Larsen 1070

Apparatus:
(P) Berhenke 1028
(P) Croizier and Thomine 1178
(P) Cummer 52
(P) Diedrich 1523
(P) Harvey 557
(P) Higgins 914
(P) Hillig and Muller 696
(P) Huillard 1386
(P) Kearns 625
(P) Kuckenhoner 1019
(P) Larkin 923
(P) Passburg 458
(P) Santman 695
(P) Simon 1148
(P) Sleeman 1148
(P) Stanher 32
(P) Stute 1267
(P) Wolff 1546

Apparatus and Process:
(P) Beaven 182
(P) Partridge 786

Floors for ——. (P) Mobberley 1279

Pasty Material. (P) Kuckenhoner 1019

Dust Separator: Modified Cyclone ——. (P) Thompson 244

Dust-Filter for Brewery Use; Tubular ——. (Törnell) 681

Dyestuffs. (Class IV.) 35, 110, 168, 247, 336, 398, 466, 541, 607, 700, 766, 853, 910, 965, 1022, 1070, 1129, 1181, 1229, 1272, 1326, 1390, 1448, 1528

Dyestuffs; Various ——:
Acetonitrile, Phenylamino-. (P) Comp. Parisienne de Coul. d'Aniline 543
Acetylacetone; Azo Compounds of ——. (Bulow and Schlotterbeck) 965
Acridine ——:
(P) Actinges. fur Anilin Fab. 338
(P) Manuf. Lyonnaise des Matieres Colorantes 402
Acridine; Manufacture of ——. (P) Manuf. Lyonnaise, &c. 541
Acridine; New Combinations of ——. (P) Comp. Parisienne de Colours d'Aniline 701
Acridine Series of ——. (P) Manuf. Lyonnaise, &c. 112
Acridine Series; Orange —— of the. (P) Actienges. fur Anilin Fab. 45
Acridine Yellow to Orange-Yellow ——:
(P) Comp. Parisienne de Coul. d'Aniline 911
(P) Imray. From The Farb. vorm. Meister, Lucius und Bruning 701
Acridine ——, Yellow to Red-. (P) Sohst 1530
Acridine ——, Yellow to Yellowish-Orange. (P) Comp. Parisienne de Coul. d'Aniline 1529
Acridine ——, Yellowish-Orange. (P) Société pour l'Industrie Chim. à Basle 1528, 1529, 1529, 1529
Acridines. Hydroxylated; Manufacture of ——. (P) Ransford. From Cassella and Co. 37
Acrylic Aldehyde (Acrolein); Action of —— on Metadiamines. (Ehrmann) 1023
Aesculetin Series of ——. II. (Liebermann and Lindenbaum) 1274
Alkanet Root. (Gawalowski) 1327
3'-Alkylamino-9-phenyl-1,2-naphthacridines. (Ullmann and others) 337
Amides; Conversion of —— into Amines. (Graebe and Rostovzeff) 1070
Amino-azo Compounds: Influence of Substitution on Formation of ——. (Morgan) 36
Aminohydroxyuiphenylamines and Analogous Substances. (Gnehm) 1273
Amino-hydroxyl Derivatives; Production of ——. (P) Vidal 38
2,2'-Aminonaphthol Sulphonic Acid. (P) Manuf. Lyonnaise des Matières Colorantes 41
Amino-orcinol; Oxidation Products of ——. (Henrich and Meyer) 1450
And Intermediate Products:
(P) Lake. From Oehler 37
(P) Société F. Bayer et Cie 41
Aniline — and Albuminoids: Chemical Reactions between. (Heidenhain) 966
Aniline —— as Precipitants of Albumin. (Heidenhain) .. 1072
Aniline; Exports of —— from Germany. (T.R.) 1563
Aniline; Manufacture of —— 910
Aniline, Toluidines, and their Analogues; Manufacture of ——. (P) Senderens 967, 1529
Anilines, Toluidines, and Analogous Bases. (P) Senderens and others 169
Anthracene:
(P) Badische Anilin und Soda Fab. 911, 1451
(P) Bally 1182, 1182
(P) Hartmann 1073
(P) Johnson. From The Badische Anilin und Soda Fab. 910
(P) Newton. From The Farb. vorm. F. Bayer and Co. 401
(P) Société F. Bayer et Cie 1451
Anthracene (Anthraquinone) ——. (P) Société F. Bayer et Cie. 701
Anthracene (Anthraquinone); Manufacture of ——. (P) Societe F. Bayer et Cie. 514
Anthracene (Anthraquinone Derivatives); Production of ——. (P) Société F. Bayer et Cie. 609

PAGE

Dyestuffs—*cont.*
Anthracene ——, Blue. (P) Comp. Parisienne de Coul. Aniline 1392
Anthracene, Blue to Green Acid ——. (P) Willcox. From The Badische Anilin und Soda Fab. 37
Anthracene Derivatives containing Nitrogen. (P) Société F. Bayer et Cie 40
Anthracene Derivatives; Production of ——. (P) Société F. Bayer et Cie 40, 40
Anthracene (Flavopurpurine, &c.); Manufacture of ——. (P) Wedekind and Co. 402
Anthracene (Polyamino-anthraquinone Sulpho Acid) ——. (P) Hepp 1392, 1530
Anthracene Series; Blue to Green ——. (P) Badische Anilin und Soda Fab. 42, 42
Anthracene Series of ——. (P) Badische Anilin und Soda Fab. 42
Anthracene Series of —— soluble in Water. (P) Badische Anilin und Soda Fab. 42
Anthranilic Acid; Action of Formaldehyde on ——. (Heller and Fiesselmann) 1181
Anthranilic Acid; Electro-thermal Formation of ——. (Lob) 1272
Anthranilic Acid, ω-Cyanomethyl; Esters of ——. (P) Badische Anilin und Soda Fab. 542
Anthraquinone; Preparation of Pure ——. (P) Sadler and Co. and Driedger 1072
Anthraquinone Series, Green —— of the. (P) Société F. Bayer et Cie 40
Anthraquinones: Hydroxyamino- and Nitroso —— (Wacker) 400
Aromatic Aldehydes and Amines; Condensation between ——. (Dimroth and Zoeppritz) 467
Aromatic Nitro Bodies; Reduction of ——:
(P) Boehringer und Soehne 169
(Pinnow) 965
(P) Wirth 1181
Aromatic Radicles in Fatty Amines; Substitution of ——. (P) Badische Anilin und Soda Fab. 1452
Aromatic Substances containing Hydroxyl Radicles; Alkaline Salts of ——. (P) Actienges. von Heyden 39
Artificial; Qualitative Analysis of ——. (Pokorny) 1299
Auramine; Action of Dimethylsulphate on ——. (Zohlen) 1390
Auramine and Salts of Phenylaminobenzophenone; Constitution of ——. (Graebe) 1130
Auramine G; Characteristics of ——. (Gnehm and Wright) 466
Azine; Tinctorial Properties of ——. (Noelting) 542
Azo Compounds; Reduction of ——. (P) Buehner 856
Azo ——:
(P) Badische Anilin und Soda Fab. 911
(P) Herzberg and Siebert 1073, 1073
(P) Levinstein, Mensching, and Levinstein 967
(P) Ransford. From Cassella and Co. 1451
(P) Société pour l'Industrie Chim. à Basle 1529
Azo ——; Action of Sulphides, Sulphites, and Hyposulphites on ——. (Rosenstiehl and Suais) 470
Azo —— and Components. (P) Comp. Parisienne de Couleurs d'Aniline 43
Azo ——, and Intermediate Compounds. (P) Actienges. fur Anilin Fab. 1452
Azo ——, and Intermediate Products. (P) Société F. Bayer et Cie. 41
Azo ——, and Limits of Formation of Diazoamino Compounds. (St. Niementowski) 1390
Azo —— and Manufacture of same. (P) Schraube and Bucherer 856
Azo —— and Manufacture thereof. (P) Julius and Tkatsch 338
Azo ——, and Sulphonic Acids therefor. (P) Lake. From Oehler 111
Azo ——; Artificial Classification of. (Bucherer) 400
Azo —— Brown-Violet. (P) Julius 1328
Azo ——, capable of Chroming on the Fibre. (P) Badische Anilin und Soda Fab. 1392
Azo ——; Dynamical Investigations on Formation of. (Goldschmidt and Keller) 1391
Azo —— for Cotton, Blue (from Acetyl-1.4-Naphthylene Diamene 7-Sulphuric Acid). (P) Manuf. Lyonnaise, &c. 541
Azo —— forCotton, Blue. (P) Manuf. Lyonnaise, &c. 856
Azo ——, for Wool:
(P) Actienges. für Anilin Fab. 112
(P) Badische Anilin und Soda Fab. 1529
Azo —— for Wool, Blue:
(P) Manuf. Lyonnaise, etc. 112, 856
(P) Weinberg 968
Azo ——, from Chloro-amino Phenol-Sulphonic Acid. (P) Badische Anilin und Soda Fabrik 43
Azo ——, from Compounds of Sodium Tetrazoditolyl Sulphite. (Seyewetz and Biot) 1071
Azo ——, from Methylphenylglycine. (Mai) 337
Azo ——, from Nitro- and Amido-Sulphonic Acids. (P) Imray. From the Society of Chem. Industry, Basle .. 1274
Azo ——, from Picramic Acid. (P) Picard and Co. 39
Azo ——, from Sodium Tetrazoditolylsulphite. (Seyewetz and Biot) 766
Azo ——, giving Blue Shades on Wool. (P) Actienges. fur Anilin Fab. 45
Azo ——, Green to Blackish-Green. (P) Manuf. Lyonnaise, &c. 911
Azo ——, Material for Producing. (P) Julius and Gunther 1530

PAGE

Dyestuffs—*cont.*

Azo Mordant ——, Brown. (P) Badische Anilin und Soda Fab. ... 1451
Azo ——, Orange. (P) Badische Anilin und Soda Fab. ... 544
Azo ——, Orange-Red. (P) Scholl ... 610
Azo Orange to Red ——. (P) Comp. Parisienne de Coul. d'Aniline ... 169, 169
Azo ——; Presence of Diazo-amino and Diazohydroxy Compounds in ——. (Vaubel) ... 401
Azo ——; Production of:
(P) Badische Anilin und Soda Fab. ... 112, 169, 701
(P) Société F. Bayer et Cie. ... 41
Azo —— (from 4-Chloro-2-Anisidine and β-naphthol); Production of ——. (P) Badische Anilin und Soda Fab. 402
Azo ——, Red:
Badische Anilin und Soda Fab. ... 112, 1451
(P) Julius ... 338
(P) Julius and Gunther ... 610
Azo ——; Reduction of Nitrated. (Rosenstiehl and Suais) 470
Azo Substantive ——:
(P) Imray. From The Society of Chem. Industry, Basle ... 855
(P) Johnson. From The Badische Anilin und Soda Fab. ... 337
Azo ——, Yellow. (P) Schultz ... 248
Azoxone; The Simplest ——. (Kehrmann and Sauger) ... 337
Azoxy-Benzenes; Hydroxylated ——. (Bamberger) ... 854
Azoxybenzylidene Bases: Research on ——. (Alway) ... 1022
Basic; Behaviour of —— towards Wool and Silk. (Knecht) 611
Basic; Discharging ——. (Hofmann) ... 170
Benzaldehyde Green and Rosamine Groups; —— of the (Liebermann) ... 965
Benzidine Blue. (Saget) ... 1023
Benzidine Blue and some Reactions of Benzidine. (Saget) ... 1181
Benzimidazole ——: Ring Formation from. (Noelting) ... 247
Black and Blue, and Materials therefor. (P) Willcox. From the Badische Anilin und Soda Fab. ... 37
Black —— for Cotton:
(P) Actienges. für Anilin Fab. ... 45
(P) Badische Anilin und Soda Fab. ... 43
Black —— from Nitroaminohydroxydiphenylamine. (P) Weissberg ... 39
Black ——; Production of ——. (P) Koechlin ... 40, 40
Blue-Black and Blue —— for Cotton. (P) Actienges. für Anilin Fab. ... 45
Blue-Black —— for Cotton. (P) Chem. Fab. vorm. Weiler-ter-Meer ... 39
Blue —— containing Sulphur (from *p*-alkyl-amino-*p*-hydroxydiphenylamine). (P) Manuf. Lyonnaise, etc. 43
Blue —— derived from Anthraquinone. (P) Farb. vorm. F. Bayer and Co. ... 40
Blue —— for Cotton. (P) Manufacture, Lyonnaise, &c. .. 41
Blue —— for Cotton (from 1.4-Naphthylenediamine-7-Sulphonic Acid). (P) Manuf. Lyonnaise, etc. ... 42, 42
Blue —— for Unmordanted Cotton. (P) Badische Anilin und Soda Fabrik ... 42, 43
Blue-Grey —— for Cotton. (P) Imray. From The Farb. vorm. Meister, Lucius und Bruning ... 37, 37
Blue, Grey —— from 1.4'-Dinitronaphthalene. (P) Comp. Parisienne de Coul. d'Aniline ... 44
Blue ——; Manufacture of. (P) Manuf. Lyonnaise des Matières Colorantes ... 41
Blue —— of the Anthracene Series:
(P) Badische Anilin und Soda Fab. ... 42, 111
(P) Comp. Parisienne de Coul. d'Aniline ... 44
Blue —— of the Diphenylnaphthylmethane Series. (P) Actienges. für Anilin Fab. ... 45
Blue ——, of the Tri- or Diphenyl-napthylmethane Series. (P) Actienges. für Anilin Fab. ... 113
Blue ——, of the Triphenylmethane Series. (P) Actienges. für Anilin Fab. ... 113
Brasilin and Hæmatoxylin. VI. (Perkin, jun.) ... 110
Brasilin and Hæmatoxylin; Research on ——. VII. (Herzig and Pollak) ... 608
Brasilin. *See also under* Hydroxychromone.
Brown ——, from Meta-Tolylenediamine. (P) Geigy and Co. 44
Brown, Green, —— containing Sulphur. (P) Geigy and Co. 44
Carbinols; Esterification of ——. (Fischer and Weiss) ... 400
Carmine Blue; Characteristics of ——. (Sisley) ... 468
Catechin; Research on ——. (Kostanecki and Tambor) .. 854
Chloramisidine; Preparation of ——. (P) Julius and Jahrmarkt ... 610
Chloro-amino Phenolsulphonic Acid 1.3.4.5. (P) Badische Anilin und Soda Fab. ... 43
Chloro-*m*-dianinobenzene and Traminobenzene Carboxylic Acids. (Cohn) ... 965
a-Choro-*p*-Nitraniline. (Cohn) ... 400
Chrysazin; Reduction of —— with Hydriodic Acid. (Schrobsdorff) ... 1273
Coal-Tar; Use of in Foods ——. (Winton) ... 1291
Coal-Tar Vital Colorations by Means of ——. (Nicolle) .. 1042
Containing Sulphur, and Material therefor. (P) Geigy ... 44
Cotton ——, Green. (P) Badische Anilin Soda Fab. ... 43
Cotton ——, Green-Black Direct. (P) Chem. Fab. Brugg Actienges. ... 169
Cotton; Increasing Fastness to Light of ——. (Krais) ... 404
α-Cyanobenzylanilines and μ-Cyanozomethines; Substituted ——. (Sachs and Goldmann) ... 1326
ω-Cyanomethylaniline and its Derivatives. (P) Badische Anilin und Soda Fab. ... 170
ω-Cyanomethylanthranilic Acid; Esters of ——. (P) Badische Anilin und Soda Fab. ... 542, 542

PAGE

Dyestuffs—*cont.*

Decomposition of —— by Light. (Silbermann) ... 466
Diazo-amines; Influence of Substitution on Formation of ——. (Morgan) ... 36
Diazo Bodies and so-called Triazolenes; Quinoid ——. (Hantzsch) ... 470
Diazo Compounds; Action of Hypophosphorous Acid on ——. (Mai) ... 247
Diazo Group; Replacement of —— by the Amino Group. (Wacker) ... 1129, 1528
Diazotisation; Elimination of a Nitro Group on ——. (Meldola and Eyre) ... 1023
Dibenzalacetone and Triphenylmethane; Research on ——. (Baeyer and Villiger) ... 607
Dibenzylideneacetone and Triphenylmethane. (Baeyer and Villiger) ... 1326
Dihydroxyfluoresceins and Dihydroxyeosins. (Liebermann and Wolbling) ... 854
Di-Indugotin; Preparation of ——. (Moir) ... 1451
p-Dimethylaminobenzaldehyde; Characteristics of ——. (Sachs and Lewin) ... 1449
Dimethylaniline; Action of —— on Sulphur Chloride. (Ehrmann) ... 1023
Dimethylnaphthosafranine; Preparation of ——. (Fischer and Hepp) ... 1130
1.1'-Dinitronaphthalene; Sulphonation of ——. (Eckstein) ... 1390
Di-*o*-dinitrodiphenylmethane and Di-*o*-dinitrobenzophenone. (Bertram) ... 766
Diphenyl Derivatives; Manufacture of ——. (P) Ullmann ... 38
Diphenylmethane ——. (P) Imray From the Farb. vorm. Meister, Lucius und Bruning ... 1528
Diphenylmethane ——; Production of. (P) Comp. Parisienne de Coul. d'Aniline ... 856
Disazo ——, Brown, Black (from *o*-*o*-Diaminophenol *p*-Sulphonic Acid). (P) Comp. Parisienne de Coul. d'Aniline ... 44
Disazo ——, Brown, Violet and Blue (from *m*-diaminophenol Sulphuric Acid capable of being chromed in the Fibre). (P) Badische Anilin und Soda Fab. ... 43, 43
Disazo ——, for Wool. (P) Comp. Parisienne de Coul. d'Aniline ... 169
Disazo —— (from *p*-Chloro-*o*-Salicylic Acid). (P) Badische Anilin und Soda Fab. ... 402
Disazo ——; Manufacture of. (P) Actienges. für Anilin Fab. ... 45
Disazo ——, Red. (P) Schraube and Voigtlaender-Tetzner 1539
Disazo-, Trisazo-, and Polyazo —— (from 2.4'.2' aminonapthol Sulphonic Acid). (P) Societe de l'Industrie Chim. a Baste ... 39
Erica Base; Some Isomerides of ——. (Schultz and Tichomiroff) ... 469
a-Ethylluteolin; Preparation of ——. (Kostanecki and Rozycki) ... 35
Fast Ingrain; Production of ——. (P) Farb. vorm. F. Bayer and Co. ... 50
Ferro-chrome Colour ——, and Production of same. (P) Haagen ... 471
Fluorescence; Influence of Substituting Groups on ——. (Francesconi and Bargellini) ... 1327
Fluorindines; Synthesis of ——. (Nietzki and Slaboszewicz) ... 35
Formazylphenylketone. (Bamberger and Witter) ... 467
From Cotton Pods or Husks. (P) American By-Products Co. ... 402
From Naphthyldiphenyl-, Dinaphthylphenyl-, and Trinaphthyl-methane. (Noelting) ... 1450
Gallocyanines; Characteristics of ——:
(Noelting) ... 469
(Vaucher) ... 468
Green —— derived from Anthraquinone. (P) Farb. vorm. F. Bayer and Co. ... 40
Hæmatein; Manufacture of ——. (Jacquemin) ... 1529
Halogen Derivatives in the Anthracene Series. (P) Société F. Bayer et Cie ... 112
Halogen Dinitronaphthalenes; Preparation of ——. (Ullmann and Consonno) ... 1272
Halogen Indigo; Manufacture of ——. (P) Badische Anilin und Soda Fab. ... 401
3-Hydroxy-β-benzylchromone; Synthesis of ——. (Hannach and Kostanecki) ... 470
o-Hydroxycarboxylic Acids; Action of Sulphites on Aromatic ——. (Bucherer) ... 1275
2-Hydroxychrome; Preparation of ——. (David and Kostanecki) ... 1130
m-Hydroxy Derivatives of Azo —— and Azoxybenzene. (Noelting and Federmann) ... 400
m-Hydroxyphenyl-*p*-tolylamine Derivatives ——. (Gnehm and Veillon) ... 336
Hystazarin; Research on ——. (Liebermann and Hohenemser) ... 855
Imports of —— by Turkey. (T.R.) ... 1111
In Milk; Detection of Artificial ——. (Winter Blyth) 794
Indigo:
(P) Badische Anilin und Soda Fab. ... 1528
(P) Comp. Parisienne de Coul. d'Aniline .. 967, 967, 1392
(P) Ellis. From The Chem. Fab. von Heyden 1181
(P) Homoika and Liebknecht ... 1073
(P) Imray. From The Farb. vorm. Meister, Lucius und Bruning ... 1024, 1528
(P) Seidel ... 769
(P) von Gallois ... 1131

PAGE

Dyestuffs—*cont.*

Indigo and Intermediate Products; Manufacture of ——. (P) Seifert and others ... 1530
Indigo and its Homologues and Substitution Products. (P) Imray. From The Farb. vorm. Meister, Lucius und Brüning ... 1131
Indigo and its Homologues; Manufacture of ——. (P) Comp. Parisienne de Coul. d'Aniline ... 401
Indigo-Blue and its Derivatives; Manufacture of ——. (P) Guggenheim ... 38
Indigo-Blue from *o*-Nitro-acetophenone. (Camps) ... 1273
Indigo; Bromine Derivatives of ——. (P) Badische Anilin und Soda Fab. ... 38
Indigo; Extraction of —— from Lonchocarpus Cyanescens. (P) Comp. Française de Chemins de Fer au Dahomey ... 38
Indigo; Extraction of —— from the Plant. (P) Calmette ... 38
Indigo —— in Condition for Transport. (P) Johnson. From Badische Anilin und Soda Fab. ... 1072
Indigo; Manufacture of ——:
(P) Badische Anilin und Soda Fab. ... 38
(P) Bender ... 338
(P) Comp. Parisienne de Coul. d'Aniline ... 543
(P) Erdmann ... 38
(P) Seidel ... 338
Indigo; Methyl Derivatives of ——. (Kuhara and Chikashigé) ... 247
Indigo; Mono-, and Dibrom- and Mono- and Di-chlor-; Manufacture of ——. (P) Rahtjen ... 543
Indigo Paste. (P) Seidel ... 338
Indigo; Preparation of —— from Indigofera Tinctoria. (Schultz im Hofe) ... 607
Indigo; Purification of Crude ——. (P) Comp. Parisienne de Coul. d'Aniline ... 401
Indigo; Reduction of ——. (P) Comp. Parisienne de Coul. d'Aniline ... 1528
Indigo; Reduction of —— with Zinc Dust and Ammonia. (Kufferath) ... 1273
Indigo; Reduction Product of ——. (P) Comp. Parisienne de Couleurs d'Aniline ... 38
Indigo; Resist White under ——. (P) Stiegelmann ... 769
Indigotin; Polymerised Condition of, and Conversion of —— into Indirubin. (Maillard) ... 398
Indogenides with Tinctorial Properties. (Noelting) ... 1450
Indole ——. (P) Société F. Bayer et Cie. ... 112
Indoxyl and Indoxylic Acid; Mono-Acid Derivatives of ——. (P) Badische Anilin und Soda Fab. ... 38
Indoxyl Derivatives from Aromatic Glycines. (P) Deutsche Gold und Silber-scheide vorm. Roessler ... 111, 169, 169
Indoxyl; Halogen Compounds of ——. (P) Badische Anilin und Soda Fab. ... 38
Indoxyl or its Homologues; Manufacture of ——. (P) Imray. From the Farb. vorm. Meister, Lucius und Brüning ... 608
Indulines of the Aminoazobenzene Melt. (Fischer and Hepp) ... 1274
Indulines; Soluble —— from Amino-azobenzene. (Ehrmann) ... 1023
Industries of Lyons, France. (T.R.) ... 1311
Ionic Phenomena in ——. (Green) ... 1071
Ketopyrazolones; Preparation of ——. (Sachs and Barschall) ... 700
Lakes; Fast Double ——; Manufacture of. (P) Imray. From the Farbwerke Hoechst a/Main ... 249
Leucauramines; New Reactions of ——. (Mohlau and others) ... 336
Leucauramines; Synthesis of Arylated ——. (Mohlau and Heinze) ... 336
Leucogallocyanine, and Production of same. (P) de la Harpe ... 1073
Litmus similar to Amino-orcinol Oxidation Product. (Henrich and Meyer) ... 1450
Luteolin and Apigenin; Constitution of ——. (Perkin) ... 1450
Manufacture of Extract Dyes. (P) Lepetit and Tagliani ... 1073
Meta-Toluic-aldehyde-*o*-Sulphonic Acid; Preparation of (P) Société Chim. des Usines du Rhône ... 39
Metallic Nitroso Derivatives of Phenols, Cresol, and Naphthol. (P) Vidal ... 543
Methylanthranilic Acid; Preparation of ——. (Schultz and Flachslander) ... 1022
Methylrubazonic Acid; Synthesis of ——. (Pröscher) ... 700
Michler's Ketone; Action of Dimethylsulphate on ——. (Zohlen) ... 1390
Monazo —— ; Dyeing Wool Mordanted with Copper Salts. (P) Actienges. fur Anilin Fab. ... 45
Mono-alphyl-α¹-Naphthylamine-α⁴-Sulphonic Acid. (P) Kalle and Co. ... 40
Mono-azo ——; Manufacture of. (P) Actienges. fur Anilin Fab. ... 46
Mono-azo ——; Orange Lakes from a New. (P) Badische Anilin und Soda Fab. ... 1451
Mono-hydroxybenzalbromindanone. (Miniat) ... 336
Mordant Colours; Manufacture of ——. (P) Lauge and Emilewicz ... 968
Mordant Dyeing of ——. (Liebermann) ... 768
Mordant — , Red (P) Badische Anilin und Soda Fab. ... 43
Naphthalene ——. (P) Société F. Bayer et Cie. ... 402
Naphthalenes, Tetra- and Poly-, and their Application in Dyeing. (P) Badische Anilin und Soda Fabrik ... 42
α-Naphthochromone; Preparation of ——. (Kostanecki and Froemsdorff) ... 470
Naphthoquinone; Hydroxy Derivatives of ——. (Friedländer and Silberstern) ... 1272

PAGE

Dyestuffs—*cont.*

α-Naphthylamine Derivatives. (Fussgänger) ... 467
Nitriles; Preparation of Acid ——. (Bucherer) ... 399
Nitrobenzaldehydes; Preparation of ——. (Sachs and Kempf) ... 541
Nitrobenzyl Chlorides; Condensation of —— with the Naphthylamines. (Barrier and Mannassewitch) ... 1449
Nitro-Compounds; Electrolytic Reduction of ——. (P) Buchner ... 856
Nitro-Compounds; Reduction of ——. (P) Gerresheim ... 339
Nitro-Derivatives; Direct Reduction of ——. (Sabatier and Senderens) ... 1070
5-Nitro-8-methoxyquinoline and its Derivatives. (Freyss and Paira) ... 1449
Nitronaphthalenes; Reduction Products of the ——. (Wacker) ... 542
4.1.3-Nitrophenylene Diamine. (P) Actienges. fur Anilin Fab ... 402
Nitrosodimethylaniline; Action of —— on Aromatic Alcohols. (Ehrmann) ... 1023
Nitrosodimethylanuline; Action of —— on β Naphthoquinone. (Erhmann) ... 1023
Nitrosomethyldiphenylamine and its Derivatives. (Grimaux and Cloez) ... 1449
Nitrosophenol ——. (Decker and Solonina) ... 1274
Nitrosophenols and *o*-Nitrosophenol; Methyl Esters of the True ——. (Baeyer and Knorr) ... 1273
Ortho-sulphonated Toluylic Aldehyde. (P) Koetschet ... 1275
Ortho-Toluene Chlorosulphonic Acid; Manufacture of ——. (P) Société de Thann et de Mulhouse ... 112
Oxazine ——. (P) Société ci-devant Durand, Huguenin et Cie ... 1452
Oxazine and Thiazine ——; Constitution of. (Kehrmann) ... 767
Oxazine ——, Blue. (P) de la Harpe ... 1182, 1182
Oxazine; Manufacture of ——. (P) Imray. From The Dyeworks, formerly Durand, Huguenin, and Co. ... 769, 855, 609
Para-chlor-*o*-amino Phenol-Sulphonic Acid; Production ——. (P) Actienges. fur Anilin Fab. ... 45, 45
Paranitroso Derivatives; Action of —— on Aromatic Alcohols. (Ehrmann) ... 1023
Phenol, Cresol or Naphthol; Di- and Tri-Nitro Derivatives of ——. (P) Vidal ... 544
Phenylacetylene and Diazoacetic Ethyl Ester. (Buchner and Lehmann) ... 248
Phenylglycine, its Homologues and Salts; Manufacture of ——. (P) Comp. Parisienne de Couleurs d'Aniline ... 543
Phenylglycine-*o* carboxylic Acid; Manufacture of ——. (P) Imray. From The Farb. vorm. Meister, &c. ... 36
Phthalein Series of ——. (P) Imray. From The Basle Chemical Works ... 338
Phthalic Green; Preparation of ——. (Haller and Guyot) ... 1450
Poisonous Effects of certain Coal-Tar ——. (Chlopin) ... 492
Produced by the Action of Isatin on Isatis Tinctoria. (Marchlewski) ... 1071
Production of —— on the Fibre. (P) Johnson. From The Badische Anilin und Soda Fab. ... 37
4-Pyrazole Carboxylic Acid from 4-Phenylpyrazolo. (Behagel and Buchner) ... 248
5 (3)-Pyrazole Carboxylic Acid from 5 (3)-Phenylpyrazole. (Buchner and Hachumian) ... 248
Pyrazole Derivatives. (Buchner and von der Heide) ... 248
Pyrazoles; Synthesis of ——. (Klages) ... 768
Quinizarin and Anthrarufin; Reduction of —— with Hydriodic Acid. (Pleus) ... 1273
Red Shades on Wool; Production of ——. (P) Actienges. fur Anilin Fab. ... 45
Reduction by Means of Iron and an Alkali. (P) Weiler-ter-Meer ... 402
Report on Sealed Communications Nos. 677—682, of La Société de Prod. Chim. &c. de St. Denis. (Noelting) ... 1023
Rhodamine ——. (P) Farbwerke Hoechst ... 337
Rhodamine Derivatives; Production of ——. (P) Comp. Parisienne de Coul. d'Anilin ... 44
Scale tor ——. (P) Jorgensen ... 1275
Substantive ——, Black. (P) Société des Matières Colorantes de St. Denis ... 40, 40
Substantive ——, Brown. (P) Badische Anilin und Soda Fab. ... 43
Substantive —— for Cotton, Black. (P) Badische Anilin und Soda Fabrik ... 43
Substantive Sulphide ——, Black. (P) Imray. From La Société des Matieres Col. de St. Denis ... 111

Sulphide ——:
(P) Actienges. fur Anilin Fab. ... 513, 543, 701
(P) Bonati ... 610, 610
(P) Chem. Fab. vorm. Weiler-ter-Meer ... 112
(P) Imray. From The Society of Chemical Industry, Basle ... 1023, 1024
(P) Johnson. From The Badische Anilin und Soda Fab. ... 249, 769
(P) Levinstein and Mensching ... 1131, 1131
(P) Manuf. Lyonnaise, &c. ... 967
(P) Meyenberg, and others ... 609
(P) Ransford. From Cassella and Co. ... 249
(P) Renbold ... 610
(P) Shillito. From Geigy and Co. ... 248
(P) Société F. Bayer et Cie ... 402
(P) Urquhart. From The Chem. Fab. vorm. Weiler-ter-Meer ... 966
(P) Vidal Dyes Syndicate ... 471
(P) Weiler-ter-Meer ... 967

PAGE

Dyestuffs—*cont.*

Sulphide —— and Intermediate Products. (P) Read Holliday and Sons, and others 1451
Sulphide —— and Material for same. (P) Johnson. From Kalle and Co. 1131
Sulphide —— and Materials for same. (P) Johnson. From The Badische Anilin und Soda Fab. 1391
Sulphide ——, Black :
(P) Badische Anilin und Soda Fab. 169, 1529
(P) Chem. Fab. vorm. Weiler-ter-Meer 112
(P) Culmann 1392
(P) Kalle and Co. 543
(P) Lake. From Chem. Works vorm. Sandoz. 1451
(P) Levinstein and Co. 911
Sulphide ——, Black, and Intermediate Product (P) Read Holliday and Sons, and others 1528
Sulphide ——, Blue :
(P) Actiengesellschaft für Anilin Fab. 170
(P) Badische Anilin und Soda Fab. 856
(P) Chem. Fabrique ci-devant Geigy 1451
(P) Dollfus 1528
(P) Herz 1275
(P) Imray. From La Société des Matières Col. de St. Denis 111
(P) Kalle and Co. 170
(P) Poirrier 1229
Sulphide Blue Cotton ——. (P) Manuf. Lyonnaise, &c. 402
Sulphide ——, Blue (from Para-amido-para-oxydiphenylamine) ; Manufacture of. (P) Imray. From The Farbwerke, Hoechst a/Maine 855
Sulphide, Blue ; Manufacture of ——. (P) Weinberg and Herz 471
Sulphide ——, Brown :
(P) Boniger 1530
(P) Kalle and Co. 543
Sulphide ——, Brown, from Nitrosotolylene Diamine. (P) Manuf. Lyonnaise de Matieres Colorantes 1392
Sulphide ——, Brown Violet. (P) Weinberg 911
Sulphide ——, Brown-Yellow. (P) Badische Anilin und Soda Fab. 967
Sulphide —— ; Dyeing with. (P) Kertesz 471
Sulphide —— for Cotton, Black. (P) Levinstein and Mensching 1182
Sulphide —— from Induline Melt. (Ehrmann) 1027
Sulphide, Green :
(P) Imray. From The Basle Chem. Works 542
(P) Ris 769
Sulphide ——, Green-Black. (P) Pfenniger Bregg 701
Sulphide ——, Greenish-Blue. (P) Manuf. Lyonnaise, &c. 112
Sulphide ; Manufacture and Purification of ——. (P) Kalle and Co. 402
Sulphide —— of *p*-Amino-*p'*-hydroxydialphylamines and of Blue Dyestuffs containing Sulphur. (P) Fab. de Coul. d'Aniline ci-dev. Geigy 967
Sulphide —— Violet, from Indophenol. (P) Manuf. Lyonnaise de Matières Colorantes 1451
Sulphonated ——, and Materials therefor. (P) Badische Anilin und Soda Fab. 42
Sulphonated Anthracene —— and Intermediate Products. (P) Badische Anilin und Soda Fab. 42
Sulphur ——, Black. (P) Badische Anilin und Soda Fab. 170
Sulphur ——, Black ; Production of. (P) Kalle and Co. .. 39
Sulphur ; Printing with ——. (P) Farb. vorm. F. Bayer and Co. 406
Sulphur ; Production of ——. (P) Epstein and Rosenthal 3
Sulphur ; Production of —— and Materials for same. (P) Johnson. From The Badische Anilin und Soda Fab.. 1327
Sulphur ——, Purified (from Dialkylamido-oxydiphenylamines), and Intermediate Products. (P) Ransford. From Cassella and Co. 1274
Sulphur (Thiopyronine) ——. (Bichringer and Topaloff). 966
Sulphur ——, Yellow. (P) Weinberg and Lange 1530
Sulphurated ——, Black, dyeing Cotton direct. (P) Comp. Parisienne de Coul. d'Aniline 44
Sulphurated —— for Cotton (from the 1.1'- and 1.4' Dinitronaphthalenes, from Trinitronaphthalene and their Derivatives. (P) Comp. Parisienne de Coul. d'Aniline 44
Sulphurised ——, Brown (from 2.4-Dinitro-*p*-hydroxydiphenylamine). (P) Comp. Parisienne de Coul. d'Aniline 44
Sym-dimethyldiamino di-*o*-tolylketone (Auramine G). (Gnehm and Wright) 466
Tetrahydroxyflavone ; A Mordant-dyeing ——. (Kostanecki and Plattner) 1130
Tetramethyldiamidodiphenylcarbinol ; Condensation Products of ——. (Guyot and Granderye) 466
Thiazine ——. (P) Badische Anilin und Soda Fab. 1529
Thiazine —— and Intermediate Products. (P) Kehrmann 37
α-Thio-isatin and Indigo ; Manufacture of ——. (P) Geigy and Co. 38
o-Toluene Chlorosulphonic Acid ; Manufacture of ——. (P) Fabriques des Prod. Chim. de Thann et de Mulhouse.. 112
Toluidines ; Coupling of —— with Diazo Compounds. (Mehner) 766
p-Tolyl-α-naphthylamine Derivatives. (Gnehm and Rübel) 168
3.3'.4'-Trihydroxyflavone ; Synthesis of ——. (Kostanecki and Rożycki) 36

PAGE

Dyestuffs—*cont.*

Triphenylmethane —— :
(P) Acb 1182
(P) Actiengesellschaft für Anilin Fab. 911
(P) Lake. From The Farb. Muhlheim vorm. Leonhardt and Co. 398
(P) Ville 911
Triphenylmethane ——, Blue. (Maron) 512
Triphenylmethane ; Effect of Sulphuric Acid on —— :
(Baeyer and Villiger) 853
(Ullmann) 853
Triphenylmethane ——, Green. (P) Koetschet 1275
Triphenylmethane ; Preparation of ——. (Norris and McLeod) 168
Triphenylmethane Series, Red ——. (P) Ville 30
Violet and Blue —— from Aminonitrosalicylic Acid. (P) Manuf. Lyonnaise de Matières Colorantes 41
Violet New Basic ——. (P) Société F. Bayer et Cie 41
Yellow —— (Canarine) from Sulphocyanide Salts. (Goldberg) 110
Yellowish Red ——. (P) Badische Anilin und Soda Fab. 1529
1.3.4.5-Xylidine Sulphonic Acid. (Junghahn) 1448
Xylylene Diamines ; Characteristics of ——. (Noelting and Thesmar) 398
Dye-Plants in Annam. (T.R.) 370
Shades, Compounds ; Influence of Absorption Spectrum on Gaslight Appearance of ——. (Paterson 611
Dyeing and Printing with Sulphur Colours. (P) Ransford. From Cassella and Co. 1453
Animal Fibres with Acid Dyestuffs. (Sisley) 770, 1230
Apparatus :
(P) Bocks 1552
(P) Church 113
(P) Corron 1134, 1533
(P) de Keukelaere 48
(P) Desurmont 50
(P) Fletcher. 1134
(P) Geissler 771
(P) Hamar 171, 171, 912, 963
(P) Hanson 1231
(P) Hindley, Walker, and Rose 473, 613
(P) Hussong 614
(P) Illingworth and others 1025, 1074
(P) Justice. From Hausan 1531
(P) Konitzer 473
(P) Lindley and Ashworth 340
(P) Major and Wood 340
(P) Mattei 1134
(P) Mellor 1073
(P) Rhodes 474
(P) Roesch and Co. 342, 1532
(P) Rolland 1133
(P) Sackville 474
(P) Schirp 406
(P) Shaw 1393
(P) Skoupil 50
(P) Weiss 1074, 1393
(P) Wolf 50, 771, 912
Apparatus for Hanks. (P) Dittmar 547
Baths for —— and Tanning. (P) Lepetit, Dollfus, and Gansser 1146
Blue Shades. (P) Johnson. From The Badische Anilin und Soda Fab. 703
Fibres and Textiles with Sulphur Dyestuffs. (P) Société pour l'Industrie Chimique à Basle 50
Lead Chromate ; Disadvantages of ——. (Leclerc de Pulligny) 1452
Linoleum, Paper, Carpets, Cork Slabs, etc. (P) Tonjes ... 114
Method and Apparatus for ——. (P) Venter 340
Piece Goods with Sulphur Dyestuffs. (P) Urquhart. From Chem. Fab. vorm. Weiler ter-Meer 1328
Reserve Effects on Primuline Red. (Kayser) 770
Slivers ; Apparatus for ——. (P) Justice. From Hausan 1531
Theory of —— :
(Gnehm and Kaufler) 611
(Knecht) 544
Tissues with Sulphur Dyestuffs. (P) Manufacture Lyonnaise de Matières Colorantes 704
Turkey-Red ; Old Process of ——. (Driessen) 545
Use of Titanium Salts in ——. (P) Dreher 771
With Alizarin Dyestuffs ; New Method of ——. (Knapstein) 1328
With Aniline Black. (Beltzer) 770
With Indigo. (P) Peterhanser 1393
With Sulphide Dyestuffs. (P) Weiler-ter-Meer 547
With Sulphur Dyestuffs. (Paul) 856
Dyewood Imports of Havre, France. (T.R.) 569
Dyewoods in Hamburg ——. (T.R.) 1045
Dynamite ; Factory for —— at Monterey, Mexico. (T.R.) 654
Factory ; Residual Products of the ——. (Cullen) 1296
In South Africa. (T.R.) 1118
New Types of —— 425

E

Earths, Alkaline Electrolytic Preparation of Bases of ——. (P) Brochet and Rauson 352
Cerite ; Action of Alcoholic Hydrochloric Acid on ——. (Meyer and Koss) 1093

PAGE

Earths—*cont.*
Polyhalogen Compounds of the Alkaline ——. (Meyer)... 720
Rare; Production of —— from Cerium Oxalicum Medicinale. (Bohm)... 719
Thoria; Precipitating and Separating ——. (Kolb)... 1093
Earthenware; Deposition of Metals on ——. (P) Layhourn.. 174
Draft Rules for Manufacture of ——. (T.R.)... 649
Drying —— and Apparatus therefor. (P) Boult. From Weber and Rauschenbach... 549
Drying of —— and Apparatus. (P) Berhenke... 1028
Kilns for Drying ——. (P) Brookes and Barnes... 549
Strengthening of ——. (P) Millet... 707
Trade of Chicago. (T.R.)... 649
Trade of Smyrna, Turkey. (T.R.)... 291
Works; Lead Poisoning in ——. (T.R.)... 371
Earth-Nuts Capable of Growth in British East Africa. (T.R.) 651
Crop of Madras. (T.R.)... 371
In Wuhu, China. (T.R.)... 881
Ebonitine; a New Insulating Material. (P) De Karavodine.. 1539
Ecgonine: Addition Product of ——. (Hesse)... 363
Edistin; Reactions of —— with Acids and Alkalis. (Osborne) 420
Effluents; Discussion on Manchester Corporation Bill for Discharge of Works' —— ... 581
From Sugar Works; Purification of ——. (Dunbar)... 185
Purification of Trade ——. (T.R.)... 801
See also under Sewage *and* Waters.
Eggs; Apparatus for Drying ——. (P) Macredy... 361
Coating Tray for Use in Desiccation of ——. (P) Taylor.. 1090
Compound for Preserving ——:
(P) Lorne... 1242
(P) Stukes... 493
Contents; Preserving of ——. (P) Goodlett... 361
Packing Compound for ——. (P) Stukes... 787
Preservation of ——:
(P) Aufsberg... 492
(P) Barlow... 1090
(P) Rylander... 183
(P) Shoning... 1291
(P) Teisler... 269
(P) Verheggen and others... 717
Egypt: Artificial Manure Trade of ——. (P)... 82
Cotton-Seed in —— . (T.R.)... 1207
Indigo Valuation Tariff of ——. (T.R.)... 1001
Rubber in the Soudan ——. (T.R.)... 1422
Sugar Valuation Tariff in ——. (T.R.)... 438
Elæolite: Treatment of —— for Producing Water-Glass, &c. (P) Dementjeff and Onsihkoff... 173
Elastic Horny Substance; Preparation of ——. (P) Lederer. 1550
Material for Stoppers for Bottles. (P) Classen... 1407
Material; Puncture-Proof Strips of ——. (P) Belledin... 1189
Elder Pith; Constituents of ——. (Browne and Tollens)... 28
Elderberry Oil. *See under* Oils.
Electrical Conductor and Anode. (P) Hargreaves and Stubbs 260
Liquid Resistance for Laboratories. (Abegg)... 277
Electricity; Applications of —— in Chemistry. (Conroy)... 1401
Chemical Generator of ——. (P) Anderson... 1143
Electro-Chemical and Electro-Metallurgical Industries. (Kershaw)... 565
Electro-Chemical Apparatus. (P) Clark... 1143
Electro-Chemistry. (Class XI.)... 54, 124, 177, 259, 352, 411, 483, 553, 620, 710, 776, 863, 916, 978, 1030, 1082, 1142, 1185, 1235, 1281, 1334, 1401, 1458, 1538
Electro-Metallurgy. (Class XI.)... 54, 124, 177, 259, 352, 411, 483, 553, 620, 710, 776, 863, 916, 978, 1030, 1082, 1142, 1185, 1235, 1281, 1334, 1401, 1458, 1538
Electro-Motive Force: Means for Generating Counter ——. (P) Dow... 1237
Electro-Plating; Apparatus for ——. (P) Taylor... 1031
Electrodes: Carbon, Manufacture of ——. (P) Pohl... 906
For Arc Lamps:
(P) Hopfelt... 964, 964, 1270
(P) Siemens and Co. and Viertel... 962
(P) Société de Mestral... 962
(P) The British Thomson-Houston Co. From Read 334
Graphite —— in Electro-Metallurgical Processes. (Collins)... 1186
Preventing Overheating of ——. (P) Bastian Meter Co. and Bastian... 352
Electrolysis: Apparatus for Fused-Bath ——. (P) Roepper and Scholl... 778
With Platinised Electrodes. (Foerster and Muller)... 1235
Electrolytes; Potential Differences in Vapours and in some Solid ——. (von Hasslinger)... 54
Retrograde Diffusion of ——. (Thovert)... 710
Electrolytic Apparatus:
(P) Boult. From The American Alkali Co.... 1143
(P) Gilmour... 615
(P) La Cour and Rink... 913
(P) McDonald... 719
(P) Rhodin... 916
(P) von Liebermann... 1031
Apparatus (Caustic Soda and Chlorine). (P) Reed.... 778
Cells, and Electrodes therefor. (P) Vogelsang... 620
Methods and Apparatus. (P) Edser and Wilderman.... 125
Rectifiers; Magnesium in ——. (Campetti)... 259
Solution. (P) Meyer... 262
Elevator Buckets: Openwork ——. (P) Baudet... 921

PAGE

Ellagic Acid; Extraction of —— from Tanning Materials. (P) Heinemann... 415
Ely, Nevada; Wet Crushing Cyanide Plant at ——... 119
Emery in Greece and Turkey. (T.R.)... 291
See also under Corundum.
Emulsion, Combustible; for Explosion Motors ——. (P) Pampe and Trollé... 1389
Separation of Fatty Substances from ——. (P) Dahlqvist and Holm... 1464
Enamel-Sifting Apparatus. (P) Zwermann... 1232
Enamels. (Class VIII.).. 52, 117, 174, 255, 347, 408, 477, 549, 615, 706, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1232, 1278, 1330, 1395, 1454, 1534
Application of Colours to ——. (P) Perrin... 1455
Producing Metallic Lustre on ——. (P) Zsigmondy... 707
Enamelled Vessels; Manufacture of ——. (P) Allison. From The Dubuque Enamelling Co... 477
Enamelling Metal Articles. (P) Oschatz... 1139
Metal Ware. (P) Ketcham... 1232
Producing Designs or Surfaces for ——. (P) Greenley.... 1183
Enzyme Action:
(Brown)... 419
(Brown and Glendenning)... 419
Enzymes; Action of —— one on another. (Wróblewski and others)... 266
Action of Sunlight on ——. (Emmerling)... 61
Action of —— upon Hemicelluloses. (Gruss)... 715
Failure of the Test for ——. (Pozzi-Escot)... 867
Of the Tea-Leaf. (Mann)... 716
Oleolytic —— in Yeast. (Delbruck)... 266
Oxidising; Research on ——. (Newton)... 182
Proteolytic; Nature of the —— in Germinated Barley. (Windisch)... 1463
Theory of the Action of ——. (Henri)... 1546
Epiosine: Investigation of ——. (Vahlen)... 1294
Erica Base. *See under* Dyestuffs.
Esparto Grass Exports of Tripoli. (T.R.)... 1049
Essences. (Class XX.)... 65, 134, 186, 272, 362, 422, 494, 559, 636, 719, 789, 871, 926, 986, 1037, 1093, 1151, 1193, 1243, 1293, 1345, 1409, 1467, 1551
Tariff Modifications on —— in Belgium. (T.R.)... 373
Essential Oils. *See under* Oils.
Esters, Carbonic Acid —— of Cinchona Alkaloids. (P) Johnson. From Vereinigte Chininfab. Zimmer and Co... 988
Cellulose; Manufacture of ——. (P) Mork and others.... 1345
Cellulose; Purification of ——. (P) Boesch... 1243
Glycollic Menthyl ——; Preparation of. (P) Hofmann and Callsen... 1195
Nitric; Saponification of ——. (Vignon and Bay)... 1303
Esterification in Plants; Mechanism of ——. (Charabot and Hébert)... 136
Ether; Cause of Explosions of ——. (Kleemann)... 789
Customs Duties on —— in United Kingdom. (T.R.)... 1167
Exempt from Duty in Holland ——. (T.R.)... 1855
Explosions of ——. (von Neander)... 789
For Manufacture of Cocaine exempt from Duty in Holland. (T.R.)... 1479
Investigation of Explosions of ——. (Hertkorn)... 789
Manufacture of ——. (P) Harris... 1553
Solution; Stannous Chloride as a Reagent in ——. (De Jong)... 1473
Ethereal Oils. *See under* Oils.
Ethyl Alcohol. *See under* Alcohol.
Chloride. *See under* Chloride.
Ethylluteolin. *See under* Dyestuffs.
Eucaine, α- and β-; Identification and Properties of ——. (Parsons)... 273
Eucalyptol Arseniate and Eucalyptol from Eucalyptus Oils. (P) Smith... 1194
Preparation of ——. (P) Merck... 1036
Preparation of —— from Eucalyptus Oils. (P) Smith.... 1194
Eucalyptus Macarthuri Oil. *See under* Oils.
Oils. *See under* Oils.
Eurotium Orizæ; Diastatic Ferments in ——. (Pozzi-Escot). 1353
Evaporating Apparatus:
(P) Anstey... 107
(P) Bender... 1267
(P) Duff and others... 344
(P) Hollings, Jarvis, and Bell... 904
(P) Honiball... 596
(P) Laird... 108
(P) Macredy... 361
(P) Mallmann... 1445
(P) Morison... 1267
(P) Neubacker... 108
(P) Nilson... 783
(P) Ordway... 1267
(P) Sachse and Kaufmann... 548
(P) Thoens... 783
(P) Untiedt... 1322
(P) Vis... 761
(P) von Seemen... 1386
(P) Wilcox... 639
Apparatus for Disinfection. (P) Feeny. From The Société des Etablissements Genesto, Herscher et Cie. 133
Apparatus *See also* Concentrating Apparatus.

PAGE

Evaporating Pan. (P) Hill and Rivett 597
Exhausting and Condensing Apparatus. (P) Webb and others 253
Explosions in Vessels; Apparatus for Preventing ——. (P) Scheuffgen 851
Explosives. (Class XXII.) 68, 139, 189, 276, 366, 425, 498, 561, 639, 723, 792, 873, 927, 989, 1038, 1097, 1155, 1195, 1246, 1296, 1349, 1412, 1467, 1554
Additions to List of "Permitted." (T.R.) 573
Explosive Charges for Guns. (P) Scott 1246
Explosive Compounds; Manufacture of ——. (P) Quinby ... 723
Cordite M.D., a New ——. (T.R.) 294
Explosive Material; Production of Easily Ignitable ——. (P) Duttenhofer 927
Mixtures or Compounds for Blasting. (P) Bate 562
Explosives, Chlorate, of the Street Type; Manufacture of —— 425
Detonating Compositions for ——. (P) Bielefeldt 636
Fire Alarm. (P) Buell 639
Hardening Smokeless ——. Cocking and Kynoch, Lim.... 1412
Improved ——:
(P) Cocking and Kynoch 1556
(P) Fuhrer 1472
(P) Hough 1471
(P) Safety Explosives, Lim. and Thiersch 1349
(P) Steele and others 1155
In French Mines ——. (T.R.) 1312
Manufacture of ——:
(P) Bonnet 639
(P) Fiedler 723
(P) Jones 1097
(P) Poetter 1471
Manufacture of Ammonium ——. (P) Volpert 1039
Report of H.M. Inspectors of —— for the Year 1901 1038
Stability Tests for Nitro ——. (Aspinwall) 687
Surtax on —— in Italy. (T.R.) 573
Torch and Rocket combined. (P) Underwood 927
See also under Blasting Compositions, Cordite, Detonators, Fulminates, Guncotton, Gunpowder, Nitro-compounds, Powder, *and* Priming.
Exports, General; of the United Kingdom for 1900-01. (T.R.) 1364
Of British and Irish Produce and Manufacture. (T.R.) .. 289
Extracts. (Class XX.) 65, 134, 185, 272, 362, 422, 494, 559, 636, 719, 789, 871, 926, 986, 1037, 1093, 1151, 1193, 1243, 1293, 1345, 1409, 1467, 1551
Extract; Manufacture of a Vegetable ——. (P) Heron 360
Extraction Apparatus:
(P) Berrigan 244, 244, 244
(Pregl) 195
(Stephan and Boeker) 1097

F

Fabrics: Apparatus for Bleaching, Dyeing —— &c. (P) Imray. From Roesch and Co. 473
Apparatus for Printing ——. (P) Calico Printers' Association and Higginbotham 857
Apparatus for Steaming, Ageing, &c, ——. (P) Walsh.... 613
Composition for Stiffening ——. (P) Graber 341
Decorated ——. (P) Roussell 473
Finishing Plain, Dyed, or Printed ——. (P) Ferreira.... 1132
Improved Cellulose ——. (P) Hill 1074
Metallising ——. (P) Danilevsky and others 341
Multi-coloured ——. (P) Meyer 342
Printing of ——, and Apparatus therefor. (P) Chippier 912
Producing Patterns upon ——. (P) Jegler 1531
Producing Variegated Effects on ——. (P) Rodger 1328
Rendering —— Impermeable to Liquids. (P) Haddan. From Dutilleul 1025
Waterproof ——. (P) Menzies 341
Waterproofing of ——. (P) Menzies 1133
Waterproof and Airtight ——. (P) Durrin 341
White Reserve under Indigo on Unbleached ——. (P) Badische Anilin und Soda Fabrik 342
See also under Fibres, Textile, and Textiles.
Factory and Workshops Act; Observations on ——. (Carey). 214
Costs. (Garry) 1439
Fats. (Class XII.) 55, 126, 178, 262, 355, 413, 483, 553, 624, 711, 789, 864, 917, 980, 1032, 1083, 1144, 1187, 1238, 1285, 1336, 1403, 1459, 1541
Animal; Detection of Vegetable Oils in ——. (Bomer) ... 192
Animal; Vegeto-fatty Acid Glycerides in ——. (Hausen) 553
Apparatus for Washing ——. (P) Davis 1145
Cholesterol and Phytosterol in —— Quant. Determination of. (Ritter) 643
Decomposition of —— by Micro-organisms. (Schreiber).. 728
Enzymic Decomposition of ——. (Connstein, Hoyer, and Wartenberg) 1541
Extraction of ——. (P) Scott 487
Free Fatty Acids in ——. (Schestakoff) 1187
Indicator in Titration of Dark-coloured ——. (Freundlich) 75
Industry in Russia. (T.R.) 81
Manufacture of Edible Vegetable ——. (P) Warr and Wright 262
Of the Californian Bay Tree; Fatty Acids of ——. (Stillman and O'Neill) 1336

PAGE

Fats—*cont.*
Purifying and Decolorising ——. (P) Arledter and Whitney. From Arledter 1338
Recovery of ——, and Apparatus therefor. (P) Kremer and Schilling 917
Refining of ——. (P) Arledter 625
Saponification of ——. (P) Delarue 262
Treatment of ——. (P) Weygang 1403
Fatty Acids; Action of the Higher —— on Alkali Carbonates. (Klimont) 126
Distillation of ——. (Kassler) 486, 553
Hexabromides of ——. (Walker and Warburton) 1144
In Polluted Waters; Detection of ——. (Causse) 427
Insoluble; Mean Molecular Weight of ——. (Tortelli and Pergami) 1187
Manufacture of Anhydrides of the ——. (P) Kessler..... 561
Matters; Transformation of —— into Sugars during Germination of Seeds. (Maze) 369
Substances; Separation of —— from Emulsions. (P) Dahlqvist and Holm 1461
Feathers; Bleaching and Dyeing ——. (P) Brown 857
Fecal Matter; Apparatus for Clarifying ——. (P) Dittler.... 270
Feed-Water Heaters: Improvement of ——. (P) Wright 596
Fennel, Bitter; Examination of Oil of ——. (Tardy)..... 1347
Ferments and Fermentations; Testing of ——. (Sorel) 1240
Inorganic ——. (McIntosh) 797
Nature of some Oxidising ——. (Kastle and Loevenhart . 196
Oxidising —— as Peroxide Producers. (Chodat and Bach) 1561
Oxidising; Phenolphthalin as a Reagent for ——. (Kastle and Shedd) 280
Fermentation, Alcoholic; Action of —— on Typhoid Bacillus, &c. (Bodin and Pailberet) 1147
Alcoholic; Action of some Antiseptics on ——. (Knoesel) 785
Apparatus for Alcoholic ——. (P) Nycander..... 984
Apparatus; Means for Regulating Admission of Air to ——. (P) Thompson. From The Pfaudler Vacuum Fermentation Co. 1191
From Point of View of Yeast Crop. (Matthews and Lott) 867
In the Molasses Distillery; Abnormal ——. (Sorel)..... 632
Lactic; Study of ——. (Lesage and Dongier) 496
Pectic ——. (Goyaud) 1353
Theory of ——. (Richter) 1239
Fermenting; Glass Tanks or Vessels for ——. (P) Weber ... 1343
Ferric Oxide and Alumina; Mutual Action of —— at Incipient White Heat. (Warth) 285
Crystallisation of ——. (Ditte) 505
In Alcoholic Solutions. (Minet) 1346
Potassium Thiocyanate as an Indicator in. Reduction of —— to Ferrous State. (De Koninck) 71
See also under Iron.
Ferro-Chrome, Customs Decisions on —— in United States. (T.R.) 1163
Ferrocyanide: Action of —— on the Latent Photographic Image. (Luppo Cramer) 138
Formation of —— from Gas Liquor. (Donath)..... 51
Manufacture of —— at the Hague Gasworks. (Rutten) .. 1277
Ferrocyanides and Ferricyanides; Iodometric Method for —— (Rupp and Schiedt) 1099
Ferro-Manganese in Russia; Manufacture of ——. (T.R.).... 1121
Ferro-Molybdenum; Volum. Determination of Molybdenum in ——. (Brakes) 832
Ferro-Nickel; Thermo-electricity of ——. (Belloc)..... 177
Ferrosilicon; Condition of Silicon in ——. (Lebeau)..... 119
Manufacture of ——. (P) Gin 1541
Ferro-Silicons of High Percentage; Determination of Silicon in ——. (Ramorino) 191
Silicon in ——; Determination of. (Norris)..... 537
Ferrous Chloride: Density of Aqueous Solutions of ——. (Dunn) 390
Liquors; Treatment of ——. (P) Rumage..... 1235
Fertilisers, and Manufacture of Same. (P) Smith 1085
Apparatus for Sterilising ——. (P) Cartter 556
Artificial ——. 783
At Hamburg. (T.R.) 1049
At Pau. (T.R.) 939
Electrical Production of ——. (P) Crooke 1545
in Russia. (T.R.) 1311
Manufacture of ——. (P) Terne 1287
Manufacture of —— at Charleston. (T.R.)..... 652
Obtainment of —— from Fecal Matter. (P) Thompson. From Maschinenbau Actiengcs. vorm. Beck and Henkel 627
Phosphate —— at Savannah. (T.R.) 653
Use of —— in Lombardy, Italy. (T.R.) 734
Use of —— in the Leeward Islands. (T.R.) 733
Fibres. (Class V.) ... 66, 113, 170, 249, 339, 403, 471, 544, 610, 701, 769, 856, 911, 968, 1024, 1073, 1132, 1182, 1229, 1275, 1328, 1392, 1452, 1530
And Textiles: Dyeing —— with Sulphur Dyestuffs. (P) Société pour l'Industrie Chimique and Basle 50
Andansonia: Differentiation of —— from Jute, &c. (Dalén and Wisbar) 1466
Animal; Production of Aniline Black on ——. (P) Bethmann 50
Animal; Reducing the Dyeing Properties of ——. (P) The Badische Anilin und Soda Fabrik 1532
Apparatus for Dyeing Textile ——. (P) Roesch and Co. . 1532
Apparatus for Mercerising ——. (P) Klauder..... 1531

PAGE

Fibres—*cont.*
Apparatus for Scouring —. (P) Whitney ... 1531
Developing Sulphur Dyestuffs on the —. (P) Société pour l'Industrie Chimique à Basle ... 50
Dyed with Cotton Colours; Preventing the Tendering of —. (P) Farb. vorm. F. Bayer and Co. ... 50
Dyed with Sulphide Colours; Causes of Tendering of —. (Ellers) ... 405
Dyeing, Bleaching and Finishing —. (P) Skoupil ... 48
Formation of Artificial —. (P) Morton ... 1074
From Reeds and other Plants; Production of —. (P) Orddy ... 1025
Fulling and Oiling —. (P) Sella ... 704
Means for Dyeing —. (P) Mellor ... 1073
Mordanting Animal —. (P) Amend ... 858
Not on Bobbins; Apparatus for Dyeing, &c. (P) Wolf ... 50
Paper; Dyeing of —. (P) Imray. From The Farb. vorm. Meister, Lucius, und Brüning ... 114
Printing on Vegetable —. (P) Badische Anilin und Soda Fabrik ... 969
Retting Vegetable —. (P) Summers ... 613
Vegetable; Apparatus for Ungumming, Cleansing, and Bleaching. (P) Leclercq ... 1531
Vegetable; Bleaching—. (P) Boult, From Gagedois ... 48
Vegetable; Mercerising —. (P) Boureart ... 171
Vegetable; Printing — with Indanthrene. (P) Johnson. From The Badische Anilin und Soda Fab. ... 1025
See also Fabrics *and* Textiles.

Fibre-Ware; Indurating —. (P) Peterson. From The United States Indurated Fibre Co. ... 636

Fibrous Materials; Apparatus for Treating —. (P) Könitzer ... 473
Apparatus for Dyeing —. (P) Illingworth and others ... 1025
Apparatus for Preparing — for Use as Fuel. (P) Spooner ... 162
Reduction of — to Pulp. (P) Lee ... 1092
Treating — for Production of Pulp. (P) Holmes ... 1093
Waterproofing and Preserving —. (P) Wharton ... 912

Fig-Must; Alcoholic Fermentation of Indian —. (Ulpiani and Sarcoli) ... 268, 1547

Filaments for Incandescence Electric Lamps. (P) Voelker ... 333
From Cellulose Solutions; Manufacture of —. (P) Thiele ... 1393
Of Glow Lamps; Apparatus for Reinforcing and Standardising of —. (P) Fanta ... 1524
Production of Fibreless —. (P) Werner ... 614

Films, Cellulose; Manufacture of —. (P) Waite ... 272
Of Lead Sulphide on Transparent Bodies. (P) Reynolds and Grubb ... 866
See also under Photographic.

Filters and Apparatus for Dealing with Sewage. (P) Haller and Machell ... 787
And Extractor Presses for Brewers. (P) Crossman ... 959
Continuous — for Sewage. (Stoddart) ... 183
For Brewery Use; Tubular Dust —. (Törnell) ... 631
„ Liquids containing Copper, &c. (P) Lorrain. From Thompson ... 54
„ Oil. (P) Neuray ... 1145
„ Sewage and Liquid. (P) Adams ... 1149
„ Sewage, &c. (P) Lowe ... 1408
„ Sterilising Water. (P) Siemens und Halske Aktien Ges ... 1466
„ Sugar Juices and Liquids. (P) Kostalek ... 982, 1146
„ Water or Sewage. (P) Adams and Creer ... 925
Gas —. (P) Harris ... 1324
Improvements in —:
(P) Chamberlain ... 458
(P) Clarke ... 1192
(P) Johnson ... 597
(P) Knight and Hawkridge ... 458
(P) Kostalek ... 1267
(P) Oster ... 1150

Filter, Oil:
(P) Sims ... 625
(P) Wyman ... 625
Portable —. (P) Holland ... 270
Rotary —. (P) Didier ... 905

Filter-Beds, Bacterial; Apparatus for Discharging Liquids over:
(P) Graham ... 1465
(P) Ransom and others ... 1465
(P) Scott-Moncrieff ... 1465

Filter-Paper a Cause of Error in Analysis. (Mansier) ... 1098, 1155
Absorption of Tannin by —. (Procter and Blockey) ... 1100
Analysis of —. (Reed) ... 691

Filter-Presses:
(P) Enzinger ... 458
(P) Smith ... 1464
(P) Wernecke ... 459
(P) Meura ... 1386
(P) Young and Ueberroth ... 1126
(P) Wilson ... 761, 904
(P) Wilson and The Wilson Syndicate ... 1224
(van der Schrieck and Windisch) ... 716
Continuous Vacuum — with Rotary Drums. (P) Kaltenback ... 32
For Porcelain Slip. (P) Locke ... 1330
For Potters. (P) Critchlow and Aynsley ... 347
Use of — Instead of Double-Bottomed Tun. (Ruckforth and Dormeyer) ... 716
Use of — Instead of Mash Tuns. (Windisch) ... 785

PAGE

Filtering Apparatus:
(P) Baechler ... 1408
(P) Bommarius ... 1345
(P) Caubet ... 1547
(P) De Meulemeester ... 1148
(P) Füllner ... 243
(P) Rojat ... 1126
(P) Soar ... 904
(P) Thompson ... 1524

Fine Chemicals. (Class XX.) ... 65, 134, 186, 272, 362, 422, 494, 559, 636, 719, 789, 871, 926, 986, 1037, 1093, 1151, 1193, 1243, 1293, 1345, 1409, 1467, 1551

Finings; Preparation of —. (P) Berry and Roberts ... 1343

Finland, Fire-Extinguishing Apparatus in —. (T.R.) ... 1205

Fire-Alarm; Explosive —. (P) Buell ... 639
-Blocks. *See under* Fuel, Artificial.
-Cracker; Manufacture of a —. (P) Delgrande ... 366
Extinguishers; Chemical —. (P) Chapman ... 850
-Extinguishing Apparatus; Chemical —. (P) Young ... 761
-Extinguishing Apparatus in Finland; Tariff Alterations. (T.R.) ... 1205
-Extinguishing; Cartridges for —. (P) Caille ... 1019

Fireproof Apparatus for Metallurgy; Manufacture of —. (P) Engels ... 1081

Fire-Proofing Composition; Production of —. (P) Heaney ... 979

Fireworks; Composition for Sparkling —. (P) Bishop ... 276

Fish and Fish Refuse; Treatment of —, and Apparatus therefor. (P) Delattre ... 555
Livers, Extraction of Oil from —. (P) Hamilton ... 1403
Oils. *See under* Oils.
-Powder; Manufacture of —. (P) Schäfer ... 924
Reducing or Rendering —. (P) Edson ... 1238
-Waste; Apparatus for Reducing or Rendering —. (P) Haddan. From Edson ... 262
-Waste; Obtaining Coagulable Gelatin-yieldable Substance from —. (P) Haddan. From Edson ... 357

Flash-Light Cartridge. (P) Rendschmidt ... 873
Cartridge for Photography. (P) Krebs. From "Photo chemische Fabrik Helios" ... 1348
Machine. (P) Bigelow ... 639

Flask for Determination of Carbon in Iron and Steel. (Kleine) ... 1097
For Gas Analysis. (Wohl) ... 1412, 1413

Flavone, 3.3.4'-Trihydroxy —. *See under* Dyestuffs.
Tetrahydroxy. *See under* Dyestuffs.

Flax Shives: Are they Woody Fibre? (Conneler) ... 63

Flesh. *See under* Foods.

Floats for Steam or Water Traps. (P) Patton ... 326
in Burettes; Use of —. (Kreitling) ... 277

Floor-Coverings. (P) Zschiedrich ... 918
Composition for Manufacture of —. (P) Thane ... 1286

Flour; Ageing and Bleaching —. (P) Andrews ... 421, 717
From Grinding by Millstones and Rollers Compared. (Lindet) ... 62
Manufacture of — from Sweet Potatoes. (P) Straus ... 633
Moist Gluten in —. (Arpin) ... 1417, 1560

Flowers and Foliage; Stiffening Material for —. (P) Rochet and Girardeau ... 405
Dual Odours of —. (O'Brien) ... 1244

Fluids and Solids; Apparatus for Mixing —. (P) ... 1019
Apparatus for Electrically Dispersing —. (P) Cooley ... 341
Apparatus for Extraction of —. (P) Schwerin ... 1335
For Promoting Combustion. (P) Battistini ... 908
Safety Taps, &c., for Inflammable —. (P) Timar ... 326
See also Liquids.

Fluorescens. *See under* Dyestuffs.

Fluorides as Butter Preservatives, and their Influence on Digestion. (Hehner) ... 923

Fluorindines. *See under* Dyestuffs.

Fluorine; Apparatus for Producing — by Electrolysis. (P) Meslans ... 353
Determination of —. (Count Leiningen-Westerburg) ... 1349
In Fluorides; Quant. Determination of —. (Burk) ... 72
In Musts and Wines. (Windisch) ... 62
Salt; Employment of Effront's — in the Distillery (Just) ... 131

Fluorspar in the United States. (T.R.) ... 936

Flux for Brazing. (P) Huth. From Pick ... 410

Fluxing and Separating Compound. (P) Miller ... 862

Fodder; Beet-Leaves for — in Germany. (T.R.) ... 1117
Rich in Sugar, Manufacture of a —. (P) Steffen ... 1465
See also under Cattle-Food.

Foods. (Class XVIII.) ... 62, 132, 182, 268, 360, 420, 492, 558, 633, 716, 786, 869, 923, 984, 1035, 1090, 1148, 1191, 1241, 1290, 1344, 1407, 1464, 1548
Apparatus for Preserving —. (P) Ellis ... 1149
Apparatus for Sterilising —. (P) Maussion ... 1465
Arsenic in; Report of Committee on —. ... 94
Benzoic Acid and Alkali Benzoates in; Detection of —. (De Brevans) ... 75
Brazilian Customs Regulations as to —. (T.R.) ... 441
Cereal; Preservation of —. (P) Winton ... 1549, 1549
Coal-Tar Dyestuffs in, Use of —. (Winton) ... 1291
Containing Molasses, and Making same:
(P) Fraser ... 1090
(P) Schrader ... 1548

PAGE

Foods—*cont.*
Detection of Salicylic Acid in ——. (Taffe) 1040
Determination of Traces of Metals in ——. (Medicus and Mebold) 1248
Extracts; Obtainment of ——. (P) Eichelbaum 1242
From Saccharine Juices. (Steffen) 266
Hydrogen Peroxide as a Preservative of ——. (Jablin-Gonnet) 420
In Brazil. (T.R.) 573, 801
Malted Cereal ——. (P) Lippen 985
Preparations from Vegetable Protein. (Wintgen) 633
Preparations; Manufacture of ——. (P) Popper 492
Preservation of:
(P) Baker 1291
(P) Kfett and Potel 1464
(P) Richter 360
(P) de Sturler 493
(P) Manasse 558
(P) Mészáros 269
Sterilisation of ——. (P) de Bock 492
Food-Products; Manufacture of ——:
(P) Ayres 492
(P) Hooker 269
Drying of ——, and Apparatus therefor. (P) Partridge ... 786
See also under Alimentary, Meat, *and* Organic Bodies.
Foreign Trade of the United Kingdom for 1901. (T.R.) 78
Formaldehyde; Action of —— on Starch. (Syniewski) 1341
Apparatus for Vaporising ——. (P) England 1559
As a Reagent for Phenols. (Endemann) 74
Delicate Method for Detection of ——. (Arnold and Mentzel) 725
Determination of ——. (Pfaff) 1102
Disinfecting by Means of ——. (P) Krell 133
Formation of —— from Methyl Alcohol. (Glaessner) 1346
Gas; Apparatus for Generating ——:
(P) Carman and Lawrence 870
(P) Mills. From Taylor and Co. 133
In Foods, Detection of ——. (Manget and Marion) 1351
In Solution; Gravimetric Determination of ——. (Vanino) 193
Investigation of —— (Raikow) 422
Lamp. (P) Kuhn 870
Manufacture of Solid ——. (P) Groppler 63
Methyl Alcohol in ——; Detection and Determination of. (Duyk) 283
Solid Composition containing ——. (P) Groppler 1036
Formates; Use of —— in Tissue Printing. (Scheurer) 472
Formazylphenylketone. *See under* Dyestuffs.
Formic Acid; New Synthesis of ——. (Moissan) 362
Use of —— in Tissue Printing. (Scheurer) 472
Formic Aldehyde; Composition for Producing Vapours of ——. (P) Trillat 1036
Formosa; Paper Manufacture in ——. (T.R.) 372
France; Blast Furnaces in ——. (T.R.) 1113
Cattle-Food and Fertilizers at Pau. (T.R.) 939
Chemical Industries of Lyons ——. (T.R.) 1310
Chemical Manures at Cherbourg. (T.R.) 938
Clay-working Industries of —— (T.R.) 731
Competition of Alcohol-Motors in ——. (T.R.) 513
Creosote Imports of Bayonne. (T.R.) 934
Currant Wine in ——. (T.R.) 1052
Duty on Liquid Carbon Dioxide in ——. (T.R.) 1563
Explosives used in Mines in ——. (T.R.) 1312
Exports and Imports of, 1899-1900. (T.R.) 289
Gelatin Factory in ——. (T.R.) 82
Indigo and Dyewood Imports of Havre. (T.R.) 569
Kaolin at La Rochelle. (T.R.) 935
Law on Production and Sale of Saccharin in ——. (T.R.) 801
Modifications of the Patent Law of ——. (T.R.) 647
New Sugar Factories in —— (T.R.) 653
Oil Trade of —— in 1901. (T.R.) 572
Ores of Zinc and Manganese at Dunkirk. (T.R.) 936
Paper Manufacture in ——. (T.R.) 372
Peat Production of ——. (T.R.) 879
Phosphates and Pyrites at Bayonne. (T.R.) 938
Phosphate Deposits in the Somme. (T.R.) 733
Pitch and Coal-Tar Imports of La Rochelle. (T.R.) 934
Resin at Bayonne. (T.R.) 937
Salts Duty-Free for Industrial Purposes in ——. (T.R.) .. 370
Salts for Agriculture Duty Free in ——. (T.R.) 370
Silk Industry of ——. (T.R.) 199
Sugar Bounties in ——. (T.R.) 1165
Sugar Industry of Dunkirk. (T.R.) 939
Sugar Yield of ——. (T.R.) 1423
Sulphur and Copper Sulphate Imports of Bordeaux. (T.R.) 925
Superphosphates at Tonnay-Charente. (T.R.) 938
Superphosphates and Bones at La Rochelle. (T.R.) 938
Tax on Products with a Base of "Industrial Alcohol." (T.R.) 202
Trade of Bordeaux in 1901. (T.R.) 933
Transport of Compressed Gases in ——. (T.R.) 879
Use of Partinium in ——. (T.R.) 800
Frits for Pottery Glazes; Preparation and Behaviour of Insoluble ——. (Rix) 317
Fruits; Composition for Preserving ——. (P) Thorn 634
Drying ——, and Apparatus. (P) Büttner and Meyer 133
Examination of Dried ——. (Beythien and Bohrisch) ... 786

PAGE

Fruits—*cont.*
Natural Occurrence of Boric Acid in ——. (von Lippmann) 869
Preservation of ——:
(P) Bain and Hannay 786
(P) de Sturler 493
Fuel. (Class II.) 32, 108, 162, 244, 395, 459, 538, 597, 606, 761, 851, 905, 959, 1019, 1065, 1126, 1178, 1225, 1267, 1322, 1386, 1445, 1524
Fuel; Apparatus for Generating Oil ——. (P) Dye 1068
Apparatus for Injecting Fluid into ——. (P) Naef 33
Apparatus for Preparing Fibrous Materials for ——. (P) Spooner 162
Apparatus for Spraying and Burning Liquid ——. (P) Kohler 1270
Application of Gaseous —— in Kilns. (P) Crosland 707
Arsenic in; Report of Committee on ——. 94
Artificial; Adhesive Composition for Use in the Manufacture of ——. (P) Charles 1525
Artificial; Agglutinant Composition for ——. (P) Soc. Georges Charles and Marquand 1446
Artificial; Apparatus for Manufacture of ——. (P) Star Patent Fuel Co. and Heath 1323
Artificial; Briquettes or Blocks of ——. (P) Johnson. From North American Fuel Co. 1020
Artificial; Cementing Agent for ——. (P) de Vulitch 1446
Artificial; Manufacture of ——:
(P) Berntrop and van Hulsebosch 1323
(P) Chailly 600
(P) Costerton 330
(P) Coulson 1388
(P) Dallas 1128
(P) Davis 1067
(P) de Micheroux 1526
(P) Edison 1067
(P) Harris 1270
(P) Hecking 1126
(P) Hoffman 1179
(P) Holmes 1323
(P) Jousset and McKay 606
(P) Koneman 1323, 1323
(P) Lefèvre and Blum 1525
(P) Peakes 733
(P) Ricker 1180
(P) Schild 1323
(P) Simons 1526
(P) Springborn 245
(P) Steiner 600
(P) Thomas 1067
(P) Tucker and Cory 459
(P) Yousbasheff 410
Calorimeter; Simple Form of ——. (P) Darling 927
Coke Manufacture from Compressed ——. (Darby) 761
Combustion of Fine ——. (P) Fenner 962
Combustion of —— in Furnaces. (P) Bormann 1126
Dust; Apparatus for Feeding and Burning ——. (P) Brookes. From Bradley 1324
For Coke Ovens; Apparatus for Compressing ——. (P) Thompson. From Darby 1226
For Furnaces, &c.; Treatment of ——. (P) Lake. From Battistini and others 762
Furnaces for Burning Dust ——. (P) Brookes. From Bradley 1126
Fusibility of the Ashes of ——. (Le Chatelier and Chantepie) 459
Gaseous; for Explosion Motors. (P) Morun 1447
Increasing the Heating Value of ——. (P) Stockmann ... 33
Liquid; Apparatus for Mixing ——. (P) Praetorius 109
Liquid; Apparatus for Spraying ——. (P) Power 961
Liquid; Apparatus for Using Petroleum and other ——. (P) Meissner and Richter 762
Liquid ——; Exempt from Duty in Ceylon. (T.R.) 1110
Liquid ——; for Explosion Motors. (P) Pampe and Trollé 1389
Liquid for Sprinkling over ——. (P) Livingstone and Vandercook 1227
Liquid; Gasifier for ——. (P) Rosenthal 1525
Liquid; Heating Devices for Use with ——. (P) Scherding 336
Micro-Organisms from the Fossil ——. (Renault) 727
Oil-; Apparatus for Burning ——. (P) Renny 1269
Oil-; Use of —— in the United States. (T.R.) 569, 1015
Peat; Manufacture of ——. (P) Kellond 1526
Powdered —— for Boiler Furnaces 1019
Production of —— from Refuse. (P) Jones 634
Treatment of —— and Recovery of By-Products. (P) Naef 33
Treatment of Bituminous ——. (P) Naef 459
Waterproof Artificial; Manufacture of ——. (P) Bartlett 1526
See also under Briquettes.
See also under Combustibles.
Fuel-Briquettes; Manufacture of —— in Germany. (T.R.) .. 1204, 1478
Fuller's Earth in the United States; Production of ——. (T.R.) 1161
Earth; Preparation of ——. (P) McKerrow 555
Fulminating Compositions; Non-Sensitive ——. (P) Hirtenberger, &c. vorm. Keller and Co. 1472
Fulminates; Preparation of ——. (Angelico) 276
Fumes; Apparatus for Condensing Sulphurous ——. (P) Webb and others 253
Fume-Arrester ——. (P) Gilliland 1384

PAGE

Fumes from Smelting Furnaces; Apparatus for Recovering Minerals from ——. (P) Lee 1030
Fumigator for Diffusing Antiseptics, &c. (P) Fleming 985
Fungi; Composition of Edible ——. (Zega) 268
Furnaces; Apparatus for Burning Liquid Fuel in ——. (P) Dyson 762
Apparatus for Charging, &c. (P) Bleckly and others 1226
Apparatus for Increasing Combustion in Boiler——. (P) Apsey 460
Assayer's ——:
(P) Calkins 618, 1538
(P) Lonergen and Calkins 618
Blast ——:
(P) Bertrand 977
(P) Herrick 916
(P) Stapf 482
Blast-; Ore-dust consuming ——. (P) Norcross and Mitchell 977
Blast; Use of ——, in Great Britain. (T.R.) 1478
Brass-founders' Melting ——. (P) Weatherhead 483
Charcoal ——. (P) Laurenius 1388
Combined Metallurgic ——, and Precipitating Water Tank. (P) Bryan 1401
Consumption of Smoke, and Production of Forced Draught in ——. (P) Hamilton 460
Copper-smelting ——. (P) Mitchell 483
Cupellation ——. (P) Laird 1030
Cupola ——. (P) Bacher 1538
Electric ——:
(P) Carr 792
(P) Conley 623
(P) Contardo 261
(P) Duff and The United Alkali Co. 697
(P) Morani 852
(P) Parker 1129
(P) Shade 1541
(P) Taylor 1143
Electric ——, and Production of Chemicals therein. (P) Brewer. From Taylor 333
Electric —— for Glass-making. (P) Lühne 773
Electric —— for Glass Manufacture. (P) Voelker 1139
Electric —— for Heating to a Predetermined Degree. (P) Grobet 160
Electric —— for Metallurgy of Iron and its Compounds. (P) Harmet 1459
Electric —— for the Laboratory 792
Electric Oscillating ——. (P) Imray. From La Société Electro-Metallurgique 915
Electric Smelting ——. (P) Weber 1083
Electric —— with Moving Electrode. (P) Société Electrique-Metallurgique 1459
Electrical ——, and Producing Chemicals therein. (P) Brewer. From Taylor 1283
Fine-fuel ——:
(P) Fenner 962
(P) Herzberg 962
For Burning Refuse. (P) Heenan 460, 493
„ Bricks. (P) Swift 860
„ Burning Cement. (P) Scumenicht 860
„ Burning Dust-Fuel. (P) Brookes. From Bradley ... 1126
„ Burning Liquid Fuel. (P) Boyle 905
„ Burning Naphtha Residue. (P) Spiegel 330
„ Burning Ore Blocks. (P) Gröndal 1081
„ Coking Peat, &c. (P) Boult. From Ziegler 1127
„ Conversion of Metallic Oxide into Metal. (P) Fyfe .. 1333
„ Converting Cast-Iron into Steel. (P) Harrison. From Standard Car Wheel Co. 976
„ Destroying Refuse. (P) Marks. From La Comp. de Travaux Sanitaires 361
„ Generating and Burning Oil-Gas. (P) Gearing 963
„ Glass-making. (P) Brooke 914
„ Heating and Melting Iron. (P) Gantt 1400
„ Heating Annealing Boxes, &c. (P) McKenna Whiteley 460
„ Heating Asphalt. (P) Montupet 1390
„ Heating Drills, &c. (P) Laird 350
„ Heating or Smelting Metals. (P) Hewitt 776
„ Laboratory Use; Electric Resistance Magnesia Crucible ——. (Howe) 69
„ Liquid Fuel. (P) Lindemann 331
„ Liquid Hydrocarbons. (P) Clubbe and Southey 33
„ Manufacture of Calcium Carbide and Melting Metals. (P) Ward, and the International Oil Furnace Co. .. 461
„ Manufacture of Red-Lead. (P) Gabel and Kearns 356
„ Melting Metals. (P) Bosshardt 915
„ Producing Metals and Alloys. (P) Keller 354
„ Production of Zinc. (P) Convers and de Saulles 620
„ Reducing Ores, &c. (P) Lake. From Schupmann ... 1536
„ Refining Lead and Zinc Fume. (P) Bartlett 351
„ Roasting Ores:
(P) Beam and Bailey 483
(P) Cappeau 483
(P) Hopper 1142
(P) Jacklin 1142
(P) Koneman 1538
(P) Roberts 1081
(P) Sheedy and Iles 1401
For Separation of Zinc from Ores ——. (P) Sébillot 1333
„ Sterilising Air. (P) Ross 1150
„ Treating Manganese Steel and other Metals. (P) Hadfield. From Hibbard 410
„ Treating Ores containing Quicksilver. (P) Fitzgerald 620
„ Treating Precious Metals and Ores. (P) Laird 123
„ Treatment of Metals, &c. (P) Shadforth 1386

PAGE

Furnaces—*cont.*
For Vaporising Combustible Liquids. (P) Laurent 1525
For Vertical Boilers, Brewers' Coppers, &c. (P) Courts... 1524
Fusion of Metallic Masses by Flame-Jet, applicable to ——. (P) Boult. From Coln-Musener Bergwerks ... 1029
Gas —— for Steam Boilers, &c. (P) Duff and others 905
Generator or Regenerative ——. (P) Beardsley 331
Glass ——. (P) Putallaz 971
Glass-making ——. (P) Gobbe 773
Glaze-melting ——. (P) Romer and Schmidtheiny 347
Heating ——. (P) Baker 852
Heating Blast for ——. (P) Naef 1029
Hot-Blast ——. (P) Bradford 1141
Improved ——:
(P) Bergfleth 1226
(P) Gallagher 962
(P) Lake. From the American Furnace Co. 1029
(P) Lewellen 1324
(P) Loeser 1524
(P) McClave 905
(P) Miller 852
(P) Murphy 1524
(P) Monteith 1268
(P) Peasley 962
(P) Reagan 1324
(P) Roberts 1226
(P) Strauss 852
(P) Stubblebine 1445
(P) Taylor 597
(P) Wakely 599
(P) Ward 599
(P) Weber, jun. 331
In which Gas is used (P) Thompson 597
Lining for ——. (P) Knox 1400
Mechanical Calcining or Roasting ——. (P) Down and Godfrey 1029
Melting ——:
(P) Cartland 350
(P) Charlier 350
(P) Schwartz 1234
Metallurgical ——:
(P) Corrigan 1030
(P) Hunter 977
(P) Stubblebine 977
Muffle —— for Assaying. (P) Batchelder 1557
Muffle —— for Glass. (P) Geille 1330
Muffle-; Improved ——. (P) Convers and de Saulles 1525
Open-Hearth —— for Steel. (P) Saniter and Smith 1141
Open-Hearth Steel ——, in Great Britain. (T.R.) 1113
Ore-Roasting ——. (P) Merton 977
Oscillating Electric ——. (P) Héroult 1237
Portable Oil. (P) Ward 462
Promoting Combustion in ——. (P) Albrecht 1268
Quicksilver ——. (P) Scott 977
Recuperative; and Gas-producer combined. (P) Maskrey 1333
Reduction ——. (P) Vosburgh 1538
Refuse Destructor ——. (P) Willshear and Amos 361
Regenerative ——. (P) Drake 1388
Regulator for Oil-burning ——. (P) Parfitt 462
Retort ——. (P) Laird 122, 618
Retort Gas ——. (P) Bredel 1324
Reverberatory Smelting ——. (P) Nevegold 863
Revolving Electrical ——. (P) Maxim 1069
Roasting ——. (P) Klepetko and Evans 1185
Rotary —— for Treating Ores. (P) Hardingham. From Davey 122
Smelting ——:
(P) Auman 775
(P) Laird 176
(P) Laughlin 1134
(P) Mitchell 775
(P) Spies 350
Smelting; Fume Arrester for ——. (P) Gilliland 1334
Smelting; Utilising Waste Heat from ——. (P) Brown.. 1185, 1400
Spelter ——. (P) Ash 978
Stassano's Electric ——. (Lucchini) 1143
Terminal for Electric ——. (P) Acheson 962
Utilisation of Heat from ——. (P) Naef 1029
Working of Blast ——. (P) Rader and Smeeth 482
Zinc ——. (P) Wetherhill 1401
See also under Crucibles *and* Muffles.
See also under Kilns *and* Ovens.
Furnace-Dust; Examination of ——. (Schneider) 1474
Fusel Oil. *See under* Oils.
Fuses for Armour-piercing Projectiles. (P) Maxim 1115

G

Galactose; New Base derived from ——. (Roux) 1418
Separation of —— from Glucose. (Thomas) 491
Gallic Acid in Tanning Materials; Detection and Determination of ——. (Spica) 281
Acid; Manufacture of ——. (P) Heinemann 415
Gallocyanines. *See under* Dyestuffs.
Leuco-. *See under* Dyestuffs, Oxazine.

PAGE

Galvanising Apparatus. (P) Heathfield 1187
Garbage; Apparatus for Cooking —. (P) Wheelwright 1285
Apparatus for Treating —. (P) Wilson..... 1292
Treatment of —, and Apparatus therefor. (P) Wilson. 1292
Garden Party at Seaforth Hall 952
Gardenia Oil. *See under* Oils.
Garhwal; Mineral Deposits of —. (T.R.) 146
Gas. (Class 11.) 32, 108, 162, 244, 326, 395, 459, 538, 597, 696, 761, 851, 905, 959, 1019, 1065, 1126, 1178, 1225, 1267, 1322, 1386, 1445, 1524
Acetylene and other; Apparatus for Generating —. (P) Henrici 109
Acetylene and other; Apparatus for Generating and Storing, &c. (P) Powers and others 34
Acetylene-; Apparatus for Generating —:
(P) Adolfsson 745
(P) Allaire 1390
(P) Anderson 1524
(P) Bailly and Chauvin 1447
(P) Barnard 1527
(P) Bazley 765
(P) Beck and Homan 1325
(P) Bishop 762, 763
(P) Bjornrud 604
(P) Bonnefis 1447
(P) Bournonville 1526
(P) Bryan 465
(P) Bucher 853
(P) Buckley and Phinney 963
(P) Bugg 1129
(P) Burgess 109
(P) Caldwell 604, 1227
(P) Charbeneau 1270
(P) Charlon 1389
(P) Clark and Bone 109
(P) Clopton 605
(P) Colony 464
(P) Cook 1227
(P) Cozins 465
(P) Dargie 1446, 1524
(P) Dargue 34
(P) Davis 963, 1128
(P) de Thiersant and Coulson 461
(P) Dickerson 604, 605
(P) Dimmick 464
(P) Dolan 605
(P) Doman and Bullas 1067
(P) Drake 605
(P) Duncombe 1527
(P) Edwards 963
(P) Einstein 605, 909, 1270
(P) Erk 605
(P) Falkenwalde 764
(P) Fuert and Martin 332
(P) Foster and Macksuick 461
(P) Gilgan 1179
(P) Guigue. From Borrelly 1323
(P) Gustafsson 604
(P) Hamm and Mosher 1069
(P) Harris 332, 465, 1069
(P) Heaton and Worthley 164
(P) Hendler 465
(P) Henley 1527
(P) Homan 1527
(P) Irish 1527
(P) Jorat 1447
(P) Julien 1447
(P) Kurg 1129
(P) Keith 1269
(P) Keller and Knappich 851
(P) Kincaid 1069
(P) Klinger 1067
(P) Lambourne and Wood 599
(P) Landauer 1389
(P) Laxton 1226
(P) Ledru 962, 1324
(P) Lépine 397
(P) Lewis 764
(P) Lockerbie and Wilkinson and Brand 961
(P) Long 765
(P) Losfield 907
(P) Loyer 1325
(P) Mackenzie 1527
(P) Macksuick 604
(P) Macquet 1067
(P) Marchand 1390
(P) Merrill and Hickman 764
(P) Metcalf 1270
(P) Meydenbauer 397
(P) Möhrer and Hopp 699
(P) Montel 765, 1069
(P) Mosher 909, 1069
(P) Mosher and Hamm 465
(P) Moussette 699
(P) Myers 604
(P) Newlin and Mathisen 1180
(P) Nonzaret 699
(P) O'Brien. From Wagner 34
(P) Pataky 1021, 1389
(P) Perkins 1069
(P) Quist and Bain 909
(P) Ransford. From La Cie. Universelle d'Acetylène 962

PAGE

Gas—*cont.*
Acetylene-; Apparatus for Generating—*cont.*
(P) Ranthmell 34, 245
(P) Ray 1129
(P) Reynolds 605, 1325
(P) Rosenbluth 606
(P) Ross 465, 1269
(P) Rcupioz 1389
(P) St. L. McGinn 605
(P) Salisbury 604
(P) Sebelle 464
(P) Shackleton and Ross 109
(P) Simonson 605
(P) Sims 1067
(P) Smith 1269, 1324
(P) Soderberg 1069
(P) Stephenson 465
(P) Stevens 605
(P) Tejada 907
(P) Thiersant 1226
(P) Towne and Clough 604
(P) Treichler 907
(P) van Praag 1069
(P) Washburn 698
(P) Wecks 909, 1127
(P) Weil and Evans 604
(P) Williamson 765
(P) Winch 1069
(P) Windham 1067
(P) Wood 765
(P) Yancey 699
Acetylene-; Apparatus for Generating and Storing —:
(P) Anderson 163
(P) Jack 397
(P) Kinsey and others 397
(P) McIntosh 333
Apparatus for Generating; Report on —. 538
Apparatus for Purifying —:
(P) Bullier and Maquenne 1388
(P) Freeman 1128
(P) McNally 1388
(P) Williamson 606
Carbide Feed Mechanism for Producing —. (P) Collin and Nicholls 539
Compound for Purifying —. (P) Bullier and Maquenne 1388
(Compressed) Lighting System. (P) Toltz and Lipschutz 397
Decomposition of — during Combustion. (Gaud) .. 396
Feeding Device for Generating Apparatus. (P) Brodin and Schepeler 907
In Buenos Ayres. (T.R.) 648
Lighting by —. (P) Strathy and Riley 763
Locking Device for Generators of —. (P) Compton. 764
Manufacture of —. (P) Forbes 599
Purification of —:
(P) Burgess 245, 963
(Keppeler) 1386
Purifiers for —. (P) Giles 332
Standards adopted for Apparatus for —. 1065
Analysis of —, by Means of Flasks. (Wohl) 1412, 1413
And Air; Apparatus for Mixing —:
(P) Broichgans 1324
(P) Seymour 906, 1178
And Air; Apparatus for Mixing and Supplying —. (P) Burrows 603
And Air; Production of a Mixture of —, and Apparatus therefor. (P) Lake. From Selas 961
And Water; Separator for —. (P) Neely 463
Apparatus for Compressing, Cooling, &c. —. (P) Naef.. 1126
Apparatus for Condensing —. (P) Carpenter 1524
Apparatus for Densifying and Exhausting —. (P) Scholl 329
Apparatus for Generating —:
(P) Bauke and Fuchs 1446
(P) de Blanitza and Herard 961
(P) Faulkner 1128, 1128
(P) Isbell 334
(P) Keith 1269
(P) Kummer 600
(P) Luther 1270
(P) Miller 1021
(P) Radcliffe 109
(P) Riesserg 1138
(P) Ross 1269
(P) Steele 1526
Apparatus for Generating, Purifying, and Storing —. (P) Whitfield 961
Apparatus for Producing —, from Peat, &c. (P) Merrifield and Checkley 1020
Apparatus for Measuring and Mixing —. (P) Boistelle. 1445
Apparatus for Proportioning and Mixing —. (P) Pettibone 852
Apparatus for Purifying —:
(P) Chandler 906
(P) Doman and Bullas 1127
(P) Donohue 852
(P) Humphrey 1322
(P) Milbourne 599
(P) Smith-Rewse and Coates 762
Apparatus for Sampling —. (Lester) 386
Apparatus for Saturating Liquids with —. (P) Weis and Anderson 408

PAGE

Gas—*cont.*
Apparatus for Separating and Recovering Elements of Mixed ——. (P) Mazza ... 1126
Apparatus for Separating Impurities from ——. (P) Winand ... 1523
Apparatus for Subjecting —— to High-tension Discharges. (P) Bradley and Lovejoy ... 1335
Apparatus for Treating Liquids with ——:
(P) Vosmaer and others ... 1292
(P) Vosmaer and Lebret ... 1523
Apparatus for Washing ——. (P) Theisen ... 1322
Apparatus for Washing and Scrubbing. (P) Holmes and Cameron ... 1524
Blast-Furnace-; Apparatus for Cooling and Cleansing ——. (P) Thwaite ... 352
Blast-Furnace-; Apparatus for Purification of ——. (P) Brookes. From The Deutsch-Luxemburgische Bergwerks-und Hutten Aktien-Ges. ... 1333
Blast-Furnace-; Process and Apparatus for Cleaning ——. (P) Clemaug ... 906
Blast-Furnace-; Removing Dust from ——. (P) Elsner . 177
Blast-Furnace-; Utilisation of —— in Austria. (T.R.) ... 730
Carburetted-hydrogen-; Apparatus for Manufacture of ——. (P) Van Steenbergh ... 764
Charging Compartments with ——. (P) Monve and Martin ... 870
Coal-; Condensation of ——. (Colman) ... 905
Coal-; Modern Competitors with ——. (P) Lecomte ... 959
Combustion; Desulphurising ——. (P) Pollacsek ... 1446
Compound for Purifying ——. (P) Blackmore ... 603
Compression, Expansion and Liquefaction of ——. (P) Joly ... 904
Compressed; Transport of ——, in France. (T.R.) ... 879
Containers for Liquefied or Compressed ——. (P) Read.. 914
Cooling and Liquefaction of ——, and Separation of Oxygen and Nitrogen. (P) Strong ... 345
Device for Detecting ——, for Attaching to Miners' Lamps. (P) Mackie ... 603
Device for Heating ——. (P) Bowman ... 599
Direct Utilisation of Heat of Waste ——. (P) Heinzerling 1020
Enrichment of, and Means therefor. (P) Hartridge ... 163
Enrichment of —— with Benzol. (Lecomte) ... 1020
Explosion Limits of Combustible ——, with Air. (Ehler) 395
Explosive ——, for Exterminating Vermin. (P) Leybold . 270
Explosive Mixtures of ——. (Bunte) ... 32
Extraction of Cyanides from ——. (Guillet) ... 1026
Filter for ——. (P) Harris ... 1324
For Driving Gas Engines; Rapid Production of ——. (P) Winand ... 1178
For Heating, &c., from Alcohol and Hydrocarbons. (P) Pampe and Trolle ... 1447
From Waste-Liquors of Cellulose Factories. (Besemfelder) ... 1192
From Wood for Use in Manufacture of Steel. (Douglas) . 860
Furnace-; Apparatus for more Complete Combustion of ——. (P) Phillips and Godden ... 460
Furnace-; Apparatus for Separating and Recovering Arsenic Fumes from ——. (P) Stone ... 1395
Furnace-; Desulphurising. (P) Pollaczek ... 1270
Furnace-; Purification of ——, for Drying Malt, &c. (P) Beaven ... 268
Heating and Lighting Power of ——, in Relation to Incandescence Mantles. (Russell and White) ... 1020
High-Pressure; Obtainment of ——. (P) Sale and Onslow ... 851
In Gas-Producers; Production and Use of ——. (P) Naef 244
In Gaseous Mixtures; Apparatus for Measuring the Constituent —. (P) Oving ... 1447
Influence of Radio-Active Substances on Luminescence of ——. (de Hemptinne) ... 143
Inhalable; Apparatus for Supplying Pure ——. (P) Abel. From Sauerstoffe-Fabrik ... 361
Lignite; Firing Pottery Kilns with ——. (Baier) ... 244
Liquefaction of ——. (P) Joly and Richardson ... 1356
Liquefaction of, and Cooling by Means of same. (P) Place 1322
Liquefied; Manipulating ——, in Sealed Tubes. (Moissan) 876
Liquid; Vessel for Holding and Shipping ——. (P) Place 1322
Manufacture of ——:
(P) Clark. From Goldschmid ... 961
(P) Dibdin and Woltereck ... 1127
(P) Godwin, Keil, and Dougall ... 907
(P) Harris ... 1447
(P) Hayes ... 109
(P) Paul and Gundlack ... 332
(P) Harris ... 334, 598
(P) Isbell ... 1180
(P) Johnson. From Deutsche Continental-Gas-Gesellschaft and Bueb ... 851
(P) Radcliffe ... 109
(P) Schniewind ... 331
Manufacture of ——, and Apparatus therefor:
(P) Lowe ... 906
(P) Schill ... 1323
(P) Westinghouse. From Knox ... 1066
Manufacture of ——, under Pressure. (P) Leroy ... 1525
Means for Causing to Move in Contact with Liquids, but Opposite Direction. (P) Theisen ... 904
Means for Condensing ——. (P) Allison. From The Smoke Exterminator Co. ... 1226
Means for Subjecting Matter to the Action of ——. (P) Naef ... 173
Method and Means for Dehydrating ——. (P) Lawton's Patents and Lawton ... 183

PAGE

Gas—*cont.*
Natural —— in Iron and Steel Works in the United States. (T.R.) ... 799
Natural ——, in Sussex. (Dawson) ... 1225
Natural ——, in the Central United States. (T.R.) ... 648
Natural: Production of ——, in the United States. (T.R.) 1354
Of Ammonium Sulphate Manufacture; Removing H_2S from —— ... 1277
Of Low Calorific Value; Obtaining Light from ——. (P) Chamberlain ... 1021
Oil-; Apparatus for Generating ——:
(P) Bavldon and Morriss ... 461
(P) Caton and Warring ... 1021
(P) Dempster ... 600, 1128
(P) Kilhan ... 600
Oil-; Apparatus for Mixing Oil and Air, and Generating ——. (P) Behm ... 1068
Oil-; Production of ——:
(P) Colborn ... 397
(P) Hughes ... 1269
Peat-; for Steel-making in Sweden. (T.R.) ... 1420
Plant for Manufacture of ——. (P) Schniewind ... 698
Pre-heating and Moistening of Fixed ——. (P) Webber.. 1020
Preventing Leakage of —— through Walls of Retorts, &c. (P) Koppers ... 1127
Producer-; Generation of ——, and Apparatus therefor. (P) Mills. From Taylor ... 539
Producer-; Treatment of ——. (P) Duff and the United Alkali Co. ... 33
Production and Utilisation of ——. (P) Westinghouse... 851
Production of ——, from Peat, &c. (P) Merrifield and Checkley ... 1021
Pumps for Compressing ——. (P) Murray ... 326
Purification of ——:
(P) Brookes. From Stearns ... 1524
(P) Humphrey ... 1226
(P) Lencauchez ... 1066
(P) Naef ... 1021
Purifying ——, and Apparatus therefor. (P) Abel. From Saltar ... 332
Receptacles for Compressed or Liquefied ——. (P) Lange 1322
Removal of Dust from ——. (P) Elsner ... 177
Schilling's Apparatus for Determining Sp. Gr. of ——, modified. (Pannertz) ... 139
Subjection of ——, to High Tension Electrical Discharges. (P) Mills. From The Atmosphere Products Co. ... 1282
Thermometers and Pyrometers. (P) Hatfield ... 326
Treating Solids with ——, in Catalytical Reactions. (P) Naef ... 33
Treatment of Materials with ——. (P) Naef ... 961
Treatment of Solids with ——. (P) Naef ... 1027
Utilisation of ——, for Industrial Purposes. (P) Thompson. From Darby ... 1178
Utilising the Heat contained in Waste ——. (P) Feeny. From Abwärme-Kraftmaschinen Actienges ... 1127
Vessel for Reception of High-Pressure ——. (P) Ludwig. 761
Water- and Semi-Water ——; Manufacture of ——. (P) Kramers and Aarts ... 331
Water-; Apparatus for Generating ——. (P) Strache 1021
Water-, in the London Gas Supply; Report on —— ... 1268
Water-; Plant for Methane-Hydrogen ——, at Sligo, Ireland. (Tully) ... 1178
Water-; Production of ——:
(P) Bormann ... 163
(P) Fleischer ... 909

Gas-Burners. *See under* Burners.
Gas-Detector:
(P) Freymann and Tolman ... 603
(P) Mackie ... 603
-Generators. (P) Boult. From Chavanon. (P) ... 598
-Generator and Holder; Automatic Carbonic Acid ——. (P) Henderson and Clayton ... 132
-Generator for Gas-Engines. (P) Bonds ... 600
-Igniters:
(P) Boult. From Lehmann and Scheele ... 332
(P) Heys. From McGregor ... 697
(P) Juhász ... 332
-Jets; High-Power Oxyhydrogen Mixed —. (P) Locke 1388
-Lighting and Gas-heating Appliances; Incandescence ——. (P) Hughes ... 962
-Lighting; Pressure System for Incandescence ——. (P) Scott-Snell ... 1179
-Liquor, Apparatus for freeing Ammonia from ——. (P) Abendroth ... 1526
-Liquor; Ferrocyanide formed from ——. (Donath) ... 51
Gas-Producers:
(P) Crossley and Atkinson ... 1388
(P) Duff ... 600
(P) Evans and Klepetko ... 1068
(P) Herrick ... 1068, 1128, 1128
(P) Herring ... 1020
(P) Hyatt ... 245
(P) Imray. From La Société . . . de la Vapeur Surchauffée ... 851
(P) Johnson. From Genty and others ... 697
(P) Kelly ... 1526
(P) Mitchell ... 1526
(P) Mond ... 460, 600
(P) Naef ... 109
(P) Oswald and Bowman ... 34
(P) Smith and Wincott ... 762
(P) Swindell ... 245
(P) Thomas and Prosser ... 163

PAGE

Gas—*cont.*
-Producer and Recuperative Furnace combined. (P) Maskrey ... 1333
-Producer; Apparatus for ——. (P) Kemp-Welch ... 1446
-Producers; Efficiency of Wilson ——. (Stead) ... 79
-Producers for Use in Heating Gas Retorts. (P) Irving and Gibbons ... 1445
-Pumps. *See under* Pumps.
-Retorts. *See under* Retorts.
-Tar Residuum; Treatment of ——. (P) Lowe ... 1227
-Water; Arrangement for Treating ——, continuously. (P) Koppers ... 765
Gaseous Currents; Apparatus for Generating ——. (P) Mallet 394
Gaseous Fluids; Treatment of ——, with Carbon Dioxide. (P) Naef ... 1232
Gasoline Regulator and Carburetter combined. (P) Titus ... 601
Gelatin; Action of Chromium Compounds on ——. (Namias) 1338
Analysis of ——. (Muller) ... 874
And Gelose in Preserves, Detection of ——. (Desmoulière) 1157
Factory in France. (T.R.) ... 82
Hydrolysis of ——. (Fischer, Levene, and Aders) ... 713
Manufacture of ——, from Bones. (P) Hilbert ... 1405
Mechanical Action of —— on Solids. (Cailletet) ... 408
Obtaining Liquids which Yield ——. (P) Edson ... 265, 982
Gelatoses: Neutral Soluble Silver Compounds of ——. (P) Imray. From the Farb. vorm. Meister, Lucius und Brüning ... 67
Gelose in Preserves, Detection of ——. (Desmoulière) ... 1157
Gems. *See under* Stones, Precious ... 876
Generator; Electro-chemical ——. (P) Amwake ... 1143
Gentian Root; Sugars in Powder and Extract of ——. (Bourquelot and Herissey) ... 1553
Gentianose, Constitution of ——. (Bourquelot and Herissey) 1251
Gentiobiose; Action of Ferments and Beer Yeast on ——. (Bourquelot and Herissey) ... 1251
Crystallised, Preparation and Properties of ——. (Bourquelot and Herissey) ... 1159
Germany: Accumulator Industry of ——. (T.R.) ... 1122
Alcohol Motors in ——. (T.R.) ... 1420
Alcohol Trust in ——. (T.R.) ... 940
Ammonia and Nitrate of Potash in ——. (T.R.) ... 1046
Amline Dyestuffs Exported from ——. (T.R.) ... 1563
Artificial Clay in ——. (T.R.) ... 371
Artificial Leather for ——. (T.R.) ... 652
Artificial versus Natural Indigo in ——. (T.R.) ... 80, 509
Beet Leaves for Fodder in —— (T.R.) ... 1117
Beet-Sugar Acreage of ——. (T.R.) ... 940
British Candles for Stettin ——. (T.R.) ... 733
Carbolic Acid and Salicylic Acid Imported by Wurtemberg ——. (T.R.) ... 84
"Cartels," Syndicates and Rings in ——. (T.R) ... 1044
Celluloid Products of ——. (T.R.) ... 801
Cement Industry of ——. (T.R.) ... 1112
Cement Testing in ——. (T.R.) ... 1206
Cement Trade of ——. (T.R.) ... 437
Chemical Industry of ——. (T.R.) ... 1060
Colonial Economic Institute in ——. (T.R.) ... 568
Customs Decision on Blue-straw Cardboard. (T.R.) ... 202
Effect of Proposed New Tariff in ——. (T.R.) ... 1044
Flake Graphite in ——. (T.R.) ... 1112
Fuel Briquettes, Manufacture of ——. (T.R.) ... 1204, 1478
Glove Industry in ——. (T.R.) ... 1161
Imports and Exports of —— to the United States. (T.R.) 568
Imports of Tar, Pitch, and Tallow into ——. (T.R.) ... 1202
Indigo Manufacture in ——. (T.R.) ... 1045
Indigo Market in —— for 1901. (T.R.) ... 508
Industrial Dividends in ——. (T.R.) ... 1419
"Inspection of Meat" Law in ——. (T.R.) ... 514
Institutions for Testing Materials in ——. (T.R.) ... 1110
Leather Trade in ——. (T.R.) ... 1049
Linoleum Industry in ——. (T.R.) ... 438
Match Manufacture in Bavaria ——. (T.R.) ... 735
Medicines and Tax on Alcohol in ——. (T.R.) ... 1312
Metallurgical Patents in ——. (T.R.) ... 1421
Mine Timber Preservation in ——. (T.R.) ... 1257
Mineral Production of ——. (T.R.) ... 729
Mining and Metal Industries of —— in 1900. (T.R.) ... 198
Nickel Mining in Silesia ——. (T.R.) ... 292
Ozone for Sterilising Water in ——. (T.R.) ... 441
Paper Industry of ——. (T.R.) ... 1166
Paper Trade of, in 1901 ——. (T.R.) ... 1052
Patent Law Decision in ——. (T.R.) ... 879
Patents in ——. (T.R.) ... 1044
Peat Briquettes in ——. (T.R.) ... 730
Petroleum in ——. (T.R.) ... 508, 1256
Potash Industry of ——. (T.R.) ... 1046, 1310
Potash Salts Industry of ——. (T.R.) ... 1161
Potato Spirit, Production of ——. (T.R.) ... 513
Preparation of New Cattle Food in ——. (T.R.) ... 1479
Report on Chemical Instruction and Industries in ——. (T.R.) ... 508
Saccharin in ——. (T.R.) ... 1004
Saccharin Prohibition Law in ——. (T.R.) ... 1167
Salt Trade of Dantzig ——. (T.R.) ... 1202
Sawdust for Fuel in ——. (T.R.) ... 145
Soap-Glue and Lined Sheets of Paper in ——. (T.R.) ... 1044
Soap Trade in Wurtemberg ——. (T.R.) ... 82
Soda Industry of —— in 1901. (T.R.) ... 290
Spirit Industry of ——. (T.R.) ... 1051
Sugar Production of ——. (T.R.) ... 147, 512, 881, 1050, 1165
Sugar Production and the Cartel in ——. (T.R.) ... 201

PAGE

Germany—*cont.*
Sulphate of Copper Required in ——. (T.R.) ... 1112
Technical Uses of Alcohol in ——. (T.R.) ... 538, 572
Trade Statistics of ——. (T.R.) ... 1109
Trusts in Wurtemberg ——. (T.R.) ... 79
Use of Copra in East Prussia. (T.R.) ... 1114
Vinegar Trade in Wurtemberg ——. (T.R.) ... 83
Zinc Production of Silesia ——. (T.R.) ... 880, 1112
Glacé Leather. *See under* Leather.
Glass. (Class VIII.) ... 52, 117, 174, 255, 347, 408, 477, 549, 615, 706, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1232, 1278, 1330, 1395, 1454, 1534.
And Hydraulic Cements; Studies on Zulkowski's Theory of ——. (Glaessner) ... 1395
And Hydraulic Cements; Zulkowski's Theory of ——. (Glaessner) ... 706
Apparatus for delivering Melted ——. (P) White. From Foster ... 971
Apparatus for Manufacture of ——. (P) Lubine ... 773
Apparatus for Refining and Delivering ——. (P) Keyes. 859
Apparatus for Silvering ——. (P) Laval ... 256
Apparatus; Sealing Wires into ——. (P) Edison and Clerici ... 333
Articles; Apparatus for Manufacture of ——. (P) Imray. From Chambers ... 477
Articles; Manufacture of Hollow ——. (P) Sievert ... 477
Articles of Uniform Weight and Capacity. (P) Hilde and Kogler ... 1395
Colouring of ——. (P) Scherhag ... 409
Composition for Ruby ——. (P) Zsigmondy ... 1027
Composition for Use as a Backing for ——. (P) Stevens.. 707
Defects in ——. (Jung) ... 174
Dulling of Window ——. (Stoermer) ... 173
Electric Furnace for making ——:
(P) Lühne ... 773
(P) Voelker ... 1139
Electrical Manufacture of ——. (P) Voelker ... 971
Extracting Definite Quantities of Molten —— from Tanks, &c. (P) Miller and The Trades Progress Co. ... 1232
For Water-Gauge Tubes. (Krull) ... 549
Framing of ——. (P) Taluau and Scattergood ... 1027, 1027
Framing of —— by Electro-deposition. (P) Scattergood . 1330
Furnaces for Manufacture of ——. (P) Geille ... 1330
Industry; Improvements in the ——. (Drulle and Dralle) 52
Machine for Working ——. (P) Colburn ... 615, 615
Manufacture of ——. (P) Voelker ... 773
Manufacture of Adherable ——. (P) Thompson. From La Société Belge . . . des Émaux Artistiques ... 347
Manufacture; Fusibility of Silicates and Borates used in ——. (Granger) ... 255
Manufacture of —— by Electricity:
(P) Brown ... 1232
(P) Redfern. From La Société de l'Industrie Verrière ... 1027
Manufacture of Window —— in Japan. (T.R.) ... 509
Mechanical Action of Gelatin on ——. (Cailletet) ... 408
Mural: Composition for the Manufacture of ——. (P) Collignon and Blondeau ... 1534
Opaque and Coloured ——. (P) (Knospel) ... 347
Oxidation and Reduction in Melting ——. (Rauter) ... 173
Photographic Decoration on ——. (P) Crabtree and Mason ... 1245
Plates; Apparatus for Manufacture of ——. (P) Appert.. 1330
Receptacles for Molten ——. (P) Brooke ... 914
Stained or Similar ——; Manufacture of. (P) Taluau 1027
Trade of Chicago. (T.R.) ... 649
Trough for Silvering ——. (P) Laval ... 1278
Utilising Waste —— for making Ornaments. (P) Geille.. 117
Varnish for Backing Silvered Mirror ——. (E.N.) ... 179
Window- and Plate-; Manufacture of ——. (P) Heal 1139
Producing Metallic Lustre on ——. (P) Zsigmondy 707
-Gall; Obtaining Glass from ——. (P) Beeker ... 1077
-Gathering Machine. (P) Ripley ... 707
-Stone; Manufacture of ——. (P) Garchey ... 914
-Ware; Apparatus for Manufacture of ——. (P) Ripley.. 1330
-Ware; Finishing Machine for ——. (P) McCloy ... 707
-Ware; Manufacture of Hollow ——. (P) Arbogast 773
Glazes for Porcelain: Analysis of ——. (de Luynes) ... 426
Insoluble Frits for Pottery ——. (Rix) ... 317
Leadless ——, for Pottery in the United Kingdom. (T.R.) 1205
Nature of Crystal Pottery ——. (Bris) ... 707
Glove Industry in Germany. (T.R.) ... 1164
Glucophosphoric Acid; Characteristics of ——. (Levene) 505
Glucose and Cerium Carbonates. (Job) ... 795
And Maltose; Equilibrium between ——. (Pomeranz) ... 1353
Conversion of Wood into ——. (P) Magnier and Brangier 632
Customs Tariff on ——. (T.R.) ... 1165
Import Duties on ——. (T.R.) ... 939
Manufacture of —— from Amylaceous Matters. (P) Wonssen and Caussin de Perceval ... 60
Refining of ——, and Apparatus therefor. (P) The Cereal Sugar Co. ... 359
Separation of Galactose from ——. (Thomas) ... 491
Glucosides; Synthesis of ——. (Fischer and Armstrong) 1302
Glue. (Class XIV.) ... 56, 128, 179, 264, 357, 415, 488, 555, 627, 713, 783, 865, 919, 982, 1032, 1085, 1146, 1189, 1239, 1286, 1338, 1404, 1461, 1544
Analysis of ——. (Müller) ... 874
And Gelatin Industry of Lyons, France. (T.R.) ... 1311
Apparatus for Making ——. (P) Kelsey ... 1189
Casein ——. (P) Slough ... 1286
Liquid ——. (P) Hall ... 627

PAGE

Glue—*cont.*
Manufacture of —, from Bones. (P) Hilbert 1405
Manufacture of —, at Damascus (Turkey). (T.R.) 1003
Preparation of —. (Andés)..... 57
Substitute for —. (P) Just..... 357
Substitute for Liquid —. (P) Schmalfuss..... 1405
Technical Examination of —. (Clayton)..... 670
Gluten; Manufacture of —. (P) Morel..... 787
Moist, in Flour; Determination of —:
(Arpin)..... 1417
(Trillat)..... 1560
Of Hard Wheat; Physical Constitution of —. (Fleurent) 133
Tailings; Utilising —. (P) Gudeman..... 633
Glycerides, Fatty — having double Melting Points. (Kreis and Hafner)..... 1542
Hexabromides of —. (Walker and Warburton)..... 1144
Of Fatty Acids; Action of Superheated Steam on —. (Klimont)..... 126
Of Fatty Acids; Double Melting Points of —. (Kreis).. 711
Vegeto-fatty Acid — in Animal Fats. (Hansen)..... 553
Glycerins: Analysis of Commercial —. (Gailhat)..... 280
Apparatus for Refining —. (P) Schmidt and Joslin.... 1084
Assimilation of — by Eurotoyopsis Gayoni. (Maze)..... 287
Determination of —:
(Chaumeille)..... 874
(Deiss)..... 874
(Zeisel and Fanto)..... 992
In Wine; Determination of —. (Trillat)..... 1560
Recovery of —, and Apparatus therefor. (P) Flandrak. 1160
Refining of —, and Apparatus therefor. (P) Douillet... 711
Separation of — from Oils, &c. (P) Danoise and others. 355
Use of — in the Platinum Process. (Rapp)..... 68
Waste Lyes and Crude Glycerin; Specific Heat of —. (Gill and Miller)..... 833
Glyceroarsenic Acid. (Auger)..... 272
Glycines. *See under* Dyestuffs.
Glycogen; Occurrence of — in various Yeasts. (Henneberg)..... 1289
Glycollic Menthyl Ester; Preparation of —. (P) Hofmann and Callsen..... 1195
Glycosol; Character of —. 791
Glycosuria Antidote, and Production of same. (P) Blum 1154
Glyoxylic Acid. Paramethyl-aminophenyl —, and Manufacture of same. (B) Boehringer and Sons. From Ach 1245
Gold; Action of Selenic Acid on —. (Lenher)..... 646
Application of Phase Rule to Melting Point of —. (Richards)..... 975
Detection and Determination of — in small quantity. (Wagoner)..... 501
Diehl's Cyaniding Process for —. (Knutsen)..... 1029
Electrolytic Precipitation of —. (Kendall)..... 863
Extraction of — from Sea-water:
(P) Bull and Watling..... 349
(P) Martin and others..... 1536
In Copper Bullion, Determination of —. (Swift)..... 1559
In Cyanide Solutions, Determination of —. (Carter)... 1558
Ores. *See under* Ores.
Precipitation of — by Zinc-Dust. (Packard)..... 1280
Recovery of — from Refractory Ores. (P) Cassel..... 485
Separation of — from Antimony. (P) Butterfield..... 123
Separation of — from Iridium. (Mietzschke)..... 279
Telluride; Investigation of Natural —. (Lenher)..... 646
Zinc-Dust as Precipitant for —, in the United States. (T.R.)..... 1421
Gold:
Colloidal Form of —. (Paal)..... 994
Colloidal; Manufacture of —. (P) (Paal)..... 916
Compounds of — with Chlorine. (Meyer)..... 52
Liquid Hydrosol of —. (Guthier)..... 1250
Grain; Apparatus for Malting, Drying, &c. (P) Sleeman 1148
Brewers; Apparatus for Pressing —. (P) Stanley..... 869
Drying of Malted —. (P) Wilkinson..... 360
Pressing Apparatus for Brewers' and Distillers' —. (P) (Menzies)..... 868
Steeping —. (P) Rice..... 1547
Sterilising and Bleaching —. (P) Buchenan..... 269
Granite. *See under* Stone.
Grape Musts: Bouquet of Wines from Fermentation of Sterile —. Rosenstiehl..... 922
Graphite; Artificial — as a Material for Anodes. (Foerster) 484
Artificial; Manufacture of —, by Electrical Fusion. (T.R.)..... 1419
Chemical Purification of —. (P) Langbein..... 408
Flake, in Germany —. (T.R.)..... 1112
In Ores. (Stillwell)..... 759
In United States, Production of —. (T.R.)..... 1001
Manufacture of —. (P) Acheson..... 1336
Temperature Limits for Separation of — from Cast Iron. (Tiemann)..... 258
Grease: Apparatus for Extracting — from Exhaust Steam:
(P) Baker..... 625
(P) McDougall..... 625
Extraction of —. (P) Cameron..... 1084
Extraction of — from Garbage. (P) Brown..... 263
-Containing Material; Treatment of —. (P) Seldner... 413
Greece; Chrome Ore, Production of —. (T.R.)..... 650
Emery Production of —. (T.R.)..... 291
Purchase of Sulphate of Copper by —. (T.R.)..... 291
Trial of Chemical Manures in —. (T.R.)..... 653

PAGE

"Grignons d'Olives," Production of —, in Tunis (T.R.) . .. 1564
Grinding and Pulverising Apparatus. (P) Breakell..... 596
And Reducing Apparatus for Lime, &c. (P) Whitham ... 1455
See also Crushing and Pulverising.
Grindstones; Artificial —. (P) Rooper..... 347
Guaiacol; Compound of — with Cinnamic Acid and Tannin. (P) Nissel..... 1096
Ether; A New —. 1346
Sulphonate; Manufacture of Sodium-o —. (P) Alpers. 364
Guaiacol, Methylene di-; Camphoric-Acid, Ester of —. (P) Summers..... 1194
Guaiacolsulphonic Acid; Characteristics of —. (Hahle).. . 362
Guaiaform; Characteristics of —. (Ehlert)..... 363
Guanidine, Determination of —. (Vozárik)..... 1041
Guano Deposits of the Seychelles —. (T.R.) 1422
Fish; Obtainment of — from Oil Residues. (P) Speltie 413
Gums; Balata Rubber in Dutch —. (T.R.)..... 293
British; Constructional Woods of —. (Hill)..... 1027
Sugar Crop of British —. (T.R.) 653
Guinea, French; Lamy (*Pendatesma Butyracea*) in —. (T.R.)..... 1164
French; Rubber in —. (T.R.) 1164
Gum. (Class XVI.)..... 57, 129, 179, 265, 358, 416, 489, 556, 628, 713, 733, 865, 919, 982, 1033, 1085, 1146, 1189, 1239, 1287, 1339, 1405, 1462, 1545
And Gum Tragacanth in Baghdad (Turkey) —. (T.R.) 1208
Arabic; Increasing the Adhesive Power of —. 129
Artificial; Manufacture of —. (P) Cerf..... 1496
Chicle; Characteristics of Mexican —. (T.R.)..... 438
Of German East Africa; Examination of —. (Mannich) 1337
Substitute for Soluble —. (P) Ekman..... 358
Textile Fabrics from —. (P) Mugnier 541
Guncotton; Press for —. (P) Hollings..... 276
Gunpowder; Apparatus for Granulating —. (P) Wilkins and Aspinwall 498
Smokeless —:
(P) Denton and Preas..... 927
(P) Lundholm 927
Treatment of —. (P) Jones..... 366
Manufacture of —. (P) Jones 498
Gutta-Percha; Determination of —. (Marckwald and Frank)..... 1351
Experiments on Chemical Behaviour of —. (Sir W. Ramsay and others)..... 1367
Extraction of —:
(Gerber) 414
(P) Mitchell 626
In German New Guinea. (T.R.)..... 733, 881
Manufacture of —. (P) Bertram and Milne..... 1188
Purification of —:
(P) Combanaire and de la Fresnaye 357, 1085
Statistics of —, in New Guinea. (Schlechter) 1338
Substitute for —. (P) Gentzsch 488, 783
Gypsum in the United States; Production of —. (T.R.) 1206
Sludge from Bones; Utilisation of —. (P) Monin 1408
Solubility of — in Aqueous Solutions of certain Electrolytes. (Cameron and Seidell) 549
Solubility of — in Aqueous Solutions of Salt. (Cameron) 257
See also under Plaster of Paris *and* Calcium Sulphate.

H

Hæmatoxylin. *See under* Dyestuffs, and Hydroxychromone.
Hæmoglobin; Medicinal Preparations of —. (P) Hanssen.. 1410
"Hafercacao," *See under* Oat-cocoa.
Hair and Bristles; Process and Apparatus for Cleansing, &c. (P) Born..... 405
Hair; Artificial —. (Süvern)..... 249
Bleaching and Dyeing —. (P) Brown 857
Halogen-thiobismuthites of Copper. (Ducatte) 877
Halogen Derivatives. *See under* Dyestuffs.
Halphen's Test for Cotton-Seed Oil in Butter. (Sjollema and Tulleken) 1344
Hamburg; Chemical Products at —. (T.R.)..... 1043
Dyewoods and Indigo in —. (T.R.) 1045
Fertilisers at —. (T.R.)..... 1049
Leather Industry of —. (T.R.) 1049
Oil Production in the District of —. (T.R.)..... 1048
Potash in — . (T.R.) 1046
Resin and Turpentine —. Imports by. (T.R.)..... 1049
Sugar and Potato Products of —. (T.R.) 1050
Tar and Pitch Trade of —. (T.R.)..... 1045
Hanover; Alcohol for Fire-Engines in —. (T.R.) 1160
Cement and Asphalt Industry of —. (T.R.)..... 1046
Hats; Material and Dyes used in Manufacture of —. (Frankel) 118
Hat-Dyeing; Substitutes for Mercury Nitrate in —..... 170
Heat; Apparatus for Effecting Exchange of — between Fluids. (Bennett)..... 326
Apparatus for Effecting Exchange of — between Liquids or Fluids. (P) Ramstedt..... 458
From Furnaces, &c.; Utilisation of —. (P) Naef..... 1020

PAGE

Heat—*cont.*
-Insulating Slabs, &c. (P) Kelly ... 347
Insulators; Machine for Moulding —. (P) Borrowe and Lumley ... 348
Non-conducting Compositions:
(P) Berry and Lawes ... 1064
(P) Herdman ... 1064
(P) McLay ... 118
(P) Struebing ... 1078
Of Metallurgical Operations; Utilising Waste —. (P) Imray. From La Société Electro-Metallurgique ... 1029
Of Waste Gases; Utilising the —. (P) Feery. From Abwarme-Kraftmaschinen Actienges ... 1127
Radiation in Optical Apparatus; Means for Stopping —. (P) Evans ... 907
Utilisation of Waste — from Furnaces, &c. (P) Naef ... 1066

Heating Apparatus:
(P) Boult. From Baumann ... 1139
(P) Fliegel ... 1149
(P) Heizmann ... 107
(P) Wright ... 596
Devices for Use with Liquid Fuel. (P) Scherding ... 830
Material; Method of —. (P) Campbell ... 599
Under Reflux Condenser and Introducing Material Simultaneously; Apparatus for —. (Guehm) ... 139
Using Hydrocarbon Oils. (P) White ... 906
See also under Drying, Condensing, *and* Cooling.

Hemicelluloses; Action of Enzymes upon —. (Gruss) ... 715
Hemp-bleaching Compound Duty-free in Canada. (T.R.) ... 509
Hemp Oil. *See under* Oils.
Heptacetylchlorlactose. (Bodart) ... 506
Heptacetylchlormaltose. (Foerg) ... 506
Heptacetyl-β-methylmaltoside; Research on —. (Koenigs and Knorr) ... 196
Heptacetylmaltose Nitrate; Research on —. (Koenigs and Knorr) ... 196
Heptine and its Derivatives; Acids obtained from —. (P) Mouren ... 1410
Manufacture of Useful Products from —. (P) Mouren. 188
Hexabromides of Glycerides and Fatty Acids. (Walker and Warburton) ... 1144
Hexemethylenetetramine Quinate. (P) Wichmann and Gabler ... 275
Hexoses; Magnetic Rotation of —. (Perkin, sen.) ... 144
Hides and Hide Powder; Action of Various Acids on —. (Paessler and Appelius) ... 1461
And Skins; Tanning of —. (P) Philippi ... 1286
And Skins; Treatment for Preservation of —. (P) Aitken 1465
Apparatus for Colouring —. (P) Rigaud ... 475
Depilation of —. (P) Burkhalter ... 265
Machine for Treating —. (P) Perkins ... 713
Preparing and Tanning —. (P) Fawley ... 555
Raw; Manufacture of Water-proof Objects from —. (P) Neuhuus ... 488
Tanning and Tawing of —. (P) Maertens ... 365
Tanning of —. (P) Amend ... 1544
See also under Skins *and* Leather.

Hoffmann Kiln; Improved Bottom for —. (P) Ingham and Langton ... 550
Holland; Copra Trade in —. (T.R.) ... 651
Ether exempt from Duty in —. (T.R.) ... 1355
Ether for the Manufacture of Cocaine exempt from Duty in —. (T.R.) ... 1479
Honey-Dextrin; Detection of —. (Beckmann) ... 180
Hops and Hop Seeds; Cattle-Food from —. (P) Makin ... 1344
Aroma and Bitter Principles of —. (Remy) ... 1341
Chemistry of —. (Bamberger and Landsiedl) ... 1190
Drying — a Pneumatic Apparatus therefor. (P) Beaven ... 182
Heating Tendency of —. (Delbruck) ... 1342
Pressing Apparatus for —. (P) Menzies ... 868
Horn; Manufacture of Imitation —. (P) Franquet ... 134
Hubl's Reaction; Origin and Nature of the Free Acid formed during —. (Ingle) ... 587
Hungary; Manufacture of Casein in —. (T.R.) ... 654
Subsidies to Native Industries in —. (T.R.) ... 79
Use of Manganese Bronze in —. (T.R.) ... 200
Hydrates; Electrolytic Production of Alkaline —. (P) Chaplin and Halleran ... 476
Hydration; Influence of Catalytic Agents on Velocity of —. (Rohland) ... 1233
Hydrazine Borates; Preparation of —. (Djavachoff) ... 646
Determination of —. (Stolle) ... 1351
Salts, Use of —, in Qualitative Analysis. (Knoevenagel and Elber) ... 1296
Sulphate for Standardising Iodine. (Stolle) ... 1351
Hydrazobenzene; Properties of —. (Freundler and Béranger) ... 429
Hydrides of the Alkaline Earth Metals; Formation of —. (Gautier) ... 796
Hydro-Aromatic Series; Synthesis in —. (Kondakow) ... 646
Hydrobromic Acid; Action of — on Monopersulphuric Acid. (Wedekind) ... 1074
Hydrocarbons; Aromatic —. (Lippmann and Pollak) ... 1271
Action of Nitro-sulphuric Acid on Saturated —. (Markownikoff) ... 853

PAGE

Hydrocarbons—*cont.*
Aromatic; Oxidation of —. (P) Willcox. From the Badische Anilin und Soda Fabrik ... 35
Aromatic — from Petroleum. (Zelinsky) ... 166
Composition. (P) Clawson ... 615
Liquid; Treatment of —. (P) The Equitable Auto-Truck Power Burner Co. ... 1446
Mixtures; Distillation or Utilisation of —. (P) Gaster. 699
Oils. *See under* Oils.
Utilising Liquid — for Heating Purposes. (P) Tapp and Akester ... 1127
Vaporising Liquid —. (P) Schunemann ... 1127
Vapour; Apparatus for Impregnating Air, &c. with —. (P) Boult. From Comstock ... 1066
Liquid; Burning of —. (P) Miller and Klahn ... 961
Hydrocellulose; Acetylated —. (P) Fab. Chem. von R. Sthamer ... 64, 65
Hydrochloric Acid; Action of — on Chromic Sulphate. (Recoura) ... 1076
Action of — on Monopersulphuric Acid. (Wedekind) .. 1074
And Nitric Acid; Relative Strengths of —. (Bodlander) ... 251
And Oxygen; Chlorinating Properties of a Mixture of —. (Matignon) ... 970
Gasometric Method for Determining —. (Riegler) ... 73
Manufacture of —. (P) Clark. From The General Chemical Co. ... 1138
Manufacture of —. (P) Hart ... 772
Production of Concentrated —. (P) Société K. Oehler. 1454
Purification of — from Arsenic. (Thorne and Jeffers) .. 792
Quantitative Separation of —. (Richards and Singer) .. 490
Hydrocyanic Acid; Detection of —. (Preiss) ... 1297
Preparation of —. (Hoyermann) ... 166
Production of —. (P) Feld ... 1553
Quantitative Separation of —. (Richards and Singer) .. 490
Hydro-Extractor; Continuous —. (Atwood) ... 761
Hydrofluoric Acid; Action of — on Monopersulphuric Acid. (Wedekind) ... 1074
Action of — upon Lead. (Prost) ... 250
Determination of the Strength of Aqueous —. (Winteler) ... 277
Hydrogen and Oxygen; Union of —. (Baker) ... 428
Electrode; Depolarisation of — by Aromatic Bodies. (Panchaud de Bottens) ... 877
Ions of Dilute Acids; Antiseptic Functions of —. (Bial) 1034
Hydrogen Chloride; Manufacture of —. (P) Meyer ... 971
Dioxide (Peroxide); Preparation of —. (P) Hulin ... 364
Peroxide; Action of — on Carbonates. (Kazanezky) ... 645
Peroxide; Action of — on Carbohydrates. (Morrell and Crofts) ... 506
Peroxide; Action of — on Phosphates. (Petrenko) ... 645
Peroxide; Action of — on Zinc Oxide. (De Forcrand) . 505
Peroxide and Uranium Salts; Colour Reaction of —. (Aloy) ... 1098
Peroxide as a Food Preservative. (Jablin-Gonnet) ... 420
Peroxide; Behaviour of Chromic Acid towards —. (Bach) ... 502
Peroxide; Behaviour of — with certain Salts. (Melikoff) 645
Peroxide; Crystallised —. (Staedel) ... 986
Peroxide; Freezing Point of Aqueous Solution of —. (Jones and Carroll) ... 1352
Peroxide; Manufacture, Properties and Uses of —. (Fawsitt) ... 229
Peroxide; Molecular Compounds of — with Salts. (Fanatar) ... 65
Peroxide; Oxalic Acid in —. (Roche) ... 190
Peroxide Solutions; Action of Metals on —. (Luttringhaus) ... 46
Peroxide; Titration of —. (Tarbouriech) ... 725
Selenide and Hydrogen Sulphide; Comparison of —. (De Forcrand and Fonzes-Diacon) ... 368
Sulphide; Manufacture of —. (P) Wing ... 254
Sulphuretted, in Coal-Gas, Determination of —. (Dibdin and Grimwood) ... 1040
Sulphuretted, in Mineral Waters; Determination of —. (Winkler) ... 190
Sulphuretted; New Reaction for —. (Ganassini) ... 1246
Sulphuretted; Removal of — from Gases ... 1277
Sulphuretted; Separation and Desulphurisation of —. (P) Hemingway ... 906
Hydroperoxides; Existence of Higher —. (Bach) ... 285
Hydrosulphites; Manufacture of —. (P) Bazlen ... 346
Manufacture of a —. (P) Imray. From the Farb. Meister, Lucius, and Bruning ... 704
Production of —. (P) Knecht ... 771
Solid Alkali; Manufacture of —. (P) Bazlen. From The Badische Anilin und Soda Fabrik ... 1393
See also under Hyposulphites.
Hydrosulphurous Acid; Powder capable of Giving — on Treatment with Water. (P) Société Lumiere et ses Fils ... 1395
Hydrotetroxide and Ozonic Acid. (Bach) ... 1417
Hydrous Compounds; Dehydration of —. (P) Cummer ... 52
Hydroxides, Metallic; Modifications of —. (Hantzsch) ... 877
Of the Heavy Metals; Solubility of — in Caustic Soda. (Rubenbauer) ... 876
Hydroxy Acids; New Class of Aldehyde Derivatives of the —. (Lobry de Bruyn and van Ekenstein) ... 286
Hydroxyanthraquinones; Mordant-Dyeing Properties of —. (von Georgievics) ... 1539

PAGE

8-Hydroxy-β-benzylchromone. *See under* Dyestuffs.
Hydroxy-Carboxylic Acids, Ortho-: Manufacture of ——. (P) Chem. Fabrik vorm. E. Schering 68
Hydroxycinchotine; Preparation of ——. (Widmar) 135
Hydroxyisopropylhypophosphorous Acid; Examination of ——. (Marie) 369
Hydroxyl Derivatives, Amino ——. *See under* Dyestuffs.
Hydroxyl Group; Organo-Magnesium Compounds as Reagents for the ——. (Tschugaeff) 1559
Hydroxylamine; Electrolytic Preparation of ——. (P) Boehringer und Soehne 1458
New Colour Reaction of ——. (Ball) 190
Use of ——, in Qualitative Analysis. (Knoevenagel and Elber) 1296
Hyoseine; Identification of ——. (Gadamer) 186
Hypnone. *See* Acetophenone.
Hypobromites; Stability of ——. (Graebe) 1076
Hypochlorites; Stability of ——. (Graebe) 1076
Hypochlorous Acid; Behaviour of —— during Electrolysis. (Foerster and Müller) 1235
Hypoiodous Acid; Examination of ——. (Taylor) 503
Hypophosphorous Acid; Action of —— on Diazo Compounds. (Mai) 247
Hyposulphites of the Alkaline Earths and of Magnesium; Electrolytic Preparation of ——. (P) Frank 51
Of the Metals of the Alkalis and Alkaline Earths; Synthesis of the Anhydrous ——. (Moissan) 1394
See also under Hydrosulphites.
Hystazarine. *See under* Dyestuffs.

I

Ice; Troublesome Formation of —— in Sulphite-Pulp Factories 635
Ice-Mill. (Schwalbe) 498
Ichthyol; Preparation of ——. (P) Helmers 364
Sulphonate, Ammonium ——. (P) McLaughlin 1553
Ignition Strips for Use with Miners' Safety Lamps. (P) Hübner 1246
Illuminant; Compound for Use as an ——. (P) Boult. From Massie 1524
Incandescence Bodies for Electric Glow Lamps. (P) Just ... 333
Bodies for Electric Lighting. (P) Abel. From Siemens and Halske Actienges 851
Mantles in Relation to Heating and Lighting Power of Gas. (Russell and White) 1020
Gas-Burners. *See under* Burners.
Incrustation; Material for Preventing or Removing ——. (P) Lowther 32
See also under Boilers.
Imports from Foreign Countries and British Possessions. (T.R.) 289
General; of the United Kingdom for 1900-1. (T.R.) 1252
Of Switzerland for 1900. (T.R.) 436
Indanone; Monohydroxybenzalbrom ——. *See under* Dyestuffs.
Indanthrene Blue: Printing with ——. (Jeanmaire) 545
India; Afridi Wax-Cloth in ——. (T.R.) 201
Brewing Industry of ——. (T.R.) 1004
British; Countervailing Duty on Dutch Sugar. (T.R.) ... 438
British; Sugar Duties in ——. (T.R.) 1059
British; Tariff Valuation of Sugar in ——. (T.R.) 513
Coal Resources of ——. (T.R.) 568
Copper and Sulphuric Acid in ——. (T.R.) 1421
Countervailing Duties on Italian Sugar in —— (T.R.) ... 372
Decreased Production of Indigo in the Punjab. (T.R.) ... 199
Discovery of Mercury in ——. (T.R.) 1421
Duties on Sugar from France in ——. (T.R.) 1479
Earth-Nut Crop of Madras. (T.R.) 371
India-rubber Production of Assam. (T.R.) 881
Indigo Crop in ——. (T.R.) 1204
Indigo Crop in Bengal. (T.R.) 731
Indigo Industry of ——. (T.R.) 1420
Manganese Ore Production of ——. (T.R.) 800
Mica Lining in ——. (T.R.) 799
Mineral Production of ——. (T.R.) 1355
Natural Indigo in ——. (T.R.) 290
New Intoxicating Drug in ——. (T.R.) 514
Paper Mills in ——. (T.R.) 734
Petroleum Output in Burma ——. (T.R.) 437
Plumbago Mining in Travancore ——. (T.R.) 80
Shellac Trade of ——. (T.R.) 82
Sugar Industry in ——. (T.R.) 882
Tanning Materials in ——. (T.R.) 1355
Tariff Valuations in ——. (T.R.) 436
Tin in Johore ——. (T.R.) 510
India-rubber. (Class XIII.) 56, 127, 178, 263, 355, 414, 487, 555 625, 712, 782, 865, 918, 981, 1032, 1084, 1145, 1188, 1238, 1285, 1337, 1403, 1460, 1543
Apparatus far Devulcanising ——. (P) Stelzer 626
Apparatus for Vulcanising ——. (P) Fritz 626
Artificial ——, from Isoprene. (Bouchardt) 56
Behaviour of —— with Concentrated Nitric Acid. (Dittmar) 626
Crop of Brazil. (T.R.) 988
Devulcanisation of ——. (P) Dawez 488

PAGE

India-rubber—*cont.*
Exports of the Gold Coast. (T.R) 652
Extraction of ——. (Gerber) 414
Goods; Analysis of ——:
(Frank and Marckwald) 726
(Heintz) 503
Goods in Asiatic Turkey. (T.R.) 800
In Ceylon. (T.R.) 511
In German New Guinea. (T.R.) 733, 881
In the Congo Free State. (T.R.) 937
In Trinidad and Tobago. (T.R.) 147
Industry; Importance of Ramie Fibre to —— 249
Landolphia Yielding —— in the French Congo. (Chevalier) 1286
Machine for Working ——. (P) Pearce 626
Manufacture; Employment of Asphaltum in ——. 919
Manufacture of Compounded ——. (P) Weber and Cairns 264
Production of —— in Assam. (T.R.) 881
Recovery of —— from Vulcanised Rubber Waste. (P) (Price) 357
Recovery of —— from Waste. (P) (Price) 865
Regenerated ——. (Frank and Marckwald) 1085
Residues; Regeneration of ——. (P) Haltenhoff 1404
Scrap; Utilising ——. (P) Harmer 626
Sheet; Manufacture of ——. (P) Blossier 1188
Solution; Storing and Discharge of ——. (P) Strachan and Robertson 904
Sponge; Manufacture of ——. (P) Lake. From Vereinigte Gummiwaaren-Fabrike Reithoffer 127
Statistics of ——, in New Guinea. (Schlechter) 1338
Substitute for ——:
(P) Bailer 1239
(P) Prampolini 981
Sulphur in ——; Determination of. (Weber) 1560
Theory of Vulcanisation of ——. (Weber) 712
Trade in —— by Brazil. (T.R.) 371
Treatment of Crude ——. (P) Thame and others 488
Tubes; Manufacture of Long ——. (P) Thompson. From the Kolner Akkumulatoren-Werks 357
Vulcanising ——. (P) Bonrn 626
See also under Caoutchouc *and* Rubber.
Indigo; Artificial *versus* Natural ——in Germany. (T.R.) .. 80, 509
At Damascus. (T.R.) 1001
Crop —— in Bengal. (T.R.) 731
Crop —— in India. (T.R.) 1204
Decreased Production of —— in the Punjab. (T.R.) 199
Discharge Process; Function of Oxalic Acid in the ——. (Schaposchnikoff and Michireff) 1276
Duty Free in the Dutch East Indies. (T.R.) 199
Dyeing; Theory of ——. (Bing and Rung) 1229
Dyeing with ——. (P) Peterhauser 1393
Exports of —— by Java. (T.R.) 1111
Extraction of —— from *Lonchocarpus Cyanescens*. (P) Comp. de Chemins de Fer au Dahomey 38
Extraction of —— from the Plant. (P) Calmette 38
Fixation of ——by Steaming. (Elbers) 1024
Fixing Dyes on ——. (P) Lurati 858
Importation of —— by the Netherlands. (T.R.) 648
Imports of Havre, France (T.R.) 569
In China. (T.R.) 1420
In Germany: Manufacture of ——. (T.R.) 1045
In Hamburg. (T.R.) 1045
In Marseilles. (T.R.) 1111
Industry of India. (T.R.) 1420
Manufacture of ——. (P) Badische Anilin und Soda Fabrik 38
Methyl Derivatives of ——. (Kuhara and Chikashigé) ... 247
Natural —— in India. T.R. 290
On Vat-Dyed Fibres: Determination of ——. (Bing and Rung) 930
Printing —— by Kalle and Co.'s Process. (Fischer and Alt) 1132
Printing —— on Wool, Silk, and Cotton. (P) Badische Anilin und Soda Fabrik 50
Printing with ——. (P) Soc. Chim. des Usines du Rhône 704
Producing Discharge and Resist Effects on and under. (White) 702
Production of ——. (P) Erdmann 38
Purification of Crude ——. (P) Comp. Parisienne de Couleurs d'Aniline 401
Recovery of —— from Waste Textiles 1073
Reduction of —— with Dextrin and Caustic Soda:
(Grosheintz) 545
(Wilhelm) 545
Reduction Product of ——. (P) Comp. Parisienne de Couleurs d'Aniline 38
Salt T: Application of —— in Calico Printing. (Kayser) 170
Synthetic; Revocation of Patents for Production of ——. (T.R.) 507
Trade in —— in Germany, 1901. (T.R.) 508
Valuation Tariff of Egypt. (T.R.) 1001
See also under Dyestuffs.
-Vat, and the Application of Artificial Indigo 404
-Vat Dyeing; Improvement in ——. (P) Playne and Macdonald 1132
-Vats, Preparing —— for Wool. (P) Playne and Macdonald 1532
Volumetric Determination of ——. (Wangerin and Vorlander) 991
Waste Waters. (Wilson and Halliwell) 702
-Red; Influence of —— in Indigo Dyeing. (Matthews) .. 222
-Seed Industry of Natal ——. (T.R.) 1111
Indigotin. *See under* Dyestuffs.
Di- ——. *See under* Dyestuffs.
Indo-China; Mineral Wealth of ——. (T.R.) 510

PAGE

Indogenides. *See under* Dyestuffs.
Indole in Molasses Tar. (Boes) 429
Compounds. *See under* Dyestuffs.
Indoxyl and its Derivatives. *See under* Dyestuffs.
Indoxylic Acid. *See under* Dyestuffs.
Indulines. *See under* Dyestuffs.
Industry, Application of Science to; L.C.C. Report on ——. (T.R.) 1105
Inflammable Liquids. *See under* Liquids.
Ingot: Compound ——. (P) Cosgrave 618
Compound ——, and Mould therefor. (P) Cosgrave 618
Ink, Copying ——. (P) Lawton 250
Manufacture of Printers' ——. (P) Wass 1032
Material for Use in Manufacture of ——. (P) De Brandel and de Baudry D'Asson 782
Of the Ancients; Composition of ——. (Leidié) 196
Inorganic Chemistry, Qualitative. (Class XXIII.) 189, 366, 426, 499, 640, 792, 873, 928, 1039, 1098, 1246, 1296, 1349, 1472, 1557
Chemistry, Quantitative. (Class XXIII.) 70, 140, 190, 277, 426 499, 562, 641, 724, 793, 873, 928, 990, 1046, 1098, 1155, 1195, 1246, 1298, 1349, 1412, 1473, 1557
Insecticides; Experiments with ——. (Lowe and Parrott) .. 559
Insect Repellent; Composition of ——. (P) Kessler 1243
Institute; German Colonial Economic ——. (T.R.) 568
Opening of the Sir John Cass ——..... 287
Instruction in Technical Chemistry; The Improvement of ——. (Lachman) 31
Insulating and Packing Material. (P) Raphael and Elias.... 353
Material:—
(P) Gentzsch 783
(P) Greening 919
(P) Haddon. From the "Pyrisolith" Co. 1282
(P) Heaney 979, 1282
(P) Heyl-Dia 357
(P) Potter 535
(P) Randolph 916
(P) Zimmer 1540
Material, and Application of same. (P) Sankey 1282
Material; Ebonitine, a New ——. (P) De Karavodine... 1539
Material; Electric ——. (P) Abrey 1282
Material; Electric ——, and Application thereof. (P) British Thomson-Houston Co. From Emmet..... 259
Material; Paper applicable as ——. (P) Taylor 1193
Insulators; Substance suitable for Ornamental ——. (P) Weaver 64
Intensification. *See under* Photographic.
Invertase; Action of ——. (Henri) 268
Free from Yeast Gum. (Oshima) 1340
In Industrial Fermentations. (Verbiese) 180
Of Yeast; Experiments on ——. (Holzmann) 1340
Iodates; Electrolytic Production of ——. (P) Corbin..... 970
Iodides; Simple Qualitative Test for ——. (Perkin) 1375
Volumetric Determination of ——. (Thomas) 873
Iodine; Action of ——, in Hydrolysis of Starch and Sugar ——. (Hale) 1040
Action of —— on Amylodextrin. (Syniewski)..... 1341
Fatty Compound of —— with Sulphur. (P) Degner..... 637
In Chile. (T.R.) 1046
In presence of Thiosulphates, Detection of ——. (Lenba) 1349
Monochloride; Use of —— in Iodine Absorptions. (Wijs) 930
Pentafluoride ——. (Moissan) 1353
Quant. Estimation of —— by Electrolysis. (Muller) 499
Preparations; Manufacture of ——. (P) Cohn..... 497
Production of Chile. (T.R.) 880
Spectroscopic Detection of ——. (Panaotovic) 1557
Values of Oils; Comparison of Methods for Determining ——. (Hunt)..... 454
Iodo-eosin as Indicator in Volumetric Analysis. (Glucksmann) 793, 1246
Iodoform; Detection of small quantities of ——. 642
Determination of ——. (Meillere)..... 1196
Examination of the Mother-Liquors from Making ——. (Roques and Gerngross) 1193
Preparation of ——, by means of Acetylene. (Le Comte). 1293
Iodophenol: A New Di-. (Brenans)..... 1094
Ionone, α- and β-; Manufacture of Homologues of ——. (P) Bloxam. From Société de Laire et Cie 791
α-; Obtainment of ——. (P) Chuit, Naef, and Co..... 137
Preparation of ——. (P) Haarmann and Reimer 1348
Pseudo ——. (P) De Laire and Co..... 68
Ipecacuanha Alkaloids; Valuation and Determination of ——. (Paul and Cownley) 1299
Indian ——. (Paul and Cownley) 1294
Reactions of the Alkaloids of ——. (Allen and Scott-Smith)..... 1475
Root; Alkaloidal Constituents of ——. (Frerichs and de Fuentes Tapis)..... 1299
Ireland; Kelp Industry of ——. (T.R.) 199
Iridium; Detection of ——. (Leidié and Quinnessen) 499
Separation of —— from Gold. (Mietzschke) 279
Iron, Analysis of ——. (Bischoff)..... 1299
And its Compounds; Electric Furnace for ——. (P) Harmet 1459
And Silicon; Compounds of ——. (Lebeau) 861
And Wrought Iron; Manufacture of ——. (P) Davies ... 349

PAGE

Iron—*cont.*
Arsenic in; Determination of ——. (Norris)..... 393
Calcium and Magnesium in ——. (Ledebur) 1140
Cast- and Wrought-; Electric Manufacture of ——. (P) Imray. From La Société Electro-Metallurgique..... 917
Cast-; Condition of Silicon in ——. (Lebeau)..... 119
Cast-; Eliminating Impurities from Crude ——. (P) Thiel 1457
Cast-; Influence of Aluminium on the Carbon in ——. (Meiland and Waldron) 861
Cast-, resembling Steel; Production of ——. (P) Soc. Bayerische Eggenfabrik..... 1537
Cast-; Testing, Examination, and Classification of ——. (Osann) 551
Cementation of —— by Silicon. (Lebeau)..... 348
Cementation or Hardening of —— by Electricity. (P) Justice. From Davis 354
Chrome-; Manufacture of ——. (P) Eckert, jun. 1080
Coating of —— with other Metals. (P) Bertrand..... 354
Combination of —— with Titanium. (P) Rossi..... 1537
Copper in; Electrolytic Determination of ——. (Koch).. 563
Electrical Resistance of ——. Benedicks)..... 1031
Electrical Resistivity increased by Alloying ——. (Barrett) 621
Electrolytic Preparation of Pure ——. (Skrabal)..... 1402
Furnace for Heating and Melting ——. (P) Gantt..... 1400
Imports of Japan in 1901. (T.R.) 1309
Influence of Heating and Quenching on Tensile Strength of ——. (Brinell)..... 1331
Ingot; Manufacture of ——. (P) Hickmann and Hutchinson 409
Malleable: Production of ——, and Apparatus therefor. (P) Eyermann..... 709
Manufacture of ——:
(P) Crean 619
(P) Hatton 552
(P) Snelus..... 1333
(P) Thiel 1281
(P) Tone 1234
(P) Witmotte and Goddyn..... 576
Manufacture of ——, and Apparatus therefor. (P) Meininghaus 617
Manufacture of —— by Electricity. (P) Simon..... 1031
Ore Deposits of Brazil. (T.R.) 800
Passive ——. (Finkelstein)..... 175
Phosphorus in: Rapid Determination of ——. (Ramorino) 611
Pig-; Colorimetric Determination of Sulphur in ——. (Naske)..... 562
Pig-; Manufacture of ——. (P) Potter 351
Pig-; Removal of Sulphur from —— in the Furnace. (Reusch) 861
Precipitation of —— by Bacterial Action. (Jackson)..... 681
Puddling of ——. (P) Carter..... 916
Remarkable (Carbamine) Reaction of ——. (von Cordier) 792
Removal of —— from Zinc Blende. (Phillips) 120
Removing Scale Oxide from ——. (P) Eaton..... 977
Retention of Arsenic by ——, in Marsh-Berzelius Method. (Parsons and Stewart) 1414
Scrap; Treatment of ——. (P) Sly 483
Separation of Zirconium from ——. (Guthier and Muller) 1350
Temperature Limits for Separation of Graphite from Pure Cast ——. (Tiemann) 858
Thermo-electricity of ——. (Belloc) 177
Treatment of Substances containing —— for Analysis. (Nissenson and Crotogino)..... 1248
Use of Carbon and Fluxes in the Blast-Furnace in Manufacture of ——. (P) Foster 349
Wrought-; Cementation of ——. (Bildt) 708
Wrought-; Direct Production of ——. (P) Reynolds..... 976
-Carbon Systems; Equilibrium of ——. (Charpy and Grenet) 616
-Plates: Electrolytic Plating of ——. (P) Popp 485
Iron Carbide, Fe_3C: Existence of a New ——. (Campbell and Kennedy) 1399
Chloride: Treatment of —— to Obtain Iron Oxide, &c. (P) Hargreaves 548
Oxide Pigment: Production of ——. (P) Rock..... 178
Salts; Influence of Sulphur Separation on Precipitation of ——. (Coppadoro) 77
Isatin; α-Thio-. *See under* Dyestuffs.
Iso-Corycavamine; Preparation of ——. (Gadamer)..... 496
Isoprene; Artificial India-rubber from ——. (Bouchardt) ... 56
Isovaleramide Derivative, and Making of same. (P) Liebrecht 638
Italy; Customs Decisions in ——. (T.R.) 799
Customs Decision on Ethyl Chloride. (T.R.) 148
Customs Decisions on Incandescence Mantles in ——. (T.R.)..... 1045
Customs Decisions on Terebene and Varnish. (T.R.)..... 147
Electrolytic Production of Caustic Soda and Calcium Chloride in ——. (T.R.) 509
Exports of Elba ——. (T.R.) 879
Juniper Berries at Leghorn. (T.R.) 941
Leather Industry in ——. (T.R.)..... 511
Mercury Production of ——. (T.R.)..... 199
New Sugar Law in ——. (T.R.)..... 1164
Olive Oil in Tuscany. (T.R.) 937
Olive Oil, Production of ——. (T.R.)..... 1048
Production of Beet-Sugar in ——. (T.R.) 734
Pumice Stone at Leghorn. (T.R.) 935
Saccharin Prohibition Law in ——. (T.R.)..... 1167
Sodium Carbonate and Copper Sulphate at Leghorn. (T.R.)..... 935

PAGE

Italy—*cont.*
Stearin Imports of Venice ——. (T.R.) 511
Sugar Imports of Leghorn. (T.R.) 940
Sugar Production of —— in 1901–2. (T.R.) 438
Surtax on Explosives in ——. (T.R.) 573
Tartaric Material Exported from ——, 1900–1901. (T.R.) 442
Trade of Naples for 1901. (T.R.) 456
Use of Fertilisers in Lombardy ——. (T.R. 734
Ivory and Bone: Substitute for ——. (P) Ensminger 1462
Ivory; Manufacture of Imitation ——. (P) Franquet 134

J

Japan; Alcoholic Liquor, Manufacture in ——. (T.R.) 148
Camphor Supplies of Formosa ——. (T.R.) 801
Coals of ——. (Anderson and Henderson) 237
Import Duty on Sugar Refined in ——. (T.R.) 734
Imports of ——, in 1901. (T.R.) 1309
Kanten from ——, Uses of. (T.R.) 1564
Mineral Production of ——. (T.R.) 570
Oil Industry of Echigo ——. (T.R.) 1045
Peppermint Oil and Crystals in ——. (T.R.) 373
Petroleum Industry of —— during 1902. (Ragosine) 1228
Petroleum Production in ——. (T.R.) 569
Saké Industry of ——. (T.R.) 882
Sugar Duty in ——. (T.R.) 572
Sugar Imports of Kobé and Osaka ——. (T.R.) 1564
Sugar in ——. (T.R.) 1051
Sulphur Production in ——. (T.R.) 509
Window-Glass Manufacture in ——. (T.R.) 509
Japan-Wax; Abnormal Constants of ——. (Bernheimer and Schiff) 55
Jasmine Flower Oil. *See under* Oils.
Perfume; Formation of ——. (Hesse) 187
Java; Cinchona Bark and Quinine in ——. (T.R.) 1118
Indigo; Exports of ——. (T.R.) 1111
Kapok in ——. (T.R.) 1111
Petroleum Production and Imports of ——. (T.R.) 1110
Jewels. *See under* Stones, Precious.
Joint: Metallic Hermetic —— obtained by Electric Fusion. (P) Roux 1458
Juar Root; Use of —— in India. (T.B.) 514
Juices, Saccharine: Obtainment of ——, and Products therefrom. (P) Steffen 266
Saccharine; Treatment of —— with Sulphurous Acid. (P) Lehmkuhl 921
See also under Sugar-Juices.
Juniper Berries at Leghorn. (T.R.) 941
Jute; Differentiation of —— from Manila, &c. (Dalén and Wisbar) 1466

K

"Kanten" from Japan: Uses of——. (T.R.) 1564
Kaolin at La Rochelle. (T.R.) 935
Kapok in Java. (T.R.) 1111
Oil. *See under* Oils.
Kelp Industry of Ireland. (T.R.) 199
Kerosenes from Kieff; Commercial ——. (Kudisch) 607
Ketocumarane. *See under* Cumaronone.
Ketones; Electro-chemical Reduction of ——. (Elbs and Brand) 1334
Separation of New —— from Marjoram Oil. (Genvresse and Chablay) 1347
See also under Dyestuffs.
Ketoses; Isolation of ——. (Neuberg) 506, 1103
Kilns and Drying Chambers for Cement. (P) Hewitt 118
Bottom for Hoffmann ——. (P) Ingham and Langton 550
Coke ——. (P) Gobiet 329
Construction of Lime ——. (P) Gleason 615
Continuous ——for Bricks:
(P) Butler and Kunze 1140
(P) Swift 1140
Continuous —— for Cement and Lime. (P) Roberts 973
Dry ——. (P) Curran 459
Fireproof Lining for ——. (P) Lake. From Portland Cement Fabrik Hemmoor, &c. 1279
For Bricks, &c.:
(P) Brice 860
(P) Brooks. From Fiske 708
(P) Hughes 708
(P) Clifford 1396
(P) Kilby 973
(P) Wilson 1397
For Calcining Lime, Cements, &c.; Application of Gaseous Fuel in ——. (P) Crosland 707
For Ceramic Wares. (P) Rivers 615
For Drying Earthenware. (P) Brookes and Barnes 549
For Fireclay and other Goods. (P) Adams 1233

PAGE

Kiln—*cont.*
For Malt:
(P) Ackroyd and Bulkley 1547
(P) Dornfeld 360
(P) Earp 1191
(P) Haynes, jun. 1148
(P) Larkin 923
For Manufacture of Lime, Cement, &c. (P) Isserlis 480
For Portland Cement or Lime. (P) Rigby 118
For Reducing Ores, &c. (P) Lake. From Schuppmann 1536
For Revivifying Spent Bone-Black. (P) Mohr 123
Improved. (P) Loeser 1524
Lime-; Improved ——. (P) Broomell 1523
Regenerative ——. (P) Drake 1388
Rotary Burning or Roasting ——. (P) Lake. From Fellner and Ziegler 479
Supply of Heat to ——. (P) Westinghouse. From Knox 1066
Tunnel —— for Burning Ceramic Articles. (P) Aufort 1139
See also under Ovens.
Kiln-Burning Apparatus. (P) Gray and South 1397
Kino, Eucalyptus: Properties of ——. (Maiuich) 1347
Kipp's Apparatus; Modification of ——. (Arnold) 408
Kjeldahl Distillations; Dephlegmator for ——. (Lovett) 849
Nitrogen Method; Experiments with ——. (Law) 847
Nitrogen Process; Modified Arsand Burner for First Part of ——. (Golding) 694
Nitrogen Test; Application of,—— in the Tanyard. (Gordon Parker) 838
Kola Compounds: Alkaloids in ——. (Warin) 1352
Nut and Extract; Determination of Alkaloids of ——. (Warin) 645
Kornfeld's Alcohol Lamp 1086
Kosin. *See under* Kousso Flowers.
Kosodin. *See under* Kousso Flowers.
Kousso Flowers (*Brayera anthelmintica*), Constituents of ——. (Lebeck) 187
Kremel's Test for Cod-Liver Oil. (Bedall) 1099
Kumaon; Mineral Deposits of ——. (T.R.) 146

L

Laboratory; The National Physical —— 197
Lace; Depositing Metals on ——. (P) Daly 912, 1187
Lacquers; Manufacture of ——. (P) Hecht and Poulenc 487
Lactates of Certain Alkaloids. (Sergejew) 496
Lactic Acid: Assimilation of —— by *Eurotyopsis Gayoni*. (Mazé) 287
Effect of —— in the Manufacture of Leather. (Eitner) 627
Formation of ——. (Katsuyama) 423
In the Tannery 57
Indirect Determination of ——. (Weigmann) 428
Two New Micrococci capable of Forming ——. (Hashimoto) 506
Use of —— in Mordanting Wool with Alumina. (Düring) 911
Use of —— for Plumping Sole Leather. (Paessler and Appelius) 1461
Lactic Fermentation; Study of——. (Lesage and Bongier) 496
Lactose and Maltose; Separation of ——. (Boyden) 1416
Heptacetylchlor ——. (Bodart) 506
Lævo-pinene. (Balbiano and Paolini) 1293
Lager Beer; Cellarage of ——. (Windisch) 1463
Lakes; Cellulose ——, and Manufacture of same. (P) Althausse 356
See also under Dyestuffs.
Lamps; Acetylene ——:
(P) Ducellier 698
(P) Miller 1325, 1325
(P) Rosenbluth 606
(P) Wise. From von Szalay 961
Acetylene; Portable ——. (P) Tejada 907
Alcohol ——. (P) Sternau and Strassburger 852
Apparatus for Distributing Hydrocarbons to ——. (P) Branch 698
Arc ——, and Electrodes therefor:
(P) British Thomson-Houston Co. From Dean 462
(P) Lee 763
(P) Société de Mestral 962
Arc; Encased Carbon for ——. (P) Siemens Bros. and Co. 1525
Auer von Welsbach's Osmium ——. (Gabriel) 396
Electric Arc:
(P) Auerbach and Gubing 964
(P) Bremer 964
(P) Evans 907
(P) Hallberg 334
(P) Jandus Arc Lamp Co. and Jones 1226
(P) Johnson 540
(P) Meyer 606
(P) Okun 606
Electric Arc; Carbon for ——. (P) Siemens Halske Aktien-Ges. 1148
Electric Arc Continuous-burning ——. (P) Rignon and Eisenmann 908

PAGE

mps—*cont.*
Electrical Glow; Manufacture and Repair of —. (P) Bran and others 34
Electric Incandescence; with Rare Earth Filaments. (P) Crook and Mines 1525
Electric-Tube —. (P) McF. Moore 964
Electrodes for Arc:
(P) Bremer 245
(P) Conradty 1447
(P) Hopfelt 1179, 1525
(P) Siemens and Co. and Viertel 962
Electrolytic Incandescence —. (P) Quain and Turnbull 907
Filaments for Electric —. (P) Voelker 333
For Burning Paraffin Wax, &c. (P) Ballardie 334
For Disinfecting, &c. (P) Roubleff 788
Formaldehyde —. (P) Kuhn 870
Gas-detecting Attachment for Miners' Safety —. (P) Mackie 603
Gasoline —. (P) Shortt 464
Glow; Apparatus for the Reinforcing and Standardising Filaments of —. (P) Fanta 1524
Glow Bodies for Nernst Electric —. (P) Drake and others 245
Glowers for Pyro-Electric —. (P) British Thomson-Houston Co. and Steinmetz 462
Hydrocarbon:
(P) Curran 1069
(P) de Voll 764
(P) Morss 464
Ignition Strips for Use with Miners' Safety. (P) Hubner 1246
Incandescence Carburetting —. (P) Wedderburn 1325
Incandescence Electric —:
(P) Doane 1325, 1325
(P) Drake and others 1226
(P) Gardner 1180
(P) Garwood 606
(P) Manee and the Nernst Co. 461
(P) Phelps 1179
(P) Potter 607
(P) Ram and the Nernst Electric Light Co. 541
(P) Reinman 540
(P) Rooney 1527
Incandescence Electrode Vapour —. (P) Hewitt 465
Incandescence —, for Use with Spirit. (P) Meenen 1323
Incandescence Gas —:
(P) Brett and Heimeberger 164, 697
(P) Duflek, Wein, and Beschorner 697
(P) Koch and Rothenberg 1269
(P) Lowy 1129
(P) Schaefer 962
(P) Thomas and Podmore 962
(P) Tice 464
Incandescence Gas Arc —. (P) Russell and Clausen 466
Incandescence; High-pressure Burners for —. (P) Keith 1146
Incandescence Hydrocarbon —:
(P) Blair 852
(P) Branch 964
(P) Washington 1129
Incandescence Oil —:
(P) Cranston 539
(P) Flora 1325
(P) Gibbes 34
Incandescence Spirit —:
(P) Boivin 1390
(P) Farkas 1390
(P) Wollheim and Baumert 1390
Incandescence Vapour —:
(P) Demayrouze 908
(P) Fee 853
(P) Galvin 34
(P) Kitson 1179
(P) Landi 333
(P) Lians 908
(P) Lux 1179
(P) Smith 1021
(P) Walther 333, 539
(P) Worms 1269
Incandescent Vapour; Means for Extinguishing —. (P) Lux 1179
Kornfeld Alcohol — 1066
Luminous Gas Electric —. (P) Fairburn-Hart. From the General Electric Co. 908
Mercury Vapour —. (P) Potter 1325, 1325
Nernst Incandescence Electric —. (P) Garrard and the Nernst Co. 462
Nernst Conductors for Electric —. (P) Garrard and Nernst Electric Light Co. 398
Osmium; Properties of Auer's —. (Remané) 1445
Petroleum —. (P) Carlson 697
Photographic Flash-Light —. (P) Zweck 497
Removable Heater for Nernst Electric —. (P) Hanks 606
Sealing Wires into Electric —. (P) Edison and Clerici 333
System of Distribution for Nernst Electric —. (P) Beebe 606
Treating Ballast Wires for Electric —. (P) Potter 852
Vapour-burning Street —. (P) Cramiger 464
Wax-burning —. (P) Pursall and Jackson 463
Lampblack; Apparatus for Collecting and Discharging —. (P) Manu 1337
Production of —. (P) Ogilvy 1084
See also under Carbon Black and Soot.
Lamy (Pendalesma Butyracea) in French Guinea. (T.R.) 1164

PAGE

Lancashire; Technical Teaching in —. (Tate) 1365
Watch Co., Prescot; Visit to — 952
Landolphia Pierrei: A Rubber Plant from Gabon. (Hua) ... 1544
Lanthanum containing Didymium; Influence of Cerium on —. (Marc) 1093
Separation of —. (Bohm) 719
Separation of Thorium from —. (Metzger) 1415
Lard Rendering Tank. (P) Marshall 263
Substitute for —. (P) Adams 1299
Latex and Rubber from Castilloa Elastica; Experiments on —. (Weber) 1461
Laudanine; Characteristics of —. (Hesse) 272
Lauric Acid and its Derivatives. (Caspari) 714
Lavender Oil. *See under* Oils.
Leaching; Apparatus for —. (P) Walter 1544
Lead; Action of Water on —. (Ruzicka) 270
And Mercury Cathodes in Sulphuric Acid Solutions; Reducing Action of —. (Tafel and Schmitz) 790
And Zinc; Treatment of Mixed Minerals of —. (P) Havemann 1457
As Anode in Sodium Hydroxide Solutions. (Elbs and Forssell) 1281
Antimonial; Production of — in the United States. (T.R.) 1563
Bounties on — in British Columbia. (T.R.) 936
Bronze containing —; Structure, &c., of. (Bailey) 531
Chemical Change Produced by Immersion of — in Distilled Water. (Clowes) 421
Chemical Hard — in Missouri. (T.R.) 510
Diminishing Solubility of — in Acids, &c. (P) Leyendecker 124
Effects of Strain on Crystalline Structure of —. (Humfrey) 1234
Electrical Reduction of —. (Sálomi) 1187
Electrolytic Deposition of — from Phosphoric Acid Solution. (Linu) 793
Electrolytic Refining and Depositing of —. (P) Betts 980
Exports of Huelva, Spain. (T.R.) 732
Extraction of — from Ores and Compounds. (P) Havemann 862
In Foodstuffs; Traces of —. (Medicus and Mebold) ... 1248
In Ores; Determination of —. (Bull) 1350
In the United States; Production of —. (T.R.) 1478
Metallic —, in Crude Zinc Furnace Cinder. (Prost, Charon, and Marissal) 874
Obtaining Metallic — from Ores. (P) Germot 351
-Poisoning in Earthenware and China Works. (T.R.) 371
Production of the United States. (T.R.) 650
Radio-Active:
(Giesel) 284
(Hofmann and others) 726
(Hofmann and Wöltl) 429
Red —. *See under* Red Lead.
Smelting without Fuel 1535
Treatment of Substances containing — for Analysis. (Nissenson and Crotogino) 1248
Lead, Chloro-, Bromo-, and Iodo-Sulphobismuthites of —. (Ducatte) 796
Chromate Dyeing; Disadvantages of —. (Leclerc de Pulligny) 1452
Dioxide; Electrolytic Production of —. (P) Johnson. From The Chem. Fab. Griesheim-Elektron 620
Dioxide; New Reaction for —. (de Koninck) 873
Oxide; Manufacture of —. (P) Lomax 624
Salts; Volumetric Determination of —. (Cowley and Catford) 1156
White —. *See under* White Lead.
Leather. (Class XIV.) 56, 128, 179, 264, 357, 415, 488, 555, 627, 713, 783, 865, 919, 982, 1032, 1085, 1146, 1189, 1239, 1286, 1338, 1404, 1461, 1544
Apparatus for Colouring —. (P) Moore 614
Apparatus for Tanning and Tawing, &c. (P) Demantké and Salentey 919
Artificial — for Germany. (T.R.) 652
Artificial: Manufacture of —. (P) Gautier 1405
Bleaching and Dyeing —. (P) Brown 857
Chamois; Manufacture of — 56
Chrome; Production of —. (P) Koster 1189
Composition for Preserving —. (P) Bonlt. From Port. 1259
Demand for — in the United States in 1901. (T.R.) 652
Dyed with Coal-Tar Colours; Fastness to Light of —. (Lamb) 156
Dyeing; Application of Salts of Heavy Metals in —. (Stiasny) 1329
Dyeing of —:
(Kauschke) 705
(P) Riedler 1533
Examination of Chrome —. (Boulanger) 919
Exports of Tripoli —. (T.R.) 1049
Finishing the Surface of —. (P) Miller 982
For Belting; Preparation of —. (P) Caldwell 1189
For Bookbinding. (Gordon Parker) 128
For Industrial Purposes; Examination of —. (Boulanger) 783
Glossing of —. (P) Cohn 1189
Imitation —, and Production thereof. (P) Rosenberg .. 627
Imports of Japan in 1901. (T.R.) 1309
Imports of Switzerland. (T.R.) 82
In Eastern Roumelia. (T.R.) 1003
Industry; Bacteria in the —. (Turnbull) 179
Industry in Italy. (T.R.) 511

PAGE

Leather—*cont.*
Industry of Hamburg. (T.R.) ... 1049
Manufacture and Preservation of ——. (P) Lamb and others ... 1286
Manufacture of Buff and Buck —— ... 415
Manufacture of Grain and Pebbled ——. (P) Pianko ... 1085
Manufacture of Waterproof ——. (P) Boult. From Trenckmann and Co. ... 415
Preservation of ——. (P) Paas and Jacobsen ... 1405
Scrap; Beating Engines for ——. (P) Case ... 265
Substitute for ——. (P) Lottier ... 1338
Substitute for ——, and Manufacture of same. (P) Lippold ... 357
Trade in Germany. (T.R.) ... 1049
Trade in Russia. (T.R.) ... 1049
Use of Molybdenum Salts in Dyeing ——. (Pozzi-Escott) 1533
Varnish for Making Enamel and Patent Leathers. (P) McKay ... 1033
See also under Hides *and* Skins.

Lecithin in Milk; Determination of ——. (Bordas and de Raczkowski) ... 1041

Lemon Extract. (Winton and Ogden) ... 1295
Juice from Messina, Sicily. (T.R.) ... 1209
Oil. *See under* Oils.

Lenssen's Method for Determination of Tin. (Müller) ... 141

Leucauramines. *See under* Dyestuffs.

Leucite Group; Treatment of Minerals of the —— for Producing Water-Glass, &c. (P) Dementjeff and Ousihkoff . 173

Levan: A New Bacterial Gum from Sugar. (Greig-Smith and Steel) ... 1381

Level-Indicators for Liquid-containers. (P) Kindermann ... 596

Liberia; Blue Prints in ——. (T.R.) ... 1160

Light. (Class H.) ... 32, 108, 162, 244, 326, 395, 459, 538, 597, 696, 761, 851, 905, 959, 1019, 1065, 1126, 1178, 1267, 1322, 1386, 1445, 1524
Chemical Action of ——. (Ciamician and Silber) ... 876, 1477
Orientating Influence of ——, in Sublimating in the Sun's Rays. (Raikow) ... 1418
Packing Material for Articles Sensitive to ——. (P) Schwarz ... 989
Sensibility of Colourless Organic Compounds to ——. (Pinnow) ... 1353

Lights: Marine Signal ——. (P) Tourle and Arzt ... 907

Lighting; Air-Pressure System of ——. (P) Raff ... 601
Incandescence ——, by Oil-Gas and Oil. (Lewes) ... 696
Method of Electric ——. (P) Hewitt ... 466

Lignite Gas. *See under* Gas.

Lille Water. *See under* Water.

Lime; Acetate of —— Duty-free in the Netherlands. (T.R.). 437
Action of —— on Alcoholic Fermentation. (Knoesel) ... 785
Apparatus for Burning ——. (P) Mace ... 1397
Calcining of ——. (P) Eldred ... 615
From Bye-Products of Water-Softening. (P) Haines ... 787
Hydraulic; Importation of —— by Beirût, Turkey. (T.R.) 1002
Hydraulic; Manufacture of ——. (P) Heap and Oddy .. 550
In a State of Fusion; Properties of ——. (Moissan) . 406, 1041
Kiln for ——. (P) Rigby ... 118
Preparation of ——. (P) Anderson ... 974
Preparation of Slaked ——. (P) Michaelis ... 479
Sandstone; Artificial —— ... 1279
Use of —— in Ammonia Liquor Distillation. (Blum) 167
See also under Calcium.

Lime, Borate of; Deposit of —— in Bolivia. (T.R.) ... 570
Carbonate of; Formation of —— under Various Conditions. (Stocks) ... 527
Carbonate of, from Sulphur Recovery Process; Use of——. (P) Mason ... 1278
Control of Conditions for Calcining ——. (P) Eldred 696
Phosphate of, Deposits in Tunis. (T.R.) ... 1564
Sulphate of; Apparatus for Draining Crystals of ——. (P) Wheelwright ... 1534

Lime-Citrate and Concentrated Lime-juice in the West Indies. (T.R.) (Watts) ... 442

Limekiln: Construction of ——. (P) Gleason ... 615
Improved ——. (P) Broomell ... 1523

Limestone: Chemical Composition of Dalmatian Bituminous ——. (Slaus-Kantschieder) ... 478
See also under Calcium Carbonate *and* Lime, Carbonate of.

Lindera Benzoin; Fatty Oil of ——. (Caspari) ... 711

Linen, Clothing; Stiffening and rendering Impervious to Water. (P) Mann ... 1074

Lining for Vessels; Acid-resisting ——. (P) Vernay ... 1386

Linoleum Industry in Germany. (T.R.) ... 438
Manufacture of Iolaid ——. (P) Klie and Poppe ... 625
Producing Coloured Patterns in ——. (P) Tonjes ... 114
Press for ——. (P) Scott ... 625
Trade of Kansas. (T.R.) ... 651

Linseed Crop of Argentina. (T.R.) ... 733
Crop of the World. (T.R.) ... 650
For Manufacture of Linseed-Oil; Duty-Free in Australia ——. (T.R.) ... 1207
Growing in New Zealand. (T.R.) ... 510
Ground ——, adulterated with Mineral Oil. (Kebler) ... 262
-Cake; Production of —— in the United States. (T.R.) .. 651
Oil. *See under* Oils.

Lipase in Animal Organs. (Mohr) ... 1352

Liqueurs; Ethereal Oils in, —— Determination of. (Mann). 726

Liquids: Aeration of ——. (P) Hampson and Swales ... 984, 1191
Agitation of ——, and Apparatus therefor. (P) Dolphin . 959

PAGE

Liquids—*cont.*
Alcoholic, Apparatus for Concentration of ——. (P) Tellier ... 1407
Alcoholic; Apparatus for Treating with Gases ——. (P) Truchot and Agron ... 1407
Alcoholic; Purification of ——, and Apparatus therefor. (P) Guillaume ... 1343
Alcoholic; Purifier for ——. (P) Clark ... 1407
And Gases or Vapours: Treatment of Materials with ——. (P) ... 1234
Apparatus and Process for Distilling ——. (P) Goss ... 1523
Apparatus for Defecation of ——. (P) Hatton ... 629
Apparatus for Aerating or Agitating ——. (P) Dolphin .. 779
Apparatus for Carbonating ——. (P) Carmichael ... 1191
Apparatus for Concentrating ——. (P) Venuleth ... 459
Apparatus for Cooling and Aerating ——. (P) Wickham. 1407
Apparatus for Determining Proportions of Compound ——. (P) Larsen ... 1125
Apparatus for Distilling. (P) Calmant ... 1523
Apparatus for Drawing off —— by Air Pressure. (P) Büttner ... 1267
Apparatus for Filtering ——. (P) Thompson ... 1524
Apparatus for Filtering and Treating —— with Gases. (P) Siemens and Halske Actiengesellschaft ... 696
Apparatus for Heating, &c. (P) Feldmeier ... 1149
Apparatus for Heating —— under Pressure. (P) Mills. From Pratt ... 1523
Apparatus for Measuring and Filling —— into Vessels. (P) Crossman ... 1290
Apparatus for Purifying ——:
(P) Cameron and others ... 185
(P) Clark and others ... 1322
Apparatus for Raising and Forcing ——. (P) Wilton 907
Apparatus for Raising or Lowering Temperature of ——. (P) Floyd ... 1291
Apparatus for Saturating —— with Gases. (P) Weis and Anderson ... 408
Apparatus for Separating —— from Solids. (P) Duncan and others ... 458
Apparatus for Separating Impurities from ——. (P) Winand ... 1523
Apparatus for Sterilising ——. (P) Rawson ... 634
Apparatus for Supplying Reagents for Purifying ——. (P) Schmidt ... 925
Apparatus for Treating Polluted ——. (P) Candy ... 133
Apparatus for Treating —— with Gases:
(P) Malmendier and Stuhler ... 1224
(P) Vosmaer and Lebret ... 1523
(P) Vosmaer and others ... 1292
Apparatus for Vaporising ——. (P) Lyle and Stewart ... 493
Automatic Distribution of —— on Bacteria Beds. (P) Roach ... 1149
Centrifugal Separators for ——. (P) Melotte ... 1407
Clarification of ——. (P) Lubberger ... 1340
Combustible: Gasifier for ——. (P) Pet and Claudel 1447
Combustible; Volatilisation of —— with Admixture of Steam. (P) Liet and Claudel ... 1067
Containing Free Acids or Acid Salts, Clearing ——. (P) Kaserer ... 1548
Electrode for Purifying ——, by Electrolysis. (P) Chipman ... 485
Evaporation of ——. (P) Naef ... 1019
Fermented, Sulphurous Acid in ——. (Mathieu and Billon) ... 1247
Filtering and Cleansing ——. (P) Smith ... 1144
For Sprinkling over Fuel. (P) Livingstone and Vandercook ... 1227
Gaseous: Apparatus for Supplying ——. (P) Charlier ... 558
In Closed Vessel: Recording the Depth of ——. (P) Childs ... 458
Inflammable; Safety Reservoirs for ——. (P) Keay 1445
Means for Aerating ——. (P) Gwynne and Sargent 1322
Means for Subjecting Matter to the Action of ——. (P) Naef ... 173
Non-Alcoholic; Manufacture of ——. (P) Nathan 1408
Of Low Boiling Points; Heating of ——. (P) Fseny. From the Abwarme-Kraftmaschinen-Ges. ... 1267
Partially Miscible —— near the Critical Point. (Friedländer) ... 284
Pasteurisation of ——. (P) Clark. From Fromme 268
Preventing Escape of Volatile —— from Vessels. (P) Spooner ... 696
Purifying and Decolorising ——. (P) Spillern-Spitzer ... 1406
Quick Current Reheater for ——. (P) Draminski..... 1463
Receptacles for Preserving ——. (P) Lake. From Piroux and Seddon ... 1055
Separation of ——, from Solids. (P) Desaulles 556
Sterilisation and Preservation of ——. (P) Amiot..... 1408
Treatment of ——, for Crystallisation or Deposition. (P) Scott ... 913
Treatment of ——, for Precipitation, Evaporation, &c. (P) Naef ... 1232
Treatment of —— with Carbon Dioxide. (P) Naef 1232
Under Pressure; Machinery for Production of ——. (P) Vogt and Reckhughausen ... 458
Vessels for Holding Volatile Inflammable ——:
(P) Imray. From La Cie des Récipients et Lampes Inexplosibles ... 1126
(P) Posno ... 700
Viscous: Controlling the Flow of ——. (P) Mendham ... 1225
Waste; Treatment of ——. (P) McPhail ... 185
See also Fluids.

PAGE

Liquid-Purifying Apparatus; Collecting Solids from ——. (P) Butt 1267
Liquors, Alcoholic; Apparatus for Refining, &c. ——. (P) Duffy 716, 716
And Caustic Alkali Lye; Electrolytic Production of a ——, and Apparatus therefor. (P) Boult. From Seibert and Tempel 970
Distillation of ——, and Apparatus therefor. (P) Scott ... 706
Fermented; Manufacture of ——. (P) Schneible 868
Malt; Manufacture of ——. (P) Schneible 716, 1290
Softening and Purifying Waste ——. (P) Haines 925
Spirituous; Apparatus for Refining, &c. ——. (P) Duffy. 558
Spirituous; Refining, Ageing, &c. ——. (P) Duffy 558
Lists of Members Elected ... 91, 93, 211, 379, 526, 664, 813, 890, 1265, 1363, 1489
Lithium and Antimony; Compound of ——. (Lebeau) 261
-Ammonium; Action of —— on Antimony. (Lebeau) 369
Antimonide; Properties of ——. (Lebeau) 369
Lithographic Printing, &c.; Surfaces for ——. (P) Duffek ... 365
Printing Plates; Preparation of ——. (P) Strecker 1135
Lithography; Photographic Half-Tones in ——. (P) Vilim and Hauser 1296
Lithopone; Analysis of ——:
(Colfignier) 1146, 1337
(Drawe) 427
Characteristics of ——. (Kochs and Seyfert) 1145
Manufacture of ——. (P) Lihme 625
Russian Customs Decision on ——. (T.R.) 293
Litmus. *See under* Dyestuffs.
Litmus-Silk; Notes on ——. (Emich) 498
Liverpool Corporation Electric Supply Department; Visit to —— 954
Logwood Black; Production of —— on Tissues. (Lauger) 46
Lonchocarpus Cyanescens; Extraction of Indigo from ——. (P) Comp. de Chemins de Fer au Dahomey 38
Los Angeles (California); Mineral Production of ——. (T.R.) 1003
Lubricants and Lubricating Apparatus. (P) Oetling 851
And Manufacture of same. (P) Downs 712
Improvement of ——. (P) Straup 1032
Of Good Electrical Conductivity. (P) Ulbrich and Pommerhanz 1543
Used with Motive Power Fluid: Recording Efficacy, &c., of ——. (P) Goetze and others 1083
Lubricating Compound. (P) Berry 712
Oil. *See under* Oils.
Lumber, Artificial; Manufacture of ——. (P) Huntington... 1331
Drying Red-Wood ——. (P) Phillips 708
Luncheon at the Adelphi Hotel, Liverpool 952
Lupinine; Characteristics of ——. (Willstatter and Fourneau) 1193
Investigation of ——. (Willstatter and Fourneau) 871
Benzoyl; Production of ——. (P) Merck 560
Lustreing Apparatus for Silk. (P) Stuart 1135
Luteolin. *See under* Dyestuffs.
Lye, Caustic Alkali; Electrolytic Production of ——, and Apparatus therefor. (P) Seibert and Tempel 970

M

Macaroni; Preparation and Properties of ——. (Winton and Ogden) 1290
Machinery. (Class I.) .. 32, 107, 243, 326, 394, 458, 538, 596, 695, 760, 850, 904, 959, 1019, 1064, 1125, 1177, 1224, 1267, 1322, 1386, 1444, 1523
Madagascar; Customs Decisions in ——. (T.R.) 437
Paper from Avoavo Bark in ——. (T.R.) 202
Rafia Fibre in —— for Paper-making. (T.R.) 940
Source of Bitumen in ——. (T.R.) 569
Magnesia; Behaviour of ——, in Portland Cement. (Glaessner) 1395
Cement; Characteristics of ——. (Luhmann) 118
Compound of ——. (P) Rueff 479
Influence of —— on Behaviour of Clay. (Maeckler) 911
Magnesium Flashlight; Velocity of Combustion and Chronophotography of the ——. (Londe) 926
In Electrolytic Rectifiers. (Campetti) 259
In Iron. (Ledebur) 1140
Refining Copper and its Alloys with ——. 258
Refining Copper with —— 1080
Use of Powdered —— in Tissue Printing. (Weiss) 473
Magnesium Amalgam; Reactions of ——. (Meunier) 420
Carbonate, and Manufacture thereof. (P) Young and Griffiths 872
Chloride; Behaviour of —— in Steam Boilers. (Ost) 1177
Compounds; Action of Organo —— on Trioxymethylene. (Grignard and Tissier) 286
Compounds, Organo ——, as Reagents for the Hydroxyl Group. (Tschugaeff) 1559
Hyposulphite; Electric Preparation of ——. (P) Frank . 51
Nitrite; Preparation of ——. (Matuschek) 705
Peroxide; Compound of ——. (P) Fuhrmann 706
Peroxide, Manufacture of ——. (P) Elias 1278
Peroxide; Preparation of Substances containing ——. (P) Krause 706
Peroxide with High Proportion of Oxygen. (P) Krause .. 1395
Sulphate, Sodium Salicylate, and Phenazone; Interaction between ——. (Woolcock) 422
Sulphite; Manufacture of ——. (P) Wing 254

PAGE

Mahwa Flowers; Sugar of ——. (von Lippmann) 713
Maize; Extraction of Albuminoid Substance from ——. (Donard and Labbé) 1464
Extraction of an Albuminoid Compound from ——. (P) Donard and Labbe 1548
Mashes; Removal of Husks from ——. (Behrend) 131
Pith; Constituents of ——. (Browne and Tollens) 728
Starch. *See under* Starches.
Treatment of ——. (P) Gaff and Gent 1149
Malay States; Tin and Tin Ore Exports from the ——. (T.R.) 860
States; Tin Industry of the ——. (T.R.) 1163, 1478
Malt; Advantages of Alternately Aerating and Steeping ——. (Windisch) 61
Albumin-dissolving Enzyme in ——. (Ehrich) 180
Analysis and Valuation of ——. (Cerny) 281
Analysis and Valuation of Kilned ——. (Prior) 784
Analysis; Limitations of Applicability of Results of ——. (Woch) 1240
Analysis of ——:
(Ling) 983
(Windisch) 1240
Apparatus for Refining, &c. —— . (P) Duffy 558
Chemical Examination of ——. (Lermer) 784
Conversion of Percentages of Extract in —— from Windisch's Tables to Balling's. (Saare) 556
Decoctions; Production of Tasteless Roasted ——. (Weyermann) 923
Diastase; Experiments with ——. (Ling and Davis) 1088
Drum. (P) Knuttel 491
Drying ——, and Apparatus therefor ——:
(P) Beaven 182
(P) Partridge 786
Drying of —— to Prevent Contamination with Arsenic. (Bradley) 868
Enzymes; Isolation of ——. (Lintner) 1034
Experiments in Making ——. (Salamon) 418
Extract; Causes of Diminished Yield of ——. (Fernbach) 490
For Beer to be Quickly Tapped; Production of ——. (P) Vollmann 359
For Rapid Production of Matured Beer. (P) Vollmann .. 62
Grain; Germinating —— in the Steeping-Trough. (P) Weisenfeld 131
Industry of Denmark. (T.R.) 441
Kilns for ——:
(P) Ackroyd and Buckley 1547
(P) Dornfeld 360
(P) Earp 1191
Liquors. *See under* Liquors.
Modern System of Mashing ——. (Briant) 1240
Parasites in ——, Detection of. (Lindner) 130
Purchase of —— on Analysis. (Saare) 556
Purification of Furnace-Gases for Drying ——. (P) Beaven 268
Refining, Ageing, &c. ——. (P) Duffy 558
Relation between Character of ——, and Liability of Wort to Infection 1034
Sulphuring of ——:
(Kukla) 61
(Windisch) 61, 1190
Water in; Determination of ——. (Schulze) 1088
Yield of Extract in —— on the Practical Scale. (Windisch) 631
-Drum. (P) Knuttel 268
-Kilns; Improved ——. (P) Haynes, jun. 923
Malting Apparatus. (P) Sleeman 1148
Industry in Bohemia. (T.R.) 1116
Practical ——. (Currie) 982
Studies on ——. (Windisch and Hasse) 1340
-Drum. (Briant and Vanx) 180
-Drum; Pneumatic ——. (P) Smith 868
Maltase, Yeast-; Synthetic Action of ——. (Emmerling) 60
Maltose and Glucose; Equilibrium between ——. (Pomeranz) 1353
And Lactose; Separation of ——. (Boyden) 1416
Heptacetylchlor ——. (Foerg) 506, 506
Manufacture of —— from all Amylaceous Matters. (P) Woussen and Caussin de Perceval 60
Manchester Corporation Bill for Discharge of Works' Effluents; Discussion on —— 581
Section; Chairman's Address to —— 1377
Soot; Examination of ——. (Irwin) 533
Mangaba Rubber. *See under* Rubber.
Manganates; Analysis of ——. (Herz) 500
Manganese and Aluminium; Separation of ——. (Dittrich and Hassel) 1414
And Magnesium; Separation of ——. (Dittrich and Hassel) 1414
And Zinc; Separation of ——. (Dittrich and Hassel) 1414
Bronze for Boiler Staybolts in Hungary. (T.R.) 200
Determination of ——. (von Knorre) 72
Estimation of ——. (Dittrich and Hassel) 1414
Fusing Point of Metallic; Determination of ——. (Heraeus) 552
In Ferro-Manganese and Spiegel; Determination of ——. (Bolin) 1414
In Spiegel; Determination of ——. (Hildreth) 279
In Steel; Rapid Determination of ——. (Ramorino) 991
Manufacture of —— by Electricity. (P) Simon 1031
New Reaction for ——. (de Koninck) 873
Ores at Dunkirk. (T.R.) 936
Ore from Spain. (T.R.) 371
Ore Production of the United States. (T.R.) 1162
Ore Production of India. (T.R.) 869

PAGE

Manganese—*cont.*
Ore Production of the Caucasus. (T.R.) ... 732
Precipitation of —— by Bacterial Action. (Jackson) ... 681
Trust in the Caucasus. (T.R.) ... 200
Volumetric Determination of ——. (Dufty) ... 70
Manganese and Calcium Carbides: Production of Mixed ——. (Brame and Lewes) ... 755
Borate; United States Customs Decision on ——. (T.R.) 935, 1046
Carbide and Calcium Carbide: Simultaneous Manufacture of —— ... 597
Chloride; Compound of Alcohol with ——. (Bourion) ... 505
Mangrove Bark in East Africa. (T.R.) ... 1311
Manilo Paper. *See under* Paper.
Manila Copal. *See under* Copal.
Differentiation of —— from Jute, &c. (Dalen and Wisbar) 1466
Manna: Mannotetrose and Manninotriose from ——. (Tanret) ... 1073
Mannan; Liquefaction of —— by Microbes. (Sawamura) ... 1547
Mannotetrose and Manninotriose, from Manna. (Tanret) ... 1033
Mannitol: Action of —— on Bismuth Nitrate. (Vanino and Hauser) ... 65
Detection of ——. (Wefers Bettink) ... 142
Solubility of ——. (Findlay) ... 1043
Mannose: Detection of ——. (Storer) ... 1474
Mantles: Apparatus for Incinerating ——. (P) Compin ... 907
For Incandescence Gas-Lighting:
(P) Bezognard de la Plante ... 1448
(P) Boult and Plaissetty ... 1389, 1389
(P) Bousfield. From Finke ... 1359
(P) Buhlmann ... 763
(P) Clamond ... 598
(P) Crease ... 763
(P) Dickson ... 461, 461
(P) Hicks ... 1129
(P) Kaufmann ... 1326
(P) Maisch ... 1527
(P) Missire ... 763
(P) Saubermann ... 962
(P) Wilson ... 698
For Incandescent Gas-Lighting; Machines for Manufacture of ——. (P) Muller and Bonnet ... 461
Incandescence; Apparatus for Burning ——:
(P) Janz ... 598
(P) Mackean ... 598
Incandescence; Customs Decision on —— in Italy. (T.R.) 1045
Incandescence Electric Lamp: Manufacture of ——. (P) Siemens Bros. and Co. From Siemens and Halske ... 1389
Incandescence; Incinerating, Shaping, and Hardening ——. (P) Wolf ... 1127
Material for Incandescent Lighting: Machine for Saturating ——. (P) Wiederhold and Morse ... 908
Means for Use in Lighting by Incandescence ——. (P) Biheller ... 698
Preparation of Threads for Incandescence ——. (P) Boullier ... 1448
Theory of the Incandescent ——. (White and Traver) ... 1012
Manures. (Class XV.) ... 57, 129, 179, 265, 358, 415, 488, 555, 627, 713, 783, 919, 1085, 1146, 1189, 1286, 1338, 1405, 1462, 1545
Artificial; Analysis of ——. (Kretschmer) ... 74
Artificial; Egyptian Trade in ——. (T.R.) ... 82
Artificial —— in Poland. (T.R.) ... 938
Artificial —— in Russia. (T.R.) ... 511
Artificial; Manufacture of ——:
(P) Dolle ... 1085
(P) Goulding and Ostersetzer ... 358
(P) Lake. From the Cyanide Co. ... 1338
(P) Lake. From the Cyanid-Gesellschaft ... 1462
Artificial; Production of —— from Refuse. (P) Jones ... 634
Chemical —— at Cherbourg. (T.R.) ... 938
Chemical Industry of Lyons, France. (T.R.) ... 1310
Chemical; Trial of —— in Greece. (T.R.) ... 653
Disintegrating Machines for ——. (P) Milne and Goulding 713
From Apatite, &c.; Manufacture of ——. (P) Wiborgh and Palmaer ... 1189
In Australia. (T.R.) ... 1423
Manufacture of —— from Sulphite Cellulose Waste. (Knösel) ... 489
Superphosphate; Gases Evolved in Manufacture of ——. (Affleck) ... 1413
See also under Fertilisers.
Marble, Artificial; Manufacture of:
(P) Blitz ... 1078
(P) Czerwak ... 1079
(P) Newton ... 1455
(P) Weill ... 1078
Colouring of. (P) Roach ... 858
Producing Deeply-Penetrating Designs in ——. (P) Hippe and Holm ... 1078
See also Stone.
Matches; Apparatus for Manufacture of ——. (P) White ... 425
Margarine; Production of —— in Russia. (Pollatschek) ... 882
Separation of —— from Butter. (Deguide) ... 1352
Trade in Austria. (T.R.) ... 1052
Marjoram Oil. *See under* Oils.
Marseilles; Bauxite at ——. (T.R.) ... 1114
Indigo in ——. (T.R.) ... 1111
Oil-Seeds at ——. (T.R.) ... 1114
Soap Industry of ——. (T.R.) ... 1114

PAGE

Marsh Apparatus for Detection of Arsenic. (Gantier) ... 1472
-Berzelius Arsenic Deposit. (Ackroyd) ... 900
Mash-Tuns for Brewing. (P) Riley ... 558
Use of Filter-Presses instead of——. (Windisch) ... 785
Mashes: Higher Pitching Temperatures for Fermenting ——. (Heinzelmann) ... 984
Mashing Operations; Modern ——. (Briant) ... 1240
Process: Transformation of Starch and Albumin during the ——. (Windisch and Hasse) ... 557
Masseenites: Apparatus for Bleaching and Washing ——. (P) Weinrich ... 1463
Apparatus for Purifying ——. Weinrich ... 630
Matches. (Class XXII.) ... 68, 139, 189, 276, 366, 425, 498, 561, 639, 723, 792, 873, 927, 989, 1038, 1097, 1155, 1195, 1246, 1296, 1349, 1412, 1470, 1554
Apparatus for Dipping and Heading ——. (P) Frost ... 1471
Ignition Composition for ——.
(P) Boult. From Safström ... 562
(P) Gans ... 792
Imported by Chinkiang, China. (T.R.) ... 802
Imports of —— by Kossovo. (T.R.) ... 84
Imports of Colombia. (T.R.) ... 515
In Sweden. (T.R.) ... 802
Machines for Making ——:
(P) Abbott and others ... 723
(P) Czerweny ... 639
(P) Lake. From Blake ... 366
Manufacture of ——. (P) Parker ... 1155
Manufacture of —— at Foochow, China. (T.R.) ... 204
Manufacture of —— in Bavaria. (T.R.) ... 735
Manufacture of Wood ——. (P) Lake. From Aktieselskabet "Progress" ... 562
Non-Poisonous Mixtures for Manufacturing ——. (P) Purgotti ... 498
Prohibition of Phosphorus —— in the Netherlands. (T.R.) ... 515
Rendering —— Obnoxious to Rodents. (P) Bowman ... 1195
Wind-proof; Manufacture of ——. (P) Garber ... 366
Matrix for Stereotypes: Pasteboard ——. (P) Winter ... 636
Mattes: Treatment of ——. (P) Potter and Harvie ... 1333
Mauritius; Tariff Amendment in ——. (T.R.) ... 436
Mazut Oil. *See under* Oils.
Meal, Corn-, Cotton-seed, &c.: Deodorising of ——. (P) Pratt ... 1084, 1188
Meat: Apparatus for Curing ——. (P) Lincoln ... 1691
Curing of ——. (P) Schlarb ... 269
Extract; Preparation of a Milk Compound Resembling ——. (P) Eichelbaum ... 1548
Extracts, and Manufacture of same. (P) Ciantar and Ross ... 269
Law for Inspection of —— in Germany. (T.R.) ... 514
Preparation for Preservation of ——. (P) Markovits and Guthmann ... 1549
See also Foods.
Medal; Award of the Society's —— ... 900
Medical and Pharmaceutical Preparations; Russian Customs Decision on —— ... 294
Medicinal Compounds. (P) Stephan ... 722
Compounds; Preparation of —— (P) Rother ... 872
Medicines and the Tax on Alcohol in Germany. (T.R.) ... 1312
Standards for ——. (Umney) ... 1467
Meeting; Proceedings of the Twenty-first Annual —— ... 949
Melibiose; Characteristics of ——. (Bau) ... 286
Members Elected; Lists of —— ... 91, 93, 211, 379, 526, 664, 813, 890, 1265, 1363, 1489
Mentha Pulegium Essence; Proximate Analysis of ——. (Tétry) ... 496
Menthol Derivative: Manufacture of a ——. (P) Lingner ... 722
Mercerising Apparatus:
(P) Crompton and Horrocks ... 405
(P) Dolder ... 342
(P) Ecob ... 49
(P) Frings ... 171
(P) Kahn ... 1133
(P) Klauder ... 1531
(P) Romer ... 48
(P) Société B. Buffaud and T. Robatel ... 49
Conditions of ——:
(Bourcart) ... 103
(Lefevre) ... 103
Process. (P) Kleinewefers ... 771
Refrigeration Employed in ——:
(Kurz) ... 250
(Lefèvre) ... 250
Vegetable Fibres, and Apparatus therefor. (P) Bourcart. 171
Merchandise, General: Imports of —— for 1900-1. (T.R.) ... 1197
Mercuric Acetate; Oxidations with ——. (Balbiano and Paolini) ... 1293
Chloride for Preserving Sugar-Juice. (Pellet and Klein). 179
Chloride Solution: Preservation of ——. (Greenish and Smith) ... 559
Chloride. *See also under* Corrosive Sublimate.
Iodide in Solution: Nature of ——. (Kastle and Reed) ... 504
Oxide; Colloidal Form of ——. (Paal) ... 995
Oxide, Red; Preparation of Pure —— by Precipitation. (Dafau) ... 1467
Thiocyanate: Intensification with ——. (Hauberrisser) ... 424

PAGE

Mercury, Colloidal; Electrical Preparation of ——. (Billitzer) 932
Discovery of —— in Austria. (T.R.) 650
Electrolytic Determination of ——. (Bindschedler) 873
In Foodstuffs; Traces of ——. (Medicus and Mebold) ... 1248
In India; Discovery of ——. (T.R.) 1421
Occurrence of —— in Mexico. (T.R.) 146
Ores. *See under* Ores.
Organo-Metallic Compounds of —— Antiseptics. (P) Mills. From Lumière 1153
Production of —— in Italy. (T.R.) 199
Production of —— in the United States. (T.R.) 199, 1257
Production of the World. (T.R.) 570

Mercury Bichloride; Action of —— on the Unfixed Silver Bromide Plate. (Reiss) 872
Chloride and Bromide; Precipitation of ——. (Viard) ... 1076
Compounds; Preparation of ——. (P) Rother 872
Lactates. (Guerbet) 986
Nitrate; Substitutes for —— in Hat-Dyeing 170
Oxybromide; Preparation of ——. (Fischer and von Wartenberg) 1345
Tannate of Constant Composition; Preparation of ——. (Zdarek) 789

Metals; Action of Nitric Acid on ——. (Ewart) 368
Adding Carbon to ——. (P) Jones 915
Alkaline Earth ——; Nitrides of the. (Gautier) 796
Amalgamation of ——, and Apparatus therefor. (P) Knappe 1334
And Metal Compounds; Hollow Bodies from Easily Fusible ——. (P) Steinweg 177
And Mining Industries of Germany in 1900. (T.R.) 198
Annealing of ——. (P) Bates and Peard 482, 976
Apparatus for Separating —— from their Ores. (P) Loose 1401
Apparatus for Squirting Heated ——. (P) Huntingdon .. 350
Apparatus for Toughening, &c. ——. (P) Hadfield. From Hibbard 410
Apparatus for Treatment of Molten ——. (P) Haber and Savelsberg 177
Application of Barium Compound in Precipitation of ——. (P) Martino 976
Articles; Enamelled ——. (P) Oschatz 1139
Base-; Producing a Metallic Lustre on ——. (P) Zsigmondy 707
Borings; Treating —— to Facilitate Melting. (P) Pagan 976
Castings; Production of Soft ——. (P) Brabrook 977
Cerium ——; Electrolytic Production of. (Muthmann, Hofer, and Weiss) 472
Changes in Elastic Qualities of —— due to Sudden Cooling. (Muir) 1455
Coatings or Deposits; Obtainment of ——. (P) Mies 262
Coating —— with other Metal. (P) Thurston 1142, 1142
Colloidal; Barium Sulphate as a Reagent for Solutions of ——. (Vanino) 426
Colloidal; Electrical Preparation of ——. (Billitzer) 932
Colouring of ——. 1398
Colouring of —— by Rieder's Process 485
Composition for Cleaning and Preserving ——. (P) Oberwilder 1084
Composition for Clearing and Soldering ——. (P) Young 1538
Composition for Covering Surfaces of ——. (P) Harding . 1028
Depositing —— on Lace, &c. (P) Daly 912
Deposition of —— on Metallic Surfaces. (P) Cowper-Coles 917
Detection of the Platinum ——. (Leidié and Quinquessen) 499
Distillation of ——. (Kahlbaum and others) 480
Distillation of —— in a Vacuum. (Kahlbaum) 118
Drawing Molten —— from Receptacles. (P) Lincoln 977
Drawing off Molten ——, and Apparatus therefor. (P) Lincoln and Gooding 553
Electric Welding of ——. (P) Hunter 486
Electrical Reduction of —— from Ores. (P) Contardo... 1083
Electrical Refining of ——. (P) Stassano 1284
Electro-Deposition of ——:
(P) Cowper-Coles and Co. and Cowper-Coles 917
(P) Harrison and Day 354
(P) Jensen. From Langbein and Co. 917
(P) Marino and Ratchkowsky 1082
Electro-Deposition of ——, and Apparatus therefor. (P) Reed 1541
Electro-Deposition of —— on Lace. (P) Daly 1187
Electrolyser for Extraction of Light ——. (P) Becker ... 1539
Electrolytic Coating of. (P) Meurant 486
Electrolytic Separation of ——. (P) Thompson. From Ulke 779
Electromotive Force of —— in Solutions of Cyanide. (Christy) 779
Elimination of —— from Mixtures. (P) Clamer 1185
Extraction of —— by Means of Calcium Carbide. (Neumann) 1140
Extraction of —— from Ores:
(P) De Alzugaray 1140
(P) Hoepfner 1081
(P) Hunt 776
(P) Lake. From Scheidel 775
(P) Rudolphs and Landin 977
(P) Sadtler 864
(P) Swinburne and Ashcroft 351, 482
For Manufacture of Wire Bars; Electro-Deposition of ——. (P) Sanders 485
Furnaces or Muffles for Annealing ——. (P) Smallwood.. 411
Hardening and Tempering ——. (P) Boult. From Miskolczy 976
Heating of ——. (P) Sargent 1081

PAGE

Metals—*cont.*
In Foodstuffs, Determination of Traces of ——. (Medicus and Mebold) 1248
Leaching and Extraction of ——. (P) Hoepfner 1081
Means for Separating Volatile from Non-Volatile ——. (P) Hardingham. From Heberlein 862
Melting and Treating ——. (P) Schwartz 1234
Melting and Treating ——, and Apparatus therefor. (P) Lane. From Hawley Down-Draft Furnace Co. 553
Of Railway Bearings; Investigation of ——. (Job) 974
Of the Alkalis; Production of ——. (P) Moeser and Eudmann 1333
Of the Cerium Group. (Behrens) 368
Of the Platinum Group; Disintegration, &c. of ——. (Holborn and Henning) 1332
Of the Rare Earths; Aromatic Bases as Precipitants for ——. (Jefferson) 929
Ornamentation of ——. (P) Hausermann 1541
Parts; Heating and Welding ——. (P) Deissler 977
Plates; Apparatus for Coating ——. (P) Williams 710
Plates of Heavy —— for Lithographic Printing. (P) Strecker 775
Plates; Electrolytic Plating of ——. (P) Popp 485
Plate; Treatment of —— in Tin-Plate Manufacture. (P) Howell and Brew 1538
Plating of ——. (P) Griffith 1334
Precious; Apparatus for Extraction of ——. (P) de Raasloff 1234
Precious; Apparatus for Recovering —— from Refractory Ores. (P) Cassel 486
Precious; Cyanide Process for Extracting ——:
(P) Bezzer 482
(P) Schulz 619
Precious; Extraction of ——:
(P) Darling 1141
(P) Davis 351
(P) de Alzugaray 863
(P) Hilt and Lane 1185
(P) Kendall 977
Precious; Extraction of ——, and Apparatus therefor. (P) Breedon 552
Precious; Metallising with ——. (P) Langhans 123
Precious; Recovery of —— by Electrolysis. (P) Webb and others 485
Precipitating and Amalgamating —— Electrolytically. (P) Henneberg and Pape 55
Preventing Oxidation of Molten ——. (P) Walker 776
Production of ——. (P) Clamer 619
Production of ——, and Furnaces therefor. (P) Keller ... 354
Production of —— in Finely-divided State. (P) Pohl 1334
Production of —— in Philadelphia. (T.R.) 800
Pseudo-Catalytic Processes Oxidation Processes. (Engler and Wohler) 257
Recovery of ——. (P) Kendall 711
Recovery of —— by Electrolysis. (P) Frasch 624
Recovery of —— from Ores. (P) Neill and Burfeind 978
Recovery of —— from Residues. (P) Bradenburg 976
Reduction of —— in the Electrical Furnace. (P) Acheson 486
Refining Composite ——. (P) Ulke 486
Scrap; United States Customs Decision on ——. (T.R.) .. 371
Separation of "Precious Particles" of ——. (P) Edwards. From The Rose Gold Reclamation Co. 915
Sheathing; Effect of Sea-Water on Muntz's ——. (Lewis) 551
Sheets; Apparatus for Coating —— with Metals. (P) Heathfield 1029
Smelting ——, and Apparatus therefor. (P) Allison. From Haines 1141
Smelting and Reducing —— Electrically. (P) Diesler 261
Smelting and Refining Volatile ——. (P) Armstrong 1538
Solution for Use in Separating ——, from Sulphide Ores. (P) Potter 410
Solution of ——. (Ericson-Aurén and Palmaer) 125
Tank for Precipitating ——. (P) Berry 482
Treating Metallic Oxides for Production of ——. (P) Weber 1142
Treatment of ——. (P) Carson 619
Utilising Waste Products from Pickling ——. (Peyton) .. 976
Vessel for Melting and Refining —— simultaneously 975
Volatile; Obtainment of ——. (P) Armstrong 917
Ware; Enamelling of ——:
(P) Jankowsky 256
(P) Ketcham 1232
Welding ——:
(P) Goldschmidt 53, 915
(P) Wachwitz and others 176
-Working Apparatus; Electric ——. (P) Burton 623

Metallic Articles; Wrappers for Preventing Tarnishing of ——. (P) Flor and Murmann 1225
Vessels; Rendering Joints of —— Hermetically Tight. (P) Adriance 1964

Metalloids; Means for Separating Volatile from Non-Volatile ——. (P) Hardingham. From Heberlein 862
Metallurgical Patents in Germany. (T.R.) 1421
Metallurgy. (Class X.) 52, 118, 175, 257, 499, 480, 550, 616, 708, 774, 915, 974, 1029, 1079, 1140, 1184, 1233, 1279, 1331, 1398, 1455, 1535
Metasilicate, Alkaline; Manufacture of ——. (P) Crispo and Mols 408
Meta-Toluic-Aldehyde-*o*-Sulphonic Acid. *See under* Dyestuffs.
Methane; New Syntheses of ——. (Sabatier and Senderens) 504
Methoxythenylbenzene; Preparation of —— (Tiffeneau) 728

PAGE

Methoxyquinoline Derivatives. *See under* Dyestuffs.
Methoxyl Groups; Zeisel's Method for Determining —— Modified. (Hewitt and Moore) 195
In Substances containing Sulphur; Determination of ——. (Kaufler) 283
Methyl-Alcohol. *See under* Alcohol.
Methylaniline; ω-Cyano —— and its Derivatives. (P) Badische Anilin, &c. 170
Methyl Anthranilate; Detection and Determination of ——. (Erdmann) 283
Methylanthranilic Acid. *See under* Dyestuffs.
Methyl; Chlorinated ——. (P) Linguer 722
Determination of —— according to Herzig and Meyer. (Busch) 725
Methylanthranilate in the Vegetable Organism. (Charabot) 1348
Salicylate; Natural and Synthetic ——. (Kremers) 1410
Methylene Citric Acid, and Manufacture of Same. (P) Sternberg 791
Di-Aceto Di-Salicylic Acetic Acid, and Manufacture of Same. (P) Summers 1194
Diguaiacol; Camphoric Acid Ester of ——. (P) Summers 1194
Methylenedisalicylic Acid, and Production of Same. (P) Summers 1154
Methylindenes from Coal-Tar. (Boes) 853
Methylglucosides; Acetyl Derivatives of the Two ——. (Moll van Charante) 728
Methylrubazonic Acid. *See under* Dyestuffs.
Mexico; Chicle Gum in ——. (T.R.) 338
Dynamite Factory at Monterey. (T.R.) 654
Mercury in ——. (T.R.) 146
Paper in ——. (T.R.) 1117
Petroleum Deposits of ——. (T.R.) 1257
Petroleum probably Existent in ——. (T.R.) 880
Petroleum Prospecting in ——. (T.R.) 370
Smokeless Powder Manufacture in ——. (T.R.) 203
Sugar-Cane Cultivation in ——. (T.R.) 293
Mica; Apparatus for Manufacture of Flake ——. (P) Michell 971
Mining in India. (T.R.) 799
Production in the United States. (T.R.) 1206
Microsol: A New Disinfectant. (Fendler) 1466
Milfoil Oil. *See under* Oils.
Milk; Apparatus for Heating ——. (P) Taleott 1548
Apparatus for Optical Examination of ——. (P) Bernstein 1475
Apparatus for Pasteurising ——:
(P) Busch and others 1548
(P) Feldmeier 1149
Apparatus for Raising or Lowering Temperature of ——. (P) Floyd 1291
Apparatus for Sterilising ——:
(P) Fliegel 1149
(P) Pakes and Barnes 1344
Casemogen of Asses' ——. (Storch) 1344
Centrifugal Separator for ——. (P) Kimball 1548
Citric Acid in; Detection of ——. (Wöhlk) 564
Composition of ——. (Richmond) 133
Composition of —— in North of England. (Collins) 1512
Decrease in the Acidity of ——. (Kirsten) 360
Determination of Lecithin in ——. (Bordas and de Raczkowski) 1041
Dry Condensed; Production of ——. (P) Hall 493
Dyestuffs in; Detection of ——. (Winter Blyth) 794
Extract; Manufacture of a ——. (P) Eberhard 1548
Extracts of —— resembling Meat Extracts. (P) Mierisch and Eberhard 183
Food Resembling Meat Extract; Manufacture of ——. (P) Eichelbaum 1548
Formaldehyde in; Detection of ——. (Manget and Marion) 1351
In a Dry Form; Preservation of ——. (P) Just 1548
Manufacture of Condensed or Desiccated ——. (P) Campbell 269
Manufacture of Preservable ——. (P) Laessig 1191
Modification of ——. (P) von Dungern 869
Pasteurising and Separating ——. (P) Stack 633
Powdered Preparation of ——. (P) Bücka and others 717
Preserving of ——:
(P) Buchmore 1548, 1548
(P) Helm 924
(P) Imray. From La Société "Le Lait" 1035
Relation between Specific Gravity, Fat, and Solids-not-Fat in ——. (Leonard) 133
Rich in Cream, &c.; Production of ——. (P) Julien 1035
Sterilisation of ——. (P) de Bock 492
Storilisation of; Apparatus for ——. (P) Amiot 1408
Test for Boiled and Unboiled ——. (Utz) 280
Milk-Albumin Preparation; Manufacture of ——. (P) Laessig 1464
Production of Oxidised ——. (P) Oppermann 1091
Production of Soluble ——. (P) Dunham 1291
Milk-Flour; Production of —— in Sweden. (T.R.) 734
Milk-Powder in Sweden ——. (T.R.) 1052
Mill for Laboratory Use. (Gneium) 139
Ice ——. (Schwalbe) 498
Mill-Boards; Colouring —— Black 1276
Millet as a Malting Material 131
Distilling —— in Scotland. (T.R.) 513
Milo; Minerals of ——. (T.R.) 798

Mineral or Minerals:
Apparatus for Desiccation of Crushed ——. (P) Diedrich.. 1523
Apparatus for Separating ——. (P) Elmore 618, 862
Cementing Agent for ——. (P) de Vulitch 1446
Deposits of Kumaon and Garhwal. (T.R.) 146
Disintegrating and Comminuting ——. (P) Graham 350
Exported by Spain. (T.R.) 437
Exports of Portugal. (T.R.) 510
Exports of Spain. (T.R.) 1113
Industry of Western Australia. (T.R.) 81
Of Copper; Treatment of ——. (P) Westinghouse 1457
Of Lead and Zinc; Treatment of ——. (P) Havemann ... 1457
Of Milo (Greek Archipelago). (T.R.) 798
Oils. *See under* Oil *and* Oils.
Output of Western Australia. (T.R.) 570
Preparation, Absorbent; Manufacture of ——. (P) Saunders 1159
Production of British Columbia. (T.R.) 1163
Production of Canada for 1901. (T.R.) 292, 570
Production of Carthagena. (T.R.) 1002
Production of Colorado. (T.R.) 732
Production of Germany. (T.R.) 729
Production of Gijon, Spain. (T.R.) 732
Production of India. (T.R.) 1355
Production of Japan. (T.R.) 570
Production of Los Angeles (California). (T.R.) 1003
Production of Quebec. (T.R.) 798
Production of Queensland. (T.R.) 1113
Production of South Australia. (T.R.) 936
Production of Spain in 1901. (T.R.) 1113
Production of the British Empire. (T.R.) 571
Production of Tunis. (T.R.) 1563
Production of Western Australia. (T.R.) 1257
Products of the United States. (T.R.) 1203
Substances; Separation of —— by Selective Action of Oil. (P) Elmore 349
Thoria in ——. (Schilling) 1243
Treatment of —— by Heat and Pressure. (P) Karavodine 1534
Wealth of Indo-China. (T.R.) 510
See also under Ores.
Mineral Wax. *See under* Wax.
Mines; Report on ——, and Statistics of —— for 1901. (T.R.) 647
Mining in British Columbia. (T.R.) 1311
In Norway. (T.R.) 1163
Industry at Wuchow (China). (T.R.) 1047
Industry of New South Wales. (T.R.) 880
Mine-Timber Preservation in Germany. (T.R.) 1257
Mirrors; Manufacture of Adherable ——. (P) Thompson. From La Société Belge. des Émaux Artistiques 347
Mitscherlich Test for Phosphorus in Presence of Alcohol. (Habermann and Oesterreicher) 189
Mixer and Heater for Gas-Burners for Stoves. (P) Bjorekner 863
Mixing Apparatus:
(P) Burdon 1019
(P) Duckworth 1224
(P) Jacobs 959
(P) Pearce 264
(P) Postranecky 1386
(P) Riotte 597
(P) Wehmeier and Banbenbis 959
Molasses: Action of Potassium Lactate in Forming ——. (Ilmer) 1189
Alcohol from; Manufacture of ——. (Bauer) 1290
Amine-Ammonia Liquor from Waste Lyes of ——. (Andrlik) 1339
Analysis of Cane ——. (Pellet) 428
Decoloration of ——. (P) Thompson. From Boot 358
Distillery; Abnormal Fermentations in the ——. (Sorel). 632
Manufacture of Cattle-Food from ——:
(P) La Société Sucrière Anon. de Doury 924
(P) Pilat and Grardel 924
Manufacture of Foods containing ——. (P) Schrader 1548
Of British Manufacture; Drawback on ——. (T.R.) 148
Purification of ——:
(P) Blachier 629, 920
(P) Kowalski and Kazakowski 921
Purification of —— by Extraction. (P) Kowalski 1033
Rapid Crystallisation of ——. (P) Delafond and Horsin-Deon 1463
Separation of —— from Massecuites. (P) Claassen 1463
Separation of Sugar from ——. (P) Claassen 1288
Spirit from; Manufacture of ——:
(Haag) 1089
(Wenck) 1289
Treatment of Waste Liquors from Desaccharifying ——. (Andrlik) 1339
Utilisation of ——. (P) Lafeuille 417
Utilising Residues from Defecation of ——. (P) Levi and others 629
Molybdenite; Deposits of —— in British Columbia. (T.R.) .. 200
Molybdenum; Analysis of Metallic ——. (Friedheim and Hoffmann) 426
In Molybdenum Steel and Ferro-Molybdenum; Volumetric Determination of ——. (Brakes) 832
In Steel; Determination of ——. (Auchy) 562
Lower Oxides; Analysis of ——. (Friedheim and Hoffmann) 426
Salts; Use of —— in Dyeing Leather. (Pozzi-Escot) 1533
Monazite; Analysis of ——. (Metzger) 1415
Deposits of Brazil; Development of ——. (T.R.) 799
In the United States. (T.R.) 936
Sand; Determination of Thorium in ——. (Benz) 563

PAGE

Mond Gas. *See under* Gas.
Monohydroxybenzophenones. (Ullmann and Goldberg)..... 1293
Monopersulphuric Acid; Action of Hydrochloric and other Acids on ——. (Wedekind)..... 1074
Mordants; Discharge for Tannic Acid ——. (Tigerstedt)..... 912
Mordanting Animal Fibres. (P) Amend..... 858
Compounds; Titanium ——. (Dreher)..... 1329
Morocco; Imports of Tangier, ——. (T.R.)..... 798
Morphia, Import Duty on, and Prohibition of Importation of —— into China. (T.R.)..... 1312
Morphigenine; Vahlen's ——. (Pschorr)..... 1094
Investigation of ——. (Vahlen)..... 1294
Morphine in Opium: Determination of ——. (Reichard)..... 1476
In Opium; Reichard's Method for Determining ——. (Schidrowitz)..... 644
In Russian Opium. (Goldberg)..... 135
Oxidation of ——. (Bougault)..... 926, 1095
Preparing Alkyl Ethers of ——. (P) Boehm. From Merck 926
Reaction for ——. (Fleury)..... 192
Relation of Chemical Constitution to Action of —— (Vahlen)..... 926
Mortars. (Class IX.)..... 52, 117, 174, 256, 409, 477, 549, 615, 707, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1233, 1279, 1331, 1395, 1455, 1535
Composition for Making ——. (P) Loewenthal..... 1233
Composition of ——. (P) Welch..... 1140
Influence of Composition and Condition on Resistance to Crushing ——. (Manzella)..... 1139
Testing the Adhesive Power of ——. (Feret)..... 256
Motors; Alcohol —— in Germany. (T.R.)..... 1420
Competition of Alcohol —— in France. (T.R.)..... 513
Mould for Glass Works. (P) Mills. From Bocuze..... 1330
Mould in Sheep's Wool; Origin of ——. (Kalmann)..... 1132
Mount Pelée; Ashes from the Eruptions of —— in 1851 and 1902. (Lacroix)..... 931
Mozambique; Oil-Nuts and Oil-Seeds Tariff of ——. (T.R.).. 200
Muffle Kilns. *See under* Kilns.
Muffles. *See under* Furnaces.
Muntz's Metal Sheathing; Effect of Sea-Water on ——. (Lewis)..... 551
Mushrooms; Extraction of Boletol from ——. (Bertrand)..... 182
Musts; Fluorine in ——. (Windisch)..... 62

N

Naphtha: Apparatus for Separating —— from Oil. (P) Edson 1032
Carriage of ——. (T.R.)..... 934
From Baku and Grosny: Decomposition Products of ——. (Charitschkow)..... 246
Grosny; Characteristics of Benzene in ——. (Markownikoff)..... 1448
Production of Baku. (T.R.)..... 569
Naphthacridines; 3′-Alkylamino-9-phenyl-1.2- ——. *See under* Dyestuffs.
Naphthalene; Cost of Extraction of ——. (Lieberknecht)... 696
1.1′-Dinitro ——. *See under* Dyestuffs.
Electrolytic Oxidation of ——. (Panchaud de Bottens)... 1237
For Heating and Motive Power; Utilising Vapours of ——. (P) Lion..... 1525
In some Essential Oils; Existence of ——. (von Soden and Rojahn)..... 1410
Naphthalenes; Halogen Dinitro ——. (Ullmann and Consonno)..... 1272
Nitro-; Reduction Products of the ——. (Wacker)..... 542
Ring Formation from peri-Derivatives of ——. (Noelting) 247
Solubility of ——. (Smith)..... 1225
See also under Dyestuffs.
Naphthofurfurane in Coal Tar. (Boes)..... 964
Naphthol, α- and β-; Distinction between ——. (Jorissen)... 1157
Derivatives. *See under* Dyestuffs.
α-Naphthochromone. *See under* Dyestuffs.
β-Naphthoquinone. *See under* Dyestuffs.
Naphthoquinones. *See under* Dyestuffs.
β-Naphthyl Hydrazones of Sugars; Isomers of ——. (von Eckenstein and Lobry de Bruyn)..... 1392
a^1-Naphthylamine-a^4-Sulphonic Acid; Mono-alphyl ——. *See* Dyestuffs.
Naphthylamine Bordeaux; Production of —— in Calico Printing. (Kayser)..... 1276
Compounds. *See under* Dyestuffs.
-a^4-Sulphonic Acid; Mono-alphyl-α ——. *See under* Dyestuffs.
Derivatives; *p*-Tolyl-α ——. (Gnehm and Rubel)..... 168
Naphthylmethane Compounds. *See under* Dyestuffs.
Naples; Perfumery and Fancy Soap Imports of ——. (T.R.). 1117
Natal; Chemical Imports of ——. (T.R.)..... 883
Indigo-Seed Industry of ——. (T.R.)..... 1111
Methylation of Spirits in ——. (T.R.)..... 654

PAGE

National Physical Laboratory; Report of Executive Committee of ——..... 430
Neat's Foot Oil. *See under* Oils.
Nebulizers. *See under* Spray-Producers.
Neodymium; Acid and Basic Sulphates of ——. (Matignon). 494
Production of Metallic ——. (Muthmann and others)..... 412
Nernst Conductors for Electric Lamps. (P) Garrard and Nernst Electric Light Co..... 398
Lamps. *See under* Lamps.
Néroli Oil. *See under* Oils.
Netherlands; Cinchona Bark Imported by the ——. (T.R.).. 654
Customs Decisions in the ——. (T.R.)..... 507
Duty on Soap in the ——. (T.R.)..... 82
Excise Duty on Salt in the ——. (T.R.)..... 509
Importation of Indigo by the ——. (T.R.)..... 648
Prohibition of Phosphorus Matches in the ——. (T.R.).. 515
Sodium Acetate and Lime Acetate Duty Free in the ——. (T.R.)..... 487
Vinegar and Acetic Acid Duty Free in the ——. (T.R.).. 1208
New Brunswick: Petroleum Industry of ——. (T.R.)..... 1310
New Caledonia: Cobalt Ore in ——. (T.R.)..... 1207
Demand for Cobalt Ore from ——. (T.R.)..... 1478
Newcastle Section: Chairman's Address to ——..... 1379
Wyoming, The Oil Field of ——. (Knight and Slosson).. 1070
New Guinea: India-Rubber and Gutta-Percha Statistics of ——. (Schlechter)..... 1358
New South Wales; Mining Industry of ——. (T.R.)..... 880
Platinum Deposits of ——. (T.R.)..... 800
New Zealand; Customs Decisions in ——. (T.R.).... 198, 508, 879
Linseed Growing in ——. (T.R.)..... 510
Potassium Carbonate Duty Free in ——. (T.R.)..... 570
Soap and Candle Manufacture in ——. (T.R.)..... 200
Tanning and Wool-Scouring in ——. (T.R.)..... 201
Nicaragua; Sugar Production of ——. (T.R.)..... 293
Nickel-Ammonium Compound; Production of a ——. (P) Frasch..... 253
Nickel and Cobalt; Modification of Rose's Method of Separating ——. (Taylor)..... 426
And Zinc; Quantitative Separation of ——. (Rosenheim and Huldschinsky)..... 141
Cause of Brown Colour of Solution obtained in Precipitating —— by Ammonium Polysulphide. (Antony and Magri)..... 429
Deposits in Russia. (T.R.)..... 570
Electrical Production of ——. (Kershaw)..... 565
Extraction of ——by Electrolysis. (Le Roy)..... 54
Extraction of —— from Ores. (P) Thofehrn and De Saint Seine..... 862
Extraction of —— from Sulphide Compounds. (P) Hoepfner..... 1081
In Nickeliferous Pyrrhotite from Sudbury. (Dixon)..... 775
Industry in the United States. (T.R.)..... 881
Melting of ——. (P) Haas..... 1281
Mining in Silesia. (T.R.)..... 292
-Plating and Polishing in Revolving Drums..... 52
Nickel Salts as Reagents for Reducing Sugars. (Duyk)..... 74
Salts; Production of ——. (P) Frasch..... 254
Nicotine; Preparations for Counteracting Effects of ——. (P) Thompson. From Siemens and Co..... 872
Nitraniline: *o*-Chloro-*p*- ——. (Cohn)..... 400
Nitranilines. *See under* Dyestuffs.
Nitrate Deposits of California. (T.R.)..... 1479
Of Soda. *See under* Sodium Nitrate.
Nitrates in Water; Determination of ——. (Trotman and Peters)..... 694
Industry in Chile. (T.R.)..... 1002, 1112
New Reaction for ——. (de Koninck)..... 873
Nitre; Oven for ——. (P) O'Brien..... 408
Nitric Acid; Action of Dilute —— on Casein. (Habermann and Ehrenfeld)..... 1158
Action of —— on Metals. (Ewart)..... 368
And Acetic Acid; Compound of ——. (Pictet and Genequand)..... 1250
And Hydrochloric Acid; Relative Strengths of ——. (Bodlander)..... 251
Apparatus for Distillation of ——. (P) Plath..... 772
Brucine Reaction for ——. (Lunge)..... 499
Manufacture of ——. (P) Ostwald..... 548
Manufacture of ——, and Apparatus. (P) Bloxam. From The Chem. Fabrik Rhenania..... 173
Production of —— from Atmospheric Nitrogen..... 1138
(P) Bradley and Lovejoy..... 1335
Nitrides, Metallic; Preparation of ——. (Guntz)..... 1476
Of the Alkaline Earth Metals; Formation of ——. (Gautier)..... 796
Nitrification; Studies in ——. (Lipman)..... 488
Nitriles; Preparation of Acid ——. (Bucherer)..... 399
See under Dyestuffs.
Nitrite; Determination of —— by Oxidation. (Waddell)..... 641
Nitrites; Preparation of ——. (Matuschek)..... 705
Nitrobenzaldehydes: Preparation of ——. (Sachs and Kempf) 541
Nitrobenzene Sulphonic Acids, *o*- and *p*-, in Alkaline Solution: Electrolytical Reduction of ——. (Elbs and Wohlfahrt)..... 1335

PAGE

Nitrocellulose and Insoluble Caseinates; Composition containing —. (P) Franquet ... 1408
Compounds; Preparation of —. (P) Browne. From Bonnaud ... 487
Denitration of —. (P) Richter ... 1038
Examination of —. (Will) ... 1555
Manufacture of Lustrous Yarns from —. (P) Bousfield. From Société Prod. Chim. de Droogenbosch ... 546
Production of —. (P) Bachrach ... 366
Researches on the Stability of —. (Will) ... 1470
Separating Solvent from —. (P) Du Pont ... 1556
Stability of —. (Will) ... 1554
The Will Test for —. (Robertson) ... 819
Nitro-Compounds, Aromatic; Influence of Cathode Material on Reduction of —. (Löb) ... 1282
Aromatic; Reactions of —. (Meisenheimer) ... 1158
Aromatic; Reduction of — to Amino-Compounds. (Elbs and Brand) ... 1334
Aromatic; Reduction of — to corresponding Amines. (P) Johnson. From Boehringer und Soehne ... 260
Separating Solvents from —. (P) Gathmann ... 1097
See under Dyestuffs.
Nitro-Explosives. *See under* Explosives.
Nitrogen, Atmospheric; Conversion of — into Ammonia. (Hoyermann) ... 106
Compounds; Manufacture of — from Atmospheric Nitrogen. (P) Bradley and Lovejoy ... 1335
Kjeldahl Apparatus for —. (Wesener) ... 639
Organic, in Waters; Determination of —. (Causse) ... 992
Oxides; Direct Reduction of — by the Contact Process. (Sabatier and Senderens) ... 1157
Oxides; Manufacture of —. (P) Ostwald ... 548
Preparation of — from Ammonium Nitrate. (Mai) ... 76
Separation of — from Gases. (P) Strong ... 345
Transformation of — into Ammonia in Treating Molasses Waste Liquors. (Andrlik) ... 1339
Nitroglycerin; Apparatus for Manufacture of —. (P) Nathan and others ... 927
Nitronaphthalenes; Reduction Products of the —. (Wacker) 542
m-Nitrophenol in Alkaline and Acid Solution; Electrochemical Reduction of —. (Klappert) ... 1334
Nitroprussides; Action of Sulphites on —. (Fages) ... 877
Nitrosocarbazole, *p*-; Preparation of —. (Schott) ... 1418
Nitrosophenol. *See under* Dyestuffs.
Nitro-sulphuric Acid; Action of — on Saturated Hydrocarbons. (Markownikeff) ... 853
Nitrous Acid; Alleged Reaction of Brucine with —. (Lunge) ... 190
Acid; Brucine Reaction for —. (Lunge) ... 499
Non-conducting Composition. (P) Francke ... 107
Coverings. (P) Michell ... 959
Material. (P) McLay ... 118
Noodles; Preparation and Properties of —. (Winton and Ogden) ... 1290
Norway; Mining in —. (T.R.) ... 1163
Pulp and Cellulose in —. (T.R.) ... 1166
Notes; Scientific and Technical —. (Class XXIV.) ... 76, 142, 195, 284, 368, 428, 504, 565, 645, 726, 795, 876, 931, 993, 1041, 1102, 1157, 1250, 1301, 1352, 1417, 1476, 1560
Notices; Official — ... 3, 91, 155, 211, 300, 379, 448, 525, 580, 663, 742, 811, 890, 949, 1012, 1063, 1124, 1175, 1216, 1265, 1320, 1363, 1430, 1487
Nut-Galls at Baghdad, Turkey. (T.R.) ... 1209
Nux Vomica, Strychnine and Brucine in; Determination of —. (Dowzard) ... 1560

O

Oak Extract in Chestnut Extract; Detection and Determination of — ... 1476
Oat-Cocoa ("Hafercacao"); Determination of Oatmeal in —. (Goske) ... 565
Oatmeal in Oat-Cocoa; Determination of —. (Goske) ... 565
Obituary Notices:
Abel, Sir Frederick ... 1175
Crowder, William ... 31
Gilbert, Sir J. Henry ... 31
Glover, John ... 595
Hartford, James ... 870
Hasenclever, Robert ... 1124
Hummel, Prof. J. J. ... 1176
Irvine, Robert ... 457
Martindale, William ... 243
Morris, George Harris ... 106
Ocean Island; Phosphates on —. (T.R.) ... 201
Octine and its Derivatives; Acids obtained from —. (P) Mouren ... 1410
Manufacture of Useful Products from —. (P) Mouren ... 188
Odours of Flowers; Dual —. (O'Brien) ... 1244
Ogden's Tobacco Factory; Visit to Messrs. — ... 954
Oils. (Class XII.) ... 55, 126, 178, 262, 355, 413, 486, 553, 624, 711, 780, 864, 917, 980, 1032, 1083, 1144, 1187, 1238, 1285, 1336, 1405, 1459, 1541
Oil and Oils:
Acetone; Manufacture of — for Denaturing Alcohol. (Bacchlin) ... 1271
Acetone; Manufacture of — from Wool Washings. (Buisine) ... 164
And Fatty Matters; Refining —, and Apparatus therefor. (P) Douillet ... 711
And Water; Apparatus for Separating —. (P) Pravicha and Douillet ... 413
Apparatus for Burning Hydrocarbon —. (P) White ... 906
Apparatus for Continuous Extraction of —. (P) Bataille ... 1460
Apparatus for Emulsifying Pharmaceutical —. (Bissenil) 1553
Apparatus for Extracting — from Exhaust Steam. (P) McDougall ... 625
Apparatus for Refining —. (P) Rocca ... 782
Apparatus for Rendering —. (P) Cameron ... 1084
Apparatus for Separating Solvents from —: (P) Erisman ... 712
(P) ... 1084
As Fuel in United States. (T.R.) ... 1045
Asphaltic; Determination of Paraffin in —. (Richardson) 690
Asphaltic Mineral —, Refining. (P) Mims ... 1528
Atlas Cedar; Composition of —. (Boisse) ... 1153
Badiana; Characteristics of Chinese —. (Tardy) ... 1347
Badiana; Preparation of Japanese —. (Tardy) ... 1346
Bergamot Leaf; Characteristics of —. (Gulli) ... 987
Bergamot; Physical Properties of —. (Moore) ... 363
Bitter Fennel; Examination of —. (Tardy) ... 1347
Body-Colour; Use of Chinese Wood Tung Oil in Manufacture of —. (Andés) ... 56
Bromine Absorption of —. (Mellhiney) ... 1542
Cajuput; Action of Air on —. (Kremers) ... 1410
Calamus; Constituents of —. (Thoms and Beckstroem) 1295
Calamus; The Calameon of —. (Thoms and Beckstroem) 1295
California Crude; Determination of Water in —. (Curtis and Tompkins) ... 1519
Camphor — as an Adulterant. (Parry) ... 1244
Camphor; Examination of —. (Dowzard) ... 1244
Camphor; Formation of — in the Tree. (Tschirch and Shirasawa) ... 1037
Camphor; Manufacture of Safrol from —. (Sugiyama) 1551
Cedrus Atlantica —. (Grimal) ... 1347
Chinese Wood —. (Henry) ... 881
Chinese Wood; Manufacture of Varnish from — ... 1404
Chinese Wood; Thickening —, and Manufacturing Resin Substitutes from —. (P) Kronstein ... 264
Cinnamon; Characteristics of Ceylon —. (Walbaum and Hüthig) ... 1095
Cinnamon; New Constituents of — ... 790
Cinnamon; Preparation of Artificial —. (Schimmel and Co.) ... 1410
Citronella; Dextro-Citronellol in Java — ... 790
Clove; Presence of Methyl-*n*-amyl-Ketone and Methyl Benzoate in — ... 791
Cod-; Analysis of —. (Trotman and Peters) ... 693
Cod; Analysis of — for Tanning Purposes. (Trotman and Peters) ... 760
Cod-Liver; Examination of —. (Utz) ... 1403
Cod-Liver; Kremel's Test for —. (Bedall) ... 1099
Coffee; Investigation of —. (Erdmann) ... 871
Convallaria Leaf; Characteristics of — ... 188
Cotton-Seed; Chemistry of Halphen's Reaction for —. (Raikow) ... 279
Cotton-Seed; Chilled —. (Pollatschek) ... 1032
Cotton-Seed — Exports from Marseilles to the United States. (T.R.) ... 200
Cotton-Seed; Extraction of —:
(P) Johnson ... 263
(P) McFarlane and Reinohl ... 918, 1084
(P) Van Winkle ... 263
Cotton-Seed — in Canada. (T.R.) ... 1003
Cotton-Seed; Investigation of Becchi's Test for —. (Gill and Dennison) ... 643
Cotton Seed; Manufacture of — in Russia. (T.R.) ... 371
Cotton-Seed; Methylation of — in Australia. (T.R.) ... 200
Cotton-Seed; Modification of Becchi's Silver Nitrate Test for —. (Tolman) ... 643
Cotton-Seed; Production of —. (Phillips) ... 1084
Cotton-Seed; Uses of —. (T.R.) ... 937
Datura; Characteristics of —. (Holde) ... 1459
Differentiation of Drying — and Marine Animal —. (Halphen) ... 74
Digester for Extraction of —. (P) Giesler ... 1543
Discovery of — at Pensacola, U.S.A. (T.R.) ... 508
Distilling of —. (P) Dubbs ... 466, 466
Essential —. (Wallach) ... 66, 1244, 1296
Essential; Determination of Methyl Anthranilate in —. (Hesse and Zeitschel) ... 1102
Essential; Examination of Commercial —. (Dowzard) 1244
Essential — in Dalmatia, Austria-Hungary. (T.R.) ... 1117
Essential — in Sicily. (T.R.) ... 1355
Essential, in Spices and Perfumery; Quantitative Determination of —. (Mann) ... 794
Essential — of Asarum Arifolium. (Miller) ... 1193
Essential — of Jasmine Flowers. (Erdmann) ... 274
Essential — of Jasmine Flowers; Composition of Artificial —. (P) Heine and Co. ... 1096
Essential, of Mustard; Determination of — in Commercial Products. (Roeser) ... 645
Essential, of Polygonum Persicaria; Constituents of —. (Horst) ... 790
Essential — of Sweet Orange Flowers. (Theulier) ... 722
Essential; Production of — in Cyprus. (T.R.) ... 1565
Essential; Tariff Modifications on — in Belgium. (T.R.) 373

PAGE

Oil and Oils—*cont.*
Ethereal, in Liqueurs; Determination of —. (Mann) .. 726
Ethereal, in Soaps; Determination of —. (Mann) 726
Eucalyptus; Characters and Constituents of New —.... 790
Eucalyptus; Examination of —. (Dowzard)..... .. 1244
Eucalyptus Macarthuri —. (Smith) 1295
Eucalyptus; Peppermint Odour in —. (Smith)..... 187
Eucalyptus; Sesquiterpene of —. (Smith)..... 363
Extraction of —:
(P) La Fayette Denton Vorce..... 1084
(P) Lundeberg..... 1238
Extraction of — from Cotton-Seed. (P) van Winkle... 263
Extraction of — from Fish, &c. (P) Edson..... 263
Extraction of — from Fish Livers. (P) Hamilton 1403
Extraction of — from Fish, and Obtaining Dried "Guano." (P) Speltie 413
Fatty, of Lindera Benzoin; Investigation of —. (Caspari) 711
Fatty; Recognition and Formation of —. (Hartwich and Uhlmann)..... 1285
Filter for —. (P) Neuray 1145
Filtering and Cleansing —. (P) Smith 1144
Fish-; Manufacture of a Tallow Substitute from —. (P) Sandberg..... 1403
For Medicinal Use; Preparation of —. (P) Lewy..... 1096
For Sulphonating; Manufacture of —. (P) Imray. From American Bye-Products Co. 711
Free Fatty Acids in —. (Schestakoff)..... 1187
From Apricot Kernels; Fatty —. (Dieterich)..... 178
From the Menhaden Fish in the United States. (T.R.) .. 572
Fuller's Earth, &c., for Treatment of —. (P) McKerrow 555
Fusel; Determination of Ethyl Alcohol in —. (Saare and Hanow) 367
Fusel, in Alcoholic Liquids; Determination of —. (Beckmann) 193
Fusel; Separation of the Amyl Alcohols of —. III. (Marckwald)..... 785
Gardenia; Properties and Composition of Essential —. (Parone)..... 1295
Gas-; Constitution of —. (Ross and Leather)..... 676
Heater, Strainer, and Separator for —. (P) Burrow ... 1227
Hydrocarbon; Apparatus for Vaporising, &c. —. (P) Tomlinson..... 462
Hydrocarbon; Purifying —. (P) Warren..... 1070
Imports of Japan in 1901. (T.R.) 1309
Imports of Salonica, Turkey. (T.R.)..... 292
In Olives; Determination of —. (Pouget)..... 1196
Industry for Queensland. (T.R.) 147
Industry in Russia. (T.R.)..... 81
Industry in Echigo (Japan). (T.R.) 1045
Iodine Values of —; Comparison of Methods for Determining. (Hunt)..... 454
Kapok-; Variation of the Mean Molecular Weight of the Fixed Fatty Acids of —. (Philippe)..... 1336
Lavender; Adulteration of — with Benzoic Acid 790
Lavender; Adulteration of — with Salicylic Acid. (Weber)..... 1244
Lavender; Examination of —. (Parry)..... 1153
Lemon; Essential —. (Schimmel) 1552
Lemon; Physical Properties of —. (Moore)..... 363
Lemon; Preparation of Artificial —. (P) Heine and Co. 1409
Linseed — at Beirut (Turkey). (T.R.)..... 1003
Linseed; Characteristics of —. (Fokin)..... 1285
Linseed; Production of — in the United States. (T.R.) 651
Lubricating —. (P) Straup 1032
Lubricating; Determining the Viscosity of —. (Zega) . 1083
Lubricating, for High-Speed Machinery; Testing Value of —..... 55
Lubricating — in Spain. (T.R.)..... 881
Lubricating; Test for "Gumming" Quality of —. (Gill) 780
Manchurian Hemp — in Russia. (T.R.) 937
Marjoram; Examination of —. (Genvresse and Chablay) 1347
Marjoram; New Ketone from —. (Genvresse and Chablay)..... 1347
Mazut; Heating Boilers with Spray of —. (P) Brunn . 1127
Method of Burning —. (P) Badger..... 698
Mineral, and their Distillates: Distillation of —. (P) McPhail..... 765
Mineral; Discoveries of — in Western Australia. (T.R.) 648
Mineral; Discovery of — in Central United States. (T.R.)..... 648
Mineral; Paraffin Wax and Lubricating Oil from —. (P) Singer and Pauli..... 1181
Mineral; Refining Crude — and their Distillates. (P) Thiele and others..... 110
Mineral; Separating Resinous Matters from —. (Daeschner)..... 168, (P) 765
Mineral; Treatment of — or their Distillates, &c. (P) Lake. From Stewart-Wallace 699
Neat's Foot, Tallow, and Horse; Analytical Values of —. (Gill and Rowe)..... 780
Neroli —, Chinese. (Umney and Bennett) 1152
Néroli Distilled in 1901; Essential Oil of —. (Jeancard and Satie) 67
Néroli; Essential Oil of —. (Schimmel's Report)..... 1552
Néroli; Portuguese —. (Theulier)..... 722
Non-Drying; Drying and Treatment of —. (P) Blakemann, jun. 981
Normal Butyl Alcohol in Corn —. (Emmerling) 419
Obtained by Destructive Distillation of Animal Matters. (Levites) 35
Of Ambrette Seeds; Fluid Essential —. (Schimmel's Report) 1552

PAGE

Oil and Oils—*cont.*
Of Asarum arifolium; Essential —. (Willer)..... 1552
„ Bystropogon Origanifolius; Essential —. (Schimmel)..... 1552
„ Cade; Investigation of —. II. (Cathelineau and Hausser) 67
„ Cade; Juniper-Wood Product Resembling —. (Kremers)..... 1410
„ Camphorosma monspeliaca; Essential —. (Cossan). 1552
„ Cinnamon; Essential —. (Schimmel)..... 1552
„ Cryptomeria japonica; Essential —. (Kimoto) 1552
„ Milfoil; Essential —. (Aubert) 1552
„ Peppermint; Italian —. (Schimmel's Report) 1552
„ Petitgrain; Essential — from Paraguay. (Schimmel's Report) 1552
„ Pseudocymopterus anisatus; Essential —. (Brandon)..... 1552
„ Rue, Essential; Constituents of an —. (Power and Lees) 1468
„ Rue, German —; Isomerisation of Methyln nylketoxime. (Honben)..... 1468
„ the Apricot-Kernel; Fatty —. (Dieterich)..... 1403
Olive; Action of Sulphuric Acid on —. (Herbig)..... 1275
Olive; Commercial Varieties and Pharmacopœial Tests of —. (Umney and Bennett) 1151
Olive — from Portugal. (T.R.)..... 510
Olive — in Andalusia in 1902. (T.R.)..... 511
Olive; Production of — in Tunis. (T.R.) 1564
Olive; Production of — in Tuscany. (T.R.) 937
Olive; Production of — in Italy. (T.R.) 1048
Olive; Treatment of — 980
Orange; Physical Properties of —. (Moore)..... 363
Oxidised; Analytical Values of —. (Lewkowitsch)..... 780
Paint-; and Manufacture of same. (P) Krebs..... 1146
Paint-; Composition of —. (P) Zingg..... 414
Petitgrain Distilled in 1901; Essential —. (Jeancard and Satie)..... 67
Petitgrain; Essential —, from Paraguay. (Schimmel's Report)..... 1552
Petitgrain; Production of — in Paraguay. (T.R.) 801
Petroleum — from Beaumont, Texas. (Hill) 1326
Petroleum Lubricating; Manufacture of — in Baku. (Ragosine) 910
Physical and Chemical Constants of Russian —. (Shukoff)..... 55
Pine-Needle; Manufacture of — 987
Production of — in District of Hamourg. (T.R.)..... 1048
Purifying and Decolorising —. (P) Arledter and Whitney. From Arledter..... 1338
Red Elderberry; Examination of —. (Byers and Hopkins)..... 1238
Refining —:
(P) Arledter..... 625
(P) Harris..... 355
(P) Rocca..... 782
Refractive Indices of certain Vegetable —. (Tolman and Munson) 1238
Regulations as to Prospecting for — in Western Australia. (T.R.)..... 508
Relation of Heat of Combustion to Specific Gravity of —. (Sherman and Snell) 624
Rosemary; Examination of —. (Dowzard)..... 1244
Rosin; Detection of — in Mineral Oil. (Halphen)..... 1474
Rosin; Determination of Mineral Oil in —. (Walker and Robertshaw)..... 1157
Rosin; Use and Production of —. (Huth and Lippert). 1336
Rue; Algerian —. (Von Soden and Henle)..... 424
Safflower; Examination of —. (Tylaikow)..... 864
Sage; New Constituent of German —. (Seyler)..... 363
Sandal; West Indian —. (Deussen) 1037
Separating Minerals by Selective Action of —. (P) Elmore..... 349
Separation of — from Waste Steam, &c. (P) Clarkson.. 625
Separation of — from Water. (P) Krause 1065
Sesamé; Detection of —. (Rauwez) 141
Sesamé, in Chocolate; Detection of —. (Utz)..... 642
Sesamé; Tests for —. (Utz) 1196
Shale; Phenols from —. (Gray)..... 845
Shale, Scottish; The Bases Contained in —. (Garrett and Smythe) 398
Solidifying and Toughening —. (P) Scammell and Muskett..... 1461
Sulphide, at Catania, Sicily; Production of —. (T.R.).. 1207
Sunflower-Seed — in the Caucasus. (T.R.) 733
Sweet, — Refining of. (P) Linde..... 355
Temperature Reaction of — with Sulphuric Acid. (Sherman and others) 564
Trade of France in 1901. (T.R.)..... 572
Train; Obtaining an Odourless Product from —. (P) Sandberg..... 413
Treatment of —:
(P) Hogarth 558
(P) Weygang 1403
Tung; Use of — in Making Body-Colour Oils. (Andés).. 56
Tung Wood; Source and Characteristics of —. (T.R.).. 1166
Turkey-Red; Analysis of —. (Herbig) 367
Turkey-Red; Characteristics of —. (Furth) 857
Turkey-Red; Manufacture of —. (Herbig)..... 1275
Vaporisation of — for Fuel Purposes. (P) Riley and Strathy..... 1127
Vegetable; Separation of — from Ground Seeds. (P) Rank and Trantom..... 412

PAGE

Oil and Oils—*cont.*
Vegetable; Treatment of Residues from ——. (P) Fresenius 1403
Vegetable —— used in Painting; Decolorising of ——. (P) Tedesco 1460
Verbena; Characteristics of ——. (Thenlier) 1468
Volatile ——; from Messina, Sicily. (T.R.) 1209
Volatile; Specific Gravities and Coefficients of Expansion for ——. (Schreiner and Downer) 274
Waste; Apparatus for Purification of ——. (P) Barratt and others 1336
Whale and Seal; Bleaching of ——. (P) Thompson. From Nielsen 262
Wijs Method of Determining the Iodine Value of ——. (Harvey) 1437
Ylang-Ylang; Production of —— in Formosa 424

Oil-Burners. *See under* Burners.
Oil-Cake, Olive; Use of —— in Cyprus. (T.R.) 1479
Ricinus ——. (Nagel) 30
Oil-containing Material; Drying of ——. (P) Haddan. From Edson 1083
Oil Field; The Newcastle, Wyoming, ——. (Knight and Slosson) 1070
Oil Fields of California. (T.R.) 1001
Of Texas. (T.R.) 934
Oil-Fuel in the United States. (T.R.) 569
Oil-Lands Concession in Persia. (T.R.) 569
Oil-Nuts and Oil-Seeds; Tariff Changes affecting —— in Mozambique. (T.R.) 200
Oil-Seed and Cake from Riga and Libau, Russia. (T.R.) 1422
Oil-Seeds at Marseilles. (T.R.) 1114
In the Trans-Caucasus, Russia. (T.R.) 81
Prices of —— at Kieff. (T.R.) 511
Oil-Shrub; Discovery of a New —— in Spain. (T.R.) 571
Ointments, Sterilised; Manufacture of ——, and Apparatus. (P) Buchelen 217
See also under Salves.
Oleaginous Substances; Press for ——. (P) Zoder and Hayne 487
Oleomargarine; Influence of Growth of Mould on Chemical Composition of ——. (Crampton) 1241
Manufacture of —— in the United States. (T.R.) 654
Olive Husks for Soap Manufacture from Syracuse, Sicily. (T.R.) 1207
Olive Oil. *See under* Oils.
Solid Fatty Acids of ——. (Holde) 126
Olives, Oil in; Determination of ——. (Pouget) 1196
Utilising the Expressed Residue of ——. (Jurgensen and Bauschlicher) 540
Ononin; Preparation and Properties of ——, (von Hemmelmayr) 637
Ontario; Peat Development in ——. (T.R.) 1309
Opium and its Preparations, Morphine in; Determination of ——. (Stoeder) 194
Morphine in; Determination of ——. (Reichard) 1476
Persian; Characteristics of ——. (Siedler) 1346
Reichard's Method for Determining Morphine in ——. (Schidrowitz) 641
Russian; Examination of ——. (Goldberg) 175
Orange Extract. (Winton and Ogden) 1295
-Flower Essence; Sweet ——. (Thenlier) 636, 722
Oil. *See under* Oils.
Orange River Colony; Trade of ——. (T.R.) 1419
Orangeite; Research on ——. (Schilling) 1293
Orcinol Derivatives. *See under* Dyestuffs.
Ores, Aluminous; Purifying ——. (P) Peniakoff 615
Antimony, containing Gold; Treatment of ——. (P) Plews 259
Antimony; Obtaining Antimony and Separating Gold from ——. (P) Butterfield 123
Antimony; Smelting of ——. (P) Cookson. From Sanderson 1457
Antimony; Treatment of ——. (P) Chatillon 1399
Apparatus for Assaying ——. (P) Armstrong 710
Apparatus for Cyaniding Talcose ——. (Stackpole) 1080
Apparatus for Electrolytical Treatment of ——. (P) Mumford 1144
Apparatus for Extracting Metal from ——. (P) Irwin ... 355
Apparatus for Lixiviating ——. (P) Naef 916
Apparatus for Roasting and Cooling ——. (P) Davis 977
Apparatus for Separating Metals from their ——. (P) Loose 1401
Briquettes of ——. (P) Ingham 163
Carbonaceous; Reduction of ——. (P) McKnight 411
Cobalt; Demand for —— from New Caledonia. (T.R.) .. 1178
Complex or Refractory; Treatment of ——. (P) Ellershausen 862, 978
Concentrates; Cyaniding —— by Percolation. (Wright) .. 1456
Concentration of ——:
(P) Haultain and Stovel 916
(P) Heys. From Boyer 1333
Concentrators. (P) Sperry 775
Containing Noble Metals; Treatment of ——. (P) Martino 1141
Containing Silica or Silicates; Treatment of ——. (P) Guirand 978

PAGE

Ores—*cont.*
Containing Sulphur and Iron; Treatment of —— (P) Chase 1281
Containing Zinc; Treatment of ——. (P) Butterfield 862
Copper; Apparatus for Treating ——:
(P) Seeman 1142
(P) Sharpneck 1141
Copper; Electrometallurgical Treatment of ——. (P) Tossizza 1336
Copper-Nickel-Sulphide; Treatment of ——. (P) Shuler 620
Copper; Recovery of Metals from ——. (P) Sebillot 1399
Cuprous Sulphide; Treatment of ——. (P) Herman 1185
Cyanide Process of Working ——. (P) Officer and others 1141
Cyaniding of Wet Crushed —— in New Zealand. (Wingate) 1456
Dalmatian Mercury ——. (Ehrmann and Shaus-Kantschieder) 501
Dry Sulphating of Certain ——. (P) Siemens and Halske. 617
Electrical Smelting of ——. (P) Stassano 1284
Electrolytic Treatment of ——. (P) Dolbear 1284
Electrometallurgic Treatment of ——. (P) Tossizza 775
Extracting Precious Metals from ——. (P) Darling 1141
Extraction of Metals from ——. (P) Keith 864
Furnaces for Smelting, &c. *See under* Furnaces.
Gold and Silver; Treatment of ——:
(P) Mudly 1333
(P) Trivick 1141
Gold —— from Washington District; Treatment of ——. (Ralston) 1079
Gold-Copper, at Santa Fé; Concentrating and Smelting ——. (P) Collins 1399
Graphite in ——. (Stillwell) 759
Iron; Apparatus for "Bricking" ——. (P) Edisen 1030
Iron; Electric Concentration of ——. (Ruthenberg) 1402
Iron; Electrical Treatment of ——. (P) Grange 1341
Iron; Moisture in Lake Superior ——. (Hulst) 1279
Iron; Treatment of ——. (P) Renard and Becker 1333
Iron; Treatment of Fine —— for Blast Furnaces. (P) Elbers 1400
Iron; Utilisation of Small ——. (Bumby) 550
Lixiviation of ——. (P) Lake. From Scheidel 775
Magnetic Concentration of ——. (Hassreidter) 1184
Magnetic Concentration of Low-Grade —— in the Electric Furnace. (Ruthenberg) 621
Magnetic Separation of Pulverised ——. (P) Spooner. From The Magnetic Ore Separation Co. 54
Manufacture of Artificial Blocks of ——. (P) Youshasheff 410
Metallic; Treatment of ——. (P) Currie 350
Nickel and Copper-Nickel; Treatment of ——. (P) Perron 1281
Of Precious Metals; Treatment of Rebellious ——. (P) Downs 1185
Platinum —— of Wyoming 709
Reduction of ——. (P) Niewerth 351
Separation of ——. (P) Fröhlich, Huth, and Edelmann ... 351
Separation of Constituents of Complex Sulphide ——. (P) Haff 709
Separators; Magnetic ——. (P) King 1399
Sulphide; Desulphurisation of ——. (P) Boult. From Carmichael 349
Sulphide; Elimination of Sulphur from ——. (P) Gutensohn 1281
Sulphide; Extracting Metals from ——. (P) Swinburne and Ashcroft 483
Sulphide; Smelting and Concentrating Unroasted ——. (P) Knudsen 123
Sulphide; Treatment of ——:
(P) Soc. La Métallurgie Nouvelle et Gin 1537
(Sulman and Picard) 975
(P) Swinburne and Ashcroft 349
Tablet for Testing —— (P) Way 1030
Telluride Gold; Treatment of ——. (P) Pethybridge. 123, 350
Tin; Analysis of ——. (Muller) 141
Treatment of ——:
(P) Best 916
(P) Borr and Spang 775
(P) McKnight 619
(P) Miller 978
(P) Wallis 481
Treatment of —— for Converting their Metals into Sulphates. (P) Abel. From Siemens and Halske Actienges 914
Treatment of Gold and Silver ——. (P) Parnell 351
Treatment of —— with Liquids or Gases or Vapours. (P) Naef 1234
Zinc, and Zinc-bearing Products; Treatment of ——. Borchers 975
Zinc —— at Dunkirk. (T.R.) 936
Zinc; Electro-metallurgical Treatment of ——. (P) Tossizza 980
Zinc; Reduction of ——. (P) Braunfels 1281
Zinc Sulphide; Treatment of Mixed ——. (P) Ferraris .. 1185
Zinc; Treatment of ——. (P) Taquet 410
Zinc-bearing —— Purification of. (P) Steinau 710
Process in the Martin Furnace; Special Modification of the ——. (Schmidhammer) 1184
Slimes; Treatment of ——. (P) Sulman and Kirkpatrick-Picard 1081
See also under Minerals.
Organic Acids from Carbonic Acid; Obtainment of ——. (P) Walther 988
Organic Chemistry, Qualitative. (Class XXIII.) 74, 141, 192, 279, 361, 427, 503, 564, 642, 725, 794, 929, 1040, 1089, 1157, 1196, 1250, 1299, 1351, 1415, 1474, 1559

PAGE

Organic—*cont.*
Chemistry, Quantitative. (Class XXIII.).... 75, 142, 193, 280, 367, 427, 503, 565, 642, 726, 794, 930, 991, 1041, 1100, 1157, 1196, 1250, 1299, 1351, 1416, 1474, 1560
Compounds, Colourless; Sensibility to Light of ——. (Pinnow) 1353
Compounds; Pyrogenetic Contact Reactions of ——. II. (Ipatiew) 567, 567
Materials; Carbonisation of ——. (P) Daube..... 1070
Matter; Destruction of —— in Testing for Arsenic, &c. (Meillière) 366
Ortho-Benzoic Sulphamide and its Salts; Concentrated Solutions of ——. (P) Porchère aine 67
Osmium: Detection of ——. (Leidié and Quinnessen) 499
Osmosis; Apparatus for ——. (P) Fuchs 1147, 1147
Osones; Preparation of —— from the Osazones of Sugars. (Fischer and Armstrong) 1302
Otto of Roses in Eastern Roumelia in 1901 ——. (T.R.) 1004
Of Rose; Purity of ——. (Parry) 561
Ovens; Coke ——:
(P) Collin 1020
(P) Fabry and Diuard 906
(P) Gates 1179
(P) Honker 1526
(P) Kennedy 1526
(P) Lewellen 1324
(P) Martin 245
(P) Nicholson and Brown 1445
(P) Rothberg 1067
(P) Simon-Carves Co. From société de Carbonisation 330
(P) Wellman 397
(P) Wilcox and Wagener 1323
Coke; By-product ——. (P) Still 1446
Coke; Making —— Tight. (P) Kuhn 1067
Nitre ——. (P) O'Brien 498
Preventing Leakage of Gas through Walls of ——. (P) Koppers 1127
Supply of Heat to ——. (P) Westinghouse. From Knox 1066
Turf Coking ——. (P) Bamme and Kahl 960
See also under Kilns.

Oxalic Acid; Formation of —— by Bacteria. (Banning) 1151
Acid in Hydrogen Peroxide; Detection and Determination of ——. (Roche) 190
Oxazine Derivatives. *See under* Dyestuffs.
Oxidation by the Electric Current. (P) Nodon and Piettre .. 1539
Processes; Pseudo-Catalytic ——. (Engler and Wöhler) . 257
Oxide of Antimony; Production of White ——. (P) St. Plews 1158
Oxides, Metallic; Action of Carbon Dioxide and Alkali Salts on ——. (Kuhling) 115
Metallic; Furnaces for Conversion of —— into Metal. (P) Fyfe 1333
Of Carbon; Hydrogenation of ——. (Sabatier and Senderens) 566
Of Tin and Lead; Manufacture of ——. (P) Lomax 624
Oxidising Agents for Destruction of Sodium Thiosulphate. (Lumière and Sevewetz) 989
Apparatus. (P) Dubois 969
Compounds; "Activating" Actions for Reducing Substances, &c., on ——. (Schaer) 1102
Enzymes; Research on ——. (Newton) 182
Oxycellulose in Calico-Printing. (Kurz) 405
In Textile Fabrics; Reduction of ——. (P) The Bleachers' Association and others 1328
Oxycelluloses: Characteristics of ——. (Nastukoff) 63
Oxygen and Hydrogen; Union of ——. (Baker) 428
Apparatus for Generating ——. (P) Kamm 1077
Bleach for Cellulose ——. (Ahlin) 134
Dissolved in Water; Titration of ——. (Wangerin and Vorlander) 1156
Gas; Pastile for Making ——. (P) Jaubert 408
Means for Rendering —— Active. (Baur) 195
Preparation of ——. (Jaubert) 614
Production of Pure ——. (P) Charlopin 1534
Retort for Generating ——. (P) Felt 971
Separating Fluids Rich in —— from Air. (P) Le Sueur.. 476
Separation of —— from Gases. (P) Strong 345
Oxy-hydrogen Gas; Use of —— in Soldering. (P) Garuti and Pompili 259
Ozone and Potassium Iodide Solutions; Reactions between ——. (Garzarolli-Thurnlach) 113
Compounds of —— with Fatty Acids, &c. (P) Weyl 637
For Sterilising Water in Germany. (T.R.) 441
Formation of ——. (de Hemptinne) 475
Influence of Voltage on Formation of ——. (Chassy) 916
Old and New Reactions of ——. (Arnold and Mentzel)... 640
Production of ——. (Ladenburg) 134
Reactions and Preparation of ——. (Arnold and Mentzel) 1297
Reagent for Detection of ——. (Chlopin) 928
Spontaneous Decomposition of ——. (Warburg) 772
Ozonic Acid. (Baeyer and Villiger) 1301
Obtainment of ——. (Bach) 1417
Ozonisers; Arrangement for Silent Discharge in ——. (P) Société Ozon-Maatzchappij 1539
Construction of ——. (P) Electric Ozone Syndicate and Smith 553
Ozonising Apparatus. (P) Vosmaer 353
Apparatus; Portable ——. (P) Goustall 1150

P

PAGE

Packeting and Filling Apparatus. (P) Lary 1125
Packing Compound for Perishable Edibles. (P) Stukes 787
Material for Articles Sensitive to Light. (P) Schwarz.... 989
Paints. (Class XIII.) 56, 127, 178, 263, 355, 414, 487, 555, 625, 712, 782, 865, 918, 981, 1084, 1145, 1188, 1238, 1285, 1337, 1403, 1460, 1543
And Dyes; Manufacture of ——. (P) Vidal 1188
Anticorrosive ——. (P) Allen and Brooke 1285
("Asol") or Protective Composition. (P) Bertrand 1146
At Beirut (Turkey). (T.R.) 1003
Apparatus for Grinding ——. (P) Cranstone 1404
Compositions for Removing ——. (P) 356
Composition for Removing ——. (P) Priestman 1084
Composition of ——:
(P) Crass 1188
(Toch) 102, 452
Paint; Composition of Fire-proof, &c. ——. (P) Lennard-Foote 1084
Distemper Wash or Water ——. (P) Cussen 1146
Drier for ——. (P) Ogilvy 782
For Bottoms of Iron and Steel Vessels. (P) Ward 56
For Iron; Preservative ——. (Andés) 178
For Renovating Furniture. (P) Tuschel 263
Improved ——. (P) Brasington 1544
Insulating ——. (P) Randolph 918
Oils. *See under* Oils.
Production of ——:
(P) Hall 918
(P) Lee 918
(P) Ogilvie 918
See also under Pigments.
Palladium; Detection of ——. (Leidié and Quinnessen) 499
Diffusion of Hydrogen through ——. (Winkelmann)..... 77
Discovery in Wyoming. (T.R.) 570
Palm-nut; Cohune —— in British Honduras. (T.R.) 1163
Pan; Super-heated Steam —— for Boiling Fat, Sugar, &c. (P) Howfield and Colliver 1085
Pancreas; Aseptic Preparation from ——. (P) Weber..... 271
Preparation, and Production thereof. (P) Weber 637
Papayotin; Digestion of Albumin by ——. (Emmerling) 421
Paper. (Class XIX.) 63, 134, 185, 271, 362, 422, 493, 559, 635, 718, 788, 870, 925, 986, 1036, 1092, 1140, 1192, 1243, 1292, 1345, 1408, 1466, 1550
And Paper-Stock, &c.; Machine for Tearing up ——. (P) Wurster 271
And Pulp Exports of Finland, Russia. (T.R.) 1257
Apparatus for Drying —— (P) Lake. From Anthony .. 1193
Apparatus for Making Compound ——. (P) Brown 635
Apparatus for Manufacture of ——:
(P) Barrett and Horne 272
(P) Boyne 1550
(P) Ehrhart 1037
(P) Mickle 719
(P) Moore and White 494
(P) Parker 271, 494, 494, 494, 1293
(P) Savery 494
Applicable for Electric Insulation. (P) Taylor 1193
Articles, Surface-Coated; United States Customs Decision on ——. (T.R.) 202
Beating Engine for Use in Manufacture of ——. (P) Savage 1345
Beating; Theory and Practice of ——. (Beadle) 1036
Carbon-; Apparatus for Manufacture of ——. (P) Crown Paper Co. 1550
Classification of Waterproof Wrapping —— in Spain. (T.R.) 1004
Colouring. (Class VI.) 114, 250, 475, 614, 705, 771, 858, 969, 1135, 1231, 1276, 1329, 1393, 1553
Colouring Mill-Boards Black 1276
Colouring of ——. (P) Schmiedel 969
Coloured; Use of Casein in Manufacture of —— 614
Fibres; Dyeing —— Ingrain. (P) Imray. From The Farb. vorm. Meister, Lucius und Bruning 114
For Platinum Toning; Collodio-Chloride —— 365
For Wrapping Metals; Freedom of —— from Chlorine and Acid. (Herzberg) 718
From Avoavo Bark in Madagascar. (T.R.) 202
Glossing of ——. (P) Cohn 1189
Grease-proof and Water-proof ——. (P) Sachsenroder ... 1193
Hand-made Printing ——; United States Customs Decision on ——. (T.R.) 442
Imported by Kossovo, Turkey. (T.R.) 84
Imports of Japan in 1901. (T.R.) 1309
In Mexico. (T.R.) 1117
Industry in Spain. (T.R.) 1208
Industry of Bohemia. (T.R.) 1117
Industry of Germany. (T.R.) 1166
Lined Sheets of; Customs Decisions on —— in Germany. (T.R.) 1044
Manufacture of ——:
(P) Lake. From Bird 1243
(P) Outerson 1093
Manufacture of —— from Waste Material. (P) Dietrich . 925
Manufacture of —— in Formosa. (T.R.) 372
Manufacture of —— in France. (T.R.) 372

PAGE

Paper—*cont.*
Marbled; Production of —. (P) Anders ... 1467
Marbling of —, and Apparatus therefor. (P) Anders ... 1150
Method and Composition for Impregnating —. (P) Back ... 493
Mills in India. (T.R.) ... 734
New Zealand Flax as Raw Material for —. (Winkler) .. 1192
Of Variable Thickness. (P) Jenks ... 925
Or Pulp-Board Making Machine. (P) Atwood ... 788
Photographic —. *See under* Photography.
Printed with Water-Colours; Rendering — Washable. (P) Sanderson and Humphrey ... 1231
Printing Colours in Graduation on —. (P) Barbountan . 341
Printing — in Canada. (T.R.) ... 442
Printing — Preparation of Coated. (P) Wezel ... 114
Refining or Pulping Engines for Manufacture of —. (P) de Pass. From Wagg ... 986
Rendering — Water-, Grease-, and Acid-proof. (P) Goessmann ... 362
Sizing of —. (P) Wurster ... 636
Sizing Preparation for —. (P) Pate ... 271
Stock; Apparatus for Treating —. (P) Mullen and Pope ... 1551
Trade of Constantinople. (T.R.) ... 514
Trade of Germany in 1901. (T.R.) ... 1052
Water- and Grease-proof —. (P) Little and others ... 362
Waterproofing of —. (P) Bird and Hanscom ... 1345
Waxed —. (P) Little and others ... 362
With Glazed Surface; Water-proof and Fat-proof. (P) Herfs ... 635
Wood-; Manufacture of —. (P) Zilles ... 494

Paper-making; Agave Fibre for — ... 185
Machines; Mixer for —. (P) Hodge ... 1409
Machine; The Fourdrinier —. (P) Moore and White .. 635
Materials; Apparatus for Sizing —. (P) Schiller ... 271
Systematic Treatment of Rags for —. (Beadle) ... 63

Paper-Mill Machinery; Blow-off Nozzle for —. (P) Baker . 870
Paper-Pulp. *See under* Pulp.
Para-chlor-*o*-aminophenol Sulphonic Acid. *See under* Dyestuffs.
Para-chlor-*o*-amino Sulphonic Acid. *See under* Dyestuffs.
Para-cresol Oxalic Ester; Preparation of —. (P) Rütgers Chem. Fab. ... 1410
Paraffin in Petroleum Residues, Asphaltic Oils, and Asphalts fluxed with Paraffin Oils; Determination of —. (Richardson) ... 690
-Wax; Production of — from Mineral Oil. (P) Singer and Pauli ... 1181
-Oil Gas. *See under* Gas; Oil-.

Paraguay; Cement Consumption in —. (T.R.) ... 649
Discovery of a New Sugar Plant in —. (T.R.) ... 293
Petitgrain Oil Production of —. (T.R.) ... 801
Raw Sugar imported by —. (T.R.) ... 882

Paramethyl-aminophenyl-glyoxylic Acid, and Manufacture of same. (P) Ach ... 1245
Paramol; A New Developer. (Jahr) ... 188
Paranitraniline Red; Coloured Resists under —. (Lauger) 472
Discharging — with Aluminium Powder. (Alt) ... 546
Sodium Sulphite as a Resist under —. (Grosheintz) ... 545
Paranitroso Derivatives. *See under* Dyestuffs.
Parchment, Vegetable; Production of — free from Germs. (P) Mackensen ... 1150
Paris Green; Manufacture of —. (P) Franchot ... 782
Parkinium; Use of — in France. (T.R.) ... 800
Pasteboard. (Class XIX.) 63, 134, 185, 271, 362, 422, 493, 559, 635, 718, 788, 870, 925, 986, 1036, 1092, 1150, 1192, 1243, 1292, 1345, 1408, 1466, 1550
And Paper; Impregnation of — with Tar, &c. (P) Walbinger ... 1243
Matrix for Stereotypes. (P) Winter. ... 636

Paste-Glue. *See under* Glue.
Pasteurisation of Liquids. (P) Clark. From Fromme ... 268
Pasteurising Apparatus:
(P) Ruff ... 923
(P) Schirmer ... 1291
(P) Busch and others ... 1348
(P) Valerius ... 869
See also under Sterilising Apparatus.

Patent-Law Amendment Bill:
(Levinstein) ... 301
(T.R.) ... 997, 1307, 1308
Deputation on the —. (T.R.) ... 433
Report on — ... 213
Text of — ... 287

Patent-Law Decision in Germany. (P) (T.R.) ... 879
Of France; Modifications of the —. (T.R.) ... 647

Patents; Amended International Convention Rules on —. (T.R.) ... 1197
In Germany. (T.R.) ... 1044
Lists of — ... 84, 148, 203, 295, 373, 442, 515, 573, 735, 802, 883, 941, 1005, 1052, 1118, 1167, 1209, 1257, 1312, 1355, 1423, 1480, 1565
Rules, 1901. (T.R.) ... 78

Pavements; Manufacture of Materials for —. (P) Wilkinson 1397
Paving Composition Asphaltic —. (P) Wilkinson and Burchinal ... 1139

PAGE

Peat; Apparatus for Preparing — for Use as Fuel. (P) Spooner ... 162
Apparatus for Producing Half-Stuff from —. (P) Esser 272
Blocks; Manufacture of —:
(P) Milne ... 330
(P) Hartmann, G. ... 330
Briquettes; Analysis of — ... 1065
Briquettes; Manufacture of —:
(P) Helbing ... 851
By Electric Power ... 1065
In Germany. (T.R.) ... 730
Calorific Power of —. (Andersson and Dillner) ... 459
Conversion of — into Fuel. (P) Green and Martin ... 851
Determining the Value of —. (Bersch) ... 1445
Development in Ontario —. (T.R.) ... 1309
For Briquettes; Treatment of —. (Kroupa) ... 395
Furnaces for Coking —. (P) Boult. From Ziegler ... 1127
Preparation of Bog — as Fuel. (P) Charon ... 1270
Press for —. (P) Milne ... 1227
Production of Gas from —. (P) Merrifield and Checkley 1021
Production of — in France. (T.R.) ... 879
Rapid Analysis of Light and Dark —. (Borntträger) ... 75
Syrup from Light-coloured; Composition of —. (Borntrager) ... 265
-Gas for Steel-making in Sweden. (T.R.) ... 1420
-Fibre Pulp; Manufacture of —. (P) Kalmann ... 422

Pectic Fermentation. (Goyaud) ... 1353
Pentane Burner; Standard — prescribed by London Gas Referees. (Clowes) ... 313
Pentosan Determination Method; Application of —. (Krober, Rimbach, and Tollens) ... 875
Pentosans; Determination of —. (Krober, Rimbael, and Tollens) ... 875
Pentoses; Determination of —. (Krober, Rimbach, and Tollens) ... 875
Pepper; Analysis of Kissi —. (Barillé) ... 984
New; from West Africa —. (T.R.) ... 1355
Peppermint Oil and Crystals in Japan. (T.R.) ... 373
Oil. *See under* Oils.
Plants; Influence of Salt on —. (Charabot and Hébert) 561
Plants; Influence of Sodium Nitrate on —. (Charabot and Hébert) ... 985
Perchlorate in Saltpetre; Determination of —. (Dupré) ... 825
Perchlorates; Electrolytic Manufacture of —. (P) Lederlin 346, 1282
Electrolytic Production of —. (P) Corbin ... 970
Perchloric and Periodic Acids —. (Astruc and Murco) ... 1352
Perfumery; Essential Oils in —. Determination of. (Mann) 794
Imports of — into Naples. (T.R.) ... 1117
Markets of Europe. (T.R.) ... 882
Perfumes; Extraction of —, and Apparatus therefor. (P) Douillet ... 711
Lecture on —. Dupont ... 1245
Periodates; Preparation of —. (Rogues and Gernegross) 1138
Periodic Acid; Preparation of Free — by Electrolysis. (Muller and Friedberger) ... 1142
Research on —. (Astruc and Murco) ... 1352
Peroxides; Function of — in Chemistry of Living Cells. (Chodat and Bach) ... 1561
Organic; Production of —. (P) Page ... 137, 1348
Peroxide Preparations; Manufacture of —. (P) Wolffenstein ... 51
Persia; Imports of Candles and Soap into —. (T.R.) ... 1311
Oil-Lands Concession in —. (T.R.) ... 569
Search for Petroleum in —. (T.R.) ... 198
Persulphates; Determination of —. (Peters and Mondy) .. 140
Determination of Alkali —. (Allard) ... 140
Electrolytic Production of —. (Muller and Friedberger) 706
Quantitative Separations by Means of —. (Dittrich and Hassel) ... 1414
Use of — as Photographic Reagents. (Marshall) ... 723
Use of — in Analysis. (Dakin) ... 848
Persulphuric Acid and its Salts; Action of Colloidal Platinum upon —. (Price) ... 343
As a Photographic Reducer ... 989
Investigation of —. (Armstrong and Lowry) ... 913
Peru; Alcohol Production of —. (T.R.) ... 882
Borate of Lime in —. (T.R.) ... 935
Coca Exports of Salaverry, —. (T.R.) ... 940
Coca Leaves from Perené, —. (T.R.) ... 1005
Exhibition of Apparatus for Use of Alcohol in —. (T.R.) ... 513
Sugar in —. (T.R.) ... 1115

Petitgrain Oil. *See under* Oils.
Petroleum. (Class III.) 35, 109, 164, 246, 335, 398, 466, 540, 607, 696, 765, 853, 909, 964, 1022, 1070, 1129, 1180, 1228, 1271, 1326, 1390, 1448, 1527
Aromatic Hydrocarbons from —. (Zelinsky) ... 166
Beaumont; Free Sulphur in — :
(Richardson and Wallace) ... 316
(Thiele) ... 1271
Beaumont; Tests of —, as Fuel. (Denton) ... 326
Composition of —. (Mabery) ... 1271
Crude — from Fergana, Turkestan. (Charitschkow) ... 699
Deposit of — in Cuba. (T.R.) ... 569
Deposits of Mexico —. (T.R.) ... 1257
Diatom Wax and its Connection with —. (Kraemer and Spilker) ... 540

PAGE

Petroleum—*cont.*
Discovery of —— in Kansas. (T.R.) 370
Discovery of —— in South Australia. (T.R.) 1160
Fractional Distillation of ——. (P) Loch 1129
From Cuba; Characteristics of ——. (Stokes) 541
From Grosny; Characteristics and Constituents of ——. (Charitschkow) 964
Galician; Investigation of ——. (Zaloziecki and Frasch) 235
Gas. *See under* Gas, Oil-.
In California; Uses of —— . (T.R.) 1000
In Germany. (T.R.) 1256
In Roumania; Production of ——. (T.R.) 1160
In Trinidad. (T.R.) 1160
Industry in Austria. (T.R.) 1420
Industry in New Brunswick. (T.R.) 1310
Influence of Water present on Flash-Point, &c., of ——. (Matuschek) 909
Italian; Examination of ——. (Balbiano) 1229
Japanese Industry in —— during 1902. (Ragosine) 1228
Oil; Apparatus for Raising ——. (Stirling) 1228
Oil Field of Beaumont, Texas. (Hill) 1228, 1326
Output in Burma, India. (T.R.) 437
Probable Existence of —— in Mexico. (T.R.) 880
Production and Imports of Java. (T.R.) 1110
Production in the United States. (T.R.) 1110
Production of Crude —— in Germany. (T.R.) 508
Production of —— in Japan. (T.R.) 559
Production of —— in N.W. Germany. (Sachse) 699
Prospecting in Mexico. (T.R.) 370
Refining of —— at Grosny, Russia. (T.R.) 731
Residues; Determination of Paraffin in ——. (Richardson) 690
Search for —— in Persia. (T.R.) 198
Spirit; Sumatra ——. (Flachs) 1022
Sulphur Content of Commercial ——. (Lecocq and Vandervoort) 1180
Synthesis of Varieties of ——. (Sabatier and Senderens) .. 853
Theory of Formation of ——. (Moissan) 335
Trade of Russia. (T.R.) 730
"White Spirit" used for Adulterating Turpentine. (Andouard) 366
See also under Asphalt, Bitumen, Oils, Naphtha, Paraffin, *and* Kerosine.

Pharmaceutical Compounds; Manufacture of ——:
(P) Newton. From The Farbenfabr. vorm. F. Bayer and Co. 1153, 1410, 1468
Specialities; Importation of —— into Turkey. (T.R.) ... 202

Phase Rule and Establishment of Equilibrium in Solid Alloys. (Rose) 53

Phenanthrene, 9-Amino-10-hydroxy ——. *See under* Dyestuffs.

Phenazin, 2.3-Dihydroxy ——. *See under* Dyestuffs, Azine.

Phenazone, Sodium Salicylate, and Magnesium Sulphate; Interaction between ——. (Woolcock) 422

Phenetidine, Acetsalicyl ——; Manufacture of ——. (P) Summers 1154

Phenetol-carbamide. *See under* Dulcine.

Phenol; Action of —— on Alcoholic Fermentation. (Knoesel) 785
Derivatives. *See under* Dyestuffs.
Sulphonic Acid, *p*-chlor-*o*- ——. *See under* Dyestuffs.

Phenols; Formaldehyde as a Reagent for ——. (Endemann) .. 74
From Shale Oil. (Gray) 845
Iodo-Derivatives of; Preparation of ——. (Richard) 423
Nitroso-, and *o*-Nitrosophenol. *See under* Dyestuffs.
Pseudo —— from Salicylaldehyde and Salicylic Acid. (Auwers and Huber) 286
Rendering —— Soluble. (P) Aktienges. für Theer- und Erdol-Industrie 63

Phenolphthalein as an Indicator for Free Alkali in Soap. (Schmatolla) 1557
Disinfectant and Purgative Preparations of ——. (P) Von Vamosey 1154
In Alcoholic Solution; Titrations with ——. (Hirsch) ... 1298

Phenolphthalin as a Reagent for Oxidising Ferments. (Kastle and Shedd) 280

Phenolsulphonic Acid; Chloro-amino ——. *See under* Dyestuffs.

Phenylacetylene and Diazoacetic Ethyl Ester. (Buchner and Lehmann) 247
See under Dyestuffs.

Phenylamine, *p*-Amino-tolyl-*p*-hydroxy ——. *See under* Dyestuffs.

Phenylcarbinol, Tetramethyldiamido-di ——; Condensation Products of ——. (Guyot and Granderyc) 466

Phenyldimethylpyrazolone; Compounds of —— with Camphoric Acid. (P) Imray, From The Farb. vorm. Meister, Lucius und Bruning 67

Phenylenediamine, 4.1.3-Nitro ——. (P) Actienges. für Anilin Fab. 402

Phenylglycine; Manufacture of ——. (P) Hentschel 1554

Phenylglycine-*o*-carboxylic Acid. *See under* Dyestuffs.

Phenylglycocoll, Acetyl-*o*-carboxylic acid. *See under* Dyestuffs.

Phonograph-Records; Coating of ——. (P) Edison 1541

Phosphates; Action of Hydrogen Peroxide on ——. (Petrenko) 645
And Fertilisers in Russia. (T.R.) 1311
At Bayonne. (T.R.) 938
Deposits of —— in the Somme, France. (T.R.) 733
Gasometric Method for Determining ——. (Riegler) 73
In Natural Waters; Significance of ——. (Woodman) ... 1242

PAGE

Phosphates—*cont.*
In Porto Rico. (T.R.) 1164
Industry in Algeria. (T.R.) 1207
Making Water-Soluble ——. (P) Cheeseman 265
Manufacture of —— at Charleston. (T.R.) 652
Market for —— in Spain. (T.R.) 372
Natural; Rendering the Phosphoric Acid in —— Soluble in Citric Acid. (P) Hoyermann 1146
Natural; Treatment of ——. (P) Cheeseman 265
Of Florida and Polynesia; Competition between ——. (T.R.) 1479
Of Rubidium and Cæsium; Properties of ——. (Von Berg) 116
On Ocean Island. (T.R.) 201

Phosphorescence of Sulphides of the Alkaline Earths. (De Visser) 565

Phosphoric Acid and Ammonia in the Beetroot; Relation between ——. (Pellet) 628
Behaviour of Lead Anodes in ——. (Fischer) 978
Citric-Soluble, in Ground Thomas Slag; Determination of ——. (Neubauer) 1415
Determination of ——. (Baxter) 1351
Determination of Citrate-Insoluble ——. (Harris) 427
In Organic Substances; Determination of ——. (Rieger) 277, 503
Per 100 of Sugar in Sugar Cane and Beetroot. (Pellet) ... 628
Production of ——. (P) Hatmaker 1533
Rendering —— available. (Baskerville) 1519
Solvent Power of ——. (Byrom) 214

Phosphorous Acid; Esterification of —— (Carré) 65
Acid; Iodometry of ——. (Rupp and Finck) 1473

Phosphorus; Detection of —— in Cases of Poisoning. (Allesandri) 640
In Iron; Rapid Determination of ——. (Ramorine) 641
In Ironworks' Products; Determination of ——. (Antony) 71
In Presence of Alcohol; the Mitscherlich Test for ——. (Habermann and Oesterreicher) 189
In Shot or Chilled Iron; Effect of Annealing on Determination of ——. (Manby) 873
Industry of Lyons, France. (T.R.) 1311
Research on Red ——. (Schenck) 368
Separation of —— in the Martin Furnace. (Ramorine) ... 1233

Phosphorus Sesquisulphide; Behaviour of —— with Mitscherlich's Test. (Clayton) 1012
Suboxide; Preparation of ——. (Browning) 68
Trihalides; Iodometry of ——. (Rupp and Finck) 1473

Photo-Chemical Reactions. (Goldberg) 1095

Photo-Etching, and Preparing Surfaces for same. (P) Thibodo and Peckinpaugh 1165

Photographic Action; the Strain Theory of ——. (Bose) 988
Blue-Printing Apparatus. (P) Whinery 1349
Blue-Print Paper; Duty on ——. (T.R.) 84
Chemicals; Progress in Preparation and Use of ——. (Eder and Valenta) 1348
Decoration; Vitrifiable ——. (P) Crabtree and Mason ... 1245
Developers:
(P) Damgaard 1554
(P) Eichengrun 1349
(P) Newton. From The Farb. vorm. F. Bayer and Co. 723, 872, 872
(P) Société des Produits F. Bayer and Co. 68
Developer; Amido-Oxybenzyl Compound as a ——. (P) Eichengrün and Demeler 639
Developer; "Diphenyl" as a ——. (Graves) 638
Developers for Incorrect Exposure. (Lüppo-Cramer) 365
Developer for Silver Chloride Gelatin. (P) Liesegang 137
Developers; Action of Oxidation Products of ——. (Lüppo-Cramer) 365
Developers, Paramel; Examination of ——. (Jahr) 188
Developer Stable in the Dry State. (P) Abel. From The Actienges. fur Anilin Fab. 365, 872
Fabric, and Preparation of same. (P) Grenier 873
Film; Casein ——. (P) Buss 1155
Films; Developing, Fixing, and Toning ——. (P) Haddon. From Elsner and Latta 276
Films; Gelatin ——. (P) Boult. From Freelandt 1097
Films; Manufacture of Celluloid-like Substances for ——. Newton. From The Farben. vorm. F. Bayer and Co... 1469
Films; Preparation of ——. (P) Soc. Anon. F. Bayer and Co. 873
Fixing Bath. (P) Bayer and Co. 1554
Flash-light Lamp. (P) Zweck 497
Half-Tones in Printing and Lithography. (P) Vilim and Hauser 1296
Image; Constitution of the Latent ——. (Lüppo-Cramer) 138
Image intensified with Mercury and Sodium Sulphite. (Hauberisser) 638
Image; Luppo Cramer's Experiments on the Latent ——. 189
Images; Production of ——. (P) Korn 989
Image; Reversal of the ——. (Wilbert) 638
Intensification; Mercurial ——. (Chesterman) 723
Paper. (P) La Soc. Derepas Frères 1296
Paper, Blue-Print; Duty on ——. (T.R.) 84
Paper; Manufacture of —— in Alsace. (Wehrlin and others) 1038
Papers; Toning Bromide and Chloro-Bromide ——. (Baker) 1195
Printing Paper:
(P) Berges 139
(P) Buss 139
Pictures; Development of ——:
(P) Eichengrün and Demeler 873
(P) Newton. From The Farbenfabriken vorm. F. Bayer and Co. 872

PAGE

Photographic—*cont.*
Pictures; Printing Surfaces for ——. (P) Huck and Fischer 1554
Pictures; Production of Coloured ——. (P) Kuny 365
Plates and Films; Devices for Testing ——. (P) Shepherd and Jones 497
Plates and Papers. (P) Buss 139
Plates; Application of Colours to ——. (P) Perria 1455
Plates; Development of —— in Daylight. (P) Ludwig 639
Plates for Ink Impressions. (P) Henriot 68
Plates for Bichromated Gelatin Processes. (P) Leuchter 1195
Plate for Reproducing Ink Impressions. (P) Henriot 1154
Plates; Obscure Causes of Fogginess 189
Plates or Papers; Manufacture of ——. (P) Newton. From Farbenfabriken vorm. F. Bayer and Co. 1411
Plates; Preparation of ——. (P) Ahrle and The Metalline Platten Ges. 1038
Plates; Preparation of Gelatino-Bromide ——, sensitive to Red. (Burbank) 1245
Plates; Reducer for Over-Exposed ——. (P) Krueger 1554
Printing Emulsions; Silver Chloride ——. (P) Luttke 425
Printing Papers. (P) Berges 139
Printing; Surfaces for ——. (P) Duffek 365
Prints; Apparatus for Producing —— by Artificial Light. (P) Varry 989
Prints; Fading of Silver-Chloride-Citrate ——. (Lumiere and Seyewetz) 1469
Prints; Obtainment of ——. (P) Abel. From The Actienges. fur Anilin Fab. 366
Prints, Polychromatic ——. (P) Vathis 1412
Prints; Production of Multicoloured ——. (P) Vathis 723
"Reducer"; Ammonium Persulphate —— 791
Reducer for Over-exposed Photographic Plates. (P) Krieger 1554
Reproduction of Plastic Subjects. (P) Baese 1469
Roll-films; Coverings for ——. (P) Abel. From The Actienges. fur Anilin Fab. 1195
Sensitised Material, and Manufacture of same. (P) Mies and Cobenzl 1554
Sensitisers for Gelatino-Bromide. (Valenta) 638
Silver Images bleached by Corrosive Sublimate; Blackening of —— by Sodium Sulphite Solution. (Valenta) 1469
Tone Printing Plates; Manufacture of ——. (P) Schreiber 1469
Toning Baths. (Novak) 276
Photographs; Application of Metallic Coating to ——. (P) Ahrle and others 139
Colour Filters for Taking ——. (P) Bauermeister 1038
Colour; Production of ——. (P) Boult. From The Miley Colour Photograph Co. 1411
Enamelled Polychrome ——. (P) Perrin 1245
Flashlight; Apparatus for Producing ——. (P) Nichols .. 1245
In Natural Colours; Production of ——. (P) Szczepanik 1097
Platinotypes (Sepia) by Cold Development. (von Hubl) . 68
Toning —— with Lead Thionates. (Lumière and Seyewetz) 1469
Photography. (Class XXI.) 68, 137, 188, 275, 365, 424, 497, 561, 638, 723, 791, 872, 926, 988, 1038, 1097, 1154, 1195, 1245, 1296, 1348, 1469, 1554
Albuminised Paper Printing; Essentials of Success in ——. (Harris) 188
Applied to Engraving Rollers for Calico-Printing. (Dépierre) 47
Baths for use in ——. (P) Hitz 561
Blue-Print and Black-Print Papers for ——, and their Preparation. (Cohn) 582
Collodio-Chloride Paper for Platinum Toning 365
Colour ——. (Worel) 1097
Flashlight Cartridge for ——. (P) Krebs. From "Photochemische Fabrik Helios" 1348
Flashlight Machine for ——. (P) Bigelow 639
Lumière Process of Colour —— 275
Mercurie Thiocyanate; Intensification with ——. (Hauberrisser) 424
Printing Out Process; Theory of the ——. (Luppo-Cramer) 138
Production of Flash Lights for ——. (P) Newton. From Farb. vorm. F. Bayer and Co. 792
Progress in ——. (Granger) 988
Sepia Platinum Paper, with Cold Development. (von Hübl) 138
Solarisation-like Phenomena in ——. (Luppo-Cramer) ... 1411
Theory of the Combined Toning and Fixing Bath. (Lumière and Seyewetz) 561
Use of Acetone Sulphite in ——. (Weintraub) 1154
Phototometer; New ——. (P) Carter 334
New Table —— Prescribed by London Gas Referees. (Clowes) 313
Phototropy; Investigations on ——. (Biltz) 1348
Phthaleines. *See under* Dyestuffs.
Phthalic Acid; Manufacture of ——:
(P) Bischler 988
(P) Fabrique Baloise de Produits Chemiques 137
Phytosterol in Fats; Quantitative Determination of ——. (Ritter) 643
And Cholesterol in Mixtures; Separation of ——. (Marcusson) 725
Pickling and Swilling Apparatus, (P) Phillips 1235
Metals; Utilising Waste Products from . (Peyton) .. 976
-Liquids; Effect of —— on Sewage Treatment. (Eddy) .. 534
Picramic Acid. *See under* Dyestuffs.
Manufacture of ——. (P) Wenghöffer 68
Solubility of ——. (Findlay) 1043

PAGE

Pig-Iron. *See under* Iron.
Pigments. (Class XIII.) 56, 127, 178, 263, 355, 414, 487, 555, 625, 712, 782, 865, 918, 981, 1032, 1084, 1145, 1188, 1238, 1285, 1337, 1403, 1460, 1543
Pigments, and Manufacture thereof. (P) Jacobs 263
Composition for Use as a White ——. (P) Mills. From The International Chemical Co. 356
Composition of ——. (Toch) 102, 452
Ferric Oxide —— Stained with various Dyestuffs. (P) Smith 1238
Fixing —— with Oily Compounds, &c. (P) Société Anglische Wollenwaaren-Manufaktur 704
From Ferrous Liquors; Production of ——. (P) Ramage 263
Iron Oxide for use as ——. (P) Rock 178
Manufacture of Composite ——. (P) Thilmany 56
Metallic; Manufacture of ——. (P) Charlier 1285
Printing Tissues with ——. (P) Lilienfeld 771
Production of Black and Dark Carbonaceous ——. (P) Ogilvie 1460
White —— from Barium Sulphate. (P) Vreeland 263, 264
White, from Zinc; Manufacture of ——. (P) Lones and Holden 555
White Sulphate of Lead ——. (P) Hannay 356
See also under Paints.
Pilocarpine; Preparation of ——. (Pinner and Schwarz) 272
Pineapple Beverage. (P) Perida 634
Bromiline from ——; Properties of 1347
Pinene; Action of Crystallised Arsenic Acid on —— (Genvresse) 424
Derivatives of ——. (Tilden and Burrows) 1087
Derivatives; Production of ——. (P) Mills. From The Ampère Electro Chem. Co. (P) 722
Lævo-. (Balbiano and Paolini) 1293
Pine-Needle Oil. *See under* Oils.
Pipes; Treatment of ——, and Apparatus therefor. (P) Torkington. From Knigbt 1397
Pitch; Boiler for ——. (P) Boult. From Baumann 1139
Causes of Greyness in Cask Brewers' ——. (Wrana) 868
Imports of —— into Dantzig, Germany. (T.R.) 1202
Imports of La Rochelle. (T.R.) 934
Trade of Hamburg. (T.R.) 1045
Plant, General. (Class I.) 32, 107, 243, 326, 394, 458, 538, 596, 695, 760, 850, 904, 959, 1019, 1064, 1125, 1177, 1224, 1267, 1322, 1386, 1444, 1523
Plants; Amino-Acids as Foods for the Lower ——. (Emmerling) 996
Aromatic; Production of Wood-Charcoal from ——. (P) Rubauds 1466
Cyanogenesis in ——. (Dunstan and Henry) 996
Esterification in ——. (Charabot and Hébert) 136
For Dyeing, in Annam. (T.R.) 870
Simultaneous Occurrence of Araban and Xylan in ——. (Browne and Tolleos) 728
Sulphur in ——; Determination of. (Frapps) 642
Plaster; Composition for Use as ——. (P) Oehs 1079
Composition of Fire-proof ——. (P) Harris and Barrick 1233, 1233
Elastic ——. (P) Carter 550
For Walls and Ceilings; Elastic ——. (P) Carter 257
Plaster-of-Paris; Indurating ——. (P) Broodsky 708
Treatment of ——. (P) Hindshaw 1079
See also under Gypsum, Calcium Sulphate, *and* Sulphate of Lime.
Plastics; Apparatus for Mixing ——. (P) Pearce 264
Plastic Articles; Production of ——. (P) Lottier 1338
Compositions, Apparatus for Mixing ——. (P) Pearce ... 1188
Composition for Woodwork, Walls, &c. (P) Clausen-Kaas 707
Compositions; Apparatus for Manufacture of ——. (P) Boult. From Lehmann 487
Compound, and Manufacture of same. (P) Randolph. 782, 916
Compounds; Production of ——. (P) Luft 1085
Materials; Apparatus for Moulding ——. (P) Borrowe and Lumley 348
Plates; Apparatus for Treating and Tinning ——. (P) Phillips 1235
For Lithographic Printing; Preparation of —. (P) Strecker 1135
For Photography. *See under* Photographic.
Plate-Cooling Apparatus; Theory and Practice of Parobek's ——. (Schartler) 1444
Platin-iridium as a Material for Anodes. (Foerster) 484
Platinum; Action of Colloidal —— on Persulphuric Acid and its Salts. (Price) 343
And its Associated Metals; Notes on ——. (Kemp) 709
Composition of Brittle ——. (Hartley) 349
Deposition of —— on Aluminium Apparatus. (Gawalowski) 1472
Deposits of New South Wales. (T.R.) 800
Detection of ——. (Leidié and Quinnessen) 499
Discovery of —— in Wyoming. (T.R.) 200, 570
Group; Disintegration and Recrystallisation of Metals of the ——. (Holborn and Henning) 1332
In the Cauca, Colombia. (T.R.) 510
In the Urals. (T.R.) 510
Metals; Identification of ——. (Leidié and Quennessen) 640
Micro-crystalline Structure of. (Andrews) 551
Mining in British Columbia. (T.R.) 799
Occurrence of —— in British Columbia. (T.R) 146
Ores of Wyoming 709

PAGE

Platinum—*cont.*
Process; Use of Glycerin in the ——. (Rapp) ... 68
Recrystallisation of ——. (Rosenhain) ... 1042
Plugs; Danger of Infection from Wooden ——. (Lindner) ... 868
Plumbago Mining in Ceylon. (T.R.) ... 80
Mining in Travancore. (T.R.) ... 80
Poison, Arrow —— from German East Africa. (Brieger and Diesselhorst) ... 1094
Poisons; Ordinance on —— in Ceylon. (T.R.) ... 514
Polish for Leather, Linoleum, &c. (P) Loreuz ... 414
Polygonum Persicaria; Characteristics of ——. (Hurst) ... 66
Polyhalogen Compounds of the Alkaline Earths. (Meyer) ... 720
Porcelain, Glazes for; Analysis of ——. (de Luynes) ... 426
Iron Spots in —— ... 174
See also under China, Pottery, and Ceramics.
Portland Cement. *See under* Cement.
Porto Rico; Phosphates in ——. (T.R.) ... 1164
Portugal; Arsenic Production in ——. (T.R.) ... 509
Mineral Exports of ——. (T.R.) ... 510
Olive Oil from ——. (T.R.) ... 510
Potash, Caustic:
Electrolysis of Molten ——. (Le Blanc and Brode) .. 1235, 1401
Imports of —— by Messina, Sicily. (T.R.) ... 1205
in Hamburg. (T.R.) ... 1046
Industry; Disposal of Waste Liquors from the ——. (Przibylla) ... 251
Industry of Germany. (T.R.) ... 1046, 1310
Salts Industry in Germany. (T.R.) ... 1161
See also under Alkali.
Potassium Ammonium Chromate. (Pretzl) ... 638
Carbonate in New Zealand Duty Free. (T.R.) ... 570
Chlorate; Explosion of —— by Heat. (Dupre) ... 217
Cyanate; Production of ——. (P) Zuckschwerdt ... 1278
Cyanide and Cuprous Sulpho-Cyanide; Interaction of ——. (Itzig) ... 286
Cyanide; Composition of Commercial ——. (Moore) ... 302
Cyanide; Poisoning by ——. (T.R.) ... 935
Cyanide; Production of Anhydrous ——. (P) Thompson. From Chem. Fab. vorm. Vorster and Grunenberg ... 253
Cyanide; Purification of ——. (P) Johnson. From the Chem. Fabrik vorm. Vorster and Grunenberg ... 176
Determination of —— as Pyrosulphate. (Browning) ... 71
Ferrocyanide in Spent Gas-Purifying Material. (Bernheimer and Schiff) ... 500
Ferrocyanide; Titration of ——. (Gruetzner) ... 426
Hydride; Preparation of ——. (Moissan) ... 285
Iodide Solutions and Ozone; Reactions between ——. (Garzarolli-Thurnlach) ... 143
Lactate; Action of —— in forming Molasses. (Ilmer) ... 1189
Magnesium Carbonate; Production of ——. (P) Precht. 117
Nitrate Imports of Germany. (T.R.) ... 1046
Percarbonate as a Substitute for Hydrogen Peroxide in Analysis. (Treadwell) ... 72
Permanganate; Determination of Copper with ——. (Guess) ... 1247
Permanganate Solution; Standardisation of ——. (Thiele and Deckert) ... 140
Permanganate; Titration of ——. (Rust) ... 1473
Persulphate and Phosphorous Acid; Reaction between ——. (Federlin) ... 1417
Quantitative Determination of ——. (Reichard) ... 140
Sulphocyanide; Double Compounds of Bismuth Sulphocyanide with ——. (Vanino and Hauser) ... 66
Thiocyanate as an Indicator in Reduction of Ferric Oxide. (de Koninck) ... 71
Potassium-Tungsten Bronze. (von Knorre and Schafer) ... 1403
Potato Products at Hamburg. (T.R.) ... 1050
Spirit; Production of Germany. (T.R.) ... 513
Potatoes; Manufacture of Flour from Sweet ——. (P) Straus 633
Pottery. (Class VIII.) ... 52, 117, 174, 255, 347, 408, 477, 549, 615, 706, 773, 859, 914, 971, 1027, 1077, 1139, 1183, 1232, 1278, 1330, 1395, 1454, 1534
Biscuit Bodies for ——. (Hegemann) ... 477, 859
Fusible Tell-tales for Use in Staking ——. (Salt) ... 255
Glazes; Crimson ——. (Jones) ... 1454
Glaze; Formation of Sediment in ——. (Heim) ... 1278
Gazes; Lead —— with Golden-Yellow Sheen. (Thiriot) ... 1232
Old Egyptian Ware of Unusual Composition. (Berthelot) 1139
Photographic Decoration on ——. (P) Crabtree and Mason ... 1245
Vaporous Method of Glazing ——. (Rix) ... 1454
See also China, Earthenware, *and* Porcelain.
Powders; Apparatus for Drying ——. (P) Croizier and Thomme ... 1178
Apparatus for Granulating ——. (P) Newton. From Laflin and Rand Powder Co. ... 1155
Apparatus for Packeting and Filling ——. (P) Lary ... 1125
Drying Smokeless ——. (P) Gathmann ... 1097
Explosive; Manufacture of ——. (P) Lake. From The Eastern Powder Co. ... 189
Manufacture of Smokeless ——. (P) Hengst ... 1155
Manufacture of Smokeless —— in Mexico. (T.R.) ... 203
Semi-smokeless ——. (P) Stire ... 366
Stability Tests for Smokeless ——. (Aspinwall) ... 687
Praseodymium; Acid and Basic Sulphates of ——. (Matignon) ... 494
Precipitates; Formation of Difficultly Soluble —— by Electrolysis. (Le Blanc and Binuschedler) ... 776

PAGE

Preservatives; Manufacture of —— in the United States. (T.R.) ... 654
President; Address to Annual General Meeting by the —— ... 893
Press for Beetroot Slices. (P) Neumann ... 921
For Linoleum. (P) Scott ... 625
For Oleaginous Substances. (P) Zoder and Hayne ... 487
For Wood-Pulp. (P) Hughes ... 362
Presses; Swinging Table for Hydraulic ——. (P) Wilkes ... 1286
Pressing Apparatus. (P) Menzies ... 868
Pressure Regulator for Vacuum Distillations. (Burstyn) ... 640
Prickly Pear; Alcoholic Fermentation of Juice of ——. (Ulpiani and Sarcoli) ... 1288
Priming Caps; Manufacture of ——. (P) Tirmann ... 562
Compositions for Detonators, &c. (P) Bielefeldt ... 1246
Primuline and Similar Colours; Developing Diazotised ——. (Mayer) ... 46
Red; Dyeing Reserve Effects on ——. (Kayser) ... 770
Printing Apparatus for Carpets and Mats. (P) Lundeberg ... 474
Apparatus for Carpets and Linoleums. (P) Wrightson ... 1133
Apparatus for Textiles. (P) Calico Printers' Association and Higginbotham ... 857
Apparatus for Warp Yarns. (P) Schmidt ... 1132
Colour for Lithographic or Metallographic Printing. (P) Adelsberger and Friedmann ... 1337
Dyestuffs on Vegetable Fibres. (P) Badische Anilin und Soda Fabrik ... 342
With Sulphur Dyestuffs:
(Fischer) ... 857
(P) Voetter ... 1231
(P) Weiss ... 1533
Proceedings of the Twenty-First Annual Meeting ... 949
Producer Gas. *See under* Gas.
Projectiles for Illuminating or Signalling. (P) Boult. From The Marine Torch Co. ... 139
Hardening ——. (P) Hadfield ... 1296
Production of ——. (P) Hadfield ... 410
Production of Hardened Steel ——. (P) Hadfield ... 410
Protective Coating for Surgeons' Hands. (P) Efrem ... 1469
Proteids; Separation of —— from Non-Nitrogenous Bodies. (P) Carstairs ... 1549
Protein Bodies; Sulphur in ——. (Osborne) ... 505
Digestibility of ——. (Jolles) ... 132
Food Preparations from Vegetable ——. (Wintgen) ... 633
Molecule; Basic Character of the ——. (Osborne) ... 420
Substances; Action of Nascent Chlorine on ——. (Ehrenfeld) ... 646
Protopine; Characteristics of ——. (Schlotterbeck and Watkins) ... 274
Prud'homme's Aniline Black; Reserves on ——. (Binder and Frossard) ... 1453
Prussian Blue in Spent Gas purifying Materials. (Schwartz) 1249
Blue in Spent Oxide; Determination of ——. (Luhrig) .. 1415
Blue; Production of ——. (P) Sauer ... 1543
Blue, Soluble in Water; Preparation of a ——. (P) Matuschek ... 355
Blue; Solubility of ——. (Wyrouboff) ... 1337
Blue; Solubility of —— under certain Conditions. (Coffignier) ... 1052
Pseudo-Catalytic Oxidation Processes. (Engler and Wohler). 257
Pseudo-ionone Compound and its Transformations. (P) De Laire and Co. ... 68
Pseudocymopterus anisatus Oil. *See under* Oils.
Pseudophenols from Salicylaldehyde and Salicylic Acid. (Auwers and Huber) ... 286
Pseudosulphocyanogen; Obtainment of ——. (Goldberg) ... 110
Pulp and Cellulose in Norway ——. (T.R.) ... 1166
Apparatus for Separating ——. (P) McLaughlin ... 1150
Apparatus for Washing ——. (P) Hinzke ... 986
Exports of Finland, Russia. (T.R.) ... 1257
Paper; Apparatus for Forming —— into Sheets. (P) Parker ... 870
Paper; Apparatus for Making ——. (P) Parker ... 494
Paper; Apparatus for Purifying ——. (P) Aberg ... 272
Paper; Apparatus for Screening ——:
(P) Sharpe ... 494
(P) Vrooman and Kirkland ... 271, 1036
(P) White ... 493
Paper; Bleaching of ——:
(Ahlin) ... 718
(P) Long ... 986, 1092
Paper —— from Crude Plants. (P) Berget ... 64
Paper; Production of —— in Canada. (T.R.) ... 84
Paper-; Utilising Broom for Manufacture of ——. (P) Persichetti ... 1467
Peat-Fibre ——; Manufacture of ——. (P) Kalmann ... 422
Reducing Fibrous Material to ——. (P) Lee ... 1092
Wood- and Paper- in Maine, United States. (T.R.) ... 514
Wood-; Apparatus for Separating Chips in Manufacture of ——. (P) Burges ... 494
Wood-; Colour Reaction for ——:
(Hertkorn) ... 1041
(Kaiser) ... 725
Wood-; Determination of Moisture in ——. (Hofmann) . 502
Wood-; Forming —— into Sheets. (P) Hughes ... 362
Wood-; From Gothenburg, Sweden. (T.R.) ... 1208
Wood-; Moisture Tests of ——. (Lester) ... 380
Wood-; Press for ——. (P) Hughes ... 362
Wood; Sampling and Estimating Moisture of ——. (Thorner) ... 641

PAGE
Pulping Machine. (P) Wurster 271
Pulp-Beating Engine. (P) Jones 635
Pulp-Board making Machine. (P) Atwood 788
Pulp-Refining Engine. (P) Clark 635
Pulp-Screen. (P) Moore 635
Centrifugal ——. (P) Barker and Sheolin 362
Pulverising Apparatus. (P) Steuart 904
See also under Crushing *and* Grinding.
Pumico Stone at Leghorn. (T.R.) 935
Pumps; Automatic Gas ——. (P) Rulf 539
For Compressing Gases or Vapours. (P) Murray 326
For Handling Heavy Oils. (P) Sterrett 625
Vacuum ——. (P) Verschoore 905
Puncture-proof Strips of Elastic Material. (P) Belledin 1189
Purgative Preparation. (P) Von Vamosey 1154
Pyknometer. (Leimbach) 1557
Pyrazole Derivatives. *See under* Dyestuffs.
Pyrazolone-3-acetic Acid; Preparation of ——. (Hufferath) .. 66
Pyrazolone; Phenyldimethyl- and Dimethylamidodimethylphenyl-, Compounds of —— with Camphoric Acid 67
Pyrazolonephenyldimethylsalicylate; Preparation of ——. (Tei.) 272
Pyrites at Bayonne. (T.R.) 938
In the United States. (T.R.) 1204
Sulphur in ——, Determination of. (Reitlinger) 1298
Pyrogenetic Contact Reactions of Organic Compounds. II. (Ipatiew) 567, 567
Pyrometer: Recording Apparatus for Roberts Austen Electrical. (Lewis) 844
Pyrometers; Gas ——. (P) Hatfield 326
Pyronine, Thio ——. *See under* Dyestuffs.
Pyrophosphoric Acid; Acidity of ——. (Giran) 969
Pyrotechnic Compound:
(P) Delgrande 366
(P) Eichengrün 1349
Pyroxylin Compound:
(P) Bonnaud 625
(P) Kitsee 925
(P) Zuhl 870

Q

Quarries; Report on —— and Statistics of —— for 1901. (T.R.) 647
Quartzite; Use of S. Russian for making Dinas Brick. (Rosenberg) 117
Queensland; Mineral Production of ——. (T.R.) 1113
Sugar Industry of ——. (T.R.) 1004
Quillaya Bark; Swiss Customs Decisions on ——. (T.R.) 511
Or Soap-bark Siftings; U.S. Customs Decision on ——. (T.R.) 437
Quinate; Hexamethylenetetramine ——. (P) Wichmann and Gabler 275
Urea ——. (P) Schütz and Dallmann 275
Quinine, Acetyl; Manufacture of ——. (P) Chem. Fab. von Heyden 1294
Aristo-. (Dresser) 789
Camphorate; Composition of ——. (Joyce) 636
Camphorate; Preparation of ——. (P) Lorimer and Joyce 1096
Hydrochloride; Manufacture of Cinnamyl ——. (P) Fuchs 364
In Java. (T.R.) 1118
Oxidation of —— by Chromic Acid. (Goldberg) 1095
Salicyl-: Salicylate of ——. (P) Throw 722
Salicylic Ether. (P) Hofmann 275
-Tree, South African; Investigation of Bark of ——. (Juritz) 1294
Quinoline, 5-nitro-8-methoxy ——. *See under* Dyestuffs.
Quinizarin. *See under* Dyestuffs.

R

Racking; Apparatus for ——. (P) Beebe 1343
Radio-active Emanation from Thorium Compounds. (Rutherford and Soddy) 196
Substances. (Hofmann and Strauss) 143
Substances; Experiments on ——. (Giesel) 76
Substances; Influence of —— on Luminescence of Gases. (De Hemptinne) 143
Substances. I. Radio-Active Lead. (Hofmann and others) 726
PAGE
Radio-Activity: Cause and Nature of ——. II. (Rutherford and Soddy) 795
Induced —— caused by Radium Salts. (Curie and Debierne) 142
Radium Studies on ——. (Berthelot) 143
Raffinose; Determination of ——. (Reinhardt) 504
Rafia Fibre for Paper-making in Madagascar. (T.R.) 940
Rags for Paper-making; Systematic Chemical Treatment of ——. (Beadle) 63
Rails, steel, and Plate; Influence of Copper on ——. (Genzmer) 119
Studies on the Manufacture of ——. (Le Chatelier) 1331
Ramie Fibre; Importance of —— in India-Rubber Industry .. 249
Method of Retting ——. (P) Depetro 1183
Rape-seed in Wuhu, China. (T.R.) 881
Rare Earths; Production of ——. (Bohm) 719
Rays, Becquerel, and Radio-active Substances. (Giesel) 1157
Receiver for Fractional Distillation. (Palomaa) 724
Recording Apparatus for Roberts Austen Electrical Pyrometer. (Lewis) 844
Red-lead; Furnace for Production of ——. (P) Gabel and Kearns 356
Technical Analysis of ——. (Szterkbers) 1156
Reducers. *See under* Photographic.
Reducing-sugars; Nickel Salts as Reagents for ——. (Duyk) 74
Reduction; Cathodic ——. (Weightman) 1538
Refractory Material; Manufacture of Bricks from ——. (P) Jacobs 1397
Refrigerating Apparatus:
(P) Condict 1126
(P) Windhausen 760
Apparatus: Absorber for ——. (P) Osenbruck 1224
Apparatus; Ammonia and like Compression ——. (P) Elsner and Knox 394
Apparatus and Process. (P) Bloume 760
Apparatus; Still for Absorption ——. (P) Condict 1126
Refrigeration, and Apparatus therefor:
(P) Brothers 241
(P) Justice. From The Dry Air Refrigerator Company 458
Refuse; Conversion of —— into Fuel, Artificial Manure, &c. (P) Jones 634
Furnace for Destroying ——:
(P) Marks. From La Comp. de Travaux Sanitaires 361
(P) Willshear and Amos 361
Quick Removal of Town ——, and Conversion into Manure. (P) Sefton-Jones. From Soc. des Engrais Complets .. 361
Town; Disposal of —— in Great Britain. (Goodrich) 1465
Regenerative Furnaces. *See under* Furnaces.
Regulator; Automatic Oil and Air ——. (P) Parfitt 462
Reichard's Method for Determining Morphine in Opium. (Schidrowitz) 644
Rendering and Drying Apparatus. (P) Glatz 782
Rendering Apparatus:
(P) Edson 262, 1238
(P) Stanley 712
(P) Turner 1238
Tank; Lard ——. (P) Marshall 263
Report of Committee on Acetylene Generators 538
Of Committee on Analysis of Materials for Portland Cement Industry 12
„ Council 981
„ Executive Committee of National Physical Laboratory. 430
„ H.M. Inspectors of Explosives for the Year 1901 1038
„ Sub-Committee on Uniformity in Analysis of Cement .. 1223
„ the Committee on Arsenic 93
On Alkali Works; Thirty-eighth Annual —— 1135
On Disinfection; Presented to London County Council ... 718
Sewage Commission ——. (T.R.) 1166
To London County Council on Application of Science to Industry 1105
Reserves on Prud'hommc's Aniline Black. (Binder and Frossard) 1453
Reservoirs; Safety Device for Use in Filling Fluid ——. (P) Hardy 599
Safety ——, for Inflammable Liquids. (P) Keay 1445
Resins. (Class XIII.) 56, 127, 178, 263, 355, 414, 487, 555, 625, 712, 782, 865, 918, 981, 1032, 1084, 1145, 1188, 1238, 1285, 1337, 1403, 1460, 1543
Resin at Bayonne. (T.R.) 937
Copal; Chemical Composition of ——. (Guédras) 1460
Imports of —— by Hamburg. (T.R.) 1049
In Beeswax; Determination of ——. (Jean) 428
Of Daumara Orientalis; Research on ——. (Tschirch and Koch) 712
Podophyllum; Determination of ——. (Gordin and Merrell) 1352
Production of —— in the United States. (T.R.) 651
Purifying and Decolorising. (P) Arledter and Whitney. From Arledter 1338
Refining of ——. (P) Arledter 625
Size; Manufacture of ——. (P) Arledter 870
Solubility of some Soft ——. (Collignier) 918
See also under Copals.
Resinous Matters in Mineral Oils; Separation of. (Daeschner) 168

PAGE

Resists under Aniline Black. (Binder and Frossard) 1182
Under Azo Dyestuffs Developed on the Fibre. (Schoen and Schweitzer) 1182, 1453
Under Indanthrene Blue. (Tigerstedt) 912
Under Indigo or Textile Fabrics. (P) White 1230
Under Steam Colours upon Woollen Tissues:
(P) Dépierre 703
(P) Koechlin 703
Under Steam Indigo. (Freer) 1452
Under Steam Indigo; Azo ——. (Colli) 1453
Upon Silk, &c.; Hydrosulphites as ——. (P) Badische Anilin und Soda Fab. 704
Resorcinol; Determination of ——. (Richard) 423
Dimethylhydro —— A Reagent for Aldehydes. (Erdmann) 192
Retort for Distillation of Wood. (P) Chapman 1129, 1129
Retorts; Gas ——; Comparison of Inclined and Horizontal ——. (Drory) 459
Gas; Vertical ——. (P) Isbell 963
Manufacture of ——. (P) Engels 1081
Preventing Leakage of Gas through Walls of ——. (P) Koppers 1127
Retort Settings Combined with Gas-Producer. (P) Herring . 1127
Rhamnus Purshianus; Essential Oil of ——. (Hansel) 187
Rhodamine Derivatives. *See under* Dyestuffs.
Rhodeose; Oxidation Products of ——. (Votoček) 1353
Rhodesia; Discovery of Copper in. (T.R.) 1112
Export Duty on Rubber from ——. (T.R.) 1115
Rhodium; Detection of ——. (Leidié and Quinnessen) 499
Rhubarb; Chinese ——. (Tschirch and Heuberger) 1153
Constituents of Chinese ——. (Tschirch and Heuberger). 1551
European and Chinese ——. (Jakabhazy) 1153
Rice for Starch Manufacture; Australian Customs Law on. (T.R.) 202
Malting of. (P) Schrottky 132
-Starch; Manufacture of. (P) Johnson. From Leconte et Cie 130
Ricinus Oilcake. (Nagel) 30
River Pollution in Coal Districts in the United States. (T.R.) 1355
Rivers Pollution; Royal Commission on —— in Belgium. (T.R.) 1365
Roasting or Calcining Chamber. (P) Radcliffe 109
Roller Mills for Manufacture of Paint, &c. (P) Wallis and Lagerwall 107
Rollers for Printing; Engraving ——. (P) Dejey 51
Roofing Compound. (P) Mitchell 1233
Fabric; and Preparation of Same ——. (P) Bird 257
Material; Chemical ——. (P) Wright 348
Rosemary Oil. *See under* Oil.
Roses, Attar of. *See under* Otto.
Resin: Hardening of ——. (P) Schaal 782
In Fats, Oils, &c.; Determination of ——. (Holde and Marcusson) 930
Oil. *See under* Oils.
See also under Colophony.
Roumania, Copper Mines of ——. (T.R.) 1047
Petroleum Production of ——. (T.R.) 1160
Sugar in. (T.R.) 1165
Roumelia; Leather in Eastern ——. (T.R.) 1003
Otto of Roses in Eastern —— in 1901. (T.R.) 1004
Rouser Apparatus for Brewers' Vats. (P) Briggs 558
Rubazonic Acid; Methyl. *See under* Dyestuffs, Methyl.
Rubber and Rubber Articles; Vulcanising ——, and Apparatus therefor. (P) Wittenberg and others 1286
Exports of Para, Brazil. (T.R.) 1049, 1164
Forest in the Soudan. (T.R.) 652
From British Central Africa and Rhodesia; Export Duty on ——. (T.R.) 1115
From Castilloa Elastica; Experiments on ——. (Weber) . 1461
In East Africa. (T.R.) 1311
In French Guinea. (T.R.) 1164
In the Soudan, Egypt. (T.R.) 1422
Mangaba; Characteristics of ——. (Ackermann) 56
Para; Chemistry of ——. (Harries) 1404
Scrap; Devulcanisation of ——. (P) Heyl-Dia 264
Substitute for —— from Oils. (P) Scammell and Muskett 1461
-Coated Materials; Preparing and Treating. (P) Minder. 1239
-like Gum from Greasewood; Extraction of ——. (P) Werner and Ellis 623
-like Latexes from the Congo Region. (Marckwald and Frank) 1188
See also under India-Rubber *and* Caoutchouc.
Rubidium; Determination of —— as Acid Sulphate. (Browning) 71
Phosphate; Properties of ——. (von Berg) 116
Rubrescin; A New Indicator for Alkalimetry and Acidimetry. (Rosenfeld and Silber) 723
Rue Oil. *See under* Oils.
Russia; Artificial Manures in Poland. (T.R.) 933
Asbestos Deposits of ——. (T.R.) 570
Beetroot Cultivation in Poland. (T.R.) 940
British Chemicals in ——. (T.R.) 507
Cement Consumption of Poland. (T.R.) 935
Ferro-Manganese Manufacture in ——. (T.R.) 1421
Hemp-Oil in Manchuria ——. (T.R.) 937
Leather Trade of ——. (T.R.) 1049
Manufacture of Benzene in ——. (Pantjuchow) 1448
Nickel Deposits of ——. (T.R.) 570

PAGE

Russia—*cont.*
Oil-Seed and Cake from Riga and Libau ——. (T.R.) 1422
Painters' Colours in ——. (T.R.) 1115
Copper Mining in Trans-Caucasia ——. (T.R.) 147
Cotton-seed Oil; Manufacture in ——. (T.R.) 371
Customs Decisions on Lithopone. (T.R.) 293
Customs Decision on Solid Fat and Degras. (T.R.) 147
Customs Regulation on Medical Preparations, &c. (T.R.) 294
Manganese Trust in the Caucasus. (T.R.) 200
Oil and Fat Industry in ——. (T.R.) 81
Oil-seeds in the Trans-Caucasus ——. (T.R.) 81
Paper and Pulp Exports of Finland ——. (T.R.) 1257
Petroleum Refining at Grosny ——. (T.R.) 731
Petroleum Trade of ——. (T.R.) 730
Phosphates and Fertilizers in ——. (T.R.) 1311
Platinum and Copper in the Urals ——. (T.R.) 510
Prices of Oil Seeds at Kieff ——. (T.R.) 511
Sugar Trade of ——. (T.R.) 1165
Sugar for Home Consumption in ——. (T.R.) 734
Sugar Production of ——. (T.R.) 512
Sunflower Seed Oil in the Caucasus ——. (T.R.) 733
Use of Agar Agar in ——. (Sokolow and others) 420
Use of Artificial Manures in ——. (T.R.) 511
Rust; Compound for Removing —— from Textiles. (P) Hammer and Coleman 473
Ruthenium; Detection of ——. (Leidié and Quinnessen) 499

S

Saccharin, British Customs Order on ——. (T.R.) 1167
Derivatives; Production of New ——. (P) Givaudan 1553
French Law on Production and Sale of ——. (T.R.) 801
In Germany. (T.R.) 1004
Meta- and Para- ——. (Kiliani and Naegell) 1418
Production of:
(P) Porchère aîné 67
(P) Koetschet 364
(P) Baur 364
Prohibition Law in Germany ——. (T.R.) 1167
Prohibition Law in Italy ——. (T.R.) 1167
Use of ——, in the United Kingdom. (T.R.) 1209
See also under Orthotoluene Sulphochloride.
Saccharine Juices; Obtainment of ——, and Products therefrom. (P) Steffen 266
Juices; Purification of —— by "Sulphocarbonation." (P) Weisberg 1406
Juices; Treating —— with Sulphurous Acid. (P) Lehmkuhl 921
Juices; *See also under* Sugar Juices.
Liquids; Purifying and Decolorising ——. (P) Spillern-Spitzer 1406
Solutions; Behaviour of certain Ammonium Salts in ——. (Andrlik) 1339
Saccharomyces Ludwigii; Separation of Galactose by means of —— (Thomas) 491
New Proof of Cellular Resistance of ——. (Alliot) 1249
Saccharomycetes; Spore-formation among the ——. (Barker) 556
Saccharose; Heat of Inversion of ——. (Petit) 195
Safflower. *See under* Oils.
Safranine Derivatives. *See under* Dyestuffs.
Dimethylnaphtho ——. *See under* Dyestuffs.
Safrol and Isosafrol ——. (Balbiano and Paolini) 1293
Manufacture of ——, from Camphor Oil. (Sugiyama) 1551
Sage Oil. *See under* Oils.
St. Lucia; Articles for Scientific Purposes Duty-free in ——. (T.R.) 437
St. Vincent; Analysis of Volcanic Dust from ——:
(Carmody) 993
(Longfield Smith) 931
Saké Brewing in Japan 418
Industry of Japan. (T.R.) 882
Salicin in different Willow and Poplar Barks. (Jowett and Potter) 1153
Salicylic Acid, Acetyl; Manufacture of Salts of ——. (P) Ellis. From the Chem. Fab. von Heyden 1296
Adulteration of Lavender Oil with ——. (Weber) 1244
Alkyloxymethyl Ester of ——. (P) Callsen 1154
A Normal Constituent of Strawberries. (Portes and Desmoulières) 182
Imports of —— by Wurtemberg. (T.R.) 84
In Foods, Detection of ——. (Taffe) 1040
In Wine, Determination of:
(Pellet) 1416
(Pellet and de Grobert) 1416
In Wines; Natural Occurrence of ——. (Windisch) 1089
p-Chloro-*o* ——. *See under* Dyestuffs.
Methylene-di ——. (P) Summers 1154
Salicylic Aldehyde (Salicylide); Manufacture of ——. (P) Wetter. From La Roche and Co. 1194
Salicylquinine Salicylate; Preparation of ——. (P) Thron ... 722
Saline Solutions; Apparatus for Crystallising ——. (P) Grantzdorfer 1147
Salinigrin in different Willow and Poplar Barks. (Jowett and Potter) 1153

PAGE

Salts. (Class VII.)..... 51, 114, 171, 250, 343, 406, 475, 547, 614, 705, 772, 858, 913, 969, 1026, 1074, 1135, 1183, 1231, 1277, 1329, 1393, 1453, 1533
Salt; Apparatus for Manufacture of ——. (P) Clarke..... 1077
Bread; Apparatus for Use in Manufacture of ——. (P) Hodgson and Holt..... 548
Common; Manufacture of ——:
(P) Gutierrez..... 858
(P) Société dite Salinen-Direction Lüneberg..... 1395
(P) Weddell..... 421
Deposits; Formation of Langbeinite Oceanic ——. (Van't Hoff and others)..... 1277
Excise Duty on —— in the Netherlands. (T.R.)..... 509
In the United States. Production of ——. (T.R.)..... 1162
Industry in South Australia. (T.R.)..... 880
Influence of —— on Peppermint Plants. (Charabot and Hémert)..... 561
Solutions; Behaviour of —— towards Copper, &c. (Ost). 1177
Trade of Dantzig, Germany ——. (T.R.)..... 1202
Triple; and Manufacture of same. (P) Courant..... 477

Salts, Compounds of —— with Hydrogen Peroxide. (Tanatar) 65
Crystalline; Manufacture of ——. (P) Thompson. From Solvay and Co..... 1076
Double ——. (Mercuric Haloid) (Strömholm)..... 1561
Double; Electro-Chemistry of ——. (Kistiakowsky)..... 124
Duty-Free for Industrial Purposes in France. (T.R.)..... 370
Electrolysis of Fused ——. (Lorenz)..... 777
Electrolysis of Mixtures of ——. (Leduc)..... 1236
Electrolytic Apparatus for Manufacture of ——. (P) Atkins..... 779
For Agricultural Purposes Duty-Free in France. (T.R.).. 570
Metallic; Action of Sodium Thiosulphate on Solutions of ——. (Norton, jun.)..... 51
Of Heavy Metals; Use of —— in Leather Dyeing. (Stiasny) 1329
Of Titanic, Oxalic, and Tartaric Acids; Manufacture of Mixed. (P) Dreher..... 988
Treatment of Solutions of ——. (P) Reed..... 778

Saltpetre, Perchlorate in; Determination of ——. (Dupré)... 825
Purification of Chili ——. (P) Fölsch and Co..... 51
See also under Potassium Nitrate *and* Sodium Nitrate.

Salves; Manufacture of Sterilised ——, and Apparatus therefor. (P) Büchelen..... 917

Sambucus Racemosa Arborescens; Examination of Oil of ——, (Byers and Hopkins)..... 1238

Sampling; Automatic System of ——. (Johnson)..... 724

Samsu; Preparation and Properties of ——. (Barker)..... 1289

San Francisco, Cement at ——. (T.R.)..... 1002

Sand, Artificial; Production of ——. (P) Shinn..... 1397

Sandal-Wood in Cocoa, Detection of ——. (Riechelmann and Leuscher)..... 1157

Sandal-Wood Oil. *See under* Oils.

Sandstone; Artificial ——. (P) Engbert..... 915
Manufacture of Dolomitic ——. (P) Brown..... 708

Sanguinarine; Characteristics of ——. (Schlotterbeck and Watkins)..... 274

Sanitation. (Class XVIII.) 62, 132, 182, 268, 360, 420, 492, 558, 633, 716, 786, 869, 923, 984, 1035, 1090, 1148 1191, 1241, 1290, 1344, 1407, 1464, 1548

Santa Fé; Concentrating and Smelting Gold-Copper Ores at ——. (P) Collins..... 1399

Saponaceous Product. (P) Koens..... 1345

Saponarin: a New Glucoside from Saponaria. (Barger)..... 637

Saponification. *See under* Soap.

Sauerbeck's Tables..... 999

Sault Ste. Marie, Ontario; Electrolytic Manufacture of Caustic Soda and Bleaching Powder at ——. (Rhodin)..... 449

Sawdust; Apparatus for Distillation of ——. (P) Hutchinson 246
For Fuel in Germany. (T.R.)..... 145

Scale. *See under* Boilers.

Schilling's Apparatus for Determining Sp. Gr. of Gas Modified. (Pannertz)..... 139

Scholarships at the Institution of Mining and Metallurgy..... 932

School of Technology; Mechanical and Engineering Departments of the Manchester Municipal ——. (Nicholson) 1512

Science, Application of, to Industry: L.C.C. Report on ——. (T.R.)..... 1105

Scientific and Technical Notes. (Class XXIV.) 76, 142, 195, 284, 368, 428, 504, 565, 645, 726, 795, 876, 931, 993, 1041, 1102, 1157, 1250, 1301, 1352, 1417, 1476, 1560

Scopolamine; Transformation of Atroscine into *i* ——. (Kunz-Krause)..... 186

Scotland; Millet Distilling in ——. (T.R.)..... 513

Scottish Section; Address by the Chairman..... 1380

Scouring; Compound for ——. (P) Taylor..... 340

Sea Water; Action of —— on Portland Cement. (Rebuffat) . 1535

Seal Oil. *See under* Oil.

Seeds; Transformation of Fatty Matters into Sugars during Germination of ——. (Mazé)..... 369

Selenic Acid; Action of —— on Gold. (Lenher)..... 646

Selenium; Action of —— on Gold and Silver Salts. (Hall and Lenher)..... 1417
Volumetric Determination of ——. (Friedrich)..... 1195

PAGE

Separating and Packetting Apparatus. (P) Darvas..... 904
Apparatus:
(P) Elmore..... 618, 862
(P) Hauberg..... 1065
(P) Hultgren..... 1291
(P) Kimball..... 985
(P) Melotte..... 1407
(P) Neely..... 463
(P) Phillips..... 1291
(P) Pravicha and Douillet..... 418
(P) Thompson..... 244
Centrifugal ——:
(P) Andersen..... 850
(P) Friesleben..... 1064
(P) Hartmann..... 269
(P) Hinchey..... 326
(P) Holmes..... 959
(P) Hult..... 492
(P) Lafferty..... 538
(P) Lindberg..... 326
(P) McCormack..... 1149
(P) Matheeuwissen..... 489
(P) Mazza..... 1126
(P) Sharples..... 270
(P) Siedel..... 717
Lining for Centrifugal ——. (P) Gales..... 493

Separating Compound. (P) Miller..... 862

Sericin of Silk; Investigation of ——. (Fischer and Skita)... 968
(Silk Glue); Preparation and Properties of ——. (Bondi) 616

Sesamé Oil. *See under* Oils.

Sesquisodium Phosphate. (Senderens)..... 548

Sesquiterpene of Eucalyptus Oils. (Smith)..... 363

Sewage and Industrial Effluents; Bayer's Method for Purifying ——. (Margosches)..... 183
Apparatus for Automatic Discharge of —— on Filter Beds. (P) Killon..... 559
Apparatus for Distributing —— over Large Areas. (P) Scott-Moncrieff..... 361
Apparatus for Purifying:—
(P) Cameron and others..... 185
(P) Candy..... 1550
Apparatus for Supplying —— to Bacteria Beds, Filters, &c.:
(P) Barr and Wilkinson..... 717
(P) McCallum..... 717
(P) Mountany and Farnsworth..... 1408
Apparatus for Treatment of ——:
(P) Candy..... 133
(P) Newton..... 1149
(P) Prevost, jun..... 985
(P) Welch and others..... 787
Automatic Distribution of —— on Bacteria Beds. (P) Roach..... 1149
Automatic Valves for Use in Bacterial Treatment of ——. (P) Melvin and Harvey..... 869
Containing Acid Iron Salts. (Kinnicut and Eddy)..... 1092
Crude; Bacterial Treatment of ——. (Clowes)..... 1549
Discharge of —— into a Tidal Estuary. (Parry and Adeney)..... 1035
Effect of Pickling-Liquids on Treatment of ——. (Eddy). 534
Filters and Apparatus for Treating ——. (P) Haller and Machell..... 787
Filters for ——:
(P) Adams..... 1149
(P) Lowe..... 1408
From Houses; Purification and Utilisation of ——. (P) Goodridge..... 634
Of Birmingham, and its Treatment. (O'Shaughnessy)... 665
Plant for Disposal of ——. (P) Anderson and others..... 985
Purification by Bacterial System. (Greatorex)..... 1291
Purification in Belgium by the Chemico-Biological Method. (Duyk)..... 1192
Purification of ——:
(P) Malabar..... 1408
(P) Peake..... 1149
(P) Tralls..... 422
Purification of ——, and Filters therefor. (P) Tomlinson. 361
Report of Commission on ——. (T.R.)..... 1166
Sludge, &c.; Profitable Disposition of ——. (P) Barnard. 787
Treatment of ——:
(P)..... 185
(P) Boult. From Vial..... 925
Treatment of ——, and Apparatus therefor. (P) Haller and Machell..... 1345
Water Deposits: Treatment of ——. (P) Thompson. From the Maschinenbau vorm. Beck and Henkel..... 1149
See also Effluents.
See also Fecal Matter.

Sewer-Vaults; Apparatus for Disinfecting ——. (P) Martin . 270

Sewerage Systems of Sidney, N.S.W. (Davis)..... 1091

Seychelles Islands, Guano Deposits of the ——. (T.R.)..... 1422

Shale Oil. *See under* Oils.

Sheepskins. *See under* Skins.

Shell; Manufacture of Imitation ——. (P) Franquet..... 134

Shellac:
Adulteration of. (Parry)..... 782
Dissolving —— and obtaining Varnish from ——. (P) Shooter..... 981
Trade of India. (T.R.)..... 82

Shield and Funnel for Re-charging Crucibles. (P) Brown ... 1537

PAGE

Shoddy; Sampling and Preparing —— for Analysis. (Meggitt) 105
Sicily:
Asphalt Exports of ——. (T.R.) 1204
Carbon Bisulphide and Sulphur Oil Production at Catania. (T.R.) 1207
Caustic Potash and Soda, Sulphate of Copper and Sodium, Carbonate Imports of Messina ——. (T.R.) 1205
Citric Acid and Essential Oils in ——. (T.R.) 1355
Olive Husks for Soap Manufacture from Syracuse ——. (T.R.) 1207
Sulphur Trade of ——. (T.R.) 1160
Sumach in ——. (T.R.) 1207
Volatile Oils, Wine Lees, &c., from Messina ——. (T.R.) .. 1209
Sieve for Clarification of Sugar Juices. (P) Fourcy 921
Signals or Buoys; Illuminating —— automatically. (P) Wiese and Groschner 540
Silica:
Common Errors in Determination of ——. (Hillebrand). 641
Impregnating Asbestos Fibre Objects with —— (P) Abel. From Siemens and Halske Actiengesellschaft 707
Separation of Alumina from ——. (P) Kayser 1232
Silicate, Meta-; Manufacture of Alkaline ——. (P) Crispo and Mols 408
Silicates; Preparation of ——. (P) McKerrow 555
Used in Ceramic and Glass Making; Fusibility of ——. (Granger) 255
Silicious Materials; Treatment of ——. (P) Dorsemagen 775
Matters; Preparation of ——. (P) McKerrow 555
Silicon and Iron; Compounds of ——. (Lebeau) 861
Cementation of Iron by ——. (Lebeau) 348
Content of Aluminium; Determining the ——. (Goldschmidt) 724
Elimination of —— from Steel in the Acid Open-Hearth. (M'William and Hadfield) 774
In Ferro Silicon; Determination of ——. (Norris) 537
In Ferro-Silicons of High Percentage; Determination of ——. (Ramorino) 191
In Steel; Determination of ——. (Auchy) 71
New Properties of Amorphous ——. (Moissan and Smiles) 1041
-Spiegel; Manufacture of ——. (P) Gin 1541
Silicon Hydride; Preparation and Properties of a New ——. (Moissan and Smiles) 504
Silk:
Action of —— on Diazo Compounds. Rossi) 250
Artificial; Collodion for Manufacture of ——. (P) Dodge. 771
Artificial; Examination of ——. (Strehlenert and Westergren) 113
Artificial; Manufacture of Threads and Ribbons of ——. (P) Vereinigte Kunstseide Fabriken 968
Artificial; Properties of ——. (Westergren) 1452
Bleaching and Dyeing ——. (P) Brown 857
Cellulose Fibres for Replacing ——. (P) Comp. Française de la Soie Parisienne 49
Defects in Weighted ——. (Gnehm, Roth, and Thomann) 968
Degumming Raw —— in Silk and Cotton Textiles. (P) Badische Anilin und Soda Fabrik 49
Dyeing Artificial ——, with 2.7-Dihydroxynaphthalene. (Settlik) 472
Fabrics; Spontaneously Developed Stains on ——. (Sisley) 1328
Fibre; Intensifying the Lustre of ——. (P) Stuart 1134
Fibroin and Glue of ——. (Fischer and Skita) 968
Fibroïn of ——. (Fischer and Skita) 472
Filaments; Apparatus for Spinning Artificial ——. (P) Strehlenert 969
Glue. *See under* Sericin.
Industry of France. (T.R.) 199
Intensifying the Lustre of ——. (P) Stuart 1276
Litmus ——. (Emich) 498
Machine for Sizing Raw ——. (P) Jacob 546
Of Lepidoptera, Natural Coloration of the ——. (Levrat and Conte) 1392
Scouring Raw ——, in Mixed Silk and Cotton Goods. (P) Badische Anilin und Soda Fabrik 49
Weighting —— with Tin Compounds. (Silbermann) 1275
Yarn; U.S.A. Customs Decision on Imitation ——. (T.R.) 509
Silver; Application of Phase Rule to Melting Point of ——. (Richards) 975
Detection and Determination of —— in Small Quantity. (Wagoner) 501
Gasometric Method for Determining ——. (Riegler) 73
In Copper Bullion, Determining ——. (Swift) 1559
In Muffle Residues; Determination of ——. (Sander) 191
Losses of —— in Cupelling. (Kauffmann) 991
Loss of —— in Roasting Zinc Blendes. (Sander) 616
Plating and Gilding Processes. (P) Schiele 917
Tellurium in Ingots of American ——. (Vincent) 409
Silver Benzoate; Solubility of ——. (Liebermann) 566
Bromide and Iodide; Solubility of —— in Water. (Kohlrausch and Dolezalek) 429
Chlorate and Sodium Chlorate; Mixed Crystals of ——. (Foote) 796
Chloride Gelatin; Developer for ——. (P) Liesegang 137
Chloride Printing Emulsions. (P) Lüttke 425
Colloidal Form of ——. (Paal) 994
Colloidal; Formation of ——. (Küspert) 1301
Colloidal; Manufacture of ——. (P) Paal 916
Compounds of Gelatoses; Neutral Soluble ——. (P) Imray. From the Farb. vorm. Meister, Lucius und Bruning... 67

PAGE

Silver—*cont.*
Haloid Layers; Treatment of ——. (P) Abel. From the Actiengesellschaft für Anilin Fab. 792
Oxide; Colloidal Form of ——. (Paal) 994
Salts; Preparation of Gelatinised ——. (P) Stephan 722
Solutions; Reduction of Ammoniacal ——. (Morgan and Micklethwait) 1373
Sub-Haloids; Formation of ——. (Emszt) 137
Size. (Class XIV.) 56, 128, 179, 264, 357, 415, 488, 555, 627, 713, 783, 865, 919, 982, 1032, 1085, 1146, 1189, 1239, 1286, 1338, 1404, 1461, 1544
Manufacture of Resin ——. (P) Arledter 870
Sizings; Apparatus for Boiling ——. (P) Diederichs 546
Skins; Preparation of —— for Tanning. (P) Alice 982
Process for Tawing ——. (P) Masson and Sansonnet 1405
See also under Hides and Leather.
Slabs; Heat-Insulating ——. (P) Kelly 347
Slag and Portland Cement; Experiments on Mixtures of ——. Beck 72
And Smelting Products; The Sulphur Content of ——. (von Juptner) 769
Blast-Furnace Iron; Composition of ——. (Blum) 118
Blast-Furnace; Rôle of Alumina in ——. (Ward) 452
Cement, Production of —— in Europe. (T.R.) 1112
Cupola-Furnace; Recovery and Value of Iron in ——. (Putman) 119
From Manufacture of Iron and Steel; Treatment of ——. (P) Prest and Cabot 258
From Martin Process. (Lecocq) 861
Hot; Generating Steam from ——. (P) Mitchell and Copeland 1401
Production of the United States. (T.R.) 1354
Thomas; Determination of Total Phosphoric Acid in ——. (Aschman) 929, 1196
Slimes; Apparatus for Electrolytical Treatment of ——. (P) Mumford 1144
Cyanide Treatment of —— on the Rand. (T.R.) 1421
Treatment of Clay —— by Cyanide Process. (Tays and Scherz) 480
Slivers; Apparatus for Dyeing ——. (P) Hanson 1231
Slubbing; Machine for Dyeing ——. (P) Desurmont 50
Smelting Apparatus. (P) Allison. From Hannes 1141
Smoke; Apparatus for Abatement of ——. (P) Phillips and Godden 460
From Boilers; Apparatus for Preventing ——. (P) Imray. From The International Smoke Prevention Co. 697
Means for Condensing ——. (P) Allison. From The Smoke Exterminator Co. 1226
Prevention of ——. (P) Raworth 1268
Purification of ——. (P) Brookos. From Stearns 1524
-Consuming Apparatus. (P) Alves and others 329
-Detector. (Freymann and Tolman) 603
-Preventing Apparatus. (P) Burns 329
Smyrna. *See under* Turkey.
Soap. (Class XII.) 55, 126, 178, 262, 355, 413, 486, 553, 624 711, 780, 864, 917, 980, 1032, 1083, 1144, 1187, 1238, 1285, 1336, 1403, 1459, 1541
And its Substitutes in Syria. (T.R.) 82
Apparatus for Cutting and Spreading ——. (P) Gaynor, jun. 1084
Apparatus for Granulating ——:
(P) Imray. From Cavenaugh 355
(P) Schweckler 981
Apparatus for Inserting Floats in Cakes of ——. (P) Berry 555
Apparatus for Manufacture of ——. (P) Boult. From Lehmann 487
Apparatus for Moulding ——. (P) Schnetzer 1543
Apparatus for Stamping ——. (P) Dodwell 413
Apparatus for Wrapping ——. (P) Lever Bros. and Phillips 487
At Mosul (Turkey) ——. (T.R.) 1048
Cake, Antiseptic ——. (P) Klein and Workman 1408
Cake; Production of ——. (P) Robinson 355
Duty on —— in the Netherlands. (T.R.) 82
Ethereal Oils in ——; Determination of. (Mann) 726
Fancy, Imports of —— into Naples. (T.R.) 1117
Frames or Moulds for ——. (P) Bolton and McNeil 1032
Heptylamine; and Water; Formation of Colloidal Hollow Bodies from ——. (Krafft and Funcke) 1301
Imports of —— by China. (T.R.) 1479
Imports of —— into Cyprus, Diarbekir, and Persia. (T.R.) 1311
Imports of Kossovo, Turkey. (T.R.) 82
Imports of Salonica, Turkey. (T.R.) 292
Improved —— and Manufacture of same. (P) Johnson .. 1543
Improvement of ——. (P) Peffer 1032
Industry of Marseilles ——. (T.R.) 1114
Machine for Boiling and Finishing ——. (P) Gottschalk. 1543
Machines for Wrapping —— (P) Pedersen 918
Manufacture of ——. (P) Parziale 864
Manufacture of ——, and Apparatus. (P) Johnsons and Willcox. From Haywood 127
Manufacture of —— in Kansas. (T.R.) 82
Manufacture of —— in New Zealand. (T.R.) 200
Material Imports by Argentina. (T.R.) 651
Metallic, from Linseed Oil; Solubility of ——, in Hydrocarbons. (Vulte and Gibson) 554
Metallic; Preparation of Solutions of ——, as Antiseptic Agents. (P) Raupenstrauch 1550
Mixing Apparatus for Manufacture of ——. (P) Karutz .. 1238

PAGE

Soap—*cont.*
Mould for ——. (P) Berry 555, 555
-Nuts; Properties of —— 1094
Production of —— in Tunis. (T.R.) 1564
Requirements at Diarbekir, Turkey. (T.R.) 800
Rosin ——, for Paper Size. (P) Chappell 494
Saponification Method. (Poilatschek) 487
Tablets; Improvements in ——. (P) Lynch 782
Tablets with Core. (P) Mally 864
Trade in Tripoli. (T.R.) 147
Trade in Wurtemberg, Germany. (T.R.) 82
Trade of Barcelona. (T.R.) 881
Works of Messrs. Lever Bros.; Visit to —— 953
-Cake. (P) Bowen 981
-Glue, Customs Decisions on, in Germany ——. (T.R.) 1044
-Plotting Apparatus. (P) Gottschalk 1543
-Press:
(P) Forster and Murdock 1145
(P) Muscar 782
(P) Watson 864
See also under Saponaceous.

Soda, Caustic; Action of ——, on Wool. (Matthews) 685
Caustic; Electrolysis of Molten ——. (Le Blanc and Brode) 1235
Caustic; Electrolytic Apparatus for Producing ——. (P) Wilson 476
Caustic; Electrolytic Manufacture of —— at Sault Ste. Marie, Ontario. (Rhodin) 449
Caustic; Electrolytic Production of —— in Italy. (T.R.) 509
Caustic; Imports of —— by Messina, Sicily. (T.R.) 1205
Crystals in Blocks, Production of ——. (P) Solvay & Co. 1305
In Small Crystals; Production of ——. (P) Winckler ... 1533
Industry of Germany in 1901. (T.R.) 290
Industry of Lyons, France. (T.R.) 1310
Process; Some Parts of the Ammonia —— open to Improvement (Bradburn) 689
Production of —— by Electrolysis. (Rhodin) 705
Sodium Acetate Duty-free in the Netherlands. (T.R.) 437
Amalgam; Manufacture of ——. (P) Smart 351
Arsenate; Vol. Determination of ——. (Dudderidge and Hill) 1156
Arsenite; Action of —— on Alcoholic Fermentation. (Knoesel) 785
Arsenite Solution; Preparation of —— for Vol. Analysis. (Lunge) 140
Bichromate; Manufacture of ——. (P) Spence and others 253
Carbonate at Leghorn. (T.R.) 935
Carbonate, Imports of ——, by Messina, Sicily ——. (T.R.) 1205
Carbonate; Manufacture of ——. (P) Thompson. From Solvay & Co. 1076
Carbonate Recovered from Cellulose Industry; Examination of ——. (Lunge and Lohofer) 70
Chlorate and Silver Chlorate; Mixed Crystals of ——. (Foote) 796
Chloride and Sodium Sulphate; Solubility of Mixtures of ——. (Seidell) 252
Cyanide; Manufacture of ——:
(P) Roessler 1232, 1534
Cyanide; Production of Anhydrous ——. (P) Thompson. From Chem. Fab. vorm. Vorster and Grüneberg 253
Cyanide; United States Customs Decision on ——. (T.R.) 80
Determination of —— as Pyrosulphate. (Browniog) 71
Hydride; Preparation and Properties of ——. (Moissan) 285
Hydroxide Solutions; Electrolysis of ——. (Elbs and Forssell) 1281
See also under Soda, Caustic, *and* Alkali.
Hypochlorite; Instability of —— in Solution. (Sünden) . 1183
Hyposulphite Exempted from Duty in Chile. (T.R.) 291
Methylarsenate (Arrhenal); Composition and Determination of ——. (Adrian and Trillat) 874
Methylarsenite; Alkalimetric Titration of ——. (Astruc) 509
Nitrate at Junin, Chile. (T.R.) 1205
Nitrate at Taltal, Chile. (T.R.) 1205
Nitrate; Decomposition of —— by Sulphuric Acid. III. (Volney) 547
Nitrate; Increase of Duty on ——. (T.R.) 509
Nitrate; Influence of —— on Peppermint Plants. (Charabot and Hébert) 987
Nitrate; Statistics of ——:
(T.R.) 146, 1002
For January 1902. (T.R.) 290
See also under Saltpetre.
Orthophosphate; An Acid Mono ——. (Giran) 547
Peroxide Baths; Heating of ——. (Luttringhaus) 856
Peroxide; Compression of ——. (P) Jaubert 1278
Phosphate; A New ——. (Joulie) 494
Phosphate; Vol. Determination of ——. Dudderidge and Hill 115
Salicylate, Phenazone, and Magnesium Sulphate; Interaction between ——. (Woolcock) 422
Salicylate; Use of —— in Determining Mixtures of Terpene Alcohols and their Esters. (Darzens and Armingeat) 142
Silicofluoride; Production of ——. (P) Enoch 344
Sulphate and Sodium Chloride; Solubility of Mixtures of ——. (Seidell) 252
Sulphate; Heat of Dilution of ——. (Colson) 995
Sulphate; Manufacture of ——:
(P) Meyer 971
(P) Société K. Oehler 1154
Sulphide, Preservation of Standard Solutions of —— 1473
Sulphite as a Resist under Paranitraniline Red. (Grossheintz) 545
Sulphite; Substitution of —— for Sodium Bisulphite in Copper Cyanide Baths. (Fischer) 710

PAGE

Sodium—*cont.*
Sulphoguaiacolate; Preparation of ——. (P) Alpers 364
Thiosulphate; Action of —— on Solutions of Metallic Salts. (Norton, jun.) 51
Thiosulphate, Oxidising Agents for the Destruction of ——. (Lumière and Seyewetz) 989
Thiosulphate, Sulphite and Sulphide; Determination of ——. (Dupre, jun. and Korn) 500

Soil; Apparatus for Sterilising ——. (P) Cartter 556
Solanine in Tobacco Seeds. (Starke) 136
Solanum Dulcamara; Chemistry of ——. (Davis) 1153
Solarisation-like Phenomena in Photography without Light. (Luppo-Cramer) 1411
Solder for Aluminium:
(P) Jackson and Kiesel 1537
(P) Neild and Campbell 976
(P) Thompson. From Nicolai and Borner 1081
(P) Webster 1185
United States Customs Decision on ——. (T.R.) 570

Soldering with Oxy-hydrogen Gas. (P) Garuti and Pompili.. 259
Solids; Analysis of Soluble ——. (Reed) 691
Apparatus for Distilling ——. (P) Calmant 1523
Differing in Sp. Gr.; On the Separation of ——. (Hinchley) 10, 102
Equilibrium between a —— and its Saturated Solution. (Lumsden) 344
Treatment of —— with Carbon Dioxide. (P) Naef 1232
Treatment of —— with Gas, in Catalytical Reactions. (P) Naef 33
Treatment of —— with Gases. (P) Naef 1027
Solutions, Colloidal ——. (Zsigmondy) 1250
Equilibrium between a Solid and its Saturated ——. (Lumsden) 344
Of Insoluble Inorganic Bodies; Colloidal and Cane-Sugar ——. (Lobry de Bruyn) 1301
Standard, of Sodium Sulphide: Preservation of ——. (Prothière and Revand) 1473
Storing and Discharge of Inflammable and Volatile ——. (P) Strachan and Robertson 904
Transport Number of very Dilute ——. (Steele and Denison) 352

Solvents; Separation of —— from Substances. (P) Du Pont . 1556
Soot Deposited on Manchester Snow; Examination of ——. (Irwin) 533
Manufacture of —— from Tar, &c. (P) Wegelin 1022
See also under Carbon Black *and* Lamp-Black.
Sorghum; Extraction of Sugar from ——. (P) Geerligs and Hamakers 628, 921
Soup Material; Manufacture of ——. (P) Scheele 1192
Spaghetti; Preparation and Properties of ——. (Winton and Ogden) 1290
Spain; Arsenic and Galena Mines in ——. (T.R.) 936
Cane Sugar Crop in Malaga, ——. (T.R.) 513
Chemical Imports by ——. (T.R.) 509
Chemical Industries at Gijón, ——. (T.R.) 731
Classification of Waterproof Wrapping Paper in ——. (T.R.) 1004
Contract for Chemicals in ——. (T.R.) 437
Copper and Lead Exports of Huelva, ——. (T.R.) 732
Copper-Matte Tariff Classification in ——. (T.R.) 1163
Customs Decision on Waterproofed Linen Woollen-cloth in ——. (T.R.) 371
Decree as to Import of Mineral Oils, Vaseline, &c. into ——. (T.R.) 881
Discovery of a New Oil-Shrub in ——. (T.R.) 571
Drums and Tanks for Sulphuric Acid in ——. (T.R.) 80
Manganese Ore from ——. (T.R.) 371
Market for Phosphates in ——. (T.R.) 372
Minerals Exported by ——. (T.R.) 437
Mineral Exports of ——. (T.R.) 1113
Mineral Production of Gijón, ——. (T.R.) 732
Mineral Production of —— in 1901. (T.R.) 1113
Mineral Production of Carthagena, ——. (T.R.) 1002
Olive Oil in Andalusia, ——. (T.R.) 511
Paper Industry in ——. (T.R.) 1208
Soap Trade of Barcelona, ——. (T.R.) 881
Sugar Production of —— for 1901. (T.R.) 1051
Sulphate of Ammonia Production in ——. (T.R.) 733
Trade of Alicante, ——. (T.R.) 1190

Specific Gravity; Separation of Solids which Differ in ——. (Hinchley) 10
Spelter; Manufacture of ——. (P) Nagel 776
Refining of ——. (P) Wessell 710
Spices; Essential Oils in ——. Determination of. (Mann) .. 794
Spiegel; Manganese in ——. Determination of. (Hildreth) . 279
Spirit Duty-Free for Industrial Purposes. (T.R.) 1309
From Molasses; Manufacture of ——. (Wenck) 1289
From Wood Fibre; Manufacture of —— 1343
Import Duties in the United Kingdom. (T.R.) 1051
Industry in Bohemia. (T.R.) 1116
Industry in Germany. (T.R.) 1051
Manufacture of —— from Molasses. (Haag) 1089
Potato-; Production of —— in Germany. (T.R.) 513
Regulations for use of Duty-Free —— at Universities, &c. (T.R.) 1562
Solidified ——. (P) Spiritine Lim. From Drapier and Dubois 1524
Solidified ——. (P) Wild 244, 1226

PAGE

Spirits. (Class XVII.) 60, 130, 180, 266, 359, 417, 490, 556, 631, 715, 784, 867, 922, 982, 1033, 1086, 1147 1190, 1239, 1288, 1340, 1407, 1463, 1546
Ageing or Treating —. (P) Scott 1035
Case —; Tariff Amendment in Australia. (T.R.) 438
Excise Duty on — in Natal. (T.R.) 734
Import Duties on —. (T.R.) 939
in Belgium. (T.R.) 1116
Methylation of — in Natal. (T.R.) 654
Perfumed: Customs Duties on —. (T.R.) 1167
Retarding Influence of Aldehydes on Maturation of —. (Hewitt) 96
Stills for Distillation of —. (P) Meyer. From Meyer and Arbuckle 1148
Use of Oil-Cake and Seeds in Manufacture of —. (P) Stang 1290
See also under Alcohol, Brandy, *and* Whisky.
Sponge; Substitutes for —. (P) Straus 981
Spray-Producers or Nebulizers. (P) Lundquist and Kern ... 538
Spraying Apparatus:
(P) Crossman 596
(P) Riotte 597
Apparatus for Oil-fuel. (P) Brunn 1127
Standards for Medicines. (Umney) 1467
Stanley Dock Tobacco Warehouses; Visit to —. 954
Stannous Chloride in Ether Solution as a Reagent. (de Jong) 1473
Chloride; Volumetric Determination of Copper, &c. by means of —. (Weil) 191
Starch. (Class XVI.) 57, 129, 179, 265, 358, 416, 489, 556, 628, 713, 783, 865, 919, 982, 1033, 1085, 1146, 1189, 1239, 1287, 1339, 1405, 1462, 1545
Acetylation of Soluble —. (Pregl) 129
Action of Barley Diastase on —. (Baker) 1087
Action of Formaldehyde on —. (Syniewski) 1341
Action of Iodine, &c. in the Hydrolysis of —. (Hale) ... 1040
And Starchy Materials; Treatment of —. (P) Thompson. From Anderson 1189
Apparatus for Treating —. (P) Tolhurst and Goldthwaite 1190
Constitution of —. (Syniewski) 1341
Determination of —:
(Gianturco) 1416
(Lietz) 930
In Cereals; Determination of —. (Lindet) 75
Laundry; Manufacture of —. (P) Tolhurst and Goldthwaite 1190
Maize; Manufacture of —. (Archbold) 4
Maize of British Manufacture; Drawback on Exports of —. (T.R.) 1311
Manufacture of:
(P) Loiselet 982
(P) Wulkan 630
Manufacture of — at Damascus (Turkey). (T.R.) 1004
Manufacture of Modified —. (P) Ceri 784
Manufacture of Rice —. (P) Leconte and Loiselet 1033
Manufacture of Soluble —:
(P) Société "Trust Chimique" 1288
(Thomas) 1033
Manufacture of Thin-boiling —. (P) Duryea 630
Potato-; Determination of —. (Kaiser) 428
Potato-; Determination of — in Yeast. (Hebebrand) .. 281
Residues; Adhesive Material from —. (P) Hoyt 1288
Rice; Manufacture of —:
(P) Johnson. From Leconte 130
(P) Société des Prod. Amylacés 1545
Soluble Form of —. (P) 1340
Syrups; Composition and Analysis of —. (Hönig) 1100
Syrup; Density of —. (Saare) 265
Syrup; Strength and Acidity of —. (Saare) 1405
Transformation of — during the Mashing Process. (Windisch and Hasse) 557
Treating Lower-Grade Products in Manufacture of —. (Kesztler) 982
Velocity of Hydrolysis of — by Diastase. (Brown and Glendinning) 419
Wheat and Maize; Examination of —. (Saare) 129
See also Amylaceous Bodies.
Stassano's Electric Furnace. (Lucchini) 1143
Stassfurt Potash Industry; Disposal of Waste Liquors of —. (Przibylla) 251
Statistics of Industry and Commerce in the United Kingdom and other Countries —. (Bateman.) (T.R.) 1107
Steam; Apparatus for Superheating or Drying. (P) McPhail 538
Chlorinating Machine for Bleaching. (Dépierre) 544
Generating and Superheating —, and App. therefor. (P) Imray. From La Soc. pour Production, &c. de la Vapeur Surchauffée 904
Superheater for Laboratory Use. (Freundlich) 1472
Stearin Imports of Venice. (T.R.) 511
Stearine and Soap Industry of Lyons, France. (T.R.) 1311
Steel; Alterations in American Bessemer Practice 1456
Annealing of —. (P) Hadfield 1280
Apparatus for Manufacture of —. (P) Wills 977
Arsenic in; Determination of —. (Norris) 393
Basic Bessemer; Manufacture of —. (P) McDonald ... 1141
Bessemer Plant for —. (McCullough, jun., and Holmhoe) 977
Burnt; Restoration of —. (P) Hirschmann and Heilmeier 1140
Carbon in; Determination of —. (Blount) 278

PAGE

Steel—*cont.*
Cementation or Hardening of — by Electricity. (P) Justice. From Davis 354
Composition for Hardening —. (P) Kolb 552
Conley Process for Producing — Direct from the Ore ... 622
Convertor for —. (P) Behrend 977
Crucible; Manufacture of —:
(P) Clark 552
(P) Clarke 1030
Direct Production of —. (P) Reynolds 976, 1185
Direct Production of — from Iron Waste or Scrap. (P) Société dite Gouvy and Marthelot 1399
Electric; Manufacture of —. (P) Imray. From The Société Electro Metallurgique 917
Electrical Resistance of —. (Benedicks) 1031
Electro-; Manufacture of — in Sweden. (T.R.) 1048
Elimination of Silicon in the Acid Open-Hearth. (M'William and Hadfield) 774
Expansion of — at High Temperatures. (Charpy and Grenet) 481
Gas from Wood for Use in Manufacture of —. (Douglas) 860
Hardening and Tempering of —. (P) Lake. From Bennett 259
Harmet Process for Producing — Direct from the Ore .. 622
Imports of Japan in 1901. (T.R.) 1309
Influence of Heating and Quenching on Tensile Strength of —. (Brinell) 1331
Ingots; Influence of Chemical Composition on Soundness of —. (Wahlberg) 774
Manganese in; Rapid Determination of —. (Ramorino) 991
Magnetostriction of Nickel —. (Osmond) 485
Manufacture of —:
(P) Andrew and Bellis 619
(P) Davies 349
(P) Fattelay 409
(P) Hadfield 552, 1280
(P) Hatton 552
(P) Hickman and Hutchinson 409
(P) Johnson and Frier 410
(P) Johnson. From McConnell 1536
(P) Knoth 1537
(P) Lake. From the Electric Furnace Co. 915
(P) Lorrain. From Thomson 349
(P) Pruszkowski 349
(P) Snelus 1333
(P) Tone 1234
(P) White, jun. 619
(P) Wilmotte and Goddyn 978
Manufacture of —, and Apparatus therefor. (P) Meiuinghaus 617
Manufacture of — by Open-Hearth Process. (P) Hughes 482
Microstructure of Hardened —. (Arnold and McWilliam) 861
Mild; Overheating of —. (Heyn) 1398
Molybdenum; Volumetric Determination of —. (Kopp) 502
Open-Hearth Process for —. (P) Smith and Bedford, jun. 351
Production of —, and Apparatus therefor. (P) Eyermann 709
Production of Cast-Iron Resembling —. (P) Société Bayerische Eggenfabrik 1537
Production of Open-Hearth — in the United States, 1901 (T.R.) 650
Projectiles, &c.; Production of Hardened —. (P) Hadfield 410
Rails. *See under* Rails.
Remarkable (Carbamine) Reaction of —. (von Cordier) 792
Removing Scale Oxide from —. (P) Eaton 977
Researches on Drawn —. (Ashworth) 774
Silicon in; Determination of — (Auchy) 71
Solutions for Treatment of —. (P) Jamieson 483
Study of the Transformations of —. (Charpy and Grenet) 480
Thermo-electricity of —. (Belloc) 177, 177
Thomas and Bertrand-Thiel Processes Compared. (Thiel) 119
Use of Electric Arc in Manufacture of —. (P) Jacolliot 1459
Want of Homogeneity of Soft Basic Martin —. (Reimer) 480
See also under Iron.
Stereotyping; Turf Matrix Pulp for —. (P) Sander and others 862
Sterilising and Preserving Apparatus; Electrical —. (P) Lake. From Giroux and Seddon 924
And Preserving Processes. (P) Lake. From Seddon and Giroux 924
Apparatus:
(P) de Boek 492
(P) Fürstenheim 717
(P) Grove 1150
(P) King 1344
(P) Lancaster 183
(P) Maussion 1465
(P) Pakes and Barnes 1344
(P) Rawson 634
(P) Royle 1192
(P) Week 869
See also under Pasteurising.
Still for Absorption Refrigerating Apparatus. (P) Condict .. 1126
For Ammonia. (P) Stroh 1326
For Distillation of Spirits. (P) Meyer. From Meyer and Arbuckle 1148
For Turpentine. (P) Gilmer 1286

PAGE

Stipites Pyrethri; Customs Decision on, in the United States. (T.R.) 84

Stone; Artificial —:
(P) Boas 1233
(P) Emerson 348
(P) McKenzie Arnn 257
Artificial Acid-proof; Manufacture of —. (P) Jurschina 915
Artificial — and Manufacture thereof. (P) Brooke and Glessop 479
Artificial; Apparatus for Manufacture of —. (P) Marx 973
Artificial; Composition of —. (P) Centi and others ... 1140
Artificial; Composition for —. (P) Mielck 1397
Artificial; Hardening of —. (P) Brookes and Son. From Hörisch 175
Artificial; Manufacture of —:
(P) Berry and Lawes 550
(P) Boivie 257
(P) Carter 708
(P) Graham 915
(P) Jurschina 973
(P) Mielck 1397
(P) Newton 1455
(P) Rott 479
(P) Sellars 1233
(P) Stevens 774
(P) Waxin 1184
Artificial; Manufacture of a Fire-Resisting —. (P) Crozier and Thomine 1397
Artificial; Manufacture of —- and Articles therefrom. (P) Chappell 1028
Artificial; Manufacture of Slabs of —. (P) Hatschek .. 118
Artificial; Preparation of Materials for —. (P) Schwarz 479
Colouring of —. (P) Roach 858
Composition for Making —. (P) Lowenthal 1233
Glass-; Manufacture of —. (P) Garchey 914
Machine for Moulding Artificial —. (P) Palmer 550
Moisture-proof Coating for —. (P) Tucker 1079
Or Brick; Artificial Manufacture of —. (P) Anderson. 974
Producing Deeply-penetrating Designs in —. (P) Hippe and Holm 1078
Production of Imitations of —. (P) Weber 549
Red Aggregates for Manufacture of Artificial —. (P) Dyson 1139
See also under Granite.

Stones, Precious; Action of Light on —. (Chaumet) 876

Stoves; Hot-blast —. (P) Roberts 762

Strainer for Paper Pulp. (P) Vrooman and Kirkland 271

Straining Apparatus. (P) Bollé. From Riensch 1064

Straits Settlements; Exports from the —. (T.R.) 508

Straw, Treatment of — for Use as Disinfectant. (P) Catton and Varagniac 1466

Strawberries; Salicylic Acid, a Normal Constituent of —. (Portes and Desmoulières) 182

Strontium; Alloys of — with Zinc and Cadmium. (Gautier) 121
Electrolytic Separation of Pure —. (Borchers and Stockem) 1284
Hydride; Preparation and Properties of —. (Gautier) 285
Metallic — and its Hydride. (Guntz) 258

Strychnicine; Characteristics of —. (Boorsma) 1095

Strychnine and Brucine, Separation of —. (Lyons) 1300
Determination of —. (Gordin) 1300
In Nux Vomica; Determination of —. (Dowzard) 1560

Stylophorum Diphyllum; Chemistry of —. (Schlotterbeck and Watkins) 273, 423

Stylopine; Characteristics of —. (Schlotterbeck and Watkins) 274

Sublimation Apparatus; A Simple —. (Nicolaysen) 69
In the Sun's Rays; Orientating Influence of Light in —. (Raikow) 1418

Subsidies in Hungary to Native Industries. (T.R.) 79

Sucrase in Industrial Fermentations. (Verbièse) 180

Sucrose; Extraction of —. (P) de Sigoyer 629

Sugar. (Class XVI.) 57, 129, 179, 265, 358, 416, 489, 556, 698, 713, 783, 865, 919, 982, 1033, 1085, 1146, 1189, 1239, 1287, 1339, 1405, 1462, 1545
Action of Iodine, &c., in the Hydrolysis of — (Hale) .. 1040

Sugars; Analysis of a Mixture of —. (Gregoire) 875

Sugar and its Solutions; Purification of —. (P) Spreckels and Kern 715
Apparatus for Boiling —. (P) Portemont 1545
Apparatus for Drying —. (P) Mahoudeau 630
Apparatus for Manufacturing — in Lumps of Desired Form. (P) Pereira 1085
Apparatus for Manufacture of —. (P) Morrell 1086
Apparatus for Moulding —. (P) Langlois 1546
Apparatus for Production of — in Crystals. (P) Lang and others 1189
Apparatus for Purging —. (P) Desaulles 922
Apparatus for Refining —. (P) Robin-Langlois 1288
Apparatus for Separating Crystals of — from Liquid. (P) Desaulles 556
Apparatus for Separating — from Massecuites, &c. (P) Desaulles 59
Batteries for the Diffusion Process. (P) Rak 783
Beet-; Acreage of — in Germany. (T.R.) 940
-Beet as a Reclaimer of Arid and Alkali Regions. (Myers) 834
Beet-; European Production of —. (T.R.) 1312
Beet-, in Montana. (T.R.) 513

PAGE

Sugar—*cont.*
Beet-, Industry of Denmark. (T.R.) 372
Beet-; Production of — in Italy. (T.R.) 744
Boiling of —. (P) Steffen 1086
Bounties for 1902—3 Campaign in Belgium. (T.R.) 294
Bounties on — in France. (T.R.) 1165
By-product of — in British Guiana. (T.R.) 512
Campaign in Austria-Hungary. (T.R.) 1208
-Canes; Amount of Crushing Required for —. (Prinsen-Geerligs) 714
-Cane; Crop of — in Malaga, Spain. (T.R.) 513
-Cane Cultivation in Mexico. (T.R.) 293
-Cane; Extraction of — from. (P) Prinsen-Geerligs and Hamaker 628
Cane-, in Preserved Fruits containing Glucose; Determination of —. (Schrefeld) 644
-Cane; Phosphoric Acid per 100 of Sugar in —. (Pellet) 628
Cane-, Production of — in Australia. (T.R.) 83
Centrifugal Apparatus for Drying —. (P) Wolff 1546
Centrifugal Apparatus for Use in Making —. (P) Hirt 783
Centrifugal Extractor for —. (P) Peterson 1406
Centrifugal Machine for Manufacture of —. (P) Holland 1086
Colorimetric Detection of —. (Ventre Pacha) 1040
Conference at Brussels. (T.R.) 439, 653
Continuous Diffusion of —. (P) Kessler 1147
Converting Cellulose into —. (P) Classen 630, 630
Converting Cellulose into Fermentable —. (Classen) .. 867
Converting Wood, &c. into —. (P) Classen 358, 1190
Countervailing Duties on Austro-Hungarian — in U.S.A. (T.R.) 438
Crop; Estimates of — for 1902-3. (T.R.) 1564
Crop of British Guiana. (T.R.) 653
Crystallisation of —:
(P) Classen 266
(P) Lambert 58
Crystallisation with Motion in the Manufacture of —. Limpricht and others 920
Crystals of — coloured throughout. (Jossé) 714
Crystals; Treatment of —. (P) Spreckles and Kern ... 784
Cubes; Removing Dust from Faces of —. (P) Scheibler 922
Customs Tariff on —. (T.R.) 1165
Defecation Scums; Drying of —. (P) Gropp 58
Density of Dissolved —. (Demichel) 57
Destruction of — in Working up Low Syrups. (Claassen) 489
Diffusion; Apparatus for Continuous and Automatic —. (P) Boutellier 920
Diffusion Process. (P) Williams 266
Diffusion Process; the Alkaline Lime —. (Andrlik) ... 416
Diffusion Residues; Experiments on Compressing —. (Herzfeld) 1189
Diffusion Vessels for —. (P) Deltour and Mist 1147
Drawback on Exported Castor and Icing —. (T.R.) 438
Dutch; Countervailing Duty on — in British India. (T.R.) 438
Dutch; Duties on — in the United States. (T.R.) 1423
Dutch; United States Countervailing Duties on —. (T.R.) 202
Duties in British India. (T.R.) 1050
Duty on — in Japan. (T.R.) 572
Elevator Buckets for Use in Manufacture of —. (P) Baudet 921
Export Trade of Russia. (T.R.) 1165
Exports of Belgium. (T.R.) 1257
Extracted by Maceration; Determination of —. (Prinsen-Geerligs) 714
Extraction of —:
(P) Count Schwerin (Botho) 59
(P) Escande and Philippet 130
(P) Schwerin 556
Extraction of — from Beetroot, &c. (P) Prinsen-Geerligs and Hamakers 628
Extraction of — from Dried Saccharine Matters. (P) y-Pompino 358
Extraction of — from Dry Saccharine Materials. (P) Refineria de San Luis 1406
Extraction of — from its Solutions. (P) Wohl 1190
Extraction of — from Sugar Cane, Sorghum, &c. (P) Geerligs and Hamakers 921
Factories in France; New —. (T.R.) 653
Factories' Waste Products; Ammonia from —. (P) Besemfelder 254
Filtration of —. (P) Louis 417
For Home Consumption in Russia. (T.R.) 734
From Beetroot and Cane Juices; Extraction of —. (P) Hlavati 1462
From France, Indian Duties on —. (T.R.) 1479
Granulated; Theory of Production of — by Steffen Process. (Cerny) 1287
Import Duties on — in the United Kingdom. (T.R.) .. 83
Imports of Japan in 1901. (T.R.) 1309
Imports of Leghorn. (T.R.) 940
Importation of Raw — by Paraguay. (T.R.) 882
In Dried Beetroot; Direct Refining of —. (P) Lafeuille 416
In Germany, Production of —. (T.R.) 1165
In Japan. (T.R.) 1051
In Peru. (T.R.) 1115
In Roumania. (T.R.) 1165
In Swedes; Variation in Amount of —. (Collins) 1513
In West Africa. (T.R.) 1115
Industry in Bohemia. (T.R.) 1115
Industry in Bulgaria. (T.R.) 513

PAGE

Sugar—*cont.*
Industry in India. (T.R.) 882
Industry of Bahia, Brazil. (T.R.) 1003
Industry of Dunkirk. (T.R.) 939
Industry of Queensland. (T.R.) 1004
Industry of the United States. (T.R.) 512
Inversion; Studies on ——. (Kullgren) 1339
Isomeric Acetohalogen Derivatives of ——. (Fischer and Armstrong) 1302
Italian; Countervailing Duties on —— in India. (T.R.) . 372
Sugar-Juices; Apparatus for Clarifying ——. (P) Litty .. 490
Apparatus for Continuous Carbonation of ——. (P) Prangey and Grobort 417
Apparatus for Defecating ——. (P) Hatton 1288
Concentration and Extraction of ——. (P) Loumeau..... 130
Concentration of ——. (Besson) 1239
Concentrated Pure —— from Beetroots. (P) Baermann . 1545
Continuous Carbonation and Sulphuration of ——. (P) Société de Construction Mecanique de St. Quentin 130
Decoloration and Defecation of ——. (P) Woostelandt and Mouraux 358
Decolorising ——. (P) Kitsée 57
Decolorising and Purifying ——. (P) Besson 58
Defecating and Decolorising ——. (P) Besson 1545
Defecation of ——. (P) Besson... 1406
Defecation of Crude ——. (P) Kowalski and Kozakowski 921
Defecators for Clarifying ——. (P) Harvey 58
Electrolytic Purification of ——. (P) Kollrepp and Wohl 1545
Evaporating —— in Vacuum Pans. (P) Greiner..... 920
Extraction of —— from Beetroots. (P) Hyros and Rak.. 1462
Extraction of Soluble Ash from ——. (P) Bull and Sendey 130
Filters for ——. (P) Kostalek 1146
Obtaining Highly Concentrated —— by Diffusion. (P) Olfinowski 358
Obtaining Pure Concentrated —— and Nutritious Residue. (P) Baermann..... 59, 59
Preservation of Samples of ——. (Pellet and Klein) 179
Purification of ——:
(P) Baudry 1406
(P) Blachier 629, 920
(P) Gouthière 1086
(P) Gouthière and Junien 59
(P) Nodon and Piettre 1288
(P) Rivière 58
(P) Scholtmeyer 57
(P) Swager 130
Purification of —— by Electric Oxidation. (P) Nodon and Piettre 629
Quick Current Reheater for ——. (P) Draminski 1463
Rapid Crystallisation of ——. (P) Delafond and Horsin-Déon 1463
Sieve for Clarification of ——. (P) Fourcy 921
Third Carbonating of ——. (Collignon) 1339
Treating —— with Aluminium Powder, &c. (Besson) ... 866
Treatment of —— with Aluminium Powder, &c. (Besson) 416, 713
Vessels for Carbonation, &c. of ——. (P) Joly 921
Sugar Law of Italy; New ——. (T.R.) 1164
Levan, a New Bacterial Gum from ——. (Greig-Smith and Steel) 1381
-Liquor from Diffusion Vessels; Drawing off and Measuring ——. (P) Sedlaczek 630
-Loaves; Apparatus for Covering and Liquoring ——. (P) Kaczorowski 783
-Loaves; Production of ——. (P) Passburg 1545
Manufacture and Refining of ——. (P) Schweitzer . 416, 1033
Manufacture; Froth Remover for Use in ——. (P) de Smet 920
Manufacture of ——. (P) Lavolay and Bourgoin 490
Manufacture of Cube ——. (P) Scheibler 1146
Maximum Recovery of Refined ——. (P) Langlois 130
Means for Boiling ——. (P) Czapikowski 1545
β-Naphthyl Hydrazones of; Isomers of ——. (von Eckenstein and Lobry de Bruyn) 1302
Nickel Salts as Reagents for Reducing ——. (Duyk) 74
Obtaining all the Crystallisable —— from Sugar Liquor. (P) Faustin 59
Of Kobé and Osaka, Japan: Imports of ——. (T.R.) 1564
Of Low Quality; Refining Raw ——. (P) Thompson. From Manoury 867
Of Mahwa Flowers. (von Lippmann) 713
Over-production of ——, in Germany. (T.R.) 881
Plant; Discovery of a New —— in Paraguay. (T.R.) 293
Preparation of Invert —— in the Brewery. (Baker) 867
Production in New Orleans District, U.S.A. (T.R.) 512
Production of —— at Pernambuco. (T.R.) 939
Production of —— at Sergipe. (T.R.) 939
Production of Europe for 1901-2. (T.R.) 293
Production of Germany and the Cartel. (T.R.) 201
Production of —— in Austria-Hungary. (T.R.) 147
Production of —— in Denmark. (T.R.) 654
Production of —— in Germany. (T.R.) 147, 512, 1050
Production of —— in Italy in 1901-2. (T.R.) 438
Production of —— in Nicaragua. (T.R.) 293
Production of —— in Queensland. (T.R.) 202
Production of —— in Russia. (T.R.) 512
Production of Spain for 1901 ——. (T.R.) 1051
Products at Hamburg. (T.R.) 1050
Products; Intermediate ——. (P) Spreckels and Kern .. 982
Purifying and Preserving Raw ——. (P) Weinrich 1545
Rapid Refining Applied to White ——. (P) Robin-Langlois 59

PAGE

Sugar—*cont.*
Reducing —— of the Cane. (Pellet) 416
Raw; Alkalinity of —— 1287
Raw; Apparatus for Bleaching and Washing ——. (P) Weinrich..... 1463
Raw; Manufacture of —— without Low Products. (P) Actienges. vorm. Hornung and Rabe 60
Raw; Purifying, Bleaching, and Refining ——. (P) (Lafontaine) 921
Recovery of —— from Saturation and Defecation Muds. (P) Baermann..... 59
Reducing, in Syrups; Determination of ——. (Tervooren) 1560
Recovery of ——. (P) Wohl and Kollrepp..... 630
Refined in Japan; Import Duty on ——. (T.R.)..... 734
Refinery in Turkey. (T.R.) 148
Refining of Raw ——. (P) Lagrange 1085
Runnings; Treatment of ——. (P) Prudent..... 130
Separation of ——, from After-Products. (P) Claassen... 1288
Separation of ——, from Massecuites. (P) Claassen..... 1463
Solutions; Apparatus for Crystallisation of ——. (P) Grantzdorfer 1147
Solutions, Purification of ——. (P) Lefranc 130
Syrups and Drainings; Purification of ——. (P) Kowalski 1033
Tariff Valuation of —— in British India. (T.R.) 513
Valuation Tariff in Egypt. (T.R.) 438
-Works; Decoloration of Concentrated Products in ——. (Buisson) 866
-Works; Method of Compression and Utilising Steam in ——. (P) Horsin-Déon..... 629
-Works; Purification of Effluents from ——. (Dunbar) .. 185
Yield of France ——. (T.R.)..... 1423
Sulphammonium, Preparation and Properties of ——. (Moissan)..... 1042
Sulphates, Alkali-metal; Separation of —— from Mixed Solutions. (P) Hoepfner and Orth 1027
And Chlorine; Production of ——. (P) Clemm. 254
Sulphate of Copper; Purchase of —— by Greece. (T.R.)..... 291
Of Lime; Action of —— on Cements. (Deval) 257
Sulphates; Preparation of Hydrochlorated ——. (Baskerville) 272
Soluble; Sulphuric Acid in ——. (Nikaido) 1247
Sulphide Oil. *See under* Oils.
Sulphide Ores. *See under* Ores.
Sulphides; Chlorinating Natural or Artificial——. (P) Alvisi 176
Electrical Resistance of Metallic ——. (P) Guinchant .. 868
Metallic; Process and Apparatus for Treating ——. (P) Gernot and Fiévet 176
Of Arsenic, Antimony, and Tin; Solubility of ——. (Lang and Carson)..... 1018
Of the Alkaline Earths; Phosphorence of ——. (de Visser) 565
Production of Alkaline Earth —— in the Electric Furnace. (P) Bouvier..... 1458
Rendering Metallic —— Soluble. (P) Collins..... 978
Sulphinide (Saccharin); Substituted ——. (P) Koetschet .. 364
Sulphinides, Substituted; Manufacture of ——. (P) Ellis. From The Société des Usines du Rhône..... 67
Sulphites; Action of —— on Nitroprussides. (Fages)..... 877
In Dried Fruits. (Beythien and Bohrisch) 786
Sulphite Lyes containing Soda; Determination of Alkali in ——. (Schwartz) 1298
Sulphite-Pulp Factories; Formation of Ice in —— 635
Sulphocyanides; Production of —— from Coal-Gas. (P) Smith and others 1077
Sulphonic Acids and their Salts; Production of ——. (P) Helmers 364
Manufacture of New ——. (P) Lake. From Oehler..... 111
Separating ——. (P) Helmers 1296
Sulphur; Acidity of Sublimed ——. (Leonard) 135
Analysis of Crude ——. (Carpenter)..... 832
And Iodine; Fatty Compound of ——. (P) Degner..... 637
Apparatus for Subliming and Refining ——. (P) Consoli. 970
Basic Properties of ——. (Edmger and Ekeley) 285
Blue or Green Modification of ——. (Orloff)..... 876
"Candle." (P) Shaw 788
Content of Slags and Smelting Products. (von Jüptner). 709
Free —— in Beaumont Petroleum. (Richardson and Wallace) 316
Free —— in Beaumont Petroleum. (Thiele)..... 1271
Imports of Bordeaux. (T.R.) 935
In Coal and Pyrites; Determination of ——. (Reitlinger) 1208
In Coal; Determination of ——. (Stoddart)..... 1298
In India-Rubber; Determination of ——. (Weber)..... 1560
In Ironworks Products; Determination of ——. (Antony) 71
In Pig Iron; Colorimetric Determination of ——:
(Lindsay)..... 279
(Naske)..... 562
In Plants; Determination of ——. (Fraps)..... 642
In Protein Bodies. (Osborne) 505
Production of —— in Japan. (T.R.)..... 509
Production of —— in the United States. (T.R.) 1204
Recovery of ——, from Precipitated Sulphide of Arsenic. (P) Riley and Barnes..... 1533
Removal of —— from Coke and Pig-Iron. (Reusch)..... 861
Trade of Sicily ——. (T.R.) 1160
Sulphur Chloride; Action of —— on Benzene. (Lippmann and Pollak)..... 1271
Dioxide; Apparatus for Generating ——. (P) Moore and Martin 870
Dioxide in Beer. (Jalowetz) 1088

PAGE

ulphur—*cont.*
Trioxide; Apparatus for Experiments with ——. (Wiehelhaus) ... 276
Trioxide; Production of —— by Contact Action. (Lunge and Pollitt) ... 1329
Trioxide. *See also* Sulphuric Anhydride.

Sulphuretted Hydrogen. *See under* Hydrogen.

Sulphuric Acid: Action of Hydrofluoric Acid on Lead in Reference to ——. (Prost) ... 250
Apparatus for Concentrating —— :
(P) Webb and others ... 253
(P) Zanner ... 476
Apparatus for Making Anhydrous ——. (P) Daub and Deather ... 1138
Apparatus for Manufacture of —— :
(P) Sébillot ... 859
(P) Stone ... 1395
(P) Winsloe and Hart ... 1183, 1183
Apparatus for Manufacture of Concentrated ——. (P) Quinan ... 772
As a Solvent for Tin Alloys — —. (Nissenson and Crotogino) ... 1350
Bounty on —— in Chile. (T.R.) ... 1354
Cathodic Polarisation in Dilute ——. (Tafel) ... 1185
Comparison of Processes for Making ——. (Lüty and Niedenführ) ... 475
Concentrated and Transportable ——. (P) Claes ... 1453
Contact Process of Manufacture of ——. (Keppeler) ... 1137
Contact Process; Revivifying Platinum used in ——. (P) Comp. Parisienne, &c. ... 1454
Determination of the Strength of ——. (Marshall) ... 1511
Drums and Tanks for —— in Spain. (T.R.) ... 80
Electrolytic Manufacture of — —. (P) Jacobs ... 1077
In Chile. (T.R.) ... 1162
In India, Production of ——. (T.R.) ... 1421
In Soluble Sulphates, Determination of ——. (Nikaido) ... 1247
Industry of Lyons, France. (T.R.) ... 1310
Influence of Impurities on Sp. Gr. of ——. (Marshall) ... 1508
Manufacture; Application of Laws of Chem. Equilibrium, &c. to ——. (Brode) ... 1393
Manufacture of —— :
(P) Comp. Parisienne, &c. ... 1454
(P) Johnson. From The Badische Anilin und Soda Fabrik ... 116, 344
(P) Krauss and von Bernneck ... 859
(P) Potut ... 706
Production of —— by Catalysis. (P) Naef ... 1076
Manufacture of —— by the Contact Process:
(P) Johnson. From The Badische Anilin und Soda Fab. ... 772
(Knietsch) ... 343, 172
(P) Wenmaekers ... 1394
Methods for Estimating Total Acidity of Gases from Chamber Process for Manufacturing ——. (Forbes Carpenter and Linder) ... 1490
Physical Chemistry of ——. (Sackur) ... 475
Production of Anhydrous ——. (P) Rabe ... 407
Reforms in the Lead Chamber Process for ——. (Meyer) ... 114
Removal of ——, from Water. (P) Reisert ... 1550
Solutions; Preparation of Standard ——. (Dauvé) ... 1098
Solutions; Reducing Action of Lead and Mercury Cathodes in ——. (Tafel and Schmitz) ... 790
Use of the Fan in Manufacture of ——. (Mühlhäuser) ... 1026

Sulphuric Anhydride; Apparatus for Cooling and Absorbing ——. (P) Stone ... 476
Apparatus for Manufacture of ——. (P) Knietsch ... 345
Catalytic Bodies and the Manufacture of ——. (P) Wetter. From de Haen ... 475
Manufacture of —— :
(P) Blackmore ... 914
(P) Briegleb ... 706
(P) Clemm and Hasenbach ... 254
(P) Comp. Parisienne, &c. ... 1454
(P) Johnson. From Verein Chem. Fabriken and Clemm ... 253
(P) Knietsch ... 253
(P) Krauss and von Bernneck ... 859
Manufacture of —— by Contact Process:
(P) Comp. Parisienne de Coul. d'Aniline ... 1453
(P) Imray. From the Farb. vorm. Meister, Lucius und Brüning ... 117
See also Sulphur Trioxide.

Sulphurous Acid; Action of —— on Red Wines. (Bouffard) ... 922
And its Salts; Poisonous Action of ——. (Kionka) ... 633
Apparatus for Manufacture of —— :
(P) Edmunds ... 1584
(P) Wenzel ... 1027
In Fermented Liquids; Determination of Free ——. (Mathieu and Billon) ... 1247
In Wine, Rapid Determination of ——. (Mathieu) ... 1559
Iodometry of ——. (Rupp) ... 1473
Solutions; Sp. Gr. of ——. (Pellet) ... 171
See also under Sulphur Dioxide.

Sulphurous Fumes; Apparatus for Condensing ——. (P) Webb and others ... 253

Sunflower-Seed Oil. *See under* Oils.

Sulphuryl Chloride; Manufacture of ——. (P) Johnson. From the Badische Anilin und Soda Fab. ... 782

Sumach in Sicily. (T.R.) ... 1207

Superheater, Steam; for Laboratory Use. (Freundlich) ... 1472

Superheating Apparatus. (P) McPhail ... 538

PAGE

Superphosphate, Alkaline; Manufacture of ——. (P) Burnard ... 408
Apparatus for Comminuting ——. (P) Brookes. From Merck & Co. ... 713
At La Rochelle. (T.R.) ... 938
At Tonnay-Charente. (T.R.) ... 938
Treatment of ——. (P) Hughes ... 129

Sweden: Customs Decision on White Lead. (T.R.) ... 147
Gold and Platinum Salts in ——. (T.R.) ... 148
Manufacture of Electro-Steel in ——. (T.R.) ... 1048
Matches in ——. (T.R.) ... 802
Milk-Flour in ——. (T.R.) ... 734
Milk-Powder in ——. (T.R.) ... 1052
Peat-Gas for Steel-making in ——. (T.R.) ... 1420
Wood-Pulp from Gothenburg, ——. (T.R.) ... 1208

Sweetening Substance, and Manufacture of Same. (P) Partridge. From the "Trust Chimique" ... 1154

Switzerland: Customs Decisions in ——. (T.R.) ... 437
Customs Decisions on Quillaya Bark, &c. (T.R.) ... 511
Imports of —— in 1900. (T.R.) ... 436
Leather Imports of ——. (T.R.) ... 82

Syrups: Apparatus for Cooling ——. (P) Walter ... 982
Apparatus for Cooling ——. (P) Werner ... 784
Brewing; Manufacture of ——. (P) Norman ... 1191
Centrifugal; Purification and Filtration of ——. (Mittelman) ... 910
Decoloration of ——. (P) Thompson. From Boot ... 358
Density of Starch ——. (Saare) ... 265
Destruction of Sugar in Working up Low ——. (Claassen) ... 489
Filtration of ——. (Andrlik and others) ... 920
Filtration of First Jet ——. (Andrlik) ... 713
From Corn or Glucose. (Gudeman) ... 714
From Light-Coloured Peat; Composition of ——. (Borntrager) ... 265
Nitrites, and the Foaming of ——. (Andrlik and Stanek) ... 265
Of British Manufacture; Drawback on ——. (T.R.) ... 148
Purification of ——. (P) Kowalski and Kazakowski ... 921
Reducing Sugar in ——; Determination of. (Tervooren) ... 1560
Starch; Composition and Analysis of ——. (Honig) ... 1100
Starch; Strength of and Acidity of ——. (Saare) ... 1405

T

Tallow, Imports of, into Dantzig, Germany. (T.R.) ... 1202
Melting of ——. (P) Scott ... 711
Physical and Chemical Constants of Russian ——. (Shukoff) ... 55
Substitute for —— from Train-Oil. (P) Sandberg ... 413
Substitute, Manufacture of ——, from Fish Oil. (P) Sandberg ... 1403
Vegetable —— Imported by the Straits Settlements. (T.R.) ... 292

Tallow-Alizarin Assistant; U.S.A. Customs Decision on ——. (T.R.) ... 1164

Tamping of Bore-holes ... 425

Tan Bark: Apparatus for Leaching —— :
(P) Smith ... 488
(P) Vaughn ... 783

Tanks; Apparatus for Filling ——. (P) Coupe ... 1126
For Cyanide Process. (P) Hervey ... 977
Of Glass for Fermenting. (P) Weber ... 1343
For Liquids. (P) Intze ... 1125

Tanneries in Maine, United States. (T.R.) ... 511

Tannic Acid from Sorrel. (T.R.) ... 293
And Tinctorial Extracts; Preparation, Purification, and Preservation of ——. (P) Peyrusson ... 1462

Tannin: Absorption of —— by Filter-Paper. (Procter and Blockey) ... 1109
And Tartar Emetic; Interaction between ——. (Ljubavin) ... 128
Determination of —— :
(Crouzel) ... 992, 1560
(Schweitzer) ... 1250
Determination of ——, and Analysis of Woods and Extracts containing it. (Thompson) ... 1416
Extracts; Manufacture of ——. (P) Klenk ... 1462
In Plants; Origin and Role of ——. (Nihoul) ... 865

Tannindigotine and its Application. (Kurz) ... 545

Tanning. (Class XIV.) ... 56, 128, 179, 264, 357, 415, 488, 555, 627, 713, 783, 865, 919, 982, 1032, 1085, 1146, 1189, 1239, 1286, 1338, 1404, 1461, 1544
Agents from the Saw Palmetto. (P) Gray ... 982
Analysis of Cod-Oils for —. (Trotman and Peters) ... 693
And Plumping Process. (P) Saxe ... 627
Apparatus for ——. (P) Walter ... 1544
Baths for —— and Dyeing. (P) Lepetit, Dollfus, and Gansser ... 1146
Chrome — —. (P) Thompson. From Wünsch ... 1544
Chrome; Researches on ——. (Krutwig) ... 1239
Extracts; Manufacture of ——. (P) Honig ... 488
Extracts; Treatment of ——. (P) Fratelli Dufour ... 1146
In New Zealand. (T.R.) ... 201
Kjeldahl's Nitrogen Test Applied in ——. (Gordon Parker) ... 838
Liquor; Composition of ——. (P) Phillippi ... 1286
Materials; Analysis of ——. (Reed) ... 691
Materials; Analysis of some New ——. (Blockey) ... 158

PAGE

Tanning—*cont.*
Materials; Apparatus for Extracting —— by Centrifugal Force. (P) Bozel 1405
Materials; Commercial Valuation of ——. (Belzer) 643
Materials; Detection and Determination of Gallic Acid in ——. (Spica) 281
Materials in India. (T.R.) 1355
Process of ——:
(P) Allen 265
(P) Amend 1544
Quick —— from the Physico-Chemical Point of View. (von Schroeder) 627
Quick Process of ——:
(P) Brandt 57
(P) Marter 1544
(P) Parga. From de Castro 1032
(Schwède) 1404
(P) Sommer 415

Taps and Stopcocks for Inflammable Fluids. (P) Timar 326
For Laboratories, &c. (P) Davis 394

Tar Products. (Class III.) 35, 109, 164, 246, 335, 398, 466, 540, 607, 699, 765, 853, 909, 964, 1022, 1070, 1129, 1180, 1228, 1271, 1326, 1390, 1448, 1527

Tar and Pitch Trade of Hamburg ——. (T.R.) 1045
Apparatus for Extraction of —— from Gas. (P) Plantinga 963
Chemical Composition of Norwegian Wood ——. (Mjöen) 335
Coating for Damp Walls. (Moorman) 1279
Continuous Distillation of —— and Apparatus. (P) Meikle 109
Exit for Hydraulic Mains; Adjustable Drory's —— 108
Extraction of Ammonia from ——. (Guillet) 1022
Imports of ——, into Dantzig, Germany. (T.R.) 1202
Molasses; Indole in ——. (Boes) 429
Obtaining —— from Furnace Gases, &c., and Apparatus therefor. (P) Rigby 1268
Water in ——; Determination of. (Senger) 1475
Wood-; Examination of —— from the Douglas Fir. (Byers and Hopkins) 1228
See also under Coal Tar *and* Wood Tar.

Tariff Changes; Australian Federal ——. (T.R.) 145
Changes in Australia. (T.R.) 197
Decisions in Australia. (T.R.) 568
Decisions in New Zealand. (T.R.) 198

Tariric Acid; Constitution of ——. (Arnaud) 412

Tartar Emetic and Tannin; Interaction between ——. (Ljubavin) 128
Emetic, Crystallised ——; Stable Form of. (Hale) 1302
Emetic; Electrolysis of ——. (von Hemmelmayer) 795

Tartaric Acid; Application of Polarimetry to the Determination of ——. (Kenrick) 1417
Acid in Lees and Tartar; Determination of the Total. (Hubert) 194
Acid in Pressed Grape Skins; Determination of ——. (Ehrmann and Lovat) 726
Acid; Synthesis of ——. (Zinno) 986
Material; Exports of —— from Italy, 1900-1901. (T.R.) .. 442

Tartrates in Glycerin; Optical Rotations of ——. (Long) 77
Influence of Temperature in Determination of ——. (Carles) 875

Taxine; the Alkaloid of Yew. (Thorpe and Stubbs) 1037

Tea Extract; Production of an Alcoholic ——. (P) Mayer ... 633

Tea-Leaves; Withering ——. (P) Shepard 493
Enzymes of ——. (Mann) 716

Teaching: Technical —— in Lancashire. (Tate) 1365

Telegraph Manufacturing Company, Helsby; Visit to —— 952

Tell-Tales; Fusible —— for Use in Pottery-Making. (Salt) ... 255

Tellurium: Action of —— on Gold and Silver Salts. (Hall and Lenher) 1417
Determination of ——. (Frerichs) 1299
Gravimetric Determination of ——. (Gutbier) 1558
In Ingots of American Silver. (Vincent) 409
Separation of —— from Antimony. (Gutbier) 1558
Tetrachloride. (Lehner) 505

Tempering Bath. (P) Lawrence 1141

Terpene Alcohols and their Esters; Use of Sodium Salicylate in Determining Mixtures of ——. (Darzens and Armingeat) 142
Peroxide; Production of ——. (P) Ramage 188

Terpenes and Essential Oils. III. (Wallach) .. 66, 1152, 1244, 1296
New Derivatives of the ——. (Tilden and Burrows) 1037

Terpin Hydrate; United States Customs Decision on ——. (T.R.) 203

Terpineol and Dimethylheptenol; Mercuric Compounds from ——. (Sand and Singer) 1293
A New —— of Melting Point 32° C. (Stephan and Helle). 987
Research on ——. (Wallach and Rahn) 1193

Testing Paper; and Making of Same. (P) Dieterich 277

Tetrazoditolylsulphite; Sodium-, Compounds of ——. (Seyewetz and Biot) 766

Tetrahydroxyflavone. *See under* Dyestuffs.

Textile Chemistry; Some Phases of ——. (Merritt Matthews) 1516
Fabric; Metallic ——. (P) Harmel 1134
Fabrics; Printing Designs on Endless Bands of ——. (P) Hoz 50
Fabrics; Recovery of Volatile Solvents used in Treating ——. Weber and Frankenburg) 968

PAGE

Textile—*cont.*
Fabrics; Waterproofing of ——:
(P) Grend and Bachelard 48
(P) Leclerq 48
Fibres or Filaments; Apparatus for Producing —— from Cellulose. (P) Topham 969
Fibres; Treatment of ——. (P) Raabe 48

Textiles. (Class V.) 46, 113, 170, 249, 339, 403, 471, 544, 610, 701, 769, 856, 911, 968, 1024, 1073, 1132, 1182, 1229, 1275, 1328, 1392, 1452, 1530
Apparatus for Ageing ——. (P) Hebden 474
Apparatus for Bleaching and Dyeing ——. (P) Roesch and Co. 342
Apparatus for Dyeing, &c. (P) Schirp 406
Apparatus for Printing ——. (P) Lecloux 1074
Apparatus for Steaming or Finishing ——. (P) Lister ... 1453
Colouring and Waterproofing ——. (P) Leciercq. 1532
Compound for Removing Rust from ——. (P) Hammer and Coleman 473
Covering —— with Metal. (P) Daly 474
Discharging Dyed ——. (P) Knecht and others 1025
Dyed with Sulphur Dyestuffs; Producing Reserver on ——. (P) Manufacture Lyonnais de Matières Colorantes ... 51
Dyeing and Treating —— and Apparatus therefor. (P) Lindley and Ashworth 340
Dyeing, Bleaching, and Finishing ——. (P) Skoupil 48
Electrical Treatment of ——. (P) Schlomann and De Castro 260
Fixing Viscose on ——. (P) Fielding 1230
Glossing of ——. (P) Cohn 1189
In Hank; Machine for Mechanically Dyeing ——. (P) Dittmar 547
Machines for Moistening ——. (P) Lake. From Comins. 473
Making Non-shrinkable, Porous, Foraminous ——. (P) Schmitz 1025
Manufacture of ——. (P) Barraclough 546
Preventing Local Production of Colour in Printing ——. (P) Knecht and others 1531
Printing of ——:
(Haber) 405
(Kayser) 1073
(P) Rumney and Co. and Young 340
Printing Colours in Graduation on ——. (P) Barhoutan . 341
Producing Designs, &c. on ——. (P) White 1230
Production of —— from Gums. (P) Mugnier 341
Reduction of Oxycellulose in ——. (P) The Bleacher's Association and others 1328
Resist and Discharge on ——. (P) Knecht 969
Spots on —— caused by Aspergillus Fumigatus. (Wehmer) 472
Treating —— with Liquids, and Apparatus therefor. (P) Cohnen 1453
Use of Casein in Sizing and Finishing ——. (P) Jean 1533
Washing ——; Improvements in. (P) Moll and Dickhuth 546
Waste; Recovery of Indigo from —— 1073
Waterproofing —— and Apparatus therefor. (P) Rushworth 1276
Water-proofing and Rot-proofing ——. (P) Williams..... 1132
See also under Piece Goods, Warps, Fabrics, Fibres, *and* Tissues.

Textile Materials; Dyeing of ——. (P) de Keukelaere 857
Material; Washing of ——. (P) Koning 1183
Materials; Waterproofing and Preserving ——. (P) Wharton 512

Thallium; Alloys of ——. (Kurnakoff and Pushin) 143
Volumetric Determination of ——. (Thomas) 501

Thermo-Electric Couples. (P) Hermite and Cooper 125
-Electric Material. (P) Bremer 1458

Thermometers for Brewers' use. (P) Reeves 632
Gas ——. (P) Hatfield 326

Thermo-Regulator and Adapter for Vacuum Distillation. (Patterson) 537
Modified Form of ——. (Patterson) 456
Sensitiveness of a ——. (Menzies) 189

Thiazine Derivatives. *See under* Dyestuffs.

Thiocyanates; Determination of ——. (Rupp and Schied) 990
Iodometric Determination of ——. (Thiel) 1298

Thiocyanogen, Sulphe ——. *See under* Sulphocyanogen.

α-Thio-isatin and Indigo; Manufacture of ——. (P) Geigy and Co. 38

Thionyl Chloride; Use of —— for Manufacture of Acetic Anhydride. (P) Wyss 1467

Thiophen; New Colour Reaction of ——. (Kreis) 930

Thiosemicarbazide as a Reagent for Aldehydes and Ketones. (Freund and Schander) 1100

Thiosulphate; Action of —— on the Latent Photographic Image. (Luppo Cramer) 138

Thiosulphates of Aromatic Amines. (Wahl) 287

Thioxanthine and Manufacture of same. (P) Ach 1245
Preparation of ——. (P) Boehringer und Soehne 424

Thioxanthines; Manufacture of ——. (P) Johnson. From Boehringer and Sons 188

Thomas and Bertrand-Thiel Processes compared. (Thiel) 119
-Powder, Manufacture of —— from Thomas Slag. (P) (Schulte Steinberg) 1338
Slag. *See under* Slag.

Thoria Earths; Precipitating and Separating ——. (Kolb) ... 1093
Occurrence of —— in Minerals. (Schilling) 1243

Thorite and Orangite Research on ——. (Schilling) 1293

PAGE

Thorium Compounds; Radio-Active Emanation from ——, (Rutherford and Soddy) 196, 795
Determination of ——. (Metzger) 563
In Monazite Sand; Determination of ——. (Benz) 563
Manufacture of ——. (P) Abel. From Siemens and Halske Actienges. 872
Radio-Active ——. (Hofmann and Zerban) 368
Separation of —— from Cerium, Lanthanum, and Didymium. (Metzger) 1415
Thujamenthone. (Wallach) 1244
Thujone; Constitution of ——. (Kondakow) 1152
Iso ——. (Wallach) 1244
Thujyl Series; Isomeric Transformations in the ——, Kondakow 1152
Thymol, Di-iodo-di-; Chlorine Compounds in ——. (Cousin) . 560
Di-iodo-di-; Exam. of Mother Liquors of ——. (Roques and Gerneross) 1193
Manufacture of ——. (P) Dinesman 722
New Source of ——. (Battandier) 1551
Volumetric Determination of ——. (Zdarek) 875
Tiles; Glazing of ——. (P) Mueller and Langenbeck 477
Manufacture of ——:
(P) Keeble 257
(P) (Rott) 479
United States Customs' Decision on Fire ——. (T.R.) 199
Timber; Apparatus for Impregnating or Dyeing ——. (P) Pfister 1231
Dyeing of ——. (P) Grunhut 1135
Preservation of Mine —— in Germany. (T.R.) 1257
See also under Lumber.
See also under Wood *and* Building Materials.
Tin and Tin Ore Exports from Malay States. (T.R.) 800
Determination of —— and its Separation from Antimony. (Ratner) 1249
Electrolytic Formation of Spongy and Crystalline ——. (Pfenhauser) 261
Electrolytic Treatment of ——. (Nauhardt) 261
Electrolytic Treatment of —— and Apparatus therefor. (P) Nauhardt 864
From Tin-plate Waste; Electrolytic Separation of ——. (Keppich) 621
In Foodstuffs, Traces of ——. (Medicus and Mebold) 1248
In Johore, India. (T.R.) 510
Industry of the Malay States. (T.R.) 1163, 1478
Lenssen's Method for Determination of ——. (Müller) ... 141
Obtainment of —— by Electrolysis. (P) Quintaine 779
Ores; Analysis of ——. (Muller) 141
Production and Consumption of the World. (T.R.) 1047
Recovery of ——. (P) Bergsoe 352
Recovery of Metallic ——. (P) Browne and Neil 1083
Separation of —— from Arsenic and Antimony. (Lang and others) 748
Separation of —— from other Metals. (Pontio) 929
Separation of —— from Scraps. (P) Twynam 978
-Aluminium Alloys; Research on ——. (Guillet) 121
-Plates, Nickel-plated, United States Customs' Decision on ——. (T.R.) 437
-Plate Scrap; Electro-Chemical Treatment of ——. (Mennicke) 980
Tin Chloride and Bromide; Precipitation of ——. (Viard) ... 1076
Oxide; Manufacture of ——. (P) Lomax 624
Sulphide; Solubility of ——. (Lang and Carson) 1018
Tinned Iron. *See under* Iron.
See also under Stannous.
Tinning Residues containing Chlorine; Treatment of ——. (P) Leaver 915
Tissues; Apparatus for Mercerising ——. (P) Kahn 1133
Apparatus for Steaming ——. (P) Peltzer and Son. 1134
Decoration of ——. (P) Jacquemin 704
Dyed in the Piece; Production of Lustrous ——. (P) Muller 1134
Dyed with Sulphur Colours; Resist on ——. (P) Farbenfabr. vorm. F. Bayer and Co. 969
Fulling and Oiling ——. (P) Sella 704
Novel Effects in Mixed ——. (P) Roussel 704
Printing of; Use of Formic Acid and Formates in ——. (Scheurer) 472
Printing —— with Pigments. (P) Lilienfeld 771
Titanium; Combination of ——, with Iron. (P) Rossi 1537
Metallurgy of ——. (Rossi) 1332
Mordanting Compound for Leather Dyeing. (Dreher) 1329
Titanium Lactate; Manufacture of ——. (P) Dreher 988, 1245
Salts; Use of —— in Dyeing Leather, &c. (P) Dreber ... 771
Tobacco and its Products; Improvement of ——. (P) Reimann 728
Aroma of ——. (Frankel and Wogrinz) 797
Chemistry of ——. (Kissling) 1104
Extract and Nicotine; Obtainment of ——. (P) Gloystein 1553
Influence of Iron on Inflammability of ——. (Ampola and Jovino) 997
Seeds; Solanine in ——. (Starke) 136
-Camphor; Constitution of ——. (Gawalowski) 1348
Tobago; India-Rubber in ——. (T.R.) 147
Toilet Cream; Composition of ——. (P) Fleming 263
Toluene Chlorosulphonic Acid, *o*-. *See under* Dyestuffs.
Ortho-, Sulphochloride; Separation of ——. (P) Baur... 364
p-Toluic Acid; Electrolytic Oxidation of ——. (Labhardt and Zschocke) 484

PAGE

Tolnic-aldehyde-*o*-Sulphonic Acid, Meta; Production of ——. (P) Société Chim. des Usines du Rhône 39
Toluidine, *p*-; Colour Reaction for ——. (Biehringer and Busch) 1559
Toluidines. *See under* Dyestuffs.
Tolylamine, *m*-Hydroxyphenyl-*p* ——. *See under* Dyestuffs.
Tolylenediamine, Meta ——. *See under* Dyestuffs.
Tolyl-α-naphthylamine, *p*-; Derivatives of ——. (Gnehm and Rubel) 168
Tool-Steel. *See under* Steel.
Torch and Rocket; Combined Marine ——. (P) Underwood. 927
Toulon; Bauxite at ——. (T.R.) 1114
Toxic Intensity; Variations in —— of Substances. (Laffont). 728
Principles of the Coriariceæ. (Marshall) 1153
Trade, Foreign, of the United Kingdom for 1901. (T.R.) 78
Marks, Amendments in Convention Rules of ——. (T.R.) 1197
Of Orange River Colony ——. (T.R.) 1419
Report 78, 145, 197, 287, 370, 507, 568, 647, 729, 798, 878, 933, 997, 1043, 1105, 1169, 1197, 1252, 1304, 1354, 1419, 1478, 1562
Trades Waste; Bacterial Treatment of ——. (Naylor) 1091
Tram Oil. *See under* Oils.
Transvaal; Import Trade of the ——. (T.R.) 1256
Trichromatic Photography. *See under* Photography.
Trihydroxyflavone, 3.3'.4'-; Synthesis of ——. (von Kostanecki and Rożycki) 36
Trimethylhexahydroöxybenzylaniline; Preparation of ——. (P) Merling 364
Trinidad; Asphalt Trade of ——. (T.R.) 145
Bamboo for Pulp in ——. (T.R.) 1208
India Rubber in ——. (T.R.) 147
Petroleum in ——. (T.R.) 1160
Trinitroxylenol; Symmetrical ——. (Blanksma) 505
Triphenylmethane Derivatives. *See under* Dyestuffs.
Tripoli; Leather and Esparto Exports of ——. (T.R.) 1049
Soap Trade in ——. (T.R.) 147
Tropidine; Conversion of ——, into Tropine. (Willstatter) ... 871
Tropine; Conversion of Tropidine into ——. (Willstätter) ... 871
Preparation of —— from Tropidine. (Ladenburg) 560
Trusts in Wurtemburg, Germany. (T.R.) 79
Tubes; Collapsible Pyroxylin ——. (P) Feval 1151
Long India-Rubber ——. (P) Thompson. From The Kölner Akkumulatoren-Werks 357
Manufacture of Metal ——. (P) Emerson 624
Tuberine; United States Customs Decision on ——. (T.R.) .. 572
Tungsten-Bronze, Potassium ——. (von Knorre and Schaffer) 1403
Tungsten-Steel, Tungsten in; Determination of ——. (Fieber) 140
Tunis; Lime Phosphate Deposits in ——. (T.R.) 1564
Mineral Production of ——. (T.R.) 1563
Production of Olive Oil, "Grignons d'Olives," and Soap in ——. (T.R.) 1564
Turf Matrix Pulp for Stereotyping. (P) Sander, Migula, and Krafft 362
Turkey; China and Earthenware Trade of Smyrna ——. (T.R.) 291
Copper Deposits of Asiatic ——. (T.R.) 732
Dyestuffs imported by ——. (T.R.) 1111
Emery Production of ——. (T.R.) 291
Gum and Gum Tragacanth in Baghdad ——. (T.R.) 1208
Imports of Candles and Soap into Cyprus and Diarbekir ——. (T.R.) 1314
Import of Chemicals into ——. (T.R.) 1197
Imports of Matches by Kossovo ——. (T.R.) 84
India-Rubber Goods in Asiatic ——. (T.R.) 800
Nut-Galls at Baghdad ——. (T.R.) 1209
Paint and Linseed Oil at Beirût ——. (T.R.) 1003
Paper Imported by Kossovo ——. (T.R.) 84
Paper Trade of Constantinople —— (T.R.) 514
Pharmaceutical Specialties in ——. (T.R.) 202
Soap and its Substitutes in Syria ——. (T.R.) 82
Soaps at Mosul ——. (T.R.) 1048
Soap Imports of Kossovo ——. (T.R.) 82
Soap, Oil, and Candle Imports of Salonica. (T.R.) 292
Soap Requirements at Diarbekir. (T.R.) 800
Sugar Refinery in ——. (T.R.) 148
Turkey-Red; Action of Oil in the Old Process for Dyeing ——. (Driessen) 642
Dyeing; Old Process of ——. (Driessen) 545
Oil. *See under* Oils.
Turmeric; Detection of ——. (Bell) 1559
Turpentine in Hamburg; Imports of —— by. (T.R.) 1049
Manufacture of a Camphor Substitute from ——. (P) Magnier and Brangier 1411
Oil; Acetic Acid Test for ——. (Squire and Cames) 929
Production of —— in the United States. (T.R.) 651
"White Spirit" used for Adulterating ——. (Audouard). 366
Tyrosin and Tyrosinase; Research on ——. (Borgonino) 180

U

United Alkali's Co.'s Works, Widnes; Visit to —— 953
United States; Aluminium in the ——. (T.R.) 936
Arsenic Manufactured in the ——. (T.R.) 935
Asbestos, Monazite and Fluorspar in the ——. (T.R.) 936

PAGE

United States—*cont.*
Asphalt Deposit in Arkansas. (T.R.) 569
Asphaltum Production of the —. (T.R.) 1204
Beet-Sugar in Montana —. (T.R) 513
Beet-Sugar Industry of the —. (T.R.) 512
Bismuth Production of —. (T.R.) 1047
Borate of Manganese in — ; Customs Decision on —. (T.R.) 1046
Bromine Production in the —. (T.R.) 1310
By-product Coke-Making in the —. (T.R.) 1203
Cement Imports of the —. (T.R.) 1162
Cement Production in the Central —. (T.R.) 649
Cement Production of the —. (T.R.) 292
Chemical Hard Lead in Missouri —. (T.R.) 510
Chemical Imports of the —. (T.R.) 1256
China, Earthenware, and Glass Trade of Chicago. (T.R.) 649
Clay-Working Industries of —. (T.R.) 1206
Coal Tar Production in the —. (T.R.) 1310
Cobalt Industry of the —. (T.R.) 881
Coke Plant in Maryland. (T.R.) 568
Cotton-oil Exports from Marseilles to —. (T.R.) 200
Countervailing Duties on Austro-Hungarian Sugar. (T.R) 488
Countervailing Duties on Dutch Sugars. (T.R.) 202, 1423
Customs Decision on Anhydrous Acetic Acid. (T.R.) 199
Customs Decision on Balata. (T.R.) 652
Customs Decision on Dentists' Cement. (T.R.) 442
Customs Decisions on Ferro-Chrome. (T.R.) 1163
Customs Decision on Fire Tiles. (T.R.) 199
Customs Decision on Imitation Silk Yarn. (T.R.) 509
Customs Decision on Manganese Borate. (T.R.) 935
Customs Decision on Metal Scraps. (T.R.) 371
Customs Decision on Nickel-plated Tin-plates. (T.R.) ... 437
Customs Decision on Prepared Tallow in —. (T.R.) ... 1164
Customs Decision on Quillaya. (T.R.) 437
Customs Decision on Scouring-Bricks. (T.R.) 292
Customs Decision on Sodium Cyanide. (T.R.) 80
Customs Decision on Solder. (T.R.) 570
Customs Decision on Stipites Pyrethri. (T.R.) 84
Customs Decision on "Sulphurated" Fruits. (T.R.) 148
Customs Decision on Surface Coated Paper. (T.R.) 202
Customs Decision on Terpin Hydrate. (T.R.) 203
Customs Decision on Tuberine. (T.R.) 572
Customs Decisions on Zinc Dust and Antimony Sulphide. 800
Demand for Leather in 1901. (T.R.) 652
Duty on Antimony Sulphide in —. (T.R.) 732
Electrolytic Bleaching in the —. (T.R.) 145
Fuller's Earth Production of —. (T.R.) 1161
Gypsum Production of the —. (T.R.) 1206
Imports and Exports of — from Germany. (T.R.) 568
Lead and Copper Production of the —. (T.R.) 1478
Lead and Zinc Production of the —. (T.R.) 650
Linoleum Trade of Kansas. (T.R.) 651
Linseed-Oil and Cake Production of the —. (T.R.) 651
Manganese Ore Production in the —. (T.R.) 1162
Manufacture of Soap and Candles in Kansas —. (T.R.) 82
Menhaden Fish-Oil in the —. (T.R.) 572
Mercury Production of the —. (T.R.) 199, 1257
Metal Production of Philadelphia —. (T.R.) 800
Mica Production in the —. (T.R.) 1206
Mineral Oil in the Central —. (T.R.) 648
Mineral Products of the —. (T.R.) 1203
Natural Gas in Iron and Steel Works. (T.R.) 799
Natural Gas in the Central —. (T.R.) 648
Natural Gas Production of —. (T.R.) 1354
Nickel Industry in the —. (T.R.) 881
Oil as Fuel in —. (T.R.) 1045
Oil Discovered at Pensacola —. (T.R.) 508
Oil-Fields of Texas. (T.R.) 934
Oleomargarine Manufacture in the —. (T.R.) 654
Open-Hearth Steel Production of — in 1901. (T.R.) 650
Palladium Discovery in Wyoming. (T.R.) 570
Petroleum Discovery in Kansas. (T.R.) 370
Petroleum Production in —. (T.R.) 1110
Phosphate Fertilisers at Savannah (T.R.) 653
Phosphates and Fertilisers Manufacturers of Charleston. (T.R.) 652
Platinum Discovery in Wyoming. (T.R.) 200
Portland Cement Imports of the —. (T.R.) 732
Portland Cement Industry of the —. (T.R.) 371
Preserved Food in the —. (T.R.) 734
Production of Antimonial Lead in —. (T.R.) 1563
Production of Barytes in the —. (T.R.) 1001
Production of Clays in the —. (T.R.) 649
Production of Coke in the —. (T.R.) 1110
Production of Graphite in —. (T.R.) 1001
River Pollution in Coal Districts in the —. (T.R.) 1355
Salt Production of —. (T.R.) 1162
Slag Production of the —. (T.R.) 1354
Statistics of Industry and Commerce in the —. (Bateman) (T.R.) 1108
Storage of Combustibles in New York City. (T.R.) 941
Sugar-Beet Refuse in the —. (T.R.) 734
Sugar Production in the New Orleans District. (T.R.) ... 512
Sulphide of Antimony in —. (T.R.) Customs Decision on 1047
Sulphur and Pyrites in the —. (T.R.) 1204
Tanneries in Maine. (T.R.) 511
Turpentine, Resin, and Wood-Tar Production of — in 1901. (T.R.) 651
Use of Oil-Fuel in the —. (T.R.) 569
Wolframite Deposits in the —. (T.R.) 146
Wood- and Paper-Pulp in Maine —. (T.R.) 514
Zinc-Dust as Precipitant for Gold in the —. (T.R.) 42

PAGE

United States—*cont.*
Zinc Industry in Kansas —. (T.R.) 81
Zinc Oxid Production in the —. (T.R.) 1422
Zinc Production of —. (T.R.) 1162
Uranium; Radio Activity of —:
(Becquerel) 143
(Soddy) 796
Salts and Hydrogen Peroxide; Colour Reaction of —. (Aloy) 1098
Urea Quinate; Preparation of —. (P) Schutz and Dallmann 275
Urethanes. *See* Carbamic Ethers.

V

Vacuum Apparatus. (P) Vis 914
Apparatus and Process for Production of —. (P) Fanta 1523
Distillations. (Fischer and Harries) 990
Distillations; Pressure Regulator for —. (Burstyn) 640
Pans; Construction of —. (P) Société Prangey and de Grobert 1406
Pans Heated by Steam Worms. (P) Blake and Smart ... 416
Pan; Improved —:
(P) Ekenberg 1548
(P) Ribaud 614
Vaillard-Desmaroux Apparatus for Sterilising Water. (Fontaine) 634
Valeramide, Iso-: Derivative of, and Manufacture of same. (P) Liebrecht 638
Valves; Automatic — for Use in Bacterial Treatment of Sewage, &c. (P) Melvin and Harvey 869
Vanadium; Detection and Separation of — from Molybdenum. (Truchot) 991
Determination of —. (Cormimbœuf) 1249
Electrolytic Determination of —. (Truchot) 991
Estimation of —. (Williams) 389
Silicide; New —. (Moissan and Holt) 1301
Vanilla Extract; Examination of —. (Winton and Silverman) 1300
Vanillin; Action of Benzaldehyde on —. (Rogow) 136
Preparation of —. 274
(P) Langot and Froyer-Delapierre 722
(Trillat) 66
(P) Vigne 68
Vaporiser, Mixer, and Regulator for Oil-Burners. (P) Larkin Or Burner for Hydrocarbons. (P) Gebhard and Rowley. 603
Vaporising Apparatus:
(P) Feeny. From Abwarme-Kraftmaschinenges. .. 1267
(P) Krastin 462
(P) Lyle and Stewart 493
(P) Riley and Strathy 1127
(P) Schunemann 1127
(P) Settergren 603
Vapours; Apparatus for Exhausting and Condensing Noxious —. (P) Webb and others 253
Apparatus for Generating —. (P) Castelnau and Thialon 851
Atomiser and Mixer. (P) Page and Wood 852
Condenser. (P) Merrick 246
Device for Heating. (P) Bowman 599
Explosion Limits of Combustible — with Air. (Eitner) 395
For Producing Incandescent Light; Apparatus for Burning —. (P) St. O. Roy 763
Generation of —. (P) Scharffe 1322
Generators for — for Incandescent Lighting. (P) Fitzpatrick. From Macpherson 397
Preventing Escape of — from Vessels. (P) Spooner 696
Production of —. (P) Hayes 109
Pumps for Compressing —. (P) Murray 2 6
Vapour-Burning Apparatus. (P) Kitson 539, 961, 961, 1388, 1388, 1389
Varnishes. (Class XIII.) 56, 127, 178, 263, 355, 414, 487, 555, 625, 712, 782, 865, 918, 981, 1032, 1084, 1145, 1188, 1238, 1285, 1337, 1403, 1460, 1543
Varnish; Composition for Removing —. (P) Priestman.... 1084
For Backing Silvered Mirror Glass. (E.N.) 179
For Making Enamel and Patent Leathers. (P) McKay .. 1033
For Waterpoofing Paper, &c. (P) de la Grange 179
Manufacture of — :
(P) Hecht and Poulenc 487
(P) Strange and Graham 1239
(P) Tedesco 1460
Manufacture of — from Chinese Wood Oil 1404
Manufacture of Printers' —. (P) Wass 1032
Oils; Production of —. (P) Smith 1238
Varnishing; Process of —. (P) Tuschel 1084
Vaseline; Decree *re* Import of — into Spain. (T.R.) 881
Vats and Pipes; Cleansing Beer —. (P) Sjoo and Tornell.. 268
Vat; Bleaching —. (P) Taylor and others 1074
Brewers' —. (P) Griesser 632
"Vegetable Butter"; a Substitute for Caccao-Butter. (Possetto) 55

Vegetables; Canning of —. (P) Plummer and Stare 787
Edible; Preparation of the Phospho-Organic Matter of —. (P) Postermak 1464
Vegetable Matter; Drying — and Apparatus. (P) Buttner and Meyer 133
Oils. *See under* Oils.
Preservation of —. (P) Bain and Hannay 786
Velvet and Allied Materials; New Effects on —. (Furth) .. 46
Mercerisation of Cotton —. (P) Capron 48, 49
Velvets and Velveteens; Printing —. (Furth) 47
Venezuela; Duties on Drugs in —. (T.R.) 198
Veratrol; Action of Nitric Acid on Tribalogen Derivatives of —. (Cousin) 369
Verbena Oil. *See under* Oils.
Vermicelli: Preparation and Properties of —. (Winton and Ogden) 1290
Vermin; Producing Explosive Gas for Exterminating —. (P) Leybold 270
Vinasses; Concentration of — in the Triple Effect. (Barbet) 716
Vine; Mildew and Oidium of the —. (Guillou) 1089
Vinegar; Duty Free in the Netherlands. (T.R.) 1208
Trade in Wurtemberg. (T.R.) 84
Vinoline in Wines; Detection of —. (Casali) 74
Viscid Substances; Apparatus for Drawing off —. (P) Mynders 1225
Viscometer; A New —. (Meggitt) 106
Viscose; Converting — into Useful Products. (P) Viscose Syndicate 65
Fixing — on Textiles. (P) Fielding 1236
Manufacture of —. (P) Fielding 1193, 1243
Viscous Liquids; Controlling the Flow of —. (P) Mendham 1225
Vitriol Works; Emergencies in —. (Carulla) 226
Volcanic Dust from St. Vincent; Analysis of —:
(Carmody) 993
(Longfield Smith) 931
Volatile Oils. *See under* Oils.
Vulcanising Apparatus. (P) Fritz 626

W

Walls; Compositions for Coating —:
(P) Clauson-Kaas 973
(P) Zschiedrich 978
Composition for —. (P) Thame 1286
Plastic Composition for —. (P) Clausen-Kaas 707
Tar Coating for Damp —. (Moorman) 1279
Wall-Coverings; Washable Embossed —. (P) Völker 1277
-Finish, and Manufacture of same. (P) Wodicka 1279
Warps for Weaving; Dyeing of —. (P) Goddard 1132
Wash, Distillers'; Treatment of —, and Apparatus therefor:
(P) Sudre and Thierry 1548
(P) Thierry 360
Washing and Bleaching Process. (P) Superolfabrik Molt and Dickhuth 49
Washing- and Disinfecting Powder. (P) Mumford and Newlands 1092
Washington District; Treating Gold Ores from —. (Ralston) 1079
Wastes; Bacterial Treatment of Trades —. (Naylor) 1091
Liquors from Pickling Iron; Treatment of —. (P) Ramage 1235
Of Stassfurt Potash Industry; Disposal of the —. (Przihylla) 251
Treatment of Liquid —. (P) McPhail 185
Liquors from Cellulose Factories: Gas from —. (Besemfelder) 1192
Water, Aerated; Apparatus for Manufacture of —. (P) Merchant 1407
Ammonia in; Determination of —. (Emmerling) 990
Apparatus for Distilling —:
(P) Chase 635
(P) Jewell 718
(P) Murphy 787
Apparatus for Electrolysis of —. (P) Garuti and Pompili 778
Apparatus for Heating and Purifying Feed —. (P) Osbourn 1267
Apparatus for Purification of —:
(P) Bell 1292
(P) Boult. From Kennicott 1192
(P) Clark 1036
(P) Clarke 869
(P) Davidson 1350, 1550
(P) Davis 1036
(P) Kennicott 1036
(P) Kinsey 634
(P) Lacomme 718
(P) Putzeys 1408
(P) Roan 1150
Water *cont.*
Apparatus for Softening —:
(P) Doulton and Manger 1242
(P) Drummond 717
(P) Wollaston 559
Apparatus for Softening and Purifying —:
(P) Beissel 1242
(P) Scott and Paterson 493
Apparatus for Softening, Filtering, &c. (P) Waite 1292
Apparatus for Sterilising —. (P) Grove 1150
Apparatus for Supplying Reagents for Purifying —. (P) Schmidt 925
Apparatus for Treatment of —. (P) McPhail 787
Characteristic Reaction for Pure —. (Causse) 642
Containing Silicon and Magnesium; Purification of —. (Rebuffat) 1549
Fatty Acids in Polluted; Detection of —. (Cousse) 427
Feed-; Purification of —, and Apparatus therefor. (P) Lemaire-Destombes 493
Ferruginous Mineral-; Apparatus for Drawing off —. (P) Buchholz 985
Filter for —. (P) Bommarius 1345
Filter for Sterilising —. (P) Siemens and Halske Aktien Ges 1466
Filtering Devices for —. (P) Scott 1036
Filtration of — through Sand and Loam. (Spring) 869
Hunermann's Method for Sterilising —. (Schuder) 985
In Steam Generators: Purification of —. (P) Dutordoir 394
in Tar; Determination of —. (Senger) 1475
Mineral, containing Sulphates; Baryta in —. (Carles) . 717
Natural; Significance of Phosphates in —. (Woodman) 1242
Nitrates in; Determination of —. (Trotman and Peters) 694
Organic Matter in; Determination of —. (de Ridder) .. 368
Portable Purifier and Filter for —. (P) Holland 270
Precipitation of Copper from —. (P) Polmeteer 787
Purification. (Class XVIII.) 62, 152, 182, 268, 360, 420, 492, 558, 633, 716, 786, 869, 923, 984, 1035, 1090, 1148, 1191, 1241, 1290, 1344, 1407, 1464, 1548
Purification and Sterilisation of —. (Rideal) 1149
Purification of —:
(P) Brueckner 422
(P) Putzeys 1466
Purification of Feed —. (P) Sorge, junr. 1386
Purification of Foul —, and Filters therefor. (P) Toulinson 361
Removing Sulphuric Acid from —. (P) Reisert 1550
Softening and Purifying —. (P) Haines 925
Softening of —. (P) Gatecliff 485
Sterilisation of Drinking —. (Rabs) 361
Sterilising and Maintaining Sterilised —. (P) Kaysser. 1408
Supplies; Purifying Municipal —. (P) Maignen 1550
Supply of the City of Winnipeg; The Artesian —. (Wenick) 746
Temperature Exchanging Apparatus for Sterilising —. (P) Desmaroux 1092
Vaillard-Desmaroux Apparatus for Sterilising —. (Fontaine) 634
-Carriage within Great Britain. (Carey) 749
-Gas. *See under* Gas.
-Glass; Treating Minerals for Production of —. (P) Dementjeff and Ousihkoff 173
-Level; Apparatus for Recording —. (P) Cutler 538
-Tank, Combined Metallurgic Furnace and Precipitating —. (P) Bryan 1401
See also under Effluents.
Waterproof Composition for Floors and Walls. (P) Thame ... 1286
Fabrics:
(P) Durrin 341
(P) Menzies 341
Wrapping Paper, Tariff Classification of —, in Spain. (T.R.) 1004
Waterproofed Woollen Cloths; Spanish Customs Decision on —. (T.R.) 371
Waterproofing Apparatus. (P) Rushworth 1276
Composition; Production of —. (P) Heaney 979
Fabrics with Casein. (P) Bousfield. From Cantu and others 113
Material:
(P) Greening 919
(P) Hipple 474
Of Various Materials. (P) Grenet and Bachelard 171
Textile Fabrics:
(P) Grenet and Bachelard 48
(P) Leclerq 48
Textile Materials. (P) Leclerq 1532
Varnishing for —. (P) de la Grange 179
Wax; Abnormal Constants of Japan —. (Beruheimer and Schiff) 55
Bottle-; Composition of —. (P) Hughes 264
Diatom —, and its Connection with Petroleum. (Kraemer and Spilker) 540
Exports of Abyssinia. (T.R.) 200
Manufacture of Mineral —. (P) von Boyen 246, 246
Refining of —, and Apparatus therefor. (P) Donillet ... 711
Specific Gravity of; Determination of the —. (Mastbaum) 1285
Weissbier; Causes of Red Discoloration of —. (Schonfeld and Dennhardt) 1243
Welding; Electric —. (P) Hunter 486
Whale Oil. *See under* Oil.

PAGE

Wheat; Composition of Hard ——. (Fleurent) 133
Starch. *See under* Starches.
Sterilising and Bleaching ——. (P) Buchenau 269
Whisky; Chemistry of ——. (Schidrowitz) 814
White-Lead and Zinc-White; Comparative Experiments with ——. (Rigolot) 1543
Apparatus for Drying ——. (P) Kearns 525
Apparatus for Manufacture of ——:
(P) Corbett 356, 414, 414
(P) Montgomery 1544
Apparatus and Method for Production of ——. (P) Bailey 1337, 1337
Manufacture of ——:
(P) Corbett 414
(P) Rowley 1543
(P) Vickerman 1543
Substitute for ——. (P) Sudre 1404
Whiting; Manufacture of ——, and Apparatus therefor ——. (P) Rigby 178
Wijs Method of Determining the Iodine Value of Oils and Fats. (Harvey) 1437
Will's Test for Nitrocellulose. (Robertson) 819
Wilson Gas-Producers; Efficiency of ——. (Stead) 79
Wines. (Class XVII.) 60, 130, 180, 266, 354, 417, 490, 556, 631, 715, 784, 867, 922, 982, 1033, 1086, 1147, 1190, 1239, 1288, 1340, 1407, 1463, 1546
Acids in ——. (Möslinger) 181
Action of Sulphurous Acid in Preventing "Casse" of ——. (Laborde) 557
Action of Sulphurous Acid on Oxydase and Colouring Matter of Red ——. (Bouffard) 922
Analysis of Natural and Artificial ——. (Carl Mautrand) 1148
Apparatus for Concentration of ——. (P) Tellier 1407
Apparatus for Determining Volatile Acids in ——. (Sellier) 367
Apparatus for Filtering ——. (P) Caubet 1547
Apparatus for Refining, &c. (P) Duffy 558
Casein as a Fining Agent for ——. (Müntz) 359
Citric Acid in ——; Detection of. (Schindler) 1415
Concentration of ——:
(Baudoin) and Schribaux 1089
(Garrigou) 1241
Containing Free Acids or Acid Salts, Clearing ——. (P) Kaserer 1548
Currant, in France ——. (T.R.) 1052
Enrichment of Tartars and Lees of ——. (P) David 1547
Fluorine in ——. (Windisch) 62
Glycerin in ——. Determination of. (Trillat) 1560
La Casse in ——, Cured by Sulphurous Acid. (Laborde) 1035
Lees from Messina, Sicily ——. (T.R.) 1209
Modified by Mycoderma Vini; Composition of a ——. (Rocques) 1148
Production of Champagne ——. (P) Oger 1547
Refining, Ageing, &c. ——. (P) Duffy 558
Retrogression of Acidity of ——. (Möslinger) 181
Salicylic Acid in —— ; Determination of. (Pellet) 1416
Salicylic Acid in; Natural Occurrence of —— (Windisch) 1089
Sparkling; Preparation of ——. (P) Garrett 1090
Sterilisation and Preservation of ——. (P) Amiot 1408
Sulphurous Acid in; Rapid Determination of ——. (Mathieu) 1559
Vinoline and Bordeaux-Red in; Detection of ——. (Casali) 74
Volatile Acids in; Determination of ——. (Rocques and Sellier) 193
Volatile Acids in; Sources of Error in Determining ——. (Curtel) 76
White; Clouding of ——. (Smith) 1034
Wire; Galvanising ——. (P) von Braucke 1537
Wires of Nickel and Iron. (Gray and Wood) 1184
Wolframite; Deposits of —— in the United States. (T.R.) ... 146
Wood; Alcohol *See under* Alcohol.
Apparatus for Carbonising ——. (P) Mourlot 1448
Apparatus for Distilling ——. (P) Roake 246, 965
Apparatus for Drying, Seasoning, and Impregnating ——. (P) Higgins 914
Apparatus for Grinding ——. (P) Wegerer 788
Apparatus for Impregnating ——:
(P) Borner 1028
(P) Lake. From Giussani 1535
Apparatus for Impregnating and Dyeing ——. (P) Pfister 1455
Apparatus for Impregnating and Seasoning ——. (P) Higgins 550
Artificial; Production of ——. (P) Helbing 479
-Charcoal; Production of —— from Aromatic Plants. (P) Rubands 1466
Compound for Preserving ——:
(P) Kleinschmidt 708
(P) Stalker 707
Conversion of —— into Dextrine, Glucose, and Alcohol. (P) Magnier and Brangier 632
Creosoting of ——. (P) Friedman 479
-Fibre; Manufacture of Spirit from —— 1343
Fireproofing of ——. (P) Rücker 347
Fireproofing of ——, and Compound therefor. (P) Ferrell 615
For Railway Sleepers; Preservation of ——. (P) Flamache 1535
Green-; Treatment of —— by an Alternating Current. (P) Guidé 1397
Identification of ——. (Stone) 117

PAGE

Wood—*cont.*
Impregnation of ——:
(P) Boult. From Hülsberg and Co. 1028
(P) Ferrell 550
(P) Ruping 1331
Means for Impregnating ——. (P) Augus 1331
Of British Guiana; The Constructional ——. (Hill) 1027
Oil, Chinese ——. *See under* Oil.
Preservation of ——:
(P) Ferrell 1455, 1535
(P) Giussani 1233
(P) Sprague 479
Preserving and Colouring ——. (P) Feyerabendt 1331
-Pulp. *See under* Pulp.
Refuse; Distillation of ——. (Siermann) 164
Spent Alkaline Liquor from Reduction of Poplar ——. (Griffin) 559
Staining ——. (P) Pfister 1393
Staining —— in Pattern. (P) Pfister 1231
-Tar from the Douglas Fir; Examination of ——. (Byers and Hopkins) 1228
-Tar; Production of —— in the United States. (T.R.) 651
See also under Tar.
See also under Timber *and* Building Materials.
Woodite; Manufacture of ——. (P) Wood and Bartlett 264
Wool; Action of Caustic Soda on ——. (Matthews) 685
Aniline Black on; Production of ——. (P) Bethmann ... 50
Apparatus for Scouring, &c. (P) Malard 1138
Apparatus for Scouring ——. (P) Whitney 1531
Bleaching and Dyeing ——. (P) Brown 857
Cleaning of ——. (P) Maertens 858
Discharging Indigo-dyed ——. (P) Berns. From The Badische Anilin und Soda Fabrik 342
Dust; Sampling and Preparing —— for Analysis. (Megzitt) 105
Influence of Assistant Mordants on the Spinning of ——:
(Flögel and Koller) 339
(Kapff) 612
Lactic Acid used in Mordanting —— with Alumina. (Düring) 911
Mordanting of ——. (Alt) 1132
Mordanting —— with Chrome. (Ulrich and Tugendhat). 769
Mould in Sheep's; Origin of ——. (Kalmann) 1132
Printing Coloured Grounds on ——. (Kochlin) 47
Process and Apparatus for Cleansing, &c. (P) Born 465
Scouring in New Zealand. (T.R.) 201
Washings; Acetone Oil from ——. (Buisine) 164
Woollen Tissues; Resists under Steam Colours upon ——:
(Dépierre) 703
(Koechlin) 703
Wort and Yeast; Apparatus for Mixing and Aërating ——. (P) Wallerstein and Fruend 632
Apparatus for Aërating ——. (P) Wallerstein and Freund 360
Apparatus for Conversion of —— into Beer. (P) Selg and Guntrum 492
Apparatus for Filtering Brewers' ——. (P) De Meulemeester 1148
Beer; Caramelising —— during Mashing. (Prior) 715
Rapid Separation of —— from Dregs. (P) De Meulemeester 1241
Wrought Iron. *See under* Iron.
Wyoming; Platinum Ores of —— 709

X

Xanthine; Homologues of ——. (P) Boehringer und Soehne 68, 424
Thio-; and Manufacture of same. (Boehringer und Soehne. From Ach) 1245
Xylene; Nitro- and Amino Derivatives of ——. (Noelting and Thesmar) 398
Xylenol, Trinitro-; Symmetrical ——. (Blanksma) 505
Xylidine Sulphonic Acid. *See under* Dyestuffs.
Xylopia Ethiopica; Constituents of ——. (De Rochebrune) .. 186
Xylylene Diamines. *See under* Dyestuffs.

Y

Yams; Production of Alcohol from —— 1089
Yarns. (Class V.) 46, 113, 170, 249, 339, 403, 471, 544, 610, 701, 769, 856, 911, 968, 1024, 1073, 1132, 1182, 1229, 1275, 1328, 1392, 1452, 1530
Yarn and Textile Fabric; Metallic. (P) Harmel 1134
Yarns and Threads; Treating —— with Liquids. (P) Prestwich 113
Apparatus for Colouring ——. (P) Fornander 1393
Apparatus for Dyeing——. (P) Corron 1134
Apparatus for Dyeing and Treating ——. (P) Major and Wood 340

Yarns—*cont.* PAGE

Apparatus for Dyeing, &c. —. (P) Hindley and others. 613
Apparatus for Dyeing, Washing, &c. —. (P) Corron.... 1533
Apparatus for Steaming, &c. —. (P) Lake. From Fries 1392
Apparatus for Testing Strength of Fine —. (Lester) ... 387
Apparatus for Treating —. (P) Hindley and others... 473
Apparatus for Washing Hanks of —. (P) Eck and Becker..... 546
Dyeing —, and Apparatus for. (P) Bocks 1532
Effect of Moisture, Acids, and Alkalis on Cotton —. (Smith)..... 471
Machines for Mercerising —. (P) Dolder..... 342
Machines for Oxidising —. (P) Fries..... 613
Mercerised Cotton —. (P) Boult. From Reichenbach 1183
Mercerising of —. (P) Pickles 704
Preparing — for Dyeing and Finishing. (P) Wardwell. 1025
Producing Variegated Effects on —. (P) Rodger 1328
Treatment and Finishing of —. (P) Ashwell 1393
Treatment of Nitrocellulose for Manufacture of Lustrous. (P) Bonsfield. From Société Prod. Chim. de Droogenbosch 546
Warp; Printing of —. (P) Schmidt 1132
Yeast Albumin Preparation of —. (Schroeder) 1418
And Wort; Apparatus for Mixing and Aërating —. (P) Wallerstein and Freund..... 632
Beer; Influence of Concentrated Salt Solutions on —. (Lepontre)..... 867
Bucheler's Process Tried for Preparation of Celery Seed —. (Hesse) 267
Cells; Chemical Processes in Dead —. (Albert)..... 60
Cells; Obtaining the Contents of —. (P) Ransford. From Gans. 491
Connexion between Physiological Condition of — and Changes in Enzyme Content. (Delbrück) 490
Conversion of — into Beer. (P) Selg and Guntrum 492
Distillery Seed-; Bucheler's Method of Preparing —. (Moritz) 417
Extract; Preparation of —. (P) Kressel..... 493
Extract; Preparation of an Alimentary —. (P) Elb.... 924
For Bread-making. (P) Heilenman. 269
For Food Preparations; Washing of —. (P) Peters.... 132
Improvements in —. (P) Davies and Wilding 786
Invertase; Further Experiments on —. (Bokorny).... 1086
Invertase of —. (Holzmann) 1340
Maltase; Synthetic Action of —. (Emmerling)..... 60
Manufacture of —. (P) Brunt 1464
Oleolytic Enzymes in —. (Delbrück)..... 266
Potato Starch in —; Determination of. (Hebebrand).. 281
Powder; Preparation of —. (P) Arzt and Wilding 924
Preparation of Permanent. (Albert, Buchner, and Rapp) 1033
Preparing — for Manufacture of Food or Manure. (P) Wardle 183
Pressed Grain; Differentiation of — from Bottom Fermentation Yeast. (Marbach)..... 417
Production of Artificial —. (P) Verein Spiritus-Fab. .. 715
Purification of Beer — for Bakers' Purposes. (P) Raben and Wrede..... 715
Seed-; Bücheler's Process for Acidification of —:
(Heinzelmann)..... 359
(Hesse)..... 632
Special; Common in High-Fermentation Beers. (Van Laer) 1196
Treatment of. (P) Oxford 421
Use of Oil Cake and Seeds in Manufacture of —. (P) Stang 1290
Washing of — by Ordinary Method and by Levigation. (Luff)..... 922
Zymase Formation in —. (Buchner and Spitta) 784
Yeasts; Action of Tannins and Colouring Matters on Activity of —. (Rosenstiehl) 181
Bottom-Fermentation; Separation of High and Low Attenuating Types of —. (Schönfeld)..... 267
English; A Study of —. (Grey)..... 417
From Sugar Canes for Fermentation of Cider. (Alliot) ... 923
Low Fermentation Brewery; Preparation and Use of —. (P) Jacquemin 786
Occurrence of Glycogen in Various —. (Henneberg)... 1289
Of the Saaz and Frohberg Types; Behaviour of —. (Schönfeld) 359
Yew; Taxine the Alkaloid of the —. (Thorpe and Stubbs). 1037
Yohimbine; Characteristics of —..... 560
Yorkshire Section; Address to —. (Bedford)..... 1520
Ylang-Ylang; Essence of —. (Darzens)..... 364
Oil. *See under* Oils.
Ytterite Group; Manufacture of the Elements of the —, (P) Abel. From Siemens and Halske Actienges..... 872

Z

PAGE

Zeïn; Extraction of —. (P) Osborne and Cornelison..... 358
Obtainment of —. (P) Wulkan..... 630
Zinc and Cobalt, Separation of —. (Rosenheim and Huldschinsky)..... 1351
And Nickel; Quantitative Separation of —. (Rosenheim and Huldschinsky)..... 141
Arsenic-free; Preparation of —. (Hehner)..... 675
Blendes; Loss of Silver in Roasting —. (Sander) 616
Blende; Magnetic Separation of —, at Denver 1184
Blende; Removal of Iron from —. (Phillips) 120
Detection of —. (Biewend) 1349
Determination of —. (Kuster and Abegg) 1557
Determination of —, and Influence of Iron on the Results. (Coppalle) 724
Dust; Production of —. (P) Convers and De Saulles .. 620
Dust; United States Customs Decision on —. (T.R.) .. 800
Electric Production of —. (Kershaw)..... 565
Electrolytic Precipitation of —. (Smith)..... 1558
Extraction of —. (P) Babé and Tricart..... 1142
Extraction of —, Direct. (P) Bermont..... 1457
Extraction of — from Ores. (P) Hoepfner 1081
Extraction of — from Ores and Compounds. (P) Havemann 862
Extraction of — from Waste Products. (P) Kellner.... 351
Free from Lead; Obtainment of —. (P) Hopkins..... 54
From Ores, Furnace for Separation of —. (P) Sébillot.. 1333
Furnace. (P) Wetherhill..... 1401
Furnace Cinder; Determination of Metallic Lead in Crude —. (Prost, Charon, and Marissal)..... 874
Galvanotechnical and Electrometallurgical Extraction and Refining of —. (P) Paweck..... 1403
In Foodstuffs, Traces of —. (Medicus and Mebold) 1248
Industry in Kansas. (T.R.)..... 81
Micro-Structure of —, and Small Impurities in. (Lewis) 1456
Obtaining — by Electrolysis, and Apparatus therefor. (P) Mond..... 354
Obtainment of — from Ores and Mattes. (P) Armstrong 917
Obtaining —. (P) Hopkins..... 1401
Ores. *See under* Ores.
Production in Silesia. (T.R.) 880
Production in Upper Silesia, Germany. (T.R.)..... 1112
Production of —. (P) Schulte 1457
Production of the United States. (T.R.) 650, 1162
Production of the World. (T.R.)..... 570
Recovery of — from Sulphide Ores. (P) Kirkpatrick-Picard 124, 351
Recovery of — from Sulphide Ores and Tailings. (P) Rogers and Oswald..... 124
Smelting of —. (P) Davies 483
Smelting or Refining. (P) Armstrong 1281
Volumetric Determination of —. (Prothière) 724
Working of — in Electric Furnaces. (P) Dorsemagen.. 917
-Bearing Materials; Treatment of —. (P) Dorsemagen 775
-Dust as Precipitant for Gold in the United States —. (T.R.)..... 1421
-Plates; Electrolytic Plating of —. (P) Popp..... 485
-White and White Lead; Comparative Experiments with —. (Rigolot) 1543
Zinc Chloride for Electrolytic Purposes; Treatment of —. (P) Swinburne and Ashcroft 411
-Gelatose Compound. (P) Eichengrün and Berendes 791
Hydroxide; Solubility of — in Ammonia and Ammonium Bases. (Herz)..... 727
Nitrite; Preparation of —. (Matuschek)..... 705
Oxide; Action of Hydrogen Peroxide on —. (De Forcrand)..... 505
Oxide in the United States, Production of —. (T.R.)... 1422
Oxide, Polymerisation and Heat of Formation of —. (De Forcrand)..... 995
Peroxides, Constitution of —. (Forcrand) 1041
Sulphide; Obtainment of —. (P) Brunjes..... 1286
Sulphide; Turbidity in Filtrates from —. (Mühlhäuser) 1099
Zirconia; Reduction of —. (Wedekind)..... 1561
Zirconium; Manufacture of —. (P) Abel. From Siemens and Halske Actienges 872
Separation of — from Iron. (Gutbier and Hüller) 1350

LIST OF NEW BOOKS.

PAGE

A College Text Book of Chemistry. (Remsen) 145
Aids to Practical Geology. (Cole) 77
Aids to the Analysis and Assay of Ores, Metals, and Fuels, &c. (Morgan) 1303
An Introduction to Chemistry and Physics. Volumes I. and II. (Perkin, junr., and Lean) 369
Annual Report of the Chief Inspector of Factories and Workshops for the Year 1901 878
Part II. 1303
Arsenic. (Wanklyn) 1043
Assaying and Metallurgical Analysis, for the Use of Students, Chemists, and Assayers. (Rhead and Sexton) 567
Board of Trade Memorandum on the Comparative Statistics of Population, Industry, and Commerce of the United Kingdom and some Leading Foreign Countries 1104
Chemicals and Allied Products. (U.S.A. Bulletin) 1104
Class List and Index of the Periodical Publications in the Patent Office Library 369
Collins, S. H. The Absorption of Arsenic by Barley. (Jan., Newcastle) 221
Cryoscopie. (Raoult) 567
Cyanide Practice. (James) 78
Die Chemische Industrie des deutschen Reiches in Beginne des zwanzigsten Jahrhunderts. (Witt) 1252
Die Chemische Industrie in der deutschen Zoll- und Handelsgesetzgebung des neunzehnten Jahrhunderts. (Muller) 1252
Die Darstellung des Chroms und seiner Verbindungen mit Hilfe des Elektrischen Stromes. (Le Blanc) 1354
Die Elektholyse des Wassers, ihre Durchführung und Anwendung. (Engelhardt) 729
Enzymes and their Applications. (Effront.) English Translation by Prescott 369
Essays in Historical Chemistry. (Thorpe) 797
Factories and Workshops. Annual Report by Chief Inspector 1354
First Book of Qualitative Chemistry. (Prescott and Sullivan) 932
Forty-sixth Report of the Commissioners of H.M. Customs ... 1354
Fosfati, Perfosfati e Concimi Fosfatici, Fabricazione ed Analisi. (Minozzi) 1561
Gas and Gas Fittings. (Hills) 877
Handbook of Technical Gas Analysis. (Winkler.) Translated by Lunge 729
Handbuch der anorganischen Chemie. (Dammer) 729, 877, 1105, 1562
Higher Mathematics for Students of Chemistry and Physics. (Mellor) 1043
International Catalogue of Scientific Literature 1105
Jahrbuch der Chemie. (Meyer) 1196
Jahrbuch der Elektrochemie. (Nernst and Borchers) 1477
Jena Glass and its Scientific and Industrial Applications. (Hovestadt.) Translated by Everett 1562
La Grande Industrie Chimique Minérale. (Sorel) 933
L'Alcool Industriale. (Ciapetti) 1561
Les Nouveautés Chimiques pour 1902. (Poulenc) 797
Lighting by Acetylene. (Dye) 568
L'Industrie des Matières Colorantes. (Dupont) 78
Manual of Agricultural Chemistry. (Ingle) 729
Methods of Gas Analysis. (Hempel.) Translated by Dennis. 1159
Mineral Resources of the United States, Calendar Year 1900. (Day) 507

PAGE

Mines and Quarries (United Kingdom), General Report and Statistics for 1901 1418
Monographien uber angewandte Elektrochemie. (Minet) 1159
New Customs Tariff of China 1419
New Customs Tariff of the Australian Commonwealth 1419
Olive Oil: Its Source, Production, Character, and Uses. (Boehm) 145
On Cane Sugar and the Process of its Manufacture in Java. (Prinsen Geerligs) 1159
On the Composition of Dutch Butter. (van Ryn) 78
Other Worlds: Their Nature, Possibilities, and Habitability in the Light of the Latest Discoveries. (Serviss) 568
Practical Chemistry: An Experimental Introduction to Laboratory Practice and Qualitative Analysis from a Physico-chemical Standpoint. (Aberg and Herz.) Translated by H. T. Calvert 77
Primary Batteries: Their Theory, Construction, and Use. (Cooper) 197
Review and Text of the American Standard Specifications for Steel. (Colby) 568
Sewage Works Analysis. (Fowler) 877
Subject List of Works on Domestic Economy, Foods, and Beverages 1196
Tabellarische Uebersicht der im Handel befindlichen künstlichen organischen Farbstoffe. (Schultz and Julius) . 997
Technisch-Chemisches Jahrbuch, 1899. (Biedermann) 729
Technisch-Chemisches Jahrbuch, 1900. (Biedermann) 1477
Text-Book of Electro-Chemistry. (Arrhenius.) Translated by McCrae 1159
A Text-Book of Inorganic Chemistry. (Holleman.) Translated by Cooper 798
Text-Book of Physiological and Pathological Chemistry. (Bunge.) English Translation by Starling 797
The Analysis of Steel-Works Materials. (Brearley and Ibbotson) 1251
The Chemistry of Pigments. (Parry and Coste) 145
The Chemistry of the Terpenes. (Heusler.) Authorised Translation by Pond 1251
The Electro-Plating and Electro-Refining of Metals. (Philip) 1251
The Elements of Physical Chemistry:
(Jones) 433
(Morgan) 798
The Experimental Study of Gases. (Travers.) With Preface by Sir W. Ramsay 78
The Gas Engineers' Laboratory Handbook. (Hornby) 567
The Mineral Industry: Its Statistics, Technology, and Trade in the United States and other Countries to the end of 1901. (Rothwell) 1354
The Scarcity of Coal. (Brough) 197
The Soap Brand Record and Trade Mark Manual. (Lamborn) 433
The Testing of Chemical Reagents for Purity. (Krauch.) Authorised translation by Williamson and Dupre 1477
The Textile Fibres of Commerce. (Hannan) 797
The Utilisation of Wastes and By-Products in Manufactures. (U.S.A., Census Bulletin) 1104
Thirty-eighth Annual Report on Alkali, &c., Works. (By the Chief Inspector) 1303
Trades Waste: Its Treatment and Utilisation. (Naylor) 877
Utilisation of Waste Products. (Koller) 1159

INDEX OF NUMBERS OF ENGLISH PATENTS ABSTRACTED.

No. of Patent.	Page.
20,667	163
1899.	
7457	347
12,583	359
14,097	349
14,233	364
14,278	349
14,501	259
14,528	340
15,292	326
15,629	361
15,866	340
15,988	361
16,067	337
16,422	340
16,880	361
17,289	350
17,376	332
17,426	338
17,659	350
17,691	344
18,335	245
18,518	262
18,594	365
18,802	364
19,116	347
21,872	361
24,120	332
24,127	365
900.	
2703	260
6761	358
8309	347
8070	361
8705	334
8934	329
9142	345
9294	329
9595	359
10,069	357
10,155	350
10,867	872
15,108	34
16,621	163
18 040	58
18,188	33
18,191	33
18,279	33
18,958	58
19,571	162
20,612	57
20,702	54
20,718	37
20,855	62
20,894	53
21,061	56
21,073	48
21,075	32
21,228	352
21,256	58
21,388	122
21,483	52
21,511	34
21,518	163
21,519	163
21,560	51
21,565	458
21,566	124
21,623	481
21,641	33
21,827	333
21,886	124
22,033	113
22,121	117
22,139	118
22,297	111
22,328	67
22,391	67
22,397	37
22,554	54
22,570	124

No. of Patent.	Page.
1900.	
22,602	262
22,662	34
22,758	36
22,776	48
22,782	109
22,844	33
22,856	185
22,887	35
22,952	257
22,957	244
22,960	109
22,989	37
23,044	109
23,044A	33
23,110	48
23,156	358
23,198	185
23,320	178
23,412	185
23,415	628
23,419	37
23,470	171
23,493	176
23,507	67
23,517	162
23,634	182
23,647	354
23,718	118
23,727	188
23,754	173
23,796	182
23,797	183
23,798	183
23,811	54
23,851	175
23,886	133
23,887	111
23,902	37
24,602	262
1901.	
50	264
100	33
116	163
199	269
240	109
241	245
274	188
330	111
331	123
392	37
430	123
457	175
493	410
517	133
524	245
601	117
751	37
754	51
759	127
781	244
801	118
930	261
999	111
1008	716
1012	61
1042	113
1070	361
1090	349
1140	114
1159	171
1160	113
1173	163
1221	264
1357	111
1358	111
1376	349
1387	264
1393	52
1508	276
1515	253
1516	253
1644	248
1738	123

No. of Patent.	Page.
901.	
1766	111
1773	163
1783	125
1787	37
1834	48
1842	344
1849	352
1850	771
1890	125
1904	116
1913	268
1934	134
1999	330
2105	169
2188	111
2250	332
2294	130
2297	356
2335	358
2342	117
2368	117
2397	139
2407	176
2409	118
2467	326
2499	118
2587	125
2645	271
2691	183
2713	407
2750	331
2755	189
2756	124
2775	107
2782	862
2836	125
2839	111
2853	54
2907	338
2913	169
2937	34
2939	177
3043	360
3050	329
3071	340
3129	269
3178	129
3239	249
3266	331
3305	173
3311	169
3327	407
3328	275
3329	345
3472	333
3495	458
3561	269
3592	271
3656	422
3671	410
3768	175
3849	330
3943	163
4012	244
4017	612
4024	249
4096	458
4099	411
4126	458
4147	349
4159	164
4176	178
4200	188
4205	179
4207	271
4228	164
4229	598
4231	461
4263	268
4279	171
4280	171
4302	598
4304	473
4350	164
4375	350

No. of Patent.	Page.
1901.	
4403	173
4420	366
4422	411
4441	473
4455	1154
4480	620
4495	117
4516	1146
4568	249
4571	460
4576	261
4586	164
4593	333
4609	337
4610	253
4657	409
4702	487
4707	461
4713	976
4792	332
4803	488
4828	476
4850	459
4859	250
4915	245
4917	410
4943	558
4951	851
4969	971
4970	959
4975	347
5015	253
5022	333
5038	461
5040	462
5042	245
5076	546
5118	326
5154	538
5156	331
5167	249
5215	408
5234	258
5235	459
5240	424
5265	485
5295	362
5316	539
5326	546
5356	497
5388	717
5404	244
5406	269
5440	259
5478	350
5492	133
5502	365
5516	341
5525	492
5544	413
5556	549
5580	249
5592	333
5653	493
5654	249
5655	473
5678	362
5693	350
5740	326
5757A	109
5764	354
5811	249
5826	333
5884	559
5846	552
5879	366
5880	249
5892	397
5936	421
5940	597
6057	408
6061	1032
6077	1029
6089	410
6099	552

No. of Patent.	Page.
1901.	
6091	410
6102	352
6129	559
6146	326
6159	561
6226	345
6246	139
6260	330
6322	409
6336	539
6352	621
6357	598
6429	340
6441	131
6468	597
6487	334
6507	634
6519	349
6534	362
6545	249
6546	249
6569	333
6580	548
6600	139
6611	332
6622	262
6623	550
6643	337
6644	473
6651	249
6666	473
6693	394
6739	699
6771	364
6795	364
6800	550
6816	394
6828	344
6829	344
6857	411
6861	599
6878	337
6882	633
6904	461
6937	360
6952	598
6971	183
7030	477
7041	460
7063	458
7084	482
7110	557
7117	460
7131	491
7148	639
7157	1081
7170	493
7178	708
7181	539
7194	471
7237	326
7246	415
7250	337
7253	717
7256	553
7258	356
7330	556
7344	493
7397	408
7398	401
7410	360
7415	698
7443	360
7484	488
7491	704
7541	471
7568	409
7629	916
7632	338
7710	706
7715	539
7722	695
7723	697
7725	709
7726	700

No. of Patent.	Page.
1901.	
7731	460
7736	696
7800	492
7802	487
7819	487
7821	597
7902	421
7919	471
7921	408
7923	341
7932	548
7995	598
8063	487
8074	760
8076	912
8086	556
8122	420
8156	912
8257	476
8259	34
8270	414
8280	777
8301	719
8331	358
8431	973
8437	626
8449	460
8479	763
8483	555
8524	269
8526	491
8545	175
8546	762
8556	549
8636	608
8722	491
8752	482
8762	763
8777	786
8800	491
8821	1030
8828	612
8882	788
8923	782
8924	471
8942	695
9011	485
9021	596
9039	558
9041	558
9084	760
9133	772
9144	596
9221	786
9337	787
9350	460
9357	558
9369	479
9377	697
9392	625
9437	707
9460	763
9482	857
9496	783
9513	697
9551	962
9556	771
9569	625
9613	471
9617	860
9642	762
9643	598
9653	558
9691	707
9694	608
9695	857
9720	1025
9733	461
9752	558
9774	709
9796	712
9823	132
9847	1025
9892	708
9920	488

No. of Patent.	Page.
1901.	
9927	917
9939	608
10,013	851
10,015	132
10,029	870
10,101	868
10,105	862
10,113	867
10,124	914
10,127	868
10,160	257
10,190	904
10,220	906
10,346	787
10,351	862
10,356	923
10,412	344
10,535	362
10,571	1149
10,629	699
10,655	778
10,657	761
10,663	765
10,680	1227
10,696	107
10,721	723
10,728	543
10,729	548
10,758	540
10,782	717
10,797	139
10,813	868
10,825	555
10,838	925
10,857	550
10,859	915
10,865	555
10,869	851
10,884	266
10,886	608
10,958	1079
10,994	562
11,035	558
11,074	355
11,082	706
11,092	1286
11,135	540
11,149	626
11,155	711
11,163	609
11,165	637
11,202	717
11,236	912
11,257	907
11,312	915
11,328	633
11,337	856
11,339	1281
11,356	599
11,358	608
11,366	1292
11,368	787
11,435	775
11,497	858
11,508	925
11,519	696
11,533	56
11,612	984
11,624	700
11,644	915
11,656	397
11,719	792
11,733	966
11,753	700
11,766	769
11,783	275
11,785	598
11,792	706
11,813	118
11,820	924
11,825	906
11,839	701
11,853	771
11,866	872
12,015	869

No. of Patent.	Page.	No. of Patent.	Page.	No. of Patent.	Page.	No. of Patent.	Page.	No. of Patent.	Page.	No. of Patent.	Page.	No. of Patent.	Page.
1901.		**1901.**		**1901.**		**1901.**		**1901.**		**1901.**		**1901.**	
2,021	609	13,452	915	15,611	460	17,471	1296	19,332	1131	21,362	1282	22,923	1550
2,093	906	13,507	961	15,621	1286	17,478	1224	19,343	133	21,364	269	22,931	330
2,098	907	13,562	171	15,678	1024	17,480	125	19,349	1267	21,372	108	22,965	1412
2,099	924	13,571	917	15,682	910	17,494	331	19,444	1226	21,376	109	22,966	1556
2,134	763	13,588	913	15,687	1523	17,507	1179	19,468	1282	21,377	109	22,990	1282
2,137	698	13,619	967	15,708	1024	17,540	1139	19,474	1397	21,395	872	23,028	1407
2,184	851	13,653	1077	15,751	1020	17,555	107	19,483	1226	21,424	976	23,055	340
2,185	838	13,662	979	15,760	460	17,564	1072	19,486	1182	21,472	1388	23,056	906
2,186	620	13,733	926	15,829	912	17,580	349	19,494	1345	21,481	617	23,060	349
2,202	701	13,755	704	15,846	109	17,581	1408	19,499	330	21,517	1471	23,124	253
2,250	548	13,793	860	15,856	1189	17,626	189	19,501	988	21,534	34	23,125	253
2,259	697	13,832	925	15,886	1191	17,628	366	19,527	1329	21,546	356	23,141	269
2,286	904	13,852	961	15,921	68	17,635	1072	19,532	1132	21,616	1279	23,143	556
2,286	927	13,863	769	15,924	1182	17,637	1127	19,555	612	21,621	1349	23,155	263
2,291	915	13,864	618	15,927	910	17,656	1027	19,585	788	21,625	988	23,188	988
2,307	851	13,877	904	15,929	1078	17,665	1179	19,586	711	21,628	1293	23,206	333
2,308	552	13,983	961	15,983	927	17,671	1192	19,587	543	21,642	961	23,214	1389
2,311	961	13,984	1082	15,984	709	17,779	1080	19,656	1276	21,645	171	23,260	1323
2,319	857	14,046	354	15,987	1035	17,789	1127	19,663	1131	21,646	1446	23,278	762
2,325	872	14,081	855	15,990	1179	17,807	1072	19,691	1191	21,692	397	23,280	477
2,326	855	14,104	1148	15,991	1179	17,815	1191	19,692	1191	21,720	1226	23,284	723
2,327	703	14,106	1025	16,032	491	17,823	959	19,720	1288	21,738	1457	23,291	1195
2,332	865	14,108	914	16,049	984	17,828	330	19,721	1131	21,746	1408	23,292	792
2,335	924	14,146	1029	16,055	961	17,950	425	19,804	906	21,756	397	23,422	1536
2,413	763	14,165	906	16,071	32	17,975	34	19,826	332	21,758	183	23,439	326
2,421	872	14,174	1083	16,109	1029	17,978	107	19,827	782	21,764	1388	23,443	347
2,421A	872	14,231	1039	16,110	1035	17,988	1403	19,857	34	21,768	1344	23,449	599
2,442	959	14,266	350	16,122	917	18,077	1078	19,898	1178	21,773	1327	23,459	1389
2,447	628	14,306	259	16,131	1280	18,102	54	19,899	1226	21,830	1453	23,469	1345
2,476	704	14,329	711	16,132	1280	18,148	122	19,902	1394	21,838	1553	23,523	183
2,500	976	14,342	961	16,133	1536	18,149	123	19,912	1393	21,856	1149	23,543	907
2,507	632	14,356	707	16,170	968	18,150	176	19,919	1322	21,863	488	23,558	1465
2,510	704	14,363	1333	16,173	1024	18,151	108	19,993	1183	21,873	276	23,556	1531
2,532	762	14,366	926	16,207	492	18,154	1279	19,998	1131	21,874	1448	23,557	1531
2,539	919	14,390	1024	16,211	851	18,159	1127	20,001	33	21,879	1327	23,695	1328
2,540	771	14,391	700	16,230	1224	18,161	1097	20,063	1388	21,909	1344	23,802	416
2,578	471	14,456	981	16,337	914	18,163	479	20,072	125	21,940	976	23,889	1246
2,578	1391	14,466	1082	16,353	1191	18,230	259	20,074	1153	21,942	864	23,892	771
2,579	962	14,483	1066	16,359	775	18,233	1098	20,077	1399	21,982	332	23,893	851
2,586	904	14,486	917	16,364	1036	18,242	1125	20,117	1348	21,985	1462	23,944	1327
2,589	914	14,567	1081	16,409	401	18,248	1064	20,142	1183	21,999	1445	23,945	1323
2,591	700	14,576	1029	16,417	1024	18,256	1282	20,143	1183	22,016	1388	24,026	1336
2,605	905	14,577A	1064	16,420	1072	18,260	331	20,200	1131	22,040	139	24,030	164
2,693	904	14,577B	1126	16,421	858	18,333	1348	20,201	1391	22,062	1286	24,069	250
2,694	904	14,577C	1066	16,429	1180	18,335	1282	20,202	915	22,076	1025	24,072	1455
2,695	1038	14,603	917	16,431	1035	18,345	1139	20,281	1239	22,081	1146	24,128	409
2,696	1020	14,643	915	16,483	413	18,366	1149	20,282	397	22,105	164	24,132	1469
2,712	1020	14,653	961	16,486	1183	18,373	1224	20,361	1226	22,116	1464	24,218	461
2,724	1079	14,654	906	16,493	1143	18,389	1182	20,396	1243	22,128	1327	24,234	354
2,729	771	14,669	769	16,500	1066	18,405	1149	20,397	1193	22,131	1322	24,235	410
2,769	870	14,676	1155	16,506	970	18,417	1282	20,398	1276	22,135	1407	24,243	1547
2,781	772	14,707	1149	16,508	1079	18,429	1081	20,401	546	22,181	1226	24,247	1396
2,797	923	14,735	910	16,592	1024	18,439	1242	20,410	1333	22,201	127	24,319	971
2,822	985	14,741	850	16,614	1033	18,528	1188	20,447	1396	22,214	67	24,321	1468
2,826	782	14,751	775	16,668	1246	18,575	906	20,454	1238	22,222	1327	24,328	174
2,861	782	14,759	961	16,677	1082	18,600	1193	20,470	413	22,233	354	24,333	914
2,863	494	14,763	907	16,699	1066	18,637	596	20,472	1178	22,301	1335	24,354	910
2,887	1020	14,812	913	16,700	1066	18,661	1178	20,476	1179	22,303	1385	24,370	1285
2,895	762	14,822	916	16,701	1269	18,716	1455	20,489	1224	22,306	1327	24,381	493
2,918	904	14,825	980	16,702	1269	18,719	1078	20,535	1189	22,314	267	24,399	394
2,950	1333	14,846	1085	16,736	1036	18,728	1183	20,537	1074	22,331	473	24,400	1327
2,958	1020	14,865	539	16,737	1126	18,783	137	20,549	904	22,334	1445	24,468	477
2,959	1021	14,953	173	16,765	1073	18,744	1078	20,551	1072	22,349	1323	24,475	257
2,972	961	14,976	1027	16,794	52	18,748	1234	20,552	1182	22,385	1182	24,483	1021
13,001	787	14,977	1076	16,811	1024	18,749	1232	20,553	1274	22,387	1399	24,524	1457
13,047	765	14,981	925	16,875	1024	18,772	1185	20,566	123	22,455	416	24,570	333
13,049	981	15,029	915	16,901	1025	18,825	1242	20,643	1028	22,461	1277	24,577	397
13,059	855	15,038	1132	16,919	968	18,843	1141	20,657	176	22,486	132	24,580	1397
13,065	864	15,045	907	16,945	783	18,874	1343	20,716	1268	22,549	1281	24,590	488
13,069	985	15,062	858	16,957	1072	18,891	177	20,740	114	22,554	1399	24,603	262
13,097	924	15,064	911	16,968	1153	18,897	1072	20,741	1274	22,577	1330	24,604	357
13,135	627	15,077	914	16,973	1033	18,912	1131	20,747	1389	22,583	1327	24,610	596
13,138	905	15,127	791	16,977	1019	18,942	114	20,760	109	22,601	1184	24,619	872
13,139	697	15,137	1445	16,984	1126	18,949	1140	20,761	270	22,614	1269	24,627	260
13,154	973	15,141	1155	17,030	259	18,951	394	20,884	1092	22,627	350	24,629	707
13,188	869	15,150	985	17,070	540	18,964	1188	20,889	1279	22,629	988	24,683	550
13,191	1021	15,153	52	17,075	1019	18,974	1290	20,895	1241	22,648	1127	24,684	548
13,192	596	15,185	109	17,094	1131	18,976	188	20,998	1330	22,662	1293	24,691	1446
13,197	907	15,204	56	17,194	334	18,978	244	21,017	1457	22,666	1322	24,697	1453
13,205	791	15,222	924	17,197	696	19,013	1132	21,056	1226	22,688	1328	24,798	347
13,206	707	15,250	976	17,213	1144	19,029	110	21,074	133	22,727	1411	24,815	1404
13,283	925	15,259	1021	17,273	1024	19,035	253	21,077	1274	22,730	410	24,821	262
13,302	1021	15,271	1150	17,276	1224	19,036	970	21,097	124	22,733	1327	24,837	397
13,302A	1019	15,324	976	17,282	1226	19,038	862	21,172	959	22,734	1182	24,840	1536
13,302B	1020	15,397	1127	17,292	34	19,045	1279	21,176	553	22,744	357	24,847	1146
13,302C	1029	15,411	1127	17,308	1276	19,068	55	21,182	1465	22,753	124	24,856	405
13,303	961	15,422	1039	17,320	970	19,125	925	21,191	345	22,758	357	24,904	1553
13,313	857	15,427	1082	17,356	1024	19,144	1183	21,212	326	22,762	1391	24,923	257
13,355	927	15,471	552	17,364	696	19,152	1127	21,229	1461	22,766	332	24,928	331
13,364	177	15,526	862	17,396	1242	19,222	989	21,231	1292	22,786	1445	24,974	539
13,375	473	15,531	1338	17,415	1281	19,234	926	21,244	962	22,838	1391	24,986	1389
13,377	855	15,536	1524	17,431	264	19,241	1127	21,272	1230	22,849	1544	24,992	1458
13,378	769	15,537	397	17,432	1148	19,249	1405	21,282	1267	22,852	243	24,993	489
13,392	1036	15,541	1140	17,434	1268	19,267	1182	21,314	1278	22,875	1344	25,009	701
13,395	857	15,579	1143	17,455	1067	19,283	1078	21,316	1408	22,891	1388	25,063	1462
13,413	973	15,595	1029	17,458	1269	19,312	1132	21,356	1269	22,902	125	25,089	1528

No. of Patent.	Page.
1901.	
25,100	280
25,152	331
25,173	330
25,180	697
25,182	353
25,183	458
25,233	502
25,239	550
25,248	1531
25,281	1446
25,400	1139
25,425	413
25,444	1533
25,469	765
25,476	1536
25,521	329
25,589	918
25,590	1446
25,596	482
25,599	1344
25,606	458
25,616	1323
25,650	1827
25,671	354
25,676	699
25,688	1469
25,695	628
25,697	1391
25,706	1410
25,759	723
25,776	872
25,780	1451
25,781	1451
25,792	1543
25,804	1469
25,809	1328
25,810	338
25,824	1192
25,884	1471
25,893	1465
25,976	1523
26,058	1391
26,059	1528
26,060	1451
26,061	608
26,067	981
26,075	1469
26,115	613
26,133	462
26,139	462
26,147	1451
26,155	473
26,165	326
26,169	538
26,198	1446
26,220	1066
26,237	1402
26,256	540
26,261	555
26,271	330
26,315	1067
26,330	539
26,337	539
26,339	347
26,350	425
26,353	792
26,375	905
26,376	350
26,379	410
26,386	561
26,411	1445
26,437	1233
26,446	976
26,456	639
26,465	1451
26,487	1270
26,520	1451

No. of Patent.	Page.
1901.	
26,535	1179
26,577	1126
26,599	331
26,602	338
26,617	1471
26,618	1353
26,620	1553
26,667	458
26,703	1524
26,707	539
26,729	353
26,743	334
1902.	
27	1524
51	461
63	1338
76	870
118	553
147	1537
224	355
232	1076
286	1469
295	1537
312	492
357	1528
383	479
384	459
386	347
391	558
392	558
393	413
418	1539
445	1193
454	763
464	458
569	471
573	1024
579	723
610	460
698	543
728	550
848	548
898	482
979	1032
1003	553
1022	717
1049	397
1074	498
1121	697
1136	962
1146	410
1242	851
1264	1191
1304	713
1325	989
1327	1544
1406	612
1429	549
1430	487
1661	492
1682	775
1684	1082
1774	962
1789	1072
1792	1288
1819	634
1862	473
2001	1388
2074	538
2115	552
2117	599
2129	722
2133	787
2144	1224
2188	1154

No. of Patent.	Page.
1902.	
2231	552
2234	775
2247	1032
2249	906
2260	549
2276	1178
2304	613
2375	1021
2379	476
2456	1278
2592	1523
2660	1230
2671	1535
2722	542
2743	706
2751	598
2752	696
2816	979
2820	778
2843	707
2851	461
2863	718
2865	775
2891	771
2954	786
2976	562
3023	639
3128	713
3178	1092
3206	697
3238	562
3347	1038
3357	1030
3371	1097
3373	1268
3402	1455
3422	1025
3426	708
3468	865
3481	539
3492	696
3493	973
3518	915
3642	1033
3752	717
3831	762
3855	865
3896	1064
3948	697
3951	562
4081	1224
4094	976
4151	697
4152	716
4353	593
4365	1038
4371	907
4383	719
4418	1035
4534	698
4543	976
4550	769
4551	609
4552	855
4621	977
4781	723
4786	850
4851	1227
4866	985
4901	907
4984	918
5015	1322
5039	398
5084	1323
5104	962
5105	632
5193	1226

No. of Patent.	Page.
1902.	
5208	904
5209	1399
5293	722
5348	912
5366	710
5381	1469
5387	728
5422	907
5503	905
5524	1067
5637	1285
5707	1127
5710	1078
5716	1464
5718	913
5796	1399
5847	869
5884	1534
5895	855
6095	976
6176	696
6221	1067
6291	907
6310	779
6311	872
6337	973
6379	908
6385	1081
6525	905
6634	918
6664	1392
6725	702
6792	634
6796	923
6826	762
6844	1028
6858	763
6859	1188
6969	1081
6972	765
6974	908
7034	908
7048	1077
7110	973
7141	925
7163	961
7167	1125
7271	908
7285	1127
7364	1524
7431	785
7451	959
7564	984
7594	962
7608	851
7660	915
7661	980
7693	982
7716	1453
7826	906
7843	1035
7851	924
7884	1388
7995	917
8082	916
8118	1225
8184	858
8287	940
8288	1284
8301	924
8304	1533
8369	1269
8371	969
8390	1150
8392	959
8412	1028
8463	1064

No. of Patent.	Page.
1902.	
8511	553
8513	1064
8633	986
8640	1096
8682	857
8717	908
8757	970
8774	915
8776	927
8779	1323
9299	1020
9303	915
9304	1085
9313	918
9331	1146
9332	1233
9373	1533
9404	1067
9405	1077
9431	1078
9438	917
9501	1141
9511	1082
9521	916
9525	1548
9536	1138
9543	1027
9598	1178
9605	1077
9608	989
9625	1286
9641	1067
9785	962
9812	970
9875	1138
9884	1464
9890	1140
9920	1149
9968	1024
9969	1024
9985	1096
10,083	1282
10,218	1085
10,228	1022
10,234	1096
10,315	1185
10,348	1345
10,350	984
10,353	1080
10,417	1524
10,423	1326
10,461	1085
10,510	1231
10,524	1243
10,699	984
10,775	1019
10,813	1097
10,926	1032
10,929	1141
10,953	977
11,035	1397
11,054	1090
11,184	1132
11,220	1021
11,340	979
11,350	1019
11,422	1035
11,495	1067
11,498	1127
11,502	1146
11,510	1525
11,525	1027
11,553	1185
11,539	1067
11,593	1243
11,703	1020
11,705	1388

No. of Patent.	Page.
1902.	
11,750	1181
11,812	1189
11,864	1020
11,873	1146
11,983	1554
11,986	1081
11,990	1192
11,991	1139
12,063	1226
12,086	1269
12,181	1553
12,183	1126
12,194	1126
12,378	1269
12,393	1267
12,360	1179
12,384	1148
12,407	1267
12,409	1269
12,450	1469
12,510	1132
12,539	1336
12,547	1031
12,559	1226
12,565	1181
12,635	1408
12,680	1188
12,681	1031
12,788	1408
12,807	1133
13,116	1267
13,118	1135
13,121	1328
13,177	1150
13,208	1269
13,271	1225
13,339	1183
13,353	1189
13,455	1083
13,512	1267
13,584	1189
13,611	1226
13,699	1125
13,757	1127
13,758	1155
13,778	1274
13,788	1267
13,954	1524
14,049	1181
14,054	1126
14,105	1296
14,108	1288
14,184	1225
14,276	1193
14,287	1179
14,340	1407
14,341	1407
14,386	1402
14,387	1282
14,441	1232
14,517	1268
14,518	1231
14,590	1159
14,644	1322
14,675	1531
14,685	1393
14,781	1282
14,852	1290
14,865	1191
14,921	1245
14,970	1333
15,031	1545
15,046	1185
15,107	1146
15,252	1191
15,259	1246
15,261	1388

No. of Patent.	Page.
1902.	
15,262	1388
15,318	1184
15,355	1288
15,517	1296
15,528	1390
15,666	1191
15,667	1224
15,691	1388
15,783	1386
15,976	1338
16,259	1233
16,272	1286
16,274	1386
16,282	1524
16,337	1286
16,338	1286
16,556	1283
16,618	1336
16,681	1524
16,694	1155
16,710	1405
16,718	1245
16,783	1460
16,855	1410
17,012	1331
17,213	1333
17,265	1446
17,290	1459
17,297	1446
17,325	1281
17,463	1446
17478	1464
17,485	1411
17,491	1267
17,506	1290
17,507	1462
17,517	1528
17,584	1464
17,603	1389
17,653	1328
17,663	1386
17,739	1343
17,744	1282
17,776	1323
17,874	1407
17,924	1194
18,042	1405
18,197	1460
18,237	1537
18,496	1472
18,506	1535
18,566	1407
18,932	1543
19,019	1524
19,034	1386
19,145	1524
19,174	1531
19,513	1545
19,701	1531
19,914	1537
20,081	1461
20,188	1194
20,214	1471
20,218	1543
20,220	1533
20,339	1393
20,356	1523
20,895	1524
20,981	1457
21,171	1471
21,189	1471
24,146	1524

TABLE OF ERRATA.

Month.	Page.	Column.	Line.	Description.
1902. January 15th.	12	1	41 from bottom	*For* "685" *read* "6·85."
„	12	1	44 from bottom	*For* "156" *read* "1·56." *For* "125" *read* "1·25."
January 31st.	101	2	9 from bottom	*For* "any" *read* "amyl."
February 15th.	160	1	bottom line	*For* "A *catechu*" *read* "Ac. *catechu*."
„	169	2	11 from top	*For* "for" *read* "by."
February 28th.	280	1	38 from bottom and 40 from bottom.	*For* "Phenolphthalin" *read* "Phenolphthalein" in both cases.
March 15th.	375	2	Class Heading XIV.	*For* "Scientific and Technical Notes" *read* "Tanning, Leather, &c."
June 16th.	789	1	3 from bottom	*Insert after* "only" *the word* "occur."
October 15th.	1229	2	25 from bottom	*For* "pyrosulphate" *read* "pyrosulphite."
„	1230	1	10 from top	*For* "pyrosulphate" *read* "pyrosulphite."
October 31st.	1294	2	13 from top	*For* "Guritz" *read* "C. F. Juritz."
„	1294	2	17 from top	*For* "Umjela" *read* "Umjela."
November 15th.	1337	2	bottom abstract	*Delete* "[*Gum Resins*]," and give reference under XVI. (Sugar, Starch Gum, &c.).
December 15th.	1464	2	5 from bottom	*For* "Fr. Pat. 18,311" *read* "Fr. Pat. 318,311."
„	1446	2	20 from top	*For* "Fr. Pat. 817,848" *read* "Fr. Pat. 317,848."
December 31st.	1523	1	11 from top	*For* "rue de Vangirard" *read* "rue de Vaugirard."

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 1.—Vol. XXI. **JANUARY 15, 1902.** No. 1.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Dr. Edward Schunck, F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Robert Irvine.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

E. A. Brotherton.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.
C. Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Otto Hehner. | A. R. Ling.

MANCHESTER.
Dr. J. Grossmann. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Clifford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
Sir Robert Pullar. | Thos. Gray.

YORKSHIRE.
George Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.
Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.
Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.
L. Archbutt ..... I., XII., XVIII.B.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. A. Butterfield, M.A. ..... II., III.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. ..... VII., X., XI.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley ..... I., X., XIII., XXI.
H. Ingle, Ph.D. ..... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw ..... VII., XI.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. ..... IV., XX.
F. H. Leeds ..... III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. ..... XXII.
W. G. McMillan ..... X., XI., XIV., XXII.
W. Macnab ..... XXII.
N. H. J. Miller, Ph.D. ..... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
G. T. Morgan, D.Sc. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
T. H. Pope ..... XX., XXI.
J. C. Richardson ..... XI.
F. W. Renaut ..... Patent List.
G. H. Robertson ..... XI.
Chas. Salter ..... I., II., III., XV., XVI.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley ..... XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
A. L. Stern, D.Sc. ..... XVII.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. ..... XVI.
E. W. Wheelwright, Ph.D. ..... XXII.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.
A. C. Wright, B.Sc., M.A. ..... IV., XVIII., XX.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.
Committee:

Percy Bateson.
J. Campbell Brown.
A. Carey.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Herbert E. Davies.
D. Herman.
Julius Raschen.
F. H. Tate.
W. Collingwood Williams.

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

SESSION 1901—1902.

Wednesday, Jan. 29th, 1902:—
Mr. Eustace Carey. "Some Observations on the Factory and Workshops Act and the Alkali Bill of 1901."

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.
Committee:

J. J. Bowley.
A. C. Chapman.
E. Divers.
H. Hemingway.
E. Grant Hooper.
D. Lloyd Howard.
W. Kellner.
J. Lewkowitsch.
B. E. R. Newlands.
Boverton Redwood.
Walter F. Reid.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

J. Barnes.
W. Brown.
J. Craven.
J. English.
B. W. Gerland.
W. Heys.
J. M. Irving.
M. J. Langdon.
A. K. Miller.
H. Porter.
I. Steohouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.
Committee:

A. Allhusen.
P. P. Bedson.
J. T. Dunn.
T. W. Hogg.
H. Louis.
F. S. Newall.
H. S. Pattinson.
John Pattinson.
W. W. Proctor.
G. Sisson.
Harry Smith.
J. E. Stead.

Hon. Local Secretary and Treasurer:
C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.
Committee:

H. C. Aspinwall.
M. T. Bogert.
C. F. Chandler.
A. P. Hallock.
J. Hartford.
E. J. Lederle.
E. G. Love.
R. W. Moore.
T. J. Parker.
R. C. Schüpphaus.
M. Toch.
G. N. Williamson.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.
Committee:

S. F. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
J. J. Sudborough.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

SESSION 1901—1902.

Thursday, Feb. 27th, 1902:—
Mr. Wilton P. Rix. "Preparation and Behaviour of Insoluble Frits for Pottery Glazes."

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.
Committee:

W. Carrick Anderson.
E. M. Bailey.
G. T. Beilby.
H. Bumby.
J. Christie.
W. J. Chrystal.
D. B. Dott.
C. J. Ellis.
W. Foulis.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
W. Ivison Macadam.
J. McCulloch.
T. L. Patterson.
D. J. Playfair.

Hon. Secretary and Treasurer:
Thomas Gray, c/o John T. Tannahill, 44, West George Street, Glasgow.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Fairley.
Committee:

E. A. Brotherton.
A. W. Cooke.
W. M. Gardner.
H. Grandage.
Edw. Halliwell.
A. J. Murphy.
S. G. Rawson.
A. Smithells.
A. Turnbull.
H. A. Watson.
Thorp Whitaker.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

Notices.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal will be issued twice a month in future, commencing with this number, and it will contain abstracts of French and United States, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections:—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. .....
.....

And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate.....

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....

Profession or Business Occupation .....

Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

CHANGES OF ADDRESS.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Ackroyd, Wm.; communications to Crossley Street, Halifax, Yorks.

Adiassewich, A., l/o Fen Court; 17, Devonshire Square, E.C.

Allingham, Jno.; retain Journals until further notice.

Ashton, Jas.; Journals to Hacken Sewage Works, Great Lever, Bolton.

Barratt, J. T., l/o N. Wales; "Normanhurst," Chingford, Essex.

Beckett, J. H., l/o Glascoed; Brymbo Hall Farm, Brymbo, near Wrexham, N. Wales.

Bentley, W. H., l/o 3; 6, Woodbine Terrace, Irlam, near Manchester.

Birley, R. K., l/o Manchester; 44, Cathcart Road, Redcliffe Gardens, S.W.

Blount, B.; Journals to 2, Broadway, Westminster, S.W.

Bothamley, C. H.; l/o Beaconsfield Road; Hurst Knoll, Weston-super-Mare.

Brown, F. W., l/o Ealing; 81, Abbey Road, N.W.

Burkhardt, Dr. G. A., l/o Pforzheim; c/o H. R. Simons, Strada Principatele Unite 2, Bucarest, Roumania.

Burnham, J. C., l/o Catford; 51, Leyland Road, Lee, S.E., and (after March 1902) Cordite Factory, Wellington, Nilgiri Hills, India.

Butler, Saml.; Journals to The Cedar, Compton, Wolverhampton.

Byrnes, E. A., l/o Patent Office; 918, F Street, N.W., Washington, D.C., U.S.A.

Cairns, Adam (*not* Andrew), 110, Commerce Street, Glasgow.

Clymer, W. R., l/o Detroit Street; 1, The Northampton, Cleveland, Ohio, U.S.A.

Craven, C. E., l/o White Cote Hill; Oak Villa, Bramley, near Leeds.

Crowther, J.; all communications to Technical College, Swansea.

Cutler, F. F., l/o New York City; 183, Essex Street, Boston, Mass., U.S.A.

Dennis, Jno., l/o Bunnyrigg; Ellonville, Dalkeith, N.B.

Elborough, T.; Journals to 59, Mark Lane, E.C.

English, F. H., l/o Hapton; 223, Monega Road, Manor Park, E.

Evans, Enoch, l/o Small Heath; 660, Coventry Road, Birmingham.

Farries, T., l/o 16; 12, Coleman Street, E.C.

Flintoff, R. J., l/o Manchester; 17, Todmorden Road, Littleboro', Lancs.

Gall, H.; Journals to 5, Rue Albert Joly, Versailles (S. et O.), France.

Giles, W. B.; Journals to The Grange, Leyton, Essex.

Gill, W. S., l/o St. Paul Street; North of Scotland Colour Works, Aberdeen.

Goetz, J., l/o Suffolk Street; 2, Kelfield Gardens, North Kensington, W.

Green, Arthur G., l/o 1; Journals to 2, Dartmouth Road, Brondesbury, N.W. (Laboratory), and 28, Victoria Street, Westminster, S.W.

Greenhough, D. W., l/o 5; 29, Rood Lane, E.C.

Hale, E. P.; communications to Endmoor, near Kendal.

Harden, A.; communications to 2, Marlborough Road, Richmond, S.W.

Hargreaves, Jas., l/o Peelhouse Lane; Farnworth, Widnes.

Harrison, W. H., l/o Brunswick Street; Knostrop Sewage Works, Leeds, and (communications) 4, Roundhay Grove, Harehills Lane, Leeds.

Havens, Dr. F. S., l/o Varick Street; 1143, Garden Street, Hoboken, N.J.; and (Journals), 602, Farmington Avenue, Hartford, Conn., U.S.A.

Hawliczek, J., l/o Waterloo; 2, Prince's Avenue, Liverpool, S.

Hinchley, J. W., l/o Furnival Street; 85, Gracechurch Street, E.C.

Idris, T. H. W.; Journals to 120, Pratt Street, Camden Town, N.W.

Jarmain, G. S., l/o Kirkheaton; Dalton Lodge, Huddersfield.

Jones, Herbert J., 52, Sneinton (*not* Snainton) Dale, Nottingham.

Joy, Douglas G., l/o Beverley; The Rookery, Stevenage, Herts.

King, A. J., l/o Ingersley Vale; Rock Bank, Bollington, near Manchester.

Kitchen, Theo.; (Journals) c/o J. Kitchen and Sons, Ltd., Port Melbourne, Vic., Australia; and (subscription) c/o Jno. H. Kitchen, 35, Queen Victoria Street, E.C.

Lamar, W. R., l/o New York City; c/o Mallincrodt Chemical Works, St. Louis, Mo., U.S.A.

Lester, Isaac E., l/o Coventry; Nirvana, Infield Park, Barrow-in-Furness.

Lett, Stephen I., l/o Liverpool; 72, Clarendon Road, Notting Hill, W., Chemical Engineer.

McCaffery, R. S., l/o New York City; San Pedro, New Mexico, U.S.A.

McCallum, J. M., l/o South Park; Southdene, Paisley, N.B.

Mathewson, E. P., l/o New York City; c/o J. A. Mathewson and Co., Montreal, Canada.

Mellors, P., l/o Spain; Locksley House, Pelham Road, Sherwood Rise, Nottingham.

Metcalf, W., l/o Oswaldtwistle; c/o Wm. Metcalf, Ltd., Tar Works, Church, Lanes.

Milestone, W. C., l/o Garratt Lane; 7, Heathfield Road, Wandsworth Common, S.W.

Moodie, Wm. E., l/o Croftingea Works; Alexandria Works, Alexandria, N.B.

Morson, T., l/o Southampton Row; 42, Gordon Square, W.C.

Morton, Jno.; Journals to North Road, St. Helens.

Nairn, Michael; communications to Ben Dhu, Kirkcaldy, N.B.

Neate, P. J., l/o High Street; "Belsize," Watts Avenue, Rochester, Kent.

Orr, Robt.; Journals to Kinnaird, Larbert, N.B.

Orr, T. W., l/o Glasgow; Esperanza Nitrate Co., Taltal, Chile.

Perks, W. G.; communications to c/o National Explosives Co., Ltd., Hayle, Cornwall; Journals as before.

Perry, D., l/o Kirkintilloch; Forth and Clyde Chemical Works, Nitshill, N.B.

Pidduck, E. W., l/o Bridge Street; University College of Wales, Aberystwith.

Pollock, A.; all communications to Kirkland, Bonhill, N.B.

Potter, R. S., l/o Hull; 2, Museum Hill, Haslemere.

Reade, T.; communications to Sebright House, Tettenhall Wood, Wolverhampton.

Ridding, Howard C., l/o Shelton; 7, Wilfred Street, Hartshill, Stoke-on-Trent.

Ritchie, Robt., l/o Shawfield Works; Hayfield, Rutherglen, Glasgow.

Robinson, Jno., l/o Blackpool; Beaconsfield Road, Widnes.

Russell, G. Harrison, l/o New Chester Road; 7, Heath Bank Road, Devonshire Park, Birkenhead.

Saalfeld, A., l/o Fennel Street; 2, South King Street, Manchester.

Sayer, H.; Journals to c/o Sherard Cowper-Coles and Co., Ltd., Grosvenor Mansions, Victoria Street, S.W.

Shallcross, A.; Journals to 926, Ashton Old Road, Manchester.

Silberrad, Dr. O., l/o Essex; Royal Arsenal, Woolwich, S.E.

Skelton, Jno. R., communications to c/o Norwich Crape Co., Ltd., St. Augustine's, Norwich.

Skertchley, S. A. R., l/o Rutland Park; 2, Woodside, Wimbledon Park, S.W.

Smith, G., l/o Polmont Station; Rosehall Terrace, Falkirk, N.B.

Smith, J. Tertius; all communications to Richmond House, Plaistow, E.

Sowerby, W. M., l/o Fleetwood; c/o United Alkali Co., Ltd., Allhusen Works, Gateshead-on-Tyne.

Stainton, W. J., l/o Stuttgart; retain Journals until further notice.

Staples, H. J.; communications to The Old Hall, Spondon, Derby.

Steel, Thos. (of Sydney, N.S.W.); Journals to 70, Holmscroft Road, Greenock, N.B.

Summers, B. S., l/o Western and Blue Island Avenue; c/o The McCormick Harvesting Machine Co., 7, Monroe Street, Chicago, Ill., U.S.A.

Sutherst, Dr. W. F.; communications to Devonshire Place, Brighton; Journals as before.

Syme, W. B., l/o Young's Paraffin Oil Co.; Elm Cottage, Addiewell, West Calder, N.B.

Travers, Morris W., l/o Kensington; University College, W.C.

Underhill, T. J., l/o Deptford; 73, Pepys Road, New Cross, S.E.

Van Laer, N., l/o Black Eagle Brewery; Truman's Brewery, Burton-on-Trent, Brewer and Chemist.

Vickers, Wm.; all communications to c/o Thos. Vickers and Sons, Miles Platting, Manchester.

Watmough, Benj.; Journals to c/o Messrs. Brotherton and Co., Ammonia Works, Calder Vale, Wakefield.

Watson, Jno., l/o Plumstead; 56, Cantwell Road, Woolwich Common, S.E.

Wedlake, H. D., l/o Penzance; c/o National Explosives Co., Ltd., Hayle, Cornwall.

Whitaker, Alfred, l/o Glenmaye; Newlaithes Grange, Horsforth, Leeds.

Will, W. W.; Journals to 162, Kennington Park Road, S.E.

Wilson, Jno., l/o Bearwood Road; Tyneside, Hagley Road, Birmingham.

Wingate, Hamilton, l/o Fort Street; Laboratory, Prince's Street, Auckland, N.Z.

Woltereck, Dr. H. C.; l/o Victoria Street; 3, Edinburgh Mansions, Howick Place, Victoria Street, S.W.

Woodham, K. G.; Journals to c/o Price's Patent Candle Co., Ltd., 3, Cross Street, Manchester.

CHANGE OF ADDRESS REQUIRED.

Chevassus, P.; l/o Lion Works, West Thurrock, Essex.

Deaths.

Bird, Henry, Bencoolen, Bude, N. Cornwall.

Case, W. T., 7, Cedar Street, New York City, U.S.A.

Crowder, Wm., Eden Vale, 177, Lower Addiscombe Road, East Croydon. Dec. 29, 1901.

Morris, Dr. G. Harris, 45, Great Tower Street, E.C.

Paterson, Dr. J. H. R., 10, Millerfield Place, Edinburgh. Dec. 23, 1901.

Welch, Thos., Green Vale Printworks, Westhoughton, near Bolton.

Liverpool Section.

Meeting held at University College on Wednesday, November 27th, 1901.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE MANUFACTURE OF MAIZE STARCH.

BY GEO. ARCHBOLD, PH.D.

Introductory.—The oldest process of manufacturing wheat starch in the United States consisted in steeping grain in water until it was soft, when it was passed through a malt mill or between rollers, and again mixed with

water. Fermentation then set in, forming lactic and acetic acids, which disintegrated the cellular structure of the kernel and liberated the starch granules. These were collected by repeated washings and precipitations, the process being continued several days, the gluten putrefying and giving off a very foul odour. The sugar and a portion of the starch were converted into alcohol, and a part of this into lactic and acetic acids, which dissolved the gluten that had escaped putrefaction. Thorough washing removed the soluble matter, and the starch left behind was dried and prepared for market. A second method (known as non-fermenting) is of French origin, and consisted of kneading wheat-flour into dough with water, then washing in a fine sieve in a stream of water as long as the passing water continued milky. The starch in suspension and the sugary portion in solution were caught below the sieve, and the gluten nearly all remained behind in a sticky elastic mass. What passed through was left to ferment for twenty-four hours at 68° F., and a little leaven was added (or skimmings of a former operation) to hasten the process. The portion of gluten carried through with the starch was thus separated and recovered by skimming. The starch was then treated as in the process previously described. This second method gave a product of about 50 per cent. of the weight of flour, while in the first process it was only 35 to 40 per cent. Most of the gluten was saved in a condition to be used for food by mixing it with potato or other substance. The starch thus produced, while good for some purposes, lacked the required strength for fine laundry work; it was not clear and pure white, like the modern product, and, being made from wheat, it was comparatively costly. The removal of the gluten was never perfect, causing endless annoyance and perplexity to the laundress when it came in contact with her hot irons. It was by these, or by still more crude and costly methods, that nearly all such starch was produced down to about the year 1841. Starch is found in wheat, rye, barley, oats, buckwheat, rice, corn millet, peas, beans, potatoes, cassava, arrowroot, and other plants, and varies greatly in quantity under different circumstances. Within the last decade the starch industry has made rapid strides, thanks to the application of scientific methods.

A new era appears to have set in, as older processes, with one exception, are no more. I refer to the "Chemico-Mechanical" process, which appears as the standard, and is accepted by all authorities as producing a starch that no other process appears to approach in purity, and one that has its own characteristics, chemically and physically, which alone distinguish it from other starches. As this process is a secret one, and the secret has been maintained for upwards of half a century, I can only briefly refer to it. In this process advantage is taken of the fact that maize or Indian corn contains two albuminoids, which envelop the starch; one of these is soluble in water, and the other in weak caustic alkali solutions. The former contains 16·7 per cent. nitrogen, and has (when dry) many of the properties of diastase; the second contains nearly 18 per cent. N, and is what is generally known as gluten. The process consists primarily of extraction of these bodies from the corn, so that the resulting starch, as it passes through the various cleansing and drying processes, is absolutely free from everything likely to set up fermentation and acidification, whereby the final product would be injuriously affected.

The National Starch Co., who control all the starch factories in the United States, use the sulphur dioxide process throughout, or that process combined with alkali in the later stages. The sulphur dioxide process throughout is used by glucose makers with advantage.

The attrition or dry process, which is in its infancy, promises a new era in this great industry. The maize is ground in an attrition mill, and, by means of a powerful blower, the constituents of the corn are separated. Starch, being the heaviest, is treated with a weak solution of alkali, to remove the oil and any remaining gluten, well washed and further treated, as in the final stages of other processes. Should this process ever be perfected (and there is no reason why it should not be) so as to thoroughly separate mechanically the whole of the starch from the bran, gluten, &c., it would have the advantage of saving the valuable albuminoid constituents of the grain in a dry state, in a condition fit for food and other economic purposes, while the total amount of starch (which is the sole object of manufacturers) is also obtained in such a state as to require the minimum expense in labour, chemicals, and time, to further purify and make it fit for commerce, *i.e.*, to complete the process, so that the final product would be equal chemically and in physical appearance to the purest commercial starches now in the market. The samples that have come under my notice, made by this process, certainly are not of this character.

The Alkaline Process.—The average composition of maize or Indian corn used in American factories is as follows, and is known as No. 4:—

	Per Cent.
Oil	5·20
Carbohydrates	71·22
[Starch therein 54·8 per cent.]	
Albuminous substances	10·46
Ash	1·52
Water	11·60
	100·00

Steeping.—As it is of the utmost importance to the after treatment of the impure starch that as much of the oil and mineral constituents of the grain be removed as possible, and the nitrogenous matter surrounding the starch of the grain, such as gluten and albumen, be thoroughly softened, so that it may be brought into a condition to be acted upon by chemical means (by NaHO or SO_2), the process of steeping is one of great importance.

The grain is steeped in warm water for three days at a temperature of 60° C., and a small quantity of bisulphite of lime is added, to prevent fermentation and subsequent development of acetic and lactic acids. However, this latter addition, unless made in such quantities as are used in the so-called sulphur dioxide process, does not accomplish this end, as, in order to arrest any development of the germs of fermentation or acidification, the liquor covering the steeped corn should stand at least 1° B., and then the antiseptic qualities of the sulphur dioxide would only be apparent during the steeping process, and injurious organisms would develop at later stages.

Chromic acid or formaldehyde, however, used only in small quantities, are far more energetic and permanent in their actions, chromic acid by its powerful oxidising properties, and formaldehyde by producing surroundings poisonous to all germs carried by the air. The use of antiseptics, and more particularly those in question, will be referred to later on.

The following figures show what takes place during the steeping process:—

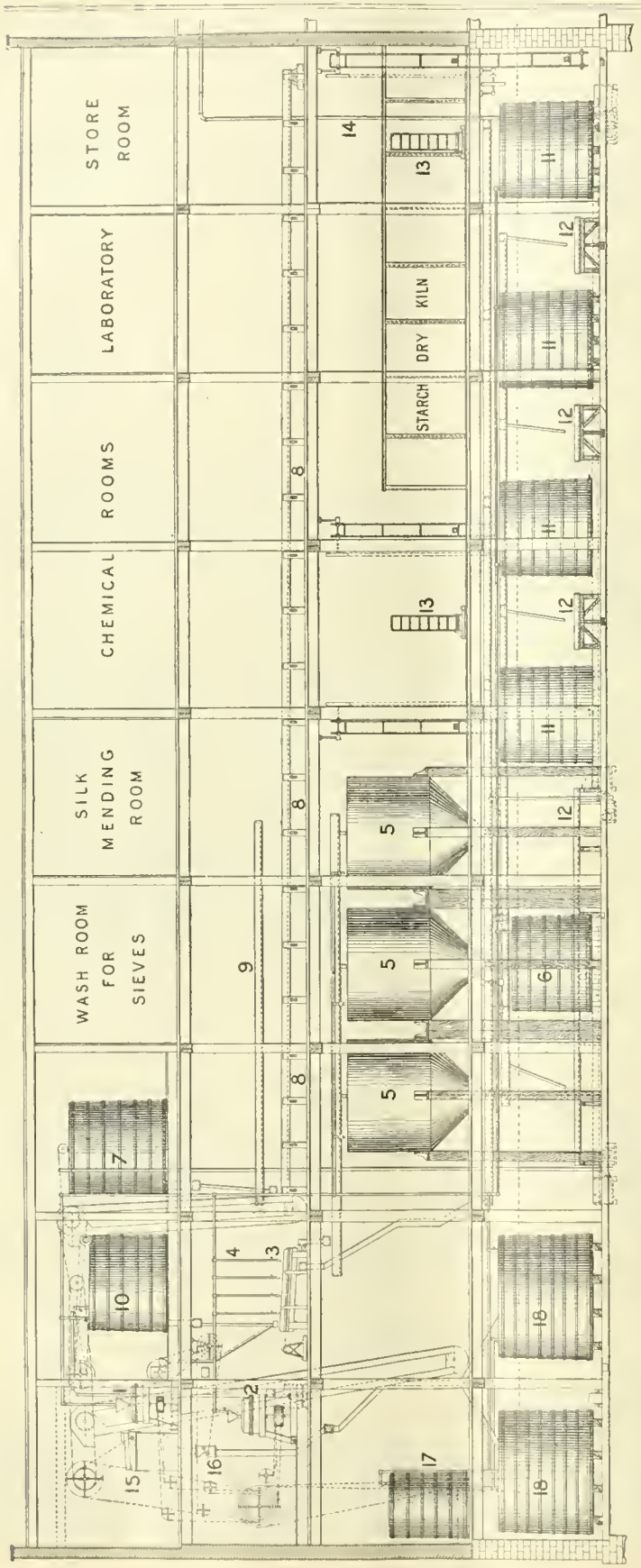
	Lb.
Original bushel of corn weighed	56·0
Water contained in this	6·5
Weight of steeped corn, subsequently dried at 100° C. *in vacuo*	49·4375

Thus 49·4375 + 6·5 = 55·9375 lb. now represents the original bushel of 56 lb. of corn. There has thus been washed away in the steeping process 56—55·9375 lb. = 0·0625 lb. as oil, albuminoid, and ash, or 1 oz. per bushel of corn.

The water absorbed by each bushel of corn in the steeping process is 29·75 lb., or about 3 galls., so that we may summarise as follows:—

	Lb.
Original water in corn	6·5
Water absorbed	29·75
Weight of subsequently dried corn	49·4375
Loss	0·0625
Total weight	85·75

The corn, as it enters the steeps, undoubtedly contains germs deposited there at some period, which develop and give rise to acetic and lactic acids, and these, in turn, react upon a portion of the gluten dissolving it. With the above method of steeping, the addition of bisulphite of lime fails to prevent the development of these germs. In



Longitudinal Sectional Elevation of Starch Plant.

Explanatory Key.

1. Degerminator.
2. First grinder.
3. Shakers.
4. Sprinklers over shakers.
5. Cones.
6. Well, after cones.
7. Regulator tanks to 8.
8. Starch tables.
9. Starch conveyors.
10. Break tanks.
11. Washing tanks.
12. Boxing tables.
13. Cars for the drying kilns and packing rooms.
14. Pumps, &c. to convey starch to glucose house.
15. Corn screen.
16. Magnetic separator.
17. Hot-water tank to supply steep tanks.
18. Steep tanks.

this sour condition the material goes to the mills for the grinding process, and is ground with a small amount of water.

The magma of ground corn, as it falls from the mills, contains 13·36 galls. of water per bushel, and as the steeped corn previously contained $3\frac{1}{2}$ galls., 9·86 galls. are used in the first grinding process per bushel of corn. As it falls direct from the mill, 1 gall. of soft magma contains 52·8 oz. of solid matter. In this condition it is run with a stream of water to the mill-well and thence to the first shakers. When run through these shakers the milky fluid has a specific gravity of 3° B. on an average, and contains in 1 gall 6·9 oz. of solid matter containing 5·42 oz. of pure starch and $1\frac{1}{2}$ oz. of dry fine feed, *i.e.*, 35 lb. per bushel of corn with $73\frac{1}{2}$ galls. of water go through these shakers to the cones.

It is therefore apparent that 21 lb. of solid matter per bushel are returned to the mills for the second grind, and thence to the second shakers, when the liquid, which comes through, is mixed with that from the first shakers, thereby reducing it in gravity without any appreciable addition of starch, the whole of the starch being practically washed through in the first instance. In the cones the solid matter quickly subsides, whilst acid water runs off.

As the material, containing all solids which have passed through the shakers to the cones, runs out to the alkali tanks it contains $20\frac{3}{4}$ oz. of solid matter per gall.; it has a specific gravity of $7\frac{1}{2}$° B. and contains 12·4 c.c. N/10 acidity per 100 grms. The $20\frac{3}{4}$ oz. of solid matter consists of $15\frac{1}{2}$ oz. of pure starch and $5\frac{1}{2}$ oz. of fine feed (which is passed through from the second grind), three-fourths of the original acid water run into the cones having run to waste.

In this condition it goes to the mixing vats, at an average gravity of 7° B. Alkali of 3° B. is added until it reaches 43 c.c. N/10 alkaliuity per 100 grms., this being equal to 8·7 c.c. of the ordinary 3° B. solution of alkali used in the factories for mixing with the starch. The alkali neutralises the acidity of the mixture and precipitates a small proportion of the

dissolved albuminoids, and the excess of alkali dissolves, or emulsifies, the oil, dissolves a further portion of gluten, and coagulates and discolours the mechanically divided fine feed and insoluble gluten (that which acids alone dissolve). This is called a separation, but it is, in fact, only a discolouration, which shows the line of demarcation between suspended starch and gluten and oil emulsion.

From the mixers or alkali tanks it is then pumped to the regulators, where it is reduced to 3° or 3½° B., and in some cases, especially in summer, more alkali is added. This dilution with water is necessary in order that it may run uniformly on the tables. The dilution enables the emulsion of oil and solution of gluten to run easily, the suspended impure starch being deposited on the tables, which form the next portion of the plant. As the starch runs on the tables it is calculated that every 32 galls. of emulsion, run from the ends, represent the soluble matter of one bushel of corn, and the deposited starch therefrom the total yield per bushel. The starch liquid should flow on each division of the tables at the rate of one gall. per 35 seconds and at 3½° B., while the flow of emulsion at the end of the division would be at the rate of one gall. per 20 seconds, the gravity being ½° B., deposition of starch accounting for the lowering of 3° B.

The waste contains nearly 2 oz. of suspended matter per gall. and 0·6 oz. of soluble matter, or a total of 2·6 oz., containing about 6·53 oz. of pure oil. Now, as 32 galls. represent one bushel of corn, we have to run to waste 1¼ lb. of solid matter in solution, 4 lb. of suspended matter containing 1 lb. of pure oil per bushel, all valuable food products.

The starch, as it is deposited on the tables, has on an average 55 per cent. of water, and its alkalinity is 25 c.c. N/10 per 100 grms. If allowed to be exposed to the air in summer it loses half its alkalinity; this is due to the lactic and butyric acid germs nourished by the gluten developing further acidity, whereby alkali is neutralised and lactate and butyrate of soda formed. The average of free alkali and lactate of soda during the year is about equal to 40 c.c. N/10 alkali per 100 grms.

From the tables the starch, containing 55 per cent. of moisture, with solution of free alkali, lactate, and butyrate of soda, &c., is conveyed to the breakers, where it is mixed with water until reduced to 11° or 12° B., and thence to the last shakers, where it passes through and runs out at 8° B., or about 26·1 oz. per gall. of dry starch, much fine coagulated feed, &c. running out of the end into a gutter for conveyance to the feed room.

This liquid at 8° B. is then run to the washers, where it is allowed to settle, the free alkali and lactate and butyrate of soda being then run to waste. The starch is next agitated with fresh water, and is raised to 25 c.c. N/10 alkalinity per 100 grms. It would appear, even at this stage, that the acid ferments are still at work, as this liquor loses in alkalinity 13·5 c.c. per 100 grms. after the second washing (a decrease of 1·3 c.c. per 100 per hour). It is obvious, then, that they remain active until the final product is obtained, when, deprived of moisture, they become inactive for the time being. Still they are not destroyed, for it is evident that finished starch remixed with water and coloured with phenol phthalein shows a gradual development of acidity. The free alkali it contains does not retard the action.

At this stage of the process, then, the whole of the vibrios are not destroyed, but run with the starch into the next tanks, the boxing tanks, where the gravity is 11° B., alkalinity 17·5 c.c. in 100 grms., the starch passing to the boxes at 23° to 24° B., alkalinity 19 in 100. The material running into the boxes contains 70 per cent. of water, and after draining over-night it contains 55·6 per cent. of water. Dumped from the boxes, it forms oblong blocks of starch, which are cut into pieces, each 12½ lb. in weight, and these pieces are placed on the tiles, where they are allowed to stand for 12 hours, the water being thereby reduced to from 40 to 45 per cent. The pieces are now transferred to the crusting kilns, where they remain for a further 12 hours at a temperature of 74° C.; the outside to the depth of an eighth of an inch thus becomes browned, and nearly the whole of the lactate and butyrate of soda, together with albuminoid impurities in solution, are transferred to the outer portions. The starch is then scraped, wrapped in paper, and placed in the kilns for from seven days to six weeks, according to the grade of starch required.

When wrapped into the paper, the starch invariably stands 12 c.c. N/10 alkalinity per 100 grms., and when removed, as a rule, retains this amount to the last, if it has been previously well washed; otherwise it comes out neutral or nearly so, the fermentation products having neutralised the soda, forming neutral or acid starch, as the case may be.

Now, in some cases, a small "fly" develops, known as *muscarius amylicus*, which soon dies on exposure to air; this, in turn, develops in the starch a lower form of microscopic organism, which develops into a sort of "maggot" in the finished starch. Numerous developments of starch life may be detected under the microscope in the starch, but whether these are injurious in an article of food is yet an open question. The starch from the scraping process is returned to the washers, alkali is added, and it is again run over the tables and shakers, and constitutes at least 20 per cent. of the entire product, which is boxed, tiled, and dried, as with the former stock.

It will be seen, therefore, that under this existing process there will always be a certain amount of starch which, while not lost, is not available as commercial starch. To obviate this it must, at the boxing stage, be subjected either to a vacuum process or to pressure by means of compressed air, so that all the soluble impurities may be exhausted in the boxing process, and the starch contain the minimum moisture of 20—30 per cent. The starch would then dry more uniformly, the kilns would contain less contaminated moisture, and the crusting process would be rendered unnecessary.

The process, although still largely used in the United States as described, has, within the last year, been greatly improved by the author, as follows:—

The oil germs are extracted from the corn after a steeping process of 12 hours, the oil being utilised as an article of profit and commerce. The crushed corn, germ-free, after treatment with sulphur dioxide, or other antiseptic, is ground, and is then ready for further treatment. By this means the three days' steeping process is rendered unnecessary, and a saving of 75 per cent. in chemicals, labour, &c. is effected. A vacuum system for extracting water is adopted, whereby the crusting and scraping processes become unnecessary. The drying kilns are so arranged, with a current of hot dry air and an exhaust for moist air, that the time required for drying is reduced from weeks or days to hours.

Improved Process.—It will be as well to give a few details of this. The clean corn, passing through a magnetic separator (see figure), which takes out iron, nails, &c., is run into large vats holding 1,000 or 2,000 bushels of corn, and is covered with warm water at 65° C., wherein is dissolved the suitable antiseptic, or it may be covered with a solution of SO_2 of 1° B. After 12 hours the water is run to waste. The somewhat softened corn is then conveyed to a specially constructed crusher, where it is crushed sufficiently to free the germ. Next, the germs are separated from the broken hulls and perisperm by flotation; the hulls sink to the bottom, and the germs rise to the top. The germs may be then collected from the surface of the liquid, and the hulls removed from the bottom. In effecting such a separation on a large scale a number of separator tanks are used.

The apparatus involves two conveyors or distributors extending over as many separator tanks as may be desired, and connected at both ends, so that the material discharges from one into the other, bringing about a constant circulation and even distribution. In the bottom of one conveyor is a series of openings or chutes, which supply the several separator tanks. Each chute is supplied to its full capacity, the last getting as much as the first. If the supply of material is too small, one or more of the separator tanks is stopped. Should the supply be on the increase, any temporary excess will be carried backwards and forwards in the conveyors and held, as it were, in reserve for the moment when the supply diminishes. If

the excess of supply to the conveyors continues for any length of time, the surplus overflows from the chute.

Within the lower portion of the tank, work spirally-arranged arms, which are in effect propeller blades. The rotation thereof causes the general advancement of the hulls and heavier materials, which sink to the bottom, and also causes a constant circulation of the separator medium. The corn hulls and germs are fed directly into the blades at the receiving end of the tank, and there the blades serve the additional function of breaking up and loosening the hulls from the germs. The hulls may be drawn off from the bottom of the tank by means of a pump. The floating germs are carried along the surface of the tank to the weir, by means of blades secured to sprocket chains, and the weir may be raised and lowered to control the depth of the medium in the tank.

The mixture is kept at 12° Baumé, partially by means of calcium chloride in solution, while the germs, floating off by one channel, are collected in a centrifugal machine, and from thence pass to a steam dryer, and to the press room, where the oil is expressed by means of an oil press, preferably "Mitchell's." Not only are the oil and oil cake valuable by-products, but the quality of the starch is greatly improved and requires much less chemicals, SO_2 or $NaHO$, in subsequent separation and refining. The weak solution of calcium chloride is run into a tank and is used over again in a subsequent operation, and finally run to waste. The crushed germ-free corn is conveyed to the mills to be re-ground, and passes through the various stages as in the preceding process. Alkali may be used, or a solution of SO_2, throughout the process, according as "alkaline" or "acid" starch is required.

After the starch reaches the washers, where it is thoroughly cleansed with repeated washings, it is run into specially constructed boxes lined with muslin and arranged side by side on an oblong tank connected with a vacuum chamber, and a vacuum effected by means of a powerful pump. The water quickly leaves the starch as a solid block in these boxes. It is now taken from the boxes and the oblong lump of starch is cut into seven-inch cubes which are placed directly in the kiln. If glucose is to be made, the starch milk can be pumped direct from the washers to the glucose house for conversion into glucose.

Under the best conditions by this improved process, it takes 10 days, from the time the corn enters the steeps, until the starch leaves the kilns for the packing department, to bring the starch into merchantable form. From further experiments made on improvements to this process, the steeping and degerminating process can be accomplished in 10 hours, the starch and by-products obtained ready for the market within 48 hours, and commercial glucose in 36 hours.

I will close this paper by giving a complete specification and description of the machinery required for a factory running 1,060 bushels per day, of 10 hours run, one half of which is to be worked into glucose, the balance into commercial starch.

Starch and Glucose: Specification for One Thousand Bushel Plant.

Steam Department.

Boilers.—Three boilers, each of 100 h.p., to be of the vertical waterproof safety type, to have water tube, grate bars and down draft so that any class of fuel can be burned. The boilers to be supplied with a full set of mountings usual with boilers. They will also have the feed connections, which will be connected to the boiler feed pump, to be of the duplex type and to have ample capacity for the 300 h.p.

For receiving the hot water from the glucose house, a hot water tank with connections to the pump.

Heater.—In order to get the water in the best condition, a heater should be placed between the pump and the boilers.

Steam Engine.—To be 16 in. in diameter, 42 in. stroke and with 90 lb. of steam to develop 150 h.p. This engine to be thoroughly well made, substantial type, heavy fly wheel; to have a steam stop valve; site oil feed on cylinder and slides.

Whole Corn Department.

Magnetic Separator.—Of standard construction operated by belt from main shaft and to have a capacity of 200 bushels per hour.

Elevator.—Of sufficient height, of the bucket type, which will be large enough when travelling at 70 ft. per minute to elevate 200 bushels of corn per hour, discharging into a hopper where the corn is conveyed to the several steeps.

Steeps.

These to consist of six wooden tanks 12 ft. diameter and 14 ft. inside measurements, made of 2 in. sound pine; to be well put together, secured by steel hoops proper size and number, so as to make the tank tight when filled.

Wet Grain Elevator and Conveyor.

The grain from the steeps to be received on a horizontal belt which will convey it to the boot of the elevator, and there raise to a distributing chute which will deliver to the crushing mills.

Germ Department.

A crusher for breaking up the corn in its wet state, not grinding, in order to separate the germs.

Degerminator.—The broken corn received by this machine and wet so that the germs are floated off and conveyed away. The cleaned corn is conducted in a different channel on the sieves.

Sieves.—What fine starch may be ground is here sieved off, while the corn is caught in an elevator specially designed for wet corn.

Oil Department.

The germs being delivered from the degerminator are sent to the germ dryer where the water is expelled.

Grinder.—This machine is especially designed for grinding the dry germ in order to put it in the best condition for giving up the oil. The meal is delivered to a heater and cake-former and then placed in a sixteen-box oil press.

Accumulator and Pump.—This when set to work upon the press eliminates the oil as far as possible, which is pumped through a filter into storage tanks. The cake is then taken to the curing and bagging table. There should also be a germ cleaner to prepare the germ before it goes to the dryer. This department now complete to have a capacity of nearly 2,500 bushels per day of 20 hours.

First and Second Grinding.

The clean corn received from the degerminator is elevated to preferably three 42 in. burrstone mills built for grinding wet corn. The results of this grinding are received in a steel tank well, and by means of a pump are elevated to two feed vats, each 8 ft. in diameter and 8 ft. high, made of wood the same general type as other vats. There should be a vertical shaft with stirrer actuated by shaft and gear from above. The starch liquor is delivered from this tank to the twelve shakers.

Shakers.—These will be 9 ft. long, 4 ft. wide, made of thoroughly seasoned wood, to have the No. 10 bolting cloth of the best material in three or four sections, the strained liquor being received in a trough, the underground portion being conducted in a different direction to receive a second grinding. These shakers will receive a vibratory motion by means of an eccentric on the shaft, the shakers themselves being set upon hickory sprains so as to give a soft but rapid motion.

Steel Settling Cones.

These cone settlers to consist of ten vessels, 12 ft. inside diameter, 7 ft. on the straight side, and about 7 ft. on the slant, to be made of $\frac{1}{4}$ in. steel plate properly riveted and

caulked so as to be tight when full. Each tank to have riveted to the incline bottom four substantial cast-iron lugs so as to set upon the steel beams of the house. Around the top of these tanks will be a 3 in. × 3 in. × ¼ in. angle iron, the outlet of the cone to be provided with an open way gate valve operated by hand wheel and screw, and a feed pipe delivering the liquor within 4 ft. of the bottom of the cone.

Close to the top of these cones are six 1-in. outlets connected to the main drain in order to take off the waste water.

Well.

The thickened starch liquor from the settling cones is received into a wooden trough, and conducted to a steel well 6 ft. in diameter, 6 ft. deep, of quarter-inch (¼ in.) steel plate to be made thoroughly tight so as to have no leakage.

Pump and Mixing Tanks.

Pump.—Starch liquor is elevated by means of pump into the mixing tanks. Four of these tanks are necessary to be made of wood, and to be provided with agitators. The treated liquor from these vats is now pumped up to a series of storage tanks or regulators.

Regulators.

These storage tanks to be four wooden vessels 10 ft. in diameter and 8 ft. deep; to be provided with agitators, that the starch liquor will be kept to a proper consistency and delivered to tables.

Tables.—These tables are of 16 sections, each 120 ft. long, and to be partitioned so that each section has three canals, 18 in. wide, with an incline of ⅜ of an inch per 12 feet.

Conveyors.—Five spiral conveyors and the cross conveyor in order to take the drained starch from the tables and deliver it to the breakers.

Breakers.—These will consist of four vats, 10 ft. in diameter and 8 ft. deep inside measurement, made of 2-in. pine, held together with iron hoops, provided with agitators the same as other vessels of similar construction.

Second Shakers.—The starch liquor is received from the breakers passed through these shakers, which are of similar construction to those specified above.

Second Settling Tanks.—These to be wooden tanks, 10 ft. in diameter by 10 ft. deep, of 1½-in. pine of the usual vat construction. At various heights on the sides, are openings provided with valves to draw off the impure water as the starch settles.

Pump.—At this point of the operation one half of the starch liquor is sent to the dry starch department, and the balance to the glucose department. We will continue with the starch.

Boxing Tables.—The thickened, purified starch liquor will be received into 400 boxes, each 7 in. × 7 in × 5 ft. 7½ in. long, inside measurement, made of ⅞-in. pine. The sides will be slightly inclined, bottom perforated to admit of drainage.

Table.—This is a suitable table provided with a vacuum chamber on which to rest the boxes to allow for the extraction of water, by means of vacuum pump.

Receiving Table.—After the starch in the boxes has become solid it is emptied upon this table and prepared for the trucks ready for the kilns.

Starch Drying Kilns.—To consist of eight chambers, 8 ft. high, 8 ft. wide, and 44 ft. long, to be made of at least 2-in. boards, tongued and grooved and well seasoned. The doors to swing outward and arranged to be air-tight after closure; the drying medium to be hot air, by means of a large substantial well-made fan, operated from an attached engine, blowing the air over a large system of steam-heated pipes, the hot air being delivered in the top of the kilns, the moist air taken out of the bottom, all openings being controlled by dampers. Each kiln chamber to be provided with two tracks of 12-lb. rail, and connected to the heading track by means of transfer tables by which the trucks can be delivered directly into the kilns from the receiving table. The trucks to be mounted on four railroad wheels, steel frame, and with metal shelves to receive the block starch.

Glucose Department.

Open Convertor.—For receiving the starch liquor from the settling tanks there will be two open convertors or two wooden vessels 5 ft. 9 in. in diameter, 8 ft. 9 in. deep, secured with bands on the outside and lined with thin sheet copper, provided with a copper heating coil and agitator.

Closed Convertors.—The closed convertors to consist of two copper cylinders, 5 ft. in diameter and 12 ft. deep, with closed ends ½ inch thick and shell ⅜ inch thick, with the necessary inlets and outlets for liquor and steam and condensation and a copper coil, also the necessary safety valve and pressure gauge.

Bag Filters.—To be of the well-known Taylor type, to be made of cast iron plates bolted together forming a reservoir on top, to be drilled and tapped so as to receive the brass connections to which the bagging will be attached, and have a capacity of filtering 10,000 galls. in 10 hours, and the necessary bags and sheaths in a duplicate set.

Animal Char Dept.—To consist of four cast iron filters, 4 ft. in diameter and 18 feet long, in three or four lengths, to have the necessary inlets for different liquors, washwater and steam, also the liquor outlets. Within the filter at the bottom there will be a false bottom with the strainer cloths. For filling and discharging the filters with char there will be a man-hole at the top and at the bottom, secured by yokes on rubber gaskets so as to insure a tight joint.

Revivifying Kilns.—For burning the spent char there will be furnished a cast iron work of a 14-pipe kiln to have the capacity of revivifying 10,000 lb. of bone black per day of 24 hours.

This kiln to have cast iron columns, steel beams, bed plates, coolers, and draw-off arrangement, and be erected on the site.

Elevators.—A dry char elevator to take the char from the kiln and elevate it to a receiving tank, which will supply the four char filters.

The wet char from the filters to be elevated to the kiln head floor, where it is distributed into the kilns.

Concentrating.—For concentrating the thin liquor into a 23 or 25° liquor, a triple effect of the Lillie type, of ample capacity to do the work in a 10 hour run; this vessel to be made of steel plates, copper tube heating service, to have the necessary vapour pipes, overflow and condensor working on the dry vacuum system. Each vessel to have charge and discharge valves, site glasses, thermometer and vacuum gauge, with the liquor connections between each vessel. For maintaining a vacuum on this triple effect it will have a vacuum pump of ample size, two sweet water draw-off pumps and a discharge liquor pump with the connections to the triple effect, making this department complete within itself.

Vacuum Pan.—A copper pan, 5 ft. 6 in. in diameter with 5 ft. depth of curb, incline bottom, dome, overflow and condensor arranged to work on the dry system. This pan to have finished composition mountings the same as the triple effect, and a 4 in. slide discharge valve.

The heating surface of this pan to consist of three 2½ in. seamless copper coils, held in position by braces thoroughly bolted within the pan. All bolts within the pan to be of Muntz metal; the bottom of the pan to have four lugs so as to rest upon the beams of the building.

Dry Feed Department.

For receiving the feed slopped from the shakers a special designed filter press for this purpose, that the feed may be in the best condition previous to sending it to the dryers, for which there will be the necessary conveyor.

Steam Dryer.—This to be circular in form, and arranged to take the moist feed from the conveyor, and by means of hot air and steam to deliver it at the outlet and in a merchantable shape for bagging for the market. The body of this dryer to be of steel with the necessary shaftings, lifters and whippers so as to break up in fine particles all of the feed.

London Section.

Meeting held on Monday, December 2nd, 1901.

MR. OTTO HEHNER IN THE CHAIR.

ON THE SEPARATION OF SOLIDS WHICH DIFFER IN SPECIFIC GRAVITY.

BY J. W. HINCHLEY, W^{H}.SC., A.R.S.M., F.C.S.

In chemical, metallurgical but chiefly in mining operations, a simple and economical method of perfect separation of the heavier from the lighter constituents of a material would be of great utility. The laboratory expedient of using heavy solutions in which the lighter particules may float can, for obvious reasons, be rarely used on a large scale. Practically, one is restricted to dynamical methods, in which, generally, momentum is imparted to or abstracted from the particles of the material, each of which then behaves according to its relative mass and surface. A fluid, usually water or air, stationary or in motion, provides a means for this purpose. If a stream of widely-separated particles of material be allowed to fall or be directed in front of a jet of air, each particle will be deflected according to the relation which exists between its surface, which determines for the most part the amount of momentum absorbed, and its mass which determines the effect of this momentum. A simple separator for such widely different materials as shells and gravel, grain and dust, may be made in this way, two or more receptacles receiving the particles from the different parts of the stream. Air, however, is a very poor medium for the purpose, on account of its compressibility and small density, the cross currents produced and small momentum imparted making it impossible in most cases to do more than concentrate. Water is much better fluid, and is in general use as a means of accomplishing, with more or less success, the separation of materials of different specific gravity. On account of its comparative incompressibility, the important factor, *its relative velocity*, can be readily and perfectly controlled, whilst any alteration in pressure can have no effect on the particle under its action.

It is a well known fact that bodies falling freely in a fluid, fall more or less slowly according as their specific gravity approaches that of the fluid, and many experiments have been made with a view to determining the rates of fall in water of particles of different size and weight. Most of the formulæ enunciated from these experiments appear to have no physical meaning, and are of little value: *e.g.*, $v. = K \sqrt{a\, d^{\frac{3}{2}} + v} + b$, where K a and b are constants for each mineral, d is the diameter of the particle, and v the velocity of fall.

In dealing with a problem of this description it is unwise to trust to theoretical reasoning alone; on the other hand formulæ obtained by conjuring with the figures given by experiment are equally untrustworthy. Some of the tables used by practical millmen are far too consistent to be the results of experiment, and are generally untrue under the conditions given.

The forces acting on a particle falling through a column of water are its weight ($K\, d^3\, G\, g$, where K is a constant, d the diameter of the particle, and G its specific gravity, g being the acceleration of gravity), the weight of water displaced ($K\, d^3\, g$) and the resistance of the liquid to the motion; this last force is a function of the velocity, surface and shape of the particle. From experiments conducted by a number of experimenters we may conclude that this resistance is directly proportional to the surface and the velocity raised to a lower power; the shape of the particle may be neglected on the assumption that all particles under consideration have similar shapes. $L\, d^2\, (v)^n$ expresses this notion mathematically—L being a constant and n a number which for very low velocities is 1, but changes at a critical speed, which is usually exceeded in separators, to about 1·6 — 1·8. The equation of motion will thus be— $K\, d\, (G - 1)\, g - L\, v^n = K\, d\, \frac{d\, v}{d\, t}$, t representing time.

It will be clear that there are two stages to the motion, in the first of which the particle is gaining velocity and in the second is moving uniformly. This fact affords a convenient means of classification for the machines under consideration, according to the particular stage of motion which is chiefly concerned in their action. Jigs, percussion tables, vanners, &c., use the first stage, separators, hydraulic classifiers, &c., are principally concerned with the uniform motion stage.

As the action of the machine is made to depend more and more on the earlier stages of the motion of the particle, the term $L\, v^n$ becomes of less and less importance and, d being a common factor of the remaining terms, the action becomes less and less dependent on the size of the particles.

Machines of the second class are mainly governed by the equation $L\, v^n = K\, d\, (G - 1)\, g$, in which the size of the particle is an important factor. In this case the perfect action of the most perfect machine is dependent upon careful sizing of the particles. Machines of the first class are not capable of perfect separation with any degree of efficiency, on account of the necessity for contact of the particles with themselves and with parts of the machines, and are only expected to concentrate. As separators, machines of the second class only, need be considered, and it is interesting to note their evolution. Huet and Geyler made a machine many years ago in which the material was allowed, at definite intervals of time, to fall down a column of water. At the base of the column a disc, carrying receivers on its circumference, revolved on a vertical axis at a definite rate, according to the material being treated; these receivers came in turn immediately under the column of water, with the result that the more slowly moving particles fell into a different receiver from that which had already received those falling fast, and the material was sorted according to the rate of fall of its particles. Hundt's settling tub was a machine depending on the same idea, but in which the solid column of water was replaced by a rotating annular column of the same liquid. The material was fed into the machine at one point of the annulus and, according to its rate of fall, was carried round and deposited in different fixed receivers below. Rittinger's "Setz Rad" was a similar machine of a more elaborate character; in one type of this machine the water was kept in rotation by a paddle wheel. In all three of these machines the water is practically stationary in a vertical direction, but there is a large class of machines in which the water moves with or against the particle. Under such circumstances, if V be the velocity of the water our equation becomes $L\, (v + V)^n = K\, d\, (G - 1)\, g$. If the motion of the water keeps the particle in equilibrium $v = 0$, and the equation becomes $L\, V^n = K\, d\, (G - 1)\, g$.

By making use of upwardly flowing water, the capacity of the machine is greater for a given size, for it is obvious that the capacities of the three machines mentioned are small, since only either a very small amount of time is in active use, or a small portion of the water column is available. Some varieties of conical slime separators contain some of the features of the most perfect machines now known, but the design is usually very unsatisfactory. In a well-known type the stuff is fed into an inverted cone pierced with holes near its apex; the particles passing through these holes enter into an upward current of water supplied from a box below, and directed by a similar cone to form an annular cone of upwardly moving water. According to the velocity of the stream, the specific gravity and size of the particles, more or less perfect separation was accomplished, the heavier separated particles being continually removed from the box below. The machines were used in series, the velocity of water in each being adjusted by bringing the cones nearer together. The contrivance has a large number of faults, but it distinctly foreshadows the latest and best machine "Lockhart's Separator."

In this machine, Figs. 1, 2, and 3, the particles are regularly delivered into an upwardly flowing annular stream of water which, by its velocity, is only capable of carrying the lighter particles away, the heavier ones falling into closed receptacle B below. So far, the machine corresponds to the conical boxes mentioned already, and it is in the details that the perfection of the action of the machine is accounted for.

It is a well-known fact that the velocity of water at different points of a stream is not constant, being very small at the boundary surfaces and, in such an annular stream, greatest about midway between them. For this reason the width of the stream is made only somewhat larger than the size of the sifted particles to be treated, and it is found that in a particular machine, if the smallest size treated be not less than half the width of the annular stream, this variation has no influence on its action. The particles are delivered into the stream with as low a velocity as possible, and that horizontal; the water by careful distribution below is made to flow with equal velocity in all parts of the annulus, although perhaps too great an effort is in evidence in this direction. The waste water, after passing the separation point X, is made to increase in velocity to ensure the effectual carrying away of the waste; to preserve the width of the stream, it is slightly coned in the opposite way to that of the conical separators described. The separated material may be removed while the machine is at work by means of an ingenious valve, E, provided with two rubber discs, one of which sweeps the gravel or dirt from the valve seat and the other finally makes the joint. The velocity of the water at the point of separation must be capable of control, with a view to securing that which does the work best. For this purpose a stand-pipe provides a constant head, and by means of an adjustable valve or cock, A, the velocity in the apparatus may be controlled when the machine is working uniformly. When, however, a partial blocking takes place in the machine by the material being fed faster than usual, the head of water, or the velocity in the machine, may increase. This would interfere with its perfect action, and is prevented, in the later machines, by a modification in design in which the working head is controlled by providing adjustable gates for an overflow. In the earlier types of machine the stuff was delivered from the inside of the annular stream, in the later forms the reverse proceeding is followed. The later form of machine has been especially devised for fine gold separation, for which it is well adapted, but with the exception of the adjustable and constant head does not in my opinion meet theoretical conditions so well. The means of providing a fairly uniform feed of equally sized particles to each separator in the battery usually required, is very important, but presents no great mechanical difficulty, and need not be considered here. It is important to note that, if the feed be too fast, the particles may shield each other, and defeat the weighing action of the current. The water which has once passed through the machine may be used over and over again, the circulation being most easily effected by means of a centrifugal pump.

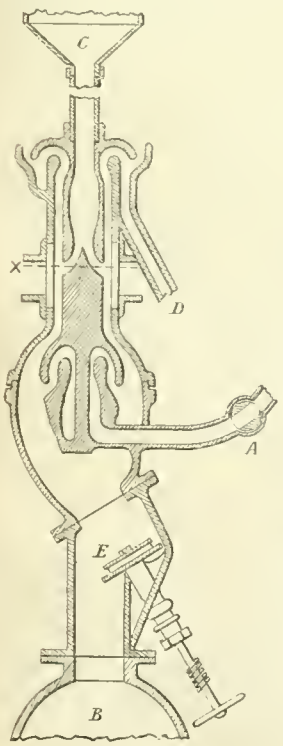


Fig 1.

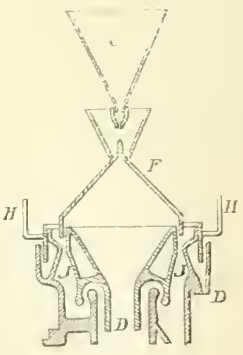


Fig 2

Fig. 1 is a diagrammatic section of one of the earlier machines. The material is fed with a little water into the hopper C, and falling down the machine, meets at the point X, the current of water flowing upwards which enters the machine by means of the cock A. The lighter portions of the material are carried off by means of the pipe D, the heavier falling into the receiver B. Fig. 2 is a diagrammatic section of the upper part of a machine of a later type; it will be noticed that the delivery annulus is rather wide. The handles H are turned to alter the working head

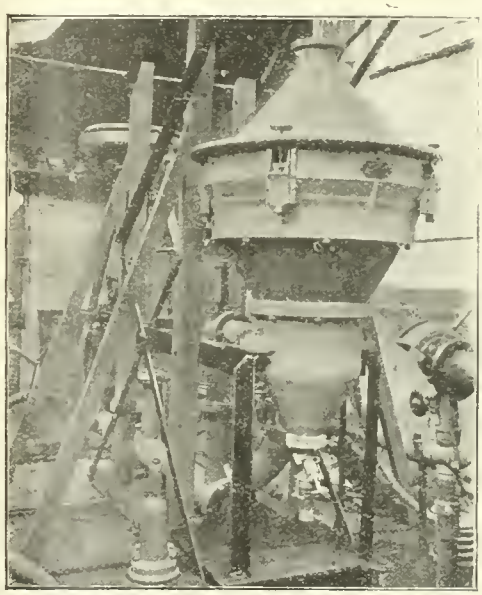


Fig. 3.

of water, the ring to which they are attached being screwed to the body of the machine; the stuff is fed on the outside of the cone F by means of the hopper C, and meets the water flowing upward from the chamber J; the lighter particles fall down the pipe D, and the separated heavier material into the chamber J to be removed as desired by a valve similar to E, Fig. 1. This machine is specially designed for fine gold; a larger machine of the same type is shown in Fig. 3, the gates for keeping the head constant being clearly seen.

To return to theoretical matters, it is clear that for a given size of separated material there is a corresponding larger size of associated lighter material which would fall with it, were it not screened to suitable limits of size. From the equation of equilibrium—$LV^n = K\ d\ (G-1)\ g$—it is seen that the fraction $G-1/G_4-1$ represents the relation

between the diameters of particles which are in equilibrium with a given velocity of stream.

The following table gives figures found in this way :—

Materials.	Specific Gravity.	$G-1/G_1-1$.	Richard's Nos.
Diamond	3·5	1·56	..
Quartz.	2·6		
Blende	4	1·87	1·68
Quartz.	2·6		
Pyrrhotine	4·5	2·18	2·26
Quartz.	2·6		
Mispickel	6·3	3·3	2·94
Quartz.	2·6		
Galena	7·5	4·06	3·76
Quartz.	2·6		
Copper	8·8	4·87	3·76
Quartz.	2·6		
Galena	7·5	2·16	..
Blende.	4		

These $G-1/G_1-1$ numbers give the outside limit of the ratio of the screen sizes for separating the materials in question. The closest separation is that of diamonds from quartz, where the ratio of the screen sizes should be less than 156:1 ; in actual work a ratio of 125:1 would probably be adopted. When separating gold from sand, assuming the gold to be very base (G = 12), the ratio would be 11 : 1·6 = 685 : 1. It would thus appear that the screens might be sized with a very large factor 2—5 ; in practice, the inventor, W. S. Lockhart, appears to use a wider annulus (Fig. 2), so that the capacity of the plant is increased by taking advantage of the large factor of separation.

With a view to determining whether the results obtained by practical experiment supported these notions, curves involving the terms $(G-1)$ and (d) have been plotted from tables published by practical millmen. For the most part, and in all cases where there is consistency between the figures, the curves obtained support the view. As an example the table, already referred to, contains figures obtained by R. H. Richards by experiments on hydraulic classifiers, which approach with a degree of closeness, greater than could be expected, those obtained from theoretical reasoning. His factors vary somewhat with the velocities of current, and are not quite consistent at the various velocities, so I have taken his highest figures as involving the least number of errors. It has been assumed that all the material particles have a similar shape, and their volumes and surfaces can be comparatively expressed as functions of their diameters. Unfortunately this is not the case, and it is necessary to take this fact into account, a fact which together with differences of quality of surface will account for the divergence of Richard's numbers from the $(G-1)$ factors.

Bodies, on falling through a medium causing resistance, tend to present their largest area in the direction of motion. Flat plates of the heavier material might, if sized by means of a round or square hole sieve, on this account, be lost. In the case, therefore, where the heavier material is that sought for, the sizing should be carried out according to the smallest dimensions of the particles ; sieves with slits, well jigged and rotated in water, meet the case.

Where the difference in specific gravity is extremely small, the separation may be facilitated by the use of a heavier liquid than water, such as a solution of salt or calcium chloride, the separation factor changing from $\frac{G-1}{G_1-1}$ to $\frac{G-G_n}{G_1-G_n}$ where G_n = sp. gr. of the solution used ; in the case of diamonds from quartz the factor might be raised by this method from 1·56 to 2.

Besides the obvious application of the machine to ore dressing and preparation, and the treatment of gravels, sands, and alluvial deposits for the separation of precious metals or gems, there is a field also in chemical operations. When the machine is supplied with one material whose particles vary in size, the separation takes place according to size. For the preparation of fine pigments by levigation the machine might prove of great service ; for coal washing there also appears to be a future for the machine, since, by its use, a far cleaner product is obtained than by the well-known methods ; for the separation of metals from each other when in the state of turnings, especially in the case of a mixture of aluminium turnings with those of brass, gunmetal, &c., there can be no more economical means.

There are certain small details which I have not mentioned on account of their obvious necessity, but which call for some remark. Arrangements are made for again filling the lower part of the machine with water, after removing the separated material. The presence of air in the tortuous passages of the machine would by its elasticity modify the velocity of the water considerably, if variation took place in the feed ; in the machines for large stuff a powerful current of water effectually removes this air, and in the low head machines, tubes of small bore are arranged to get rid of the difficulty.

Finally, although there are no doubt further advances to be made in the separation of materials by making use of their physical differences, the machines I have described appear from their action to have reached a far higher efficiency than the nature of the problem would warrant one in expecting.

Discussion.

The Chairman said that it was too late for an adequate discussion a subject which had so many aspects, both theoretical and practical. It was a matter of the most far-reaching importance and touched many industries. It appeared to have been handled hitherto in a thoroughly practical manner, disregarding all theoretical considerations.

Mr. H. Handoll said that he had had some practical experience of the machine so ably described by Mr. Hinchley. The drawings before the meeting hardly did it justice, and it was a pity that the actual machine could not be coupled up so as to shew it in actual working.

New York Section.

Meeting held on Friday, December 20th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

REPORT OF THE SUB-COMMITTEE ON UNIFORMITY IN ANALYSIS OF MATERIALS FOR THE PORTLAND CEMENT INDUSTRY.

In April 1901 your Committee sent out the following circular, which explains itself :—

Uniformity in Technical Analysis : Portland Cement and Cement Rocks.

At the March meeting of the New York Section of the Society of Chemical Industry a paper was read on the subject "Uniformity in Technical Analysis," in which it was suggested that the section might do a good work by attempting to bring about such uniformity along lines which were of interest to particular groups of its members or others. The matter was referred to the Sectional Committee for action, and at a meeting a few weeks ago the Chairman was authorised to appoint a committee of those interested in different branches of applied chemistry to

endeavour to carry out work along the lines suggested in the paper. The following Committee was appointed :—

Mr. Clifford Richardson, Chairman.
Mr. T. J. Parker.
Mr. E. G. Love.
Mr. Russell W. Moore.
Mr. Durand Woodman.

The undersigned have undertaken, as a Sub-Committee, to investigate the subject of methods of analysis of materials pertaining to the Portland cement industry, and would be glad to have you join them in analysing samples of raw cement mixture and finished Portland cement, sending your results and a description in detail of your methods of analysis to the Chairman at Long Island City. From comparison of the results and methods which are reported it is hoped that some uniform method can be arranged which can be relied on for general use so that such discordant results as have been obtained, at times, in the past may be avoided.

Persons desiring samples should address,

H. A. Schaffer, Esq.,
Easton, Pa.

We hope that you may find time to join in the work.

Clifford Richardson,
New York Testing Laboratory,
Long Island City, N.Y.

S. B. Newberry,
Sandusky, Ohio.

H. A. Schaffer,
Easton, Pa.

In response to this circular replies were received from more than 30 chemists, largely those who are connected with the Portland cement industry, signifying their readiness to join in the work.

The Committee was particularly fortunate also in enlisting the interest of the Director of the United States Geological Survey in the work, who authorised Mr. W. F. Hillebrand, of the Survey Laboratory, to give us the benefit of his experience by making careful analyses of the samples distributed, the results of which, owing to his well-established reputation for accuracy, could be regarded as establishing the actual composition of the materials. The Director also authorised Mr. Hillebrand to review the results and methods returned to the Committee in order to point out the sources of such lack of uniformity as might occur and to suggest a method, which should at the same time be practicable, and bring about uniformity in the work of the practical man. The Committee and those taking part in the work are much indebted to Mr. Hillebrand for the interest he has displayed and the amount of time he has devoted to the matter.

Up to September 25th replies had been received from the following chemists, giving their results and descriptions of their methods. Subsequently three more gentlemen responded.

Analysts.

Geo. W. Rockwell	Bonneville Portland Cement Co., Siegfried, Pa.
Howard E. Reid	Lawrence Cement Co., Siegfried, Pa.
J. F. Davis.....	Sandusky Portland Cement Co., Syracuse, Indiana.
L. P. Newin.....	Lehigh Portland Cement Co. (Mill B), Allentown, Pa.
C. R. Rauch..... ...	Lehigh Portland Cement Co. (Mill A), Allentown, Pa.
W. F. Hillebrand	U.S. Geological Survey, Washington, D.C.
Herbert C. Kohl	Virginia Portland Cement Co., Craigsville, Va.
Clifford Richardson.....	New York Testing Laboratory, Long Island City.
Wm. B. Newberry.....	Dexter Portland Cement Co., Nazareth, Pa.
Herbert S. Turner	Chicago Portland Cement Co. Oglesby, Ill.
Harry S. Hartzell	Coplay Cement Co., Coplay, Pa.
Chas. F. McKenna	221, Pearl Street, New York City.
H. A. Schaffer	Vulcanite Portland Cement Co., Vulcanite, N.J.
Edward M. Hagar	Illinois Steel Co., Chicago, Ill.
Lathbury and Spackman.	Philadelphia, Pa.
W. R. Oglesby.....	Wabash Portland Cement Co., Stroh, La Grange Co., Ind.
Harry Drew	Alpha Portland Cement Co., Easton, Pa.
J. B. Dixson.....	Glens Falls Portland Cement Co., Glens Falls, New York

The results of the analyses and the description of the methods employed were as follows :—

The analyses and methods numbered 0 were those of Mr. Hillebrand, the one numbered 1 Mr. Richardson's, while the analysis, No. 1a, of the rock, was carried out with the modifications suggested by Mr. Hillebrand without fusion.

The results and the methods in use were as follows :—

Cement Rock Analyses.

Analyst.	SiO_2.	Al_2O_3. Fe_2O_3.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.
0	15·18	7·09	5·38	1·71	40·31	1·65
1	15·75	7·08	5·30	1·76	41·54	2·14
1a	15·37	...	5·46	..	40·40	1·81
2	14·68	7·83	..	..	41·14	1·83
3	13·92	8·06	..	..	40·22	1·85
4	(21·16)	(3·10)	..	..	39·94	1·10
5	14·18	6·70	..	..	41·36	2·01
6	14·70	8·30	..	..	39·97	1·88
7	12·78	8·59	..	..	39·79	1·87
8	13·97	7·80	..	..	41·78	1·39
9	14·44	8·44	6·64	1·80	41·15	1·70
10	13·60	8·36	..	..	41·02	2·00
11	14·64	8·01	5·31	2·73	39·53	1·78
12	14·18	7·80	6·54	1·26	41·68	1·80
13	14·92	8·16	..	..	41·92	1·94
14	13·56	7·49	5·27	2·22	40·30	1·97
15	(20·82)	(2·80)	..	..	40·51	..
16	14·71	7·48	..	..	40·67	1·81
17	14·52	7·42	..	..	40·46	..
High	15·75	8·50	6·64	2·73	41·92	2·14
Low	12·78	7·08	5·27	1·26	39·53	1·10
Difference	2·97	1·42	1·37	1·47	2·39	1·04

No. 4.—SiO_2.—Reported as "Siliceous Matter."
No. 15.—SiO_2.—This was reported as SiO_2, but the analyst states that this percentage contains a considerable proportion of iron, alumina, lime, and some magnesia.
No. 16 = Average of two analyses.
The figures in brackets were excluded from extremes. The first 14 numbers only were reviewed by Prof. Hillebrand.

After the preceding results had been distributed to the various analysts, No. 4 reported the following, and asked that they be inserted in place of those originally sent. This being impossible, as it would make Mr. Hillebrand's review unintelligible, it has been necessary to insert them here :—

	Per Cent.
Silica.....	14·12
Alumina and iron	7·92
CaO	41·32
MgO	1·81
Loss on Ignition.....	34·28
	99·45

Cement Analyses.

Analyst.	Loss on Ignition.	SiO_2.	Al_2O_3.	Fe_2O_3.	Al_2O_3. Fe_2O_3.	CaO.	MgO.	SO_3.
0	..	21·31	6·89 (*b*)	2·54 (*c*)	9·43(*a*)	62·89	2·64	1·34
1	..	20·90	7·46	2·65	10·11	63·20	2·98	1·33
2	1·11	20·92	7·06	3·06	10·12	63·53	2·88	1·38
3	1·30	20·06	..	..	10·98	62·84	2·70	1·42
4	2·15	20·00	..	..	11·36	62·30	2·85	1·38
5	1·07	20·26	..	..	9·32	64·28	2·52	1·71
6	1·34	20·96	7·62	2·30	9·92	62·17	2·89	1·35
7	2·30	20·84	7·25	2·75	10·00	62·01	3·04	1·42
8	1·22	19·82	8·20	2·76	10·96	63·68	2·80	1·43
9	1·04	20·76	7·70	2·62	10·32	63·00	3·13	1·59
10	1·78	19·18	..	..	11·12	63·29	3·04	1·30
11	..	21·46	6·26	3·76	10·02	63·20	3·12	1·35
12	3·20	20·76	6·98	2·65	9·63	62·72	2·64	1·30 (*d*)
13	..	21·56	..	..	10·24	64·30	3·02	..
14	2·68	19·53	8·01	2·36	10·37	63·53	3·06	1·35
15	..	20·32	..	..	10·20	63·40	2·80	..
16	1·34	20·41	..	..	9·86	63·22	3·15	1·51
17	..	20·76	..	..	9·72	62·63	2·80	..
Highest.....	3·20	21·56	8·20	3·76	11·36	64·30	3·15	1·71
Lowest.....	1·04	19·18	6·26	2·30	9·32	62·01	2·52	1·30
Difference..	2·16	2·38	1·94	1·46	2·04	2·29	0·63	0·41

(*a*) = Al_2O_3, Fe_2O_3, TiO_2, P_2O_5.
(*b*) = Al_2O_3, TiO_2, P_2O_5.
(*c*) = Including FeO.
(*d*) = Sulphur as sulphides = 0·04 per cent. − (additional).
No. 1 − H_2O = 1·12.
No. 16 = Average of two analyses.

The first 14 numbers only were reviewed by Prof. Hillebrand.

Method No. 0.

Report of Analysis of Limestone and finished Portland Cement made for Mr. Clifford Richardson.

The samples were received from Mr. H. A. Schaffer, Vulcanite, New Jersey, in the latter part of May, and the analyses were begun about the 1st of June. The samples were labelled as follows:—

"*Sample No.* 1.—Limestone from Vulcanite, N.J., and Annville, Penn., mixed in proper proportions for making Portland cement."

"*Sample No.* 2.—Finished Portland cement made from material No. 1."

The analyses were made, so far as the nature of the material admitted, according to the directions laid down in Bulletin 176 of the United States Geological Survey, published in 1900, and entitled "Some Principles and Methods of Rock Analysis." Special points are elucidated by explanatory foot notes. It should be stated, however, that for the determination of silica, iron, alumina, &c., lime, and magnesia, solution was accomplished without the use of sodium carbonate as a flux, since the cement was wholly decomposable by dilute hydrochloric acid, and the limestone mixture could be converted into a cement equally soluble and freed from all carbonaceous matter, by strong ignition for a short time. It is believed that no one of the mean values tabulated below is in error more than one-tenth of one per cent. on the total summation, that in many cases they are correct to within two one-hundredths of a per cent., and that in a few the error is to be sought in the third decimal.

Analysis I.

Mixed Limestone.

			Mean.
SiO_2	15·17	15·20	15·18
TiO_2	0·23	0·23	0·23
Al_2O_3	4·91	4·92	4·98 4·94
Fe_2O_3	0·94*	0·94*	0·96* 0·95
FeO	0·46*	0·46*	* 0·46
FeS_2	0·39* − (0·21 S)	0·37* − (0·20 S)	* 0·38

* These figures are based on the following amounts of total iron counted as Fe_2O_3, 1·70, 1·70, and 1·73. In order to obviate the influence of titanium the iron was reduced by hydrogen sulphide in sulphuric solution and not by zinc.

The values for FeO may be low, since they represent probably only that present as carbonate, whereas the silicate minerals may have held some. The determination was effected by extracting all carbonates, in an atmosphere of carbon dioxide, with dilute sulphuric acid, filtering from gypsum and carbonaceous matter, and titrating with permanganate. In this way the reducing action of carbonaceous matter is minimised or altogether excluded, while it might be considerable were it attempted to determine all FeO in the usual way with a mixture of sulphuric and hydrofluoric acids.

The values given for pyrites are based on the respective sulphur determinations, tests having shown that practically the whole of the sulphur existed in this form.

Analysis I.—*cont.*

			Mean.
MnO	0·05†	0·05†	0·05 0·05
CaO } SrO }	40·30	40·28	40·34 40·31
MgO	1·67	1·63	1·65
K_2O	0·95‡	0·98‡	0·97
Na_2O	0·14‡	0·16‡	0·15
H_2O−105°	0·38	0·38	0·38
H_2O+105°	1·32	1·30	1·31
CO_2	32·45	32·31	32·37 32·38
P_2O_5	0·21	0·21	0·21
C	0·54§		0·54
			100·09

† The determinations of manganese recorded in this and the following analysis are numerous, not because of any importance attached to its determination, but for the purpose of testing a new colorimetric method which seems adapted to the estimation of small amounts of manganese.

‡ The lower of these results was obtained by an application of the Lawrence Smith method in which four grms. of limestone were rubbed up directly with 1 grm. of ammonium chloride without addition of precipitated calcium carbonate. For the second determination 2 grms. of limestone and 2 of precipitated calcium carbonate were used. The higher figures are, doubtless, very close to the truth.

§ By direct weight of carbon dioxide after extracting the carbonates by dilute hydrochloric acid, filtering on asbestos, and igniting with lead chromate.

Analysis II.

Finished Cement.

			Mean.
SiO_2	21·27	21·34	21·31
TiO_2	0·26	0·26	0·26
Al_2O_3	6·38	6·38	6·38
Fe_2O_3	2·01* }	1·99	2·00*
FeO	0·48* }		0·48*
MnO	0·06	0·06	0·06
CaO }	62·67	62·84	62·82
SrO }		0·07	0·07
MgO	2·64	2·64	2·64
K_2O	0·56†	0·50	0·50

* Because of the presence in the cement of a small amount of decomposable sulphide, the figure here given for FeO may be but an approximation, and if so the values for Fe_2O_3 are subject to a corresponding correction.

† This value for K_2O is believed to be high, and has, therefore, not been utilised in obtaining a mean value.

ANALYSIS II.—*cont.*

		Mean.
Na_2O ..... 0·26	0·24	0·25
$H_2O-105°$ ..... 0·15	0·16	0·16
$H_2O+105°$ ..... 0·64	0·56	0·60
CO_2 ..... 0·62	0·64	0·63
P_2O_5 ..... 0·25	0·25	0·25
SO_3 ..... 1·34‡ } 1·34		1·34‡
S ..... 0·09‡ }		0·09‡
		99·84

‡ Hydrochloric acid caused an appreciable evolution of hydrogen sulphide gas; hence two determinations of sulphur were made, one of the total sulphur by fusion with soda and nitre, the other by extraction of sulphates by hydrochloric acid. These data permitted the calculation of the unoxidised sulphur.

Comparison of the foregoing analyses makes it seem as if the composition of the limestone mixture, from which the sample of cement furnished was made, must have differed materially as to certain constituents from that of the "limestone mixture" sample, in spite of the agreement implied by the attached labels.*

The fact that a little gypsum was purposely added to the clinker, and that some fuel ash is included in the finished cement does not invalidate the above conclusion. The most striking discrepancy occurs in the potash, which is hardly more than one-third of what it apparently should be as calculated from the limestone analysis. The titanium, the manganese, and the phosphoric acid, which are probably very accurately determined, show marked deficiencies, as do also the alumina and silica. In order to test my own determinations of alkalies, I have caused to be made by other chemists in this laboratory certain checks which resulted as follows:—

	Limestone.		Cement.	
	K_2O.	Na_2O.	K_2O.	Na_2O.
Analyst A	0·94	0·17	0·52 0·48	0·23 0·24
Analyst B	0·91 0·91	0·29 0·14	0·52 0·53	0·38 0·24

These agree sufficiently well with my own results to prove the very great loss of potash if the original limestone is of nearly uniform composition. It seems as if there may have been a marked volatilisation of certain constituents under the influence of reducing fuel blown in with the air blast.

This hypothesis does not seem to be beyond the bounds of probability, for we know that titanium is thus volatilised in the blast furnace, and that phosphorus can be reduced from the compounds and volatilised if not in contact with bodies with which it can form a fixed alloy. Whether this explanation is a valid one or not can only be settled by collecting and examining the flue dust.

METHOD No. 1.

Analysis of Finished Cement.

$SiO_2.Al_2O_3.Fe_2O_3.CaO.MgO.K_2O.Na_2O.SO_3$.

SiO_2.—One-half grm. of the finely powdered cement was weighed out, and transferred to a large platinum dish, and 10 c.c. of HCl and 50 c.c. of water added, and the dish covered with a watch glass and allowed to digest on the steam bath for about 15 minutes, the cement being completely decomposed. The cover was then removed, washed with a little water and the solution evaporated to dryness. The residue, without further heating, was treated with 5 c.c. of HCl and 25 c.c. of water, the cover replaced and digested for about 10 minutes on the steam bath, when it was filtered and washed thoroughly. The filtrate was again evaporated to dryness, the residue, without further heating taken up with 5 c.c. of HCl, and 25 c.c. of water, and the small amount of silica it contained filtered on a separated paper, the filtrate and washings passing into the flask containing the main bulk of solution. The papers containing the residue were transferred wet to a weighed platinum crucible and ignited, first over a Bunsen burner until the carbon of the filter was completely consumed, and finally over the blast for 30 minutes and checked by a further blasting of 10 minutes or to constant weight. The residue was treated in the crucible with about 10 c.c. of HF and four (4) drops of H_2SO_4, and evaporated over a low flame to complete dryness. The small residue was finally blasted, cooled, and weighed. The difference between this weight and the weight previously obtained gave the amount of silica (SiO_2).

Al_2O_3 and Fe_2O_3.—The filtrate, about 250 c.c., from the silica determination was made alkaline with NH_4OH and boiled to expel excess of NH_3, or until there was but a faint odour of it, and the precipitated iron and aluminium hydrates, after settling, were washed once by decantation and slightly on the filter. The precipitate was dissolved in hot dilute HCl, the solution passing into the beaker in which the precipitation was made. The aluminum and iron were then reprecipitated by NH_4OH, as described above. The precipitate was collected on the same filter used in the first instance and thoroughly washed. After drying in the air bath it was removed from the paper as completely as possible. The paper was then placed in a weighed platinum crucible and ignited separately, followed by the dried precipitate. Finally the whole was blasted 10 minutes, with care to prevent reduction, cooled and weighed as $Al_2O_3 + Fe_2O_3$.

Fe_2O_3.—The combined iron and aluminum oxides were fused in a platinum crucible at a very low temperature with about 10 grms. of $KHSO_4$, the melt taken up with hot water and 25 c.c. of dilute H_2SO_4. The clear solution was digested on the steam bath for about ten minutes, and the small amount of silica filtered out, weighed, and corrected by HF and H_2SO_4. The filtrate was reduced with Zn and titrated by K_2MnO_8 to determine total iron as Fe_2O_3. The aluminum was calculated by difference. The Ti present, of course, affects the accuracy of this determination.

FeO.—One grm. of the cement was placed in a 600 c.c. Erlenmeyer flask and covered with about 150 c.c. of dilute H_2SO_4. The flask was then stoppered with a valve and moderately heated to aid dissolution. After the cement was completely dissolved the solution was cooled and titrated by $K_2Mn_2O_8$.

CaO.—To the filtrate from the $Al_2O_3 + Fe_2O_3$ precipitate a few drops of NH_4OH were added and the solution brought to boiling. To the boiling solution 10 c.c. of a saturated solution of ammonium oxalate was added and the boiling continued until the precipitated CaC_2O_4 assumed a well defined granular form. It was then removed from the flame and set aside for about two (2) hours and filtered. The precipitate and filter were placed wet in a platinum crucible and ignited over the full flame of a Bunsen burner, until the carbon of the filter was wholly destroyed. It was then redissolved in HCl and the solution made up to about 100 c.c. with water. Ammonia was added in slight excess and the liquid was boiled. The small amount of Al_2O_3 which was separated was filtered out, weighed, and the amount added to that found in the first determination. The lime was then reprecipitated by ammonium oxalate, as above described and weighed as an oxide by igniting and blasting to constant weight.

MgO.—The combined filtrates from the calcium precipitate were acidified with HCl and concentrated on the steam bath to about 150 c.c., 30 c.c. of a saturated solution of $Na(NH_4)HPO_4$ was added, and the solution transferred to a beaker and boiled for several minutes. It was then removed from the flame and cooled by placing the beaker in ice water. After cooling NH_4OH was added drop by drop with constant stirring until the crystalline ammonium-magnesium ortho-phosphate began to form, then three or four drops more were added and the stirring continued for several minutes. It was then set aside for several hours in a cool atmosphere and filtered. The precipitate was redissolved in a hot solution of dilute HCl and made up to about 100 c.c.; 2 c.c. of a saturated solution of

* "This is quite possible."—Schaffer.

$Na(NH_4)HPO_4$ was then added, and ammonia drop by drop, with constant stirring until the precipitate was again formed as described above. It was then allowed to stand for about two (2) hours when it was filtered on a Gooch crucible, ignited and blasted for 30 minutes, cooled and weighed as $Mg_2P_2O_7$.

K_2O and Na_2O.—For the determination of the alkalis, the well-known method of Prof. J. Lawrence Smith was followed, both with and without the addition of $CaCO_3$ with the NH_4Cl.

SO_3.—One grm. of the cement was dissolved in 15 c.c. of HCl, evaporated to dryness on the steam bath, taken up with about 10 c.c. of HCl and 50 c.c. of water, filtered, and the residue washed thoroughly. The solution was made up to 250 c.c. in a beaker and boiled. To the boiling solution 10 c.c. of a saturated solution of $BaCl_2$ was added slowly, drop by drop, from a pipette and the boiling continued until the precipitate was well formed. It was then set aside over night, filtered, ignited, and weighed as $BaSO_4$.

Total Sulphur.—One grm. of material was weighed out in a large platinum dish and fused with Na_2CO_3 and a little KNO_3. The melt was treated in the crucible with boiling water and the liquid poured into a tall narrow beaker and more hot water added to the crucible until the mass was all dissolved. The solution was then filtered. The filtrate contained in a No. 4 beaker was acidulated with HCl and evaporated to dryness. It was redissolved in 10 c.c. HCl and 50 c.c. water, transferred to a beaker, and the solution made up to about 250 c.c. with distilled water and boiled, and the sulphur precipitated as $BaSO_4$ and allowed to stand over night. It was then decanted on a small filter and the precipitated $BaSO_4$ treated in the beaker with strong HCl and allowed to digest on the steam bath for a few minutes. It was then diluted with hot water, filtered, ignited, and weighed as $BaSO_4$.

H_2O.—Water was determined by the method of Penfield, as described in Bulletin No. 176, United States Geological Survey, by Hillebrand.

CO_2.—One grm. of the material was weighed out and placed in a flask, to which was attached a long stem separatory funnel and a small condenser, placed at such an angle that the condensation fell back into the flask. To the condenser was attached, by means of rubber tubing, U-tubes containing anhydrous $CuSO_4$ and $CaCl_2$, followed by a Geissler absorption bulb, containing a saturated solution of KOH. About 75 c.c. of dilute HCl was poured through the funnel, slowly at first. When all of the acid was in the flask and violent action ceased it was heated gently and finally boiled for twenty minutes, the condensation falling back into the flask. The bulb was detached and hung in the balance case for 20 minutes along with an empty bulb, as a counterpoise. It was then weighed and the CO_2 determined. The apparatus was of course connected with the necessary means for the introduction of CO_2 free air.

Loss on Ignition.—Half a grm. of the cement was weighed out in a platinum crucible, blasted 15 minutes and weighed. The loss in weight, which was checked by a second blasting of five minutes, was set down as loss on ignition.

Raw Rock Mixture.

Half a grm. of the mixture was fused with sodium carbonate in a platinum crucible. The melt was dissolved in HCl, and the analysis conducted as with the finished cement.

After consultation with Mr. Hillebrand, another analysis was made by solution of the rock in HCl, after strong ignition and conversion to a condition corresponding to a finished cement.

Method No. 2.

This method of analysing raw cement material is as follows:—

A 1 grm. sample is fused with about three times its weight of Na_2CO_3, dissolved in HCl, evaporated to dryness, and heated in an air bath until all traces of HCl is driven off. After cooling, the sample is treated with 50 c.c. of dilute HCl, about 40 per cent. strength, and a few drops of HNO_3, and is then boiled for about five minutes and filtered while hot, the precipitate of SiO_2 is washed free from all acid, dried slowly, ignited, and weighed.

To the filtrate is added NH_4OH in slight excess; it is then boiled and filtered while the solution is hot. The precipitate is dried, ignited, and weighed.

To the filtrate from the iron and alumina $(NH_4)_2C_2O_4$ is added in excess, both solutions being boiling at the time. After boiling the combined solution for a few minutes the precipitate is allowed to settle for about 10 minutes, then is filtered off, dried, ignited, and weighed as CaO.

The remaining filtrate is evaporated to about 250 c.c., cooled, and 30 c.c. of a saturated solution of Na_2HPO_4 and 15 c.c. concentrated NH_4OH are then added and the whole stirred violently. The precipitate is allowed to settle over night and is then filtered off, dried, ignited, and weighed as $Mg_2P_2O_7$. In raw materials, all Ca and Mg present are reported as carbonates.

The method of analysing the cement is the same with two exceptions. First the sample is not fused, but is dissolved directly in about 30 c.c. of half strength HCl. Second, the iron and alumina are reprecipitated, since the first precipitation carries down an appreciable amount of CaO.

To determine SO_3 in cement, a 2-grm. sample is treated with 5 c.c. conc. HNO_3, 10 c.c. conc. HCl, and 10 c.c. water, evaporated to dryness, taken up with 50 c.c. water and 5 c.c. conc. HCl, boiled, and the SiO_2 is filtered off; the filtrate nearly neutralised with NH_4OH, heated to boiling, and then 15 c.c. of a boiling saturated solution of $BaCl_2$ added. After boiling for about an hour the precipitate is allowed to settle for several hours, and is then filtered off, dried, ignited, and weighed as $BaSO_4$.

The iron and alumina in a sample of cement, separated as requested, gave the following results:—

Fe_2O_3	3·06
Al_2O_3	7·06

To separate iron and alumina, the ignited precipitate is digested in dilute HCl, about one-third strength, until everything is dissolved, excess of acid driven off, nearly neutralised with Na_2CO_3, boiled, and while boiling, the solution is poured into a strong boiling solution of KOH. After boiling for about five minutes the precipitate is allowed to settle, then filtered and washed, redissolved in dilute HCl, precipitated with NH_4OH, boiled, filtered, washed, ignited, and weighed.

Method No. 3.

Analysis of Portland Cement.

Weigh one-half grm. of the cement into a small casserole (3½ ins.) and add excess of conc. HCl, heating on a plate until all dissolves. Evaporate to dryness and bake until free from acid; take up with 50 c.c. water and 10 c.c. HCl and heat slowly until near boiling point, and silica is free from iron. Filter out SiO_2, wash with hot water, dry, ignite, and weigh.

The filtrate, not exceeding 250 c.c. at this point, is brought to boiling and precipitated with a slight excess of ammonia, then boiled for five minutes, filtered and washed with very hot water, ignited, and weighed as Al_2O_3 and Fe_2O_3.

Heat filtrate, about 450 c.c., to boiling, and add with constant stirring 30 c.c. of a boiling solution of ammonium oxalate (sat. in the cold). Allow precipitated oxalate to settle 15 minutes, filter and wash with small quantity of water and set aside filtrate. Continue washing with 400 c.c. very hot water, ignite over Bunsen burner, cool, break up lumps in crucible and blast for five minutes, and repeat breaking up and patting down of CaO, blasting again for ten minutes, desiccate immediately and weigh as soon as thoroughly cool. Constant weight may be checked by another working and blasting of the lime and re-weighing.

To the filtrate from the calcium oxalate, add 15 c.c. of saturated solution of microcosmic salt, acidulated with HCl, and evaporate to 250 c.c. Cool thoroughly, gradually adding dilute ammonia until solution is alkaline, and then add one-fourth of its bulk of strong ammonia water. Set aside over night, filter and wash with 400 c.c. of dilute

ammonia (one part of 0·90 sp. gr. to four parts water), dry, char carefully, ignite and weigh as $Mg_2P_2O_7$.

Sulphuric anhydride is determined by oxidation with bromine water, solution in HCl, evaporation and separation of silica as above, washing to 400 c.c. and precipitating this boiling filtrate with $BaCl_2$ solution, washing with 500 c.c. hot water, drying, igniting, and weighing as $BaSO_4$.

Method for Raw Rocks.

Treat one-half grm. of the material (dried at 105°) in small casserole with slight excess of diluted HCl, one pint acid to one pint water, heat to boiling, then evaporate to dryness. Take up with 10 c.c. HCl and 30 c.c. water, bring to boiling point, filter and wash twice with hot water. Remove, ignite, filter, and fuse with not more than 3 grms. Na_2CO_3, dissolve fusion in one to one acid in casserole previously used and evaporate to dryness. Cool and powder, flaking mass in casserole with small glass pestle and again bake. Take up with 10 c.c. HCl and 50 c.c. water, bring just to boiling point and filter through same funnel into previously obtained filtrate (not more than 60 c.c. in volume), wash SiO_2 with hot water to 250 c.c. of filtrate and proceed exactly as under method of cement. Factors used are—

$Mg_2P_2O_7$	0·3621	for MgO.
	0·7576	„ $MgCO_3$.
CaO	1·785	„ $CaCO_3$.
$BaSO_4$	0·3435	„ SO_3.

Beakers used are Shott and Gen. Jena, 600 c.c. only. Filter paper, B and A's; "B," 11 and 12 c.c.; 0·90 sp. gr. ammonia water; and 1·2 sp. gr. hydrochloric acid.

METHOD NO. 4.

Portland Cement.

(*a*) *For Silica, Iron and Alumina, Lime and Magnesia.*—One-half grm. was weighed off and placed in a small beaker glass. To this 10 c.c. of 1 to 1 hydrochloric acid and a drop of concentrated nitric acid were added; the solution was run down to dryness on a sand bath and the residue heated rather vigorously on an iron plate, until all acid was driven off and the mass assumed a dark brown color. On cooling this was taken up with 10 c.c. of concentrated hydrochloric acid and brought to boiling. To the solution thus obtained about 100 c.c. hot water were added. The insoluble silica was filtered off, ignited, and weighed as SiO_2.

To the filtrate a drop of concentrated nitric acid was added to completely oxidise any ferrous iron and then ammonia water until its odour was faintly recognisable. The solution and precipitate thus produced was brought to brisk boiling and kept so until the odour of ammonia was imperceptible.

The precipitate was allowed to settle and then filtered off; after being washed with boiling water seven or eight times it was ignited and weighed as $Fe_2O_3 + Al_2O_3 = R_2O_3$.

The filtrate was brought to boiling and about 20 to 30 c.c. of saturated solution of ammonium oxalate was added, the solution continuing to boil for some minutes.

The precipitate was filtered off and washed eight to ten times with boiling water. It was then thrown into dilute sulphuric acid (6 to 10 c.c. H_2SO_4 + 300 c.c. water) and brought to boiling. In this condition the lime was titrated with permanganate of potash standardised against chemically pure oxalic acid.

The filtrate was placed in a basin of cold water to hasten cooling. To it a rather large excess of ammonium phosphate solution added, and the contents of the beaker glass were stirred very briskly for five to ten minutes, and then allowed to stand for a period of one and a half hours. The precipitate was then filtered off, washed with cold water faintly alkaline with ammonia, ignited, and weighed as $Mg_2P_2O_7$.

(*b*) *For Sulphuric Anhydride.*—Two grms. were treated as above described, and the sulphate in the subsequent filtrate precipitated as usual with barium chloride. The precipitate was allowed to stand two and a half hours, filtered off, ignited, and weighed as $BaSO_4$.

(*c*) *For Loss on Ignition.*—Two-tenths of one grm. were weighed off and placed in a platinum crucible and strongly ignited for a period of 20 to 30 minutes. The crucible was cooled and weighed again.

2. Cement Rock.

The siliceous matter, iron and alumina, carbonate of lime and carbonate of magnesia were determined in a manner identical with (*a*) of Section 1.

METHOD NO. 5.

One-half of a grm. was carefully weighed, transferred to a crucible, mixed with sodium carbonate, and fused for 10 minutes. After a thorough incineration it was cooled and dissolved in a casserole with HCl and water. When solution was completed the crucible was carefully washed off with warm water, and a few drops of HNO_3 added to the solution. The casserole, with its contents, were then placed on a steam bath and slowly evaporated to hard dryness.

After evaporation was completed, a small portion of HCl and water was again added to redissolve the contents of casserole, and again heated to boiling. Then diluted with hot water and filtered through a Baker and Adamson Ashless No. A filter. The precipitate was thoroughly washed and dried, or rather drained, on blotting paper and slowly ignited in a tared ignition crucible (platinum). After ignition was completed and the SiO_2 weighed, a little H_2SO_4 was added to the contents of crucible, and then the whole dissolved in HF, evaporated to dryness, then heated and weighed, and the difference in weight subtracted from the first weight of SiO_2, and this same difference added to Al_2O_3 and Fe_2O_3.

The filtrate was heated to boiling, NH_4OH slowly added until excess, and boiled a few minutes. When the precipitate had settled, it was filtered through above-mentioned filters and washed twice with hot water. The precipitate on the filter was then dissolved in HCl (1—4), and washings run into beaker in which precipitate was made. The filter, being thoroughly washed with hot water, and no trace of HCl found on it and not being punctured, was used again to filter the solution. The contents of beaker, after thorough solution, were again heated and precipitated as before, and thoroughly washed with hot water. After drying precipitate on filter as before (on blotting paper) it was slowly ignited and finally weighed. This weight, plus the weight of residue from silica in HF, multiplied by 2, gave weight of Al_2O_3 and Fe_2O_3.

The filtrate from above was heated to boiling and a concentrated hot solution of ammonium oxalate added until CaC_2O_4 was all precipitated. When precipitation was thoroughly settled (about one half hour) it was filtered through a No. B (B and A) filter, and washed 20 times with hot water. The precipitate was then dissolved in dilute hot H_2SO_4 (1—3) washings run into same beaker in which precipitate was made and thoroughly washed with water. A few drops of concentrated H_2SO_4 were added and the solution heated and then titrated with a standard solution of $KMnO_4$. This solution is made with 10 grms. $KMnO_4$ and 2,000 c.c. water. It is always kept in stock, and two bottles are in constant use besides the larger one containing the stock solution. It is kept in cobalt blue bottles at least ten days before using and under the same conditions as the one in use. So if there is any change after the portions are transferred from the stock bottle, experience shows that it will always be within the times it has been standing, that is, there is practically no change one week after being transferred.

Titrations are always checked by determining CaO gravimetrically, at least several times a week. This has been done in this work. Two half-grm. portions were taken as a check and finished complete. This gravimetric method is simply the heating the calcium oxalate precipitate to a constant weight with the aid of a blast lamp.

The precipitate from the calcium is allowed to get perfectly cool, microcosmic salts or sodium phosphate solution added, and then ammonia water drop by drop

from a burette until ammoniacal. The solution is stirred, and after being settled is filtered. This time of settling is usually over night, depending on the arrangement of work in the laboratory. When settled it is filtered, and, without washing more than once or twice, is redissolved in dilute hot HCl (1—4), and thoroughly washed and precipitated as before. It is then washed thoroughly with NH_4OH and water, with sometimes some ammonium nitrate. It is then ignited and weighed. This weight, multiplied by 2 and then by 0·36212, gives MgO. The weight, multiplied by 2 and then by 0·7576, gives $MgCO_3$, as the case may be.

For SO_3 determination, we invariably use a separate sample, usually 2 grms., and dissolve in nitrohydrochloric acid, evaporate to separate SiO_2, and, after filtering and washing, add a solution of barium chloride and let stand until settled, usually about four or five hours. Filter, wash with hot water, ignite, and weigh,—which weight, divided by 2 and multiplied by 0·34352, gives weight of SO_3.

For loss on ignition we take from 1 to 5 grms. and heat to a constant weight.

We do not always use HF in our raw materials, but always in our Portland cement analysis.

We separated the iron and the alumina in the samples of cement rock and cement in question, but did not submit them to you because of the extreme variations in the two methods of analysis used. We have always had much trouble in checking this determination, and have searched almost every authority on the subject, but are still unable to find a uniform method of analysis of these two elements.

The two methods employed here are as follows:—

(1) Where the iron and the alumina were weighed, as in the regular method of analysis, together, the precipitate was fused with sodium carbonate and dissolved in a small beaker in very dilute HCl and water. This filtrate or solution was heated and filtered if necessary. Then a few small crystals of citric acid added, then NH_4OH until excess, and finally ammonium sulphide until all sulphide of iron was precipitated. After washing this precipitate slightly it was dissolved in hot HCl and water, and washings run into same beaker in which precipitate was made. *HNO_3 was now added and the mass evaporated to total dryness, redissolved in HCl and HNO_3, and finally precipitated with NH_4OH as originally.

(2) The combined precipitate was fused, after weighing in potassium bisulphate, and dissolved, reduced through zinc column, and titrated with standard $KMnO_4$ solution.

Both these analyses show alumina by difference, which the author does not approve. Alumina may be determined in the former analysis in a rather long and tedious manner, but very few manufacturing cement laboratories have access to all the large platinum ware therein needed, according to Mr. Blairs.

Method No. 6.

Analysis of Cement.

Silica.—The cement was finely ground and dried, and 0·5 grm. dissolved in 10 c.c. hydrochloric acid (equal parts acid, sp. gr. 1·20, and water) and a few drops of concentrated nitric acid, evaporated to complete dryness, and heated strongly for a while at the end. Then 10 c.c. of the same strength hydrochloric acid were added to the dish, the whole heated until the soluble salts were in thorough solution, and diluted up with 50 c.c. hot water. The residue of silica, after filtration, was ignited without previous drying. The determination of the silica was completed by loss with hydrofluoric and sulphuric acids.

Alumina and Ferric Oxide.—The filtrate from the silica was heated nearly to boiling, and ammonia added in faint excess, the solution allowed to boil a minute or two, and the precipitated aluminum and iron hydroxides filtered and slightly washed. The precipitate was washed back into the same beaker in which it was formed, dissolved in sufficient hydrochloric acid, diluted, reprecipitated as before, filtered, and thoroughly washed. The ignited alumina and ferric oxide were fused with sodium carbonate, and the iron determined volumetrically, and calculated to ferric oxide, Fe_2O_3. The alumina, Al_2O_3, was obtained by difference.

Lime.—The clear filtrate from the alumina and iron hydroxides was made ammoniacal and heated to boiling, and 20 c.c. of saturated hot ammonium oxalate were added, and the precipitated calcium oxalate filtered off after standing about 20 minutes. After being thoroughly washed, this precipitate was washed back with hot water and dilute sulphuric acid into the beaker in which it was precipitated, then dissolved by sulphuric acid, diluted to about 300 c.c. with hot water, and titrated with potassium permanganate.

Magnesia.—To the cold filtrate from the calcium oxalate precipitation, 15 c.c. saturated solution of sodium ammonium phosphate were added, and then the proper quantity of strong ammonia. The precipitate was allowed to come down over night. The undried precipitate and filter were ignited and the magnesia calculated from the weight of the magnesium pyrophosphate.

Sulphuric Anhydride.—For SO_3 1 grm. of cement was dissolved in 20 c.c. of 1 to 1 hydrochloric acid, and evaporated to dryness. The residue was heated with hydrochloric acid, and excess of acid expelled and hot water added. In the hot filtrate the precipitation was made with 10 c.c. hot barium chloride solution (containing 100 grms. of the salt in 1000 c.c. of water), and allowed to boil, and then put in warm place over night.

Raw Material Mixture.

Silica. Of the dried sample 0·5 grm. was dissolved in 10 c.c. strong hydrochloric acid and 20 c.c. water, and a little bromine water. The solution was evaporated to dryness, redissolved in 20 c.c. 1 to 1 hydrochloric acid, and hot water added. The filtrate (A) from the insoluble silicious matter was analysed separately. The insoluble silicious matter was fused with sodium carbonate, and the silica determined in the usual way. The filtrate (B) from the silica was also analysed separately for the alumina and ferric oxide, lime, and magnesia, by the methods used for the determination of the same in the main solution (A) below.

Alumina and Ferric Oxide together.—The alumina and ferric oxide from the insoluble silicious matter were added to these from the hydrochloric solution (A) of the sample. The precipitation of the aluminium and iron hydroxides in this solution was carried out as in the cement analysis, but with only one precipitation.

Calcium Carbonate.—The calcium carbonate was determined from the filtrate from the aluminum and iron hydroxides by the method used for the determination of the lime in the cement.

Magnesium Carbonate.—The magnesium carbonate was determined from the filtrate from the calcium oxalate by the method used for the determination of the magnesia in the cement.

Method No. 7.

Analyses of Cement.

Take 1 grm. of finely ground sample, transfer to 4-inch casserole, add 10 c.c. hydrochloric acid, strength 1 to 1, and a few drops nitric acid (conc.). Evaporate down carefully to dryness, continue heating at about 120° C., until no more odour of hydrochloric acid is apparent, cool, add 20 c.c. 1 to 1 hydrochloric acid, heat gently for 10 minutes. Add about 150 c.c. hot water and keep near boiling point for five minutes longer, filter on washed filter, continue washing with hot water until wash water no longer gives reaction for chlorine.

Ignite residue (silica) without drying filter paper, and begin ignition at highest heat of the burner, cool acid, weighing from desiccator.

To solution add ammonia until faintly ammoniacal. Boil up for a few minutes, allowing beaker and contents to remain near boiling point for five minutes longer. Allow to settle, decant supernatant liquid carefully, finally transfer

* Instead of adding HNO_3 as above, the author also used bromine water, and precipitated Fe_2O_3 immediately, without evaporating, but boiling for several minutes.

hydrates to filter, wash out and rub with "policeman" carefully to remove any adherent portion of precipitate, wash with hot water until no reaction for chlorine.

Ignite iron and alumina hydrates without drying acid immediately at highest heat of the burner, transfer to desiccator, cool, and weigh.

To filtrate from iron and alumina precipitate, add five or six drops of ammonia, heat to boiling, add 20 c.c. boiling solution of oxalate of ammonia, allow to boil for two or three minutes, stirring precipitate to avoid bumping of the beaker. Allow to stand in warm place for 10 or 15 minutes. Filter off oxalate of lime, wash five or six times with hot water. Place filter paper with contents along the inner side of the beaker, wash down the oxalate of lime, directing the spray from wash bottle upon both sides of the filter paper, finish washing with dilute sulphuric acid, strength 1 to 3, to dissolve any adherent lime salt in filter paper, and upon sides of beaker and glass rod. Dilute with cold water to about 50 c.c., add 8 c.c. conc. sulphuric acid, add hot water to 300 c.c., allow oxalate to dissolve completely, stirring. Titrate with standardised solution of potassium permanganate and estimate CaO direct.

Cool filtrate from oxalate of lime by immersing in cold water, add 150 c.c conc. ammonia, then 20 c.c. microcosmic salt, stirring vigorously for three or five minutes, allow to settle for three or four hours, filter, wash, precipitate with solution containing 1 part ammonia, 3 parts water and 0·15 part conc. nitric acid. After transferring precipitate of ammonium magnesic phosphate to crucible, heat carefully until filter paper is completely incinerated. A dull red heat is sufficient until the magnesia is nearly white, pressing down the blackened filter paper with a platinum rod promotes the incineration. Finally finish ignition at highest heat of the burner, covering crucible with lid to favor such condition. Cool and weigh calculating MgO from pyrophosphate.

Estimate iron by fusing combined ignited oxides of iron and alumina after weighing with 10 times weight of sodium carbonate, cool crucible quickly by immersion in beaker of cold water. Remove fused mass by disintegration with hot water, add sufficient 1 to 2 sulphuric acid to thoroughly dissolve, warm, and, when dissolved, add sufficient granulated zinc to reduce to ferrous iron. Cool, dilute, and titrate with standard permanganate, calculate ferric oxide from amount of iron present, deduct ferric oxide from combined oxides for alumina.

For sulphuric anhydride, take 1 grm. sample, transfer to 4-inch casserole, add 15 c.c. 1 to 1 hydrochloric acid (but no nitric acid as usually outlined), evaporate and heat until hydrochloric acid is all gone. Cool, add 7 c.c. same acid, evaporate down until only few drops acid are left, about sufficient to hold soluble chlorides in solution. Dilute to about 100 c.c., filter off silica, wash thoroughly, heat to boiling, add 10 c.c. boiling solution of barium chloride, boil a few minutes, allow precipitate to settle in warm place for two hours. Filter off barium sulphate, using the precaution of a double filter to avoid possible loss of finer portion of precipitate. Wash thoroughly, ignite carefully, and finish decarbonization of filter paper and ignition at a low red heat; cool, weigh, and calculate sulphuric anhydride present.

Raw Material Mixture.

Take 0·500 grm. sample, transfer to beaker, cover, add 20 c.c. hydrochloric acid with addition of a small quantity of bromine water, allow to boil gently until bromine fumes have disappeared. Dilute to 200 c.c. with hot water, add ammonia until faintly alkaline, boil a few minutes, allow to settle and filter. Precipitate will contain silica, iron and alumina hydrates, insoluble silicates, and carbonaceous matter. Solution will contain lime and magnesia previously existing as carbonates. Determine the carbonate of lime and carbonate of magnesia, as outlined for cement analysis, the only distinction being that a different factor is used in the calculation.

Ignite precipitate as previously directed, using high heat at once, cool and weigh. To ignite mass, add ten times the weight of sodium carbonate, about 1 grm., without removing from the crucible, stir to incorporate. Fuse, treat fused mass as directed for cement, transfer to casserole and dehydrate silica as directed. Proceed as for cement in estimation of silica. To filtrate, add ammonia and proceed as already outlined for estimation of alumina and ferric oxide. Determine lime and magnesia if existent as above.

The advantages of the method adopted may commend itself where economy of time and work is a desideratum. Brevity is its chief merit, there being only one tedious evaporation to dryness, one filtering, ignition and weighing of iron and alumina oxides. There is no introduction of a large mass of saline salts into solution, which would be necessary when entire sample is fused, and afterwards difficult to completely remove by washing.

Carbonate of Lime.—The method which we have adopted for the determination of the carbonate of lime in the mixture, if that be the sole constituent sought, is thoroughly accurate.

Ignite 0·500 grm. sample for two or three minutes in platinum crucible. Invert crucible over beaker and detach ignited mass by gently tapping upon bottom of crucible. Stir remaining portion with platinum rod to loosen and transfer to beaker. Direct a small spray of 1 to 1 hydrochloric acid upon sides of crucible, stir with platinum rod, pour the few drops into beaker, wash out once with a little water, rub with finger, few drops more of hydrochloric acid, wash off rod and finger into beaker. If care be exercised there need be no effervescence in beaker, the comparatively dry sample occupying one side of the beaker and the few drops of hydrochloric acid the other. A too energetic disengagement of carbonic acid gas might result in loss, as beaker is not covered during the operation. Cover with watch glass, add 20 c.c. 1 to 1 hydrochloric acid and a little bromine water. Heat until bromine fumes are gone, dilute to 250 c.c. with hot water, add ammonia until alkaline. Boil, add 20 c.c. ammonia oxalate boiling. In three or four minutes precipitate will have settled sufficiently to filter—the silica, iron and alumina promoting the action more rapidly than if oxalate of lime alone be present. Determinate the carbonate of lime directly by titrating with standard potassium permanganate.

Time occupied for the determination after sample is weighed and in crucible need not exceed 30 minutes.

Method No. 8.

Analysis of Cement.

Silica, Iron, Alumina, Lime, Magnesia.—One-half grm. of the material was fused with sodium carbonate, the fused mass then being dissolved with dilute hydrochloric acid in a 500-c.c. beaker.

The solution was evaporated to dryness on a steam bath and the residue then baked on a hot plate until no odour of HCl could be detected. The mass was then moistened with about 5 c.c. concentrated HCl, 50 c.c. water added and boiled for about three minutes, when the insoluble residue was filtered out, washed 6—8 times with boiling water, ignited, and weighed as SiO_2.

The filtrate was then brought to boiling and the hydrates of iron and aluminum precipitated by adding a slight excess of ammonia. This was then boiled off until the odour of ammonia was almost imperceptible, when the precipitate was filtered out, washed 6—8 times with boiling water, ignited and weighed as Fe_2O_3 and Al_2O_3.

This was then fused with bisulphate of potassium, the fusion dissolved in water, a few drops of sulphuric acid and about 2 grms. of C.P. zinc added. After the zinc had entirely dissolved, the reduced iron was titrated with permanganate and the amount found, calculated as Fe_2O_3 subtracted from the combined amount of Fe_2O_3 and Al_2O_3, thus getting the Al_2O_3 by difference.

The filtrate was brought to boiling and about 50 c.c. of boiling saturated solution of ammonium oxalate added with a few drops of ammonia. The precipitate was allowed to settle while standing on a steam bath for about 20 minutes, filtered out, washed 8—10 times with boiling water, washed off the filter into a beaker, dissolved in dilute sulphuric acid (5 c.c. acid to 100 c.c. water) and titrated with permanganate.

The filtrate was cooled, about 50 c.c. saturated solution of ammonium phosphate added together with a small amount of ammonia, stirred briskly for about 3 minutes, allowed to stand 12 hours, the precipitate filtered out, washed 18—20 times with hot ammonia water (1 ammonia to 4 water), ignited, and weighed as $Mg_2P_2O_7$.

Loss on Ignition.—One-half grm. was ignited in a closed platinum crucible for about 30 minutes over a blast lamp, the crucible and material being reweighed and the loss noted.

Sulphuric Anhydride.—One-half grm. was fused with sodium carbonate, the fusion dissolved in hydrochloric acid and water, the silica and hydrates of iron and aluminium precipitated with ammonia and filtered out, and the sulphuric acid in the filtrate then precipitated with barium chloride in the usual way.

Raw Mixture.

One grm. was treated with a small amount of dilute hydrochloric acid, and after effervescence ceased, evaporated to dryness. Dilute hydrochloric acid was then added and the insoluble residue filtered out, this was ignited and fused with sodium carbonate.

The fusion was dissolved in dilute hydrochloric acid, the solution evaporated to dryness and the resulting residue baked on a hot plate until no odour of hydrochloric acid could be detected.

Five c.c. of hydrochloric acid and 50 c.c. of water were then added and boiled for about three minutes, the insoluble portion was filtered out, washed 6—8 times with boiling water and weighed as SiO_2.

The filtrate was added to that from the previous filtration and the Fe_2O_3, Al_2O_3, CaO, and MgO were determined as in cement, except that the separate determination of the iron in the Fe_2O_3, Al_2O_3 precipitate was omitted, and that the precipitate of calcium oxalate was not dissolved, and the oxalic acid titrated, but was ignited, allowed to cool, crushed, reignited with the crucible covered over the blast lamp for about 15 minutes, and weighed as CaO.

Method No. 9.

Analysis of Cement Mixture.

Dissolve 1 grm. of the finely pulverised and dried mixture in dilute HCl. Filter, ignite the insoluble residue in platinum and fuse with a mixture of five parts K_2CO_3 and four parts Na_2CO_3. Dissolve the fused mass in dilute HCl, and add to the first filtrate.

Evaporate to dryness and bake at 110°—120° C. till acid fumes have disappeared. Take up in dilute HCl. Boil for a few minutes. Filter, wash, ignite, and weigh as SiO_2.

Heat the filtrate to boiling with a few drops of nitric acid or bromine water. Add NH_4OH till the solution is just faintly odorous of it. Keep hot about 10 minutes. Filter and without washing dissolve the precipitate of hydrates in hot dilute HCl. Wash the paper clean with hot water. Save the paper and ignite it with the second precipitate of hydrates. Reprecipitate the hydrates as before. Filter, adding the filtrate to the first, wash, ignite, and weigh as $Al_2O_3 + Fe_2O_3$. Evaporate the filtrate to about 150 c.c. Add slight excess NH_4OH and precipitate the lime with excess of $(NH_4)_2C_2O_4$ solution. Let stand in a warm place till the precipitate has completely settled. Filter and wash clean. Remove the paper from the funnel, spread out on a large watch glass and wash the precipitate into a 600-c.c. beaker with a jet of hot water, finishing with dilute H_2SO_4, dilute to 400 c.c., add excess of H_2SO_4, heat almost to boiling and titrate with standard $KMnO_4$.

Evaporate the filtrate to 150 c.c., cool thoroughly, add 5 c.c. Na_2HPO_4 and slight excess of NH_4OH. Let stand three to four hours, then make strongly ammoniacal and let stand over-night. Filter, wash with three per cent. NH_4OH solution, ignite, and weigh as $Mg_2P_2O_7$.

For Fe_2O_3 treat 1 grm. of the mixture as before. Make one precipitation of the hydrate (excess of NH_4OH does no harm), filter, wash, dissolve in dilute H_2SO_4, reduce with C.P. zinc and titrate with decinormal $KMnO_4$ solution.

Make the filtrate acid with HCl, heat to boiling and add with constant stirring 5 c.c. of hot $BaCl_2$ solution. Keep in a warm place several hours or better over-night. Filter, wash, ignite, and weigh as $BaSO_4$.

For loss on ignition, ignite one-half grm. in a platinum crucible over a Bunsen burner till the organic matter is removed, then to constant weight over the blast lamp.

Cement Clinker or Cement.

Weigh out one-half grm. of the finely ground and dried cement into 4-in. evaporating dish, add 30 c.c. of a mixture of equal parts strong HCl and water and a few drops of HNO_3. Cover with a watch glass and boil gently till the cement is completely decomposed, or till no dark-coloured particles remain. Cool a little, remove the watch glass and evaporate to dryness, finally drying at 120° C.

Cool and boil gently with 30 c.c. of the same half-strength acid, dilute to 60 c.c. with hot water, filter, wash, ignite, and weigh as insoluble matter, practically all SiO_2. If SiO_2 is to be accurately determined it may be found by difference, using hydrofluoric acid and dilute H_2SO_4, and evaporating to dryness, igniting, and weighing.

The remaining determinations are exactly the same as for the cement mixture.

For Fe_2O_3 and SO_3, weigh out 1 grm. of cement into a 4-in. evaporating dish, add 5 c.c. water and 1 c.c. strong HNO_3, then 50 c.c. of the half-strength HCl. Boil and evaporate as for complete analysis. In taking up in acid after drying, as little acid as possible must be used. The method is then the same as for the cement mixture.

Method No. 10.

Cement and Raw Rock.

Loss on Ignition.—Ignite 0·5 grm. of the sample in a covered platinum crucible for 20 minutes, using the heat of a Bunsen burner.

Silica. — Fuse the residue from the loss on ignition determination with 3 grms. of sodium carbonate. Dissolve the fusion in hydrochloric acid, evaporate to dryness on a hot plate, heat until the mass no longer smells of hydrochloric acid. Add 80 c.c. hydrochloric acid (1 to 1), boil for five minutes. Add 30 c.c. of boiling water and again boil for five minutes. Filter out silica and wash until the volume of the filtrate is about 250 c.c.

Aluminium and Iron Oxide.—To the filtrate from silica add a few drops of nitric acid, bring to boiling and precipitate with a slight excess of ammonia. Boil until the liquid smells but slightly of ammonia. Filter and wash once with hot water, then wash the precipitate back into the beaker, dissolve in hydrochloric acid and reprecipitate. Boil until the liquid smells but slightly of ammonia, filter out the aluminium and ferric hydroxides, and wash until the volume of the filtrate equals 350 c.c.

Lime.—Add a few drops of ammonia to the filtrate from aluminium and iron hydroxides, bring to boiling and precipitate with a boiling solution of ammonium oxalate. Continue to boil for one minute, then allow to stand until the precipitate settles. Filter out calcium oxalate and wash by decantation until the filtrate measures 500 c.c. Then continue washing into another beaker with 300 c.c. boiling water, rejecting this second wash water. Ignite the calcium oxalate until the filter paper is entirely burned off. Cool, then add about 2·5 grms. of ammonium sulphate and 1 grm. of ammonium nitrate. Heat very gently until the mass comes to a quiet fusion, finally heating to bright redness until the fumes of ammonium sulphate are entirely driven off. Weigh as calcium sulphate and calculate to calcium oxide. (J. Amer. Chem. Soc. 22, 477.)

Magnesia.—Is determined according to the method of Handy. Concentrate the first filtrate from calcium oxalate to 200 c.c., transfer to Erlenmeyer flask, add 25 c.c. of ammonia and cool to 20° C. Then add 20 c.c. of a 10 per cent. solution of sodium ammonium phosphate. Cork tightly and shake for five minutes, allowing to stand until the precipitate settles. (15 minutes is usually sufficient.) Filter and wash with 10 per cent. ammonia water. When washed transfer to a bisque drying plate.

This will rapidly absorb the greater part of the water and ammonia adhering to the filter. Remove from the plate and dry in an oven at 50° to 60° C. for 15 minutes, or in air for one hour.

The magnesium ammonium phosphate is then titrated with N/10 sulphuric acid and sodium hydrate, using methyl orange as an indicator. One c.c. of N/10 sulphuric acid equals 0·002 grm. of magnesia.

Sulphuric Anhydride in Cement.—Dissolve 3 grms. of cement in hydrochloric acid (1 to 1), evaporate to dryness and heat until hydrochloric acid is entirely driven off. Dissolve the mass in hydrochloric acid, boil, filter out silica and precipitate sulphuric acid from boiling filtrate with a boiling solution of barium chloride. Continue boiling until the barium sulphate settles quickly on standing. Weigh as barium sulphate and calculate to sulphuric anhydride.

Method No. 11.

Analysis of Cement Rock.

One-half grm. of rock was weighed out, transferred to a Jena beaker (capacity 250 c.c.), covered with water, and concentrated HCl added until all effervescence ceased. About 10 drops of concentrated nitric acid were then added and the solution evaporated to dryness on the hot plate. After the mass had become perfectly dry, the beaker was covered with a watch glass, placed on the hottest part of the stove, and allowed to bake until no more acid odours could be detected. It was then moistened with concentrated HCl, allowed to stand a few minutes and the insoluble matter filtered off.

The insoluble matter was fused, in a platinum dish, with sodium carbonate and treated as under B.

(*a*) To the filtrate from the insoluble matter, ammonia was added in slight excess and the solution boiled until most of the ammonia had passed off. The precipitate, which consists of the principal amount of the iron in the rock, was filtered off and washed with boiling water.

The filtrate from the iron was then heated to boiling, the lime precipitated with an ammoniacal solution of ammonium oxalate and the solution boiled for 10 minutes. The calcium oxalate was allowed to settle for 15 minutes, then filtered off and washed with boiling water. The beaker in which the precipitation was made was then placed under the funnel and the calcium oxalate dissolved in dilute sulphuric acid. This solution was then heated to near boiling, titrated with standard permanganate, and the weight of CaO calculated from the volume of permanganate used.

The filtrate from the lime was made acid with hydrochloric acid and evaporated until the solution was about 250 c.c. in volume. The magnesium was then precipitated by the addition of ammonia and sodium ammonium phosphate, and the solution stirred until the crystals began to form. After standing three hours it was filtered off and washed with a 1 to 3 solution of ammonia water. The precipitate was then burned, ignited, and weighed as $Mg_2P_2O_7$, from which the amount of MgO was calculated (Factor, wt. $Mg_2P_2O_7 \times 0{\cdot}36213 = 2MgO$).

(*b*) After making the sodium carbonate fusion the fusion was covered with boiling water and allowed to stand until it had loosened from the sides of the dish. It was then transferred to a beaker, the dish rinsed with dilute hydrochloric acid, and the mass dissolved in HCl. The solution was then evaporated to dryness and baked, as described before. It was then covered with concentrated hydrochloric acid, heated gently, and the silica filtered off. This was washed with boiling water, the still wet precipitate and paper placed in a platinum crucible, burned, ignited, and weighed.

The filtrate from the silica was made ammoniacal, boiled until most of the ammonia had passed off, filtered, and washed with boiling water. The precipitate was then combined with the iron precipitate obtained under A, burned, ignited, and weighed as R_2O_3.

To separate the iron and alumina, the R_2O_3 precipitate was fused with $KHSO_4$ for one hour, the fusion transferred to a flask, reduced with metallic zinc, and the ferrous iron titrated with standard permanganate. The difference between the weight of the Fe_2O_3 found and the weight of R_2O_3 gave the weight of Al_2O_3.

The volatile matter was determined by igniting $\frac{1}{2}$ grm. of the rock in a platinum crucible for 10 minutes at the highest heat of the blast lamp.

Analysis of Cement.

One-half grm. of the cement was transferred to a Jena beaker (capacity 250 c.c.), covered with water, and concentrated hydrochloric acid added until the solution was half acid. Ten drops of nitric acid were then added and the solution evaporated to dryness on the hot plate. After the mass had become dry it was baked until no more acid fumes could be detected. After cooling it was covered with concentrated hydrochloric acid, heated gently until all iron salts had gone into solution, and diluted with water. The silica was then filtered off, washed with boiling water, burned without drying, ignited, and weighed.

To the filtrate from the silica, ammonia was added in slight excess and the solution boiled until most of the ammonia had passed off. The precipitate was then filtered off and washed with boiling water, after which it was burned, ignited, and weighed as R_2O_3.

The filtrate from the R_2O_3 was heated to boiling, the lime precipitated as oxalate, and the precipitate treated as described under the cement rock.

The magnesia was determined in the filtrate from the lime as also described under the cement rock.

The separation of the iron and alumina was made by the bisulphate fusion.

Sulphuric Oxide.—One grm. of the cement was treated with a 50 per cent. hydrochloric acid solution, about 15 drops of nitric acid added and the solution evaporated to dryness. After baking, taking up with hydrochloric acid, and diluting with water, the silica was filtered off. The filtrate was then heated to boiling and the sulphuric oxide precipitated with barium chloride. The boiling was continued for 10 minutes and the precipitate allowed 2 hours to settle. It was then filtered off, washed with boiling water, burned, ignited, and weighed (Factor, wt. $BaSO_4 \times 0{\cdot}34293 = SO_3$).

Method No. 12.

The method employed in our laboratory for the complete analyses of cement is as follows:—

One-half grm. of cement is dissolved in a No. 1 beaker by approximately 20 c.c. of dilute hydrochloric acid (1 to 1) taken down to dryness and roasted for about one-half hour, at moderate heat on a hot plate. When cool the residue is dissolved in dilute hydrochloric acid, silica then filtered, ignited, and weighed. The filtrate is made slightly ammoniacal, then brought to boiling, the precipitate is allowed to settle for a few minutes, then filtered and washed thoroughly with hot water, dried, ignited at high heat, and weighed (care should be taken when precipitating alumina to have a sufficient amount of ammonium chloride present in the solution). The bulk of the filtrate is now about 300 c.c. in which the lime is precipitated by ammonium oxalate, boiled for a few minutes, allowed to settle for about one-half hour, then filtered and washed thoroughly with hot water, the precipitate is then dissolved in dilute sulphuric acid and titrated with potassium permanganate in the usual way. All the above results can be obtained in from three to four hours, when only a few samples are carried on at one time.

The magnesia in cement being so low, it is advisable to allow the precipitate to settle over-night before filtering; then the magnesia is precipitated in a cold solution by microcosmic salts.

In case of raw material it would be necessary to fuse the insoluble matter in order to separate the silica from the alumina, and in very careful work we recommend, as a check, after the silica is weighed, to volatilise it with hydrofluoric acid.

For determination of sulphur existing as sulphate in cement, we dissolve the sample in dilute hydrochloric acid, then precipitate the silica and alumina together, acidulate the filtrate, and precipitate boiling with barium chloride. This we find very rapid and thoroughly satisfactory.

If sulphides are present, and total sulphur is wanted, we oxidise the sulphides with bromine. If sulpbides are wanted, when sulphates are present, this result can, of course, be obtained by determining total sulphur and sulphates separately, the difference between the two results will give the sulphides.

For determination of volatile, we weigh out 1 grm. sample in a small crucible; this is tightly covered and left over a hot Bunsen burner flame, which should thoroughly envelop it for 20 minutes (but not over blast lamp). Great precaution in this determination is needed only when sulphides are present.

Method No. 13.

The method used on both was practically the same, namely to treat 0·500 grm. of the moistened sample in a platinum dish with concentrated hydrochloric acid; after solution, evaporate to dryness, take up with HCl and dilutiog, filter. The residue is fused, and after this is dissolved it is evaporated to dryness, taken up with strong HCl, and then water, and filtered. The filtrate is added to the main solution in which iron and alumina, lime, and magnesia are determined as in an ordinary mineral analysis. The lime is determined gravimetrically.

In an ordinary technical analysis, but not in this one, I sometimes, when hurry is needed, omit the fusion and consequent second evaporation, and after treating the silica with HF, ascribe the residue found here to alumina and iron and add to it the figures for those bases.

Method No. 14.

Analysis for Mixture and Cement.

Between 0·5 and 0·75 grm. of the sample is fused with sodium carbonate, the fused mixture taken up in hydrochloric acid and evaporated to dryness on the water bath. The last traces of hydrochloric acid having been expelled on the sand bath, the perfectly dry residue is taken up in dilute hydrochloric acid, boiled, allowed to stand until the silica has settled, and then the clear liquid is decanted through a filter; the residue again treated with hydrochloric acid, boiled, allowed to settle, and the clear liquid decanted off. This is again repeated, the silica finally brought on the paper and washed free from hydrochloric acid. The precipitated silica is ignited wet, the ignition being completed on the blast lamp, and weighed.

The iron and alumina are precipitated with ammonia, the ammonia boiled off, filtered, and washed a few times, then the precipitate is washed from the paper into the beaker in which it was originally precipitated, dissolved in hydrochloric acid, and reprecipitated with ammonia. The precipitate of iron and alumina is dried, ignited, and weighed. Iron and alumina are separated by fusing with potassium bisulphate, and the iron determined by permanganate; the alumina is determined by difference.

The calcium in the combined filtrates is precipitated from the hot boiling solution after addition of ammonia by ammonium oxalate, allowed to settle, filtered, and washed with boiling water. The precipitate of calcium oxalate is dried, ignited, blasted for 15 minutes at the full heat of the blast lamp, and weighed as calcium oxide.

The filtrate from the calcium is concentrated by evaporation and the magnesia precipitated by sodium ammonium phosphate, and the magnesia determined in the regular manner.

For the determination of sulpbur 2 grms. are taken, digested in hydrochloric acid, evaporated to dryness on the water bath, and the last traces of hydrochloric acid expelled on the sand bath. The dry mass is then taken up in hydrochloric acid, filtered, and washed as for silica, and the sulphuric acid determined in the filtrate in the regular manner.

For loss on ignition a 1-grm. charge is used.

Method No. 16.

Analysis of Portland Cement, Limestones, and Clays.

The sample is weighed out in three portions:—

I. For the determination of loss on ignition, a sample of about 1 grm. is weighed out in a small platinum crucible and heated for an hour at 100°—105° C. If the quantity of moisture is found to be greater than 1·10 per cent. a corresponding correction is made on the other two portions. The dried sample is then heated from 10 to 15 minutes with a Bunsen burner, and then ignited to constant weight with a blast lamp.

II. For the determination of sulphuric anhydride, a sample of 3 grms. is weighed out and treated with a mixture of 25 c.c. of water, 25 c.c. of hydrochloric acid (1·2 sp. gr.), and 15 c.c. of nitric acid (1—2/10 sp. gr.). The mixture is heated slowly to boiling, boiled a few minutes, and evaporated to dryness on a water bath. When it is dry it is treated with 25 c.c. of concentrated hydrochloric acid and evaporated again. The completely dried mass is moistened with concentrated hydrochloric acid, 50 c.c. of water is added, and the whole slowly heated to boiling. The lumps of siliceous matter are broken up with a flattened stirring rod and the solution is filtered and washed with hot water until it attains a volume of about 250 c.c., when it is placed on a water bath and heated until the beaker can just be held in the hand. A few drops of concentrated hydrochloric acid and 5—10 c.c. of an approximately 10 per cent. solution of barium chloride are added, and the analysis is allowed to stand over-night or until completely cold. It is then decanted through a filter, washed once by decantation, once with hot water, once with dilute hydrochloric acid, then again with hot water, finally transferred to the filter, washed free from chloride, dried, ignited, and weighed. Before the final weight is taken the precipitate is moistened with a drop or two of concentrated sulphuric acid and ignited.

III. For the determination of silica, oxide of iron and alumina, oxide of calcium and oxide of magnesium, a sample of 0·5000 grm. is weighed out into a clean 20-c.c. platinum crucible and mixed by means of a platinum wire with 5 grms. of mixed sodium and potassium carbonates and a pinch of sodium nitrate. The mixture is fused 15 to 30 minutes with a Bunsen burner, then a few minutes with blast lamp, the fusion is cooled and transferred to a 250-c.c. beaker containing barely enough water to cover the crucible. When the cold fusion is disintegrated, the crucible is removed and washed out with a drop or two of concentrated hydrochloric acid, which is diluted before adding to the main solution. The beaker is covered with a watch glass and concentrated hydrochloric acid is added, drop by drop, until the solution is strongly acid and effervescence has ceased; it is then heated to boiling and transferred while hot to a casserole and heated on a water bath until dry; when dry the silica is dehydrated at 120°—130° C. for an hour, and cooled. The contents of the casserole are moistened with concentrated hydrochloric acid, 50 c.c. of water are added, solution is heated to boiling and filtered into a 400-c.c. beaker. The silica is washed, dried, ignited and weighed. The weighed silica is moistened with a drop or two of concentrated sulphuric acid and 10 c.c. of hydrofluoric acid, the whole is evaporated to dryness, and 0·3 of the residue in the crucible is subtracted from the weight of the silica, and added to the weight of the oxide of iron and alumina.

A few drops of concentrated nitric acid are added to the filtrate, it is heated to boiling, cooled a few minutes, an excess of ammonia (sp. gr. 0·9) is added, and the excess boiled out. The solution is filtered, washed once by decantation, precipitate thrown on the filter, dissolved in dilute hydrochloric acid and precipitated as before. The hydrates of iron and aluminium are washed free from chloride, dried, ignited, and weighed. The ignited precipitate is fused with a small quantity of potassium bisulphate, dissolved in water, filtered, and weighed. The weight of silica as determined by difference with a drop or two of hydrofluoric acid is added to the original silica, and subtracted from the iron and aluminum oxides.

The filtrates from these two precipitations, together with the first two or three washings are concentrated on a water bath in a 400 c.c. beaker to a volume of about 100 c.c., made alkaline with ammonia, and from 20 to 30 c.c. of a saturated solution of ammonium oxalate is added. The solution is heated to boiling, allowed to settle, decanted through a filter into a 600-c.c. beaker, washed once by decantation, dissolved in dilute hydrochloric acid, and

reprecipitated with ammonia. A few drops of ammonium oxalate are added, the solution is boiled, settled again and filtered. The oxalate of calcium is washed and ignited to oxide with a blast lamp. The second filtrate from the calcium, together with the first two or three washings, are concentrated to a small volume and added to the first filtrate, the whole is made alkaline, 10 to 15 c.c. of a 10 per cent. solution of hydro disodic-phosphate are added, and a quantity of ammonia (sp. gr. 0·9) is added, equal to one-fourth of the volume of the original solution. The solution is stirred vigorously, and allowed to stand over night, then the phosphate of magnesia and ammonia is filtered out, washed, ignited, and weighed.

The final ignitions on the oxides of silica, iron, and aluminium and calcium, and also the pyro-phosphate of magnesia are done with a blast lamp.

The alkalis are not ordinarily determined.

Corrections are made for impurities in reagents.

Method No. 17.

Analysis of Cement Rock.

Fuse half a grm. of material with about ten times its weight of mixed carbonates. Dissolve fusion in hydrochloric acid. (Acid = 1 part HCl, sp. gr. 1·20, to 1 part water.)

Evaporate the solution to dryness on the sand bath, take up with hydrochloric acid and water, warm, then boil. Filter, wash thoroughly, burn, and weigh.

To the filtrate add ammonia in slight excess, boil and filter. Wash the iron and alumina precipitate back into the beaker, redissolve in hydrochloric acid and water, precipitate with ammonia, boil, filter, wash, burn, and weigh.

To the boiling filtrate from the iron and alumina add about 20 c.c. of a boiling saturated solution of ammonium oxalate and continue boiling for about five minutes. Allow the precipitate to settle, filter, wash thoroughly. Wash the precipitate into the beaker used for the precipitation of lime, add about 300 c.c. of water. Dissolve the oxalate of lime by adding sulphuric acid. Titrate with standardised potassium permanganate.

Allow the filtrate from the oxalate to become cold, add about 20 c.c. of a saturated solution of ammonium phosphate and about 20 c.c. of strong ammonia. Stir, precipitating the magnesia as ammonium magnesium phosphate.

Analysis of Cement.

Treat half grm. of cement with half strength hydrochloric acid (HCl = 1 part HCl, sp. gr. 1·20, to 1 part water).

Evaporate to dryness or until all the hydrochloric acid is driven off. Take up with hydrochloric acid and water, bring to a boil, add water and filter, wash, ignite, and weigh.

To the filtrate add ammonia in slight excess, boil and filter. Wash the precipitate of iron and alumina back into the beaker, redissolve in hydrochloric acid and water, reprecipitate with ammonia, boil, filter, wash, burn, and weigh.

To the boiling filtrate from the iron and alumina add 20 c.c. of a boiling saturated solution of ammonium oxalate and continue boiling for about five minutes. Allow the precipitate to settle, filter, wash thoroughly. Wash the precipitate back into the beaker, add about 300 c.c. of water. Dissolve the oxalate of lime by adding sulphuric acid. Titrate with standardised potassium permanganate.

Allow the filtrate from the oxalate of lime to become cold, add about 20 c.c. of a saturated solution of ammonium phosphate and 20 c.c. of strong ammonia. Stir until the precipitate is all down. Allow to stand 12 or more hours in a cold place. Filter, wash, ignite, and weigh.

The preceding results and description of methods were, as has been said, submitted to Mr. Hillebrand through the Director of the Survey, accompanied by the following letters.

September 25th, 1901.

Dr. Charles D. Walcott,
Director, U.S. Geological Survey,
Washington, D.C.

Dear Sir,

You were recently kind enough to authorise Mr. W. F. Hillebrand to assist the Committee of the Society of Chemical Industry on Uniformity in Technical Analyses, by making careful analyses of two samples of raw rock mixture and finished cement, the results of which you have already placed in my hands. In the meantime ordinary analyses of these materials have been made by fourteen chemists, and reported to me, together with the description of the methods which were employed. These results are far from concordant in themselves and are evidently incorrect as shown by Mr. Hillebrand's figures. I am writing to ask you, therefore, if you will submit these figures and methods, which I enclose, to Mr. Hillebrand, and ask him to be kind enough to give the Committee his view in regard to the principal source of error in the work of these chemists, and to make some suggestions for a rapid method of analysis which shall furnish more reliable results. The cement chemists inform me that it is necessary that they should be able to complete determinations of silica, iron, alumina, and lime within one working day.

The work of the Committee, as far as it has gone, seems to be of considerable value as pointing out the loose methods adopted in ordinary analytical chemistry, and I think with your co-operation that more can be accomplished in this direction in the future.

Very truly yours,
(Signed) Clifford Richardson.

Long Island City, N.Y.,
October 4th, 1901.

Dr. W. F. Hillebrand,
U.S. Geological Survey,
Washington, D.C.

Dear Sir,

I have sent to the Director of the Survey the results of the analyses of the raw rock mixture and finished cement made by fourteen chemists, not including yourself, together with the descriptions of the methods employed, and have asked him to submit them to you and to make some suggestions for a rapid method of analysis suitable for use by commercial chemists and in cement plants.

The method which I have outlined, after consultation with you, I think will meet the case. It is No. 1. One of my assistants has carried out an analysis on this plan, and the results are on the accompanying sheet. The results obtained in this way for the raw rock mixture are given in the table as No. 1a. If you see any modifications which should be introduced into this method please let me know. After the Committee has heard from you it will be in a position to present the matter to the Society.

Very truly yours,
(Signed) Clifford Richardson.

Time Consumed in Analysis of Rock Mixture.

	A.M.
Analysis begun	9.15
Preparing and weighing crucible, weighing crucible and substance	9.35
"Blasting" (strongly igniting?) to render rock soluble in HCl	9.50
Cooling and weighing after "blasting," not necessary unless loss on ignition is to be determined	10.15
Solution and evaporation, first time	11.30
Taking up residue and digesting	11.45
Filtering and washing	12.0
	P.M.
Filtrate evaporated, second time	1.10
Taken up, digested and filtered	1.30
Igniting and "blasting" SiO_2	2.10
During the igniting and blasting of the SiO_2 the iron was precipitated, boiled, and filtered.	
Correcting the SiO_2 with HFl, about	2.40
In the meantime the iron was reprecipitated and filtered, and the lime thrown down and reprecipitated.	
The igniting, weighing, and blasting of iron and lime occupied about	4.10
The magnesia solution from the lime precipitate was evaporated in the meantime, and about 30 minutes consumed in cooling and precipitating	4.40
Magnesia was determined the following morning.	

Under date of October 28th, Mr. Hillebraud reported, through the Director, as follows:—

Department of the Interior,
U.S. Geological Survey,
Washington, D.C.,
October 28th, 1901.

Mr. Clifford Richardson,
New York Testing Laboratory,
Long Island City, N.Y.

Dear Sir,

Enclosed herewith you will find a report by Dr. Hillebrand on the lines asked for in your letter of September 25th in which the analytical results and methods of fourteen chemists relating to certain samples of limestone mixture and finished cement are critically discussed and suggestions made for securing greater uniformity in that field of technical analysis.

I hope the important end which your Committee has in view may be promoted by this report.

Very respectfully,
(Signed) H. C. Rizer,
Acting Director.

Clifford Richardson,
Chairman of Committee of the New York Section of the Society of Chemical Industry on Uniformity in Technical Analysis.

Dear Sir,

Under authority from the Director of the U.S. Geological Survey, I take pleasure in acceding to your request of September 25th, addressed to the Director, asking that I give "my views in regard to the principal sources of error" in the technical analysis of limestone and cements as exemplified by returns from fourteen different chemists, and that I "make some suggestions for a rapid method of analysis which shall furnish more reliable results," this last request being coupled with the condition that the chemist shall be able to complete determinations of silicon, iron, aluminium and calcium within one working day.

The chemists referred to above have made partial analyses of a uniform sample of raw rock mixture and of the cement resulting from the burning of this mixture, and they have furnished in more or less detail the methods employed by them in making the analyses. Copies of their results, tabulated below, were furnished to me by you, and also copies of their analytical descriptions, but copies only, without anything to indicate their original source, so that I am in entire ignorance of the identity of the makers of a single one of the analyses except those which were made in your own laboratory. It is important that this should be fully understood.

As an introduction to the discussion I repeat here the means of the careful exhaustive analyses of these same raw mixture and cement samples made by myself last June and reported to you in detail August 30th.

Table I.

Detailed Analyses by W. F. Hillebrand.

—	Limestone Mixture.	Finished Cement.
SiO_2	15·18	21·31 (low rather than high).
TiO_2	0·23	0·26
Al_2O_3	4·94	6·38
Fe_2O_3	0·95	2·00
FeO	0·46	0·48
FeS_2	0·38(0·205 S)	..
MnO	0·05	0·06
CaO	40·31	62·82
SrO		0·07
MgO	1·65	2·64
K_2O	0·97	0·50
Na_2O	0·15	0·25
$H_2O - 105°$	0·38	0·16
$H_2O + 105°$	1·31	0·60
CO_2	32·38	0·63
C	0·54	..
P_2O_5	0·21	0·25
SO_3	None	1·34
S	See FeS_2 above	0·09 as sulphide.
	100·09	99·84

What degree of reliance is to be placed on these figures I have already indicated in my report of August 30th. Suffice it to say they are unquestionably in all cases very near to the truth, and they serve as the basis for my comparisons and criticisms.

In the tables below the analyses of different chemists are indicated by the numbers assigned them by yourself. For convenient comparison my own head the lists, but in them are reproduced only those constituents which wese determined by some or all of the other chemists. It should be noted here that none of the latter reported titanium or phosphorus, but by the methods of analysis used these constituents were weighed chiefly with the oxides of iron and aluminium and counted as such.

Table II.

Analyses of Limestone Mixture.

Analyst.	SiO_2.	Al_2O_3. Fe_2O_3. (TiO_2.) (P_2O_5.)	Al_2O_3. (TiO_2.) (P_2O_5.)	Fe_2O_3.	CaO. (SrO.)	MgO.	$CaCO_3$.	$MgCO_3$.	MgO.*	Loss on Ignition.	Mode of Attack.
Standard	15·18	7·09	5·38	1·71	40·31	1·65	(71·98)	(3·45)	..	(34·69)	Acid after ignition.
1	15·75	7·08	5·30	1·76	41·54	2·14	74·18	4·47	..	..	Alk. fusion.
1A	15·37	..	5·46	..	40·40	1·81	(72·14)	(3·78)	..	..	Acid after ignition.
2	14·68	7·83	..	..	41·14	1·83	73·46	3·84	..	..	Alk. fusion.
3	13·92	8·36	..	.	40·22	1·85	71·82	3·87	..	..	Acid and fusion.
4	21·16	3·10	..	..	39·94	1·10	71·32	3·29	..	..	Acid.
5	14·18	6·70	..	..	41·36	2·01	73·85	4·21	..	34·07	Alk. fusion.
6	14·70	8·30	..	..	39·97	1·88	71·37	2·98	0·45	..	Acid and fusion.
7	12·78	8·50	..	..	39·79	1·87	71·05	2·26	0·79	..	„
8	13·97	7·80	..	..	41·78	1·39	74·59	2·90	..	..	„
9	14·44	8·44	6.64	1·80	41·15	1·70	73·48	3·56	..	34·00	„
10	13·60	8·36	..	..	41·02	2·00	73·25	4·18	..	34·14	Alk. fusion.
11	14·64	8·04	5·31	2·73	39·53	1·78	70·59	3·72	..	34·60	Acid and fusion.
12	14·18	7·80	6·54	1·26	41·68	1·80	74·43	3·76	..	34·58	„
13	14·92	8·46	..	..	41·92	1·94	(74·86)	(4·06)	..	..	„
14	13·56	7·49	5·27	2·22	40·30	1·97	(71·96)	(4·12)	..	35·42	Alk. fusion.
High	21·16	8·50	6·64	2·73	41·92	2·14	74·59	4·27	..	35·42	
Low	12·78	3·10	5·27	1·26	39·53	1·10	70·59	2·26	..	34·00	
Difference	8·38	5·40	1·37	1·47	2·39	1·04	4·0)	2·21	..	1·42	

Bracketed figures calculated by myself.

* MgO not combined with CO_2.

In order to better compare the more important features of these analyses, I have rearranged them below in such a form as to show in the first place the several sums of SiO_2 + Al_2O_3, &c., then these + CaO and MgO, and finally a grand total obtained by adding to each of the last sums a constant for all other constituents as shown by the full

analyses of Table I. The object of this last addition is to present in a manner more readily seen and understood at a glance the variations in summation representing excess or loss due to impurities from reagents or to defective manipulation. I have purposely omitted as separate entries the several values for SO_3, not only because of the generally fair agreement of its figures but chiefly because the determination of sulphur has no connection with that of the other constituents. Errors in its estimation affect in no way the correctness of those, hence it will be considered by itself later, as well as the ignition losses.

The data thus assembled are now ready for discussion in the light afforded by outlines of the methods employed, and Tables IV. and V. are instructive. To discuss each analysis in detail would consume too much time and space, but general inferences will be illustrated by special cases.

TABLE III.

Analyses of Finished Cement.

Analyst.	SiO_2.	Al_2O_3. Fe_2O_3. (TiO_2.) (P_2O_5.)	Al_2O_3. (TiO_2.) (P_2O_5.)	Fe_2O_3.	CaO. SrO.	MgO.	Loss on Ignition.	SO_3.	S.	Mode of Attack.
Standard	21·31	9·43	6·89	2·53	62·89	2·64	..	1·34	0·09=0·22 SO_3	Acid.
1	20·90	10·11	7·46	2·65	63·20	2·98	..	1·33	..	„
2	20·92	10·12	7·06	3·06	63·53	2·88	1·11	1·38	..	„
3	20·06	10·98	..	..	62·84	2·70	1·30	1·42	..	„
4	20·09	11·36	..	..	62·30	2·85	2·15	1·38	..	„
5	20·26	9·32	..	..	64·28	2·52	1·07	1·71	..	Alk. fusion.
6	20·96	9·92	7·62	2·30	62·17	2·89	..	1·35	..	Acid.
7	20·84	10·00	7·25	2·75	62·01	3·04	2·20	1·42	..	„
8	19·82	10·96	8·20	2·76	63·68	2·80	1·22	1·43	..	Alk. fusion.
9	20·76	10·32	7·70	2·62	63·00	3·13	1·04	1·59	..	Acid.
10	19·18	11·12	..	..	63·20	3·04	1·78	1·30	..	Alk. fusion.
11	21·46	10·02	6·26	3·76	62·20	3·12	..	1·35	..	Acid.
12	20·76	9·63	6·98	2·65	62·72	2·64	3·20	1·30	0·04=0·10 SO_3	„
13	21·56	10·24	..	..	64·50	3·02	..	..	..	„
14	19·53	10·37	8·01	2·36	63·53	3·06	2·68	1·35	..	Alk. fusion.
High	21·56	11·36	8·20	3·76	64·80	3·13	3·20	..	..	
Low	19·18	9·32	6·26	2·30	62·01	2·52	1·04	..	..	
Difference	2·38	2·04	1·94	1·46	2·29	0·61	2·16	..	..	

TABLE IV.

Limestone Analyses Re-arranged.

——	Standard.	1.	1A.	2.	3	4.	5.	6.
SiO_2	15·18	15·75	15·37	14·68	13·92	21·16	14·18	14·70
Al_2O_3, &c.	7·09	7·08	(7·08)	7·83	8·36	3·10	6·70	8·30
	(22·27)	(22·83)	(22·45)	(22·51)	(22·28)	(24·26)	(20·88)	(23·00)
CaO	40·31	41·54	40·40	41·14	40·22	39·94	41·36	39·97
MgO	1·65	2·14	1·81	1·83	1·85	1·10	2·01	1·88
	(41·96)	(43·68)	(42·21)	(42·97)	(42·07)	(41·04)	(43·37)	(41·85)
Const.	35·86	35·86	35·86	35·86	35·86	35·86	35·86	35·86
	100·09	102·37	100·52	101·34	100·21	101·16	100·11	100·71

——	7.	8.	9.	10.	11.	12.	13.	14.
SiO_2	12·78	13·97	14·44	13·60	14·64	14·18	14·12	13·56
Al_2O_3, &c.	8·50	7·80	8·44	8·36	8·04	7·80	8·46	7·49
	(21·28)	(21·77)	(22·88)	(21·96)	(22·68)	(21·98)	(23·38)	(21·05)
CaO	39·79	41·78	41·15	41·02	39·53	41·68	41·92	40·30
MgO	1·87	1·39	1·70	2·00	1·78	1·80	1·94	1·97
	(41·66)	(43·17)	(42·85)	(43·02)	(41·31)	(43·48)	(43·86)	(42·27)
Const.	35·86	35·86	35·86	35·86	35·86	35·86	35·86	35·86
	98·80	100·80	101·59	100·84	99·85	101·32	103·10	99·18

It is next in order to outline very briefly the way in which the standard analyses were made, so far as relates to the main constituents reported by all analysts.

Outline of Procedure in making the Standard Analyses.

Solution of the cement was effected by hot dilute hydrochloric acid, similarly of the limestone mixture, but not until after strong ignition over the blast to render it completely soluble.

Whether all cement mixtures can be thus rendered wholly soluble I am unable to say, but doubtless most of them can be, and if so, this method should always be resorted to in order to avoid the use of alkali carbonates. It has the further advantage of fully oxidising sulphides and carbonaceous matter. Should the effect of ignition not be quite that sought, the very small residue from treatment with acid will need but a minimum of sodium carbonate for decomposition by fusion. The methods for separation employed were identical in both cases, so far as applicable, with those set forth in Bulletin No. 176 of the U.S. Geological Survey. The analysis is in fact for technical purposes a silicate analysis of simple character.

TABLE V.

Cement Analyses Re-arranged.

	Standard.	1.	2.	3.	4.	5.	6.	7.
SiO_2	21·31	20·90	20·92	20·06	20·60	20·26	20·96	20·84
Al_2O_3 &c.	9·43	10·11	10·12	10·98	11·36	9·32	9·92	10·00
	(30·74)	(31·01)	(31·04)	(31·04)	(31·36)	(29·58)	(30·88)	(30·84)
CaO	62·89	63·20	63·53	62·84	62·30	64·28	62·17	62·01
MgO	2·64	2·98	2·88	2·70	2·85	2·52	2·89	3·04
	(65·53)	(66·18)	(66·41)	(65·54)	(65·15)	(66·80)	(65·06)	(65·05)
Const.	3·57	3·57	3·57	3·57	3·57	3·57	3·57	3·57
	99·84	100·76	101·02	100·15	108·08	99·95	99·51	99·46

	8.	9.	10.	11.	12.	13.	14.
SiO_2	19·82	20·76	19·18	21·46	20·76	21·56	19·53
Al_2O_3 &c.	10·96	10·32	11·12	10·02	9·63	10·24	10·37
	(30·78)	(31·08)	(30·30)	(31·48)	(30·39)	(31·80)	(29·90)
CaO	63·68	63·60	63·29	62·20	62·72	64·30	63·53
MgO	2·80	3·13	3·04	3·12	2·64	3·02	3·03
	(66·48)	(66·13)	(66·33)	(65·32)	(65·36)	(67·32)	(66·59)
Const.	3·57	3·57	3·57	3·57	3·57	3·57	3·57
	100·83	100·78	100·20	100·37	99·32	102·69	100·06

Silica was obtained by first evaporating to moderate dryness on the steam bath, and again evaporating the filtrate. Only in this way can one be sure not to have a very considerable amount of silica in the filtrate, a fact which the tabulated analyses demonstrates in the most striking manner. The silica obtained was strongly blasted and also corrected by hydrofluoric and sulphuric acids. The small amount of silica subsequently recovered from the ammonia precipitate was included in the total.

Aluminium, iron, titanium, and *phosphorus* were precipitated together twice by ammonia, and from the filtrates was recovered that which had been held in solution or had redissolved in the washings, always an appreciable amount unless special precautions are taken. Ignition was completed by the blast.

In the weighed mixture thus obtained, total iron was determined by titration with potassium permanganate after dissolving in acid potassium sulphate, filtering from a trace of silica, reducing the iron in the filtrate by hydrogen sulphide, and boiling this out while passing carbon dioxide through the flask. Only in this way is the influence of titanium to be avoided, and a correct result for iron to be obtained.

Titanium was determined colorimetrically in the titrated iron solution after concentration.

Phosphorus, having been determined in a separate portion, the data were now given for obtaining aluminium by difference, a method which I regard as by far the most accurate, especially when the precipitate contains other constituents than iron and aluminium oxides.

Lime, together with the strontia present, was precipitated twice as the oxalate and weighed as oxide, care being taken not to wash excessively with hot water, because calcium oxalate is by no means insoluble in boiling water.

Magnesia was precipitated twice to insure a double phosphate of approximately normal composition, and then strongly blasted to be sure of having $Mg_2P_2O_7$. It was then corrected for contaminating $Ca_3P_2O_8$, and the lime increased to correspond. An error made by some chemists when practising this correction is to regard the contamination as $Ca_2P_2O_7$ instead of $Ca_3P_2O_8$.

Platinum vessels were used throughout, except for the precipitation of the magnesia.

DISCUSSION OF THE TECHNICAL ANALYSES.

Limestone Mixture.

The analyses of the limestone mixture, Tables II. and IV., will be first taken up.

Modes of Attack.

The methods of attack employed varied. In 1, 2, 5, 10, and 14 direct fusion with sodium carbonate took place; in 3, 6, 7, 8, 9, 11, 12, and 13 fusion was used after preliminary attack by acid, and generally on the residue obtained by evaporation and filtration. Only in 1A and 4 was acid alone used; in the former case, after strong ignition, in the latter, without.

Silica.

The most casual inspection reveals that, with exception of 1, 1A, and 4, none of the technical analyses shows the whole of the silica. These exceptions are easily explained, for in 1 and 1A the silica was determined substantially, as in the standard analysis, and in 4 the unignited sample was attacked by hydrochloric acid, and the residue from evaporation and filtration was called silica, though it contained the greater part of the silicates of the mixture, not only silicates of alkalics and alumina, but of lime and magnesia as well, as is shown by the low figures for these last two constituents and the great excess in summation for $SiO_2 + Al_2O_3$.

Examination of the various outlines of methods reported with the analyses shows plainly in the majority of cases why there is a general deficiency of silica. The prime cause lies in the fact that but a single evaporation was resorted to. In spite of evident efforts by all, or nearly all, the analysts to secure complete dehydration by strong drying in a variety of ways, and at temperatures from that of the steam bath to 120° and the indefinite one of the "hottest part of the oven," complete success was not once achieved. It is quite possible that in more than one instance the reverse of what was intended resulted by recombination between the silica and bases, due to overheating. It is plain beyond question that the reviewer's practice of many years, that of two evaporations and filtrations, is the only one that will ensure a maximum value for silica. (See on this point Alex. Cameron in Chem. News, 69, 171, 1894.)

Yet, low as the results are, they are still too high, for only in 1, 1A, 6, and 12 does it appear that the invariably impure silica was corrected by hydrofluoric acid, and in none but 1, 1A, and 14 is there any statement that the blast was applied.* Incomplete washing may possibly have helped to raise the result in some of those cases where sodium carbonate was used.

In a few cases special causes have aided to lower the silica. For instance, in 7 the analyst dissolves in hydrochloric acid and a little bromine water, dilutes, adds ammonia until faintly alkaline, and boils a few minutes. The precipitate is assumed to contain all the silica, which is certainly incorrect, for ammonia did not precipitate all the silica that went into solution from the partial decomposition of the silicates. That this is so is clearly shown by the summation in Table IV., not only that of the $SiO_2 + Al_2O_3$, but of all constituents as well. A deficiency of about 1 per cent. is apparent, and this tends to show, in accord with the reviewer's experience, that the missing silica remained in solution during all the following separations. This may also have happened in 14.

In connection with this analysis 7, it is to be noted that losses might occur through the manner of igniting the precipitates of silica and of alumina, that is, by applying at once to the moist precipitates the highest heat of the burner.

In general it may be said that those analysts using acid at first and a carbonate fusion afterwards will get lower silicate results, other things being equal, than those who fused at once with the alkali. For in nearly every case of this kind there must be two unequal losses of silica, a minor one in the original filtrate, and a larger one in that following the alkali treatment. That the figures given do not always show themselves in harmony with this statement is to be explained in a variety of ways, as by differences in the temperature of ignition and degree of removal of sodium chloride and in the amounts of contamination by constituents of the rock. The last difference is to be attributed largely to the varied temperatures used in dehydrating silica.

Aluminium, Iron, Titanium, Phosphorus.—For the purposes of a technical analysis, the ammonia method of precipitation of the above four constituents, which all the analysts made of, would have been justified with even a larger amount of manganese than is actually present in the samples. Unless, as here, the manganese is not present in sufficient proportions to affect with too serious an error the figures for lime and magnesia, it were better to precipitate by ammonia in the presence of bromine, so as to obtain the greater part of the manganese with the iron and alumina rather than with the lime and magnesia. In any case the precipitation should be repeated, for the failure to do so has resulted generally in the contamination of the Al_2O_3, etc., by calcium carbonate (see page 24). Only in analyses 1, 1A, 5, 9, 10, and 14 does it appear that a double precipitation was made.

With exception of 1, 4 and 5 the analyses show in general a marked excess in this group of constituents. The very abnormally low results in 4 has already been accounted for in discussing *Silica*. The low result in 5, coupled with low silica, is only to be explained by incomplete precipitation, or excessive washing, or else by mechanical loss. Probably the high figure for CaO in this analysis might be in part at least accounted for by this missing silica and alumina, were it not for the fact that the lime was estimated volumetrically by titration of the oxalate. It is true that the analyst says the lime was checked by a separate gravimetric test, but no figure is given for this.

In all other cases the excess of Al_2O_3, &c., over the standard value is to be attributed largely to silica, but in no case except 1 and 1A is mention made of any correction on this account, nor does the blast seem ever to have been applied to the Al_2O_3, though this is a less important omission than with the silica. It is to be noted as supporting the view that the high values for Al_2O_3 are attributable largely to silica, that the several sums of $SiO_2 + Al_2O_3$, &c., deviate in general less from that of the standard than do the separate weights of SiO_2 and Al_2O_3.

Estimation of Iron.

The widely differing results of most of the few ferric determinations admit of little comment. The methods used were—

Decomposition of the ignited Al_2O_3, &c., by fusing with acid potassium sulphate or sodium carbonate (though in one or two instances fresh samples of limestone mixture were operated on), followed in all but one case by reduction with zinc and titrating by permanganate. A portion of the excesses over the standard determination are beyond doubt to be referred to the reducing action of nascent hydrogen on titanium, but such results as are shown in 11, 12, and 14 can only be due to carelessness. Of course all errors are duplicated in the Al_2O_3 in the opposite direction, since that was found by difference.

In presence of titanium, reduction of the iron by hydrogen sulphide is the only simple method by which exact results are attainable. No correction is needed, and when conducted with due care the method gives irreproachable results.

Lime.

In all ordinary analyses, strontia, if present, as here, will be precipitated with the lime and counted as such.

In analyses 4, 5, 6, 7, 9, 11 and 12, lime was determined after one precipitation as oxalate by titration with potassium permanganate. In 10 it was weighed as sulphate, and as the oxide in all except perhaps one of the other analyses.

By considering the volumetric results separately, very convincing evidence is thrown on the question of contamination of the alumina precipitate by calcium. Their tendency is evidently towards lowness, for of the five sensibly deficient lime values four were volumetric and the fifth was obtained after washing with a large amount of hot water. In the cement analyses (Tables III.) all of the five values that can be regarded as low (4, 6, 7, 11, 12) were the results of titration. Of the three high volumetric values for lime in each series, two in each or four in all, were obtained after a double precipitation of the alumina, and that they are high instead of normal is certainly in part at least attributable to inclusions of magnesium oxalate. Similar contamination must make the low volumetric values still too high as regards the amount of lime actually titrated, and naturally all or nearly all the gravimetric results except 1 and 1A should be affected in a like manner.

In view of the above there is no reason to doubt that the gravimetric results for lime are defective also when but one precipitation of alumina was made, and that the apparent excess which most of them show is due to insufficient blasting, or more probably to foreign inclusion.

In this connection the reason for a statement by analyst No. 2 is not at all apparent. With limestone mixtures he makes only one precipitation of alumina, but two with cements, because then the first precipitate is apt to carry some lime. Why this should not be so in the other case he does not say.

Only analyst No. 3 has succeeded, both in his limestone and cement analyses, in making apparently almost perfect separations of lime and magnesia by a single precipitation and in obtaining them free from other foreign contamination. There has doubtless been a compensation of errors here, long washing with very hot water offsetting the retained magnesium oxalate, as shown recently by Richards, McCaffrey, and Bisbee, whose paper on the occlusion of magnesium oxalate by calcium oxalate, in the Proc. Amer. Acad. and Zeit. anorg. Chem. for 1901, should be carefully studied by all analytical chemists. Some analysts allowed but 10—20 minutes between precipitation and filtration of the lime, whereas 2—3 hours should be allowed for complete separation (Richards, l.c.)

In the standard analyses, both of limestone and cement, the CaO and $Mg_2P_2O_7$ were corrected in opposite directions for the $\frac{1}{2}$ mgrm. or thereabouts of lime which the latter always contains as $Ca_3(PO_4)_2$, but for technical work this is usually a superfluous refinement which was not attempted

* I am well aware that Prof. Lunge takes issue with me as to the necessity for using the blast to dehydrate silica, basing his opinion on results obtained with silica from silicon tetrafluoride, but certain it is that with silica obtained in the ordinary course of analysis blasting is absolutely necessary.

by any of the analysts. The lime thus found with the $Mg_2P_2O_7$ has its source partly in excessive washing of the calcium oxalate, which is very appreciably soluble in boiling water. (See Richards, l.c.) When, as happened in a few cases, 400 c.c. and even 800 c.c. of hot water are used for washing, the error due to this solubility may be of some moment.

Magnesia.

Little need be said as to this constituent beyond what has already been given in connection with *Lime*.

The low result in 4 has been fully explained under *Silica*. The almost invariably high results are due, probably, to one or more of several causes—contamination by lime, by alumina,* by silica, and by failure to apply long continued blast. In every case the conditions of precipitation were fatal to the formation of a magnesium-ammonium phosphate of normal composition, that is, one which on ordinary ignition will give pure pyrophosphate. Only by successive blastings and weighings (Neubauer) can a normal pyrophosphate be obtained from the usual precipitate, which is deficient in magnesia. In the present case the small percentage of magnesia probably renders the error on this account trifling.

It should be remembered that in manganiferous limestones and cements, the manganese, if not separated, will be distributed over the Al_2O_3, &c., the CaO, and the $Mg_2P_2O_7$.

Calculation of $CaCO_3$ and $MgCO_3$.

The prevailing practice of calculating all calcium and magnesium to the state of carbonates, while doubtless harmless in the majority of cases, is unscientific. When phosphates and silicates are present, it is certain that a portion of these bases are otherwise combined than with CO_2, and it is so in the sample under discussion. Moreover, limestones almost invariably carry a part or all of their iron and manganese as carbonates, and when these are appreciable in amount and a direct CO_2 estimation has been made, distribution of the latter should not be solely between CaO and MgO.

Let me illustrate by the present case, using the standard analysis for a basis. The phosphate present may be assumed to be one of calcium, requiring roughly 0·25 per cent. CaO, leaving 40·06 CaO for 31·42 CO_2, assuming that none of the calcium is in the silicates. The whole or nearly all of the FeO is certainly carbonate; likewise the MnO, if not as peroxide, requiring together 0·31 CO_2, leaving 0·65 CO_2 for 0·59 MgO, and a maximum balance of 1·06 MgO for the silicate state. Since it is possible that a little CaO and FeO exist in silicates or other accessory minerals, the MgO really available for this purpose is presumably below 1·06.

The practice of analysts, 6 and 7, to determine separately the lime and magnesia in the part insoluble in acid, is, therefore, commendable; but in order that the results may be reasonably accurate, contact with the acid should be as brief as possible, and the temperature kept as low as is consistent with complete solution of any dolomitic carbonate that may be present. Otherwise a very considerable part of the silicates may at times be decomposed, and the purpose of the analyst vitiated.

Perhaps to some these remarks may seem to approach hyper criticism, and to demand a greater refinement in analysis than commercial need demands. It must be remembered, however, that not all limestones and cement mixtures are so constituted as this one, and that my suggestions are not made with it and its like alone in mind, but are intended to cover a wider field.

Loss on Ignition.

The few determinations of loss on ignition require little comment. The variations are doubtless due to differences of temperature and time of application of the blast, and they are not of moment when it comes to the practical application of the results. The figures given include not only CO_2, but H_2O, organic matter, and the difference between $2FeS_2$ and $1Fe_2O_3$, diminished by the oxygen taken up by FeO and MnO. Calculation on this basis from the analysis of Table I. shows that the theoretical ignition loss should be 34·69, subject to a slight decrease if any of the pyritic sulphur was retained by calcium as sulphate. It is noteworthy that this calculated value is very close to the experimental figures of analyses 12 and 13.

Cement Analyses.

It is unnecessary to subject to detailed criticism the methods employed for the cement analyses, since the foregoing remarks on the limestones apply in the main equally well here. Only a few points will be touched.

Modes of Attack.

It is to be noted that, notwithstanding the ready and complete solubility of the cement in hydrochloric acid, four analysts, Nos. 5, 8, 10 and 14, fused with sodium carbonate. This is a practice which should be abandoned. If any portion of the cement resists the action of hydrochloric acid, this should be collected on a filter without preliminary evaporation and fused with sodium carbonate. The hydrochloric acid solution of this fusion should be evaporated for silica after union with the first filtrate. By this procedure the amount of sodium salt introduced need never affect the results of analysis.

Loss on Ignition.

The wide variations in the values for this determination with which we are confronted in Table III. demand rather careful consideration. It would seem most reasonable to account for these by actual variations in the H_2O and CO_2 contents of the several cement samples at the time of analysis. The cement absorbs both moisture and carbon dioxide readily, and the samples showing the least ignition loss are presumably those earliest analysed or least exposed. If so, the analyses highest in "loss" should show the lowest summations in other constituents. For the two showing the highest loss, Nos. 7 and 12, this is true. But to accept this explanation as to 12 is to run counter to the evidence afforded by its other values, which, taken all in all, are in very close accord with those of the standard. Adding the alkalis of the standard analysis to the other values found by analyst 12, gives a summation in excess of 101. It seems extremely probable, therefore, that the value, 3·20 for loss on ignition in 12, is an error of transcription.

Whether this is so or not, it is very probable the values for silica and bases in all the analyses are more or less affected by differences in the H_2O and CO_2 contents of the several cement samples. It is, therefore, that all samples of a cement, which are to be analysed by different chemists, should be sealed air-tight, and not opened until the analysis is to be made.

With limestone and raw cement mixtures this precaution is probably for the most part unnecessary.

Sulphur.

The methods of attack by analysts 2, 3, 5, 8, 9, 11, 13, and, less certainly, 4 should give the total sulphur, and it is to be noted that these give higher results than all others except 7. One or two of those enumerated, however, precipitated iron and aluminum by ammonia, and used the filtrate for the sulphur estimation. This, while proper for iron alone, is not admissible when aluminum is present, if great accuracy is desired, because of the danger of loss by precipitation of some basic aluminum sulphate.

It is noteworthy also, that all analysts without exception evaporated to dehydrate silica before precipitating with barium chloride. As I and others have on former occasions insisted, this is an unnecessary precaution; at least when small amounts of sulphur are in question, for precipitation of silica need not be feared, even when present in much greater amount than in any cement, provided a reasonable dilution, say, 200—300 c.c. is observed.

* This is not readily precipitated by ammonia in presence of ammonium oxalate; hence, if present, will not appear wholly with the lime.

The remaining analysts dissolved simply in hydrochloric acid and thus obtained only the sulphur of sulphates. It is manifest that if the total sulphur and not merely that of sulphates is desired an oxidising attack must be employed.

Conclusions.

The chief conclusions derived from a critical examination of all the data reported are embodied in the following summary of rules, and they bear out fully the views long since formed and frequently published by myself.

To the non-observance of these rules, coupled with incomplete washing, of precipitation, and perhaps in some cases the employment of impure reagents, are to be attributed nearly every one of the more or less marked variations in the tabulated analyses.

(1) Cement samples whose composition is to be controlled by different chemists should be sealed air-tight and not opened until the analysis is about to be made.

(2) *Mode of Attack.*—Limestone and raw cement mixtures should be heated over the blast in order to render them wholly soluble and to oxidise sulphides and organic matter. If any residue should then remain on treatment with hydrochloric acid (with finished cements as well) this should be collected without evaporation and fused with a minimum of sodium carbonate, its hydrochloric acid solution being added to the former.

For sulphur an oxidising attack, either in the wet or dry way, must be used with both limestone and cement in order to obtain all the sulphur.

(3) *Separations.*—(*a*) Without two alternating evaporations and filtrations it is impossible to obtain a correct result for silica, no matter how or at what temperature dehydration has been conducted. The blast should always be applied for at least 10 minutes, and in careful work correction by hydrofluoric and sulphuric acids should not be neglected.

(*b.*) Iron and aluminum, with any titanium and phosphorus present, should be twice precipitated by ammonia in presence of sufficient ammonium chloride to retain magnesium in solution. Without this double treatment very appreciable amounts of lime will contaminate the alumina. If manganese is present in more than traces it is advisable to add bromine before the ammonia, so as to weigh the most of the manganese with the alumina rather than with the lime and magnesia. Application of the blast is advisable.

(*c*) Iron cannot be accurately determined volumetrically in presence of titanium if zinc is employed for its reduction. Hydrogen sulphide should be used and all excess boiled out in a current of carbon dioxide.

(*d*) In accurate work lime should be twice precipitated, whether it is to be determined volumetrically or by weight, and at least 1 hour should intervene between precipitation and filtration. Compensation of errors affords satisfactory results in the hands of few operators with but a single separation from magnesium.

(*e*) Magnesium pyrophosphate is only to be obtained of normal composition after long blasting (Neubauer) when precipitated under the conditions prevailing in technical analysis, that is in presence of much ammonia and ammoniacal salts, especially the oxalate.

Strict observance of all the above rules is doubtless often impossible in the hurried routine of a technical laboratory, but the inevitable penalty of material deviation from them is a decrease in the accuracy of the results.

In the scheme of analysis prepared by you and submitted for my opinion effort has been made to reconcile the two opposing factors, haste and accuracy, with a tolerable degree of success. I return it to you with a few suggestions for changes which seem to be desirable in the interest of accuracy or permissible for shortening the time required, and I have little doubt that by carefully following it as amended technical chemists will be able to arrive at results which will agree fairly well and will satisfy commercial needs.

The scheme involves extra manipulation, though it can perhaps be carried out within the time limits set, as shown by the time schedule arranged by you and accompanying the outline of methods. But because of these extra manipulation it is probable that fewer analyses can be carried on simultaneously, and hence technical workers may hesitate to adopt it. If so, however, it does not seem that any greater uniformity or exactness can be expected than is shown by the series of analyses which have been the subject of this review.

(Signed) W. F. Hillebrand,
Washington, D.C.,
October 28th, 1901.

Suggestions regarding Scheme of Analysis submitted by Mr. Clifford Richardson.

The title should cover analyses of limestones and limestone mixtures as well as finished cements.

Paragraph 1 should prescribe the ignition of limestone and raw mixtures and the fusion of any residue (from cements also) that may be insoluble in hydrochloric acid with a small amount of sodium carbonate, and the addition of the hydrochloric acid solution of this fusion to the former. From this point the procedure should be identical in both cases.

SiO_2.—The time of blasting silica can be very well shortened to a maximum of 10 minutes, without further check, when but $\frac{1}{2}$ grm. of sample is operated on. The weight of silica will rarely much exceed 1 decigram and 10 minutes should suffice for its complete dehydration over a good blast.

The strength of HCl solution used in the silica evaporation should be stated approximately. I should call 5 c.c. of acid of 1·12 sp. gr. much too little to use, for it would contain only about 1 grm. of HCl. It should be made clear that the evaporated residue is to be digested with the acid a little while before further diluting.

Al_2O_3 &c.—It is perhaps hardly necessary for a technical analysis to prescribe that the precipitate shall be dried and removed from the filter, though this might be recommended for the best work.

Fe_2O_3.—The H_2S method of reduction should be prescribed for the best work.

FeO.—For technical work it does not seem necessary to prescribe any rule for FeO.

CaO.—The time allowed for settling the first CaC_2O_4 precipitate (2 hours) is quite too much if a second precipitation and filtration are to be made the same afternoon. The time schedule is in error on this point. The "outline" makes it appear that the full flame is applied at once to the moist CaC_2O_4 precipitate wrapped in its paper. I know that this is done by some European chemists with ammonium-magnesium phosphate, but I should question its advisability here.

10—15 minutes blasting without any further check ought to be sufficient to reduce the CaO. Personally I never find more than 5—10 minutes blasting necessary. I do not insist on this point, but offer it in interest of time saving.

MgO.—After the precipitate has formed I should add more than three or four drops of ammonia to hasten complete precipitation. With all the ammonium salts present I regard it as useless to attempt to follow strictly the directions of Gibbs, Gooch, and Austin, for precipitating Mg, and would rely on long blasting to secure normal $Mg_2P_2O_7$. It should be stated that dilute ammonia water is used for washing.

When a Gooch crucible is used I should hesitate to recommend the blast, at least unless it is well known that the asbestos undergoes no change at this high temperature. Some asbestos which stands the Bunsen flame will not endure that of the blast.

SO_3 and S.—To save time I should omit the evaporation of silica to dryness. It is an unnecessary precaution. I presume total sulphur can be obtained by a wet oxidation as well as by a dry one. If the latter is used the crucible should be set in a hole in asbestos board to keep out sulphur from the gas flame. It is just as well to nearly neutralize with ammonia before adding barium chloride.

H_2O.—Not necessary to mention Penfield's method, which is only safe in careful hands, especially when any CO_2 or sulphides are present.

In the light of the results and methods reported and of Mr. Hillebrand's criticisms, your committee submits the following memorandum of a tentative method for the analysis of such materials, raw mixture and finished cement, and recommends that the samples which it distributed in April of this year be again analysed and the results, with criticisms of the method, both as to accuracy and applicability, be sent to the Chairman as soon as possible.

Method suggested by Clifford Richardson, for the Analysis of Limestone, Raw Mixture, and Portland Cement, proposed for Trial by the Committee and modified in accordance with the Suggestions of W. F. Hillebrand.

Solution.—One-half gram of the finely-powdered substance is to be weighed out and, if a limestone or unburned mixture, strongly ignited in a platinum crucible over the blast for 15 minutes. It is then transferred to an evaporating dish, preferably of platinum for the sake of celerity in evaporation, covered with a watch-glass and 10 c.c. of HCl, diluted with about 50 c.c. of water, added. Digestion on the water bath is allowed to go on for about 15 minutes when the substance should be entirely decomposed.* The cover glass is then removed, washed and the solution evaporated to dryness, as far as this may be possible on the bath.

Silica.—The residue, without further heating, is treated at first with 5—10 c.c. of strong HCl and then with as much water as the dish will comfortably hold. The cover is then replaced and digestion allowed to go on for 10 minutes on the bath, after which the solution is filtered and the separated silica washed thoroughly with hot water. The filtrate is again evaporated to dryness, the residue, without further heating, taken up with acid and water and the small amount of silica it contains separated on another filter paper. The papers containing the residue are transferred wet to a weighed platinum crucible, dried, ignited, first over a Bunsen burner until the carbon of the filter is completely consumed, and finally over the blast for 30 minutes and checked by a further blasting of 10 minutes or to constant weight. The silica, if great accuracy is desired, is treated in the crucible with about 10 c.c. of HF and four drops of H_2SO_4 and evaporated over a low flame to complete dryness. The small residue is washed, finally blasted, cooled and weighed. The difference between this weight and the weight previously obtained gives the amount of silica.†

Al_2O_3 and Fe_2O_3.—The filtrate, about 250 c.c., from the second evaporation for SiO_2, is made alkaline with NH_4OH, and boiled to expel excess of NH_3, or until there is but a faint odour of it, and the precipitated iron and aluminium hydrates, after settling, are washed once by decantation and slightly on the filter. Setting aside the filtrate, the precipitate is dissolved in hot dilute HCl, the solution passing into the beaker in which the precipitation was made. The aluminium and iron are then reprecipitated by NH_4OH. The second precipitate is collected and washed on the same filter used in the first instance. The filter paper, with the precipitate, is then placed in a weighed platinum crucible, the paper burned off and the precipitate ignited and finally blasted 10 minutes, with care to prevent reduction, cooled and weighed as $Al_2O_3 + Fe_2O_3$.‡

Fe_2O_3.—The combined iron and aluminium oxides are fused in a platinum crucible at a very low temperature with about 10 grms. of $KHSO_4$, the melt taken up with hot water and 25 c.c. of dilute H_2SO_4. The clear solution is then digested on the steam bath for about 10 minutes, and, if accuracy is desired, the small amount of silica is filtered out, weighed, and corrected by HF + H_2SO_4. The filtrate is reduced by hydrogen sulphide, boiling out the excess afterwards whilst passing CO_2 through the flask, and titrated with permanganate.§

CaO.—To the combined filtrate from the $Al_2O_3 + Fe_2O_3$ precipitate a few drops of NH_4OH are added, and the solution brought to boiling. To the boiling solution 10 c.c. of a saturated solution of ammonium oxalate is added, and the boiling continued until the precipitated CaC_2O_4 assumes a well-defined granular form. It is allowed to stand for 20 minutes, or until the precipitate has settled, and then filtered. The precipitate and filter are placed wet in a platinum crucible, and the paper burned off over a small flame of a Bunsen burner. It is then ignited, redissolved in HCl, and the solution made up to about 100 c.c. with water. Ammonia is added in slight excess, and the liquid is boiled. The small amount of Al_2O_3 which is separated is filtered out, weighed, and the amount added to that found in the first determination, when great accuracy is desired. The lime is then reprecipitated by ammonium oxalate, allowed to stand until settled, washed,* weighed as oxide by ignition and blasting to constant weight, or determined with standard permanganate.†

MgO.—The combined filtrates from the calcium precipitates are acidified with HCl, and concentrated on the steam bath to about 150 c.c., 30 c.c. of a saturated solution of $Na(NH_4)HPO_4$ are added, and the solution transferred to a beaker and boiled for several minutes. It is then removed from the flame and cooled by placing the beaker in ice water. After cooling, NH_4OH is added drop by drop with constant stirring until the crystalline ammonium-magnesium ortho-phosphate begins to form, and then in slight excess, the stirring being continued for several minutes. It is then set aside for several hours in a cool atmosphere and filtered. The precipitate is redissolved in hot dilute HCl, the solution made up to about 100 c.c., 2 c.c. of a saturated solution of $Na(NH_4)HPO_4$ added, and ammonia drop by drop, with constant stirring until the precipitate is again formed as described. It is then allowed to stand for about two hours, when it is filtered on paper or a Gooch crucible, cooled and weighed as $Mg_2P_2O_7$.

K_2O and Na_2O.—For the determination of the alkalies, the well-known method of Prof. J. Lawrence Smith is to be followed, either with or without the addition of $CaCO_3$ with the NH_4Cl.

SO_3.—One grm. of the cement is dissolved in 15 c.c. of HCl, filtered and the residue washed thoroughly.‡

The solution is made up to 250 c.c. in a beaker and boiled. To the boiling solution 10 c.c. of a saturated solution of $BaCl_2$ is added slowly drop by drop from a pipette and the boiling continued until the precipitate is well-formed. It is then set aside over night, filtered, ignited and weighed as $BaSO_4$.

Total Sulphur.—One grm. of material is weighed out in a large platinum crucible and fused with Na_2CO_3 and a little KNO_3 being careful to avoid contamination from sulphur in the gases from the source of heat. The melt is treated in the crucible with boiling water and the liquid poured into a tall narrow beaker and more hot water added until the mass is all dissolved. The solution is then filtered. The filtrate contained in a No. 4 beaker is to be acidulated with HCl and made up to about 250 c.c. with distilled water, boiled, the sulphur precipitated as $BaSO_4$ and allowed to stand over-night.

Loss on Ignition.—Half a grm. of the cement is to be weighed out in a platinum crucible, and blasted 15 minutes, The loss by weight, which is checked by a second blasting of 5 minutes is the loss on ignition.

Respectfully submitted,
CLIFFORD RICHARDSON,
For the Committee.

* If anything remains undecomposed it should be separated, fused with a little Na_2CO_3 dissolved and added to the original solution.

† For ordinary control work in the plant laboratory this correction may, perhaps, be neglected; the double evaporation never.

‡ This precipitate contains, TiO_2, P_2O_5, MnO.

§ In this way only is the influence of titanium to be avoided, and a correct result obtained for iron.

* The volume of wash water should not be too large, *vide* Hillebrand.

† The accuracy of this method admits of criticism, but it convenience and rapidity demand its insertion.

‡ Evaporation to dryness is unnecessary, *vide* Hillebrand.

RICINUS OILCAKE.

BY DR. OSKAR NAGEL.

RICINUS oilcake, or castor pomace, is not fit for feeding purposes, as it contains a poisonous albuminoid (about 1 per cent.), which in some of its chemical properties is

similar to fibrine. Like fibrine, this body, which is called Ricin or Ricinin, is soluble in a 10 per cent. cold solution of sodium chloride in water, and is precipitated out of this solution by heating.

On these observations I have based a process for refining castor pomace, so that it may be used for feeding purposes, the salt used being always recovered.

In carrying out this purification the powdered castor pomace is mixed with 6—7 times its weight of 10 per cent. salt solution and allowed to stand for 6—8 hours, during which it is thoroughly stirred. Then the whole mass is filter-pressed, and washed with a 10 per cent. salt solution until a sample of the filtrate, heated in a test-tube, shows no precipitate. The cakes are removed from the filter press and dried.

The filtrate, containing the salt solution of Ricin, is heated to boiling, to precipitate the Ricin and filtered. The filtered salt solution can now be used again.

It is an interesting physiological fact, that Ricin, which shows such poisonous effects on man, has no effect on chickens, for some were fed exclusively on castor pomace for eight days without injury.

Erratum.

THE IMPROVEMENT OF INSTRUCTION IN TECHNICAL CHEMISTRY.

(This Journal, June 1901, 546—551.)

This paper was attributed to Mr. Albert Lachman in error. It was written by Dr. Arthur Lachman, Dean of the College of Science and Engineering, University of Oregon, Eugene, Oregon, U.S.A., to whom the apologies of the Society are due for the mistake.

Obituary.

SIR J. HENRY GILBERT, F.R.S., LL.D., D.Sc., &c.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY.

Sir Joseph Henry Gilbert, the eminent agricultural chemist, who for over fifty years collaborated with Sir John Bennet Lawes, died on Monday, Dec. 23, at his residence at Harpenden at the age of eighty-four, having survived his friend and collaborateur about sixteen months. (See this Journal, 1900, 811.) He had been in failing health for some time, but after his usual autumn sojourn in Scotland he seemed to revive, though the improvement was but transitory. The deceased gentleman was son of the late Rev. Joseph Gilbert, of Nottingham, and was born at Hull on August 1, 1817. He was educated at Glasgow University, but before proceeding there met with a gun accident which for a time much impaired his health, and also deprived him of the sight of one of his eyes. At Glasgow he devoted special attention to chemistry, where he worked in the laboratory of the late Professor Thomas Thomson, and subsequently attended classes at University College, London, under Graham. He also spent a short time under Liebig at Giessen, where he took the Ph.D. degree in 1840. After completing his studies at University College, he devoted some time to the chemistry of calico printing, dyeing, &c., in the neighbourhood of Manchester; and in 1843 commenced that association with the late Sir John Bennet Lawes, at Rothamsted, as director of the laboratory and agricultural experiments there, in which he afterwards found his life's work, an association which continued uninterruptedly until Sir John Lawes's death in August, 1900. He was elected a member of the Chemical Society in 1841, was President of that Society in 1882–3, and had been a Fellow of the Royal Society since 1860, and a recipient, with the late Sir J. B. Lawes, of one of its Royal medals. He was Sibthorpian Professor of Rural Economy in Oxford University for two terms of three years each, from 1884 till 1890, and was awarded the Albert medal of the Society of Arts in 1893, in recognition of his services to agriculture at Rothamsted. In 1880, Dr. Gilbert became President of the Chemical section of the British Association for the Advancement of Science, and in 1882, and again in 1884, visited North America, travelling over wide areas of the United States and Canada, in order to study the conditions of agriculture in those two vast regions. Honours had been showered very liberally upon him, and most of the learned societies counted him among their members. In 1883, Glasgow University conferred upon him the degree of LL.D. (*honoris causa*), as did the sister seat of learning in the East of Scotland in 1890, whilst Oxford University presented him with its M.A. degree in 1884, and Cambridge made him a D.Sc. ten years later. He was a Fellow of the Linnean and Royal Meteorological Societies, a corresponding member of the Academy of Sciences, Institute of France, of the Society of Agriculturists of France, of the Society for the Encouragement of National Industry in Paris, and a Chevalier du Mérite Agricole of France. In conjunction with the late Sir John Lawes he had received the Gold Medal of Merit for Agriculture from Germany. Sir J. Henry Gilbert, who was knighted in 1893, was twice married, first in 1850 to Eliza, daughter of the Rev. George Laurie, who died in 1853, and secondly in 1855 to Maria, only daughter of Mr. Benjamin Smith, who survives him.

WILLIAM CROWDER.

We deeply regret to have to record the death of Mr. William Crowder, who passed away at the age of 73, on Dec. 29, and was interred on Jan. 4 at the Woking Cemetery. He was an original member of the Society of Chemical Industry, and devoted much time and energy to the London Section, his familiar figure being rarely absent from the meetings at Burlington House.

Born at Hackney on Nov. 6, 1829, he attended school successively at Margate, Great Marlow, and Streatham. At the age of 14 he went as a clerk in a hat factory, and for five years tried in various situations to fit himself for commercial life, but without success. Some chemical experiments having interested him before he left school, notwithstanding long hours and scanty pocket money, he contrived to study chemistry for some five years. At 19 he was out of employment, but resolved to earn his living by chemistry. In March, 1848, he secured a post as laboratory assistant at the Royal Agricultural College at Cirencester. In January, 1849, he became assistant to Dr. Thos. Anderson, Chemist to the Highland and Agricultural Society in Edinburgh. Thence he went to Newcastle in a similar capacity, made a special study of calico-printing, and lectured on the subject before the Literary and Philosophical Society. He then practised as a consulting and analytical chemist and assayer in Newcastle for about three years. In 1858, his wife's health broke down, and they emigrated to Natal, where they remained for 12 years, during which time Mr. Crowder tried many ways of earning his living—a chemist's shop, an artificial ice factory, a brewery, tobacco plantation, salt-works, being established in succession, with poor results. In 1870, he returned to Newcastle, where for some years he was associated with Mr. Langdale. In 1873, however, he entered upon what proved to be his life-task at the Guano Works at Tidal Basin, London, now known as the Anglo-Continental Works. Here he held sway for 22½ years, both as chemist and manager, with eminent success. Our Journal (Vol. X., 1891) bears evidence of the mastery he had acquired of the manufacture of sulphuric acid.

He retired in 1895, building a laboratory at his house in Hackney, where he occupied himself mainly with metallurgical experiments. His failing health compelled him to relinquish work two years ago.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	32
II.—Fuel, Gas, and Light	32
III.—Destructive Distillation, Tar Products, Petroleum	35
IV.—Colouring Matters and Dyestuffs	35
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	46
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	51
VIII.—Glass, Pottery, and Enamels	52
IX.—Building Materials, Clays, Mortars, and Cements	52
X.—Metallurgy	52
XI.—Electro-Chemistry and Electro-Metallurgy	54
XII.—Fats, Fatty Oils, and Soap	55
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c	56
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	56
XV.—Manures, &c.	57
XVI.—Sugar, Starch, Gum, &c.	57
XVII.—Brewing, Wines, Spirits, &c.	60
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	62
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	63
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	65
XXI.—Photography	68
XXII.—Explosives, Matches, &c.	68
XXIII.—Analytical Chemistry	69
XXIV.—Scientific and Technical Notes	76

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Incrustation in Steam Generators, Water Tanks, and other Water-containing Vessels; Manufacture or Production of Material suitable for Removing and Preventing ——. T. Lowther, Bobrik, Russia. Eng. Pat. 21,075, Nov. 21, 1900.

The green portions and roots of plants belonging to the order *leguminosæ*, and preferably to the sub-order *papilionaceæ*, such as tares, vetches, lentils, and peas, are heated with water under pressure for some hours, and the solution is cleared and concentrated. The seeds of the plants are comminuted, and treated, with agitation, with warm water, and the concentrated solution is added to that obtained from the green portions. The mixed solution, concentrated to a syrupy liquid, may be used as such, or as a solid, but is conveniently incorporated with dried peat or the like, which is then dried and powdered. A small proportion of a suitable alkali or alkaline mixture is preferably added to the solution obtained. The dried extract obtained may be added to the feed water of boilers, and is said to remove scale.—E. S.

Drying Moist Material; Apparatus for Rapidly ——. E. Stauber, Berlin. Eng. Pat. 16,071, Aug. 9, 1901.

Air is driven, by means of a fan, over heated pipes into a chamber which holds the material to be dried; outlet tubes from this chamber are provided with nozzles, which are directed into a series of pipes along which cold air is driven by the same fan; this cold air rapidly cools the warm saturated air from the chamber, and is said to condense the vapours.—J. W. H.

French Patent.

Vacuum Filter-Presses with Rotary Drums; Continuous ——. M. Kaltenback. Fr. Pat. 311,399, June 1, 1901.

In continuous filter-presses working with a revolving drum, inside which a vacuum is made, an arrangement for regulating the height of the scraper-blade which detaches the cake from the drum, is so made that its distance may be varied according to the extent of the immersion of the drum in the liquid. This arrangement consists of inclined guides along which the scraper is free to move. In this way a cake of any desired thickness may be obtained, and the filter may be applied to products of various thicknesses by varying the immersion of the drum. Another claim provides for the employment of perforated metal or wire gauze over the filtering cloth, for the protection of the fibres of the cloth from the direct action of the scraper-blade, and thus preventing the clogging of the cloth with mud and preserving its filtering capacity.—J. F. B.

II.—FUEL, GAS, AND LIGHT.

Peat; Rapid Technical Analysis of Light and Dark ——. H. Bornträger.

See under XXIII., *page* 75.

Gas; Explosive Mixtures of ——. H. Bunte. J. f. Gasbeleucht. 1901, **44**, [45], 835—842.

The author comments on results of experiments, on the explosibility of mixtures of such gases with air, made in his laboratory by Eitner, Trautwein, and others. The mixtures can be exploded only when the percentage of combustible gas in them falls between certain limits, which vary with the nature of the gas, and, to a certain extent, with the prevailing conditions, such as the shape and size of the containing vessel and the method of ignition. The limits for the different gases are affected chiefly by the proportion of oxygen which is needed for the complete combustion of each gas, that is to say, by the composition of the detonating gas ("Knallgas") corresponding to each combustible gas. The following table shows the principal data for the more important gases under fixed experimental conditions, *i.e.*, when fired over water in a tube 19 mm. wide by electric spark. The values are therefore comparable, but do not apply to the gases if fired under other conditions.

The limits are extended when the containing vessel is of greater width, or when the mixture is ignited by a gas flame, especially if the latter is applied at the lower, instead of the upper end of the containing vessel. The different gases are not affected to the same degree by changes in temperature and pressure. More dilute mixtures of carbonic oxide can be exploded if under higher pressure than the normal, and Le Chatelier and Boudouard have shown that a mixture containing only 7·4 per cent. of carbonic oxide is explosive at a temperature of 600° C.

Hence, under the high pressures and temperatures which prevail in the cylinders of gas engines, blast-furnace gas and producer gas, containing only a small proportion of carbonic oxide, can be exploded, and utilised for the production of motive power.

Description of Gas.	Explosion occurs when the percentage of Combustible Gas in the Mixture with Air falls within the limits—		Percentages of theoretical Detonating Gas in the Explosive Mixture at the—	
	Lower Limit.	Upper Limit.	Lower Limit.	Upper Limit.
Carbonic oxide..	16·5	74·95	24·75	15·78
Hydrogen	9·45	66·4	14·17	21·16
Water gas	12·4	66·75	18·80	20·94
Acetylene.....	3·35	52·3	11·72	14·03
Illuminating gas	7·9	19·1	17·40	31·15
Ethylene	4·1	14·6	16·40	23·91
Alcohol	3·95	13·65	15·00	24·17
Methane.....	6·1	12·8	18·30	27·47
Ether.....	2·75	7·7	19·25	22·61
Benzene	2·65	6·5	19·87	22·25
Pentane	2·40	4·9	21·60	22·47

The limits between which a mixture is explosive may be brought closer, and ultimately made to meet (when the mixture ceases to be explosive) by replacing the oxygen of the air present, more or less completely, by carbon dioxide. Under the aforesaid experimental conditions, the illuminating gas mixtures become non-explosive when 7·5 per cent. of carbon dioxide is present; the carbonic oxide mixtures when 10·5 per cent. is present. Hence, if, before admitting gas to new plant or mains, chimney gases are first passed in until the greater part of the air is expelled, the combustible gas may then be admitted, and no explosive mixture will be produced.

Ignition will not extend throughout the mass of an explosive mixture, if the velocity with which the mixture escapes at the point of ignition, exceed the rate at which combustion is propagated through the mixture in question. The maximum rate of propagation of combustion occurs when the proportion of combustible gas present in the mixture slightly exceeds the proportion in the theoretical detonating gas mixture, and is for hydrogen 4·2, for methane 0·6, and for illuminating gas 1·3 metres per second. But this maximum, under normal conditions, is immensely exceeded when the mixture is strongly compressed in closed pipes, &c.; for under such conditions a rate of propagation of 2,800 metres per second has been observed. The mechanical effects of such an explosive wave are most violent. The propagation of combustion in an explosive mixture is prevented by cooling the gas below the temperature of ignition. This may be done simply by contracting the orifice by which the gaseous mixture communicates with the flame, until the cooling effect of the walls of the orifice extinguishes the flame before it traverses the orifice. Combustion cannot be communicated through a tube 2 mm. in diameter, even to the most inflammable gaseous mixture —J. A. B.

English Patents.

Catalytical Reactions; Treatment of Solid Material with Gas, especially applicable to ——. P. Naef, New York. Eng. Pats. 18,188 and 18,191, Oct. 12, 1900.

These inventions relate to Eng. Pats. 20,659 and 20,660, 1899 (see this Journal, 1900, 1094—1095). The claims (one specification has 134 and the other 154) refer to successive treatment and intermediate adjustment of temperature, deposition of impurities, the drying of the gases, purification of the agent by treatment with acid, alkali, or both, agitating devices, partitions, &c.—J. W. H.

Fuel; Treatment of ——, *and the Recovery of By-Products.* P. Naef, New York. Eng. Pat. 18,279, Oct. 13, 1900.

Surplus volatile matter is removed from bituminous coal, prior to coking or consumption in furnaces, by passing the coal in powder through a cylinder, in which it is exposed either to the direct action of heated gas, such as water-gas, or to heated surfaces, whereby part of the volatile matter of the coal is converted into gas and hydrocarbon vapours. Oil and ammonia are recovered from the gas in suitable washers. The coking cylinder may be inclined, and fed and discharged continuously by means of screw conveyors. Many modifications are described, and 71 claims are made. —J. A. B.

Coke; Manufacture of ——. A. Custodis, Düsseldorf, Germany. Eng. Pat. 21,641, Nov. 29, 1900.

Waste materials from the manufacture of iron, such as the dust deposited by blast-furnace gases, are mixed with peat, lignite, or other carbonaceous fuel, and the mixture is carbonised in a coke oven. The iron in the waste materials is stated to melt and form a fine skeleton in the coke, rendering it porous but hard, and specially suitable for use in the manufacture of iron.—J. A. B.

Producer Gases; Treatment of ——. E. J. Duff and The United Alkali Company, Ltd., both of Liverpool. Eng. Pat. 100, Jan. 1, 1901.

In producer plant in which the hot gas is passed through cooling pipes, round about which the air and steam for the service of the producer are passed, the temperature of the gas is not reduced below about 300° C., at which it enters the ammonia-recovery washers. Much water is consequently evaporated in the latter. The patentees surround a number of the cooling pipes, through which the gas last passes, with water, which reduces its temperature to about 100° C. The air for the service of the producer passes first over the water about the posterior cooling pipes and then round about the remaining cooling pipes, which are not surrounded by water, and are at a higher temperature. The air thereby takes up steam evaporated from the cooling water, and the steam is superheated by subsequent contact with the hotter cooling pipes. A supply of steam to the producer from an extraneous source is thus saved. —J. A. B.

Stirring or Injecting Fluid into Fuel in Gas Producers or into other Solid Material; Apparatus for ——. P. Naef, New York. Eng. Pat. 23,044, Dec. 17, 1900.

In the producer containing the coke or other material are arranged a number of vertical or horizontal rods or water-cooled pipes, provided with projecting arms or spikes. The continuations of the rods or pipes outside the producer are provided with means (such as bevel wheels, driving chains, &c.) of rotating them or giving them a reciprocating motion, so that the material in the producer may be crushed and have its descent facilitated. The arms or spikes may also be hollow; the stirrers then serve for injecting air, steam, or water into the fuel in all directions and throughout the mass.—H. B.

Fuel; Process for Increasing the Heating Value of ——. L. Stöckmann, Göttingen, Germany. Eng. Pat. 20,001, Oct. 7, 1901.

To the fuel materials there is added about an equal amount of any finely comminuted bodies which possess a greater heat of combustion than the original fuel. For example, ashes, cinders, or slack may be added to wood, peat, or brown coal.—R. S.

Furnaces for Liquid Hydrocarbons. E. J. Clubbe and A. W. Southey, London. Eng. Pat. 22,844, Dec. 14, 1900.

The furnace comprises a primary vaporiser, consisting of a spiral steel tube communicating with the supply of liquid hydrocarbon; the main vaporiser, consisting of a loop of steel tube; a vapour nozzle communicating with both vaporisers; a Bunsen tube into which the nozzle is directed; and a refractory mass consisting of spirals of nickel steel tubes with small blocks of refractory material packed loosely round them. The Bunsen tube is devoid of baffles or gauze diaphragms. The loop of the main vaporiser extends into the refractory mass, which is surrounded by a

casing that may also enclose the boiler tubes or other surfaces to be heated. In starting the furnace, the primary vaporiser is heated by any convenient means and the fuel is admitted into it. The jet of gas issuing from the nozzle is ignited, and the flame plays on the inside of the Bunsen tube, on the main vaporiser, and on the refractory mass. When the main vaporiser is sufficiently heated, vapour issues from the nozzle at such a high velocity as to carry the flame forwards from the Bunsen tube into the refractory mass, which becomes incandescent, further combustion taking place therein.—H. B.

Gas-producing Plant. T. H. Oswald, London, and F. E. Bowman, Knutsford. Eng. Pat. 17,292, Aug. 29, 1901.

The gas producer is in direct communication with a gas engine, the motive power of which is furnished by the gas generated. The gas is drawn from the generator by the engine. The producer is a vertical generator having at the top a chamber, above which is an annular boiler. In the bottom plate of the latter are fitted a number of Field tubes, which are supplied with water from the boiler and are heated by the gas generated. The boiler is connected by an external steam pipe with the bottom of the generator. The gas given off passes to a gas scrubber, and thence through an expansion chamber to the engine.—R. S.

Acetylene Gas; Apparatus for the Production of ——. W. H. Dargue, Newcastle-on-Tyne. Eng. Pat. 15,108, Aug. 24, 1900.

One or more generating chambers, placed in the lower part of the tank of a gasholder, are supplied with water from the tank according to the movements of the gasholder, which actuates levers attached to a cap on the supply pipe.
—J. A. B.

Acetylene Gas for Household Lighting Purposes; Apparatus for Generating ——. T. Rauthmell, Holme, Westmoreland. Eng. Pat. 21,511, Nov. 28, 1900.

Two or more generators, containing carbide disposed on a spiral shelf, are supplied with water through taps actuated by the rise and fall of a gasholder in an annular tank. The central space of the annular tank is automatically filled with water as soon as the gasholder has descended to a given point, and the gas thus expelled from the central space supplements that stored in the gasholder proper.
—J. A. B.

Acetylene Apparatus. J. O. O'Brien, Manchester. From M. Wagner, Paris. Eng. Pat. 17,975, Sept. 9, 1901.

Water is supplied from an encompassing reservoir, through a pointed screw-valve actuated by an external milled head, to carbide arranged on trays in a generating chamber. The water has to pass through a chamber beneath the carbide and up small central grooves to the carbide trays, and consequently can only reach the latter in limited quantities at a time. Over-production of gas forces back the water through the grooves into the lower chamber and thence into the reservoir. A safety pipe is also provided. The gas evolved passes through purifying material in a central pipe to a cock and burner.—J. A. B.

Acetylene and like Gases; Apparatus for the Generation, Storage, and Purification of ——. V. Powers and The Bevois Patent Lighting Company, Ltd., both of Southampton. Eng. Pat. 19,857, Oct. 4, 1901.

One or more generating chambers, arranged in a tank, are supplied with water through a regulating chamber, in which the flow of water is controlled by the pressure thrown by the gasholder into which the gas evolved passes. The gasholder, when it rises to a given point, encounters a weight, which increases the pressure on the gas and thereby cuts off the flow of water from the regulating chamber to the generating chamber. The generating chamber contains trays of carbide, superposed by a dummy casing, which reduces the air space. The chamber is covered by a bell, which is forced up by the expansion which occurs when the carbide is decomposed.—J. A. B.

Burners for Liquid Hydrocarbons [Incandescent Oil Lamps]. J. D. Gibbes, Paris. Eng. Pat. 2937, Feb. 11, 1901.

In using lamps of the circular-wick type, in which the outer wick tube completely covers the wick and its upper edge, and the vapour-yielding surface is regulated by a tube sliding inside the wick, there is a tendency for the strong central air current to detach the flame from parts of the inner surface of the wick. To overcome this tendency, the sliding tube is provided at its upper edge with an inwardly projecting flange, or is otherwise made so as to have an internal diameter considerably less than that of the wick, and the strong air current therefore flows past the flame, which burns steadily upon the exposed wick surface. To facilitate the lighting of the wick, a pinion wheel, engaging two racks, is made, when revolved, to raise the flame-spreader and to lower the sliding tube simultaneously, thus exposing a considerable portion of the inner surface of the wick.—H. B.

Incandescent Vapour Burning Lamp. G. Galkin, St. Petersburg. Eng. Pat. 8259, April 22, 1901.

This relates to a lamp in which the pressure generated within a closed vessel of air, situated in the path of the hot waste gases, is caused to force up to the vaporiser the oil which is contained in an annular reservoir arranged upon the lamp above the level of the incandescent burner. The vaporiser consists of a tube, slightly inclined from the vertical, which passes down within a central channel formed in the closed cylindrical air vessel, the upper end of the tube being connected to a pipe leading up from the oil reservoir, and the lower end projecting sidewards, outside the casing of the lamp, to a valve and jet, which deliver the vapour downwards into the mixing tube of the burner below. Attached to the lower end of the vaporising tube is a perforated metal plate, which projects horizontally a short distance above the top of the mantle. By supplying the oil first to the upper, cool end of the vaporising tube, so that it gradually attains the maximum temperature of the vaporiser, it is claimed that the deposition of carbon is reduced to a minimum.—H. B.

Incandescent Gas Burners. C. Killing, Düsseldorf. Eng. Pat. 21,534, Oct. 26, 1901.

The mouth of the burner, instead of having the usual approximately horizontal disc of wire gauze, is provided concentrically with a gauze cylinder, which projects a short distance above the burner rim, and is closed at the top by an imperforate conical cover or flame-spreader. Thus the mixture of gas and air is made to issue through the gauze in a lateral direction. To keep the mantle in the correct position relatively to the flame, the burner rim is provided with a flange or projections, or the burner top may be widened.—H. B.

Electrical Glow Lamps; Manufacture and Repair of ——. F. Blau, A. Scharf, I. Löti, S. Löti, and R. Latzko, Vienna. Eng. Pat. 22,662, Dec. 12, 1900.

Glow lamps gradually deteriorate through loss of carbon from the filament. The object of this invention is to cause the precipitation of fresh carbon upon the filament, while the lamp is burning, in such quantity that the normal loss is approximately compensated. In making the lamp there is introduced into the bulb a volatile carbon compound of very low vapour tension, such as anthracene, or a compound which is decomposed by heat, evolving a gas containing carbon, such as paracyanogen. In either case the hot filament takes up carbon from the gaseous substance. Absorbing materials, such as palladium or silver, may be also introduced, for absorbing such detrimental by-products as hydrogen or chlorine. It is sometimes preferable to arrange that at the ordinary working temperature of the lamp, the amount of gaseous carbon compound produced is not sufficient to compensate for the loss of carbon from the filament, and such lamps are now and then burned temporarily in a heated chamber so as to quickly restore the proper amount of carbon to the filament.—H. B.

Carbohydrates: Thermal Effects in the Building up and Breaking down of ——. D. Mohr.

See under XXIV., *page* 77.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Oils obtained by Destructive Distillation of Animal Matters. S. J. Levites. Chem.-Zeit. 1901, **25**, [92], Rep. 336.

An investigation of some oils produced from animal matter showed that they contained the nitriles of palmitic and stearic acids (30 and 10—15 per cent. respectively). Their specific gravities were 0·96—0·98, and the greater part of each distilled over above 180° C. Such liquids are used chiefly for medicinal purposes, but they are sometimes employed for "methylating" alcohol. For this purpose, they should be redistilled, and the fraction distilling at 200°—250° C. collected. Oils obtained from leather clippings, hoofs, &c., are not so well suited for this purpose as that from bones, but the yield from the latter is smaller.
—E. H. T.

Phenols; Use of Formaldehyde as a Reagent for ——. Endemann.

See under XXIII., *page* 74.

Ferrocyanide from Gas Liquor; Formation of ——. E. Donath.

See under VII., *page* 51.

English Patent.

Aromatic Hydrocarbons and their Derivatives; Impts. in the Oxidation of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 22,887, Dec. 14, 1900.

The invention consists of a process for the oxidation of toluene, xylene, nitrotoluene, and the like, and conversion into the corresponding aldehydes by the use of oxides of nickel and cobalt (with or without the addition of a salt of nickel or of cobalt). The lower oxide of nickel resulting from the reaction can readily be reconverted into the higher oxide and used again. The following is an example of the method of procedure. 300 parts of toluene are mixed with 150 parts of nickel oxide, the mixture heated on a boiling water bath for about five or six hours, filtered, to collect the nickel compound resulting, and the benzaldehyde separated from the excess of toluene by shaking with aqueous bisulphite solution. The benzaldehyde is obtained from its bisulphite compound in the usual way.—F. N.

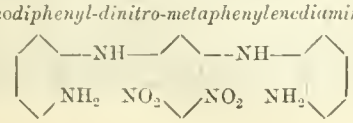
IV.—COLOURING MATTERS AND DYESTUFFS.

Fluorindines; New Synthesis of ——. R. Nietzki and J. Slaboszewicz. Ber. **34**, [15], 3727—3732.

The fluorindines have been obtained only by reactions carried out at high temperatures, and hence the constitutional formulæ set up by O. Fischer and Hepp for this class of dyestuffs have hitherto been to some extent hypothetical. The authors have succeeded in preparing phenofluorindine (homofluorindine), the simplest representative, and tolufluorindine, its nearest homologue, by a smooth reaction, and have thereby confirmed the views of Fischer and Hepp.

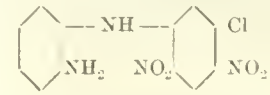
Symmetrical dinitrodichlorobenzene was condensed with two molecules of *o*-phenylenediamine, by suspending the two substances in amyl alcohol and boiling for eight hours (at 120°—125° C.) in the presence of a concentrated aqueous solution of the calculated quantity of sodium acetate.

Diaminodiphenyl-dinitro-metaphenylenediamine—



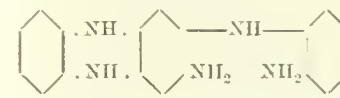
is obtained in yellow, shining needles, melting at 253° C., which dissolve with difficulty in glacial acetic acid and in xylene, and scarcely at all in alcohol and in benzene.

If dinitrodichlorobenzene and orthophenylenediamine are boiled in ethyl alcoholic solution (under reflux-condenser) in the presence of anhydrous sodium acetate, the primary reaction product *aminodinitrochlorodiphenylamine*—

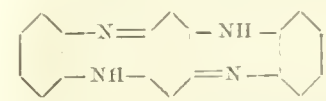


is formed almost exclusively. This body melts at 232°, and forms orange-yellow crystals, which are sparingly soluble in alcohol. It is converted into diaminodiphenyl-dinitro-meta-phenylene diamine, when the intimate mixture with the calculated amount of ortho-phenylene diamine and anhydrous sodium acetate (and a little alcohol) is heated to 130°—140° C. in a sealed tube.

By the reduction of diaminodiphenyl-dinitro-metaphenylenediamine, *Diaminodiphenyl-tetraminobenzene* is obtained. This base shows a great tendency to oxidise; but the hydrochloride and the double salt with zinc chloride were prepared pure. By gently oxidising the hydrochloride, one molecule of ammonia is split off, and *aminophenyl-diaminophenazine* is formed. This substance which is probably represented by the following formula:—



is obtained as a brown crystalline powder. It loses a second molecule of ammonia when boiled with dilute hydrochloric acid, and is converted into the hydrochloride of *phenoflnorindine*—



which separates in fine green shimmering needles. The same result is obtained in one operation, if diaminodiphenyl-tetraminobenzene be boiled with dilute hydrochloric acid in the presence of air.

Dimethylfluorindine (*tolufluorindine*) was prepared in a similar manner by condensing dinitrochlorobenzene with orthotoluylenediamine ($NH_2 : NH_2 : Cl_2$, 1 : 2 : 4) and oxidising the reaction product.

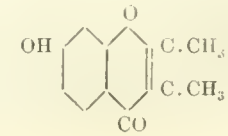
Tolufluorindine is very like its lower homologue; it is sparingly soluble in most solvents, but yet more readily than the latter. The blue solution of the salts shows a more violet fluorescence, while the base itself dissolves with a colour which is almost that of eosine red—H. L.

α-Ethylluteolin. v. Kostanecki and A. Rozycki. Ber. **34**, [15], 3719—3721.

Kostanecki and Lloyd (Ber. **34**, 2492) have recently shown that if 2.4-diethoxybenzoylacetone (Bloch and Kostanecki, Ber. **33**, 471) be boiled with methyl iodide and caustic potash in alcoholic solution, one hydrogen atom of the methylene group between the two carbonyls is replaced by a methyl group—

$$C_6H_3(OC_2H_5)_2COCH_2COCH_3[OC_2H_5 : OC_2H_5 : COCH_2COCH_3, 2 : 4 : 1] \rightarrow C_6H_3(OC_2H_5)_2.CO.CH(CH_3).COCH_3$$

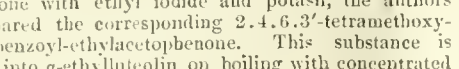
Since this diketone was converted into 3-hydroxy *αβ*-dimethyl-chromone—



on boiling with hydriodic acid, a method, probably of general application, was hereby found for the preparation of α-alkylchromones.

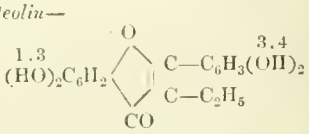
By treating 2.4.6.3′-tetramethoxy-4′-ethoxybenzoyl-acetophenone with ethyl iodide and potash, the authors have prepared the corresponding 2.4.6.3′-tetramethoxy-4′-ethoxybenzoyl-ethylacetophenone. This substance is converted into α-ethylluteolin on boiling with concentrated hydriodic acid, and therefore the reaction is also applicable to the preparation of α-alkylflavones.

2.4.6.3′-*Tetramethoxy-4′-ethoxybenzoyl-ethylacetophenone*



crystallises from alcohol in white leaflets, melting at 132°—133° C. The alcoholic solution gives no coloration with ferric chloride.

α-*Ethylluteolin*—



prepared from the above diketone, crystallises from very dilute alcohol in faintly yellow needles melting at 286°—287° C.

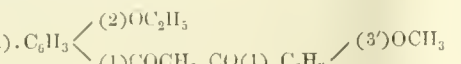
The substance dissolves readily in alkalis with a yellow colour. A yellow coloration is produced on moistening the crystals with concentrated sulphuric acid. The substance is a mordant dyestuff. Upon an alumina mordant a yellow shade is produced, which is very weak when compared to produced by luteolin.—H. L.

3.3′.4′-*Trihydroxyflurone.* v. Kostanecki and A. Ròżycki. Ber. **34**, [15], 3721—3727.

The authors have succeeded in the synthesis of 3.3′.4′-trihydroxyflavone, which was of particular interest for the systematic development of the flavone group. For 3.3′.4′-trihydroxyflavone bears to fisetin (3.3′.4′-trihydroxyflavonol) the relation that chrysin (1.3-dihydroxyflavone) bears to galangin (1.3-dihydroxyflavonol); luteolin (1.3.3′.4′-tetrahydroxyflavone) to quercetin (1.3.3′.4′-tetrahydroxyflavonol); and apigenin (1.3.4′-trihydroxyflavone to campherol (1.3.4′-trihydroxyflavonol).

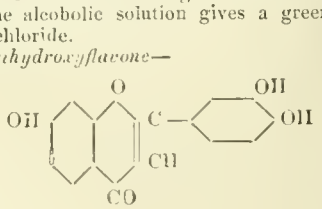
Campherol, $C_{15}H_{10}O_6$, was obtained (Gordin, Inaug. Dissertation, Berne, 1897) by treating campherid (Ber. **32**, 318) with strong hydriodic acid. It crystallises from alcohol in faintly yellow voluminous needles, which contain one molecule of water of crystallisation. The melting point is 271°. The solution in vitriol is coloured yellow, and fluoresces on standing.

2.4.1′-*triethoxy-3-methoxybenzoyl-acetophenone*—



was prepared by melting resacetophenone-diethylether (4 grms.) with the ethyl ester of ethylvanillinic acid (4·5 grms.) in the presence of metallic sodium (0·5 grm.). It crystallises from alcohol in long needles melting at 134°—135° C. The alcoholic solution gives a green coloration with ferric chloride.

3.3′.4′-*trihydroxyflavone*—



is obtained from the above diketone by boiling the latter with concentrated hydriodic acid. The substance crystallises from very dilute alcohol in faintly yellow needles, containing water of crystallisation, which melt at 326°—327° C. It is readily soluble in caustic soda. The alcoholic solution gives a green coloration with ferric chloride. The vitriol solution (greenish-yellow) has a not very strong green fluorescence. Cloth prepared with an alumina mordant is dyed a pale yellow.

Action of Ethylbenzoate on Resacetophenone Diethylether.—The ethyl ester of benzoic acid can be coupled with resacetophenone diethylether to a diketone, precisely as the ethyl ester of ethyl-vanillinic acid. 2.4-*Diethoxybenzoyl-acetophenone*—

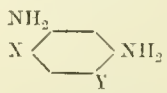
$$C_2H_5O(4)C_6H_3(2)OC_2H_5(CO.CH_2.COC_6H_5).$$

crystallises in yellowish needles, melting at 120°—121°. A red coloration is produced on adding ferric chloride to the alcoholic solution.

On boiling this substance with concentrated hydriodic acid, it is converted into 3-ethoxyflavone (Emilewicz and Kostanecki, Ber. **31**, 696).—H. L.

Diazo-amines and Amino-azo Compounds; Influence of Substitution on the Formation of ——. G. T. Morgan. Proc. Chem. Soc. **17**, [243], 236—238.

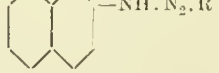
The disubstituted derivatives of *m*-phenylenediamine having one free para-ortho-position with reference to the amino-radicles interact readily with diazonium salts, giving rise to amino-azo compounds in almost theoretical quantities. The diamines of the general formula—



having substituents in both the para-ortho-positions, do not easily condense with diazonium salts, and the yield of amino-azo compound is very poor.

The bases of both series, however, combine with primulin diazotised on the cotton fibre, the diamines of the first series give rise to reddish-brown azo compounds, whilst those of the second series furnish dyestuffs having a brownish-yellow tint.

Although the interaction of β-naphthylamine and a diazonium salt leads to the direct formation of an *o*-amino-azo derivative containing the diazo residue $R.N_2-$ in the α-position contiguous to the amino group, yet 1-chloro-2-naphthylamine, under similar conditions, yields stable diazo-amines of the type—



In this compound, the azo group has no tendency to shift into the aromatic nucleus, this transference being apparently prevented by the presence of the chlorine atom in the adjacent ortho position.

The following acyl derivatives were prepared in characterising certain of the diamines employed in this investigation. *Diformyl*-4 : 6-*diamino*-1 : 3-*xylene*, needles, m. pt. 182°—183°, the corresponding *diacetyl* and *dibenzoyl* derivatives, m. pts. respectively at above 260° and 253°; *diformyl*-2 : 4-*diamino*-1 : 3-*xylene*, m. pt. 219°—220°, the *diacetyl* derivative, m. pt. above 260°, and the *dibenzoyl* derivative, m. pt. 232°; *diformyl*-5-*chloro*-2 : 1-*tolylenediamine*, silky needles, m. pt. 166°, the *benzoyl* derivative, m. pt. 205°.

III. Pyrazolone-3-Acetic Acid. A. Hufferath. J. prakt. Chem. 1901, **64**, [19], 334.

See under XX., page 66.

English Patents.

Phenylglycine-o-carboxylic Acid; Manufacture of ——. [*Indigo.*] O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 22,758, Dec. 13, 1900.

The manufacture is claimed of phenylglycine-*o*-carboxylic acid by a process which consists in heating a dry mixture of the alkali (or alkaline earth) salts of *o*-chlorobenzoic acid and glycocoll.—A. C. W.

Blue Grey Dyestuff for Cotton; Manufacture of ——. O. Imray. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 392, Jan. 7, 1901.

By the action of sulphides of alkali metals on such compounds as are formed by introducing hydrogen sulphide into the heated solution of 1.5-dinitronaphthalene in concentrated sulphuric acid, blue-black cotton dyestuffs may be obtained. Instead of introducing hydrogen sulphide into the solution, the hydrogen sulphide may be developed in the solution itself by the introduction of a metallic sulphide. The compounds obtained vary according to the concentration of the sulphuric acid employed. The process may be carried out with or without addition of zinc chloride, without any essential difference being noticeable in the properties of the dyestuffs formed.—F. N.

Dyestuff [Blue, Grey] from 1.5-Dinitronaphthalene; Manufacture of a ——. O. Imray, London. From The Farbwerke Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 751, Jan. 11, 1901.

By reacting with sulphuretted hydrogen on 1·4′-dinitronaphthalene dissolved in chlorosulphonic acid, a product is obtained, which dyes blue shades from an acid bath. On subsequent treatment with chromates, the shade becomes grey.—T. A. L.

Colouring Matters, and of Intermediate Products for use therein; Manufacture and Production of New ——. H. H. Lake, London. From K. Oehler, Offenbach-on-Main, Germany. Eng. Pat. 22,397, Dec. 8, 1900.

The intermediate compounds are triazoles obtained by the action of oxidising agents on the sulphonated azo dyestuffs from β-naphthylamine or its derivatives and diazo compounds. The triazoles may be further sulphonated, and these products when fused with caustic alkalis yield hydroxytriazoles which combine with diazo and tetrazo compounds to form azo dyestuffs. The fastness to washing and light of fabrics dyed with these products is increased by treating them with metallic salts. For example, the triazoletrisulphonic acid of the dyestuff, sulphanilic acid-azo-amino-R-salt is fused with three times its weight of caustic soda-lye for five hours at 220°—240° C. The melt after dissolving in water is acidified with hydrochloric acid when dihydroxytriazole sulphonic acid separates directly or after adding salt. In order to obtain a dyestuff from it, the tetrazo compound, from 18·4 kilos. of benzidine is added to a strongly alkaline solution of 38 kilos. of the acid. The intermediate compound forms at once, and is then treated with a solution of 25 kilos. of the sodium salt of 1.4-naphthol sulphonic acid. After 12 hours the whole is warmed to 90° C., and the dyestuff salted out. It gives dark violet shades on unmordanted cotton.—T. A. L.

Colouring Matters on the Fibre; Manufacture and Production of ——, *and of Products for Use therein.* J. Y. Johnson. From The Badische Anilin und Soda Fabri7, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 178k, Jan. 25, 1901.

The patentees produce reddish-yellow to orange colouring matters on the fibre by combining Primuline (sulphonic acid) which has been diazotised on the fibre with phenylpyrazolone-carboxylic acid, the so-called tartrazinogen (which can be obtained by saponifying the condensation product of phenyl-hydrazine and oxalyl acetic ester: (see W. Wislicenus, Annalen, 246, 321) or with homologous and analogous derivatives of tartrazinogen, which can be obtained by condensing ortho- or para-tolyl hydrazine, α- or β-naphthylhydrazine, or para-nitro-phenylhydrazine with oxalyl acetic ester and subsequent saponification of the condensation products obtained.—F. N.

Blue to Green Acid Anthracene Dyestuffs; Production of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik. Eng. Pat. 20,718, Nov. 16, 1900. 2nd Edit.

Methylanthraquinone melting at 179° C. is converted into a nitro-derivative, which is then reduced, preferably by sodium sulphide, to the corresponding amine, or else converted into an alphylamino derivative, by heating with aromatic amines. These amines, or alphylamines, nasulphonated or after sulphonation, are acted on by halogens and the halogen products are finally condensed with aromatic amines. The products give fast blue to green shades on wool from an acid bath, and differ from products obtained in a like manner from anthraquinone itself. Thus the dyestuff formed from nitromethylanthraquinone by reduction, bromination, heating with *p*-toluidine and subsequent sulphonation gives redder shades of blue than that obtained from the unmethylated product.—T. A. L.

Colouring Matters [Black, Blue] therefrom; The Manufacture and Production of New Products for Use in the Manufacture of Colouring Matters and of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 22,989 Dec. 15, 1900.

The starting point for these products is 1.3.4.6-dinitrodichlorobenzene which is condensed with an equimolecular proportion of *p*-aminophenol in presence of sodium acetate, yielding dinitrochloro-*p*-hydroxydiphenylamine. This product, by the action of a hydrosulphide or of a salt of xanthic acid is converted into a thiophenol or xanthic acid derivative, which, on fusing with sulphur and an alkaline sulphide yields dyestuffs giving greenish-black shades on cotton. These, on steaming in presence of oxygen or by treatment with alkaline oxidising agents, give indigo-blue shades. The thiophenol derivative can also be obtained by reacting with potassium thiocyanide on 1.3.4.6-dinitrochlorobenzene, forming dinitrodisulphocyanbenzene, which, on treatment with *p*-aminophenol yields *o*-*p*-dinitro-*m*-sulphocyan-*p*-hydroxy-diphenylamine. This product is then treated with potassium hydrosulphide in alcoholic solution. It is unnecessary to isolate the thiophenol product, as the dyestuffs can be obtained directly by treating dinitro-chloro-*p*-hydroxydiphenylamine with sulphur and sodium sulphide.
—T. A. L.

Thiazine Dyestuffs and Intermediate Products: Preparation of ——. F. Kehrmann, Geneva. Eng. Pat. 23,902, Dec. 31, 1900.

The starting point for these derivatives is thiodiphenylamine which by the action of oxidising agents is converted into a salt of phenazthionium. This on oxidation with one or two molecular proportions of an aromatic amine yields dyestuffs of the thiazine series. It is not necessary to isolate the phenazthionium salt and dyestuffs can be obtained directly from thiodiphenylamine and aromatic amines by the action of an oxidising agent as the following example shows. A concentrated solution of 65 kilos. of ferric chloride in alcohol is slowly added with constant agitation to a cold concentrated alcoholic solution of 9·5 kilos. of aniline and 19·9 kilos. of thiodiphenylamine. The solution turns dark green and is diluted with water, the new dyestuff, anilinophenazthionium chloride being precipitated by salt. The product is readily soluble in alcohol and hot water and crystallises from the latter in coppery leaflets. It dyes tannined cotton deep dark green shades. By employing two molecular proportions successively or simultaneously of the same or of different amines, symmetrical or asymmetrical thiazines are produced.
—T. A. L.

Acridines; Manufacture of Hydroxylated ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 23,419, Dec. 21, 1900.

The patentees find that aminohydroxy and dihydroxyacridines are obtained by heating tetramino ditolylmethane or diaminodimethylacridine with mineral acids under pressure. They further claim the manufacture of dihydroxydimethylacridine by condensing *p*-aminocresol with formaldehyde and heating the product so obtained with mineral acids. The dyestuffs produced give greenish-yellow shades on tannined cotton and are also valuable for dyeing leather and for calico printing.—T. A. L.

Colouring Matters; Utilisation of ——, in the Manufacture of Pigments. A. Thilmany. Eng. Pat. 11,533, June 5, 1901.

See under XIII. A., *page* 56.

FRENCH PATENTS.

Indigo from Indigo Plant; New Method for Extracting ——. L. C. A. Calmette. Fr. Pat. 301,826, May 6, 1901. Supplement.

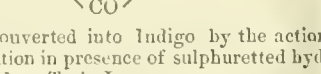
THE patentee macerates the plant in closed vessels with water at 59°—60° C. out of contact with the air for 2—3 hours. He thus obtains a solution containing indigo white which on oxidation yields Indigo.—T. A. L.

Indigo; Production of ——. H. Erdmann. Fr. Pat. 307,205, Jan. 18, 1901.

THE method consists in heating with caustic alkalis to temperatures below 200° C. derivatives of the acetonitrile compound of anthranilic acid having the typical formula $1.2.C_6H_4.CO_2R.NACH_2CN$, in which R is an alkyl group and A the radicle of an organic acid. Naphthalene is used as a diluent for the melt, and after its removal (decantation at 100° C.) the heavier portion is distilled with steam and Indigo is precipitated from the clear yellow distillate by passing a current of air through it.—T. A. L.

α-Thio-isatin and Indigo; Manufacture of ——. J. R. Geigy and Co. Fr. Pat. 309,768, April 6, 1901.

IN Fr. Pat. 291,416 the patentees have described a method for the production of Indigo by the action of ammonium sulphide on α-isatin anilide (Eng. Pat. 15,497 of 1899; this Journal 1900, 657). They now find that this reaction can be carried out in two stages, and that in an acid solution in presence of sulphuretted hydrogen, α-isatin anilide is decomposed into aniline and a hitherto unknown substance α-thioisatin having the formula—



This product is converted into Indigo by the action of a dilute alkaline solution in presence of sulphuretted hydrogen or a soluble sulphide.—T. A. L.

Indigo Blue and its Derivatives; Manufacture of ——. B. Guggenheim. Fr. Pat. 310,599, May 7, 1901.

PHENYLGLYCOCOLL is treated with phosphorus pentachloride yielding chloro-anilino-acetic acid. This reacts with aluminium chloride in carbon bisulphide or light petroleum spirit giving off hydrochloric acid and forming a red condensation product (probably ψ-indoxyl) which in presence of water becomes yellow. In place of aluminium chloride, other substances such as aluminium bromide or iodide or metallic oxides, as silver or lead oxide may be employed. The condensation product on air oxidation yields Indigo.—T. A. L.

Indigo; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 310,880, May 15, 1901.

INDOL or its bisulphite compound when treated in alkaline solution with a current of air in presence of sodium sulphite is converted into Indigo. The same conversion takes place if an aqueous paste of indol be treated with Caro's acid $H_2S_2O_8$ (this Journal, 1901, 578) obtained by mixing 25 kilos. of potassium persulphate and 28 kilos. of sulphuric acid (66° B.) diluted with 1,000 kilos. of ice. A yellow solution is formed which becomes darker and deposits Indigo on standing. The product requires purification by boiling with alcohol which extracts a red coloured substance. —T. A. L.

Indigo; Production of Halogen Compounds of Indoxyl and Bromine Derivatives of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 311,536, June 6, 1901.

THIS process consists in allowing halogens or substances capable of developing halogens to act upon indoxyl or upon compounds which can produce the same. The process is carried out in a neutral or acid solution. The halogen derivatives so obtained are yellow substances, insoluble or slightly soluble in water or acids, and are distinguished by the readiness with which they are transformed into indigotin colouring matters on the fibre or otherwise. Bromindoxyl especially changes easily to bromindigo, giving off hydrobromic acid, thus proving that it contains a bromine in the benzene ring as well as in the pyrrol ring. By allowing bromindoxyl to act upon indoxyl during the passage of a current of air, ordinary indigo can be obtained. —F. N.

Indoxylic Acid and Indoxyl; Production of Mono Acid Derivatives of ——. The Badische Anilin und Soda Fabrik. Fr. Pat. 311,562, June 8, 1901.

IT is known that the ethyl ester of indoxylic acid, treated with acetic anhydride, gives an acetyl derivative melting at 138° C. (*Vide* A. Bayer, Ber. 1881, **14**, 1742).

The acid derivatives for which claim is made are obtained by means of acid anhydrides or chloro acids, which are brought, with or without presence of solvents, into reaction with (*a*) indoxylic acid or its salts; (*b*) mixtures of indoxylic acid with indoxyl or with mixtures of their salts; (*c*) indoxyl or its salts; (*d*) solutions of indoxyl prepared by boiling solutions of indoxylic acid with alkalis.—F. N.

Indigo; Process for Manufacturing a Reduction Product of ——. Compagnie Parisienne de Couleurs d'Aniline. Fr. Pat. 312,469, July 6, 1901.

A STABLE reduction product is obtained by the simultaneous action of zinc-dust and bisulphite on indigo. This product can either be directly dissolved in the indigo vat by adding sufficient alkali, or the zinc may be first removed by means of hydrochloric acid.—H. L.

Indigo from Lonchocarpus Cyanescens; Extraction of ——. La Compagnie Française de Chemins de Fer au Dahomey. Fr. Pat. 312,404, July 4, 1901.

THE *lonchocarpus cyanescens* is a plant which grows principally in Dahomey and in the neighbouring provinces, and has only been used on a small scale by the inhabitants of the country for colouring purposes.

The claims are for the extraction of indigo from the plant by a process similar to the treatment of indigofera, and for the indigo as a new product.—F. N.

Diphenyl Derivatives; Manufacture of ——. F. Ullmann. Fr. Pat. 307,467, Jan. 25, 1901.

WHEN the diazo compound of o-nitraniline is decomposed at a low temperature with cuprous chloride, it is converted almost completely into *o-o*-dinitrodiphenyl (m. pt. 124° C.) only traces of *o*-nitrochlorobenzene being formed. The latter may be readily reconverted into *o*-nitraniline by the action of ammonia. Similarly *p*-chloro-*o*-nitraniline melting at 115° C. gives 6.6′-dinitro-4.4′-dichlorodiphenyl melting at 136° C.; *m*-chloro-*o*-nitraniline melting at 125° C. gives 6.6′-dinitro-3.3′ dichlorodiphenyl melting at 170° C.; and *m*-nitro-*p*-toluidine melting at 114° C. gives 6.6′-dinitro-4.4′-ditolyl melting at 139° C.—T. A. L.

Amino-hydroxyl Derivatives by Oxidising Aromatic Amines; Production of ——. R. Vidal. Fr. Pat. 307,631, Jan. 30, 1901.

AROMATIC amines in which the position para to the amine group is free are converted in concentrated sulphuric acid solution by the action of oxidising agents such as alkali bichromates, chlorates, perchlorates, persulphates, &c., into *p*-aminohydroxyl derivatives. For instance a mixture of 2 kilos. of aniline sulphate and 3 kilos. of concentrated sulphuric acid (66° B.) is treated with finely powdered potassium bichromate until a deep blue colour is produced. The melt becomes hot and liquefies, and on cooling, *p*-aminophenol sulphate crystallises out. In place of the above oxidising agents, the reaction may be effected by means of an electric current. The paste is placed in the

positive compartment of an electrolytic cell whilst simultaneously the negative may be employed for the reduction of nitrobenzene to aniline.—T. A. L.

Dyestuff [Black] containing Sulphur, derived from Nitro-aminohydroxydiphenylamine; Manufacture of a ——. I. Weissberg. Fr. Pat. 297,483, Feb. 16, 1901. Supplement.

According to the chief patent of Feb. 2, 1900, to which this is a supplement, a black for unmordanted cotton is obtained by heating together 10 kilos. of nitro-aminohydroxydiphenylamine, 20 kilos. of sodium sulphide and 8 kilos. of sulphur. The patentee now finds that a similar dyestuff is produced if the first mentioned substance be replaced by *o*-*p*-dinitro-*p*-hydroxydiphenylamine.—T. A. L.

Red Dyestuffs of the Triphenylmethane Series; New ——. J. Ville. Fr. Pat. 308,968, March 14, 1901.

These dyestuffs which are known as "Urbines," are obtained by oxidising with sodium arseniate and sodium acetate, a mixture of chloral and a dialkylated *m*-aminophenol in glacial acetic acid. Urbine M is obtained from dimethyl-*m*-aminophenol and Urbine E from the diethyl derivative, the products having the formula—

$$R_2N.C_6H_3.C : (C_6H_3(OH)NR_2)_2$$
$$\backslash O /$$

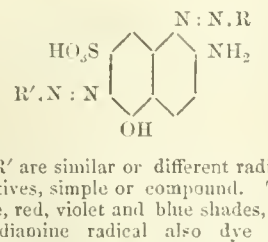
where R represents an alkyl group. The products dye wool and silk from neutral or slightly acid (acetic) baths, whilst the reds obtained on tannined cotton are somewhat bluer.—T. A. L.

Aromatic Substances containing Hydroxyl Radicles; Manufacture of Alkaline Salts of ——. Chem. Fabrik von Heyden Actien Gesellschaft. Fr. Pat. 310,478, May 2, 1901.

By treating phenol with lime and an alkali sulphite in aqueous solution, sodium phenolate is formed together with a precipitate of calcium sulphite. The process has a technical value for removing sodium sulphite from the melt obtained by fusing benzene and naphthalene sulphonates with caustic alkalis. Phenol and lime are added, when the sulphurous acid is separated as calcium sulphite and sodium phenolate is formed in solution. The process is not applicable to aromatic substances containing hydroxyl groups which yield insoluble or only slightly soluble calcium salts as for example alizarin.—T. A. L.

Disazo, Trisazo and Polyazo Dyestuffs from 2.4'.2' amino-naphthol Sulphonic Acid; Manufacture of New ——. Soc. de l'Ind. Chim. à Bale. Fr. Pat. 309,688, April 4, 1901.

The patentees find that 2.4'.2'-aminonaphthol sulphonic acid will combine in various ways with diazo, diazo-azo, and tetrazo derivatives or with intermediate compounds from the latter. The resulting products have the general formula—



in which R and R' are similar or different radicles of diazo or tetrazo derivatives, simple or compound. The products dye wool orange, red, violet and blue shades, whilst those containing a *p*-diamine radical also dye unmordanted cotton. They are also suitable for mixed goods, and, on account of their fastness, for different coloured lakes. The shades are fast to acids and alkalis, and some of them to chlorine.—T. A. L.

Azo Dyestuffs derived from Picramic Acid; New ——. L. Picard and Co. Fr. Pat. 310,145, April 20, 1901.

The azo dyestuffs from picramic acid give by subsequent treatment with sulphate of copper after dyeing, a very fast shade. It is found that the copper salts of these dyestuffs can be readily prepared, and possess the same property when dyed from an acid bath. For instance, the combination of equimolecular proportions of diazotised picramic acid and aminonaphtholdisulphonic acid H in alkaline solution is treated with an equimolecular proportion of an ammoniacal copper solution. The copper salt precipitates and can be collected and dried. It is soluble in water and dyes wool indigo blue shades from an acid bath.—T. A. L.

Dyestuffs [Blue-Black] for Cotton; Manufacture of —— Chemische Fabriken vorm. Weiler-ter Meer. Fr. Pat. 310,713, May 10, 1901.

The process consists in heating *p*-amino-dinitrodiphenylamine, 1.3.4.$(NO_2)_2$.C_6H_3.NH.C_6H_4.NH_2.4.1, with sulphur and alkaline sulphides, with or without the addition of solvents, such as water or glycerin, and at temperatures not exceeding 188° C. At lower temperatures (not exceeding 155° C.) the product obtained is a blue, which, after chroming, gives darker shades fast to washing, light, acids and alkalis, whilst if the melt be raised to 180° C. for one hour, a similarly fast bluish-black dyestuff is formed. On heating for a longer time an olive dyestuff is obtained.
—T. A. L.

Colouring Matters [Sulphur]; Production of ——. W. Epstein and E. Rosenthal. Fr. Pat. 311,429, June 3, 1901.

New dyestuffs are obtained by heating certain nitro derivatives of benzidine or its homologues with alkaline sulphides and sulphur. One of these derivatives has been described by Tauber (Ber. 1890, 23, 795) as an ortho-ortho-dinitrodiphenyl—

The tertiary benzidines yield analogous compounds, when nitrated in the same manner. Tetramethylbenzidine gives a dinitrotetramethylbenzidine, m. pt. 230° C.; tetra-ethylbenzidine and a dinitrotetraethylbenzidine, m. pt. 114° C. By using more than 2 mols. of nitric acid, polynitrotetra-alkylbenzidines can be obtained.

By heating these nitro derivatives with sulphur and sulphides of alkali metals, colouring matters can be obtained which produce, on unmordanted cotton, shades which vary from yellow to brown and black. No addition of alkaline sulphide to the bath is required. By after-treatment with chromates or copper salts, the dye becomes faster.—F. N.

Meta-Toluic-aldehyde-o-Sulphonic Acid; Preparation of ——. La Société Chimique des Usines du Rhône, formerly Gilliard P. Monnet et Cartier. Fr. Pat. 311,739, June 15, 1901.

Metatoluic-aldehyde is run into 10 times its weight of fuming sulphuric acid (60 per cent. SO_3), while the temperature is kept at about 0·5° C. The mixture is agitated till a test is completely soluble in water. The mixture is then poured on ice and neutralised with barium carbonate. The product thus obtained shows with phenylhydrazine the characteristic precipitate of an aldehyde, and yields with aromatic amines dyestuffs which are fast to alkalis.—F. N.

Black Sulphur Colouring Matter; Production of ——. Kalle and Co. Fr. Pat. 311,517, June 5, 1901.

The patentees claim the manufacture of a black sulphur dyestuff from a condensation product of dinitrochlorbenzene 1.2.4 with the amino phenolsulphonic acid, which they obtain by transforming nitro-acetylmetanilic acid into nitrophenolsulphonic acid, and reducing the latter. The fusion with sulphur and sodium sulphide is carried out at a temperature of 130°—150° C.—F. N.

Mono-alphyl-α¹-Naphthylamine-α⁴-Sulphonic Acid; Production of ——. Kalle et Cie. Fr. Pat. 311,838, June 17, 1901.

The patentees claim the manufacture of mono alphyl-α¹-naphthylamine-α⁴-sulphonic acid by heating a hydrochloric acid solution of α¹-naphthylamine-α⁴-sulphonic acid and an aromatic amine under a reflux condenser or in an autoclave, and give the following examples:—

I. 149 kilos. of α¹-naphthylamine-α⁴-sulphonic acid (91 per cent.) and 150 kilos. of paratoluidine are suspended in 400 litres of water and dissolved with about 100 kilos. of hydrochloric acid (22° B.). The solution is then heated in a closed vessel for 15 hours to 150° C., and the tolylalphanaphthylamine sulphonic acid is afterwards isolated in the well-known manner.

II. 98 kilos. of α¹-naphthylamine-α⁴-sulphonic acid (91 per cent.), 270 kilos. of aniline, 150 kilos. of hydrochloric acid, and the corresponding amount of water are heated in an autoclave to 140° C. during 20 hours, and yield phenyl peri acid of remarkable purity and in nearly theoretical quantity. —F. N.

Black Dyestuff; Manufacture of a ——. E. Koechlin. Fr. Pat. 308,564, Feb. 27, 1901.

The patentee combines benzidine with *o*-chlorotrinitrobenzene in alcoholic solution in presence of caustic soda, and heats the resulting product with sodium sulphide and sulphur, obtaining a black of unknown constitution. —T. A. L.

Black Dyestuff; Manufacture of a ——. E. Koechlin. Fr. Pat. 308,829, March 8, 1901.

By condensing 1.2′-aminonaphthol or Clève acid (a mixture of 2.2′- and 2.3′-naphthylamine sulphonic acids) with *o*-chloro-dinitrobenzene in alcoholic solution in presence of caustic soda, a product is obtained which, when heated with sulphur and sodium sulphide, gives a direct black. —T. A. L.

Black Substantive Dyestuffs. Soc. Anon des Mat. Col. et Prod. Chim. de St. Denis. Fr. Pat. 292,400, Jan. 18, 1901. Supplement.

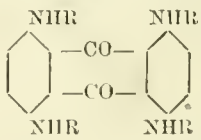
The subject-matter of this specification, which is an addition to the original one of Sept. 8, 1899, has already been abstracted (Eng. Pat. 1150 of 1900; this Journal, 1900, 1102).—T. A. L.

Black Dyestuffs; New Substantive ——. Soc. Anon. des Mat. Col. et Prod. Chim. de St. Denis. Fr. Pat. 292,400, Feb. 9, 1901. Supplement.

The specification is a third supplement to the chief patent. According to the second supplement to the latter (see preceding abstract), dyestuffs are obtained by reacting at 150°—160° C., and finally at about 200° C., with the products obtained by the action of chloride of sulphur on phenol or cresol, on disubstituted diphenylamines. It is now found that the intermediate products formed at temperatures below 160° C. are also fast cotton dyestuffs. The diphenylamine derivatives suitable for this invention are derived from *p*-phenylene diamine and phenol or *o*-cresol. The following typical example is given. A solution of 150 kilos. of indophenol (obtained by oxidising equimolecular proportions of *p*-phenylene-diamine and phenol) in 500 kilos. of sodium sulphide in cold water is allowed to stand for some time, and is then gently heated to 120°—130° C., when it is mixed with the product obtained by the action of 200 kilos. of chloride of sulphur on 100 kilos. of phenol. The whole melt is kept for two hours at 130° C., and the temperature is then gradually raised to 150°—160° C., until the mass becomes dry, when it may be employed directly for dyeing purposes, giving blue shades on unmordanted cotton.—T. A. L.

Dyestuffs [Green] derived from Anthraquinone; Manufacture of Sulphonic Acids of New ——. Farbenfabriken vormals F. Bayer. Fr. Pat. 243,316, Feb. 2, 1901. Supplement.

It has been shown in the chief patent to which this is supplementary that the sulphonic acids of alphylaminoanthraquinones are valuable dyestuffs. According to the present specification, sulphonic acids of the tetra-alphylaminoanthraquinones of the general formula—



in which R represents an aromatic radicle, are also valuable dyestuffs, giving yellowish to bluish-green shades on chrome-mordanted wool. The tetra-alphylamino-anthraquinones are obtained by boiling α-dinitro-α-dihalogen anthraquinones with aromatic amines, in which process all the halogen and nitro groups are replaced by aromatic amine radicles. The resulting products are then treated with sulphonating agents.—T. A. L.

Dyestuffs [Blue] derived from Anthraquinone; Manufacture of New ——. Farbenfabriken vormals F. Bayer and Co. Fr. Pat. 243,315, March 11, 1901. Supplement.

The patentees claim the production of dyestuffs by replacing in 1.4-aminohydroxyanthraquinone or its sulphonic acids, the hydroxyl group by the radicle of a primary aromatic amine. They further claim the production of dyestuffs from *p*-nitro-*p*-amino-anthraquinene or from *p*-diuitro-*p*-diamino-anthraquinones by similarly treating them with primary aromatic amines, in this case the nitro group or groups being replaced by the amine radicles. All these products after sulphonation give blue or greenish-blue dyestuffs applicable to unmordanted or chrome-mordanted wool. —T. A. L.

Anthracene Derivatives containing Nitrogen; Manufacture of New ——. Fr. Bayer and Co. Fr. Pat. 309,612, April 2, 1901.

By the action of dehydrating agents (zinc chloride, phosphoric, hydrochloric, or sulphuric acid) on α-alphylamino-anthraquinones, condensation products are obtained which are more basic than the original compounds, and are very probably acridine derivatives. For example, 10 kilos. of 1.4′-di-*p*-toluino-anthraquinone (from quinizarin and *p*-toluidine) and 800 kilos. of sulphuric acid (70 per cent. H_2SO_4) are heated at about 145° C. until the sulphate of the new base separates in long, thin needles. The salt, after filtering, is decomposed with caustic soda, and the base is purified by crystallisation from pyridine.—T. A. L.

Dyestuffs [Green] of the Anthraquinone Series; Manufacture of New ——. Farbenfabriken vorm. F. Bayer. Fr. Pat. 243,315, April 12, 1901. Supplement.

By reacting with primary aromatic amines on 1.4-dichloro-anthraquinone, dyestuffs of the Quinizarin Green series are formed.—T. A. L.

Anthracene Series; Manufacture of Derivatives of ——. Fr. Bayer and Co. Fr. Pat. 310,329, April 27, 1901.

On heating the *p*-nitrohydroxyanthraquinones with concentrated sulphuric acid in presence of boric acid, the nitro groups are successively removed as nitrous acid and replaced by hydroxyl groups. For example, 10 kilos. of dinitro-anthrarufin sodium disulphonate, 200 kilos. of sulphuric acid (66° B.), and 10 kilos. of boric acid are heated to 140° C. until a sample shows the characteristic spectrum of the 1.4.1′.4′-tetrahydroxyanthraquinone disulphonic acid. The melt is then poured into water and the product salted out. It may be purified by fractional crystallisation.—T. A. L.

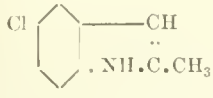
Anthracene Series; Manufacture of Derivatives of the ——. Fr. Bayer and Co. Fr. Pat. 310,585, May 6, 1901.

It is known that by treating dinitro-anthraquinones with aromatic amines, dialphyldiamino-anthraquinones are produced, both the nitro groups being replaced by aromatic

radicles. The patentees find that this reaction takes place in two stages, and that it is possible to obtain substances having the composition of nitro-alphylamino-anthraquinones. The method consists in stopping the reaction as soon as the dinitro compound has disappeared. The chief product then is a nitro-alphylamino compound.—T. A. L.

Dyestuffs [Violet]; Manufacture of New Basic ——. F. Bayer and Co. Fr. Pat. 308,033, Feb. 11, 1901.

Valuable basic dyestuffs giving red, violet, and blue shades on wool, silk, and tannined cotton are obtained by condensing *p*-diaminobenzophenone and its alkyl derivatives, thioketones, or the corresponding auramines with α-methyl- or α-phenylindole or their derivatives containing alkyl or halogen in the benzene ring. For example, 3·3 kilos. of tetra-ethyl-*p*-diaminobenzophenone and 1·7 kilos. of Pr^2-methyl-B^3-chloroindole having the formula—



are dissolved in 20 litres of hot alcohol and mixed with 5 kilos. of concentrated hydrochloric acid. After heating for three hours on the water-bath, half the alcohol is distilled off, and the residue is poured into a mixture of ice and brine. The dyestuff gives violet shades on wool, silk, or tannined cotton.—T. A. L.

Dyestuffs and Intermediate Products; Manufacture of New Azo ——. F. Bayer and Co. Fr. Pat. 297,367, March 7, 1901. Supplement.

In place of the symmetrical guanidine derivatives produced according to a supplement of Oct. 19, 1900, from thiourea derivatives obtained from certain aminonaphthol sulphonic acids, the patentees now claim the employment of asymmetrical derivatives of thiourea, the preparation of which is described in the supplement of July 16, 1900. The azo dyestuffs obtained from these asymmetrical guanidines are similar to those formed from the symmetrical products. (See also Eng. Pat. 18,939 of 1900; this Journal, 1901, 982.)—T. A. L.

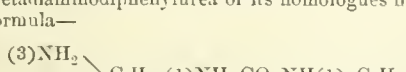
Dyestuffs, and Intermediate Products therefor; Manufacture of New ——. F. Bayer and Co. Fr. Pat. 311,339, May 30, 1901.

Nitro-metanilic acid having the formula $1.4.2.C_6H_3.NO_2.NH_2.SO_3H$ is treated with phosgene in presence of sodium carbonate in aqueous solution. The dinitro compound is then reduced and the *p-p*-diaminodiphenylurea disulphonic acid obtained is converted into a tetrazo compound and combined with dyestuff components. The same condensation product is obtained by reacting with phosgene on *p*-phenylenediamine sulphonic acid (Ger. Pat. 64,908). The dyestuffs formed can also be obtained by starting with *p*-nitraniline *o*-sulphonic acid or with acet-*p* phenylene diamine sulphonic acid, combining either of these substances after diazotisation with, for example, 2.1′-aminonaphthol, then reducing or hydrolysing respectively, and finally acting with phosgene on the monazo dyestuff produced.

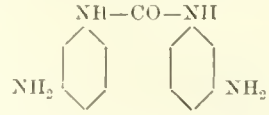
—T. A. L.

Azo Colouring Matters; Production of ——. Farbenfabriken vorm. F. Bayer and Co. Fr. Pat. 311,542, June 6, 1901.

This invention relates to the manufacture of disazo colouring matters by combining the tetrazo compound of metadiaminodiphenylurea or its homologues of the general formula—



with two molecules of beta-1-amino-alpha-3-naphthol-beta-4-sulphonic acid or of other suitable components. As an example, the production of an orange cotton dyestuff is described, from metadiaminodiphenylurea—



and the above-mentioned aminonaphthol sulphonic acid.

—F. N.

Dyestuffs [Violet, Blue] derived from Aminonitrosalicylic Acid. Manuf. Lyon. de Mat. Col. Fr. Pat. 307,740, Feb. 1, 1901.

The diazo compound of aminonitrosalicylic acid [$(NH_2:NO_2:OH:CO_2H = 1:5:2:3)$] is combined in an alkaline solution with 1.1′.2.4-aminonaphthol disulphonic acid or other peri-aminonaphthol sulphonic acid. The product dyes wool reddish-violet from an acid bath, or indigo blue shades in presence of a copper salt.—T. A. L.

Dyestuff [Blue] for Cotton; Manufacture of a ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 303,524, March 11, 1901. Supplement.

According to the chief patent, the dyestuff obtained from alkylated aminohydroxydiphenylamine is precipitated from the crude melt by sodium chloride. It is now found that this salt may be replaced by the chlorides of other metals of which the sulphides are soluble in water.—T. A. L.

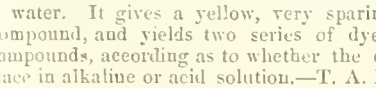
2.2′-Aminonaphthol Sulphonic Acid; Manufacture of a New ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 309,924, April 13, 1901.

The disulphonic acid obtained by sulphonating 2.2′-aminonaphthol with 10 times its weight of sulphuric acid (66° B.) for about 12 hours at 30° C. is of little technical interest. If, however, the melt be diluted with one-eleventh its weight of water and heated for 24 hours to 100° C., one of the sulphonic acid groups is removed and the resulting 2.2′-aminonaphthol sulphonic acid is a valuable dyestuff component. The sodium salt of the new acid is almost insoluble in cold water. It gives a yellow, very sparingly soluble diazo compound, and yields two series of dyestuffs with diazo compounds, according as to whether the conjugation takes place in alkaline or acid solution.—T. A. L.

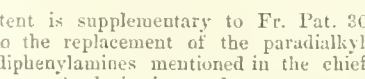
Colouring Matter [Blue]; Manufacture of ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 303,524, March 28, 1901.

This patent is supplementary to Fr. Pat. 303,524, and relates to the replacement of the paradialkylaminoparahydroxydiphenylamines mentioned in the chief patent by homologous and substitution products.

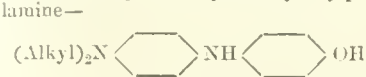
By melting with sulphur and sulphides of the alkalis, the patentees obtain from paradialkylaminophenylparahydroxymetatolylamine—



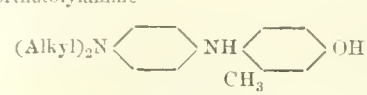
a reddish-blue dyestuff, from paradialkylaminophenylparahydroxyorthotolylamine—



a deep blue dyestuff, from paradialkylaminoparahydroxymetachlordiphenylamine—



and from paradialkylaminoparahydroxydiphenylamine metacarboxylic acid—



greenish-blue dyestuffs for unmordanted cotton.—F. N.

Blue Dyestuffs containing Sulphur derived from p-alkyl-amino-p-hydroxydiphenylamine; Manufacture of ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 309,898, April 12, 1901.

Monalkyl derivatives of *p*-amino-*p*-hydroxydiphenylamine are obtained by simultaneous oxidation of monalkyl-*p*-phenylene diamine and phenol or its derivatives, like cresol, *o*-chlorophenol, or salicylic acid. Methyl-*p*-amino-*p*-hydroxydiphenylamine crystallises in colourless needles from water, and melts at 171° C., whilst the ethyl derivative, which crystallises similarly, melts at 130° C. On heating the methyl derivative with twice its weight of crystallised sodium sulphide and half its weight of sulphur to 120° C. for 6—10 hours, a melt is obtained which can be used directly for dyeing. It is, however, preferable to purify the dyestuff by dissolving the melt in water and precipitating the product with salt or calcium chloride. It dyes cotton from a bath containing salt and sodium sulphide a pure blue shade, fast to washing, light and chlorine.—T. A. L.

Blue Cotton Dyestuff from 1.4-*Naphthylenediamine*-7-*Sulphonic Acid; Manufacture of* ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 312,388, July 3, 1901.

The acetyl derivative of $\alpha_1\alpha_2$-naphthylenediamine-β_4-sulphonic acid is diazotised and combined with Clève's acid; the product is again diazotised and combined with Clève's acid.

The resultant combination is again diazotised and combined with β_2-amino-α_3-naphthol-β_4-sulphonic acid in alkaline solution, and finally saponified. The dyestuff obtained may be diazotised and combined on the fibre like the diaminogen dyestuffs, giving blue shades remarkable for their purity and fastness to light and milling.—F. N.

Blue Cotton Dyestuff; Manufacture of ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 312,403, July 4, 1901.

The mixed diazo compound formed by combining *p*-phenylenediamine with Clève's acid and β_1-naphthol-$\beta_2\beta_4$-disulphonic acid is diazotised and combined with a further molecule of Clève's acid. The product is again diazotised and finally combined with β_1-amino-α_3-naphthol-β_4-sulphonic acid in alkaline solution. A product is thus obtained which dyes cotton direct a red shade of blue, fast to light and washing.—F. N.

Dyestuffs of the Anthracene Series. Badische Anilin und Soda Fabrik. Fr. Pat. 307,104, Jan. 14, 1901.

According to several Fr. Pats. (see also Eng. Pat. 8051 of 1899; this Journal, 1900, 341), amino-anthraquinone and its derivatives are converted by the action of halogens into well-characterised halogenated products which, on heating with aromatic amines, yield new dyestuffs. It is now found that the same reaction takes place with sulphonated aromatic amines in aqueous solution under pressure, with or without the addition of a salt of an alkali or alkaline earth; for example, calcium acetate. For instance, 2·5 kilos. of bromo-β-amino-anthraquinone sulphonic acid, 5 kilos. of sodium sulphanilate, and 10 litres of water are heated in an enamelled autoclave to 200° C. until no further increase in colour takes place. The melt is then dissolved in water and precipitated with salt. It dyes chrome-mordanted wool a bluish grey.—T. A. L.

Dyestuffs of the Anthracene Series soluble in Water; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 308,661, March 2, 1901.

The method consists in heating, under pressure or not, nitro derivatives of anthraquinone together with the salts of sulphonic acids of aromatic amines in presence of water. —T. A. L.

Blue Dyestuff of the Anthracene Series; Manufacture of a ——. Badische Anilin und Soda Fabrik. Fr. Pat. 309,503, March 29, 1901.

When β-amino-anthraquinone is fused with caustic potash at 200°—300° C., it yields a leuco product which, in presence of water and air, is converted into a sparingly soluble crystalline blue dyestuff. The same product is also formed from β-amino-anthraquinone sulphonic acid, β-amino-hydroxyanthranol, or the corresponding hydroquinone. The new substance is insoluble in alkalis and dilute mineral acids, but dissolves in alkalis in presence of reducing agents (sodium hydrosulphite). The vat so formed dyes cotton very fast blue shades.—T. A. L.

Dyestuffs of the Anthracene Series giving Blue to Green Shades; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 309,761, April 6, 1901.

The condensation of the halogen derivatives of amino- or diamino-anthraquinones and their derivatives by boiling them with aromatic amines is effected in presence of alkaline acetates or carbonates in order to prevent by-reactions. —T. A. L.

Dyestuffs, and Materials therefor, from Halogen Hydroxymethylanthraquinone; Manufacture of Sulphonated ——. Badische Anilin und Soda Fabrik. Fr. Pat. 311,103, May 23, 1901.

When amino-β-methylanthraquinone is treated with bromine, it yields bromo-aminomethylanthraquinone, which, by the action of potassium nitrite in sulphuric acid solution, is converted into bromohydroxymethylanthraquinone. This product condenses readily with aromatic amines in presence of fused sodium acetate, the resulting compounds after sulphonation yielding fast violet to violet-red dyestuffs for mordanted or unmordanted wool.—T. A. L.

Anthracene Dyestuffs and their Intermediate Products; Manufacture of Sulphonated ——. Badische Anilin und Soda Fabrik. Fr. Pat. 311,357, May 31, 1901.

The condensation products from nitro-anthraquinone derivatives and aromatic amine sulphonic acids give halogen products when treated with free or nascent halogens. For example, the condensation product from nitro-anthraquinone sulphonic acid and sodium sulphanilate, on treatment with bromine in aqueous solution, yields bromosulphanilino-anthraquinone sulphonic acid. This substance, when heated to 180°—200° C. in an enamelled autoclave in aqueous solution with *p*-toluidine in presence of calcium acetate, yields two dyestuffs which differ by their solubility in alcohol. The more soluble product gives green shades on chrome-mordanted wool, whilst the other dyes greyish-green to black. If necessary, the condensation products may be sulphonated.—T. A. L.

Anthracene Colouring Matters [Blue to Green]; Production of ——. The Badische Anilin und Soda Fabrik. Fr. Pat. 307,912, June 3, 1901.

This specification is supplementary to the two Fr. Pats. of the provisional numbers 296,310, Feb. 6, 1901, and 298,230, April 6, 1901, and relates to the production of greenish-blue anthracene dyestuffs by treating with energetic sulphonating agents—preferably fuming sulphuric acid with addition of boric acid—the condensation products of mono-amino-beta-methylanthraquinones (halogenated) with aromatic amines.—F. N.

Colouring Matters [Blue] Dyeing Unmordanted Cotton; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 308,557, July 1, 1901.

This specification is supplementary to the Fr. Pat. 308,557, Feb. 27, 1901, and relates to the manufacture of blue sulphur dyestuffs from indophenolthiosulphonic acids as can be obtained by oxidising para-diamino-thiosulphonic acids with phenols. In the example, the production is given of the intermediate indophenol thiosulphonic acids from dimethyl-para-phenylenediamine thiosulphonic acid, with ortho- or meta-cresol, and their transformation, by heating them with sulphur and alkali sulphides, into dyestuffs which dye indigo shades on unmordanted cotton; they can also be dyed in the vat.—F. N.

Tetra- and Poly-hydroxynaphthalenes and their Application in Dyeing; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 307,554, Jan. 28, 1901.

Alizarin Black obtained by the action of sulphuric acid on dinitronaphthalenes by known methods does not consist of

pure Naphthazarin, but contains polyhydroxynaphthoquinones. According to the present specification, these products are reduced to their leuco derivatives by the action of iron in aqueous solution, Naphthazarin yielding tetrahydroxynaphthalene, which can be separated from the polyhydroxynaphthalenes formed simultaneously by its greater solubility in water. It is found that the tetrahydroxynaphthalene dyes wool brown shades, and alumina-mordanted cotton yellow shades, which darken on exposure to air. Oxidising agents, more particularly chromates, yield fast black lakes. Owing to its solubility, tetrahydroxynaphthalene dyes level, and is also fast to washing. It is almost twice the strength of Alizarin Black.

—T. A. L.

Dyestuffs [Brown, Violet, Blue] from m-diaminophenol Sulphonic Acid capable of being Chromed on the Fibre; Production of Disazo ——. Badische Anilin und Soda Fabrik. Fr. Pat. 308,000, Feb. 9, 1901.

The *m*-diaminophenol sulphonic acid having the constitution OH : $(NH_2)_2$: SO_3H = 1:2:6:4 can be converted into a tetrazo compound without any formation of dyestuff of the Bismarck Brown type. The tetrazo compound combines with two molecular proportions of an amine or phenol, or their derivatives, the operation in the case of different conjugates taking place in two stages. The dyestuff, for example, from R salt and β-naphthol gives violet shades on wool, which, on subsequent chroming, become blackish-blue.

—T. A. L.

Blue Dyestuffs for Unmordanted Cotton; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 308,557, Feb. 27, 1901.

By oxidising dialkyl-*p*-phenylenediamine thiosulphonic acids and phenol, there result dialkylamino-indophenol thiosulphonic acids. When these products are heated with sulphur and alkaline sulphides to about 125° C., leuco derivatives are obtained which readily oxidise in the air to fast blue dyestuffs.—T. A. L.

Dyestuffs [Violet, Blue] from m-Diaminophenol Sulphonic Acid capable of Chroming on the Fibre; Production of Disazo ——. Badische Anilin und Soda Fabrik. Fr. Pat. 308,558, Feb. 24, 1901.

The nitro-aminophenol sulphonic acid of Ger. Pat. 93,443, or the dinitrophenol-*p*-sulphonic acid of Fr. Pat. 280,031, when treated with reducing agents, yield *m*-diaminophenol sulphonic acid having the constitution OH:$(NH_2)_2$:SO_3H = 1 : 2 : 6 : 4. This product gives a tetrazo compound, which combines with two molecular proportions of a dyestuff component, such as β-naphthol, dihydroxynaphthol, naphthol sulphonic acids, *m*-phenylenediamine, or amino-naphthol sulphonic acids, to form wool dyestuffs, giving violet to blue shades, which, on subsequent chroming, become greener and darker. (See also Fr. Pat. 308,000 above, and Eng. Pat. 18,624 of 1900; this Journal, 1901, 890.)—T. A. L.

Red Mordant Dyestuffs; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 309,573, April 1, 1901.

By combining tetrazodiphenyl with salicylic acid and with 1.3-naphthol sulphonic acid, or with one of its derivatives sulphonated in the β-position or substituted (for example by benzoyl) in the amino group, valuable red mordant dyestuffs fast to milling are obtained. The order in which the combination takes place is immaterial.—T. A. L.

Brown Substantive Dyestuff; Manufacture of a ——. Badische Anilin und Soda Fabrik. Fr. Pat. 311,190, May 25, 1901.

Hexanitrodiphenylamine (dipicrylamine), when heated with sulphur and alkaline sulphides, yields a brown dyestuff for cotton or wool, fast to soap, acids, and light. The shades are darkened by passing the dyed fabric through a bath containing chromates, copper sulphate, and acetic acid.

—T. A. L.

Green Cotton Dyestuff; Production of —— Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Fr. Pat. 312,573, July 10, 1901.

When paranitraniline is heated together with sulphur and an alkali sulphide, it yields green dyestuffs directly dyeing cotton, which are totally different from those obtained from paraphenylenediamine according to the Fr. Pat. 236,405, Feb. 19, 1894. The following example is given:—80 kilos. of crystallised sodium sulphide are heated with 25 kilos. of sulphur to 150° C., and 20 kilos. of paranitraniline are gradually added, while the temperature is raised to 200°, kept at that point for four hours, and afterwards raised for two hours to 230°. The dyestuff thus obtained dyes unmordanted cotton deep green shades, which are fast to light and oxidising agents.—F. N.

Black Colouring Matter for Cotton; Manufacture of ——. Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Fr. Pat. 311,438, June 3, 1901.

The process herein described is supplementary to that of the Fr. Pat. 292,793, Sept. 25, 1899, and consists in heating with sulphur and alkaline sulphides, or with sulphur and caustic alkalis, the oxydinitrodiphenylamine sulphonic acid, obtained from *o*-aminophenol-*p*-sulphonic acid and 2.4-dinitro 1-chlorbenzene, but with addition of copper or a copper salt. The product so obtained dyes cotton black shades, which are fast to light and washing. They can be treated on the fibre with chromates or copper salts.—F. N.

Black Substantive Dyestuffs for Cotton; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 293,138, April 1, 1901. Supplement.

According to the chief French patent of Oct. 6, 1899 (Eng. Pat. 20,232 of 1899; this Journal, 1900, 818), the patentees obtain substantive black dyestuffs by fusing *m*-dinitrodi-*p*-hydroxydiphenyl-*m*-phenylenediamine with sulphur and alkaline sulphides. They now find that this substance may be replaced with advantage by dinitrochlorodi-*p*-hydroxydiphenylenediamine, obtained by condensing trichlorodinitrobenzene, melting at 103°·5 C., with two molecular proportions of *p*-aminophenol in presence of sodium acetate. The condensation product forms an orange crystalline powder insoluble in water, readily soluble in alcohol, especially when hot. It softens at 155° C., and melts with blackening and effervescence at 215° C.

—T. A. L.

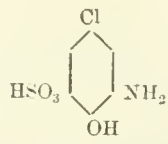
Azo Components and Azo Dyestuffs; Manufacture of New ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 309,794, April 9, 1901.

The patentees find that 2.4′.2′-aminonaphthol sulphonic acid condenses with phenylthiocarbimide and its homologues in presence of sodium carbonate, forming probably asymmetrical thioureas, which combine with diazo and tetrazo compounds, yielding bright cotton dyestuffs fast to acids.

—T. A. L.

Chloro-amino Phenolsulphonic Acid 1.3.4.5, and Azo Colouring Matters therefrom; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 311,722. June 13, 1901.

The production of 1.3.4.5-chloro-aminophenol sulphonic acid, as claimed in the Fr. Pat. 301,530, June 22, 1900, is not practicable, since the nitration of the monosulphonic acid of paradichlorobenzene does not give a uniform product. The patentees arrive at the same compound—



by sulphonating the 1.4-dichlorobenzene and heating the sulphonic acid so obtained with alkaline solutions under pressure; the hitherto unknown 1.4-chlorophenol-5-sulphonic acid so obtained gives, on nitration in sulphuric acid solution and subsequent reduction, the above-mentioned

chloro-aminophenolsulphonic acid; the diazo compound of this acid only combines with certain components and only at a moderately high temperature, *e.g.*, with 2.5.7-aminonaphtholsulphonic acid, 2.5.7-phenylaminonaphtholsulphonic acid and with the various betanaphtholsulphonic acids, yielding red to reddish-yellow wool dyestuffs, which, on chroming, change to bluish-black or blue.—F. N.

Dyestuff [*Blue, Grey*] *from* 1.4′-*Dinitronaphthalene; Manufacture of* ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 307,087, Jan. 12, 1901.

When sulphuretted hydrogen is passed into 1.4′-dinitronaphthalene (50 kilos.) dissolved in 400 kilos. of chlorosulphonic acid (sulphuric chlorhydrin), the temperature rises spontaneously to 130°—140° C., and is maintained thereat by cooling until the reaction is complete. The melt is finally heated for five hours to 110°—220° C., a current of sulphuretted hydrogen being passed through the whole time. It is then poured on to ice, and the filtered product is purified by dissolving it in sodium carbonate. It dyes blue shades from an acid bath, which, on subsequent treatment with chrome, yield fast grey shades.—T. A. L.

Dyestuffs [*Blue*] *of the Anthracene Series; Manufacture of* ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 309,772, April 6, 1901.

The dyestuffs in question are sulphonic acids of tetraminoanthraquinones, and are obtained by dinitrating the acidyl (preferably oxalyl) derivatives of diamino-anthraquinone, reducing these products, and subsequently sulphonating them, when sulphonation and elimination of acidyl groups, take place simultaneously. The dyestuffs give fast blue shades on wool from an acid bath. Products having very similar properties can also be obtained by boiling the dinitrodiamino-anthraquinones or their acidyl derivatives with sodium bisulphite solution, and precipitating the new derivatives with hydrochloric acid.—T. A. L.

Dyestuff [*Brown*] *derived from* 2.4-*Dinitro-p-hydroxydiphenylamine; Manufacture of a Sulphurised* ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 308,735, March 5, 1901.

The product is obtained by acting with neutral sulphites on 2.4-dinitro-*p*-hydroxydiphenylamine or on 2.4-nitro-amino-*p*-hydroxydiphenylamine under pressure, and fusing the product so formed with alkaline polysulphides.—T. A. L.

Dyestuffs; Manufacture of Direct Cotton Sulphurated Black ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 309,322, Mar. 23, 1901.

Black dyestuffs for unmordanted cotton are obtained by fusing with sulphur and alkali sulphides, chloronitrophenolsulphonic acid ($OH:NO_2:SO_3H:Cl = 1:2:4:6$) or dichloronitrophenol ($OH:Cl:NO_2:Cl = 1:2:4:6$). These substances are obtained by the action of nitric acid in aqueous solution on the mono- or dichlorophenolsulphonic acids formed by the action of chlorine on *p*-phenolsulphonic acid. The shades produced are darkened by subsequent treatment with copper salts.—T. A. L.

Disazo Dyestuffs [*Brown, Black*] *from o-o-Diaminophenol p-Sulphonic Acid; Manufacture of* ——. Cie Parisienne de Coul. d'Aniline. Fr. Pat. 310,597, May 6, 1901.

The patentees find that the tetrazo compound from *o o*-diaminophenol-*p*-sulphonic acid will combine successively with two different dyestuff components. The resulting products dye wool reddish-brown to dark brown shades, which, when treated on the fibre with metallic salts, yield fast brown to black lakes. The same products may be obtained by starting with o-nitro-o-aminophenol-*p*-sulphonic acid, diazotising this and combining it with one component, reducing the nitrohydroxyazo compound formed with sodium sulphide, diazotising the resulting aminohydroxyazo compound, and combining this with a second dyestuff component. (See preceding Fr. Pat. 308,000, page 43.)
—T. A. L.

Dyestuffs for Cotton obtained from the 1.1′- *and* 1.4′-*Dinitronaphthalenes, from Trinitronaphthalene and their Derivatives; Manufacture of Sulphurated* ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 304,981, May 10, 1901. Supplement.

The method described in the chief patent of Oct. 30, 1900 (fusion of 1.1′-dinitronaphthalene with alkaline polysulphides in presence of zinc salts), is also applicable to other reaction products of 1.1′-dinitronaphthalene, such as those obtained by the action of sodium sulphide in aqueous solution with or without the addition of sulphur, or else by the action of fuming sulphuric acid, and also to the reduction product of this derivative obtained by means of sulphites. Another transformation product is that obtained by passing sulphuretted hydrogen into the sulphuric acid solution of dinitronaphthalene. When this is heated with sodium sulphide, zinc chloride, and sulphur, a bluish-black cotton dyestuff is obtained.—T. A. L.

Rhodamine; Production of Derivatives of ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 311,815, June 15, 1901.

The process consists in a condensation of the acyl derivatives of meta-aminophenol, like acetyl-meta-aminophenol (meta-hydroxyacetanilide), or benzoyl-meta-aminophenol (meta-hydroxybenzanilide), with dialkylamino-oxybenzoylbenzoic acid, yielding asymmetric acyl derivatives of dialkylrhodamines. Concentrated sulphuric acid is used as a condensing agent.—F. N.

Dyestuffs [*Brown, Green*] *containing Sulphur; Manufacture of* ——. J. R. Geigy and Co. Fr. Pat. 306,989, Jan. 9, 1901.

Brown dyestuffs for unmordanted cotton are formed by fusing azo dyestuffs, such as hydroxyazobenzene (20 kilos.), Orange II., or similar derivatives, with dry sodium sulphide (40 kilos.) to a high temperature (300° C. and above), without access of air, until a maximum intensity of colour is obtained. The melt can then be used directly for dyeing. The patentees further find that when *p*-nitrophenol and hydroxyazobenzene are heated with sulphur and sodium sulphide to about 200°—240° C., products are obtained which dye unmordanted cotton olive to green shades.
—T. A. L.

Dyestuffs [*Brown*] *containing Sulphur derived from m-Tolylenediamine; Manufacture of* ——. J. R. Geigy. Fr. Pat. 306,655, Jan. 16, 1901. Supplement.

In place of employing phthalic acid according to the chief specification, the patentee makes use of thiodiglycollic acid, which is readily obtained by treating salts of chloracetic acid with sodium sulphide. For the production of a dyestuff, 40 kilos. of sulphur are dissolved in an iron vessel in 120 kilos. of crystallised sodium sulphide, and 17 kilos. of *m*-tolylenediamine are stirred in, and subsequently a solution of 14 kilos. of sodium thiodiglycollate is added. The temperature is raised to 250°—300° C. until sulphuretted hydrogen is no longer evolved, and the product obtained can be employed directly for dyeing. It gives reddish-orange-brown shades on cotton from a salt bath, but these are fugitive to light. If, however, after dyeing, the fabric be treated with oxidising agents (bichromate or copper sulphate and acetic acid), yellowish-brown shades are obtained resembling cachou, which are very fast to light, acids, alkalis, and soap. In place of *m*-tolylenediamine, other products enumerated in the chief patent may be employed, but *m*-phenylenediamine only gives a weak dyestuff of a greyish shade.—T. A. L.

Dyestuffs containing Sulphur; Manufacture of Sulphonic Acids of Alkyl Derivatives of p-Amino-p-hydroxydialphylamines and of ——. J. R. Geigy. Fr. Pat. 310,809, May 15, 1901.

Indophenol (obtained by simultaneously oxidising *p*-aminodimethylaniline and phenol) is treated in presence of water with crystallised sodium sulphide, dissolved in water, and heated to about 60° C. until an almost colourless solution is obtained. On adding hydrochloric acid, a precipitate of

dimethyl-*p*-amino-*p*-hydroxydiphenylamine sulphonic acid is obtained. When this product, or one of its homologues, is fused with alkaline polysulphides, leuco compounds are obtained, which, by the action of oxidising agents (air, sodium hypochlorite, hydrogen peroxide, or persulphates in an alkaline solution, or else potassium bichromate or ferric chloride in a faintly acid solution), are converted into products which dye unmordanted cotton fast blue shades from a bath containing sodium sulphide.—T. A. L.

Dyestuff, Black, for Cotton; Production of a ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 306,876, Jan. 5, 1901.

The product is obtained by boiling in aqueous solution dinitrochlorohydroxydiphenylamine—

$$1.3.4.(NO_2)_2.C_6H_3.NH.C_6H_3.Cl.OH.1.3.4,$$

together with sulphur and an alkaline sulphide. The dinitrochlorohydroxydiphenylamine is produced by heating together in a suitable solvent, dinitrochlorobenzene—

$$(Cl:(NO_2)_2 = 1:2:4)$$

with chloraminophenol ($OH:Cl:NH_2 = 1:2:4$) in presence of sodium carbonate or acetate. The condensation product is almost insoluble in water, but readily soluble in caustic alkalis. It separates from boiling alcohol in red needles melting at 180° C. For the preparation of a dyestuff, 31 kilos. of it are added to 60 kilos. of sulphur and 150 kilos. of crystallised sodium sulphide in 180 litres of water, the whole being boiled for 10 hours under a reflux condenser. The dyestuff is then precipitated from the blackish-blue solution, either by adding salt or a mineral acid, or else by passing a current of air through it. In the latter case it is necessary to add sodium sulphide in order to obtain a clear solution. The product dyes unmordanted cotton from a bath containing sodium sulphide and salt, a deep greenish-black shade, which remains unchanged by treatment with hydrogen peroxide.—T. A. L.

Dyestuffs [Blue Black and Blue] for Cotton; Production of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 307,719, Feb. 1, 1901.

The products are azo derivatives of the alkyl ester of 3.6-diamino *p*-cresol $1.3.6.4.C_6H_2.CH_3.(NH_2)_2.OCH_3$ and Cléve acids, the resulting products being diazotised and combined with certain naphthol sulphonic acids. They may be finally diazotised on the fibre and combined with β-naphthol or *m*-tolylenediamine, yielding indigo-blue or bluish-black shades. Two methods are employed, the first of which is illustrated by the following example:—The methyl ether of acetdiamino-*p*-cresol, $1.3.4.6.C_6H_2.CH_3.NHCOCH_3.OCH_3.NH_2$, is diazotised and combined with $1.3'.C_{10}H_6.NH_2.SO_3H$; the amino-azo compound is diazotised and combined in alkaline solution with 2.1′.2′-aminonaphthol sulphonic acid, the resulting product being ultimately hydrolysed by boiling with caustic soda. This dyestuff gives blackish-blue shades on unmordanted cotton, which, on diazotisation and combination with β-naphthol or *m*-tolylenediamine, give fast bluish-black or black shades. The following example illustrates the alternative method. The methyl ester of nitro-aminocresol, $1.3.4.6.C_6H_2.CH_3.NH_2.OCH_3.NO_2$ is diazotised, combined with 1.3′-naphthylamine sulphonic acid, again diazotised, and combined with 2.3′-naphthol sulphonic acid, the resulting nitro product being reduced with sodium sulphide. The product dyes unmordanted cotton violet-grey, and, after diazotisation and combination with β-naphthol on the fibre, yields fast indigo-blue shades.—T. A. L.

Dyestuffs [Blue] of the Diphenylnaphthylmethane Series; Manufacture of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 309,104, March 18, 1901.

The basic dyestuff obtained by condensing α-dinaphthylamine with tetramethyldiaminobenzophenone, when acted on with fuming sulphuric acid (10 per cent. SO_3) at 20°—30° C., gives a product dyeing blue shades on wool from an acid bath. Further sulphonation gives redder shades. (Compare Eng. Pat. 22,456 of 1900; this Journal, 1901, 1108.)—T. A. L.

Azo Dyestuffs giving Blue Shades on Wool in presence of Copper Salts; Manufacture of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 310,410, April 30, 1901.

By sulphonating 4.2.1-chloro-aminophenol with four times its weight of 100 per cent. sulphuric acid, it is converted into a sulphonic acid, which, after diazotisation, is combined in alkaline solution with 1.1′.3.3′- (H acid) or with 1.1′.2.4-aminonaphthol disulphonic acid. The products so obtained dye wool fast blue shades from acid baths containing copper salts.—T. A. L.

Dyestuffs [Orange] of the Acridine Series; Manufacture of New ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 280,164, March 29, 1901. Supplement.

In place of condensing, as in the chief patent, benzaldehyde and β naphthol with *m*-tolylenediamine, it is now found that the latter product may be replaced by its alkyl derivatives, giving acridine dyestuffs of a redder shade. The products, heated together to about 190° C., yield leuco derivatives, which, on oxidation with ferric chloride, give dyestuffs—that from ethyl-*m*-tolylene diamine—

$$(CH_3:NHC_2H_5:NH_2 = 1:2:4)$$

dyeing orange shades on tannined cotton.—T. A. L.

Red Shades on Wool; Production of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 310,508, May 3, 1901.

These shades, ranging from red to violet-red, are produced by dyeing wool from baths containing copper salts with the azo dyestuffs obtained from diazotised *o* aminophenol, its nitro, chloro, and sulphonic acid derivatives combined with naphthol mono- or disulphonic acids.—T. A. L.

Para-chlor-o-aminophenol Sulphonic Acid; Production of a ——. Actienges. für Anilinfabr., Berlin. Fr. Pat. 311,700, June 12, 1901.

The patent refers to the conversion of *p*-chlor-*o*-nitrophenol into a sulphonic acid of the corresponding *p*-chlor-*o*-aminophenol by means of bisulphite of soda solution; for instance, 25 kilos. of *p*-chlor-*o*-nitrophenol and 100 kilos. of bisulphite of soda dissolved in 500 litres of water are boiled under a reflux condenser till a clear solution is formed, 100 kilos. of hydrochloric acid (12° B.) are added, and the sulphur dioxide is boiled off, when the new *p*-chlor *o*-aminopbenol sulphonic acid crystallises out after cooling.—F. N.

Colouring Matters Dyeing Wool Mordanted with Copper Salts, Blue Shades; Production of Monazo ——. Actiengesellschaft für Anilinfabrikation, Berlin. Fr. Pat. 311,889, June 18, 1901.

These dyestuffs are produced by diazotising the *p*-chlor-*o*-aminophenol sulphonic acid (obtained by treating *p*-chlor-*o*-nitrophenol with sulphites or bisulphites of the alkalis) and combining the diazo compound obtained with 1.8-aminonaphthol-3.6- or 2.6-disulphonic acid.—F. N.

Disazo Colouring Matters; Manufacture of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 311,963, June 20, 1901.

1·8-amino-4-sulphonic acid is treated with the molecular amount of α-diazonaphthalene in acid solution, and the azo body thus formed is combined with a diazotised *p*-chlor-*o*-aminophenol sulphonic acid. In the place of the last component, the product of the sulphonation of chlor-*o*-aminophenol, or the isomeric derivative obtained by treating *p*-chlor-*o*-aminophenol with alkali sulphites or bisulphites, may be employed.

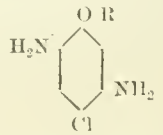
The dyestuffs thus obtained dye wool in an acid bath, yielding blacks which are moderately fast to washing, but on subsequent chroming become deeper and at the same time perfectly fast to washing and milling.—F. N.

Para-chlor-o-amino Sulphonic Acid; Production of a ——. Actienges. für Anilinfabr., Berlin. Fr. Pat. 311,700, June 22, 1901. Supplement.

This addition to the Fr. Pat 311,700, relates to the production of *p*-chlor-*o*-aminophenol sulphonic acid by heating *p*-chloro-*o*-nitrophenol with neutral alkali sulphites in a closed vessel instead of boiling with bisulphites under the reflux condenser, as described in the main patent. As an example the following is given:—26 kilos. of *p*-chlor-*o*-nitrophenol, 180 kilos. of sodium sulphite, and 230 litres of water are heated together for five hours in a pressure boiler to 150°—160° C.—F. N.

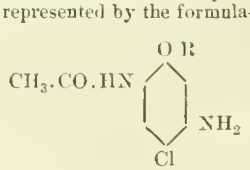
Colouring Matters [Directly Dyeing Cotton]; Manufacture of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 312,290, July 1, 1901.

The disazo colouring matters, containing as first component the alkyl ester—[R = an alkyl group]

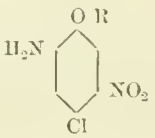


as middle component one of the two alpha-1-naphthylamine-beta-3- or beta-4- sulphonic acids—so-called Clève's acids, and as end component the beta-1-naphthol-beta-3-sulphonic acid (beta-naphthol sulphonic acid F), are valuable dyestuffs for unmordanted cotton.

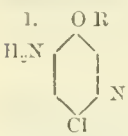
One can either start from the acetyl derivative of the said alkyl ester represented by the formula—



and finally splitting off the acetyl group, or from the nitro-amino compound—



and reducing the final disazo body with alkaline reducing agents, so obtaining disazo colouring matters of the two isomeric series, as shown in the following formulæ:—



N=N—radicle of Clève's acid—N=N—beta-naphthol sulphonic acid F.

II. Beta-naphthol sulphonic acid F —N=N—radicle of Clève's acid —N=N

For example, 24·1 parts of the methyl ether of mono-acetyl diammo 4-chlorphenol are dissolved in water, with addition of 30 parts of hydrochloric acid, and are diazotised in the well-known manner with 7 parts of sodium nitrite. The solution is run into a well-cooled solution of 24·5 parts of Clève's acid, with sufficient soda to keep the mixture alkaline. After acidifying, it is rediazotised with 7 parts of sodium nitrite, and the so formed amino-azo compound is run into a solution of 27 parts of the sodium salt of beta-naphthol sulphonic acid F, and carbonate of soda is added to keep the combination mixture alkaline. After 12 hours' well stirring and gradually heating to 50° C., the acetyl disazo compound is salted out and filter-pressed. It is saponified by heating to a moderate temperature with a solution of caustic soda. The dyestuff so obtained produces on unmordanted cotton violet-greyish shades, which, by subsequently diazotising on the fibre and combining with beta-naphthol, yield nice indigo like shades of remarkable fastness.—F. N.

Mono-azo Colouring Matters; Manufacture of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 312,496, July 8, 1901.

Nitro-aminophenol (OH : NH_2 : NO_2 = 1 : 2 : 4) is diazotised and combined with asymmetrical chlor-*m*-phenylenediamine (Cl : NH_2 : NH_2 = 1 : 2 : 4) or with symmetrical chlor-*m*-phenylenediamine (Cl : NH_2 : NH_2 = 1 : 3 : 5).

The dyestuff obtained yields on chrome-mordanted wool deep yellowish-brown shades, which, are remarkable for their fastness to light and washing.—F. N.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Hydrogen Peroxide Solutions for Bleaching; Action of Various Metals on ——. P. Lüttringhaus. Färber-Zeit. 1901, **12**, [21], 328—331.

With a view to determining the relative suitability of various materials for the construction of vessels for containing bleaching baths of hydrogen peroxide, the action upon this compound of the following metals, namely, iron, lead, copper, zinc, and aluminium was investigated. Upon a bath prepared from sodium peroxide (1 part), sulphuric acid (1 part at 66° B.), and Epsom salts (3 parts), these were found to exert a destructive action in the order given, the first having a considerable, and the last a very slight action. Upon solutions of hydrogen peroxide, obtained by dissolving together sodium peroxide (1 part) and sulphuric acid (1·3 part at 66° B.), and rendered slightly alkaline, in one case with sodium silicate, and in a second case, with ammonia, the list, in order of activity, is lead, copper, iron, zinc, aluminium.

It is assumed that the oxides of zinc and aluminium which are formed, combine with some of the alkali present, and thus reduce the alkalinity of the baths, solutions of hydrogen peroxide, it is known, being more stable when acid or neutral than when alkaline. From these results it would appear, first, that the baths should be heated by direct steam, so that the heating may be effected rapidly and the steam pipe withdrawn when not in use; and, secondly, the steam pipes should be made of copper or brass, pipes made of aluminium, as also those of stoneware and india-rubber, not having as yet been tried on an industrial scale.—E. B.

Velvet and Allied Materials. Fürth. Färber-Zeit. 1901, **12**, [22], 342.

Pleasing effects in damask velvet are obtained by printing designs on the cloth under high pressures, so that on subsequently teasling the fabric, the compressed printed portions remain smooth, whilst the remainder of the material is raised. The process is susceptible of many modifications, and four printing recipes are given as illustrations.—G. T. M.

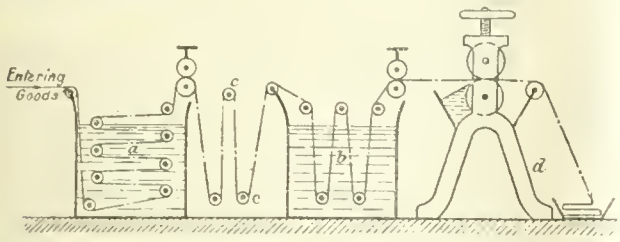
Logwood Black on Tissues prepared with Sodium Beta-Naphtholate; Production of ——. Langer. Bull. Soc. Ind. Mulhouse, Procès-Verbaux, 1901, 154.

The colour mixture contains, in addition to logwood extract and a thickening agent, chromium nitrate-acetate and a considerable proportion of potassium chlorate. This mixture is applied to textile fabrics prepared with sodium β-naphthol.—E. B.

Primuline and Similar Colours; Developing Diazotised ——. K. Mayer. Färber-Zeit. 1901, **12**, [21], 332.

A combination of the two processes of "developing" Primuline and similar dyestuffs which have been dyed and diazotised on the fibre, and of stiffening the fabrics thus treated by passing them through starch paste.

The fabric is dyed in tank *a* (see figure), cooled by running over the rollers *c*, passed through the diazotising solution in tank *b*, and the colour is developed, and the fabric simultaneously stiffened by a passage through the mangle *d*, which contains a hot mixture of, for instance, 2,000 parts of water, 120 parts of starch, and 2·5 parts of sodium β-naphtholate.



Decomposition of the diazo compound on the fabric does not occur in the hot paste, as combination with the β-naphthol is effected instantaneously.—E. B.

Calico Printing; Application of Photography in Engraving Rollers for ——. J. Dépierre. Rév. Gen. des Mat. Col. 1901, **5**, [59], 257—258.

The following method of engraving rollers for use in calico printing has been introduced into practice by Rolffs, who has patented it in Belgium:—The design to be reproduced is photographed through a screen upon a transparent film. This is then placed upon the roller to be engraved, which has previously been coated with a layer of sensitised gelatin. After exposing the latter to light, the unaltered gelatin is removed; that which remains is charred, and the roller is then etched with acid in the ordinary manner. In this way the design is obtained upon the roller in the form of a fine stipple. The slight running of the colour, aided by the pressure exerted upon this in printing, causes the impression to be quite firm and solid, all trace of the stipple being lost.

The screens employed in the process are prepared by tracing horizontal or diagonal lines to the number of five or six per millimetre upon glass plates. The lines are then filled with lampblack. Two plates, engraved exactly alike in this manner and placed together, face to face, with the lines at suitable angles to one another, constitute a screen. The latter being made exactly of the size of the plate upon which the design is to be photographed, is placed above the plate at a distance of 1½ mm., and the design is photographed. The photograph is developed, fixed, and washed as usual. The film is next stripped from the plate (transparent films unattached to glass may be used instead) and dried. It is then pasted upon the roller to be engraved, which has previously been covered in the dark with a layer of gelatin sensitised with potassium bichromate, and is smeared with grease to ensure perfect adherence to the roller. After exposure to light, the film is removed, and the roller is washed in water containing a little colouring matter—for instance, Methyl Violet—which renders the design more easily visible. The roller is next dried, and is then placed over a gas flame to char the gelatin left upon it. Lastly, it is etched as usual with nitric acid and polished.

For small designs—for instance, portraits, small pictures, &c., for which the process is especially adapted—it is necessary, on account of the frequent repetition of the design upon the roller, to produce the design upon a small die roller. This is done by the same method. The copper printing roller is then engraved as usual from a mill roller prepared from the die thus obtained.

The coating of the copper rollers or dies with the film of gelatin is a very important operation. It must be done quite uniformly. A method, patented by Macmeeke (Ger. Pat. 114,924) to this end, consists in mounting the roller upon a revolving support, and allowing the gelatin solution to drip upon the roller from a vessel which is gradually moved forward along it, the revolution of the roller being continued until the film is dry. The covering can also be accomplished by means of transfer rollers, such as are used in newspaper printing.—E. B.

Printing Coloured Grounds [Aniline Black, &c.] on Wool. H. Koechlin. Bull. Soc. Ind. Mulhouse, Procès-Verbaux, 1901, 154—155. (Sealed note deposited Sept. 10, 1890.)

Aniline Black.—The "chlorinated" woollen tissue is padded in a solution of aniline sulphate, dried, and printed with a mixture of potassium bichromate and ferric nitrate.

Indophenol Blue.—The wool, prepared as in the last instance, is padded in a solution of aminodimethylaniline and α-naphthol, and printed with potassium bichromate.

Paraphenylenediamine Brown.—This is produced similarly to Aniline Black, with *p*-phenylenediamine sulphate in place of aniline sulphate.

Grey.—"Pyrolignite" of iron is printed upon the wool prepared with gallic acid, tannic acid, or catechu.

Red and Brown.—The wool is prepared with sodium alizarate and nitro-alizarate, printed with salts of alumina and chrome respectively, and steamed for two minutes.

Reserves may be produced under certain of these grounds by means of stannous chloride (500 to 1,500 grms. per litre).—E. B.

Printing Velvets and Velveteens. Fürth. Färber-Zeit. 1901, **12**, [21], 325—328.

Velvets.—For the production of these, the tissue, before printing, is partly raised, and is scoured and bleached if necessary. It is then dyed, printed under heavy pressure with discharge colours or with Aniline Black, passed through a steam-ageing machine, washed, and dried. After this, the raising of the nap is completed, the tissue, for this purpose, being passed several times through a 14- to 24-roller raising machine. A style which has been in extensive vogue in Germany is produced by printing upon grounds dyed mostly with Paranitraniline Red or Benzopurpurin 4 B, a reserve for Aniline Black consisting, for fine patterns, of finely ground chalk (100 grms. per litre of printing colour), or, for heavier patterns, of acetate of soda (200—250 grms. per litre), and then padding on the printing machine under heavy pressure, an Aniline Black mixture, the object being to cause this to penetrate the tissue as much as possible, so that, when the tissue is afterwards raised, the red may not be seen under the black. The padded tissue is then steamed as usual, washed, and dried, and it is then raised and finished.

When basic dyestuffs on a tannic acid mordant and insoluble azo colours are employed in dyeing the grounds, the preliminary raising of the tissue must be done to a greater degree than when direct cotton dyestuffs are used, as the colours of the first two classes penetrate the tissue less than those of the last class do. It is also advisable to bleach the tissue before dyeing it with the colours of the same two classes.

Velveteens.—Owing to the difficulty in obtaining a deep penetration by the colours in the printing of velvets, the production of velveteens has come into existence. In these the requisite effect is produced by damping the tissue. This is accomplished in various ways. One of them is to use a damping machine, such as is employed in the processes of finishing, but this method has the drawback that drops of water are splashed upon the tissue. Another method is to steam, but this does not moisten the tissue enough. Mangle-padding, even when very heavy pressure is employed, leaves the tissue too moist. The best results, the author finds, are obtained by placing a padding roller in the printing machine, during the printing operation, behind the printing rollers, and padding with a solution of 1 part of Turkey-red oil (33 per cent.) in 100 parts of water, thickened with dextrin or gum tragacanth, or when Aniline Black is being printed, using a solution of 1 grm. of ammonium metavanadate in 100 litres

of water, similarly thickened. After steaming the tissues thus printed, and washing and drying them, the raising which has been partially performed before dyeing and printing, is completed. When properly carried out, this process gives a tissue which presents almost the same appearance on both sides.

Plush Velvets.—The object in the preparation of these, is to keep the print as much as possible on the face of the tissue. To this end the raising of the tissue is accomplished as much as possible before printing; the printing is done with slight pressure, and the tissue after steaming, &c., is merely slightly raised and is then finished. The same colours are employed in this as in the other styles mentioned above, with the addition of Naphthylamine Bordeaux, Diaminogene Blue, Immedial Blue, and other fast colours, for the dyed grounds.—E. B.

English Patents.

Textile Fibres; Treatment of ——, Preparatory to their Conversion into Yarn. F. V. M. Raabe, London. Eng. Pat. 21,073, Nov. 21, 1900.

The waste obtained in spinning flax and similar bast fibres after being submitted to the operations of opening and cleaning, is treated with an emulsion of a vegetable oil and alkali, thickened with Irish moss. Strong rovings capable of being spun into yarn in an easy and economical manner, are produced from the fibres thus treated.—E. B.

Bleaching of Vegetable Fibres and Fabrics. A. J. Boult. From A. Gagedois, Paris. Eng. Pat. 23,110, Dec. 18, 1900.

The process claimed consists in saturating vegetable fibre or textile materials, such as flax, hemp, grasscloth, jute, or cotton, in a liquid composed of (1) alkali peroxides (or alkaline earths acting as oxidising substances) and (2) either (*a*) soap, or salts of magnesium or of aluminium or of alkali silicates or (*b*) soap and of amylaceous or gummy or resinous or gelatinous materials. This second group of substances acts as a thickening and protecting matter for the fibre.

Example with silicate of sodium: 1—3 per cent. of peroxide of sodium; 2—8 per cent. of silicate of sodium; 2 per cent. of Marseilles soap.

Example with amylaceous materials: 1—3 per cent. of peroxide of sodium; 4—6 per cent. of starch or flour very finely ground; 1—3 per cent. of white soap.—H. L.

Dyeing Textile Materials; Machines for ——. G. de Keukelaere, Belgium. Eng. Pat. 22,776, Dec. 13, 1900.

The machine is principally characterised by a movable case intended to contain the material to be dyed; the said case being closed at the top and having perforated sheet-metal lateral walls, and in the centre a conduit formed by two perforated metal plates. A flush-joint arranged at the lower part of the case is adapted to be automatically (through the weight of the case itself) connected with the supply pipe of the dyeing fluid. A dye vat surrounds the movable case in such a manner that the free passage of the dyeing liquor across the case from the conduit to the perforated sides, is assured.—H. L.

Dyeing, Bleaching, and Finishing Textiles and Fibres; Process and Apparatus for ——. J. Skoupil, Lettowitz, Austria. Eng. Pat. 1834, Jan. 26, 1901.

Centrifugal action is employed to force dye, &c., liquors, under reduced or increased pressure, through textile materials.

The latter are placed in suitable receptacles or wrapped around a perforated drum, open at the ends and enclosed in a jacketed boiler. The liquors supplied to the interior of the drum are forced through the materials when the drum is revolved.—E. B.

French Patents.

Waterproofing of Textile Fabrics. J. Leclerq. Fr. Pat. 306,852, Jan. 5, 1901.

The fabric is rendered impermeable to water by passing it successively through an emulsion of resin soap and a bath containing an aluminium salt.—G. T. M.

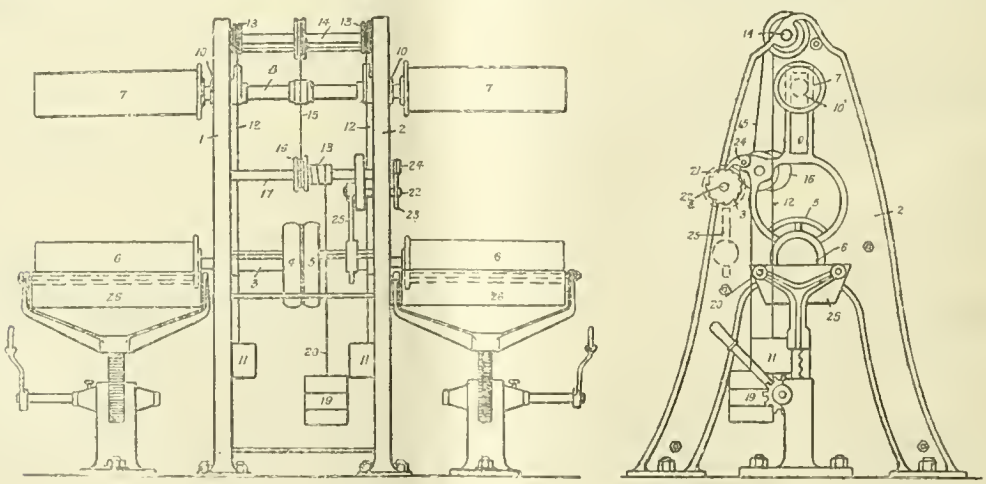
Waterproofing Textile Fabrics. P. Grend and A. Bachelard. Fr. Pat. 307,607, Jan. 24, 1901.

The dried fabrics are steeped in a waterproofing mixture consisting of paraffin, benzene, soap and alumina, and then dried at 90° C. The process may also be employed for feathers and furs. In some cases the aluminium soap is first applied in aqueous solutions and the goods, after drying, subsequently treated with benzene and paraffin.

—G. T. M.

Mercerising Cotton Yarns while Preserving their Elasticity; Method of and Apparatus for ——. A. Römer. Fr. Pat. 306,826, Jan. 4, 1901.

The object of this invention is to impart to or preserve in cotton yarns, during the process of mercerising under tension, as much elasticity as possible. This is accomplished by the employment of an elastic tension. To this end, the yarns in the form of hanks are stretched upon reels 6, 7 (see Figure), and treated with a mercerising solution and afterwards with water, while they are subjected to an elastic tension produced by suspending the upper reels 7, by means of counterpoises 11, affixed to pulleys 13, from a roller 14, and connecting the latter with a pulley 16, and from this through a chain 18, to a weight 19, the



Apparatus for Mercerising Yarns.

contraction of the yarns thus causing the reels 7, which are movable up and down, to approach the reels 6, which are not so movable, and hence causing the weight 19 to be raised. The reels 6 are revolved by means of the pulleys 4, 5, on the shaft 3. The vessels 26, which contain the solutions requisite for the treatment of the yarns are raised into position, after the yarns have been placed upon the reels, and are lowered again to facilitate their removal when the operation of mercerising is completed.

As showing the advantage of this method of mercerising, the following results are mentioned:—Samples of the same kind of cotton yarn which had been mercerised in the ordinary manner (b), and by the new process (c), were tested along with untreated yarn (a). The mean breaking strains of lengths of 50 cm. were (a) 447, (b) 544·5 and (c) 583 grms., while their mean extensibilities, for the same length of thread, were (a) 27·9, (b) 25·7, and (c) 30·2 mm.—E. B.

Cotton Velvet. Mercerisation of ——. G. G. Capron. Fr. Pat. 306,837, Jan. 4, 1901.

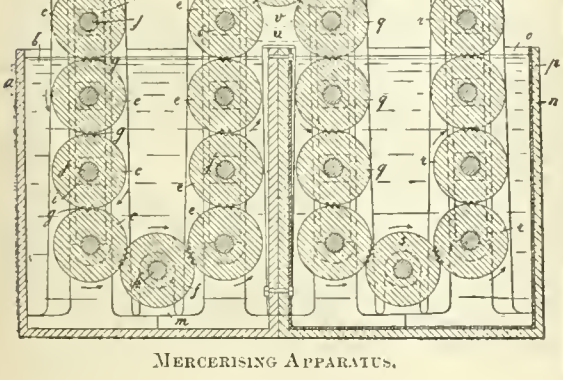
Cotton velvet, when mercerised with a caustic soda solution of density 1·375—1·385 at 10—15° C. either with pressure or with or without tension, has the lustrous appearance and texture of silk velvet. The mercerisation process is most advantageously applied to the fabric after weaving, but before cutting the raised surfaces. When this is done, the cut pile maintains its lustre throughout the subsequent operations.—G. T. M.

Cotton; Final Treatment of Colours Produced on ——. *by the Sulphur Colouring Matters.* Actienges. für Anilin Fabrikation. Fr. Pat. 307,255, Jan. 21, 1901.

Cotton goods, dyed with sulphur dyestuffs, when exposed to the atmosphere for some length of time, undergo considerable changes resulting in the tendering of the fibre. This result is probably due to the liberation of a mineral acid owing to the partial oxidation of the dyestuff. It is found that vegetable fibres dyed with sulphur colours and then treated with certain oxidising agents in alkaline solutions are not tendered by long exposure to a warm and moist atmosphere. The oxidising agents employed are sodium peroxide and hypochlorite and potassium ferricyanide, permanganate and chromate.—G. T. M.

Mercerising Cotton Fabrics; Method of and Apparatus for ——. J. R. Ecob. Fr. Pat. 308,117, Feb. 13, 1901.

The apparatus forming the subject of this invention consists of two or more tanks *a*, *b* (see Fig.), in which are placed several sets of rollers, *c*, *e*, *q*, *r*, in contact one with another, and rotated by suitable gearing. The first tank contains the mercerising agent, *e.g.*, a solution of caustic soda, the second water or a solution of acid for removing or neutralising the alkali.



Mercerising Apparatus.

The tissues and yarns to be mercerised are passed in continuous contact with the rollers through the tanks, the excess of the caustic soda solution being removed from the fabrics as they leave the first tank by the squeezing roller *w'*. In the case of tissues, the contraction in width is stated to be resisted to an extraordinary degree in this apparatus, while the selvages of the tissues are kept quite straight.
—E. B.

Mercerising Apparatus. Société B. Baffaud and T. Robatel. Fr. Pat. 309,244, March 19, 1901.

An apparatus, consisting essentially of a number of rods arranged in pairs horizontally and symmetrically one above the other on opposite sides of a frame. The rods in the lower set are fixed, while those in the upper set can be raised or lowered as required. The materials to be mercerised, namely, either yarns or tissues, are placed upon the various pairs of rods and are then treated under tension with the necessary solutions.

The apparatus is either made portable so that it can be dipped into the requisite solutions, or is fixed, in which case the latter are applied in movable vessels.—E. B.

Washing and Bleaching; Process for ——. Superolfabrik Dr. Molt and Dr. Diekhuth. Fr. Pat. 308,849, March 9, 1901.

The use of pulverulent sodium peroxide in washing and bleaching is attended with some danger, for when brought into contact with the mucous membrane of the nose or eyes, it sets up acute inflammation.

It is proposed to mould it into a suitable solid form (pastilles, tablets, or sticks) either with or without diluents, such as sodium carbonate. This compact form dissolves in water more slowly than the powder, and hence the decomposition of the peroxide is reduced to a minimum.
—G. T. M.

Scouring of Raw Silk in Mixed Silk and Cotton Goods with Mercerisation of the Cotton. The Badische Anilin und Soda Fabrik. Fr. Pat. 286,961. Additional Patent, Feb. 11, 1901.

Raw silk, either alone or interwoven with cotton, is scoured at 15°—20° C. in a bath containing 50 c.c. of caustic soda solution (40° B.), and 25 c.c. of Turkey-red oil in 1 litre of water. In this operation the oil may be replaced by an equivalent amount of oil-soap.

Mixed silk and woollen goods are scoured at 7°—10° C. in a bath containing 300 parts of glycerin, 700 parts of caustic soda solution (40° B.), and 200 parts of water, the process being continued for 2—5 minutes. The glycerin may be replaced by dextrose or Turkey-red oil. (Compare this Journal, 1900, 344.)—G. T. M.

Degumming of Raw Silk in Silk and Cotton Textile Materials, with Simultaneous Mercerising of the Cotton. Badische Anilin und Soda Fabrik. Fr. Pat. 286,961, Additional Patent. March 20, 1901.

In the master Fr. Pat. 286,961, March 18, 1899, and in the additional patents dated respectively Jan. 5, 1900, and Feb. 11, 1901 (see preceding abstract), a process of degumming raw silk is described, consisting in treating silk or cotton and silk fabrics with caustic alkali, together with glucose, glycerin, sulphoricinate, or soap. In the present additional patent, alkali sulphides are substituted for caustic soda. In the case of half silk goods, the cotton is simultaneously mercerised.—H. L.

Strong Cellulose Fibres for Replacing Silk, obtained from Cellulose Solutions in Direct Solvents. La Compagnie Française de la Soie Parisienne. Fr. Pat. 308,715, March 5, 1901.

Elastic cellulose fibres of great tensile strength and capable of replacing silk are obtained, from solutions of cellulose in zinc chloride or ammoniacal cupric chloride, when the separation of the threads is effected by moderately strong sulphuric acid (30—65 per cent. H_2SO_4). The best results are obtained at the ordinary temperature with 50 per cent. acid. The threads produced by a more dilute acid are

weaker and less pliant, whilst the employment of acid of higher concentration than 65 per cent. results in the partial disintegration of the product. (See this Journal, 1900, 436, 820.)—G. T. M.

Dyed Cotton; Process for Preventing the Tendering of ——. Manufacture Lyonnaise de Matières Colorantes. Fr. Pat. 308,238, Feb. 18, 1901.

Cotton fabrics dyed with sulphur dyestuffs (Immedial Blue, Vidal Black, &c.), and subsequently treated with acids, are prevented from becoming tendered by passage through solutions of acetates or analogous salts, the action of these compounds being to remove the free mineral acid. The acetates of ammonium, magnesium, and the alkali metals are very efficacious in this respect, but sometimes certain formates, borates, or tungstates, may be employed with advantage.—G. T. M.

Tendering of Fibres Dyed with Cotton Colours requiring Subsequent Treatment with Metallic Salts; Prevention of the ——. Farbenfabriken vorm. Fr. Bayer and Co. Fr. Pat. 309,281, Mar. 22, 1901.

The tendering of fibres dyed with direct colours requiring subsequent treatment with metallic salts, is prevented by treating the goods with dilute solutions of sodium carbonate. This process is interposed between the treatment with metallic salts and the operations of hot pressing or steaming.—G. T. M.

Fast Ingrain Dyes; Production of ——. Farbenfabriken vorm. Fr. Bayer. Fr. Pat. 307,041, Jan. 10, 1901.

2 : 4-Dichloro-1-aniline and its isomerides containing the chlorine atoms in positions 3 : 4 and 2 : 5 may be employed instead of *p*-nitraniline in producing ingrain azo-dyes, the shades of colour obtained, being very bright and fast to scouring agents. A bright greenish-yellow colour is produced on cotton dyed with Primuline, by introducing the fibre into a solution of the diazotised dichloro-aniline containing excess of sodium acetate and sodium carbonate.
—G. T. M.

Aniline Black on Wool and other Animal Fibres; Production of ——. G. Bethmann. Fr. Pat. 308,544, Feb. 27, 1901.

It is the basic character of the wool fibre rather than its reducing action, which interferes with the development of Aniline Black on woollen fabrics. The wool is therefore saturated with acid, either in solution or in the form of vapour; it may be first acidified and dried, and subsequently treated with a solution of aniline hydrochloride and potassium chlorate, or the acid and oxidising agent may be applied simultaneously. The acid is employed either in cold or hot solutions, and rather more chlorate is used than in the ordinary processes for Aniline Black.—G. T. M.

Dyeing, Bleaching, and Finishing Textile Materials; Apparatus for ——. J. Skoupil. Fr. Pat. 308,129, Feb. 14, 1901.

In one form of apparatus described, the fabrics are tightly wrapped round a revolving cylinder with perforated sides and open ends, placed concentrically in a fixed cylindrical vessel, the latter being partially jacketed, so that its temperature may be varied at will. The revolving drum may be modified so as to carry round its periphery compartments with perforated covers for containing loose articles, or it may be fitted with a concentric cylindrical cullender, so that an annular chamber is formed, within which the goods may be placed. The interiors of the revolving drum and the fixed envelope, are connected by a series of pipes with a pump, so that the liquid employed in treating the textile materials can be pumped either into the cylinder or into its peripheral chamber or compartments, thence projected by centrifugal force through the goods into the fixed envelope, and finally returning to the pump.—G.T.M.

Slubbing; A Machine for Dyeing ——. F. Desurmont. Fr. Pat. 311,755, June 7, 1901.

A machine for dyeing slubbing is claimed.—H. L.

Dyeing, Bleaching, &c. of Fibre not on Bobbins; Apparatus for ——. C. Wolf. Fr. Pat. 311,643, June 6, 1901.

The material is placed in a box perforated on all sides, which is introduced horizontally into the dye vat and fixed into position. The dye liquor is forced to pass through the material contained in the box by means of a pump.—H. L.

Dyeing Animal Fibres and Mixed Textiles with Sulphur Dyestuffs; Process for ——. Société pour l'Industrie Chimique à Bâle. Fr. Pat. 311,950, June 20, 1901.

Sulphur dyestuffs cannot be used for dyeing these materials, because the sodium sulphide necessary for the solution of the colour is liable to destroy the animal fibre. The present process consists in substituting ammonium sulphide for sodium sulphide and is preferably carried out by adding an excess of an ammonium salt to the dye bath prepared in the usual way. In most cases it is advantageous also to add carbonate of soda.—H. L.

Developing Sulphur Dyestuffs on the Fibre; Process for ——. Société pour l'Industrie Chim. à Bâle. Fr. Pat. 312,596, July 11, 1901.

The dyed materials are placed in a suitable receptacle (before rinsing) and subjected by means of a steam injector to the simultaneous action of hot moist air and of a peroxide. The peroxide may be replaced by a volatile, easily oxidisable substance, such as oil of turpentine.—H. L.

Colours for Chemical Printing. A. Hoz. Fr. Pat. 306,980, Jan. 9, 1901.

The colours employed in this printing are conveniently applied in the form of strong solutions or pastes as used in dyeing, mixed with thickening materials, such as linseed oil varnish; appropriate mordants are also added when necessary. A printing paste for blue is prepared by mixing strong solutions of Basel and Victoria Blue and chromium acetate with emulsions of Alizarin Blue SR and starch and working up the mixture into a uniform product with linseed oil varnish and animal fat. Two other examples are given for printing in red and yellow. After printing, the fabric is steamed or passed through an oxidising bath in order to develop the colour and fix it on the fibre.—G. T. M.

Indigo Printing on Wool, Silk, and Cotton. Badische Anilin und Soda Fabrik. Fr. Pat. 306,137, Jan. 21, 1901.

This process is a modification of one already described (Fr. Pat. 294,525, Oct. 10, 1900), and consists in printing on the textile fabric a mixture of indigo powder, metallic hydrosulphite, thickening material, and a solvent capable of dissolving indigo white, such as acetin, glycerin, or sulphonated castor oil. The hydrosulphite employed in the given example is the double sodium zinc salt.—G. T. M.

Printing Designs on Endless Bands of Textile Fabrics or similar Materials. A. Hoz, Rorshach, Switzerland. Fr. Pat. 300,668. Additional Certificate, Feb. 25, 1901.

The design employed in the inventor's "chemical printing" is traced in oil colours (this Journal, 1901, 985) on the clean surface of the printing cylinder from a print or tracing drawn on gummed lithographic paper; it is then made up and strengthened by the addition of a further quantity of grease covered with resin. The cylinder is then treated with an aqueous solution of acid, which attaches itself only to those parts not covered by the design.

The printing machine is fitted with two distributors, one for giving out the oil colour which is taken up exclusively by the oiled parts of the cylinder, and the other supplying water, which moistens only the clean acidified surface. The oil colours are made up with linseed oil varnish, and contain their appropriate mordants, the shades being subsequently developed, if necessary, by steaming, oxidation, soaping, or other suitable treatment.
—G. T. M.

eserves on Textile Materials Dyed with Sulphur Dyestuffs; Process for Producing ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 311,644, June 10, 1901.

HE process consists in first printing upon the cotton a aste containing salts of copper, zinc, manganese, lead, or nickel, and then dyeing the material in a cold or tepid ath. The metallic salts form an insoluble lake with the estuff, which is washed off the fibre after dyeing. If a ead salt be used, a yellow effect can be produced by passing he dyed material through a bichromate of potassium bath. —H. L.

Rollers for Printing, &c.; Process for Engraving ——. J. Dejcy. Fr. Pat. 301,054. Addit. Pat. April 30, 1901.

COPPER plates or rollers, which bear a reserve of nickel or cobalt, or of an alloy of these two metals, are placed in a bath containing a copper salt (such as copper sulphate) and subjected to the action of an electric current. The copper is attacked and engraved according to the design, while the reserve is left untouched. Similarly, iron or steel rollers and plates can be engraved by reserving a pattern with a nickel or cobalt reserve, and then passing through an electrolytic bath containing ferrous sulphate or iron salts. —H. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Ferrocyanide from Gas Liquor; Formation of ——. E. Donath. J. f. Gasbeleucht. **44**, 1901, [47], 880—881.

H. BOWER has proposed (Eng. Pat. 361 of 1896; this Journal, 1897, 129, and earlier patents) to recover the small amount of cyanogen in gas liquor by adding iron in some form, to produce a double cyanide. It is well known that gas liquor corrodes iron, especially when hot. The author has examined the scrapings from part of a liquor distilling apparatus, which had become completely rotten, and found them to consist mainly of graphite and Prussian blue. Observations at a works where sal-ammoniac was produced by directly saturating gas liquor with crude hydrochloric acid enabled him to elaborate a method for the production of Prussian blue from the cyanogen in gas liquor, applicable to works where this mode of making sal-ammoniac is followed. The yellow mother-liquor remaining after ammonium carbonate has crystallised out by the cooling of "concentrated" gas liquor, is added to crude concentrated hydrochloric acid, which contains arsenic. A muddy dark-green deposit results, consisting chiefly of Prussian blue, with some arsenic sulphide and tarry matters. On drying this deposit, and digesting it with crude concentrated hydrochloric acid, the Prussian blue dissolves. The other constituents are removed by filtering through a lambs'-wool bag. On diluting the filtrate, the Prussian blue is deposited again in a pure state. The diluted acid remaining, may be employed in the manufacture of sal-ammoniac.—J. A. B.

Aluminium Chloride with Alkali Chlorides; Compounds of ——. E. Baud. Comptes Rend. **133**, [22], 869—871.

BY melting aluminium chloride and chloride of potassium, sodium, or ammonium, in an oil bath at 270° C., compounds of the formula $Al_2Cl_6.2MCl$ were formed. The heats of formation of the potassium and ammonium compounds (26·38 and 26·53 cals.) are almost the same, and greatly exceed that (11·84 cals.) of the sodium compound; the use of the sodium compound rather than of the others, in preparing aluminium, is thus justified.

By heating the potassium or sodium compound at 500° C. with excess of alkali chloride, one more molecule of the latter is taken up, and the compounds $Al_2Cl_6.3KCl$ and $Al_2Cl_6.3NaCl$ are formed (heat of fixation of KCl 4·15, of NaCl 3·45 cals.). If the temperature be raised, and if into fused alkali chloride the calculated amount of $Al_2Cl_6.2MCl$ be projected, the compounds $Al_2Cl_6.6KCl$ and $Al_2Cl_6.6NaCl$ are formed (heat of fixation of the last 3 mols. of KCl, 6·10, of NaCl, 4·24 cals.).—J. T. D.

Hyposulphites [Hydrosulphites] of the Alkaline Earths, and of Magnesium; Electrolytic Preparation of ——. A. R. Frank, Berlin. Ger. Pat. 125,207, 1899.

THE bisulphites of the corresponding metals are electrolysed, the concentration of the solution being so chosen that the hyposulphite, being insoluble in the liquor, is deposited as it is formed (*e.g.*, calcium bisulphite solution containing 55 grms. of SO_2 per litre; 2·6—3·2 volts, 2 ampères).—J. T. D.

Metallic Salts; Action of Sodium Thiosulphate on Solutions of ——, *at High Temperatures and Pressures.* J. T. Norton, jun. Chem. News, 1901, **84**, [2191], 254; [2192], 261.

THE author first reviews previous work on the use of sodium thiosulphate for precipitating metallic salt solutions, and then gives the results of his own experiments. In the first series of qualitative tests, the metallic salt solution was heated with excess of sodium thiosulphate in a closed Pfungst tube for one hour at 140°—200° C. Under these conditions of temperature and pressure, it was found that salts of nickel, cobalt, iron, zinc, lead, mercury, silver, copper, cadmium, antimony, and bismuth are completely precipitated as sulphides; with salts of manganese the precipitation is only partial; and arsenic is not precipitated from an arseniate without the addition of acid. With stannous salts a dirty white precipitate of uncertain composition is produced. Salts of aluminium, chromium, titanium, zirconium, and thorium are completely precipitated as hydroxides, but with beryllium salts the precipitation is incomplete. Salts of selenium and tellurium are reduced, and the elements are precipitated. A second series of quantitative experiments with salts of the metals which are precipitated as hydroxides by sodium thiosulphate, confirmed the above results. Mere boiling with sodium thiosulphate for a reasonable time, without increased pressure, will not completely precipitate aluminium and chromium, but is sufficient in the case of zirconium and titanium.—A. S.

Chili Saltpetre [Nitre]; Purification of ——, *from Potassium Perchlorate.* H. Folsch and Co., Hamburg. Ger. Pat. 125,206, June 1, 1900; (through Zeits. angew. Chem. **14**, [46], 1167.)

1. THE mother-liquors from the recrystallisation of the crude saltpetre are used again till they are saturated with potassium perchlorate; when this is the case they are run off at 20° C., and cooled to 0° C., when they deposit a mixture of sodium nitrate and potassium perchlorate. The liquor from this deposit is used to lixiviate fresh saltpetre, and the process goes on till the liquor is saturated with common salt and has to be thrown away. 2. The deposit from 1 is lixiviated with water, leaving a commercially pure potassium perchlorate, and furnishing a supply of liquor for the lixiviation of fresh saltpetre, to replace that thrown away in 1.—J. T. D.

ENGLISH PATENTS.

Anhydrides of Organic Acids; Manufacture of —— H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 21,560, Nov. 28, 1900.

THE process claimed, consists in treating anhydrous acetates with gaseous chlorine and sulphur dioxide at about 20° C. in a closed vessel. The sulphur dioxide must always be present in slight excess. After completion of the reaction, the acetic anhydride is distilled off *in vacuo*. The process is applicable to other organic acids.—A. C. W.

Peroxide Preparations; Manufacture of ——. R. Wolffenstein, Berlin. Eng. Pat. 754, Jan. 11, 1901.

SOLUTION of a zinc salt, such as zinc sulphate, supersaturated with ammonia, is treated with hydrogen peroxide in slight excess, when zinc peroxide slowly separates, and may be filtered off after a few days. By adding a fixed alkali to the solution with the peroxide, sufficient to cause complete precipitation, a basic zinc peroxide is obtained, and may be dried as a stable powder, capable of yielding "as much peroxide oxygen as corresponds to a 25 per cent. solution of hydrogen peroxide." Very dilute solutions of H_2O_2 may be used in the process. Magnesium peroxide and its compounds are similarly obtained. If it be desired to obtain the zinc peroxide, for instance, in a finely-divided form, alumina may be precipitated with the peroxide; the ready-formed zinc peroxide may be dissolved in an acid or in an alcohol in which an aluminium salt is dissolved, and the peroxide and the alumina may be precipitated together by an alkali.—E. S.

Concentrating Apparatus; Improved ——, applicable to Acids, Saline Solutions, and in general to other Liquids capable of Concentration. G. C. Marks, London. From Amelie Hannetelle-Chapuis, Paris. Eng. Pat. 1393, Jan. 21, 1901.

The vessel containing the liquid to be concentrated, is provided with a hydraulically luted cover, through which pipes pass for admission of the liquid and for exit of the vapours, and centrically a vertical pipe, within which is another pipe passing into a box or caisson immersed in the liquid. The concentration is effected by the circulation of highly-heated air or of a hot liquid through the submerged box (which has corrugated sides), the air or liquid entering the space between the inner and outer pipe, and returning to be reheated through the inner pipe. When the invention is applied to the concentration of chamber sulphuric acid, the containing vessel may be made of lead-coated cast iron.—E. S.

French Patent.

Hydrated Baryta; Electrolytic Process of Manufacturing ——. A. Brocket and G. Ranson. Fr. Pat. 302,618, 1900.

See under XI. A., *page* 54.

VIII.—GLASS, POTTERY, ENAMELS.

Glass Industry; Impts. in the ——. R. Dralle and C. Dralle. Chem.-Zeit. 1901, **25**, [95], 1058.

Largely a review of facts already abstracted (this Journal, 1900, 443, 901; 1901, 124). A paper by Inwald (Diss. Berlin) dealing with the composition and properties of phosphatic glasses is also discussed; calcium phosphate is only dissolved by normal glasses at a very high temperature, and on cooling it separates, causing a turbidity; 0·25 mol. of SiO_2 is replaceable by an equivalent amount of H_3PO_4. To obtain calcium phosphate glasses at a lower temperature, easily fusible glasses containing either an excess of alkali or boric acid must be used. Normal lime-soda phosphatic glass is more soluble in water than normal lime-soda silicate glass, but the solubility is diminished by the presence of boric acid.—W. A. D.

IX.—BUILDING MATERIALS CLAYS, MORTARS, AND CEMENTS.

Portland Cement and Slag; Experiments on Mixtures of ——. P. Beck.

See under XXIII., *page* 72.

Cement; Modification of Schumann's Apparatus for Determining the Specific Gravity of ——. P. Beck.

See under XXIII., *page* 69.

Portland Cement Industry; Report on Uniformity in Analysis of Materials for the ——.

See page 12.

English Patents.

Hydrous Compounds; Process for Dehydrating ——. A. E. Cummer, Cleveland, Ohio, U.S.A. Eng. Pat. 15,153, July 25, 1901.

In this process hydrous compounds are heated till partly dehydrated or calcined, for the production of plaster, and they are then removed from the source of heat, the dehydration being completed by the heat stored up in the material, which is kept out of contact with air. An apparatus is also described for carrying out the process, consisting of crushing mills, and of elevators and conveyors for feeding crushed raw material into an inclined revolving heating chamber, and for removing it, when partly dehydrated, to bins in which the dehydration is finished.—W. C. H.

Bricks, Crucibles, Furnace Linings, and other Articles; Refractory Impervious ——. W. S. Rawson and R. D. Littlefield, Surrey. Eng. Pat. 21,483, Nov. 23, 1900.

Refractory impervious bricks, &c. by this process are made by intimately mixing finely-ground calcined magnesite, or magnesium oxide, with a highly basic borate (as calcium borate). This mixture is moistened, moulded, and baked at a high temperature. The mixture may also be made of calcined dolomite and a fusible boron compound. Lead or iron borates may be used in place of, or together with, calcium borate. The product is said to be suitable for articles which have to resist the action of molten lead oxide, &c.—W. C. H.

Building Blocks and Bricks; Manufacturing ——, and Apparatus for use therewith. Baron V. Barreto, Brandon Park, Suffolk. Eng. Pat. 16,794, Aug. 21, 1901.

Ground ashes and clinker or sand are mixed with unslaked lime, and the mixture put into a specially constructed drum, and water sufficient to slake the lime, added. Steam is generated in the process of slaking, and allowed to exert a pressure up to about 40 lb. per square inch. After a time the mass is removed from the drum, and mixed with more ground ashes, clinker or sand being also added. This mixture is then pressed into blocks, which are run into a steaming or drying chamber, where the final action upon the blocks is stated to take place.

The slaking drum is a closed cylinder mounted, not on trunnions but on rails, on which it can travel backwards and forwards when rotated by the unwinding of a cable wound round one end.—W. C. H.

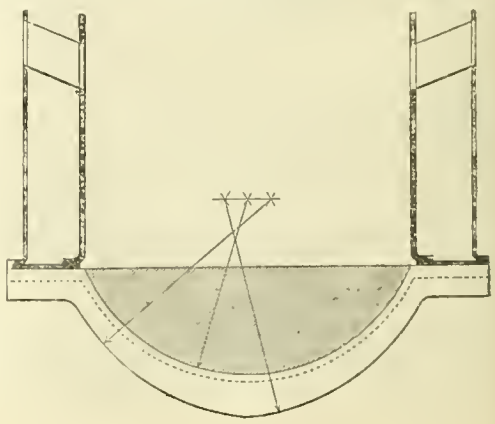
X.—METALLURGY.

Gold; Compounds of ——, with Chlorine. F. Meyer. Comptes Rend. **133**, [21], 815—818.

Liquid chlorine is condensed on gold contained in a glass tube cooled by solid carbon dioxide and acetone; the tube is then sealed, and the temperature allowed to rise. By alternately heating and cooling the tube, the whole of the gold can be converted into fine crystals of auric chloride. This chloride, on heating, dissociates into chlorine and aurous chloride; the conditions of the dissociation have been studied by the author, who shows that no compound intermediate between $AuCl_3$ and $AuCl$ exists.—J. T. D.

Chromite as a Hearth Lining for a Smelting Furnace. W. Glenn. Eng. and Mining J. 1901, **72**, [20], 637.

The author points out that as a lining for a copper-smelting cupola furnace, chromite (chromic ore) possesses the following advantages: it is not fusible; it is not attacked by the constituents, or by any of the fusion products of copper ore; it is worn but slowly by the flowing of dense fluids over it; when heated and cooled it does not become friable; and it is not subject to explosions when quickly heated to high temperatures. In the summer of 1899, at the Elizabeth Mine, Strafford, Vermont, U.S.A., J. W. Tyson constructed a chrome ore bottom for a water-jacketed cupola copper-ore furnace of rectangular form, the hearth of which is 36 by 120 ins., having 14 tuyères of 5-in. clear opening. To contain the chrome ore, and form with it the furnace bottom a cast-iron basin was made, with surrounding flange, the outer edges of which coincided with the exterior walls of the water-jacket. In the figure is shown a vertical section



passing through two of the tuyères of the water-jacket, and through one of the ribs, which strengthen the bottom. The bottom of the basin is an inverted arch of 36-in. chord and 12-in. versed sine, and 1 in. in thickness, except the flanges, which are 1·5 in. thick. It is in two sections, each of which is 5 ft. 7 ins. long. Each section is reinforced by three ribs, 1 in. in thickness and depth, by means of two of which the sections were bolted together, with an asbestos gasket in the joint. The two outer ends of the basin are closed by segments, of the form shown by the diagonally shaded part of the figure, which were cast with the sections. The chrome ore was filled into the basin, the lumps being fitted in as well as possible, then the interstices filled with smaller lumps hammered in, and finally the cracks filled with ground ore. Tyson lays stress on the necessity of the ore being well compacted and of no perishable cementing material being employed. He also recommends a course of fire-bricks being laid on end over the whole of the chrome-ore hearth, providing a depth of 8 ins. of brick to be dissolved before the fused materials could reach the chrome ore, thus permitting the hearth to heat slowly, and to "glaze over" before it could in turn be attacked. The hearth described, is stated to have suffered no appreciable degeneration down to June 1901.

The author states that his experience leads him to believe that the bridge-wall of a blister-copper furnace should be lined with blocks of chrome ore well compacted, and that the slag-line of the furnace hearth should be formed of blocks of chrome-ore, about 10 ins. in height. The larger blocks should be built into the walls, and then the smaller ones wedged in among them.—A. S.

Nickel Plating and Polishing in Revolving Drums. Électricien, Aug. 17, 1901, **22**, 101—104.

The Delval and Pascales system of plating small articles with gold, silver, nickel or copper in revolving drums is described. The special feature of the process is the commutator which supplies the current to the anode connections inside the bath. Instead of these being permanently connected to the source of the current, they are so arranged that by means of the commutator, the bars not actually touching the articles in the drum are cut out of circuit, so that any leakage of current through them is prevented.—A. S.

Aluminium; Impts. in the Metallurgy of ——. C. P. Townsend. Elect. World and Engineer, 1901, July 6, **38**, 14-15.

According to Roberts-Austen, 45 per cent. of the total expenses in the manufacture of aluminium are incurred in the preparation of pure alumina from bauxite. The author describes the processes recently patented by C. Hall. In the first, the bauxite is calcined, mixed with 8—10 per cent. of carbon, and kept in a state of fusion in a carbon-lined electric furnace, heated either by direct or alternating current. No aluminium is separated by this treatment (see Moissan, this Journal, 1895, 370), but the contained impurities are reduced, and especially in the presence of much iron, settle at the bottom of the bath as a fused ferro-alloy.

The second method is similar to the one just described, the difference consisting in the employment of metallic aluminium in the molten bath, instead of the current, for eliminating the undesirable metals. Instead of pure aluminium, a ferro-aluminium containing about 50 per cent. of each component may be used. Titanium is the most difficult element to remove, but it is pointed out that a small percentage of this element is rather advantageous than otherwise, if the aluminium is to be employed for structural purposes.

The product obtained by the above methods differs considerably from ordinary pure alumina; it is a greyish-white crystalline body of vitreous lustre, sp. gr., 3·7—3·9, and somewhat resembles corundum. According to Hall, it contains a certain proportion of a carbide and also of a suboxide (Al_3O_4).—A. S.

Alloys; The Phase Rule and the Establishment of Equilibrium in Solid ——. T. K. Rose. J. Soc. Arts, 1901, **49**, 846.

The solubilities of metals in each other rise with the temperature; above a certain temperature there is only one homogeneous liquid, and below this temperature there may be two liquids. Applying to solid alloys the law of phases, a law based on purely thermo-dynamic consideration, which was enunciated by Gibbs, then at any temperature, if the pressure does not vary and the system is in the stable state, the number of phases must in general be equal to the number of different constituents present; at certain critical temperatures, the melting point of a phase, the equilibrium is disturbed by any slight change in the external conditions, and the number of phases then becomes one more than the number of constituents present. Examples of the application of the law are given. In 1898 J. E. Stead showed that in very soft steel, containing less than 1 per cent. of carbon, the crystalline grains grow in size from 500° C. to 700° C.; above this temperature there is little change until at 900° C. the large crystals are broken up, and the iron is said to be "refined." The growth of crystals under similar conditions was observed by Charpy in 1896, in copper-zinc alloys. Ewing and Rosenhain attribute the growth of crystals to electrical action dependent on the impurities which form eutectics, with the result that material from one crystal is deposited on another. It is well known also, that strain alters the electric potential of a metal. In an experiment of Sir W. Roberts-Austen with two pieces of pure gold, this explanation could not hold, since the presence of impurity or eutectic was impossible. Reference is made to the cooling curves of electrolytic iron, and the application of the phase rule to carbon-iron alloys; in any of these alloys there are only two constituents, carbon and iron, but there are many possible phases, α, β, and γ iron, solid solutions of carbon in each form of iron and liquid solutions of various composition. Cementite, ferrite, martensite, graphite, and probably diamond, are all phases which have been recognised; perlite is a mixture of ferrite and cementite; in general only two of these can exist at one temperature and pressure; at temperatures below 1000° C. these alloys must consist either of carbon-iron solution and graphite, or carbon-iron solution and cementite; probably, as suggested by Stansfield, the former constitution obtains at low pressures, the latter at high pressures.—J. W. H.

Separation of Solids which differ in Specific Gravity. J. W. Hinchley.

See page 10.

Crucible Furnace for Laboratory Use; Electric-Resistance Magnesia ——. H. M. Howe.

See under XXIII., *page* 69.

Iron Works Products; Determination of Sulphur and Phosphorus in ——. U. Antony.

See under XXIII., *page* 71.

Steel; Determination of Silicon in ——. G. Auchy.

See under XXIII., *page* 71.

Antimony; Volumetric Determination of ——. O. Petriccioli and M. Reuter.

See under XXIII., *page* 73.

Cyanides and Cyanates; Reciprocal Determination of —— J. W. Mellor.

See under XXIII., *page* 71.

English Patents.

Welding Metals. H. Goldschmidt, Essen, Germany. Eng. Pat. 20,894, Nov. 19, 1900.

The metals to be welded are fixed in position but with a small space between them. A mould is formed around the joint and molten iron produced by the process described below, is then cast upon them so as to fill the joint. The process referred to is as follows:—To a mixture of aluminium and oxide of iron (the latter chemically as pure as possible) oxide of manganese, oxide of chromium, or tungstic acid may be added; this is brought to reaction by means of igniting pellets. After the reaction is completed, the contents of the crucible consist of a layer of molten alumina floating on the top of highly heated smelted iron. First

the molten alumina is removed and then the highly heated iron is cast between the carefully cleaned welding surfaces which are now pressed together. As soon as the metal is congealed, it is put under a certain pressure, so as to gradually cool down under compression. After the mould has been removed, the joint may be still exposed to a finishing operation which consists in flattening and smoothing the same. Under certain circumstances, it is of great advantage to choose the mould so as to obtain ribs around the joint after the casting has been completed.—J. H. C.

Magnetic Separation of Pulverised Ores. A. F. Spooner. London (from the Magnetic Ore Separating Co. Proprietary, Ltd., Melbourne, Australia). Eng. Pat. 18,102, Sept. 10, 1901.

The pulverised ores are passed in a shower through a heated chamber, then cooled in a water bath or otherwise, sized if necessary, and magnetically separated.—J. H. C.

Copper Extraction by the Wet Method. T. A. Irvine, Hornsey. Eng. Pat. 20,702, Nov. 16, 1900.

The ore after crushing is treated with a solution containing 4 oz. of chloride of sodium and one fluid oz. of sulphuric acid to each gallon. The process may be accelerated by the application of heat or by the addition of peroxide of manganese. The copper is thus brought into solution and may be afterwards precipitated in any convenient way.
—J. H. C.

Filters, for Liquids containing Copper or other Finely-Divided Matter. J. G. Lorrain, London (from G. Thompson, U.S.A.). Eng. Pat. 23,811, Dec. 29, 1900.

A floating filter is employed having a perforated bottom covered with flannel.—J. H. C.

Zinc free from Lead; Process for Obtaining ——. E. H. Hopkins, London. Eng. Pat. 22,554, Dec. 11, 1900.

The mixed oxides of zinc and lead such as are obtained by roasting sulphide ores are heated with carbonaceous matter in a closed retort, and the vapours are passed through a filter of incandescent carbon whereby the zinc is obtained in a state of purity, while the lead remains with the carbon and may be removed by blowing or sifting.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Electrolytes; Potential Differences in Vapours and in some Solid ——. R. v. Hasslinger. Monatsh. für Chem. 22, [9], 907—916.

The author has measured a number of potential differences between metals and the vapours of certain salts, sprayed into a Bunsen burner in the form of solution. The most remarkable result observed was that iron or nickel assumed a positive potential towards platinum. Further experiments showed that the E.M.F. varied with the temperature. In some cases a maximum value is reached which then diminishes to zero as the temperature is further raised, and finally changes in sign. This phenomenon is well marked with lithium chloride vapour and with the solid electrolytes, lime and magnesia.—J. S.

Cobalt and Nickel; Electrolytic Method of Extracting ——. Le Roy. Bull. Soc. Ind. de Mulhouse, Procès-Verbaux, 1901, 154—155.

The method, which is applicable to the treatment of certain ores found in New Caledonia, is based upon the solubility of the monoxides of cobalt and nickel at the moment of their formation and the relative insolubility of the oxides of iron and manganese in ammoniacal solutions of ammonium salts.—E. B.

Barium; Preparation of ——. Guntz. Comptes Rend. 133, [22], 872—874.

Barium amalgam, obtained by electrolysing barium chloride solution with a mercury cathode, was placed in an iron boat in a porcelain tube surrounded by a platinum spiral and well jacketed with asbestos. By passing an electric current through the spiral, the tube was very gradually heated to about 1150° C. The mercury was thus completely distilled into the cooler parts of the tube, and a residue of metallic barium was left in the boat. The metal is silver-white, not quite so soft as lead, fusible at dull redness and very volatile at bright redness. It oxidises rapidly in air and often takes fire. Metallic barium decomposes water and alcohol, and forms with liquid ammonia a metal-ammonium similar to the corresponding lithium and calcium compounds.—J. T. D.

Sugar Juices; Purification of ——, by Electro-dialysis and Ozone. G. Schollmeyer. Austrian Pat. 3101, 1900.

See under XVI., *page* 57.

English Patent.

Electric Batteries [Electrode-retaining Blocks]. G. W. Johnson, London. From The Société Paul Chapuy and Co., Paris. Eng. Pat. 2853, Feb. 9, 1901.

The electrodes, which may be of any preferred description, are embedded in retaining masses or blocks made of a ceramic substance or substances not acted on by the electrolyte, and mixed with a granular or divided material, which is volatilised or burnt during the baking at a high temperature, leaving pores or interstices in the block. Strips or distance pieces of insulating material are inserted between the blocks, leaving small free spaces between them, which allow any particles detached from the block or the electrode to fall to the bottom of the cell, thus avoiding slow discharge or short circuiting.—G. H. R.

French Patents.

Hydrated Baryta: Electrolytic Process of Manufacturing ——. A. Brochet and G. Ranson. Fr. Pat. 302,618, July 31, 1900. Addition, Jan. 21, 1901.

Claim is made (1) for a process for extracting barium hydrate from a solution of barium sulphide containing barium chloride or other barium salt, by means of electrolysis in a cell fitted with a diaphragm; the baryta formed is, in this case, separated by cooling the solution; (2) for extracting baryta from barium sulphide solution by electrolysis, the cathode compartment containing sodium chloride, so that the baryta is precipitated as it is produced by the soda yielded by the sodium chloride. (3) The use in these two processes of attackable metallic anodes, with or without a diaphragm, thus giving, besides baryta, the sulphide of the metal of which the anode is composed.

In the addition to this patent, dated Jan. 21, 1901, claim is made for the combination, in an electrolytic process, with or without diaphragm, for the manufacture of the alkaline-earth bases, of: (1) The sulphide of an alkaline-earth base with the corresponding chloride; in this way the base is obtained at the cathode and sulphur at the anode. (2) The same mixture as in (1), with the use of insoluble anodes, so as to yield at the anode sulphur more or less mixed with alkaline-earth sulphides and sulphates. (3) The same mixture, using soluble anodes, by which means an insoluble metallic sulphate is obtained at the anode. (4) The same mixture in the anode compartment, with an alkali chloride replacing in part the alkaline-earth chloride in the cathode compartment, giving at the anode sulphur or an insoluble sulphide, according as the anode employed is insoluble or soluble. In cases (2), (3), and (4) the alkaline earth is obtained at the cathode.—T. H. P.

Sugar; [Electric] Process for the Extraction of —— Count Schwerin (Botho). Fr. Pat. 309,792, 1901.

See under XVI., *page* 59.

Vanillin: Manufacture of [by an Electric Process] ——. G. Vigne. Fr. Pat. 310,983, May 11, 1901.

See under XX., *page* 68.

(*B.*)—ELECTRO-METALLURGY.

ENGLISH PATENT.

Metals; Process for Electrolytically Precipitating and Simultaneously Amalgamating ——. [*Rotating Cathode.*] W. S. Henneberg and E. C. H. Pape, Hamburg, Germany. Eng. Pat. 19,068, Sept. 24, 1901.

A ROTATING drum, whose cylindrical surface forms the cathode, is enclosed in a vessel lined with non-conductive material, and provided with a layer of mercury at the bottom of such depth that all parts of the cathode surface come into contact with it on the rotation of the drum. An anode surface is provided in the upper part of the vessel, concentric to the cathode drum, and in the annular space between, and resting on the mercury, is the solution from which the metals are to be precipitated on the cathode. The precipitate is then wholly or partially dissolved by dipping the cathode in the mercury bath and is thus amalgamated.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Tallows and Oils; Physical and Chemical Constants of Russian ——. A. A. Shukoff. Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [11], 229, and [12], 250.

Russian Tallows.—The tallow industry has been completely revolutionised during the last 70 years. In 1830 nearly 65,000,000 kilos. were exported, whereas in 1900 19,040,000 kilos. were imported, and only 944,000 kilos. exported.

Russian tallows are characterised by their high solidifying points. Thus St. Petersburg tallow solidifies at 45°—46° C., and bone-fat at 41°—42° C.

The following varieties are known in commerce:—

Benzine [*Petrol. Spt.*] *Bone Fat* (*St. Petersburg*) is a very pure fat containing 0·65 to 1 per cent. of water.

Benzine Bone-Fat from South Russia is usually very impure, and often contains calcium soaps. Water and impurities, 3 to 4 per cent.; titre, 40°—42° C.; free acids, 30 to 40 per cent.

Benzine Horse Bone-Fat contains 3 to 4 per cent. of water and impurities; titre 38·2° C.

White Natural Bone-Fat (*St. Petersburg*) is produced by the gelatin factories. It contains water and impurities, 0·3 to 1·5 per cent.; free acids, 20 to 30 per cent.; titre, 40°—45° C.

Leather Fat (*St. Petersburg*) contains 2 to 4 per cent. of water and impurities; titre, 37·6°—38·9° C.

Town Tallow II. A. (*St. Petersburg*) varies greatly in quality. Water and impurities, 1 to 3 per cent.; titre, 39·3°—43·2° C.

Town Tallow I. A. (*St. Petersburg*). — Water and impurities, 0·5 per cent.; titre, 45°—46·6° C.

Orenburg Mutton Tallow, termed "coutir" or "courduque." obtained from sheep's tails. Water, 0·83 per cent.; titre, 42·4° C.

Southern Mutton Tallow.—Water, 0·41 per cent.; titre, 46·8° C.

Elk Tallow is not met with in commerce. It has the following characteristics:—Water, 0·52 per cent.; titre, 46·7° C.; iodine value, 35·9; saponification value, 200; free acids, 1·8; and unsaponifiable matter, 0·23 per cent.

Physical and Chemical Constants of Russian Oils.—The following table gives the chief results obtained by the author in the examination of some vegetable oils:—

Oil.	Sp. Gr. at 15° C.	Free Fatty Acids.	Saponification Value.	Iodine Value (Waller).	Solidification Point of Fatty Acids.	Unsaponifiable Matter.
		Mgrms.			° C.	Per Cent.
Cameline	0·927	4	155	152—153	17—18	..
Hempseed	0·931—0·933	0·45	192—194·9	157—166	16	1·07
Colza	0·916—0·919	0·95—9·5	94·3—110·4	175·5—181	13·5—16·5	..
Cotton seed (Samarkand)	0·923—0·926	0·25—7·8	192—194·5	112—116	32—33	..
Linseed	0·935—0·936	..	..	171—179	..	..
Mustard seed	0·920	0·14—0·18	181—181·9	114·9—120	13·4—13·7	..
Walnut	0·923	..	192·1	128	14·3	..
Cedar nut	0·928	..	193·7	143·8	11	..
Poppy	0·925—0·926	..	193—194	131	17—19	..
Olive, Persian	0·9199	8·0	190·8	85	21·8	..
,, Crimea	0·918	0·69	186	82·3	..	..
Castor, medicinal (cold expression)	0·9655	0·41	178	84	..	..
Safflower	0 927	..	195·4	141·6	..	..
Sesamé	0·924—0·926	0·1—4·3	188—190	111—115	23·4	..
Soja bean	0·924	0·13	190·6	124	24·1	..
Sunflower	0·924—0·926	0·13—0·14	191·7—193	136	19·4—19·8	..

See also under Trade Report, *page* 81.—C. A. M.

"Vegetable Butter": A Substitute for Cacao-Butter. G. Possetto. Giorn. di Farm. Chim. 1901, 337; through Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [11], 233—234.

THE title of "vegetable butter," or "cacao-butter S," is given to a commercial substitute for genuine cacao-butter, which is sold in blocks of about 2 kilos. or in flat cakes wrapped in tinfoil. The fat has a faint tallow-like smell and taste. It behaves almost like cacao-butter towards alcohol and ether, and shows the following constants:—Melting point, 34°—35·5° C.; iodine value, 7·8; saponification value, 237·0; Reichert value, 5·50; and free acids, 0. It is partially soluble in hot 95 per cent. alcohol, and, on rapidly cooling the solution, a white semi-crystalline precipitate is deposited, which gives physical and chemical constants almost identical with those of Japan wax. The author came to the conclusion that the product consisted of 70 to 75 per cent. of cocoanut oil and 25 to 30 per cent. of Japan wax.—C. A. M.

Oils for High-Speed Machinery; A New Method of Testing the Value of Lubricating ——. W. Jour. Franklin Inst. 1901, **42**, [5], 329. From the Engineering Mag.

A NEW apparatus is described for testing the value of oils for journal bearings. The vertical spindle of an electromotor is provided with a foot-step bearing to receive the oil to be tested; the speed of the motor and the pressure on the foot-step bearing are capable of control; the spindle is entirely surrounded by an oil chamber, which is in turn jacketed to prevent the escape of heat. The apparatus has shown that many oils which give excellent results at moderate speeds, work badly at over 3,000 revolutions per minute. Within certain limits, higher speeds need oil of greater viscosity.—J. W. H.

Japan Wax; Abnormal Constants of ——. O. Bernheimer and E. Schiff. Chem.-Zeit. 1901, **25**, [91], 1008.

THE authors have examined a number of commercial samples of Japan wax, and state that they have obtained values differing considerably from those commonly accepted

for a pure product. Thus in four cases they obtained the following results, which they compare with the normal figures as given by Lewkowitsch:—

——	1.	2.	3.	4.	Normal Values.
Acid value.....	12·28	11·8	14·0	13·7	20
Saponification value	220·00	220·3	222·1	221·0	220—222
Iodine value.....	10·56	10·8	11·3	10·6	4·2
Melting point.....	53° C.	52·6° C.	53·4° C.	53·2° C.	48—55

—C. A. M.

Fats; Indicator in the Titration of Dark-coloured ——. J. Freundlich.

See under XXIII., *page* 75.

Oils, Drying and Marine Animal; Differentiation of ——. G. Halphen.

See under XXIII., *page* 74.

Body-Colour Oils; Use of Chinese Wood (Elæococca) Oil (Tung Oil) in the Manufacture of ——. L. E. Andes.

See below.

Oils obtained by Destructive Distillation of Animal Matters. S. J. Levites.

See under III., *page* 35.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Body-Colour Oils; Use of Chinese Wood Tung Oil (Elæococca) in the Manufacture of ——. L. E. Andés. Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [12], 252—253.

For some time past, products known as "hard-drying oils," "rapid oils," &c. have been sold. These have the property of drying in a relatively short time when mixed with body colours. They are essentially very thin varnishes composed of copal, drying oil (usually boiled linseed) and turpentine. The colours mixed with them dry very rapidly, but are wanting in lustre and require subsequent varnishing.

When Tung oil became more commonly known, attempts were made to use it in place of these products, but although it dries rapidly, it has the drawback of becoming moist and of separating from the surface on which it has dried. To render it suitable for the purpose, special treatment is necessary. It is first heated for two hours at about 170° C. in an enamelled boiler, and allowed to cool slowly and to stand for several days. The clear oil is then withdrawn, and the lower layer used for inferior paints. The clear oil is again heated at 180° C., with the result that it becomes fairly thick after an hour. It is then cooled to 130° C., and 2 per cent. of powdered litharge gradually sprinkled in, after which the requisite amount of turpentine to thin the oil to the right consistency, is added, and the product stored and left to clarify.

A good body-colour oil should have the consistency of ordinary linseed-oil varnish, and when incorporated with a body colour should dry within 5—6 hours. The dried paint can receive a coat of varnish which will dry without affecting the layer beneath it.—C. A. M.

English Patents.

Paint for the Coating of Bottoms of Iron and Steel Vessels and other Submerged Surfaces for the Prevention of Corrosion and Fouling; A Quick-drying Liquid Cement ——. W. Ward. South Shields. Eng. Pat. 21,061, Nov. 21, 1900.

The paint for the first coating contains 11 ingredients, the medium consisting of amber resin, gum kauri, Stockholm tar or pitch, pine varnish or oil, coal tar, naphtha or other spirit and turpentine; the poisons used for the second coating, which has 13 ingredients, are the oxides of copper, antimony and mercury, mineral green, and carbolic acid.

—J. W. H.

Pigments; Manufacture of Composite Colouring Matters or ——. A. Thilmany, Düsseldorf, Germany. Eng. Pat. 11,533, June 5, 1901.

Lithophone (a precipitate of zinc sulphide and barium sulphate) or zinc white is mixed with dextrin, gelatin, albumin, &c. in suitable solution, and treated before or after drying with an organic dyestuff in solution; a mordant such as alum or aluminium acetate may also be used.

—J. W. H.

(*B.*)—RESINS, VARNISHES.

English Patent.

Coating Surfaces; Composition for ——. C. Lean. London. From A. Wolf, Paris. Eng. Pat. 15,204, July 26, 1901.

Equal parts of stearine and resin are melted together, and a little bitumen, benzoin, and creosote added as hardening agents.

The composition may be used for coating porous materials and for decorative purposes by the addition of pigments.—J. W. H.

(*C.*)—INDIA-RUBBER, &c.

Mangaba Rubber. E. Ackermann. Chem.-Zeit. 1901, **25**, [93], 1038.

This substance, derived from Araguaya in Para (North Brazil) has many of the properties of Para-rubber, and is obtained from the milk-juice of a bush called Mangabeira, which grows on the Para side of Toeantin and Araguaya, between Itaeunga and Tapirape amongst the plain vegetation. The juice is abundant, is easily collected and is heated in earthen vessels to obtain the solid product. The rubber is little known and has not yet found a market. It may be bought locally for about 1 mark per kilo.

—R. L. J.

India-Rubber; Artificial ——, from Isoprene. G. Bouchardt. Gummi-Zeit. 1901, **16**, [8], 133—134.

Isoprene (1 part) and hydrochloric acid saturated at 0° C. (12—15 parts) were sealed in a tube and placed in a freezing mixture. A definite reaction, attended with evolution of heat, ensued on shaking the tube, which was then left for 2—3 weeks at the ordinary temperature. The contents were then diluted and distilled so long as oily drops were observed in the condenser. The residue, purified by long boiling with water, solidified to a substance of the composition C, 87·1; H, 11·7; Cl, 1·7; which had all the properties of rubber and gave similar distillation products.

—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Chamois Leather; Manufacture of ——. Leather Trades Rev., Nov. 13, 1901, 833—834.

The inner or flesh side of sheep skins, technically called "linings," are put into lime pits for a period of 10—14 days, being laid up at the side of the pits for five or six hours each day, and are then levelled by the "frizer" with a very keen knife over the beam. Most of the lime is removed by a bran dreneh, which gives the skins a firm, leathery feel, and they are then squeezed in a press until water ceases to ooze from them. The remaining moisture is evenly distributed by milling or stocking for about an hour, and the skins, after being freely sprinkled with cod oil, are milled for three or more hours, the remaining lime being thus converted into a soap. The skins are then dried by a current of air for a day or more according to the season, and the following day are stocked, again sprinkled with oil, and milled for three or more hours. The skins now pass through a series of stoves, starting with a

temperature of about 100° F., where they dry up to a brownish colour, the stage being known as "first drying upper." The process of stocking and drying is repeated several times until the final drying operation called heating, is reached, when the skins are hung close together by the necks instead of apart and by the hind shanks. The temperature of the final stove is 150°—160° F., from which the skins are rapidly removed whilst hot, packed into bins and covered with matting to keep in the heat. The spontaneous heating which now ensues is one of the most delicate stages of the manufacture and requires constant watching day and night to avoid burnt leather, whilst it fails altogether if the quantities packed are too small to heat properly. In all these latter stages irritating vapours (acrolein) are evolved, from which the eyes of the workmen must be protected. The leather which if properly heated is dark brown in colour, is spread out to cool before the final treatment. The skins are first soaked in water at about 110° F., pressed to remove the major portion of the oxidised oil (sod-oil) and then washed at about 120° F. in an alkaline paddle-bath containing soda-ash (4 lb.) and soda crystals (2 lb.) for every 10 dozen skins. After about two hours the leather is washed with clean water at 130°—140° F., and then liquored in a mixture of cod-oil (10 lb.), soft soap (20 lb.), and boiling water (7 gallons). The goods are passed to the wringing machine or hydro-extractor, and then dried in sheds by air or artificial heat. "Fleshers" or heavier linings require longer treatment and more extensive washing.—R. L. J.

Lactic Acid in the Tannery. Leather Trades Rev., Nov. 13, 1901, 832—833. From Der Ledermarkt.

Lactic acid occurs naturally, together with acetic acid (*a*) in the bating of limed hides, where its function is to remove lime, (*b*) in the liquors of the tanpits and "layaways," where it materially assists in the absorption of tannin by its plumping action on the hides. The extracts and other materials used in modern tanning, form organic acids less rapidly than did the older materials, and whatever the agents employed, time and somewhat exact conditions of temperature are all important for the due development of such acid by natural means.

It has become the practice therefore to add ready made acid. Mineral acids require extreme care and knowledge or may produce very serious damage, whilst lactic and acetic acids, are attended with little danger. The latter, which is chiefly obtained by dry distillation of wood, is liable to contain coal-tar derivatives of an antiseptic nature, and these interfere with the natural fermentation process which the acid is intended to supplement. Lactic acid has accordingly come to the front, especially in America, where for some time it has been almost the only substance for deliming and bating hides.—R. L. J.

Adhesives [Glue]; Impts. in ——. L. E. Andés. Chem.-Zeit. 1901, **25**, [95], 1061.

A new method for preparing glue (Amer. Pat. 660,379) consists in cooling a hot solution of glue under pressure until it becomes gelatinous and then forcing it out into rods which dry in the process. Bornträger (Oesterr. Chem.-Zeit. 1900, 515) suggests the following method of preparing a liquid adhesive:—To 250 grms. of strong glue dissolved in 1 litre of hot water, 10 grms. of barium peroxide in 5 grms. of sulphuric acid, of 76° B., and 1·5 grms. of water are added, and the mixture warmed during 48 hours at 80° C. Sulphur dioxide is evolved, and a clear, non-gelatinising syrup, which does not ferment with time, is obtained; it has great adhesive power, and can be used, when dried in strips, as a substitute for gum arabic. Hydrogen peroxide or sodium peroxide should be used for bleaching glue. Oxygen in the nascent state destroys the odour of glue and its gelatinous nature. Glue has a strongly acid reaction, due to the presence of acetic, lactic, and butyric acids, and only gelatinises when acid or neutral; in presence of alkali it does not gelatinise, but decomposes more rapidly than usual.—W. A. D.

English Patent.

Tanning; Process of Quick ——. C. Brandt, Austria. Eng. Pat. 20,612, Nov. 15, 1900.

This process consists in immersing the hides as they come from the lime pit, in a weak solution of picric acid, and afterwards in a strong tanning liquor.—J. L. B.

XV.—MANURES, Etc.

Manures, Artificial; Methods of Analysis of ——. F. Kretschmer.

See under XXIII., *page* 74.

Defecation Scums [Fertiliser]; Process of Drying ——. G. Gropp. Ger. Pat. 116,760, Aug. 31, 1899.

See under XVI., *page* 58.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Juices; Purification of —— *by Electro-dialysis and Ozone.* G. Schollmeyer, Dessau. Austrian Pat. 3401, March 6, 1900.

This process consists is submitting the saccharine juices to the simultaneous action of electro-dialysis by means of either soluble or metallic electrodes and of a finely-divided stream of ozonised air.—T. H. P.

Sugar Juices; Process for Decolorising ——. I. Kitsée. Austrian Pat. 4530, Oct. 17, 1900.

Sugar juices are decolorised by treatment with chlorine gas, and the chlorine is removed by olefiant gas.

—L. J. de W.

Sugar; Density of Dissolved ——. A. Demichel. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **19**, [3], 287—289.

Denoting the weight of a litre of sugar as G grms., and assuming it to contain S grms. of sugar, it follows that the weight of water is G—S grms.

Let x be the specific gravity of the sugar in solution, and a that of the water at the temperature of the experiment, then $\frac{S}{x}$ is the volume occupied by the sugar, $\frac{G-S}{a}$ is that of the water, and the whole forms 1,000 c.c.

Hence $x = \frac{\frac{a}{1,000\,a - G}}{\frac{S}{S}} + 1$ .....(1).

Barbet, in 1879, applying similar reasoning, gave to x the value 1·595, which is that of solid sugar, assuming that it retained this value in solution. On making a calculation on solutions of sugar of different strengths, he found a contraction, which was a maximum at 42·7 per cent., became zero at 78 per cent., and then changed to an expansion of the solution. The German commission on standards found a density for sugar in solution of 1·55625, which also gives a contraction, with a maximum at 62·6 per cent., but no dilatation. We are, however, quite ignorant of the density of sugar in solution, and both calculations are wrong in basis. For let x be constant in equation (1) and it will follow that $\frac{1,000\,a}{S} - \frac{G}{S}$ will also be constant, or $1,000\,a - G = -KS$, for G is greater than $1,000\,a$. This gives $G = 1,000\,a + KS$, that is, the specific gravity of sugar solutions increases proportionately to the sugar they contain. It has long been known that this is not the case; we must, therefore, conclude that the specific gravity of sugar in solution varies with that of the solution. On applying the densities compared with water at 15° C., taking the percentages of sugar from Windisch's tables, and writing $\frac{x}{a}$ and $\frac{G}{a}$ as d and D, and putting S for $\frac{S}{a}$, which does not introduce any sensible error, we have $d = \frac{S}{1,000 - D + S}$. A table calculated from this formula for solutions of sugar varying from 2·6 grms. to 1,030

grms. of sugar per litre, shows that the density first increases from 1·59 to 1·63, and then decreases to 1·59; that is, it becomes sensibly equal to that of solid sugar in saturated solutions.

It may be asked if the variation is real and not simply the result of the method of calculation employed. The latter is more probable, since solution is possibly not a simple phenomenon as the equation assumes, but a partial decomposition or dissociation.—L. J. de W.

Defecation Scums; Process of Drying ——. G. Gropp, Niezychowo. Ger. Pat. 116,760, Aug. 31, 1899.

The process claimed, consists in drying the defecation scum from sugar factories by mixing it with quicklime, with which part of the water combines, forming calcium hydroxide, whilst the remainder evaporates. In this way the scums are converted into an impalpable powder, easy of transport, and further, their fertilising value is increased by the presence of the calcium hydroxide; fermentation is also avoided.—T. H. P.

Reducing Sugars; Nickel Salts as Reagents for ——. Duyk.

See under XXIII., *page* 74.

Degree Balling [Sugar Solutions]; New, Rapid, and Exact Method for the Determination of the ——. J. Kovar.

See under XXIII., *page* 75.

Maize Starch; Manufacture of ——. G. Archbold.

See page 4.

Starch in Cereals; Determination of ——. L. Lindet.

See under XXIII., *page* 75.

English Patents.

Charcoal of Great Decolorising Power [Sugar]; Process for Manufacturing ——. R. Ostrejko. Latkurry, Russia. Eng. Pat. 18,040, Oct. 10, 1900. Also Fr. Pat. 304,807, Oct. 24, 1900; and additional Pat. Jan. 12, 1901.

A mixture of carboniferous substances and compounds of the metals of the alkaline earths or magnesium group is ignited in the moist state, air being excluded, and the resulting carbon washed with hot dilute hydrochloric acid and finally with water. Examples of the mixtures used, are wood shavings or ground coal and slaked lime with a sprinkling of water. The paste, intimately mixed, is subjected to dry distillation. Where lime has no injurious action, the carbon obtained may be used directly for purification, otherwise the lime is dissolved out by acid, the carbon washed with water and dried. Its decolorising power, which is considerable, may be increased by again igniting it. Instead of lime, crude calcium acetate or calcium chloride may be used, and starch, naphtha residues, and pitch, including the pitch separated from sulphuric acid used to purify mineral oils, when it is diluted to 90° B., may be used as carboniferous substances.

The decolorising power tested on caramel solution, shows that the charcoal is 10 times as efficacious as bone charcoal, and 50 to 60 times as ordinary wood charcoal.

The use of the process is claimed for the regeneration of charcoal, and for regenerating sulphuric acid used for purifying mineral oils or in analogous industries, and the use of the charcoal for purifying pyroligneous acid and sugar juices.

In the additional patent, the carboniferous substances in the moist state, during the dry distillation, are submitted to the action of gases or vapours (as water vapour or carbon dioxide), which have no injurious influence on the carbon produced. The gases or vapours may be introduced into or generated in the retort.—L. J. de W.

Sugar Juice and other Liquids; Continuous Defecators for the Clarification of ——. R. Harvey, Glasgow. Eng. Pat. 21,256, Nov. 24, 1900.

This system of continuous defecators is mainly designed for use in combination with the mangano-electro-chemical process of defecation. The plant consists of a series of vertical defecators arranged in steps. The liquor enters the lower chamber of the first vessel and is kept in oscillating motion by means of a vane or "punkah" worked from the outside. In its upward course through the vessel it passes between a series of vertical, parallel zinc plates, suitably insulated from the sides of the vessel and forming the electrodes for the electrical defecation. From the top of the first vessel, the liquor is led down to the bottom of the next, and so on throughout the series. Valves are fitted to the bottoms of the vessels so that any of them may be cut off for cleaning purposes.—J. F. B.

Sugar; Improved Crystallisation Process, especially applicable for Use in Manufacture of ——. M. Lambert, Toury, France. Eng. Pat. 18,958, June 14, 1900, and addition to Fr. Pat. 301,251, Nov. 26, 1900.

The object of the invention is a process applicable to the crystallisation of all kinds of material used in chemical and other industries, and especially of sugar. The principle is that of successive crystallisations and remeltings for the purpose of obtaining crystal masses of increasing purity.

This rapid crystallisation process consists in allowing the mother liquor to be drained off from a crystalliser, and continuously circulating the liquor obtained by melting the crystals through the crystallisers and a reheater until the required degree of concentration is obtained. The liquor is afterwards passed through another reheater and filter, after which it passes to the boiling apparatus.

The addition to the French patent claims the use of steam with crystallisers of the Dufay system for the purpose of obtaining by heating, a more prompt and complete purging or cleansing from molasses at whatever points of the apparatus the vapour may be applied.

—L. J. de W.

French Patents.

Beetroot Juice; Apparatus for the Extraction of Ammonia from ——, before it enters the Evaporation Apparatus. H. Perrin. Fr. Pat. 305,701, Nov. 24, 1900.

The apparatus consists of a receptacle in which a vacuum is produced, and into which the juice is introduced by a pipe furnished with a pulveriser or rose through which the juice is drawn by the vacuum as a fine spray or rain, whereby the ammonia is disengaged.

The best result is obtained when the spray is sent from below upwards, as the fine particles then remain the longest possible time in the surrounding vacuum. The carbonated juice thus deprived of almost the whole of its ammonia passes to the first body of the evaporator.

—L. J. de W.

Sugar Juices; Process for Purifying ——, *by Bases or Compounds in the Nascent State.* L. Rivière. Addition to Fr. Pat. 270,479, Dec. 26, 1900.

In the principal patent the use is claimed of barium sulphide for the purification of beetroot and cane juice.

The additional patent claims the exclusive use of alkaline earthy sulphides, sulphydrates, and sulphuretted hydrogen, together with the compounds set free on contact with sugar juices, for the preservation and purification of these juices, and the treatment of sugar juices in rasping works by the above compounds.—L. J. de W.

Sugar Juices; Process for Decolorising and Purifying ——. J. Besson. Fr. Pat. 308,384, Feb. 25, 1901.

Sugar juices and syrups are purified and decolorised by treatment with volatile bases, as ammonia, and their salts and metals, as aluminium, in powder.—L. J. de W.

Sugar Juices; Purification of Crude ——. H. Gouthière and G. E. Junieu. Fr. Pat. 310,691, May 9, 1901.

This process consists in treating the sugar juices with a concentrated solution of ferric fluoride, which undergoes partial decomposition into hydrofluoric acid and more or less insoluble oxyfluorides of varying composition. These compounds precipitate certain albuminoid matters, the hydrofluoric acid acting also as an antiseptic. Milk of lime is then added and the liquid heated, by which means insoluble ferric hydrate and calcium fluoride are formed and complete the purification by carrying down with them albuminoids and other foreign materials. Traces of iron which remain in solution are removed by precipitation with either phosphoric acid or acid phosphates of the alkaline earths. The insoluble precipitates formed in this process, readily subside and the saccharine liquid can be easily filtered.
—T. H. P.

Sugar Juice: Process for obtaining very Pure, Concentrated ——; *and a very Nutritious Residue containing little Water, by Treating Beetroots without using Water.* A. Baermann. Fr. Pat. 308,379, Feb. 22, 1901.

The object of the process is to obtain a very pure concentrated sugar juice, poor in extractive matter by separation from saccharine products, beetroots for example, and at the same time to produce a substantial food for cattle, without the need of water to obtain the result.

Beetroot molasses heated from 90° to 100° C. is added to fresh pulp or entire beetroots so as to bring the temperature rapidly to 60°—90° C. This may be done in a receptacle furnished with sieves, where the pulp is carried against a current of the hot molasses The pulp is drained and carried forward by a worm, to be pressed. The juice obtained, is heated and mixed with fresh pulp from which it drains free from fibre and ready for ordinary treatment.
—L. J. de W.

Sugar Juice; Process for obtaining very Pure Concentrated ——, *and Highly Nutritive Residues containing little Water, by the Treatment of Beetroots without Water.* A. Baermann. Addition to Fr. Pat. 308,373, May 15, 1901.

The modification of the original process here described consists in pressing, in suitable apparatus, beetroot pulp or slices with a convenient quantity of undiluted juice obtained from the beets. Of the juice thus obtained, a quantity equivalent to the amount of beetroot treated, is led into the separating pan, whilst the remainder, together with the solid residue, is separated under high pressure into pressed juice and marc; the latter, which is rich in extractive matter, is used as cattle food. The pressed juice is used to treat fresh quantities of the beets in the manner above described.—T. H. P.

Saturation and Defecation Muds; Recovery of the Sugar from ——. A. Baermann. Fr. Pat. 311,182, May 25, 1901.

The muds resulting from the defecation and saturation of the raw sugar juices are washed in the filter presses or other convenient arrangements until all the sugar has been extracted. The washing waters containing the sugar in dilute solution are then cooled to a temperature below 30° C. and treated with powdered lime in excess. A quantity of lime equal to 2·5—3 times the weight of the sugar present is found to be sufficient. In this way the whole of the sugar is precipitated in the form of pure sucrate of lime. This is removed by means of filter presses and may be used for the defecation of raw juice or worked up in any other manner.—J. F. B.

Beetroot Marc: Process of Purification of the Gummy Matter extracted from ——. Margulies. Fr. Pat. 303,295, Aug. 27, 1900.

This process consists in submitting to dialysis the liquid obtained by lixiviating beetroot marc with chemical reagents (acids, alkalis, or acid salts) in order to separate these latter, which may be recovered by evaporation of the dialysed liquid. The liquid remaining, containing the colloidal arabin, which does not diffuse, is also evaporated, preferably *in vacuo*. The gum thus obtained is very pure and has adhesive properties equal to those of natural gum arabic.—T. H. P.

Bagasse; Process of Diffusion or Rapid Lixiviation of ——, *with a Limited Number of Diffusers.* Manowey and Naudet. Fr. Pat. 311,397, June 1, 1901.

The exhaustion of the bagasse is effected by the installation between the two cane-mills of a small number (3 to 6) of diffusers, provided with an arrangement for establishing a forced circulation. The bagasse coming out of the first cane-mill is charged into the diffusers and subjected to a systematic process of lixiviation in the closed vessels at a very high temperature. A special injecting apparatus is so arranged as to cause the juice, circulating in the ordinary juice-conduits of the diffusion battery, to pass through a series of re-heaters, from which it is returned to the battery into a diffuser charged with fresh bagasse. The temperature of the re-heated juice being from 100° to 105° C., its entrance brings about an almost instantaneous rise of the temperature of the bagasse to 100° C. This circulation and rapid heating of the bagasse accelerates the extraction and ensures the sterility of the juice obtained from it. The exhausted bagasse is finally pressed between the rollers of the second cane-mill.—J. F. B.

Rapid Refining; Process of ——, *applied to White Sugars.* J. Robin-Langlois. Fr. Pat. 310,368, April 29, 1901.

In the process use is made of the combined action of a boiling pan and of a malaxeur, the first bringing about the formation of grains in an alkaline medium which is kept as cold and as fluid as possible, whilst in the malaxeur, by more or less slow cooling, the liquor assumes the condition of a massecuite. After centrifugating, the syrup is mixed with a little char and treated again as above.—T. H. P.

Sugar; Apparatus for separating ——, *from Massecuites, or other Crystalline Product from its Mother Liquor.* Desaulles. Fr. Pat. 309,568, April 1, 1901.

An apparatus by means of which sugar of good quality may be separated from massecuites, together with molasses of low saline and organic co-efficients. Re-boiling of second products and the serious losses attending it, are done away with. A sketch and full description of the apparatus are given.—T. H. P.

Sugar; Process for the Extraction of ——. Count Schwerin (Botho), Wildenhoff. Fr. Pat. 309,792, April 9, 1901.

This process consists in submitting the finely-divided saccharine matter, such as beetroot shavings, mixed if necessary with more or less water, to the action of an electric current. One wall of the vessel containing the matter to be treated, serves as the negative electrode, and consists of finely perforated metal, whilst the other, composed of filtering cloth, separates the matter from a cell of water into which the positive electrode dips. On passing the current, the dissociable substances present, undergo electrolysis, the non-dissociable material at the same time being discharged through the perforated negative electrode by a process of electro-endosmosis. When all the sugar has been removed, the saccharine liquid can be freed from albuminoids, and purified in the ordinary manner.—T.H.P.

Crystallisable Sugar; Process for Obtaining the whole of the ——, *contained in any Sugar Liquor from Beetroots or Sugar Canes.* H. Faustin. Fr. Pat. 306,786, Dec. 26, 1900.

The inventor mixes with the sugar liquor any metal whatever in quantity equivalent to the salt contained in the liquor, and then acidifies with hydrofluosilicic or hydrofluoric acid, or soluble salts of these, together with any acid, to render the alkalis present slightly soluble or insoluble. To prevent the sugar from being attacked by the acids introduced, an equivalent quantity of organic bodies is added, producing, with the chlorides present in the sugar liquor, bodies that are insoluble or slightly soluble.

When the metal added has disappeared, that is, has been transformed into salt, the liquid is heated to 75° C., and filtered cold. If a quantity of organic non-sugar be present, tannin and soluble phosphate of lime are added. The filtered liquors are decolorised by various alloys, as $SbZn_3$, and neutralised with lime, baryta, calcium or barium sulphide, heated to boiling and filtered. If the filtrate be alkaline, it is neutralised with CO_2, heated to boiling, filtered, and condensed [concentrated] in a vacuum apparatus, to obtain the sugar.

Another method is to generate hyposulphurous acid with zinc or iron in fine powder and sulphurous acid, and remove the metal with SH_2. Or, the liquor is electrolysed and treated with tannin and calcium phosphate to remove organic matters.

MnO_2 or BaO_2 may be added during liming, and an equivalent of hydrofluosilicic acid.

The filtered liquor from the last carbonatation is rendered alkaline with baryta, and a metal added in fine powder to produce nascent hydrogen and decolorise the liquor during concentration.

The first syrups from the centrifugals are returned to the diffusion juice, preferably after the first carbonatation. By working thus, the sugar is obtained white and of high purity without any molasses residues.—L. J. de W.

Raw Sugar; Process for Manufacture of ——, *without Low Products.* Act. Maschinenfab. und Eisengiess. vorm. Hornung und Rabe. Sangerhausen. Fr. Pat. 311,499, June 5, 1901.

This process, for obtaining first quality raw sugar and molasses only, consists in utilising the sugar from the massecuites of the third jet for boiling to grain the massecuites of the second jet, and introducing the washed crystals from the latter, as they are obtained, into the juices of the first, second, or third saturation; or, in operating in such a way that the No. 3 sugar is introduced into the second jet massecuite, and that the washed sugar is then mixed with the syrups spun from the first products, the enriched syrup being then boiled to second jet massecuite, the sugar from which is passed to the saturation juice.

—J. F. B.

Glucose and Maltose; Process for the Manufacture of ——, *from all Amylaceous Matters.* H. Woussen and P. Caussin de Perceval. Fr. Pat. 307,736, Feb. 1, 1900.

After boiling the grain or other amylaceous matter with water, liquefaction and commencement of saccharification are produced by a very small quantity of malt, about one-eighth to one-tenth of the quantity ordinarily used for saccharification. The juices are then saccharified in sterilised vats by mucedines by the method of the *Société L'Amyle*, to the point required. The small quantity of alcohol produced, may be recovered, and the juice is then filter-pressed. The residue may have the oil extracted, and the cakes be sold as fodder or for manure. The filtered juice and washings are treated either with sulphate of alumina or phosphoric acid or monocalcium phosphate, and these decomposed and removed by the addition of lime or chalk. The turbid liquors are again filter-pressed, and the cakes used for manure.

The liquor is now passed over a special form of char, concentrated in a triple effect to 20° B., again clarified, and passed over a special char and boiled *in vacuo* to form a syrup, or for solid glucose, as desired.

Ordinary bone charcoal retains dextrin obstinately, and no amount of washing will remove it. The pure char to be used allows of the recovery of the dextrin. It is prepared by passing a continuous current of water, faintly acidified, over ordinary animal charcoal, contained in vats furnished with a false bottom, to remove the whole of the soluble matters. The grains of char which preserve their form are then washed. It is possible to recover dextrin from such char, which is carbon only, by boiling some hours with acidulated water. The dextrin is converted into dextrose, which is no longer retained by the char. This recovery of the dextrin would be impossible with ordinary char, since phosphate and carbonate of lime would pass into solution along with the dextrose formed.

The pure char, when washed, may be revivified by calcination.—L. J. de W.

Animal Black; Revivification of ——. J. Blachier and L. Rouillon, Paris. Fr. Pat. 309,292, March 23, 1901.

Claim is made for the use of hydrogen for the revivification of animal black after use for decolorising saccharine juices, wines, &c., the colouring matters absorbed by the charcoal being destroyed by the hydrogen.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Dead Yeast Cells; Chemical Processes in ——. R. and W. Albert. Centr.-Bl. f. Bakter. u. Parasitenk. **7**, [2], 737—742. Chem. Centr. 1901, **2**, [22], 1209.

R. Albert has succeeded (this Journal, 1901, 269), by suitable treatment with a mixture of alcohol and ether, in converting fresh yeast into a permanent powder containing the zymase in an unaltered condition. The yeast powder suspended in sugar solution showed a series of different microscopic forms, that form exhibited before the commencement of fermentation being quite unlike that after the fermentation has ended. In the latter case there are apparently still some yeast cells surrounded by cell membrane, but they are widely separated one from another, and are interspersed with empty cell walls. The changes have no direct bearing on the alcoholic fermentation, for they take place in a similar manner, and even more rapidly, if the yeast powder be suspended in distilled water at 40°—45° C., instead of in sugar solution. Antiseptics (toluene, thymol, chloroform) in the ordinary amounts have no influence, but formaldehyde and mercuric chloride prevent the changes. These changes are attributed to the presence of the proteolytic enzymes of yeast, for if the yeast powder be suspended in water and after adding toluene, be allowed to stand in the thermostat, the quantity of dissolved albuminoids, both the coagulable and those already hydrolysed, increases from hour to hour. After 48 hours, coagulable albumin is no longer present in the filtrate, whilst the reaction with Millon's reagent still increases in intensity. The yeast suspension filtered, after 48 hours, through a Berkefeld filter, yielded a filtrate in which the changes described by Hahn and Geret (this Journal, 1898, 1065) were observed. The albumoses also disappear finally, and the residue remaining after evaporation, consists of a crystalline mass of leucin, tyrosin, &c. These processes explain the different forms obtained with dead yeast before and after suspension in water or before and after fermentation. By the disappearance of the albumin in consequence of the action of the proteolytic enzymes, the difficultly digestible particles, resembling the protoplasmic particles of nucleïn-like nature discovered by Hieronymus in yeast cells, are rendered visible.

The yeast powder exhibits the phenomenon of auto-fermentation. This takes place in a suspension in water after about half hour at 35° C., and as with living yeast and expressed extract of yeast, a connection can be traced between the glycogen and auto-fermentation. The auto-fermentation takes place in the interior of the cells, which thus contain, besides zymase, also a diastatic enzyme capable of hydrolysing glycogen. The authors found that zymase could not be extracted without destroying the cell walls. The limited action of zymase in the expressed extract of yeast is due to the presence of proteolytic enzymes. After one hour in the clear filtrate from the yeast powder suspension, the presence of invertase could be detected, and the authors hold that it is not impossible that pure invertase may be prepared from the yeast powder.

—A. S.

Yeast Maltase; Synthetic Action of ——. O. Emmerling. Ber. 1901, **34**, [15], 3810—3811.

Whilst emulsin splits up amygdalin into glucose, benzaldehyde and hydrocyanic acid, the maltase of yeast only attacks the disaccharide, splitting off one molecule of glucose, and leaving the other still attached to the aromatic

residue in the form of a glucoside of mandelonitrile (Fischer, this Journal, 1895, 877), which is easily hydrolysed by emulsin. In investigating the synthetic action of yeast maltase (compare this Journal, 1901, 377), the author has succeeded in demonstrating the reversibility in concentrated solutions of its action on amygdalin. The glucoside of mandelonitrile [benzaldehyde cyanhydrin], melting point 149° C., was prepared free from amygdalin according to Fischer's directions. 30 grms. of the glucoside and 18·5 grms. of glucose were dissolved in 50 c.c. of a solution of yeast maltase and sealed up in tubes with a little toluene. The tubes were kept at a temperature of 35° C. for three months. The contents were then boiled, diluted to 250 c.c. with water, and fermented with a species of yeast secreting no maltase and previously proved to be without action on amygdalin. The glucose having been removed by fermentation, the solution was concentrated to a syrup, and the excess of mandelonitrile glucoside was extracted by acetone. The residue was purified by means of alcohol and obtained in the form of white scales, m. pt. 199° C. This substance was found to be amygdalin; the yield was only 0·5—0·35 grm. This instance of enzymatic synthesis may throw some light on the formation of amygdalin in the plant.

—J. F. B.

Enzymes; Action of Sunlight upon ——. O. Emmerling. Ber. 1901, **34**, [15], 3811—3814.

The author has investigated the action of light—both diffused and direct sunlight—upon the specific activity of several of the commoner enzymes, under conditions whereby the influence of the air and micro-organisms was eliminated as far as was possible.

The enzymes were employed in approximately 1 per cent. aqueous solutions in presence of 1 per cent. of toluene and exposed in vessels filled to the top. The specific activities of the solutions were determined (*a*) in the freshly-prepared solutions; (*b*) in solutions kept in the dark; (*c*) in solutions exposed for five days to diffused sunlight; and (*d*) in solutions exposed during the same length of time to direct sunlight.

On the whole, the influence of light on the activity of the enzymes was only slight. Invertase, emulsin, and diastase were quite unaffected; lactase, employed in the form of an extract of kefir grains, was only slightly affected; the activity of rennet and of yeast maltase was considerably diminished by exposure to light, but in the case of maltase, which is only obtainable in the form of an extract of yeast, other constituents may have played a part, especially since a sample of maltase obtained from maize was far more resistant.

In the case of pepsin and trypsin, the results were irregular, exposure to light being sometimes apparently without influence and sometimes harmful.

Preliminary experiments with toxins, *e.g.*, diphtheria toxin, indicated that this class of bodies is far more sensitive to the destructive influence of light than ordinary enzymes.—J. F. B.

Malt; Economic Advantages by Alternately Aërating and Steeping, in the Manufacture of ——. W. Windisch. Woch. für Brau. 1901, **18**, [45], 573—574.

The author describes two experiments carried out at a large malthouse.

In the first, the barley was steeped for 72 hours; the first water was run off after a short washing by means of Bothner's pneumatic washing machine, and the other waters were renewed every 12 hours, a short aëration being given before letting off the second water so as to complete the washing. On the floor, the barley chittted after about 40 hours, and the wet couches showed a tendency to become warm. The highest temperature recorded was 27·5° C. and frequent turning was necessary to keep it down. After nine days on the floor, the malt was withered for 24 hours and kilned for 48 hours with a final temperature of 62·5° C., since pale malt was required. After deducting all the usual losses (moisture, soluble matter, and culms) the loss due to respiration amounted to 9 per cent.

In the experiment carried out simultaneously by Windisch's process, the steeping occupied 60 hours altogether. In the first steep Bothner's apparatus was run for 15 minutes to wash the barley, and the water was drawn off immediately. In each of the other steeps the water was allowed to remain on the grain for four hours, and the barley was left without water for another four hours. Before drawing off each water, the Bothner machine was run for five minutes, not for washing or aërating, but merely for thoroughly mixing the grain. In the last 10 hours of this alternate water and air steep, the barley began to chit very evenly throughout the mass. It was then spread thinly on the floor and showed no tendency to heat. The couch was loosened with the fork every 12 hours, and the highest temperature reached was only 17·5° C. Germination on the floor was carried out for 12 hours longer than in the other case; half of the green malt was taken direct to the kiln and the other half was spread on the withering floor. It was dried rapidly in the kiln in 24 hours with a final temperature of 85° C.

Thus two factors were introduced for the improvement of the malting process; in the first place the air-water steep enabled germination to be carried out at a cool temperature, and in the second place a rapid drying with strong draught followed by a high-kilning temperature was substituted for the prolonged kilning at a low temperature.

The result showed that the loss by respiration was reduced to 5·5 per cent. Whilst the yield of malt dry-substance from barley dry-substance was increased by 3·7 per cent. Moreover, the percentage of extract (determined with coarse grist) was raised from 77·0 per cent. in the first case to 78·9 per cent. in the second, calculated to malt dry-substance. The author draws attention to the fact that Bothner's pneumatic washing apparatus performs the work of mixing up the grain in the steep most efficiently, and entirely overcomes any difficulty of unevenness in the sprouting of the corn, sometimes encountered in steeping with aëration.—J. F. B.

Malt; Sulphuring of ——. A. Kukla. Oesterr. Brauer- und Hopfenzeit. 1901 [21], 242; through Woch. für Brau. 1901, **18**, [46], 595—596.

The author draws attention to the fact that within the last few years the sulphuring of malt has become such a general practice in Austria that it is a rare occurrence to meet with any commercial malt which has not been so treated. If the brewers decided to reject all sulphured malt, the greater part of the deliveries of all the maltsters would be returned. The author states that from the technical point of view, the sulphuring of malt, unlike that of hops, has no object. Sulphuring is carried out merely because sulphured malt has a better appearance than unsulphured, and the inexperienced buyer thinks he is getting a paler and sounder article. Windisch is of opinion that the sulphuring of malt without the knowledge of the buyer is most undesirable and sometimes a fraudulent practice. Kukla shows that sulphuring frequently has a destructive effect on the diastatic power of the malt, and the latter saccharifies only with difficulty. Sulphured malt is characterised by its relatively high acidity and deficiency in extract, but, in spite of bad saccharification, the wort runs off just as readily as with unsulphured malt.—J. F. B.

Malt; The Sulphuring of ——. Windisch. Woch. für Brau. 1901, **18**, [18], 625.

Kukla's statement (see preceding abstract) that the sulphuring of malt is practised in Austrian maltings has been contradicted, the maltsters pointing out that it is not to their interests to sulphur malt. In the official report of factory inspectors, some remarks are made about the harmful effects of sulphuring malt during the kilning process. It has been claimed that the sulphurous acid penetrates the covering of the green malt and prevents the formation of mould, also it produces the bleaching effect on malt destined for the manufacture of light beers. Windisch, however, insists that the sulphuring of malt is unnecessary, and advises the rejection of all such malts in breweries.

—J. L. B.

Malt for the Rapid Production of Matured Beer; Process for Manufacture of ——. P. Vollmann. Ger. Pat. 124,504. Feb. 25, 1900; through Woch. für Brau. 1901, **18**, [47], 609.

The barley is steeped in the usual manner for three or four days; it is then caused to germinate by spreading on the malting floor and turning over from time to time to prevent the temperature from rising above 20°—22° C. On about the sixth day it is piled into layers of two metres in height and allowed to remain for a day at the longest, according to the temperature reached, which should be between 25° and 37° C. It is then spread out to cool, after which it is again piled up as before and left for a day: this alternate heating and cooling may be repeated several times. The effect of this treatment is to bring about a considerable saccharification of the green malt, which produces a specially aromatic kilned malt. The albuminoids of the malt are so far broken down that the nitrogenous constituents of the wort are very rapidly assimilated by the yeast. Consequently the fermentation is very vigorous, and the beer contains a very small proportion of nitrogen. It is stated that a properly matured full-bodied beer may be brewed from this malt in 14 days.—J. F. B.

Fluorine in Musts and Wines. K. Windisch. Zeits. Unters. Nahr. und Genussm. 1901, **4**, [21], 961—968.

Attention is drawn to the fact that a number of grape-musts imported from Spain for fermentation in Germany contain fluorine compounds, added as preservatives to prevent fermentation and loss of weight in transit. Although distillery fermentations are sometimes carried out in presence of fluorides by acclimatised yeasts, the presence of fluorides in these grape-musts has had the effect of preventing or very considerably retarding the subsequent fermentation.

The author summarises the various methods for the detection of fluorine compounds in wine and beer. The best test for fluorides is undoubtedly the etching of a watch-glass by the hydrofluoric acid given off on treatment with concentrated sulphuric acid in a platinum dish. The conversion into silicon tetrafluoride by heating with silica and fuming sulphuric acid and decomposition of the vapours with water is less convenient.

The test may be made, in the case of wines poor in extract, upon the ash obtained in the ordinary course of analysis, but if a separate portion be incinerated specially, it is better to add a little calcium chloride to the liquid to fix the fluorine. In the case of saccharine liquids, such as musts, sweet wines or beers, the precipitation method is preferable and larger quantities of liquid can be dealt with. In this case 500 c.c. of the liquid are made alkaline with ammonium carbonate and boiled, calcium chloride is then added whilst boiling. The flocculent precipitate is filtered off, dried and burnt without the filter, since filter-paper frequently contains fluorine; it is then tested by the etching method. In this way a quantity of fluorine less than 1 mgrm. may be detected in a litre of wine or beer.

The quantitative estimation of fluorine in organic substances is a matter of much greater difficulty, since the organic matter cannot be removed without loss of fluorine. If the method of direct incineration be employed, a considerable proportion of the fluorine is volatilised, even if sodium carbonate or barium hydrate be added before burning. If the precipitation method be applied, a portion of the fluorine escapes precipitation and can be detected in the filtrate. Wislicenus has recently described an apparatus for incinerating without losing volatile matters like fluorine (see this Journal, 1901, 1030).—J. F. B.

Wines; Rapid Method for Detecting Vinoline and Bordeaux Red in ——. A. Casali.

See under XXIII., *page* 74.

Wine; Sources of Error in the Determination of Volatile Acids in ——. Curtel.

See under XXIII., *page* 76.

Carbohydrates; Thermal Effects in the Building-up and Breaking Down of ——. D. Mohr.

See under XXIV., *page* 77.

English Patent.

Casks; Apparatus for Cleansing ——. B. M. Drake and T. M. Gorham, Westminster. Eng. Pat. 20,855, Nov. 19, 1900.

This apparatus consists of a pipe with perforations or slots through which water issues for cleansing the deposit from casks. The pipe is inserted in the tap-hole and is connected by a flexible pipe to a water-ejecting nozzle fixed in the bung-hole for the purpose of preventing the clogging of the aperture by dislodged deposit. A claim is also made for the construction of the water-ejecting apparatus.

—J. L. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Flour resulting from Grinding by Millstones and Rollers; Comparative Composition of ——. L. Lindet. J. Pharm. Chim. **14**, [10], 433—437.

The demand for very white flour has induced the substitution of rollers for millstones; but, however perfect the machinery, it is practically impossible to completely decorticate the grain. The various portions of the husk are found to contaminate the grain at different stages, in varying proportions. The various residues from the mills do not present the same composition, or the same food value. Hence the author has collected and compared the products from two mills, one a cylinder mill of Montrouge, the other a millstone mill of L'Assistance publique. The starch was estimated by separating the natural starch, after digestion of the grain and its residues with pepsin and hydrochloric acid, and saccharifying with sulphuric acid, so as to deduct its weight from the amount of glucose and dextrin obtained. The cellulose was extracted after treatment with acid and soda (1 per cent. sulphuric acid, 5 hours at 100°; 2 per cent. soda, 5 hours at 100°).

Water, mineral matter, nitrogenous matter, and oil were estimated in the usual manner. The results are tabulated as follows:—

Montrouge.

	Large Bran.	Medium Bran.	Small Bran.	Spurious Grain.	Fine Bran.	Blowings.
Water	11·52	10·97	10·75	10·72	10·19	10·58
Starch	14·37	14·76	32·80	33·75	37·75	49·32
Cellulose	13·10	12·88	7·42	5·80	4·37	6·00
Pentosans	21·20	21·40	16·10	11·45	11·20	11·50
Oil	2·19	2·60	3·73	5·15	3·70	1·79
Other non-nitrogenous matter.	17·18	17·57	12·93	15·76	15·90	9·24
Nitrogenous matter.	14·44	14·00	13·12	14·44	14·21	7·19
Mineral matter	6·00	5·82	3·15	3·01	2·68	1·38
	100·00	100·00	100·00	100·00	100·00	100·00

L'Assistance publique.

	Large Bran.	Medium Bran.	Small Bran.	Spurious Grain.	Fine Bran.	Blowings.
Water	11·22	11·68	12·30	10·70	9·56	8·89
Starch	16·68	20·43	23·02	40·00	45·57	43·32
Cellulose	10·97	10·78	9·73	5·82	4·37	5·85
Pentosans	16·80	15·55	19·30	11·30	9·60	14·50
Oil	2·14	2·93	3·27	3·50	2·34	2·28
Other non-nitrogenous matter.	24·13	23·55	17·78	12·69	14·55	16·80
Nitrogenous matter.	12·69	10·56	11·37	14·21	12·25	6·56
Mineral matter	5·3	4·58	3·23	2·28	1·76	1·80
	100·00	100·00	100·00	100·00	100·00	100·00

The author judges that, from the point of view of the cleaning from the by-products of grinding, as well as in whiteness of the resulting flour, the superiority rests with the roller mills.—C. T. T.

Benzoic Acid and Alkali Benzoates in Foodstuffs; Detection of ——. J. de Brevans.

See under XXIII., *page* 75.

(C.)—DISINFECTANTS.

FRENCH PATENTS.

Antiseptics, Solid or Liquid; Manufacture of ——, *upon a base of Saccharine or other analogous Sweetening Agent.* R. Smidlin. Fr. Pat. 308,352, Feb. 21, 1901.

THE patentee claims the manufacture of a substance, to be used for the preservation of foods or for toilet purposes, which consists in an association, chemical or not, of benzoyl sulphonic-imide, *p*-phenetol carbamide or their salts with antiseptics, such as sulphurous acid, sulphites, formaldehyde, boric, salicylic, and hydrofluoric acids and their salts, &c. —A. C. W.

Phenols, Soluble; Method for rendering ——. Actiengesellschaft für Theer- und Erdöl-Industrie. Fr. Pat. 309,807, April 10, 1901.

THE patentees find that the salts of phenanthrene mono- and disulphonic acids act as solvents for cresol. The sulphonates of other tar hydrocarbons and also carbazol act in the same way. The solutions are valuable as disinfectants or for pickling timber.—T. A. L.

Formaldehyde; Process for the Manufacture of Solid ——. R. Groppler. Fr. Pat. 312,327, July 2, 1901.

THE patentee states that the addition of a very small quantity of a soda soap (preferably of stearic acid) is sufficient to cause the ordinary formaldehyde solution to solidify on cooling; the various claims are for the different methods by which the constituents are brought into the hot solution.—A. C. W.

XIX.—PAPER, PASTEBOARD, Etc.

Flax Shives: Are they to be designated Woody Fibre? C. Councler. Chem.-Zeit. 1901, **25**, [95], 1057.

FLAX shives contain, according to the method of retting and scutching, from 10·64—14·08 per cent. of wood gum as determined by Thomsen's method; the amount of wood gum in beech wood is very similar, varying from 9·40 to 11·57 per cent. of the dry substance. Calculating the wood gum (xylan) from the yield of furfural, the amount present in dry flax shives is 21·32—22·30 per cent. by Tollens and Krüger's method and 19·43—20·29 per cent. by the author's method; beech wood gives corresponding values of 19·34—24·14 and 19·74—21·92 per cent. Flax wood gives 1·29—2·10 per cent of ash, a quantity much greater than that given by beech (0·5 per cent.), but in the latter case the yield of ash increases with diminution of the diameter of the wood section.

Flax shives contain 0·3141—0·3434 per cent. of nitrogen, whilst stout beech wood yields 0·09615—0·13361, and beech twigs 0·32 per cent. From the preceding, flax shives must be considered as consisting of true woody fibre, and this view is confirmed by the following comparisons made by Hugo Müller's method:—

—	Flax Shives.	Beech Wood.
	Per Cent.	Per Cent.
Alcoholic benzene extract	1·33— 2·04	1·89
Aqueous extract	3·71— 4·48	3·03
Incrusting material	47·40—49·44	12·11
Cellulose (ash-free)	44·67—47·15	52·97

—W. A. D.

Cellulose from the Cotton of the Cotton-seed Husk. T. Newsone, Roslindale, Mass., U.S.A. Amer. Pat. 683,785; through Papier-Zeit. 1901, **24**, [89], 3321.

THE short cotton fibres, which remain attached to the seed husks after the fibres fit for spinning have been taken away, are very suitable for paper-making and other purposes where the full length of the fibre is not required. The chief difficulty of their utilisation lies in the removal of the brown fragments of husk and other foreign matters. The crude cotton fibre contains wax-like constituents of a very resistant nature, insoluble in water and only partially dissolved by alkalis. This wax makes the fibres water-resistant and unfit for paper-making. The use of strong alkalis is to be avoided, since these partly oxidise and partly dissolve the fibres. The process here described utilises the solvent properties of volatile hydrocarbons such as petroleum naphtha to remove these waxes as well as other incrusting matters of the husk without injury to the fibre. The inventor treats the seed-husks and the attached fibres with the vapours of boiling naphtha, the vapours entering at the top of the extraction vessel, condensing and flowing down through the mass, the solvent containing the dissolved matters being passed back into the evaporator. After all soluble matters have been extracted, the naphtha adhering to the mass is driven off by hot air and the contents of the extraction vessel are removed and boiled in another vessel with alkali, such as a 2 per cent. solution of caustic soda, under a pressure of 60 lb. per square inch, for four hours. The residues of seed husks are dissolved by the alkali and the fibres are worked up for paper. Under the microscope these fibres have a different appearance from ordinary cotton. They are elastic and not flattened and are completely transparent.—J. F. B.

Oxycelluloses; Notes on the ——. A. Nastukoff. Ber. 1901, **34**, [14], 3589—3591. (See also this Journal, 1901, 573.)

THE oxycellulose, soluble in ammonia, which is obtained by boiling cellulose with nitric acid of 1·3 sp. gr., is termed β-oxycellulose. Cross and Bevan obtained a yield of this of only 30 per cent. from cotton, the rest being oxidised to oxalic acid. Much later, Faber and Tollens obtained a yield of 70 per cent., and the author now works so as to get a 90 per cent. yield of β-oxycellulose. Thus, the suggestion of Cross and Bevan that a portion of the cellulose molecule (*i.e.*, about 30 per cent.) may be of a more resistant constitution than the rest, is now negatived. For the preparation of β-oxycellulose, the author takes a quantity of nitric acid of sp. gr. 1·3 equal only to 2·5 times the weight of the cellulose, and heats for 1 hour on a water-bath. A yield of 90 per cent. of oxycellulose, which is completely soluble in boiling ammonia is obtained. If larger proportions of acid are used, lower yields are obtained, and corresponding quantities of oxalic acid are produced. The author also found that β-oxycellulose combines with barium to form a salt containing about 5 per cent. of barium. On the other hand, γ-oxycellulose, prepared with bleaching powder, gives a barium salt containing only about 1 per cent. of barium. The β-oxycelluloses and their salts are hard, whilst the γ-compounds are brittle. On evaporating solutions of the sodium salt of γ-oxycellulose, lustrous films are produced, which are easily detached from the glass. The solutions of β-oxycellulose salts leave no such films; it is true that by evaporation in a desiccator, films are formed, but they are of quite a different kind. The salts of β-oxycellulose lose considerably in solubility after drying at 80°—110° C., whereas the solubility of the salts of γ-oxycellulose is not affected by this treatment.—J. F. B.

Rags for Paper-Making; Systematic Chemical Treatment of ——. C. Beadle. Chem. News, 1901, **84**, [2192], 257—258.

THE rags are sorted in the mill into 20 or 30 varieties, each of which is fairly uniform; only one sort of rag is examined at a time.

These rags are then charged into the boiler with a known quantity of soda, and the capacity of the boiler, the weight of the rags and the volume of the liquor are noted; the

liquor should be just sufficient for the complete saturation of the rags. The time required to bring the boiler to full pressure is observed, and samples of the liquor are drawn off every hour. The free alkali in these samples is titrated with normal acid, the point of neutralisation being determined by spotting on litmus paper. The boiling is finished when the alkalinity of the samples remains constant.

Subsequent boilings are made with a quantity of soda only slightly in excess of that found to be used up in the first boiling. The total soda is usually determined only in the first and last samples of liquor from the boiler, by titration after incineration.

The loss of weight of the rags is determined by treating a 10 lb. average sample tied up in a bag in the boiler and weighing the contents afterwards. In this way the treatment of each sort of rag may be accurately controlled. The result of some of the author's experiments are shown in the table below. It will be noticed that one-half of the total soda is neutralised at the end of the first hour and that after the third or fourth hour the treatment is complete; further boiling is unnecessary and indeed harmful.

Quality of Rag.	Weight of Charge in Cwt.	Gallons of Liquor Per Cwt.	Strength of Cold Liquor Per Cent. Na_2O.	Percentage of Na_2O on Rags.	Free Na_2O at Different Stages of Boiling when Total Na_2O = 100.					
					0.	1 hour.	2 hours.	3 hours.	4 hours.	5 hours.
No. 1 and No. 2 cottons (mixed).	..	..	..	..	100	72	48	18	..	..
" " "	32	24·0	0·33	0·697	100	38	15	8	..	..
No. 2 cotton	..	25·7	0·654	1·68	100	48	24	19	..	..
No. 3 "	..	22·0	0·90	1·78	100	60	27	17	..	..
" "	..	24·0	0·70	1·50	100	49	31	17	..	..
" "	..	25·2	0·55	1·22	100	70	43	13	10	..
" "	31	24·0	0·65	1·36	100	31	21	15	..	..
" "	30	25·5	0·76	1·71	100	43	30	25	..	..
No. 3 and No. 4 cotton (mixed).	..	25·0	0·80	1·74	100	69	43	26	23	..
No. 2 linen.....	32	24·0	1·17	2·45	100	25	20	19	..	..
No. 3 "	..	23·0	1·44	..	100	40	24	17	13	13
No. 2 and No. 3 linen (mixed).	32	24·0	0·91	1·91	100	80	24	9	7	..
No. 3 linen.....	32	24·0	1·0	2·14	100	50	20	15	11	..
No. 4 "	..	25·5	1·36	..	100	29	16	15	11	..
Cotton waste (hulls)..	..	28·0	1·76	4·40	100	32	28	24	22	21

—J. F. B.

Paper Pulp from Crude Plants. Alphonse Berget, Paris. Amer. Pat. 683,836; through Papier-Zeit. 1901, **26**, [92], 3427.

According to this process, paper-making fibres are obtained direct from the crude plants by an electrical retting process, analogous to that by which textile fibres are obtained from flax and hemp. The solution of the incrusting matter is brought about by the combined action of certain chemicals such as lime, dilute hydrochloric acid or sea-water, and of an alternating electric current. The process as applied to plants of the nettle order is described. The stalks of the nettles, after the removal of the leaves, are crushed between rollers until they form a thick mass. They are laid for several days in a solution containing 4 per cent. of caustic lime; they are then drained and piled into a stack, standing on a waterproof base which is covered with a metal sieve. The height of the stack should not exceed one metre, in order to avoid too great a pressure on the lower layers. Another metal sieve makes electrical contact from the top. The strength of the current should be five or six ampères per 100 kilos. of stuff to be treated; under the influence of the current, the temperature of the mass reaches 50°—55° C., and this temperature should not be exceeded. A rapid retting ensues, and the incrusting matters are decomposed and dissolved. For nettles an eight hours' treatment is sufficient, and the mass is then left undisturbed for one or two days for the completion of the retting. The product is then washed, beaten, and bleached for conversion into pulp. The process is especially suitable where water power is obtainable.—J. F. B.

Caseïn Films; Waterproof ——. A. Schmidt. Amer. Pat. 670,689, Dec. 15, 1897; through Papier-Zeit. 1901, **26**, [95], 3530.

When a 5 per cent. solution of soda-caseïn is mixed with formaldehyde, no coagulation takes place; the solution remains clear and liquid for a long time. But when such a mixture is spread out on glass or paper and allowed to dry, a transparent film of caseïn is formed which is completely insoluble in water. Films of caseïn so treated may be distinguished from ordinary films in the following manner. The films are carefully removed from their backings and placed in water to which a couple of drops of Methylene Blue have been added. On warming, the film which has not been treated with formaldehyde is dyed a pale blue, whilst the formaldehyde film assumes a dark blue colour. A solution of caseïn in ammonia behaves in a similar manner, but if large quantities of formaldehyde be added, a precipitate is formed.

The following proportions are cited: 100 grms. of caseïn and 1·5 grm. of caustic soda are dissolved in a litre of water, to which are added about 15 grms. of a 40 per cent. solution of formaldehyde; or 100 grms. of caseïn and 10 c.c of a 10 per cent. solution of ammonia are dissolved in 2 litres of water, to which are added about 30 grms. of a 40 per cent. solution of formaldehyde. Either of these gives insoluble films on drying, which may be used for photography, surgical bandages, paper-coating, &c.

—J. F. B.

Sodium Carbonate, Crude, Fused (Recovered), of the Cellulose Industry; Examination of ——. G. Lunge and W. Lohöfer.

See under XXIII., *page* 70.

English Patent.

Insulators; Manufacture of a Substance suitable for Ornamental and other purposes ——. B. Weaver, London. Eng. Pat. 1012, Jan. 15, 1901.

The substance, which resembles vulcanite, is capable of being cut or drilled and is moulded from a mixture of powdered asbestos and shellac with any suitable colouring matters. To the mixture of three parts of asbestos and colouring matter, two parts of shellac are added, and the mixture is heated and stirred until thoroughly amalgamated to the consistency of dough. Any metals or inlays desired in the articles are placed in the moulds and the mass is pressed in the heated moulds until shaped. The articles are removed, baked in an oven until the material is nearly set, and then returned to the heated moulds, until finally hardened and finished.—J. F. B.

French Patents.

Hydrocellulose; Acetylated ——. Fabrik Chemischer Preparate von R. Sthamer. Fr. Pat. 308,506, Feb. 26, 1901.

Hydrocellulose is treated with glacial acetic acid and acetyl chloride in the proportion of about 350 parts of each

reagent to 199 of hydrocellulose. After this reaction, sulphuric acid is added, and the whole is heated to about 65°—70° C., the acetylated hydrocellulose being afterwards thrown down with water.

The product, dissolved in warm alcohol, sets to a gelatinous mass at the ordinary temperature, and is no longer precipitable by water. On evaporating the alcoholic solution, a transparent solid is left, which is completely insoluble in water. These products may be used in photography, or for making impervious fabrics, varnishes, &c.—C. S.

Hydrocellulose by means of Hydrochloric Acid and Potassium Chlorate; Manufacturing ——. Fabrik Chemischer Präparate von R. Sthamer. Fr. Pat. 309,759, April 2, 1901.

The process consists in treating cellulose with hydrochloric acid at a temperature of 60°—70° C. in presence of a quantity of potassium chlorate insufficient to transform the cellulose into oxycellulose. The dried and pulverised product is a sandy white powder, highly resistant towards acids and alkalis, and therefore suitable for making acid- and alkali-proof articles.—C. S.

Viscose; Treatment for converting —— into Useful Products. Viscose Syndicate, Ltd. Fr. Pat. 309,548, March 30, 1901.

The viscose is treated with a weak acid (*e.g.*, acetic acid), and then with a neutral dehydrating agent (brine, or alcohol) to precipitate the alkali cellulose-xanthate, which is afterwards separated from the mother liquor and redissolved in water. The first two reactions may be reversed in their order.

The product, which is purer than crude viscose, is claimed to be suitable for sizing better-class paper or warp yarns, and for dressing fabrics.—C. S.

Celluloid; Composition resembling ——. E. Zühl. Fr. Pat. 308,372, Feb. 22, 1901.

In this process camphor is replaced, partly or entirely by dibasic or multibasic acids of the aromatic series, or by their anhydrides and esters (*e.g.*, phthalic acid, phthalic anhydride, phthalonic acid, phthalic mono-ethyl ester, &c.).—C. S.

Celluloid; Composition resembling ——. E. Zühl. (Addition to Fr. Pat. 308,372), April 15, 1901. (See previous abstract.)

The camphor is replaced by esters of phthalic acid, wherein one of the acid groups comprises on the one hand the radicle of an aliphatic alcohol, and on the other the radicle of a base (esters of phthalamic acid and phthalanilic acid).—C. S.

Celluloid; Composition resembling ——. E. Zühl. Fr. Pat. 309,962, April 15, 1901. (See preceding abstracts.)

Camphor is replaced by the phenol or naphthol esters of inorganic acids (phosphoric acid).—C. S.

Celluloid; Composition resembling ——. E. Zühl. Fr. Pat. 309,963, April 15, 1901. (See preceding abstracts.)

In this case the camphor is replaced by esters of oxalic acid, wherein one of the acid groups comprises on the one hand the radicle of an aliphatic alcohol, and on the other the radicle of a base (esters of oxamic acid).—C. S.

Celluloid; Composition resembling ——. E. Zühl. Fr. Pat. 310,942, May 18, 1901. (See preceding abstracts.)

The camphor is replaced by halogen substitution products of aromatic hydrocarbons, nitrated halogen substitution products, or amino halogen substitution products.—C. S.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Hydrogen Peroxide; Molecular Compounds of ——, *with Salts.* S. Tanatar. Chem.-Zeit. 1901, **25**, [92], Rep. 326.

The crystalline compound $KF + H_2O_2$ is obtained by dissolving potassium fluoride in hydrogen peroxide (15 per cent.), in the proportion of 1 mol. of the salt to 2 mols. of the peroxide. This solution is acidified with hydrofluoric acid, concentrated in a platinum dish on the water-bath at 50° C., cooled, and then treated with alcohol in a separating funnel. To the lower layer of liquid, alcohol is added, and then on standing in a desiccator, hard, large, needle-shaped crystals of the double compound separate. These are filtered off and washed with a very little water. After drying over sulphuric acid, the compound can withstand a temperature of 70° C., but at 110° oxygen is evolved. The double compound $Na_2SO_4.9H_2O.H_2O_2$ is prepared by dissolving sodium sulphate in a 3 per cent. solution of the peroxide, evaporating at 50° C. to incipient crystallisation, and then precipitating with alcohol. The salt is finally washed with alcohol and ether.

In a similar manner $NaNO_3.Na_2O_2.8H_2O$ can be obtained in a crystalline form from an alkaline sodium nitrate solution and hydrogen peroxide; it is easily decomposed.—E. H. T.

Phosphorous Acid; Esterification of ——, *by Glycerin and Glycol.* P. Carré. Comptes Rend. **133**, [22], 882—884.

Phosphorous acid and glycerin heated together in equi-molecular proportions at 125° C. form a glycerophosphorous acid. The amount of ester formed, reaches a maximum (60·7 per cent. of the total acid present) after 30 hours, and then slowly decreases through evaporation of the glycerin; the same limit is reached in 10 hours if the heating be carried out under a pressure of only 15 mm. of mercury, and the limit is raised to 69·3 per cent. and 86·7 per cent. when the mixture contains, with one molecule of acid, 2 molecules and 10 molecules respectively of glycerin. Boiling with water regenerates the acid and glycerin. By saturating the esterified mixture with baryta, the author has prepared barium glycerophosphite as an uncrystallisable syrup, very soluble in water, saponified rapidly by alkalis and slowly by boiling water. The solution of this salt, exactly decomposed by sulphuric acid, yields a weak solution of glycerophosphorous acid, which, however, cannot be concentrated without partial hydrolysis. The calcium salt is similar in properties to the barium salt, and is identical with that obtained by Lumière and Serrin by acting on glycerin with phosphorus trichloride.

Glycol yields with phosphorous acid an acid and a barium salt in all respects similar to the corresponding products from glycerin.—J. T. D.

Bismuth Nitrate; Action of Mannitol on ——. L. Vanino and O. Hauser. Zeits. anorg. Chem. **28**, 210—218. Chem. Centr. 1901, **2**, [21], 1148.

If crystallised bismuth nitrate be triturated with mannitol, a sticky mass is produced after some time, which dissolves in water to a clear solution. The stability of the solution is greatest if equi-molecular proportions of the bismuth nitrate and mannitol be taken. Solutions prepared from a mixture of $2Bi(NO_3)_3 5H_2O$ and $1C_6H_{14}O_6$, acquire, on standing, a colour varying from yellow to black, and evolve nitrogen and nitrous vapours. Mineral acids precipitate basic salts from the solutions. On evaporating bismuth-mannitol solutions, complete decomposition occurs, with separation of a white insoluble powder. The solutions alter considerably on keeping. Freshly-prepared solutions give with alkali, a precipitate of bismuth metahydrate; with alcohol, a separation of mannitol. After standing some time, the solutions become coloured, and give with alkali, precipitates soluble in excess of the reagent. With solutions which have stood for a short time, alcohol gives precipitates containing bismuth and mannitol.

Bismuth Oxide-Mannitol Hydrate, $Bi_2O_3(C_6H_{14}O_6)_4 + 3H_2O$, is obtained by allowing a solution prepared from 1 molecule of bismuth nitrate and 2 molecules of mannitol to stand for a sufficient length of time and then precipitating with alcohol. It forms crystals soluble in water to a clear solution, which decomposes on standing or on the addition of acids.

Bismuth Oxide-Mannitol, $Bi_2O_3(C_6H_{14}O_6)_4$, prepared by heating the hydrate to 130° C. It forms a pale yellow powder insoluble in water, soluble in caustic potash or soda.

Bismuth Nitrate-Mannitol solution forms a suitable raw material for the manufacture of bismuth salts. Oxalic acid

precipitates white bismuth oxalate; citric acid, the citrate; gallic acid, the subgallate; K_2CrO_4 and $K_2Cr_2O_7$ as also KI, behave as with ordinary bismuth solutions. Borax solution gives a white precipitate, and salicylic acid and camphoric acid, give the corresponding bismuth salts.—A. S.

Bismuth Sulphocyanide; Double Compounds of ——, *with Potassium Sulphocyanide.* L. Vanino and O. Hauser. Chem.-Zeit. Rep. 1901, **25**, [92], 327.

To prepare the double salt, $Bi(SCN)_3.3KSCN$, a freshly-prepared solution of bismuth nitrate containing mannitol is treated with the theoretical quantity of potassium sulphocyanide. After the yellowish-red solution has been treated with 5—6 times its volume of absolute alcohol, it is allowed to stand for several hours in a cool place. The precipitated mannitol, nitre, &c., are filtered off, and on evaporating the filtrate the double salt is obtained; it is crystallised several times from alcohol and forms large, brick red crystals which do not decompose on standing. It is very slightly hygroscopic, is decomposed by water, but dissolves readily in alcohol to form an orange-red solution which colours glass.

By taking an excess of potassium sulphocyanide, large, deep-red crystals of $Bi(SCN)_3.9KSCN$ are obtained. These show a greenish iridescence, are extremely hygroscopic, decompose soon on standing, but less quickly in alcoholic solution. Ammonium sulphocyanide yields similar compounds.—E. H. T.

Diamide; Derivatives of ——, *with closed Atomic Groups.* Th. Curtius. *III. Pyrazolone-3-acetic Acid.* A. Hufferath. J. prakt. Chem. 1901, **64**, [19], 334—319.

Pyrazolone-3-acetic ester was obtained by adding pure hydrazine hydrate, drop by drop, to acetonedicarboxylic ester cooled in ice. The pure ester crystallises in fine plates with a pearly lustre, which melt at 189°—190° C. Attempts to prepare the acid or its salts from the ester, failed. In physiological action the ester shows similar antipyretic properties to those exhibited by 3-methylpyrazolone, larger doses than of antipyrine being required to lower the body temperature. By the action of acetic anhydride, 1-acetylpyrazolone-3-acetic ester was obtained; it melted at 116°—117° C. The ester gives by the action of nitrous acid an isonitroso derivative, the silver salt of which is a red precipitate. Ethyl iodide, acting on the silver salt, gives 4-ethoximepyrazolone-3-acetic ester. Pyrazolone 3-acetic ester gives, with a solution of *p*-diazotoluene sulphate, 4-azotoluenepyrazolone-3-acetic ester, a yellow dyestuff, which crystallises in fine dark yellow asbestos-like needles; in alcoholic solution it dyes wool a golden yellow; its silver salt is pale red in colour.

By the action of sufficient hydrazine hydrate, acetonedicarboxylic acid is converted into pyrazolone-3-acetic hydrazide, which forms compounds with aromatic aldehydes. An isonitrosoazide was also prepared by the action of nitrous acid on the hydrazide hydrochloride.—A. C. W.

Polygonum Persicaria. P. Hurst. Chem.-Zeit. 1901, **25**, [95], 1055—1056.

The spotted knotweed, *polygonum persicaria*, has the following percentage composition: moisture 10·07, ash 6·52, ethereal oil 0·053, wax 1·92, tannin 1·52, mucic and pectic substances 5·42, calcium oxalate 2·18, total nitrogen 3·97, ammonia 0·31, cellulose 27·61, volatile acids 0·0464, sugar 3·24. The ash contains Na, K, Mg, Ca, Fe, Cl, SO_3, SiO_2, P_2O_5, and considerable quantities of Mn. The wax dissolved by light petroleum, consists of an easily hydrolysable phytosterol oleate along with free phytosterol, and a solid acid melting at 55° C. The ethereal extract contains chlorophyll and a resin, and the alcoholic extract, sugar, tannin, gallic acid, quercetin and a phlobaphen; the latter is hydrolysed by dilute sulphuric acid forming a sugar which gives an osazone melting at 177°—178° C. Only traces of volatile aminic bases are present, but considerable quantities of ammonia: the bases precipitated by phosphotungstic acid are two or three in number and differ in their solubility in chloroform and amyl alcohol. The ethereal oil is noteworthy as consisting principally of volatile fatty acids, especially acetic and butyric acids; the remainder is made up of a camphor-like solid with an agreeable odour (*persicariol*) and a liquid, not further investigated.—W. A. D.

Cinchona Alkaloids Soluble in Ether. W. L. Scoville. Pharm. J. 1901, **67**, [1638], 551.

The author agrees with previous investigators that ether is not a suitable solvent for the separation of cinchona alkaloids. He finds that the relative solubility of the alkaloids is greatly modified by the conditions under which the solvent is applied. Those which alone are practically insoluble in ether, become much more soluble in the presence of an alkaloid which is soluble in ether; for example, in a mixture of quinine with cinchonidine or cinchonine, the latter alkaloids are carried into solution in considerable quantity, in excess of their normal solubility in ether. It was also observed that the presence of a little alcohol in the ether will entirely alter the solvent power of the menstruum on the hydrated bases.—A. S.

Alcohols; Oxidation of Unsaturated ——, *by Contact Actions. Production of Vanillin.* A. Trillat. Comptes Rend. **123**, [21], 822—824.

Unsaturated as well as saturated alcohols yield aldehydes, when their vapours, mixed with air, are passed over a heated platinum spiral or metallic gauze. Thus, allyl alcohol yields acrolein, which by further oxidation is in part converted into formaldehyde and glyoxal: and cinnamyl alcohol yields cinnamic aldehyde. The most remarkable of these oxidations is, however, that of eugenol or isoeugenol, from 100 grms. of which there were obtained in this way 2·9 grms. of crude vanillin, the residual substance being chiefly unaltered isoeugenol. The side-chain is broken off at the double linking, oxygen taking its place. In the preparation of vanillin by the action of ozone on isoeugenol, the yield is better when the process is worked on a larger scale.—J. T. D.

Bergamot; A New Crystalline Compound Extracted from Essence of ——. Soden and Rojahn. J. Pharm. Chim. **14** [10], 466—467.

Among the definite compounds found in essence of bergamot is *bergaptene*, a crystalline powder which is extracted from the least volatile portions of the essence.

The authors have succeeded in isolating from the residues of distillation, another crystalline compound which they have named *bergaptine*. It melts at 59·05 and crystallises from a solution of light petroleum spirit in colourless, inodorous, insipid plates, very soluble in ether, alcohol, and chloroform. The precise composition has not yet been determined.—C. T. T.

Terpenes and Essential Oils. III. O. Wallach. Annalen, **319**, [1], 77—120.

Base from methylheptenone, isomeric with coniine.—By the action of phosphorus pentoxide on methylheptenone oxime a base, $C_8H_{13}N$, is obtained. The reaction is best effected by dropping the oxime on the pentoxide, each drop falling on a fresh portion. On reduction by sodium and alcohol, the base yields trimethylpiperidine, $C_8H_{17}N$, which boils at 166° C. This reduced base appears to be a mixture of two isomerides.

Bromomethylheptenone, $C_8H_{13}BrO$, is best obtained by adding bromine to a well cooled solution of methylheptenone oxime in methyl alcohol, pouring into caustic soda, shaking, again adding caustic soda and distilling with steam. The distillate is then acidified, extracted with ether, the extract dissolved in glacial acetic acid, and excess of semicarbazide solution added. The pure bromoketone was then separated from the semicarbazone by dilute sulphuric acid, and distilled with steam. It boils at 96° C. under 9 mm. pressure. The semicarbazone, after repeated recrystallisation from alcohol, formed white scales, which melted at 184° C. The oxime melted at 58° C. and boiled at 140° C. under 9 mm. pressure. The benzylidene compound, $C_8H_{11}BrO:ClIC_6H_5$, obtained by condensation with benzaldehyde in the presence of caustic soda, forms white

shining scales, melting at 155° C. Oxidation with permanganate and then with chromic acid converts the bromoketone into levulinic acid.

Base, $C_8H_{15}N$, of a new type, and a new isomeric *Methylheptenone*. The hydrochloride of methylheptenylamine, $C_8H_{17}N$, the base produced by the reduction of methylheptenone oxime, yields an addition compound with bromine, the aqueous solution of which, on evaporation, yields the salt of a new base, $C_8H_{15}N$, which differs in certain respects from all bases hitherto known. It combines with benzaldehyde on heating, without elimination of water, to form a compound $C_{15}H_{21}NO$, which melts at 99°—100° C.

The new Methylheptenone is best obtained by adding sodium nitrite to a cooled solution of the base $C_8H_{15}N$ in acetic acid, and finally warming. It boils at 161°—162° C.; the semicarbazone melts at 93°—95° C. after recrystallisation from methyl alcohol. On reduction by sodium in solution in moist ether, the ketone yields a methylheptenol which boils at 166°—167° C. and is scarcely altered by boiling with dilute sulphuric acid. The properties of the ketone show it to be distinct from the three known methylheptenones; the remaining δ-methylheptenone could not give butyric acid on oxidation. Thus it must differ from natural methylheptenone in the position of the oxygen atom.—A. C. W.

Oil of Cade; Investigation of ——. *II. Cadinene.* Cathelineau and Hausser. Bull. Soc. Chim. 1901, **25—26**, [20], 931—933. (See also this Journal, 1900, 772.)

Cadinene hydrochloride was prepared in the following manner:—the portion of oil of cade insoluble in sodium carbonate was distilled in steam, sodium carbonate being added towards the end of the operation. The volatile matter was then mixed with 3 vols. of alcohol (90 per cent.) and a current of hydrochloric acid gas passed through. After standing 24 hours, the alcoholic layer was decanted and the oil filtered through cotton wool, then after washing with alcoholic hydrochloric acid and a little absolute alcohol, the crystals were recrystallised from absolute alcohol. The oil still contained cadinene; it was washed with water, subjected to a current of ammonia gas at 245°—250° C., washed and fractionated. The fraction passing over at 268°—275° C. was then subjected afresh to the treatment with hydrochloric acid. About 80 grms. of the hydrochloride were obtained per litre of oil, though the whole of the cadinene was not extracted. The quality of oil of cade is in proportion to its percentage of cadinene; the above process enables comparative values to be obtained.—A. C. W.

Néroli and Petit Grain distilled in 1901; *Essential Oils of* ——. P. Jeancard and C. Satie. Bull. Soc. Chim. 1901, **25—26**, [20], 934—936. (See also this Journal, 1901, 1017.)

The severe winter and the lateness of vegetation near Cannes, caused the distillation of orange flowers to commence about May 10, instead of towards the end of April. The authors give the properties of the oils produced, for comparison with the oils of 1899 (this Journal, 1900, 847).

Neroli.	Sp. gr. at 27° C.	Optical Rotation $l = 100$.	Esters. Total.	Esters. True.
		° ′		
Neroli from pistils, May 10—21...	0·8684	+1 50	18·62	16·17
„ ordinary, May 11—22	0·8670	+2 30	14·21	10·53
„ „ May 22—28	0·8670	+4 40	10·53	7·10
„ „ May 28—June 3.	0·8660	+4 48	11·27	8·08
Communelle, without néroli from pistils.	0·8662	+5	11·02	7·35
Communelle, with néroli from pistils.	0·8670	+4 10	11·51	8·33
Petit Grain.				
June 5—20	0·8820	−4 50	55·19	48·53
„ 20—25	0·8830	−5	53·37	49·73
Communelle	0·8820	−4 56	53·44	48·04

—A. C. W.

Tartrates in Glycerin; Optical Rotations of certain ——. J. H. Long.

See under XXIV., *page* 77.

Chloroform; Determination of ——. W. A. Pucknell.

See under XXIII., *page* 76.

English Patents.

Silver Compounds [of Gelatoses], Manufacture of Neutral Soluble ——. O. Imray, London. From the Farbwerke vormals Meister, Lucius und Brüning, Hoechst-on-Main, Germany. Eng. Pat. 23,507, Dec. 22, 1900.

The patentee claims the process for the manufacture of neutral soluble silver compounds which consists in adding a silver salt to a neutral solution of a gelatose and then evaporating or precipitating by alcohol or acetone. The products, which are also claimed, are not precipitated by ordinary reagents for silver; they are to be used as antiseptics. The term gelatoses is to be understood to include products of the hydrolysis of gluten and aldehyde-gluten, glutoses, glue-peptone, glue-albumose, semi-gluten, hemicollin and the like.—A. C. W.

Anthrapurpurin Biacetate; Manufacture of ——. W. L. Wise, London. From Knoll and Co., Ludwigshafen-on-Rhine, Germany. Eng. Pat. 22,328, Dec. 7, 1900.

Nearly all drugs used as purgatives contain derivatives of hydroxyanthraquinone; it has been found that anthrapurpurin compounds may be used instead. Anthrapurpurin biacetate is a microcrystalline yellow powder, melting at 175°—178° C., insoluble in water and dilute acids, and slowly decomposed by alkalis. The processes are claimed for the manufacture of this biacetate, which consist in acetylating anthrapurpurin by ordinary methods, or in heating the triacetate with anthrapurpurin.—A. C. W.

Phenyldimethylpyrazolone and Dimethylamidodimethylphenylpyrazolone, with Camphoric Acid; Manufacture of Compounds of ——. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoechst-on-Main, Germany. Eng. Pat. 22,391, Dec. 8, 1900.

The claims are for the manufacture of compounds with camphoric acid of the bases mentioned in the title, by processes which consist in causing 1 or 2 mols. of the pyrazolone to react with 1 mol. of camphoric acid, with or without the presence of a solvent. The processes must be conducted in the absence of light and moisture. It is stated that in the compounds the antihydrotic action of the camphoric acid is increased and the toxic action of the dimethylaminodimethylphenylpyrazolone decreased.

—A. C. W.

Substituted Sulphinides; Manufacture of ——. G. B. Ellis, London. From the Société Chimique des Usines du Rhône, Lyons, France. Eng. Pat. 22,214, Dec. 6, 1901.

The process is claimed for the manufacture of *p*-aminobenzoyl sulphonic-imide, which consists in boiling *p*-nitro-*o*-toluene sulphamide with a solution of sodium sulphide. The product is stated to be a sweet substance free from bitter taste.—A. C. W.

French Patents.

Ortho-Benzoic Sulphamide and its Salts; Obtaining —— in very Concentrated Solutions. Porchère anié. Fr. Pat. 280,211, April 2, 1898.

The patentee in the main patent and certificates of addition claims solutions of benzoic-*o*-sulphamide, and *p*-phenetol

carbamide in glycerin, water, alcohol, glucose, syrups, &c., the solution being effected at the boiling point of the solvent.—A. C. W.

Xanthine; Preparation of Homologues of ——. C. F. Boehringer und Söhne. Fr. Pat. 306,984, Jan. 9, 1901.

The first claim is for the process described in Eng. Pat. 1901, 526 (this Journal, 1901, 833). In the action of acetic anhydride on uric acid in the presence of pyridine, diacetyl diamino-uracide, $C_8H_{10}N_4O_4$, is an intermediate product. By the action of inorganic acids, glacial acetic acid, or acetic anhydride, it is transformed into methylxanthine. The second and third claims cover the processes here described.—A. C. W.

Hydroxy-Carboxylic Acids; Manufacture of Ortho ——. Chemische Fabrik auf Actien vorm. E. Schering. Fr. Pat. 307,186, Jan. 17, 1901.

The alkali salt of a phenol, cresol or naphthol, is mixed with about 10 per cent. of a crystallised alkali sulphite, and treated with gaseous carbon dioxide. The method can also be applied to the product obtained by fusing with caustic alkalis, the benzene, toluene or naphthalene sulphonates. Sodium sulphite is formed simultaneously, and when the whole melt in the dry state is treated with gaseous carbon dioxide, it yields the corresponding hydroxy carboxylic acid, which may be separated in the usual manner.
—T. A. L.

Pseudo-ionone; A New Compound named ——, *and its Different Transformations, with their Industrial Application, especially in Perfumery.* De Laire and Co. Fr. Pat. 229,683. Certificate of Addition, April 10, 1901.

In using different acids to effect the transformation of pseudo-ionone into ionone, the temperature and the concentration must be different. With strong hydrobromic, hydriodic, hydrochloric and phosphoric acids, and with 50 per cent. sulphuric acid, the reaction takes place in the cold. In the case of arsenic and formic acids, the water-bath must be heated; oxalic acid requires much longer heating. Whilst sulphuric acid of 100 or 80 per cent. strength gives principally β ionone, the strong acids mentioned above give chiefly α-ionone. These observations apply to the isomerisation of other condensation products of citral.—A. C. W.

Vanillin; Manufacture of ——. G. Vigne, Neuilly, France. Fr. Pat. 310,983, May 11, 1901.

Solution A is obtained by dissolving sugar in water, adding sodium, neutralising with hydrochloric acid, and then adding a few drops of ammonia. Solution B is obtained by precipitating silver nitrate by sodium chloride, dissolving in ammonia, and carefully adding potassium bichromate. This solution is contained in the outer vessel of a cell, in which is the negative pole; the porous cell contains solution A, and the unoxidisable positive pole. A current of 8—10 ampères at 10 volts is passed for 24 hours, and then the solution in the porous cells is brought to crystallisation, when chemically pure vanillin is obtained. This process, applicable to all sugars, is claimed.—A. C. W.

Erratum.

This Journal, 1901, 1237, col. 1, line 7 from bottom, insert before "methyl-*n*-nonylketone" the words "*other derivatives of*," and in line 6, instead of the words "Thoms finds that," read, "*Thoms produced*," deleting in lines 5 and 4 the words "is also present."

XXI.—PHOTOGRAPHY.

Platinum Process; Use of Glycerin in the ——. Brit. Jour. Phot. 1901, **48**, [2167], 723.

R. Rapp, of Vienna, has described a method of development in which glycerin is used as a means of control. The prints pinned to a board, are first brushed over with glycerin and the excess removed; the developer is then applied in suitable strength by the same means, local retardation, as required, being accomplished by the further application of glycerin.
—J. W. H.

Platinotypes (Sepia) by Cold Development. Brit. Jour. Phot. 1901, **48**, [2167], 723.

Baron von Hübl has described a process in which citrate instead of chloride of mercury is used; 1 grm. of yellow oxide of mercury is dissolved in a solution of 5 grms. of citric acid in 20 c.c. of water, and filtered; the arrowroot-sized paper is sensitised with 1—4 c.c. of this solution, added to 8 c.c. of normal iron solution, 4 c.c. of platinum solution (1 in 6), and a little citrate or oxalate of ammonium to keep the high lights clear; the developer should be strongly acid with oxalic acid, potassium oxalate being present to the extent of from $12\frac{1}{2}$ to 25 per cent.—J. W. H.

English Patent.

Photographic Plates for Producing Ink Impressions; Impts. in ——. A. Henriot, Reims, France. Eng. Pat. 15,921, Aug. 7, 1901.

The process may be summarised thus: a glass plate receives an adherent film of albumin and potassium silicate, upon which is deposited an emulsion prepared from gelatin, potassium bromide and mercury nitrate. The plate is then immersed in dilute potassium bichromate solution. It is exposed under a photographic negative until a faint picture appears, when the back is exposed until this picture disappears. After washing, the plate may then be inked by means of a roller and printing ink, and prints obtained in the press. The claims are for the plate, the emulsion, and the process by which the latter is prepared.—A. C. W.

French Patent.

New Chemical Compounds [Photographic Developers]; Process for the Production of ——. Soc. Anon. des Produits F. Bayer and Co. Fr. Pat. 311,778, June 14, 1901.

The halogen-substituted methyl alcohols, obtained by the action of haloid acids on formaldehyde and its derivatives, combine with nitro- or chlorophenols in the presence of dehydrating agents, to give compounds containing the group CH_2X. (X = halogen). The halogen methyl alcohols may also be used in the nascent state. For example, sulphuric acid, hydrochloric acid, formaldehyde and o-chlorophenol produce the compound $C_6H_3(CH_2Cl)(OH)Cl$. On treatment with water these compounds change the group CH_2Cl into CH_2OH, on treatment with alcohols into CH_2OR (R = alcohol radical), on treatment with acids or alkali salts into $CH_2O{:}COR$. The compounds last mentioned are converted into amides by reducing agents. These processes are claimed, also the products as new articles of manufacture and their industrial use, finally the application of the amines as photographic developers.—A. C. W.

XXII.—EXPLOSIVES, MATCHES, Etc.

Picric Acid; Manufacture of ——. L. Wenghöffer, Berlin. Ger. Pat. 125,096, Sept. 6, 1900. Through Zeits. angew. Chem. 1901, **14**, [47], 1190.

The object of the patent is the preparation of picric acid from a commercial product less subject than phenol to considerable variations in market price. Aniline is used as the raw material; it is first converted by well-known processes, giving an almost quantitative yield, into sulphanilic acid, which is then converted into diazobenzene sulphonic acid by means of nitrous acid, the preparation of picric acid from this being readily effected by treatment with the theoretical quantity of nitric acid at a gentle heat.
—W. G. M.

Phosphorus Suboxide. K. C. Browning. Proc. Chem. Soc. **17**, [243], 243.

The author has investigated the following methods used to prepare so-called phosphorus "suboxide":—

(i.) Oxidation of phosphorus, both in the solid state and in solution, by air diluted with carbon dioxide.

(ii.) Action of metals on phosphorus oxychloride.

(iii.) Action of acetic anhydride on sodium hypophosphite.

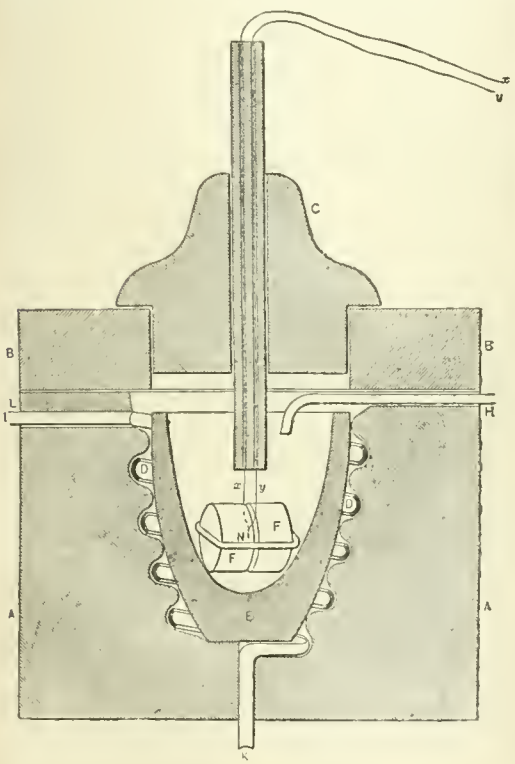
The results obtained confirm, on the whole, those of Chapman and Lidbury and of Burgess and Chapman, although the author believes that the suboxide *can* exist under certain conditions.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

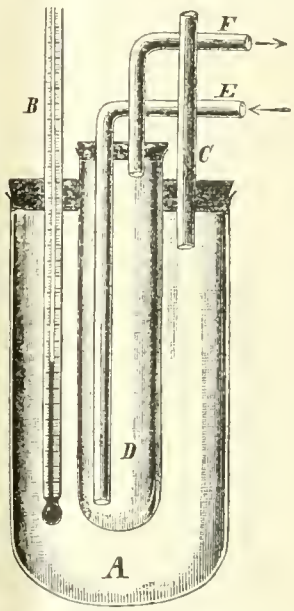
Crucible-Furnace for Laboratory Use; Electric-Resistance Magnesia ——. H. M. Howe. Eng. and Mining J. 1901, **72**, [20], 636.

The figure shows a vertical section of an electric-resistance magnesia crucible furnace, as used by the author for determining the cooling curves of steels. The furnace itself consists of two semi-cylinders of magnesia, A A, with a cover B B, and a stopper C, of the same material; the latter is perforated to admit the connecting wires, *x y*, of a thermo-electric couple. The furnace is heated by the spiral of platinum wire D D (entering and departing by the openings I K), through which a current of any desired strength is passed, bringing it to incandescence. H is a pipe through which any desired gas can be introduced, L is packing, and E is the crucible of magnesia. FF are a pair of discs, bound together, but separated by the inverted thermo-junction N, of the thermo-electric pyrometer, so



that retardations in the heating and cooling of the steel discs can be observed and recorded. The furnace can be used for a variety of purposes, *viz.*, for heating objects in any desired atmosphere, and when it is desirable to avoid an atmosphere containing the products of combustion of any fuel; for attaining quickly and accurately a given temperature; for maintaining a small object for a long time at a definite temperature, &c. In order to increase its radiating surface, the spiral D may be made of special wire of U-shaped cross section, like that employed for the ribs of umbrellas. It has been stated that nickel wire serves well for heating by resistance, for temperatures up to 1200° C., and some of the new high-resistance alloys also should be available for moderate temperatures. Apart from the platinum, the apparatus is stated to be cheap, as well as simple and effective. In practice, the author encloses the furnace in a large mass of powdered lime, to reduce the loss of heat by radiation.—A. S.

Sublimation Apparatus; A Simple ——. C. Nicolaysen. Chem.-Zeit. 1901, **25**, [93], 1031.



The substance to be sublimed is placed in the bottom of the outer tube A, about 6 cm. wide. It volatilises on to the condensing tube D, which is cooled by a current of water flowing in the directions indicated by the arrows. The vertical tube C is about 30 cm. long. If much material has to be dealt with, a small dish may be adjusted under the tube D, to catch any sublimate that falls from it.—R. L. J.

Cement; Modification of Schumann's Apparatus for Determining the Specific Gravity of ——. P. Beck. Zeits. anal. Chem. 1901, **40**, [10], 646—649.

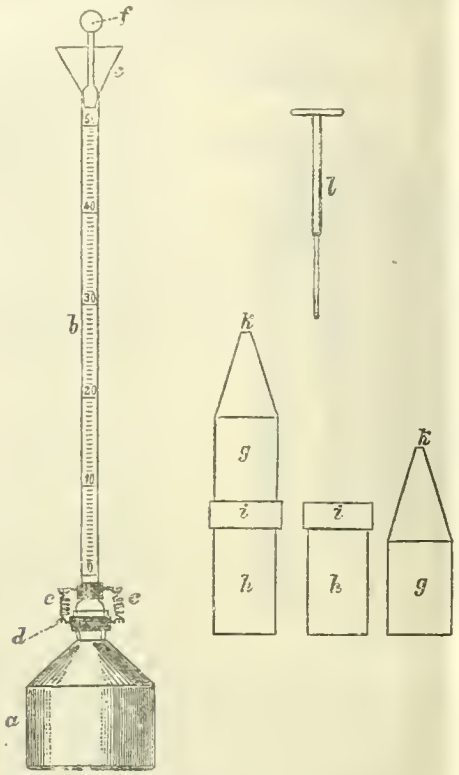
In place of oil of turpentine, which has a considerable viscosity, the author uses carbon tetrachloride which is mobile, and allows the cement poured in to fall easily to the bottom without forming an emulsion. It also rises more quickly in the measuring tube, consequently the reading can be taken immediately, and since the experiment only takes 10—15 minutes, a correction for temperature is unnecessary. To prevent loss by volatilisation, a glass stopper is ground into the upper funnel-shaped end of the measuring tube. Also carbon tetrachloride does not burn or harden, and has an agreeable smell, and its lower boiling point allows almost all the cement used in an experiment to be recovered, for it can be rinsed into a flask with a little more tetrachloride, which can be distilled off on a water-bath, and the cement used for other determinations.

In the figure, the measuring tube *b*, with a funnel-shaped opening at the top, is ground into the vessel *a*, and is divided into $\frac{1}{10}$ c.c. A glass stopper fits into the upper opening. The neck of the vessel, and the lower ground in part of *b*, have each an opening 2 mm. wide (*d*), so that both accurately correspond for a given position of *b*, whereby the liquid can be easily set at the zero point.

Even by working carefully, it is impossible to prevent the cement from rushing too quickly into the tube *b*, and blocking it, which necessitates tapping the apparatus on a wood or cloth base to make the cement move, and, in doing so, liquid may be lost. To prevent this, *a* and *b* are provided with two metal rings with hooks, which are easily held together by the springs *c*. The ring on *b* is moveable, and, after the liquid has been set at the zero point, is brought up to a suitable position, after which the springs can be fastened.

With the apparatus is supplied a metal vessel of two parts, which are of exactly equal weight, so that the funnel-shaped half *g* can be used as counterpoise for the half *h* in which the cement is weighed off. After the cement is weighed in *h*, the part *g* is fixed on by the gripping ring, and the metal vessel turned over, so that its opening 4 mm. wide *k* projects into the measuring tube *b*. Then *h* is removed, and its contents allowed to empty into

the apparatus at will, by moving up or down the wire pestle *l*. To prevent easily flowing material from blocking the tube *b*, the upper part of *l* is made thick enough to close the opening *k*, and by gently easing *l*, small quantities can be admitted at the time. Several estimations can be made with this instrument successively. After reading off the volume in *b*, the apparatus can be stood in a saucer, the



springs *c* loosened, and some carbon tetrachloride forced out till the liquid again stands at the zero point in *b*, when the springs are refastened, and a fresh estimation can be made, and so on till the vessel *a* is practically filled with material.
—W. C. H.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Manganese; Volumetric Determination of ——. L. Dufty. Chem. News, 1901, **84**, [2191], 248.

The author proposes a modification of the colorimetric method recommended by Reddrop and Ramage (this Journal, 1895, 305) for the determination of small quantities of manganese by means of "sodium bismuthate," using a solution of permanganate as a standard, and comparing the colours in Nessler tubes. For the determination of manganese in steel, the process is as follows:—0·1 grm. of the steel is dissolved in 2 or 3 c.c. of nitric acid (sp. gr. 1·2), and after determining the carbon, the solution is transferred to a graduated, stoppered, 25 c.c. tube, and diluted with nitric acid (sp. gr. 1·2) to 20 c.c. if the manganese be under 0·8 per cent., or to 25 c.c. if over that percentage. A standard steel, containing a known proportion of manganese, is treated in an exactly similar manner. 0·2 grm. of "bismuthate" is then added to each tube through a dry funnel, the whole thoroughly mixed at once, and again after an interval of five minutes. The tubes are then allowed to stand in a dark cupboard for about 30 minutes, and then exactly 5 c.c. of the clear pink solutions transferred to the comparing tubes, the standard being diluted to a convenient tint for comparison.—A. S.

Sodium Carbonate, Crude, Fused; [Recovered Soda] of the Cellulose Industry; Examination of ——. (*Analysis of Mixtures of Alkali Silicates, Carbonates, Sulphates, and Hydroxides.*) G. Lunge and W. Lohöfer. Zeits. angew. Chem. **14**, [45], 1125—1134.

The analysis of the "Schmelzsoda," obtained in the manufacture of cellulose from wood pulp or straw by the boiling down with sodium sulphate and calcining of the spent alkaline liquors, has usually been conducted by processes similar to those used in the examination of ball soda, and other products of the Leblanc process. But the much greater proportion of silicate and of sulphide in "Crude Fused Soda" [Recovered Soda], renders several of these processes inapplicable, as this investigation has proved. The authors summarise their results as follows:—1. Sodium silicate solution does not react completely with barium chloride according to the equation—

$$Na_2SiO_3 + BaCl_2 = 2NaCl + BaSiO_3:$$

at least 40 per cent. of the sodium silicate is unconverted. Hence sodium silicate, in any quantity, cannot be separated from hydroxide by the addition of barium chloride, as carbonate can; and this method is not applicable to the determination of hydroxide in liquors containing, besides carbonate, much silicate. 2. In titrating sodium silicate with normal hydrochloric acid, accurate results are obtained if Methyl Orange be used as an indicator (*i.e.* the change of tint occurs when Na_2SiO_3 is exactly converted into NaCl), but not if phenolphthaleïn be used. The same remark applies to mixtures of sodium silicate and carbonate; but mixtures of silicate and hydroxide, or of silicate, carbonate, and hydroxide, give accurate results with either indicator, phenolphthaleïn indicating the conversion of silicate and hydroxide into chloride and of carbonate into bicarbonate, and methyl orange indicating the conversion of the whole of the sodium compounds into chloride. A mixture of silicate and sulphide, or of silicate, sulphide, and carbonate, can be titrated only with methyl orange; while a mixture of silicate, sulphide, carbonate, and hydroxide can be titrated either with phenolphthaleïn (formation of NaHS and $NaHCO_3$), or with methyl orange (complete conversion of all into NaCl). These irregularities are explained by the hydrolytic dissociation of the sodium silicate into hydroxide and colloidal silicic acid, which latter functions as an acid to phenolphthaleïn, though not to methyl orange; when, by the neutralisation of the hydroxide, a sufficient amount of sodium chloride is formed, this "salts out" the silicic acid, *i.e.* converts it into a form in which it does not affect phenolphthaleïn. The same effect is produced by adding common salt as such; with this addition, solutions of silicate, or of silicate and carbonate, can be titrated with phenolphthaleïn.

On the basis of these results, the authors propose the following plan for the analysis of crude fused sodium carbonate:—Dissolve 50 grms. of the powdered sample by shaking in a litre flask with about 500 c.c. of water (free from air and carbon dioxide) at about 45° C., and make up to the mark.

1. *Insoluble Matter.*—Determine in the usual way, as with ball soda.

2. *Alkalinity.*—Titrate 20 c.c. (= 1 grm.) with normal acid, first with phenolphthaleïn, and then further with methyl orange.

3. *Sulphide and Sulphite.*—Dilute 20 c.c. with air-free water to 200 c.c., acidify with acetic acid, and titrate rapidly with N/10 iodine and starch.

4. *Sulphite.*—Precipitate the sulphide from 100 c.c. with alkaline zinc solution, make up to 250 c.c., filter through a dry filter, and titrate 50 c.c. of the filtrate, after acidifying, with iodine and starch.

5. *Silicate.*—Evaporate 20 c.c. to dryness, after addition of hydrochloric acid (keep as free from air as possible during this addition, to avoid oxidation of H_2S and SO_2 before they escape), and weigh the silica in the usual manner.

6. *Sulphate.*—Precipitate the filtrate from the silica determination with barium chloride.

The calculation of the analysis need not be entered upon here.—J. T. D.

Cæsium and Rubidium as Acid Sulphates and Potassium and Sodium as Pyrosulphates; Determination of——. P. E. Browning. Amer. J. Science, Silliman, **12**, [4], 301—304. Chem. Centr. 1901, **2**, [19], 1093.

The author finds that cæsium and rubidium salts of volatile acids when treated with excess of sulphuric acid and dried to constant weight at 250°—270° C., give acid sulphates of the type $RHSO_4$, which change on stronger ignition, to R_2SO_4. Cæsium salts show a tendency to retain a greater amount of SO_3 than that corresponding to the formula, $RHSO_4$; whilst at 300° C., the tendency is to form pyrosulphate. Under similar conditions, potassium and sodium salts give pyrosulphates of the formula, $R_2S_2O_7$, which on further ignition are converted into the normal sulphates.

—A. S.

Sulphur and Phosphorus in Ironworks Products; Determination of——. U. Antony. Gaz. chim. ital. **31**, [2], 274—277. Chem. Centr. 1901, **2**, [21], 1177.

For the rapid determination of sulphur and phosphorus in iron, the author recommends the use of the oxidising mixture previously described (this Journal, 1899, 866) consisting of 4 parts of manganese dioxide, 1 of potassium permanganate and 2 of dry sodium carbonate. 5 grms. of the sample reduced to an extremely fine state of division, are intimately mixed with 40 grms. of the oxidising mixture, then covered with a layer of the latter, and heated in a platinum crucible at first gradually, but at the last over the blast to redness, the mixture being frequently stirred with a thick platinum wire. After cooling, the melt is extracted with boiling water, the solution filtered, acidified with nitric acid, and evaporated to about 30 c.c. A little ferric chloride, ammonium chloride, and ammonia are then added, the solution heated, filtered, and the sulphur determined in the filtrate as barium sulphate. The precipitate which contains the phosphorus, together with silicon and arsenic, is dissolved in hydrochloric acid, the solution evaporated to dryness, the residue dried at 120°—130° C., dissolved in dilute hydrochloric acid, the arsenic removed by sulphuretted hydrogen and the phosphorus determined in the usual manner. Chromium, tungsten, &c., in steels can also be determined by this method.—A. S.

Steel; Determination of Silicon in——. G. Auchy. J. Amer. Chem. Soc. 1901, **23**, [11], 817—820.

The low results obtained when Drown's method of determining silicon is used for steel (0·01 to 0·035 per cent. loss for 0·15 to 0·20 per cent. silicon) have been attributed by Dudley to iron sulphate enclosing and protecting the silicic acid from the dehydrating action of the sulphuric acid. Dudley suggested stirring to insure sufficient contact and the writer found the silicon loss to be only 0·006 per cent. when the liquid was stirred for five minutes after the appearance of sulphuric fumes.

This extra labour would be avoided if Dudley's suggestion be carried out of keeping the iron salts in solution until the silica in rendered insoluble. The author found that by the use of *aqua regia* instead of nitric acid, and of 3·2 c.c. of strong sulphuric acid per grm. of drillings, the iron salt did not separate out till just before the evolution of sulphuric fumes, but the loss of silica was as great as by the regular method. The results given by three methods are tabulated, the steels analysed containing 0·15 to 0·25 per cent. silicon. The loss of silicon was determined by evaporating the filtrate.

Twenty determinations by Drown's method show a mean loss of 0·019 per cent., the greatest loss being 0·034, and the least 0·010.

Ten determinations by the author's method give a mean loss of 0·024 per cent., the maximum loss being 0·034, and the minimum 0·016.

Eighteen determinations by the old Swedish method (sulphuric acid alone) show a mean loss of 0·004 per cent., the maximum loss being 0·012, while in four determinations no loss was observed.

For steel analysis the Swedish method is recommended, for low carbon steels and wrought iron it is perhaps better to use hydrochloric acid. In the case of high carbon steels, the liquid in a covered dish may be boiled down rapidly on a thin steel plate heated by a full Bunsen flame to the end of the operation.

Results obtained with a pig iron containing 3·55 per cent. of silicon show that Drown's method is as effective here as the old Swedish.

These results are compared with silicate analyses in which from 1·5 to 3 per cent. of the total silica remains in the filtrate from the first silica separation in spite of repeated evaporations before filtering. Cameron (Chem. News, **69**, 171). The author recommends that the hydrofluoric acid treatment should be omitted unless the silica remaining in the filtrate be determined, as the errors oppose each other. Results obtained with different ferrosilicons were—

Silicon lost per cent., 0·43, 0·23; hydrofluoric acid residues, per cent., 0·16, 0·24, 0·14.

Total silicon (silicon as usual + silicon in filtrate) was determined in 3 samples of steel by Drown's method (11 determinations), and by the Swedish method (7 determinations), the greatest observed difference being 0·006 higher by the Swedish method and the mean difference 0·002.—J. N. G.

Ferric Oxide; Potassium Thiocyanate as an Indicator in the Reduction of——, to the Ferrous State. L. L. de Koninck. Chem.-Zeit. Rep. 1901, **25**, [88], 317. From Zeits. anorg. Chem. 1901, **28**, 175.

Ebeling (Chem.-Zeit. Rep. 1901, **25**, 166) has recommended the addition of 1—2 drops of a 10 per cent. solution of potassium thiocyanate (sulphocyanide) solution as an indicator to mark the end-point in the reduction of ferric to ferrous solutions by means of zinc prior to titration by the permanganate method in place of the old system by which a drop of the solution was removed in order to make the test. The new departure is open to two objections: (1) thiocyanates in acid solution are decomposed by zinc with the formation of hydrogen sulphide, so that the indicator may be entirely destroyed before the reduction of the ferric compound is complete; and (2) thiocyanates in acid solution reduce either permanganate or bichromate solutions energetically, from which cause any residual thiocyanate left in the iron solution, after reduction is complete, may give rise to serious errors.—W. G. M.

Cadmium; Quantitative Determination of——. E. H. Miller and R. W. Page. Zeits. anorg. Chem. **28**, 233—241. Chem. Centr. 1901, **2**, [21], 1181.

The authors compare the electrolytic (cyanide), the carbonate, and the phosphate methods. The electrolytic method gives very accurate results, if excess of cyanide and the presence of other salts are avoided. The carbonate method is troublesome and less accurate. Determination as cadmium ammonium phosphate is very accurate, if a neutral solution is precipitated in the cold with a large excess of di-ammonium hydrogen phosphate, and then allowed to stand overnight. If the precipitation is effected in boiling solution, or if the solution be boiled with the precipitate, the composition of the latter alters, and the results obtained are too low. The use of an asbestos filter should be avoided, as it will lead to errors, owing to the solubility of asbestos in ammonium phosphate and nitric acid. Cadmium ammonium phosphate contains 1 molecule of water; it can be dried at 100°—103° C. without decomposition.—A. S.

Cyanides and Cyanates; Reciprocal Determination of——. J. W. Mellor. Analyst, **26**, Nov. 1901, 286—289.

The principle of the author's method is first to determine the equivalent of the cyanide in terms of silver nitrate, and then to estimate the amount of cyanate in the whole in terms of nitric acid. It is conducted as follows:—

1. A solution of the commercial cyanide is made by dissolving 20 grms. in 100 c.c. of distilled water, adding thereto calcium nitrate solution, free from chlorides, to precipitate carbonates, &c., filtering, and washing, and making the clear liquid up to 200 c.c. Thus 1 c.c. = 0·1 grm. of original sample.

2. Excess of aqueous ammonia and a few drops of potassium iodide are mixed with 10 c.c. of this solution, which is then titrated with decinormal silver nitrate. The result = m.

3. To another 10 c.c. is added concentrated silver nitrate until no further precipitation takes place, whereby all the cyanide radicle in the $KAgCy_2$ is precipitated as AgCy, together with the silver cyanate. The mixed precipitate is filtered, washed with ice-cold water, and warmed with 5 c.c. of normal nitric acid to about 50° C. to decompose the cyanate. After filtering and washing, the filtrate is titrated with standard alkali. If normal soda be used, and the quantity required be n c.c., then $0{\cdot}0405(5-n)$ grms. is the quantity of potassium cyanate in 1 grm. of sample; and $0{\cdot}013\,n$ grm. is the amount of potassium cyanide in 1 grm. of sample.

If desired to calculate as "available cyanogen," then $0{\cdot}0052\,n$ grm. is contained in 1 grm. of sample. This avoids the higher valuation given to any sodium cyanide present when expressed as potassium cyanide. The following is an analysis by the above method of a sample of potassium cyanide used for gold extraction :—

	Per Cent.
Insoluble matter, carbonaceous	4·85
„ „ ash	1·07
Carbonate radicle (CO_3)	4·69
Sulphate „ (SO_4)	trace
Chloride „ (Cl)	trace
Cyanate „ (OCN)	4·04
Cyanide „ (CN)	32·51
Potassium	49·90
Sodium	1·59
Loss	1·85

—A. W.

Potassium Percarbonate as a Substitute for Hydrogen Peroxide in Analysis. F. G. Treadwell. Chem.-Zeit. 1901, **25**, [91], 1008.

Potassium percarbonate being now manufactured in a high degree of purity, the author calls attention to the advantage of using it in place of the unstable hydrogen peroxide. In the dry condition it can be kept indefinitely without undergoing any change, and on treatment with cold dilute acid, it is readily decomposed with the formation of hydrogen peroxide, $K_2C_2O_6 + 2H_2SO_4 = 2KHSO_4 + 2CO_2 + H_2O_2$. The solution thus obtained is suitable for the qualitative detection of titanium, vanadium, chromium and cerium, and for the oxidation of ferrous salts to ferric salts.

Potassium percarbonate can also be used in many cases in which alkaline hydrogen peroxide is employed. Thus, hydrogen sulphide, soluble sulphides, and sulpho-salts are readily oxidised to sulphuric acid; manganese, nickel, and cobalt salts to higher oxides; and chromic salts to chromates. Like hydrogen peroxide it can also be used to effect reductions, hypochlorites and hypoiodites, for instances, being completely reduced to the respective chloride or iodide.

The commercial salt contains about 80 per cent. of percarbonate, and is free from all but traces of chloride or sulphate.—C. A. M.

Portland Cement and Slag; Experiments on Mixtures of ——. P. Beck. Zeits. anal. Chem. 1901, **40**, [10], 649—666.

This is a continuation of experiments made by R. and W. Fresenius on the detection of admixtures to Portland cement, and the recognition of slag. The points treated of are loss on ignition, alkalinity of the water-extract, and the amount of potassium permanganate solution used. This, the author states, is an insufficient criterion of the presence of slag, and recommends the determination of the sulphur present as sulphide.

Several tables are given, and a description of the analysis of Heidelberg Portland cement.

The sulphur in slag is estimated as $BaSO_4$. The material is fused with potassium sodium carbonate and sodium nitrate, and the sulphur oxidised by nitric acid.

A table shows the sp. gr. of cement, and varying mixtures of cement and slag, before and after heating to redness. The sp. gr. decreases with increasing amounts of slag.

The author finds that by heating cement for a short time as much is dissolved out, as would be by cold water after several days contact.

For the permanganate absorbed, the author recommends taking a known weight of substance in a flask and mixing it with a little water. More water is then added and an excess of permanganate, and the mixture well shaken; the excess of permanganate being titrated back.

The sulphide sulphur is estimated as cadmium sulphide, in an atmosphere of carbon-dioxide.

He recommends the following process :—A known weight of cement and slag is put into a flask with about 50 c.c. of water, one or two grms. of pure cadmium carbonate, and 100 c.c. of water are added, then dilute sulphuric acid in small portions at the time, and the whole well shaken. By carbon dioxide air is expelled from the flask, which is set aside till the solution is clear. This is then filtered and titrated with diluted permanganate solution, the permanganate absorption having been determined also before the separation of the sulphide sulphur.—W. C. H.

Manganese; New Method of Determining ——. G. v. Knorre. Zeits. angew. Chem. **14**, [46], 1149—1162.

The solution containing manganese (such a quantity as will contain about 0·1 grm. of the metal) is placed in a capacious Erlenmeyer flask, and ammonium persulphate added (50—100 c.c. of a solution containing about 60 grms. per litre). The liquid is boiled for about five minutes, and the precipitated manganese dioxide filtered and washed. It is then transferred (with the filter) to the flask in which it was precipitated, dilute sulphuric acid is added, followed by a known quantity of a titrated dilute solution of hydrogen peroxide. After the precipitate is completely dissolved, the excess of hydrogen peroxide is determined by standard potassium permanganate, and the manganese is calculated from the amount of permanganate equivalent to the hydrogen peroxide destroyed. Instead of hydrogen peroxide, ferrous sulphate may be used.

The author standardises his permanganate solution by carrying the method through on a known quantity of manganese ammonium sulphate, potassium permanganate, or other manganese compound of definite composition. When the permanganate is standardised by iron or ferrous salts, the method gives results about $1\frac{1}{2}$ per cent. too low, though gravimetric determinations indicate that the manganese is completely precipitated by the boiling with persulphate.—J. T. D.

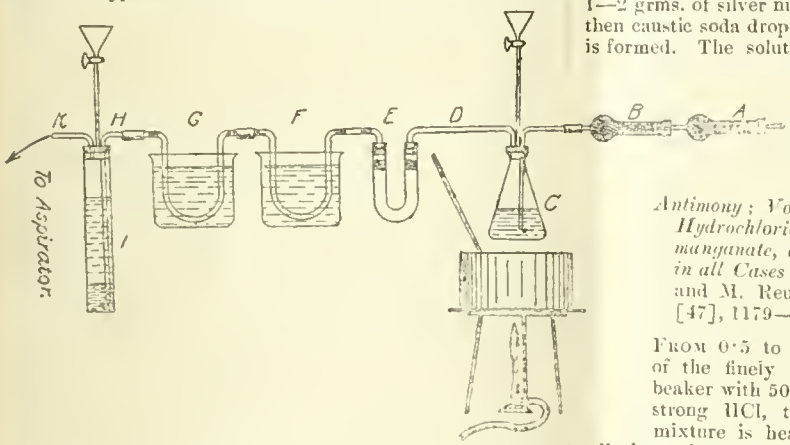
Fluorine in Fluorides, easily decomposible by Sulphuric Acid; Quantitative Determination of ——. W. E. Burk. J. Amer. Chem. Soc. 1901, **23**, [11], 825—829.

The author recommends a modification of Carnot's method. A perfectly dry mixture of about 3 grms. of calcined silica and 0·20 grm. of powdered fluoride is placed in a 150 c.c. Erlenmeyer flask C, and 40 c.c. of conc. sulphuric acid added through the tap funnel. The acid should have been heated to about 165° C. in a current of dry air. The mixture is heated in an oil bath at 120°—135° C. for $1\frac{1}{2}$ hours; a steady stream of air enters the apparatus through A (glass wool and H_2SO_4) and B (fused calcium chloride); C is occasionally shaken. The U-tubes are plugged with glass wool at the points shaded. G F are made of 5 mm. tubing and stand in cold water.

The delivery tube H dips below a few mm. of mercury at the bottom of I which contains 20 c.c. of freshly prepared 10 per cent. potassium fluoride solution. At the end of the operation the liquid in I containing precipitated K_2SiF_6 is pipetted into a beaker, and II and I washed; the total volume should be less than 75 c.c. The coating formed on the inside of I must not be detached. An equal volume of 90 per cent. alcohol is now added, and after settling, the precipitate is collected on a Gooch filter, washed with 90 per cent. alcohol till the filtrate no longer reacts with

barium chloride and dried to constant weight at 100° C. Weight of precipitate × 0·34511 gives the amount of fluorine in the substance analysed.

Sources of error are (1) moisture in the air current or in the connecting tubes, the latter are heated and evacuated before the apparatus is set up, and heated with a flame in a



current of air before a determination is made. (2) Sulphuric acid fumes if carried over cause high results, but should be held back by the glass wool plugs. (3) Flakes are liable to be formed in I by the action of the potassium fluoride solution on the glass; the author suggests that I and the connecting tubes from C to I should be made of platinum. No results are given.—J. N. G.

Chlorides, Hydrochloric Acid, Silver, and the Phosphates; Simple, Quick, Gasometric Method for Determining ——. E. Riegler. Zeits. anal. Chem. 1901, **40**, [10], 633—638.

The method depends upon the reaction of hydrazine sulphate and caustic soda with silver chloride, whereby metallic silver is separated, and nitrogen set free, which is measured. The equation given is:—

$$4AgCl + N_2H_4H_2SO_4 + 6NaOH = 4Ag + 4NaCl + Na_2SO_4 + 6H_2O + N_2.$$

Theoretically one part of nitrogen corresponds with 20·424 parts of silver chloride, but in practice the author finds 20·2 parts.

The chloride solution is acidified with nitric acid, and heated, and a 5 per cent. silver nitrate solution added, as long as the chloride precipitates. The precipitate is allowed to settle, washed free from acid, and together with the paper introduced into the outer generating vessel of a Knop-Wagner nitrometer. About 30 c.c. of water, and 0·5 grm. of crystallised hydrazine sulphate are added, and then 10 c.c. of a 10 per cent. caustic soda solution are pipetted into the inner vessel. The generating vessel is closed with an india-rubber cork, and immersed in a cooling vessel, which like the jacket round the burettes is filled with water at room temperature. The cork carries a glass tube and stopcock, and is connected by a rubber joint with the graduated burette. The water in the burettes is brought to the zero point in the graduated one. The generating vessel is shaken for about half a minute, to evolve the nitrogen, and the apparatus again cooled. The water is levelled off in the burettes, and the reading taken, and from Baumann's table the weight of nitrogen calculated. This, multiplied by 20·2, gives the weight of silver chloride, or by 5, the weight of chlorine, or by 8·23, the weight of sodium chloride.

For hydrochloric acid, some nitric acid is added, and the solution shaken with excess of a 5 per cent. silver nitrate solution, and treated as above. A soluble silver salt is treated with an excess of sodium chloride.

A phosphate is first converted into silver phosphate, which reacts as follows:—

$$Ag_3PO_4 + 3NaCl = Na_3PO_4 + 3AgCl.$$

The silver chloride is estimated as described above. The author finds 1 mgrm. of nitrogen corresponds with 3·33 mgrms. of P_2O_5 (instead of 3·37). The phosphate to be estimated is dissolved in a known quantity of water, strongly acidified with nitric acid, and a quantity containing 0·15—0·16 grm. P_2O_5 is diluted with 50—60 c.c. of water, and 1—2 grms. of silver nitrate, dissolved in water, added, and then caustic soda drop by drop till a permanent precipitate is formed. The solution is made alkaline with ammonia, warmed, and the precipitate washed into a flask, dissolved in nitric acid, and 1 grm. of sodium chloride added, and this precipitate treated as before.—W. C. H.

Antimony; Volumetric Determination of ——, *in Hydrochloric Acid Solution, by means of Permanganate, and the Application of this Method in all Cases occurring in Practice.* O. Petriccioli and M. Reuter. Zeits. angew. Chem. 1901, **14**, [47], 1179—1183.

From 0·5 to 1 grm. (or in special cases 5 grms.) of the finely crushed substance is treated in a beaker with 50 c.c. of hot water and 50 c.c. of pure, strong HCl, the water being added first. The mixture is heated on a sand-bath to 70° C. until all the antimony is dissolved, which requires ½—1 hour. It is then filtered into a large beaker or Erlenmeyer flask, the residue being washed first with water containing HCl and then with pure water. The filtrate, after the addition of some tartaric acid, is diluted to 750 c.c., heated to 70° C., and precipitated with hydrogen sulphide. The precipitate is filtered, washed with H_2S water, and rinsed back into the original precipitation vessel with the aid of hot water. The sulphide is warmed with 50 c.c. of strong HCl (avoiding boiling) until no more H_2S is evolved. The presence of H_2S is at once detected, if a little cold water be added to the solution, by the reappearance of a precipitate of red Sb_2S_3, the addition in the absence of H_2S causing only a slight milkiness, due to basic chloride. When all H_2S is expelled, the liquid is diluted until this milkiness is observed, the turbidity is removed by just sufficient dilute HCl, added drop by drop, and the solution is titrated with permanganate, in accordance with the equation—

$$5SbCl_3 + 16HCl + 2KMnO_4 = 5SbCl_5 + 2KCl + 2MnCl_2 + 8H_2O$$

If 5·27 grms. of pure $KMnO_4$ be dissolved per litre of standard solution, 1 c.c. of the resulting solution will be equivalent to 1 per cent. of Sb reckoned on 1 grm. of the original substance. The end-point of the reaction is sharply defined.

Application to Ores.—Sb_2O_4 ores (cervantite) must be attacked by fusion with Na_2CO_3 and S, dissolving the melt in hot water, filtering off any FeS that may be present, and precipitating the Sb_2S_3 by acidification, preferably with acetic acid, (because, when this acid is used, there is less risk of antimony remaining in solution, and the precipitate is much finer). The supernatant liquid is decanted through a filter, and the residue is then treated with hot water, in which a little $KClO_3$ has been dissolved. Strong hydrochloric acid is now added with brisk shaking, until nothing is left of the precipitate but yellow sulphur. Should there be any precipitate on the filter, the funnel with the filter is placed in the neck of the Erlenmeyer flask and the filter paper is pierced, so that the escaping chlorine may attack the mass; after a quarter of an hour, the residue is washed into the flask. The antimony in the solution in the flask is precipitated by H_2S, and the rest of the process is as previously described.

Application to Sublimation Products.—0·5 grm. of the product is treated with about 100 c.c. of dilute (1:1) HCl, allowed to remain in a warm place for half an hour, diluted with water until turbidity is produced, cleared with HCl, and titrated direct with $KMnO_4$; this gives the amount of Sb present as Sb_2O_3. 0·5 grm. of the

product is then fused with Na_2CO_3 and S; and treated as in the last paragraph, to determine the total Sb, the difference between this and the former result represents the Sb present as Sb_2O_4.

Application to Slags.—The fusion method with Na_2CO_3 and S alone is applicable, unless experience shows that there is practically no Sb_2O_4 present, in which case 1—5 grms. may be dissolved in 100 c.c. (1:1) dilute HCl, allowed to stand on the sand-bath for half an hour, diluted with cold water to about 1 litre, and titrated direct. —W. G. M.

Manures, Artificial; Methods of Analysis of ——. F. Kretschmer. Zeits. angew. Chem. **14**, [45], 1136—1138.

A description of the methods of analysis used in the Landwirthschaftlichen Versuchsstationen in their ordinary routine work.

Nitrogen.—*Nitric Nitrogen:* Dissolve 10 grms. of the nitre, and make up to 1 litre. Dilute 50 c.c. with 200 c.c. of water, place in a distillation flask with 20 c.c. of sodium hydroxide solution and 3 grms. of aluminium foil. After 12 hours, distil into 25 c.c. of standard sulphuric acid, and titrate the excess of acid with sodium hydroxide and methyl orange. *Ammoniacal Nitrogen:* Use 0·5 grm. of ammonium sulphate, 1 grm. of a mixed manure; place in the distilling flask with 200 c.c. of water, and 3—4 grms. of calcined magnesia, distil into 25 c.c. of standard acid, and titrate as above. *Organic Nitrogen* by the Kjeldahl-Wilfahrt method. Heat 1 grm. with sulphuric acid and mercury in the usual way, precipitate the mercury with sodium sulphide, make alkaline, and distil off and titrate the ammonia as above. In the case of guanos, &c., containing traces of nitric nitrogen which is to be determined in the total nitrogen, phenolsulphonic acid is substituted for sulphuric acid in the process. The condenser used in the distillation is a plain glass tube of 2 cm. diameter, with a bulb at the end connected to the flask, so as to prevent spirted liquid from being carried over, and bent round and drawn out at the end dipping into the standard acid. Even if this acid boils, towards the end of the operation, there need be no loss.

Phosphoric Acid.—*Soluble Phosphoric Acid:* Place 20 grms. of the sample in a Stohmann's litre flask with 800 c.c. of water, and shake for half an hour; make up to the mark and filter. To 50 c.c. of the filtrate add 50 c.c. of Märeker's solution (10 per cent. solution of citric acid containing 2 per cent. of ammonia) and 20 c.c. of magnesia mixture (70 grms. ammonium chloride, 55 grms. magnesium chloride, 250 c.c. 10 per cent. ammonia, make up to 1 litre). Stir the solution well, allow the precipitate to settle, filter in a platinum Gooch crucible, and weigh as pyrophosphate. In the Bonn station the same crucible is used successively for five filtrations before being cleaned out and re-felted. In the case of double superphosphates, boil 50 c.c. of the solution (corresponding to 0·5 grm. of substance), for 10 minutes with 10 c.c. of nitric acid, to convert any pyrophosphate into ortho-salt, then determine the soluble phosphoric acid by the molybdate method. *Total Phosphoric Acid* is determined in all phosphatic manures except Thomas meal by the molybdate method. In the case of Thomas meal, moisten 10 grms. in a 500 c.c. flask with water, add 50 c.c. of strong sulphuric acid, and boil till the meal is decomposed; fill to the mark, cool, mix, and filter. Treat 50 c.c. of the filtrate by the citric acid method, as for soluble phosphoric acid. *Citrate-soluble Phosphoric Acid* in Thomas meal: Digest 5 grms. with 500 c.c. of 2 per cent. citric acid in a half-litre flask for half an hour with constant rotation, and filter. To 50 c.c. of the filtrate add 50 c.c. of Kellner-Böttcher solution (1 kilo. of citric acid, dissolved in 5 litres of 20 per cent. ammonia, and 5 litres of magnesia mixture added), shake or stir the precipitate for half an hour, and filter in the Gooch crucible at once.

Potassium.—In a litre flask place 10 grms. of the sample in fine powder, and boil with 400 c.c. of water; precipitate the sulphates with barium chloride, then remove the excess of barium, together with the iron and alumina, the lime and magnesia, by ammonium carbonate and ammonia, fill to the mark, mix, and filter. Evaporate 100 c.c. of the filtrate in a platinum dish on the water-bath, ignite gently, dissolve the residue in hot water, and determine in usual way.

Calcium.—In manures containing no phosphoric acid, the calcium is precipitated as oxalate, and weighed as lime. In the presence of phosphoric acid, however, the calcium is precipitated with sulphuric acid and alcohol, and weighed as sulphate.—J. T. D.

ORGANIC CHEMISTRY.—QUALITATIVE.

Phenols; Use of Formaldehyde as a Reagent for ——. Eudemann. Zeits. anal. Chem. 1901, **40**, [10], 667.

A solution of Formaldehyde (Formalin) evaporated nearly to dryness with phenols, and treated with a dehydrating agent, as concentrated sulphuric acid, yields coloured products, probably analogous in constitution to the triphenylmethane dyestuffs, the colour depending on the nature of the phenol used. Thus phenol gives fuchsin red, salicylic acid red, &c.; tannin does not react. The reaction also occurs with other aldehydes; and conversely phenols can be used as reagents for formaldehyde.

The author adds that while unprepared, white silk gives with concentrated sulphuric acid, first a yellow then an orange, and finally a violet solution, silk that has been treated with formaldehyde gives at first a distinct brown, and on longer standing an olive-green colour, the fibre appearing to be insoluble.—W. C. H.

Oils; Differentiation of Drying and Marine Animal ——. G. Halphen. J. Pharm. Chim. 1901, **14**, [9], 391—397.

The insoluble bromides obtained with the author's reagent (this Journal, 1901, 1244) differ in their behaviour towards carbon tetrachloride, the precipitates from the drying oils giving a gelatinous deposit on cooling a hot solution, whilst those from marine animal oils form an opalescent solution from which only traces of crystals separate.

In applying the test, 0·25 c.c. of the pure drying or marine animal oils, or 1 c.c. of mixtures are shaken with 20 times the volume of the author's bromine reagent, and the closed tube allowed to stand for at least 30 minutes. The precipitate is collected, washed with 2 to 3 c.c. of ether, pressed between filter paper, and exposed to the air for an hour or two. From 5 to 6 c.c. of boiling carbon tetrachloride are then poured over the filter, and the filtrate again heated and poured over the precipitate, this treatment being repeated once more.

The filtrate is then evaporated to dryness, the residue weighed, and the amount of carbon tetrachloride necessary to have 2·5 c.c. for each 0·1 grm. of substance calculated. The precipitate is then heated in a narrow tube with this proportion of carbon tetrachloride, the solution allowed to stand for 3 or 4 hours then its appearance noted.

The author shows that his method is capable of detecting 10 per cent. of linseed, hempseed, whale or fish oils in castor, cotton seed or olive oils.—C. A. M.

Reducing-Sugars; Nickel Salts as Reagents for ——. Dayk. Ann. Chim. anal. appl. **6**, 364. Chem. Centr. 1901, **2**, [22], 1217.

The author uses a mixture of 25 c.c. of a 20 per cent. solution of nickel sulphate, 25 c.c. of caustic soda solution (sp. gr. 1·33) and 50 c.c. of a 3 per cent. aqueous solution of tartaric acid. The greenish solution is stated to be quite stable, even in the warm. When boiled with reducing sugars, the reagent becomes brown or black, the reaction being very delicate.—A. S.

Wines; Rapid Method for Detecting Vinoline and Bordeaux Red in ——. A. Casali. Staz. sperim. agrar. ital. 1900, **33**, 183—189; through Zeits. Untersuch. Nahr.- u. Genussm. 1901, **4**, [21], 996.

Vinoline.—The detection of vinoline is carried out similarly to that of Magenta. One hundred c.c. of wine are made alkaline with ammonia and a few drops of caustic soda, and

then shaken with 30 c.c. of chloroform. The latter is allowed to evaporate spontaneously in a porcelain dish, and the colour base is left behind. The dyestuff shows a red colour in chloroform solution after acidification. Vinoline is detected in wine yeast and argol in a similar manner, 10 grms. of the substance being mixed with 50 c.c. of water at 90° C.

Bordeaux Red.—For the detection of Bordeaux red, 50—100 c.c. of wine are treated with 10—20 c.c. of a 10 per cent. solution of barium chloride and then with sufficient potassium bisulphate in 10 per cent. solution to precipitate all the barium. After filtration, 3—6 c.c. of hydrochloric acid are added to the solution, and it is made up to its original bulk with water. The solution is then boiled for five or ten minutes with some degreased wool fibres. If the wine be coloured with Bordeaux red, the wool after washing will be dyed a bright red, and the colour will remain after the addition of ammonia.

Free vinoline may also be extracted from wines which contain 9—10 per cent. of alcohol by means of warm amyl alcohol, even in the presence of acetic or hydrochloric acid. Wool dyed in amyl alcoholic solutions is turned green by ammonia, and is changed to violet-red on the addition of hydrochloric acid.—J. F. B.

Benzoic Acid and Alkali Benzoates in Foodstuffs; Detection of ——. J. De Brevans. J. Pharm. Chim. **14**, [10], 438—440.

The author has utilised a reaction described by Girard for the detection of benzoic acid and alkali benzoates in preserved fruits, &c., based on the formation of Aniline Blue, when benzoic acid acts on rosaniline hydrochloride dissolved in aniline oil.

The sample is exhausted with water, the solution filtered, and acidified with a few drops of sulphuric acid to decompose benzoates, and set free the benzoic acid. The liquid is agitated three separate times in a beaker, each time with 50 c.c. of a mixture of equal volumes of light petroleum spirit and ether; the three portions are bulked, filtered, and evaporated. The residue left on evaporation may contain saccharin, salicylic acid, or benzoic acid. If it contains saccharin, the persistent sweet taste will indicate it. To detect the presence of salicylic acid, the characteristic test of perchloride of iron is used. Benzoic acid may be suspected if the sample presents the following characteristics:—a peculiar aromatic odour, a very irritating vapour on warming on a platinum dish, certain special crystallographic characters, and crystalline benzoic acid left by evaporation. The absence of saccharin and salicylic acid being determined, a dry test tube containing about ½ c.c. of a solution of aniline containing 2 centigrms of rosaniline hydrochloride per 100 c.c. and a small quantity of the suspected matter, is warmed on a sand bath for about twenty minutes at a boiling temperature (about 184°). The liquid, at first red, acquires a blue tint if benzoic acid is present. Several drops of hydrochloric acid are added to convert the excess of aniline into hydrochloride soluble in water, and the mixture is agitated with water to dissolve this salt; there remains a blue insoluble substance which adheres to the side of the tube. It is collected on a filter, is washed to remove all violet matter which is formed at the same time, and then dissolved in alcohol. The blue coloration is obtained when operating with a mgrm. of benzoic acid. The results obtained are confirmed by the known reaction of neutral perchloride of iron on benzoic acid exactly saturated with potash.—C. T. T.

Fluorine in Musts and Wines. K. Windisch.

See under XVII., *page* 62.

ORGANIC CHEMISTRY.—QUANTITATIVE.

Peat; Rapid Technical Analysis of Light and Dark ——. H. Bornträger. Zeits. anal. Chem. 1901, **40**, [10], 639—641.

The author determines in light peat, nitrogen, water, fibre, and molasses or sugar-forming bodies; in dark peat, water, fibre, humic acid, and nitrogen, which is always about 1·5—2·5 per cent., and 1—1·5 per cent. in light peat.

First, the water is determined by drying at 110° C.; at most this amounts to 20 per cent. in air-dried peat.

Then 5 kilos. of light peat are treated with 2 kilos. of water for 5 hours under 5 atmospheres pressure, and the liquid drawn off under 2 atmospheres pressure, and evaporated. The residue is pressed in a screw press, and the fibre dried at 110° C. and weighed. Light peat as a rule yields 22 per cent. of molasses, and 55 per cent. of fibre, the rest being water, ash, and nitrogen.

Of dark peat 5 kilos. are similarly treated with 3 kilos. of water, and 0·8 kilo. of potash, and the fibre determined as above. From the weight of this, and the water, the humic acid is obtained by difference, and varies from 25—60 per cent., and the fibre from 30—60 per cent.

It is suggested that the molasses could be used for fodder, the fibre for pasteboard, and the humic acid as a disinfectant. The author states that the calorific value of peat briquettes depends on the content of humic acid, since this contains 3½ times as much carbon as cellulose, and easily loses its chemically combined water on heating, which is not the case with fibre.—W. C. H.

Fats; Indicator in the Titration of Dark-coloured ——. J. Freundlich. Oesterr. Chem.-Zeit. **4**, 441. Chem. Centr. 1901, **2**, [19], 1094.

In the titration of dark coloured fats, the end reaction is not sharp, and frequently cannot be distinguished, when phenolphthalein is used as indicator. De Negri and Fabris have recommended the use of Alkali Blue (M. L. & B.), but the author finds that the preparation sold under this name is not suitable. Good results are obtained, however, by the use of Alkali Blue H O L A (M. L. & B.). 10 c.c. of an approximately 2 per cent. solution of the dyestuff in 96 per cent. alcohol are used for each titration.—A. S.

Sugar; Density of Dissolved ——. A. Demichel.

See under XVI., *page* 57.

Starch; Determination of ——, *in Cereals.* L. Lindet. J. Pharm. Chim. 1901, **14**, [9], 397—400.

The method described by the author (this Journal, 1896, 923), in which the glutinous envelope is dissolved by means of pepsin and the starch expressed through a sieve, suffers from the drawbacks that the filtration is very tedious, and that the starch is liable to contain cellular *débris* and insoluble salts.

To obviate these the author now decants the liquid instead of filtering, then saccharifies the starch and calculates the dextrins and glucose produced into the corresponding amount of starch. The starch water which passes through the sieve is transferred to a conical 500 c.c. flask, where the starch is allowed to settle, and washed once or twice by decantation. From 12 to 24 hours should be allowed between each decantation, and bacterial action prevented by the addition of a small quantity of formaldehyde. When the cereal contains much fat it is also advisable to remove this previously before the digestion with pepsin.

The residual starch is then treated with 100 c.c. of a 0·25, 0·50, or 1 per cent. solution of sulphuric acid for an hour at 110° C., after which the liquid is neutralised, and diluted to 250 c.c., and the glucose and dextrin determined by means of Fehling's solution and polarisation, and calculated into starch.—C. A. M.

Degree Balling; A New, Rapid, and Exact Method for the Determination of the ——. J. Kovar. Zeits. für Zuckerind. in Böhmen, 1901, **26**, [2], 63—77.

The author describes his new pyknometric method, by which the degrees Balling may be read direct from the scale-pan of the balance. The necessary instruments consist of a specially prepared counterpoise, termed the "correction-tare," a special set of weights and a pyknometer of approximately 100 c.c. capacity.

The Correction-Tare is, in the first place, a counterpoise for the empty pyknometer, but since a pyknometer containing exactly 100 c.c. is hardly obtainable, a correction must be applied for the divergence of its capacity from 100 c.c., this divergence must not exceed 0·3 c.c. on either side.

The products of the sugar factory, the densities of which have to be determined, are divided by the author into two classes; to the first belong those with densities between the limits 1·040 and 1·080, such as diffusion juices, saturation juices, and the expressed juice of the beet; to the second belong those with a density between 1·370 and 1·485, comprising spun syrups, boiled syrups, and molasses. This classification does not include thick juices and masseeuites, but if the quotient of these has to be determined, they may be diluted so as to fall into the first group. The correction is made by multiplying the divergence of the capacity of the pyknometer from 100 c.c. (not exceeding 0·3 c.c.) by the average density of each of these two groups respectively, and adding or subtracting the weight so found to or from the counterpoise, a separate correction-tare being required for each group.

The error introduced by taking the mean density of each group as the basis of correction is at most only 0·015° and 0·03° Balling respectively.

The Weights.—If ordinary weights are used in conjunction with the correction-tare, the specific gravity can be read off directly, but if degrees Balling be required, a special series of weights must be constructed. Unfortunately the Balling scale does not increase in arithmetical progression with constant differences, and the error involved in assuming that it does so increases with the length of the scale included. To reduce the error in each of the above groups to permissible limits, the author constructs two series of weights for each group, *viz.*, for group I. from 10° to 15° Balling in one series, and from 16° to 21° in the other, the fractional parts being common to both, whilst for group II. the weights are divided from 70° to 79° and from 80° to 90°. The value of each of the weights in grms. is indicated in the paper.

Pyknometer.—For liquids of the first group, an ordinary measuring flask marked at 100 c.c. is sufficient, for those of the second a real pyknometer is required. This may be improvised by cutting the neck of a measuring flask exactly at the 100 c.c. mark and grinding the edge to a plane, so that the contents may be accurately measured by sliding a glass plate over the top.

Wine; Sources of Error in the Determination of Volatile Acids in ——. Curtel. Ann. Chim. anal. appl. **6**, 361—364. Chem. Centr. 1901, **2**, [22], 1217.

One source of error is that neutral salts of volatile acids give up a part of this acid on warming in presence of tartar. For washing and as source of steam, freshly boiled, distilled water should be used, as even the carbon dioxide dissolved in water, increases the yield of volatile acids. Also any esters of acetic acid present may give free acetic acid by hydrolysis. The author determines the volatile acids by difference. Steam is passed for an hour through 25 c.c. of the wine and 25 c.c. of water, the volume being maintained constant. The difference between the residual acid and the, total acid of the wine, after deducting the carbonic acid gives the amount of volatile acids.—A. S.

Chloroform; Determination of ——. W. A. Pucknell. Pharm. J. 1901, **67**, [1638], 551.

10 c.c. of approximately normal alcoholic potash, the amount of chlorides, if any, in which must be known, are treated in a bottle with a measured volume of the chloroform mixture, containing from 0·05 to 0·2 grm. of $CHCl_3$. The bottle is closed with a sound cork and a cloth tied over the latter. The liquids are mixed by rotation and the bottle placed in boiling water for 3 hours, care being taken that the contents at no time come in contact with the cork. After cooling, the mixture is exactly neutralised with sulphuric acid and phenolphthaleïn, and the amount of potassium chloride determined by titration with N/10 silver nitrate solution, 1 c.c. of which corresponds to 0·003969 grm. of chloroform.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Preparation of Nitrogen from Ammonium Nitrate. J. Mai. Ber. **34**, [15], 3805—3806.

For the preparation of considerable quantities of nitrous oxide, the author tried heating a solution of ammonium nitrate in a solvent of high-boiling point, the object of using the solvent being to render the decomposition more regular and to avoid the risk of explosion. Using pure glycerin, sp. gr. 1·26, as the solvent, however, it was found that the gas evolved consisted of nitrogen, with a small proportion of carbon dioxide. The reaction apparently consists in the oxidation of glycerin to glyceric acid, thus—$C_3H_8O_3 + 2NH_4NO_3 = C_3H_4O_4 + 2N_2 + 5H_2O$. Subsequently part of the glyceric acid is decomposed, with liberation of CO_2. The yield of nitrogen is practically quantitative. When glycerine and ammonium nitrate alone are heated together, the evolution of gas is apt to be too violent at first. This can be prevented by the use of a few drops of concentrated sulphuric acid. In using the method for the preparation of nitrogen, 20 grms. of concentrated glycerin are warmed with three drops of concentrated sulphuric acid, and 10 grms. of ammonium nitrate are dissolved in the mixture. The mixture is then heated. At 100° C. the gas begins to be evolved, and at 165° the evolution proceeds quietly and regularly. A temperature above 170° should be avoided. The gas is washed by passing it first through an alkaline solution to remove CO_2, and then through concentrated sulphuric acid, to remove a small amount of pyridine bases which distil over.—H. B.

Radio-active Substances. F. Giesel. Ber. **34**, [15], 3772—3776.

The author, having experimented with specimens of "radio-lead sulphate," received from Hofmann and Strauss, is unable to agree with the conclusions of these observers (this Journal, 1901, 1150); he considers that the existence of a new radio-active element in "radio-lead" has not been satisfactorily established. Part of one specimen, which had been kept for about 9 months, was exposed for one hour to cathode rays. At the end of that time no difference in activity was observed between it and the untreated portion. Another specimen, only three months old, was found to have just the same activity. These experiments show that radio-lead sulphate does not lose its power of emitting Becquerel rays in 9 months at any rate, and that the radiation is not restored or intensified by the cathode discharge. From one specimen of the radio-lead sulphate, the carbonate, chloride and sulphide were prepared, and these four compounds, each wrapped in thin paper, were placed for 15 hours upon thin aluminium foil which was resting upon the film side of a gelatin-bromide plate. All the preparations had approximately the same photographic effect, but the sulphide, which was small in amount, seemed to be most active. Hofmann and Strauss, on the other hand, found that only the sulphate affected the plate. The apparent contradiction is due to the fact that their experimental arrangements did not exclude the influence of phosphorescent light. When the preparations, each wrapped in black, opaque paper, were laid directly upon the glass side (the back) of a sensitised plate, no effect whatever was produced in 15 hours; but when they were wrapped in transparent paper, a distinct blackening of the plate was caused by the sulphate only.

The author concludes that radio-lead sulphate emits a mixture of Becquerel rays and light rays, the latter (phosphorescence) being constantly excited by the former. On placing the substance on the back of a sensitised plate, the Becquerel rays are almost entirely absorbed by the glass, while the light rays penetrate to the sensitive film readily. When black paper or aluminium is interposed between the substance and the plate, the light rays, and with suitable arrangements, the Becquerel rays also, are entirely stopped. The author has perceived by the eye the phosphorescence of the radio-lead sulphate.

Hofmann and Strauss' experiment of mixing, and then separating, radium and lead can be so performed that the

lead compounds separated from the mixture are active, although radium cannot be detected in them by chemical means.—H. B.

Iron Salts; Influence of the Separation of Sulphur on the Precipitation of ——. A. Coppadoro. Gaz. chim. ital. **31**, [2], 217—221. Chem. Centr. 1901, **2**, [21], 1179.

The precipitate of sulphur produced by passing sulphuretted hydrogen through an acid solution of a ferric salt, always contains, even after the most careful washing, small quantities of iron compounds, the amount of the latter being dependent upon the weight of ferric salt taken and the amount of sulphur separated. The precipitate of sulphur produced in a solution of a ferrous salt by the addition of thiosulphate and acid is also contaminated with iron.—A. S.

Palladium; Diffusion of Hydrogen through ——. A. Winkelmann. Ann. d. Physik. 1901, **6**, [1], 104—115.

The author finds that the quantity of hydrogen passing through glowing palladium is not proportional to the pressure of the gas, but at low pressures is greater than would correspond to such a relation. The results obtained can be best explained by the hypothesis that dissociation of the hydrogen takes place, and that the amount of diffused gas is proportional to the pressure of the dissociated molecules.—A. S.

Arsenic Fungi. B. Gosso. Bot. Centralbl. 1901, **87**, 131. Pharm. J. 1901, **67**, [1638], 551.

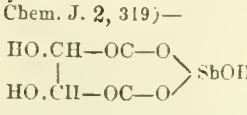
The author has examined *Penicillium brevicaule*, which belongs to the group of fungi, which have the property of decomposing compounds of arsenic, with the production of the peculiar garlic-like odour. He finds that it is capable of producing alcoholic fermentation and of inverting starch. —A. S.

Tartrates in Glycerin; Optical Rotations of certain ——. J. H. Long. J. Amer. Chem. Soc. 1901, **23**, [11], 813—817.

After referring to the connection between the molecular rotation of a dissolved active body and its degree of ionisation, the author gives the specific rotations of the following tartrates in aqueous solution and in glycerin, in which solvent the degree of ionisation must be relatively small.

Salt.	$[\alpha]_D^{20}$ for Water.	$[\alpha]^{20}$ for Glycerin.
$KNaC_4H_4O_6\,4H_2O$	22·1° c = 5 to 30	28·85° c = 5 28·35° c = 10 27·87° c = 15 27·40° c = 20 26·96° c = 25
$KSbOC_4H_4O_6\,\frac{1}{2}H_2O$	140·69° c = 2 141·27° c = 5 141·40° c = 6	139·25° c = 2 141·17° c = 3 143·75° c = 4
$KBOC_4H_4O_6$	58·10° c = 5	30· 9° c = 5
$(NH_4)_2C_4H_4O_6$	34·50° c = 5	43·50° c = 4
$(NH_4)HC_4H_4O_6$	26· 0° c = 1·5	27· 7° c = 0·75
$(NH_4)SbOC_4H_4O_6\,\frac{1}{2}H_2O$	150· 0° c = 5	146·10° c = 3 146·25° c = 4
$(NH_4)SbOC_4H_4O_6\,2\frac{1}{2}H_2O$	115· 7° c = 5	109·37° c = 4

The similar value found for potassium antimonyl tartrate in water and glycerin agrees with the very low ionisation of this salt determined by Hädrich (Zeit. phys. Chem. **12**, 746), while its molecular rotation in water is almost identical with that of the corresponding ammonium salt, suggesting the existence of an active acid in these salts which may have the constitution assigned to it by Clarke (Amer. Chem. J. **2**, 319)—



The heavy ion of this acid has about seven times the effect on the polarised ray that is exerted by the lighter ion of ordinary tartaric acid.

Potassium boryl tartrate has a much lower rotation in glycerol than in water; this is ascribed to the formation of a compound of glycerin and boric acid leaving a simple tartrate.—J. N. G.

Carbohydrates; Thermal Effects in the Building-up and Breaking-down of ——. D. Mohr. Zeits. Spiritusind. 1901, **24**, [48], 491—492.

The formation of carbohydrates from carbon dioxide, as it occurs in the plant, is a strongly endothermic process, effected by the influence of sunlight on the green parts of the living plant. The oxidation of the carbohydrates to the final-products—carbon dioxide and water—is strongly exothermic. The heat of combustion of starch is 685 calories per gram-molecule, that of dextrin is 677·2. On the other hand, the heat of combustion of cane sugar, anhydrous maltose, or glucose, is about the same as that of dextrin, 677·4—677·6 calories; that of 2 gram-molecules of alcohol is 651·4. Thus, there is an evolution of heat from starch to dextrin of 7·8 calories, from dextrin to glucose little if any, and from glucose to alcohol of 26 calories, which closely approaches the values found by the direct determination of the heat evolved during fermentation.

According to the laws of thermodynamics, only those reactions are effected by enzymes, which tend to take place with evolution of heat. Where the heat changes are only very slight, alterations of conditions of temperature or concentration may change the tendency in the reverse direction. Hence the reversion of glucose to maltose or dextrin under the action of the ordinarily hydrolytic enzymes is quite comprehensible; but it is very improbable that reversion to starch will be effected by these means, since the difference of heat is too great.

The author discusses whether it is more profitable to burn starch direct as a fuel or to convert it into alcohol. In converting a kilo. of starch into alcohol (with a yield of 80 per cent. of the theoretical), there is a loss of heating value of about 24 per cent.; but, taking the market prices of 100 kilos. of potato starch at 17·5 marks and 100 kilos. of alcohol at 27·92 marks (both in the anhydrous condition), it will be found that the cost of 1,000 calories from starch is 4·14 pf. as against 3·94 pf. from alcohol. Thus, the process of fermentation for the utilisation of starch as a fuel is economically justified.—J. F. B.

New Books.

Practical Chemistry: An Experimental Introduction to Laboratory Practice and Qualitative Analysis from a Physico-chemical Standpoint. By R. Abegg and W. Herz, Professor and Demonstrator of Analytical Chemistry at Breslau University. Translated by H. T. Calvert, B.Sc. (Vict.). Macmillan and Co., Ltd., London. 1901. Price 6*s*. The Macmillan Company, New York.

This little work, which is dedicated to Prof. Ladenburg, takes the form of a small 8vo volume, with authors' and translator's prefaces, table of contents, and 118 pages of subject-matter. There is a pocket formed in the outer cover containing a blank table divided into squares, the whole being for the purpose of exercises in indicating the compounds formed by the various ions, the latter being arranged vertically and longitudinally in the table. The work is arranged on the following lines:—I. Preparations. II. Analysis. Theoretical Foundations. Reactions of Cations. Reactions of Anions. III. Systematic Analysis for the Detection and Qualitative Separation of the Elements.

Aids to Practical Geology. By Grenville A. J. Cole, F.G.S., Professor of Geology in the Royal College of Science, Ireland. Chas. Griffin and Co., Exeter Street, Strand, London. 1891. Price 10*s*. 6*d*.

8vo volume, containing dedication, preface, table of contents, list of illustrations, 136 in number, and 390 pages of

subject-matter. The work concludes with an alphabetical index. The arrangement of the text is on the following lines:—I. Sampling of the Earth's Crust. II. The Examination of Minerals. III. Examination of Rocks. IV. Examination of Fossils.

CYANIDE PRACTICE. By ALFRED JAMES, Mining and Mechanical Engineer, &c., &c. E. and F. N. Spon, Ltd., 125, Strand, London, W.C. 1901. Price 15*s.* nett. Also Engineering and Mining Journal, Incorporated, 253, Broadway, New York.

LARGE 8vo volume, containing frontispiece, preface, table of contents, list of illustrations, introduction, subject-matter filling 171 pages, and the alphabetical index. The text is illustrated with 25 engravings and line plans and sketches. The subject is treated as follows:—INTRODUCTION, with history of the process; its early struggles in Africa and elsewhere, &c. I. Investigation of Samples. II. Plant. III. Extraction. IV. Treatment of Slimes. V. Filter-press Treatment of Slimes. VI. Treatment of Sulpho-Telluride Ore. VII. Dry Crushing. VIII. Costs. IX. Extractor-Box Work and Sump-Solutions. X. Losses in Cleaning-up. XI. Bromocyanides. XII. Chemical. XIII. Recent Cyanide Practice. Tables, with Diameters, Areas, and Contents of Vats. 1,000-grain Assay Table. As stated in the preface, "It is hoped that the process section will give sufficient information to enable the mining engineer to accurately test his products, design and erect efficient and economical plants, and work them successfully." The latter part of the book deals with the treatment of dry, crushed, and roasted ores, and with that of slimes by filter-press and other methods.

THE EXPERIMENTAL STUDY OF GASES: AN Account of the Experimental Methods involved in the Determination of the Properties of Gases, and of the more Important Researches connected with the subject. By MORRIS W. TRAVERS, D.Sc., Assistant Professor of Chemistry and Fellow of University College, London; with an Introductory Preface by Prof. WM. RAMSAY, LL.D., F.R.S., &c. Macmillan and Co., Ltd., London. 1901. Price 10*s.*

LARGE 8vo volume, containing introductory preface by Prof. W. Ramsay, author's preface, table of contents, 320 pages of subject-matter, illustrated with 130 engravings, and the alphabetical index. The general scheme of the work is foreshadowed in the following chapter headings:—I. The Fundamental Gas Laws. II. Mercury Pumps. III. Gas Manipulation. IV. Collecting and Storing Gases. V. Preparation of Pure Gases. VI. Reading Instruments. VII. Measurement of Volume. VIII. Calibration. IX. Gas Analysis. X. Composition of Atmospheric Air. XI. Gases of the Helium Group. XII. Determination of Density. XIII. and XIV. Relationship of Temperature, Pressure, and Volume over Limited and Wide Ranges of Pressure. XV. Liquefaction of Gases. XVI. Manipulation of Liquefied Gases. XVII. Vapour Pressure and Critical Constants. XVIII. Solubility of Gases in Liquids. XIX. Specific Heats. XX. Effusion, Transpiration, and Diffusion. XXI. Refractivity. XXII. Spectrum Analysis. APPENDIX. Methods of Maintaining a Constant Temperature.

ON THE COMPOSITION OF DUTCH BUTTER. By Dr. J. J. L. VAN RYN, Director to the Royal Agricultural Experiment Station at Maastricht. Baillière, Tindall, and Cox, 8, Henrietta Street, Strand, London. 1902.

A SHORT treatise of 48 pages, followed by a report on the new Belgian Butter Law, occupying seven pages. In the first part, tables are given stating analytical results and values, and also the character of the soil of districts where the cows were fed.

L'INDUSTRIE DES MATIÈRES COLORANTES. Par JUSTIN DUPONT. Professeur à l'Institut Commercial, Chargé de Conférences Technolog. à l'École de Phys. et de Chim. Industr. Libraire J. B. Baillière et Fils, 19, rue Hautefeuille, près le boulevard Saint-Germain. 1902. Price 5 fr.

SMALL 8vo volume, containing preface (by Ch. Lauth) 352 pages of subject-matter, illustrated with 31 woodcuts the table of contents, and an alphabetical index. The subjects treated of comprise:—PART I. i. The Natural Dyestuffs. ii. Dyewood Extracts. iii. Vegetable Dyestuffs not Derived from Woods. PART II. Artificial Dyestuffs. i. Raw Materials. Coal-Tar; Intermediate Products. Dyestuff Derivatives. PART III. Application of the Dyestuffs. i. Textile Fibres. ii. Direct Dyeing. iii. Mordant Application. iv. Formation of Colour on the Fibre.

Trade Report.

I.—GENERAL.

FOREIGN TRADE OF THE UNITED KINGDOM FOR THE TWELVE MONTHS ENDED 31ST DECEMBER.

Bd. of Trade J., Jan. 9, 1902.

I. Imports from Foreign Countries and British Possessions.

	Twelve Months ended 31st December	
	1900.	1901.
	£	£
I. Animals, living (for food)	9,622,319	9,400,033
II. (A.) Articles of food and drink, duty free.	156,090,088	162,949,666
(B.) Articles of food and drink, dutiable.	49,230,529	47,595,501
Tobacco, dutiable	4,799,417	4,819,473
III. Metals	33,195,391	30,787,452
IV. Chemicals, dyestuffs, and tanning substances.	5,560,793	6,129,559
V. Oils	11,033,320	11,030,606
VI. Raw materials for textile manufactures.	77,347,363	79,401,772
VII. Raw materials for sundry industries and manufactures.	65,079,691	57,954,510
VIII. Manufactured articles	93,225,005	93,609,751
IX. (A.) Miscellaneous articles	16,771,621	17,298,198
(B.) Parcel post	1,119,626	1,262,462
Total value	523,075,163	522,238,986

NOTE.—Sugar and other cognate articles became liable to duties on the 19th April, 1901, and are included in Section II. (B.) of the above table.

II. Exports of British and Irish Produce and Manufacture.

	£	£
I. Animals, living	901,843	742,499
II. Articles of food and drink	13,621,755	14,881,915
III. Raw materials	4,179,009	33,377,644
IV. Articles manufactured and partly manufactured, viz.:—		
(A.) Yarns and textile fabrics	102,212,400	103,471,561
(B.) Metals, and articles manufactured therefrom (except machinery and ships).	45,346,909	39,413,762
(C.) Machinery and millwork	19,619,784	17,855,335
(D.) Ships, new (not registered as British).	8,587,710	9,159,376
(E.) Apparel and articles of personal use.	10,394,200	10,940,060
(F.) Chemicals, and chemical and medicinal preparations.	9,262,510	8,942,109
(G.) All other articles, either manufactured or partly manufactured.	36,144,067	38,068,759
(H.) Parcel post	2,951,809	3,642,369
Total value	291,191,996	280,498,889

PATENT RULES, 1901.

Official J., Dec. 24, 1901.

By virtue of the provisions of the Patents, Designs, and Trade Marks Acts, 1883 to 1888, the Board of Trade do hereby make the following rules:—

(1) These rules may be cited as the Patent Rules, 1901, and shall come into operation upon the 1st January, 1902.

(2) For rules 24 to 29, both inclusive, of the Patent Rules, 1890 (International and Colonial arrangements), shall be substituted the following rules :—

International and Colonial Arrangements.

(24) The term "foreign application" shall mean an application by any person for protection of his invention in a Foreign State or British Possession to which, by any Order of His Majesty in Council for the time being in force, the provisions of section 103 of the Patents, Designs, and Trade Marks Acts, 1883, have been made applicable.

(25) An application in the United Kingdom for a patent for any invention in respect of which a foreign application has been made shall contain a declaration that such foreign application has been made, and shall specify all the Foreign States or British Possessions in which foreign applications have been made, and the official date or dates thereof respectively. The application must be made within 12 months from the date of the first foreign application, and must be accompanied by a complete specification, and signed by the person or persons by whom such first foreign application was made. If such person, or any of such persons, be dead, the application must be signed by the legal personal representative of such dead person, as well as by the other applicants, if any.

(26) The application in the United Kingdom shall be made in the Form A in the Second Schedule to these rules, and, in addition to the specification left with such application, must be accompanied by :—

(1) A copy or copies of the specification, and drawings or documents corresponding thereto, filed or deposited by the applicant in the Patent Office of the Foreign State or British Possession in respect of the first foreign application, duly certified by the official chief or head of the Patent Office of such Foreign State or British Possession as aforesaid, or otherwise verified to the satisfaction of the Comptroller.

(2) A statutory declaration as to the identity of the invention in respect of which the application is made with the invention in respect of which the said first foreign application was made, and if the specification or document corresponding thereto be in a foreign language, a translation thereof shall be annexed thereto and verified by such statutory declaration.

(27) On receipt of such application, together with the prescribed specification and the other document or documents accompanying the same, required by the last preceding rule, and with such other proof (if any) as the Comptroller may require of or relating to such foreign application or of the official date thereof, the Comptroller shall make an entry of the applications in both countries and of the official dates of such applications respectively.

(27A) If the complete specification left with the application be not accepted within 12 months from the date of the first foreign application, it shall, with the drawings, if any, be open to public inspection at the expiration of that period.

(28) Save as aforesaid all proceedings in connection with such application shall be taken within the times and in the manner described by the Acts or rules for ordinary applications.

(29) The patent shall be entered in the Register of Patents as dated of the date on which the first foreign application was made, and the payment of renewal fees, and the expiration of the patent, shall be reckoned as from the date of the first foreign application.

Dated the 18th day of December, 1901.

G. W. Balfour,
President, Board of Trade.

Trusts in Wurtemberg (Germany).

Foreign Office Annual Series, No. 2732.

The formation of trusts in various branches of trade, and their arbitrary determinations of prices, seem to have effectually banished in Wurtemberg the sympathies which were formerly expressed for them. The formation of trusts in some branches renders the formation of trusts in other branches necessary; thus, the spirits of wine and the paper trusts, formed in 1900, were followed by trusts in the varnish and the writing-paper industries. The prices of raw materials, apart from the cost of carriage and protective duties, used to be regulated by supply and demand; now they are determined by the conflicting interests of industrial groups, and complicated by the participation of banks, and the demand for increased protection by the agrarian party.

Subsidies in Hungary to Native Industries: Law XLIX. of 1899.

U.S. Cons. Reps., Dec. 12, 1901.

The Government may grant subsidies to—

(1) Factories, constructed and fitted according to the latest methods of technical science, manufacturing industrial articles not hitherto produced in the countries of the Hungarian Crown.

(2) To the following factories, already in existence, or to be erected, fitted with modern technical appliances, *viz.* :—

(*a*) Factories for porcelain, pottery, fire-bricks, glass plates, looking-glass, and bottle glass.

(*b*) Factories producing metal pipes (cast-iron pipes excepted), metal wires, wire tacks, zinc-ware, and machines to work raw materials.

(*c*) Factories for scientific apparatus.

(*d*) Paper mills, paper pulp, cellulose, and paper-hanging factories.

(*e*) Factories for making chemical products (breweries, beet-sugar factories, and industrial distilleries excepted); factories for caoutchouc-ware and candles.

(*f*) Plants for dyeing silk, wool-washing factories, yarn and tissue finishing factories (colour printing excepted).

(*g*) Mining undertakings for the production of metals by washing, amalgamation, and with electrical power; as also coke works using native coals.

(*h*) Chemical manures, malt, dextrin, glucose, vegetable oil, chicory, coffee substitute, and preserve works.

(*i*) Distilleries producing cognac from wine and wine lees, and submitting themselves to Government control.

(*j*) Mineral-oil factories, mines, and mineral oil and potassium salts works.

(*k*) Electrical plants furnishing power for industrial purposes.

II.—FUEL, Etc.

Efficiency of Wilson Gas Producers.

J. of Gas Lighting, Dec. 14, 1901.

Mr. J. E. Stead, F.C.S., of Middlesbrough, has reported on the working of a Wilson's power-gas generating plant. This report deals with an examination of the gas taken from a main flue into which eight coal-fired Wilson producers were working. The fuel was Durham rough slack. In a perfect heat engine, 2,563 thermal units would produce one indicated horse-power for one hour; but a good gas engine has a thermal efficiency of only 27 per cent. Consequently, it requires about 9,500 British thermal units for every indicated horse-power. According to Mr. Stead's report, it is possible in ordinary working, with a set of Wilson producers, to make a gas which yields, after cooling, 75 per cent. of the original calorific value of the coal. A gas engine of 27 per cent. thermal efficiency will thus turn 20 per cent. of the heat of the fuel into indicated horse-power; and, with an engine having a mechanical efficiency of 83 per cent., this means the conversion of 16·6 per cent. of the original power of the coal into brake horse-power. On the other hand, if the best class of modern steam engines use 12 lb. of steam per indicated horse-power, and are boilered to get 10 lb. of steam per lb. of high-class coal, with 90 per cent. mechanical efficiency of their own, this means that they also can show a brake horse-power for about 16 per cent. of the coal heat. It is evident, however, that these are only the beginnings of the data required for a complete comparison of the two kinds of motive power. Wilson gas is stated by

Mr. Stead to average 140 thermal units per cubic foot, and about 1 lb. of ordinary Durham slack will yield one horse-power, indicated. Where the coal is rich enough in nitrogen —say, 1·4 per cent.—and not less than 50 tons per day of 24 hours is gasified, it is considered that it will pay to erect sulphate recovery plant. The combined plant, with three producers, then costs about 12,000*l.* This is for a production of 4,500 indicated horse-power.

Alcohol-consuming Apparatus.

U.S. Cons. Reps., Dec. 1901.

The enormous production of alcohol in France has led to the offer of a series of prizes for apparatus that will lead to its greater consumption. An exhibition of inventions for the use of alcohol for illuminating, heating, or for power was held in Paris, from Nov. 16 to 24 last.

The exhibitions and experiments were divided into three classes:—

First. Motors and insulated carburettors.

Second. Incandescent lighting, divided into two classes: (1) Apparatus using pure medicated alcohol; (2) apparatus using carburetted alcohol.

Third. Heating.

The output of alcohol augments, and it is contended that the increased volume is the work of fraudulent "*bouilleurs de cru*," who declare but a small part of what they produce. (see this Journal 1900, 1057). They have a license from the Government to produce alcohol, but their production invariably exceeds the quantity reported, and upon which they pay the tax. The market is thus flooded with alcohol, for which a means of consumption is wanted.

A report, presented to the French Parliament two years ago, gave the quantity of alcohol produced in France and Germany, in 1897. The production in France was reported to be 53,415,174 galls. of legal alcohol. The illegal product mentioned above could not even be approximated. For 1899, the production for all France was 59,210,580 galls. The excess of stock consisted largely of the unreported production of the *bouilleurs de cru*. Of 250 distilleries, 50 produced nearly the entire quantity reported, as given above. The material from which this alcohol was produced is set forth thus:—

	Galls.
Farinaceous substances	11,003,473
Molasses:—	
Domestic	18,507,584
Imported	4,332,388
Beets	14,373,146
Marc (grape residue after wine-making)	2,050,683
Wine	457,154
Cider	598,897
Total	51,323,325

"The striking feature in these figures," says the report, "is that alcohol is an industrial product furnished by our agriculture and by importation."

The production of alcohol in Germany, in 1897, was 95,532,300 galls., two-thirds of which was derived from potatoes of domestic origin. It was produced in country distilleries, which number about 12,500, of which 5,226 produce only from 264 to 2,642 galls.

The report submitted to the French Parliament says that France's best customer for sugar, the United States, will soon become an exporter, on account of its relation to Cuba, and it therefore urges the enactment of a law that will encourage the manufacture of alcohol, as a consumer of the supposed future surplus in the beet crop. The present annual sugar product of France is 850,000 tons, of which the United States buys more than any other country. Should American purchases fall off, the beets now worked up into sugar would go to increase the output of alcohol, for which there is as yet no means of consumption. It is observed that alcohol enters but very little into use for lighting, whilst, in Germany, it is the great illuminant for parks and public places.

IV.—COLOURING MATTERS, Etc.

Indigo; Artificial *v.* Natural ——, in Germany.

Frankfurter Zeit., Jan. 3, 1902.

The clothing department of the Prussian Ministry of War has recently come to a decision which is of importance to the German chemical industry. The samples hitherto sent out to the manufacturers of the blue cloth used in the army were dyed with unpurified Indigo, derived from the plant. It has been established that the German artificial Indigo gives a purer and brighter shade, which is of equal fastness. The military authorities have therefore decided, in the future, to send out samples dyed exclusively with artificial Indigo. Cloth manufacturers are to be allowed to work according to the old pattern for next year's delivery, in order to give them an opportunity to clear out any stock they may have of the impure product of the Indigo plant. The consumption of German Indigo will thereby be materially increased. The value of the export of the artificial dyestuff went up by 1,500,000 marks (75,000*l.*) in 1900, whilst the import of natural Indigo fell off in value, during the same period, by no less than 4,300,000 marks (265,000*l.*). (See also this Journal, 1901, 232—234.)

—H. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Drums and Tanks for Sulphuric Acid in Spain.

Bd. of Trade J., Dec. 26, 1901.

A British firm in Huelva desires to be placed in communication with British manufacturers of drums and tanks for the transport, on a large scale, of low grade (58°—60° B.) sulphuric acid. These receptacles must be specially prepared, and guaranteed to resist the corrosive action of this strength of acid. Replies should be addressed to the British Vice-Consul at Huelva, from whom further information may be obtained.

Corundum in Canada.

Bd. of Trade J., Dec. 26, 1901.

A company is being formed, in Toronto, for the purpose of manufacturing abrasive wheels and machinery from the Craig Mine corundum, which has proved to be a perfect abrasive material. A charter will shortly be applied for, and the industry will, it is expected, be situated in Toronto.

Sodium Cyanide: United States Customs Decision.

Chem. Trade J., Dec. 28, 1901.

Merchandise was imported at New York, classified as a chemical salt, dutiable at 25 per cent. *ad val.*, under par. 3, Act of 1897. The importers claimed the article to be dutiable as cyanide of potassium, under par. 66, at 12·5 per cent. Chemical analysis showed that the article contained no cyanide of potassium whatever, but was composed of cyanide of sodium, to the extent of 75·88 per cent. The protest was therefore overruled, and the decision of the Collector affirmed.

Plumbago in Travancore (India).

Bd. of Trade J., Dec. 19, 1901.

According to *Indian Engineering* of Nov. 16, about 14 miles from Trivandrum, in Travancore, is a plumbago mine which has timbered shafts underground, is worked by Cornish miners, and turns out more than 100 tons of plumbago each month. The operations are stated to be far in advance of those in Ceylon, though not so widely distributed, or extensive as regards output. The export of the mineral from Travancore, in 1900, was 1,600 tons.

Plumbago in Ceylon.

Bd. of Trade J., Dec. 26, 1901.

In the *Ceylon Blue Book*, for 1900, it is stated that the fall in the value of plumbago has checked mining operations, which are carried on principally in the North-

Western, Central, and Western Provinces, and many of the smaller mines were abandoned. The larger pits yielding better qualities, and those of wealthy owners employing skilled European supervision, showed an increased output, and prospered fairly.

In Kurunegala, only 50 plumbago pits were worked, in 1900, as compared with 154, in 1899, and in the Southern Province only 30 acres were leased, as against 117. In the Central and Western Provinces, there were similar signs of depression.

X.—*METALLURGY.*

Mineral Industry of Western Australia.

Bd. of Trade J., Dec. 26, 1901.

The report of the Department of Mines of Western Australia, for 1900, states that the total output of minerals, for 1899, exceeded by far that of any previous year, whilst the total mineral output, for 1900, shows a decrease in value of 167,906*l.* on 1899, a falling off of about 2·6 per cent., as compared with the total value of the mineral output for that year.

With the exception of lead and gold, the output of the various minerals shows a marked increase.

Tin.—Though the output of tin ore, for 1900, shows an increase of 488 tons, valued at 31,432*l.*, as compared with 1899 (823 tons, valued at 56,702*l.*, as against 335 tons, valued at 25,270*l.*, in 1899), the progress of this industry during the year is somewhat disappointing.

Copper.—The value of the copper ore raised, during 1900, has been 43,673*l.*, showing an increase of 7,735*l.* over 1899 (2,664 tons, valued at 35,938*l.*, in 1899). The output from the Malcolm district, in the Mount Margaret Goldfield, shows the largest increase, and the deposits in this district give promise of large and consistent return in the near future. Western Australia gives every prospect of becoming a large copper producer. Deposits of this mineral, which give every prospect of payable results are found from Kimberley, in the north, to Phillips River, in the south, and the results from the mines in the vicinity of Murrin Murrin, which is 75 miles from a railway, and 540 miles from a seaport, show what is to be expected in places closer to the seaboard.

Zinc in Kansas (U.S.A.).

Bd. of Trade J., Dec. 26, 1901.

There were 11 establishments engaged in the smelting and refining of zinc, in 1900, with 1,487 wage-earners, and products valued at 5,790,144 dols. In 1890, four establishments were reported, with 341 wage-earners, and products valued at 963,500 dols. The increase in the value of products during the decade was 500·9 per cent.

XII.—*FATS, OILS, Etc.*

Oil and Fat Industries in Russia.

A. A. Shukoff. Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [11], 229—230; [12], 250—251. (See also page 55.)

According to the author, the Russian oil industry is in a very satisfactory condition. The export of the seeds is diminishing, and the manufacture of oil increasing, steadily year by year. This is shown by the figures of the official statistics.

Exports (1,000 Kilos.).

Seeds.

——	1900.	1899.	1898.
Linseed	271,024	215,920	248,032
Hempseed	9,114	21,744	7,072
Rapeseed	63,376	73,488	75,088
Poppy-seed, Sunflower-seed, &c.	18,576	19,744	11,008

Oilcake.

——	1900.	1899.	1898.
Linseed	127,392	196,912	196,656
Hempseed	22,304	17,328	17,536
Rapeseed	43,888	59,104	45,152
Poppy-seed, Sunflower-seed, &c.	133,696	89,632	41,640
Various	29,312	27,520	29,184

Imports (1,000 Kilos.).

——	1900.	1899.
Copra	36,592	32,480
Castor	10,488	16,688
Sesame-seed	3,696	1,760

The total value of the oil and oilcake produced was as follows:—In 1890, 34,888,000 francs; in 1893, 59,466,000 francs; and in 1897, 71,788,000 francs. The number of factories, in 1897, was 647, employing over 8,000 workmen.

The statistics of the total amount of oil produced in Russia are uncertain, but the following figures, representing 1,000 kilos., are given for 1897:—Linseed oil, 33,855; sunflower oil, 16,885; cocoanut oil, 10,857(?); hempseed oil, 5,855(?); castor oil, 4,956(?); rapeseed oil, 2,589; mustard-seed oil, 744; sesame-seed oil, 220; cameline oil, 100; and palm oil, 108. Linseed, sunflower-seed, and hempseed oil are very largely used as edible oils.

Stearin from Archangel Liver Oil.—The crude oil is filtered in the cold, and the residue sold as a commercial product, and employed to a small extent in the manufacture of soap. It contains 2·35 per cent. of water, and has a titre of 30°—32° C., and an iodine value of 110·9.

Russian Vegetable Oils.—Cameline oil is expressed in small quantities, in South Russia, which is also the main source of *hemp-seed oil*. *Colza oil* is not produced in large quantities in Russia, and the largest proportion of it is obtained from the western districts. The exports of this oil have shown a great increase. *Cotton-seed oil* is expressed to a small extent in Turkestan, in local factories, but is hardly met with in the Russian markets. *Linseed oil* is the most important oil, and is expressed in all parts of Russia. The seeds from the northern districts contain less oil (32 per cent.) than those from the south (36 per cent.). *Mustard-seed oil* is extracted almost exclusively in Sarepta, a German settlement on the bank of the Volga. *Walnut oil* is only obtained in small quantity, and is seldom found in commerce. *Cedar-nut oil* is obtained in small quantities in the south of Siberia, and *poppy oil* in the south and south-east of Russia. The cultivation of the *olive* tree has not developed to any considerable extent, though there are plantations at Krim, and in the Caucasus, on the Persian frontier. The *castor-oil* plant is grown in the Caucasus, but the amount of seed is very small, and insufficient for the trade, so that nearly all the Russian oil is obtained from foreign seed. The seed from the Caucasus contains as much as 50 per cent. of oil. The cultivation of the *safflower* (*Carthamus tinctoria*) in South Russia (Saratowa) is beginning to develop. The seeds yield up to 20 per cent. of oil. *Sesame oil* is partly produced in the Caucasus and in Turkestan, and partly imported from Persia. As a rule, the Russian seeds do not contain much oil (40 per cent.). *Soja-bean oil* is obtained from seed grown in an experimental station, in South Russia. The seeds yield about 15 per cent. of oil. *Sunflower-seed oil* is produced in large quantities in Southern Russia, and is, after linseed oil, that most commonly met with.—C. A. M.

Oil Seeds in the Trans Caucasus (Russia).

Foreign Office Annual Series, No. 2729.

The linseed crop is stated to be considerably below the average, and it is difficult to say what rates will rule, Russia, with its comparatively small crops, being absolutely

dependent on the American markets. There is now little or no stock here. Price, f.o.b., Novorossisk, 39*s.* 4*d.* per 360 lb.

Sunflower seed is being more cultivated year by year, and new crushing mills are being built to meet the increased demand for the oil, which is extensively used as a foodstuff. Mill-owners are at the present moment reaping a handsome profit.

The production of oilcake is increasing in proportion to the building of crushing mills. The principal markets are as follows :—Sunflower-seed oilcake, Denmark ; mustard-seed oilcake, Dunkirk, Antwerp, Holland ; linseed oil-cake, Dunkirk, Antwerp, Holland ; and rapeseed oilcake, Marseilles.

Prices, f.o.b., Novorossisk :—Sunflower-seed oilcake, 16*s.* ; linseed oilcake, 18*s.* 1*d.* ; mustard-seed and rapeseed oilcake, 9*s.* 7*d.*, per 360 lb.

Soap and its Substitutes in Syria (Turkey).

U.S. Cons. Reps., Dec. 1901.

Whilst toilet and shaving soaps are imported from abroad, the Syrian soap-manufacturing industry is important, particularly the Nablous, Haifa, and Tripoli soap factories. "Mount-Carmel soap," manufactured by an American firm at Haifa, is in demand in the United States. Olive oil enters largely into the production of Syrian soap.

In Syria, an article which is extensively used for washing woollen and cotton stuffs is the soapwort (*Saponaria officinalis*) root (known as "shursh halawy"). The Consul thinks that it would pay to import this root into the United States.

The Arabs of the interior burn the desert shrubs called "ushran," of the family of *Salsolaceæ*, and extract soda from the ashes. A solution of the ash is powerfully detersive. They also use a lye of wood ashes for washing clothes.

Sesame oil (known as "seraj") is used by Arabs for the face and body ; also for prickly heat, eczema, and other diseases of the skin.

Soap in the Netherlands.

U.S. Cons. Reps., Dec. 16, 1901.

The import duties on soaps entering the Netherlands are as follows, per 100 kilos. :—

	Florins.*
Perfumed and transparent soaps	4
Other hard soaps	2
Other soft soaps	1
Creoline soap	2
Dry soap, in packages	5 per cent. *ad val.*

* 1 florin = 1*s.* 8*d.* or 0·40 dol.

Soap powder, not perfumed, pays the same duty as "other hard soaps."

The wholesale price of French perfumed cream shaving soap is, for 12 porcelain boxes, each containing a little over an ounce of soap, 6 to 12 florins ; and for a dozen boxes, each containing a little over half an ounce, from four to six florins. The price of the powder is $1.20 to $1.80 per dozen boxes. Shaving soap, in cakes of Dutch manufacture, sells at 9 to 12 cents per lb.

Manufacture of Soap and Candles in Kansas (U.S.A.).

Bd. of Trade J., Dec. 26, 1901.

There were seven establishments engaged in this industry, in 1900, with 177 wage-earners, and products valued at 1,083,337 dols. In 1890, there were nine establishments, 39 wage-earners, and products valued at 253,219 dols. The value of products increased 327·8 per cent. during the decade. The establishments engaged in this industry make use of the oils, fatty matter, offal, and other waste products of the slaughtering and meat-packing houses.

Soap in Kossovo (Turkey).

Foreign Office Annual Series, No. 2730.

Soap is the most contested of all imports. Its use is rapidly spreading among the populations of this district, and, in spite of an increased local manufacture, its importation, during 1900, shows an increase of over 50 per cent. on 1899. France stands first with the ordinary qualities, and her success is due to the colour put into the soap, which is sold to the natives as "toilet soap." The United Kingdom comes next, but with only three-fifths of the French total, whilst Italy has begun to compete with Austria-Hungary in the better soaps.

Soap in Wurtemberg (Germany).

Foreign Office Annual Series, No. 2732.

Prices of raw materials for soap manufacture showed a considerable advance, in 1900, solid fats increasing by 50 per cent., oils by 100 per cent., soda and potash by about 35 per cent. An increase in the manufacture of Wurtemberg soaps can scarcely take place, as the raw materials are subject to heavy import duties, and the majority of the countries to which the soaps are exported exact a 50 per cent., *ad val.*, duty.

XIII. B.—RESINS, VARNISHES, Etc.

Shellac in India.

Chem. and Druggist, Dec. 28, 1901.

A pamphlet on the shellac industry, written by Dr. Geo. Watt and Mr. D. Hooper, has been issued as one of the *Agricultural Ledger* series. The authors obtained a series of samples, in illustration of the details narrated, from practically every district in India where a trade in lac or an industry in lac manufactures exists. There are 347 pages of reading-matter, and they include a history of lac and lac-dye ; India's external trade in lac ; the production and cultivation of lac ; the manufacture of lac and lac-dye ; the chemistry of lac and lac-dye ; and the industrial and art uses of lac and lac-dye.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Gelatin Factory in France.

U.S. Cons. Reps., Dec. 7, 1901.

A new factory has commenced manufacturing fine glues and gelatins from bone meal, with a capacity of 1,200 tons annually.

Leather in Switzerland.

Foreign Office Annual Series, No. 2734.

Total imports for 1900, 954,600*l.* Imports from the United Kingdom, 40,000*l.* ; decrease, 29,400*l.*, the principal decreases being in sole leather, 10,700*l.* ; leather, necks and bellies, 15,400*l.* ; harness leather, 1,300*l.* ; superior shoes, 800*l.* ; and leather gloves, 800*l.*

The United States increased her exports to Switzerland by 11,090*l.* (the increase being in leather, necks, and bellies), the total imports from the United States, for 1900, amounting to 141,500*l.* Australia figures for the first time as an exporter of leather to Switzerland, to the amount of about 3,000*l.*, *viz.*, leather for soles, 1,500*l.* ; other leather, necks and bellies, 1,500*l.*

The total imports of leather goods show a decrease of 85,000*l.*, which is partly explained by the fact that some Swiss tanneries have successfully introduced the manufacture of various articles which hitherto were imported from other countries. The imports of superior and common boots and shoes decreased by more than 20,000*l.* The imports of india-rubber shoes increased by nearly 5,000*l.*

XV.—MANURES, Etc.

Artificial Manures in Egypt.

Bd. of Trade J., Jan. 2, 1902.

A communication has been received from Mr. George P. Foaden, Secretary to the "Société Khédiviale d'Agriculture," stating that a considerable trade in manures has

arisen in Egypt, the importation of which, during 1899, he estimates at 35,000*l.*

Mr. Foaden is now anxious that the requirements of Egypt in this respect should be brought to the notice of the public through the Board of Trade, and invites tenders for the following quantities of artificial manures:—

(1) 225 tons of superphosphate, with a right to increase the order to 500 tons at the terms accepted, such manure to contain 16 to 18 per cent. of phosphoric acid.

(2) 60 tons of nitrate of soda, with a similar right to increase the order to 150 tons.

(3) 60 tons of sulphate of ammonia, with a similar right to increase the order to 150 tons.

The whole to be quoted for c.i.f. Alexandria, to be delivered by the end of January, and all correspondence to be addressed to G. P. Foaden, Esq., Khedivial Agricultural Society, Cairo.

XVI.—SUGAR.

United Kingdom.

Sugar Import Duties.

Bd. of Trade J., Dec. 19, 1901.

The Board of Trade have received a further amended schedule of the fixed rates of duty on certain articles containing sugar, which has been issued by the Commissioners of Customs, for the guidance of Customs officers. The following additions require to be made to the schedules already published:—

	s.	d.
Confectionery, liquorice—if declared by the importer not to contain more than 30 per cent. of added sugar or other sweetening matter—subject to occasional sampling and test..... cwt.	1	3
Milk, condensed, slightly sweetened, whether whole, separated, or skimmed—if declared by the importer not to contain more than 18 per cent. of added sugar—subject to occasional sampling and test..... cwt.	0	9

(See also this Journal, 1901, 515, 629, 948, 1160.)

Cane-Sugar Industry in Australia.

Bd. of Trade J., 299—301, *Nov.* 14, 1901.

Queensland.—The Australian cane-sugar-growing States present conditions of the industry which distinguish them from other such countries. The system worked in most countries is that of the "plantation," where large areas lie contiguous to the mills, and the growing and manufacturing are one concern, and represented by the white capitalist and his staff of officers on the one hand, and subject, and frequently cheap, labour on the other. This system obtained in Queensland in the earlier history of sugar-growing. The previous large estates have, recently, and, more particularly, since the inauguration of the Government central-mill system, become divided up into small farms, which have been rented or sold to cane growers. This great change has brought about a condition of things which is unique, and in a large measure peculiar to the Australian cane-sugar States. The most important economic and social results of this change are found in the circumstance that the ownership and occupancy embraces a large number of strong, responsible, and progressive white settlers, with families of coming men and women, who are being distributed over the sugar-growing areas. These settlers are furnishing the cane which keeps the mills in operation, and it is not only apparent that the maintenance of the sugar industry, but also the settlement of the country, is to be chiefly in their hands. At this time, there are 2,610 cane growers in Queensland, with an average area per grower, under sugar-cane, of 42·6 acres.

The effect of this system upon the demand for, and supply of, labour is important. The large number of small farmers who now have the occupancy of the lands are not only the owners or tenants, they are also settled white labourers, with the distinction that they and their families are engaged in cultivating their own lands for their own gain. As labourers working for hire, many of these settlers would never have been found on the soil, but as free men, with a personal interest in their occupancy, they are the hardest performers of given kinds of work in the field, and by their labour they have already to a considerable extent modified the exclusive employment of subject labour, and in localities where hitherto the white labourer had hardly been found. The following table shows a decrease in the number of Pacific Islanders employed, and a simultaneous expansion in the sugar production:—

Year.	Cane Crushed.	Sugar Made.	Pacific Islanders in Queensland.
	Acres.	Tons.	No.
1885	38,557	55,796	10,755
1890	40,208	68,924	9,689
1899	79,435	123,289	8,826

The next table shows the sugar crop for the last four years. The total result of 1900 was very low, the falling off in the crop and yield being due to extreme drought:—

Year.	Cane Crushed.	Volume of Sugar.	Yield per Acre.
	Acres.	Tons.	Tons.
1897	65,432	97,916	1·49
1898	82,391	163,734	1·98
1899	79,435	123,289	1·55
1900	72,651	92,554	1·27

The following table gives the price of raw sugar, with the corresponding prices of the Colonial Sugar-Refining Company's refined sugar, for the years stated:—

Year.	Values of Raw Sugar.	Values of Refined Sugar.
	Per Ton. £ s. d.	Per Ton. £ s. d.
1895	9 9 8	16 6 0½
1896	9 9 5	17 7 8
1897	8 18 5	16 6 1½
1898	8 11 0	15 8 8
1899	9 4 10	15 8 7½
1900	9 13 0	16 4 4
Average value	9 5 5	16 3 7

Value of the crop, 1900, 920,913*l.*

Value, in average, of the crops, 1897—1900, 1,076,318*l.* 15*s.* 9*d.*

New South Wales.—Following an account of the history and increase of the sugar industry in this State, from the year 1864, the subjoined table is given, showing the area of cane harvested during the years 1895 to 1899:—

Year.	Acreage of Cane.	Sugar Made.
	Acres.	Tons.
1895	14,398	22,213
1896	18,194	28,557
1897	12,936	27,653
1898	14,578	29,110
1899	9,435	15,352
Average for 5 years of sugar	13,908	24,577

The average yield of sugar per acre for the five years above recorded was 1·76 tons.

The production of cane in New South Wales, in 1899, was 170,509 tons, or a yield per acre of 18 tons of cane. For the same year the production of Queensland was 1,176,466 tons, with a recorded yield of 14·8 tons per acre.

—J. L. B.

XVIII. A.—FOODS.

Vinegar in Wurtemberg (Germany).

Foreign Office Annual Series, No. 2732.

The sale of vinegar was dull and the competition of acetic acid was keen, during 1900, as spirits of wine rose in value, whilst calcium acetate fell about 45 per cent., and is, in addition, imported duty-free from the United States.

XVIII. C.—DISINFECTANTS.

Carbolic and Salicylic Acids in Wurtemberg (Germany).

Foreign Office Annual Series, No. 2732.

The demand for nitro-phenols has latterly decreased, as these chemicals have been replaced for certain purposes by other products; the import of carbolic acid comes, as heretofore, almost exclusively from the United Kingdom.

The dissolution of the "Salicylic Acid Trust," towards the end of 1900, resulted in a general fall of chemical products prepared from salicylic acid. The export of these chemicals to the United States, France, and Austria has been rendered almost impossible by the high duties which prevail. The chemical works seem to desire the enactment of trade treaties based upon the principle of free importation of raw materials, and a reciprocal treatment with other countries for duties on chemicals.

XIX.—PAPER, PASTEBOARD, Etc.

Pulp Mills in Canada.

Bd. of Trade J., Dec. 26, 1901.

The Dominion Government Statistician states that the pulp mills of Canada, with a capacity equal to the production of 316,500 tons of wood pulp, actually produced, in the nine months ended 30th September, 1901, the following quantities: 142,085 tons of mechanical pulp, 61,934 tons of sulphite, and 8,485 tons of soda pulp. They were therefore employed to the extent of two-thirds of their capacity.

The outside markets took about 41½ per cent. of the entire output. The United States took one-eighth, and the United Kingdom over one-quarter. Great Britain's purchases were valued in the Canadian Customs Returns at 750,000 dols.; those of the United States at 684,000 dols. Other countries took 38,500 dols. The home market absorbed or held over for future sales about 124,000 tons.

The export of wood pulp from Canada, during the ten months ended 31st October, amounted to 1,220,593 dols., of which 67,755 dols. went to the United Kingdom and the remainder to the United States.

Blue-print Paper: U.S. Custom Decision.

Bd. of Trade J., Dec. 26, 1901.

Paper used for making photographic blue-print paper is not itself a photographic paper, but is capable of being used for printing books; it is therefore dutiable under par. 396 of the Tariff.

Paper in Kossovo (Turkey).

Foreign Office Annual Series, No. 2730.

The only quality of paper imported from the United Kingdom is a small-size note paper, mostly in fancy boxes. The fact that this sells well, in spite of Austro-Hungarian competition, and in spite of its size, which is not suited to local requirements (and the quality of foreign paper does not suit even the local buyer), makes competition with Austria-Hungary and Germany, if properly pushed, by no means hopeless.

XX.—FINE CHEMICALS, Etc.

Camphor in Ceylon.

Bd. of Trade J., Dec. 26, 1901.

Owing to the monopoly established by Japan, the price of crude camphor rose to 200*s.* a cwt., in 1900, and if this price be maintained, there is some prospect of growing the plant profitably in Ceylon, where it succeeds well in many districts. A series of distillation experiments yield fairly promising results.

Stipites Pyrethri: U.S. Customs Decision.

Bd. of Trade J., Dec. 26, 1901.

"Stipites pyrethri," the stems of the herb pyrethrum, cut into lengths of 50 to 70 cm., and pressed into bales, are free of duty, as crude drugs, under par. 548 of the Tariff.

XXII.—EXPLOSIVES, Etc.

Matches in Kossovo (Turkey).

Foreign Office Annual Series, No. 2730.

Matches come entirely from Austria-Hungary, at present; but a syndicate having been formed at Trieste, a rise of 30 per cent. in the price has been decided upon, which makes competition in this article very possible. The agents at Salonica realise a 40 to 45 per cent. profit, which they intend increasing next year, whilst the retailers in the provinces average 15 to 20 per cent. profit.

All but the most expensive matches (wholesale price, f.o.b., Salonica, for Uskub and Monastir, 2*l.* 5*s.* per dozen boxes of 100 matches) are thoroughly bad. Of the quite inferior kind (1*l.* per 200 dozen), only two in five will burn, and of these in general use ("Salon," 1*l.* 4*s.* per 200 dozen), all splutter when struck, whilst a large percentage do not catch at all.

Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

25,645. H. McPhail. Improvements relating to steam superheaters. Dec. 16.

25,676. C. Still. Continuously acting distilling apparatus. Complete Specification. Dec. 16.

25,772. F. C. J. Bird. Improvements in an apparatus or still for the direct recovery of alcohol or other volatile liquid from solid or semi-solid substances, the evaporation of liquids, and the drying of solid materials. Dec. 17.

25,904. E. A. Lesueur. Improvement in art of causing evaporation. Dec. 19.

25,921. G. Pott and R. Williamson. Improvements in centrifugal machines. Dec. 19.

25,992. G. Pott and R. Williamson. Improvements in centrifugal machines. Dec. 19.

25,976. A. Vosmaer and A. Lebret. Improvements in apparatus for treating liquids with gases or gases with liquids. Dec. 19.

25,993. R. Robertson and W. Rintoul. Improvements in apparatus for the treatment of gases with liquids. Dec. 19.

26,031. C. H. Owen. An improved complete apparatus for obtaining, storing, and utilising liquid gases, vapours, air, and the like. Dec. 20.

26,078. R. Thomson. Improvements in and relating to kilns, furnaces, and the like. Dec. 20.

26,165. T. R. Murray. Improvements in pumps for pumping or compressing gases or vapours. Complete Specification. Dec. 21.

26,249. A. Borsu. Improvements in centrifugal separators. Dec. 23.

26,324. A. Kitson. Improvements in or appertaining to vapour-burning apparatus. Dec. 24.

26,375. W. McClave. Improvements in furnaces. Complete Specification. Dec. 24.

26,430. G. Pott and R. Williamson. Improvements in centrifugal machines. Dec. 27.

26,419. D. F. Chalmers. Improvements in covers for pipe joints for use in connection with covering, whose purpose is to prevent the radiation of heat. Dec. 27.

26,537. O. Dieffenbach. *See* Class VII.

26,540. T. J. Carr. Improvements in liquid fuel injecting and burning apparatus. Dec. 28.

26,545. W. C. Courts. Improvements in smoke-consuming apparatus. Dec. 30.

26,576. A. G. Brookes.—From P. B. Bradley, United States. Improvements in or relating to fuel feeders for furnaces. Complete Specification. Dec. 30.

26,577. A. G. Brookes.—From P. B. Bradley, United States. Improvements in or relating to fuel feeders for furnaces. Complete Specification. Dec. 30.

26,578. A. G. Brookes.—From P. B. Bradley, United States. Improvements in or relating to fuel feeders for furnaces. Complete Specification. Dec. 30.

26,667. H. Duncan, R. R. Sherriff, and The Gold Recovery from Slimes Syndicate, Ltd. Improvements in Apparatus for separating liquids from solids. Complete Specification. Dec. 31.

26,703. C. Loeser. Improvements in and relating to kilns or furnaces. Dec. 31.

26,712. E. W. Parish. Improvements in and relating to apparatus for heating liquids. Dec. 31.

26,715. J. P. Hultgren and F. H. Getzmann. Improved centrifugal separator drum. Dec. 31.

26,725. R. Müller. — From K. Hebbeler, Germany. Improvements in or relating to filters. Dec. 31.

Complete Specifications Accepted.*

1900.

23,751. G. W. Johnson.—From P. Naef, United States. Absorbing, precipitating, distilling, lixiviating, and generally subjecting matter to the action of gases or liquids.

1901.

2352. H. Reck and A. Borsu. Centrifugal separators. Dec. 24.

II.—FUEL, GAS, and LIGHT.

Applications.

25,656. L. Jameson and C. Brockwell. Compressed spirit for burning and heating purposes. Dec. 16.

25,729. W. J. Crossley and J. Atkinson. Improvements in apparatus for heating the air and gas in gas-producer plants. Dec. 17.

25,782. L. B. Atkinson. Improvements in and relating to the production and distribution of producer-gas. Dec. 17.

25,810. A. Just. Improvements in the manufacture of incandescence bodies for electric glow lamps. Complete Specification. Dec. 17.

25,847. D. G. H. Ransom. Improvements in Bunsen gas burners. Dec. 18.

26,077. R. Thompson. Improvements in and relating to the combustion of fuel. Dec. 20.

26,103. W. T. Lancaster. Improvements in or in connection with inclined retorts of gas-producers. Dec. 21.

26,142. J. S. Chenhalls. Improved means for utilising waste heat. Dec. 21.

26,220. A. J. Boult.—From E. Y. Comstock, United States. Improvements in and relating to carburetters. Complete Specification. Dec. 23.

26,242. F. J. Heering. Improvements in mantles for incandescent gas burners. Dec. 23.

26,271. W. A. Milne. Composite peat blocks. Complete Specification. Dec. 23.

26,330. B. J. B. Mills.—From J. R. Taylor, United States. Improved process and apparatus for generating producer gas. Complete Specification. Dec. 24.

26,372. T. A. Johnson. Improvements in gas producers. Dec. 24.

26,411. J. R. Nicholson and H. Brown. Improvements in coke ovens. Dec. 27.

26,461. C. B. Tully and V. B. Lewes. Improvements in and means or apparatus for the manufacture or production of gas suitable for heating and illuminating purposes. Dec. 27.

26,487. R. Hopfelt. Carbide electrodes for arc lamps and process of manufacturing the same. Dec. 27.

26,535. R. Hopfelt. Improvements in and in the manufacture of carbide electrodes for arc lamps. Dec. 28.

26,536. W. T. Goodsir. Liquid for the treatment and renovation of mantles for incandescent gas lighting. Dec. 28.

26,635. E. W. Lancaster. Improvements in acetylene generators. Dec. 30.

26,750. C. G. Brett and F. Henneberger. An improvement in incandescent mantles. Dec. 31.

Complete Specifications Accepted.

1900.

16,621. J. G. L. Bormann. Gas production. Dec. 24.

21,518. W. T. Purves and The Notkin Syndicate, Ltd. Automatic carburetting apparatus. Dec. 31.

21,519. W. T. Purves and the Notkin Syndicate, Ltd. Automatic carburetters. Dec. 31.

23,320. W. S. Rock. Production of oxide of iron. Dec. 24.

1901.

1173. J. H. Hartridge. Methods and means for carburetting air and enriching gas for illumination, heating, and power purposes, partly applicable for purifying hydrocarbons. Dec. 31.

2691. Lawton's Patents, Ltd., and A. W. Lawton. Method of and means for dehydrating gases or gaseous mixtures, applicable for cooling gases or gaseous mixtures, or for other analogous purposes. Dec. 24.

3934. E. Anderson. Apparatus for generating and storing acetylene gas. Dec. 31.

4159. F. Stadelmann and Co., Ltd., and L. Thurnauer. Incandescent gas burners. Dec. 31.

4350. W. Green. Incandescent gas burners. Dec. 31.

4403. E. C. Rossiter, H. W. Crowther, and G. S. Albright. *See* Class VII.

22,105. J. W. Bray. Acetylene gas burners. Dec. 31.

24,030. J. Heaton and N. T. Worthley. Acetylene gas generating apparatus. Dec. 31.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Applications.

25,807. W. R. Gentzen and L. Roth. *See* Class V.

26,647. N. M. Henderson. Improvements in and connected with retorts for the destructive distillation of shale or other oil-yielding minerals. Dec. 31.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

25,650. J. Y. Johnson.—From The Badische Anilin and Soda Fabrik, Germany. Improvements in the manufacture and production of sulphur colouring matters and material for use therein. Dec. 16.

25,697. J. Y. Johnson.—From the Badische Anilin and Soda Fabrik, Germany. The manufacture of new substantive colouring matter containing sulphur and material for use therein. Dec. 16.

25,780. R. B. Ransford.—From L. Cassella and Co., Germany. Improve blue cotton dyestuffs. Dec. 17.

25,781. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of dyestuffs. Dec. 17.

25,809. J. Y. Johnson.—From The Badische Anilin and Soda Fabrik, Germany. The manufacture and production of colouring matter containing sulphur. Dec. 17.

26,058. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of indoxyl. Dec. 20.

26,059. O. Imray.—From The Farbwerke vormals Meister, Lucius, und Brüning, Germany. Manufacture of formyl-methyl-anthranilic acid. Dec. 20.

26,060. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of indoxyl from methyl-anthranilic acid or certain derivatives thereof Dec. 20.

26,061. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of indoxyl or its homologues. Dec. 20.

26,147. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of dyestuffs. Dec. 21.

26,448. T. R. Shillito.—From The Aniline Colour and Extract Works, formerly J. R. Geigy and Co., Switzerland. Sulphur dyestuffs. Dec. 27.

26,465.—H. H. Lake.—From Chemical Works, formerly Sandoz, Switzerland. Improvement in and relating to the manufacture of black sulphur dyes for cotton. Dec. 27.

26,520. R. Holliday and Sons, Ltd., J. Turner, J. Turner, and H. Dean. Improvements in the production of intermediate products and colouring matters therefrom. Dec. 28.

26,602. O. Imray.—From The Basle Chemical Works, Switzerland. Improvements in the manufacture of fast dyestuffs of the phthalein series. Complete Specification. Dec. 30.

26,603. J. B. Senderens, H. A. d'Andoque de Sériègé, and H. R. de Chefdebien. Improved manufacture of aniline, toludines, and like bases. Filed Dec. 30. Date applied for, July 11, 1901, being date of application in France.

Complete Specifications Accepted.

1901.

274. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. Manufacture of ortho-oxycarbonic acids. Dec. 24.

751. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a dyestuff from 1·5-dinitronaphthalene. Nov. 27.

2397. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of disazo colouring matters. Dec. 24.

2913. H. E. Newton.—From The Farbenfabriken vormals F. Bayer und Co., Germany. Manufacture or production of new basic dyestuffs. Dec. 24.

3311. H. E. Newton.—From The Farbenfabriken vormals F. Bayer und Co., Germany. Manufacture or production of dyestuffs of the anthracene series. Dec. 24.

18,976. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Manufacture and production of thioxanthins. Dec. 24.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

25,807. W. R. Gentzen and L. Roth. Improvements in the treatment of woody and other vegetable substances for the recovery of useful products therefrom. Dec. 17.

26,012. W. J. Hawkins and F. R. Roberts. An improved means of printing in colours. Dec. 20.

26,115. E. Hindley, S. Walker, and M. Rose. Improvements in apparatus for dyeing, scouring, bleaching, and otherwise treating yarn in cop or other similar compact form. Complete Specification. Dec. 21.

26,155. O. Imray.—From the firm of C. Roeseh et Cie., Germany. Improved apparatus for treating fibres, fabrics, or the like with bleaching, dyeing, or like liquors. Dec. 21.

26,468. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in printing cotton. Dec. 27.

26,509. R. J. C. Mitchell. An improved process and apparatus for treating felted fabrics. Dec. 28.

Complete Specifications Accepted.

1901.

939. E. Ashworth and J. Lindley. Apparatus used in the dyeing, bleaching, and treatment of cotton and other textile materials. Dec. 24.

1159. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Printing textile materials with indigo. Dec. 31.

4279. J. C. Hamer. Apparatus for dyeing and otherwise treating yarn or rovings in compact form. Dec. 31.

21,645. P. Bourcart. Process and apparatus for the mercerisation of vegetable fibres. Dec. 24.

VII.—ACIDS, ALKALIS, AND SALTS.

Applications.

25,776. F. S. Young and W. S. Griffiths. Improvements in and relating to magnesium carbonate and process of making same. Complete Specification. Dec. 17.

25,880. J. T. A. Walker and J. T. Steele. Improvements relating to the manufacture of caustic soda and to the treatment of lime sludge produced in such manufacture. Dec. 18.

26,070. G. Glock. Improvements in processes for purifying and concentrating pyroligneous acid. Dec. 20.

26,329. R. Pearson and O. Mareh. Process of producing nitrogen peroxide, and of converting it into nitric acid. Dec. 24.

26,396. W. Feld. Improvements in and relating to the recovery of hydro-cyanic acid from gases. Dec. 24.

26,537. O. Dieffenbach. Improvements in and in apparatus for the manufacture of chlorine and other chemical products. Dec. 28.

26,625. G. B. Ellis.—From La Société Chimique des Usines du Rhône anciennement G. P. Monnet et Cartier, France. Improvements in the manufacture of aldehydes. Dec. 30.

26,669. A. E. Berry and F. G. A. Roberts. An improved process for making sodium and potassium sulphite. Dec. 31.

Complete Specifications Accepted.

1900.

23,493. W. Alvisi. Process for chlorinating natural or artificial sulphides by means of free chlorine. Dec. 31.

1901.

3305. A. G. Bloxham.—From The Chemische Fabrik Rhenania, Germany. Manufacture of nitric acid and apparatus therefor. Dec. 24.

4403. E. C. Rossiter, H. W. Crowther, and G. S. Albright. Manufacture of cyanides. Dec. 31.

14,953. K. Dementjeff and J. Ouschkoff. Method for the industrial working of the mineral called Eleaolith, for the production of water glass, alumina, sulphate of alumina, alum alumina, and of the chlorides and sulphates of the alkali metals. Dec. 24.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

25,851. J. Barker, S. Wickens, and H. Phillips. Mosaic or tesselated glass decoration. Dec. 18.

26,093. H. P. Embrey. Improved construction of kilns, and ovens for firing bricks, tiles, terra-cotta goods, and like articles. Dec. 21.

26,099. S. H. Leech. Improvements in the manufacture of terra-cotta and the like articles. Dec. 21.

Complete Specifications Accepted.

1900.

23,520. S. Hill. Manufacture of glass bottles by machinery and apparatus therefor. Dec. 31.

24,328. G. W. Laybourn. Deposition of metals or earthenware bodies. Dec. 31.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

25,862. J. P. Norrington. An improved artificial paving stone. Dec. 18.

26,213. C. F. Theurer and H. C. Hansen. Improvements in furnaces or kilns for burning Portland cement, marl, magnesite, and the like. Dec. 23.

26,214. C. F. Theurer and H. C. Hansen. Improvements in kilns for burning Portland cement, lime, marl, magnesite, and the like. Dec. 23.

26,258. L. P. Ford. Improvements in the manufacture of artificial stone bricks. Dec. 23.

26,259. L. P. Ford. Mould for the manufacture of large blocks of artificial stone. Dec. 23.

26,296. E. D. Nicholson. *See* Class X.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

23,851. C. Diesler. Manufacture of cement. Dec. 31.

1901.

457. A. G. Brookes. — From C. Hörisch, Germany. Process for hardening artificial stone or the like. Dec. 24.

3768. W. Michaelis. Manufacture of hydraulic cement. Dec. 24.

X.—METALLURGY.

APPLICATIONS.

25,628. J. W. Sankey. Improvements in or relating to enamelling metallic surfaces. Dec. 16.

25,671. P. M. Justice.—From C. Davis, United States. Improvements in the method or process of hardening steel. Complete Specification. Dec. 16.

25,698. The Redruth Foundry Company, Ltd., and T. H. Tregoning. Improvements in and connected with apparatus for pulverising and amalgamating ores. Dec. 16.

25,905. T. Twynam. Improvements in the treatment of complex sulphide ores, containing chiefly zinc and iron sulphides. Dec. 19.

25,928. O. Lugo and W. M. Callender. Process for the elimination and extraction of the noble metals, such as gold, from their solutions. Dec. 19.

25,951. D. Richards. Improvements in the manufacture of iron and steel, and in apparatus thereof. Dec. 19.

26,166. F. Ellershausen and R. W. Western. Improvements in the treatment of zinc ore containing cadmium or otherwise. Dec. 21.

26,296. E. D. Nicholson. Improvements in, and means or apparatus for use in, the production of basic material for use as converter and furnace linings and the like, the calcining of mineral substances, such as lime and various ores, and similar operations. Dec. 24.

26,338. J. B. de Alzugaray. Improvements in and connected with the manufacture of metallic alloys. Dec. 24.

26,379. G. Huth.—From F. Pich, Germany. An improved flux for brazing. Dec. 24.

26,446. D. Bates and G. W. Peard. Improvements connected with the annealing of metals. Complete Specification. Dec. 27.

26,470. W. P. Thompson.—From Le Syndicat de l'Acier Gerard, France. Improved process and apparatus for the smelting of steel and other metals direct from their ores by aid of heat and electricity. Dec. 27.

26,595. W. F. Bedell. Improvements in amalgamators. Complete Specification. Dec. 30.

26,631. T. Winterbottom. Improvements in machines for breaking pig iron. Dec. 30.

26,667. H. Duncan, R. R. Sheriff, and the Gold Recovery from Slimes Syndicate, Ltd. *See* Class I.

26,689. G. Teichgraeber. Improvements in apparatus for heating the air for supplying blast furnaces. Complete Specification. Dec. 31.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

23,320. W. S. Rock. *See* Class II.

1901.

2939. C. Haber and A. Savelsberg. Apparatus to be employed in the treatment of molten lead, copper, and other metals. Dec. 24.

13,364. C. E. Steinweg. Process of manufacturing hollow bodies from easily fusible metals and metal compounds. Dec. 31.

18,150. D. Laird. Smelting furnaces. Dec. 31.

20,657. H. Wachwitz, L. Sattler, and M. Dünkelsbühler. Manufacture of plated metals. Dec. 24.

23,531. J. T. Pagan and W. Buckley. Production of metal castings. Dec. 24.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

APPLICATIONS

26,112. S. G. Wider. Improvements in primary electric cells or batteries. Dec. 21.

26,229. H. White. Improvements in or relating to secondary electric batteries. Dec. 23.

26,237. F. N. Blanc. Improvements in accumulators Dec. 23.

26,328. R. Pearson and O. March. Means of performing electro-chemical reactions. Dec. 24.

26,363. V. Karavodine. An improved insulating material, and process of manufacture of same. Dec. 24.

26,673. F. E. Elmore. Improvements in apparatus for the generation and electrolytic application of electric currents. Dec. 31.

26,714. O. Zöpke. Improvements in or relating to electric accumulators regenerative by gases. Dec. 31.

26,729. T. J. Bain and J. O. Hunt. Improvements in electric battery. Complete Specification. Dec. 31.

26,754. J. W. Stover and N. H. Suren. Improvements in apparatus for use in charging storage batteries. Complete Specification. Dec. 31.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

23,729 Baron H. F. d'Arnoult. Secondary batteries. Dec. 30.

1901.

3992. H. W. Cobb. Electrical accumulators. Dec. 24.

4429. F. M. Chaplet. Electric storage batteries or accumulators. Dec. 31.

4586. C. N. Gauzentès. Primary batteries. Dec. 31.

XII.—FATS, OILS, AND SOAP.

APPLICATIONS.

25,717. J. Carstairs. An improved process for the separation of albuminoids from fat, oil, and similar bodies not containing nitrogen. Dec. 17.

25,792. G. Bamberg. Improvements in detergents and their manufacture. Dec. 17.

25,957. D. M. Sutherland. An improved process and apparatus for oxidising and solidifying drying oils. Dec. 19.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

APPLICATION.

26,261. T. C. Fawley. Improvements in the method of and means for preparing and tanning hides and the like, applicable also to dyeing and analogous purposes. Complete Specification. Dec. 23.

XVI.—SUGAR, STARCH, AND GUM, ETC.

APPLICATIONS.

25,695. H. Manoury and L. Naudet. Improvements in and relating to the treatment of bagasse. Complete Specification. Filed Dec. 16. Date applied for June 1, 1901, being date of application in France.

26,320. C. F. Topham. Improvements in the manufacture of viscose. Dec. 24.

XVII.—BREWING, WINES, SPIRITS, Etc.

Complete Specifications Accepted.

1900.

23,198. H. McPhail. Treatment of pot-ales, wash liquors, sewage, and other aqueous waste or by-products. Dec. 24.

23,634. E. S Beaven. Process of drying malt, hops, and other substances, and apparatus therefor. Dec. 24.

1901.

40. J. H. Brodrick. Compounds and processes for making home-made wines. Nov. 27.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

25,933. M. Stoll. Preservation of foods with carbonic acid. Dec. 19.

B.—Sanitation; Water Purification.

25,875. O. Rämisch. Improvements in apparatus for purifying water and collecting matters suspended therein, especially suitable for treating the effluents of paper and pulp mills. Dec. 18.

Complete Specifications Accepted.

B.—Sanitation; Water Purification.

1900.

22,856. A. Desgrez and V. Balthazard. Apparatus for regenerating and purifying air. Dec. 24.

23,198. H. McPhail. *See* Class XVII.

23,412. D. Cameron, F. J. Commin, and A. J. Martin. Apparatus for purifying sewage and other liquids. Dec. 31.

XIX.—PAPER, PASTEBOARD, Etc.

Applications

25,978. C. Töbelmann. Improvements relating to the treatment of coated paper. Complete Specification. Dec. 19.

26,075. H. E. Newton. — From The Farbenfabriken vormals F. Bayer und Co., Germany. The manufacture and production of celluloid-like substances, and their use in industry. Dec. 20.

26,260. J. R. Desmarest and J. M. P. Geyer. Method of treating vegetable matters with a view of obtaining paper pulp. Dec. 23.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

25,688. C. Combes. A process and apparatus for the manufacture of carbon tetrachloride. Dec. 16.

25,699. W. R. Bousfield. Improvements in the manufacture of substances usually prepared by fractional distillation, and apparatus therefor. Dec. 16.

25,706. H. E. Newton. — From The Farbenfabriken vormals F. Bayer und Co., Germany. The manufacture and production of pharmaceutical compounds. Dec. 16.

25,804. H. E. Newton. — From The Farbenfabriken vormals F. Bayer und Co., Germany. The manufacture and production of pharmaceutical compounds. Dec. 17.

25,807. W. R. Gentzen and L. Roth. *See* Class V.

26,618. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. The manufacture of camphene. Dec 30.

26,619. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. The manufacture of camphene. Dec. 30.

26,620. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. The manufacture of camphene. Dec. 30.

26,713. E. de Pass.—From La Société Serrés et Rérat, France. Process for the manufacture of medicamental carbonic acid. Dec. 31.

Complete Specifications Accepted.

1900.

23,727. C. Moureu. Manufacture of useful products from heptine and octine.

1901.

274. A. Zimmermann. From The Chemische Fabrik auf Actien vormals E. Schering, Germany. Manufacture of ortho-oxycarbonic acids. Dec. 24.

4200. C. Ramage.—From A. S. Ramage, United States. Process for the production of terpene peroxide. Dec. 31.

21,758. O. Mierisch and O. Eberhard. Processes for making milk extracts resembling meat extracts. Dec. 24.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

25,759. M. S. Abbot, F. A. H. Loomis, and F. D. Ives. Improvements in and relating to machines for making matches. Complete Specification. Dec. 17.

25,788. H. J. Richards, C. B. Dougherty, M. Williams, and A. L. Williams. An improved squib for blasting purposes. Complete Specification. Dec. 17.

25,884. J. Wetter.—From The Westfälisch-Anhaltische Sprengstoff-Aktiengesellschaft, Germany. Improvements in or relating to blasting compositions. Dec. 18.

25,994. R. Robertson and W. Rintoul. Improvements relating to the manufacture of explosives, celluloid, and the like. Dec. 19.

26,146. C. W. A. Goodfellow. Improvements relating to detonating agents for explosive compounds. Dec. 21.

26,247. J. A. E. Criswell. Improvements in match making machinery. Dec. 23.

26,617. J. Wetter. — From Westfälisch - Anhaltische Sprengstoff - Aktiengesellschaft, Germany. Improvements relating to safety explosives or blasting compositions. Dec. 30.

26,621. J A. E. Criswell. Machine for making matches. Dec. 30.

26,622. J. A. E. Criswell. Machine for making matches. Dec. 30.

26,623. J A. E. Criswell. Machine for making matches. Dec. 30.

Complete Specifications Accepted.

1901.

3725. A. Hollings. Presses for guncotton or the like. Dec. 24.

5967. W. C. Roberts - Austen, K.C.B. Detonators. Dec. 24.

17,626. H. H. Lake.—From Eastern Powder Company United States. Manufacture of explosive powder. Dec. 24.

20,755. J. Führer. Safety detonating composition as a substitute for preparation of fulminate of mercury. Dec. 31.

23,740. F. L. Nathan and R. Robertson. Manufacture of explosives. Dec. 24.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 3809.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES

ISSUED TWICE A MONTH.

No. 2.—Vol. XXI. **JANUARY 31, 1902.** No. 2.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Robert Irvine.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

E. A. Brotherton.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.
C. Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Otto Hehner. | A. R. Ling.

MANCHESTER.
Dr. J. Grossmann. | J. Carter Bell.

NEWCASTLE.
V. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Clifford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
A. Archbutt. | J. T. Wood.

SCOTTISH.
Sir Robert Pullar. | Thos. Gray.

YORKSHIRE.
George Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.
Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.
L. Archbutt. I., XII., XVIII.B.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. A. Butterfield, M.A. II., III.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. .... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw .... VII., XI.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. .. IV., XX.
F. H. Leeds .. III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .. XXII.
W. G. McMillan X., XI., XIV., XXII.
W. Macnab ..... XXII.
N. H. J. Miller, Ph.D. .... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
G. T. Morgan, D.Sc. ... IV., V.
J. G. Parker, Ph.D. XIV
H. T. Pentermann ..... XVI., XVII.
T. H. Pope ..... XX., XXI.
J. C. Richardson ..... XI.
F. W. Renaut .... Patent List.
G. H. Robertson ..... XI.
Chas. Salter ..... I., II., III., XV., XVI.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
A. L. Stern, D.Sc. ..... XVII.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. .. XVI.
E. W. Wheelwright, Ph.D. ..... XXII.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.
A. C. Wright, B.Sc., M.A. ... IV., XVIII., XX.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.
Committee:

Percy Bateson.	Herbert E. Davies.
J. Campbell Brown.	D. Herman.
A. Carey.	Julius Raschen.
Eustace Carey.	F. H. Tate.
G. C. Clayton.	W. Collingwood Williams.
Jas. T. Conroy.	

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.
Committee:

J. J. Bowley.	B. E. R. Newlands.
A. C. Chapman.	Boverton Redwood.
E. Divers.	Walter F. Reid.
H. Hemingway.	F. Napier Sutton.
E. Grant Hooper.	L. T. Thorne.
D. Lloyd Howard.	C. T. Tyrer.
W. Kellner.	Frank Wilson.
J. Lewkowitsch.	

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

SESSION 1901—1902.

Monday, Feb. 3rd, 1902:—
Dr. A. Dupré, F.R.S. "The Explosion of Potassium Chloride by Heat."
Prof. F. Clowes, D.Sc. "The New Table Photometer and Standard Pentane Burner."

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

J. Barnes.	J. M. Irving.
W. Brown.	M. J. Langdon.
J. Craven.	A. K. Miller.
J. English.	H. Porter.
B. W. Gerland.	I. Stenhouse.
W. Heys.	H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Reynoldson.
Vice-Chairman: N. H. Martin.
Committee:

A. Allhusen.	H. S. Pattinson.
P. P. Bedson.	John Pattinson.
J. T. Dunn.	W. W. Proctor.
T. W. Hogg.	G. Sisson.
H. Louis.	Harry Smith.
F. S. Newall.	J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.
Committee:

H. C. Aspinwall.	R. W. Moore.
M. T. Bogert.	T. J. Parker.
C. F. Chandler.	R. C. Schüpphaus.
A. P. Hallock.	M. Toch.
J. Hartford.	G. N. Williamson.
E. J. Lederle.	D. Woodman.
E. G. Love.	

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.
Committee:

S. F. Burford.	A. L. Stern.
F. J. R. Carulla.	J. J. Sudborough.
R. M. Caven.	S. Trotman.
H. B. Mayfield.	G. J. Ward.
J. O'Sullivan.	J. White.
J. M. C. Paton.	

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

SESSION 1901—1902.

Thursday, Feb. 27th, 1902:—
Mr. Wilton P. Rix. "Preparation and Behaviour of Insoluble Frits for Pottery Glazes."

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.
Committee:

W. Carrick Anderson.	W. Foulis.
E. M. Bailey.	D. S. Jerdan.
G. T. Beilby.	A. D. Ker.
H. Bumby.	J. G. F. Lowson.
J. Christie.	W. Ivison Macadam.
W. J. Chrystal.	J. McCulloch.
D. B. Dott.	T. L. Patterson.
C. J. Ellis.	D. J. Playfair.

Hon. Secretary and Treasurer:
Thomas Gray, c/o John T. Tannahill, 44, West George Street, Glasgow.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Fairley.
Committee:

E. A. Brotherton.	S. G. Rawson.
A. W. Cooke.	A. Smithells.
W. M. Gardner.	A. Turnbull.
H. Grandage.	H. A. Watson.
Edw. Halliwell.	Thorp Whitaker.
A. J. Murphy.	J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

Notices.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French as well as British patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections:—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
Signature of Candidate .....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
Profession or Business Occupation .....
Date .....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

LIST OF MEMBERS ELECTED 23rd JANUARY 1902.

Anthony, John, 82, Bay Street, Toronto, Canada.

Bain, James Watson, School of Practical Science, Toronto, Canada, Chemist.

Baird, Dr. Julian W., Massachusetts College of Pharmacy, Boston, Mass., U.S.A., Professor of Chemistry.

Bennett, James Moss, 302, Upper Richmond Road, Putney, S.W., Metallurgist.

Binning, Stevenson, 101, Shooter's Hill Road, Blackheath, S.E., Technical Chemist.

Bousfield, Geo., St. Swithin's, Hendon, N.W., Electro-Chemist.

Bull, Irving C., P.O. Box 294, Middletown, N.Y., U.S.A., Chemist.

Burkard, Dr. Ernest, The Heyden Chemical Works, Garfield, N.J., U.S.A., Chemist.

Clark, Robert M., Rockbank, Partickhill, Glasgow, Chemist,

Cowan, Fredk. W., 8, Nassau Street, Toronto, Canada, Chocolate Maker.

Crush, E. H., 17, Foyle Road, Westcombe Park, Blackheath, S.E., Technical Chemist.

Davis, Charles B., 218, West 134th Street, New York City, U.S.A., Technical Chemist.

Davis, Emerson, 515, Cass Avenue, Detroit, Mich., U.S.A., Chemist.

De Cew, J. A., School of Practical Science, Toronto, Canada, Assistant in Chemistry.

Dodd, T. H., 28, The Village, Old Charlton, Kent, Chemist (Royal Arsenal).

Easterbrooks, Frank D., Raritan Copper Works, Perth Amboy, N.J., U.S.A., Chemist.

Ellis, M. C., Knockaloe, Bedford Park P.O., Toronto, Canada, Jeweller.

Fisher, Pearson, c/o Messrs. Manlove, Alliott, and Co., Ltd., Bloomsgrove Works, Nottingham, Mechanical Engineer.

Gray, J. Campbell, Glengoyt, Strines, near Stockport, Printworks Chemist.

Greenwood, Conrad Varley, Green Hill, Colne, Lancashire, Cotton Mill Manager.

Guenther, Felix, jun., Sun Portland Cement Co., Ltd., P.O. Box 102, Owen Sound, Ontario, Canada. Chemist.

Heebner, Prof. Chas. F., Ontario College of Pharmacy, Toronto, Canada, Professor of Pharmaceutical Chemistry.

Henderson, Jas. A. Russell, 33, Blythswood Drive, Glasgow, Technical Chemist.

Hodgkins, D. H., 19, East Park Street, Newark, N.J., U.S.A., Manufacturing Chemist.

Hunter, Henry Blount, c/o Liquid CO_2 Manufacturing Co., S.E. Corner, 36th Street and First Avenue, New York City, U.S.A., Industrial Chemist.

Laist, Frederick, 1408, N. Main Street, Santa Ana, Cal., U.S.A., Chemist.

Lazell, Ellis Warren, 1110, Stephen Girard Building, Philadelphia, Pa., U.S.A., Chemist.

Leighton, A. E., 78, Hillfield Avenue, Hornsey, N., Analytical Chemist.

Lewis, Frederick H., Virginia Portland Cement Co., Craigsville, Va., U.S.A., Manager.

Littlewood, Dr. James B., U.S. Patent Office, Washington, D.C., U.S.A., Chemical Examiner.

Longden, A. H., Stanton-by-Dale, Nottingham, Analytical Chemist.

Lyon, Edward H., 141, Charles Street, New York City, U.S.A., Manufacturing Chemist.

Melcher, Arthur C., 58, Bowen Street, Newton Centre Mass., U.S.A., Chemist.

Merritt, William G., c/o Berry Bros., Ltd., Varnish Works, Detroit, Mich., U.S.A., Chemist.

Meyrick, L. J., 137, City Road, Birmingham, Assistant Analyst.

Miller, H. Harold, Consumers' Gas Co., 269, Front Street E., Toronto, Canada, Draughtsman and Chemist.

Milnes, Ernest E., Joseph Smithson, Ltd., India Buildings, Halifax, Yorks, Chemist.

Molesworth, F. H., 39, Hunter Street, Sydney, New South Wales, Australia, Analytical Chemist.

Morrell, Dr. R. S., Gonville and Caius College, Cambridge, Lecturer.

Nesbitt, Dr. Beattie, 44, Adelaide Street, W., Toronto Canada, Physician.

Neumann, Dr. Edgar, 10, Randolph Crescent, Maida Hill London, W.

Pakes, Walter C. C., Government Laboratory, Pretoria, South Africa, Analyst and Bacteriologist.
Palmer, Fredk. G., Laboratory, The Associated Portland Cement Manufacturers (1900), Ltd., White's Branch, Swanscombe, Kent, Analyst.
Pauli, Dr. Hermann, Kensington Infirmary, Marloes Road, London, W., Scientific Chemist.
Pittard, John, 30, Mansfield Road, Ilford, Essex, Chemical Manufacturer.
Powney, William E. F., 67, Barrett's Grove, Stoke Newington, London, N., Analytical Chemist.
Riederer, Herman S., 251, West 95th Street, New York City, U.S.A., Chemist.
Roberts, William H., 52, Devonshire Road, Prince's Park, Liverpool, S., Analytical Chemist.
Robinson, Henry Fishwick, Culcheth Chemical Works, Newton Heath, Manchester, Manufacturing Chemist.
Rosebrugh, Prof. T. R., 666, Spadina Avenue, Toronto, Canada, Professor of Electrical Engineering.
Rücker, Dr. Hermann von, 163, East 56th Street, New York City, U.S.A., Chemist.
Ruhoff, O. E., c/o Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Chemist.
Schloss, Joseph A., Apartado 65, Monterey, Mexico, Analytical Chemist.
Schulze, Emil A., The Guaranty Mantle Co., Balham Hill, London, S.W., Incandescent Mantle Manufacturer.
Simonson, W., 126, W. Ninth Street, Cincinnati, Ohio, U.S.A., Chemist.
Smither, F. W., 30, Cole Building, Nashville, Tenn., U.S.A., Analytical Chemist.
Smyth, Dr. Morland, Mander Brothers, John Street, Wolverhampton, Chemist.
Stevens, Henry P., The Firs, Ash, Surrey, Demonstrator in Chemistry.
Tone, Frank Jerome, c/o The Carborundum Co., Niagara Falls, N.Y., U.S.A., Manager.
Torrey, Charles A., jun., 17, Park Vale, Brookline, Mass., U.S.A., Chemist.
Van Zwaluwenburg, Jas. G., 32, Second Street, Elizabeth, N.J., U.S.A., Analytical Chemist.
Warren, H. D., The Gutta-Percha and Rubber Manufacturing Co., Ltd., 45–49, West Front Street, Toronto, Canada, President.
Watkins, E. J., 224, Green Street, Upton Park, London, E., Works Chemist.
Weed, Henry T., 80, Livingston Street, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.
Williams, Harold R. S., 25, Coverdale Road, Lancaster, Gas and Chemical Engineer.
Williams, Walter Scott, 21, Hoosac Street, North Adams, Mass., U.S.A., Chemical Engineer.
Wilson, Leonard P., 123, Chadwick Road, East Dulwich, S.E., Technical Chemist.
Withers, Prof. W. A., State A. & M. College, West Raleigh, N.C., U.S.A., Professor of Chemistry.
Young, Roland F., c/o The Wouldham Cement Works, West Thurrock, near Grays, Essex, Cement Works Chemist.

CHANGES OF ADDRESS.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Annandale, J. H.; Journals to The Vale, Polton, Midlothian, N.B.
Appleton, H. A., l/o Warrington; c/o Vinolia Co., Ltd., Carpenter's Road, Stratford, E.
Ashwell, H., l/o 91; 117, Waterloo Crescent, The Forest, Nottingham.
Ashwell, J. H., l/o 91; 117, Waterloo Crescent, The Forest, Nottingham.
Aykroyd, H. E., l/o Ilkley; Oakwood Dye Works, Bradford.
Bechi, G. de, l/o London; c/o Messrs. W. Blythe and Co., Church, Lancs.
Beckett, G. H., l/o Shore Road; Glendys Cottage, Stevenston, N.B.
Berry, A. E.; (communications) 95, Osborne Road, Forest Gate, E.; Journals as before.
Bielecki, Dr. Jan, l/o Walicois Street; Red. of "Chemik Polski," 118, Marszalkowska Street, Warsaw, Russian Poland.
Bramwell, Major E., l/o Felsberg; Morpeth Road, Hoylake, Cheshire.
Briggs, Wm., l/o Erskine Terrace; Mount Pleasant, Blackness Avenue, Dundee.
Brookes, E. A., l/o Manchester; c/o The Chilian Mills, Ltd., Chiguayante, Concepcion, Chile.
Bunting, W. L., l/o Accrington; Forest Bank, Crawshawbooth, near Manchester.
Caldecott, W. A., l/o Colesberg; Rand Club, Johannesburg, Transvaal.
Cates, W. A., l/o Leyton; "Waterloo," St. Mawes', Cornwall; and (after Feb 28, 1902) retain Journals.
Christison, Geo., l/o Kelvinside North; Cremona, Cambridge Drive, Glasgow.
Clanahan, H. C., l/o King Street; 79, Mosley Street, Manchester.
Crow, Dr. J. K.; all communications to 2, Ulundi Road, Blackheath, S.E.
Crowther, J., l/o Swansea; South Australian School of Mines, Adelaide, South Australia.
Darke, J. M., l/o Shepard Street; 551, Essex Street, Lynn, Mass., U.S.A.
Dewar, Alex. H., l/o St. Petersburg; retain Journals until further notice.
Diehl, O. C., l/o Detroit; 611, Thompson Street, Saginaw, Mich., U.S.A.
Dobb, Thos., l/o Union Road; 4, Cavendish Road, Sharrow, Sheffield.
Eastick, C. E., l/o Mile End New Town; Preston Lodge, Leytonstone.
Elworthy, H. S., l/o London; 3, Battlefield Road, Sandpit Lane, St. Albans.
Fleming, W. P.; Journals to 247, Linthorpe Road, Middlesbro', Yorks.
Fritzsche, K., l/o Berlinerstrasse; c/o Schimmel and Co., Miltitz, near Leipzig, Germany.
Guest, E. G., l/o Orwell Terrace; 5, Churchill, Edinburgh.
Guttmann, Oscar; all communications to 12, Mark Lane, E.C.
Hamilton, Robt.; all communications to 62, Tempest Road, Beeston Hill, Leeds.
Harlock, E. B.; Journals to Newton Farm, Middlewich.
Harris, Arthur; all communications to 22, Marsh Gate Lane, Stratford, E.
Hartmann, E. E., l/o Papaikou; Waialua, Oahu, Hawaii.
Hodgson, Chris., l/o Darlington; 33, Oakdale Road, Nether Edge, Sheffield.
Holmes, F. G.; all communications to 31, St. George's Road, Waterloo, Liverpool.
Howard, D. Lloyd; (communications) Little Friday Hill, Chingford, Essex; Journals as before.
Hyde, Wm. Grantley; all communications to 26, Winsham Street, Clapham Common, S.W.
Institute of Mining and Metallurgy, l/o Broad Street House; 722–725A, Salisbury House, London Wall, E.C.
King, Alf. J.; (communications) Rock Bank, Bollington, near Macclesfield (*not* Manchester); Journals as before.
Labonde, Dr. Leon; Journals to P.O. Box 594, Rochester, N.Y., U.S.A.
Lagerwall, Dr. I.; all communications to Southorpe, Wallington, Surrey.
Lee, J. L., l/o West Street; Woodfield, Lytham, Lancs.
Liebmann, Dr. A., l/o 61; 10, Marsden Street, Manchester.
Loewenthal, Dr. R., l/o Sandweg; Uhlandstrasse, 39, Frankfurt a/M., Germany.
Lundholm, C. A.; Journals to Nobel's Explosives Co., Ltd., Ardeer Factory, Stevenston, N.B.
McBretney, E. G., l/o Pontefract Road; 23, Ferrybridge Road, Castleford, Yorks.

MacKean, Wm., l/o Palmer Street; 76, York Street, Westminster, S.W.
Maxwell, J.; (communications) English Street, Carlisle; Journals as before.
Meusching, Dr. C.; (communications) 62, Delaunays Road, Crumpsall, Manchester; Journals as before.
Miller, A. R., l/o Cambuslang; all communications to Castlebank, Bothwell, N.B.
Mitchell, J. W., l/o Wood Leigh; Plantation House, Clough Fold, near Manchester.
Muter, Dr. Jno., l/o London; The Châtelet, Horley, Surrey.
Neale, P. R.; all communications to c/o Messrs. Morris and Co., Doncaster.
Nichols, W. H., l/o Cedar Street; The Nichols Chemical Co., 25, Broad Street, New York City, U.S.A.
O'Brien, F., l/o Liverpool; The Grove, Nicholas Road, St. Mark's, Bristol.
Oliver, Wm. Letts; Journals to 101, Vernon Street, Oakland, Cal., U.S.A.
Paton, W. G., l/o St. Helens, 18, Bertram Road, Liverpool.
Pattison, Jas., l/o Glasgow; Drimnamona, Kilmalcolm, N.B.
Pearce, W.; all communications to Salway Hill, Woodford Green, Essex.
Pentecost, S. J.; Journals to Sherwood Hill Works, Basford, Nottingham.
Phipson, Dr. T. L., l/o Erpingham Road; Cara Mia, Putney, S.W.
Pilling, Jno. E.; Journals to Agnew Villas, 78, Whitegate Drive, Blackpool.
Preston, R., l/o Bury; Grasmere, Whitefield, near Manchester.
Pritchard, E. J., l/o Burrows; North Hill, Swansea.
Pullar, H. S.; (communications) Pullar's Dyeworks, Perth; Journals as before.
Rawson, Chris.; (communications) 44, St. Augustine Road, Bedford; Journals as before.
Richardson, D. B., l/o Isle of Mull; Auchencck, Killearn Station, N.B.
Riley, Jno.; Journals to Mayfield, Thornliebank, near Glasgow.
Ripley, P. F., l/o Andover; c/o American Woollen Co., Maynard, Mass., U.S.A.
Roberts, Lly. E. V., l/o Bath; 11, Albion Terrace, Faversham, Kent, Chemist (Cotton Powder Co., Ltd.).
Robinson, Thos.; (communications) The Villa, Nitshill, N.B.; Journals as before.
Rogers, Jno., l/o Stevenston; 2, Barrie Terrace, South Beach, Ardrossan, N.B.
Ruhl, Louis; Journals to c/o Roessler and Hasslacher Chem. Co., P.O. Box 1999, 100, William Street, New York City, U.S.A.
Rushby, Wm., l/o Cheapside; 22, Surrey Street, Batley, Yorks.
Scrymgeour, Wm., l/o Glasgow; Whistlebrae, Lamington Heights, Kalgoorlie, W. Australia.
Shepherd, R. des F., l/o Hull; c/o Calico Printers' Association, 56, Mosley Street, Manchester.
Shukoff, Dr. A. A.; Journals to Borowaja, No. 86, St. Petersburg, Russia.
Silberrad, Dr. O.; all communications to Research Laboratory, Royal Arsenal, Woolwich, S.E.
Smiles, J., l/o Canonmills; 173, Bruntsfield Place, Edinburgh.
Smith, E. Sell, l/o E. Chicago; 219, East Market Street, Warren, Ohio, U.S.A.
Spence, H.; (communications) c/o Peter Spence and Sons, Ltd., Manchester Alum Works, Manchester; Journals as before.
Stafford, C. H.; (communications) Hollyfield, Weldbank, Chorley; Journals as before.
Studer, S. J., l/o Grappenhall Road; Helvetia, Stockton Heath, near Warrington.
Sutherland, R. M.; (communications) Solsgirth, Dollar, N.B.; Journals as before.
Takamine, Dr. J., l/o Central Park West; 61, West 108th Street, New York City, U.S.A.
Tatlock, J., l/o 40; 45, Renfrew Street, Glasgow.
Towse, W.; Journals to c/o Messrs. E. and J. Richardson, Elswick Leather Works, Newcastle-on-Tyne.
Tripp, Dr. E. H.; (communications) 46, Terrace Road, Swansea; Journals as before.
Trobridge, A., l/o Gosforth; c/o Trobridge and Co., Ltd., South Shore Road, Gateshead-on-Tyne.
Turnbull, Dr. A.; Journals to 33, St. Michael's Road, Headingley, Leeds.
Turnbull, W. S., l/o Renton; 37, West George Street, Glasgow.
Walker, D. C., l/o Anaconda; Gibbonsville, Idaho, U.S.A.
Walker, J. W.; all communications to Fernlea, Irvine, N.B.
Webster, Geo. J.; Journals to Standard Chemical Co., Ltd. Gooderham Building, Toronto, Canada.
Wense, Dr. W., l/o Luneburg; Fabrikvorsteher, Bleicherode, Germany.
Wessel, Carl; (communications) Geheimer Commerzienrath C. Wessel, Bernburg; (Journals) Deutsche Solvay-Werke Act. Ges., Bernburg, Germany.
Whitaker, Thorp; (communications) 35, Pemberton Drive, Bradford; Journals as before.
Wielandt, Dr. W., l/o Middlesbro'; Hertzstrasse 8, Karlsruhe, Germany.
Wiener, A. F.; all communications to Vanadium Alloys (1901), Ltd., 31, Lombard Street, E.C.
Wilson, R. H.; Journals to Eaglescliffe, R.S.O., co. Durham.
Young, Jno., l/o Norwich; (communications) Gas Works, Sculcoates, Hull; Journals as before.
Young, W. G.; all communications to Analyst's Office, Great Northern Railway, Doncaster.

MEMBER ELECTED 20th DECEMBER 1901.

Allen, Rd. F. (*not* Allan, Rd. F.); Hart Park, New Brighton, N.Y., U.S.A., Chemist.

Deaths.

Hatschek, M., 41, Montserrat Road, Putney, S.W.
McKillop, F. W., Port Dundas, Glasgow.

London Section.

Meeting held on Monday, January 6th, 1902.

MR. OTTO HEHNER IN THE CHAIR.

The Chairman, in commencing the proceedings, said it was with very great regret he had to inform the Society that since the last meeting one of the oldest members, in fact, one of the founders of the Society, one who had been indefatigable in connection with the London Section, and had always given his best work to the Society, had passed away, and was laid to rest on January 4th. He referred to the death of Mr. William Crowder.

They would also be sorry to hear that Dr. Geo. H. Morris had also just died in the prime of his life. He would always be remembered in his association with Dr. Horace Brown, more especially in their joint investigations on the hydrolysis of starch. Dr. Morris was a most intelligent pioneer in that exceptionally difficult department of organic chemistry.

REPORT OF THE ARSENIC COMMITTEE.

The Chairman said the first business that evening was the presentation of the Report of the Joint Arsenic Committee of the Societies of Chemical Industry and Public Analysts. In March last a Committee was appointed, consisting of a number of gentlemen, not only representing the London Section, to inquire into the subject of arsenic testing, and to report on a process which might safely be followed for the

detection and determination of small traces of arsenic. No specific instruction was given to the Committee as to the scope of the inquiry, but it was soon felt that it was impossible to deal with the subject in its entirety, and that the inquiry must be limited in some way, and it would be seen from the head lines of the paper which had been circulated how far the Committee thought it desirable to limit the scope of the inquiry. Very soon after the appointment of the Committee, the Society of Public Analysts, who were also deeply interested in the subject, expressed a desire to be associated with it, and agreed to accept the report of the Committee as binding on themselves, if the Committee were considered to be a joint one of the two societies. As this was somewhat beyond the powers which he, as Chairman of the London Section possessed, he reported the facts to the Council, who, recognizing the importance of the matter, resolved that the Committee should not be considered only one of the London Section, but as representing the whole Society. When the labours of the Committee were nearly at an end, he reported to the Council that he hoped soon to be able to report that the Committee had agreed on a method of analysis. The Council then gave him permission to deal with the Report which was now before the meeting, and he had great pleasure as Chairman of the London Section in laying it before the members. But as the Society of Public Analysts was interested in the matter, and in fact were jointly concerned, he had taken on himself to ask the President of that Society to inform the members that they would be welcome at the meeting that night, so that there would be no occasion to go twice over the same Report.

The Committee consisted of himself, Mr. Alfred H. Allen, Mr. Alfred C. Chapman, Mr. Estcourt, Mr. David Howard, Mr. Ling, Dr. Messel, and Dr. Thorne. After a great deal of work, they had agreed on the Report, which he would ask the Secretary presently to read. He desired to lay this Report before the meeting, not so much for discussion, because it seemed to him that it would scarcely be open to a section to discuss what was virtually a Council Report, but to receive the Report, and, if necessary for the purposes of elucidation of any point which might not be clear.

The Secretary (Mr. A. R. Ling) then read the Report.

DETECTION AND APPROXIMATE ESTIMATION OF MINUTE QUANTITIES OF ARSENIC IN BEER, BREWING MATERIALS, FOODSTUFFS AND FUELS.

The joint committee of the Society of Chemical Industry, and of the Society of Public Analysts, appointed in March 1901, and consisting of: —

Messrs. Otto Hehner (Chairman),
Alfred H. Allen,
Alfred C. Chapman,
C. Estcourt,
David Howard,
*Arthur R. Ling,
Rudolph Messel, and
Leonard T. Thorne,

report as follows: —

After an examination of various methods, the Committee recommend that of Marsh-Berzelius.

Materials Required.

Hydrochloric Acid.—The purest hydrochloric acid obtainable is very rarely free from arsenic. To the "pure" acid, as purchased for analysis, diluted with distilled water to a sp. gr. of 1·10, sufficient bromine is added to colour it strongly yellow (about 5 c.c. per litre); sulphurous acid, either gaseous or in aqueous solution, is then added *in excess* and the mixture is allowed to stand for at least 12 hours. Or hydrobromic acid and sulphurous acid may be used. The acid is then boiled till about one-fifth has evaporated and the residue can either be used direct, or may be distilled, the whole of the arsenic having volatilised with the first portion.

Sulphuric Acid.—This is more frequently obtainable arsenic-free than hydrochloric acid. If not procurable, to about half a litre of sulphuric acid, "pure for analysis," a few grammes of sodium chloride are added and the mixture distilled from a non-tubulated glass retort, the first portion of about 50 c.c. being rejected. For the purpose of the test to be described, one volume of the distilled acid is diluted with four volumes of water.

Nitric acid can, as a rule, be obtained free from arsenic, without much difficulty, the pure redistilled acid being used. This should be tested by evaporating 20 c.c. in a porcelain dish, which should then be washed out with dilute acid, and tested as described in this report.

The purified acids should be prepared as required, and should not be stored for any length of time. If this be unavoidable, however, Jena flasks are to be preferred, since most bottle glass is liable to communicate traces of arsenic.

Zinc.—Arsenic-free zinc is obtainable from chemical dealers. It should be regranulated, by melting it and pouring it from some height into cold water. Mr. A. H. Allen holds it to be essential, both for a regular evolution of hydrogen and for the formation of uniformly deposited brown-coloured mirrors, that the zinc should contain a trace of iron.

Lime.—Caustic lime, even when made from white marble, is not always free from arsenic. A selection must, therefore, be made from various samples. If pure lime is not obtainable, magnesia may equally well be used, and can more readily be obtained of sufficient purity.

Calcium Chloride.—This salt often contains arsenic, and before being used as a drying agent must be freed from the volatilisable part of the impurity, by moistening it with strong hydrochloric acid, fusing and regranulating.

Apparatus.

A bottle or flask, holding about 200 c.c. (for frothing materials preferably wider at top than bottom) is fitted with a doubly-bored cork, india-rubber stopper or with a ground-in glass connection, carrying a tapped funnel holding about 50 c.c. and an exit tube. The latter is connected with a drying tube containing, first a roll of blotting paper soaked in lead acetate solution and dried, or a layer of cotton wool prepared in a similar way, then a wad of cotton wool, then a layer of granulated calcium chloride and finally a thick wad of cotton wool. To this tube is fitted a hard glass tube, drawn out as shown in the figure, and of such external diameter that at the place where the arsenic mirror is to be expected, the tube just passes through a No. 13 Birmingham wire gauge (corresponding with 0·092 inch). The exact size is not material, but all tubes used for standards and tests should be as nearly as practicable of the same diameter. A good Bunsen flame is used to heat the hard glass tube close to the constriction. About one inch of tube including the shoulder ought to be red hot. A piece of moderately fine copper gauze (about one inch square) wrapped round the portion of the tube to be heated, assists in insuring an equal distribution of heat. A suitable form of apparatus is shown in the drawing.

Mode of Testing.

About 20 grms. of zinc are placed in the bottle, and washed with water to clean the surface, as particles of dust may contain arsenic; all parts of the apparatus are connected, and a sufficient quantity of acid (prepared as previously described) is allowed to flow from the funnel, so as to cause a fairly brisk evolution of hydrogen. When the hydrogen flame—which, during the heating of the tube should be kept at as uniform a height as possible (about a quarter of an inch)—burns with a round, not pointed tip, all air has been removed from the apparatus. The Bunsen burner should then be placed under the hard glass tube as described, and more acid (10 to 20 c.c. is generally enough) run in as required. With good materials no trace of a mirror is obtained within half an hour. Great care must be taken that when additions of acid are made to the zinc, no bubble of air is introduced, since in presence of air, the arsenic mirror may become black and unevenly distributed, whilst it is brown when the experiment has been properly conducted.

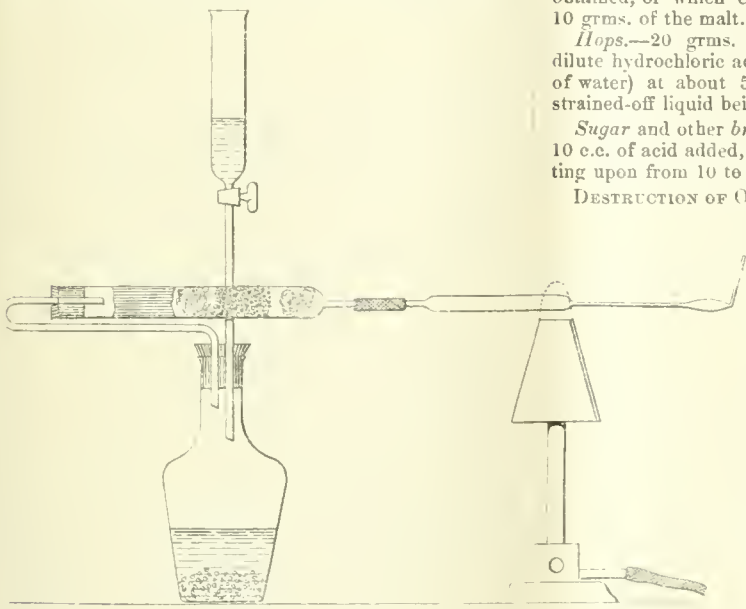
Should the blank experiment not be satisfactory, it must be ascertained, by changing the materials methodically,

* Mr. Ling also acted as Secretary.

whether the fault lies with the acid, zinc, other materials, or with the apparatus.

Preparation of Standard Mirrors.—When a satisfactory blank experiment has been obtained, a series of standard mirrors must be prepared under the following conditions:—

A hydrochloric acid solution of arsenious oxide, containing in each cubic centimetre 0·001 mgrm. of As_4O_6, is prepared by diluting a stronger solution with distilled water. Two c.c. of this solution (equal to 0·002 mgrm. of arsenious oxide) are introduced into the apparatus, a new tube having been joined to the drying tube. If the zinc is sensitive, a distinct brown mirror is obtained after 20 minutes. It is important to note that some "pure" zinc is from a cause at present unknown, not sufficiently sensitive; that is to say, the addition of minute quantities of arsenic produces no mirror. The portion of the tube containing the mirror should be sealed off while still filled with hydrogen; in contact with air the mirrors gradually fade. Mirrors are now similarly made with 0·004, 0·006, 0·008, and 0·01 mgrm. of arsenious oxide. With a little practice it is easy to obtain the deposits of arsenic neatly and equally distributed. The standard mirrors, properly marked, are mounted on a white card or porcelain slip. It is to be understood that the first stage of every test must be a blank of at least 20 minutes.



Hydrochloric acid is somewhat more sensitive than sulphuric acid, that is to say, it gives rather denser mirrors with minute quantities of arsenic. If for one reason or another, sulphuric acid is preferred by the operator, he must make a set of standard mirrors with sulphuric acid, and use these for comparison.

Organic materials, such as beer, yeast, &c. cannot be tested, when sulphuric acid is used, without destruction of the organic matter, whilst, as a rule, they can be directly tested with hydrochloric acid. However many materials are met with in which it is preferable to destroy the organic matter.

Procedure without Destruction of Organic Matter.—The apparatus is started and a blank experiment allowed to go on for 20 minutes. If no trace of a deposit is obtained, 10 c.c. of the liquid to be tested, and about 10 c.c. of hydrochloric acid are put into the funnel and slowly introduced into the bottle without air-bubbles. Some materials (beers, for example) are apt to froth, hence the necessity for slow introduction. If after about 10 minutes no mirror appears, another 10 c.c. of the liquid with 10 c.c. of hydrochloric acid, are added, and the experiment continued for 15 to 20 minutes, acid being from time to time added, as may appear necessary.

Malt.—Fifty grms. of the malt are placed in a 300 c.c. separator funnel furnished with a stop-cock; 50 c.c. of hydrochloric acid, prepared as described, and 50 c.c. of water are warmed to about 50° C. and poured on the malt. The whole is then allowed to digest for 15—20 minutes with frequent agitation, and the acid then allowed to run off by the stop-cock. About 60 c.c. of the acid liquor is thus obtained, of which every 20 c.c. contains the arsenic from 10 grms. of the malt.

Hops.—20 grms. of hops are digested with 100 c.c. of dilute hydrochloric acid (1 vol. of the purified acid to 1 vol. of water) at about 50° C. for half an hour, 50 c.c. of the strained-off liquid being used for the test.

Sugar and other *brewing materials* are dissolved in water, 10 c.c. of acid added, and the solution tested direct, operating upon from 10 to 20 grms. of material.

Destruction of Organic Matter.—A. *Acid Method.*—10 grms. of the substance are placed in a $3\frac{1}{2}$ in. porcelain crucible and covered with pure redistilled nitric acid (about 10 to 15 c.c.). The whole is then heated on a sand bath until the evolution of brown fumes ceases. Three c.c. of concentrated arsenic-free sulphuric acid are then added, and the heating continued till the mass just begins to char, when a further quantity of 5 c.c. of nitric acid is added. The heating is now continued till all the acid is expelled, leaving in the crucible a black, nearly dry, charred mass. The crucible is about half filled with water and a few c.c. of hydrochloric acid, or of dilute sulphuric acid run in (according as the one or the other is to be used in the Marsh apparatus), the whole being allowed to extract for about half an hour on a water-bath. It is then filtered into a porcelain basin, the charred mass washed with hot water, and the filtrate concentrated down to about 30 c.c., which is allowed to cool, and is then ready for the test. It is essential that the mass should be *thoroughly* charred, and that the solution, when filtered, should be colourless.

In the case of *beer*, 10 or 20 c.c. are evaporated to dryness on a water-bath, and the residue oxidised as above stated.

Hops.—10 c.c. of pure nitric acid and 5 c.c. of pure concentrated sulphuric acid are mixed in a $3\frac{1}{2}$-inch porcelain crucible, and the hops are then added in small portions at a time, each quantity being thoroughly disintegrated by pressure under the acid with a glass rod, a further quantity of 5 c.c. of nitric acid being added when about half the hops have been thus introduced. The crucible with its contents is then cautiously warmed so as to avoid frothing over. When the evolution of dense red fumes ceases, the heating is increased, and the acids are evaporated on a sand bath, and the dry charred mass extracted with dilute acid, filtered, concentrated, and introduced into the Marsh apparatus in the ordinary way. It may be noted that with many English hops of relatively fine texture, the addition of the second quantity of nitric acid above recommended is unnecessary.

When, owing to the presence of larger quantities of arsenic, smaller amounts of substance, *e.g.*, 0·5 grm. to 2 grms. are taken, the quantities of acids recommended above may, of course, be reduced.

B. *Basic Method.*—The materials are mixed with pure lime or magnesia (1 grm. for 20 c.c. of beer) dried and incinerated. For sugars or other solid materials, about half their weight of base is employed. The ash is dissolved in hydrochloric acid, and the solution tested. This method is not recommended for hops.

Of *coal* or other *fuel*, after careful sampling, two portions of 1 grm. each are weighed. One portion is incinerated in a platinum dish in a muffle and the hydrochloric acid extract of the ash tested for "non-volatile arsenic." The other is intimately mixed with 1 grm. of lime or magnesia

and also incinerated. The hydrochloric acid extract of the latter gives the "total arsenic," the difference between the two determinations being the "volatile arsenic." It may, in some cases, be found that the above-mentioned quantity of fuel gives a mirror too dense to be measured. When this is the case the hydrochloric acid extract is diluted to a determinate volume and an aliquot portion taken.

Sulphites.—The sulphurous acid must be oxidised by bromine, the excess of the latter being removed by heating.

The Committee have convinced themselves that arsenic in both states of oxidation can be detected and estimated by the procedure described.

As an additional precaution, a fresh tube should always be substituted for that containing the mirror, and the experiment continued for a further period of 15 minutes. Should a second mirror be formed, the quantity of arsenic with which it corresponds is to be added to that shown by the first.

It must be understood that the tests are all only approximate, and that mirrors corresponding with less than 0·003 mgrm. of arsenious oxide in the quantity of materials taken, cannot be safely relied upon. When a mirror has been obtained, a duplicate test should always be made to preclude error by accidental contamination.

The proof that the mirrors are arsenical is obtained as follows:—The narrow portion of the tube containing the mirror (which should not be denser than that produced by 0·01 mgrm. of arsenious oxide) is cut off, the hydrogen replaced by air, and the ends sealed up. The tube, held in the tongs is then heated by drawing it repeatedly through the flame of a Bunsen lamp until the mirror has disappeared. On cooling, minute crystals of arsenious oxide deposit, the sparkling of which can be seen with the naked eye if the tube be held before a luminous flame, and which can be readily identified under the microscope by their crystalline form.

This test, as recommended, is one of such extreme delicacy, that with quantities of 20 grms. (or 20 c.c.) it will give an indication of the presence of 0·000015 per cent. (or one part in 7,000,000) of arsenious oxide. This would represent with solids, 1/1000 grain per pound, with liquids 1/100 grain per gall. It must be understood that the Committee do not suggest any limits for traces of arsenic which may be regarded as negligible; but they desire to express the opinion that limits should officially be fixed by the Royal Commission or otherwise. This could be easily effected by prescribing the amounts of solids and liquids, respectively, to be taken for the test, and the minimum mirror to be recognised.

The Chairman said he should be glad to give any further information if desired.

Mr. B. E. R. Newlands, after thanking the Council for allowing the London Section to first hear this Report, proposed a vote of thanks to the members of the Committee, which included not only experts and professional chemists, but also several gentlemen who were manufacturers. All these gentlemen had devoted a great deal of time to the matter, and had made some hundreds of determinations, and had exchanged samples with one another. He knew of more than one member of the Committee who made up samples containing a fixed quantity of arsenic and sent them round to all the other members of the Committee who had not the slightest idea of what they contained, but who examined them and sent in their results to the gentleman who had sent their samples round. In this way the number of determinations was multiplied to a great extent, and the Committee were entitled to their gratitude for their kindness in doing all this work. Although it was a somewhat ancient story now, the question of arsenic in food was very important, and these gentlemen had done a very great service to the community.

Mr. Gordon Salamon seconded the vote of thanks. He said he felt he might claim to do so because he was largely engaged in endeavouring, in conjunction with others, to arrest the terrible epidemic which occurred in Manchester district last year. It had been said that they ought not to have recommended the Reinsch method because it was not sufficiently certain in its application to the determination of minute quantities of arsenic. Anyone who had heard the Report just read, or could appreciate the amount of minutiæ which the Committee had worked out in connection with the proper application of the Marsh-Berzelius test in connection with brewing materials, must come to the conclusion that, having to contend, as he and his colleagues had, with the ravages that the poison was making, and stop them at all hazards, they were justified in adopting a process which could be speedily applied and which they had to hand in a very available form, one, moreover, which indicated the existence, not of traces, but of poisonous quantities of arsenic. That was their justification and reason for adopting that test. Until now his lips had been closed with regard to this matter, but he felt he might now say that during that anxious time when there was very little sleep for anyone concerned, had they used the Marsh-Berzelius test, and placed it in the hands of unskilled chemists, it would have been perfectly impossible for the brewers to have applied it as now prescribed by the Committee. What they had to do was to deal with the facts as they existed, and with poisonous quantities of arsenic. He might further add that had they adopted the process as now described, they would practically and wrongfully have condemned the beer in the Manchester and the North of England district, because it was at that time not known that brewing materials were so liable to contain traces of arsenic derived from various sources, though not to a poisonous extent. At that period there were few beers in the north that would not have given a mirror by the Marsh-Berzelius test. He thought it was only right to state why he and his colleagues had adopted the Reinsch test after it had been considered by the President of the Commission, Mr. Fletcher Moulton, in conjunction with other tests which were presented to him. With regard to this Report there were several questions he should like to have put, but he would refrain because the Chairman had deprecated discussion, and it would not be in good taste to import a discussion into a vote of thanks. He seconded the motion most heartily, but he hoped an opportunity might be given for asking certain questions in connection with the Report, because some questions had arisen which required elucidation, not in respect of the work which had been done, but in connection with other points in arsenic testing of brewing materials, which it appeared to him it would be well to look into.

Mr. Newlands said he was sure it was not the wish of the Committee to prevent a discussion of the Report taking place at the proper time, after it had been considered by the Council. He then put the motion, which was carried unanimously.

The Chairman said he did not know that it was necessary to reply, but the Committee were exceedingly glad to find that their labours were appreciated. He, personally, should be delighted to have the widest and fullest discussion, but as chairman, not only of the Committee, but of the London Section, he had to consider the time at their disposal, and if he allowed a general discussion on this question, he feared the reader of the next paper would have very little chance. Mr. Salamon knew that every member of the Committee would be delighted to give him the fullest information.

THE RETARDING INFLUENCE OF ALDEHYDES ON THE MATURATION OF POTABLE SPIRITS.

J. T. HEWITT, M.A., D.SC., PH.D.

The Constituents of Spirits.

Higher Alcohols (*Fusel Oil*).—Fusel oil consists for the most part, of amyl alcohols, and of these 3-methylbutanol-1 forms the greater portion, the optically active 2-methylbutanol-1 being present in less quantity. Normal and iso-primary butyl alcohols are also generally present, the propyl-alcohols if present would not be found in the feints, but with the ethyl alcohol, since the alcohols mixed with water give mixtures attaining a vapour pressure of 760 mm. at about 80° C. or practically at the boiling point of ethyl alcohol itself. But the terms "fusel oil" and "higher alcohols" are not synonymous; other substances

present in spirits have boiling points above those of alcohol and water and consequently appear in the latter portions obtained on careful fractionation. It has only to be remembered how for some time a red coloration with aniline acetate was held to be a test for amyl alcohol (Jorissen, Ber. 1889, **13**, 2439), to see how careful one should be; it was K. Foerster who pointed out that the test depended, not on the amyl alcohol itself, but on the minute quantities of furfural accompanying it as an impurity (Ber. 1882, **15**, 280, 322).

Fatty Acids and their Esters. — Take, secondly, the "compound ethers"; how is it that these occur in spirits? Either they are formed by the interaction of acids already present in new spirits with alcohols, or else they are produced on maturation by oxidation of alcohols or aldehydes to acids and subsequent esterification. Probably the free acids originally present in the spirits will account for any esters formed, the idea of oxidation taking place to any appreciable extent in a cask being at least doubtful. That spirits "mature" in contact with the air in the sense that they become less raw in taste, is to be ascribed more to evaporation than to oxidation of impurities.

In new spirits, volatile organic acids are present in appreciable amount, a fact which was recognised as far back as 1851–52 when Rowney isolated caprylic ($CH_3[CH_2]_6COOH$) and capric ($CH_3[CH_2]_8COOH$) acids from the fusel oil of Scotch whisky. (Trans. Roy. Soc. Edin. **20**, ii. 219; Q. J. Chem. Soc. **4**, 372, **5**, 22). Allen only mentions acetic acid (this Journal, 1891, **10**, 305), but certainly these two higher homologues are present, not only in the fusel oil but also to a certain extent in the whisky, and it is very possible that other acids of the same series might be isolated. Butyric and caproic acids are both fermentation products and the so-called "oenanthic ether" ($C_6H_{13}.COOC_2H_5$) is largely used as a spirit flavouring.

On keeping the spirit, slow esterification takes place, but is never complete. Leave a spirit long enough and, eventually, equilibrium will be attained, and it is a physical impossibility for the organic acids to become completely esterified in presence of water.

Allen calls attention to this point (Commercial Organic Analysis, 3rd edit., Vol. I., p. 145), and only recently A. Zega (Chem. Zeit. 1901, **25**, 793), who was entrusted by the Servian Government to decide between certain samples being "natural spirits" or "artificial" in the sense that they were obtained by dilution of practically pure alcohol and addition of flavouring materials, showed that the best decision could be arrived at by estimation of free organic acid and organic acid combined as esters, the ratio of free acid to total acid never falling below 1 : 2. The ratio was indeed generally considerably higher, 18 samples of grape brandy (*Tresterbranntwein*) gave numbers which varied from 1 : 2·5 to 1 : 5·3, whilst, for plum brandy (*Zwetschgenbranntwein*) the ratio was found, in 21 samples, to range between 1 : 4 and 1 : 8·4. With alcohols obtained by rectifying apparatus, the quantities of acid were small, but the ratio of free acid to acid combined as esters was reversed, varying from 1 : 1·3 to 1 : 1·75.

An old whisky may be entirely deprived of its characteristic flavour by distillation after it has been rendered faintly alkaline with sodium carbonate, a process which removes free fatty acid, but does very little towards saponifying the esters present.

The incompleteness of the esterification of fatty acids, even in very old spirits, is exemplified by the large analytical material given by Girard and Cuniasse (Manuel pratique de l'Analyse des Alcools et des Spiritueux). One striking case mentioned by them is that of a La Rochelle brandy of 1860 (sp. gr. = 0·9391) in which the free acids and the esters were respectively 960 and 633·6 milligrammes per litre, i.e., even after upwards of 30 years the free acid exceeded esters by roughly 50 per cent.

Aldehydes and Ketones.—Leaving the acids and the esters to which they give rise, we have one other class of compounds containing only carbon, hydrogen and oxygen, viz.,—the aldehydes and possibly ketones in subsidiary quantity. The origin of aldehydes in spirits is twofold: on the one hand there are aldehydes of the $C^nH_{2n}O$ series obtained by direct oxidation of the corresponding alcohols. On the other we have furfural, and possibly other products produced by the decomposition of carbohydrates. Woody fibre and gums yield two pentoses, xylose and arabinose on hydrolysis; these when heated in dilute mineral acid solution yield furfural.

The production of such substances is not then at all a matter of surprise, the distillation of liquids usually containing some barley husks in suspension and to a certainty some pentoses in solution must necessarily give rise to furfural. The furfural is present in spirits to a small amount, generally somewhere about five parts in 100,000 in the case of pot-still whisky, so that its contribution to the flavour of whisky is practically nil. On the other hand furfural has a by no means good reputation as far as its physiological action is concerned. In addition to earlier work which has been carried out in this direction (*Cf.* Magnan, Jahresb. d. Pharm. und Toxicologie, 1887, N.F. **22**, 609.), an abstract from Semaine méd.), I may call attention to a paper by Sir Lauder Brunton and Professor Tunnicliffe in the *Lancet* of December 1900, in which not only the evil effects on cats but also on men are described.

Until recently the estimation of aldehydes other than furfural in whisky, which I believe to be the cause of the peculiar raw smell and taste of pot-still whisky, has been no easy matter, no really reliable general method having been published.

Aldehydes (and ketones) react very quickly with primary hydrazines to form non-volatile hydrazones which may be removed by distillation. Phenylhydrazine is itself volatile, so that any excess will pass over with the distillate and contaminate the latter. One may remove any such hydrazine by re-distillation with a mineral acid. Such treatment is, however, likely to produce other changes in the spirit: esterification is promoted, while basic substances, to which the spirit may owe a part of its characteristic flavour, are held back. What is needed is a primary hydrazine of neutral properties, non-volatile itself, and forming non-volatile hydrazones. Such a substance is the sodium (or other suitable metal) salt of phenylhydrazine-para-sulphonic acid. The salts of other aromatic hydrazine sulphonic or carboxylic acids can be used: but the sodium salt of phenylhydrazine para-sulphonic acid is the cheapest which can be obtained; it crystallises well and, deprived of water of crystallisation, will keep apparently any length of time.

If this salt be dissolved in water, then added to a new pot-still whisky and the mixture allowed to stand, the raw smell quickly disappears, and on distillation the spirit is obtained in a quite potable form. Whisky so treated is found to be free from furfural if sufficient salt has been added to combine with all the aldehydes present.

It is necessary to obtain data as to the amount (*a*) of furfural; (*b*) of total aldehydes in new and old spirits. With regard to the former, Allen remarks: "The presence of furfural in spirits can be detected, and the proportion roughly guessed at by the reaction of the sample with a solution of aniline in glacial acetic acid" (Commercial Organic Analysis, 3rd edit., Vol. I., p. 159). This colour reaction may be worked into a fairly good colorimetric estimation.

The colour is due, as Stenhouse (Annalen, 1870, **156**, 197) and Schiff (Annalen, 1880, **201**, 355; Ber. 1878, **11**, 832, 1694, 1840) have shown, to the production of dyestuffs of basic character in which one molecule of the aldehyde unites with two molecules of the base. The reaction, not taking place between ions, needs time for completion; it is a reaction in which the velocity is by no means infinitely great.

That one should work under comparable conditions is shown by the following experiments.

(*a.*) *Influence of Time.*—Four Nessler tubes of 35 mm. diameter were each charged with 10 c.c. of a solution of furfural in methylated spirit (the spirit itself was furfural-free.) One c.c. of an aniline acetate solution* was added to each of the tubes at 12.38 p.m., 12.43 p.m., 12.49 p.m.,

* Made by dissolving 10 grms. of aniline in sufficient acetic acid for clear solution and then making up with water to 100 c.c.

and 1.38 p.m. respectively. At 1.12 p.m. very little difference was to be seen in the first three tubes; at 2.15 p.m. the first three tubes were identical in shade, but a little darker than the fourth tube. By 2.38 p.m. all four tubes were of equal shade. Hence, with solutions of the strength taken, the full shade takes nearly an hour to develop; after this it remains stationary until it begins to fade, as it always does sooner or later on exposure to light. In a reaction of this sort, the rate of development of the colour will obviously depend not only on the concentration of the furfural, but also on that of the aniline, and for rapid work it will be advantageous to increase the quantity of the latter substance present.

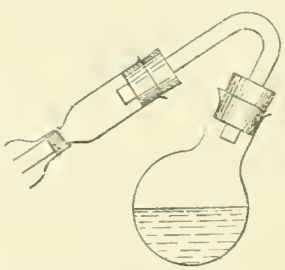
(*b.*) *Influence of Alcoholic Strength on Depth of Shade.*—To measure the effect, if any, of the quantity of water present on the shade produced, the following solutions were made up :—

(i.)	2 c.c. of 1 per cent. furfural solution	+ 30 c.c. of water.
(ii.)	„ „	+ 20 „
(iii.)	„ „	+ 10 „
(iv.)	„ „	no water „

Methylated spirit added to 50 c.c.

Five c.c. of aniline acetate solution (1 grm. of aniline in 10 c.c.) were added to each solution: (i) became turbid almost immediately; the others developed their colour without precipitation, (ii) being more orange in shade than (iii), and (iii) in turn than (iv). The effect of the water seems to be to develop the colour more rapidly; after 10 minutes (ii) was darkest in shade. After 30 minutes (iii) and (iv) were compared; 5 c.c. of dilute alcohol (80 c.c. methylated spirit20 : c.c. water) had to be added to (iii) in order to reduce its colour to the same shade as (iv). Thus an increase of 20 per cent. in the water in a solution had apparently increased the quantity of furfural by about 10 per cent. The effect of water is not very great, but it shows that for anything approaching an accurate colorimetric estimation, the alcoholic strengths of the test solution and of the spirit to be tested should at any rate roughly approximate.

(*c.*) *Removal of Colouring Matter.*—The removal of the colouring matter of a spirit can be effected by distillation, but since distillation cannot be carried to dryness on account of charring the residue and the high boiling point of furfural, evidently one will not obtain all the furfural in the distillate by one distillation. A small round-bottomed flask, tilted as shown in the sketch, was charged with 2 c.c. of furfural solution (1 per cent.) and 10 c.c. of methylated spirit. This was rapidly distilled over a naked flame to nearly the last drop. The following process was repeated three times, 10 c.c. of methylated spirit were added, and the liquid distilled to nearly the last drop. The united distillates were made up to 50 c.c. with methylated spirit. A check solution was made with 2 c.c. of the 1 per cent. furfural solution made up to 50 c.c. with methylated spirit. Five c.c. of aniline acetate solution were added to each quantity; the colours in each Nessler glass developed at the same rate and to the same extent. The residue left in the distilling flask was tested for furfural; after half-an-hour no furfural reaction could be detected.



(*d.*) *Influence of Temperature.*—The colorimetric estimation can be carried out well at the ordinary laboratory temperature, obtaining two liquid specimens within a degree or two of one another presents no difficulty. Hot solutions are out of the question, the colouring matter produced by aniline and furfural being rapidly and completely destroyed at 100° C.

Method of estimating Furfural.—The reagents necessary are alcohol, aniline, acetic acid, and furfural. Most spirits to be tested are of roughly proof strength; methylated spirit, which gives no furfural reaction, may be diluted to sp. gr. 0·920; there is no occasion to use rectified spirit. If the methylated spirit show a furfural or other reaction with aniline acetate, it is as well to boil it under reflux with 5 to 10 per cent. of caustic potash solution (50 per cent.) and then to rectify with a column. For this purpose I generally make my own column with about 10 or 15 bulbs. The spirit boiling at 78°—80° C. is collected apart, and if it still shows a reaction with aniline acetate, it is mixed with a solution of sodium phenylhydrazine sulphonate in the minimum quantity of water.* After standing 12 hours the spirit is again rectified and the distillate reduced to a specific gravity of 0·920 by addition of water.

The aniline should be pure and freshly distilled.

The acetic acid is the ordinary commercial glacial acetic acid. It sometimes contains traces of furfural (Victor Meyer, Ber. (1878) **11**, 697, 1870). In making up the aniline acetate solution, take equal volumes of freshly distilled aniline, acetic acid and water, boil for a few minutes and cool to ordinary temperature; any furfural is thus effectually destroyed.

The furfural to be used should be freshly distilled (b. pt. 161°) and standard solutions made up with the spirit of 0·920 sp gr. to contain 10, 1, and 0·1 grm. of furfurol per litre respectively.

For estimation, the spirit, if colourless, can be employed directly, if coloured (usually it is), then a definite volume must be distilled nearly to the last drop, fresh dilute spirit poured into the flask and the process repeated three or four times. The united distillates are then made up to some definite volume.

Two measuring cylinders graduated in c.c. and of the same diameter are chosen. Into one glass 20 c.c. of the liquid are poured, into the other is measured a quantity of standard furfural solution containing, approximately, the same amount of furfural solution as is contained in the 20 c.c. of spirit. The volume of the standard furfural solution is then also made up to 20 c.c. by the dilute spirit, 1 c.c. of the concentrated aniline acetate solution is added to each vessel, and after standing 10 minutes, the shades on looking through the spirits against a white background, and also on holding up to the light are carefully adjusted by addition to one or other vessel of the dilute alcohol.

A number of spirits have been examined in this way; the results are given in mgrm. per litre.

Scotch Whiskies.

1.	New malt whisky (Glenlivet type)	55
2.	Whisky of same distillery (5 years in cask)	44
3.	Foreshots of same distillery	3
4.	Mixed low-wines and feints (same distillery)	8
5.	Another new malt whisky	15
6.	„ „ „	105
7.	„ „ „	16
8.	„ „ „	20
9.†	„ „ „	41
10.†	„ „ „	55
11.	„ „ „	63
12.	A mature whole malt whisky (5 years)	41
13.	„ „ „ „ (10 years)	39
14.	„ „ „ (Islay, 17 years)	32

Other Whiskies.

15.	New Irish (1900 1901; sp. gr. 0·8513)	64
16.	Matured Irish pot-still whisky (? 5 years)	45
17.	Canadian club whisky of 1891	15
18.	American rye	14

* Generally 10 grms. of the salt to each litre of spirit is ample.
† Samples from same distillery, same season (1900–1901), but different periods. No. 9 taken in Dec. 1900, No. 10 in June 1901.

Various Spirits.

19. Brandy "Fine Old Cognac"	17
20. Old Jamaica rum	32
21. Aguardiente peste (Spanish, made from sugar)	none
22 Aguardiente sucio (Spanish, from bad wine)	?0·5
23. Cana (Portuguese, from sugar)	trace
24. Bagaço (Portuguese, from grape husks after pressing)	8
25. Figo (Portuguese, from figs)	28
26. Genebra (Portuguese)	27
27.* Dop Brandy (Cape Colony)	5
28.* „ „ („ „ another sample)	21
29.*Cape Smoke	8
30. Grape Brandy (California 1896)	22
31. „ „ („ 1898)	22
32. Prune „ („ 1896)	30
33. Peach „ („)	97
34. Vodka	none

It will be noticed that generally speaking the furfural content is greater in whisky than in most other spirits, a result which is naturally to be expected when one considers the large amount of woody fibre entering the mash-tun whether malt or grain is used. The quantity normally present in a pot-still whisky may be largely exceeded in the case of a genuine rum. I am not referring to rums manufactured in Europe from beet-molasses, but to rums obtained from sugar cane molasses and crushed cane, where pentoses have every chance of getting into the wash. Girard and Cuniasse give an analysis of a genuine Guadeloupe rum (sp. gr. 0·9334) containing no less than 133·6 mgrms. per litre (Manual pratique, p. 300).

Apparently the furfural disappears to some extent in the maturation of spirits. Are we to imagine it to be one of the substances which by breaking up give a good flavour to old whisky? I think not; it probably is merely absorbed by the wood of the cask. Allen (Commercial Organic Analysis, 3rd edit., I., 160) gives an analysis of a grog obtained by steaming out a cask in which the finest pot-still whisky had been kept for 18 years and finds strong traces of aldehyde and furfural. If there were much change to be produced in furfural by keeping, it should be observed by preserving an alcoholic solution in glass-stoppered bottles. This I have done, having kept the following solutions in glass stoppered bottles for 3½ years exposed to light, viz., an aqueous solution with 1 grm. per 100 c.c. and solutions in methylated spirit containing, respectively, 1 grm. and 0·1 grm. per 100 c.c. At the lapse of the time stated, no diminution of furfural content could be measured in the alcoholic solution containing 1 grm. in 100 c.c., whilst the other two solutions had apparently lost furfural to a small extent.

The loss of furfural in these two latter cases is possibly to be ascribed to the action of light, since freshly distilled furfural, though straw-coloured gradually becomes brown in well-stoppered glass bottles. The action of light is excluded in the case of a cask, so that diminution in amount of furfural is probably to be ascribed to absorption by the wood.

But in addition to furfural, other aldehydes are present in new spirits in quantities varying inversely as the care exercised in the manufacture. These almost certainly result from the oxidation of the alcohols. Märcker (Spiritus-Fabrikation, 7te Aufl. p. 54) ascribes the production of acetaldehyde to the oxidation of ethyl alcohol during the period when fermentation produces its highest temperature, *i.e.*, before distillation is effected. There is, however, the possibility, and indeed probability of a certain oxidation taking place during the distillation itself; one of the great points of the most modern automatic distilling plants being that distillation proceeding quite regularly, no air is sucked back into the column by the speed of distillation slackening off, and consequently no oxidation takes place.

* Difficult to estimate, some impurity developing a yellow colour with the aniline acetate.

The fatty aldehydes present in spirits arise from the oxidation of primary alcohols; in addition to acetaldehyde which has been previously recognised, attention may be drawn to the fact that valeraldehyde, having a boiling point lying between those of ethyl alcohol and water, may possibly occur in spirits. In determining aldehydes, I decided to reject colorimetric methods since there are grave doubts as to whether different aldehydes react in a similar manner (*cf.* Paul, Jahresh. der Pharm. und Toxic. 1896, N.F. **30**, 755).

Rieter's method (Schw. Wochenschr. f. Ch. und Pharm. 1896, 237), depending on the combination of aldehydes with sulphurous acid, is more scientific; the method of Strache, Benedikt, and Kitt (Monatshefte, 1891, **12**, 524; 1892, **13**, 299; 1893, **14**, 270) is apparently quite free from objections when the quantity of aldehydes to be determined is considerable. Otherwise, evaporation of a large quantity of liquid has to be resorted to, and one must then contend with the volatility of the phenylhydrazine employed in their method.

I resolved to take sodium phenylhydrazine sulphonate, on account of the ease with which one could obtain a pure specimen, its solubility in water, and its non-volatility; as, if a large amount of liquid had to be examined, then one could concentrate without fear of loss of the excess hydrazine. Finding subsequently that hydrazines reduce ammoniacal solution of copper sulphate apparently quite as well as they do Fehling's solution, I tried the process of rendering the hot solution of the sodium salt ammoniacal, and running in copper sulphate solution of known strength until a blue colour was produced. Under conditions which are not essential to this paper,* aldehydes may be estimated with fair accuracy.

Old whiskies contain approximately one-third or one-fourth the quantity of aldehydes occurring in the spirits fresh from the still.

But the strongest argument for the diminution in the aldehyde content of whiskies as maturation proceeds, is the fact that if a new raw whisky, with its characteristic smell, be treated with a solution of sodium phenylhydrazine sulphonate, the raw smell disappears in the course of a few minutes without any other constituent than the aldehydes being affected. I do not mean for a moment to infer that an old liqueur whisky is produced; but some of the products (viz., the aldehydes) which have to be got rid of by maturation are immediately removed, and, if only the liquid be again distilled, are removed permanently.

The question arose as to how the process could be applied in practice. The obvious thing seemed to be to add the reagent to the contents of the low-wines charger, and after allowing the liquid to rest a few hours, to then proceed with the distillation in the usual manner.†

A firm of distillers, to whom my best thanks are due, very kindly arranged to have the process tried in one of their distilleries. Two periods were worked, the same quantity of malt (of the same sample) being used in each case, and, with the difference of using no reagent in one case, but adding it during the other period, the two quantities were worked under exactly similar conditions.

The chief points noticed were that the sharp smell during the collection of the foreshots disappeared when the reagent had been added to the contents of the low-wines charger. The time from the first appearance of the foreshots until the spirit cleaned was reduced from 1—1½ hours to an average of 35¼ minutes; the least time noted was 15 minutes, the longest 52, on which occasion the alcoholic strength was greater than usual, the spirit breaking at 34 O.P.

The chief differences between the spirit made by the ordinary process and the process in which sodium phenylhydrazine sulphonate was added, were as follows:—

1. *Whisky by Ordinary Process.*—Strength in spirit vat, 18·8 O.P. Ordinary raw malt whisky. Strong furfurol reaction.

* I intend publishing this method, with control data, subsequently.

† English Patents of 1898, 15,452 and 22,607; Cape Colony, 1701; Canada, 63,188; U.S.A., 625,108; D.R.P., 104,987

2. *Whisky by Sulphonate Process.*—Strength in spirit vat, 20·3 O.P. Malt whisky deprived of raw taste and smell. Furfurol reaction absent. The spirit nevertheless remained malt whisky, and was not thereby converted into a diluted silent spirit.

Basic Substances in Spirits.—Most spirits contain small quantities of cyclic nitrogen bases. Where rectification is employed, these, having higher boiling points than alcohol, accumulate in the fusel oil. Pyridine has been recognised as a constituent for some time, Haitinger definitely confirming its presence in 1882 (Monatshefte, **3**, 188). Krämer and Pinner obtained a basic substance which they thought to be a collidine, though it was not analysed (Ber. 1870, **3**, 75). Besides bases of this series, a number of others have been isolated at different times, containing two atoms of nitrogen in the molecule. Thus, Schrötter discovered bases in a product from beetroot-molasses, two of which were found to possess the formulæ $C_8H_{12}N_2$ and $C_{10}H_{16}N_2$ (Ber. 1879, **12**, 1431). Morin (Comptes Rend. **106**, 360) isolated a base of the formula $C_7H_{10}N_2$ from fusel oil. Stöhr thought this was probably identical with his synthetical trimethylpyrazine (Jour. f. prakt. Chemie, **53**, 509). All these bases might well be alkylated pyrazines from their formulæ, and since Bamberger and Einhorn (Ber. 1897, **30**, 224) have succeeded in isolating 2:5-dimethylpyrazine from fusel oil and identifying it by reduction to the corresponding dimethylpiperazine (lycetol), we may assume with a great degree of probability that such is actually the case. In addition, a base of the composition $C_{10}H_{21}ON_3$ was found to be present; the quantity was not great, and it was analysed as the phenylcarbimide derivative ($C_{10}H_{21}ON_3$, $3C_7H_5ON$) and chloroplatinate. Probably these bases play a part in the flavour of whisky.

Conclusions.—The maturation of spirits seems not to altogether consist in a transformation of the products present in the raw material, but also in a direct loss of certain constituents by diffusion through the casks and evaporation from the outer surface. The substances so lost appear for the greater part to consist of aldehydes. Mr. James Barr (Questions, 2683–5), when appearing before the Royal Commission of 1891, expressed his opinion that the improvement of spirits on keeping is due to a gradual evaporation, through the pores of the cask, of something more volatile than fusel oil. It is a noteworthy fact that in all cases aldehydes boil at a lower temperature than the corresponding alcohols.

The question as to whether the higher alcohols disappear materially on keeping, seems still to be a somewhat open one. Many of the fusel oil determinations that are made cannot really be said to give an idea as to whether alcohols alone, or alcohols and other substances in addition, have been determined.

The higher alcohols play a part in the flavour of spirits, and seeing how rare it is to obtain them quite free from small quantities of impurities which may be far more active physiologically than the alcohols themselves, one is in considerable doubt as to whether their removal is really any advantage.

In determining the compound ethers in any sample of spirits, care should be taken that the free, as well as the total organic acid, is determined; and the practice of determining the total organic acids after hydrolysis, and returning the result as if all these were present as esters, should be discouraged.

Although some progress has been made in the identification of the bases present in spirits, more work in this direction is very desirable. Pyridine and its homologues may be comparatively inactive physiologically (*cf.* Brunton and Tunnicliffe, Jour. of Physiology, 1894, **17**, 272) when administered in small doses, but the same can certainly not be said for some of the oxygenated bases.

Finally, I have to tender my best thanks to Professor Hirschfelder, of San Francisco, and Mr. J. MacAlister for the kindness they have shown in supplying me with samples of different spirits, and to the distillers who have allowed experiments to be made with their plant.

Discussion.

Dr. Schidrowitz said that this paper was interesting to all chemists, especially to himself, as for some time past he had been working on somewhat the same ground, namely, the by-products of spirits. Many processes had been brought forward for the maturation of spirit. The first desideratum, of course, was satisfactory manufacture. The raw materials must be carefully chosen, the mashing, fermenting, and distilling operations must be carefully carried out, otherwise inferior spirit would be produced which no maturation would make perfect. No method of manufacture had yet been devised which would produce a spirit capable of being drunk in the raw state. So far the processes brought forward were roughly those which acted by means of a current of air, ozone, or ozonised air. Again, there were electrical processes, which consisted in electrolysing the spirit, or in adding an electrolysed solution of some salt to the same. Then there were the processes which require the production of an exaggerated cask action, for instance, by heating the spirit under pressure in the presence of a quantity of oak shavings in the presence of air, ozone, or oxygen. Then there were processes in which a low temperature was employed, as an instance of which he would give Pictet's experiments, in which the temperature was brought down to $-80°$ C., and it was alleged that hereby a product equal to 12-year old spirit was obtained. Then there was the process of Scott, consisting in the passing of dry, cold, filtered air into the spirit, which it was said did not remove any of the alcohols or ethers. He had no great experience of these processes, but some of them were said to act well. All these processes were, with all respect to the inventors, based on empirical methods. Dr. Hewitt was the first to devise a process on a rational scientific basis; one which took out certain specific bodies by means of certain specific chemical substances. He was rather at variance with Dr. Hewitt with regard to aldehydes, for he did not think the actual amount of aldehydes present was a criterion of the potability of spirit. Many published analyses (of brandies in particular) went to show that the total aldehydes increased in amount with age, but he thought it possible that certain specific aldehydes might be modified by maturation. He thought the strictures placed on Schiff's method of estimating aldehydes were perhaps not quite justified, because the furfural could be eliminated by estimating it separately, but in any case the influence of furfural on Schiff's test was so small that it was practically of no importance, and the influence of the other aldehydes, including many of the higher ones, had been, he believed, worked out by Luson, Girard, and others. The same thing held good with regard to estimating furfural with aniline acetate. Girard and Luson recommended that a 50 per cent. alcohol solution be used, but did not say whether there was any considerable variation due to differences in alcoholic strength. Dr. Hewitt said that roughly it must be the same in all cases. From some experiments of his own within the last few months, he said emphatically that the solution must be practically exactly 50 per cent. in every case, or very erroneous results would be obtained. With regard to the orange colour produced in the South African specimens, that was also produced in old whiskies. If you add aniline acetate to an old sample, you got at first a brownish coloration, which later on acquired the violet tinge they all knew. He had come to the conclusion that in these cases you could not estimate the furfural by the colorimetric method without some modification. He had himself worked out a method for overcoming that difficulty, but would not go into it now, as it might form the subject of a communication later on.

Mr. A. R. Ling said he thought Mr. Allen had shown pretty conclusively that the physiological effect of the higher alcohols contained in the fusel oil of potable spirits had been exaggerated. There could be no doubt, however, that aldehydes were compounds of very great physiological activity, and the method Dr. Hewitt had described of removing them from potable spirits was one which ought to be effective. He was personally interested in the estimation of furfural, and was anxious to find a rapid,

and at the same time, reliable method. He had tried heating a solution of furfural in a stoppered bottle with a known volume of Fehling's solution, and titrating the unreduced excess of cupric salt with a solution of invert sugar or glucose of known titre. The reduction of the Fehling's solution by furfural took place, however, so slowly that there was a danger of secondary change occurring and the method had to be abandoned. Some such analytical method as Dr. Hewitt was now working out would probably meet his requirements.

Mr. E. Grant Hooper said he should have liked to hear from Dr. Hewitt something of the results he had obtained by his new process on spirits with which he could make a comparison. For instance, taking the spirit commonly produced at a given distillery, what reduction was there in the furfural compounds when that same spirit at the same age was treated by his process? He had not heard any information on that point, though perhaps it was contained in the paper. He was interested to hear that Dr. Hewitt accepted the conclusion established before the Spirits Commission and buried in a Blue Book some 10 years old, that the potability of spirit was practically entirely due to the modification of the furfural compounds in whisky. Another speaker had alluded to the higher alcohols, but it appeared to him (Mr. Hooper) to have been established that the potability of spirit was governed by the amount of these furfural or aldehyde compounds, it having been shown that the amount of higher alcohols practically remained unaltered even in spirit some 15 years old whereas the furfural diminished. There was no doubt if Dr. Hewitt had succeeded in discovering a method by which these furfural compounds, could, at the moment of distillation, be practically removed without destroying those other substances which, in whisky, gave the character which was appreciated by the consumer—which, indeed, made the difference between whisky and what was called plain spirit—he had achieved a great result. It had been pointed out that the quantity of spirit in the bonded warehouses was enormous, and it was obvious that the actual money value of that spirit—though that value was nothing like the retail value, because it had not paid duty, and the duty was many times the cost of the spirit, yet the capital kept idle whilst the spirit was maturing over a period of years represented a very large sum. Dr. Hewitt had referred to the differences he had observed in spirits produced at the same distillery. He thought it ought not to be forgotten that distillation was never absolutely uniform. Whisky, as distinct from plain spirit which was sometimes used in blending, was prepared in a pot-still, which, certainly as far as the United Kingdom was concerned, was always heated directly by fire. The furfural and empyreumatic bodies which contributed to the flavour of whisky were due to this direct fire-heating, and varied according to the skill with which the heating of the still was conducted, so that in no two distilleries or even in two operations at the same distillery using the same materials, could it be expected that the proportion of these compounds would be absolutely alike. Doubtless, in carefully managed concerns considerable uniformity was exhibited, but perhaps where "Cape smoke" was produced, there would be more reckless firing and greater differences in the product might naturally be anticipated.

Prof. Mills said a good many years ago he made a considerable number of experiments on the ageing of whisky, and was the first to apply passing a current of air through it on a large scale, which had for many years been continuously carried out. He found it necessary, in endeavouring to age whisky, to first of all set up an arid condition which, in fact, generally prevailed in all ordinary Scotch whiskies. Having set up that condition, the next thing to do was to pass an exceedingly moderate current of air through it, so moderate that you could hardly call it a current, for not exceeding 24 hours. Under these circumstances the air carried away the whole of the aldehyde and left behind, if you prolonged the action of the air, a substance almost entirely free from odour. All that was necessary then was to place the whisky in a cask and age it in the ordinary way, and in about three months time it acquired three years age. Obviously a process like that required a great deal of care in handling. Dr. Hewitt's process was much more direct and would be presumably far better because the valuable flavouring properties would not be interfered with. Its adoption, however, would be to a great extent a question of cost. A current of air was cheap, but sodium phenylhydrazine sulphonate and other expensive chemicals were not so cheap, and he understood Dr. Hewitt to say that an ageing process must follow in any case. With regard to getting rid of aldehyde by exposure in the cask in the ordinary way of ageing, no more clumsy method could have been invented. It was very slow and expensive, costing some 2*d*. per week per 100 gallons, and it required a much longer time for some spirits than for others. One of the chief points of value about the paper was that it seemed to provide an alternative means for abolishing this exceedingly non-technical and unscientific method of ageing potable spirit.

Dr. Rideal suggested that if hydrazine sulphonate were capable of fixing the aldehyde compounds present in the whisky completely the same should be true of the aniline and acetic acid in the ordinary Schiff reaction, therefore it would be also possible to use these reagents in the same way as the author employed the phenylhydrazine.

Mr. A. C. Chapman said he wished some reference had been made to some published results by Mr. Allen which showed that the maturing of spirits was to some extent to be ascribed to the selective absorption of the objectionable constituents by the wood of the cask. It had now become fairly well recognised that those substances which were usually included under the term "fusel oil" were not responsible for the evil effects of raw spirits. Dr. Hewitt's opinion appeared to be that the aldehydes were the chief sinners in this respect. He (Mr. Chapman) had some years ago made a number of determinations of the amounts of fusel oil and of furfural existing in beer which had been stored for a long time, in one case as long as 25 years, and he had found the quantities present to be similar to those which were usually met with in new beers brewed under the ordinary conditions, so that prolonged storage in the case of beer did not appear to lead to any marked reduction at least in the proportions of the higher alcohols.

Mr. Procter said he had analysed some of the spirit produced by Dr. Hewitt, and wished to bear testimony to the fact that the process really did something. In some processes which had been recommended, when the spirit was examined before and after, it was very difficult for a chemist to detect any difference, but so far as Dr. Hewitt's process was concerned, there was no doubt that some effect had been produced; he had removed a large proportion at least of the furfural and aldehyde bodies present. Whether that removal of furfural and aldehyde would be equivalent to ageing was, of course, a different question.

The Chairman said everybody apparently recognised the great task which Dr. Hewitt had set himself, and had come to the conclusion that he had employed rational means to attain his object. Whether the means employed effected all that was implied in the word "ageing" was a question for further experience.

Dr. Hewitt, in reply, said that Dr. Schidrowitz had recommended 50 per cent. alcohol for furfural estimation; on reference to the paper he would find alcohol of sp. gr. 0·920 had been used. Mr. Ling had spoken about the estimation of furfural by Fehling's solution, and he could quite understand any trouble he might have had. With regard to the action of fusel oil he believed what Mr. Hooper said was correct. He did not think any alcohol was as bad as it was represented. On Saturday morning he imitated Mr. Allen by consuming 5 grms. (equal to 77 grains) at one operation, about the quantity that would be found in a proof gallon of ordinary whisky. After 20 minutes his pulse had diminished by two beats per minute, a further 10 minutes restored it to its normal condition, and no further effect could be detected, therefore he did not think there was much wrong with the action of amyl alcohol. With regard to blowing air

through spirit referred to by Prof. Mills, there was something undoubtedly done by air blowing. There was always a certain smell in these new spirits produced by the still. He did not know to what it was due. You might take clean spirit and put it into a still and distil a second time, and there would be a strong smell produced. It might possibly be something in the still. Dr. Rideal had proposed the use of aniline acetate, and probably it would remove the furfural, but he would find a portion of the aniline in the distillate, which would not be an improvement. The great point was to use non-volatile substances. Mr. Procter had borne testimony to the fact that he had removed the aldehydes and furfural to a considerable extent, but he (Dr. Hewitt) did not think in the sample Mr. Procter had there was very much furfural to be detected.

Errata.

ON THE SEPARATION OF SOLIDS WHICH DIFFER IN SPECIFIC GRAVITY.

BY J. W. HINCHLEY, Wh.Sc., A.R.S.M., F.C.S.

(*This Journal, Jan.* 15, 1902.)

On p. 12 of the number of the Journal for Jan. 15, col. 1, in the paragraph below the table, certain ratios are given incorrectly. In the fifth line the ratios should be 1·56:1 and 1·25:1, and in the eighth line 11:1·6 = 6·85:1 ; not as there stated.

New York Section.

Meeting held on Friday, December 20th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE COMPOSITION OF PAINTS AND PIGMENTS.

BY MAXIMILIAN TOCH.

The painting and preservation of wooden structures and of masonry of all kinds are problems which are not entirely solved, although there are millions of gallons of mixed paints, ready for use, sold every year for these purposes.

In America, it is customary to paint the fronts and sides of buildings. The fronts, being composed of pressed brick, do not absorb oil paint, so this looks fairly well and lasts from three to five years. But the painting of side walls is different. There the bricks are coarse and porous, and the mortar joints are rough ; and when a coat of paint is applied to such a wall, a process of selective absorption takes place, the linseed oil goes into the brick and nearly all the pigment remains on the surface. In a few months the paint, not having sufficient binder to hold it, flakes and peels.

This is particularly true of new walls, and as an ordinary brick will absorb 8 oz. of water, a damp wall presents the worst kind of surface to hold paint. There are soluble salts in mortar and bricks, and in a short time after a building is completed, a white efflorescence shows, which disappears in damp weather, but reappears when the air is dry. This cannot be brushed off, and only goes after many rain storms. The composition of this efflorescence varies : it is frequently composed of chlorides of calcium and magnesium, sulphate of lime, chloride of sodium, and oxalate of lime ; and as these are more or less hygroscopic, they form a resting and germinating place for fungi. Some years ago I found crystals of oxalate of lime for which I could not account, and as I only found these crystals when a certain fungus, known as *Penicilium crustaceum*, was present, it occurred to me that this fungus might be the cause. On nutrient glue containing lime these crystals always appeared. With CaO present in the mortar, and CO and CO_2 present in the air, the reaction might be as follows :—$CaO + CO + CO_2 + H_2O = CaOC_2H_2O_4$* (calcium oxalate).

Linseed oil paint will not adhere to a newly erected wall, unless, as stated by some, a coat of Portland cement be applied as a thin wash. This method requires practice and a knowledge of what proportions to apply. The cement in such cases must be mixed with a proper aqueous medium which will prevent its dusting after it is dry.

Another successful method is the application of a bitumen paint, which will be described later, coated over with a suitable decorative coat, but in such work it is essential to fill up the joints with Portland cement after the paint is applied, such filling being termed "pointing up," and the bitumen paint must be of an elastic semi-drying nature to which cement will adhere. In the United States, some outside walls are finished in this manner to prevent the penetration of damp. This should only be done after a wall has dried out and its soluble salts have been washed away.

About 30 million gallons of mixed paint (ready for use) were sold in the United States, during 1901. The greater portion of this was not used in the large cities, but in the towns and villages, where structures are of wood. In no country is so much paint made as in the United States of America, and the bulk of that paint is composed of lead, zinc, and linseed oil, and only the darker shades are made of oxides of iron and other pigments. Many manufacturers use a small quantity of water in their mixtures, and when the quantity of water is not over two per cent., it cannot be regarded as an adulterant. The water used is usually slightly alkaline, and in the case of lime water it forms a calcium soap with linseed oil and thickens the paint so that it never settles hard in the tin and is easily stirred. Simple tests for the water are distillation at 212° F. ; further, filtration of the oil, and the addition of dehydrated copper sulphate, which turns bright blue when added to the liquid ; and, thirdly, putting a strip of gelatin into the paint for 12 hours, which absorbs the water only and swells up.

Red Lead.—This pigment, Pb_3O_4, is probably the oldest pigment known in the arts excepting white lead. It is largely specified by engineers, but within the last 10 years so much has been written against it that it is looked upon by some with disfavour. It takes about 30 lb. or more to form a suitable paint with one gallon of linseed oil, and unless properly mixed it is likely to sag, streak, or run. Painters complain that it is too heavy to work.

Laboratory tests of red lead are quite satisfactory, but large scale tests prove that this material is much overestimated. Recently thousands of tons of structural iron arrived in New York City, for use in the subway now being constructed. All this iron had a coat of red lead and was piled up in the streets for months. The photographs taken of various piles of the iron, thus coated, proved that—

1. Red lead is a carrier of oxygen and air bubbles, and is not a stop to progressive oxidation.

2. Red lead does not form a good protective coating for more than six months under extreme conditions.

3. Red lead darkens quickly, showing that H_2S rapidly attacks it.

4. Red lead is a good first coat paint, if it be speedily followed by a second coat of a more elastic paint.

5. Red lead is a better protector on the top of a beam than on the bottom, because in drying on the bottom, its weight separates it from its base, whereas on the top it settles firmly to its base.

A mixture of red lead, zinc oxide, and artificial barium sulphate is a much better paint than any of these materials used singly, and some experts advise the addition of carbon or lamp black. Such a mixture might readily possess qualities which are advantageous in a paint.

* Those who claim that a fungus cannot liberate oxygen would approve the above equation. Those who claim that fungi do liberate oxygen can explain the formation of oxalate by substituting CO_2 for CO.

A paint containing red lead should contain a lighter pigment, so that a greater quantity of oil may be used, for where red lead is too heavy and takes too little oil, graphite takes too much oil and is too light in gravity. A mixture of the two would therefore be superior to either.

From Mr. Harry Smith's experiments, published in this Journal for December, 1899, it is easily seen that red lead is not unique, and that a paint containing a maximum amount of barytes will do everything that red lead will do. Red lead will not stand exposure under trying conditions, unless it be coated over with a carbon bitumen paint, and, as in the case of the Elevated Railroad posts in New York, if moisture gets under the linseed oil, it forms a blister, and oxidation is progressive. Greater defects are to be found in red lead, carbon, zinc oxide, white lead, &c. by themselves, than in a mixture of two or more.

White Lead.—White lead is siccative with linseed oil, has remarkable covering qualities, is a good drier, and is unctuous under the brush. But it blackens in the presence of H_2S, it produces lead poisoning among painters, and its drying qualities are such, that it continues to dry in linseed oil until finally no oil, as such, is left, and the resulting product is like chalk. The consumption of white lead is decreasing.

White lead should not be used alone. The specifications for mixed paints, as published by the United States Lighthouse Department, demand 75 per cent. of zinc oxide and 25 per cent. of white lead.

Zinc Oxide.—In 1900, some 44,000 tons of zinc oxide were produced in the United States. It mixes well with other pigments, particularly with white lead. It is made in two ways, viz. :—from the metal, by the aid of heat, and by decomposition of the ore. Zinc oxide made from the ore is used more largely than that made from the metal. The latter is not so durable as the former, and on a very large surface, as, for instance, the hull of a vessel or the outside of a building, the difference in whiteness is soon apparent. Zinc oxide, as the drying progresses, becomes very hard and brittle. This is more the case with the oxide made from the metal than with that made from the ore; and in order to overcome this, linseed oil is treated with one-third of 1 per cent. of litharge, and this is mixed with zinc oxide. A flexible drying paint is thus produced, and in the manufacture of oilcloth this is essential. Zinc oxide is not visibly affected by H_2S, which gives it greater advantage for interior painting. It likewise is less absorbent than other white paints, and can be washed; on outside walls it withstands the action of the atmosphere, when used to the extent of 50 per cent. with white lead and barium sulphate.

Carbon Blacks.—Under this heading are included charcoal, graphite, carbon black made from natural gas, lamp black made from dead oil, powdered coal, &c.

All the good qualities of a heavy pigment are reversed in the carbon paints, and the under-side of an I beam painted with a carbon paint is better protected than the top. Thus, a good carbon black should be combined with litharge, red lead, and barytes, in order to compensate for the lightness of the black. A large building, containing in its interior many thousand square feet of iron surface, was coated with two coats of graphite paint after the iron was cleansed. The work did not satisfy the supervising architect, and I had to decide whether the painter had complied with the specifications or not. The paint specified was of two different makes, both of excellent quality, and after the painter had applied it, rust showed itself over a great portion of the surfaces. I decided in favour of the painter, on the ground that the engineer who specified the paint made an error in applying a mixture of graphite with linseed oil only on an iron surface where the water condensed almost every day. The paint was porous, and the painter had unavoidably covered with it places where moisture had condensed. Oxidation at once started, was progressive, and broke through the paint. Had the engineer specified a coat of graphite paint, containing barytes or red lead, and then a coat of black varnish, much better results would have followed.

Gas-blacks and lampblacks have wonderful covering qualities, and where a good lead and zinc paint will only cover 500 sq. ft. to the gallon, gas-black paint will cover 1,000 sq. ft. to the gallon.

Oxides of Iron.—These are either very good or very bad. The good qualities are those of the Indian Red type, which are made by the burning of ferrous sulphate until Fe_2O_3 is left. The poor kinds are those made by grinding natural earths which are reduced with gypsum, clay, and other hygroscopic materials. An inert base mixed with a calcined iron oxide makes a very good paint, but it is doubtful whether such materials are not carriers of oxygen, and, therefore, harmful as protective paints. For a coating on brickwork, the red clays and Venetian reds possess some advantage.

Barium Sulphate, Natural Barytes.—Barytes used in a paint should not be always regarded as an adulterant. In the December number of this Journal, 1899, is the record of a large number of tests showing the amount of rust on 1,500 square yards of surface painted with different pigments; those mixtures that contained 70 and 80 per cent. of barytes showed no rust, and the only other paint that stood as high was the red lead paint containing nearly 90 per cent. of dry red lead. A mixture of barytes and other pigments, sufficient to form a covering body to the surface applied, does all that was done by red lead, which confirms my theory that red lead is only good on account of its high specific gravity.

Seventy per cent. of barytes, 10 per cent. of carbon black, 10 per cent. of zinc oxide, and 10 per cent. of graphite, ground in pure linseed oil containing a sufficient quantity of driers, will outwear red lead, and if both be painted over a rusty surface, the scales of rust will break through the red lead more quickly than they will through the black paint containing barytes.

Artificial Barium Sulphate.—Originally manufactured in France under the name of Blanc Fixe, it was sold in paste form for paper coating. Its specific gravity, when dried, is about 2·4, and it is absolutely impalpable. If dried out in the heated drying room, it dries into a hard mass which is not readily powdered, but if properly made and suitably dried, it forms a fluffy white powder, which is useful in the manufacture of liquid paints. Linseed oil dries with a porous film and absorbs water, but a linseed oil paint, containing sufficient inert material to close up the pores, is at once weather-proof and durable.

In June, 1899, the outside walls of a most exposed building in the city of New York were first coated with a hydrocarbon paint in order to close the pores of the brick, and over this were applied two coats of linseed oil paint, the composition of which was 25 per cent. of white lead, 50 per cent. of zinc white, and 25 per cent. of artificial barium sulphate. Those walls are still in perfect condition, no damp has penetrated, and no peeling or disintegration of the paint has taken place. This proves that barium sulphate fills up the pores of linseed oil and that this proportion of zinc oxide and lead carbonate, in which zinc oxide predominates, is the most suitable mixture for that locality. If paint will stand in the atmosphere of the Atlantic coast, it will last much longer in the interior, for the best paint rapidly deteriorates at the sea-shore.

Zinc Sulphide.—This pigment was invented by J. B. Orr, of England. It is the result of the following reaction—

$$BaS + ZnSO_4 = BaSO_4 + ZnS.$$

It contains barium sulphate, 70½ per cent., and zinc sulphide, 29½ per cent.

The dense white precipitate obtained is heated and thrown into water while still hot, then ground very finely and dried.

Great purity of the raw materials used in this manufacture is necessary for the production of a pure white article. This compound is used in enormous quantities for the manufacture of enamel paints, linoleum, and table oilcloth. It is a saturated compound, and it does not continue to oxidise linseed oil; it therefore might be termed a non-siccative. In making enamel paints where rosin varnishes are employed, it does not combine with the rosin, and, therefore, will not saponify. If zinc oxide

could be combined with barium sulphate in the same manner, it would be an ideal paint. Zinc sulphide is, however, photogenic; it absorbs light and turns greyish black when exposed to brilliant sun-light, but when placed in a dark room, it loses its grey effect and turns white again.* Thus, enamelled iron bedsteads, which were grey when exposed to sunlight, after dark would all appear white. This material will not replace zinc oxide and white lead, as exposure appears to affect it. Linseed oil which is prepared with a lead drier is frequently blackened when mixed with this pigment because of the formation of lead sulphide. This material is known variously as lithopone, Beckton White, Oleum White, Orr's White, &c.

Casein Paints.—Whey, mixed with whitening and a cheap oxide, makes a good barn or fence paint, and lately patents have been granted for the making of casein paints. The casein is extracted from whey, and when dried and powdered, a suitable alkali and sufficient ground mineral are added (talc, whitening, &c.). Casein paint, when applied to an inside wall, dries and becomes insoluble, so that it will not rub off. On wooden exteriors at the seashore it stood for one year without decomposition, but on brick surfaces it did not stand owing to the action of alkaline solvent salts contained in both brick and mortar.

Japanese Wood Oil or China Wood Oil.—This oil, which is also known as Tung Oil, is used in China and Japan for making paints and varnishes like linseed oil, to which it is superior in many respects. Within the past ten years the demand has largely increased. Unfortunately, some samples which came under my notice did not react under the same conditions as those which I have of known purity. The oil has a peculiar pungent odour. At about 450° F. it gelatinises and forms an insoluble film. The oil in a raw state becomes waxy at low temperatures, and organic salts, analogous to the stearates, settle out.

This oil dries by oxidation, but, unlike linseed oil, dries throughout the film at the same time (usually within six hours). It is waterproof and weatherproof, and when found in paint or varnish cannot be considered as an adulterant, as it is usually dearer than linseed oil and improves the working and wearing qualities. If the price of this oil came down to that of linseed oil, paint and varnish makers would use it much more largely. The treatment and preparation of this oil for paint and varnish making is kept secret.

Tar.—This material if properly deodorised and neutralised can be used in small quantities to some advantage on metallic surfaces that are not readily cleansed, but as very few paint manufacturers understand its manipulation, it is better left out of paint. Linseed oil paint can never be used over tar. As a smoke-stack paint tar is also useless, since it distils off at high temperatures and leaves nothing but a scaly residue behind. The tar of commerce, if thinned and applied to iron pipes without being properly neutralised, is dangerous, because oxidation continues under it with extreme rapidity.

Benzine.—Ordinary benzine has very little disagreeable odour. It is used as a diluent like turpentine. Its solvent qualities exceed that of turpentine, and a limited quantity is no disadvantage in a heavy viscous paint.

Turpentine.—This material is used as a diluent. Any large quantity of it is deleterious to the life of a paint or varnish, and, as it will flash at a temperature of 105°, its fire risk is greater than that of kerosene. A limited quantity is of value to a heavy paint, as it increases the working quality.

Maize Oil.—This oil, while it possesses no advantage in the manufacture of mixed paints, is used to some extent (as much as 25 per cent.) in the grinding of paste paints, to prevent them from getting hard in the package. When used as such, it exerts no bad influence on the paint, but in large quantities, as a mixture with linseed oil, it should be avoided.

Linseed Oil.—This is the most popular and best liquid medium for making paint and varnish. It is frequently sophisticated. There is up to now no good substitute for linseed oil, and only China wood oil ranks higher.

Oil which is newly pressed is unfit for making paint. New oil is generally greenish, due to the chlorophyll that it contains. Old oil is generally yellow, due to the presence of xanthophyll.

Old and clear oil will not react with dried copper sulphate, new oil gives it a bright blue colour which indicates the presence of water.

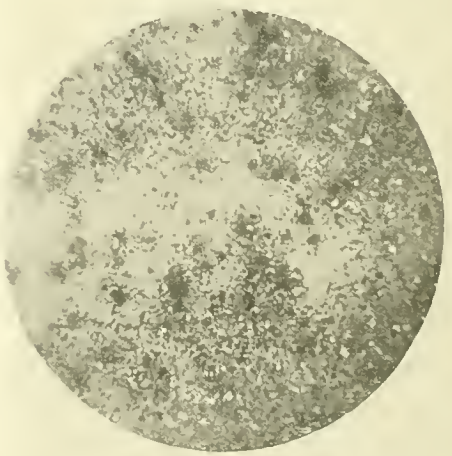
Hydrocarbon or Bitumen Paints.—Asphaltum *per s* reduced with a suitable solvent makes a very poor paint. Black paints composed of 20 per cent. of asphaltum, and 80 per cent. of rosin, thinned down with benzine, possess no merits whatever. Rosin is decidedly harmful on iron as it promotes oxidation. A hydrocarbon paint that will withstand corrosive action should be composed of the highest grade of bitumen, associated with pigments which give it body, but have no action on it. There should also be a small percentage of a high grade resin to enable it to resist weather. The oil used with it must dry with extreme flexibility. Such a paint will stand exposure to extremes of heat and cold, and has been used with success in chemical factories, to protect walls from free chlorine gas, iron structures, where acid was freely used, the interior of vats used for acid and alkaline solutions, walls into which moisture had penetrated, wooden and iron ships which were affected by corrosion and rot, and beams which were subjected to sulphurous acid, steam, and smoke. In all these cases it served its purpose, because it was not porous, and dried with a continuous film which was at once hard and impervious. No process of selective absorption takes place, as is the case with linseed oil paints that carry a large percentage of pigment.

Progressive Oxidation.—Nearly all forms of iron will continue to oxidise under given conditions of moisture and air. This is not the case with lead, copper, and zinc, because their oxides form a protective coating.

If a protective coating of paint be given to a clean metallic surface, oxidation cannot ensue unless the paint be itself a carrier of oxygen. Rosin, acid tar, some oxides of iron containing moisture, and paints containing calcium sulphate or chloride are all harmful because they are carriers of oxygen, and some investigators say the same of red lead. Linseed oil, which dries with a porous film, absorbs water and conducts it to the metallic surface, hence pure linseed oil is no protection to an iron surface.

It has been stated that iron or steel embedded in concrete cannot rust, but this is incorrect. Unless it be well coated

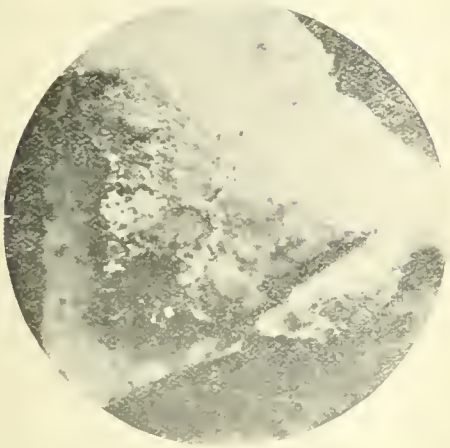
Fig. 1.



"Photomicrograph, × 100, of red lead in oil taken from paint pot and dried on slide. The film is filled with air bubbles and the coat is transparent in spots, although to the naked eye it looks solid."

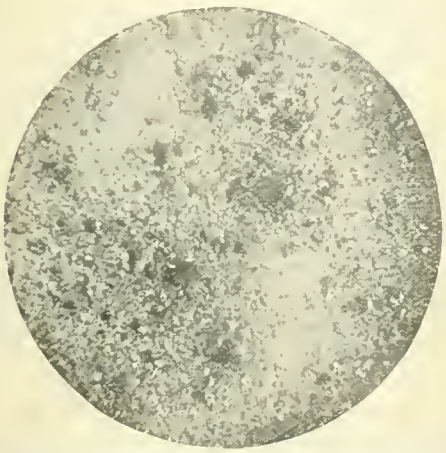
* This phenomenon takes place in the presence of organic matter.

Fig. 2.



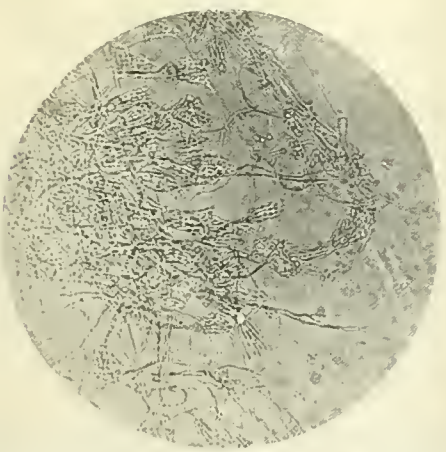
"Photomicrograph, × 100, of a film of dried paint taken from iron pillar showing rust blisters. The dark spot is red lead and a fissure runs through the centre. The zinc oxide and white lead are white and are intact."

Fig. 3.



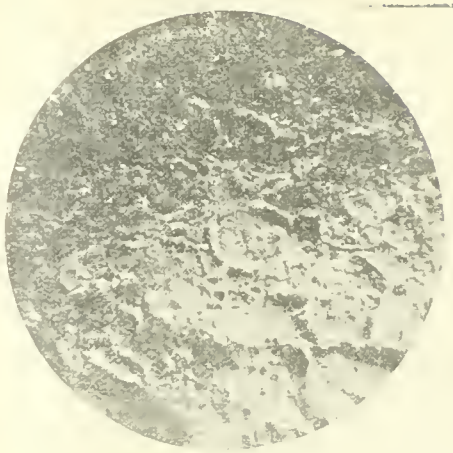
"Photomicrograph, × 100, of film of red lead paint showing grains of various sizes, all more or less encysted with air bubbles."

Fig. 4.



"Photomicrograph, × 600, of *Penicillium crustaceum*. This is the greenish fungus which makes calcium oxalate on brick walls."

Fig. 5.



"Dried film of red lead encrusted with rust, × 100, taken from a painted structure which showed no rust on surface."

with a varnish paint containing bitumen, it will rust and eventually disintegrate. The anchors of the Niagara Bridge rusted out completely, after having been embedded in concrete. It is therefore of vital importance that anchors, tension members, and metal supports should be properly coated before being embedded. It appears that clean steel, embedded in a coating of cement which is properly trowelled, cannot rust, even though subjected to the worst conditions.

The photomicrographs accompanying this article were all taken under the proper chromatic conditions. Yellow and brown oxide have very nearly the same chromatic value as red lead, and special screens had to be made varying from light yellow to orange brown to filter the rays accordingly. The plates were all sensitised for the purpose with erythrosin.

Nottingham Section.

Meeting held on Wednesday, December 18th, 1901.

MR. LEONARD ARCHBUTT IN THE CHAIR.

THE SAMPLING AND PREPARATION OF SHODDY, WOOL DUST, AND SIMILAR MATERIALS FOR ANALYSIS.

BY LOXLEY MEGGITT, F.I.C.

In the present paper, I confine myself to the preparation of the above for the estimation of nitrogen. It is practically impossible to get a representative sample of a few grms. from the above materials for the following reasons :—They are often composed of a mixture of loose and matted material. They contain some cotton, pieces of wood, little pieces of cloth, &c. The moisture content of various portions is vastly different.

Preliminary Sampling.—Take from 2 to 4 lb. of the material from about a $\frac{1}{2}$-cwt. lot, which has been as carefully drawn as possible from the bulk, and weigh accurately. Spread out on a zinc tray or other suitable receptacle and place in a warm place, so as to partially dry. When deemed dry enough for further subdivision, weigh again, and calculate the percentage loss of moisture.

Treatment of the partially dried Material.—Carefully select and weigh out the following quantities for the purposes indicated :—

Moisture.—Weigh out about 20 grms. and dry in water oven.

Preparation of Powder for Nitrogen Estimation.—Weigh out about 35 grms. into a 7-in. porcelain dish (tared). Sprinkle well with 20 c.c. of pure H_2SO_4 from a pipette and then with 20 c.c. of water from the same pipette. Place a rod in the dish and put on a water bath. Stir occasionally, and at the end of from 1½ to 2 hours a uniform creamy liquid will be the result. Allow to cool. Add about 30 grms. of caustic lime, stir thoroughly, and if no action begin in about five minutes, place on water bath. As soon as action commences, remove from water bath Immense volumes of steam are given off. When the action slackens, stir well and break up as much as possible. A little more lime may be sprinkled where there is any stickiness visible. A rough powder is the result. It is as well to dry for an hour or two in air or water oven. Allow to stand over-night covered with paper, so as to prevent the danger of its absorbing moisture after weighing. Weigh in the dish. Detach the powder, grind, and bottle.

Prepared Powder.—Estimate the percentage of nitrogen in.

Data required and Method of Calculation :—

Total Moisture.	Actual Estimation.
A = Percentage of moisture lost on partially drying	18·34
B = Grms. of partially dry shoddy taken for estimation of its moisture	21·09
C = Grms. of water lost from B on drying.	1·07
Total moisture = $\frac{(100 - A) \times C}{B} + A$	22·48

Percentage of Nitrogen in Original Sample.

F = Grms. of partially dry shoddy taken for preparation of powder	35·44
G = Grms. of prepared powder produced	114·03
H = Percentage of partially dried shoddy in prepared powder $\frac{F \times 100}{G}$	31·08
I = Percentage of nitrogen in prepared powder	2·136
Percentage of nitrogen on original sample = $\frac{100 \times I \times (100 - A)}{H \times 100}$	5·612

Lime.—This should be fine, and may be ground up from a clean piece of commercial Buxton lime.

Discussion.

Mr. F. J. R. Carulla asked whether the nitrogen had been estimated in the old way, and also by Mr. Meggitt's way, in the same sample. As a buyer he would not object to the new method.

Prof. F. Stanley Kipping asked was there not loss of ammonia when adding lime?

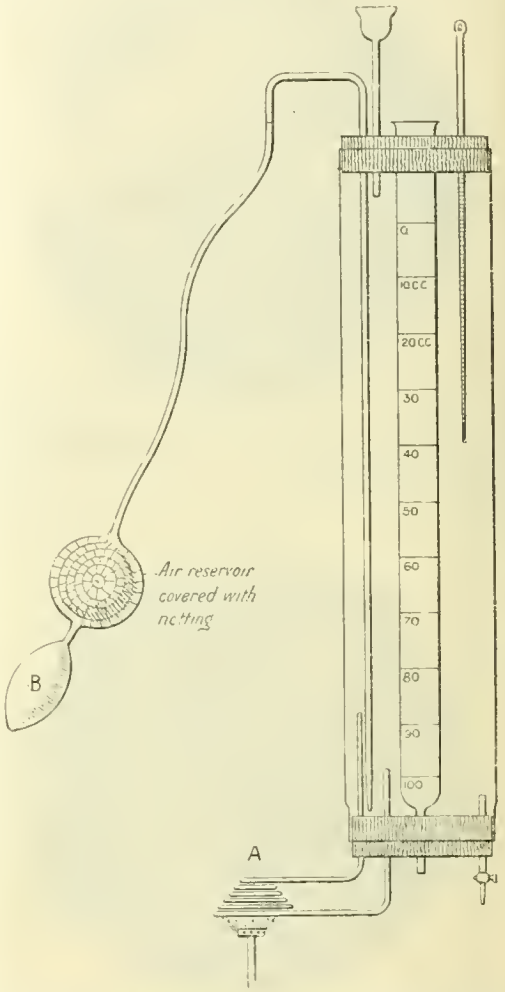
The Chairman asked if there was any reason why, instead of adding lime, an aliquot portion of the liquid obtained by treating the shoddy with sulphuric acid could not be weighed off and treated direct by Kjeldahl's process.

Mr. Meggitt replied that there was not the slightest sign of loss of ammonia; none could be smelt, and the results came quite up to expectation. About 20 grms. of lime was sufficient for neutralisation of the H_2SO_4, and, if desired, this quantity and about 10 grms. of calcined gypsum might be used. The viscous liquor produced after digestion with H_2SO_4 was not perfectly uniform and contained some small clotted particles; this constituted the only objection to weighing off an aliquot portion, as suggested by the chairman. He had tried making this liquor up to standard volume with water, but found that it was not miscible.

A NEW VISCOMETER.

BY LOXLEY MEGGITT.

Mr. Meggitt exhibited a viscometer (see figure) in which the temperature of the water in the outer jacket is maintained constant by means of a copper coil A, heated by means of a rose bunsen, the water being stirred by a current of air which is blown through the water by means of the rubber hand-bellows B. Mr. Meggitt stated that a



more delicate regulation of the temperature was obtained in this manner than by any other arrangement which he had tried.

Obituary.

GEORGE HARRIS MORRIS, Ph.D., B.Sc., F.I.C., &c.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY.

Dr. G. H. Morris, who passed away, after a brief attack of pneumonia, on the 30th ult., was born at Bristol in 1858, received his education at the Grammar School of that town, and afterwards became assistant to Prof. Tilden at Clifton College. In 1878 he continued his studies in chemistry under Prof. Johannes Wisliscenus at the University of Würzburg, where he took the degree of Ph.D. On his return to England in 1879 he assisted Mr. Shenstone in the equipment of a new laboratory at Exeter Grammar School. After this he rejoined Prof. Tilden, who was shortly afterwards appointed to the Chair of Chemistry at Mason College, Birmingham. There, Dr. Morris acted as Demonstrator of Chemistry for about three years, after which he succeeded Mr John Heron as Chemist to Messrs. Worthington and Co., of Burton-on-Trent, where he became associated with Dr. Horace T. Brown. At that time

Burton-on-Trent was, so to speak, the home of starch chemistry. The well-known researches of C. O'Sullivan, and of Brown and Heron, had appeared; and in 1885, Brown and Morris published their first joint paper on "The Non-Crystallisable Products of the Action of Diastase upon Starch." In this paper the authors made several additions of technological importance to our knowledge, establishing among other facts the existence of the class of compounds known as malto-dextrins. The theoretical conclusions with regard to the breaking down of the starch molecule by diastase have been somewhat modified in the light of our present knowledge, but the main facts recorded by Brown and Morris in 1885 have been substantially confirmed by the subsequent work of the authors themselves, and by that of Ling and Baker, of Prior, and of Brown and Miller. In 1890, Brown and Morris published their classical paper on the "Germination of the Gramineæ" which contained many points of the highest importance to the technology of malting. An equally recondite paper (though perhaps it had not the same practical value) was published by them in 1893 on "The Chemistry and Physiology of Foliage Leaves." Brown and Morris also produced several papers bearing on practical brewing; and among these may be mentioned one published in 1899 on "The Relation of the Initial Heat of the Mash to the Striking Heat." Many other papers in both pure and applied Chemistry have also appeared in our own Journal, the Journal of the Chemical Society, and in the Journal of the Federated Institutes of Brewing; of some of these Dr. Morris was sole author; among them are:—"The Sterilisation of Wort in the Copper" and "The Analysis of Brewing Sugars." His name will be remembered as a highly valued abstractor of our Journal between the years 1885 and 1889. He was joint author with Dr. E. R. Moritz of the well-known "Text Book of the Science of Brewing." In 1894 he entered into partnership with Dr. Moritz as consulting chemist. He was one of the Editors of the Brewing Trade Review; and for some time he held the position of lecturer on technical bacteriology at the Jenner Institute of Preventive Medicine. Last year the degree of B.Sc. (*honoris causa*) was conferred upon him by the University of Birmingham. Numerous friends and scientific confrères cannot but regret that this active and useful life has been brought so prematurely to a close.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	107
II.—Fuel, Gas, and Light	108
III.—Destructive Distillation, Tar Products, Petroleum	109
IV.—Colouring Matters and Dyestuffs	110
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	113
VI.—Colouring Wood, Paper, Leather, &c.	114
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	114
VIII.—Glass, Pottery, and Enamels	117
IX.—Building Materials, Clays, Mortars, and Cements	117
X.—Metallurgy	118
XI.—Electro-Chemistry and Electro-Metallurgy	124
XII.—Fats, Fatty Oils, and Soap	126
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c	127
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	128
XV.—Manures, &c.	129
XVI.—Sugar, Starch, Gum, &c.	129
XVII.—Brewing, Wines, Spirits, &c.	130
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	132
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	134
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	134
XXI.—Photography	137
XXII.—Explosives, Matches, &c.	139
XXIII.—Analytical Chemistry	139
XXIV.—Scientific and Technical Notes	142

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Roller Mills applicable for the Manufacture of Paint, White Lead, Pigments, Printing Ink, Confectionery, or the like. C. Wallis, London, and R. E. M. Lagerwall, Northfleet, Kent. Eng. Pat. 10,696, May 23, 1901.

The first crushing is effected in the mill between two central rollers, driven at equal speeds. Two other rollers, driven at an increased speed, run in contact with the central rollers, one with each, and a further crushing is effected between each of the central rollers and the adjacent faster-driven roller, the crushed material being delivered at both ends of the mill.—R. A.

Coating Steam Pipes or the like; Improved Non-conducting Material for ——. O. Francke, Mühlhausen. Eng. Pat. 17,555, Sept. 2, 1901.

Equal parts of finely ground tan bark, containing "a percentage of tannic acid," whitening, and water glass, are well mixed, to form a pulp; the mass is moulded into plates or slabs, and finally dried.—J. W. H.

Heating, Drying, Superheating, Condensing, or Cooling Gases, Vapours, or Liquids; Improved Surface-apparatus for ——. J. Heizmann, Strassburg, Germany. Eng. Pat. 17,978, Sept. 9, 1901.

The apparatus, or an element of it, is constructed of two flat metal plates, arranged so as to stand parallel to each other, at a small distance apart, closed round their outer edges, and at two opposite sides connected to suitable inlet and outlet collecting-pipes, the plates being also traversed by a great number of hollow rivets, short tubes, &c., set "quincuncially" in rows.—R. A.

Evaporators [Salt Water]. H. C. Anstey, New Brompton, Kent. Eng. Pat. 2775, Feb. 8, 1901.

The heating tubes of the evaporator are so fixed in position, that they can be withdrawn separately for cleaning, examination, or repair. Two methods of fixing the tubes are described in the specification. The tubes are sloped upwards from the tube plate, and passages are provided for draining off the water condensed in them. Means are also provided for controlling the level of the water, and for regulating its density in the evaporator.—R. A.

Vaporising Liquid [Lye, &c.]; Apparatus for ——. P. Neubäcker, Danzig, Germany. Eng. Pat. 21,372, Oct. 24, 1901.

To prevent foaming of the liquid treated, the vapours are caused to pass from a steam compartment, in which they are at a higher pressure, through suitable valves, into a compartment under a lower pressure, the liquid carried away by the vapours being spread out in a thin stratum in passing through the valves. The valves may be of annular form with a narrow aperture, or they may be arranged to impart a whirling movement to the liquid traversing them.—R. A.

Heating, Evaporating, or Concentrating Infusions, Solutions, and Liquids; Apparatus for ——. D. Laird, Forfar, Scotland. Eng. Pat. 18,151, Sept. 11, 1901.

The apparatus is of the type in which a water-bath is employed. The bath rests on a slab of fire-clay or other refractory material, which forms the crown or top of an inclined furnace flue or flame bed, constructed in the lower fire-clay portion of the furnace, the under side of the slab being formed with heat-deflecting ribs. The bath is surrounded by fire-clay slabs, encased in an envelope of thin sheet steel and bound together by hoops, the level of the liquid in the bath being maintained by a supply from a drip cock and regulated by an overflow pipe. The steam generated in the tank passes into a condensing coil, the water of condensation being returned to the tank. A tray resting on the top of the tank and casing is formed with a number of circular recesses, to receive metallic or other saucers containing the liquid to be treated. The furnace is heated by a burner generating a flame of liquid hydrocarbon and air under pressure, or hydrogen and air.

—R. A.

II.—FUEL, GAS, AND LIGHT.

Alcohol; Industrial Uses of [Fuel and Light] ——, *in Germany.* G. Arachequesne. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **19**, [3], 243—259.

The author describes special forms of apparatus for the application of alcohol to the purposes of illumination, heating, and motive power.

In order that the vapour of alcohol may burn, it requires to be mixed with 7·368 times its weight of air, and, consequently, to prevent the condensation of the vapour produced, it must either be superheated, or the air must be heated.

For household purposes, the alcohol is brought to the vaporising chamber, either by a wick or by pressure from a reservoir, and is there heated, either by the flame itself or a side jet. A litre of alcohol gives approximately the same heating effect as a cubic metre (about 34 cb. ft.) of gas. The mouth of the can or holder for the alcohol is covered with two layers of wire gauze. With such a vessel, alcohol may be poured even on a flame without danger.

In burning by means of a Bunsen burner, the mixture of air and alcohol must be superheated before being ignited. This precaution serves to mark the superiority of alcohol over petroleum. All the hydrocarbides used for heating and illumination—acetylene, illuminating gas, petroleum spirit, benzene, alcohol, acetone, toluene, petroleum — dissociate and give a deposit of carbon at a temperature between 325° and 350° C. The problem is complicated by the vaporising and superheating necessary with liquid hydrocarbons. But if the solution of the problem of superheating be easy with liquids boiling at about 80° C., as alcohol, benzene, or petroleum spirit, since before reaching the critical point of dissociation there is a margin of 250°, it becomes impossible with petroleum, which, boiling at a temperature of about 250° C., requires, besides a previous mixing, 10 to 12 times its weight of cold air.

Thus, whilst alcohol can be burned in a Bunsen, it is impossible to do so with petroleum.

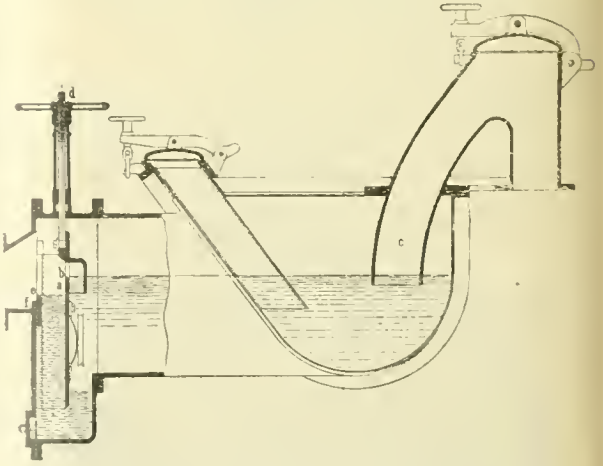
Whilst the exhaust gases from motors or engines working with petroleum, give a disagreeable smell, those from alcohol similarly used yield coal gases, and have scarcely any perceptible smell. In spite of the inferiority of the calorific power of alcohol, it may compare favourably with petroleum, since the heat units transformed into work in the cylinder are greater; there is therefore much less heat lost than with petroleum. Of 100 heat units developed by alcohol, 23·8 are transformed into mechanical work; with petroleum, only 13 per cent. The cost per horse-power is thus about equal (Germany), the calorific power of petroleum being almost double that of alcohol.

There is divergence of opinion as to the best mixture of alcohol, water, and benzene to be used for motors, the average horse-power of which varies from 4 to 12. The cost per horse-power hour is from 1·6*d.* to 2*d.* A disadvantage of alcohol is the action which liquid alcohol, even when pure, has upon iron, zinc, and aluminium in the presence of air. The valve of the vaporiser is therefore of bronze, which metal is not attacked. The containing vessels and pipes are of copper or tinned iron. At Ferrières, on a motor of 6 horse-power, the consumption of alcohol was 438 grms. of denatured alcohol per horse-power per hour.—L. J. de W.

Tar Exit for Hydraulic Mains; Adjustable Drory's ——. J. f. Gasbeleucht. 1901, **44**, [49], 918—919.

Drory's tar off-take is commonly attached to hydraulic mains in gas works for the purpose of effecting the outflow of tar from the hydraulic main before the ammoniacal liquor escapes. Its aim is to keep the hydraulic main free from tar, and the liquor at a constant level therein, so that the depth of seal of the dip-pipes in the liquor in the main is uniform. But the height of the edge, over which the tar flows off, only is adjustable, and the depth of liquor in the hydraulic main is consequently affected by a decrease in the fluidity of the tar, or by changes in the specific gravity of the liquor. Hence actually the dip-pipes do not remain sealed to a constant depth in the liquor.

Menzel has devised an adjustable off-take (Ger. Pat. 125,595), which overcomes these faults of the ordinary Drory arrangement. It is shown in the annexed figure, in which *a* is an adjustable barrier, having a slit *b*, through which the liquor flows away from the hydraulic main, and the height of which determines the depth to which the dip-pipes are sealed. The tar flows away from the hydraulic main beneath the barrier *a*, and over the upper edge of the slide *e*, which moves up and down in unison with the barrier *a*, but drops below the upper edge *f* of the socket, before the barrier *a* reaches its lowest position. Hence the



tar rises relatively to the liquor on the hydraulic main side of the barrier *a* when that barrier is brought to a lower position than that which corresponds to a normal seal of the dip-pipes of, say, about 20 mm., but when the barrier *a* is fixed to give the normal seal, the tar flows away and cannot accumulate in the hydraulic main. In the event of the tar thickening, its level rises on the hydraulic main side of the barrier *a* until the greater pressure thus caused, forces it under the barrier, while the level of the liquor remains unaffected.

Provision is made by means of a shoot, extending beneath the surface of the liquor, and having a self-closing lid, for access to the bottom of the trough while work is proceeding, in order to remove any tar which has become too hard to flow away.

The advantages claimed for Menzel's arrangement are:—(1) That tar cannot collect in the hydraulic main; (2) that the depth of seal of the dip-pipes can be fixed directly, and read off on the regulating spindle; (3) that it remains as so fixed; and (4) that the yield of gas is increased, and the deposition of scurf reduced, owing to the reliable and uniform working of the settings which results from its adoption.—J. A. B.

Gas; Modification of Schilling's Apparatus for Determining the Specific Gravity of ——. F. Pannertz.

See under XXIII., *page* 139.

ENGLISH PATENTS.

Mixing Liquid Fuels of Different Specific Gravities; Process and Apparatus for ——. H. Praetorius, Breslau, Germany. Eng. Pat. 20,760, Oct. 16, 1901.

A POROUS material, such as kieselguhr, is placed in a receptacle, and the liquids are added in the determined proportions. The specifically lighter liquid is first allowed to soak in, and the heavier then added. The liquids thus contained in the pores of the finely divided material, are stated to yield a practically permanent gas, suitable for working motors, in accordance with their composition. A mixing receptacle, with outlet pipe for the gas, is described. In this pipe is a device for mixing dry air with the gas. The mixture passes to the motor or elsewhere for use.—J. A. B.

Gas Producers. P. Naet, New York, U.S.A. Eng. Pat. 23,044, Dec. 17, 1900.

AIR is forced beneath the bars of a gas producer consuming bituminous fuel. Some of the gas is drawn off through outlets a little above the bars, and is led to a combustion chamber. Water or steam is admitted to the producer above these outlets. The fuel is mechanically fed in at the top, and is kept mixed by rotating bells suspended from the cover, the supporting pipes being preferably water-cooled. Gas is withdrawn from the top of the furnace, and by-products may be separated from it. It is then sent to the combustion chamber already mentioned, which also receives a supply of air. Thus, all the fuel is finally burned without producing smoke. The burning gases from the combustion chamber are used to heat a steam boiler. In a modification, the bituminous fuel is burned in a fireplace in the boiler, but before reaching the fireplace, it passes down a gas-producer, and the gas withdrawn from the top of the producer is also led to the grate. Air is forced into the burning fuel.—R. S.

Combustible Gas; Manufacture or Production of ——. J. Radcliffe, Wrexham. Eng. Pat. 21,376, Oct. 24, 1901.

THE fuel for producing this gas is caused to slowly descend the rotary chamber in the apparatus described in the following abstract, whilst air, or a mixture of air and steam, is passed upwards.—R. S.

Combustible Gas, Calcining or Roasting Ores, and other Substances, and for other Purposes; Apparatus suitable for the Manufacture or Production of ——. J. Radcliffe, Wrexham. Eng. Pat. 21,377, Oct. 24, 1901.

THE apparatus consists of an inclined rotary roasting-, or calcining-chamber, which communicates at its top end with a stationary chamber having a gas outlet, and a feeding device for fuel comprising two adjustably telescopic tubular parts, the lower edge of which is always kept beneath the fuel level in the chamber. The lower tube may be protected by being provided with a water jacket. At the bottom of the rotary chamber there is a bridge, and an inlet for air, steam, or combustible gas, or vapour. The ashes pass over the bridge to a trapped outlet.—R. S.

Gas or Vapour; Production of ——, *for use with Explosion Engines, and other Purposes.* A. Hayes, Salt Lake City, U.S.A. Eng. Pat. 5757A, March 19, 1901.

HYDROCARBON oil is vaporised by forcing it in a fine stream or spray through a flame; air is mixed with the vapour formed by the action of the flame upon the spray, and the mixture is led to a gas engine. There are provided for these operations, a mixing tube, means for forcing a fine stream or spray of oil into this tube, a device for maintaining a vaporising flame within the mixing tube about the spray of oil, and means for supplying air above the flame to mix with the vapour generated.—R. S.

Acetylene Gas; Apparatus for Generating ——. W. W. Clark, Stratford, Essex, and G. Bone, Manor Park, Essex. Eng. Pat. 22,782, Dec. 13, 1900.

THE carbide holder, forming part of the apparatus described under Eng. Pat. 18,590 of 1899 (this Journal, 1900, 815), is subdivided in such a way that each compartment is surrounded by water. A special cover for the holder is also described.—J. A. B.

Acetylene Generators. J. Shackleton, Larne, and A. Ross, Ballyclare, both in co. Antrim. Eng. Pat. 22,960, Dec. 15, 1900.

TRAYS containing carbide, mounted stepwise about a central rod within a tank in which a bell is sealed, are supplied, from the lowermost one upwards, with water from a spout, which delivers on to the top of the bell. The water runs down the outside of the bell and then rises within it. There may be a water tank in the crown of the bell, and there is a cock on the supply of water to the spout, operated by the rise and fall of the bell.—J. A. B.

Acetylene Gas Generators. J. A. Burgess, Bradford, Ontario, Canada. Eng. Pat. 240, Jan. 3, 1901.

CARBIDE is fed at intervals, as required, through an opening, provided with a cover, in the top of a closed vessel, on to a conveying belt within the vessel, the lower part of which contains water. The belt is moved forward by an external crank, operated by hand or automatically, so as to precipitate the carbide into the water at a suitable rate.—J. A. B.

Acetylene and other Gases; Apparatus for the Manufacture of ——. J. J. Hendler, Kansas City, U.S.A. Eng. Pat. 15,846, Aug. 6, 1901.

A GENERATING chamber, divided horizontally into cells, each containing calcium carbide, is supplied with water from tipping cups, one mounted above each cell and communicating therewith by an S-shaped pipe, which furnishes a water seal. The cups are tipped in turn through mechanism operated by a rod attached to the bell of the gasholder, according to the movements of the latter. The gas, on its way from the generating chamber to the gasholder, bubbles through water in a chamber at the base of the holder.—J. A. B.

Incandescent Gas Burners. C. P. Ehmann, Manchester. Eng. Pat. 15,185, July 26, 1901.

WITHIN the mixing tube of an incandescence gas burner of the usual commercial form is suspended a helix of wire, preferably of copper wire.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

ENGLISH PATENTS.

Tar; and Apparatus therefor; [Continuous] Distillation of ——. J. Meikle, Glasgow. Eng. Pat. 2105, Jan. 30, 1901.

THE patentee employs three or more flat-bottomed stills heated by means of the waste gases from superheater furnaces, and connected in series. The stills contain a tubular portion for distilling the tar by superheated steam, and the process is assisted by passing live steam directly

into the stills through a perforated coil. The head of each still is cylindrical and connected with a condenser. The tar, after losing its lighter portions in the first still, heated by waste steam from the second still, is pumped into the second still, where it gives off its less volatile constituents, and finally into the third still, in which the final distillation is effected, and from which the finished tar is continuously pumped. The superheated steam passes into the third still round the outside of the tubes containing the tar, and thence to the second still, after, if necessary, passing through a second superheater. It finally heats the first still. A vacuum is kept in all the stills by means of a pump, and the flow of tar and distillation is conducted at such a rate that the contents of the first still remain at about the same consistency.—T. A. L.

Mineral Oils and their Distillates; Refining of Crude ——. F. C. Thiele, J. M. Parker, and J. F. Finke, New Orleans, U.S.A. Eng. Pat. 19,029, Sept. 24, 1901.

The process described is especially applicable to the refractory crude mineral oils found in the Trenton limestone formation, more particularly those discovered in the Southern States, such as Texas, Louisiana, and California, and referred to in general as oils of the Lima type. The oil is treated with 0·5—1·5 per cent. (by weight) of nitric acid (sp. gr. 1·42) until there is no further evolution of sulphurous acid, and the oil no longer gives a precipitate with tetrachloride of tin, showing the absence of terpenes and polyterpenes (F. C. Thiele, this Journal, 1900, 138). After washing with water until free from acid, the oil is agitated with a substance capable of evolving nascent hydrogen, such as soda-lye and a mixture of zinc dust and powdered iron, until a sample mixed with a small quantity of sulphuric acid (57° B.), no longer evolves nitrous fumes. The oil is then washed with water and finally, with dilute sulphuric acid until it no longer colours the latter.—T. A. L.

IV.—COLOURING MATTERS AND DYESTUFFS.

Yellow Dyestuff [*Canarine*] *obtained from Sulphocyanide Salts; Sulphocyanogen, so-called Pseudosulphocyanogen and the* ——. A. Goldberg. J. prakt. Chem., 1901, **64**, [21, 22], 439—470. (See also this Journal, 1901, 113, 238, 798, 1103.)

Canarine, prepared on the technical scale, is found on analysis to have the formula before given—$H_6C_8N_8S_7O$. When heated with excess of caustic potash for some hours, a portion of the sulphur is substituted by oxygen, and a dyestuff of less value is obtained. By the action of alkali hydroxides or hydrosulphides at 150°—180° C., Canarine is destroyed, ammonia, sulphuretted hydrogen, and carbon dioxide being produced. Decomposition also occurs on heating with ammonia, ammonium sulphide, or aniline at 150°—180° C. On warming, aqueous ammonia dissolves the free dyestuff; the solution dyes cotton similarly to the solutions in fixed alkalis. Water at 100° C. in a sealed tube does not alter the dyestuff, but at 180° C. ammonia, sulphuretted hydrogen, carbon dioxide, sulphur, a soluble (probably cyanuric acid) and an insoluble organic compound were produced. Strong hydrochloric acid at 150°—180° C. yields cyanuric acid; the reaction may be $H_6C_8N_8S_7O + 11H_2O = 2C_3N_3O_3H_3 + 6H_2S + S + 2NH_4HCO_3$. Canarine is only slightly decomposed at 150°—160° C.; at high temperatures, water, sulphur, and sulphuretted hydrogen are evolved and Liebig's mellon, C_9N_{12}, remains.

The sodium and potassium salts of Canarine appear to contain amounts of alkali metal representing not more than one-third of the total hydrogen in the free colouring matter, and therefore only that fraction may be considered as replaceable by those metals. The salts swell up considerably on washing, and are partially hydrolysed. On heating with water in a sealed tube, the dissociation is practically complete. Salts of the alkaline earths and heavy metals give precipitates with aqueous solutions of the alkali salts of Canarine. Canarine, both alone and when dyed on fabrics, is not affected by stannous chloride or zinc dust and caustic soda.

On acidifying the alkaline filtrate from the sodium salt of Canarin, as obtained in the process of manufacture, a very voluminous precipitate is obtained, which shrinks in drying to form a pale yellow and coherent mass. The quantity of this by-product amounts to somewhat more than one-third of the dyestuff obtained in the same operation. It contains large quantities of free sulphur; on long boiling with caustic soda it evolves a little ammonia, and on heating with strong hydrochloric acid at 150° C., cyanuric acid, ammonia, and much sulphuretted hydrogen are produced. When heated in a sealed tube with potassium hydrosulphide, the yellow by-product gives dithiomelanuric acid—

$$H_4C_3N_4S_2O + H_2S = S + H_2O + H_4C_3N_4S_2.$$

Ammonia and ammonium sulphide in a sealed tube at 100° C. yield thio-ammelin—

$$H_4C_3N_4S_2O + NH_3 = S + H_2O + H_5C_3N_5S.$$

The following is a brief summary of the more important conclusions drawn by the author:—

The formation of Canarine is represented by the equations—

$$x\text{KSCN} + x\text{Cl} = x\text{KCl} + (\text{CNS})x\,;\ (\text{CNS})_{12} + 6H_2O = H_6C_8N_8S_7O + H_4C_3N_4S_2O + \text{COS} + H_2S_2O_3\,;$$
$$2\text{COS} + H_2S_2O_3 = H_2O + 4S + 2CO_2.$$

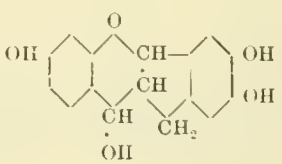
Different isomeric or polymeric modifications of cyanogen sulphide are obtained at different temperatures by the action of dry halogens on dry sulphocyanides. Only the product obtained at 150° C. yields the dyestuff in good quantity. The so-called "pseudosulphocyanogen," obtained from aqueous solutions of sulphocyanides by the action of halogens, nitric acid, &c., is quite different from sulphocyanogen. The "pseudosulphocyanogen" differs slightly in composition and properties, according to the method of its formation. The dyestuff obtained by the action of alkalis on these various products is always identical, but the yield from "pseudosulphocyanogen" is very small. The latter substance probably contains small quantities of sulphocyanogen, from which alone the dyestuff is derived.

—A. C. W.

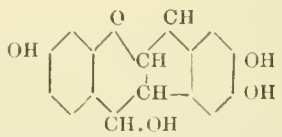
Brasilin and Hæmatoxylin. Part VI. The Constitution of Brasilic Acid, of Brasilin and of Hæmatoxylin. W. H. Perkin, jun. Proc. Chem. Soc. **17**, [244], 257—259.

In part I. of this research (A. W. Gilbody, W. H. Perkin, jun., and J. Yates (this Journal, 1900, 40 and 528) it was argued that since trimethyl-brasilin on oxidation with permanganate yields 2-carboxy-5-methoxyphenoxyacetic acid and meta-hemipinic acid, the constitution of brasilin must be represented by one of the following formulæ:—

I.



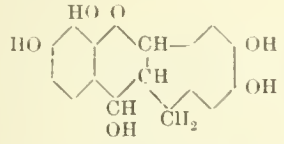
II.



In order to decide between these two formulæ, the author has submitted brasilic acid to a detailed examination, and has obtained results which show clearly that formula I. must be accepted as representing the constitution of brasilin.

It has already been shown (this Journal, 1900, 40 and 528) that tetramethyl-hæmatoxylin, on oxidation with per-

manganate, gives products which are exactly similar to those obtained from trimethyl-brasilin, and there can, therefore, scarcely be a doubt that the constitutional formula of hæmatoxylin is—



English Patents.

New Sulphonic Acids and Colouring Matters therefrom; Manufacture of ——. [*Dyestuffs, Azo-*] H. H. Lake. London. From K. Oehler, Offenbach-on-Main, Germany. Eng. Pat. 22,297, Dec. 7, 1900.

The interaction between alkali sulphites and diazotised aminohydroxy compounds yields derivatives of the following typical constitution, $(SO_3H)_n.OH.X.N:N.SO_3H$, in which X represents a benzene or naphthalene radicle. These substances, which are very soluble, are termed "sulphonic-diazo-phenol (or naphthol)-sulphonic acids," and on combination with diazo- or tetrazo-compounds yield azo dyestuffs. In the case of the latter, the intermediate compounds formed in the first stage of the reaction will react under suitable conditions in the second stage with a different component from that employed at first, yielding mixed disazo compounds.—T. A. L.

Black Colouring Matter Directly Dyeing Cotton; Manufacture of ——. C. D. Abel, London. From The Actienges. für Anilin Fabrikation, Berlin. Eng. Pat. 330, Jan. 5, 1901.

Already abstracted (Fr. Pat. 306,876; this Journal, 1902, 45).—T. A. L.

Colouring Matters of the Anthraquinone Series; Manufacture and Production of——. [*Dyestuffs, Anthracene.*] J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1357, Jan. 21, 1901.

Already abstracted (Fr. Pat. 307,104; this Journal, 1902, 42).—T. A. L.

Naphthalene Compounds (Tetrahydroxynaphthalene) and their Employment in Dyeing and Printing; Manufacture and Production of ——. [*Dyestuffs, Napthazarine.*] J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 23,887, Dec. 31, 1900.

Already abstracted (Fr. Pat. 307,554; this Journal, 1902, 42).—T. A. L.

Colouring Matters of the Anthracene Series; The Manufacture and Production of ——. [*Dyestuffs, Anthracene.*] J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1358, Jan. 21, 1901.

An extension of Eng. Pats. 7591 and 25,080 of 1899 (this Journal, 1900, 341 and 1102). Already abstracted (Fr. Pat. 308,661; this Journal, 1902, 42).—T. A. L.

Diphenyl Derivatives; Manufacture of ——. F. Ullmann, Geneva, Switzerland. Eng. Pat. 1766, Jan. 25, 1901. (See Fr. Pat. 307,467; this Journal, 1902, 38.)

—T. A. L.

Colouring Matters [Grey, Black] Directly Dyeing Cotton; Manufacture of ——. C. D. Abel, London. From The Actienges. für Anilin Fabrikation, Berlin. Eng. Pat. 2188, Jan. 31, 1901.

Already abstracted (Fr. Pat. 307,719; this Journal, 1902, 45).—T. A. L.

Black Colouring Matters; Manufacture of Substantive ——. [*Dyestuffs, Sulphide.*] J. Imray, London. From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis. Eng. Pat. 999, Jan. 15, 1901.

This specification is an extension of Eng. Pats. 18,409 of 1899 and 1150 of 1900 (this Journal, 1900, 658 and 1102). The patentees now find that there may be employed, in place of the diamino or aminohydroxy-derivatives or mixtures already mentioned, other diamino, aminohydroxy-, or dihydroxy-derivatives of secondary amines containing two similar or different aromatic nuclei, and also substituted derivatives of these substances containing, for example, NO_2, SO_3H, CO_2H groups, and the like. They also include the leuco compounds of indophenol dyestuffs. For example, 200 kilos. of commercial sulphur chloride are added, drop by drop, to 160 kilos. of phenol in the cold. When the evolution of hydrochloric acid has ceased, the mixture is heated to 150°—160° C. and treated with 130 kilos. of *p*-amino-*o*-nitro-*p*-hydroxydiphenylamine (obtained by reducing the corresponding *p*-hydroxydinitrodiphenylamine with sodium sulphide on the water-bath), the whole being then heated to 170°—190° C., with constant agitation. After mixing with 500 kilos. of sodium sulphide fused in its water of crystallisation, the mass is heated to about 180° C. in an oil-bath kept at 200° C., with constant agitation, for five hours, until it solidifies. The hard, brittle mass is insoluble in acids, but soluble in water, and dyes unmordanted cotton at the boil greenish-black shades, which on oxidation become deeper black.—T. A. L.

Blue Dyestuffs; Manufacture of ——. [*Dyestuffs, Sulphide.*] J. Imray, London. From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, Paris, France. Eng. Pat. 2839, Feb. 9, 1901.

An extension of Eng. Pat. 999 of 1901 (see above). Already abstracted (Fr. Pat. 292,400; this Journal, 1902, 40).—T. A. L.

French Patents.

Indoxyl Derivatives [Indigo] from Aromatic Glycines; Manufacture of ——. Deutsche Gold und Silber-scheide-Anstalt vorm. Rossler. Fr. Pat. 312,763, July 17, 1901.

The patentees obtain indoxyl by fusing the sodium salt of phenylglycin or of its *o*-carboxylic acid with sodium amide at about 180° or 250° C. Heumann used caustic potash and had a poor yield because the alkali destroyed much of the indoxyl at the temperature employed (250°—350° C.), as soon as it was formed. The use of sodium-amide thus means at once a lower temperature and a less drastic action, and consequently a larger yield. Sodium or potassium cyanide may be added as a diluent to the melt, but these products do not take any part in the reaction. In the first example mentioned, the products are indoxyl, sodium oxide, and ammonia, and the finished melt, on treatment in the usual manner, yields Indigo.—T. A. L.

Blue Dyestuff of the Anthracene Series; Production of a ——. [*Dyestuff, Anthracene.*] The Badische Anilin und Soda Fabrik. Fr. Pat. 309,503, Supplement, July 10, 1901.

The blue dyestuff obtained, according to the chief patent (this Journal, 1902, 42), is insoluble in water and has no affinity for wool or silk. It is now found that on heating it with fuming sulphuric acid (12 per cent. SO_3) in presence of boric acid to about 130° C., it is converted into a soluble product. On oxidation with chromic or nitric acid, it yields a yellow substance which dyes wool bluish-green shades. Instead of sulphonating the original blue dyestuff, the same sulphonic acid or one of its isomerides may be obtained by reacting with caustic potash on β-aminoanthraquinone sulphonic acid at 150°—175° C. in an oil-bath, the sulphonic acid group under these conditions remaining intact. The dyestuff may also be rendered soluble by treating the unsulphonated product with caustic soda-lye and sodium hydrosulphite at about 60°—70° C. The solution so obtained deposits on cooling, small needles of the sodium salt of the leuco product which in paste form can be employed directly, together with a suitable thickening, for calico printing.—T. A. L.

Dyestuff capable of being Chromed on the Fibre; Production of a Disazo ——. [*Dyestuff, Azo-.*] The Badische Anilin und Soda Fabrik. Fr. Pat. 312,899, July 22, 1901.

Sodium *p*-hydroxybenzyl sulphonate is converted by the action of nitrosulphuric acid into its dinitro derivative. This, on reduction, yields diamino-*p*-hydroxybenzyl sulphonic acid, which, on treatment with nitrous acid, forms a tetrazo compound capable of combining with two molecular proportions of β-naphthol. The resulting product dyes wool brownish-violet shades, which, on chroming, become blackish-blue. Very level shades are obtained, very fast to fulling, washing, light, boiling water, and steaming.—T. A. L.

Dyestuff. Red; Production of a ——. [*Dyestuff, Azo-.*] The Badische Anilin und Soda Fabrik. Fr. Pat. 313,533, Aug. 16, 1901.

Tetrazo-diphenyl is combined with sodium phenol *o*-sulphonate in alkaline solution, the intermediate compound formed being subsequently combined in acetic or weak hydrochloric acid solution with γ-aminonaphthol sulphonic acid. The dry dyestuff forms a bright greenish powder, readily soluble in water to a bluish-red solution. It gives bright red shades on wool very fast to washing, fulling, and light, more especially after chroming. The resistance to light surpasses that of any known azo dyestuffs, and on wool rivals even that of Alizarin.—T. A. L.

Dyestuffs of the Acridine Series; Manufacture of New ——. [*Dyestuffs, Acridine Series.*] Manuf. Lyon. de Mat. Col. Fr. Pat. 312,771, July 16, 1901.

Very valuable dyestuffs for tannined cotton and leather are obtained by reacting with formaldehyde and *m*-diamines on dyestuffs of the acridine series, such as Acridine Yellow (3.6-diamino-2.7-dimethylacridine) or Benzoflavine (3.6-diamino-2.7-dimethyl-9-phenylacridine). The products are faster to alkalis and light than the original derivatives, and being more basic have a greater solubility. It is, however, not necessary to start from the finished dyestuff, but the new derivatives may be obtained by heating together in presence of acids, equimolecular proportions of tetra-aminoditolylmethane, formaldehyde, and tolylene diamine, and subsequent oxidation, though under these conditions the reaction does not proceed so smoothly, and a certain amount of Acridine Yellow is formed. The hydrochloride of the new dyestuff behaves characteristically when dissolved in concentrated sulphuric acid, giving a dark-red colour, whilst Acridine Yellow gives a yellow solution.
—T. A. L.

Blue Dyestuffs for Wool; Manufacture of ——. [*Dyestuff, Azo* ——.] Manuf. Lyon. de Mat. Col. Fr. Pat. 313,119, July 30, 1901.

The azo dyestuff obtained from diazotised *o*-chloro-*p*-nitraniline and 1.1′.3.3′- or 1.1′.2.4-dihydroxynaphthalene disulphonic acid is reduced with sodium sulphide, and the resulting amino compound is alkylated or benzylated. The product dyes evenly, and is fast to alkalis and light.
—T. A. L.

Greenish-Blue Dyestuffs; Production of Sulphurated ——. [*Dyestuffs, Sulphide.*] Manuf. Lyon. de Mat. Col. Fr. Pat. 313,306, Aug. 6, 1901.

According to Fr. Pat. 303,524 (this Journal, 1902, 41), sulphuretted pure blue dyestuffs (Immedial Sky Blue) are obtained from dialkylamino-*p*-hydroxydiphenylamine by the action of alkaline polysulphides. The patentees now find, on adding copper sulphate to the melt, that a dyestuff is obtained giving greenish-blue shades on cotton from a bath containing sodium sulphide, fast to washing and light.—T. A. L.

Azo Dyestuffs for Wool giving Blue Shades in Presence of Copper Salts; Manufacture of ——. [*Dyestuffs, Azo-.*] Actiengesellschaft für Anilinfabrikation. Fr. Pat. 312,792, July 7, 1901.

The 2.6-dinitro-*p*-cresol melting at 35° C. is reduced with ammonium sulphide, yielding 2·6-nitroamino-*p*-cresol ($OH:NO_2:NH_2:CH_3 = 1:2:6:4$) melting at 127° C. This product, after diazotising, is combined in an alkaline solution with 1.1′.2.4- or with 1.1′.3.3′-aminonaphthol disulphonic acid. The resulting dyestuffs give fast blue shades on wool from acid baths containing copper salts.
—T. A. L.

Ortho-Toluene Chlorosulphonic Acid; Manufacture of ——. Les Fabriques de Produits Chimiques de Thann et de Mulhouse. Fr. Pat. 312,797, July 17, 1901.

Fuming sulphuric acid gives, with toluene at a low temperature, a mixture of *o*- and *p*-toluene sulphonic acid, from which the latter can be separated, according to Ger. Pat. 57,391, Sept. 23, 1890, by adding a small quantity of water. The mother-liquors contain nearly all the *o*-sulphonic acid, which, after liming out and converting into the sodium salt, can be converted into *o*-toluene chloro-sulphonic acid by phosphorus pentachloride.

The patentees claim a new method for this manufacture:—

1. By a second addition of water to the sulphonation mixture and long cooling the ortho-acid is separated in a pure state.

2. By treating the magnesium salt of the so obtained acid with chloro-sulphuric acid, in order to obtain the ortho toluene sulphonic chloride—

$$[C_6H_4.CH_3.SO_3]_2Mg + 2SO_3HCl = 2C_6H_4.CH_3.SO_2Cl + MgSO_4 + H_2SO_4.$$

The yield from 184 parts of toluene is given as 126 parts.
—F. N.

Halogen Derivatives in the Anthracene Series; Manufacture of ——. F. Bayer and Co. Fr. Pat. 313,124, July 31, 1901.

Anthrarufin, chrysazin, and erythro-oxyanthraquinone, when treated in a suitable diluent or solvent, with gaseous or nascent halogens, yield *p*-dihalogen derivatives.
—T. A. L.

Dyestuffs [Indole]; Manufacture of New Basic ——. F. Bayer and Co. Fr. Pat. 308,033, Supplement, Aug. 12, 1901.

Similar dyestuffs to those described in the chief patent (this Journal, 1902, 41) are derived from α-methyl- or α-phenyl-indole derivatives alkylated in the imino group. The products can also be obtained by condensing *p*-diaminodiphenylcarbinol or its derivatives with derivatives of α-methyl- or α-phenyl-indole, alkylated in the imino group, or with derivatives containing alkyl groups or halogen in the benzene ring, the resulting leuco bases being finally oxidised. The products dye wool, silk, and tannined cotton from neutral or slightly acid baths, giving red, violet, and blue shades, fast to dilute acids and to alkalis.
—T. A. L.

Dyestuffs for Cotton; Manufacture of ——. [*Dyestuff, Sulphide.*] Chemische Fabriken vorm. Weiler ter Meer. Fr. Pat. 310,713, Supplement, July 29, 1901.

The patentee corrects some errors in quantities in the chief patent (this Journal, 1902, 39), and characterises more particularly the dyestuffs obtained. For example, 12 kilos. of *p*-amino-dinitrodiphenylamine, or the corresponding amount of diaminonitrodiphenylamine, 60 kilos. of crystallised sodium sulphide, 20 kilos. of sulphur, and 20 litres of water, are heated, after adding 12 kilos. of glycerin for 20 hours, so that the melt is kept at 125° C. The product so obtained dissolves to a violet solution and gives dark blue shades on cotton. If the heating be prolonged, a black dyestuff is formed. Those dyestuffs obtained by prolonged heating show a great fastness to washing and are also improved by a subsequent treatment with metallic salts.
—T. A. L.

Dyestuffs [Black] containing Sulphur; Manufacture of Soluble ——. [*Dyestuff, Sulphide.*] Chemische Fabriken vorm. Weiler ter Meer. Fr. Pat. 313,052, July 29, 1901.

The products obtained, according to Fr. Pat. 310,713 (this Journal, 1902, 39) and its supplements (see above), are unstable substances. When exposed to the air in a finely divided state they undergo oxidation, yielding stable dyestuffs, the bluish-black of the previous patent giving, after this treatment, a greyish-black.—T. A. L.

Dyestuffs [Blue] of the Triphenyl- or of the Diphenyl-naphthylmethane Series; Production of New ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 313,500, Aug. 14, 1901.

These products are obtained by condensing tetra-alkyl-diaminobenzophenone with *m*-tolyl-α- or -β-naphthylamine, their alkyl or benzyl derivatives by means of phosphorus oxychloride with or without a suitable diluent. The products are subsequently sulphonated, if necessary, by treatment with fuming sulphuric acid. The dyestuffs are distinguishable from those of the Victoria Blue type by their stability to alkalis.

The naphthylamine derivatives referred to are new products and have the following characteristics. *m-Tolyl-α-naphthylamine* obtained by heating together α-naphthylamine or α-naphthol and *m*-toluidine hydrochloride is a yellow oil boiling at 355° C. under 140 mm. pressure. *Methyl-m-tolyl-α-naphthylamine* is an oil boiling at 340° C. under 120 mm. *m-Tolyl-β-naphthylamine* crystallises from alcohol in shining white leaflets melting at 70° C. and on methylation yields *methyl-m-tolyl-β-naphthylamine*, boiling at about 350° C. under 120 mm.—T. A. L.

Dyestuffs [Blue] of the Triphenylmethane Series; Production of New ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 313,565, Aug. 17, 1901.

Blue dyestuffs for wool, which give bright shades and are stable to alkalis, are obtained by condensing an alkyl-benzyl-*m*-toluidine sulphonic acid with formic aldehyde and oxidising the dialkyldibenzyldiaminoditolylmethane disulphonic acid so formed, together with dimethylaniline or dimethyl-*m*-toluidine. An alternative method is to condense an alkyl-benzylaniline with formic aldehyde, and oxidise the dialkyldibenzyldiaminodiphenylmethane disulphonic acid so obtained, together with dimethyl-*m*-toluidine.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Artificial Silk. Strehlenert and Westergren. Chem.-Zeit. 1901, **25**, [98], 1100.

The authors, in a communication to the Chemical Society of Stockholm, submitted the results of a comparative examination of the various types of artificial silk and of the processes by which cellulose is converted into this form. They record their opinion as to the relative advantages of the viscose method, an important factor being that wood pulp is the most suitable raw material for this process, and that it further offers the prospect of working up the waste wood, which in the Scandinavian pulp industry amounts to over 40 per cent. of the wood felled.

The following results of determinations of breaking strains are recorded:—

	Absolute Breaking Strain in Kilos. per 1 sq. mm.	
	Air-dry.	Wet.
Natural silk:—		
China raw silk	53·3	46·7
French „	50·4	40·9
„ silk, boiled off	25·5	13·6
„ „ dyed red and weighted	20·0	15·6
„ „ blue black, 110 per cent. weighting	12·1	8·0
„ „ black, 140 per cent. weighting	7·9	6·3
„ „ „ 500 „ „	2·2	..
Collodion "silks":—		
Chardonnet, undyed	14·7	1·7
Lehner, undyed	17·1	4·3
Strehlenert, undyed	15·9	3·6
Pauly, undyed	19·1	3·2
Cross and Stearn, viscose	11·4	3·5
„ „ latest viscose "silk"	21·5	..
Cotton yarn	11·5	18·6

—C. F. C.

Hat Manufacture; Material and Dyes used in ——. E. Frankel. Färber-Zeit. 1901, **12**, [23], 357—361.

Short staple wool, thoroughly freed from grease, and well washed, is moistened with water and glycerin, and then carded. The fine carding machine used in this process is fitted with an apparatus for removing foreign material, such as pelt and burrs, and the spinning is kept distinct from the carding so as to avoid the presence of dust and burrs in the finished material. After spinning, the fibre is felted, acidified with 2—3 per cent. sulphuric acid, milled, and carbonised by heating for several hours at 80° C. The milling is effected with warm water and a little sulphuric acid or soap: with easily milled goods, lukewarm water is employed, but difficultly milled material requires boiling water. All soap or acid has to be removed from the felt, before dyeing, by thorough washing; the acid is best got rid of by a preliminary treatment with very dilute silicate of soda. After washing, the felt is rolled and shaped.

In those cases where the fur of hares or rabbits is employed, the felting is accomplished by the aid of mercuric nitrate or chloride.

The methods used for dyeing the felt should not involve mordanting, as this often causes disintegration, although a slight subsequent treatment with 1—2 per cent. potassium chromate, kept at a gentle boil for 10—20 minutes, or for 30 minutes in extreme cases, is often advantageous in strengthening the material. For hard felts, the best dyestuff, in the author's opinion, is Anthracene Chrome Black F or 5 B; these dyestuffs can be used together, and are shaded by help of Anthracene Yellow B N or Brilliant Milling Green B. For soft felts, Naphthylamine Black 4 B is the best dyestuff; and for loose material, anthracene one-bath dyes are preferable. The loose material dyed in this way is fast to all subsequent operations, such, for example, as milling. A series of dyestuffs is quoted as useful for either loose felts or the finished milled material.

—W. A. D.

English Patents.

Waterproof Fabrics and Imitation Linen Goods from Casein; Manufacture of ——. J. E. Bousfield, London, from F. Cantu, G. Miglioretti, and G. Maffei, Milan, Italy. Eng. Pat. 1160, Jan. 17, 1901.

The specification relates to the manufacture of waterproof materials, resembling fabrics treated with wax, india-rubber, or varnish, or pegamoid, and of imitation linen goods, resembling those made with celluloid, by coating fabrics with casein solutions, and rendering the coating insoluble by exposing the coated materials to the action of formalin vapours.—J. F. B.

Textile Yarns and Threads; Treating ——, *with Liquids;* J. E. Prestwich, Farnworth. Eng. Pat. 1042, Jan. 16, 1901.

The yarns are placed in the form of hanks upon a winch inside a closed vessel, which is provided with inlet and outlet for the liquids employed, and a pipe communicating with a condensing apparatus for vapours generated when volatile solvents are used. When other than atmospheric pressure is applied, the vessel is also connected with a pump.

Sufficient dye or other liquid is run into the vessel to cover the lower portion of the winch, so that, on this being revolved, the yarns become thoroughly permeated. While the operations of scouring or dyeing are proceeding, the winch is turned slowly; afterwards, the liquid unabsorbed by the yarns is withdrawn and the winch is rotated very rapidly to expel from them as much as possible of the liquid by centrifugal action. The drying of the yarns thus commenced, may be completed by heating the interior of the vessel.—E. B.

Dyeing Machine. H. W. Church, Lowell, Mass., U.S.A. Eng. Pat. 22,933, Dec. 4, 1900.

A hollow, perforated, rotary cylinder, provided with longitudinal compartments, is set upon a slightly inclined axis. Textile materials, namely, loose animal, or vegetable fibres, are fed into the cylinder through an opening machine, and, after being treated, are discharged

through a central opening in the lower end of this. They may then be received and further treated in a second similar cylinder placed, end to end, near the first. When it is necessary to mordant and dye the fibres, the first cylinder is employed in the former and the second in the latter of these operations. In some instances, three or more cylinders may be used.

Claims are made for the combination of the above apparatus with suitable opening, feeding and moistening devices, for the purpose of delivering the fibres in a loose, wet state into the cylinders, and with tanks, in which the cylinders revolve, for the reception of the necessary mordanting and dyeing solutions.—E. B.

French Patents.

Discharges upon Sulphur Colours; Production of White and Coloured ——. The Farbenfabriken vorm. F. Bayer and Co. Fr. Pat. 313,413, Aug. 10, 1901.

The sulphur colours, dyed upon cotton tissues, are discharged in pattern by means of sodium chlorate along with the chlorates of aluminium, chromium, and iron. The mordants fixed in the patterns thus obtained are then dyed with suitable dyestuffs, such as Alizarin, Alizarin Orange, Alizarin Blue, Alizarin Heliotrope, Alizarin Cyanin R, Gallocyanin, &c., giving coloured effects. For example, a red pattern on a black ground is produced by dyeing the cotton tissue with Katigen Black and printing with a mixture of 15 kilos. of sodium chlorate, 2 kilos. of potassium ferricyanide, and 56 kilos. of aluminium chlorate solution at 25° B., thickened on the water-bath with 22 kilos. of British gum. After printing, the tissue is steamed for 1—3 minutes, washed and soaped, an excellent white discharge being obtained. The tissue is then dyed with Alizarin in the usual manner from a bath containing Turkey-red oil.—E. B.

Black Colour [of the Aniline Black Class] not turning Greenish; Production on the Fibre of a ——. La Compagnie Parisienne des Couleurs d'Aniline (Farbwerke vorm. Meister, Lucius, and Brüning). Fr. Pat. 313,035, July 27, 1901.

A black which is very fast to soap, alkalis, acids, light, and hot pressing, is obtained upon cotton and silk fabrics by the action of oxidising compounds, such as sodium chlorate and aluminium chlorate with the acetates or hydrochlorides of the amino derivatives or aminohydroxy primary, secondary, or tertiary derivatives of the diphenylamine series, or their homologues. The colour is formed in the absence of oxygen carrying salts, such as vanadium salts and potassium ferrocyanide, upon drying the printed tissue. The steaming or ageing operations, necessary in the case of Aniline Black, may thus be dispensed with. Moreover, a black is obtained with about one-third the quantity of base required in the production of Aniline Black and with very little mineral acid. Also it has no tendency to turn greenish. As an example, 30 grms. of *p*-amino-*p*-hydroxy diphenylamine or an equivalent quantity of a base of one of the above-mentioned classes, are mixed with 100 grms. of acetic acid at 8° B., 30 grms. of acetin, 600 grms. of thickening containing acetic acid, 60 c.c. of aluminium chlorate solution at 22° B., and 180 c.c. of water. The tissue printed with this is dried, steamed for three minutes, washed and soaped.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patents.

Paper Fibres; Process for Dyeing ——. [*Ingrain Papers.*] O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst a/Main. Eng. Pat. 1140, Jan. 17, 1901.

Fibres suitable for the manufacture of coloured papers are treated in a boiling bath, as in the dyeing of cotton, with dyestuffs that directly dye cotton. The fibres may be subsequently treated with metallic salts, diazo compounds, or the like.—H. L.

Paper; Preparation of Coated Printing ——. J. Wezel, Leipzig, Germany. Eng. Pat. 18,942, June 11, 1901.

This invention relates to an improved method for preparing "art" chromo or other colour printing paper by damping the paper before coating it, but in the same single operation, for the purpose of eliminating unevenness in the paper and enabling it to take up the coating colour more efficiently. After leaving the reel, the paper is damped and is guided in a zig-zag course over tension rollers to the coating machine; thence it travels in festoons over the drying apparatus towards the calendering rollers, but is again damped before it reaches these; after calendering, it is conveyed under tension for a considerable distance until thoroughly dried.

The two damping sprays are operated by the same gear which sets the machine in motion and the paper is caused to travel a sufficient distance after damping before reaching the machines, to obtain a uniform distribution of the moisture.—J. F. B.

Dyeing or Producing Colour Patterns in Linoleum, Paper Carpets, Cork Slabs, Bricks, Artificial Flags, and other Materials; Apparatus for ——. C. Tönjes, Germany. Eng. Pat. 20,740, Oct. 16, 1901.

A pattern or design which passes right through the linoleum, or other like material, may be produced in a continuous operation. A drum carrying the colouring matter is divided radially into a number of separate chambers containing the different dyes arranged according to the order or scale of the coloured pattern to be produced. On the forward movement of the band of material, by means of which the drum is revolved, the different chambers of the drum are brought to rest successively on the band of material, and the respective dye is drawn or forced through the material in the usual manner. Either dry or liquid dyes may be used. In order to prevent the dye falling out, the dye chambers are closed to the outside by means of a back pressure valve, or of a porous material such as felt, through which the dye may be forced.—H. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Lead Chamber Process; Reforms in the ——. T. Meyer. Zeits. angew. Chem. **14**, [50], 1245—1250.

The author discusses the physical conditions necessary for the best yield of acid by the lead chamber process.

The successful working of the contact process depends very largely upon the maintenance of that temperature which has been found most favourable for the reaction. A corresponding temperature must exist for the reactions occurring in the chamber process; but this has not been exactly determined, though it probably lies above 50° C. Undoubtedly the great evolution of heat in the process raises the temperature in the chambers above this point, and the velocity of reaction is lower than it would be were the temperature lowered. Observed facts in the working of the process—the better working of the chambers in winter than in summer, the advantage of long pipes, of small chambers, &c—bear out this statement; and it is further confirmed, in the author's experience, with the set of tangential chambers at Harburg (this Journal, 1900, 823). The cooling tubes there described withdraw daily 300,000 cal. from the process, yet there was no fall of temperature in the chamber, the increased speed of reaction making up the loss of heat. The yield of acid from this chamber was increased, after the installation of these cooling tubes, by about 15 per cent.; and 15 per cent. of the total daily heat evolution in the chamber (353,000 cal.) is not very different from the amount absorbed by the cooling-water. The surface of these cooling-tubes is only some 4 per cent. of the chamber-surface exposed to the air; but in a system of tangential chambers now being built, the surface of the cooling tubes in the first chamber will be 14 per cent. of that exposed to air. Should the effect of this be favourable, it will be necessary to go still further in this direction. Obviously, so long as the cooling effect is not noticeable through a fall in the chamber-temperature below that most favourable to the reaction, its result must be increased production of acid, the heat removed being replaced by that

generated by reaction of additional materials. The introduction of these cooling arrangements is not costly; the lead tubes are only slowly affected (as 1½ years' experience shows) by the chamber gases; and, where the heated water produced can be utilised, there may be a saving.

Regarding the reaction in the chamber—

$$2H_2O + 2SO_2 + O_2 \rightleftarrows 2H_2SO_4,$$

so long as the H_2SO_4 produced remains in the gaseous state, as a balanced action, the law of Guldberg and Waage shows that (calling the molecular concentrations, in gram molecules per cb. m. C_{H_2O} *et sim*)—

$$\frac{C^2_{H_2O} \times C^2_{SO_2} \times C_{O_2}}{C^2_{H_2SO_4}} = \text{const.}$$

Now we shall increase the value of this constant, *i.e.*, increase the rate of production of H_2SO_4, and diminish the speed of the inverse reaction, by increasing the concentration of H_2O, SO_2, or O_2, or by decreasing that of H_2SO_4. Detailed calculation shows that the increase of the oxygen concentration, to have any significant result, must be considerable; and as it is only practicable to supply the oxygen as air, this suggestion may be dismissed. Increase of water-concentration (the square of the concentration coming into the calculation) would be more effectual, and theory indicates here an advantage in working the chambers "thinner," and drawing off a weaker acid, than is customary in England. A general increase in the numerator-concentrations could only be effected by diminishing the diluent nitrogen, or by working under compression, neither plan practicable. Diminution of the sulphuric acid concentration means, of course, more rapid withdrawal of the acid by condensation. To do this by cooling is out of the question; but Lunge has already remarked that condensation of the acid is favoured by impact against flat surfaces and by friction. The remarkable difference between the amount of acid condensed in the centre of the first chamber in the installation at Harburg (20 kilos., sp. gr. 1·53, per cb. m.), and that (7·3 kilos., sp. gr. 1·55, per cb. m.) on the average over the whole chamber is no doubt to be ascribed to friction against the edge and walls of the exit tube. Lunge has proposed to take advantage of this fact in his plate-towers; but, as applied to the sulphuric acid process, these do not provide enough cooling surface, and the author would propose rather to construct one of his tangential chambers with cooling tubes exposing a surface, say, half as great as that of the walls and roof. For a chamber of 10 m. diameter and 9 m. high, this would mean about 115 tubes of 62 mm. outside diameter and 8 m. long. There would be in this chamber less surface for impact and friction than in a plate tower, but the amount of cooling surface would much more than compensate for that; and this chamber might be followed in series by a plate tower, which would give the advantage of its great surface for impact and friction at a time when, the reaction being in great part over, heat evolution would be lessened, and less cooling agency would be required. Such an arrangement is to be included in the new plant already mentioned.

The author also suggests the possibility of hastening the condensation of the acid by electrostatic action similar to that of a dust-settler, which might be carried out by insulating the cooling-tubes and charging them alternately, positively, and negatively.

In an ideal plant, the gases from the pyrites burners would pass first into a tangential chamber serving to mix them, to regulate or lessen fluctuations of draught, and to remove dust; they would then divide, passing up two parallel Glover towers, one serving to denitrate the nitrous vitriol and regenerate acid for the Gay-Lussac, the other to concentrate the chamber acid. Thence they would go through a tangential chamber furnished with cooling pipes as described, followed by one or two plate towers fed with weak acid. The end of the system would be one Gay-Lussac tower, or possibly two in series. The weak acid from the plate towers would go with the nitrous vitriol to the one Glover tower, where also would be fed in the nitric acid needed. In considering the reaction in the chambers, the author omitted for simplicity the consideration of the nitric acid; but he points out that the speed of reaction must be, up to a certain point, proportional to the active mass of nitric acid present, and that a liberal allowance of it should therefore be made, and consequently ample Gay-Lussac accommodation provided.

Costs are given of two installations: the three tangential chambers, 10 m. diameter and 8 m. high at Harburg, 1875 cb. m. capacity, cost 34,080 marks; and the whole installation, yielding daily 11 tons of acid of sp. gr. 1·53, and comprising 10 dust-burners, settling chamber, Glover, three chambers, two Gay Lussacs, and all necessary accessories, but without boiler or air-compressor, cost 110,000 marks. Another installation, with six tangential chambers, capacity 2,850 cb. m., cost 170,000 marks. The following table shows the difference between the old and the tangential systems for equivalent production of acid:—

	Old System.	New System.	Difference.
Chamber space	2,800 cb. m.	1,875 cb. m.	925 cb. m.
Ground area (excluding burners).	640 sq. m	440 sq. m.	200 sq. m.
Lead for chambers...	90,200 kilos.	56,200 kilos.	34,000 kilos.
Total cost of apparatus	92,500 marks	78,200 marks	14,300 marks
Cost of ground (5 mks. per sq. m.).	3,200 „	2,200 „	1,000 „
Cost of buildings (60 mks. per sq. m. a section).	35,200 „	26,400 „	8,800 „
Total capital for installation.	131,000 „	107,000 „	24,000 „
Costs per 100 kilos. acid (1·53 sp. gr.).	40 pf.	33 pf.	7 pf.

The difference will be still further increased by the introduction of the cooling arrangements described.—J. T. D.

Ammonia, "Solid"; Production of ——. Chem. Fabrik Bettenhausen Marquart und Schulz, Bettenhausen, Cassel. Ger. Pat. 124,976, Aug. 21, 1900. Zeits angew. Chem. 1901, **14**, [48], 1211—1212.

Claim is made for a process of obtaining a solid substance of alleged great technical value by heating an aqueous solution of ammonia (25 to 33 per cent. NH_3) to about 40° C. and introducing a small quantity (3 to 5 per cent.) of sodium stearate. Potassium stearate or other alkali salts of stearic acid can also be employed, but larger proportions (10 to 20 per cent.) are necessary.—C. A. M.

Metallic Oxides; Action of Carbon Dioxide and Alkali Salts on ——, *and the Relative Strengths of Hydrochloric and Nitric Acids.* O. Kühling. Ber. 1901, **34**, [16], 3941—3945.

The author has made some further experiments in this direction, with the following results:—Mercuric oxide is attacked slightly by sodium chloride solution, and more strongly when carbon dioxide is passed into the liquid, the mercury in the latter case going into solution as chloride and not as bicarbonate. Mercuric oxide is not acted on when suspended in sodium nitrate solution through which a stream of carbon dioxide passes. In the case of lead oxide, rather more action takes place when it is suspended in sodium nitrate solution and carbon dioxide bubbled through the liquid, than with either cupric or mercuric oxide; the amount of nitric acid taken up by the oxide is, however, very small compared with the amount of chlorine separated in a similar manner from sodium chloride solution. From these results it is concluded that nitric acid possesses stronger acid properties than hydrochloric acid. It is found that the chloride solutions contain carbonic acid in a chemically combined condition, whilst in the nitrate solutions only dissolved carbonic acid is present.
—T. H. P.

Chlorates; Process used at Niagara Falls for the Production of Electrolytic ——. J. B. C. Kershaw. Electrician, 1901, **48**, 304—305.

An illustrated description of the cell and process used by the National Electrolytic Co. at their Niagara Falls works

lor production of chlorates, is given. The cell now used is protected by Eng. Pat. 393, 1901 (this Journal, 1901, 482). It is constructed on the filter-press principle, a number of narrow frames, each provided with an anode and cathode, being bolted together to form a composite cell. The anodes are thin sheets of platinum foil supported on metal plates; the cathodes are vertical grids of copper wire. The flow of electrolyte takes place through each cell unit in an upward direction, the flow being regulated to maintain a cell temperature of 50° C., and a percentage of chlorate not rising above 3 per cent. in the solution flowing from the cell. Refrigeration is employed to cause the chlorate to crystallise out from this dilute liquor.

The second part of the author's article is devoted to an examination of the patentee's claims for novel features in this cell. It is shown that two of the claims are weak, the use of a rapid flow of electrolyte, and of open non-diaphragm cells for chlorate production, having been long known and practised. The discovery that chlorate could be produced in an electrolytic cell without the aid of a diaphragm is said not to rest with the patentees, but with Charles Watt, who published it 50 years ago. The chief novel feature of the cell described above, in the author's opinion, is the use of a gridiron type of cathode, in place of the flat cathodes usually employed. These wire cathodes, which hang vertically in the cell, facilitate the escape of the hydrogen liberated at their surface, and thus minimise the losses arising from reduction.—J. B. C. K.

Aluminium; Action of ——, on Salt Solutions and some Fused Salts. C. Formenti and M. Levi. Boll. Chim. Farm. **40**, 689—696. Chem. Centr. 1901, **2**, [25], 1298.

From experiments with salts of antimony, arsenic, bismuth, silver, copper, cobalt, nickel, silicon, boron, gold, platinum, palladium, cadmium, lead, tin, beryllium, cerium, niobium, thorium, zirconium, chromium, uranium, tellurium, ammonium, zinc, iron, manganese, and mercury, the authors conclude that aluminium is superior as a reducing agent to the metals hitherto used. In many cases the aluminium does not completely replace in the salt the displaced metal, and the reduced metal is frequently mixed with more or less aluminium (sometimes as alloy), so in all cases the purity or otherwise of the end product must be ascertained. In some cases the metal separated forms a basic salt or an oxide. With some sulphates the aluminium forms alums. Aluminium acts upon an aqueous solution of aluminium chloride, with evolution of hydrogen and formation of a hydrated subchloride. The reduction of a salt by aluminium takes place the more readily, the larger the difference between the heats of combination of aluminium and the other metal, respectively, with the other component of the salt.—A. S.

Rubidium and Cæsium; Phosphates of ——. E. v. Berg. Ber. 1901, **34**, [17], 4181—4185.

The author has prepared and studied the properties of the primary, secondary, and tertiary phosphates of rubidium and cæsium, which may be readily obtained by mixing aqueous solutions of phosphoric acid and of the hydroxide or carbonate of the metal in the calculated proportions.

Primary rubidium phosphate, RbH_2PO_4, separates from aqueous solution in large, colourless, four-sided prisms containing no water of crystallisation; the salt has an acid reaction to litmus, and the addition of alcohol to its solution causes its precipitation as a voluminous, crystalline precipitate. The secondary phosphate, $Rb_2HPO_4 + H_2O$, is obtained in the form of indistinctly crystalline, hygroscopic granules reacting alkaline towards litmus. The tertiary salt, $Rb_3PO_4 + 4H_2O$, forms very hygroscopic, badly-formed, short prisms giving a strongly alkaline solution. Rubidium metaphosphate, $RbPO_3$, obtained by heating the primary salt, is a white powder differing from the corresponding potassium and sodium compounds by being soluble in water, yielding a neutral solution. The pyrophosphate, $Rb_4P_2O_7$, prepared by heating the dirubidium salt, is obtained as a white, hygroscopic mass giving a neutral aqueous solution.

Primary cæsium phosphate separates in tabular crystals which have a glassy lustre and dissolve readily in water, giving a strongly acid solution. The secondary salt ($+ H_2O$) forms a white, microcrystalline mass, very soluble in water, and differing from the corresponding rubidium compound in not being precipitated by ammonia. The tertiary phosphate crystallises with $5H_2O$ in small, white, hygroscopic crystals having an alkaline reaction. Cæsium metaphosphate is obtained as a difficultly fusible, coarsely granular mass, giving a faintly acid aqueous solution. The pyrophosphate forms a hygroscopic, glassy mass dissolving in water to an alkaline solution.—T. H. P.

Ammonia Solution; Influence of Salts and other Substances on the Vapour-Pressure of Aqueous ——. E. P. Perman. Proc. Chem. Soc. **17**, [244], 261.

The author has investigated the effect produced by urea, mannitol, potassium sulphate, ammonium chloride, and copper sulphate respectively on the vapour-pressure of aqueous ammonia solution by a method similar to that described for sodium sulphate (Trans. Chem. Soc. 1901, **79**, 725; this Journal, 1901, 474). The objects of the research were to find (1) the effect upon the pressure of substances which have no direct chemical action on the ammonia; (2) the effect of rise of temperature on copper sulphate ammonia solution; (3) evidence for or against the existence of hydrates in solution.

The conclusions arrived at by the author are: (1) that salts of the alkalis have a great effect in raising the pressure, but that the effect of other substances which might be expected to have no direct chemical action on the ammonia is either small or nothing.

(2) That copper sulphate forms complexes with ammonia in solution which tend to decompose on heating, especially when the proportion of copper sulphate is small.

(3) The effect of potassium sulphate is similar to that of sodium sulphate in raising the pressure. There is but little reason to suspect the existence of a hydrate of potassium sulphate, as it crystallises without water; consequently it would appear that neither sulphate exists in solution as a hydrate.

Persulphates; Determination of ——. C. A. Peters and S. E. Moody.

See under XXIII., *page* 140.

English Patents.

Sulphuric Acid; Manufacture of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik of Ludwigshafen-on-Rhine, Germany. Eng. Pat. 1904, Jan. 28, 1901.

The sulphuric acid obtained by the catalytic process, described in Eng. Pats. 15,947 and 15,949, 1898 (this Journal, 1899, 831), in which purified gases from the pyrites burners are used, is stated to have been free from arsenic, nitrous compounds, and lead, but to have contained "a small quantity" of iron. The object of the present invention is to obtain the acid practically free from iron, or containing at most 0·003 per cent. of iron. This is effected by passing the gases containing sulphuric anhydride from the catalytic apparatus, into an apparatus, constructed upon the principle of an ordinary wash-bottle, of wrought iron, containing sulphuric acid mixed with *at least* 27 per cent. of anhydride, but preferably with from 30 to 40 per cent., such acid having practically no action on iron. It is necessary to pass in continuously steam, water, or dilute sulphuric acid (not through an iron tube), to maintain the absorbent liquid at the described strength. The dilution of the fuming sulphuric acid, free from iron, thus obtained must not be effected in an iron vessel. As the SO_3 taken from the furnace to the absorber may mechanically carry iron compounds with it, it is prescribed that the gases be freed from these by filtering, or by passage through wide tubes, or by washing with fuming sulphuric acid in an intermediate vessel. The sulphuric acid, free from iron, obtained as described, is stated to be suitable for use in accumulator electric batteries, and in the manufacture of paper, &c.—E. S.

Sulphuric Anhydride; Manufacture of ——, *by the Contact Process.* O. Imray, London. From Farbwerke vormals Meister, Lucius, und Brüning, Hoechst a/Main, Germany. Eng. Pat. 2368, Feb. 4, 1901.

When a mixture in suitable proportions of sulphur dioxide and oxygen is heated in a contact apparatus to the most effective temperature, about 80 per cent. of the SO_2 is converted into SO_3, with liability to the reverse action. But if the mixture of gases be now withdrawn, cooled, and the contained SO_3 absorbed, as by concentrated sulphuric acid, the remaining mixture of gases, on re-heating and passage into the contact chamber, again gives a similar proportional yield of SO_3, so that the total yield of the anhydride is raised to about 96 per cent. of the SO_2 treated.

The hot impure gases, containing SO_2 and O, are passed from the furnace through a dust chamber and a series of purifiers, then through a set of pipes heated from the furnace, and at a temperature preferably exceeding 500° C., into a contact chamber, from which they are passed through a counter-current apparatus, in which they are cooled, giving up their heat to oppositely-flowing gases. The cooled gases then pass through an apparatus in which the SO_3 is absorbed, as by strong sulphuric acid, and are returned to be again heated in the counter-current apparatus, passing thence into a second contact chamber, in which the temperature is regulated by a device described in Eng. Pat. 285, 1899 (this Journal, 1899, 1124). The gases are then treated as before for absorption of the SO_3.—E. S.

Anhydrous Caustic Baryta; Manufacture of ——. P. L. Martin, Tourcoing, France. Eng. Pat. 601, Jan. 9, 1901.

The barium salt to be decomposed is placed in fire-clay basins, which are set in a muffle furnace, with return flue beneath. The fire-brick supports to the basins are protected against leakage of the salt when it becomes fluid, by iron plates. Means for stirring the charge, and for removing it in lumps as it consolidates, are provided; as well as suitable channels and an uptake for withdrawing any nitric fumes or other gases that may be evolved, which are taken to a condenser. The third claim is for "treating baryta salts in closed vessels" to obtain anhydrous caustic baryta.
—E. S.

Potassium Magnesium Carbonate; Production of ——. H. Precht, Stassfurt, Germany. Eng. Pat. 2342, Feb. 4, 1901.

About 100 parts of magnesium carbonate containing three molecules of water of crystallisation are added to 70 parts of potassium chloride in concentrated solution, and carbon dioxide is passed in. The magnesium carbonate is stated to be thus completely converted into the insoluble potassium magnesium carbonate. The solution of magnesium chloride is evaporated to recover such potassium chloride as remains associated with it. The present invention is compared with that described in Eng. Pat. 184, 1881, according to which anhydrous magnesium carbonate was used, instead of the hydrated salt now claimed.—E. S.

Alkaline Cyanides; Production or Purification of ——. G. Craig, Glasgow, and R. M. Paterson, Paisley, N.B. Eng. Pat. 22,121, Dec. 5, 1900.

The solution of impure alkali cyanides in liquefied ammonia, is treated with an agent insoluble in the menstruum and capable of decomposing any sulphur compound present to form a sulphide, and if necessary, also to react on any carbonates. The purifying operation is carried out in air-tight vessels, containing for instance, lead chloride, fitted with filtering appliances and means for passing the solution of the cyanide in liquefied ammonia through. The process may be conducted in series, and the deposit of sulphide or carbonate be washed with liquefied ammonia, the latter being afterwards expelled and recovered. The washed residue is reconverted into lead chloride, which is used over again. Other specified lead salts may replace the chloride in the process.—E. S.

Alkali Chloride; Method and Apparatus for Electrolysing ——, *with Mercury Cathodes.* P. La Cour. Eng. Pat. 1783, 1901.

See under XI. A., *page* 125.

VIII.—GLASS. POTTERY, ENAMELS.

English Patent.

Glass for making Ornaments; Utilising Waste ——. E. Geille, Brussels. Eng. Pat. 4495, March 2, 1901.

The scrap or waste glass is heated with 15 per cent. of a mixture composed of 50 per cent. of sand, 25 per cent. of limestone, 18 per cent. of sodium carbonate, 4 per cent. of fluorspar, and 3 per cent. of felspar, until sufficiently fluid to be poured into suitable fire-resisting moulds; to make the material adhere to masonry, fragments of glass are scattered over the surface of the material in the mould, which is again pressed; after removal from the mould, the "outer" surface is finished more or less brilliantly by greater or less exposure to the heat of a suitable furnace; coloured oxides may be added to the mass before pressing; a "ribbed" design may also be moulded on the surface, the space between the ribs being filled up with a more fusible coloured glass added subsequently.
—J. W. H.

IX.—BUILDING MATERIALS CLAYS, MORTARS, AND CEMENTS.

Wood; Indentification of ——. H. Stone. J. Soc. Arts, 1901, **50**, [2559], 40—48.

The author first refers to the incomplete condition of the subject of discriminating various species of timber, and then proceeds to put forward a scheme for the classification and identification of the different varieties of wood. The principle followed is that of starting from plain or fairly obvious characters and leaving the more doubtful ones for the end of the series, where there are fewer species to deal with, and other aids come in. The main separation in the case of the woods of the broad-leaved trees is that of woods having two kinds of rays, as many Cupuliferæ, from those which have but one. The latter are then divided into those having rays separated by intervals greater or less than the transverse diameter of their larger pores, that is to say, the intervals between some may be equal to the pore diameter at the most, and conversely, in the other class, the intervals may be equal to the pore diameter, but never less. Further subdivisions are based upon the presence of soft tissue and its arrangement, followed by the arrangement of the pores, and concluding with the degree of definiteness of the ring boundary. In this way members of the same genus, having a similar arrangement of rays, pores, and soft tissue, fall into the same ultimate group and can then be further distinguished by physical and chemical characters, such as: the range of the weight per cubic foot, hardness, colour of the solution produced by boiling in water and alcohol, reaction with iron salts, capacity for absorption of water, phenomena produced during burning, character of the surface, whether dull or lustrous, and the particular elements, rays, pores, or ground tissue which produce the effect, and, lastly, the colour.—A. S.

Quartzite; Applicability of South Russian ——, *for the Manufacture of Dinas Brick.* L. B. Rosenberg. Chem.-Zeit. 1901, **25**, [96], Rep. 345.

In view of the increasing metal industry of South Russia and the Urals, the author has examined the native South Russian quartzite, as to its suitability for the manufacture of fire-brick. Quartzite does not generally occur in Russia in large deposits, but in larger or smaller isolated blocks distributed over and enclosed in the so-called black earth; this is especially the case with the better qualities. Quartzite is consequently difficult to obtain, and costly. Burning tests at different temperatures and for different periods of time showed that the material is suitable for the manufacture of "Dinas brick," and it is concluded that the native Russian mineral is capable of competing with foreign products.—A. S.

Magnesia Cement. E. Luhmann. Chem.-Zeit. 1901. **25**, [96], Rep. 345.

Sorel's magnesia cement can be applied to preparation of worked stones of the finest quality. When strongly burnt powdered magnesia is stirred with a solution of magnesium chloride of 20°—30° Bé., a good hardening mass is obtained, which can be worked like gypsum, and binds together considerable quantities of sand or other powdered material, takes a good polish, and has a rigidity equal to a good sandstone. The hardening is due to the formation of magnesium-oxychloride, which has a strong crystalline habit. A compound corresponding to the formula $Mg\begin{cases}OH\\Cl\end{cases} + 5Mg(OH)_2 + 12H_2O$ can be separated. On heating, these stones lose water, but no hydrochloric acid. Long treatment with boiling water dissolves magnesium chloride, leaving, finally, hard magnesium hydroxide, of the composition of brucite. Crystalline oxychlorites, corresponding to the formulae—

I. $Mg\begin{cases}OH\\Cl\end{cases} + 4Mg(OH)_2 + 5H_2O$, and

II. $Mg\begin{cases}OH\\Cl\end{cases} + 2Mg(OH)_2 + 4H_2O$

have been prepared. Sorel's cement is prepared from finely ground and intimately mixed calcined magnesite, and absolutely dry magnesium chloride; which mixture can be preserved and exported in soldered tin vessels. By mixing the cement with sawdust and water, a material ("xylolith") is obtained, similar to wood, but which becomes hard.

—W. C. H.

English Patents.

Stone, Artificial; Manufacture of Slabs and Plates of ——. L. Hatschek. Vöcklabruck. Austria. Eng. Pat. 22,139, Dec. 5, 1900.

This invention consists in the application of the methods of pasteboard making to the manufacture of artificial stone. A dilute mixture of hydraulic binding substances and finely-divided fibrous materials, such as asbestos, vegetable fibre treated with sodium silicate, or glass wool roughened with hydrofluoric acid solution, is fed by means of an endless band to rollers, to be pressed layer by layer, until the desired thickness is obtained.—J. W. H.

Building Material and other Purposes; Slabs or Plates suitable for Use as ——. J. Wilkinson, Birmingham. Eng. Pat. 2499, Feb. 5, 1901.

Slabs, made of perforated metal sheets, or netting embedded in cement or composition, and coated on one side or both sides with a glass or other suitable facing.

—W. C. H.

Heat Non-conducting Materials. J. C. S. McLay, London. Eng. Pat. 11,813, June 10, 1901.

A composition made from the waste residue obtained in the manufacture of tartaric acid, combined with heat non-conducting materials, especially those of a fibrous nature, and agglutinating substances, so as to form a composition easily applied to steam-pipes, &c.—W. C. H.

Cement Kilns and Drying Chambers; Impts. in ——. W. W. Hewitt, Greenhithe, Kent. Eng. Pat. 23,718, Dec. 28, 1900.

The hot effluent gases from the kiln may be led to the chimney through drying chambers, which are alternately charged with slurry to be dried or discharged into the kiln itself.—J. W. H.

Kiln for Manufacture of Portland Cement or Lime. J. S. Rigby, Liverpool. Eng. Pat. 801, Jan. 12, 1901.

An iron or steel kiln, of which the portion that is subjected to the greatest heat is cooled by circulating water through the space between the body of the kiln and an external jacket.—W. C. H.

Portland Cement; Manufacture of ——. H. E. Rusager, Frederiksberg, Denmark. Eng. Pat. 2409, Feb. 4, 1901.

Portland cement is made by subjecting to a preliminary reduction one or the other or all of the raw materials in their natural humid state, without drying and grinding, and mixing in "tube mills" with the addition of the least possible quantity of water (1 part of water to from $2\frac{1}{2}$ to 3 parts of solids), burning the resulting thick and dense sludge in rotary kilns, and grinding the clinker either directly or after cooling. As a modification, one or the other of the raw materials may be dissolved in water and the solution added to the remaining raw material in the "tube mill."—A. W.

X.—METALLURGY.

Metals; Distillation of ——, *in a Vacuum.* Kahlbaum. Sitz. der Naturforsch. Ges. Basle, Nov. 20, 1901; Zeits. angew. Chem. 1901, **14**, [49], 1235.

The author has made experiments for the last 10 years with the object of obtaining the metals in an absolutely pure condition. He has proved by spectrum analysis that the distillates obtained *in vacuo* possess an extraordinary degree of purity, although not absolutely pure. The duration of the distillation is about 600 hours, and the progress of the operation in the porcelain tubes is watched by means of the Röntgen rays. In determining the specific gravity, the author has melted the metals in a vacuum and then exposed them to a very high pressure (up to 20,000 atmospheres) in castor oil. It was found that the specific gravity which at first increased, diminished to a perceptible extent above a certain pressure.—C. A. M.

Blast-Furnace [Iron] Slags; Composition of ——. L. Blum. Chem.-Zeit. 1901, **25**, [88], Rep. 313—314.

Two systems, those of Mrázek and of Platz, are available for the calculation of blast-furnace charges. The former is based on the assumption that the silica and the bases in the slag are in molecular proportion, the latter on the hypothesis that there is a fixed proportion between the total weight of silica and alumina on the one hand, and of bases of the general formula RO on the other. This ratio, given by Platz (average for grey- and white-irons) as—

$$\frac{RO}{SiO_2 + Al_2O_3} = \frac{52}{48},$$

has been modified to $\frac{51}{49}$ by Ledebur, to take into account the lime required for the sulphur. In the one case alumina is classed as a base, in the other as an acid. The question of the rôle played by alumina has now been decided by the author, by the examination of two slags produced under precisely similar conditions in the same blast-furnace, using two charges, varying in the proportion of alumina, for the production of basic pig free from manganese. Reckoned according to Mrázek's system, the first slag had a silica ratio of 16·498:22·730, and was a mixture of 62·2 per cent. of singulo-silicate with 37·8 per cent. of sub-silicate, whilst the second slag had a silica-ratio of 17·073:22·069, and was a mixture of 70·7 per cent. of singulo-silicate with 29·3 per cent. of sub-silicate. Thus the basicity of slag I. appeared to be greater than that of slag II., which contained less alumina, but this was not the case. Hence Al_2O_3 cannot be considered as taking the place of CaO. Reckoned by the Platz method, the ratio of slag I. was $\frac{49·6}{50·4}$, and that of slag II. $\frac{50·5}{49·5}$, the latter agreeing with the Ledebur average, given above. According to this, the basicity of slag I. is less than that of slag II. But the percentages of sulphur in the pig-irons produced in the two cases were identical, so that there can have been no variation in the basicity of the slag, in spite of the difference in the ratios above quoted. Hence the effect of alumina on the character of the slag is neutral. The molecular composition of the calcium silicate is, in each case, $3CaO.2SiO_2$. The following conclusions are drawn from the experiments: (1) the influence of Al_2O_3 in a blast-furnace slag is neutral, neither acid nor basic; (2) the basic character of a slag is dependent upon the lime, which must always suffice, after satisfying the sulphur present, to form sesqui-silicate $3CaO.2SiO_2$ with the silica present; (3) basic blast-furnace slag must be considered as a calcium sesqui-silicate in which alumina and other "RO"-bases are present as indifferent substances.

The ratio between SiO_2 and CaO is not always the same; when, for example, white-iron is being run, the ratio is that of a bisilicate $CaO.SiO_2$. When the proportion of lime is reduced still further, the Al_2O_3 and "RO"-bases lose their neutral character and, as bases, enter into combination with silica. In the case of slags from furnaces running on white-iron for puddling, the proportion of $CaO:SiO_2$ is 48·2:51·8. It is only necessary, in calculating furnace charges, to reckon that for basic- and foundry-pig the ratio $\frac{CaO}{SiO_2} = \frac{58·3}{41·7}$.—W. G. M.

Thomas and Bertrand-Thiel Processes. A Comparison. O. Thiel. Chem. Zeit. Rep., 1901, 371.

The Bertrand-Thiel process does not require any definite amount of phosphorus and manganese in the ore, and the pig-iron can be made (in Westphalia) at 1.5—2 marks cheaper. The Martin furnace in the Bertrand-Thiel process requires less dolomite than the Thomas converter, and the cost of repairs is lower than with a mechanical converter. The Thomas process requires 205 men for a production of 700 tons of cast-iron per day, the other requires 188 men. Interest and depreciation are said to be higher in the Thomas process. The author gives the cost per ton of cast-iron: in the Thomas process 78·88 marks, or after deduction of the by-products, 74·88 marks; in the other process 73·15 marks or 69·25 marks respectively. Thus the Bertrand-Thiel process makes 1 ton of cast-iron at a less cost by 5·23 marks than the Thomas process and at 3·93 marks less than the Martin scrap process. In working the Bertrand-Thiel process with fluid pig-iron, the number of charges is $8\frac{1}{3}$—9 in 24 hours, the phosphorus is more completely removed than in other processes, and the slag is richer in phosphorus than Thomas slag. The Thomas process requires a certain kind of pig-iron, and the addition of scrap is barely 5 per cent.; in the Bertrand-Thiel process 85 per cent. of pig-iron is worked with 15 per cent. of scrap. With a daily production of 700 tons, this process consumes 175 tons of Swedish magnetic ore with the pig and scrap; the entire production of one blast-furnace is thus ample. The author has calculated the costs for Westphalia and the Minette region; after deducting the Thomas slag the cost of 1 ton of cast-iron by the Bertrand-Thiel process is obtained as 5·76 and 6·73 marks lower respectively. In the Thomas process much phosphorus is burnt, and much slag lost.
—A. C. W.

Cupola-Furnace Slag; Recovery and Value of Iron in ——. C. H. Putnam. Chem.-Zeit. 1901, **25**, [96], Rep. 347.

In most foundries the iron in the slag is regarded as valueless. The author shows that by suitable mixing with raw iron, the iron can be used for castings, at least for rougher work. For this purpose, the hardening effect of the iron derived from the cupola furnace slag must be counteracted by the mixture of soft non-siliceous raw iron. The saving amounted to 200 kilos. per day (= 12·60 M.). The slag is ground in a mill, and the iron in larger pieces kept back. The ground slag, with the smaller pieces of iron goes through a magnetic separator which consists of an inclined revolving cylinder, round which a copper wire runs. On magnetising the cylinder, the iron is held back, and after some time the current is switched off and the iron collected. The separator in one hour separated the iron from a day's yield of slag. The cost of the current was 9 pf. per hour.
—W. C. H.

Cast Iron and Ferrosilicon; Condition of Silicon in ——. P. Lebeau. Comptes Rend. **133**, [24], 1008—1010.

Silicon is absolutely unattacked by nitric acid or potassio-cupric chloride; and as the insoluble residue after the solution of a sample of pig iron or of ferrosilicon in these liquids has never been found by the author to contain free silicon, the absence of free silicon in the metal may be considered as proved. In endeavouring to prepare iron silicides artificially, the author has succeeded (this Journal, 1899, 586; 1900, 1116) in obtaining only three:—Si_2Fe, SiFe, and $SiFe_2$. The first of these is only formed in presence of a great excess of silicon, and hence cannot exist in iron. The second is dissociated at or above the melting point of silver; for by dissolving it in melted silver, and, after cooling, dissolving away the silver, the author finds it almost completely destroyed according to the equation $2SiFe = Si + SiFe_2$. The last of these silicides is recovered absolutely unaltered when treated in the same way, even though the temperature has been raised to the boiling point of silver. Though the crystallised compound $SiFe_2$ is unattacked by nitric acid, yet if it be finely powdered, nitric acid attacks it slightly, coating the surface with a protecting film of silica; it is therefore quite conceivable that this substance might exist uniformly distributed in solid solution throughout cast iron, and yet not be found in the residue after the metal was dissolved. The author concludes that the whole of the silicon in cast iron or ferrosilicon exists as $SiFe_2$ in solid solution in the metal, thus confirming the views, arrived at by quite different roads, of Le Chatelier and of Stead.—J. T. D.

Steel Rails and Plate; Influence of Copper on ——. R. Genzmer. Chem.-Zeit. 1901, **25**, [96], Rep. 347.

Ruhfus maintained that the proposition of Stead and Evans, that steel and ingot iron can have a distinct quantity of copper (about 1·3 per cent.) without becoming "red short," is not always correct; the quantity of copper that can be present in steel depending entirely upon the chemical combination. The author confirms this and shows that a charge of Swedish iron, and commercial iron can carry a considerable quantity of copper. The first test after smelting showed no trace of "red shortness." If ordinary iron is taken (having an admixture in the form of oxide), the first tests only smelt badly, and the "red shortness" disappears only by the addition of material containing manganese. Experiments on ingot iron for stamping showed that not more than 0·25 per cent. of copper can be present, with a small content of phosphorus and sulphur; if these are higher, red shortness appears even with 0·20 per cent. of copper.—W. C. H.

Wet Crushing Cyanide Plant at Ely, Nevada. Eng. and Mining J. 1901, **72**, [23], 753—755.

A description of the large combination plant at Ely, Nevada, for the treatment of low grade gold ore by cyaniding, after wet crushing and amalgamation. The operations involved comprise:—(1) Screening and crushing; (2) amalgamating; (3) concentrating; (4) sizing and settling; (5) leaching; (6) precipitating; (7) slimes treatment; (8) refining and assaying.

(1) *Screening and Crushing.*—The coarser ore is first crushed by an Austin gyratory crusher, and then further by a set of 16-in. by 36-in. rolls, which feed, in a divided stream, into two No. 3 Trent Chilean mills. The finer grade of ore is fed directly into the Chilean Mills, which work independently of one another. The capacity of the crushing plant is stated to be not less than 300 tons in 24 hours.

(2) *Amalgamating.*—Four plates, 4 ft. by 9 ft., of copper, 3 lb. to the square foot, and plated with silver, $1\frac{1}{2}$ oz. to the square foot, are arranged in connection with each Chilean mill on a grade of $1\frac{1}{4}$ ins. The power for operating the crushing and amalgamating machinery is provided by a 50 h.p. Westinghouse A.C. motor at 2,000 volts.

(3) *Concentrating.*—The tailings from the plates, after proper division, are run directly upon eight Cammett tables. The ores carry varying amounts of lead carbonate in a granular form, together with some heavy oxide of iron and small amounts of sulphides, and the concentrates obtained contains most of the lead, which appears to carry much of the silver from 2 to 8 oz. ton of ore—and 35—50 dols. of gold per ton. The concentrating tables are operated by one 10 h.p. Westinghouse A.C. motor at 400 volts.

(4) *Sizing and Settling.*—The settling tanks are four in number, each 26 ft. square and 5 ft. deep and made of $\frac{3}{16}$-in. steel. The pulp falls from rotary distributors into the tanks filled with water. The overflow passes out at either end of the tank through rows of $1\frac{1}{4}$-in. holes, into launders, which conduct the water bearing the slimes to the department provided for the treatment of the latter. The ore is drained and dried by means of two vacuum pumps, and is discharged

through sludge gates into cars which deliver it to the leaching tanks.

(5) *Leaching.*—The tanks in which the ore is treated with the cyanide solution are six in number and are similar to the settling tanks.

(6) *Precipitating.*—The equipment for precipitation (by the zinc dust method) consists of two precipitating tanks, 10 ft. diameter by 5 ft. deep, which are provided with hoods and ventilating flues; one receiving tank, 16 ft. diameter, 12 ft. deep; one pump tank, 14 ft. by 6 ft.; two No. 3 iron Gould's rotary pumps; two No. 5 filter presses with 36 chambers, 1½ ins.; and an air compressor. Two pressure tanks, each 5 ft. diameter and 12 ft. long are used, one for an air receiver, the other as a pressure tank, to contain the solution after it has been precipitated, when it is necessary to place the same under pressure to force it through the filter presses. The pumps and presses are on a cement floor, which has a drainage to the pump-tank, thus insuring against all losses of gold solution or precipitates from any cause. The power is provided by one 20 h.p. Westinghouse, A.C. 400 volt motor.

Slimes Treatment.—The overflow from the intermediate settling tanks passes through V-shaped boxes of special design in which practically 98 per cent. of the material is recovered. This is drawn off intermittently through taps in the bottom of the boxes directly into the agitating tanks, whence the mixture of slime and gold solution is dropped into decanting tanks, where it is allowed to settle for an hour. The supernatant liquor is passed through a filter press and then pumped into the precipitating department. The thick slimes are washed by means of sump cyanide solution into a pressure tank, and thence forced through a 36 in. by 36 in. filter press, where practically all the liquor is recovered.

Refinery and Assay Department. — The refinery is equipped with one lead-lined digestion tank, 6 ft. dinameter and 5 ft. deep, in which the product is treated with sulphuric acid, and which is provided with a No. 4 double exhaust fan to carry away the gases formed in this treatment. There are also a lead-lined filter press with 30 chambers, 18 in. square, for drying the gold powder after digestion; a melting furnace of a size suitable to take an 18 in. graphite crucible; a retort furnace for reducing the amalgam, and an iron muffle (32 ins. by 54 ins. by 8 ins.), drying furnace for drying the aurocyanides, burning the papers and cloths from the filter press, and for drying the gold after digestion.
—A. S.

Zinc Blende; Removal of Iron from ——. W. B. Phillips. Eng. and Mining J. 1901, **72**, [22], 710.

The author carried out a series of experiments with a view of separating the iron-bearing compounds from zinc blende. With zinc ores carrying pyrite, chalcopyrite, and galena, it is possible to separate the lead compounds by jigging, and the use of a classifying table, but the iron-bearing compounds cannot be thus separated, and they pass over with the final zinc concentrates. The results given are of trials with a magnetic separator of the so-called magnetic permeability, or saturated field type, and with a jig product containing 48·00 per cent. of zinc, 1·00 per cent. of copper, 1·80 per cent. of lead, 6·71 per cent. of iron, 10·00 per cent. of silica, and 31·45 per cent. of sulphur. This was gently roasted to remove a portion of the sulphur, and then passed over the magnetic separator (at 110 volts and 6 ampères) at rates of speed varying from ½ ton per hour to 6 tons per hour. Table I. shows the nature of the original ore, A.; of the slightly roasted ore, B.; and the results obtained by treating B. at different rates of speed.

Table I.

Ore B., i.e., Ore A., Slightly Roasted. Pole 1 and 2. 110 Volts. 6 Ampères.

——	Ore A. Original Material.	Ore B, *i.e.*, Ore slightly Roasted.	½ ton per Hour.		1 ton per Hour.		2 tons per Hour.	
			14·40 % Magnetic Heads.	85·60 % Zinc Concentrates.	11·90 % Magnetic Heads.	88·10 % Zinc Concentrates.	10·81 % Magnetic Heads.	89·19 % Zinc Concentrates.
Zinc	48·00	49·50	10·50	53·50	7·50	54·50	8·50	56·00
Copper	1·00	1·50	5·20	None	6·00	None	3·50	None
Lead	1·80	3·00	1·00	0·80	0·40	0·40	0·60	0·60
Iron	6·71	6·38	34·54	3·30	26·84	1·54	45·98	1·76
Silica	10·00	10·68	27·10	20·00	20·40	7·68	13·68	8·56
Sulphur	31·45	22·81	..	..	..	..	..	..

——	Ore A. Original Material.	Ore B, *i.e.*, Ore slightly Roasted.	3 tons per Hour.		4 tons per Hour.		5 tons per Hour.		6 tons per Hour.	
			10·09 % Magnetic Heads.	89·91 % Zinc Concentrates.	9·54 % Magnetic Heads.	90·46 % Zinc Concentrates.	9·15 % Magnetic Heads.	90·85 % Zinc Concentrates.	9·09 % Magnetic Heads.	90·91 % Zinc Concentrates.
Zinc	48·00	49·50	5·50	56·00	6·50	58·00	5·50	55·00	8·50	55·50
Copper	1·00	1·50	1·50	None	4·25	None	4·10	Trace	3·60	Trace
Lead	1·80	3·00	0·60	0·80	None	0·60	0·20	0·60	0·60	0·60
Iron	6·71	6·38	42·13	1·87	39·89	1·65	43·78	1·65	43·45	1·65
Silica	10·00	10·68	13·88	11·84	14·00	12·60	17·42	22·04	12·40	8·30
Sulphur	31·45	22·81	..	..	..	..	..	..	..	..

The best results appear to be obtained with a speed of 4 tons per hour; at this rate, 90·46 per cent. of the ore treated came over as zinc concentrates, containing 58·00 per cent. of zinc, no copper, 0·06 per cent. of lead, 1·65 per cent. of iron, and 12·60 per cent. of silica; whilst there were 9·54 per cent. of magnetic heads containing 6·50 per cent. of zinc, 4·25 per cent. of copper, no lead, 39·89 per cent. of iron, and 14·00 per cent. of silica. Excluding the results obtained with the slowest speed, the average content of zinc in the zinc concentrates was about 56 per cent., and the author considers it to be quite feasible to obtain from 88 to 90 per cent. of the gently roasted ore as concentrates containing from 56 to 58 per cent. of zinc, and not more than 1·75 or 1·80 per cent. of iron.

Another test was made with the ore after it had been more strongly roasted, and the results obtained are shown in Table II.

It appears to be disadvantageous to strongly roast the ore, for the percentage yield of zinc concentrates is diminished, the loss of zinc in the magnetic heads increases, and there is a tendency towards a lower zinc content in the concentrates. By a stronger roast, there may be also a loss of zinc as oxide. The author concludes that it is not necessary to remove more than one-third of the sulphur in roasting.

TABLE II.

Ore C., i.e., Ore A., more Strongly Roasted. Pole 1 and 2. 110 Volts. 6 Ampères.

	Ore A. Original Material.	Ore C, *i.e.*, Ore more strongly Roasted.	½ ton per Hour.		1 ton per Hour.		2 tons per Hour.	
			18·99 % Magnetic Heads.	81·01 Zinc Concentrates.	15·09 % Magnetic Heads.	84·91 % Zinc Concentrates.	14·32 % Magnetic Heads.	85·68 % Zinc Concentrates.
Zinc	48·00	50·00	18·50	56·00	17·00	58·60	17·50	56·00
Copper	1·00	2·30	1·30	Trace	1·00	0·70	1·65	0·50
Lead	1·80	0·80	1·60	None	0·60	0·20	2·00	0·40
Iron	6·71	6·49	27·39	1·65	34·54	1·76	34·32	1·76
Silica	10·00	12·32	19·86	9·24	21·24	10·76	18·34	10·60
Sulphur	31·45	16·72	..	..	..	..	..	..

	Ore A. Original Material.	Ore C, *i.e.*, Ore more strongly Roasted.	3 tons per Hour.		4 tons per Hour.		5 tons per Hour.		6 tons per Hour.	
			13·41 Magnetic Heads.	86·59 Zinc Concentrates.	12·71 % Magnetic Heads.	87·29 Zinc Concentrates.	12·19 % Magnetic Heads.	87·81 Zinc Concentrates.	12·14 % Magnetic Heads.	87·86 % Zinc Concentrates.
Zinc	48·00	50·00	19·00	48·50	16·00	47·50	16·50	51·00	25·50	55·00
Copper	1·00	2·30	5·50	9·30	4·20	2·30	3·20	2·60	7·00	6·00
Lead	1·80	0·80	1·80	0·20	1·80	0·60	2·20	None	0·20	2·00
Iron	6·71	6·49	34·54	1·87	35·75	2·08	34·87	2·31	34·76	1·87
Silica	10·00	12·32	21·02	10·36	20·56	9·88	19·48	13·24	18·80	12·92
Sulphur	31·45	16·72	..	..	..	..	..	..	..	..

—A. S.

Aluminium-Zinc Alloys. J. W. Richards. Eng. and Mining J. 1901, **72**, [22], 715.

ALLOYS containing 1, 2, 3, 4, 5, 6, 7, 8, and 9 parts respectively of zinc to 1 part of aluminium, with specific gravities ranging from 4 to 6, do not appear to possess any specially valuable mechanical properties. The alloy containing 2 parts of aluminium to 1 of zinc (33⅓ per cent. Zn) is, according to W. F. Durand (Science, 1897, 396), equal to cast-iron in strength, melts at about 425° C., does not readily oxidise, and resists corrosion well. The author confirms these statements. He finds that there is no difficulty in preparing with this alloy, castings having a tensile strength of 40,000 lb. per square inch. The alloy closely resembles in its properties a high carbon steel, being extremely rigid, slightly elastic, and breaking short with a fine-grained fracture. Its specific gravity is 3·8.

The alloy of 3 parts of aluminium to 1 part of zinc (25 per cent. Zn) is softer than the previous alloy, has a tensile strength of 35,000 lb. per square inch, and elastic limit nearly the same, with a slight elongation before breaking. It is stated that remarkably clean and sharp castings can be made with it if proper precautions be taken as to the proper gating of the mould and the exact temperature of casting. Its specific gravity is 3·4. It is not so hard and short as the alloy with 33⅓ per cent. of zinc, nor quite so strong, but is more easily worked and is more resistant to shock. It is non-magnetic, and is at present being used for scale beams, surveying and astronomical instruments, light machine parts, surgical appliances, &c.

With less than 25 per cent. of zinc, the strength and hardness of aluminium-zinc alloys decrease rapidly, and when the amount of zinc is 15 per cent. or less, the alloy can be forged, rolled, or drawn. Castings made from the alloy with 15 per cent. of zinc showed an elastic limit of 16,000 lb. per square inch; tensile strength, 22,330 lb.; elongation in 2 inches, 6 per cent.; and reduction of area, 16½ per cent.—A. S.

Ammonium Amalgam. H. Moissan. Comptes Rend. **133**, [21], 803—808.

SODIUM amalgam has no action on liquid ammonia at −35° C., but if ammonium iodide be dissolved in the liquid, the sodium amalgam at once acts on it, becoming much more fluid. If now after washing the amalgam with ammonia, it be cooled to −80° C., it solidifies, and can be dried and handled. When introduced into a vacuous tube connected with a Sprengel pump, it undergoes no change as the temperature rises till about −40° C., when it melts; and between this temperature and 15° C. it swells to fifteen or twenty times the original volume of the amalgam. Slowly at this temperature, more rapidly when heated, it gives off gas, which on analysis proves to be a mixture of two volumes of ammonia and one volume of hydrogen. However, the author is inclined to regard this substance, not as ammonium amalgam, but as the amalgam of an ammoniacal hydride, a compound containing sodium, ammonia, and hydrogen; for a somewhat similar substance is produced by the reaction on aqueous ammonia of sodium amalgam containing sodium hydride in solution, though sodium amalgam alone reacts on aqueous ammonia without swelling up, producing a slow evolution of hydrogen only.—J. T. D.

Strontium; Alloys of ——, with Zinc and Cadmium. H. Gautier. Comptes Rend. **133**, [24], 1005—1008.

ON heating together in a covered crucible, strontium chloride, zinc chloride, and sodium, a small amount of a sodium-zinc-strontium alloy was obtained, which, when treated with alcohol, left a metallic powder, a zinc-strontium alloy, containing 14 per cent. of strontium. The powder is very readily oxidised in damp air, and the yield is very small. On heating a mixture of zinc, sodium, and strontium iodide, an alloy of zinc and strontium containing 18 per cent. of the latter was obtained. This was placed in a porcelain tube and heated for some time, with the view of distilling off the zinc; but it was found that the strontium was equally volatile, and no separation could be effected. When cadmium was used in place of zinc, the alloy obtained contained 20 per cent. of strontium; and by heating this at 250°—300° C. for a day, it was enriched to 45 per cent. of strontium. This alloy exhibits a bright metallic surface, which, however, readily tarnishes in the air. It decomposes water rapidly, leaving pulverulent cadmium; burns slowly in oxygen at a red heat, brilliantly in sulphur vapour, less so in phosphorus vapour. In chlorine it burns brightly when slightly warmed, in iodine vapour at a red heat. It absorbs hydrogen at a dull red heat, forming strontium hydride, from which the cadmium can be completely volatilised; this hydride is white, very readily changed in air, and has the formula SrH_2. The author is pursuing the study of these compounds.—J. T. D.

Tin-Aluminium Alloys; Contributions to the Study of the ——. L. Guillet. Comptes Rend. **133**, [213], 935—937.

BY igniting mixtures of aluminium and precipitated stannic oxide in various proportions between Sn_3Al and $SnAl_4$

(the limits of inflammability), and attacking the fused residues with hydrochloric acid only two definite crystalline compounds were obtained, which analysis showed to be $AlSn$ and Al_4Sn.—J. T. D.

Tungsten-Steel; Determination of Tungsten in ——. R. Fieber.

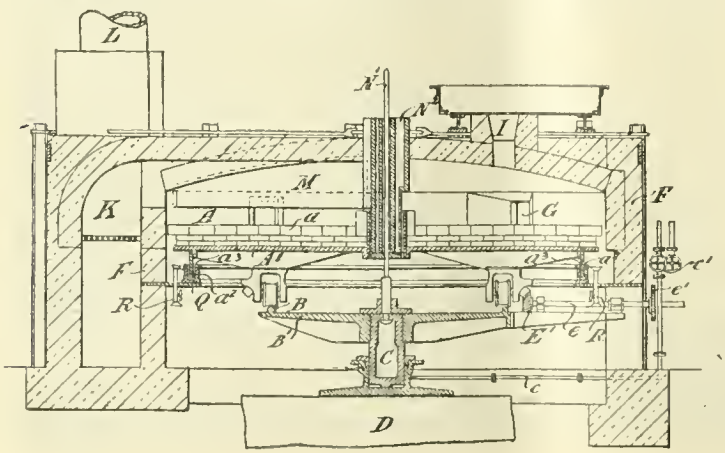
See under XXIII., *page* 140.

English Patents.

Furnace; Rotary ——, *applicable for Use in Roasting or Calcining Ores.* G. G. M. Hardingham, London. From R. Davey, Pertusola, Italy. Eng. Pat. 21,388, Nov. 26, 1900.

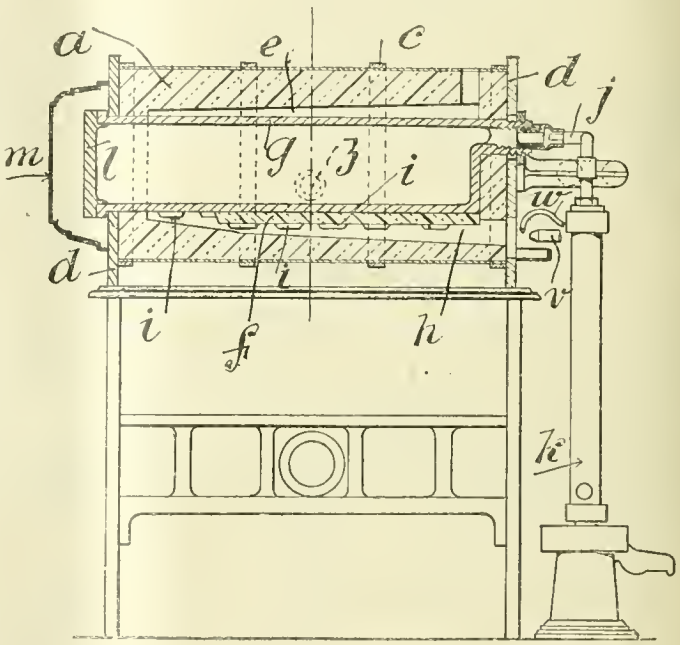
For a rotary furnace for roasting or calcining ores, 10 claims are made for the various parts, separate and complete, constructed and operated in accordance with the accompanying cross section. The furnace is horizontally circular, and consists of a vertically adjustable hearth A, composed of refractory material *a*, supported by a plate A^1 under which are rollers or wheels running on a circular track B, which in turn is constructed on a plate B^1 supported by a hydraulic ram C, the cylinder for which is bedded upon the foundation D and connected with water supply through *c* and c^1. The hearth is vertically adjusted by the ram according to the temperature of working, and is revolved by means of bevel gearing E^1 on a shaft *e* worked from outside, e^1. It is surrounded by a circular wall F provided with inspection apertures G, and, to prevent the admission of air, it is furnished with a continuous flange a^2 dipping into an annular water trough a^3, mounted on a ring Q secured to the inner side of the wall F. Air can be admitted, if required, by valves R situated in the ring. The fireplace K and the flue shaft L are in close proximity, the discharge door being in the circular wall on the other side of the shaft on a level with the hearth, whilst the charging opening I is in the roof.

A screen or deflector M, radiating from the centre to a point between the passages communicating with K and L, diverts the flames round the furnace, and a radiating bar or perforated diaphragm between the centre and a point between the shaft L and the discharge door, can be lowered on to the hearth to assist discharging. Both the screen and the bar are hollow, and can be suitably connected with a water supply for cooling. The screen M may be operated by an outside rack at the upper end of the central shaft N^1, the latter being connected with the track plate, B^1, and ram, C, so that with the aid of an outside spur wheel in mesh with the rack and a wire rope lifting connection, not shown, the screen may be made to follow any vertically moving parts of the furnace. The radiating bar or diaphragm is operated by an eccentric which gives to it an intermittent rising and falling movement, by which means, with the revolution of the hearth, the ore may be automatically mixed and alternately banked up and turned over, the bar finally resting on the hearth to bank up the charge so that it gradually moves towards the exit door. Water circulates round the shaft N^1 in the annular chamber, N^2.—A. W.



Retort Furnace. D. Laird, Forfar. Eng. Pat. 18,148, Sept. 11, 1901.

This patentee claims the furnace for retorting amalgams shown in the accompanying longitudinal sectional elevation, and especially for the provision of a fireclay base such as *f* for supporting the retort, and regulating and distributing the heat thereto. The furnace is constructed of a fireclay dome-shaped body *a*, in a steel casing bound with hoops, and with metallic end-plates *d*. The interior is a chamber



c, at the bottom of which are arranged slabs *f* of fireclay, which form the bed or support of the retort *g*, which may be muffle shaped. Below this bed is a flame bed *h*, which is a channel from front to back under the centre of the flat bottom. It has branch passages *i* which pass from right to left under the fireclay bed, and open out into a space at the sides and roof of the retort between it and the fireclay body *a*, one or more sight-holes *z* being also made. The retort is heated through an opening by an outside burner, consisting of an air blast nozzle *v*, and a liquid hydrocarbon drip nozzle *w*. A suitable condenser *k* is provided, and connected with the retort at *j*. At the other end of the retort is a door *l*, which is asbestos-packed, and which can be removed bodily, and also an outer door *m* hinged to one of the end plates, and secured by swing bolts pivotted to snugs on the end plate engaging with slots formed in snugs on the door. The door *l* may be provided with tapped snugs in engagement with screwed rods which bear on the end plate, to facilitate removal. To equalise the heating, the flame bed *h* inclines towards the end

farthest from the flame, where also the retort may be left bare and without the fireclay base.—A. W.

Precious Metals; Furnace for the Cupellation of ——, and for Oxidising and Roasting Ores. D. Laird, Forfar. Eng. Pat. 18,149, Sept. 11, 1901.

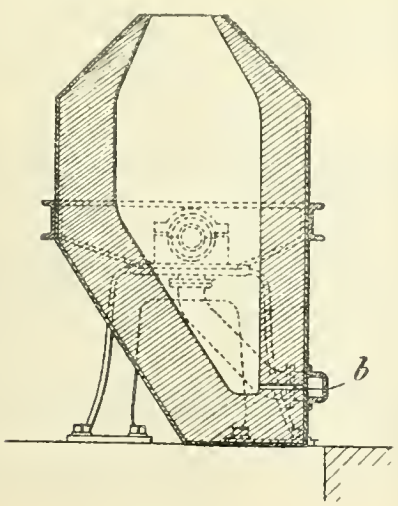
The cupellation furnace is constructed on the principle illustrated in the preceding abstract, and the arrangement, construction, and combination of its parts are claimed. In place of the muffle, there is a plain fireclay hearth, with an inclined flame-bed underneath and an outside burner for heating by oil or gas. The flame-bed passes from end to end underneath the longitudinal centre of the hearth, which, on its under surface, contains right and left projections or ribs for deviating the flames and hot gases to each side of the hearth. The hot gases then travel upwards on to and over the top of the hearth, and heat directly on the upper surface the substance which is being cupelled, oxidised, or reduced, finally passing out at the top through an opening in the movable cover at the burner end. At the other end of the furnace is a projecting shelf on a level with the hearth, so that a trayful of cupels can be slid bodily along the hearth in or out of the furnace. This end may be closed by two plugs as usual, an upper and lower one, for manipulative purposes.—A. W.

Telluride Gold Ores; Treatment of ——. W. Pethybridge, London. Eng. Pat. 1738, Jan. 25, 1901.

The decomposition of telluride of gold from the ores containing it is effected by subjecting the finely-divided ore to the action of a solution of ferric chloride alone which results in a solution of the tellurium and the separation of the gold in a free and solid form. In the case of oxidised ores containing telluride of gold together with iron, they are first treated with hydrochloric acid and water whereby the ferric chloride necessary for the subsequent decomposition of the telluride of gold is formed from the iron present in the ores. The spent ferrous chloride in contact with fresh ore at a high temperature may be converted into ferric chloride by any suitable oxidising reaction or process. The decomposition of telluride of gold, with both the gold and the tellurium in solution, can be affected by generating free chlorine by the addition of hydrochloric acid and bodies capable of yielding chlorine to the solution in contact with the ore, and in the presence of ferric chloride in solution.
—G. H. R.

Sulphide Ores [Cu, &c.]; Process and Apparatus for Smelting and Concentrating Unroasted ——. E. Knudsen, Sulitjelma, Norway. Eng. Pat. 20,566, Oct. 14, 1901. (Under International Convention).

The combined process consists of smelting and concentrating sulphide ores, even to the raw metal in the case of copper, in one furnace and in one operation without the use



of any outer heat supply. The operation may be conducted in any furnace, but preferably in those having the lower parts tapering towards the bottom where the tuyère holes are arranged, such as the converter illustrated in vertical cross section, for which a separate claim is made. The interior of the furnace is first made white hot, or thereabouts, and the ore in small lumps is thrown in on to the top of some red hot coke in the bottom. An unheated air blast is then blown in through the horizontal row of tuyères *b* at a pressure of 2 to 3½ lb. per sq. in. until the ore is melted, when the blast is increased to 4 to 5½ lb. This is maintained until the flame indicates sufficient concentration, *i.e.*, a sky blue for a 65 per cent. copper regulus, a greenish tinge in blue for a 74 per cent. regulus, or a more yellowish colour for the lower percentages of copper. The contents are then discharged, the furnace being hot enough and ready for the next charge, with a little fresh coke added if necessary. The heat is chiefly maintained by the oxidation of the sulphur, the oxides of which are intercepted and utilised.—A. W.

Precious Metals; Process of Metallising with ——. R. Langhans, Berlin. Eng. Pat. 430, Jan. 8, 1901.

The process consists of wetting, coating, or impregnating a foundation with a solution of compounds of precious metals with aliphatic sulphur derivatives in a volatile or volatilisable solvent, causing the solvent to volatilise, and decomposing the compound or compounds left behind by heat. The derivatives are the sulphur derivatives of alcohol radicals, aldehydes and ketones of the fatty series, particularly with so-called sulphine salts, their nitrates and nitrites, whilst the solvent may be a volatile hydrocarbon, alcohol, chloroform, &c., but preferably bromoform, as giving a more concentrated solution. A separate claim is made for the application of the compounds in the form of a bromoformic solution, and also for each application of the process for the following specific purposes. For manufacturing mirrors, specula, and reflectors, by using an incombustible foundation having the shape of the mirror, coating the reflecting surface with one or more compounds in solution, drying, heating to decomposition point, and burning in the deposited metal or metals, such, for instance, as platinum. For manufacturing folia for use in galvanic gas batteries, &c. by impregnating paper, asbestos, slates, or similar combustible or incombustible materials with the solution and heating to decomposition point. For making blanks for telegraphic purposes by applying the solution in the form of signs, figures, or representations to be transmitted to an electrically non-conductive porous sheet foundation, and decomposing by heat without destroying the foundation. For manufacturing metallic skeletons for incandescent mantles, &c. by impregnating a combustible fabric with the solution, drying, burning the fibre, and exposing the metallic structure produced to welding heat. For manufacturing filaments for electric incandescent lamps, by covering a combustible thread, preferably one from a cellulose solution, first with the solution and subsequently with powdered refractory oxides capable of emitting light under the action of heat, and heating to decompose the aliphatic sulphur compound and to burn the thread.

The metallising compounds preferred are those formed by the combination of sulphides of the fatty alcohol radicals with the halogen salts of the precious metals. For the purposes above named, ethyl sulphide-platinum chloride or protochloride, is used where a combustible foundation is to be treated but not to be destroyed, and nitrated ethyl sulphide-platinum, prepared by treating the chloride compound with silver nitrate, is employed where the foundation is to be burned away.—A. W.

Antimony Ores; Obtaining Antimony and Separating Gold from ——. J. C. Butterfield, London. Eng. Pat. 331, Jan. 5, 1901.

The claims are for refining impure antimony by pressing the metal into cakes and distilling it from a vacuum; for separating antimony from auriferous antimony ores by dissolving it out with a strong solution of ferric chloride, precipitating it with metallic iron, pressing it into cakes, and distilling from a vacuum; and for the complete process

of treating auriferous antimony ore as follows:—The finely-divided ore is treated in enamelled iron vessels with a strong solution of ferric chloride approximately in proportion sufficient for the equation, $Sb_2S_3 + 3Fe_2Cl_6 = 2SbCl_3 + 6FeCl_2 + 3S$. The solution of the two chlorides is drawn off from the gangue, and sulphur and antimony are precipitated by warming with metallic iron, producing more ferrous chloride. The antimony is then washed free from iron, dried at ordinary temperatures or pressed into cakes, and distilled in a crucible or retort having an air-tight cover provided with a pipe connected with a vacuum pump, by which a vacuum of 28 inches of mercury, or more, is maintained. A much lower temperature is necessary than usual and the loss is less. The gold, which remains with the gangue and sulphur, is recovered therefrom by cyanide or lead in the usual manner.—A. W.

Lead; Process for Diminishing the Solubility of ——, in Acids and other Chemical Compounds. H. Leyendecker, Cologne, Germany. Eng. Pat. 2756, Feb. 8, 1901.

For the above purpose, small quantities of copper are added to the molten lead. Two additional and separate claims are made for the following two alloys, *viz.*, lead with $\frac{1}{10}$ to $\frac{1}{2}$ per cent. of copper; and lead with $\frac{1}{10}$ to $\frac{1}{2}$ per cent. of copper and $\frac{3}{10}$ to $\frac{3}{10}$ per cent. of antimony; both alloys being less sensitive than lead to the action of acids and other chemical compounds.—A. W.

Zinc; Extraction and Recovery of ——, from Sulphide Ores or Tailings. C. Rogers, Kew, and A. M. Oswald, Caulfield, both in Australia. Eng. Pat. 21,097, Oct. 21, 1901.

Calcium polysulphide is claimed for use in precipitating zinc sulphide from sulphate solutions, separately and in conjunction with the following process, which is also claimed as a whole. The zinc sulphide ores or tailings are subjected to a partial roast in a furnace having a closed chamber or chambers; the exterior sulphate of zinc is leached out, preferably by discharging the roasted hot material into water, and by the aid of dilute sulphuric acid, the internal core of unroasted sulphide returned, preferably through a heated pipe to dry it, to the closed chamber or chambers for re-roasting, and the operation repeated until sufficient zinc and sulphur are removed, the remaining material being then a product from which lead, &c., can be recovered by smelting. The zinc is precipitated from the solutions by calcium polysulphide, prepared by slacking one part of quicklime, grinding and mixing it with one part of sulphur, and boiling the powder for two hours in water in the proportions of about 1 to 10.—A. W.

Zinc; Recovery of ——, from Sulphide Ores. H. F. Kirkpatrick-Picard, London. Eng. Pat. 22,570, Dec. 11, 1900.

The process is for the treatment of unroasted sulphide ores by mixing them with a reducing agent, such as lime, iron or iron oxide, and a carbonaceous material suitable for coking, forming the mixture into briquettes, and distilling the same in such a manner as to first form a coke and then reduce and volatilise the zinc, the resulting sulphide of calcium or iron and any non-volatile metals remaining in minute particles in the coke.—A. W.

Aluminium; Process for Improving the Quality of ——. H. J. Haddan, London. From The Metcorit Gesellschaft, G. m. b. H., Berlin. Eng. Pat. 22,753, Nov. 11, 1901.

The process consists of adding phosphorus to molten aluminium encased in a perforated receptacle closed with a lid, which is lowered into the bath and moved about therein by means of a lever until the phosphorus has melted and combined with the metal. A small quantity of magnesium, 0·5 to 1·0 per cent., may also be added. Furthermore, the casting mould should be heated to the temperature of red-hot iron, and the casting of phosphorus-aluminium alloy should be removed from the mould from one to two minutes after being cast, and then allowed to cool in the open air, these points being claimed separately, and as a combined process.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Double Salts; Electro-chemistry of ——. W. A. Kistiakowsky. J. Russ. Phys. Chem. Soc. 1901, **33**, [6] and [7], 480—496 and 592—621.

The author introduces a new method of calculating the electrolytic potentials of the alkali and alkaline earth metals from the heats of formation of the haloid salts in dilute aqueous solution. The numbers obtained, which are calculated from the results of Thomsen and Berthelot with reference to the potential of the hydrogen electrode immersed in a solution of normal concentration taken as zero, differ somewhat from those given by Wilsmore (Zeit. phys. Chem. 1900, **35**, 291—332).

The concentration and temperature conditions requisite for the formation of the complex salts $Ag_3I(NO_3)_2$ and Ag_2INO_3 have been investigated, and from measurements of the electromotive force of the concentration cell,

$$Ag \mid AgNO_3.AgI \mid AgNO_3(conc.) \mid AgNO_3 \mid Ag,$$

the author shows that the salt $Ag_3I(NO_3)_2$ yields the ions Ag_3I and $2NO_3$. In the case of Ag_2INO_3 the ions are probably Ag_2I and NO_3.

A relative measure of the energy of formation of double salts of potassium cyanide with other metallic cyanides has been obtained by determining the electromotive force of the element R | KCN | RX | R, R being a metal and RX one of its salts. Where R is Mg, Al, Zn, Cd, Il, or Cu, the author finds that the electromotive force increases as the tension of decomposition of the double cyanide decreases, as is required by the principle of electro-affinity put forward by Ahegg and Bodländer in 1899. The exceptions to this rule, namely, Ni, Pb, Hg, and Ag, are due to the capacity possessed by these elements of forming complex cathions.

The author has devised a special apparatus in which he has determined the relative velocities of migration of the ions of the double salts $Ag_3Cr(C_2O_4)_3 + 4H_2O$, $K_3Fe(CN)_6 + 3H_2O$ and $K_3Co(CN)_6$, the results showing that Kohlrausch's law holds also for such complex salts.—T. H. P.

Carbon Anodes; Electrolysis of Alkali Chloride Solutions with ——. L. Sprosser. Zeits. für Elektrochem. 1901, **7**, [71], 971—976; [72], 987—994; [73], 1012—1017; [74], 1027—1035; [76], 1071—1076; and [77], 1083—1093.

Full details are given of all the experiments, the results of which have already been communicated by the author in conjunction with F. Foerster (this Journal, 1901, 999—1000).—J. S.

Chlorates; Process used at Niagara Falls for the Production of Electrolytic ——. J. B. C. Kershaw.

See under VII., *page* 115.

English Patents.

Accumulators or Secondary Batteries. [*Cerium Electrolyte.*] C. Auer von Welsbach, Vienna. Eng. Pat. 21,566, Nov. 28, 1900.

The electrolyte consists of a solution of at least one metallic salt, such as one of zinc, and of cerium salts, preferably sulphate. The carbon anode is formed of graphitised carbon filaments, and the cathode is a plate of zinc or zinc amalgam coated with mercury. Two forms of cell are described, the one for transport, and the other for stationary purposes.—G. H. R.

Electrical Storage (Planté) Batteries and Accumulators. [*Electrodes.*] L. F. Lacroix, Marseilles. Eng. Pat. 21,886, Dec. 3, 1900.

The bimetallic wire of which the electrodes are formed is made by drawing out "non-formable" cores from an ingot

of antimoniated lead, and soldering or welding them with a fusible alloy to a tubular casing. Ribbons can be produced by passing the wire through a rolling mill. Each electrode is composed of numerous pieces of the wire soldered at one end to a supporting plate or equivalent, and suspended from it. The containing vessel has two grooved shoulders in its upper part, the notches of which are alternately deep and shallow, according to whether they receive the bent or the straight part of the supports. The supports of the negatives have their bent ends in the right-hand shoulder, and those of the positives in the left shoulder, so that the ends of the supports are alternately in two different planes, and their upper part is provided at the end with a cylindrical projection which fits into corresponding holes in a collecting bar or strip resting on, and connecting together, plates of like polarity. The containing vessel is closed with a plate provided with an upper reservoir, in which is a hole for the escape of gas. The separators are of perforated ebonite or other suitable material, corrugated only at certain distances, the undulations being in pairs, one to the right and the other to the left, the total width being equal to the distance normally separating two electrodes.—G. H. R.

Electric Storage Batteries or Accumulators. J. T. Niblett, Westcombe Park. Eng. Pat. 1890, Jan. 28, 1901.

The electrode or element comprises a metallic conducting support coated on one side with active material, and on the other with insulating or inferiorly-conductive material, which closely surrounds it and the edges of the support like a frame, and encases all the parts of the metallic supports which would be otherwise exposed to the electrolyte. When the conducting support for the active material is of sheet lead or other soft metal, a sheathing or reinforcement is formed of rigid or semi-rigid insulating or inferiorly-conductive material surrounding the terminal or lug which may be coated with a not readily oxidisable metal, such as gold, platinum or antimony. A separator for use between the elements consists of a plate of earthenware or similar material, porous at the parts to be located between the partitions of the element coated with active material, and non-porous or impervious at the parts placed between the uncoated portions of the element.—G. H. R.

Electric Batteries. [*Self-regenerating Depolariser.*] G. Rosset, Paris. Eng. Pat. 2587, Feb. 6, 1901.

The depolarising agent, preferably in solution, is composed of "cupric acid" combined with an alkaline base, especially with ammonia [cuprammonium], with or without the presence of organic substances for facilitating solution. The depolariser is capable of self-regeneration by contact with the atmosphere. A porous battery vessel is employed, in the wall or walls of which an insoluble, or only slightly soluble, salt, such as a ferrocyanide of copper, is deposited to prevent the diffusion of the saline solutions through the walls.—G. H. R.

Electrolytic Polarisation Cells having an Aluminium Electrode. [*Electrolyte.*] Siemens Bros., London. From Siemens and Halske Actiengesellschaft, Berlin. Eng. Pat. 17,480, Aug. 31, 1901.

A solution having no chemical action on the aluminium is proposed as the electrolyte for aluminium electrolytic cells, such as an acid solution of an organic salt of ammonium, or a solution of the mandelate of an earth or an alkaline earth, or of the bicarbonate of calcium or magnesium.—G. H. R.

Electrical Accumulators. [*Metallic Magnesium.*] T. A. Edison, Orange, New Jersey, U.S.A. Eng. Pat. 20,072, Oct. 8, 1901.

In an electrical accumulator of the type employing an alkaline zincate or other metal solution, a surface or plate of metallic magnesium is used, upon which the zinc or other metal is plated in charging. The depolariser is preferably an electrolytically active nickel-oxygen or cobalt-oxygen compound as described in Eng. Pat. 2490, 1901 (this Journal, 1901, 589).—G. H. R.

Alkali Chloride; Method and Apparatus for Electrolysing —— with Mercury Cathodes. P. La Cour, Vejen, Denmark. Eng. Pat. 1783, Jan. 25, 1901.

A device for leaching alkaline amalgams obtained by electrolysis is characterised by stretching wire gauze in the leaching cells immediately above the amalgam, and over horizontal strips at the lower parts of the partitions between the decomposition and the leaching cells. The gauze retains the lye above it so that it can only sink regularly and quietly on to the amalgam when the lye beneath the gauze is withdrawn. A container, adjustable in height, is arranged in conjunction with the leaching cells, and is partially filled with mercury. It is provided at its upper part with an overflow pipe, and is connected by a pipe with the underside of the wire gauze, so that the lye can be withdrawn under the pressure due to a given column of mercury.—G. H. R.

Electrolytic Methods and Apparatus. [*Alkali Salts.*] E. Edser, Putney, and M. Wilderman, Ealing. Eng. Pat. 22,902, Dec. 14, 1901.

In electrolytic cells, such as described in Eng. Pat. 18,958, 1898 (this Journal, 1899, 923), where the combining and decomposing compartments are separated from each other by a partition of superimposed mercury troughs, the difference between the surface tensions of the mercury and the amalgam is utilised to effect their circulation between the compartments. Local variations in the surface tension of the amalgam and the consequent circulation of it and the mercury are produced by increasing the speed with which the alkali metal existing as amalgam combines with water, which is effected by placing on the amalgam in the combining compartment pieces of carbon, partially metal-coated, or a combination of carbon and metal filings. In the cells having a combining compartment and no electrical combining circuit carbons are employed in contact with both the mercury and the caustic alkaline solution, the contact between the former and the carbons being formed by wire. Sudden variations in the surface tension of the amalgam are produced by sending momentary electrical currents through it to an electrode suspended in the alkaline hydrate solution, and one method of obtaining this intermittent current is by employing a rotating disc commutator with revolving arm, adapted to automatically and momentarily complete a current circuit any desirable number of times in rapid succession at suitable intervals. Other variations as to method of obtaining the intermittent current are also described.—G. H. R.

Thermo-Electric Couples; Manufacture of ——. [*Copper Sulphide.*] E. Hermite and C. F. Cooper, Paris. Eng. Pat. 2836, Feb. 9, 1901.

This method of making thermo-electric couples is an improvement on that described in Eng. Pat. 2835, 1901 (this Journal, 1901, 482), and consists in first submitting bars of copper to the action of sulphur vapour and then heating them in absence of air and presence of copper, so that the latter may absorb the sulphur vapour evolved from the bars. A compound wire of brass and copper is wound round a bar of copper sulphide, and the compound bar is then exposed to the action of sulphur vapour, and is finally heated in absence of air and presence of copper. By adding about 5 per cent. of iron sulphide to the copper sulphide at the time of fusion, the bars subsequently cast offer greater resistance to the deterioration caused by heat. The couple is protected by coating it with iron or copper sulphide, or with a mixture of both, either by dipping the couple in the molten sulphide, or by casting the latter around it. Protection may also be effected by casting brass, bronze, German silver, or similar metal or alloy around the couple.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Metals; Solution of ——. T. Ericson-Aurén and W. Palmaer. Zeits. physik. Chem. **39**, 1—13. Chem. Centr. 1901, **2**, [25], 1293.

It is found that in studying the velocity of solution of a metal in an acid, results cannot be obtained corresponding

with the law of mass action. From the results of further experiments, however, the authors deduce a general formula for the velocity of solution of metals, based upon the view that solution is always caused by a local current, set up in the short circuit formed by metal, acid, and impurity of metal. The temperature has a much smaller influence on the velocity of solution of metals than on other reactions, and this small temperature coefficient is in agreement with the relatively small temperature coefficients of electro-motive forces and electrical resistances.—A. S.

XII.—FATS, OILS, AND SOAP.

Fatty Acids; Action of the Higher ——, on Normal Alkali Carbonates. J. Klimont. J. prakt. Chem., 1901, **64**, [21, 22], 493—495.

It is known that, under certain conditions, the strong mineral acids convert normal carbonates into bicarbonates, whilst the dilute acids give neutral salts and carbon dioxide. The lower fatty acids behave similarly to dilute mineral acids. If stearic acid, dissolved in a suitable solvent, be allowed to act in the cold upon a strong solution of a normal carbonate, the alkali salt of the acid is obtained, but no carbon dioxide is evolved. On heating, carbon dioxide is evolved, but apparently not in molecular proportion. The author has titrated fatty acids with a semi-normal solution of sodium carbonate; 1 mol. of carbonate was found to correspond to 1 mol. of acid, except in the case of acids somewhat soluble in water (capric acid), which required rather less of the carbonate solution. Excess of oleïc acid dissolved in benzene was well mixed with a strong solution of soda; after treating with benzene and acetone, and boiling with alcohol until the latter gave no residue on evaporation, the residual substance was found to be sodium bicarbonate.

—A. C. W.

Glycerides of Fatty Acids: Action of Superheated Steam on ——. J. Klimont. Zeits. angew. Chem. 1901, **14**, [51], 1269—1270.

The author's investigations have been made with the object of determining to what degree of temperature and pressure it is possible to subject certain fats without fear of their being hydrolysed; and he points out that such information is of importance for many technical purposes, such as the lubricating of steam cylinders, &c.

Action of Superheated Steam on Fats in an Autoclave.—In each case the fats were freed from free fatty acids by treatment with sodium hydroxide solution, after which they were filtered hot, and dried. 30 grms. were then heated with 500 c.c. of water in an autoclave for the period mentioned, and the acid values subsequently determined. In this way the results shown in Tables I. and II. were obtained.

Table I.

Pressure Maintained at 7 Atmospheres.

Fat.	Acid Values, after			
	2 Hours.	4 Hours.	6 Hours.	8 Hours.
Cocoanut oil	0·1	0·3	0·5	0·9
Japan wax.....	4·8	5·3	9·4	13·1
Tallow..	17·5	37·2	67·3	81·8
Cacao butter....	12·3	24·5	45·1	62·6
Olive oil	15·1	32·1	53·0	71·4
Sesamé oil	14·3	31·4	56·2	76·0
Cottonseed oil ..	10·0	23·2	36·3	51·7
Linseed oil	11·4	21·1	43·3	56·1

Thus the difference in the degree of decomposition of cocoanut oil and Japan wax, as compared with the other fats, at a pressure of 7 atmospheres, disappears when the pressure is increased to 15 atmospheres.

Action of a Current of Superheated Steam on Fats.—In these experiments the neutral fats were heated in a flask immersed in an oil-bath; whilst steam was introduced from a boiler kept at about a pressure of 3 atmospheres. Before entering the flask, the steam was passed through a copper spiral heated by means of a Bunsen burner, and its temperature taken, whilst the oil in the bath was brought to the same temperature. As it was found difficult to keep the pressure quite constant, the following results can only be regarded as approximately correct.

Table II.

Pressure Maintained at 15 Atmospheres.

Fat.	Acid Values, after			
	1½ Hours.	2 Hours.	4 Hours.	6 Hours.
Cocoanut oil	78·6	90·2	123·9	185·5
Japan wax.....	..	12·3	32·5	46·1
Tallow.....	..	62·3	106·3	155·8
Cacao butter....	..	34·5	76·1	160·5
Olive oil	..	66·5	114·5	159·5
Sesamé oil	..	61·7	108·4	153·7
Cottonseed oil ..	..	42·2	80·2	128·6
Linseed oil.....	..	38·1	78·5	130·5

Table III.

Action of Steam at a Pressure of 3 Atmospheres for 30 Minutes.

Fat.	Acid Values, at about			
	170° C.	180° C.	190° C.	200° C.
Cocoanut oil	..	..	0·2	0·4
Olive oil	0·6	1·0	3·1	8·9
Sesamé oil	0·6	0·9	2·5	7·4

Action of Steam at Different Pressures in an Autoclave.—The following results were obtained by heating olive oil for six hours in an autoclave with steam at the pressures named:—

Pressure in Atmospheres.	Acid Values.	Pressure in Atmospheres.	Acid Values.
3	6·4	10	62·3
5	35·3	13	108·3
6	41·7	15	159·5
7	53·0		

—C. A. M.

Olive Oil; Solid Fatty Acids of —— D. Holde. Mitth. a. d. königl. tech. Versuchsanst. 1901, **19**, [3], 115—117.

In a former communication (this Journal, 1901, 1003) the author and Stange stated that they had isolated from pure olive oils a mixed glyceride, oleo-dimargarin. He now describes his further experiments on the fractional crystallisation of the fatty acids of this glyceride by means of magnesium acetate, in comparison with results obtained with a mixture of stearic acid (2·84 grms.) and palmitic acid (2·56 grms.) melting at 55·5°—56·5° C. The fatty acids of the first fraction from the artificial mixture melted at 66·5—67·5 and on further crystallisation readily yielded stearic acid melting at 68°—69° C. On the other hand, the solid fatty acids from the glyceride gave four fractions with fatty acids melting at 55·5°—57° C., whilst by repeated recrystallisation, melting points of 57·5°—59·5° C. were obtained. The fatty acids in the mother liquid also showed a similar melting point. Moreover, the molecular equivalent of the fatty acids in the first fraction was 280·4 in the case of the mixed stearic and palmitic acids, as against 273 for the solid fatty acids of the mixed glyceride.

Hence, the author considers it proved that the substance which he has isolated from olive oil is not oleo-palmito-stearin like that isolated by Klimont from cacao butter (this Journal, 1901, 1121), but a glyceride of the formula—

$$(C_{18}H_{33}O_2).C_3H_5 : (C_{17}H_{33}O_2)_2.$$

—C. A. M.

Sesamé Oil; Detection of ——. F. Ranwez.
See under XXIII., *page* 141.

English Patent.

Soap; Means or Apparatus to be employed in the Manufacture of ——. Johnsons and Willcox, London. From W. F. Haywood, Los Angeles, California, U.S.A. Eng. Pat. 759, Jan. 11, 1901.

The saponification of the materials is effected in a vacuum chamber, jacketed with a steam-space, inlet, and condensed water outlet. A rotating longitudinal frame carries agitators, formed to act also as scoops to carry vapour from the upper part of the chamber into the mass below. A central axle, rotated independently of the frame, and in reverse direction, carries paddles, stirrers, or beaters. The frame has four longitudinal members, and the ends of alternate agitators are connected to two of these diametrically opposite to each other, and the ends of the other agitators to the other pair of opposite members, so that the agitators are alternately at right angles to each other, with the reversely rotating paddles between. Means are provided for introducing ingredients to the chamber without destroying the vacuum.
—E. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*B.*)—RESINS, VARNISHES.

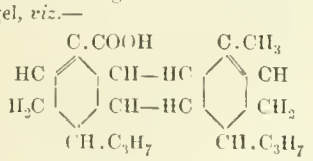
Colophony: Contributions to the Knowledge of ——. W. Fahrion. Zeits. angew. Chem. 1901, **14**, [48], 1197—1208; and [49], 1221—1233.

After giving a historical survey of the whole subject, the author describes in detail his experiments with one variety of colophony, from which he has arrived at the following conclusions:—

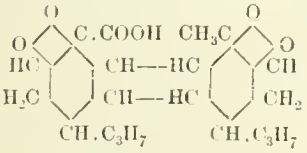
1. American colophony consists in the main of sylvic acid, $C_{20}H_{30}O_2$, and the formula assigned by Mach to the acid, $C_{19}H_{28}O_2$ (abietic acid) is incorrect.

2. The sylvic acid is present in the colophony in the form of an amorphous modification, which, on treatment with dilute alcohol, or when subjected, in alcoholic solution, to the action of a current of hydrochloric acid gas, is transformed into the crystalline modification which melts at a considerably higher temperature, and when heated for some time at higher temperatures is reconverted into the amorphous form.

3. Owing to its structural composition, which the author's experiments showed to agree with the formula of Bischoff and Nastvogel, *viz.*—

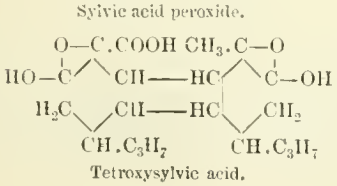


sylvic acid, and especially its salts, undergo spontaneous oxidation with great readiness, a molecule of oxygen taking the place of each of the double linkings, with the formation of compounds, the probable constitution of which is—



and

Sylvic acid peroxide.



Tetroxysylvic acid.

The superoxides, $C_{20}H_{30}O_6$, which are insoluble in petroleum spirit, readily change into the soluble hydroxysylvic acids, $C_{20}H_{29}(OH)O_3$ and $C_{20}H_{28}(OH)_2O_4$. Both kinds of oxidation products occur naturally in colophony in varying amounts, and account for the different composition of different kinds of colophony.

4. The hydroxysylvic acids which are soluble in petroleum spirit, are not the final products of spontaneous oxidation. For the dihydroxysylvic acid has a great tendency to absorb a further molecule of oxygen, yielding a derivative insoluble in petroleum spirit; and the tetroxysylvic acid also, on further spontaneous oxidation yields insoluble derivatives of unknown nature.

5. Secondary oxidation processes also occur with the formation of decomposition products, which are neutral, unsaponifiable, soluble in petroleum spirit, and partially volatile on heating. These substances are also met with in colophony.

6. Colophony also contains a small proportion of a neutral, saponifiable substance, which is soluble in petroleum spirit, and, in the author's opinion, is probably an acid anhydride.

7. On oxidation with alkaline potassium permanganate, sylvic acid yields considerable quantities of the products formed on spontaneous oxidation, probably tetrahydroxysylvic acid, $C_{20}H_{30}(OH)_4O_2$.

As regards the bearing of these results on the analysis of commercial samples of colophony, the author points out that in most cases, especially in the varnish industry, great oxidisability is a desideratum. In his opinion a good colophony should have an acid value as high as possible, the nearer to that of pure sylvic acid (185·4) the better. On the other hand its ester value, and its percentage of unsaponifiable matter and substances insoluble in petroleum spirit should be as small as possible. All these conditions appear to stand in a certain relation, and the lighter the colour of a colophony, the better are they fulfilled. The author considers that his results may help to explain the changes which take place in the spontaneous oxidation of unsaturated fatty acids.—C. A. M.

Colophony. W. Fahrion. Zeits. angew. Chem. **14**, [50], 1252—1253.

Tschirch and Weigel having given to the crystallised acid $C_{13}H_{20}O_2$, which they isolated from Strasburg turpentine, the name *obienic*, not *abietic*, acid, the author proposes to use the latter name for the acid from colophony. Mach's abietic acid, $C_{19}H_{28}O_2$, seems to be identical with *sylvic* acid, to which the formula $C_{20}H_{30}O_2$ has been ascribed (see preceding abstract).

After driving off the turpentine from the resin, the latter is heated for a long while, till the whole has become quite amorphous. The more completely the crystallised substance is destroyed, the more transparent and the more highly valued is the rosin, the best sorts of which are quite free from crystals, while in the poorer kinds small bow-shaped crystals can be detected under the microscope.—J. T. D.

(*C.*)—INDIA-RUBBER, &c.

English Patent.

Rubber Sponge; Manufacture of ——. H. H. Lake, London. From Vereinigte Gummiwaaren-Fabrike Harburg-Wein, vormals Menier. J. W. Reithoffer, Harburg-on-the-Elbe, Germany. Eng. Pat. 22,201, Nov. 4, 1901.

The unvulcanised rubber, either in its solid or dissolved condition, is incorporated with metallic salts, seeds, moulded bodies composed of sugar, dextrin, gelatin, or the like, which are not gasified by heat, and which, after vulcanisation is completed, can be removed from the rubber by solution or washing, leaving the mass porous and spongy.
—L. A.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannin and Tartar Emetic; Interaction between ——. N. N. Ljubavin. J. Russ. Phys. Chem. Soc. 1901, **33**, [8], 680—684.

The author has studied the action taking place when solutions of tannin and tartar emetic are mixed under different conditions of concentration and in presence of sodium acetate and of ammonia. The action depends on the order in which the two solutions are mixed; thus when a 1 per cent. solution of tannin (2—3 molecular proportions), is added to a 1 per cent. solution of tartar emetic (1 molecular proportion), a precipitate is obtained, whilst if the solutions are mixed in the inverse order, no precipitate is formed.

The precipitate is in every case white and gelatinous, giving greyish lumps when dried in a desiccator. When dried at 100° C., its composition is represented by the formula $C_{14}H_7SbO_9$. The filtrate from the precipitate always gives reactions for tannin and for antimony.

—T. H. P.

Leather for Bookbinding. J. Gordon Parker. J. Soc. of Arts, **50**, [2558], 25—32.

The author describes in detail the experiments and investigations which were carried out by the second sub-committee, and on which this committee based its recommendations, which were published in the Society of Arts' Report on Leather for Bookbinding. (This Journal, 1901, 819.)

To find out whether any special tanning material had any advantage or disadvantage in the production of leather, calf, goat, and sheep skin were tanned, one of each skin, in each of the following tanning materials: Pure sumach, *pistacia lentiscus*, tamarisk, oak bark, myrobalans, quebracho, mimosa bark, gambier, larch bark, chestnut extract, oakwood extract, turwar bark, and hemlock extract. One-half of each skin was removed from the tanning liquor as soon as it was lightly tanned, the other half being left in the liquor for a longer period, the liquors being also made stronger. The leathers so produced, were rinsed through water to remove superfluous tan, allowed to drip, lightly oiled on the grain surface, and dried in the usual manner. One piece of each was subjected to the following tests for 30 days:—

(1) Direct sunlight; (2) Gas light; (3) The light of an incandescent gas burner; (4) A 16 candle-power incandescent electric lamp; (5) Fumes of burnt gas; (6) Action of moist and dry air alternately; (7) An atmosphere of carbon dioxide; (8) Action of direct sunlight, the leather being protected from the air by a sheet of glass.

The experiments with the fifth set of leathers, which were subjected to the fumes of burnt gas, were carried out in a chamber 8 ft. high and 6 ft. square, the temperature of which was not allowed to exceed 90° F., a temperature usual at the upper shelves of several libraries. The leathers after this treatment were compared, and it was found that those tanned with certain tanning materials were less affected than those tanned with others; that the fumes of burnt gas appeared to act on all leathers more than any other agent. It was found that artificial light had only a slight effect upon the leather, providing the latter was protected from the products of combustion, also that direct sunlight and air appeared to have a very strong disintegrating action upon most of the samples, but when the leather was protected by a covering of glass, the action was less intense. Moist and dry air appeared to have no special deteriorating action. The same thing was noticed with regard to the set exposed to carbon dioxide. The electric incandescent light appeared to have less effect than ordinary gaslight or the incandescent gas burner. In each case the leathers tanned with sumach, were the least affected, followed in regular rotation by myrobalans, chestnut extract, oakwood extract, oak bark, gambier, larch bark, hemlock, quebracho, pistacia, and tamarisk. The worst was the leather tanned with turwar bark. The portions of the leather which had been more heavily tanned were more affected than those which had been lightly tanned.

These results showed that the tannins which belong to the pyrogallol class of tanning materials were the least affected, while those of the catechol series became very red in colour and hard in texture, the fibres appeared to be disintegrated, and in the worst cases the fibres of the leather appeared to come off in the form of powder when rubbed. The tannins of the catechol series appear to part readily with water when exposed to the action of light, heat, or acids, and are converted into red, resinoid substances which appear to thoroughly disintegrate the fibres of the leather, causing it to become hard and lose all strength.

It was found that East India tanned goods tanned with turwar bark were most sensitive to either gas fumes, light, or heat. These goods are usually re-dressed in this country, they are stripped by washing in weak alkalis, brightened in colour by washing in water containing sulphuric acid, and afterwards re-tanned in sumach. This treatment makes the leather even more sensitive, and samples of such leather exposed to gas fumes and direct sunlight for 60 days were quite rotten at the end of the period.

It was found that the oak-bark tanned calf leather stood the tests described above very well, provided the fibres were not overloaded with tannin. The decay of modern oak bark tanned calf was found to be due partly to the leather being too heavily tanned, and, secondly, to the trade custom of brightening the colour and removing the stains by washing in sulphuric acid.

The dyeing, seasoning, and glazing of the leather, provided no sulphuric acid was used in the dye bath to develop the colour, did not impair the life of the leather.

Further experiments showed that calf and sheep skins appeared to be the weakest, while goat, seal, and pig skins produced the strongest leathers.

The use of sulphuric acid, either as a brightening agent or in the dye-bath, was shown to be universal, as out of 38 samples of commercial morocco, 36 were found to contain free sulphuric acid; 12 samples of skivers out of 18 examined, contained sulphuric acid; 32 samples of calf leathers were tested, 27 of which contained free acid; 18 Persian goat and 23 Persian sheep were also tested, and in each case free sulphuric acid was found. This was also the case with six samples of pig skin. These were all of English manufacture, some obtained direct from the manufacturers, others from leather merchants and book-binders. French and German leathers were also tested, and were found to contain even a higher proportion of acid, one sample containing as much as 1·3 per cent.

As it is always the custom in tanyards to wash the skin well in water after the treatment with acid, the following test was undertaken to ascertain the amount of washing necessary to remove the acid. Several skins were treated with known quantities of sulphuric acid, and washed at varying periods with running water, and it was found practically impossible to remove the whole of the acid by rinsing or washing in the ordinary manner. The acid, however, was found to be easily neutralised by washing the skin in water containing either potassium or sodium lactate or acetate.

It was found that skins which came from abroad, preserved in salt, were, when tanned, weaker in texture than either dried or fresh skins. Sheep skins which come from New Zealand and Australia in what is known as a "pickled" condition were found to be weak and unsuited for book-binding work. A lot of leather examined microscopically was found to be damaged by over-puering. This was especially marked in many samples of pig skin. Most commercial leather was found to be too heavily tanned; that is to say, besides the tannin which was combined with the fibres, a large amount of uncombined tannin was adhering to and contained in the fibres. This uncombined tannin appeared to oxidise, and to cause the disintegration and rotting of the fibres.

Several substitutes for leather, consisting mostly of cloth or cotton foundations covered over with some material of a waterproof nature, were also subjected to a similar series of tests to those described for the leather, and although they withstood the action of light and heat, they were more easily affected by the fumes of burnt gas than the poorest qualities

of leather, and in dry atmospheres they became hard and brittle.

Oxalic acid used for brightening leather on the backs of books made the leather hard and brittle, and caused it to decay.

The use of sulphuric acid to plump the leather in tanning had the same effect as when used as a brightening agent.

Cheap brands of sumach were found to be adulterated with the leaves of *pistacia lentiscus* and *tamarix africana*. Both of these materials belong to the catechol series, and skins tanned with sumach containing either of these adulterants produce leather which is unsuited for bookbinding work.

The author was struck with the number of disguises under which the ordinary skin masqueraded. Sheep skin lends itself to being worked up to imitate morocco, calf skin, crocodile, and alligator leathers, and in many cases books were found to be bound with these imitations.

The author advised bookbinders and librarians to use leathers which had been tanned with pure sumach, and to insist that in the manufacture or dyeing of these leathers, no sulphuric acid should be used at any stage. He absolutely condemned the use of Persian morocco or Persian sheep skin, as these skins begin to decay in less than ten years. Buyers of leathers should not demand high finishes, bold grains, and other characteristics in the leather, such as could only be obtained at the expense of its strength and durability.—J. G. P.

XV.—MANURES, Etc.

ENGLISH PATENT.

Superphosphate for Fertilising Purposes; Treatment of ——. J. Hughes, London. Eng. Pat. 3178, Feb. 14, 1901.

SLAKED lime is added to ordinary superphosphate in such proportion as to convert, to any desired extent, the water-soluble phosphate into phosphate not soluble in water, but soluble in a one-tenth per cent. solution of citric acid, the proportion of lime being so adjusted as not to render the resultant product distinctly alkaline. The "converted superphosphate" thus obtained is claimed for use as a general manure. Reference is made to Eng. Pat. 19,574, 1900 (this Journal, 1901, 267).—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Cellobiose. Z. H. Skraup and J. König.

See under XXIV., *page* 144.

Acetochloroglucose and Acetochlorogalactose; Synthetic Researches with ——. Z. H. Skraup and R. Kremann.

See under XXIV., *page* 144.

Gum Arabic; Increasing the Adhesive Power of ——. Papier-Zeit., 1901, **26**, [100], 3712.

THE adhesive power of gum arabic may be greatly increased by the addition of a little sulphate of alumina, according to the following recipe:—To 250 grms. of concentrated gum solution (2 parts of gum to 5 parts of water) are added 2 grms. of crystallised sulphate of alumina dissolved in 20 grms. of water. This mixture sticks even unsized paper, millboard, wood, glass, porcelain, and other materials to which labels often adhere with difficulty and easily come off.—J. F. B.

Wheat and Maize Starches of Commerce. D. Saare. Zeits. Spiritusind. 1901, **24**, [49—50], 502 and 512—513.

Wheat-Starch.—The moisture ranged from 9·9 to 15·3 per cent., mean 13·2 per cent. The other constituents were calculated on the dry substance. The ash lay, as a rule, between 0·10 and 0·24, mean 0·20, although in one case it was 0·44 per cent. The albuminoids (mainly residues of gluten) were from 0·18 to 0·59 per cent., mean 0·38 per cent. The fat (ethereal extract) was from 0·05 to 0·13, mean 0·09 per cent. The reaction was either neutral or very faintly acid, never reaching 5 c.c. of decinormal soda per 100 grms., which is the "acid-free" limit in the potato-starch trade.

Maize Starch occurs in lumps and as fleur, the former being generally used for industrial purposes, and the latter as food. The moisture fell practically within the same limits as with wheat starch; 15 per cent. may be regarded as the normal maximum. The ash averaged 0·16 per cent., and the albuminoids 0·48 per cent. in the case of the white samples, rising to 1·88 per cent. in the case of yellow products. The fat averaged 0·06 per cent. In the best samples of maize-starch, the acidity was not much greater than in ordinary qualities of wheat-starch. But the peculiar flaky nature of maize gluten, which does not form a plastic mass like that of wheat, necessitates chemical treatment for its removal. In Germany this is generally effected by treatment with sulphurous acid, and in the commoner qualities the acidity of the starch is frequently high. Sometimes sulphuric acid is added before drying in the centrifugal, in order to obtain large lumps. Generally, the residual sulphurous acid is not sufficient to affect the stiffness of the paste, but in those samples which had been treated with sulphuric acid, the residual acidity was from 22 to 25 c.c. of decinormal soda, and in these cases the stiffness of the paste was very inferior.—J. F. B.

Soluble Starch; Acetylation of ——. F. Pregl. Monatsh. für Chem., 1901, **22**, [19], 1049—1066.

THE soluble starch was prepared by Zulkowsky's method (Ber. **13**, 1395), but using 100 grms. of potato starch per kilo. of glycerin. The final purification was by dissolving in water and filtering into alcohol; yield, 60 per cent. According to the quantity of sulphuric acid in the acetylating mixture, an acetyl compound insoluble or soluble in alcohol is obtained. The following method gives the insoluble compound:—5 grms. of soluble starch are shaken with 45 c.c. of acetic anhydride, and mixed with 5 c.c. of a cold mixture of 22·5 c.c. of acetic anhydride and 2·5 c.c. of strong sulphuric acid. On frequent shaking, the starch gradually dissolves. After 48 hours, the solution is poured into much water, the product well mixed and ground with water, filtered, washed, and dried *in vacuo* over sulphuric acid. The yield is 132 per cent. of the starch. The product has the composition $C_6H_7O_5(C_2H_3O)_3$; it is free from ash and sulphur, does not reduce copper or bismuth salts in alkaline solution on boiling, and gives no coloration with iodine. The triacetyl compound, on saponification with caustic potash on the water-bath, gives a substance in every way identical with the original soluble starch. The author found that soluble starch cannot be dried *in vacuo* to constant weight except at a temperature of 100°—110° C.; the figures then obtained agree very closely with $C_6H_{10}O_5$. For soluble starch obtained by another method, Syniewski has given the formula $3C_6H_{10}O_5.H_2O$ (this Journal, 1897, 1029). The optical rotation of the acetyl compound dissolved in ethyl acetate is $[\alpha]_D = +163·6°$; that of soluble starch in aqueous solution is $[\alpha]_D = +191·27°$. Molecular weight determinations, which were not concordant, showed that the molecule of the acetyl compound must be eight or nine times that of the empirical formula.

The acetyl derivative soluble in alcohol is obtained as follows:—5 grms. of soluble starch in fine powder, dried *in vacuo*, are mixed with 25 c.c. of acetic anhydride, and then with a freshly prepared, somewhat cooled mixture of 3 c.c. of anhydride and 2 c.c. of strong sulphuric acid. When the temperature has fallen to 70°—80° C., the solution is poured into water. The product is well washed, and dried in the air; the 35 grms. obtained from 25 grms. of soluble starch are then dissolved in 40 c.c. of alcohol on the water-bath, the solution cooled, and the deposit again "recrystallised" three times, after which it is dissolved in a little ethyl acetate, and the solution allowed to fall slowly (one drop in two seconds) through a column of ether 90 cm. long. The yield is 40 per cent. of the starch employed. The acetyl compound thus obtained, $C_6H_7O_5(C_2H_3O_2)_3$, has the rotation $[\alpha]_D = 148·6°$; the molecular weight is about 840, thus indicating threefold the formula just given. On saponification in the cold, it yields a substance, $C_6H_{10}O_5$, with the rotation $[\alpha]_D = 187·0°$, very soluble in water, the

solution giving a red coloration with iodine, whilst the acetate gave no reaction. This substance is doubtless an erythrodextrin. The continued action of alkalis considerably reduces the optical rotation of the dextrin. It reduces Fehling's solution, the reducing power being about 12·5 per cent. of that of glucose. It cannot be identified with any dextrin hitherto described, but resembles that obtained by Syniewski by the action of malt extract on starch paste. —A. C. W.

Hexoses, Disaccharoses, and Polyhydric Alcohols; Magnetic Rotation of some ——. W. H. Perkin, sen.

See under XXIV., *page* 144.

English Patent.

Rice-Starch and other Amylaceous Substances; Manufacture of ——. G. W. Johnson, London. From Leconte et Cie., Electro-Suerière, Paris. Eng. Pat. 2294, Feb. 1, 1901.

The process consists in digesting the rice or other amylaceous substances with alkaline solutions of diminishing strength, washing, grinding, and afterwards subjecting the starch milk, suspended in a faintly alkaline liquid, to the action of an electric current, which coagulates the impurities and gives a starch of remarkable whiteness.—J. F. B.

French Patents.

Sugar Juice; Process for the Purification of ——; *by upward Filtration and Treatment with Quicklime and Carbon Dioxide.* J. Swager. Fr. Pat. 115,818, Feb. 6, 1900.

After the juice has been treated with quicklime, it is subjected to an upward filtration in order to remove the scum from the juice. Saturation with carbon dioxide follows. The apparatus for carrying out these operations is characterised by a filter in which the liquid enters at the bottom and the filtered solution passes out through the top. This is placed between the defecating and saturating vessels.—J. L. B.

Sugar Solutions; Purification of ——. L. Lefranc. Fr. Pat. 301,898, Sept. 4, 1900.

For the removal of inorganic impurities from sugar solutions, a fluorine compound, such as ferrous fluosilicate, is added. For purification from organic non-sugar and for neutralising the fluorine compounds, two bases constituting a salt are added, such as alkali, alkaline earthy or metallic manganites, manganates, permanganates, ferrites, ferrates, zincates, &c., also the aluminates of barium, strontium, and calcium. Following the use of fluosilicate, one of the above salts is added according to whether a reducing or oxidising effect is required.

If the removal of organic non-sugar only is required, the patentee uses a metallic oxidising or reducing salt, such as ferric or ferrous sulphate. The iron compound so formed is then decomposed by the addition of a suitable salt so that the resulting liquid is neutral.—J. L. B.

Juice or Syrup derived from the Beetroot or Sugar Cane; Impts. in the continuous Carbonatation and Sulphuration used in the Chemical Defecation of ——. La Société de Construction Mecanique de St. Quentin. Fr. Pat. 304,277, Oct. 4, 1900.

The patentees claim the use of a mechanical mixing movement in apparatus for continuous carbonatation, the intermittent or continuous circulatory movement being applied in the lower part of the apparatus so as to ensure complete admixture; also the application of the improvement to the continuous treatment of any liquid by any gas, and in particular to the "blow-ups," for the continuous carbonating and sulphiting of sugar juices, syrups, and molasses of sugar works and refineries.—J. L. B.

Sugar Juice or Unrefined Sugar Syrups; Method for the Extraction of Soluble Ash from ——. H. C. Bull and W. Sendey, London. Fr. Pat. 304,462, Oct. 12, 1900.

This process consists in passing an electric current through the juice or syrup, the anode being suspended in the juice or syrup contained in one compartment and the cathode suspended in an alkaline solution in another compartment, the two compartments being separated by a layer of mercury.—J. L. B.

Sugar Juice; New Method for Concentration and Extraction of ——. E. Loumeau. Fr. Pat. 304,567, Oct. 18, 1900.

The saccharine juice is frozen by means of liquid air. The defecated juice is placed in a closed double-jacketed vessel surrounded by a coil through which liquid air circulates. At the low temperature produced, a portion of the water in the solution of sugar is frozen and the more concentrated syrup after being withdrawn, is then boiled down in the vacuum pan without having to pass through the triple effect apparatus.—J. L. B.

Sugar Manufactories; Treatment of Runnings in ——. D. Prudent. Fr. Pat. 305,229, Nov. 9, 1900.

After the massecuite has passed the centrifugal apparatus, small grains of sugar which have passed through the meshes remain in the runnings. The patentee by improved treatment, is able to recover these as crystals without further reboiling, by conveying the syrup to a mixer where, under the combined action of mixing and cooling, a new crystallisation ensues. The mass is then filter-pressed and the sugar washed out with hot juice and boiled for first jet.—J. L. B.

White or Refined Sugar from Raw Sugar; Process for the Maximum Recovery of ——. J. R. Langlois. Fr. Pat. 306,294, Dec. 19, 1900.

The sugar to be treated, is dissolved in water or purer sugar juice to the point of saturation or supersaturation. When the melting is finished, cooling is effected by the use of a mixer, which keeps the mass in movement. According to the degree of saturation, to the temperature, and to the sudden or slow cooling, the size of the grain can be adjusted as desired. Diagrams of an apparatus are appended showing the arrangement of a series of melters, mixers, and centrifugals for working very low sugars in the battery.—J. L. B.

Sugar; New Process for the Extraction of ——. Escande and Philippet. Fr. Pat. 304,091, Sept. 27, 1900.

The patentees base their claim for the preparation of crystallised sugar on the slow cooling of syrups of high density, with the object of avoiding the operation of boiling to grain. The solution, after being defecated and concentrated to 35°—40° B., is introduced into a mixing vessel capable of being cooled or heated. During the process of filling, the mixer is kept at a temperature of 90°—105° C., at atmospheric or reduced pressure. When the mass contains about 20 per cent. of water at 40° C., it is conveyed to the centrifugals.—J. L. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barley and Malt; Detection of Parasites in ——. Lindner. Woch. für Bran. 1901, **18**, [49], 638.

For the detection of parasites in consignments of barley or malt, a sample, about 1 or 2 kilos., taken at the time of delivery in the presence of both buyer and seller, should be sealed up in a large bottle. The form of bottle best adapted for this purpose is the mushroom-shaped specimen bottle largely used at exhibitions, presenting a large surface for observation. If weevils or other parasites were present in the grain in small proportions, they will rapidly multiply in the bottle if kept in a warm room. Care must be taken that the bottle is properly closed, otherwise the loss of moisture would prevent the development of the parasites.

This fact is often utilised to destroy the parasites when they have made their appearance in the grain stored in bulk. If the grain be shovelled over and exposed, in dry weather, or if it be dried in the kilns, the parasites will be destroyed and their ravages stopped. Another plan is to place bags of water-absorbent substances in the heaps of grain in such a way that the latter does not come into actual contact with the chemicals.—J. F. B.

Barleys Rich and Poor in Protein; Experience with ——. Woch. für Brau. 1901, **18**, [52], 698—699.

Referring to the absence of "break" after fermentation, the writer agrees with the view that the fault is caused by the heating of the grain on the malting floor. Given a sufficient aeration of the barley in the steeping cisterns, not too long a duration of the steeping process, careful spreading of the couches, and proper ventilation of the malting floors, a temperature of 19° C. will never be exceeded, even in summer and with barleys rich in protein. Heating must be attributed more to the lack of these favourable conditions than to the protein content of the barley. It is not necessary that the temperature reached should be very excessive for the quality of the malt to be impaired; 20°—22·5° C. is quite high enough to have a bad effect. The writer concludes that no variation in the method of brewing, either by taking three decoctions or by the short-mashing process, can remedy the error of high temperatures or "forcing" conditions on the floor. Further, if the malt be prepared by cool germination, other conditions being normal, the richness or poorness in protein of the barley employed does not affect the quality of the beer produced.—J. F. B.

Millet as a Malting Material [*Distillery*]. Zeits. Spiritusind. 1901, **24**, [49], 503.

A correspondent writes that it is the custom in the eastern parts of Galicia to employ millet malt for the saccharification of the potato mashes. For mashing 6,500 kilos. of potatoes at 18—20 per cent. of starch, no more than 70—80 kilos. of millet are employed. For the yeast-mash, however, no millet is used, but 20 kilos. of barley are malted. So that, in all, only 70—80 kilos. of millet, and 20 kilos. of barley in the form of green malt, are used. Although millet costs rather more than barley, there is very little loss in malting, so that good results and considerable economy are said to be obtained.

The writer discusses this system, and states that it is doubtful, when such a small proportion of malt is employed, whether there is sufficient diastase left at the end of the primary fermentation to saccharify the residual dextrin and bring it into a fermentable condition. Next, it is not certain whether the starch in the millet ever becomes gelatinised, since with so small a quantity of malt, it is not permissible to employ high mashing temperatures. In order not to destroy any of the diastase, a temperature of 62° C. must not be exceeded, and the gelatinisation of the millet starch at this temperature is doubtful. The writer's experience in mashing raw millet is that it requires a temperature as high as that necessary for maize. If this be the case, the starch of the millet malt would be lost. Lastly, if millet malt is good for the main mash, he cannot understand why it is not used in the preparation of the yeast-mash, in order to avoid the inconvenience of malting two kinds of grain.—J. F. B.

Maize Mashes; Removal of Husks from ——. P. Behrend. Zeits. Spiritusind. 1901, **24**, [49], 502—503.

In the mashing of maize in the distillery, the author has determined the losses of extract and fermentable sugar caused by the removal of the husks from the mash. Tables are given showing the losses in the husks when they are removed (*a*) without washing, and (*b*) after washing with one water. The removal of the husks without washing is seen to be quite out of the question, as it involves a loss of 7·4 per cent. of the original starch, equivalent to 4·4 litres of absolute alcohol per 100 kilos. of grain mashed. When the exhausted grains are washed, the loss, of course, depends upon the quantity of water employed, but this is strictly limited on account of diluting the mash. Owing to the construction of the Hampel husk-remover, the absolute removal of the husks is not possible. The author's experience shows that it is best to remove not more than 20 kilos. of moist husks (after washing) per 100 kilos. of maize, so arranging matters that the loss of sugar in these husks shall be equivalent to not more than 0·5 litre of absolute alcohol. The question arises as to what advantage is to be got by removing the husks at all. The main advantage claimed will only be apparent to distillers in Germany, where the excise duty is levied on the volume of the mash. The removal of the husks enabled the author to mash 11 cwt. in place of 10 cwt. in an exciseable space of 17 hectolitres, thus effecting a considerable saving in duty, labour, and other expenses. The mash without the husks is more mobile; it is not necessary to allow so large a space for frothing during fermentation; a more concentrated mash may be fermented, thus ensuring a greater purity of fermentation; and, lastly, the cooling arrangements in the fermenting vats do their work more efficiently in a clearer mash.—J. F. B.

Fluorine Salt; Employment of Effront's ——, *in the Distillery*. F. Just. Zeits. Spiritusind., 1901, **24**, [50], 515.

The writer has used hydrofluoric acid with considerable success in a hot climate (Argentina); the effect of this acid is to retard the fermentation—a property which is of great use in a hot country, but hardly desirable in Europe. He expected to find a similar action in the case of Effront's fluorine salt, but, to his surprise, systematic trials showed that this salt neither hastens nor retards the fermentation; neither is a greater quantity of spirit obtained from the material when this antiseptic is employed. It is a splendid preventive of the development of bacteria, but its price is too high for every-day use. If the malt be bad, and too little lactic acid be present in the yeast and mash, the fluorine salt gives no assistance. A higher yield of spirit was never observed. The experience of other people also confirms the writer's conclusions. When the most careful attention is paid to the cleanliness of rooms and vessels, the fluorine salt is superfluous. It may be of some assistance in badly conducted distilleries, but it is expensive, and its action against strong bacterial infection is weaker than that of hydrofluoric acid.—J. F. B.

Absinthe; Examination of ——. A. Hubert. Ann. Chim. anal. appl. **6**, 409—413. Chem. Centr. 1901, **2**, [24], 1283.

Absinthe is either prepared directly by alcoholic maceration and subsequent distillation, from anise, fennel, valerian, and wormwood, or from essences which have been obtained from these plants. Chlorophyll is generally used as a colouring material. The amount of essences varies from 1·5 to 5 grms. per litre. Absinthe, on dilution with water, gives a characteristic milky turbidity, but false specimens may be prepared possessing this property by the substitution of some resin for the essence. For the detection of adulteration, determinations of the essences, the resin, and artificial colouring matters are sufficient (see this Journal, 1896, 137). In 12 samples of absinthe, the specific gravity varied from 0·8966 to 0·9982; alcohol, 47—67 per cent.; extract, 0·360 to 1·720 grm. per litre; acid, 0·024 to 0·288 grm. per litre; aldehydes, 0·005 to 0·155 grm. per litre; furfurol, 0·0002 to 0·0007 grm. per litre; ether, 0·005 to 0·123 grm. per litre; and essences, 1·506 to 4·250 grms. per litre. Reducing substances were absent or only present in traces.—A. S.

Yeast for Food Preparation; Washing ——, *with Dilute Acetic Acid*. Peters, Schaerbeek. Ger. Pat., Nov. 19, 1897.

See under XVIII. A., *page* 132.

English Patents.

Malt Grain; Process for Germinating —— *in the Steeping Trough*. M. Weisenfeld, Munich, Germany. Eng. Pat. 6441, March 27, 1901.

The object of this invention is to cause the barley or other grain to sprout whilst in the steeping trough, under the influence of water and air, in such a way that such sprouting shall be uniform throughout the mass. The grain is arranged in the steeping trough in layers, either side by side or one over the other, by means of vertical, perforated, hollow partitions or horizontal, perforated floors. In the vertical form of arrangement, the hollow partitions rest on a perforated floor, through which air is admitted to all parts of the grain, and by which the steeped grain is discharged when the partitions are moved upwards and a slide is opened. When horizontal perforated floors are used, air and

water are admitted to the grain by means of a system of perforated pipes in each compartment. In this latter form, a wide vertical shaft may be provided for discharging the grain. This shaft is constructed in cylindrical sections, one for each compartment, so that the trough may be emptied from above downwards by removing the sections consecutively.—J. F. B.

Ageing Liquors [Alcoholic]; New or Improved Process for ——. H. J. Haddan, London. From J. C. Riley, Chicago, U.S.A. Eng. Pat. 10,915, May 14, 1901.

This process consists in allowing the liquor to remain in contact with purified beech-wood shavings (or other equivalent material) for a sufficient length of time to ensure complete saturation—generally for about two hours. The liquid is then drawn off and a blast of air is forced through the shavings, which are then ready for another charge of liquor. The same liquor may be run four or five times until sufficiently treated. The shavings are purified by extraction with a solution of sodium carbonate.—J. F. B.

Rice; Malting of ——. E. C. Schrottky, Dresden, Germany. Eng. Pat. 9823, May 11, 1901.

The unshelled rice is placed on the false bottom of a shallow vessel, provided with an outlet with tap, for water below the false bottom, covered with water at 35°—38° C., and allowed to steep at this temperature for 24—30 hours if new rice, or 48—54 hours if old rice. The water is then drawn off, and the rice left all night with the water-outlet open, so that the air has free access. Next day the rice is again steeped in water at 35° C. for 12 hours, and next night again left without water and freely exposed to the air. This alternate steeping and aeration is continued for 5—6 days, until germination has proceeded far enough; the rice is then shovelled together into a layer of about 30 cm. deep, so as to heat somewhat, then spread out to prevent overheating, and finally dried.—L. A.

Gas-Generator and Holder; Automatic Carbonic Acid ——. J. F. Henderson and C. W. Clayton, London. Eng. Pat. 22,486, Nov. 7, 1901.

The combined generator and holder consists of a vertical lead-lined cylinder, containing sodium carbonate solution ("soda solution") or its equivalent, in its lower part, and in the upper part a vessel for acid, which drops through a valve in the bottom. The valve is worked automatically by a lever connected with a piston, which is raised or lowered according as the pressure of the gas exceeds or falls below a certain amount.—W. C. H.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Proteïns; Digestibility of ——. A. Jolles. Monatsh. für Chem., 1901, **22**, [19], 991—995.

The author has previously shown that there are essential differences in the constitution of the proteïns, and that, according to the constitution, a certain portion of the nitrogen is converted into urea on oxidation. Parallel experiments on man were undertaken to ascertain the difference in nutritive value of caseïn, which gives about 73 per cent. of its nitrogen as urea on oxidation, and fibrin, which gives about 45 per cent. In the fibrin period 34·3 per cent. of the total nitrogen in the food was unabsorbed, in the caseïn period 16·7 per cent. Thus the physiologically nutritive value of the proteïns in regard to nitrogen depends on the amount of the urea-forming groups. The hexone bases appear to be less completely utilised; they could be qualitatively detected in the fæces.—A. C. W.

Yeast for Food Preparations; Washing —— with Dilute Acetic Acid. Peters, Schaerbeek. Ger. Pat., Nov. 19, 1897; through Zeits. Spiritusind. 1901, **24**, [50], 516.

In preparing yeast for foodstuffs, the bitter substances and other impurities must first be removed by thorough washing. This is generally done by the aid of mineral acids, but in this case the yeast takes a very long time to settle. In the present process the washing of the yeast is assisted by the addition of one part of acetic acid per 1,000 of washing water. The diluted yeast is strained, and then repeatedly washed with this acetic acid water. Four washings are generally sufficient to remove all impurities. The advantage of acetic acid over other acids lies in the fact that the yeast settles more quickly and then occupies a much smaller volume. No foreign taste is imparted to the yeast, the impurities are rapidly and efficiently removed, and no decomposition of the yeast takes place.—J. F. B.

Albuminoids; Influence of the Medium, especially of Inorganic Substances, on the Properties of ——. J. Starke. Zeits. Biolog. **42**, 187—227. Chem. Centr. 1901, **2**, [23], 1230.

The author puts forward the view that albuminoids need for their solution, free hydroxyl or hydrogen ions, and that precipitation takes place if these are diminished or disappear. For instance, on the addition of a neutral salt, globulin is precipitated from an acid solution, on account of the retardation of dissociation, but not from an alkaline solution. An alkaline solution which, owing to the addition of a neutral salt, contains more dissolved globulin than it would do without such addition, gives a precipitate on dilution with water and on dialysis; a globulin solution prepared with alkali alone gives no precipitate under like conditions. A pure albumin solution coagulates wholly, a natural (slightly alkaline) solution, partially on heating, but an alkaline albumin solution only after the addition of a neutral salt (a small quantity of an alkaline earth salt or a larger quantity of an alkali salt). The author attributes coagulation to the loss of water of crystallisation (water of constitution), since the action in promoting coagulation of the different salts (increasing series, **1**, $MgSO_4$; **2**, NaCl, KCl; **3**, $CaCl_2$, $MgCl_2$) corresponds to the capacity of their solutions of absorbing water.

The temperature at which coagulation occurs is raised by the addition of a neutral salt, but the influence of the different salts is neither an additive property of the components of the salt, nor a function of the degree of dissociation; indeed wholly non-dissociable compounds, such as glucose, raise the coagulation temperature, although to a much less extent than salts. There is no relation between the action of the salts in promoting coagulation, and their influence on the temperature of coagulation. (See also this Journal, 1901, 379.)—A. S.

Albuminoids of Cows' Milk; Contribution to the Knowledge of the ——. G. Simon. Zeits. physiol. Chem. **33**, 465—541. Chem. Centr. 1901, **2**, [24], 1271.

Precipitation of the Total Albuminoids of Milk. — The author finds that Almén's tannic acid solution and phosphotungstic acid effect complete precipitation of the albuminoids of milk, and give concordant results. Precipitation with trichloracetic acid gives correct results only with undiluted milk. The methods of Ritthausen and J. Munk give reliable results, but require longer time than the first-mentioned methods. With metaphosphoric acid and with Riegler's asaprol reagent (asaprol = the calcium salt of β-naphthol monosulphonic acid), the precipitation of the albuminoids is somewhat—but only very slightly—less complete than by the methods previously referred to. The filtrate from the albumin precipitate, in all cases, contains "extractive nitrogen."

Separation of the Caseïn from the Albumin and Globulin.—The author prefers, before all others, the method of Hoppe-Seyler (acetic acid and a current of carbon dioxide) and that of Schlossmann (precipitation of the caseïn with potash alum). By saturating the milk with magnesium sulphate or sodium chloride, too high results for the caseïn are obtained, as the latter carries down with it the globulin. Lehmann's method, which consists in pouring the milk on to porous earthenware plates, with subsequent scraping off of the unabsorbed residue, also gives too high results, as there is always obtained a mixture of caseïn, globulin, and other nitrogenous compounds.

—A. S.

Hard Wheats; Composition of ——, and Physical Constitution of their Gluten. E. Fleurent. Comptes Rend. **133**, 944—947.

Following up his analyses of soft wheats, the author now gives analyses of carefully taken samples of hard wheats, Russian, Algerian, and Canadian (the last, however, containing 25 to 30 per cent. of soft wheat). The figures are as follows :—

——	Russian Wheat.	Algerian Wheat.	Canadian Goose Wheat.
Average weight of a grain	0·030	0·048	0·037
Constitution :—			
Endosperm	84·95	84·99	84·94
Embryo	2·00	1·50	2·05
Husk	13·05	13·51	13·01

Composition of the Entire Wheat.

Water	11·42	11·34	11·56
Nitrogenous matters :—			
Gluten	14·76	11·00	10·88
Soluble (diastases, &c.)	2·25	1·82	1·67
Ligneous, of husk	1·92	1·90	1·91
Starch	50·15	55·05	54·55
Fatty matters	1·18	1·93	2·70
Soluble carbohydrates :—			
Sugars	2·14	2·68	2·18
Galactose	0·65	0·46	0·75
Of husk	1·76	2·19	1·90
Celluloses	9·73	9·40	9·21
Mineral matters	1·56	1·42	1·35
Undetermined and loss	2·48	0·81	1·54
	100·00	100·00	100·00

These hard wheats contain at least 2½ per cent. of albumin more than the soft wheats. They are richer in gluten than the soft wheats, the Russian specimen being especially remarkable in this respect. As with soft wheats, the sum of the gluten and starch is constant (65); the sum of the sugars and soluble nitrogenous matters is also constant. The author's deosimeter (this Journal, 1901, 941) does not give accurately the proportion of gliadin in the flours of these wheats, for the amount of total soluble matters is greater than in the soft wheats by means of which it was graduated, and also the gluten contains a much larger proportion of coagluten than that of the soft wheats. The gluten of the Russian wheat was found to contain: gliadin 46·45, glutenin 37·89, congluten 15·66 per cent. To the coagluten is due the tenacity and want of elasticity of the flour of these hard wheats, which makes inferior bread, and is largely used in making artificial foods.—J. T. D.

Milk; Composition of ——. H. D. Richmond. Analyst, 1901, **26**, [309], 310—318.

The average composition of milk, as shown by the analyses of 13,798 samples, during the year 1900, is given in this paper. The average for fat was 3·64 per cent.; for solids-not-fat, 8·93 per cent.; and for gravity, 1·0323. With regard to the variation of constituents of the solids-not-fat, the auther states that "any deficiency of solids-not-fat below 9·0 per cent. is chiefly due to a deficiency in the milk sugar"; any excess above 9·0 per cent. is chiefly due to excess of proteïds. As the result of a considerable amount of work on the relation between the proteïds and salts of milk, he considers that one-third of the base with which casein is combined in milk is soda, and not lime; and that casein forms a molecular compound with calcium phosphate. —W. P. S.

Milk; The Relation between Specific Gravity, Fat, and Solids-not-Fat in ——. N. Leonard. Analyst, 1901, **26**, [309], 318—319.

The author has re-calculated the formula $G/D = S\sigma - F\phi$, where D is the density of the milk (water = 1), and obtains the formula $G/D = 3{\cdot}775\ S - 0{\cdot}743\ F$, whence $F = 0{\cdot}836\ T - 0{\cdot}221\ G/D$. The results given by this formula are scarcely as accurate as those given by the simpler one.—W. P. S.

English Patent.

Fruit and other Vegetable Matter; Process and Apparatus for Drying ——. A. Büttner and C. Meyer, Uerdingen, Germany. Eng. Pat. 19,343, Oct. 29, 1901.

The process consists in heating the vegetable matters before drying, in order to burst the cells; the juices can then readily be pressed out or removed by the centrifugal. The solid matter is dried by any suitable form of drying apparatus, and the juices are treated separately. They may either be thrown away, or concentrated in any form of multiple evaporator, and the thick syrup mixed and dried down with the solid matter; or, if they contain any valuable or poisonous constituents, these are removed before mixing and drying down with the solid parts.

The apparatus claimed consists of the preliminary heater, which is a vessel provided with a finely perforated false bottom with a steam-inlet pipe situated a short distance below the false bottom. A rotating helix may be provided longitudinally in the heating apparatus, or, in another form, two helices may be placed side by side, in which case the perforated false bottom is saddle-shaped between the two helices.—J. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

English Patent.

Sewage and other Polluted Liquids, and Apparatus for use in connection therewith; Treatment of ——. F. Candy, Balham, Surrey. Eng. Pat. 517, Jan. 8, 1901.

The humus residues deposited by the effluent from bacteria beds are collected and added to the untreated sewage entering the bacteria beds. Automatic apparatus for effecting the intermittent discharge of liquid from tanks is described, consisting of a valve connected by a lever with a tilting vessel, which, when filled with liquid which overflows from the tank, overbalances, and raises the valve, discharging the tank. The falling of a float then actuates another lever, which tilts and discharges the vessel, and allows the valve to return to its seat. A revolving sprinkler is also described for distributing sewage over the surface of a bacteria bed.—L. A.

(*C.*)—DISINFECTANTS

English Patents.

Formaldehyde; Process and Apparatus for Disinfecting by means of ——. G. Krell, Bruckhausen, near Husten, Westphalia, Germany. Eng. Pat. 23,886, Dec. 31, 1900.

Formaldehyde solution is rapidly poured into a vessel into which a sufficient mass of heated metal has been placed to evaporate the liquid.—L. A.

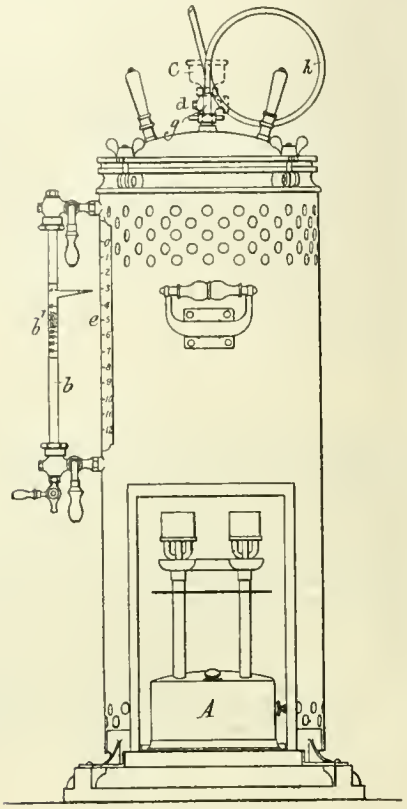
Formaldehyde Gas for Fumigating, Disinfecting, and Sterilising Purposes; Apparatus for Producing ——. B. J. B. Mills, London. From E. D. Taylor Co., New Brunswick City, New Jersey State, U.S.A. Eng. Pat. 5492, March 15, 1901.

Any solid which on being heated evolves formaldehyde (*e.g.*, paraformaldehyde or trioxymethylene, or both) is compressed into candles, which are placed within suitable metallic casings and ignited at the bottom. The heat thus generated vaporises the formaldehyde, which escapes through the wire-gauze top of the casing without becoming ignited. —L. A.

Disinfection by the Evaporation of Solutions, such as Formic Aldehyde; Apparatus for ——. V. I. Feeny, London. From La Société Anonyme des Établissements Geneste, Herscher et Cie., Paris. Eng. Pat. 21,074, Oct. 21, 1901.

The apparatus is for disinfecting by the evaporation of a solution, and, in the form illustrated, consists of an evaporating vessel or boiler furnished with a water gauge *b*, a graduated scale *e*, fixed upon the boiler opposite the water gauge and provided with a slider, and a graduated sliding scale b^1, attached to the water gauge. The heat is provided by a lamp, A, or other means. A funnel C, with a cock *d*

can be screwed into the top, for filling, and the disinfectant vapours afterwards pass off through a small fitting *g* connected with a thin pliable copper tube *h*. The scale *e* corresponds to aliquot parts of the boiler volume, each division corresponding to the minimum quantity of a 7½ per cent. formic



aldehyde solution required to disinfect a unit volume, 500 or 1,000 cb. ft. according to Fluegge's or similar tables. The sliding scale b^1, is divided into equal parts, to correspond to the minimum quantity for a smaller unit of volume, 25 or 50 cb. ft. In operation, one or other of the scales is set when the liquid approaches boiling point, the tube *h* passed through the keyhole of the sealed room to be disinfected, and the solution boiled until the necessary quantity has been evaporated.—A. W.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose; An Oxygen Bleach for ——. A. Ahlin. Gothenburger Handels-Zeit.; thorough Papier-Zeit. 1901, **26**, [98], 3635.

The author has devised a process for revivifying exhausted bleach liquors and obtaining a powerful bleaching agent with special properties.

The exhausted bleach liquors (from an electrolytic bleach works) are mixed with air by means of a special contrivance capable of effecting an extremely intimate mixture, so that a milky emulsion is produced from the originally clear liquor. The emulsion is introduced into the ordinary bleaching hollander in which cellulose is being bleached with hypochlorite in the usual way. The aerated liquid is stated to hasten the bleaching and increase the whiteness of the product.

A pulp brought into the half-bleached condition by hypochlorite immediately becomes pure white when the emulsion is introduced. The bleached pulp gives no reaction with aniline salts, and all traces of incrusting matters are effectually destroyed. To obtain such a result in the ordinary way, it is well known that large quantities of chlorine and prolonged treatment are necessary, whilst the hydrochloric acid produced tends to hydrolyse and weaken the fibres. Wood-cellulose bleached in this way has as great an affinity for dyes as flax, and the unimpaired strength of the fibres makes it especially suitable for paper-making.—J. F. B.

Cellobiose. Z. H. Skraup and J. Konig.

See under XXIV., *page* 144.

Celluloid; Risk of Fire from ——. Die Celluloid Industrie, 1901, [3], 10—11. Supplement to Gummi-Zeit. 1901, **16**, [11].

Speaking generally, celluloid takes fire only when exposed to a naked flame. It may decompose more or less, however, at temperatures ranging from 120°—140° C., according to the particular degree of instability of the nitrocellulose used in its manufacture, so that it is decidedly dangerous to store celluloid in quantity, near steam pipes for instance. The writer describes a serious explosion, followed by fire, caused apparently by the overheating of a mass of celluloid articles.—R. L. J.

English Patent.

Celluloid Printing Blocks; Improvements in the Production of ——. D. Lichtenberg-Madsen, Odense, Denmark. Eng. Pat. 1934, Jan. 28, 1901.

This is an improvement on the inventor's Eng. Pat. 25,519, 1899 (see this Journal, 1900, 461), for obtaining printing blocks of celluloid by pressing a composition of hot, soft, celluloid upon a negative matrix of a harder celluloid composition not so readily softened by heating.

The claim in this patent provides for the moulding of the negative matrix from the original design by pressing homogeneous vulcanite or ebonite, softened by heat, upon the original.—J. F. B.

French Patents.

Celluloid; A New ——. E. Franquet. Fr. Pat. 312,817, July 18, 1901.

The inventor claims the use, in the manufacture of celluloid, of the following compounds in place of part or the whole of the camphor generally employed:—Acetyldiphenylamine, triphenylphosphate, amylidenedimethyl ether, and amylidenediethyl ether. They have the advantage of being odourless. —J. F. B.

Shell, Ivory, Horn, Bone, &c., from Nitrocellulose and Casein; Manufacture of Imitation ——. E. Franquet. Fr. Pat. 312,846, July 19, 1901.

This invention relates to the manufacture of compositions of a celluloid nature containing both nitrocellulose and casein in intimate mixture, and to the method by which these two substances are incorporated together. The nitrocellulose mass is prepared by any of the ordinary celluloid processes. The casein is converted into a plastic mass by immersing casein in an aqueous solution of borax or sodium carbonate for 24—48 hours. The solution is then drained off, and the mass is steeped in alcohol or other convenient solvent of celluloid, which displaces most of the water absorbed and renders the casein capable of being mixed with the celluloid. The preparation of the casein may be performed in one operation by steeping it in a mixture of 1 part of the borax solution with 3—10 parts of alcohol. The two masses are then thoroughly incorporated by rolling machinery similar to that used in the celluloid industry. Compositions consisting of one-third, one-half, and two-thirds of casein are specified.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Ozone; Production of ——. A. Ladenburg. Ber., 1901, **34**, [16], 3849—3851.

The author has endeavoured to find the best conditions for the production of ozone by the silent electric discharge.

The apparatus consisted of a battery of 20 or 30 accumulators, a Siemens' electromotor interrupter, which, at 60 volts, gave 2,100 revolutions and 42,000 breaks per minute, a Ruhmkorff of about 20 cm. diameter, and a Berthelot's ozoniser cooled in running water. The current of oxygen was sent through a glass bulb for 20 or 30 minutes at a regular speed, the bulb closed, the ozone estimated by means of potassium iodide (this Journal, 1901, 749), and calculated as a percentage of the volume of the bulb. Under the conditions given, the maximum yield of ozone (about 10 per cent. at 17°—20° C.) was obtained with a current of 2—2·5 ampères; either more or less current caused a decrease in the yield.—A. C. W.

Sulphur; Acidity of Sublimed ——. N. Leonard. Analyst, 1901, **26**, [309], 319—320.

Although sublimed sulphur, according to the British Pharmacopœia, should not have any action on litmus, the author states that it is rare to meet with samples complying with this requirement. In eight samples the amount of sulphuric acid was found to be from 0·02 to 0·25 per cent., the average being 0·08 per cent. A sample of perfectly neutral sublimed sulphur, when kept in a moist state in a stoppered bottle, became distinctly acid after three months, and at the end of four years contained 0·2 per cent. of sulphuric acid. No sulphurous acid could be detected. Another sample dried at 100° C., and kept in a dry state for four years, showed a barely perceptible acid reaction.—W. P. S.

Basic Bismuth Gallate; The supposed ——. of the Codex. P. Thibault. J. Pharm. Chim., 1901, **14**, [11], 487—493.

Pure bismuth gallate was prepared by the action of gallic acid on hydrated bismuth oxide (this Journal, 1901, 149). The salt has the formula $C_7H_2O_7Bi$; it is soluble in excess of alkalis and alkali carbonates. The solution of bismuth gallate in caustic potash was evaporated in a current of hydrogen, in order to avoid the influence of the carbon dioxide of the air, and the residue extracted by alcohol The compound left was soluble in water, insoluble in alcohol and ether. It had the composition corresponding to the formula $C_7H_2O_7BiK_2.2H_2O$, after drying at 100° C. Similar results were obtained with caustic soda. These facts are considered to show that bismuth gallate is different from other bismuth salts, that it is not really a basic salt, but should be regarded as a complex acid—bismuthogallic acid.—A. C. W.

Bismuth Compounds of Organic Acids employed in Pharmacy. Prunier. J. Pharm. Chim. 1901, **14**, [11], 493—499.

None of the organic salts of bismuth—benzoate, salicylate, and basic gallate—are correctly named in the Codex. The two former are mixtures, and therefore cannot be considered as salts. Thibault has shown that a true salicylate exists (this Journal, 1901, 927), and that the basic gallate should be termed bismuthogallic acid (see preceding abstract); in fact, it reddens litmus, and is soluble in both acids and alkalis. Bismuthogallic acid (dermatol) is given the formula—

$$C_6H_2(CO_2H)(OH)\begin{matrix}O\\ \diagup\diagdown\\ O\end{matrix}Bi(OH).H_2O,$$

which explains the formation of its alkali salts. The following formulæ have already been proposed for airol—$(OH)_2.C_6H_2.CO.OBi(OH)I$, and iodogallicine—

$$(OH)_2(CO.OCH_3)C_6H_2.OBiI.OH.$$

Tartaric acid also forms a compound with bismuth containing 1 atom of metal to 2 mols. of acid, from which the bismuth is not precipitated by excess of alkalis.—A. C. W.

Opium, Russian ——, and Results of the Quantitative Determination of Morphine. E. Goldberg. Chem.-Zeit. 1901, **25**, Rep., 367.

Although there are districts in Russia with soil and climate suitable for the cultivation of the poppy, it is rarely grown. The author has examined samples from the Ssemiretschinsky district. Russian opium forms flattened spherical lumps, differing in size, wrapped in poppy leaves, soft and elastic within, of a pale brown colour and smooth section, with a waxy lustre, of a peculiar narcotic odour and a sharp, bitter taste. A microscopic examination revealed in the opium portions of the fruit capsule, but no foreign impurities. Four samples contained 15·3—17·2 per cent. of water, 4·25—4·4 per cent. of ash, and 38·5—39·7 per cent. of water-soluble constituents. The author has compared the processes of the Russian Military Pharmacopœia II. and the German Pharmacopœia IV. for the determination of the morphine. The results follow, expressed in percentages:—

	Russian Military Pharmacopœia II.		German Pharmacopœia IV.	
	Gravimetric.	Volumetric.	Gravimetric.	Volumetric.
Asia Minor opium I.	10·75	10·58	10·23	10·15
„ „ II.	11·63	11·52	10·95	10·73
Persian „	8·45	8·26	7·84	7·75
Russian „ I.	8·23	8·12	7·34	7·25
„ „ II.	7·74	7·64	7·16	7·12
„ „ III.	7·83	7·68	7·08	7·00
„ „ IV.	7·86	7·65	7·11	7·06

The author is of the opinion that the water in powdered opium should be fixed at 5 per cent., and the morphine at 10 per cent. Russian opium, which contains less than 10 per cent., could then be mixed with other opiums containing more morphine.—A. C. W.

Hydroxycinchotine. W. Widmar. Monatsh. für Chem., 1901, **22**, [19], 976—982.

Skraup has shown that the cinchonine "sulphonic acid" is probably an addition compound (this Journal, 1901, 499). Jungfleisch and Léger obtained a hydroxycinchonine by boiling cinchonine with dilute sulphuric acid (Comptes Rend. **105**, 1258). The author employed the sulphonic acid obtained as a by-product in the preparation of β-isocinchonine by the action of sulphuric acid of 1·7 sp. gr. The brown resin obtained on evaporation of the solution was dissolved in sulphuric acid of 1·52 sp. gr., and the solution heated on the water-bath for three hours. After cooling, an equal volume of alcohol and ammonia was added, to alkaline reaction. The bases were extracted by ether, and neutralised; the salts were dissolved in 50 per cent. alcohol, and water added to incipient turbidity. On cooling, a crystalline base separated. The mother liquor contained β isocinchonine. After purification, the base, $C_{19}H_{24}N_2O_2$, melted at 268° C. (uncorr.); it crystallised in white prisms. The optical rotation was $[\alpha]_D = +200·79°$. The sulphate, $(C_{19}H_{24}N_2O_2)_2H_2SO_4.8H_2O$, formed thick white prisms which melted at 233°—234° C. The hydrochloride formed white needles containing $2H_2O$; it melted at 227°—229° C. The hydroxycinchonines obtained by Jungfleisch and Léger were readily soluble in alcohol, and differed in melting point and optical rotation from the above compound.

—A. C. W.

Caffeine: Occurrence of ——. Beitter. Ber. Deutsch. Phar. Ges. Through the Chem. and Druggist, 1901, **59**, [1140], 872.

The author examined various portions of the coffee bean and other plants as to their content in caffeine, with the results shown in the accompanying table.

China tea contained 3·06 per cent. in the leaf dust, traces in the fruit and root, and 1—2 per cent. in the old and young leaves. Assam tea contained 2·48 per cent. in the young leaves and 1·66 per cent. in the old leaves. Dried Maté leaves contained 1·28 per cent., whilst the well-roasted leaves showed 1·10 per cent. Kola nuts contained 1·24—1·50 per cent.

	Arabian Coffee.	Liberian Coffee.
	Per Cent.	Per Cent.
Green seeds	1·22	..
Roasted seeds	1·04	..
Wood	traces	none
Root	none	none
Old leaves	1·26	..
Young leaves	1·46	0·52
Stem-bark	none	none
Pericarps	1·24	none
Ripe fruits	1·00	0·76
Half-ripe fruits	1·80	0·44
Young fruits	1·02	..
Twig-bark	..	none

—A. S.

Cotoïne. J. Pollak. Monatsh. für Chem., 1901, **22**, [10] 996—1001. (See also this Journal, 1895, 382.)

By the transformation of hydrocotoïne into dimethylphenylcumarin, its formula is shown to be $C_6H_2(OCH_3)(OCH_3)(CO.C_6H_5)(OH)$[1 : 3 : 4 : 5] (Monatsh. für Chem. **18**, 742). The author has now prepared from cotoïne a mononitroso compound by the action of acetic acid and potassium nitrite. Excess of the reagent did not yield a dinitroso compound. Thus, according to the observations of Kostanecki (Ber. **20**, 3133), the position between the two hydroxyls, which are in the *m*-position, must be occupied. Therefore the formula of cotoïne is $C_6H_2(OCH_3)(OH)(CO.C_6H_5)(OH)$[1 : 3 : 4 : 5]. Nitrosocotoïne crystallises from acetic acid in yellow needles or dark red leaflets; the latter effloresce in the air, and probably contain acetic acid of crystallisation. Both forms melt at 153°—154° C.—A. C. W.

Artemisin. M. Freund and L. Mai. Ber. 1901, **34**, [15], 3717—3719. (See also this Journal, 1901, 1235.)

Artemisin, $C_{15}H_{18}O_4$, is contained in the seeds of *Artemisia maritima*; like santonin, $C_{15}H_{18}O_3$, it is a lactone. It dissolves in acids to form the salts of a monobasic acid. The silver salt, $C_{14}H_{19}O_3.CO_2Ag$, crystallises with $2H_2O$, which is lost *in vacuo* over sulphuric acid.

The methyl ester, obtained by heating the silver salt with methyl iodide, melts at 180° C.; on heating with hydrochloric acid, artemisin is regenerated. On distillation with zinc dust, artemisin yields a hydrocarbon, $C_{12}H_{12}$, boiling at 264° C., which appears to be identical with β-dimethylnaphthalene (Annalen, **211**, 368). By the same reaction santonin yields 1.4-dimethylnaphthalene.—A. C. W.

Solanine in Tobacco Seeds. J. Starke. Bull. Class. Sci. Acad. R. Belge, 1901, 379. Pharm. J. 1901, **67**, [1640], 599.

The author was unable to detect the presence of solanine in the seeds of *Nicotiana tabacum* and *N. macrophylla*, which, according to Albo, contain this alkaloid. The statement of other observers, that nicotine does not occur in the seeds themselves, is confirmed.—A. S.

Berberine; Determination of ——. H. M. Gordin.

See under XXIII., *page* 142.

Cocaïne; Detection of ——. H. Proelss.

See under XXIII., *page* 142.

Vanillin; Action of Benzaldehyde on ——. [*Dialdehydes obtained by the Action of Aldehydes on Aromatic Hydroxyaldehydes.*] M. Rogow. Ber. 1901, **34**, [16], 3881—3884.

By means of zinc chloride as condensing agent, a reaction may be effected between aldehydes and aromatic hydroxyaldehydes, similar to that between aldehydes and phenols—

$$R.CHO + 2C_6H_4(OH).CHO = R.CH[C_6H_3(OH)CHO]_2 + H_2O.$$

The products readily resinify, and are not easily isolated unless definite conditions are observed. Benzaldivanillin is obtained as follows:—20 grms. of vanillin are well ground with 10 grms. of recently fused zinc chloride, the mixture brought into a flask provided with an upright tube, 6·5 c.c. of benzaldehyde added, and the mixture heated for six hours in an oil-bath at 114°—116° C. The product is heated with 125 c.c. of 80 per cent. acetic acid, the solution cooled, mixed with 600 c.c. of water, and after 24 hours the precipitate filtered off, dissolved in glacial acetic acid, the solution boiled with animal charcoal for 30 minutes, filtered hot, the residue washed with hot acetic acid, the filtrate heated to boiling, and boiling water added until a slight turbidity appears. After 24 hours the crystalline deposit is twice recrystallised from hot 80 per cent. acetic acid, dried, boiled with much benzene, the filtrate cooled, 2 vols. of petroleum spirit added, and stirred. After 1½—2 hours this precipitation is twice repeated: finally the precipitate is washed with light petroleum spirit. Benzaldivanillin forms light, white, microscopic needles, which melt at 221·5°—222·5° C. (corr.). It reduces ammoniacal silver nitrate in the cold, Fehling's solution on warming, is soluble in caustic soda, ammonia, and sodium carbonate, insoluble in sodium bicarbonate. By the action of acetic anhydride and one drop of sulphuric acid, benzaldivanillin gives the hexacetate—

$$C_6H_3.CH[C_6H_2(C_2H_3O_2)(OCH_3).CH(C_2H_3O_2)_2]_2,$$

which melts at 159·5°—162·5° C. (corr.), and is readily soluble in benzene and acetone.—A. C. W.

Esterification [*Rhodinol, Geraniol, Linalool, &c.*] *in Plants: The Mechanism of* ——. E. Charabot and A. Hébert. Bull. Soc. Chim. 1901, **25**, [22], 955—955.

The authors have previously found that when geraniol is esterified by acetic acid, the ratio of combined geraniol to total geraniol, when a state of equilibrium had been attained, is 67 : 100 (Bull. Soc. Chim. **25**, 884). Rhodinol has now been treated in a similar manner. The alcohol was obtained from geranium oil, and separated from geraniol by the method of Tiemann and Schmidt (this Journal, 1896, 564). The ratio of combined to total rhodinol is 83 : 100. Thus rhodinol is more completely esterified than geraniol.

The division of an acid amongst the alcohols in the plant was next studied. Algerian geranium oil was shaken with a 50 per cent. solution of sodium salicylate (45 per cent. strength is better), which dissolves terpene alcohols, but not their esters. (See, however, Darzens and Armingent, page 142.) The pure alcohols were separated from the mixture of esters and free alcohols by means of phthalic anhydride, and the rhodinol was then estimated in both mixtures by destroying the geraniol with phthalic anhydride. A process given in Schimmel's Report for April, 1901, was also used:—10 c.c. of the mixture of alcohols is heated on the water-bath for one hour with 20 c.c. of strong formic acid, when the geraniol is dehydrated, whilst the rhodinol is converted into the ester, which is then estimated by saponification. The result by both processes was that the esters contain a somewhat higher proportion of rhodinol than the free alcohols.

The results of this communication and the preceding (*loc. cit.*) are summarised as follows:—Esterification in plants is produced by the direct action of acids on alcohols; it is facilitated by some substance playing the part of a dehydrating agent. This conclusion is based on the observations (1) that linalool is esterified by acetic acid far more slowly than in the plant; (2) that those terpene alcohols, which are most easily esterified by a particular acid, are also found to be combined with that acid in the largest proportion in the plant; (3) that for the same terpene alcohol, the acid which combines most readily with the alcohol is also the acid of which the ester is most abundant in the plant; (4) that when two alcohols co-exist in a plant and a mixture of them is esterified, the acid is divided between them in the same manner as in the plant.

—A. C. W.

Albumin from Yolk of Egg; Carbohydrate Groups in ——. C. Neuberg. Ber. 1901, **34**, [16], 3963—3967.

The albumin was obtained by the method of Grübler; it gave up no reducing substance to boiling water. It was

freed from ovomucoid by twice dissolving in dilute alkali, precipitating with acetic acid, and boiling the very slightly acid liquid. 60 grms. of the material, fine as dust, were shaken with 60 c.c. of fuming hydrobromic acid (sp. gr. 1·49) for two hours in the cold. The jelly was diluted with 300 c.c. of water and boiled gently for 1½ hours. After removal of bromine (as lead bromide and *in vacuo*) and evaporation, reducing substances were extracted by alcohol and oxidised by nitric acid. From the product norisosaccharic acid was finally isolated as the cinchonine salt. Thus, a group producing chitosamine is present in the albumin. The mother-liquors of the cinchonine salt contained what was most probably the *d*-saccharate; this must be a secondary product.

The alcoholic extracts of the product of the hydrolysis by hydrobromic acid (as above) yielded with *p*-bromophenylhydrazine the *d*-glucosazone alone. The substance, from which the saccharic acid is produced, is still to be found.

The following salts have not hitherto been described:—*Cinchonine d-saccharate* crystallises in spherical clumps or in fine white needles, which turn brown at 190° C. and slowly decompose; it is soluble in water and hot alcohol, less soluble in acetone, insoluble in benzene, chloroform, ethyl acetate, and ether; $[\alpha]_D = +152°$. *Quinine d-saccharate* crystallises in long needles, which melt at 174° C.; it is similar in properties to the cinchonine salt.

—A. C. W.

Corydaline. Part VII. Corydaline; Constitution of ——. J. J. Dobbie and A. Lauder. Proc. Chem. Soc., **17**, [244], 252.

The decomposition products of corydaline have been studied by the authors in greater detail, with the following results. The acid, $C_6H_4N(CO_2H)_3$, obtained by oxidising corydaline (this Journal, 1892, 264 and 633), is, by long-continued heating with potassium permanganate in alkaline solution, converted into 2:3:4:6-pyridinetetracarboxylic acid. The acid, $C_5H_4N(CO_2H)_3$, must therefore either be 2—CH_3 3:4:6-pyridinetricarboxylic acid or 2—CH_3 4:5:6-pyridinetricarboxylic acid. From what follows, the former formula is probably the correct one.

Corydilic acid, $C_{12}H_6N(OCH_3)_2(CO_2H)_3$ (Trans. Chem. Soc. 1897, **71**, 657), is soluble in hydrochloric acid, and under certain conditions forms an unstable hydrochloride. When boiled with potassium permanganate, it is split up into a mixture of meta-hemipinic acid and the acid $C_6H_4N(CO_2H)_3$.

When corydic acid (Trans. Chem. Soc. 1897, **71**, 657), $C_{14}H_9N(OCH_3)_2(CO_2H)_2$, is oxidised with permanganate at the ordinary temperature, it yields a yellow, dibasic acid, $C_{12}H_9N(OCH_3)_2(CO_2H)_2$, which contains the two methoxyl groups of corydic acid.

Mild oxidising agents remove four atoms of hydrogen from corydaline and convert it into dehydrocorydaline, an intensely yellow coloured base (Trans. Chem. Soc. 1897, **71**, 657). Berberine is also a yellow coloured base, but readily takes up four atoms of hydrogen, forming colourless tetrahydroberberine. Corydaline therefore corresponds to tetrahydroberberine and dehydrocorydaline to berberine.

$C_{22}H_{27}NO_4$. Corydaline (colourless).	$C_{20}H_{21}NO_4$. Tetrahydroberberine (colourless).
$C_{22}H_{23}NO_4$. Dehydrocorydaline (yellow).	$C_{20}H_{17}NO_4$. Berberine (yellow).

The four oxygen atoms of corydaline are all present in methoxyl groups (Trans. Chem. Soc. 1892, **61**, 605).

Corydaline to Berberine, Relation of ——; *Oxidation of Berberine with Nitric Acid.* J. J. Dobbie and A. Lauder. Proc. Chem. Soc. **17**, [244], 255.

In the previous abstract it is shown that the constitution of corydaline can be expressed by a formula similar to one of the formulæ proposed by Perkin for berberine.

By oxidising berberine with dilute nitric acid in exactly the same way as was followed in the preparation of corydic acid (Trans. Chem. Soc. 1897, **71**, 657), an acid, $C_{16}H_{11}NO_6$ (m. pt. 285°), was obtained closely resembling corydic acid in properties, and obviously bearing to berberine the same relation as corydic acid to corydaline. This acid is only soluble with great difficulty in hot water; it dissolves in sodium hydroxide, forming a blood-red solution. It is dibasic, almost all its salts are soluble, a notable exception being the acid silver salt. It contains no methoxyl groups.

English Patent.

Organic Peroxides; Production of ——. R. H. Page. Detroit, U.S.A. Eng. Pat. 18,733, Sept. 19, 1901.

The process claimed consists in subjecting a mixture of an aromatic aldehyde and a fatty anhydride, in a thin film or on absorbent material, to the action of a gaseous oxidising agent (air), the supply of which is regulated. The retarded oxidation thus attained is stated to give a much better yield than oxidation in the open air.—A. C. W.

Phthalic and Benzoic Acid; Manufacture of ——. Fabrique Baloise de Produits Chimiques. Fr. Pat. 313,187, Aug. 2, 1901.

See Eng. Pat. 15,527; this Journal, 1901, 1139. See also Berichte, **21**, 1616.

French Patent.

α-Ionone; Process for Obtaining ——. Chuit, Naef and Co. Fr. Pat. 312,790, July 17, 1901.

The claims relate to a new process for converting pseudo-ionone with very good yields into a mixture of cyclic isomers, containing a predominant proportion (about 80 per cent.) of α-ionone, by causing syrupy phosphoric acid to act upon pseudo-ionone, preferably at a low temperature, diluting and distilling with steam.

For purification, the mixture of isomers obtained is first treated with sodium sulphite or bisulphite in presence of ammonium chloride; common salt is then added to the solution until saturated, and the crystalline compound of α-ionone which is precipitated is filtered off. This crystalline compound may either be used as such in perfumery or the α-ionone may be set free by any known process (*e.g.*, decomposition with soda), and obtained absolutely pure and colourless by steam distillation.—J. F. B.

XXI.—PHOTOGRAPHY.

Silver Sub-Haloids. K. Emszt. Zeits. anorg. Chem. **28**, 346—354. Chem. Centr. 1901, **2**, [25], 1300.

The author has examined the action of nitric acid, ammonia, and sodium thiosulphate on the products obtained, according to Vogel's method (this Journal, 1900, 374), by the action of silver nitrate on cuprous haloids. He finds that nitric acid dissolves half the silver, and that ammonia and sodium thiosulphate dissolve silver haloid. These products cannot be identical with the sub-haloids formed by the action of light on photographic plates, as they are sensitive to light, and a developer is without action on them. Mercury dissolves silver from the products obtained by Vogel's method, and the latter also become richer in silver by washing, so that apparently they decompose immediately after formation into silver and silver haloid.—A. S.

Silver Chloride Gelatin; Developer for ——. H. and R. E. Liesegang. Chem.-Zeit. 1901. Rep. 372.

Certain substances, which cannot be used for silver bromide, can be used as developers for silver chloride, which is more easily reduced. A solution of gallic acid, to which soda has been added, develops exposed silver chloride gelatin paper (without excess of silver nitrate) in a few minutes; without alkali there is no action. Alkaline tannin solutions do not act. A mixture of hydroquinone and sulphite develops silver chloride, as do pyrogallol and pure *p*-aminophenol in a pure aqueous solution without sulphite. Amidol is less active than metol; the aqueous solution of the former is without action, but the aqueous solution of metol develops a red picture on silver chloride

gelatin paper, though more slowly than with pure pyrogallol. An addition of sulphite converts metol into a rapid developer.—A. C. W.

Thiosulphate and Ferrocyanide; Action of ——, upon the Latent Photographic Image. Lüppo-Cramer. Brit. J. Phot. 1902, **49**, [2174], 11.

Although the practical advantage of using a small quantity of sodium thiosulphate in or before a ferrous oxalate developer, and that developer only, has been known for years, but little is understood of the mechanism of the process involved. The thiosulphate serves not merely to accelerate development; it actually decreases the time of exposure. For instance, an exposure of eight seconds followed by a development for eight minutes in oxalate without thiosulphate, and an exposure of four seconds followed by a development for six minutes with a preparatory bath of thiosulphate, yield almost identical negatives. In fact, as Abney has said, for the same time of development, employment of thiosulphate enables the period of exposure to be reduced to one-third. Using a 1:1000 bath of thiosulphate, it seems to make very little difference whether the reagent is added to the oxalate developer, employed as a preliminary bath followed by a gentle rinse in water, or used as a separate bath followed by a three hours' wash in running water. But the favourable action of the thiosulphate is only to be noticed when it is employed after exposure; a plate similarly treated before being put in the camera showed general fog, and suggested photographic under-exposure. Even after being used several times the thiosulphate bath gives no indication of having dissolved silver. It might therefore be inferred that an insoluble double thiosulphate of silver or silver sulphate was formed by this treatment; but such an hypothesis fails to explain why the process is ineffective before exposure, and why thiosulphate is altogether useless when alkaline development is adopted. Other substances beside thiosulphate behave in a similar manner to the ferrous oxalate developer: sodium sulphite, which is weaker; "liver of sulphur," which is more powerful. Made up as a 1:1000 bath, the latter body quickly decomposes and deposits sulphur; in this condition it augments the capacity for development very considerably, and produces an appreciable amount of fog. Even a one per million solution yields an exceptionally dense negative. The stronger solution of "liver of sulphur" alters the colour of the silver bromide to a brownish-yellow as seen by daylight, and the change is noticeable in the dark room, silver sulphide being apparently formed. Neither sulphite nor thiosulphate produces this effect. "Thiosinamin," which is so energetic a solvent of silver halides that it has been proposed as a fixing reagent, somewhat resembles thiosulphate in its effect upon oxalate development, but it does not shorten the time of necessary exposure. As a 1:200 preparatory bath, ammonium thiocyanate retards the initial stages of development, but the action gradually increases in rapidity, until finally more detail in the shadows is brought out, as well as a marked quantity of fog. All these substances, except the polysulphides of the "liver of sulphur," are solvents of silver; the only property common to them all is that they contain sulphur. In this connection it is interesting to compare the parallel action of alkaline gallic acid, which plays a part in chemical development only when the actual developer is "metol" (this Journal, 1900, 465).

Potassium ferrocyanide, which has been recommended by Himly for use in conjunction with quinol (this Journal, 1890, 102), is a simple accelerator of alkaline development, but its action is not to be compared in extent with that of thiosulphate in iron development. The ferrocyanide can be used in the proportion of 50 c.c. of a 20 per cent. solution to every 200 c.c. of developer, and it exerts its influence upon "adurol," pyrogallol, and "metol," as well as upon quinol. If the latent image is immersed for one minute in a 20 per cent. solution of potassium ferrocyanide, then washed thoroughly, and finally developed with quinol and potassium hydroxide, only a very faint negative is produced, which cannot be strengthened even by prolonged treatment.—F. H. L.

Latent Image; Constitution of the ——. Lüppo-Cramer. Brit. J. Phot. 1902, **49**, [2174], 12.

Briefly reviewing the results mentioned in a serial article which has been published in the above journal, Lüppo-Cramer sums up the present position of our knowledge of the effect of light upon sensitive silver films in the following manner. There is a complete absence of proof that normal photographic exposure produces any chemical change in silver bromide. Since precipitated bromide is easily reduced to the metallic state in the absence of light, even by substances which are not photographic developers, it is superfluous to presuppose the existence of a chemically altered silver bromide in the exposed film merely to explain "development." Emulsified bromide is apparently in an unstable condition, dissociated or ionised. In this state it reacts with numerous bodies (*e.g.*, in "ripening" processes or their opposite) in such fashion that the action of light is facilitated or obstructed. Actual chemical reduction does not occur until the developer is applied. The most reasonable hypothesis is that light produces a molecular change. This is common enough: it happens when finely-powdered selenium is converted to the crystalline modification by light; when selenium in light becomes a better electrical conductor; when sulphur responds in the electroscope to light rays; when the chloride, bromide, and iodide of silver in crystals are reduced to powder by insolation; when they become electrical conductors in similar circumstances.

F. H. L.

Printing-out Process; Theory of the ——. Lüppo Cramer. Chem.-Zeit. 1901, **25**, [96], Rep. 348.

The excess of silver nitrate in the printing-out film has, according to H. W. Vogel's method, been regarded as an active sensitising agent, the silver nitrate indeed by exposure absorbing the liberated chlorine, and forming silver chloride. The author found this theory insufficient. He showed that silver nitrate alone does not favour the splitting off of the halogen in the separated silver chloride, that the admixture of citric acid does not materially alter it, and that a strong reduction takes place before the contact of the citrate. Since in consequence of exposure, not only is pure silver chloride slightly reduced, but silver citrate by itself experiences still less alteration, while a mixture of both supplies a proportionate amount of silver, so the principle of absorption would account for some by itself. If that in its simple form were sufficient to explain the splitting off of chlorine (at least in the separated silver chloride), a body, which absorbs chlorine, without supplying at the same time nitric acid, as a reactive agent (like silver nitrate), must produce a further breaking down. The addition of ammonia to the silver chloride in place of silver nitrate, and the addition of ammoniacal silver oxide showed no interruption of the breaking down of the silver chloride, which was comparable with the effect of organic silver salts. The experiment with ammoniacal silver oxide on emulsified silver chloride showed the superiority of a silver chloride-citrate emulsion in regard to the separated silver obtained.—W. C. H.

Sepia Platinum Paper, with Cold Development. A v. Hübl. Phot. Corr. **38**, 674; through Chem.-Zeit. **25**, [100], Rep. 360.

By sensitising platinum paper with an oxysalt of mercury instead of mercuric chloride, a paper is obtained from which, by development in the cold, perfect prints may be made, the tone varying with the quantity of mercury salt used from yellowish black-brown to red-brown. The best salt to use is the citrate:—1 grm. of yellow mercuric oxide and 5 grms. of citric acid warmed with 20 c.c. of water till dissolved and filtered. The paper, prepared with arrowroot, is sensitised by a mixture of 8 c.c. of 20 per cent. ferric oxalate, 4 c.c. of 1:6 potassium chloroplatinite, and 1 to 4 c.c. of the mercuric citrate. Addition of ammonium citrate or oxalate gives clearer lights, of sodium chloroplatinate or potassium chromate gives greater intensity. The developer is a 1:4 or 1:8 solution of potassium oxalate, acidified with oxalic acid; and the development takes at least five minutes. After development the print is soaked for half an hour in 1 per cent. hydrochloric acid, and then washed.—J. T. D

ENGLISH PATENTS.

Photographs; Process for the Application of a Metallic Coating to Plates and other Rigid Bodies of any Desired Material, Framed or otherwise, for Permanent ——. C. P. H. Ahrle, and the Metalline-Platten-Gesellschaft, Frankfort-on-the-Main, Germany. Eng. Pat. 6246, March 25, 1901.

THE plate or other object is coated with japan varnish, which is allowed to become dry and then polished. The varnished surface is then covered with a filtered solution containing 8 parts of albumin, 4·5 parts of honey, 11·5 parts of water, which penetrates into the japan. The surface thus prepared, while just moist, is dusted over with bronze powder by means of a soft brush, and the surface when thoroughly dry is hardened by pouring alcohol over it.

—L. A.

Photographic Printing Papers; Manufacture of ——. M. Berges, Lancey, France. Eng. Pat. 6609, March 29, 1901.

THIS invention provides for the manufacture of a photographic printing paper, dispensing with the preparation of a separate gold toning bath. To an ordinary coated paper, a sensitising solution of gelatin containing a gold salt, ammonium sulphocyanide, silver nitrate and an acid (*e.g.*, citric acid) is applied. The prints are placed without washing in a solution of common salt until properly toned and are then fixed and hardened in the usual manner.

—J. F. B.

Plates and Papers; Manufacture of Photographic ——. Otto Buss, Ruschlikon, near Zurich, Switzerland. Eng. Pat. 22,040, Nov. 1, 1901.

CASEIN is dissolved in citric acid solution, glycerin added (to make the film ultimately formed flexible) and the liquid filtered while warm. Paper is coated with this liquid at a temperature of 35° to 50° C., then dried, and drawn slowly over or through a dilute solution of sodium or ammonium chloride, which renders the film insoluble. The dried or still damp paper is then sensitised by being floated upon a silver solution.—L. A.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENT.

Projectiles for Illuminating or Signalling Purposes. A. J. Boult, London. From The Marine Torch Co., Baltimore, U.S.A. Eng. Pat. 10,797, May 25, 1901.

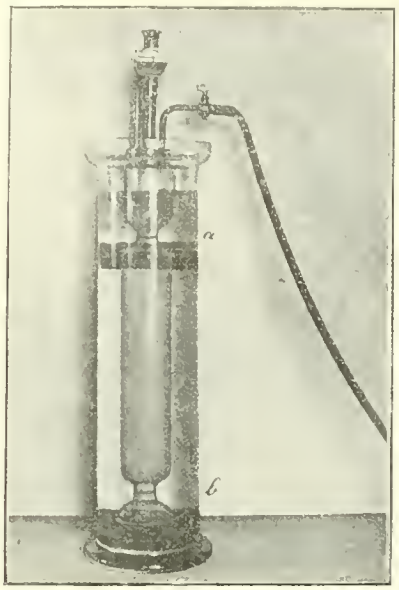
THE specification, which is accompanied by drawings, comprises 14 claims. A cylindrical shell has, at the front, burners and an igniter containing calcium phosphide, and at the base a case containing calcium carbide. When the shell enters water, the phosphide is attacked, phosphuretted hydrogen is evolved, and takes fire as the shell floats upright. Water then enters openings near the base and reaches the carbide. Acetylene is evolved and is ignited as it issues from the burners at the top. The shell is provided with a tail, upon which are rotating wings. The water inlets are provided with an arrangement for preventing the flame of the powder, on discharge, from igniting acetylene present in the shell.—A. C. W.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Gas; Modification of Schilling's Apparatus for Determining Specific Gravity of ——. F. Pannertz. J. f. Gasbeleucht. 1901, **44**, [50], 936.

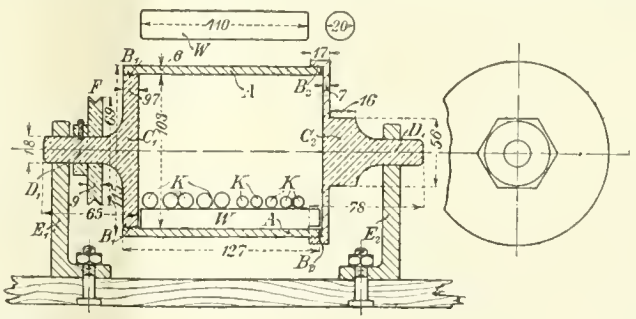
THE ordinary form of Schilling's effusion test for determining the specific gravity of gas has the gas cylinder uniformly cylindrical. The author contracts it to about one-third its diameter at the places where the marks are, by which the time of its descent into the water is measured, as the speed of its descent at these places is thereby lessened, and the time can thus be more accurately taken. The contractions and marks are shown at *a* and *b* in the annexed figures. In order to make the meniscus more distinct, the author puts a white strip vertically on the farther side of the



outer glass cylinder, and also two black transverse bands, about 3 cm. deep, at about the height of the marks on the gas cylinder.—J. A. B.

Mill for Use in the Laboratory. R. Gnehm. Zeits. angew. Chem. 1901, **14**, [48], 1208—1209.

THE small mill shown in the figure is constructed on the principle of an indigo mill. It consists of a piece of gas tubing, A, of suitable dimensions (say, 127 mm. in length by 103 mm. in width), provided with an internal screw thread at B_1 and an external one at B_2. Two brass plates, C_1 and C_2, are screwed into these ends so as to form a closed drum, and projections from these plates, D_1 and D_1, form pins resting in an iron frame E_1, E_2. The cylinder is made to rotate by means of the twine-pulley, F. To

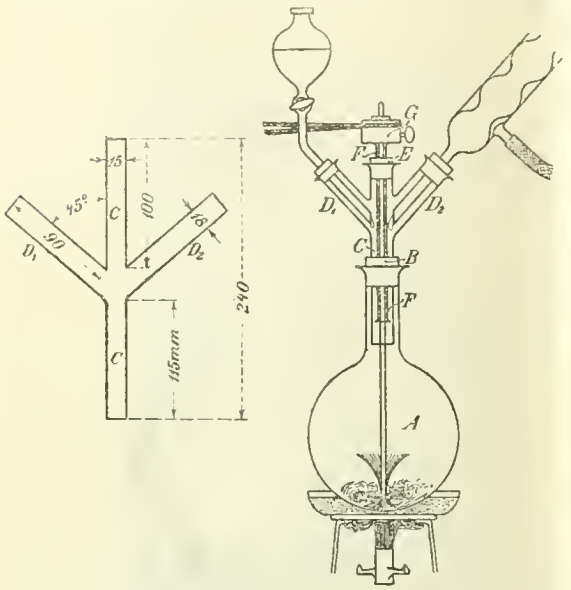


charge it, the plate, C_2, is unscrewed, and the material to be pulverised introduced, together with several iron cylinders, W, or balls, or both. The apparatus is stated to be serviceable in treating cellulose with strong sodium hydroxide solution and similar operations.—C. A. M.

Apparatus for Simultaneous Heating under a Reflux Condenser, and Introduction of New Material. R. Gnehm. Zeits. angew. Chem. 1901, **14**, [48], 1209.

THE simultaneous heating and stirring and introduction of fresh material is easily effected by means of the device

shown in the figure. The glass tube, C, passed through an india-rubber cork, B, has two side tubes, D_1 and D_2, fused on to it, into one of which is fitted the end of the reflux condenser, whilst through the other either solid or



liquid substances can be introduced. A suitable stirrer passes through the centre tube, and is driven by a cord passing over the pulley, G.—C. A. M.

INORGANIC—QUANTITATIVE.

Sodium Arsenite Solution; Preparation of ——, *for Volumetric Analysis.* G. Lunge. Zeits. angew. Chem. 1901, **14**, [52], 1293.

Replying to a criticism by Petriccioli and Reuter (Zeits. angew. Chem. 1901, **14**, [47], 1181), to the effect that Mohr's method of preparing sodium arsenite solution by boiling arsenious oxide with sodium bicarbonate solution, as given in Lunge's pocket-book, is wrong (because some Na_2CO_3 is thus produced, which is liable to absorb iodine), the author shows, by quoting the results of experiments, that the method in question is perfectly sound. The absorption of iodine by the normal carbonate is so small as to be negligible; but even this need not be taken into account, both because such error as there may be occurs in standardising the solution as well as in analysis, and because a salt intermediate between bicarbonate and carbonate is formed, and not carbonate, and the compound produced absorbs practically no iodine.—W. G. M.

Potassium Permanganate Solution; Standardisation of ——, *by Means of Iron.* H. Thiele and H. Deckert. Zeits. angew. Chem. 1901, **14**, [49], 1233—1231.

In a series of comparative determinations, the authors found that the errors in standardising permanganate solution with different kinds of commercial iron were much greater than in the case of florists'-wire (Blumendraht) or piano-wire, though even with the latter they were considerable. If the proportion of iron was taken at 99·6 per cent., the errors with the commercial iron were nearly 1 per cent. too high. On heating the liquid to the boiling point, the maximum errors were increased by about 0·1 per cent. Oxalic acid, on the other hand, when recrystallised and pressed in a Witt press between filter-paper, gave very good results as a standardising agent.—C. A. M.

Potassium; Quantitative Determination of ——, *by Means of Picric Acid.* C. Reichard. Chem.-Zeit., 1901, **25**, 1151—1154. (See also this Journal, 1901, 1242.)

Potassium picrate is less soluble in water than the chloroplatinate; 1 part of the former requires 260 parts of water at 15° C., whilst 0·9 part of the latter is soluble in 100 parts of water. Even at the greatest permissible dilution, potassium picrate is separated by the sodium salt in well-formed needles, which unite to a coherent network. The precipitation is complete within a few minutes. In the present communication the author considers the precipitation in pure solutions. There is no ready method for converting the potassium picrate into one of the ordinary salts of potassium, and, in view of the high molecular weight of the picrate, it is best weighed as such. In regard to the liquid for washing the precipitate: potassium picrate is soluble in alcohol of 95 per cent. strength in the cold; sodium picrate is less soluble in ether than the potassium salt, consequently water must be used. The process is as follows:—The potassium salt and sodium picrate are dissolved separately each in the smallest quantity of water, the solutions heated to boiling, and the hot picrate solution filtered into that of the potassium salt. After standing several hours, the liquid is decanted through a filter and the mass of crystals washed by repeated quantities of 1—2 c.c. of water, avoiding stirring with a glass rod. After drying, the crystals on the filter are transferred by means of a camel's-hair brush to the main portion, which is dried at 80° C. A hemispherical porcelain dish is the most suitable vessel for the precipitation. In the results quoted, the loss rises to 5 per cent. of the total potassium taken.—A. C. W.

Persulphates; Determination of ——. C. A Peters and S. E. Moody. Amer. J. Science, Silliman, **12**, [4], 367. Chem. Centr. 1901, **2**, [24], 1276.

The authors have compared the existing methods for the determination of persulphates. Le Blanc and Eckardt's method (this Journal, 1899, 299) gives good results, if the persulphate solution, after the addition of the ferrous ammonium sulphate, be heated on the water-bath for 10 minutes at 60°—80° C., or allowed to stand for 11 hours at the ordinary temperature. Grützner's method (this Journal, 1900, 276) gives unsatisfactory results, as the reagents themselves consume a small quantity (0·06—0·19 c.c. of the iodine solution. If allowance be made for this error, however, the results are good. Mondolfo's method (this Journal, 1899, 947) is not reliable, as the decomposition of the potassium iodide by the persulphate is not complete, even after heating for a considerable length of time. With the method of Namias (this Journal, 1900, 1149), the decomposition of the persulphate is incomplete in the prescribed 10—12 hours, and is dependent upon the amount of sulphuric acid present; with exclusion of air, the amount of iodine set free is diminished. With the two last-named methods, the amount of persulphate found was, on the average, 0·1208 grm. instead of 0·1219 grm.—A. S.

Persulphates; Determination of Alkali ——. G. Allard. J. Pharm. Chim., 1901, **14**, [11], 506—508.

The most simple process for the determination of persulphates consists in titrating the iodine liberated from potassium iodide; the published accounts are, however, at variance as to the reliability of the method. The potassium persulphate employed by the author was obtained by double decomposition from ammonium persulphate and potassium chloride; its purity was established by conversion into barium sulphate. When the iodine is liberated from a solution acidified by sulphuric acid, too high results were obtained. In a neutral solution the results were good; it is necessary to leave the liquid at least 30 minutes before the titration. (See previous abstract.)—A. C. W.

Tungsten-Steel; Determination of Tungsten in. R. Fiebex. Chem.-Zeit. 1901, **25**, [97], 1083.

There are several accurate processes for the estimation of tungsten in steel, but they are for the most part tedious. The author recommends a more rapid method. Five grms. of the steel, preferably in the form of drillings, are boiled with strong hydrochloric acid; the precipitate is filtered off and fused with potassium and sodium carbonates. The melt is dissolved in water, and the resulting solution is added to

the original filtrate, which is then evaporated to dryness in a porcelain dish and heated to 120° C. The residue is taken up with hydrochloric acid, and the solution is rinsed into a beaker and boiled for three hours. The insoluble residue, consisting of tungstic acid, with the whole of the silica, and with traces of iron and chromium (if present) is filtered, the solution being only so far diluted as to prevent its destroying the filter. The filtrate is boiled again for three hours and passed through the same filter, and, if wished, the operation may be again repeated; but this is not absolutely necessary. The precipitate on the filter is, after ignition, fused with sodium-potassium carbonate, and the melt is dissolved in hot water; the solution is filtered to remove the iron and chromium, neutralised with nitric acid in the usual way, and mixed with mercurous nitrate solution to precipitate the tungstic acid. Care must be taken to expel all the carbon dioxide before adding the mercurous salt, and the solution must be quite neutral; this point may be recognised by the faint yellowish-green tint of the liquid. If too much acid be present, precipitation will be incomplete, and if ammonia be added, the tungsten precipitate will be reddish-brown or black. The precipitate is washed with a very hot dilute solution of mercurous nitrate, ignited, and freed from silica through the agency of hydrofluoric acid.—W. G. M.

Nickel and Zinc; Quantitative Separation of ——. A. Rosenheim and E. Huldschinsky. Ber. 1901, **34**, [16], 3913—3916.

This method of separation depends on the fact that ammonium zinc sulphocyanide, like the corresponding double cobalt compound, is soluble in a mixture of 25 volumes of ether with 1 of amyl alcohol, whilst the nickel compound is insoluble in this liquid (see this Journal, 1901, 840). The solution of the mixed metals (containing 0·165 to 0·330 grm. of metal) is evaporated to dryness and the residue, mixed with 12 grms. of ammonium sulphocyanide, dissolved in 50 c.c. of water, the liquid being then repeatedly shaken up with the ether-amyl alcohol mixture. The solvent is then distilled off from the zinc solution, the residue dissolved in a little hydrochloric acid, and the zinc precipitated in a porcelain basin by means of sodium carbonate; after filtering, the metal is determined as zinc oxide in the usual way. The aqueous nickel solution is evaporated to dryness and the residue heated gently at first and afterwards more strongly for a short time, to decompose the ammonium sulphocyanide. The nickel is then digested on the water-bath with about 10 c.c. of dilute nitric acid and the filtered liquid neutralised with ammonia and ammonium oxalate; the nickel is then determined by electrolysis. Good results are obtained by this method.—T. H. P.

Tin; Lenssen's Method for the Determination of ——. J. A. Müller. Bull. Soc. Chim. 1901, **25**, [23], 1002—1004.

The volumetric estimation of tin by iodine solution is used because of its rapidity and the clearness of the end reaction. The author has conducted a series of experiments and finds that the results are too low, even under the most careful conditions. For the blank experiments to check Lenssen's method, iodine resublimed five times, was dissolved in pure concentrated potassium iodide solution, obtained by evaporating a perfectly bright alcoholic solution of the recrystallised salt. The distilled water used was boiled and cooled immediately before use. The tin gave on analysis: Sn, 99·76; Fe, 0·13; Pb, 0·05. The solution of the metal in hydrochloric acid was effected in an inclined test-tube, fitted with a rubber stopper and a bent tube dipping into a small flask containing water. The solution and washings were quickly transferred to a large conical flask, filled with carbon dioxide; 80 c.c. of a decinormal solution of Rochelle salt, prepared with freshly-boiled water, and enough sodium carbonate added in small quantities until the solution was slightly alkaline; enough of the iodine solution added to almost effect oxidation, stirring well, and the titration finished from a burette. The blank experiment gave under the same conditions, but without tin, such a solution that one drop of iodine solution caused a blue coloration; whilst in adding 80 c.c. of solution of Rochelle salt to 5 c.c. of a solution of stannous chloride, it titrated 1·3 c.c. of iodine, then titrated after one hour after addition of sodium carbonate gave iodine equal to 1·28 c.c. The results obtained were as follows:—

Weight of Tin dissolved.	Volume of Iodine Solution.	Coefficient Decinormal of the Iodine Solution.	Corresponding Weight of Tin.	Percentage of Tin Found.
Grm.	c.c.		Grm.	Per Cent.
0·5286	88·66	0·9930	0·5216	98·68
0·4609	77·23	0·9940	0·4549	98·69
0·4131	69·23	0·9940	0·4077	98·70
0·4529	75·07	1·0108	0·4496	99·27
0·4054	67·24	1·0108	0·4027	99·34
0·6069	99·36	1·0108	0·5951	99·03
0·6329	104·64	1·0108	0·6267	99·02
0·6304	99·77	1·0595	0·6263	99·35

1 c.c. of decinormal iodine solution corresponds to 0·005925 grm. of tin.—C. T. T.

Tin Ores; Analysis of ——. J. A. Muller. Bull. Soc. Chim. 1901, **25**, [23], 1004—1007.

I.—The author states that the various methods for the estimation of tin in cassiterite are somewhat wanting in accuracy. The reduction of cassiterite with nitro-hydrochloric acid, and fusion with cyanide of potash, and weighing the metallic mass obtained, after washing, drying, and fusion, gives good results only if the mineral is fairly pure; but in the presence of inert bodies, such as quartz, the reduction of the powdered mineral gives a very finely-divided metallic mass, which it is not possible to cause to cohere in a single button. Fusion with a mixture of potassium carbonate and sulphur gives the same result, the reduction being only complete with pure binoxide; whilst if the residue is submitted to three or four successive treatments to complete extraction, the tin, as sulphate, is appreciably soluble in water. The author made experiments as to the time required for complete reduction of the tin binoxide, at a moderate red heat, using mixtures of cassiterite and quartz, in a current of pure hydrogen, kept always in large excess. He finds that the percentage of tin in binoxide whether mixed or not with inert bodies may be estimated by deducting the loss of weight, when heated with hydrogen for three hours, with satisfactory approximation. The possible minerals associated with cassiterite are quartz, mica, topaz, fluorspar, apatite, blende, galena, mispickel, molybdenite, and wolfram. Quartz, mica, and topaz do not undergo any change on heating with hydrogen. The other minerals can be eliminated by successive treatments of the powdered mineral with nitro-hydrochloric acid, hot water, by a solution of neutral tartrate of ammonia (to eliminate lead sulphate), and finally by ammonia and water to dissolve molybdic and tungstic anhydrides.

II.—The author has applied the above method to the analysis of tin pyrites. In this case the powdered pyrite was calcined at a dull red heat, in a muffle, then, after treatment of the residue with a little nitric acid, drying, and recalcination, it was again heated with nitric acid, dried at 110°, and exhausted successively with dilute nitric acid and *aqua regia*. The residue thus obtained should be almost entirely composed of tin dioxide, quartz, and inert silicates, with the exception of a small quantity of oxide of iron which cannot be completely eliminated, even on repeated treatments with *aqua regia*. Thus, in an experiment, 1·4414 grm. of pyrites gave a residue weighing after calcination 0·4865 grm., and of which 0·4837 grm. lost 0·1036 grm. by heating in hydrogen, which corresponded to a yield of 26·77 per cent.—C. T. T.

ORGANIC—QUALITATIVE.

Sesamé Oil; Detection of ——. F. Ranwez. Rev. intern. falsific. **14**, 125—127. Chem. Centr. 1901, **2**, [23,] 1240.

To examine the delicacy of the sesamé oil reaction, the author treated 10 c.c. of concentrated hydrochloric acid with 10, 5, and 2 drops, respectively, of a 2 per cent. alcoholic solution of furfurol. After three hours, no

coloration was perceptible; after 24 hours the stronger solution showed a faint yellow colour, which, after four days became brownish yellow, but with not the least shade of red. Mixtures of olive oil with sesame oil were then examined in a similar manner. With 1 per cent. of sesamé oil, a distinct red coloration appeared immediately; with $\frac{1}{500}$ per cent., a faint rose coloration was produced; whilst with $\frac{1}{1000}$ per cent., the rose coloration was no longer perceptible. Butter free from sesamé oil gave no coloration with hydrochloric acid and furfurol, even after standing five days.—A. S.

Mannitol; Detection of ——. H. Wefers Bettink. Nederl. Tijdschr. Pharm. **13**, 321. Chem. Centr. 1901, **2**, [25], 1320.

Mannitol can be detected by being oxidised to the corresponding aldehyde, *d*-mannose, the latter being recognised by means of its reducing power towards Fehling's solution. The substance in question must first be examined for the presence of compounds capable of reducing Fehling's solution and also for that of cane sugar. For the latter, 0·05 grm. of the substance is dissolved in 3 c.c. of concentrated sulphuric acid and a drop of water added; if cane sugar be present, a brown coloration gradually forms. For the detection of mannitol, 0·01 grm. of the substance is dissolved in 1 c.c. of dilute sulphuric acid, three drops of a solution of one part of potassium bichromate in 25 parts of water added, and the whole boiled for one minute. The solution is now rendered alkaline with a few drops of caustic soda, and boiled with 1 c.c. of Fehling's solution.—A. S.

Cocaïne; Detection of ——. H. Proelss. Apoth.-Zeit. **16**, 779—781 and 788—789. Chem. Centr. 1901, **2**, [25], 1321.

The author considers that for the extraction of alkaloids, the method of Stas-Oto, extraction with alcohol containing tartaric acid, especially in combination with Hilger-Küster's gypsum process, is the best, but the amyl alcohol may be quite well replaced by other liquids, for example, in the case of morphine, by the alcoholic chloroform recommended by Kippenberger, as chloroform is usually the best general solvent. The best solvents for the individual alkaloids are:—For *colchicine*, all the usual solvents good from acid solution; for *digitaline*, chloroform, alcohol + chloroform from acid solution; for *picrotoxine*, ether + chloroform, alcohol + chloroform, benzene from acid solution; for *brucine*, ether, chloroform, from sodium carbonate or ammonia solution; for *veratrine*, chloroform, ether + chloroform, alcohol + chloroform, acetic ether from sodium carbonate solution; ether, benzene, from ammonia solution; for *strychnine* and *atropine*, chloroform, alcohol + chloroform, benzene from sodium carbonate and ammonia solution; for *codeine*, alcohol + chloroform, benzene, acetic ether from sodium carbonate and ammonia solution; for *morphine*, acetic ether from ammonia solution, alcohol + chloroform from potassium bicarbonate solution. Benzene is most suitable and ether and acetic ether are least suitable for shaking out emulsions.

It is stated that alkaloids are, as a rule, much more resistant against putrefaction than has hitherto been supposed.

Of the reactions for cocaïne, the author considers reduction with calomel to be the only useful one. He states that he is not able to confirm the statements of Kuborne, jun., that cocaine evaporated with nitric acid, becomes violet with alcoholic potash; of Schell, that pilocarpine is also reduced by calomel; and of Lenz, that cocaine fused with caustic potash, becomes coloured greenish yellow to bluish red—A. S.

ORGANIC—QUANTITATIVE.

Berberine; Determination of ——. H. M. Gordin. Proc. Amer. Pharm. Assoc. Pharm. J. 1901, **67**, [1640], 599.

When an aqueous solution of berberine acid sulphate is treated with an excess of potassium iodide, the hydriodide is precipitated, the reaction being as follows:—

$$C_{20}H_{17}NO_4.H_2SO_4 + KI = C_{20}H_{17}NO_4.HI + KHSO_4.$$

By determining the free acid after the reaction is complete, the weight of berberine present may readily be calculated. Berberine acid sulphate is precipitated from an alcoholic solution of salts of berberine, even in presence of free hydrochloric acid, by a slight excess of sulphuric acid, especially after the addition of an equal volume of ether. This is not the case, however, in aqueous solution, because as berberine hydrochloride is less soluble in water than the acid sulphate, a slight excess of hydrochloric acid results in the precipitation of the hydrochloride in the presence of free hydrochloric and sulphuric acids. It follows from these facts that the precipitate obtained from alcoholic solutions in the course of the Lloyd-Thompson method for the assay of berberine is really berberine acid sulphate and not berberine hydrochloride as stated. Also in Linde's method, in which precipitation is effected from weak (38 per cent.) alcoholic solution, the precipitate is not the acid sulphate, but consists mainly of the hydrochloride.

The method proposed by the author for the assay of crude drugs containing berberine is as follows:—The alcoholic extract is mixed with an equal volume of ether; then acidulated with sulphuric acid, the acid sulphate filtered off, treated with excess of potassium iodide solution and the free acid titrated in an aliquot portion of the liquid with N/40 caustic soda.

Berberine may also be determined by precipitating the base as the hydriodide and converting this into the very insoluble crystalline berberine-acetone. The berberine salt is precipitated as hydriodide, and the latter collected and washed with 2 per cent. potassium iodide solution. The precipitate is then washed into a flask with a known amount of water, heated for five minutes on the water-bath, and treated with half as much acetone as water added. 5 c.c. of 10 per cent. caustic soda solution are then added, the mixture gently shaken for 10 minutes, cooled, sufficient water added to bring the proportion of acetone and water to the ratio 1:8, and the whole allowed to stand for 12 hours in the cold. The berberine-acetone is collected, the volume of the filtrate being noted, and the precipitate dried, first *in vacuo*, and finally at 105° C. and weighed. A correction must be made for the solubility of the berberine-acetone in the volume of aqueous acetone mother liquor present (1 c.c. of a mixture of acetone and water, 1:8, dissolves an amount equivalent to ·0000273 grm. of berberine alkaloid).—A. S.

Terpene Alcohols and their Esters; Use of Sodium Salicylate in the Determination of Mixtures of ——. G. Darzens and P. Armingeat. Bull. Soc. Chim., 1901. **25**, [24], 1053—1055.

Charabot and Hébert have determined a mixture of terpene alcohols and esters by taking advantage of the solubility of the former in a 50 per cent. solution of sodium salicylate, which does not dissolve the esters or terpenes. The authors have tested this method on mixtures of linalol, geraniol, rhodinol, and their acetic esters. After treating the mixture with 4 vols. of the sodium salicylate solution, allowing to stand 24 hours and decanting the insoluble portion, water was added to precipitate the dissolved portion; the saponification value, and hence the percentage of esters, was determined in the original mixture and in the dissolved portion. The latter always contained a large quantity of esters, and in fact a mixture of rhodinol and rhodinyl acetate containing 15 per cent. of the latter was entirely soluble in the sodium salicylate solution. Direct experiment also showed that the terpene alcohols could not be extracted alone from the natural essential oils by this method. The process does not give even approximate results.—A. C. W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-Activity; Induced ——, *caused by Radium Salts.* P. Curie and A. Debierne. Comptes Rend. **133**, [23], 931—934.

Substances enclosed with solutions of radium salts exhibit induced radio-activity even more strongly than when the radium salt is in the solid state. The intensity of the

induced radiation seems to be independent of the nature of the substance exposed; it is also independent of the nature and the pressure of the gas in the enclosure. Many substances (not phosphorescent substances alone) become luminous under these circumstances; zinc sulphide shows an especially brilliant luminosity. The glass vessel itself becomes luminous, the brightness being greater in wide than in narrow portions of the vessel. The intensity depends only on the quantity of the radium solution introduced (increasing with that quantity), and not on the mode of its distribution in the vessel.—J. T. D.

Radium; Studies on ——. M. Berthelot. Comptes Rend. **133**, [24], 973—976.

A small quantity (0·145 grm.) of active barium chloride containing about one-eighth of its weight of radium salt was sealed in a glass tube. This was enclosed in a wider tube of thin glass, either directly, or after being wrapped in black paper. The whole was then placed in a wider tube and surrounded by iodic anhydride, the apparatus being arranged so that a stream of dry air could be passed through the annular space containing the anhydride, and afterwards bubbled through two little wash-bottles containing silver nitrate and caustic potash respectively. Three experiments were carried out (all in the dark), one without the radium tube, one with the radium tube wrapped in black paper, and one with the tube placed directly in its glass case. In each, air was slowly bubbled through for seven days. In the first two, there was no indication of change in the iodic anhydride; but in the third, the iodic anhydride was tinted violet, and a trace, visible, but not weighable, of silver iodide was found in the liquids. It thus seems that the visible phosphorescence of the radium is active in producing this change. The lead-glass tube containing the radium was blackened during these experiments, and the substance was accordingly transferred to another tube of leadless glass. Three similar experiments were now carried out at 100° C., but for three hours only, 1/56 of the duration of the others. In no case was there any alteration of the anhydride, though slight volatilisation occurred. It thus appears that the susceptibility of iodic anhydride to decomposition is not increased by rise of temperature from 10° C. to 100° C. in anything like the same proportion as, for instance, the speed of esterification (125 : 1), though the latter is a reversible process. During these three experiments, the tube containing the radium acquired a violet tint, no doubt through the oxidation of the manganese it contained, under the influence of the radiation. Calculations based on the figures of Curie and of Becquerel for the absolute value of the energy of radiation of radium would indicate that the quantity of iodine set at liberty in the experiment described above might be about 0·005 mgrm.—J. T. D.

Radio-Active Substances; Influence of ——, *on the Luminescence of Gases.* A. de Hemptinne. Comptes Rend. **133**, [23], 934—935.

When a radio-active substance is brought near a tube containing gas submitted to electric oscillations from an induction coil or a Tesla's apparatus, and the pressure is gradually reduced, the gas shows luminosity at a higher pressure than that at which luminosity would begin if the radio-active substance were absent (in a tube of air used by the author 44 mm. instead of 33 mm.), and the colour of the light emitted is different. The intensity of the phenomenon increases with the molecular weight of the gas. The author has previously shown that X-rays exert a similar influence.—J. T. D.

Uranium; Radio-Activity of ——. H. Becquerel. Comptes Rend. **133**, [24], 977—980.

By mixing barium chloride solution with the solution of a radio-active uranium salt, and then fractionally precipitating with a sulphate, it is possible to obtain a barium sulphate much more active than the original uranium compound, while the residual uranium compound shows a diminished activity. It has been reasonably supposed that the activity was due not to the uranium compound itself, but to some other substance thus fractionally separated. The author, however, re-examining after some time a series of substances treated as above, finds that the uranium compound has regained its original activity, while the active barium sulphate has entirely lost the property. He considers, therefore, that the activity resided originally in the uranium, that in the barium sulphate being only induced. The exact process of this induction, and of the loss of activity by the barium sulphate and the gain by the uranium salt, is still a matter for speculation and conjecture.—J. T. D.

Radio-Active Substances. K. A. Hofmann and E. Strauss. Ber. 1901, **34**, [16], 3970—3973.

The author makes reply to criticisms recently made by F. Giesel (Ber. 1901, **34**, 3772; this Journal, 1902, 76) on his physical experiments with radio-active lead (this Journal, 1901, 1150).—T. H. P.

Ozone and Potassium Iodide Solutions; The Reactions between ——. K. Garzarolli-Thurnlackh. Monatsh. für Chem. 1901, **22**, [9], 955—975. (See also this Journal, 1900, 767, 776.)

When ozone is passed through a solution of potassium iodide, in a short time the action is with iodine in an alkaline iodide solution; the products of the reaction were found to vary with its duration. The author, therefore, studied the products of an instantaneous reaction. A vessel containing a bulb of potassium iodide solution was filled with ozone. On breaking the bulb and shaking, the action was practically instantaneous. In the resulting liquid the free iodine was estimated in one portion after extraction with carbon bisulphide, the iodine free and as hypoiodite, &c., in another portion by potassium arsenite; and in a third portion the free and total combined iodine by means of thiosulphate. The liquid was always alkaline. By mixing equivalent solutions of iodine and potassium hydroxide, determining the free iodine by extraction with carbon bisulphide, and the total iodine by means of arsenite solution, it was found that iodine and potassium hydroxide may coexist in very dilute solutions, and that the amount of hypoiodite decreases very rapidly. This experiment also showed that the product of the action of ozone must contain some substance, other than hypoiodite, capable of oxidising arsenious acid. The reaction product was accordingly brought into excess of silver nitrate solution, the precipitate washed and digested with sodium chloride; the filtrate, which was alkaline, gave no reaction with potassium iodide, but when carbon dioxide was passed, iodine was at once liberated. Thus periodate is present. About five minutes after the action of ozone, free iodine, potassium hydroxide, hypoiodite, iodate and periodate are present, of which, after 24 hours, small quantities of free iodine and potassium hydroxide, very little periodate, and relatively much iodate, remain. When ozone is passed into a solution of potassium iodide, the conditions are more favourable to the formation of periodate and less to that of hypoiodite. It has not yet been shown that potassium or hydrogen peroxide is a product of the reaction. The fume produced by the action of a rapid current of ozone on potassium iodide solution contains an oxide of iodine which acts on potassium arsenite, and thus cannot be iodic anhydride alone.—A. C. W.

Thallium; Alloys of ——. N. S. Kurnakoff and N. A. Pushin. J. Russ. Phys. Chem. Soc. 1901, **33**, [7], 565—588.

The relations between melting point and composition are given for mixtures of thallium with each of the following metals: sodium, potassium, tin, cadmium, and mercury, the results being expressed in the form both of tables and of curves. The authors have found that in combination with potassium or sodium, as well as with tin or cadmium, thallium behaves similarly to the heavy metals having an acid character, such as mercury and lead, which also it much resembles in the free state; in alloys with mercury, bismuth, or lead, however, the rôle of thallium is similar to that of the alkali metals. The melting-point curves for sodium-thallium and potassium-thallium show distectic points corresponding with compounds of the composition

NaTl and KTl, which melt at 305·8° and 335·0° respectively. The author's results complete the following series of sodium alloys: $NaHg_2$, NaTl, Na_2Pb, Na_3Bi, in which it will be seen that, corresponding with the increase of the atomic weight and acid properties of the heavy metal present, there occurs an increase in the relative number of sodium atoms contained in a molecule of the alloy.

—T. H. P.

Cellobiose. Z. H. Skraup and J. König. Monatsh. für Chem., 1901, **22**, [19], 1011—1036.

The sugar termed cellose (this Journal, 1901, 740) is now designated cellobiose in order to distinguish it from monoses. The octacetyl derivative is obtained when ordinary white paper, filter paper, or filter-paper pulp (7·5 grms.), is torn into pieces of about 0·5 sq. cm., and well shaken with 20 c.c. of acetic anhydride in a 200 c.c. conical flask. Four c.c. of concentrated sulphuric acid are mixed with 7 c.c. of acetic anhydride in a small flask, and the mixture, after cooling to 70° C., poured at once on the paper. On shaking, the paper soon dissolves, and the solution acquires a reddish-brown colour. It is then poured into 500—700 c.c. of water. The precipitated acetyl compound is filtered over linen, well washed, and pressed. After recrystallisation from 95 per cent. alcohol or ethyl acetate, it is obtained in fine white needles, melting at 227°—228° C. The yield is about 2 grms. of pure substance. The acetyl derivative is readily soluble in hot alcohol, ethyl acetate, chloroform, and benzene, with difficulty in hot ether, and is practically insoluble in water.

It was not found possible to convert linen thread or cotton-wool into the acetyl compound, on account of mechanical difficulties; but with pure paper pulp from cotton or linen, after stirring well in boiling water, washing with alcohol and ether, and drying in a thin layer in the air, the same acetyl derivative was obtained.

It resists the action of glacial acetic acid to 180° C. On hydrolysis with cold alcoholic potash, it is converted into a heavy granular powder, which consists of cellobiose, $C_{12}H_{22}O_{11}.\frac{1}{4}H_2O$. Cellobiose is unfermentable by yeast; 1 grm. reduces 153·13 c.c. of Fehling's solution. It exhibits the phenomenon of birotation. The product has a sweetish taste; the product of inversion by sulphuric acid had the optical rotation and reducing power for Fehling's solution of dextrose.

The phenylhydrazone could not be obtained by Fischer's method in aqueous solution, but on boiling in alcohol, a hygroscopic hydrazone, decomposing at 90° C., was formed. The phenylosazone forms fine yellow needles, which melt at 198° C. Cellobiose is the simplest polysaccharide obtained from cellulose, and might thus be supposed to be present in germinating plants, in which cellulose is being built up from sugars.—A. C. W.

Acetochloroglucose and Acetochlorogalactose; Synthetic Researches with ——. Z. H. Skraup and R. Kremann. Monatsh. für Chem., 1901, **22**, [19], 1037—1048. (See also this Journal, 1901, 291, 626, 1151.)

Previous syntheses by means of acetochloroglucose and acetochlorogalactose have been conducted with the uncrystallised compounds, which can now be obtained crystalline. The authors have attempted syntheses by their means in the absence of water. The results are briefly: the lead compound of glucose does not react with acetochloroglucose in chloroform solution. A silver compound of glucose could not be obtained, as solutions of glucose in strong alcohol mixed with sodium ethylate at once separate reduced silver. Acetochloroglucose dissolved in ether or toluene reacts with sodium or molecular silver only with great difficulty, and then with total decomposition. The reaction with silver alone yielded a crystalline product, which was the β-pentacetylglucose of melting point 112° C. This is remarkable, since acetochloroglucose by the action of silver acetate gives the α-compound melting at 132° C. When acetochloroglucose, dissolved in ether, is boiled with sodium and powdered silver nitrate, an acetonitroglucose is obtained, which melts at 92° C., is almost inactive, and is isomeric with the acetonitroglucose of Colley and Königs, into which it is converted on recrystallising from alcohol. The new nitro-compound gives the α-pentacetate on boiling with acetic acid and sodium acetate. Acetochlorogalactose gives a different reaction with sodium and silver nitrate; tetracetylgalactose is formed, which, on acetylation with acetic anhydride and sodium acetate, gives galactose pentacetate. In regard to the action of phenylhydrazine on acetochloroglucose (this Journal 1901, 513), acetylphenylhydrazine and glucosazone have been found as products.—A. C. W.

Crystalline Albumin from the White of Crows' Eggs. W. W. Worms. J. Russ. Phys. Chem. Soc. 1901, **33**, [6], 448—459.

By means of 2 per cent. ammonium sulphate solution the author has isolated from the white of crows' eggs and crystallised an albumin which has been examined crystallographically by Larsky, who states that the crystals probably belong to the orthorhombic system. In 2 per cent. ammonium sulphate solution the albumin has a specific rotation indicated by $[\alpha]_D$ −29·35°; in aqueous solution, when freed as far as possible from ammonium sulphate by dialysis, it has an acid reaction towards litmus which it loses on heating or on precipitation by alcohol. With acids the albumin forms compounds, the rotatory powers of which are higher than those of the albumin, and are further increased on heating. The following table gives the composition of the crystalline albumins obtained by Panormoff from the whites of hens' and pigeons' eggs, and of that now described by the author:—

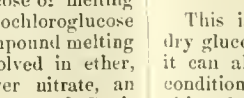
	Hen.	Pigeon.	Crow.
C	52·97	52·06	52·10
H	7·28	7·12	7·13
N	15·10	13·28	13·69
S	1·63	1·07	1·08

These numbers show the great similarity in composition between the compounds obtained from pigeons' and crows' eggs, although they are not identical, as is shown by differences in composition of the derivatives formed with hydrochloric and hydrobromic acids.—T. H. P.

Hexoses, Disaccharoses, and Polyhydric Alcohols; Magnetic Rotation of some ——. W. H. Perkin, sen. Proc. Chem. Soc. **17**, [244], 256.

The object of this investigation was to see if any clue could be obtained from the magnetic rotation of the sugars as to the cause of their bi- or multirotation. Some of the polyhydric alcohols were also examined in order that data might be obtained from which to calculate the probable values for the various sugars.

From the rotations obtained for glucose and for fructose, it was found that the suggestion that birotation was due to hydration was untenable. The magnetic rotations are too low for substances possessing the aldehydic and ketonic constitutions usually assigned to these sugars, but they correspond with substances containing an oxygen atom linked as in ethylene oxide or the lactones, all of which give low numbers. This agrees with the suggestion of Lowry (Trans. Chem. Soc. 1899, **75**, 215), that when in solution and having undergone the largest amount of change, glucose exists chiefly in an isomeric form, for which he gave two formulæ, of which the more probable one, judging from the magnetic rotation, may be represented thus:—



This is the formula originally proposed by Tollens for dry glucose (Ber. 1883, **16**, 92). When slightly modified, it can also be used to represent fructose in an isomeric condition, equally consistent with the magnetic rotation of this substance in solution.

Saccharose may be regarded as built up from glucose and fructose, both being in their isomeric forms, with elimination of water, its constitution being that proposed by E. Fischer (this Journal, 1894, 167—168), which is a slight modification of that suggested by Tollens (Ber. 1883, **16**, 923).

Maltose and lactose, which possess both birotation and reducing power, appear to have analogous structures.

Casein Derivative containing Sulphur and Chlorine. T. Panzer. Zeits. physiol. Chem. **33**, 595—608. Chem. Centr. 1901, **2**, [24], 1270.

By oxidising casein with hydrochloric acid and potassium chlorate and then saturating the liquid with sulphuretted hydrogen, a light brown precipitate, easily soluble in ammonia and ammonium sulphide, is produced, which does not give the albumin colour reactions, but is precipitated from its neutral solution by partial saturation with ammonium sulphate or complete saturation with magnesium sulphate or sodium chloride. The product is not dissolved by pepsin-hydrochloric acid. It has the composition :—Carbon, 43·14; hydrogen, 5·10; nitrogen, 10·08; sulphur, 8·86; phosphorus, 0·42, chlorine, 8·36; and oxygen, 24·04 per cent. Of the 8·86 per cent. of sulphur, 0·39 per cent. can be separated in a form capable of blackening lead paper, and 0·17 per cent. is already present in an oxidised form.—A. S.

New Books.

A College Text Book of Chemistry. By Ira Remsen, President of the Johns Hopkins University. Macmillan and Co., Ltd., London. 1901. Price 8*s.* 6*d.*

8vo volume containing preface, table of contents, and subject-matter filling 676 pages. The illustrations number 79. This book is intended by its author to fill a place between his "Introduction to the Study of Chemistry" and the "Inorganic Chemistry." Especial attention is given in it to the parts dealing with matters pertaining to physical chemistry.

The Chemistry of Pigments. E. J. Parry and J. H. Coste. Scott, Greenwood, and Co., 19, Ludgate Hill London, E.C. 1902. Price 10*s.* 6*d.* India and Colonies, 11*s.*; other countries, 12*s.*

This work, demy 8vo, is one of 285 pages, with preface table of contents, and alphabetical index. It is illustrated with five wood engravings. The subject-matter is subdivided as follows :—I. Introduction on Light and Colour. II. Application of Pigments. III. Inorganic Pigments. IV. Organic Pigments.

Olive Oil: Its Source, Production, Character and Uses. Fredk. Boehm, 16, Jewry Street. London, E.C. 1901.

8vo volume containing table of contents, alphabetical index, introduction, and 47 pages of subject-matter. Then follows a table of values of olive oil imported into the United Kingdom, an olive oil parity table, and a map showing the geographical positions of olive oil centres. The subject is treated as follows :—I. Botanical Origin, Habitat, and Character of the Plant. II. Method of Preparing the Oil. III. Geographical Distribution of the Trees. IV. Production and Export of Various Countries. V. Chemical and Physical Characters of the Oils. VI. Pests which attack the Orchards. VII. Uses.

Trade Report.

I.—GENERAL.

Chemical Imports of South Africa.

Chem. and Druggist, Jan. 4, 1902.

The following figures relate to the exports of drugs, chemicals, &c. from Germany to South Africa, during 1899 and 1900. Refined glycerin and potassium cyanide show substantial decreases :—

Article.	Cape Colony, Natal, Rhodesia, &c.	Transvaal and Orange River Colony.	Year.
	£	£	
Perfumery	6,300	2,050	1899
	7,550	50	1900
Chemical manufacturers' unenumerated	5,150	800	1899
	1,600	350	1900
Essential oils	450	100	1899
	450	50	1900
Glycerin, refined	18,150	118,350	1899
	100	..	1900
Potassium cyanide	8,900	101,250	1899
	7,850	18,900	1900
Other potash salts	350	350	1899
	350	..	1900

Australian Federal Tariff Changes.

Chem. and Druggist, Jan. 11, 1902.

The following amendments have been made by the House of Representatives :—

Tariff Classification.	Schedule.	As amended.
Spirituous compounds, which include bitters, essences, fluid extracts, sarsaparilla, tinctures, medicines, infusions, toilet preparations.	14*s.* gall. proof or under.	If not containing more than 25 % proof spirit, 3*s.* 6*d.*; 50 %, 7*s.*; 75 %, 10*s.* 6*d.* gall.; over, 14*s.*
Candles, &c., stearin, paraffin-wax, &c. lb.	1½*d.*	1*d.*
Cocoa-butter, caramel, and caramel-butter lb.	2*d.* and 15 %	1*d.*
Confectionery, &c. lb.	2*d.* and 15 %	2*d.*
Canary, hemp, and rape seed	15 %	1*s.* 6*d.* cental.
Soap, perfumed lb.	4*d.*	3*d.*
„ n.e.i., and polishing „	1*d.*	½*d.*
Lime-juice and other fruit-juices, and fruit-syrup, non-spirituous gall.	1*s.*	9*d.*
Linseed cental	2*s.*	2*s.*
If used for making oil	2*s.*	Free
Mustard seed lb.	2*d.*	„
Oilmen's stores, special preparation of infants' and invalids' foods.	20 %	„

(See also this Journal, 1901, 1155.)

II.—FUEL, Etc.

Sawdust for Fuel in Germany.

Bd. of Trade J., Jan. 2, 1902.

Sawdust as fuel has been produced, in Prussia, in the form of small octagonal bricks, weighing half a pound each. This fuel burns in air-tight stoves with a small flame, and leaves but little ash. No binding ingredient is used; the sawdust is dried, and pressed into the shape of the briquette. The absence of all tarry or oily substances prevents smoke. The weight of such a briquette indicates the heavy pressure under which it takes its shape, and the edges look like polished oak; it is heavier than a piece of hard wood of the same size.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Asphalt in Trinidad (B.W.I.).

Ch. of Comm. J., Jan. 1902.

The asphalt trade was more prosperous, in 1899, than in any previous year, but it made a still further advance, in 1900, when, of the 160,000 tons shipped, 33,311 tons were exported by independent diggers. In 1896, the latter produced only 9,000 tons, but the industry has regularly increased. (See also this Journal, 1901, 1038.)

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Electrolytic Bleaching in the United States.

Chem. Trade J., Jan. 4, 1902.

Experiments have been conducted in the laboratory of Trinity College, Hartford, Conn., in electrolytic bleaching.

The fabric to be bleached was saturated with a solution of sodium chloride containing free hydrochloric acid, and placed between two carbon electrodes carrying a weak current, of an electromotive force of two volts. The bleaching effect at the anode is credited to the nascent oxygen, produced by the secondary chemical reaction between the liberated chlorine and the water. The best results are obtained with a very small current-intensity, and an electromotive force below 1·67 volts.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphate of Ammonia Statistics.

Bradbury and Hirsch, Liverpool, Jan 1902.

Production of ammonia, calculated into sulphate of ammonia, in the United Kingdom, from all sources, during 1901, is estimated at 220,000 tons, viz.:—

Gas works	148,500
Iron works	16,000
Shale works	36,500
Coke and carbonising works and producer gas work	19,000
	220,000

Of this production—

England contributed	146,500
Scotland ,,	70,500
Ireland ,,	3,000

The production during the previous three years, in tons, was:—

	1898.	1899.	1900.
Gas works	130,000	134,000	142,000
Iron works	17,700	18,000	17,000
Shale works	37,300	38,500	37,000
Coke and carbonising and producer gas works	11,500	15,000	17,000
Total	196,500	205,500	213,000

Nitrate of Soda Statistics.

Shipments, Consumption, Stocks, and Prices for Three Years. W. Montgomery and Co. 31st December 1901.

	1899.	1900.	1901.
	Tons.	Tons.	Tons.
Shipments for six months ended 31st December	819,000	897,000	708,000
Shipments for year ended 31st December	1,373,000	1,429,000	1,263,000
Afloat for Europe on 31st December	505,000	576,000	393,000
Stocks in United Kingdom ports:—			
Liverpool	6,000	10,000	5,000
London	1,800	4,000	2,000
Out ports	22,200	21,000	18,000
	30,000	35,000	25,000
Stocks in Continental ports on 31st December	206,000	186,000	218,000
Consumption in United Kingdom for six months ended 31st December	34,000	43,000	35,000
Consumption in Continent for six months ended 31st December	270,000	235,000	229,000
Consumption in United Kingdom for 12 months ended 31st December	123,000	135,000	118,000
Consumption in Continent for 12 months ended 31st December	1,017,000	991,000	1,036,000
Consumption in United States for 12 months ended 31st December	160,000	175,000	192,000
Consumption in other Countries for 12 months ended 31st December	30,000	23,000	13,000
Consumption in the World for 12 months ended 31st December	1,330,000	1,324,000	1,364,000
Visible supply on 31st December	741,000	794,000	642,000
Price on 31st December per Cwt.	7*s.* 9*d.*	8*s.* 6*d.*	9*s.* 6*d.*

X.—METALLURGY.

Mercury in Mexico.

Bd. of Trade J., Jan. 2, 1902.

In *La Tierra de Mexico*, for December, 1901, it is stated that mercury occurs in Mexico, in various places, in small quantities, associated with rocks of the green sand formation of the Cretaceous period. The most important districts are Guadalcazar and Huitzuco, in the State of Guerrero. In the former locality, it occurs in calcareous rocks of the Cretaceous age, where it forms veins and impregnations, the age of the formation and nature of the deposits being similar to those in California. In 1894, the Guadalcazar district produced about 2,500 flasks,* and Huitzuco about 5,000 flasks, these two districts producing 260 of the 268 metric tons in Mexico, in that year. The production for 1900, amounted to 335 metric tons.

Wolframite in the United States.

Chem. Trade J., Jan. 4, 1902.

Wolframite deposits have already been found in Arizona and Nevada, and in a few other localities. The ore has recently been discovered in the Black Hills of Dakota, and the deposit has been described in a paper read before the American Institute of Mining Engineers. This tungsten ore is said to contain 61·0 per cent. of tungstic acid, WO_3.

Minerals in Kumaon and Garhwal (India).

Pioneer of Allahabad, Nov. 1901.

Asbestos, good in colour and long in fibre, is frequently found. Porphyritic granite, associated with much schorl, is found in parts of Eastern Kumaon, and here true lodes have been observed traversing both the granite and the adjacent clay-slate, and containing traces of oxide of tin. Copper and lead have been abundantly worked in the past, and copper-bearing rocks are found all over both Kumaon and Garhwal.

Extensive old works cover many acres of hill-side, and the mountains are here and there covered with ancient slags, containing sometimes as much as 2 per cent. of copper.

The revenue derived as royalties from the copper ores was considerable, even in the first half of the last century. The copper ores mined, before the country was taken over by the British, must have been enormous, judging from the extent of old mines. The copper ores occur mostly in limestone formations, often associated with talc slates and schists. Both irregular deposits and true lode formations are met with, the latter being often of great size. The ores mined by the natives were mostly green and blue carbonates and oxides of copper. Sulphides they put aside as too refractory for their primitive methods of smelting, and beneath the deposits of carbonates which they worked out, extensive deposits of copper pyrites and grey copper ore still left. In several cases, lodes of copper and iron pyrites of considerable width, which have been absolutely untouched by the natives, crop out very close to the surface. One feature is the number of gossan "hacks" to be noticed in the copper districts. The natives have occasionally worked these, presumably for iron, to a little depth, but there can be little doubt that systematic exploration would reveal in depth great masses of copper pyrites. The hill copper was formerly noted for its purity, and even now the natives prefer to obtain their metal from Nepal, owing to its being so much softer and purer than that obtainable from Europe.

Platinum in British Columbia (Canada).

U.S. Cons. Reps., Dec. 28, 1901.

The superintendent of the assay office, at Vancouver, reports that, among the specimens of gold brought to him to be refined, he has found considerable quantities of platinum, and he is under the impression that the miners do not know platinum when they see it. In all the placer-

* Flask of mercury = 75 lb. (avoir.)

mining districts of British Columbia and the Yukon Territory, large amounts of platinum and kindred metals have been thrown away by miners who did not know the value of the product. With the present price of platinum, it will pay prospectors to be on the look-out for this metal, which doubtless exists in considerable quantities in this province. Platinum is not found in ledges, so far as is known, except in one place in the world. It is found in black sand containing a large percentage of magnetic-iron ore and a varying quantity of gold. (See also this Journal, 1901, 1259.)

Copper Mining in Trans-Caucasia (Russia).

Bd. of Trade J., Jan. 9, 1902.

The richest deposits of copper are to be found in the districts of Zanguézoursk, Kasakh, and Elisabethpol, in the Province of Elisabethpol; in the neighbourhood of Artviusk, in the Province of Koutais; and in the district of Bortchalinsk, in the Province of Tiflis.

In spite of the relative richness of these deposits, copper foundries in Caucasia are comparatively few in number. This is attributed to three causes, viz.:—(1) Insufficiency of roads; (2) Ignorance of the peasants; and (3) The lack of initiative among capitalists.

The total production of pure copper in all the foundries of the Trans-Caucasus, in 1900, amounted to 232,934 pouds (3,743 tons), or nearly one-half the total production of copper in the Russian Empire.

In order to give the copper industry of the Trans-Caucasus full scope, it would be necessary to permit the free exploitation of the deposits of ore in the land belonging to the ex-serfs of the Provinces, which, in spite of their richness, have remained up to the present entirely untouched.

XII.—FATS, OILS, Etc.

Oil Industry for Queensland.

Bd. of Trade J., Jan. 9, 1902.

In a recent issue of the *Queensland Agricultural Journal*, it is stated that the oil industry should prove a profitable undertaking, for the following reasons:—There is an unlimited market for paint oils in Australia, where many of the buildings are of wood. Almost every known variety of oil-yielding seed can be produced in Queensland.

Cotton has been grown there for many years, with varying success, but the seed has never been utilised for oil-extracting purposes; hence a valuable product, which could have been profitably turned to account, was wasted.

The sunflower can be easily grown, succeeds in any region where maize can be grown, and produces about an equal weight of grain.

Linseed is a crop similar to wheat or barley, in that the cultivation and handling are practically the same, whilst the yield is equal to, if not greater than, that of those cereals. Many wheat-growing areas in Queensland are admirably adapted to the cultivation of linseed.

Castor flourishes along the entire seaboard; although only small attempts have been made to grow it systematically, the attempts go to prove that, under cultivation, the yield of seed is increased by systematic planting and pruning. Rape is easily grown.

Peanut (earthnut) will grow in almost any part of Queensland, but some difficulty, which may easily be overcome, is experienced in harvesting the nuts. Other oil-seeds, such as hemp, gingelly, &c., can be produced in Queensland, whilst the tropical north may produce cocoanuts, in large quantity, as well as tropical oil-yielding seeds.

Solid Fat and Degras: Russian Customs Decision.

Bd. of Trade J., Jan. 9, 1902.

Solid fat, worked, crude, or melted, and *degras*, are to be dutiable, under Section 51, Point 2 (instead of Point 3) of the Tariff, at the rate of 1 rouble $12\frac{1}{2}$ copecks per poud, gross (7*s.* $4\frac{3}{4}$*d.* per cwt., gross), with the 20 per cent. surtax imposed by the Imperial ukase of the 5th August, 1900.

Soap Trade in Tripoli.

Handels Museum (through Imp. Inst. J., Jan. 1902).

The large demand for soap in Tripoli is mostly supplied by imports from France, Italy, Tunis, Malta, and Crete. French soap costs 36, and Italian only 28·50 francs per 100 kilos. Whilst Marseilles was formerly the principal source of supply, Italy now competes very successfully, its product being lower priced. The quality from Tunis is also too dear to compete advantageously with the Italian product. The quantity of Maltese and Cretan soap is not very large.

XIII. A.—PIGMENTS, PAINTS, Etc.

White Lead: Customs Decision (Sweden).

Bd. of Trade J., Jan. 9, 1902.

White lead of all kinds (Tariff No. 141) is free.

XIII. B.—RESINS, VARNISHES, Etc.

"Terebene" and Varnish: Customs Decisions (Italy).

Bd. of Trade J., Jan. 2, 1902.

"*Terebene*" is dutiable at the rate of 3 lire per kilo., under par. 9*e* of the Tariff.

Varnish, without spirit, containing oil of tar, is dutiable at the rate of 20 lire per 100 kilos., under par. 81*b* (2) of the Tariff.

XIII. C.—INDIA-RUBBER, Etc.

Rubber in Trinidad and Tobago (B.W.I.).

Chamber of Com. J., Jan. 1902.

Rubber is the only new cultivation likely to provide a staple export in the future. It is, as yet, in an experimental stage. There are eight plantations in Trinidad, and two in Tobago. Several large sales of Crown Land, in Trinidad, have recently been made, on the understanding that they are to be devoted to this cultivation. It is also extending yearly in Tobago, chiefly in combination with cocoa. The rubber chiefly planted is the Central American *Castilloa Elastica*, of which there are 100,000 trees planted in Tobago, as well as some thousands of the Brazilian "Mouchet." The former promises to be the most profitable. The West African silk rubber has also been recently introduced. The greater part of the plantations are still quite young—from one to four years old—and no large return can be anticipated until they have been seven or eight years in existence. The quality appears to be good. A sample of *Castilloa*, grown and prepared on the Richmond estate, was valued in England, by experts, at 3*s.* 6*d.* per lb.

XVI.—SUGAR, STARCH, Etc.

Sugar Production in Germany.

Bd. of Trade J., Jan. 2, 1902.

The quantity of raw sugar produced in Germany, in October last, amounted to 611,767 metric tons, and, in November, to 658,583 metric tons. In October, 151,972 metric tons of refined sugar were produced in the sugar factories, and in November, 171,121 metric tons. During the first four months (August to November) of the present sugar campaign, the production of raw sugar amounted to 1,337,532 metric tons, and of refined, to 449,706 metric tons, the figures for the corresponding months of the previous year being 1,208,548 metric tons of raw, and 412,673 metric tons of refined, sugar. During November, 395 factories were engaged in the manufacture of beet-sugar, and 15,675,390 metric tons of beet will probably be used in sugar manufacture during the present campaign.

Sugar in Austria-Hungary.

Bd. of Trade J., Jan. 2, 1902.

The production of sugar in Hungary, for the current season, was 1,224,800 tons, against 1,083,300 tons, for that ended 1st June, 1901. The total sugar-beet crop of Austria-

Hungary is estimated at 8,500,000 metric tons, against 7,400,000 tons, in 1900. Nearly half of this quantity—*viz.*, 4,000,000 tons—was produced in Bohemia. The constant expansion of the sugar industry in Europe, and the gradual loss of some of its important eastern markets, are stated to be almost certain to bring about a serious crisis at a not very distant period. (See also this Journal, 1901, 1160.)

Syrup or Molasses of British Manufacture; Drawback on.

Bd. of Trade J., Jan. 9, 1902.

A notice has been issued, by order of the Commissioners of Customs, with regard to the drawback allowed on the exportation of syrups or molasses of British manufacture. The following is the text of the notice :—

"Subject to the conditions specified in the Second Schedule to the Finance Act, 1901, the Board of Customs allow, on the exportation of syrups or molasses of British manufacture, drawback at the rates of import duty for molasses (1*s.*, 2*s.*, or 2*s.* 9*d.* per cwt.), according to the amount of sweetening matter contained in the article."

"Any claim for drawback, as to which the exporter may be able to prove that the amount allowable under the preceding paragraph is not equal to the duty paid in respect of the quantity of that article, which appears to the satisfaction of the Treasury to have been used in the manufacture or preparation of the goods, will be dealt with upon its merits; but a statutory declaration will be required in each case, showing the quantity and description of the sugar or other articles used in the manufacture, and the relative rate of duty paid upon importation."

"The Board of Customs, however, will, on application, be prepared to consider whether, and on what conditions, a statutory declaration in each instance may be dispensed with in the case of regular exporters of British manufactured syrups or molasses."

Sugar Refinery in Turkey.

Handels Museum (through Imp. Inst. J., Jan. 1902).

In the neighbourhood of Adrianople, a sugar refinery is being erected, the concession having been obtained by a high Turkish official. All materials necessary for building and machinery are to be admitted duty-free. A concession has also been obtained for opening a deposit of coal which has been discovered in the vicinity of the refinery, and which will furnish the necessary fuel. The beet-root will be grown on the lands adjoining. The necessary machinery has already been ordered from European factories.

XVII.—BREWING, WINES, SPIRITS.

Alcoholic Liquors in Japan.

Bd. of Trade J., Jan. 2, 1902.

The Journal of the Japan Foreign Trade Association, for November last, publishes statistics of the manufacture and imports of alcoholic liquors in Japan, in the years 1898, 1899, and 1900, on which the following table is based :—

Alcoholic Beverages manufactured in Japan.

	1898.	1899.	1900.
	Koku.	Koku.	Koku.
Refined, unrefined, white, and sweet saké, and distilled spirits.	4,571,670	4,446,022	4,288,766
Alcohol, and mixed saké	47,177	3,875	5,258
Beer.....	81,351	87,256	120,371
Wine.....	2,372	3,071	3,792
Total koku.....	4,705,850	4,540,224	4,418,187

Note.—Koku = 32·7 galls.

As regards the imports of alcoholic liquors into Japan, it may be noted that the total quantity imported, in 1900, amounted to 17,477 koku, as compared with 81,736 koku, in 1899.

XVIII. A.—FOODS.

"Sulphurated" Fruits: United States Customs Decision.

Bd. of Trade J., Jan. 2, 1902.

The following decision affects the classification under the United States Customs Tariff.

The importation of fruits treated with sulphurous acid (except as an external bleach, previous to desiccation) is prohibited.

XX.—FINE CHEMICALS, Etc.

Sulphuric and Acetic Ethers in Belgium.

Bd. of Trade J., Jan. 2, 1902.

A Belgian Royal Decree, fixes the import duties on sulphuric ether at 5 francs, per 100 kilos., and on acetic ether, at 8 francs, per 100 kilos.

Ethyl Chloride: Customs Decision (Italy).

Bd. of Trade J., Jan. 2, 1902.

Ethyl chloride is dutiable at the rate of 10 lire per 100 kilos. under par. 59 of the Tariff, and is subject, in addition, to the surtax on alcohol, at the rate of 1 lire per kilo. of the product (real net weight).

Gold and Platinum Salts in Sweden.

Bd. of Trade J., Jan. 9, 1902.

A Swedish Royal Decree, which introduces the following alterations into the Customs Tariff of Sweden, took effect from the 1st inst. :—

Tariff No.	Articles.	Rates of Duty.	English Equivalents.
	Chemico-technical preparations, not specified—	Kron.öre	*s. d.*
284½	Chloride of gold, chloride of gold and potassium, chloride of gold and sodium (gold-salt), chloro-platinite of potassium, and chloride of platinum.	Kilo.0 08	Lb. 0 0½

Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

1902.

165. E. G. Scott. Improvements in filter presses. Jan. 2.

312 C. A. Hult and O. W. Hult. Improvements in centrifugal apparatus. Complete Specification. Jan. 4.

368. W. L. Wise.—From The Compagnie Parisienne d'Eclairage et de Chauffage par le gaz, France. Improvements in apparatus for discharging retorts. Jan. 6.

376. M. Crawford and F. W. Dunlap. Improvements in or relating to carburettors. Jan. 6.

464. E. M. Knight and J. Hawkridge. Improvements in filters. Complete Specification. Jan. 7.

585. H. J. Fox and The Pulsometer Engineering Company, Ltd. Improvements in filters. Jan. 8.

593. R. B. Ransford.—From The Pharmaceutisches Institut Ludwig W. Gans, Germany. Process for clarifying liquids. Jan. 8.

612. C. McNeil.—Partly communicated by C. W. Petchell, Natal. Improvements in or connected with centrifugal machines. Jan. 9.

642. E. C. Newcomb. Method and means for generating superheated steam or vapour. Complete Specification. Filed 9 Jan. Date applied for, 7 June 1901, being date of application in United States.

653. A. Schnakenberg. Improvements in condensing pots. Jan. 9.

728. W. Ingham and B. Langton. Improved bottom for Hoffmann kiln. Complete Specification. Jan. 10.

770. F. Siemens. Improvements in regenerative gas furnaces. Jan. 10.

791. W. L. Wise.—From The Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz, France. Improvements in or relating to apparatus for charging retorts and to apparatus suitable for regulating the speed thereof. Jan. 10.

792. E. S. Beaven. *See* Class XVII.

848. O. Sachse and L. Kaulmann. Improvements in or relating to brine evaporators. Complete Specification. Jan. 11.

903. F. Jacobson, O. T. Westlin, and J. S. Carlson. Improvements in vaporisers. Complete Specification. Jan. 13.

929. E. Caffyn. Improved construction of jar or drum for holding beer and other liquids. Jan. 13.

940. C. W. Vollmann. Improvements in freezing apparatus. Complete Specification. Jan. 13.

1034. R. J. Cracknell. Improvements in refrigerating machinery. Jan. 14.

1120. H. G. Turner. Improved manufacture of refractory material from magnesite, applicable for furnace linings and other purposes. Jan. 15.

1141. J. R. Richmond. Improvements in surface condensers. Jan. 15.

1236. E. H. Pryce. Improvements in appliances for removing scale or other adhesive matters from boiler tubes and other surfaces. Jan. 16.

Complete Specifications Accepted.*

1901.

2975. J. Dewhurst. Apparatus for use in filtering and conducting liquids. Jan. 8.

3200. A. Wilson. — From E. M. Söhne, Germany. Centrifugal apparatus. Jan. 8.

5529. K. Enzinger. Filtering materials. Jan. 8.

20,757. D. Turk. Device for regulating and controlling the supply of gas and air to furnaces and the like. Jan. 15.

II.—FUEL, GAS, and LIGHT.

Applications.

1902.

46. F. Tigges. Incandescent gas light candle. Complete Specification. Jan. 1.

51. O. H. Bayldon and H. E. Morriss. Improvements in generators of gas from petroleum or paraffin oil and in means for consuming same for heating purposes. Complete Specification. Jan. 1.

153. T. G. Allen, jun. Improvements in Bunsen burners for acetylene gas. Jan. 2.

186. A. Waddell and F. Waddell. Improvements in the arrangements of gas producers and recuperative flues in gas retort and other settings. Jan. 3.

188. G. P. Werrett. Improvements in acetylene gas generators. Jan. 3.

204. J. W. Carswell and S. Trotter. Improvements in machines for drying peat fuel. Complete Specification. Jan. 3.

384. S. Pergeline. Manufacture of smokeless coal blocks. Complete Specification. Jan. 6.

454. J. F. Crease. Improvements in the manufacture of incandescence mantles. Complete Specification. Jan. 7.

484. P. Davies and The Hydroleum Company, Ltd. Improvements relating to the separation of undesirable matter from carburetted water-gas or analogous tars. Jan. 7.

586. W. L. Wise.—From The Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz, France. Improvements in the quenching or cooling of coke, and apparatus therefor. Jan. 8.

757. C. B. Burdon. Improvements in and relating to the separation of gases, chiefly for obtaining oxygen from the atmosphere, and in apparatus therefor. Jan. 10.

852. W. L. Wise.—From Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz, France. Improvements in or pertaining to the working of gas retorts. Jan. 10.

886. G. J. Rausch. Improved apparatus for the manufacture of acetylene gas. Jan. 13.

887. H. F. Müller. A new or improved acetylene generator. Jan. 13.

961. W. W. Lewis. Improvements in and connected with portable acetylene generators. Jan 14.

1040. W. Kennedy. Improvements in plant for manufacturing coke. Complete Specification. Jan. 14.

1049. T. Bradshaw-Jack. Improvements relating to apparatus for the production and storage of acetylene gas. Complete Specification. Jan. 14.

1080. W. Chettins. Improved method for burning the smoke of coal. Jan. 15.

1164. M. Paterson. Improvements in acetylene gas generators. Jan. 16.

1397. H. Marshall. Improvements in methods of and apparatus for carburetting air or gas. Jan. 18.

Complete Specifications Accepted.

1901.

241. J. A. Burgess. Process or method for treating and purifying acetylene gas. Jan. 15.

781. P. Naef. Production of gas in gas producers, and treatment and utilization in internal combustion engines. Jan. 15.

4915. T. Ranthmell. Apparatus for generating acetylene gas for household lighting, and other purposes. Jan. 15.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

1902.

58. R. B. Ransford. — From L. Cassella and Co., Germany. The manufacture of *p*-amidotolyl-*p*-oxyphenylamines and dyestuffs therefrom. Jan. 1.

357. R. Holliday and Sons, Ltd., J. Turner, H. Dean, and J. Turner. Production of a new intermediate compound, and a black dye therefrom. Jan. 6.

569. Vidal Dyes Syndicate, Ltd.—From H. R. Vidal, France. Improvements in and relating to the manufacture of dye. Complete Specification. Jan. 8.

573. Vidal Dyes Syndicate, Ltd.—From H. R. Vidal, France. Improvements relating to oxydising aromatic amines to obtain amidohydroxylated derivatives. Complete Specification. Jan. 8.

771. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of new blue dyestuffs. Jan. 10.

841. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of disazo dyestuffs for wool. Jan. 11.

Complete Specifications Accepted.

1901.

1644. T. R. Shillito.—From J. R. Geigy and Co., Switzerland. Sulphur dyestuffs. Jan. 15.

3239. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new colouring matter and derivatives thereof, and employment thereof in dyeing. Jan. 15.

4568. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a brown sulphurised dyestuff from 2 : 4-dinitro-para-oxydiphenylamine or 2 : 4-nitro-amido-oxydiphenylamine. Jan. 15.

5167. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of fast double-colour lakes. Jan. 15.

5654. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Manufacture of acid dyestuffs belonging to the diphenylnaphthylmethane series. Jan. 15.

6545. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters containing sulphur. Jan. 15.

25,100 G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Reduction of aromatic nitro-compounds to the corresponding amines. Jan. 15.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

1902.

25. J. H. Neave. Improvements in the manufacture of hats from fur, wool, and other fibres. Jan. 1.

28. R. C. Menzies. *See* Class XIX.

172. W. L. Wise.—From L. Weiss, Germany. Improvements in or relating to the printing of fabrics. Jan. 2.

453. A. H. Arzt. An improvement in waterproofing. Jan. 7.

734. G. Shackleton and A. Ayrton. Improvements in washing or cleansing wool. Jan. 10.

755. W. Smith. Improvements in or relating to the finishing of fabrics. Jan. 10.

922. A. W. Playne and L. W. Macdonald. Improvements in indigo vat dyeing. Jan. 13.

1172. T. Worth. A new or improved compound for use in the manufacture of linoleum and similar materials. Jan. 16.

1368. G. B. Sadler. Improvements in or connected with the kiers or vats used in the bleaching of textile fabrics. Jan. 18.

1406. J. C. Tyms. Improvement in bleaching keir with circulation valves. Complete Specification. Jan. 18.

1432. F. T. Woodley. Improvements in the manufacture and production of a filamentary cellulose material, and fabrics therefrom. Jan. 18.

Complete Specifications Accepted.

1901.

3592. C. F. Cross, E. J. Bevan, and C. Beadle. Treatment of viscose for the preparation of useful products therefrom. Jan. 15.

4280. J. C. Hamer. Apparatus for dyeing and otherwise treating fibrous material in a spun or other state. Jan. 8.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Application.

1902.

938. A. F. Dunn. Improvements in or connected with applying bronze and other powders to paper and like materials. Complete Specification. Jan. 13.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

1902.

232. W. P. Thompson.—From Solvay and Co., Belgium. Improvements in the manufacture of carbonate of soda and other crystalline salts. Jan. 3.

698. W. Ostwald. Improvements in the manufacture of nitric acid. Complete Specification. Jan. 9.

788. S. Dreyfus and The Clayton Aniline Company, Ltd. Improvements in and apparatus for use in the concentration of sulphuric acid or the like. Jan. 10.

1042. I. A. Peters. An improved alkaline material for use in the arts. Jan 14.

Complete Specifications Accepted.

1901.

524. J. W. Woodall and F. Windham. Carbide of calcium. Jan. 15.

516. T. G. Webb and Webb's Patents, Ltd. Apparatus for concentrating sulphuric acid and other liquids. Jan. 15.

2407. A. Germot and H. E. L. Fiévet. Process of and apparatus for treating metallic sulphides. Jan. 8.

4610. G. W. Johnson.—From The Firm of Verein Chemischer Fabriken, Germany. Manufacture or production of sulphuric anhydride. Jan. 15.

19,035. H. A. Frasch. Process of producing nickel salt. Jan. 15.

23,124. W. P. Thompson.—From Stassfurter Chemische Fabrik vormals Vorster und Grüneberg A. G., Germany. Production of anhydrous cyanide of sodium from an aqueous solution. Jan. 15.

23,125. W. P. Thompson.—From Stassfurter Chemische Fabrik vormals Vorster und Grüneberg A. G., Germany. Process for making briquettes of a mixture of cyanide of potassium and cyanide of sodium. Jan. 15.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

1902.

94. W. F. Allpress.—Partly communicated by P. O. Griffiths, High Seas. Improvements in bottles and in apparatus for the manufacture thereof. Jan. 1.

182. J. Maddock. Improved socketing thimble for placing earthenware and the like. Jan. 3.

308. C. A. Dunbar. Improvements in lecrs for annealing glass. Complete Specification. Jan. 4.

400. F. A. Walton and C. J. Noke. A novel combination of glass and pottery ware or other material. Jan. 7.

1369. F. Mountford. Novel automatic machinery or apparatus for decorating or glazing tiles and other similar articles of pottery-ware, glass, metal, and other substances. Jan. 18.

1429. A. J. Boult.—From F. C. R. Weber and A. B. Ranschenbach. An improved method of and apparatus for drying earthenware articles. Complete Specification. Jan. 18.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, and CEMENTS.

Applications.

1902.

383. N. Brooke and W. Glossop. Improvements in artificial stone and in the manufacture thereof. Complete Specification. Jan. 6.

386. A. Wolskel. Improvements in preparing asphalt. Complete Specification. Jan. 6.

1172. T. Worth. *See* Class V.

Complete Specifications Accepted.

1901.

4630. C. Hitchins. Asbestos linings for buildings and the like. Jan. 15.

24,923. G. C. F. Boivie. Manufacture of artificial stone. Jan. 15.

X.—METALLURGY.

Applications.

1902.

143. A. Reynolds. An improvement in metallurgical converters. Jan. 2.

144. A. Reynolds. A method for fusing and reducing ores. Jan. 2.

145. A. Reynolds. Improvements in metallurgical apparatus. Jan. 2.

228. G. P. Parrot and J. C. Ghest. Improvements relating to the treatment of pulverulent iron and other ores. Jan. 3.

234. H. H. Lake.—From A. Rabezz Ana, Italy. Improvements relating to kilns for the treatment of ores and the like. Jan. 3.

295. G. W. Johnson.—From The Chemische Fabrik Griesheim - Elektron, Germany. Improvements in the manufacture of the metals of the alkalis. Jan. 4.

306. J. E. Kohlmeyer and F. A. Edwardes. Improvements in and relating to the treatment of tailings or slimes resulting from ore stamping and similar operations. Jan. 4.

554. J. H. Dewhurst. Improvements in ladles for carrying and tipping blast furnace slag. Jan. 8.

898. T. Stapf. Improvements in and relating to blast furnaces. Complete Specification. Jan. 13.

1003. L. Lincoln, D. B. Lincoln, and C. S. Gooding. Improvements in the process of and apparatus for drawing off molten metal from cupolas, blast furnaces, and the like. Complete Specification. Jan. 14.

1076. J. Ward. Improvements in and relating to ingot moulds for casting steel ingots. Jan. 15.

1146. C. V. Potter. An improved solution to be used in and process for the separation of metals from sulphide ores. Complete Specification. Jan. 15.

1170. A. Patterson. Improved machinery for charging steel and like furnaces. Jan. 16.

13,862. W. Oswald. Manufacture of hearths with blast channels for metallurgical furnaces. Jan. 8.

18,230. H. H. Lake.—From W. R. Bennett, United States. Hardening and tempering of steel. Jan. 15.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

1902.

118. M. d'Audrimont. Improvements in or relating to anodes for electrolytic operations. Complete Specification. Jan. 2.

382. E. Friese. Improvements in galvanic cells. Complete Specification. Jan. 6.

418. B. J. Hall. Improvements in the construction and working of electric batteries. Jan. 7.

1139. H. W. Butler. Improvements in the manufacture and production of electric batteries of the kind known as dry batteries. Jan. 15.

1351. O. Spillern-Spitzer. An improved process for purifying and bleaching liquids, more specially saccharine liquids, by electric dialysis in conjunction with a halogen (chlorine). Jan. 17.

Complete Specifications Accepted.

1901.

2933. C. A. Wilde. Electrodes for secondary batteries or accumulators. Jan. 8.

5063. T. T. A. Hansen and C. C. F. F. Petersen. Accumulators for secondary batteries. Jan. 15.

23,215. V. Cheval and J. Lindeman. Electrical accumulators. Jan. 15.

24,627. L. M. G. Rosée d'Infreville. Electric batteries. Jan. 15.

XII.—FATS, OILS, AND SOAP.

Applications.

1902.

292. C. H. Steer. Improvements in manufacturing of soap. Jan. 4.

385. C. Fresenius. Improvement in the treatment of inferior oilseed cakes and other residues from the manufacture of vegetable oils, to render them suitable for use as cattle food. Jan. 6.

393. G. Sandberg. A method for obtaining an odourless product from train oil for use as a substitute for tallow. Complete Specification. Jan. 6.

979. J. F. Straup. Oil-cooling compound. Complete Specification. Jan. 14.

1291. J. Enoch and Rose, Downs, and Thompson, Ltd. Improvements in the method of and machinery or apparatus for extracting oil from seeds and the like, and for forming cakes from such or any suitable substance, for cattle feeding and like substances. Jan. 17.

1430. A. J. Boult.—From L. B. Lehmann, Germany. Improvements in or relating to apparatus for use in the manufacture or treatment of soap or other plastic composition. Complete Specification. Jan. 18.

Complete Specifications Accepted.

1901.

6622. H. Delarue. Saponification of fats. Jan 15.

24,821. W. P. Thompson.—From A. N. Nielsen, Newfoundland. Bleaching of whale and seal oil. Jan. 15.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, ETC.

Applications.

1902.

332. W. H. Willatt. Improvements in the apparatus for making carbon black. Jan. 6.

686. M. D. W. Vincent. An improved polish. Jan. 9.

1077. E. Bailey and A. Crowther. Improvements in a process and apparatus for the manufacture of white lead from pig lead by electro-chemical fusion. Jan. 15.

Complete Specifications Accepted.

1901.

50. C. O. Weber and A. Cairns. Compound india-rubber. Jan. 8.

4176. J. S. Rigby. Method for the manufacture of whiting, and apparatus therefor. Jan. 8.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

Applications.

1902.

676. W. F. Schroeder.—From F. W. Moore, United States. An improvement in the splitting of skins. Jan. 9.

1010. H. H. Lake.—From Turner Tanning Machinery Company, United States. Improvements relating to machines for use in treating hides, leather, skins, and the like. Complete Specification. Jan. 14.

1013. H. H. Lake.—From Turner Tanning Machinery Company, United States. Improvements relating to machines for use in treating hides, leather, skins, and the like. Complete Specification. Jan. 14.

1018. H. H. Lake.—From Turner Tanning Machinery Company, United States. Improvements relating to machines for use in treating hides, leather, skins, and the like. Complete Specification. Jan. 14.

1327. J. Paas and A. Jacobsen. A new or improved process of preserving leather. Jan. 17.

1424. A. C. Granville and R. G. J. Rawlinson. An improved method of cleaning, purifying, and removing the wool from imported sheepskins. Jan. 18.

Complete Specification Accepted.

1901.

2645. J. Pate. Sizing preparations. Jan. 15.

XV.—MANURES, ETC.

Application.

1902.

63. H. Schulte-Steinberg. Improvements relating to the manufacture of Thomas powder from Thomas slag. Jan. 1

XVI.—SUGAR, STARCH, AND GUM, ETC.

Application.

1902.

269. J. Nicholas. Improvements in the treatment of sugar cane sorghum and reeds of similar nature. Jan. 4.

Complete Specification Accepted.

1901.

4207. J. R. Hatmaker.—From J. A. Just, United States. Process for obtaining pure solutions of casein. Jan. 8.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

1902.

304. J. T. Norman. Improvements in maturing or purifying spirits. Jan. 4.

391. J. F. Duffy. A new or improved method for refining, ageing, mellowing, and purifying malt and spirituous wines and liquors. Complete Specification. Jan. 6.

392. J. F. Duffy. Improvements in apparatus for refining, ageing, mellowing, and purifying malt and spirituous wines and liquors. Complete Specification. Jan. 6.

792. E. S. Beaven. Improvements in the process and apparatus for filtering furnace gases in malt and other kilns. Jan. 10.

929. E. Caffyn. *See* Class I.

1341. R. C. Scott. Improvements in the manufacture of spirit. Jan. 17.

1342. R. C. Scott. Improvements in the purification of spirit. Jan. 17.

Complete Specifications Accepted.

1901.

997. F. Knüttel and The Berliner Actiengesellschaft für Eisengiesserei und Maschinenfabrikation. Process of curing raw malt. Jan. 15.

7724. W. Palethorpe. Spargers or sprinklers particularly for use in brewing. Jan. 15.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

1902.

458. F. A. Schouten and A. F. Spencer. An improved process for preserving milk, cream, and other liquids, and means and appliances therefor. Jan. 7.

504. J. Goodfellow and S. G. Ellis. An improved food extract. Jan. 7.

648. J. Sutter-Collin. Improvements in processes of preparing condensed milk. Complete Specification. Jan. 9.

1022. H. J. Bücka, C. Hansen, L. Nissen, and O. B. Wimmer. An improved process and apparatus for the production of a powdered milk preparation. Complete Specification. Jan. 14.

1328. R. Schultz. A new or improved method of preserving eggs. Jan. 17.

1366. F. W. Hampshire. A method of treating fruits and vegetables in combination with farina or the like cereal or farinaceous product to form an improved food preparation. Jan. 18.

B.—Sanitation; Water Purification.

81. S. H. Hodgkin and The Pulsometer Engineering Company, Ltd. Improvements in or relating to water purifying and softening apparatus. Jan. 1.

847. R. Orchard and S. Rideal. Improvements in and connected with the sterilisation and softening of water. Jan. 11.

1276. W. Watson. Improvements in apparatus for treating effluent and other impure waters and the residuum therefrom. Jan. 17.

Complete Specifications Accepted.

A.—Foods.

1901.

3489. A. Schleissner. Process for the preparation of a milk especially suitable for children. Jan. 15.

25,037. C. Ollendorff. Pasteurising apparatus. Jan. 15.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

1902.

28. R. C. Menzies. Improvements in bleaching paper pulp or like material. Jan. 1.

960. C. F. Cross, E. J. Bevan, H. Spence, and P. Spence and Sons, Ltd. Improvements in and connected with the manufacture and preparation of paper. Jan. 14.

1138. J. N. Goldsmith and The British Xylonite Company, Ltd. Improvements in and relating to the manufacture of xylonite. Jan. 15.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

1902.

286. J. Wetter.—From the firm of Rud. Rütgers, Germany. Process or processes for the manufacture of paracresol oxalic acid ester, and for the separation of paracresol from metacresol. Jan. 4.

1116. B. J. B. Mills.—From La Société Anonyme des Plaques et Papiers Photographiques A. Lumière et ses Fils, France. A mixture capable of giving off, by treatment with water, hydrosulphurous acid or hydrosulphites. Jan. 15.

XXI.—PHOTOGRAPHY.

Applications.

1902.

565. A. Schmalenberg. — From C. Ernst and Co., Aktiengesellschaft, Germany. Improvements relating to negatives for the photographic production of ornamental borders on sensitised surfaces. Jan. 8.

579. S. Vathis. Improvements in processes for the production of multicolour photographic prints. Complete Specification. Jan. 8.

1116. B. J. B. Mills.—From La Société Anonyme des Plaques et Papiers Photographiques A. Lumière et ses Fils, France. *See* Class XX.

1226. E. Ehlermann. An improvement in the production of grained photographic pictures. Jan. 16.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

1902.

839. W. P. Jones. A new or improved composition for the heads of matches and the like. Jan. 11.

984. J. E. Petavel and J. Bruce-Kingsmill. A recording pressure gauge for explosives. Jan. 14.

1074. A. Purgotti and L. Purgotti. A new process for manufacturing non-poisonous mixtures for matches of every description, ignitable on any surface. Complete Specification. Jan. 15.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

Complete Specification Accepted.

1901.

25,037. C. Ollendorff. *See* Class A.

PATENT UNCLASSIFIABLE.

Application.

1902.

1465. L. Wirtz. The manufacture of a chemical compound. Jan. 18.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 3870.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 3.—Vol. XXI. FEBRUARY 15, 1902. No. 3.—Vol. XXI.

Subscription of Members 25/- per annum; Entrance Fee 21/-; Election by the Council.

Price to Non-Members 36/- per annum; To Members 25/- per Set of extra or back numbers.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Robert Irvine.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

E. A. Brotherton.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.
C. Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Otto Hehner. | A. R. Ling.

MANCHESTER.
Dr. J. Grossmann. | J. Carter Bell.

NEWCASTLE.
W. L. Reynoldson. | F. C. Garrett.

NEW YORK.
Clifford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
Sir Robert Pullar. | Thos. Gray.

YORKSHIRE.
George Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.
L. Archbutt, I., XII., XVIII.B.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. A. Butterfield, M.A., II., III.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. .... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D. .. V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw .... VII., XI.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. .. IV., XX.
F. H. Leeds .. III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .. XXII.
W. G. McMillan X., XI., XIV., XXII.
W. Macnab ..... XXII.
N. H. J. Miller, Ph.D. .... XV.
C. A. Mitchell, B.A. ..... XII., XXII
G. T. Morgan, D.Sc. ... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
T. H. Pope ..... XX., XXI.
F. W. Renaut .... Patent List.
G. H. Robertson ..... XI.
Chas. Salter ..... I., II., III., XV., XVI.
R. Seadon ..... II.
J. Shields, D.Sc., Ph.D. .... XI.
A. Shonk ..... Gen. Chem,
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
A. L. Stern, D.Sc. ..... XVII.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. .. XVI.
E. W. Wheelwright, Ph.D. ..... XXII.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.
A. C. Wright, B.Sc., M.A. ... IV., XVIII., XX.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.
Committee:

Percy Bateson.
J. Campbell Brown.
A. Carey.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Herbert E. Davies.
D. Herman.
Julius Raschen.
F. H. Tate.
W. Collingwood Williams.

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

SESSION 1901—1902.

Wednesday, Feb. 26th, 1902:—
Dr. Jas. T. Conroy. "Catalysis and its Applications."

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.
Committee:

J. J. Bowley.
A. C. Chapman.
E. Divers.
H. Hemingway.
E. Grant Hooper.
D. Lloyd Howard.
W. Kellner.
J. Lewkowitsch.
B. E. R. Newlands.
Boverton Redwood.
Walter F. Reid.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

J. Barnes.
W. Brown.
J. Craven.
J. English.
B. W. Gerland.
W. Heys.
J. M. Irving.
M. J. Langdon.
A. K. Miller.
H. Porter.
I. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Reynoldson.
Vice-Chairman: N. H. Martin.
Committee:

A. Allhusen.
P. P. Bedson.
J. T. Dunn.
T. W. Hogg.
H. Louis.
F. S. Newall.
H. S. Pattinson.
John Pattinson.
W. W. Procter.
G. Sisson.
Harry Smith.
J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.
Committee:

H. C. Aspinwall.
M. T. Bogert.
C. F. Chandler.
A. P. Halloek.
J. Hartford.
E. J. Lederle.
E. G. Love.
R. W. Moore.
T. J. Parker.
R. C. Schüpphaus.
M. Toch.
G. N. Williamson.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.
Committee:

S. F. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
J. J. Sudborough.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

SESSION 1901—1902.

Wednesday, Feb. 26th (not Feb. 27th as stated), 1902:—
Mr. Wilton P. Rix. "Preparation and Behaviour of Insoluble Frits for Pottery Glazes."

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.
Committee:

W. Carrick Anderson.
E. M. Bailey.
G. T. Beilby.
H. Bumby.
J. Christie.
W. J. Chrystal.
D. B. Dott.
C. J. Ellis.
W. Foulis.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
W. Ivison Macadam.
J. McCulloch.
T. L. Patterson.
D. J. Playfair.

Hon. Secretary and Treasurer:
Thomas Gray, c/o John T. Tannahill, 44, West George Street, Glasgow.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Fairley.
Committee:

E. A. Brotherton.
A. W. Cooke.
W. M. Gardner.
H. Grandage.
Edw. Halliwell.
A. J. Murphy.
S. G. Rawson.
A. Smithells.
A. Turnbull.
H. A. Watson.
Thorp Whitaker.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

Notices.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French as well as British patents. American Patents will appear in the next number.

INDEX, 1901, AND LIST OF MEMBERS.

The Index and Title Page for 1901, and the List of Members, will be issued with the number of the Journal for Feb. 28th.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections:—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
.....
And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
Signature of Candidate.....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....
Profession or Business Occupation .....
Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Addison, Dr. Wm. L. T.; Journals to 513, Markham Street, Toronto, Canada.

Appleyard, G. H., l/o Wilmington Oil Mills; c/o British Oil and Cake Mills, Ltd., 151, Cleveland Street, Hull.

Beaver, C. J., l/o Marsland Road; Somerleyton, Sherwood Avenue, Sale, Cheshire.

Bermingham, Jno., jun., l/o San Francisco; California Powder Works, Pinole, Contra Costa Co., Cal., U.S.A.

Birley, R. K.; all communications to c/o Messrs. Chas. Macintosh and Co., Ltd., Cambridge Street, Manchester.

Bottomley, Dr. J. Frank, l/o Glasgow; 21, Wentworth Place, Newcastle-on-Tyne.

Campbell, Jas. E., l/o Manchester; 3, View Street, Worcester, Mass., U.S.A.

Cannon, J. C.; all communications to 12, Western Road Shoreham, Sussex.

Clayton, H., l/o Chorley; 51, Smallbrook Lane, Westleigh, Lancs.

Colquhoun, L., l/o Perranporth; c/o South African Explosives Co., Modderfontein, Transvaal Colony.

Crowther, H. W., l/o Beeches Road; The Beeches, West Bromwich.

Dawson, Geo.; Journals to Holm Lea, Gorton Road, Reddish, Stockport.

Dick, Jno.; Journals to c/o Dick, Ridout, and Co., 77, York Street, Toronto, Canada.

Dowson, J. E., l/o Old Queen Street; 39, Victoria Street Westminster, S.W.

Ducas, B. P., l/o Conties Slip; 151, Front Street, New York City, U.S.A.

Duckham, A.; all communications to Phœnix Wharf, West Ferry Road, Millwall, E.

Fade, L., l/o Perth Amboy; c/o Deutsche Gold und Silber Scheide Anstalt, Frankfurt a/M., Germany.

Farrell, F., l/o Deodar Road; 89, Albert Bridge Road, London, S.W.

Gibbs, W. P.; l/o Canada; retain Journals until further notice.

Gray, Dr. Thomas; all communications to 204, George Street, Glasgow.

Greenhalgh, J. Herbert; Whitebirk (*not* Whitekirk), Green Mount, near Bury.

Günther, C. E.; all communications c/o Liebig's Extract of Meat Co., Ltd., 9, Fenchurch Avenue, London, E.C.

Haines, R.; all communications to Haines Street, near Chew Street, Germantown, Philadelphia, Pa., U.S.A.

Hanna, C. E., l/o St. James' Street; P.O. Box 2303, Montreal, Canada.

Hartzell, H. S., l/o N. 8th Street; 126, North 4th Street, Allentown, Pa., U.S.A.

Hefford, Geo. W.; Journals to County Technical Schools, Stafford.

Henshaw, S.; Journals to Chatterley, Tunstall, Staff.

Herrick, R. F., l/o 22; 16, Herrick Street, Winchester, Mass., U.S.A.

Hiby, Dr. W.; Journals to c/o Otto Hilgenstock Coke Oven Co., Ltd., 109, Victoria Street, London, S.W.

Hopkins, Herbert W.; Journals to c/o Waihi G.M. Co., Waihi, Paeroa, N.Z.

Just, Jno. A.; Journals to 116, East Castle Street, Syracuse, N.Y., U.S.A.

Keys, W. H., l/o Hall End Chemical Works; Lyndou House, West Bromwich.

Labonde, Dr. L.; all communications to P.O. Box 594, Rochester, N.Y., U.S.A.

Lant, H.; all communications to Ivy Bank, Wath-on-Dearne, Yorks.

Levett, W.; Journals to Mines Safety Explosives Co., Stanford-le-Hope, Essex.

Mansbridge, Wm., l/o Colgate; 133, Park Grove, Hull.

Morgan, T. M.; Journals to Longue Pointe, near Montreal, Canada.

Olden, Chas., l/o Birmingham; Hunstanton, Norfolk.

Orsman, W. J., l/o Roburite Explosives Co.; Chemical Laboratory, Gatburst, near Wigan.

Pittuck, F. W.; all communications to 15, Stratford Grove, Heaton, Newcastle-on-Tyne.

Pope, T. H.; Journals to 59, Gillott Road, Edgbaston, Birmingham.

Preston, A., l/o Park Hill View; 29, Southfields, Manchester Road, Bury, Lancs.

Rothberg, Dr. M. E., l/o Johnstown; Lebanon, Pa., U.S.A.

Scholefield, H. E., l/o Wavertree; Edge Hill Chemical Works, Liverpool.

Sevin, Chas.; communications to 68, Central Hill, Upper Norwood, S.E.; Journals as before.

Smith, J. Cruickshank; all communications to 20, Felday Road, Lewisham, S.E.

Smith, Walter E., l/o Jenkins Street; 158, Doyle Avenue, Providence, R.I., U.S.A.

Spence, Jno. W., l/o Glasgow; Tiviot Colour Works, Manchester Road, Stockport.

Spencer, H. R. S.; Journals to Spring Side, Sharples, Bolton, Lancs.

Stoker, G. N.; all communications to 9, Lessar Avenue, Clapham Common, S.W.

Swanson, Jas. F.; all communications to c/o Mr. R. Glover, 13, Belville Street, Greenock, N.B.

Swinburne, Geo., l/o Collins Street; (Journals) 99, Queen Street, Melbourne, Vic., Australia; and c/o C. R. Lee and Co., 5, Laurence Pountney Hill, London, E.C.

Tatlock, R. R.; all communications to Novara, Stirling, N.B.

Taylor, M., l/o Palmerston Road; The Clough, Buckhurst Hill, Essex.

Thiel, Dr. A. Walther; communications to 125, Eccles Old Road, Pendleton; Journals as before.

Thomson, T.; communications to Westlea, Barrhead, near Glasgow; Journals as before.

Waldsteiu, Dr. M. E., l/o Trinity Place; 107, Murray Street, New York City, U.S.A.

Watson, Eric E.; (Journals) c/o The Queensland Smelting Co., Aldershot, Maryborough, Queensland, Australia; and c/o S. Watson, Queen Insurance Buildings, Dale Street, Liverpool.

Wigglesworth, Ily.; l/o Liberty Street; 25, Broad Street, New York City, U.S.A.

Wilkins, W. G.; Journals to c/o Derby Chemical Colour Co., 47, Bridge Street, Derby.

Death.

Martindale, Wm., 19, Devonshire Street, Portland Place, W. Feb. 2.

Yorkshire Section.

Meeting held on January 27th, 1902.

MR. G. WARD IN THE CHAIR.

THE FASTNESS TO LIGHT OF LEATHERS DYED WITH COAL TAR COLOURS.

BY M. CHAS. LAMB.

Partly on request, partly of long outstanding purpose, I lately took up the subject of the fastness to light of leathers dyed with coal tar colours.

By the kind permission of the Royal Botanic Society of London, the use of a glass-house was obtained at the Society's Gardens in Regent's Park, London, and in this glass-house some 1,500 small pieces of Sumach-tanned leather dyed with coal tar dyestuffs (each piece with its own special dyestuff), as supplied by the principal German, Swiss, French, and English manufacturers, were arranged on boards placed horizontally, half of each pattern piece being carefully protected from the light, whilst the other halves of the pieces were fully exposed to it. To obtain a standard by which to judge the fading of the colours, six much larger pieces of leather were dyed in colours (A, B, C, D, E, F, say) known to be not very fast to light, and six sample pieces cut from these, one from each, were exposed along with the 1,500. At the end of nine days of bright sunlight, it was found that the colour of the sample cut, say from the D piece, had just faded.

The 1,500 pieces were then examined, and all those noted that had faded in this first "period."

A second sample from the D piece was exposed with the 1,500. The "period" of fading of the second sample was a month, the conditions of weather not being so favourable for bright sunlight. Note was then made of the colours among the 1,500 pieces that had faded up to the end of the second "period." Before the investigations came to an end, ten "periods," extending over 13 months, were completed. At the end of that time all the colours had gone.

Along with the dyed pieces of leather, samples from the same skins, undyed, were also exposed, that the effect of light upon the colour of the leather, as tanned only, might be ascertained. At the end of the full interval of 13 months the colour had perceptibly darkened. In judging of the fading of the dyed pieces allowance was made for this darkening.

In dyeing leather with the acid colours, sulphuric acid was added to the dye-bath. For dyeing with the basic colours, the excess of tannic acid in the leather was fixed in an insoluble form by treatment of the leather, previous to dyeing, with a bath of tartar emetic and salt.

Many changes of colour occurred. In periods two and three, particularly, many Blues, such as Turquoise Blue, New Patent Blue, &c., changed to Violets and Greens. Some Greens, such as Fast Acid Green, Solid Green, Emerald Green, &c., changed to Slates. Other Greens, such as Malachite Green, changed to Violets, and a few Violets to Maroons.

Changes were also noticeable in Browns. In the case of many brown leathers—the dyestuffs used being evidently mixtures of reddish brown and yellow to which had been added for toning down a small proportion of green, blue, or violet—the colour after exposure became green, blue, or violet; became, that is, the colour used for toning down; also many mixed Blacks changed to reddish Violets, bluish Violets, Maroons, &c.

Period 1.

July 14th to July 23rd, 1900. *Number of days inclusive*, 9.

Curcumein S.	Erythrosine.
Eosine O O.	Methyl Eosine.
Eosine Y S.	Naphthol Green B.
Eosine B S.	Phloxine B T.
Eosine A.	Phloxine N.

PERIOD 2.

July 14th to August 14th. Number of days inclusive, 31.

Acid Violet 6 B.
Acid Violet R S.
Acid Violet 2 B.
Brilliant Green.
Benzoflavine.
China Green.
Chrysoidine R E.
Chrysoidine A G.
Chrysoidine O.
Chrysoidine J.
Citronine A.
Emerald Green.
Fast Acid Green B N.
Fast Green ext.
Imperial Green G 1.
Imperial Green G 2.
Imperial Green G 3.
Malachite Green.
Naphthol Yellow S.
Methyl Violet 2.
Orange 4.
Rose Bengal.
Russian Green B B.
Rheonine N.
Russian Green G.
Russian Green Y.
Russian Red G.
Russian Red 2 G.
Russian Red R.
Solid Green B.
Solid Green cryst.
Solid Green cryst O.
Turquoise Blue B B.
Turquoise Blue G.
Titan Brown R.
Ultramarine Blue.
Vesuvine.
Vesuvine B.

PERIOD 3.

July 14th to September 21st. Number of days inclusive, 69.

Alkali Blue 6 R.
Alkali Blue 6 B.
Acid Green 3 B.
Acid Yellow.
Auramine 2.
Auramine O.
Auramine G.
Acridine Scarlet 3 R.
Acridine Scarlet R.
Archil Subst. N.
Bismarck Brown G G.
Bismarck Brown N Y Y.
Bismarck Brown F.
Bismarck Brown M.
Bismarck Brown P S.
Bismarck Brown F W.
Bismarck Brown R.
Bismarck Brown O.
Bordeaux B.
Chrysoidine G.
Chrysoidine R.
Chrysoidine Y.
Chrysoidine Y Y.
Chrysoidine cryst.
Crumpsall Yellow R F P.
Crumpsall Yellow Y Y P.
Cotton Blue R.
Corvoline G.
Cerise A.
Cannella P W.
Cannella L.
Cannella O F.
Cannella N W.
Cannella Y.
Cannella P.
Diamond Blue 3 R.
Diamond Green B.
Ethyl Green.
Eboli Green G.
Fast Acid Blue B.
Fast Acid Violet 4 B.
Formyl Violet S 4 B.
Fast Acid Magenta B.
Lavilliere 2.
Lavilliere 1.
Lazuline Blue R.
Light Green N.
Methyl Green.
Naphthol Yellow.
Neptune Green S.
Phosphine 3 R B.
Phosphine B. ext.
Phosphine 3.
Phosphine 4.
Phosphine 2.
Phosphine 1.
Phosphine N.
Phosphine 3 R.
Phosphine N A.
Phosphine G A.
Philadelphia Yellow G.
Philadelphia Yellow O R.
Philadelphia Brown.
Turmeric Yellow.
Thioflavine T.
Vesuvine cone.

PERIOD 4.

July 14th to November 15th. Number of days inclusive, 124.

Aniline Yellow 2.
Acid Brown R.
Acid Brown B.
Acridine Red B.
Acridine Red 3 B.
Acridine Red 2 B.
Acid Violet 3 B N.
Acid Violet B N.
Acid Violet F S.
Acid Green ext.
Acid Green B B ext.
Acid Green G G ext.
Acid Green 225.
Acid Green O.
Acid Green cone.
Acid Blue Green shade.
Azo Acid Violet R ext.
Azo Acid Violet B.
Atlas Scarlet 1.
Azo Cochineal.
Bordeaux extra.
Bordeaux Y.
Bismarck Brown Y.
Bismarck Brown Y ext.
Bismarck Brown 30 R.
Bismarck Brown 2 B.
Bismarck Brown Y S.
Chrysoidine ext.

PERIOD 4—*continued.*

Cuba Yellow.
Corvoline B.
Chrysophenine G.
Cyanole ext.
Cerise D 2.
Cerise N.
Cresyl Fast Blue 2 B.
Cardinal 4 B.
Crimson N.
Carnation M.
Dahlia.
Diamond Magenta.
Eboli Green B.
Fast Brown 3 B.
Fast Navy Blue B M.
Fast Navy Blue A.
Golden Yellow.
Guinea Green B.
Guinea Green G.
Grenadine G.
Indian Yellow T.
Indian Yellow G.
Indigo Blue L.
Indigo Blue N.
Magenta W B.
Magenta R F.
Magenta W B G.
Methyl Blue.
Methyl Green Y S.
Methyl Violet 4 R.
Methyl Violet C.
Methyl Violet 6 B.
Methyl Violet 3 R.
Methyl Violet R.
Methyl Violet 3 B.
Methyl Violet B ext.
Methyl Violet 2 R.
Methyl Violet B B.
Methyl Violet B O.
Maroon.
Magenta Scarlet B.
Magenta Scarlet G.
Marine Blue.
New Golden Brown A 1.
New Patent Blue G A.
Naphthol Blue G.
New Victoria Black G.
New Blue B.
Neutral Violet.
New Magenta O.
New Metamine Blue.
Naphthylamine Black R.
Nanking.
Naphthol Blue Black N.
Orange G G.
Phosphine E.
Phosphine E E.
Phosphine L.
Phosphine G.
Phosphine R.
Phosphine W A.
Phosphine 2 A.
Patent Phosphine G G.
Pure Blue cryst.
Philadelphia Black B.
Pyronine G.
Russian Red R.
Russian Red G G.
Russian Red B.
Russian Red G R.
Resorcin Yellow.
Rosaniline cryst.
Rubin.
Scarlet G.
Scarlet R.
Solid Green C E.
Solid Yellow B.
Soluble Blue G S.
Soluble Blue R.
Soluble Blue B.
Violet cryst O.
Xanthine cryst G.
Xanthine 3 G O.

PERIOD 5.

July 14th to January 20th. Number of days inclusive, 190.

Acid Brown L.
Azo Flavine 7,032.
Azo Yellow 3 R.
Azo Yellow R.
Azo Acid Brown.
Acid Phosphine J O.
Azo Phosphine.
Auramine cone.
Acridine Orange No.
Anthracene Acid Brown G.
Acid Maroon.
Acid Brown R R.
Acid Brown D.
Acid Brown Y.
Acid Green 4 B.
Azo Rubine S.
Azo Fuchsin G W ext.
Acid Violet R.
Azo Crimson L.
Atlas Orange Y S.
Atlas Orange R S.
Atlas Scarlet 3.
Amaranth.
Bronze Acid Brown.
Bismarck Acid Brown.
Brill Scarlet 4 R B.
Brill Scarlet Y Y.
Brill Scarlet Y.
Brill Scarlet B.
Carmosine Orange A.
Capri Green 2 G.
Capri Blue G O.
Cardinal 1.
Cardinal 3 B.
Croceine Scarlet B.
Croceine Scarlet R.
Croceine Scarlet R R.
Cotton Blue O O.
Double Ponceau 2 R.
Double Ponceau 4 R.
Eclipse Blue.
Erioglancine.
Fast Brown G.
Fast Brown N.
Fast Violet B S.
Fast Red A.
Fast Navy Blue R M.
Fast Red ext.
Golden Brown Y.
Homophosphine G.
Golden Orange.
Fast Red P R ext.
Fast Blue E 1.
Fast Blue O.
Fram Blue G.
Induline B.
Mandarin G ext.
Methyl Blue.
New Phosphine.
Naphthylamine Brown.
Naphthol Brown.

PERIOD 5—*continued.*

Nigrosine W.	Pure Blue P.
Nigrosine G O.	Patent Phosphine 3 R.
Nigrosine R.	Ponceau 4 G B.
Naphthylamine Black 4 B.	Ponceau 3 R ext.
Naphthylamine Black 6 B.	Ponceau 2 R.
New Blue R.	Ponceau Y.
Orange S.	Phosphine Yellow R.
Orange 2.	Rhodamine 6 B N.
Orange 2 B.	Scarlet B.
Orange P.	Scarlet Y.
Orange G.	Saframine G ext.
Orange G T.	Scarlet 3 R.
Orange N.	Scarlet B B.
Orange ext.	Scarlet G 1.
Orange ext. conc.	Safranine ext.
Orange A.	Solid Blue G.
	Victoria Black G.
	Water Blue 3 B.

PERIOD 6.

July 14th to April 12th. *Number of days inclusive*, 272.

Azo Bordeaux.	Milling Red R.
Acid Violet 3 B A.	Nigrosine L T.
Azo Fuchsin B.	Nigrosine J B.
Acid Green 5,677.	New Phosphine Pure.
Atlas Scarlet 6.	New Patent Blue 4 B.
Bordeaux 3 B.	New Claret L.
Burmese Red.	Ponceau 10 R B.
Brill Croceine M O O.	Ponceau 4 R.
Curcumein extra.	Ponceau B O.
Croceine Scarlet B.	Ponceau 4 R B.
Croceine Scarlet 6 R.	Ponceau 6 R B.
Cochineal Scarlet P S.	Safranine A G ext.
Dark Nut Brown.	Safranine 2.
Fast Red K G.	Scarlet 4 R.
Fast Red 21,528.	Solid Brown O.
Induline A.	Sloeline B S.
Induline L.	Victoria Black.
Methylene Blue B.	Wool Ponceau 1 R.

PERIOD 7.

July 14th to May 4th. *Number of days inclusive*, 294.

Azo Yellow P S.	Methylene Blue 2 R.
Azo Flavine.	Orseillien.
Acid Magenta O.	Phenol Black S S.
Azo Bordeaux.	Phosphine Subst.
Archil Red A.	Quinoline Yellow.
Azo Crimson S.	Turmeric Subst.
Bordeaux B. ext.	Tartrazine.
Bordeaux B L.	Solid Yellow G.
Brill Croceine 3 B.	Resorcin Brown.
Croceine Scarlet 8 B.	Rhodamine B.
Croceine Scarlet 7 B.	Solid Blue R.
Claret Red B.	Safranine 1 ext.
Cotton Blue 2.	Safranine T.
Cuba Yellow.	Safranine Scarlet B.
Croceine A Z.	Scarlet E C.
Fast Milling Red B.	Victoria Black B.
Flavindnline 2.	Water Blue R.
Fast Scarlet B.	Water Blue 3 R.
Induline N W.	Water Blue B T R.
Indian Yellow R.	Water Blue P P.
Methylene Blue B B.	Water Blue B B.
Methylene Red G.	

PERIOD 8.

July 14th to June 1st. *Number of days inclusive*, 322.

Azo Fuchsin S.	Cotton Blue B B.
Azo Acid Magenta B.	Cotton Blue L.
Acid Brown V.	Cresyl Blue 2 B S.
Bavarian Blue D B.	Chromotrope 2 R.
Bordeaux S.	Fast Blue R.
Brill Safranine G.	Fast Red S.
Brill Safranine O.	Induline R.
Brill Rhoduline Red.	Imperial Scarlet.
Chromotrope 6 B.	New Methylene Blue N.

PERIOD 8—*continued.*

New Methlyene Blue G G.	Swiss Blue R.
New Methylene Blue B B.	Scarlet B ext.
Nigrosine B.	Victoria Black Blue.
Ponceau O R B.	Violamine R.
Rhodamine B ext.	Water Blue 4 B.

PERIODS 9 AND 10.

June 14th, 1900, to August 15th, 1901. *Number of days inclusive*, 397.

Violamine.	Fast Blue 5 B.
Nigrosine W G.	Acid Violet 4 R.

It will be noticed by those interested in wool dyeing, that many of the aniline colouring matters which are fairly fast upon wool, as shown by Professor Hummel, in his reports to the British Association, are not necessarily fast upon leather. Upon wool, the basic colouring matters as a class are fugitive; upon leather, these colours as a class are not so fugitive.

The author has now in hand and is progressing with a still larger research. The object of it is to ascertain whether leathers dyed with dyestuffs mixed together to produce commercial shades of colour are affected by light in the same manner as when dyed with the single dyes as placed on the market; also to ascertain what effect, if any, is caused by the substitution for sulphuric acid of acetic and lactic acids, sodium and potassium bisulphate, alum, &c.; also to ascertain what effect various finishes have upon the fading.

DISCUSSION.

Mr. GATE asked whether the purity of the tanning materials used was likely to alter the durability of the dye, and also whether diamond black, a very fast dye on wool, was suitable for leather.

Mr. SEIDLER stated that experiments which had hitherto been made on leather with diamond black had been unsuccessful.

Mr. HUNT asked if the different temperatures at which leather was dyed as compared with wool would be likely to influence the fastness of the resultant colour to light.

Prof. PROCTER, in reply to the last question, was not of opinion that the difference of temperature would have much effect.

THE ANALYSIS OF SOME NEW TANNING MATERIALS.

BY F. AUSTYN BLOCKEY.

THESE analyses are not the outcome of a special research, but are merely a collection of analyses made in the Leather Industries Laboratory of the Yorkshire College during the past few months.

All the analyses have been made by the standard method of the International Association of Leather Trades Chemists.* The solid materials—barks, pods, &c.—have been extracted in the Procter tanning extractor, and the non-tannin determinations carried out by the hide-filter method.

Australian Tanning Materials. (*Mostly Wattle Barks.*)

The term wattle is applied in Australia to various species of acacia, with which the country may be said to abound, something like 350 being known, while New South Wales alone contains over 100 different species. The barks of all wattles are more or less astringent, though many of them are quite worthless from the tanner's point of view, because they either contain but little tannin, or are too dark-coloured.

Wattles will grow on the poorest soil, and land may be utilised for their growth when it can scarcely be put under other cultivation, and where not even grass grows. At the

* Journ. Soc. Chem. Ind., 1898, p. 6.

same time bark grown on richer soil is stronger in tannin. Sandy soil is the best, especially where it lies over a clay subsoil, while trees grown on limestone soils are distinctly inferior in tanning properties. Where sandy soil is available it is simply necessary to break up the surface by harrowing previous to sowing the seeds. These should be sown in May after having been soaked for some hours in nearly boiling water. The seeds are sown about one foot apart, and after being allowed to grow to a reasonable height the young trees are thinned so as to be from 6 to 10 feet apart. When the trees have attained a height of 3 to 4 feet the lower branches are pruned off, and every effort made to keep the stem straight to facilitate the stripping and help the yield of bark.

Almost the only published analyses of Australian wattle barks were made by Mr. J. H Maiden, F.L.S., then Curator of the Technological Museum, Sydney, but these were made by the Löwenthal method, which has now been practically superseded by the hide-powder filter method, and I thought it desirable to repeat analyses of the more important species by the hide-powder filter method (which gives results only roughly comparable with the former) upon a very comprehensive set of samples furnished by Mr. Maiden to the Yorkshire College.

Analysis of Australian Tanning Materials.

Botanical Name.	Local Name.	From	Tanning Matters.	Non-tanning Matters.	Insoluble.	Water.
Acacia pycnantha.....	Golden wattle, "No. 1, special."	South Australia.....	49·5	9·4	29·9	11·2
„ „	Golden wattle, "No. 2, ordinary."	„ „	40·2	9·0	39·6	11·2
Acacia decurrens sur ; normalis.	Sydney green wattle.....	St. Mary's, N.S.W.	41·4	7·9	39·2	11·5
Acacia decurrens var; leichhardtii.	Green wattle.....	Bateman's Bay, N.S.W..	38·5	9·1	41·4	11·0
Acacia decurrens var; pauci glandulosa.	„ „	„ „ „ ..	36·1	7·8	44·5	11·6
Acacia decurrens, var. mollis..	Black wattle.....	.....	38·3	4·4	46·2	11·1
„ penninervis.....	Hickory bark.....	Bateman's Bay.....	37·7	5·2	46·1	11·0
„ binervata.....	Black wattle.....	Cambervarra.....	30·2	6·7	52·0	11·1
„ dealbata.....	Silver wattle.....	N.S.W.	12·2	4·3	71·9	11·6
Eugenia Smithii.....	Lilly pilly	„	10·7	16·1	62·2	11·0

Acacia pycnantha, "broad-leaved wattle," "golden, black, or green wattle," called by the aboriginals of Victoria "witch," probably contains more tannin than any other known bark. The sample marked "No. 1 special," from Mr. Maiden, contained nearly 50 per cent of tanning matter, and produced leather of a superior colour to most of the Australian wattles. South Australia has practically a monopoly of this tree, which grows from 20 to 25 feet high.

Acacia decurrens, "black wattle," "green or feathery wattle," "Sydney green wattle," known by the aboriginals of New South Wales as "wat-tah"; contains a large amount of tanning matter, varying in the three samples analysed from 36 to 41 per cent. It is used considerably in the tanneries of Australia, and as it will grow on the poorest soil, every encouragement should be given to its cultivation. The species occurs mostly near the coast and on mountains in Victoria, New South Wales, and Southern Queensland.

Acacia dealbata, "silver wattle," is said to contain 25 per cent. of tannin in the best samples, though the particular specimen received from Mr. Maiden only contained 12·2 per cent. The material evidently varies considerably, as Mr. Maiden quotes analyses varying from 17 to 25 per cent. (analysed by the Löwenthal method, and calculated to bark dried at 100° C.).

Acacia binervata, "black wattle" or "hickory," grows as a coast species in New South Wales and Queensland; though not so strong as *A. decurrens* or *pycnantha*, is still a valuable bark, and is used largely by tanners.

Acacia penninervis, "hickory" or "mountain hickory," seems a valuable material, and apparently has not received the attention it deserves, as the Australian tanners did not consider a wattle bark at all! It grows in New South Wales, Victoria, Queensland, and Tasmania; in the two former as a mountain or highland species.

As will be seen from the card which I now pass round for inspection, containing samples of leather tanned in most of the wattle barks included in the table of analyses, compared with similar samples tanned in oak-bark and valonia, two of the principal tanning materials employed for heavy leathers in England, all the wattle barks have a decidedly red colour. This fact precludes their use to more than a limited extent in England, in spite of the fact that they are so very much stronger than English tanning materials. Wattle bark is largely employed in Australia for tanning Australian sides and hasils, both of which are largely exported to England. The bark is also exported to England to some extent, and is employed by the English tanners for mixing with oak-bark and valonia for the production of the heavier classes of leather.

Several species of wattle, and especially *A. mollissima*, have been naturalised in South Africa and Natal, and yield an important supply of bark. African wattles, however, are usually somewhat weaker than Australian, containing usually about 30 per cent. of tanning matter, and sometimes up to 35 per cent., though Mr. M. C. Lamb has recently communicated to the author an analysis of a South African wattle which contained 47 per cent. of tanning matter.

Australian Eucalyptus Kinos.

Scientific Name.	Local Name.	From	Tanning Matter.	Non-tanning Matter.	Insoluble.	Water.
Eucalyptus siderophloria	"Iron bark" kino	Cambevarra, N.S.W.	73·2	4·0	6·4	16·4
„ amygdalina.....	"Ribbon gum" kino	N.S.W.	64·8	7·2	10·9	17·1
„ pipenta	Kino	„	31·5	5·6	46·0	16·9
„ corymbosa.....	"Bloodwood" kino	„	30·3	2·7	54·3	12·7
„ punctata	"Grey gum" kino	„	38·3	5·0	42·9	13·8
„ stillata	Kino	„	31·6	9·4	42·9	16·1

Only two of the Australian kinos analysed ("Iron bark" and "Ribbon gum") appear to contain tannin in appreciable quantity, the rest containing a large proportion of woody fibre and other insoluble matter. The Australian kinos are usually obtained by woodcutters, being found in a viscid state in cavities of the wood, and soon becoming hard and

brittle on exposure to air and sun. Minor quantities are also obtained by incising the bark of living trees, and evaporating to dryness the treacly fluid which thus flows out. Other species of kinos are the "red," "white," or "flooded" gum from *Eucalyptus rostrata*, which contain tannin in appreciable quantities. The above species of kinos are imported from Australia, but there are no statistics to show in what quantities.

Indian Tanning Materials.

A number of analyses of Indian tanning materials and solid extracts sent for examination by the Indian Section of the Imperial Institute have been made. Several of these samples appear to contain tannin only in small quantities, and are consequently unsuitable for tanning purposes.

A sample of pods from Burmah, however, *Cæsalpinia digyna* ("teri" and "tari" pods) seem likely to prove a valuable tanning material, and may be able to take the place of turwar bark (*cassia auriculata*), which has been strongly condemned by the Committee of the Society of Arts on Bookbinding Leathers, from the tendency of leathers tanned with it to darken and rapidly decay. Leather tanned with *C. digyna* compares very well with that tanned with *C. coriaria* ("divi-divi"), and in favourable cases the colour is almost white. A sample of ground tanning material analysed by the author, and believed to be identical with *C. digyna* contained 55 per cent. of tanning matter, and produced a leather equal in colour to that tanned in the best sumach. If it prove free from the tendency of divi-divi liquors to undergo injurious fermentation, during which a deep red colour is developed, it will no doubt prove a valuable addition to our tanning materials.

The pods differ considerably in appearance from divi-divi, having hard walls, and usually containing two round seeds. These seeds contain little or no tannin, but about 25 per cent. of a light-coloured oil. In Burmah, the pods are roasted and eaten, principally by the younger portion of the population, and if too much be partaken of at once, produce an intoxicating effect. The pods are also used as a drug. The plant itself grows to about 10 ft. high, and is a spreading bush. The flowers appear during the rainy season, and the pods ripen about February or March. The material occurs in Prome, Toungoo, Bassin, Mynang, and other parts of India and Burmah, and it is stated can be obtained in large quantities.

One sample from Assam, analysed by Prof. Dunstan, Director of the Scientific Department of the Imperial Institute, contained 60 per cent. of tannin after removing the nuts, and drying the cases at 100° C.

Another material of considerable strength is a species of gall growing on *pistacia vera*, called "Gool-i-pista," which contain 30 per cent. of tanning matter, and produce a leather almost equal in colour to the best sumach. If it could be obtained in commercial quantities, it would no doubt prove a very valuable tanning material.

The bark of a sample of *Terminalia oliveri* from Mandalay contained 31 per cent. of tanning matter, but produced a leather of somewhat yellow colour. The leaves from the same tree (Thaun leaves) contain only 14 per cent. of tannin, and are used for making a cutch substitute, which is nearly or quite equal to true cutch from *Acacia catechu*, both in dyeing and tanning properties, the particular sample examined containing 61·8 per cent. of tannin.

The belleric myrobalans or "bedda nuts" from *Terminalia bellerica* are slightly downy, and larger than ordinary myrobalans, but the sample examined only contained 8 per cent. of tannin, while the latter frequently yield 35 per cent. A sample of solid extract prepared from the bark of this tree sent by the Imperial Institute, contained as much tannin as many of the best samples of cutch from *acacia catechu*, and may no doubt prove a valuable material.

Cercops candolleana, the "Tengah" bark of the East Indies, a tree closely allied to the mangroves, contains 18 per cent. of tanning matter, and yields an extract which is said to be equal to cutch for dyeing, though it is probably inferior for tanning, purposes.

The tanning contents of the bark of *Rhizophora mucronata* (a species of mangrove) seem to vary considerably; David Hooper, Indian Museum, Calcutta, analysed a sample which contained 26·9 per cent. of tannin, Dr. Koerner (Deutsche Gerbersehule, Freiberg) analysed two samples, one containing 48 per cent., and the other 21 per cent. of tannin, while two samples sent here by the English Imperial Institute only yielded 4·5 and 6·1 per cent.

Indian Tanning Materials.

Botanical Name.	Material.	From	Tanning Matter.	Non-tanning Matter.	Insoluble.	Water.
Cæsalpinia digyna	Pods (shell cases only)	Pegu circle, Burmah	43·9	20·4	25·3	10·4
„ „	„ (including nuts)	„ „ „	23·5	20·1	46·5	9·9
Bruguiera gymnorhiza	Bark	Sunderbuns, Bengal	9·7	4·6	72·0	13·7
Kandelia rheedii	„	„ „	17·3	4·2	66·6	11·9
Rhizophora mucronata	„	Lower Bengal	4·5	6·6	79·3	9·6
„ „	„	Pegu circle, Burmah	6·1	2·2	80·8	10·9
Ceriops candolleana	„	Sunderbuns, Bengal	18·0	4·6	66·7	10·7
Terminalia oliveri	„	Mandalay	31·1	10·2	48·4	10·3
„ „	Leaves	„	14·4	12·2	64·5	8·9
Pistacia vera "Gool-i-pista"	Galls	India (district not known)	30·1	17·8	42·4	9·7
Terminalia tomentosa	Nuts	„ „ „	10·6	26·8	51·9	10·7
Terminalia bellerica ("Bedda nuts").	„	„ „ „	8·3	16·6	65·7	9·4

Solid Extracts from Indian Tanning Materials.—As will be seen from the table of analyses, many of the cutches obtained from Indian tanning materials are very rich in tannin, and likely to prove valuable substitutes for the true cutch from *Acacia catechu*. The analysis of these materials is often extremely difficult, owing to the large amount of colouring matter they contain, and, in some cases, it is impossible to get the non-tannin solutions free from traces of tannin and colour, without using very dilute solutions, when of course a very small error in weighing may make considerable difference in the final result.

Acacia catechu.—The extract from wood forms the "cutch" or "dark catechu" of commerce. A lighter variety known as "kath" or "white cutch" is also made in India and principally used for chewing with betel. A *catechu* is a tree 30—40 feet high, common in India and Burmah, and also in tropical East Africa, where, however, it is not utilised.

Trees of about one foot diameter are cut down, and the wood is reduced to chips, and boiled with water in earthern jars over a mud fireplace. As the liquor becomes thick and strong, it is decanted into another vessel, and the evaporation continued till the extract will set on cooling, when it is poured into moulds made of leaves or clay, the drying being completed by exposure to the sun and air. "Kath" or pale cutch, is made in Northern India, by stopping the evaporation at an earlier point, and allowing the liquor to cool, and crystallise over twigs and leaves thrown into pots for the purpose. Good cutch contains about 60 per cent. tanning matter, and is principally used for dyeing browns and blacks with chrome and iron mordants. The sample

Analysis of Indian Solid Extracts.

Scientific Name.	When derived.	Remarks.	Tanning Matter.	Non-tanning Matter.	Insoluble.	Water.
Bruguiera gymnorhiza	Sunderbunds	Solid extract	60·3	21·0	1·8	16·9
Ceriops candolleana	"	Extract from bark	57·3	16·5	17·0	9·2
Chickrassia velutina	Upper Burma	" "	46·6	26·0	17·0	10·4
Kandelia rheedii	Sunderbunds	Solid extract	48·8	20·0	19·2	12·0
Pentacme siamensis	Upper Burma	Extract from bark	66·0	9·2	14·6	10·2
Pterocarpus indicus	" "	" "	63·4	10·2	16·4	10·0
" marsupium	Madras	Gum kino	70·6	9·6	5·3	14·5
Shorea obtusa	Upper Burma	Extract from bark	59·2	20·8	9·0	11·0
" robusta	Dehra Dun	Solid extract by single precess from old branches.	28·8	52·8	6·6	11·8
Terminalia bellerica	Upper Burma	Extract from bark	70·4	12·4	3·8	13·4
" oliveri	" "	Solid extract	61·8	24·0	5·6	8·6
" tomentosa	" "	" "	55·6	15·8	16·2	12·4
Xylia dolabriformis	" "	Extract from chips	60·3	13·6	12·1	14·0
Rhizophora mucronata	Sunderbunds	Solid extract	14·3	44·7	28·1	12·9
Acacia catechu, "dark cutch"	India	Extract from wood	58·9	10·0	19·1	12·0
" " "kath or white cutch."	"	" " "	73·2	5·8	6·8	14·2
" " "yellow kath"	Pegu circle (Burma)	Solid extract	69·2	8·0	10·4	12·4

of dark cutch examined however does not contain so much tannin as is usually found.

The sample of "yellow kath" examined was received from the Imperial Institute; it is said to be greatly valued by dyers for obtaining light shades, and would no doubt prove, from its strength and excellent colour, admirably adapted for tanners' requirements.

Pterocarpus marsupium.—This is a natural kino or gum resin apparently obtained by evaporating to dryness the fluid found in cavities of the wood; it is observed in Central and South India, and forms the gum kino of European Materia Medica. It is one of the strongest samples analysed, and compares favourably with the best Australian samples. The tree from which the gum is derived is called "Indian kino" tree.

My thanks are due to Mr. F. W. Hunt for assistance in the analysis of the Indian cutches.

Members of the Sumach Family (Rhus).

Through the kindness of Mr. A. G. Perkin, of the Yorkshire College Dyeing Department, I have been fortunate in obtaining several specimens of leaves of the American sumachs of undoubted genuineness, collected by the late Prof. Trimble of Philadelphia, and have made analyses and colour-tests of these in order to compare them with Sicilian sumach, which is used in this country and on the Continent in enormous quantities. In 1894, the total exports of sumach from Palermo to the United Kingdom reached about 8,400 tons, whilst the export to all countries was 25,000 tons valued at about 192,000*l.*

In Sicily, the genuine sumach is divided into "*sommaco forte*," or "*mascolino*," which contains the most tannin, and is of superior colour, and "*feminello*," which is weaker and of considerably less value. The best mascolino sumach contains from 27 to 30 per cent. of tannin, whilst the feminello only contains from about 20 to 22 per cent. As received in the English market, however, genuine sumach (*Rhus coriaria*, not contaminated with other materials) contains usually about 27 per cent. of tanning matter, though the quality seems of late to have improved considerably, several samples recently examined at the Yorkshire College containing upwards of 30 per cent. of tannin.

Analysis of Leaves of Rhus Family.

Botanical Name.	From	Tanning Matter.	Non-tanning Matter.	Insoluble.	Water.	Tintometer measurement ½ per cent. solution in 1 cm. cell. Red.	Yellow.
Rhus glabra	Southern states, U.S.A.	24·6	16·5	51·8	7·1	1·3	3·2
" typhina	Virginia	12·7	15·8	60·4	11·1	3·5	8·0
" aromatica	U.S.A.	12·6	10·1	64·9	12·4	5·9	14·0
" cotinoides	"	20·4	12·6	53·3	13·7	3·3	7·3
" semialata	"	4·7	8·5	75·3	11·5	22·4	64·0
" metopium	"	8·2	13·0	68·5	10·3	..	..
" cotinus	Italy	16·7	14·4	57·5	11·4	..	..
" coriaria, A	Sicily	27·1	16·9	47·7	8·3	0·8	3·0
" " B	"	26·7	14·8	50·5	8·0	0·9	2·5

As will be seen from the table, and from the cards which I now pass round, containing analyses and samples of leather taoned with some of these American sumachs in comparison with two average samples of Sicilian sumach, the latter are distinctly superior in the amount of tannin they contain to all the American samples, while the difference in colour is still more in favour of the Sicilian samples.

Rhus glabra which contains more tannin than any other of the American samples, is very largely used in the United States for the same purposes as Sicilian sumach is used in this country, namely, as a tannin, material for soft leathers, and where a light coloured leather is desirable, and also for brightening the colour of leather tanned with dark materials such as mimosa bark, &c. This species of sumach grows like a weed in America, overrunning large quantities of land. From its darker colour it is very doubtful whether it would pay for exportation to Europe to compete with Sicilian sumach.

The Virginian crop of sumach is said to reach about 8,000 tons annually, and is generally collected during the months of June or July. From experiments made on the effect of collecting sumach at different periods of the year, it seems that for white and delicately coloured leathers the collection should be made in June, while for dyeing dark-coloured leathers, and for dyeing and calico-printing in dark colours, the collection may be made in July. Sumach collected after the 1st of August is darker and contains less tannin in its leaves than that collected earlier.

Rhus cotonoides would no doubt form a valuable substitute for R. glabra in the States as, although not containing so much tannin, it is quite equal in colour to the former.

Rhus typhina ("staghorn" or Virginian sumach) varies between 12 and 18 per cent. of tannin, but is darker than R. glabra.

Rhus semialata, though only containing a very small quantity of tannin in the leaves, yields Chinese or Japanese galls which contain upwards of 70 per cent. of tannin.

Rhus continus, though included in the list, is not an American sumach. The leaves are used in dyeing and are known as "Venetian sumach." It is cultivated in the Appenines, where it is called "scotino"; its twigs and wood form "young fustic," so largely used by dyers to obtain a bright yellow shade.

My thanks are due to Mr. H. Brumwell, Assistant in the Leather Department, for assistance in carrying out some of the determinations included in this paper.

Journal and Patent Literature.

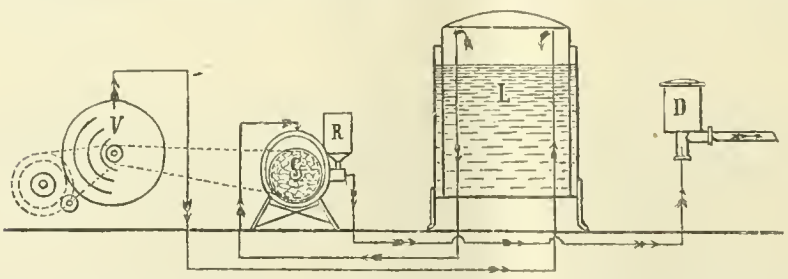
Class.	Page.
I.—General Plant, Apparatus, and Machinery	...
II.—Fuel, Gas, and Light	162
III.—Destructive Distillation, Tar Products, Petroleum	164
IV.—Colouring Matters and Dyestuffs	168
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	170
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	171
VIII.—Glass, Pottery, and Enamels	174
IX.—Building Materials, Clays, Mortars, and Cements	174
X.—Metallurgy	175
XI.—Electro-Chemistry and Electro-Metallurgy	177
XII.—Fats, Fatty Oils, and Soap	178
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	178
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	179
XV.—Manures, &c.	179
XVI.—Sugar, Starch, Gum, &c.	179
XVII.—Brewing, Wines, Spirits, &c.	180
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	182
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	185
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	186
XXI.—Photography	188
XXII.—Explosives, Matches, &c.	189
XXIII.—Analytical Chemistry	189
XXIV.—Scientific and Technical Notes	195

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

II.—FUEL, GAS, AND LIGHT.

Carburetted-Air Apparatus; A New ——. S. Schiff. Chem.-Zeit., 1901, **25**, [101], 1139—1149.

THE apparatus, which is very suitable for laboratories, &c., where no coal-gas supply is available, is illustrated in the sketch. The small fan V, which is driven by a falling weight, supplies air to the gasholder L, the fan being automatically put out of action when the holder is filled. The air from the gasholder passes through the carburettor C, which contains kieselguhr saturated with benzine (petroleum spirit), and thence passes, by way of the pressure regulator D, to the burners. The device R, for filling the carburettor, is of peculiar construction: it is opened by the apparatus itself, no benzine can be taken out of it, and the outer air has no access to the liquid. The proportion of benzine taken up by the air in the carburettor is far above the limit of explosiveness; and, owing to the great absorptive power of



kieselguhr, there is no actual liquid in contact with the air, and thus no drops of liquid can be carried over. No combustible gas is stored up, except the small amount in the carburettor itself. The heating power of the carburetted air produced is about 3,000 calories, which may be increased to 4,000 calories if a small proportion of benzol is added to the benzine; it can be used economically for Bunsen burners or for incandescent gas lighting.—H. B.

Coal; The Scarcity of ——. Bennett H. Brough. Reprint from *Nineteenth Century*, No. 278, April 1900. Waterlow and Sons, Ltd., 24, Parliament Street, S.W.

PAMPHLET of eight pages.

ENGLISH PATENTS.

Peat, Turf, Sawdust, Shavings, Wood, Grass, or other Fibrous Materials for use as Fuel; Machinery and Apparatus for, and Method of, Preparing ——. H. J. Spooner, London. Eng. Pat. 19,571, Nov. 1, 1900.

THIS specification claims machinery (illustrated by five sheets of drawings) for compressing and macerating peat, &c., so as to remove water, naphtha, or other liquid contained by it.—H. B.

Burners for Liquid Hydrocarbons; Atmospheric ——. E. H. J. C. Gillett, Hounslow. Eng. Pat. 23,517, Dec. 22, 1900.

THE combustible mixture of hydrocarbon vapour and air is supplied to a number of shallow circular chambers or pans, of like diameter, placed concentrically one above the other. The chambers are in open communication with each other at their central portion, but towards their outer edges they are separated from each other by horizontal air spaces. Round the periphery of each chamber is a horizontal continuous slit or series of apertures, through which the combustible mixture issues, giving a ring-shaped flame. Each

chamber is provided, towards its outer edge, with a number of circular, vertical passages, and the chambers are so arranged that the passages in each chamber coincide concentrically with the corresponding passages in all the other chambers. There is thus formed a series of vertical passages up through which air passes and issues into the horizontal air spaces, furnishing an additional supply of air to the flames.—H. B.

Briquettes of Coal, Charcoal, Ore, and other Materials; Agglutinating Material, and the Manufacture of ——. T. Ingham, Liverpool. Eng. Pat. 1773, Jan. 25, 1901.

Seaweeds capable of yielding algin, such as *Laminaria*, are boiled in an alkaline solution, and either the mixture, or the residue left after separation of more or less of the algin, is used as the binding material in forming the briquettes described in the title. In order to render the briquettes moisture-proof, they are, while drying, exposed to the vapour of methylated alcohol, or to SO_2 or HCl gas. Thus they may be dried in a channel through which gases of combustion from sulphurous coal are passed.—E. S.

Water Gas Production. J. G. L. Bormann, Berlin. Eng. Pat. 16,621, Sept. 18, 1900.

Combustible gases are produced in a generator charged with ignited coal supplied with air rich in oxygen, and the gases are conveyed through a serpentine pipe arranged in the brickwork of a chamber heated by a furnace, steam being introduced by another similarly set pipe, both pipes being maintained at a temperature over 1,200° C. The gases entering the chamber, consist mainly of carbon monoxide and hydrogen; the former, reacting at that high temperature with the steam, produces carbon dioxide and hydrogen, and it is stated that the hydrogen "is almost entirely drawn into the uppermost part of the superheating chamber," whence it is taken direct to a second generator, similar to the first, containing incandescent fuel, which receives through its grate the carbon dioxide produced in the chamber, together with oxygen, or air rich in oxygen, from a producer of that gas. The reduction of the carbon dioxide to the monoxide is effected in the second generator, a heating gas being thus formed consisting essentially of a mixture of carbon monoxide and hydrogen. Part of the combustible gas produced in the first generator is utilised in heating the oxygen-producing apparatus. When it is desired to produce illuminating gas, the process is so modified as to replace part of the carbon monoxide by hydrogen, hydrocarbons from the coal being also present. —E. S.

Blast Furnace and other Gases; Removing Dust and the like from ——. J. A. Elsner. Eng. Pat. 18,891, 1901.

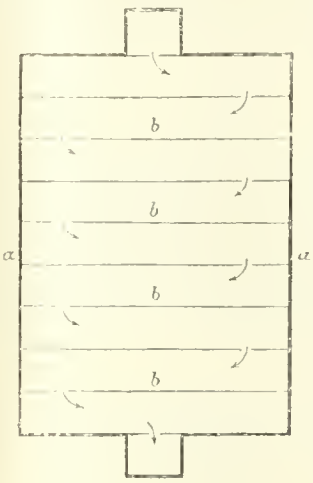
See under X., *page* 177.

Gas-Producer; Improved Construction of a ——. J. L. Thomas, Swansea, and D. W. Prosser, Neath Abbey, Glamorgan. Eng. Pat. 116, Jan. 2, 1901.

An iron-cased rectangular (or circular) chamber, lined with refractory material, has a hopper and valve for admitting fuel placed centrally in the cover, with a number of poker holes around it. Sloping grates are placed at opposite sides of the lower portion of the chamber, and the air, injected by steam, is forced into the space between the grates and sloping iron plates placed parallel to and below them, to conduct the ashes which fall through the bars to a water-sealing trough at the bottom. Poker holes are provided in the sides of the producer above the grates. By this arrangement the whole of the lower part of the fuel in the producer chamber is exposed to the action of steam and air.—W. G. M.

Carburetting Air for Illuminating and Heating; Method of and Apparatus for Automatically and Continuously ——. N. Notkin, Moscow. Eng. Pat. 20,667, Nov. 1, 1895.

Comprises means for carburetting air in connection with lamps for lighting and heating purposes. The air is caused to pass downwards through a chamber *a*, divided by horizontal partitions *b* into a number of compartments, which are filled with a loose or porous material saturated with a liquid hydrocarbon. By perforating the partitions alternately on one side and the other, the gas is made to take a zigzag course.



The air supply is regulated by a screw cap with notched or slotted sides. The invention is shown applied to suspended lamps and table lamps for lighting, and to wall lamps for lighting or heating purposes.

Carburetting Apparatus; Automatic ——. W. T. Purves and the Notkin Syndicate, Ltd., both of Edinburgh. Eng. Pat. 21,518, Nov. 28, 1900.

A carburetter on the Notkin principle, as described above (see also succeeding abstract), is made of cheap, plain material to serve as a refil to lamps of ornamental exterior. It makes a screw-, or other tight joint with the mouth of the pipe which leads to the burner.—J. A. B.

Automatic Carburetters. W. T. Purves and the Notkin Syndicate, Ltd., both of Edinburgh. Eng. Pat. 21,519, Nov. 28, 1900.

A carburetter of the Notkin type, as described above (Eng. Pat. 20,667 of 1895), has placed between it and the gas outlet, a chamber which remains charged with the gas, and serves to "steady" the light, which is stated to be less affected by concussion and vibration than when the apparatus is without this chamber. The carburetting chamber is filled with absorbent material, such as rag felt, charged with hydrocarbon liquid, the vapour of which is taken up by air which passes over the material. This carburetted air constitutes the gas with which the light is supplied. —J. A. B.

Carburetting Air and Enriching Gas for Illumination, Heating, and Power Purposes; Methods and Means for ——. J. H. Hartridge, Hendon Eng. Pat. 1173, Jan. 18, 1901.

Air or gas under high pressure is injected into a vessel, in the bottom of which hydrocarbon liquid is maintained at a constant level. The nozzle of a pipe which dips in the liquid is set at an angle of 90°, or slightly less, to the mouth of the pipe by which the air or gas is injected, and the liquid is thus drawn up by the stream of air or gas, and broken into fine spray. The impregnated air or gas passes by a circuitous course to the outlet at the top of the vessel, in which a pressure slightly above that of the atmosphere, is maintained. Or the hydrocarbon liquid may flow in a regulated stream downwards through a coil immersed in water at a suitable temperature, while the air or gas to be carburetted passes upwards through the coil. Taps are attached to the inlets for both the gas or air and the liquid, and are regulated by hand, or automatically, according to the pressure within the apparatus or outlet pipe.—J. A. B.

Acetylene Gas; Apparatus for Generating and Storing ——. E. Anderson, Tonbridge, Kent. Eng. Pat. 3943, Feb. 23, 1901.

A generator, containing carbide receptacles supported at different heights, forms the central part of an annular tank in which a gasholder bell floats. Water is supplied to the generator through a teleseoping pipe, passing through the

crown of the bell, and having its outer end connected to a flexible pipe attached to the bottom of a tank containing water. This tank is at such a height relative to the bell, that when the latter is much extended, its crown rises above the level of the water in the tank, and the flow of water to the generator automatically ceases; while, when the bell is in a low position, the level of the water in the tank is higher than the crown of the bell, and water flows from the tank to the generator.—J. A. B.

Acetylene Gas Burners. J. W. Bray, Leeds. Eng Pat. 22,105, Nov. 2, 1901.

In order to ensure that the jets of gas, issuing, in admixture with air drawn in through orifices in the burner, through two burner tips inclined towards one another, strike one another at a suitable distance from the tips to give a good flat flame, the burner either is made of a square bar with projections, which, after boring, is bent so that the issuing jets will be at right angles or thereabouts to one another, and will intersect; or is made of a bar of circular section, and the outer surfaces of the projections are continued below the bar, so that the projections may be readily "set" in the same plane.—J. A. B.

Acetylene Gas Generating Apparatus. J. Heaton, Auburn, and N. T. Worthley, Brunswick, both in Maine, U.S.A. Eng. Pat. 24,030, Nov. 26, 1901.

A GASHOLDER tank, in which water is maintained at a constant level, supplies water to the outer tank of a generator. This outer tank communicates at the bottom with an inner water chamber, which communicates, at the top only, with a central chamber containing superposed pans of carbide. Water passes to near the bottom of the carbide chamber through a perforation near the top of its walls. The water is depressed below this perforation, and consequently ceases to enter the carbide chamber, when the pressure within the generator is about 4½ ins. The gas evolved passes to the gasholder, which throws a pressure of 3 ins., through a sealed bell which normally throws a further pressure on the generator of 1½ ins. But when the bell of the gasholder is nearly grounded, it operates a lever, which raises the sealed bell, and by thus reducing the back pressure, allows more gas to pass from the generator to the gasholder. The pressure within the generator is thereby reduced, and more water enters the carbide chamber.—J. A. B.

Incandescent Gas Burners. Falk, Stadelmann, and Co., Ltd., and L. Thurnauer, London. Eng. Pat. 4159, Feb. 26, 1901.

This describes a device, applicable to burners of the Kern type, for facilitating the removal of the mantle from the burner body, and also for protecting the lower edge from damage caused by swaying. Surrounding an inner tube, which is adapted to be slipped over the burner head, is fixed concentrically an outer tube, the sides of which are perforated. These tubes carry a side-support for the mantle, and when the mantle is suspended from it, the lower part of the mantle hangs in the annular space between the two tubes. Prongs may be attached to the outer tube, for holding a glass globe. The whole device may be lifted off the burner without injuring the mantle.—H. B.

Incandescent Gas Lamps. C. G. Brett and F. Henneberger, London. Eng. Pat. 4228, Feb. 27, 1901.

The purpose of the invention is to obtain a high light efficiency from gas at the ordinary pressure by the use of a strong air current induced by an elongated chimney. To the top of a Kern burner tube (a tube of the double truncated form) is attached a burner top somewhat smaller than the usual corresponding size, which thus produces a gaseous mixture requiring, for its complete combustion, an additional supply of air outside the flame. A tall chimney, open at the top and bottom, the lower part somewhat closely surrounding the mantle, is supported upon the burner by a skeleton frame which allows the free admission of air round the lower edge. The lower part of the chimney is of glass, and the upper part consists of metal or china; its lower edge comes slightly below the rim of the burner head.—H. B.

Incandescent Gas Burners. W. Green, Moseley. Eng. Pat. 4350, March 1, 1901.

This specification describes an "anti-vibrator" arrangement. The burner is suspended from a series of spiral springs, the lower ends of which are hooked on to the base of the burner gallery. To the base of the mixing tube is attached a governor of sufficient weight to check any excessive vertical or horizontal vibration, and the lower end of the governor communicates with the gas-supply pipe by means of a flexible "vertically elastic" connection. One form of the latter consists of a thin-walled, flexible, rubber chamber. Another form consists of a rigid tube extending horizontally from a gas-supply nipple, and a horizontally disposed rubber tube returning from the end of the rigid tube to the base of the governor.—H. B.

Primary Batteries. [*Lanterns, &c.*] C. N. Gauzentès, Paris. Eng. Pat. 4586, March 4, 1901.

The battery consists of an inner lining of lead, which forms the positive electrode, insulated from the outer casing of tin plate. The negative electrode is formed of a rod of zinc or other metal, attached to the cap or stopper which closes the cell, or it may be formed of an iron rod helically wound with an iron wire, which is likewise attached to the stopper. With such a battery, it is said, "a lantern may be made which has merely to be inverted to light or extinguish it, the negative electrode being of such a length that on inverting the battery, it is clear of the liquid."—G. H. R.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Wood Refuse; Distillation of ——. E. Siermann. Chem.-Zeit., 1901, **25**, [103], 1158. (See also this Journal, 1901, 977.)

The Heidenstam process consists in pressing the dried refuse into briquettes, which are carbonised, so that the tar, wood acid, &c., escape freely whilst the mass is kept under pressure. In the distillation of wood refuse, a resinous crust is formed on the sides of the retort, interfering very much with the efficiency of the apparatus. Schneider claims to have overcome this by the use of a revolving horizontal cylindrical retort, through which the material is carried by a conveyor screw, revolving in an opposite direction. The refuse enters at the firing end of the cylinder, and is discharged at the opposite end, down a wide pipe into one of two chambers of the cooler, which are filled and cooled alternately; the gases leave the retort at its middle, and the refuse is preheated on the top of the furnace before entering the cylinder. The cylinder is made of cast iron, strengthened by wrought-iron hoops. A plant, the retort of which was 3 m. long by 1 m. diameter, carbonised 570 kilos. of sawdust and shavings (beech, elm, oak, &c.), containing 24·15 per cent. of water, in three hours, yielding 122 kilos. of charcoal (5·06 per cent. of water), and 241 kilos. of liquor, consisting of 0·24 per cent. of tar, and 99·76 per cent. of aqueous liquor; the latter contained 6·6 per cent. of acetic acid (glacial), and traces of acetone and methyl alcohol. 12 kilos. of gas coke were used for firing, and 105 kilos. of Westphalian coal for the steam engine.—J. W. H.

Acetone Oil; Manufacture of ——, *from Wool Washings.* A. and P. Buisine. Bull. Assoc. Chim. Sucr. Dist., 1901, **19**, [6], 662—688. (This Journal, 1898, 266, 485; 1899, 292, 405.)

Denaturing of Alcohol.—Acetone oil was reported by a French Commission to be a very effective substance for the denaturing of alcohol; and since 1895 it has also been adopted by the Swiss Government for the same purpose. In France, however, it was not generally adopted, owing to

the supply being insufficient, and this has led the authors to study the methods of producing it in larger quantity.

Production of Acetone Oil from Wool Washings.—Acetone oil is a mixture consisting principally of homologues of ordinary acetone, such as methylethylketone, methylpropylketone, &c., with boiling points up to 250° C. Starting from the idea that these higher acetones should be produced by the dry distillation of mixtures of acetates with calcium propionate, butyrate, &c., the authors have made experiments to obtain them from the volatile acids present in aqueous wool washings.

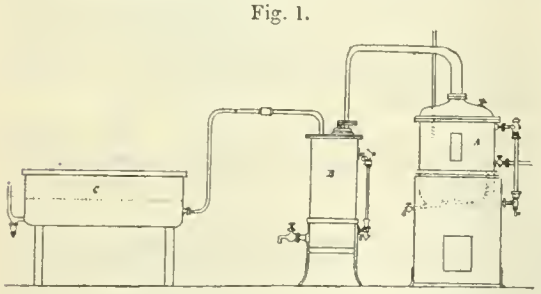
Composition of Wool Washings.—By the spontaneous fermentation of this liquid, volatile fatty acids, from acetic to capric acid, are produced, together with other substances. The following analysis is given of the fermented washings after concentration to 11° B.:—Dry residue, 153·4; ammonium carbonate, 1·5; total nitrogen, 4·5; potassium carbonate, 7·6; volatile acids (expressed as H_2SO_4), 16·0; fat, 15·5; mineral matter, 77·4; and potassium carbonate left on ignition, 65·5 grms. per litre.

The volatile acids consisted of:—Formic acid, trace; acetic acid, 10·7; propionic acid, 5·4; butyric acid, 1·3; valeric acid, 1·2; caproic acid, 1·0; caprylic acid, trace; and benzoic acid, 1·0 grm. There were also traces of phenol.

Method of Manufacture.—In the authors' experimental installation, capable of dealing with about 100 litres of the wool washings per day, the liquid was first left to ferment for a week. It was then treated with a suitable proportion of sulphuric acid to convert all potassium present into sulphate, after which it was filtered to separate fatty substances and earthy matters precipitated by the sulphuric acid. The residue was pressed into cakes in a hydraulic press.

The filtered liquid was transferred to a vessel feeding the copper still, A, of the apparatus shown in Fig. 1. This was connected with two tubes coming from a Herman's steam generator, and was also heated by direct fire, whilst a spy-glass was provided at the top. The volatile acids carried forward by the steam were absorbed by milk of lime in the vessel B. In this way from 90 to 95 per cent.

Fig. 1.



of the volatile acids were separated, the residual portion consisting of acetic acid.

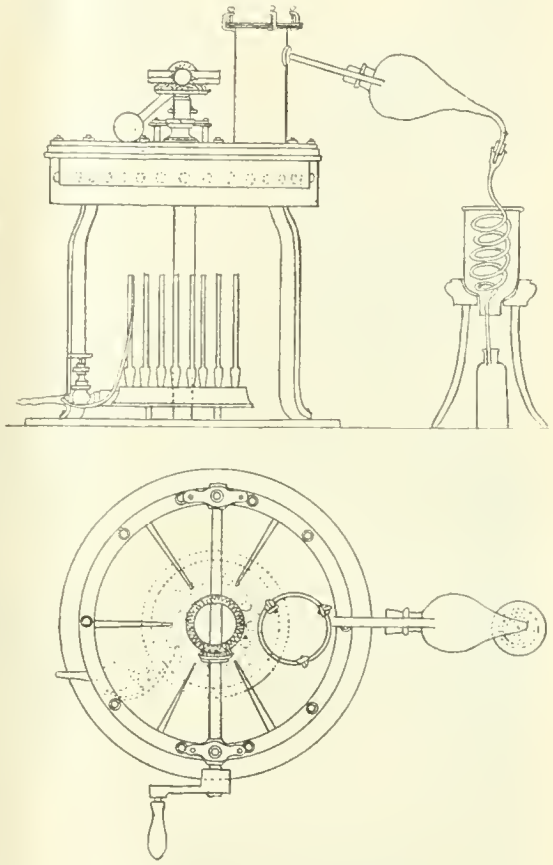
During the distillation a large quantity of potassium sulphate was deposited, and the remainder was subsequently crystallised when the liquid in the still had been concentrated to the required extent (about one-tenth of its original volume). On boiling the milk of lime in B, water was expelled, and a concentrated solution of the calcium salts of the acids obtained.

The concentration tank C was a vessel with a false bottom, heated by means of the steam coming from the vessel B. In this vessel the calcium salts were eventually obtained as a solid mass, free from water.

Dry Distillation of the Calcium Salts.—The apparatus used for obtaining the acetone oil from these salts is shown in Fig. 2. It consisted of a very shallow copper still, provided with an agitator worked by hand, and heated by means of gas flames. The calcium salts, obtained as described above, were heated rapidly to a high temperature, this precaution being necessary for obtaining a good yield. The acetone vapours were condensed in the manner shown, 1 kilo. of the mixed salts yielding about 400 c.c. of acetone oil in 30 minutes.

In the case of wool washings of concentration 8° to 10° B., the ammonia present was separated by evaporating them in the vessel A (Fig. 1) to about 20° B., conducting the vapours into sulphuric acid and crystallising the ammonium sulphate. Washings which had already been concentrated to 20° B. did not yield ammonia on distillation. The

Fig. 2.



ammonium sulphate thus obtained, contained a considerable proportion of compound ammonias, notably trimethylamine, which, however, did not detract from its value as a manure.

Yield of Products.—The authors have found that wool washings are nearly constant in composition, whatever their origin. Treated as already described they would yield: (1.) Ammonium sulphate containing compound ammonias. (2.) Calcium salts of volatile acids yielding acetone oil on decomposition. (3.) Potassium sulphate (90—97 per cent. of pure salt), about two-thirds of the total quantity. (4.) A pasty mother-liquor amounting to about one-tenth of the liquid treated and containing per litre of about 1,500 grms. —(*a*) 500 grms. of pasty potassium sulphate (*i.e.*, the residual third); (*b*) 10 grms. of acetic acid (expressed as H_2SO_4); and (*c*) organic matter containing 31 grms. of nitrogen. This organic matter can be used advantageously in the manufacture of compound manures. (5.) Pressed cake, which, after removal of the fat, gives a powder containing:—Organic matter, 26; mineral matter, 7·5; and nitrogen, 1·5 per cent.

The following table gives the yields per cubic metre obtained from four samples of different origin and different degrees of concentration, together with the quantities of reagents and coal required for their treatment:—

Industrial Plant.—In the authors' experiments on a manufacturing scale, means were taken to obviate the chief

drawbacks of the experimental apparatus, *viz.*, the deposition of potassium sulphate during the concentration, and the difficulty of completely drying the calcium salts.

——	I.	II.	III.	IV.
Concentration	8° B.	9·5° B.	18° B.	19·3° B.
Potassium carbonate, on ignition.	49 kilos.	65·3 kilos.	137 kilos.	160 kilos.
Volatile acids (in terms of H_2SO_4).	12·4 „	12·6 „	28 „	29·5 „
Ammonium sulphate ..	6·7 „	7·2 „	—	—
Dry calcium salts	15·5 „	16 „	37 kilos.	39 kilos.
Acetone oil	7 litres	8 litres	17 litres	18 litres
Potassium sulphate (90—97 per cent.).	45 kilos.	60 kilos.	125 kilos.	140 kilos.
Pasty residue	30 „	38 „	95 „	100 „
Fat	11·6 „	14·4 „	27 „	25·5 „
Powder from pressed cake.	23 „	25 „	80 „	100 „
Sulphuric acid (66°) ...	40 „	55 „	110 „	125 „
Quicklime.....	10 „	10 „	25 „	25 „
Coal	200 „	200 „	200 „	200 „

Concentration.—The apparatus eventually adopted for the concentration of the fermented wool washings, with the recovery of the ammonia as ammonium sulphate, was that of Wache and Locoge. This consists essentially of a vertical tube 70 mm. in diameter and about 10 metres in length, heated externally by circulating steam. The lower part of this tube is immersed in the tank containing the liquid to be concentrated, whilst the top opens into a bulb-shaped chamber, termed a separator, the lower part of which is connected with a second tube passing down to the tank. Above the separator is an absorption vessel containing sulphuric acid, then a condenser, and finally a vacuum pump. The froth which ascends with the evaporating vapours is retained by the separator, and falls back through the other tube into the tank. The vessel containing the sulphuric acid for the absorption was the same as those used in gasworks.

Separation of Volatile Acids.—Wache and Locoge's apparatus was also used for this operation, but the tubes were constructed of copper instead of iron. The potassium sulphate could not crystallise on the sides of the tube, but was continually washed down to the tank, where it collected, and was eventually withdrawn and passed through a centrifugator.

Absorption of Volatile Acids.—The vessel employed for this purpose was a copper cylinder in which a fine shower of milk of lime was made to fall upon the points of cones, the bases of which were studded with projections so as to form numerous points of contact with the acid vapours ascending from the lower part of the cylinder. A perforated plate was fixed in the upper portion to prevent the froth rising. The milk of lime falling over the cones passed through a tube at the bottom into the tank to be pumped through the cylinder as before, thus circulating in the same way as the wool washings in the condenser. The milk of lime was maintained at a constant strength by the addition of fresh quantities of lime introduced into a compartment of the tank separated from the rest by a metal filtering plate.

Drying of the Calcium Salts.—After concentration of the solution of calcium salts in the same way as in the experimental apparatus, the last traces of water were removed by means of Huillard's apparatus. This consists of a vessel for the pasty material, through which runs an endless metallic band passing over a series of rollers. The material carried forward by this is conveyed through a chamber where it meets with a current of dry air, and is finally detached in another vessel by means of special wheels.

Distillation of the Calcium Salts.—This was carried out in exactly the same manner as the distillation of acetone from calcium acetate, except that a somewhat higher temperature was employed.

Characteristics of the Acetone Oil.—The oil thus obtained was a yellowish-brown liquid with a very pronounced acrid odour. It had a specific gravity of 0·833 to 0·835, and contained 18 to 21 per cent. of substances insoluble in water, and 6·5 to 9 per cent. insoluble in sodium bisulphite solution.

On distillation, it yielded the following fractions:—At 60° to 70° C., 1 to 4 per cent.; 70° to 76° C., 50 to 53 per cent.; 76° to 80° C., 10 to 16 per cent.; 80° to 85° C., 7 to 10 per cent.; 85° to 90° C., 4 to 6 per cent.; 90° to 100° C., 7 to 10 per cent.; 100° to 110° C., 4 to 6 per cent.; and above 110° C., 4 to 8 per cent.

The redistilled acetone oil was colourless, but still possessed a strong odour. The pure methylethyl-ketone, boiling at 80° to 90° C., was colourless and nearly odourless, but invariably had a marked bitter taste. The residue, boiling above 90° C., had also an acrid taste. In the authors' opinion, any of these products might be used for the denaturing of alcohol, according to the uses for which the latter was intended.—C. A. M.

Petroleum; Preparation of Aromatic Hydrocarbons from ——. N. D. Zelinsky. Chem. Zeit., **26**, [7], 68.

By repeating Nikiforow's method of consecutive decomposition under increased pressure, the author arrived at the following results:—

The aromatic fraction passing over between 75° and 180° C. amounts to 14·1 per cent. of the petroleum treated, and consists of 58 per cent. of benzol and 28 per cent. of toluol. By previously treating the same fraction with sulphuric acid and alkali, a purified product is obtained, containing 65·5 per cent. of benzene (b. pt. 80°—81° C.) and 29 per cent. of toluene (b. pt. 109°—111° C.). The benzene has the sp. gr. 0·8762 at 19°/4° C. The properties of the toluene are normal. The same fraction also contained *m*-xylene, *p*-xylene, traces of *o*-xylene, and ψ-cumene. The fraction 180°—200° C. contains tetramethylbenzene; and all these hydrocarbons furnished the characteristic derivatives. The higher fractions contained naphthalene (1·5—2 per cent.), and anthracene was detected in the still higher fractions obtained by distillation *in vacuo*.

The benzol and toluol furnished by petroleum are superior to those from coal tar, owing to the absence of thiophene and its homologues. The non-reaction with bromine and permanganate indicates absence of di- and tetrahydro compounds.

The author also succeeded in obtaining a considerable quantity of benzol from petroleum spirit ("benzine") of b. pt. 85°—95° C., by decomposing same twice in succession under a pressure of 3½ atmospheres; consequently, hexamethylene and its derivatives can be converted into benzene and its homologues.—C. S.

Hydrocyanic Acid; Preparation of ——, *in the Electric Furnace; and Conversion of Atmospheric Nitrogen into Ammonia.* H. Hoyermann. Chem. Zeit., **26**, [7], 70—71.

On the basis of a report by Moissan, the author attempted to prepare hydrocyanic acid from a mixture of acetylene and nitrogen in an electric furnace composed of blocks of unslaked lime, but obtained no satisfactory results, the acetylene being decomposed, with deposition of carbon, by the high temperature of the furnace. He then modified the apparatus by using hollow electrodes, and feeding through these to the arc a mixture of acetylene and ammonia, obtained by decomposing carbide with concentrated ammonia. With a current of 120 ampères and 70 volts, both this mixture and one of acetylene and nitrogen (from potassium nitrite) gave hydrocyanic acid. The most suitable proportion of acetylene to nitrogen was found, by several experiments, to be 1:2, a higher ratio of acetylene causing obstruction of the hollow electrodes by deposited carbon. The yield of hydrocyanic acid, as ascertained by titration, was 60—70 per cent. of the acetylene used. Under similar conditions, other hydrocarbons, such as benzene, also furnished considerable quantities of hydrocyanic acid. It would appear as though a portion of the hydrocyanic acid first formed is decomposed by impurities present in the mixed gases; and the author believes that quantitative results would be obtained by working with pure gases in an air-tight furnace, and eventually in an atmosphere of hydrogen.

Ammonia from Atmospheric Nitrogen.—A mixture of equivalent quantities of calcium fluoride and aluminium, placed in a graphite crucible and heated to pale redness in an enclosed furnace for a considerable time, furnished a grey, scarcely sintered mass, which evolved ammonia on treatment with boiling water. The mass seemed to consist largely of calcium nitride, and contained 6—8 per cent. of nitrogen. A parallel experiment, conducted in a porcelain tube and a current of pure nitrogen, gave only negative results.—C. S.

Ammonia Liquor Distillation; The Use of Lime in ——. E. Blum. J. für Gasbeleuchtung, &c., 1901, 44, [48], 895—898.

In working up ammonia liquor, the more nearly the lime is added in the proper proportion to the amount of ammonia present, the better will be the result obtained. Debruck, of Düsseldorf, replaces the hand pump usually adopted to feed the milk of lime, by an automatic pump actuated by the water flowing from the condensers. At Messrs. Otto's works, Dahlhausen, and other gasworks, an automatic steam pump, shown in Figs. 1—5, has been installed. K is the milk of lime tank, R the stirring gear actuated by the pump, and V is a distributing valve. In the casing A is the rubber membrane B, shown at the top of the casing; this membrane controls the fall of the weight C by means of the tap D. As the weight falls, the rod E strikes the lever F, and depresses it; the regulating arm G is thus liberated so that the extended spring I can act and open the steam port; the plunger is thus raised, moves G, through the levers F and H and the spring I, and cuts off steam at the right moment. At the end of the stroke, the peg K raises the lever F, whereby the regulating arm G, held by H, is again liberated, so that it can force upwards the extended spring; by the ascent of the plunger the membrane is again raised, air entering by the rubber valve L. The number of strokes can be regulated within wide limits by means of the tap D. The distributing valve, Fig. 5, has as many chambers as there are apparatus to supply; the weights prevent the ball valves from rising, except when lifted in turn by the cam operated through a ratchet wheel by the pump.

Fig. 1.

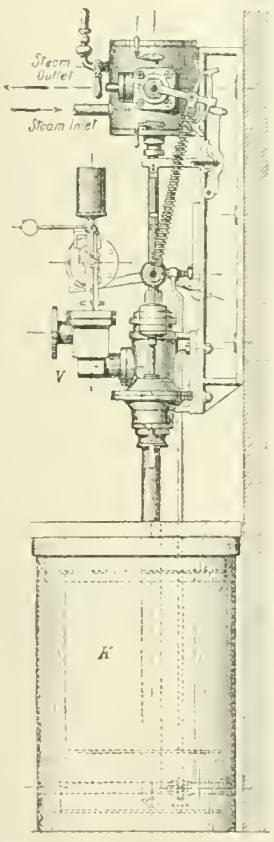


Fig. 2.

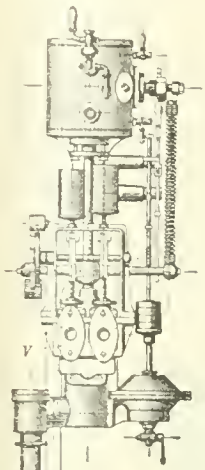
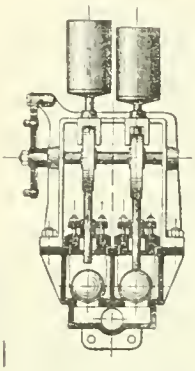


Fig. 5.



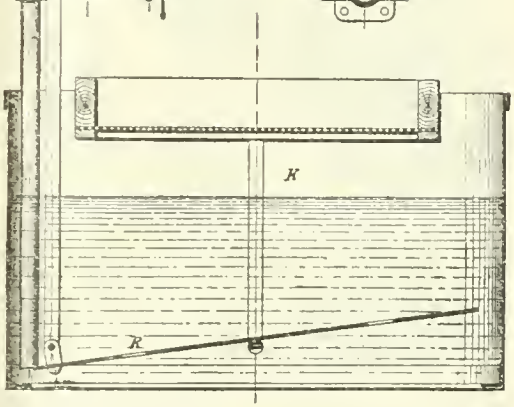


Fig. 3.

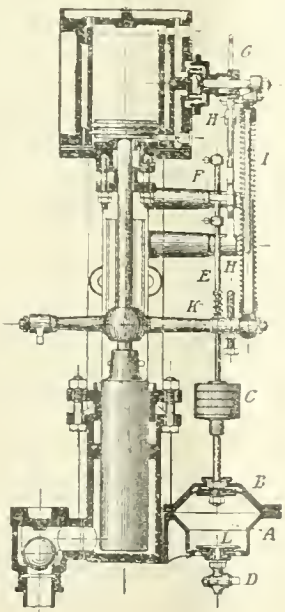


Fig. 4.

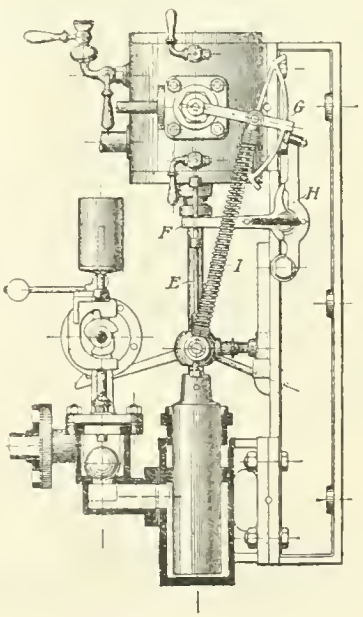
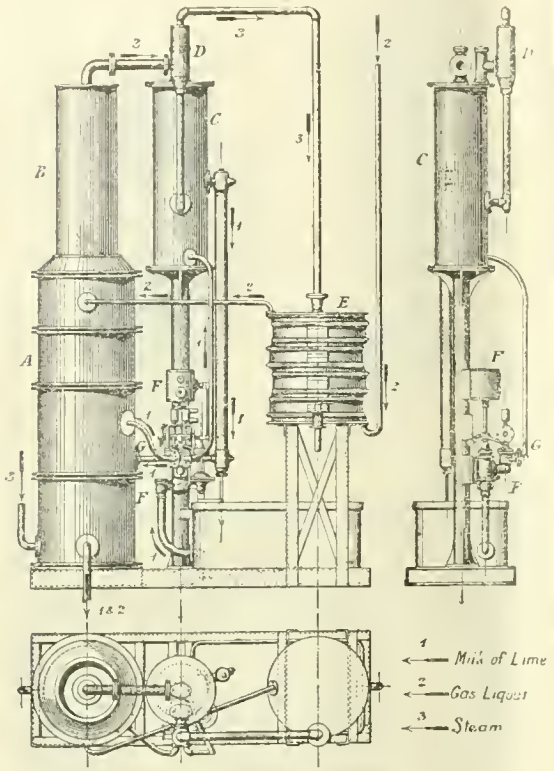


Fig. 6 shows the application of the pump to a concentrated liquor plant of a capacity of 660 galls. per 24 hours. A is the still, B the reflux condenser, C a carbonic acid washer, D a lime catcher, E the condenser in which the vapours are condensed, F the steam pump, and G the distributing valve. By the insertion of the carbonic acid washer between the still and condenser, a liquor of higher

Fig. 6.



strength, *viz.*, over 20 per cent. instead of 15 per cent., may be obtained. Milk of lime is regularly pumped into this washer, absorbs a certain amount of carbon dioxide, and then flows into the still, together with the requisite amount of milk of lime for liberating the fixed ammonia. The steam pump makes two or three strokes per minute, stirring up the milk of lime at the same time, instead of, as formerly, the 30—45 strokes by hand every quarter of an hour.—J. W. H.

Mineral Oils; Separating, in an Undecomposed Condition, the Resinous Matters Contained in ——. — Daeschner. Rev. Prod. Chim., **4**, [20], 309.

The oil to be purified is poured, with constant stirring, into a quantity of potato spirit, determined by a preliminary experiment, and contained in a closed vessel provided with stirrers. The vessel is also fitted with a pipe for conveying the evolved gases to a condenser. When the mixture has attained the right proportions, the resinous matters will separate out almost instantaneously, and subside to the bottom of the vessel, where they form a viscous mass, rendered comparatively liquid by the presence of the potato spirit. This mass is then transferred to a still, where the solvent is recovered by the aid of superheated steam.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Triphenylmethane; Preparation of ——. J. F. Norris and G. MacLeod. Amer. Chem. J., 1901, **26**, [6], 499—505.

In the synthesis of hydrocarbons from polyhalogen compounds by Friedel and Crafts' reaction with aluminium chloride, the usual course has been to separate the main product of the reaction by distillation; the authors, however, find that if the crude mixture be purified by crystallisation, other products are obtained, and that the hydrocarbon is formed by the decomposition of these during distillation. For instance, they have obtained triphenylchlormethane by the condensation of carbon tetrachloride with benzene, instead of triphenylmethane. Apparently, in the Friedel and Crafts' reaction, polyhalogenated compounds do not lose all their halogen atoms during the condensation.

The authors have carefully studied the condensation of chloroform with benzene in presence of aluminium chloride, whereby triphenylmethane is obtained by distillation. If, instead of distilling, the aluminium compound be decomposed by ice in presence of much carbon bisulphide, about one-half of the crude product is obtained in the form of crystals, identified as triphenylcarbinol, and the remainder as an uncrystallisable oil. The latter probably reduces the carbinol during distillation to give the hydrocarbon.

—J. F. B.

p-Tolyl-α-naphthylamine; Derivatives of ——. R. Gnehm and E. A. Rübel. J. prakt. Chem., 1901, **64**, [23 and 24], 497—517.

The *monosulphonic acid* of *p-tolyl-α-naphthylamine* (the base itself has long been used industrially, in particular for the manufacture of "Night Blue") is prepared by carefully introducing acetyl-*p*-tolyl-α-naphthylamine (10 grms.) into sulphuric acid monohydrate (50 grms.), and allowing the mixture to stand for two weeks. The product is then poured into water, boiled up, and filtered from the insoluble residue (2 grms.). The filtrate contains the sulphonic acid of acetyl-*p*-tolyl-α-naphthylamine, which is converted into the barium salt (7·5 grms.), and hydrolysed by means of alcoholic potash. The barium salt of *p*-tolyl-α-naphthylaminomonosulphonic acid is then obtained in small yellow plates mixed with potassium acetate and carbonate, from which it cannot be separated by crystallisation.

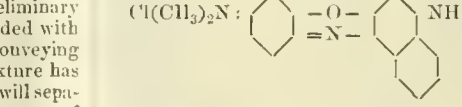
p-Tolyl-α-naphthylnitrosamine—

$$C_{10}H_7.N(NO).C_6H_4.CH_3$$

was prepared from the base by means of nitrous acid; it crystallises in golden-yellow needles (m. pt. 102° C.). At the ordinary temperature it is readily converted by alcoholic hydrochloric acid into the isomeric *p-tolyl-p-nitroso-α-naphthylamine*, $NO.C_{10}H_6.NH.C_6H_4.CH_3$. This substance crystallises in characteristic crimson needles, m. pt. 161° C., and reacts with *p*-nitrobenzylcyanide (Sachs, Ber., **34**, 118) to form *p-tolylaminonaphthyl-p-cyanoazomethine-p-nitrophenyl*—

$$NO_2.C_6H_4.C(CN):N.C_{10}H_6.NH.C_6H_4.CH_3.$$

The latter body melts at 218° C., and forms lustrous violet scales, which are soluble in organic solvents, but insoluble in water. On hydrolysis with dilute acids it yields the diamine and nitrobenzoylcyanide. A tolylated Nile Blue (*tolylaminonaphthodimethylaminophenoxazoniumchloride*)—



was obtained by warming *p*-tolyl-α-naphthylamine with the hydrochloride of nitrosodimethyl-*m*-aminophenol in glacial acetic acid solution. The dyestuff is sparingly soluble in pure water, but dissolves in alcohol and glacial acetic acid. On adding ammonia to the alcoholic solution of the dyestuff, the colour base is obtained in the form of red-brown needles melting at 199° C, sparingly soluble in cold alcohol and insoluble in water.

The same dyestuff is produced by heating Meldola's Blue with *p*-toluidine (*cf.* Nietzki and Bossi, Ber., **25**, 2998, for the formation of Phenyl Nile Blue by the action of aniline on Meldola's Blue).

An analogous dyestuff, tolylated "Ethyl" Nile Blue, was produced by condensing nitrosodiethyl-*m*-aminophenol with

p-tolyl-α-naphthylamine, and identified with a substance produced by treating "ethyl" Meldola's Blue (prepared from nitrosodiethylaniline and β-naphthol) with *p*-toluidine.

The absorption spectra of the two new dyestuffs are shown in a diagram, together with those of Meldola's Blue and of Nile Blue, and also the "Ethyl" Meldola's Blue. It is pointed out that the spectroscope is of good service in their preparation, providing a convenient means to follow the course of the reaction.—H. L.

English Patents.

Dyestuffs of the Anthracene Series; Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 3311, Feb. 15, 1901.

See Fr. Pat. 243,316; this Journal, 1902, 40.—T. A. L.

Dyestuffs; Manufacture or Production of New Basic ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 2913, Feb. 11, 1901.

See Fr. Pat. 308,023; this Journal, 1902, 41.—T. A. L.

Disazo Colouring Matters; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 2397, Feb. 4, 1901.

See Fr. Pat. 308,000; this Journal, 1902, 43.—T. A. L.

French Patents.

Aniline, Toluidines, and Analogous Bases; Manufacture of ——. J. B. Senderens, H. A. d'Andogne, and H. René. Fr. Pat. 312,615, July 11, 1901.

The process is carried out by allowing hydrogen, alone or mixed with water-gas, to act in the dry way upon nitrobenzene or similar nitro-compounds in the presence of finely-divided metals, such as copper, nickel, cobalt, iron, or platinum.—H. L.

Indoxyl Derivatives [Indigo] from Aromatic Glycines; Manufacture of ——. Deutsche Gold- und Silber-Scheide Anstalt vorm. Roessler. Fr. Pat 312,763, Supplement, Aug. 16, 1901.

One part of sodamide, 4 parts of caustic potash, and 3 parts of caustic soda are heated together from 180°—210° C., and to the melt are added two parts of the potassium salt of phenylglycine. (See this Journal, 1902, 111.)—F. N.

Indoxyl Derivatives [Indigo] and Homologues; Manufacture of ——. Deutsche Gold- und Silber-Scheide Anstalt vorm. Roessler. Fr. Pat 312,763, Supplement, Aug. 22, 1901. (See this Journal, 1902, 111.)

It is found that a good yield of indoxyl (or its homologues) is obtained if the potassium salt of phenylglycine (see above) is substituted by "phenylglycine-phenylglycine" (phenylglycine-pheoylglycide, $CH_2.COOH.C_6H_5N.CO.CH_2.NH.C_6H_5$ J. prakt. Chem., [2], **40**, 432, and Ber., **22**, 1863).

The fusion with sodamide is carried out essentially as in the example given in the chief Fr. Pat. 301,339.—F. N.

Green-Black Colouring Matters [Direct Cotton Dyes] containing Sulphur; Production of ——. Chemische Fabrik Brogg Actienges. vormals Zimmermann and Co. Fr. Pat. 313,586, Aug. 19, 1901

Dyestuffs directly dyeing cotton in green shades, which become black on oxidation, are obtained by fusing the salts of benzene or toluene or xylene sulphonic acids (or mixtures of these substances) with sodium sulphide and sulphur. In place of the salts of these acids, the corresponding free acids, or the sulphonic chlorides or the sulphamides, may be used.—F. N.

Mono-azo Dyestuffs [Orange to Red] suitable for the Preparation of Lakes; Production of ——. [*Dyestuffs. Iso.*] Comp. Parisienne de Couleurs d'Aniline. Fr. Pat. 313,598, Aug. 19, 1901.

Diazotised *o* nitraniline-*p* sulphonic acid or *p*-nitraniline-*o*-sulphonic acid is combined with β-naphthol.—H. L.

Orange to Red Mordant Dyestuffs; Production of ——. Compagnie Parisienne de Couleurs d'Aniline. Fr. Pat. of addition, 305,491, Aug. 22, 1901.

In the chief patent, 305,491, dyestuffs are described which are prepared for diazotising *o*-aminophenol and combining the diazo compound with 1-phenyl-5-pyrazolone. In place of the first component, the use of the following derivatives is now claimed: — 3-amino 2-cresol-5-sulphonic acid; 3-amino-4-cresol-5-sulphonic acid; 3-amino-4-cresol-6 sulphonic acid; 3-amino-5-nitro-4-cresol; 3 amino-6-nitro-4-chlorophenol; 8-amino-4-chlorophenol-6-sulphonic acid. The dyestuffs thus obtained are generally of a bluer and finer shade than those described in the chief patent.—F. N.

Disazo Colour for Wool; Production of ——. Compagnie Parisienne des Couleurs d'Aniline. Fr. Pat. 313,748, Aug. 23, 1901.

o-p-Diaminophenol-*o*-sulphonic acid is obtained by reducing the corresponding dinitrophenol-sulphonic acid. It has not hitherto been described. A brown dyestuff for wool is obtained if this acid be tetrazotised and combined with 2 mols. of β-naphthol. On chroming, the brown shade is converted into a black.—H. L.

Aromatic Nitro Bodies; Reduction of ——. Boehringer and Sons. Fr. Pat. 313,599, Aug. 19, 1901.

It is claimed that the reduction of aromatic nitro bodies to the corresponding amino derivatives may be effected by means of copper in acid solution. The advantage of the method is that the copper which goes into solution may be very readily recovered electrolytically. 3·81 kilos. of copper, 6 kilos. of concentrated hydrochloric acid (38 per cent.), and 12·3 kilos. of nitrobenzene are intimately mixed in an apparatus provided with a reflux condenser. The reduction takes place with evolution of heat, and an almost quantitative yield of aniline is obtained. (See Eng. Pat. 25,100, Jan. 9, 1902.)—H. L.

Azo Dyestuffs capable of being Chromed on the Fibre; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 313,671, Aug. 21, 1901.

m-Diaminophenol-*p*-sulphonic acid is tetrazotised and combined with 2 mols. of the same or of a different amine or phenol. Identical substances are obtained from diaminochlorobenzene sulphonic acid, which is prepared by the reduction of the dinitrochlorobenzene sulphonic acid described in Fr. Pat. 287,180, 1899, and has not hitherto been described. During the processes of tetrazotisation and combination, the chlorine atom in this acid is replaced by an hydroxyl group. With 2 mols. of β-naphthol, a brown dyestuff for wool is obtained, which develops into a black after chroming. Two mols. of *m*-phenylenediamine yield a red-brown, which turns to a black-brown; with 1 mol. of α-naphthylamine and 1 mol. of β-naphthol, a red-brown dyestuff is formed, which, after treatment with chrome, converts into a blue-black.—H. L.

Black Dyestuff for Cotton; Production of ——. [*Dyestuffs, Sulphide.*] Badische Anilin und Soda Fabrik. Fr. Pat. 313,773, Aug. 24, 1901.

The production of a blue-black dyestuff (Immedial black) by melting *o-p*-dinitro-*p*-oxydiphenylamine with sulphur and an alkaline sulphide is described in Fr. Pat. 271,909 (1897). The present claim is for the production of a green-black dyestuff directly dyeing cotton, by treating *o-p*-dinitro-*p*-oxydiphenylamine with sulphur and an alkaline sulphide in the presence of a copper salt. (See this Journal, 1902, 43, 112.)—H. L.

ω-Cyanomethylaniline and Derivatives thereof; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 313,872, Aug. 29, 1901.

Anhydroformaldehyde aniline or anhydroformaldehyde compounds of other aromatic amines are treated with bisulphite. The bisulphite compounds thus obtained react with metallic cyanides to form ω-cyanomethylaniline or its derivatives. The following equations show the two phases of the reaction :—

$$(1)\ C_6H_5N{:}CH_2 + HSO_3Na = C_6H_5NH.CH_2.SO_3Na.$$

$$(2)\ C_6H_5NH.CH_2.SO_3Na + KCN = KNaSO_3 + C_6H_5NH.CH_2CN.$$

The cyano compounds so obtained (see Fr. Pat. 300,287, April 21, 1900) are intended for the manufacture of Indigotine and of derivatives thereof. (See also H. Erdmann, Fr. Pat. 307,205 ; this Journal, 1902, 38.)—H. L.

Black Sulphur Dyestuff; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 313,902, Aug. 30, 1901.

p-Nitrosophenol combines, molecule for molecule, with 2.4-dinitro-1-chlorobenzene, forming an insoluble, crystalline product, m. pt. 165° C. The reaction is carried out in alcoholic solution in the presence of sodium acetate, and proceeds at the ordinary temperature. *p*-Aminophenol and dinitrophenol are obtained on reduction.

On fusing this substance with sulphur and sodium sulphide, a dyestuff is obtained which dyes cotton a green shade, which is converted into a black by oxidation. The same dyestuff is obtained if the condensation product be replaced by an equimolecular mixture of *p*-aminophenol with dinitrophenol.—H. L.

Blue Dyestuff directly dyeing Cotton ; Production of ——. [*Dyestuffs, Sulphide*] Kalle and Co. Fr. Pat. 313,737, Aug. 23, 1901.

The dinitro-oxydiphenylamine obtained by the condensation of *p* aminophenol with 2.4-dinitro-1-chlorobenzene can be partially reduced to a nitro-amino-oxydiphenylamine, which crystallises in red-brown needles, m. pt. 204° —205° C. This substance is condensed with two molecular proportions of 2.4-dinitro-1-chlorobenzene by boiling the alcoholic solution of the two bodies for a short time in the presence of an alkaline salt. The reaction product crystallises in red needles, m. pt. 180°—182° C., and is converted into a blue dyestuff by the action of sodium sulphide and sulphur. For example : 8 kilos. are introduced at 100° C. into a mixture of 40 kilos. of sodium sulphide, and 14 kilos. of sulphur and a little water. The temperature is then slowly raised to 140° C., and kept at that point for from 2—5 hours. The pulverised melt may be directly used for dyeing, and produces clear, steel-blue shades on unmordanted cotton.—H. L.

Blue Dyestuff directly dyeing Cotton ; Production of ——. [*Dyestuffs, Sulphide.*] Act. Ges. für Anilin Fabr. Fr. Pat. 313,917, Sept. 2, 1901.

In preparing a blue dyestuff from *p*-dimethylamino *p*-oxydiphenylamine (Immedial sky-blue), it is difficult to avoid the formation of by-products, and for this reason the temperature of the melt must be kept below 120° C. (Fr. Pat. 305,524 ; this Journal, 1900, 41), and a subsequent purification is recommended (Fr. Pat. 305,494). It is claimed here that by the addition of glycerin to the melt subsequent purification is not necessary, and that the reaction may be carried out at 130° C.—H. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Waterproofing Paper, Cardboard, Cloth ; Varnish for ——. S. de la Grange.

See under XIII. B., *page* 179.

Acetone Oil ; Manufacture of ——, *from Wool Washings.* A. and P. Buisine.

See under III., *page* 164.

Hat Dyeing ; Substitutes for Nitrate of Mercury in ——. Deutsche Hutmacher Zeit. ; through Textile Colorist, 1901, **23**, [276], 364.

In the preparation of hat bodies, they are treated with nitrate of mercury solution ; this treatment effects the removal of the cortex of the hairs, and results in better felting and quicker and more uniform action both of mordants and dyestuffs. Nitrate of mercury, however, is not only dangerous to the workmen who come into contact with it in the dye-house, but it always leaves behind poisonous matter, which, during the processes undergone by the felt in the dry state, escapes into the air in the form of dust, and is a source of great danger to the workpeople. The use of the mercury salt is now not essential, as efficient substitutes, of a non-poisonous character, have been introduced. For instance, potassium permanganate dissolved in 40 times its weight of water, is applied, by means of brushes, to the hair at a temperature of about 85° F., and the hat bodies are then dried at about 140° F. It is advantageous to add about 1 lb. of sulphuric acid to every 150 lb. of the permanganate solution.

Another substitute for nitrate of mercury is hydrogen peroxide. The hairs are steeped for a short time in a 3 per cent. solution of hydrogen peroxide, rendered faintly alkaline with ammonia or soda, then wrung and dried.

—A. S.

"Indigo Salt T" [Calico Printing] ; An Application of ——. E. C. Kayser. Färber-Zeit., 1901, **12**, [24], 374—376.

A mixture is made of 30 grms. of Kalle's "Indigo Salt T," dissolved by the aid of heat in 60 c.c. of sodium bisulphite solution at 58° Tw., 450 grms. of gum-arabic thickening, and 45 grms. of tannic acid, dissolved in 50 c.c. of water. This is printed, and dried at a low temperature. The printed tissue, which must be protected as much as possible from the light, is without delay over-printed with caustic soda dye (equal volumes of a solution at 76° Tw. and gum-arabic solution). This has the effect of simultaneously discharging the tannic acid and developing the Indigo (see this Journal, 1893, 988). The tissue is again dried at a low temperature, and is then steamed for half a minute, to complete the action of the alkali upon the tannic acid. It is next passed through a bath of tartar emetic, acidified with acetic acid. Then it is well washed, dyed with a suitable basic dyestuff, such as Safranine, Rhodamine 6 G, Rhoduline Red or Auramine, well rinsed, first in cold, then several times in boiling water, to which a little tartar emetic is added. After this, the tissue is soaped, rinsed, dried, cleared in a "steam-chloring" machine, and finished. Irregular designs in red or yellow, and blue on a white ground are thus obtained.

A modification of the style consists in padding the cotton tissue with tannic acid and tartar emetic, printing a thickened solution of "Indigo Salt T" (30 grms. per litre), drying, over-printing with caustic soda, steaming for half a minute, washing, dyeing the parts of the tissue undischarged by the caustic soda with a basic dyestuff, and clearing.

—E. B.

Basic Dyestuffs [Calico Printing] ; Proposed Methods of Discharging ——. G. Hofmann. Färber-Zeit., 1901, **12**, [24], 377—378.

The following methods of obtaining coloured discharges upon grounds dyed with basic dyestuffs, are suggested as being possibly of technical value :—

1. Printing a mixture of caustic soda and a direct-cotton dyestuff upon a ground dyed with a basic dyestuff upon an antimony tannate mordant.

2. Over-dyeing a direct-cotton dyestuff with a basic dyestuff and printing caustic soda, to modify the shade of or completely discharge the basic dyestuff.

3. Dyeing upon an antimony tannate mordant with a mixture of two basic dyestuffs, of which one is, and the other is not, dischargeable by alkali, and then printing with

caustic soda: thus, from a mixture of Brilliant Green and Bismarck Brown, a brown pattern upon an olive ground is produced.—E. B.

ENGLISH PATENTS.

Fabrics, Felts, Feathers, Furs, and other Materials; The Waterproofing of ——. P. Grenet and A. Bachelard, Saint-Etienne, France. Eng. Pat. 13,562, July 3, 1901.

THE material is first immersed in a bath of tepid water, containing, if the materials are not new, 2 per cent. of soap; they are then placed in "a benzene solution" containing 2 to 5 per cent. of a mixture of alum, 10 parts; carbonate of soda, 2 parts; and 1 to 3 per cent. of paraffin; finally, they are dried.—J. W. H.

Yarn Mercerising Machine. M. Friogs, Paris. Eng. Pat. 23,470, Dec. 22, 1900. (Date claimed, under International Convention, May 26, 1900.)

HANKS of yarn are placed upon two shafts, one above the other, which project outwards from opposite sides of supporting casings, attached to the framework of the apparatus which is the subject of this invention. The lower pair of arms and casing are balanced by a counterpoise, and are readily movable up and down for the purpose of facilitating the removal of the hanks which have been treated, and their replacement by others, and of securing the requisite degree of tension for them during the mercerising operation, the distance between the shafts being to this end mechanically adjustable. The lower arms revolve in vessels into which a solution of caustic soda is forced when the hanks are in position for mercerising. After the lapse of a certain time, this solution is withdrawn, the hanks are allowed to drain, and water is then sprayed upon them to remove the alkali, these several operations being performed automatically by means of suitable mechanism, consisting of levers, rods, cams, &c., and lasting for predetermined periods of time.—E. B.

Mercerising Vegetable Fibres; Process and Apparatus for ——. P. Bourcart, Remiremont, France. Eng. Pat. 21,645, Oct. 28, 1901.

LOOSE vegetable fibres *m* (see figure), for instance cotton in the form of sliver, are placed between two endless bands *d*, *e*, of wire gauze, and passed round perforated drums *a*, *b*, *c*, successively through baths of caustic soda, water, and acid. The drums are divided into compartments, into which the caustic soda and acid solutions are drawn from the troughs

Dyeing and otherwise Treating Yarn or Rovings; Apparatus for ——. J. C. Hamer, Radcliffe. Eng. Pat. 4279, Feb. 28, 1901.

A MOVABLE carrier is placed inside a tank, provided with a liquor inlet, at the side, and a liquor outlet, at the bottom, and connected with a pump for circulating the liquor employed. The bottom of the carrier is cone-shaped, and fits into the outlet, which is of the same shape. The perforated hollow spindles upon which the yarns or rovings to be treated are wound, are placed upon the sides of the carrier, in suitable apertures.—E. B.

Dyeing and otherwise Treating Fibrous Material in a Spun or other State; Apparatus for ——. J. C. Hamer, Radcliffe. Eng. Pat. 4280, Feb. 28, 1901.

FIBROUS materials, in a loose or spun state, are placed, for the purpose of dyeing, in perforated baskets around the periphery of a drum set in a tank and made to revolve upon a horizontal, perforated, hollow axis. Dye-liquor is forced into the latter from a perforated pipe fixed in its centre, and is sprayed downwards upon the bottom of the baskets as they pass underneath the pipe.

In a modification of the apparatus, in addition to the central supply pipe, liquor-supply pipes are provided at the sides of the drum, which dip into the tank, raising the liquor and causing it to flow through the materials contained in the baskets when the apparatus is in use.—E. B.

Indigo: Printing Textile Materials with ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Germany. Eng. Pat. 1159, Jan. 17, 1901.

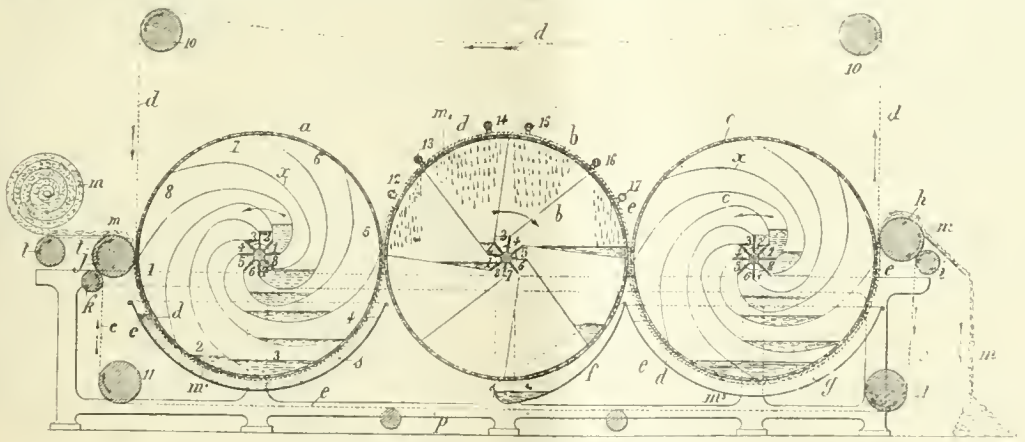
A MODIFICATION of Eng. Pat. 22,402 of 1900 (this Journal, 1901, 1111) and Fr. Pat. 294,525. See Fr. Pat. 306,137; this Journal, 1902, 50.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphurous Acid Solutions; Specific Gravity of ——. *Influence of the Method of Preparing the Gas.* H. Pellet. Bull. Assoc. Chim. Sucr. Dist., 1901, 19, [6], 752—736.

THE author has repeated the determinations of the specific gravity of different solutions, and has obtained results differing greatly from those given by Wurtz. He gives the following table of specific gravities of sulphurous acid solutions at 15° to 17° C.:—

Sulphurous Acid in 100 c.c.	Specific Gravity.
1	1007·5
2	1015·0
3	1022·5
4	1030·0
5	1037·5
6	1045·0



APPARATUS FOR MERCERISING UNSPUN FIBRES.

s and *g* respectively, through the materials, to hollow trunnions at the axes of the drums, whence they are returned to the troughs. The washing is effected on the counter-current principle by means of a system of perforated pipes 12 to 17, arranged above the drum *b*, a great part of the caustic soda previously applied being recovered. The drum *e* may be dispensed with, if desired.

The fibres treated in this way are prevented from contracting, and are given a silky lustre.—E. B.

He has rarely met with a solution having a greater specific gravity than 1045 at 15° to 17° C.

He shows that the maximum strength of aqueous solutions varies with the quality of the gas from which they are prepared, and that the purer the gas the stronger the solution. This explains the difference in the specific gravity of different solutions, each supposed to be saturated with sulphur dioxide. Moreover, the strength of a solution saturated with sulphurous acid obtained from a gas rich in sulphur dioxide can be reduced by the introduction of a gas containing less sulphur dioxide.—C. A. M.

Sulphuric Acid; Manufacture of —— by the Contact Process. R. Knietsch. Ber., **34**, [17], 4069—4115.

A LECTURE delivered to the German Chemical Society. In the historical introduction, four periods are indicated: the first beginning with Phillips' application, in 1831, of the catalytic action of platinum first noticed by Humphry Davy in 1817, to the formation of sulphur trioxide; the second, dating from the discovery of Wöhler in 1852, that many oxides and other substances possessed catalytic powers; the third, from Winkler's conclusion that it was necessary to use a mixture of the reacting gases in the proportions in which they react, and that excess of either gas hindered the reaction; and the fourth, in which chemists again strove to effect complete reaction with the gases from the pyrites burners. Not much progress had been made when the author first studied the subject, and it was from theoretical considerations, rather than from the practical results previously attained, that any hope for the future was derived.

Experiments made with pure sulphur dioxide largely diluted with air were first made, and it was found that practically complete conversion of the sulphur dioxide into trioxide occurred; so that this great dilution in no way hindered the reaction. The experiments were now continued, using burner-gases taken direct to the laboratory from the burners by a long leaden pipe; this pipe acted as a settler, and removed dust and ashes, and the gases were further cleaned and dried by passing through several wash-bottles containing sulphuric acid, before reaching the tube containing the contact substance. In these experiments also, nearly complete reaction occurred, and the contact substance, even after many days, showed no lessening of its activity. Experiments on the large scale were therefore undertaken; but, though the gases were cleaned and purified exactly as in the laboratory experiments, and in addition passed through dry coke and asbestos filters, yet the activity of the contact substance gradually diminished to zero. Laboratory experiments showed that certain substances—prominent among them arsenic—exerted a "poisonous" action on platinum, very small amounts being enough to destroy altogether the catalytic activity of the metal; and in the white cloud of sulphuric acid which was always present in the gases, even after the long purifying treatment, the presence of arsenic was proved. To effect the complete purification of the gases has been one of the most difficult problems in the development of the process; to achieve it, the most thorough and intimate agitation and mixture with water or sulphuric acid is necessary, and must be continued, whatever apparatus be used, till optical as well as chemical purity is reached. Some interesting facts have been arrived at during these investigations. The gases should be slowly cooled; if cooled quickly, the sulphuric acid cloud is much more difficult to remove by the subsequent treatment. At first, long iron pipes were employed for this purpose, as the concentration of the acid contained in the gases was so high that, if it should attack the iron at all, only an evolution of sulphur dioxide was to be expected; but, in spite of the optical purity of the gases, slow but certain deterioration of the contact substance occurred, and only after long and laborious work was this effect traced to arsenic in a gaseous form, proceeding, without doubt, from the attack of the iron by the acid. When contact between the gases and the iron was prevented, this deterioration no longer occurred. When working the burners hard, a cloud often appeared, which resisted all attempts to remove it; it turned out to be sulphur, and contained arsenic, which affected the contact substance as before. This cloud was finally dispersed by thorough mixture and agitation of the hot gases, so as to burn the sulphur completely. This was effected by blowing in steam, and several collateral advantages were found to follow: the acid present was diluted and condensed, so that it did not reach and act on the iron or lead pipes, and the formation of hard crusts of flue-dust in the pipes was very much lessened.

The reaction $SO_2 + O = SO_3$ evolves 22,600 calories. But little attention has been paid to this fact; and the early forms of contact apparatus were so arranged as to be heated to redness and kept at that temperature by outside heat. The apparatus under the author's care consisted of a series of parallel vertical tubes, the lower halves packed with contact substance, and having heating arrangements at the bottom and at the middle. When (the whole having been brought to a red heat) the lower heat was shut off, and cold air allowed to circulate around the lower halves of the tubes, not only did the yield rise, but the rate of passage of the gases could be greatly increased without lessening the completeness of the reaction.

Thus, the reaction once started, cooling instead of heating was seen to be necessary; and, indeed, not only can the lower heat be shut off at this stage, but the cooling air is so far heated by the heat of the reaction itself, that it partially serves to heat the incoming gases in the upper part of the tubes, and the middle heat is only needed as a supplement. Under these circumstances, and when the most favourable conditions as to rate of passage are reached, only the upper portion of the contact substance is visibly red hot. Further progress has been made in this direction, so as either on the one hand to use the purified burner gases themselves as cooling gases, and thus heat them directly, or to utilise the heat of the gases as they leave the contact chamber. Besides the direct economy of fuel effected by thus utilising the heat of reaction, overheating is prevented, and the life of the iron apparatus correspondingly prolonged, while maximum efficiency and greater durability in the contact substance are secured.

It is noteworthy that the reaction proceeds under these circumstances almost quantitatively at the atmospheric pressure, and that no compression is necessary, as was thought to be the case in the early days.

The packing of the asbestos is a matter of some importance; it must not be so loose that the gases can pass through without contact, nor yet so packed as to cause great resistance to the passage of the gases. It is best packed in layers on perforated plates strung on an iron rod, kept at a little distance from one another by projections; in this way all the tubes of the apparatus can be similarly and evenly packed.

Since the heat of solution of sulphur trioxide in water is much greater than that of its solution in oil of vitriol, it might be expected that the easiest and most complete absorption of trioxide from the contact process would be effected by the use of water. It is found, however, that oil of vitriol containing 97—98 per cent. of H_2SO_4 is much more effective than either water or sulphuric acid of any other strength; and in practice a single absorption vessel is sufficient for even a very rapid stream of gas, provided the strength of the acid be kept uniform by the regular addition of water and the regular overflow of the acid formed.

This particular concentration of acid is marked by several of its physical properties:—The boiling point is a maximum and the vapour pressure a minimum at this concentration; the specific gravity is also a maximum, while the electrical resistance suddenly begins to rise at this point, towards a maximum at 100 per cent. H_2SO_4, and the action on iron sinks considerably.

When fuming sulphuric acid is to be made, more than one absorbing vessel may be needed. Cast iron becomes unavailable here, not because it is rapidly attacked, but because it readily fractures or explodes. This appears to be due to the fuming acid diffusing into the iron, and there slowly evolving sulphur dioxide and hydrogen sulphide, thus causing a condition of internal stress. Wrought iron is attacked by fuming acid containing less than 27 per cent. of SO_3, but when the content of SO_3 exceeds this, the acid has practically no action on wrought iron, and vessels of

this substance can be used for years without sensible corrosion.

The results of many experiments showing the influence on the reaction of variations in the temperature, the composition of the gases, and the rate of flow (or the proportion of contact-substance) are given in the form of curves, and discussed. It results from these, first, that the law of mass-action holds here as in other cases, so that complete reaction is impossible with the gases mixed in exact stochiometrical proportions, and the complete conversion of either gas is only effected by having an excess of the other; and next that, using chamber gases (say 7 volumes of sulphur dioxide, 10 volumes of oxygen, and 83 volumes of nitrogen), the nitrogen is without influence, save as a diluent, affecting the rate, and that the limit of the reaction is dependent solely on the temperature, and not upon the nature of the contact-substance. As to temperature, below 200° C. there is no reaction; above 900°—1000° sulphur trioxide is dissociated; between these limits the reaction occurs, reaching a maximum about 450° C. While, then, as above stated, the nature of the contact-substance is a matter of indifference as far as completeness of reaction goes, we must, for rapidity, use a contact-substance possessing its greatest activity about 450° C. The only contact-substance yet known fulfilling this condition, is platinum.

The growth of the production of sulphuric acid by the contact process in the Badische Company's works is shown by the following figures :—

	Tons.
In 1888.....	18,500
„ 1894.....	39,000
„ 1899.....	89,600
„ 1900.....	116,000

At the end of the paper are given a series of tables embodying an exhaustive set of determinations, for sulphuric and fuming sulphuric acid of various strengths from 1 to 100 per cent. of SO_3, of :—1. Melting point. 2. Density. 3. Specific heat. 4. Heat of solution. 5. Electrical resistance. 6. Boiling point. 7. Vapour pressure. 8. Viscosity. 9. Capillarity. 10. Action on iron. These are all illustrated graphically by curves, both separately and together, and the connexion of their variations with one another, and with the existence of hydrates of the acid, as well as some of their technical bearings, are discussed in the paper.—J. T. D.

Cupric Hydroxide; Action of —— on Solutions of Metallic Salts. A. Mailhe. Comptes Rend., **134**, [1], 42—45.

The author has extended his observations (this Journal, 1901, 943) to the metallic sulphates. In the cold, tetracupric hydroxide yields slowly, at 25°—30° C. more quickly, with sulphates of cadmium or nickel, salts of the formula, $2MSO_4.3CuO.12H_2O$. At 100° C. the salt formed, with either of these metals or with cobalt, is $2MSO_4.3CuO.10H_2O$, while the cobalt salt formed in the cold is—

$$3CoSO_4.5CuO.16H_2O.$$

Zinc sulphate in the cold yields a great variety of salts, according to the concentration of the solution and the amount of copper hydroxide added; but on boiling always gives $2ZnSO_4.3CuO.12H_2O$. In all cases copper is found in the solutions after the experiment. No displacement of metal occurs with manganous sulphate, while complete displacement of the metallic oxide or hydroxide occurs with mercuric, ferric, or aluminium sulphate.—J. T. D.

Ammoniacal Liquor; Supply of Lime in Working up ——. E. Blum.

See under III., *page* 167.

Hydrocyanic Acid, and Ammonia, from Nitrogen, in the Electric Furnace. H. Hoyermann.

See under III., *page* 166.

English Patents.

Gases or Liquids; Means to be employed in Absorbing, Precipitating, Distilling, Lixiviating, and generally for Subjecting Matter to the Action of ——. G. W. Johnson, London. From P. Naef, New York, U.S.A. Eng. Pat. 23,754, Dec. 28, 1900.

The invention relates to the construction of columns, with diaphragms of various kinds, for the precipitation of bicarbonate from alkaline solutions or ammoniated brine, for distilling liquids containing ammonia compounds, &c.; coned, concave, inclined, perforated, or reticulated diaphragms or combinations of these are claimed.—J. W. H.

Nitric Acid; Manufacture of ——, and Apparatus therefor. A. G. Bloxam, London. From Chemische Fabrik Rhenania, Aachen, Germany. Eng. Pat. 3305, Feb. 15, 1901.

The manufacture of nitric acid by acting on nitre with sulphuric acid, or with a polysulphate, is conducted in two stages. Two retorts, worked alternately, are set, one in each branch, from the main furnace flue, while below, in the main flue, a third retort is set, receiving more heat, and supplied with valved inlet pipes, one from each of the superior retorts, for passage of the charge from the latter. The furnace is so constructed that the hot gases can be directed to either of the upper retorts. The process is carried out by running fused "polysulphate" on to saltpetre placed in one of the upper retorts, and when the greater part of the nitric acid obtainable is distilled off, the molten contents are slowly run into the lower retort (which already contains some bisulphate, as it is never entirely emptied), and the remainder of the nitric acid is distilled. Meanwhile, the other upper retort has been similarly charged and worked; but before the contents are run into the lower retort, the latter is caused to partially discharge its contents, which, with added sulphuric acid, are run into a closed receptacle set externally on the furnace, and run thence into a bucket to supply the upper retorts, the process being thus continuous, with alternate use of the upper retorts.—E. S.

Water-Glass, Alumina, Alums, and Aluminium Sulphate; Method for the Industrial Working of Elæolite and Minerals of Similar Composition for the Production of ——. K. Dementjeff and J. Ousihkoff, both of Elebuga, Russia. Eng. Pat. 14,953, July 23, 1901.

Three methods are claimed for the treatment of elæolite and other minerals of the leucite group. (1) *With Sulphurous Acid:* The mineral may be wetted and exposed to the action of gaseous SO_2, or the aqueous acid may be used. Solution is complete, except as to foreign bodies, which are separated by filtration. The solution, on continued heating, deposits aluminium sulphite and gelatinous silica, while the alkalis remain in solution. The deposit is treated with sulphuric acid to obtain alum cake, the sulphur dioxide evolved is collected for re-use, and the residue of silica is used in the production of water-glass. (2) *With Sulphuric Acid:* The mineral is stirred in sulphuric acid of 10° B. The cleared solution after a time, and especially on heating, becomes gelatinous, when it is boiled with water and filter-pressed. The residue is made into water-glass by means of caustic soda. The solution contains alkali metal, alums, and aluminium sulphate, and is treated to obtain these. (3) *With Hydrochloric Acid:* Small quantities at a time of the mineral are agitated with HCl of 8° to 10° B., and the cleared solution is heated to throw down gelatinous silica. The filtrate is concentrated and heated until the aluminium chloride is decomposed. By lixiviating, alkali chlorides are obtained in solution, and a residue of alumina remains.—E. S.

Cyanides; Manufacture of ——. E. C. Rossiter, Birmingham; H. W. Crowther, West Bromwich; and G. S. Albright, Egbaston. Eng. Pat. 4403, Mar. 1, 1901.

Copper sulphocyanide is dried, mixed with finely-divided copper, and heated, at first gently, and at last to 400° or 500° C., in a current of hydrogen, or of coal-gas or the like, freed from oxygen, carbon dioxide, and moisture. Cuprous sulphide is formed and hydrocyanic acid gas evolved, which latter, with the excess of hydrogen, is passed into a solution of caustic alkali; the solution is then concentrated in vacuum pans to obtain a solid cyanide. The residue of cuprous sulphide is roasted to obtain the oxide, part of which is utilised in producing sulphocyanide, and part is reduced to metal by hydrogen for use in the next operation.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Processes of Oxidation and Reduction in Melting ——. G. Rauter. Zeits. angew. Chem., 1902, **15**, [1], 7—8.

A number of equations are suggested as probably expressing the interaction of the constituents of glass, but no experimental proofs are given.

The reaction between silica and sodium sulphate causes large volumes of sulphur dioxide to escape from the furnace.

Sodium sulphate is now less often used as a means of colouring glass yellow by its reduction with carbon; its place has been taken by metallic oxides.

Uncertain results are obtained, owing to the formation of sodium pentasulphide when the mass is heated beyond a certain point; this gives a browner shade than the monosulphide first formed.—J. N. G.

Glass; The Dulling of Window ——. M. Stoermer. Sprechsaal, **34**, [34], 1173—1174.

The cause of window glass becoming dull during storage, is traceable to an unduly high proportion of alkali, the glass so prepared being unable to stand the action of atmospheric influences. Weber has shown that a durable glass can be obtained by the use of equal numbers of molecules of aluminium trisilicate, lime, and alkali, also that with a larger proportion of silica, the amount of the alkali can be increased; and again that the silica may be diminished provided the lime be increased in relation to the alkali.

The author has found in several instances that good results may be obtained by adjusting the proportion of silica, lime, and alkali to 5·32 : 1 : 1, *e.g.*, by taking:—sand 160 parts, calcined sodium sulphate 75, powdered marble 50, and coke 4—5 parts. About three parts of the sodium sulphate may be replaced by an equal quantity of potash; and, in one instance where the pots in the corner of the furnace required about three hours longer than the rest, it was found possible to accelerate these by replacing six parts of the sodium sulphate by potash.—C. S.

Mirror Glass; Backing Silvered ——. E. N. Sprechsaal, **34**, [40], 1398.

See under XIII. B., *page* 179.

Glass; Defects in ——. C. Jung. Sprechsaal, **34**, [45], 1575—1576.

Bubbles in glass are the result of low temperature in the furnace, the glass being insufficiently fluid to permit the escape of gases liberated from the charge of glass metal; they may also, however, when the charge contains excess of alkali, be due to continuous volatilisation of minute quantities of the latter. Though spoiling the appearance of the glass, they do not impair its durability.

Stony concretions are caused by introducing the glass metal into a cooled kiln, the result being merely superficial melting of the mass, and hence the formation of globular lumps containing an unfused core. They may be obviated by using softer charges of metal when the pots are half emptied, and by employing a higher fusing temperature.

Another frequent defect is cloudiness produced by refractory drops forming on the covers of the pots, and falling thence into the glass charge. This can be prevented, to a large extent, although not entirely obviated, by a suitable construction of the covers.

Irregular stripes are produced by the use of cullet of different degrees of hardness, and indicate the path traversed by the more refractory particles under the influence of the air blast; or they may be the result of unequal density caused by differences of temperature in various strata of the glass charge during the use of the blast.

A smoky tinge is imparted to glass usually by an excessive proportion of lime in the charge; and cloudiness is caused by frequent heating up of the glass, partial devitrification being the result.—C. S.

Porcelain; Iron Spots in ——. Sprechsaal, **34**, [45], 1574—1575.

Although it is desirable to have the raw materials as free as possible from iron, the mechanical condition of the latter has more influence on the formation of spots in porcelain than the actual content, since, if present in a finely-divided state, iron merely colours the ware a yellowish tinge without spotting. The accidental intrusion of iron fragments, such as filings, or dust mixed with oil, is a more serious danger.—C. S.

English Patent.

Earthenware Bodies; The Deposition of Metals on ——. G. W. Laybourn, Stoke-on-Trent. Eng. Pat. 24,328, Nov. 29, 1901.

The earthenware bodies are soaked in water, dusted with plumbago, and placed in the ordinary electroplating bath; mention is also made of incorporating a suitable conducting substance with the clay before firing.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Bricks of Lime and Sand; Method of Producing ——. Thonind. Zeit., **25**, [106], 1712.

The process of P. and J. Lopatin and W. Galecki (Ger. Pat. of March 10, 1899) consists in saponifying with soda the residue from the distillation of tar, mixing the product with milk of lime, and employing the whole as a binding agent for sand. The proportions taken are as follows:—Tar residue, 4 litres; soda, $\frac{3}{4}$ kilo.; milk of lime, 130 litres; and of this mixture a quantity equivalent to 5—10 parts of slaked lime is taken to 100 parts of fine sand. The plastic mass is moulded under a pressure of about 250 atmospheres, and the bricks, after drying for some time at 20° C., are finally exposed to the simultaneous action of carbon dioxide and dry superheated steam, under a pressure of about six atmospheres.

The milk of lime causticises the soda, the active ingredients in the product being therefore quicklime, caustic soda, saponified or emulsified tar constituents, and calcium carbonate. The first two combine with the sand, to form silicates—an operation facilitated by the pressure and superheated steam, whilst the carbon dioxide combines with the residual quicklime and caustic soda, the tarry matters becoming uniformly distributed through the mass and rendering the bricks impervious to atmospheric influences.—C. S.

Bricks; Clinker ——, from Fusible Clay. R. Thonind. Zeit., **25**, [104], 1687—1689.

To prepare good clinker bricks from calcareous clay, in a ring kiln which will furnish well-burned ordinary bricks at a kiln-temperature equivalent to Seger cone 07—06, the author recommends the following method.

The bricks above the protecting wall and nearest the sides should be set rather farther apart than those towards the centre of the kiln. The charge should be also properly dried before being placed in the kiln, and the latter should be well dried by fire heat before the baking process is commenced, gas coke being the best fuel for this preliminary heating.

For firing the charge, long-flame small coal, screened through a 15 mm. sieve, forms a suitable fuel, the larger separated portions being used for steam-raising. In heating up a chamber of the kiln, the fuel is added in small quantities every half hour, the next chamber receiving a larger supply at the same intervals, whilst the two following chambers are fed, every quarter of an hour, with just as much coal as they can consume in that time. This forced firing in the said two chambers is continued until the temperature attains that of Seger cone 011. The fifth chamber being assumed to have reached this stage, the feed is reduced to every half-hour, until the temperature is that of Seger cone 09, whereupon a still further reduction is made, at intervals of one hour, until cone 06 begins to bend. This method of firing ensures the production of uniformly hard burnt bricks, and is indeed necessary in the case of

fusible clays, since these require special care in the kiln. It is advisable to provide a clockwork signal, marking the quarters and half hours, for the guidance of the fireman, and also to mark the peep-hole doors, to indicate which chambers are to be fed at the different intervals mentioned. The Seger cones are placed (six in a chamber) about 10 ins. above the floor at the beginning and end of the chamber. A peep-hole is arranged in the end door, and three others about 32 ins. below the arch of the kiln.—C. S.

Concrete for use in Salt Mines. Ebel. Zeits. angew. Chem., 1902, **15**, [2], 44.

The best material to prevent the incursion of water into the workings of a salt mine is Sorel's so-called magnesia cement, which is made by mixing calcined magnesia with a solution of magnesium chloride of 25 or 30 B. If the magnesia has been prepared from magnesite, it always contains carbon dioxide, and although a cement made from such impure magnesia sets very rapidly and yields a very hard concrete, the gas passes off during the setting and gives rise to the formation of cracks. If the percentage of carbon dioxide exceed a certain limit, the cement dries so quickly that it will not adhere to rock salt. When made from the magnesium chloride liquors of potash factories working up carnallite, the magnesia is free from carbonate; and supposing it to be sufficiently pure to contain about 90 per cent. of MgO, the cement prepared therefrom sets and hardens less rapidly than that mentioned above, but it yields a concrete quite free from cracks, and one which unites satisfactorily with rock salt.

Portland cement can be employed for similar purposes, provided a material which sets and hardens slowly enough be selected. The setting may be postponed by gauging the cement with the sump water of the salt mine instead of with pure water; and the more concentrated the saline solution used in mixing the cement, the more slowly will it set. Yet, finally, Portland cement gauged with salt water becomes as hard as that wetted with potable water.

If a magnesia cement concrete has to be laid under water, care must be taken that it is lowered to its destination in closed receptacles, for if it be permitted to drop through a layer of water, the magnesia becomes hydrated, the chloride dissolves, and the cement will not harden.

—F. H. L.

Cement: Influence of "Chloride of Lime" on the Setting of Portland ——. F. Hauenschild. Thonind. Zeit., **25**, [112], 1771.

The author investigated the influence of a preparation sold as "calcidum"—consisting largely of water and bleaching powder—on the setting of Portland cement. The sample of cement, when mixed with three parts of sand and 9 per cent. of water, gave the tensile strength 17½ kilos. after three days' exposure to air, and 18 kilos. after five days in the air and two under water. Under similar conditions, the cement made up with "calcidum" instead of water gave the values 24·2 and 8·5 kilos. respectively, whilst bleaching powder solution of the same strength (30° B.) gave the values 33 and and 9·2 kilos. It is thus evident that bleaching powder, though increasing the strength of cement in air, is useless for exposure to moisture.—C. S.

Cements; Determination of Alkalis in Portland and Natural ——. T. B. Stillman.

See under XXIII., *page* 191.

English Patents.

Cement; Manufacture of ——. C. Diesler, Coblenz, Germany. Eng. Pat. 23,851, Dec. 31, 1900.

The component materials, calcareous and siliceous, are intimately mixed and exposed to heated air at a temperature of 900° C. or to steam at 600°—700° C. The operation is carried out in a cylinder heated on the outside, hot air or steam being blown into the apparatus by means of the hollow shaft of an inner cylinder; the material is fed into both cylinders, and is mixed by means of blades on the hollow shaft and inner cylinder, which rotate in opposite directions.—J. W. H.

Cement; Improved Hydraulic ——. W. Michaelis, Berlin. Eng. Pat. 3768, Nov. 20, 1901.

Portland cement, owing to its high content of lime and alumina, cannot resist the action of sea-water. It is claimed that a cement which does resist such action is obtained by burning a mixture of calcareous material and an iron ore, or a manganiferous oxidised iron ore, or a by-product such as spent pyrites, with an admixture of silica if necessary, and grinding the product.—W. C. H.

Stone; Hardening of Artificial ——. Wm. Brookes and Son, London. From C. Hörisch, Berlin. Eng. Pat. 457, Jan. 8, 1901.

By this process artificial stones are hardened by exposing them to the action of gases or vapours, such as carbon dioxide or air, &c., supplied through pipes, the orifices of which are fixed on to the surfaces of the blocks; or the gases are introduced into cavities in the blocks.—W. C. H.

X.—METALLURGY.

Iron; Passive ——. A. Finkelstein. Zeits. physik. Chem., **39**, 91—110. Chem. Centr., 1901, **2**, [26], 1331.

In order to ascertain whether the passivity of iron is due to a film of oxide, or whether the iron actually behaves as a noble metal, the author carried out a series of electrical tests. It was found that passive iron behaves like platinum and not like aluminium, the passivity of which depends upon a film of oxide. The author concludes from the results of his experiments, that iron is really an alloy of ferrous and ferric iron. In a ferric salt solution, the base metallic ferrous iron goes into solution, and the noble metallic ferric iron is precipitated, but is gradually converted into the allotropic modification of ferrous iron, till equilibrium between the two modifications is attained. In soft iron, this transformation has a greater velocity than in hard iron. (See also this Journal, 1898, 585; 1900, 1151; 1901, 1116).—A. S.

Aluminium. E. Wilson. J. Soc. Arts, 1901, **50**, [2560], 54—60.

A long and detailed paper dealing with the progress made in the manufacture and technical applications of aluminium and its alloys. The author states that aluminium can be successfully soldered with a solder of the following composition:—Block tin, 28; phosphor tin (10 per cent. of phosphorus), 14; lead, 3·5; and spelter, 7 parts. All dirt and grease are first removed from the surface of the metal by means of a small quantity of benzine: the solder is then applied with a copper bit, and when the cleaned surface is covered, the metal is scratched through the molten solder with a little wire scratch brush. In this way the film of oxide on the surface of the metal is broken up, and the solder, containing its own flux, takes up the oxide and renders the aluminium capable of being "tioned" and consequently satisfactorily soldered.

Light Aluminium Alloys.—The results of a series of tests of various light aluminium alloys are given, but in comparing these results, it should be noted that the iron and silicon, which are always present, are not constant in quantity.

Copper.—Alloys containing 1·5—2 per cent. of copper show a breaking load of 40,000 lb., and a limit of elasticity of 33,000 lb. per square inch; specific resistance at 15° C., 3·3 × 10⁻⁶ ohms (pure commercial aluminium, 2·7 × 10⁻⁶ ohms); temperature coefficient, 0·0030 (aluminium, 0·0040); linear coefficient of expansion, 0·000024 (aluminium, 0·0000234).

Zinc.—Addition of zinc up to 2 per cent. does not improve the tensile properties of aluminium-zinc alloys, the breaking load for the alloy with 2 per cent. of zinc being less than that for the alloy with 1·2 per cent. of zinc. Zinc alloys have greater conductivity than the corresponding copper alloys.

Nickel.—The alloy containing 2·2 per cent. of nickel has a breaking load of 38,600 lb., and a limit of elasticity of 20,300 lb. per square inch.

Nickel-Copper.—The alloy containing 1·29 per cent. of nickel and 1·08 per cent. of copper is characterised by its comparatively low percentage extension (0·146 with 16,250 lb per square inch), its high coefficient of expansion (0·0000252), and its low temperature coefficient (0·00178). Its specific resistance is 3·41 × 10−6 ohms at 15° C.; breaking load, 15,900 lb., and limit of elasticity, 36,600 lb. per square inch.

Nickel-Iron.—The alloy containing 2·6 per cent. of iron and 1·39 per cent. of nickel gave the following results:—Breaking load, 42,200 lb., and limit of elasticity, 24,400 lb. per square inch; specific resistance, 3·4 × 10−6 ohms at 15° C.; temperature coefficient, 0·0032; and coefficient of expansion, 0·0000222.

Nickel-Zinc.—Five nickel-zinc alloys were examined. The greatest breaking load shown was 36,000 lb. per sq. in.; the limit of elasticity was low. The alloy containing 0·83 per cent. of nickel and 0·90 per cent. of zinc had the comparatively low specific resistance of 3·03 × 10−6 ohms at 15° C.

Iron-Manganese.—The alloy containing 0·56 per cent. of iron and 1·78 per cent. of manganese gave a breaking load of 35,300 lb., and a limit of elasticity of 24,400 lb. per sq. in. Its specific resistance was high.—A. S.

Ferro-Silicons of High Strength; Determination of Silicon in ——. C. Ramorino.

See under XXIII., *page* 191.

Silver; Determination of —— in Muffle Residues. K. Sander.

See under XXIII., *page* 191.

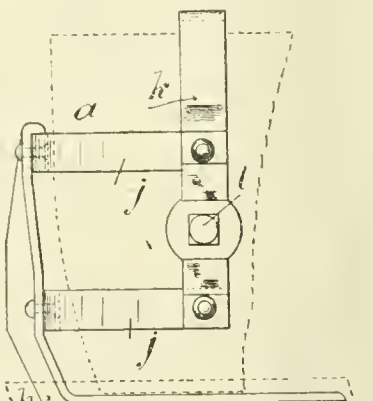
Copper, Lead, Antimony, and Tin; Separation of ——, *in Alloys. Solubility of Copper Sulphide in Alkaline Sulphides.* A. Rossing.

See under XXIII., *page* 191.

English Patents.

Furnaces; Smelting ——. D. Laird. Forfar. Eng. Pat. 18,150, Sept. 11, 1901.

The claims are for an improved means for removing and replacing the crucibles of smelting furnaces, and for tilting the crucibles to pour out the contents, which consist of a pedestal on which the crucible rests in the furnace, and



which is provided with a horizontal groove or recess, and of a cradle with a foot to occupy the recess, so that it can be slipped in under the crucible and give support to the same when being lifted by the cradle. The furnace is a vertical cylindrical one, and can be lifted up bodily, to leave the crucible on the pedestal ready for removal.

The cradle is specially claimed, and is made as shown in the accompanying drawing. It consists of a backbone *h* with a foot *i*, and with two curved or semicircular ribs *j j* rivetted thereto. The two ribs at both extremities are bolted to uprights *k*, which are bent inwards at their upper ends, to lap over the crucible. Suitable long lifting handles project from both sides at *l*. In operation, the foot *i* is pushed along the groove in the pedestal underneath the crucible, which is then lifted up and tilted towards the curved ribs for pouring, the inward bend of the uprights preventing the crucible from slipping out of the cradle.—A. W.

Sulphides; Process for Chlorinating Natural or Artificial ——, *by Means of Free Chlorine.* U. Alvisi, Rome, Eng. Pat. 23,493, Dec. 22, 1900.

Compounds of sulphur with metals may be treated with chlorine in the dry or wet way to obtain metal chlorides, sulphur chloride being also obtained by the dry method. For example, roasted copper pyrites is subjected to the action of chlorine in a suitable heated vessel to which a condenser is attached, and the S_2Cl_2 which distils over is collected, and may be decomposed by water, yielding hydrochloric and sulphuric acids and sulphur. In presence of excess of chlorine, SCl_2 may also be formed, and the two chlorides may be separated by fractional distillation. The fixed products are lixiviated, and from the cupric solution so much of the iron as does not separate as basic salt on heating and concentration, is removed by digestion with copper oxide. The roasted copper pyrites may, alternatively, be treated with chlorine in presence of water, in which case also complete desulphurisation is stated to be effected, but the sulphur may be partly set free and be partly found as sulphuric acid. The greater portion of iron dissolved may be separated as a basic salt. The process may also be conducted on the unroasted pyrites by the dry or wet method.—E. S.

Sulphides, Metallic —— *; Process of and Apparatus for Treating* ——. A. Germot, Asnières (Seine), and H. E. L. Fiévet, Paris, both of France. Eng. Pat. 2467, Feb. 4, 1901.

The sulphides, either dry, moist, or in suspension, are to be oxidised to sulphates by the action of ozone at a suitable temperature between 60° and 300° F. It is preferred to place the finely crushed sulphides in a series of closed vessels so arranged in connection with a raised tank that water, acids, or other liquids may be circulated through them, percolating through the sulphides in their course. The sulphides are introduced into these vessels through a manhole at the top of each, and thence fall upon a bed of flints resting upon a grid placed near the bottom of the tank, below the inlet of the circulating liquid, but sufficiently high to allow a dead space below for the accumulation of exhausted slimes, which may be removed from time to time through a valve at the bottom. The raised tank is provided with a heating coil or other means of raising the liquid to the required temperature. The ozone is introduced through a small pipe in the first, and circulates through the whole series of treating vessels. The use of spirit of turpentine is suggested as a solvent for ozone, for the purpose of this patent. Where subsulphides (*e.g.* Cu_2S) are treated with ozone, sulphuric acid may be employed in the series of vessels.—W. G. M.

Metals; The Welding of ——. H. Wachwitz, L. Sattler, and M. Dunkelsbuhler, all of Nüremberg. Eng. Pat. 20,657, Oct. 15, 1901.

The object of the following process is to avoid oxidation, at the high welding temperature, of the metals welded.

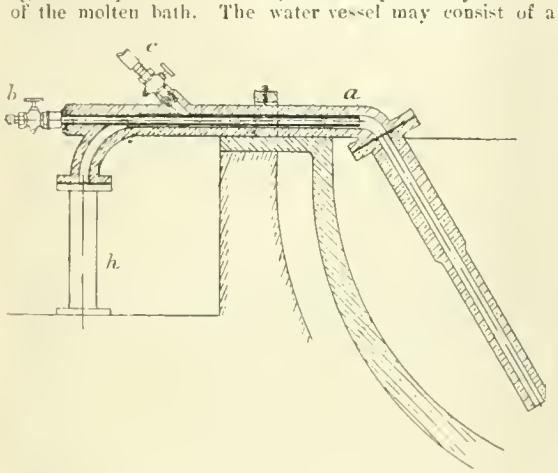
A thin coating of aluminium is applied by friction to the surfaces to be welded together, and in some cases a thin sheet of aluminium is placed between the surfaces, which are pressed together at a high temperature. In welding aluminium to another metal, only the latter is coated with aluminium.—W. C. H.

Metals and Metal Compounds; Process of Manufacturing Hollow Bodies from Easily Fusible ——. C. E. Steinweg, Lüdenscheid, Germany. Eng. Pat. 13,361, July 1, 1901.

The mould, to be internally coated with fusible metal to produce a hollow body, is provided with an opening in its lower side, and is dipped into the molten bath, and taken out again after a layer of metal has solidified upon its inner walls, the fluid metal rising and falling into and out of the said mould. To prevent the solidification of a layer of metal on the outside, the mould is surrounded, except at the upper and lower openings, with a jacket, which is or becomes heated to a temperature equal to that of the molten metal, and the whole dipped into the bath, the mould inside being kept cool to produce the layer of metal.—A. W.

Lead, Copper, and other Metals; Apparatus to be employed in the Treatment of Molten ——. C. Haber and A. Savelsberg, both of Ramsbeck, Germany. Eng. Pat. 2939, Feb. 11, 1901.

The apparatus claimed is for the treatment of the above metals by poling by means of steam, and is made substantially in the form illustrated in the accompanying vertical section, and for the purpose described. It comprises a poling tube *a*, supported by a pillar *h*, and dipping into the metal bath, which tube can be supplied with water either from a main or from a vessel provided with means whereby the pressure is equalised to allow the water to enter against the pressure of steam, and be vaporised by the heat of the molten bath. The water vessel may consist of a



portable vertical tank, closed at the top, and with suitable means for filling with water. In addition it has two outlets provided with cocks, one of which, near the bottom and below the surface of the water, is connected by a flexible tube to the water supply pipe *b*, whilst the other, near the top and opening into the air space above the water, is similarly connected with the side pipe *c*. The pressure in the poling tube and on the surface of the water is thereby equalised, and the extra weight of the column of water maintains the supply through *b* to be vaporised by the heat of the bath.
—A. W.

Gases; Removing Dust and the like from Blast Furnace and other ——. J. A. Elsner, Dortmund, Germany. Eng. Pat. 18,891, Sept. 21, 1901.

The gases are passed through a chamber or receptacle containing an arrangement of laths, strips, or plates disposed so as to produce a disproportionately large contact surface, the said surface being undulated or chequered, shaped, grooved, punctuated, ribbed, or otherwise rendered rough. The dust deposited on the surface is removed by scraping or shaking. A shaking arrangement is described, in which the frames containing the laths are suspended from chains, and are connected at their lower ends to a spring-controlled yoke, a rack on the yoke being engaged by a revolving segment, by means of which the frames are continually or periodically moved in an intermittent and violent manner.
—R. A.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*B.*)—ELECTRO-METALLURGY.

Iron and Steel; Therma-electricity of ——. G. Belloc. Comptes Rend., **131**, [5], 336—337.

Couples of steel, platinum, and platinum-rhodium were heated in an electric furnace *in vacuo*, in such a way that the temperature could be maintained stationary, or changed at any desired rate. Thus, the electromotive forces (E), and also the rates of change of electromotive force with temperature (dE/dt), could be determined. Three specimens were investigated, the carbon-contents and critical temperatures of which were as follows:—

	Carbon, Per Cent.	a_1.	a_2.	a_3.
A. Soft iron	Traces	Indefinite	740°	870°
B. Mild steel	0·30	700°	780°	780°
C. Hard steel	1·25	660°	660°	660°

The values of $dE\ dt$ were determined at nine temperatures between 100° and 1,100° C., and curves constructed from the observations. These curves were similar; all showed a maximum between two minima. The first minimum was in all at 470°, and had the same value. The maximum was in each below the temperature of a_3, and was higher as that temperature was higher. The second minimum followed the maximum in each case at a roughly corresponding temperature-interval. The values given are the means of many series of experiments, which show that E is less (at a given temperature) during cooling than during heating, especially for temperatures between a_3 and 1,100°. Observations at different rates of rise or fall of temperature show that the E.M.F. is influenced both by the viscosity and the hysteresis of the substance.—J. T. D.

Steels and Ferro-Nickels; Thermo-Electricity of ——. G. Belloc. Comptes Rend., **134**, [2], 105—106.

The author has extended his former experiments with a greater number of steels of varying and known carbon-content. The curves showing the values of E at varying temperatures indicate a continuous increase of E with t; while the curves showing the variations of $dE\ dt$ with t are of the same form as those previously obtained (see preceding abstract). The displacements of the points of maximum and minima with increasing content of carbon show that the portion of the curve between 650° and 1,000° C. may be taken as an index of the proportion of carbon in the steel.

The author has similarly examined a number of nickel-steels, containing from 5 to 35·5 per cent. of nickel. These give quite different results from the steels described above: the results are summarised as follows:—1. The general form of the curves relating E and t of the ferro-nickel-platinum couples is parabolic, save in the case of the 5 per cent. alloy. 2. The 5 and 28 per cent. alloys show abrupt changes about 400° or 500° C., indicative of molecular change. 3. The 28 per cent. alloy exhibits a very high E.M.F. (6,300 microvolts) at its neutral point (495° C.). 4. Small alterations in the percentage of nickel may cause very great variations in the E.M.F. and in the temperature of the neutral point.—J. T. D.

Copper Refining; Electrolytic ——. G. E. Walsh. Elect. Rev., N.Y., Aug. 24, 1901, [39], 213—214. Science Abstracts, 1901, **4**, [12], 1054.

The crude copper comes to the refinery in the form of bars or cakes, which are first tested as to quality and value, and then heated in a reverberatory furnace, preparatory to being formed into anodes for the electrolytic process. In each tank there are about 20—25 anodes and 25 cathodes; a free circulation is kept up between the tanks, new liquor being introduced as fast as the other is drawn off. The electrolyte contains about 16 per cent. of copper sulphate

and 5 per cent. of sulphuric acid. The average current required is about 10 ampères per square foot of anode surface. The impurities, containing gold and silver, are deposited at the bottom of the tanks in the form of a black mud, which is afterwards screened and treated for the recovery of its valuable contents.

It has been found that the cost of maintaining a plant at the highest efficiency is greater in the series system than in the multiple, but the former saves some loss of energy. It is estimated that there is a saving of nearly 2 dols. per ton of refined copper in the multiple system; in some instances, where the refinery is a part of a converting establishment, the saving has been as much as 3½ dols. per ton. The average current efficiency of the multiple system is 95 per cent., as against 90 per cent. for the series system under similar conditions.

The cost of producing refined copper by the electrolytic process has fallen from 30 dols. per ton, when it was first attempted, to 8—10 dols. per ton.—A. S.

Copper; Deposition of ——, *from Various Electrodes.* A. A. Beadle. Electro-Chemist, July 1901, [1], 168—169. Science Abstracts, 1901, **4**, [12], 1053.

The author made experiments with electrolytes composed of solutions of various salts of copper, for the purpose of studying the structure of the deposit under varying conditions. The following solutions were used:—

Solution.	Composition.	Grms. of Cu per Litre.	Specific Resistance in ohms per c.c.
A	Copper sulphate acidified with H_2SO_4.	258	2·2
B	Copper nitrate acidified with HNO_3.	352	2·2
C	Copper potassium cyanide with excess of KCN.	47	3·65
D	Cupric acetate acidified with acetic acid.	5	45·0
E	Copper ammonium sulphate acidified with H_2SO_4.	41	1·22

Soluble anodes were employed and current densities varying from 10 to 320 ampères per square foot, and the same current was allowed to pass till decided signs of irregularity, such as sponginess, nodules, or spikes, appeared in the deposit. The author concludes from his results that the safe rate of deposit is roughly proportional to the amount of copper in solution.—A. S.

XII.—FATS, OILS, AND SOAP.

Apricot Kernels; Fatty Oil obtained from ——. K. Dieterich. Zeits. Untersuch. Nahr. und Genussm., 1901, **4**, 1159—1160.

Samples of oil obtained by the author from apricot kernels gave the following constants: butyro-refractometer, at 25° C., 65·6—67·0; saponification value, 193·1—215·1; and iodine value, 100—108·7 (Hübl), 107·8—108·9 (Hübl-Waller). These figures are very similar to those yielded by the fatty oils of almonds and cherry kernels.—W. P. S.

Vegetable Oils in Animal Fats; Detection of ——, *by the Phytosterol Test.* A. Bömer.

See under XXIII., *page* 192.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Preservative Paints for Iron. L. E. Andés. Zeits. angew. Chem., 1902, **15**, [2], 25.

The samples of paints, varnishes, and boiled oils employed alone or consecutively as protective agents for iron, were exposed under different sets of conditions: — (1) To ordinary weather; (2) To water; (3) To 3 per cent. sodium chloride solution; (4) To hydrochloric acid of 1:2 or 1:3 strengths; and (5) To a 1:16 solution of copper sulphate. The iron sheets were sometimes given one coat only of the composition to be examined, sometimes two or more, and sometimes a priming coat of raw linseed oil or boiled oil only, or of some other paint or varnish was first applied to them.

Tests in Air.—In this series the plates were exposed side by side in a horizontal position to sun and rain for a period of six months; at the end of this time they were rinsed in water, cleaned with soap and a brush, and the appearance of the films examined. 76 different plates were exposed, 39 of them were primed with raw or boiled linseed oil, seven with wood oil, and three with a mixture of two parts of "varnish" with one of turpentine. 15 plates had the paints applied without any preliminary coat, two were primed with red lead, and 13 received a priming of red lead in boiled oil or wood oil. 62 of these 76 compositions bore the test perfectly, and no distinction could be made between them. From a study of the failures, the following conclusions may be drawn:—Neither raw linseed oil, boiled oil, wood oil, nor a coloured spirit varnish consisting principally of dammar, used alone and as a single coat, will prevent iron from rusting in the air. The 62 successes appear to confirm the old statement that a good boiled oil with the most indifferent pigment capable of selection, yields a correspondingly permanent paint.

Tests under Water.—This series of tests was carried out by immersing either iron plates as before, or sheets of glass, in bottles filled with the water of the Vienna "Hochquelle," keeping the samples at the ordinary room temperature. With the solitary exception of red lead, no paint of which the vehicle is a drying oil, can prevent iron from rusting. Hence it follows that for the protection of ships, when both the water is in movement and the iron itself in a state of constant vibration, oil paints are utterly useless. The only permanent coating for iron under water is a spirit varnish, *i.e.*, a resin dissolved in a volatile solvent; and this is one of the very materials valueless in protecting from the weather.

Tests in Saline Liquids.—A three per cent. solution of sodium chloride injures paint far less than fresh water does; in fact a single coat of white lead in oil resists salt water better than several coats of the same resist pure water. A spirit varnish composed of resin and celluloid forms an excellent preservative for iron.—F. H. L.

English Patents.

Iron [Pigment]; Production of Oxide of ——. W. S. Rock, Jersey. Eng. Pat. 23,320, Dec. 20, 1900.

Metallic iron, in the form of light machine scrap, turnings, or borings, with or without an addition of coke or gas carbon in pieces of convenient size, is spread out in flat trays and exposed alternately to the action of water or some cheap saline solution and to that of damp air, care being taken that the material never becomes dry. Finally the oxide is removed from the metal by a jet of water, and the residue is treated afresh.—F. H. L.

Whiting; Improved Method in the Manufacture of ——, *and the Apparatus therefor.* J. S. Rigby, West Thurrock, Essex. Eng. Pat. 4176, Feb. 27, 1901.

The chalk and water are mixed thoroughly by passing through one or two mills, according to the quality of whiting to be produced. Each mill is provided with a rotating agitator; the chalk cream passes from the first to the second through a strainer placed in the connecting channel, which opens out of the former at a point not too near the bottom. The walls of the second mill are double, the inner wall having straining panels, through which the cream passes into the space between the walls, whence it flows into a channel running along the ends of a series of rectangular precipitating tanks; this channel is provided with dams, so that the liquid may be caused to flow into, or be cut off from, any of the tanks at will. Ordinarily it passes from the long connecting channel to a second channel at right angles to the first, running along the side of the tank nearest to the mills; thence it flows over a weir into a

parallel channel communicating, by means of vertical pipes, with the interior of the tank at a level considerably above the bottom. The tanks are sloped sufficiently in cascade form to allow the overflow from the first tank to pass into the first cross channel, and thence, over another weir, into a second parallel channel, from which it flows through vertical pipes into the second tank, exactly as in the first case, and so on. Each tank is provided with a door at the end (or with a door at each end) for the removal of precipitated matter. Finally, the liquid flows into separators with a floor pervious to moisture, to draw off (by means of pumps) the water contained in the mixture, and leave the whiting ready for drying into cakes.—W. G. M.

(*B.*)—RESINS, VARNISHES.

Varnish for Waterproofing Paper, Cardboard, Cloth, and also for Painting. S. de la Grange, Rev. Prod. Chim. **44**, [21], 325.

The following mixtures are prepared:—

(1.) Ten grms. of octonitrocellulose are dissolved in a mixture of 50 c.c. of amyl acetate and 50 c.c. of 95 per cent. alcohol, and the solution is filtered through carded cotton fleece.

(2.) Forty c.c. of castor oil, palm oil, or other vegetable oil, are mixed with sufficient colouring matter to furnish the desired shade.

These two products are thoroughly mixed and applied to the paper by means of a machine similar to those used for making oilcloth; the paper is dried for 2 hours, then rolled and calendered to make the varnish pliant, or stamped with a design in a suitable machine.

To use the same varnish for paint, 50 parts by volume of the solution are mixed with 50 of the mixture of 1 and 2, and with 1 part each of amyl acetate and 95 per cent. alcohol. This paint is said to adhere very well to glass, iron, plaster, wood, cement, and to have a high lustre.

—C. S.

Varnish for Backing Silvered Mirror Glass. E. N. Sprechsaal, **34**, [40], 1396–1399.

The best protective coating for silver on the back of mirror glass is a clear solution of 4 kilos. of shellac in 20 litres of alcohol containing 5 c.c. of ammonia to neutralise the resin acids in the shellac. Two or three coats of this solution are applied with a soft brush, and then covered with 3—4 coats of backing composed of colcothar, 5 kilos.; Krems white lead, 1 kilo; and Venice turpentine, 1 kilo.; well mixed and ground in a paint mill. The turpentine, being thick, should be first reduced with spirit, at the rate of 20 litres of diluent to 10 kilos. of turpentine, 3 litres of the mixture being used for mixing with the colcothar and white lead. The right proportions will have been attained when the mixture dries quickly and glossy, without being tacky.

Asphalt varnish may be used for this final backing, the glass being laid on a warm table, and the black surface afterwards dusted over with aluminium bronze powder, which is then rubbed in with a soft cloth and polished with velvet: the warmer the glass the quicker will the bronzing be completed. The finished coating resembles that on quicksilvered mirrors.—C. S.

ENGLISH PATENT.

Antifouling Composition for Coating the Bottoms of Ships and other Vessels which may be exposed to the Action of Fresh or Sea Water. J. H. Stephenson, London. Eng. Pat. 4205, Feb. 27, 1901.

This composition consists of resin, 1 cwt.; soft soap, 4 lb.; boiled oil, 2 galls.; turpentine, 4 galls.; benzol, 14 galls.; Indian red, 1 cwt. 3 qrs.; mercuric chloride, 1 lb. 12 oz., with enough ether to dissolve the latter ingredient.

—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Leather Industry; Bacteria in ——. A. Turnbull. Leather Trades Rev., Jan. 8, 1902, **35**, 23—24.

In the following stages of the tanning industry, bacterial action is attended with serious loss or danger.

(*a*) In the transport of raw hides, especially fallen hides. The growth of putrefactive bacteria, which are naturally present and by their life-processes convert hide-substance into a soluble form, must be checked by some method of desiccation, *i.e.*, the skins are slowly and thoroughly dried by sun and air, or treated with salt, which has a drying effect on the fibres. The micro-organisms, however, are not killed by these means, and always develop on moistening, and especially if such hides undergo long soaking. Rapid softening by the aid of chemicals, such as caustic soda (1 part per thousand), or sodium sulphide (2 per thousand), is therefore preferable. Putrid soaks especially cause extreme loss of hide-substance.

(*b*) In the use of old lime-liquors. Fresh lime liquor greatly retards the growth of bacteria, but when much dissolved hide-substance is present, this antiseptic property disappears. The ammonia, which is a product of bacterial action, also dissolves hide-substance in this stage. A strictly limited growth of bacteria certainly assists in unhairing, but there is great danger of the action becoming excessive.

(*c*) The possible presence of the anthrax bacillus, and its spores, in foreign dried hides and the dust falling from them, is a source of deadly danger to the workmen, and can only be met by extreme care and personal cleanliness on the part of those handling suspicious hides.

Bacteria exert an important beneficial action in the following stages:—

(*a*) *In Bating and Puering*, the results of which are due to the life-processes of micro-organisms. The materials commonly used are of uncertain composition, and their action is very difficult to regulate. The use of a definite bacillus, and of a specially prepared medium (Erodin), which admits of much greater control, has been already fully described. (See this Journal for 1894, 218; 1895, 449; 1898, 1010; 1899, 990.)

(*b*) *In Drenching.*—The lactic and acetic acids, which are active in removing the lime, and also, probably, in opening the skin, are produced by the fermentation action of bacteria. (See this Journal for 1893, 422, and 1897, 510.)

(*c*) The acid tan liquors used for sole-leather manufacture, owe their properties to acids developed by yeast and other organisms on the glucosides present in the tan liquors.

—R. L. J.

XV.—MANURES, Etc.

Soil Bacteria; Process for Inoculating the Earth with ——. Fr. Bayer and Co. Blät. Zuckerrübenbau, 1901, 217.

A new soil organism, "Alinit Bacillus Beta," from humus soil is described. It is stated that this bacillus increases the nitrogen of the soil to a greater extent than alinite ("Alinit Bacillus Alpha").

The new bacillus is obtained from soils on which the production of crops is increased by the application of alinite. Such soils are found to be rich in pentosans. The bacteriological examination of the soils showed that the alinite bacilli were accompanied by the new alinit-bacillus Beta. The latter has not the power of fixing free nitrogen when alone, but it increases considerably the power of the original alinite when both are present. It is effective not only in the case of cereal crops, but with all crops.

In inoculating the soil, any of the usual methods may be employed, but it is advisable to add to the soil a supply of carbohydrate, such as a solution of molasses. A quantity of soil is impregnated with a culture of alinit-bacillus Beta. After some days, a culture of alinit-bacillus Alpha, in water containing molasses, is added. The soil is then applied to the land in the usual manner.—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Juice; Preservation of Samples of ——, by Mercuric Chloride. H. Pellet and L. Klein. Bull. Assoc. Chim. Sucr. Dist., 1901, **17**, [6], 725—729.

Dealing with the causes of the irregular analytical results sometimes obtained with samples of sugar juice preserved with mercuric chloride, the authors show that in addition

to the temperature and degree of sterility of the flasks, the alkalinity and purity of the juice itself have considerable influence. Thus, if the juice be alkaline, some of the mercuric chloride is decomposed with the formation of mercuric oxide, and with a consequent loss of antiseptic power. Samples of crude juice may also yield precipitates with mercuric chloride without being alkaline. Hence, for the preservation of such crude or alkaline juice, it is necessary to add sufficient mercuric chloride to allow for this precipitation. In a series of comparative experiments, a juice with an alkalinity of 0·15 grm. per litre, in terms of calcium hydroxide, was diluted with 10 per cent. of water and exposed in a sterilised flask to temperatures up to 35° C. After 52 hours the sugar determined by the polarimeter had fallen from 41 to 5 per cent. The same juice containing 0·1 grm. of mercuric chloride per litre, treated in a similar manner, remained unaltered for 52 hours; but after 140 hours the percentage of sugar had fallen to 21 per cent., and after 164 hours to 8 per cent. By first neutralising the juice with 20 drops of acetic acid, and then adding the same proportion of mercuric chloride, the keeping qualities were greatly increased, the polarimetric reading being the same after 92 hours, and only falling from 41·2 to 40·5 after 188 hours. An addition of 1·5 grm. of mercuric chloride per litre, preserved the juice for 356 hours, the whole time of observation.

As regards the effect of the mercuric chloride on the sp. gr. of the juice, it is stated that if 0·1 grm. be used with a sugar juice containing 120—130 grms. of solid matter per litre, the influence is but slight; but when the addition is greater than that, allowance must be made for it. Thus, when using a Brix hydrometer, 1 grm of mercuric chloride is equivalent to 2·15 grms. of solid extract in the sugar juice. The influence on the reduction is considerable, especially when the amount of mercuric chloride exceeds 1 grm., since it too is reduced like the Fehling's solution. But by using lead acetate instead of mercuric chloride with a portion of the juice placed in a separate flask, the amount of reducing substances can be determined correctly after a lapse of 12 to 24 hours.—C. A. M.

Honey-Dextrin; The so-called ——. E. Beckmann. Zeits. Untersuch. Nahr.- und Genussm., 1901, **4**, [23], 1065—1069.

The author detects the presence of added dextrin or glucose syrup in honey by adding 3 c.c. of a 2 per cent. solution of barium hydroxide and 17 c.c. of methyl alcohol to 5 c.c. of a 20 per cent. solution of the honey. In natural dextro- or lævo-rotatory honey the methyl alcohol precipitates nothing, or only the slightest trace, but if it be adulterated with dextrin, a considerable precipitate is obtained. The precipitating power of baryta and methyl alcohol to dextrins of different molecular weights has been investigated, and it has been found that dextrins coloured by iodine produce more precipitate than the achroodextrins. This observation was extended to achroodextrins I. and II., and mixtures of these, and it was found that the lower the molecular weight the smaller the weight of barium compound precipitated. The chemical individuality of achroodextrin III. (Prior, this Journal, 1896, 915) or maltodextrin β (Ling and Baker, this Journal, 1897, 154), was confirmed by a critical study of its barium and lead compounds.

A methyl alcohol solution of lead acetate has been suggested by the author as a means of detecting molasses in honey, the precipitate obtained being more copious than the barium compound. With this precipitant also the weight of the precipitate decreases with the molecular complexity of the dextrin. Maltose, cane sugar, and dextrose, under these conditions are not precipitated. Baryta gives better results with dextrins of low molecular weight than lead does. The presence of dextrose greatly inhibits the precipitating power of methyl alcoholic solutions of lead acetate or baryta.

The chemical nature of honey dextrin has been investigated, but not with very conclusive results. From a study of its derivatives the author considers it to be a disaccharide. It is fermentable by most yeasts, with the exception of Saaz yeast, and is very easily hydrolysed.—J. L. B.

Tyrosin and Tyrosinase. G. C. Borgnino. Bull. Assoc. Chim. Sucr. Dist., 1901, **19**, [6] 691—713.

In this paper the author gives a summary of all that is known of tyrosin and tyrosinase, with references to all the original papers quoted. A description is first given of the occurrence and formation of tyrosin in organisms, and of its production in the hydrolytic decomposition of proteids. This is followed by an account of the various methods employed for its extraction from animal and vegetable substances. Then follows a discussion on its constitution, an account of its synthetical formation, and, finally, a description of the qualitative reactions used for its detection, and of the colorimetric method employed for its quantitative determination.

The section dealing with tyrosinase opens with an account of enzymes in general, and of their mode of action and classification. Oxydases in general are then discussed, and a description given of the methods of detecting them in animal and vegetable tissues. Next is an account of tyrosinase itself, its occurrence, identification, and action on tyrosin; and, lastly, some remarks on the possible part played by tyrosin and tyrosinase in different processes in the manufacture of sugar.—C. A. M.

Sugar Works Effluents; Purification of ——, *by the Oxidation Process.* Dunbar.

See under XVIII. B., *page* 185.

XVII.—BREWING, WINES, SPIRITS, Etc.

Sulphurous Acid Solutions; Specific Gravity of ——. *Influence of the Method of Preparing the Gas.* H. Pellet.

See under VII., *page* 171.

Sucrase or Invertase in Industrial Fermentations ——. F. Verbièse. Bull. Assoc. Chem. Sucr. Dist., 1901, **19**, [6], 688—691.

In a former communication (this Journal, 1901, 1227) the author attributed irregularities and stoppage of fermentation of beetroot molasses to the inversion being insufficient, *i.e.*, to deficiency of sucrase, rather than to degeneration of the yeast, as urged by Dejonghe. In further support of his view, the author states that he has observed that yeast which had become inactive through absence of sucrase was still capable of fermenting directly fermentable sugars, and induced active fermentation when transferred from the must to grain-wort. The fact that Dejonghe has found lævorotatory sugar in incompletely fermented must, simply means that in that particular case the stoppage of fermentation was due to some other cause than that of absence of sucrase. In his opinion fermentation may be expected to cease when the yeast is placed in musts having a restrictive influence on the inversion of saccharose, sucrase being particularly susceptible to the action of certain salts in must.—C. A. M.

Malt; The Occurrence of an Albumin-dissolving Enzyme in ——. E. Ehrieb. Bierbrauer, 1901, **4**; through Zeits. Untersuch. Nahr.- und Genussm., 1901, **4**, 1176.

In his first series of experiments on the extraction of the soluble albuminoids of malt and barley, the author came to the conclusion that, in the case of barley, no enzymic action took place. The fact that more albuminoids were extracted at a temperature of 50° C. was attributed to their greater solubility in hot water. Further experiments, however, led to the opposite conclusion. Equal parts of barley and malt were mashed separately and mixed, and the nitrogen content of the worts estimated. The amount of nitrogen in the mixed wort was considerably higher than the sum of the nitrogen of the separate worts, showing that albumin had been dissolved by the action of the malt enzyme. In some malts the action of the enzyme is scarcely observable.—W. P. S.

Drum Malting. L. Briant and C. Vaux. J. Fed. Inst. of Brewing, 1901, **7**, [5], 404—426.

The authors communicate the results of their experience in malting by the pneumatic drum system, which they have

been working successfully for some years. The barley is steeped in the ordinary way and charged into the germinating drums; these are of the usual type, with aëration from the periphery to a central exhaust shaft, and arrangements for sprinkling; the aërating plant is common to the whole system of drums, and the air is filtered and cooled (or warmed) by passage through a coke tower through which water is sprayed. The drums have a capacity for 30 quarters of barley, and are rotatable at the rate of one revolution in 35 – 40 minutes. No general rule can be laid down for the treatment in the drum, but the following procedure is fairly typical: — On charging from the steep, the drum is given one rotation without air and then allowed to lie for some hours; it is then revolved for half an hour with a limited supply of air and the temperature is got up to 60° F. as soon as possible. It is then slightly cooled to 58° F. and allowed to rest for a further short period without air. The current of air is then turned on, the amount being regulated according to the outside temperature and for the next five days the drum is kept at 60° F. by turning when required, care being taken not to chill the grain. Sprinkling is done on the fifth or sixth day, according to appearance, generally only once. The quantity of sprinkling water varies from 2·5 to 4 gallons per quarter, applied at a suitable temperature; some barleys can be worked without sprinkling. The temperature of the grain is maintained at 60° F. until the ninth day, when germination begins to flag. With a normal rootlet the drum is not allowed to rest between the third and seventh day for more than four hours at a time; with long rootlets it is turned more frequently. On the tenth or eleventh day, with good modification, the temperature is allowed to rise to 62° or 64° F., if no signs of withering are apparent; on the fourteenth day it has risen to 66° or 68° F. and the piece is ready for loading about the fifteenth day. From the tenth day onwards the moist air is cut off and only dry air is supplied. With drum malt the indications of withering are somewhat different from those in floor malt, the rootlet being less brown.

The grain is then charged into the drying drum, which is similar in construction to the germinating drum, but with provision for a more intense draught of air. The air employed is heated by a direct fire.

The following temperatures are recorded :—

	Inlet.	Outlet.
	° F.	° F.
First 12 hours	110—120	65—70
Next 24 hours	120—130	70—75

The authors do not regard the system of drying in the drums in its present form as entirely satisfactory; and they state that better results are obtained by drying in an ordinary kiln.

After 36 hours in the drying drum, the grain goes to the curing drum, which is smaller in size. The results of curing in the drum are completely successful.

The following temperatures are recorded :—

	Inlet.	Outlet.
	° F.	° F.
First 12 hours	130—140	75—80
Next 12 hours	150	80—90

The inlet temperature is then gradually increased until the malt arrives at the desired temperature for firing off, as indicated at the outlet, at which it is maintained for 8—12 hours. Both drying and curing drums are rotated continuously, and the total duration of the drying and curing varies from 72 to 96 hours. Incidentally it is remarked that drum-germinated malt is always practically free from mould, and that the system of drum drying and curing greatly diminishes the quantity of arsenic retained by the malt. The remainder of the paper deals with the economic aspects of the system and the advantages and constancy of the process and the product.—J. F. B.

Yeasts; Action of Tannins and Colouring Matters on the Activity of ——. A. Rosenstiehl. Comptes Rend., **134**, [2], 119—122.

Yeast was introduced into a sterile must prepared by a patent process of the author's, and containing much more colouring matter than ordinary grape-must, while absolutely free from suspended solids. About four-fifths of the colouring matter disappeared during the fermentation, but at the end a deepening in tint again took place, the final depth of colour being estimated at one-third of that of the original must. The temporary effect here is attributed by the author to the formation, by the reducing action of the yeast, of leuco-compounds, which are afterwards re-oxidised by the air; but the permanent loss of colour is due to absorption of the colouring matter by the yeast, which is dyed deep rose, and is capable still of taking up more colouring matter. This action of the yeast, which seems closely analogous to the dyeing of silk, is, like the latter, selective; it is not exerted at all on azo-dyestuffs, save benzidine derivatives, and but little on the phthaleins, but is strongly exerted on the acridine, thioüine, safranine, and rosaniline groups, of which substances the yeast will take up from 5 to 8 per cent. of its weight. The yeast shows the same absorptive power for tannins, and hence it is not surprising that it should show it also for the colouring matters of the grape, which are related to phlorogluecinol much as the tannins are related to pyrogallol.

The retarding action on fermentation of the astringent matters of apple juice, observed by the author, finds its explanation in these phenomena; for if the dyed yeast be used in successive cultures in fresh musts, the fermentation becomes slower and slower, though the cells multiply vigorously. The physiological functions of the organism are modified profoundly by the introduction of the colouring matter into its substance; and the fermentative power is destroyed before the faculty of reproduction is sensibly weakened.—J. T. D.

Beer; Process for Brewing two kinds of —— in one Operation. P. Mumme. Woch für Brau., 1902, **19**, [1], 4—5.

It is often advantageous to brew two kinds of beer simultaneously from the same mash, namely, a lager beer and a very light beer of the class known as "single" beer. All that is required is an extra boiling copper to take the wort drawn off for the second brewing. If a pale lager beer and a dark "single" beer are required, a little colour malt is mashed separately, to be added to the latter. There are two methods which may be adopted in working the double process. Either a sufficient quantity of original wort may be drawn from the whole and diluted with water or very weak spargings for the "single" beer, the lager beer being brewed with the remainder together with the spargings, or else the whole of the first runnings may be taken for the lager beer and the whole of the spargings for the "single" beer. In the latter case, the lager beer is naturally of the very best quality, and this method is especially suitable for "Bock" beers; but the flavour of the "single" beer, which consists only of spargings, would be correspondingly inferior. The author gives examples of the calculations necessary for carrying out both of these processes. In the second method, a density of the original wort corresponding to 18 per cent. of extract may be found to be too high, since it would mean that the first runnings would only contain 50 per cent. of the total extract of the malt, and the quantity of "single" beer from the spargings might be too great. If this be so, the remedy would be to add some of the after-runnings to the lager beer wort, or else to dilute the mash, so that the quantity of the first runnings is increased. It is stated that a considerable saving of fuel may be effected by introducing some such process as this, especially in small breweries.—J. F. B.

Wines; Acids in ——, *and the Retrogression of Acidity of Wine.* Möslinger. Zeits. Untersuch. Nahrungs- und Genussmittel, 1901, **4**, [23], 1120—1129.

Lactic acid is not an invariable but a general constituent of wines of different origin and manufacture; the amount

of it is often of material importance. The presence of acidity in wines is due to two reasons: 1. It results from the action of the specific lactic organism on the sugar of the extract, thus causing an increase in the sugar-free extract and the acidity. The formation of lactic acid can proceed slowly with the alcoholic fermentation. 2. By the decomposition or formation of malic acid, notably in wines poor in alcohol. It is characteristic that in such cases the sugar-free extract is diminished by at least one half and the free acid by at least the equivalent of lactic acid formed.

Ordinary grape must, or must derived from old and sour grapes, contains no appreciable quantity of lactic acid. This also holds for normal and pure fermentations of must. —J. L. B.

Amyl Alcohol; Fermentation ——. G. Bemont. Comptes Rend., **133**, [26], 1222—1224.

Fermentation amyl alcohol was separated by the careful fractionation of 32 kilos. of fusel oil as a liquid boiling at 131° C., optically active, sp. gr. 0·8065, and yielding on oxidation an optically active valeric (methylethylacetic) acid of b. pt. 175° C.—J. T. D.

Heptacetyl maltose Nitrate [*Acetonitromaltose*] *and Heptacetyl-β-methyl maltoside.* W. Kœnigs and E. Knorr.

See under XXIV., *page* 196.

Wine; Determination of Volatile Acids in ——. X. Rocques and G. Sellier.

See under XXIII., *page* 193.

Fusel Oil in Alcoholic Liquors; Determination of ——. E. Beckmann.

See under XXIII., *page* 193.

Methyl Alcohol in Alcoholic Liquids; Detection of ——. F. Habermann and Osterreicher.

See under XXIII., *page* 192.

English Patents.

Malt, Hops, and other Substances, and Apparatus therefor; Process of Drying ——. E. S. Beaven, Warminster, Wiltshire. Eng. Pat. 23,634, Dec. 27, 1900.

In kilns in which the products of combustion of the fuel come into contact with the material which is being dried the flues are terminated in short vertical shafts, in which accurately fitting cages are suspended, containing lime or other substance capable of combining with and removing arsenious oxide from the products of combustion. The lower end of each shaft is a tank containing liquid, into which the cage and contents can be lowered and dipped from time to time to revivify the material in the cage. —L. A.

Yeast for use in the Manufacture of Food or Manure; Preparing ——. W. Wardle. Eng. Pat. 6971, 1901.

See under XVIII. A., *page* 183.

Mash Tun, Hop Back and Cooler for Use in Brewing; Combined ——, (*also applicable as a Digestor and Raw Grain Converter*). E. W. Lancaster, London. Eng. Pat. 23,796, Dec. 29, 1900.

The combined mash tun, hop back, cooler, digestor, and raw grain converter consists of a vertical metal cylinder having hemispherical ends and a perforated false bottom, and provided with a suitable drainage box at the bottom of the tun, steam, air, and hot-water pipes connected to the drainage box, valves to regulate the admission of steam, air and water to the tun, a horizontal sparger at the top, a horizontal shaft carrying rakes or stirrers shaped to fit the bottom, a vertical shaft rotating in the tun, a horizontal bar carrying fixed vertical rakes on one side of the shaft and a single fixed rake at the other side of the shaft, the horizontal bar being secured to the vertical shaft, a horizontal shaft carrying revolving rakes and supported in bearings formed in brackets secured to the horizontal bar operated from the vertical shaft by bevelled gear and gearing for rotating the shafts.—J. F. B.

Pot Ales, Wash Liquors, Sewage, and other Aqueous Waste or Bye-Products; Treatment of ——. H. McPhail. Eng. Pat. 23,198, 1900.

See under XVIII. B., *page* 185.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Boletol [*from Mushrooms*]; *Extraction of* ——. G. Bertrand. Comptes Rend. **134**, [2], 124—126.

This substance is extracted from fresh mushrooms of the genus *Boletus*, by boiling with alcohol, and precipitating with lead acetate. When the lead precipitate is decomposed by weak hydrochloric acid, some of the boletol goes into solution, and is extracted by repeated treatment with ether; but the bulk of it is retained by the fatty substances in the precipitate, and is separated by extraction with ether, evaporation to dryness, and extraction of the residue with water. It crystallises in fine needles of a bright red colour; its strong solution is also red, but on dilution becomes ultimately pure yellow—the colour which the substance gives to the fungi which contain it. When the solution is boiled, the substance will no longer crystallise on concentration; it must be taken completely to dryness and redissolved. Boletol contains no nitrogen.—J. T. D.

Salicylic Acid; Normal Constituent of Strawberries. L. Portes and A. Desmoulières. Ann. Chim. anal. appl. **6**, 401—407. Chem. Centr. 1901, **2**, [26], 1360.

By the examination of a large number of samples of fresh strawberries, the authors have found that salicylic acid, probably as the methyl ester, is a normal constituent of this fruit. The amount of salicylic acid in the fresh berries is about 1 mgrm. per kilo. The authors point out the significance of this discovery for analysts in connection with the examination of fruit preserves, &c. for the presence of salicylic acid, added as a preservative.—A. S.

Oxidising Enzymes. [*Tea, &c.*] C. R. Newton. Indian Gardening and Planting, Nov. 28, 1901.

The author first refers to those oxidising enzymes already known, such as laccase (this Journal, 1894, 1071; 1895 374, 1074; 1896, 561), malase, tyrosinase (this Journal 1896, 565), catalase (this Journal, 1901, 598), olease, myrosin, lipase (this Journal, 1897, 642), and emulsin, and then proceeds to discuss the enzyme present in tea. Tea contains an enzyme, to which the author gives the name *thease*, a per-enzyme, and a catalase. The function of the enzyme in the living plant is probably, in conjunction with some plant acid, to act on the tannins or glucosides, converting them into aldehydes and phenols, which are assimilated by the plant. Thease converts tannic acid into glucose. It has been detected in the leaf, young shoots, root (in much larger quantities than in the young shoots), and seeds of the tea plant. It is probably contained in the sap of the plant, and not in the cells in contact with the tannin. It is the principal factor during the fermentation of the tea leaf, since if it be extracted, the leaf fails to colour; thus, in the manufacture of green tea, the enzyme is destroyed before the cell walls are broken. The quantity of thease present, appears to vary with the quality of the leaf. Its action is greatly increased by the presence of manganese (see also this Journal, 1897, 626, 833).

The author finds that a large number of plants of the most diverse orders, contain in some one or other of their organs (especially in the roots) an enzyme. For instance, in oak-bark, camaigre, and other dock tannins, there is a considerable quantity of an enzyme capable of rapidly

converting tannin into glucose. He has applied for a patent in India and Ceylon for a process of extracting and making use of suitable enzymes to aid and intensify the action of the enzyme already existing in the tea-leaf, and he states that in all cases in which he has tried this process, a considerable improvement in quality has taken place.

—A. S.

Dextrin of Honey; The So-called ——. E. Beckmann.
See under XVI., *page* 180.

ENGLISH PATENTS.

Casks and Dairy Utensils; Apparatus for Sterilising and Lining Wooden ——, *with Mineral Wax or Albumin.* E. W. Lancaster, London. Eng. Pat. 23,797, Dec. 29, 1900.

THE apparatus consists of a pump or air-compressor, a reservoir for containing compressed air, a heater in which the air from the reservoir or compressor may be heated to a temperature of 300° F., a tank to contain melted mineral wax, and means for melting the latter and keeping it melted, means for introducing hot and cold air into the casks, and for spraying the melted wax over the entire surface of the casks.

A form of heater consisting of two concentric rings of continuous metal pipes set in a furnace composed of three concentric metal cylinders, and a specially designed rotating waxing nozzle are also claimed. The washed and dried casks are first sterilised by the injection of heated air for about three minutes, and are then placed over the waxing nozzles which coat the interior, the excess of wax draining back into a vessel whence it is returned to the tank; the coating of wax is fixed by the injection of cold air.

—J. F. B.

Casks and Dairy Utensils which are lined with Mineral Wax, Pitch, or Shellac; Apparatus for Washing and Drying ——. E. W. Lancaster, London. Eng. Pat. 23,798, Dec. 29, 1900.

THE apparatus consists of a suitable air-compressor with a reservoir in which the compressed air is stored, pipes to convey the compressed anhydrous air and hot water under pressure, to the casks or other receptacles, and spraying devices to admit the air and water to the interior of the casks. The air and water pipes are combined by means of a three-way cock to the spraying nozzles. The form of spraying nozzle claimed consists of a pear- or acorn-shaped piece of metal with tangential or other perforations. Below the nozzle is a hollow cone carrying oblique vanes on its outside; the current of waste water escaping from the cask causes the whole to rotate on a ball bearing, with a conical projection to prevent the water entering the bearing. In another kind of nozzle the vanes are on the inside, and the nozzle is caused to rotate by the impact of water or air discharged from tangential orifices on the fixed supply pipe. The casks are washed by spraying with hot water and dried by substituting cold anhydrous air by means of the three-way cock.

—J. F. B.

Dehydrating Gases or Gaseous Mixtures applicable for Cooling Gases or Gaseous Mixtures, or for other analogous Purposes; Improved Method and Means for ——. Lawton's Patents, Limited, and A. W. Lawton, London. Eng. Pat. 2691, Feb. 7, 1901.

THE gaseous mixtures employed for the preservative treatment of organic substances (fruit, vegetables, &c.) in a closed chamber are dehydrated by withdrawing the mixture from the chamber in which the substances are being treated, forcing it against artificially cooled surfaces (refrigerating coils, &c.), on which the moisture is deposited, and then returning it to the chamber, the circulation being continued as long as is necessary. The invention may also be employed in conjunction with the process and apparatus described in Eng. Pat. 1878 of 1899, for preserving fruit, vegetables, &c., or in conjunction with any similar process and apparatus, the heated gas or gaseous mixture coming from the producer being passed through the cooling apparatus before it is passed into the chamber.—B. A.

Yeast for use in the Manufacture of Food or Manure; Preparing ——. W. Wardle, Burton-on-Trent. Eng. Pat. 6971, April 3, 1901.

FRESH brewers' yeast, as it leaves the press, is mixed with hop meal, made by grinding dried sweet spent hops, in about equal proportions, and after lying in a cool place for a few days, with occasional turning over, the mixture is dried in kilns and is then fit for use, either alone or mixed with other cattle foods.—L. A.

Milk Extracts resembling Meat Extracts; Processes for Making ——. O. Mierisch, Dresden, and O. Eberhard, Ludwigslust, Mecklenburg, Germany. Eng. Pat. 21,758, Oct. 29, 1901.

SKIM milk is freed from casein, from sugar, and from albumin. It is then slightly acidulated with phosphoric or hydrochloric acid, and evaporated *in vacuo* to the consistency of thick syrup. During the crystallisation of the sugar, the liquid is sterilised, either by adding formalin or by pasteurisation.—L. A.

Eggs; Method of Preserving ——. J. A. Rylander, Norrkoping, Sweden. Eng. Pat. 23,523, Nov. 20, 1901.

AIR is heated in a closed vessel to 80° C., and kept saturated with a solution of salicylic acid in alcohol. The eggs are placed in this air for two minutes to sterilise the interior, then removed, and coated with a solution of potassium or sodium silicate heated to 60° or 70° C.—L. A.

(*B.*)—SANITATION; WATER PURIFICATION.

Sewage and Industrial Effluents; Bayer's Method for the Purification of ——. B. M. Margosches. Polytechn. Beilage z. Leipziger Monatschr. f. Textilind., 1901, [6]. Chem. Centr., 1901, **2**, [26], 1357.

THE author has examined this process, which consists in treating the effluents with a mixture of zinc dust, charcoal and lime (see this Journal, 1901, 830). The experiments were made with canal waters, largely contaminated by industrial effluents, and the following summary of the results obtained, is given:—(1) The process yields, in all cases, a perfectly clear, colourless and odourless water, free from putrefactive bacteria, which after standing a week, even when mixed with river water, does not undergo putrefaction. The dissolved organic matter is only partly removed, but the method compares favourably, in this respect, with other chemical mechanical processes, as in the most unfavourable case, one-fifth, and in the most favourable case, more than four-fifths of the organic nitrogen is removed. The clarification of the crude effluent takes place rapidly, after the addition of the reagents, the main quantity of the sludge settling in a short time. The purification can thus be effected in relatively small settling tanks, with a corresponding economy of space and expense. (2) The organic matter separated in the sludge can be converted into useful materials by destructive distillation. In this way a good heating and illuminating gas (of at least 8½ candle power), is obtained, whilst 78 per cent. of the organic nitrogen contained in the sludge is converted into ammonia. (3) The reagents used in the process can, in part, be regenerated without suffering any considerable loss of efficiency. By repeated use (five or six times), the charcoal becomes enriched with phosphoric acid to the extent of 1·5 per cent., whilst it also contains, on the average, 1 per cent. of nitrogen; it has therefore a certain fertilising value, which makes it suitable for agricultural purposes. (4) The charcoal most suitable for the process is prepared by the destructive distillation of a mixture of blood and sawdust, and the by-products (illuminating gas and ammonia) obtained, cover the cost of preparation. (5) The cost of the whole process of purification is, for the most part, covered by the value of the by-products.—A. S.

Sewage Filter; The Continuous ——. F. W. Stoddart, Bristol. Pamphlet, 1901.

THE author remarks that whilst an immense amount of work has been done in attempts to purify sewage from its grosser impurities by chemical precipitation, and latterly by

the septic tank process, intermittent filtration stands very much as it was left by the Rivers Pollution Commissioners in 1868, whose conclusions have been adopted and endorsed by practically all subsequent investigators. A little consideration, however, shows that a system in which the filter is at intervals completely filled upwith sewage, a liquid devoid of oxygen, and allowed to remain full for some hours is radically wrong, and that the continuous passage of both sewage and air though the filter simultaneously, is a more promising method.

The author's observations have led him to the conclusion that in a filter, the ratio of sewage to soil or filtering material should be small enough to enable the latter to remain permanently charged with air. Trials with a laboratory apparatus, first described in 1893 (*Practitioner*, **51**, 1893, 391—5), in which a constant trickle of sewage was maintained through a tube packed with lumps of chalk, the interstices of which were not allowed to become waterlogged, but remained open and in free communication with the external air, showed that sewage was completely nitrified continuously, at the rate of 200 gallons per square yard of surface per 24 hours; but to maintain this oxidation it was found absolutely essential that the air should always be present in unbroken continuity from the top to the bottom of the filter. If the outlet became choked by accumulation of filtrate, or if a continuous horizontal layer of liquid formed at any point in the filter, oxidation speedily became imperfect, and when the filter had been brought to the highest state of efficiency, a simple flushing with liquid, especially with sewage, almost completely destroyed its oxidising power, which was only slowly regained. Mechanical difficulties in designing a suitable arrangement for feeding the sewage in drops impeded for several years the large scale development of this filter. But at length the difficulties were overcome, and a successful plant, consisting of the following parts, was erected.

1. *Supply Channel.*—A gutter, with its margin horizontal, in direct communication with the septic tank or sewer outlet.

2. *Distributor.*—A number of narrow V-shaped gutters supported across the filter bed, at right angles to the supply channel over the margins of which the sewage flows into the gutters. Along the lowest part of the under surface of each gutter is placed a series of vertical points, and the sewage overflowing the gutters drips from these points, of which there 360 to the square yard, on to the filter This distributor, which works entirely by gravitation, requiring less than one inch of head, and has no fine orifices to become choked, has at various times been frozen into a solid block, overwhelmed with sludge, and subjected to enormously heavy downfalls of rain, without any detriment to its work.

3. *Filter.*—This is built upon a sloping floor, without channels or pipes of any kind, of the cheapest material found locally, the only necessary condition being that it is insoluble in water and not too friable. The material is broken into irregular fragments of uniform size, ranging from 2 to 3 inches in diameter, except the bottom layer, which is composed of pieces of double that size. All fine material must be entirely removed by screening and washing, so that the liquid which drips from the distributors can flow right through the mass in thin films, over the surfaces of the fragments and in contact with the air, without being held up in any part of the filter. Retaining walls are not necessary, though they may be sometimes convenient. The collecting channel at the base must be capacious, and capable of carrying away 10,000 gallons per square yard of filter. The oxidising power of such a filter increases with its depth, but in a more rapid ratio, and there is no minimum, two feet being quite a practicable working depth, when no more can be obtained.

On first starting such a filter, little change is observed until about the third day, when the sewage odour disappears. Nitrification sets in about the eighth to the tenth day, and increases in vigour up to about the sixth week, when the filter is mature; and the effluent is not only fit to be admitted into any watercourse without risk of offence, but is in a condition to improve polluted water into which it may be discharged. So far as present experience goes, such a filter is capable of continuing its work for years without deteriorating.

Crude sewage can be applied to the filter, provided that it has previously undergone sufficient decomposition by flowing through a long system of sewers, otherwise preliminary septic tank treatment is desirable.

Quantity of Sewage dealt with.—The ordinary domestic sewage, both of water-closet and dry-closet towns, gives, on an average, after 24 hours detention in a tank, an effluent yielding 0·5 part of albuminoid ammonia per 100,000. The continuous sewage filter successfully deals with such tank effluent at the rate of 500 gallons per cubic yard per day. Thus, a filter of the usual depth of six feet will purify 1,000 gallons per square yard per day. Stronger sewage requires a greater area, in proportion to its strength, but no special provision is needed for storm water, as the sewage can be diluted to any extent, a storm flow amounting to as much as 10,000 gallons per square yard per day, maintained for several hours, having been successfully dealt with at existing works.

The following results were obtained at Knowle, Bristol:—

	Tank Effluent, 12th Sept. 1900.	Filter Effluent, 12th Sept 1900.	Filter Effluent, 15th Feb. 1901. (Storm flow.)
Rate of flow per square yard per 24 hours.	—	1,000 gallons.	6,700 gallons.
	Parts per 100,000.		
Saline ammonia	5·12	2·64	1·00
Albuminoid ammonia	0·50	0·13	0·12
Nitrogen as nitrates and nitrites.	Nil	1·46	0·35
Chlorine	8·60	8·60	3·30
Oxygen absorbed in four hours at 80° F.	3·37	1·35	1·00
Incubation test. Oxygen absorbed in three minutes, at 80° F. Fresh	—	0·432	—
Incubation test. Oxygen absorbed in three minutes, at 80° F. After six days incubation in closed vessel	—	0·428	—
Dissolved oxygen after saturation, and standing in open vessel for 24 hours, per cent. of saturation figure.	—	92	—
Smell	Strong Sewage.	None	—

Effect of Temperature. — Recent winters have been comparatively mild, but several short spells of severe frost have occurred, and on one occasion — 10° C. was registered. On no occasion, however, has the action of the filters been prejudicially affected. The comparatively high temperature at which the tank effluent arrives, and the fact that it passes right through the filter in about two minutes, combine to prevent serious cooling. The lowest temperature hitherto observed in the filter effluent has been 4 C.

Character of Effluent.—The application of the incubation test to the final product of the continuous filter has brought to light the imperfection of the usual chemical standards. It appears that a certain portion only, averaging about 70 per cent., of the organic constituents of sewage is reducible by bacterial action, and is capable of undergoing putrefaction. It follows that a strong sewage subjected to treatment will retain a larger unattacked residue, and will yield more albuminoid ammonia than a weaker sewage, yet both effluents are equally exhausted of fermentable material, and therefore equally unputrescible.

The most marked characteristics of the effluent produced by the continuous sewage filter are non-putrescibility, high nitrification, high oxygen content, and complete absence of sewage odour and flavour. The only feature to which exception might be taken is the constant presence of suspended solids. The presence of these solids, however,

which are coarsely granular, quite inoffensive, and settle out readily, in reality affords evidence of the satisfactory working of the filter. A brilliant effluent would show that the filtering material was too fine in texture, and such an effluent would soon show insufficient oxidation.

The effluent, which ordinarily contains 12 parts of calcium nitrate, 2 parts of calcium phosphate, and 2 parts of potassium oxide per 100,000, has been found very beneficial to grass-land, largely increasing the yield of normal grasses and clover, and not promoting a rank growth.

The author concludes with some remarks on the elimination of pathogenic bacteria, and an account of the sewage works at Knowle, Bristol, and the experimental filters at Horfield.—L. A.

Effluents from Sugar Works; Purification of ——, by the Oxidation Process. Dunbar. Zeits. Vereins Deut. Zuckerind, 1901, [551], 1011—1020.

The effluents from beet sugar factories are most difficult to deal with both on account of their quantity, their characteristic odour, and their readiness to undergo putrefaction with the evolution of objectionable gases.

The author communicates his experience with a process of partial purification by oxidation, remarking that all the waste waters of the factory, except the condensing waters, had to be treated. The waters were first collected and mixed in a settling pond. After a variable time they were raised from this by a pump into a channel supplying the oxidation plant. This consisted of two vats of about 20 cubic metres capacity, one of which was filled with boiler slag and the other with coke. These constituted the primary oxidisers. From these the water was discharged into the secondary oxidisers, consisting of a number of iron tanks filled with broken slag or coke in pieces varying from 3 to 10 mm. in size. The oxidisers were charged with waste waters twice a day, and the water remained in the primary oxidisers for 2—4 hours, and in the secondary ones for 3—5 hours

The object, which was successfully achieved, was to convert the waste waters into an effluent no longer possessing the peculiar odour of the beet root, which, on standing in the air for 10 days or so, showed no tendency to undergo "stinking" putrefaction with production of a black deposit and sulphuretted hydrogen. No attempt was made to obtain a perfectly pure effluent; the product was still very muddy, and contained a considerable quantity of organic matter. Irrigation fields were still necessary for the disposal of the purified effluent, but the pollution of the air in their neighbourhood was entirely prevented, and their purifying capacity was increased.

The author followed up the work performed by the oxidisers by a series of determinations of the oxidisable matter in the waters by means of permanganate The proportion of oxidisable matter in the waters charged into the oxidisers increased as the season advanced. This was mainly due to the filling up of the settling pond with mud, with a decrease of its efficiency, and to the putrefaction of this mud, yielding soluble products which passed on to the oxidisers. The capacity of the oxidisers to do all that was required of them was preserved to the end. When once the oxidisers had acquired their specific properties, *i.e.*, had "ripened," it was found that the water had lost about 30 per cent. of its original oxidisable matter after passing the primary vessels, and from 60 to 70 per cent. when discharged from the secondary oxidisers on to the fields. Fish remained quite healthy in this effluent when diluted with five times its volume of water.—J. F. B.

English Patents.

Air; Means or Apparatus for Regenerating and Purifying ——. A. Desgrez and V. Balthazard, Paris. Eng. Pat. 22,856, Aug. 13, 1900 (under International Convention).

The apparatus, which is portable, is for supplying fresh air to firemen and other persons in places where the atmosphere is unable to support life. It comprises a chamber provided with air inlet and outlet, and a fan driven by a small motor, which maintains a continual circulation of the air through the chamber. The latter contains, at the bottom, some water into which sodium peroxide is discharged in predetermined quantity, at regular intervals, by suitable mechanism. The oxygen thus generated replaces that which has been used up in respiration, and the sodium hydroxide absorbs the carbon dioxide formed. The air passing from the chamber and warmed by the reaction is cooled by passing through a refrigerator.—L. A.

Pot-Ales, Wash Liquors, Sewage, and other Aqueous Waste or Bye-Products, Treatment of ——. H. McPhail Wakefield, Yorks. Eng. Pat. 23,198, Dec. 19, 1900.

The waste liquids are first allowed to settle in tanks, with or without the addition of chemicals, then filtered, and finally evaporated under reduced pressure in multiple-effect evaporators. The precipitates and residues are treated for the recovery of any valuable by-products which they may either contain or yield by destructive distillation.—L. A.

Sewage and other Liquids; Apparatus for Purifying ——. D. Cameron, J. Commin, and A. J. Martin, all of Exeter. Eng. Pat. 23,412, Dec. 21, 1900.

The invention consists in improved methods for delivering sewage and such liquids to the beds or filters in which they are treated by bacteria. Reference is made to Eng. Pats. 3003 and 23,042, 1896 (this Journal, 1897, 459 and 753), to 22,965, 1897 (1898, 862), to 5671 and 19,697, 1898 (1899, 511 and 1046) and to 18,322, 1899. Liquid is supplied in succession to a series of perforated pipes set over a filter bed, by a revolving chamber, having openings spirally around it, and a number of pockets, the chamber being rotated by delivery of the liquid, and supplied with a checking device. For alternate delivery of liquid to two filters, a tipping chamber having perforated tubes is used, operated automatically and alternately by overflow from one or other of the receptacles. Means involving the control of the valves of the filters by tipping buckets actuated by clockwork mechanism, are described for delivering liquid successively to a series of filters, and discharging it at intervals, definitely regulated. Mechanism is described whereby series of filters are filled and discharged.—E. S.

XIX.—PAPER, PASTEBOARD, Etc.

Agave Fibre Industry [Paper]. J. Soc. Arts, 1901, **50**, [2562], 102.

Agave (*Agave Americana*) is the name given to a large genus of fibre-yielding plants, indigenous to Central America, chiefly to Mexico, and which were introduced into India probably by the Portuguese. A company was formed two years ago at Pawai, in the Bombay Presidency, for carrying on the agave fibre industry. Agave fibre is specially suitable for the manufacture of paper, making a strong, tough, smooth paper, which even when unsized, may be written upon without the ink running Also for cordage purposes, agave fibre is stated to be equal in value to most known fibres. The fibre prepared up to the present in India, though of good colour, is harsh and brittle, but this is probably chiefly due to imperfect modes of extraction. Experiments made in the Madras Presidency have shown that agave fibre stands a far greater strain than coir, *hibiscus cannabinus*, *sanseviera zeylanica*, and *gossypium herbaceum*, and is only inferior in resisting power to *crotularia juncea* and *calotropis gigantea*. Another species of agave is also coming into importance, *Agave Sisalana*, which yields the sissal hemp of commerce.

For the cultivation of agave a gravelly or laterite soil is most suitable, whilst a damp and water-logged soil is most disadvantageous. The plants, which do not need any manure, thrive under unfavourable circumstances, and are found in many parts of India, so that it is possible for a great industry to be developed, the only essential being that the plantations should be within convenient reach of a sufficient water supply.—A.S.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Borax when Distilled with Methyl Alcohol; Behaviour of ——. E. Polenske.

See under XXIV., *page* 195.

Bromoform; Preparation of ——, *by Electrolysis.* P. Coughlin. Amer. Chem. J., **27**, [1], 63—68.

The apparatus used by the author for the preparation of bromoform by the electrolysis of potassium bromide in the presence of acetone (*cf.* E. Schering, Ger. Pat. 29,771: Elbs and Herz, this Journal, 1897, 932), consisted of a beaker of 250 c.c. capacity, in which was suspended a porous cup of 110 c.c. capacity. The porous cup was made the cathode chamber, and in this was a solution of 10 grms. of sodium carbonate in 100 c.c. of water. The cathode was a piece of iron-wire gauze of about 60 sq. cm. superficial area on one side. The beaker contained the anode solution, consisting of 25 grms. of potassium bromide and 10 c.c. of acetone dissolved in 75 c.c. of water; 6 grms. of solid sodium carbonate were gradually added during the operation. A piece of platinum foil, which had an area of 50 sq. cm. on each side, formed the anode. The theoretical current yield was obtained when an anode density of 3·8 ampères per sq. cm., a voltage of 4·2, and a temperature of 25°—30° C. were employed. The actual yield of bromoform in 2·4 ampère-hours under these conditions was 3·8 grms. —H. L.

Xylopia Ethiopica [*New Alkaloid*]; *Constituents of* ——. De Rochebrune. Pharm. Rundschau, 1901, **34**; through Pharm. Zeit., **46**, [70], 692.

The fruits of *Xylopia ethiopica*, the so-called Ethiopian pepper, which is used by the natives of West Africa as a condiment, either alone or mixed with the fruits of *Capsicum frutescens*, is found to contain a new alkaloid which crystallises in fine long needles. This the author has named anonaceïne. The fruits, leaves and bark also yield an aromatic, fragrant, volatile oil and a resinous body.—J. O. B.

Alkaloids; The Alkalimetric Factors of Certain Di-Acid ——. H. M. Gordin. Archiv der Pharm., **239**, [9], 645—647.

In a previous communication (this Journal, 1900, 78), the author has shown that generally, when salt-forming alkaloids are precipitated from solution in standard acid by neutral Mayer's or Wagner's reagent, the excess of acid remaining in the solution will at once give the amount combined with the base, one molecule of alkaloid being equivalent to one molecule of acid. Berberine was found to be an exception to this general rule, the anomalous reaction being subsequently explained by further investigations. Another exception occurs in the case of certain alkaloids which form with acids two or even three series of salts, such, for instance, as the cinchona alkaloids, which form salts combining with one, two, or three molecules of monobasic acid. It is therefore necessary to determine the nature of the double salt thus formed under these conditions, since the molecular weight of the compound gives no clue to its composition. It is found that when quinine, cinchonidine, or cinchonine is precipitated with potassium periodide, each molecule of the base combines with two molecules of potassium iodide and uses up two molecules of acid.—J. O. B.

Hyoscine and Atroscine. J. Gadamer. J. prakt. Chem. 1901, **64**, [23 and 24], 566—568.

The author replies to O. Hesse (this Journal, **20**, [12], 1233), and maintains his view that the "Atroscine" of Hesse $C_{17}H_{21}NO_4 + 2H_2O$, m.pt. 37° C., is the unstable hydrate of *i*-scopolamine $C_{17}H_{21}NO_4 + H_2O$ m.pt. 56°—57° C., into which it is spontaneously converted on keeping.—H. L.

Atroscine into i-Scopolamine; Spontaneous Transformation of ——. H. Knox-Krause. J. prakt. Chem., 1901, **64**, [23 and 24], 569—571.

The author (see preceding abstract) has determined the melting point of a sample of natural (inactive) atroscine, which has been in his possession since 1898, and finds that it now melts at 57° C., the m.pt. of *i*-scopolamine. The crystals have a weathered appearance, and are no longer hard and transparent.—H. L.

Cocaine Hydrochloride; Decomposition of ——, *by Hydrochloric Acid in Alcoholic Solution.* P. Horst. Chem.-Zeit., 1902, **26**, [3], 27—28.

The formation of methyl benzoate in the decomposition of cocaine by acids or alcoholic potash is generally regarded as due to a secondary reaction between benzoic acid and methyl alcohol, both of which are produced from the cocaine. It might, however, be possible that the methoxyl and benzoyl groups united at once, when in the nascent state. The author passed hydrochloric acid gas through solutions of benzoic acid in ethyl alcohol containing a little methyl alcohol, and in methyl alcohol containing a little ethyl alcohol. The ester produced in each case was that of the predominant alcohol. Methyl benzoate could not be detected in the products of the action of hydrochloric acid gas on a solution of cocaine in ethyl alcohol. In the test for cocaine, the formation of methyl benzoate must therefore be due to a secondary reaction.—A. C. W.

Canadine and Berberine; Relationships between ——. B. Gadamer. Archiv der Pharm., **239**, [9], 648—663.

In addition to berberine and hydrastine, Hale pointed out the presence of a third alkaloid in the rhizome of *Hydrastis canadensis* (Jahresb. der Pharm., 1875, 123) to which Schmidt afterwards gave the name canadine and showed that the pure base and its salts are colourless, not yellow. The formula $C_{20}H_{21}NO_4$ was attributed to it, differing from that of berberine by 4 atoms of hydrogen. The melting point was found to be 132—135° C. while that of synthetic hydroberberine was 166—167° C. The author noted that berberine is a very strong base, not only colouring litmus green (blue and yellow), but also reacting with phenolphthaleïn even in very dilute solutions. Hydroberberine and canadine, on the other hand, are so feebly basic that their salts may be titrated with dilute alkali using phenolphthaleïn as the indicator. The author further observes the analogy between berberine and the tarconinemethylchloride of Perkin.

The two bodies also correspond in their oxidation products and physical characters.

He found that hydroberberine hydrochloride, when converted into the *o* bromo-camphorsulphonate, and recrystallised, was separable into two isomeric forms from which lævo- and dextro-canadine were liberated. This lævo-canadine was found to be identical in every respect with natural canadine, having the same melting point 132—133° C., and the same rotation $[\alpha]_D = -298$. Dextro-canadine was only obtained pure after many recrystallisations, and was found to be dextro rotatory to the same degree, viz., $[\alpha]_D = +297{\cdot}43$. Its melting point is 139—140°. In general appearance and reactions the two canadines were identical.—J. O. B.

Opium and its Preparations; Determination of Morphine in ——. W. Stoeder.

See under XXIII., *page* 194.

Morphine: Characteristic Reaction for ——. G. Fleury.

See under XXIII., *page* 192.

Antipyrine Nitroprusside, Antipyrine Ferrocyanide, and Antipyrine Ferricyanide. M. C. Schuyten. Handelingen van het vijfde Vlaamsch Natuur-en Geneeskundig Congres, Brugge, Sept. 29, 1901. Chem. Centr., 1901, **2**, [26], 1362.

These salts can be readily prepared by double decomposition. *Antipyrine nitroprusside*, $(C_{11}H_{12}N_2O)_2H_2(NO)$

$(CN)_5Fe.H_2O$, is a light brown, amorphous body, of m. pt. 77—78° C., soluble in water, and of acid reaction. The solution in water becomes blue on exposure to the air; the solution in acetone is green. *Antipyrine ferrocyanide*, $(C_{11}H_{12}N_2O)_2H_4(CN)_6Fe$, is white, but acquires a bluish colour at about 150° C.; it is easily soluble in water. *Antipyrine ferricyanide*, $(C_{11}H_{12}N_2O)_3.H_3(CN)_6Fe$, forms yellow needles, easily soluble in water.—A. S.

Antipyrine; Ferric Haloid Compounds of ——. M. C. Schuyten. *Ibid.* Chem. Centr., 1901, **2**, [26], 1362.

Antipyrine-ferric chloride or ferropyrine, $(C_{11}H_{12}N_2O)_3FeCl_3$ (see this Journal, 1895, 594), forms an orange-yellow powder, which becomes brown at about 150° C., and melts at about 205° C. On warming the aqueous solution, a reddish-brown precipitate is produced, which partly redissolves on cooling. *Antipyrine-ferric bromide* and *antipyrine-ferric iodide* could not be prepared either by double decomposition or by direct union of the components. —A. S.

Rhamnus Purshianus; Essential Oil of ——. H. Hänsel. Pharm. Zeit., **46**, 858. Pharm. J., 1901, **67**, [1641], 640.

The author obtained from cascara sagrada bark, by steam distillation, 0·055 per cent. of a semi-solid, because partially crystallised oil, melting at 18·5° C. to a brown liquid, giving an intensely yellow solution in alcohol. The oil, which has the specific gravity 0·9475 at 23° C., is slightly acid, has the peculiar and powerful odour of the bark, and an aromatic, pungent, slightly bitter taste. —A. S.

Eucalyptus Oils; Peppermint Odour in ——. H. G. Smith. Paper read before the Roy. Soc., New South Wales. Pharm. J., 1902, **68**, [1646], 21.

The author has isolated the constituent to which the peppermint odour possessed by many eucalyptus oils is due. It occurs in greatest amount in the oil obtained from the leaves of *E. dives* and *E. radiata*, and in fair quantity in the oils of several other species. It is usually found in those oils which contain much phellandrene but little eucalyptol (see this Journal, 1901, 744). It is probably a new ketone, having a composition corresponding to the formula $C_{10}H_{18}O$.—A. S.

Citron Oil. S. Gulli. Chem. and Druggist, 1902, **50**, [1115], 19.

The author states that pure citron oil is rather rare on the market, as the three varieties of fruit grown in Reggio Calabria and in Sicily are, as a rule, exported in brine, the oil only being made to special order at the period of the fruit crop. The commercial oil is usually a mixture of citron oil with more or less abundant portions of lemon oil, and bitter or sweet orange oil. The three varieties of citron cultivated in Reggio Calabria and Sicily are:—(1) *Citrus Medica*, var. *Vulgaris* (Risso). The fruit, which is known by the name of "Cedro," has a thick rind and a hard flesh. (2) *Citrus Medica*, var. *Gibocarpa* or *Citrea* (Risso). A small citron known as "Cedrino." (3.) *Citrus Medica*, var. *Rhegina* (Pasquale). The fruit, known by the name of "Cedrone," is about 2 decimetres in length, and has an abundant eatable flesh surrounding the acid-bitter juicy part. The yield obtained by hand-pressure is about 300—350 grms. of oil per 1,000 citrons. The oil is known in Reggio Calabria and Sicily as "essenza di cedro or cedrino"; in England, as citron oil; and in France, as "essence de cédrat." Three samples examined by the author gave the following results:—No. 1 was a pure oil made by the author last year from "cedri"; No. 2 was commercial citron oil containing a considerable amount of lemon oil; and No. 3 was a mixture of lemon oil, bitter and sweet orange oil, and lime oil with small portions of citron oil.

No.	Specific Gravity.	Rotation (100 mm. Tube).
1	0·8706	+ 67°
2	0·858	+ 62° 13′
3	0·862	+ 78° 8′

The two characters, *viz.*, sp. gr. and optical rotation, are sufficient to detect adulteration.—A. S.

Kousso Flowers (Brayera anthelmintica); Constituents of ——. A. Lobeck. Archiv der Pharm., **239**, 672—696.

By repeated fractional crystallisation from absolute alcohol, commercial kosin, having the empirical formula $C_{23}H_{30}O_7$, and melting at 148° C., has been separated into two distinct crystalline constituents, α- and β-kosin.

α-Kosin forms long lemon-yellow needles having similar reactions to kosin. It melts at 160° C., and has the empirical formula $C_{23}H_{26}O_7$. It is identical with the body previously isolated and described by Daccomo and Malagnini. The yield from commercial kosin is about 4 per cent. It was found to contain two methoxyl and three hydroxyl groups.

β-Kosin forms deep yellow prisms, melting at 120° C., and is more soluble in alcohol than α-kosin. It has the empirical formula $C_{23}H_{30}O_7$ and contains two methoxyl groups.

Protokosin.—In addition to these two bodies, kosin yields to methyl alcohol protokosin, $C_{29}H_{34}O_9$, crystallising in small shining needles, readily soluble in ether, benzene, chloroform, and hot alcohol; less soluble in cold alcohol, and insoluble in water. It melts at 176° C., but can also be obtained in the form of an anhydride, of m. pt. 182° C., by the condensation of two molecules of protokosin, with elimination of one molecule of water. Protokosin contains two methoxyl groups.

Kosodin.—This is separated from the mother-liquor of protokosin by precipitation with light petroleum spirit. It occurs in crystalline tablets which melt, when recrystallised from alcohol, at 178° C. It is similar in reaction to kosin. The formula $C_{31}H_{40}O_{11}$ is assigned to it; it contains two methoxyl groups.

Kosotoxin.—This was obtained as a yellowish-white amorphous body from the reddish-yellow resinoid residue insoluble in the ether and petroleum spirit mother-liquor, after the isolation of protokosin and kosidin. It agrees in general characters with the kosotoxin of Leichsenring, except that the melting point is 62° C. instead of 80°, as stated by that author. It has probably the formula $C_{52}H_{68}O_{20}$, and contains two methoxyl groups.

The decomposition products of all the kosotoxins were found to be identical, and to give all the reactions for methylphloroglucinol.

Commercial Kousso Extract.—The commercial extract of kousso is considered a satisfactory article, and its use in medicine should be abandoned. Recent specimens were found to be practically devoid of active principles.—J. O. B.

Jasmine Perfume; Formation of ——. A. Hesse. Chem. Ind., 1902, **25**, [1], 1—6.

The four methods generally used at Grasse for the extraction of a perfume from flowers are:—(1) Extraction of the fresh blossoms with ether, light petroleum spirit, chloroform, &c. (2) Maceration, *i.e.*, treatment with fat at about 70° C. (3) Distillation of the blossoms in a current of steam. (4) Enfleurage, which consists essentially in spreading the blossoms over a layer of fat and keeping for about 24 hours in the closed "châssis." Passy (Comptes Rend., 1897, **124**, 783) divides flowers into two categories, *viz.*, (1) Flowers like the rose and orange blossom, which contain their perfume practically quite complete, and which can be technically treated by maceration, extraction, or distillation. (2) The great majority of flowers (including jasmine) containing only an insignificant amount of perfume, which they produce and emit continuously. For these the enfleurage is adapted, because it preserves the life of the flower and gathers the perfume emitted every moment so long as life lasts. Experimental proof of this hypothesis is furnished by the comparative investigation carried out by the author on 1,000 kilos. of freshly plucked jasmine blossoms. By the method of extraction (I.) 178 grms. of essential oil were obtained from 1,000 kilos.;

by distillation (II.) (from same quantity of blossoms) 194 grms. were obtained; while the enfleurage yielded no less than 1,784 grms. of oil in the fat (III.), and 195 grms. of oil were found still remaining in the blossoms (IV.) The chemical composition of the oils obtained is shown in the subjoined table:—

	I. (178 grms.)	II. (194 grms.)	III. (1784 grms.)	IV. (195 grms.)
	Grms.	Grms.	Grms.	Grms.
Jasmone.....	5·7	6·2	55·5	6·2
Benzyl acetate....	35·6	44·2	1248·8	68·2
Benzyl alcohol....	21·3	23·2	107·1	34·3
Methylanthranilate	..	2·87	5·3	2·86
Indole.....	..	..	44·16	..

From this (1) it is clear that the jasmine blossoms subsequently produce during enfleurage about nine times as much oil of jasmine as they contain when plucked. (2) It seems probable that the oil originally contained in the blossom remains there, both during and after the enfleurage, and that it is mainly the freshly formed oil which is exhaled into the enfleurage fat. (3) The absence of indol in the fresh blossoms and also after enfleurage, shows that the indol found in the jasmine pomade of commerce (Ber. **32**, 2612) is not a decomposition product of vegetable albumin, but a normal constituent of the exhaled perfume. (4.) It is probable that methyl anthranilate is not contained in the blossoms in a free state, but as a more complex compound which is readily split up; for it is obtained both by distillation in steam and by the enfleurage, but not by extraction.

To a large extent this article is a *résumé* of work by the author and others, and previously published elsewhere, to which copious references are given.—H. L.

Convallaria [*Lily of the Valley*] *Leaf Oil.* H. Hansel's Report; through Pharm. Centralh., **42**, [33], 496.

The leaves of *Convallaria majalis* yield, on steam distillation, 0·058 per cent. of a green volatile oil, which becomes brown on exposure to the air. It is solid at ordinary temperatures, having a crystalline structure, melting at 40°—40°·5 C., and commencing to boil at 120° C. It has a pleasant aromatic odour, a sharp spicy taste, and an acid reaction. On pressing between absorbent paper, the odorous liquid portion is removed; the solid portion, recrystallised from alcohol, forms white, almost odourless scales, melting at 61° C.—J. O. B.

Extraction of Aqueous Solutions with Chloroform; Apparatus for ——. F. Pregl.

See under XXIII., *page* 195.

English Patents.

Terpene Peroxide; New Process for the Production of ——. C. Ramage, Leicester. Communicated by A. S. Ramage, Cleveland, Ohio, U.S.A. Eng. Pat. 4209, Feb. 27, 1901.

The claims relate to the oxidation of terpene hydrocarbons, and the production of a new antiseptic or medicament—terpene peroxide, $C_{10}H_{16}O_2$—for the treatment of diseased tissues. The process consists in passing ozone or ozonised air through a terpene hydrocarbon. When oil of turpentine is employed, it is treated preferably at a temperature of 120° C., and when oil of eucalyptus is used it is heated to 60° C. Terpene peroxide passes out in the form of dense white fumes, which are condensed at 0° C. A resinous by-product, which is also claimed, remains behind to the extent of about 5 per cent. in the case of turpentine, and 50 per cent. in the case of eucalyptus.—J. F. B.

Heptine and Octine; Manufacture of Useful Products from ——. C. Moureu, Paris. Eng. Pat. 23,727, Dec. 28, 1900.

By the action of sodium on heptine and octine, C_7H_{12} and C_8H_{14}, in ethereal solution, sodium compounds are obtained, which, by the action of carbon dioxide, give the sodium salts of new acids, $C_8H_{12}O_2$ and $C_9H_{14}O_2$. The acids may be liberated by the action of mineral acids; by ordinary processes they yield acid chlorides, which react with aromatic amines to produce substituted amides. The esters of the acids may be obtained by known processes or by the action of chloroformic esters on the sodium compounds of the hydrocarbons; on treatment with sulphuric acid and pouring into water, the esters give the corresponding β-ketonic acid esters by fixation of a molecule of water. The same β-ketonic esters are obtained by heating the acids, $C_8H_{12}O_2$ and $C_9H_{14}O_2$, with alcoholic potash and esterifying the resulting β-ketonic acids. The processes described are claimed, and also the products, as new articles of manufacture. The esters possess aromatic properties, and are stated to be useful in the manufacture of essences, perfumes, sweetstuffs, liqueurs, &c. The amides are stated to possess therapeutic properties. The physical properties of many of these esters and amides are given.—A. C. W.

Hydroxycarboxylic Acid; Manufacture of Ortho ——. A. Zimmermann, London. From the Chemische Fabrik auf Actien vorm. E. Schering, Berlin, Germany. Eng. Pat. 274, Jan 4, 1901.

(See Fr. Pat. 307,186; this Journal, 1902, 68.)

—A. C. W.

Thioxanthines; Manufacture and Production of ——. G. W. Johnson, London. From C. F. Boehringer und Soehne, Waldhof, Mannheim, Germany. Eng. Pat. 18,976, Sept. 23, 1901.

The patentee claims the process for producing 8-thioxanthines, which consists in heating the acid salts of alkali metals and uric acid or its homologues with carbon bisulphide and water under pressure at 150° C. The uric acids, in which the alkyl groups are attached to the alloxan nucleus, are alone susceptible of this reaction; the 7- and 9-alkyl uric acids are not changed by heating with carbon bisulphide. 3-Methyl-8-thioxanthine is also claimed as a new article of manufacture; it crystallises in bright yellow laminæ, and begins to soften and decompose at about 340° C.—A. C. W.

XXI.—PHOTOGRAPHY.

Albuminised Paper Printing; Essentials for Success in ——. G. T. Harris. Brit. J. Phot., 1901, **48**, [2172], 805—806.

The author claims that the albumin process is capable of giving prints which cannot be excelled for quality of image, tone and surface; he recommends generous salting, and a silver bath of at least 50 grains to the ounce, made alkaline with sodium carbonate; nothing but perfectly fresh egg-albumin must be used in the manufacture of the paper, and the key to success throughout its treatment is alkalinity; perfect fixing is more important than much washing, which always degrades the tone. The use of tartaric and citric acids to improve the keeping qualities of the paper is of doubtful advantage in view of the quality of the resulting prints; paper sensitised in the neutral bath will keep perfectly for three or four weeks, and if pressed between blotting paper, saturated with sodium carbonate, does not discolour until over twice that time has elapsed. The author has prints up to forty years old which are still perfectly good.—J. W. H.

"Paramol": A New Developer. R. Jahr. Brit. J. Phot., 1902, **49**, [2175], 32. (See this Journal, 1901, 1239.)

The author has tested "paramol," and finds that it brings up the image rather quickly, density and detail coming out simultaneously afterwards. It is soluble in 12 times its weight of water. It can be used for negatives, diapositives, and papers. It yields a bluish negative. Compared with a standard pyrogallol developer by means of a Chapman Jones plate tester, the paramol brought out the lower numbers more strongly in five minutes' time; but it gave a little more fog, and a rather steeper gradation of tones. The first numbers appeared in four seconds at a temperature of 20° C.—F. H. L.

Foggy Plates; Obscure Causes of ——. Brit. J. Phot., 1902, **49**, [2175], 25.

This is an article calling attention to certain practical causes of fogged plates, which are explained by Russell's investigations (this Journal, 1897, 825; 1899, 516) into the action of hydrogen peroxide upon sensitive gelatin emulsion. The interior parts of photographic apparatus are frequently blacked with a "stain" or varnish containing terpenes, or they comprise certain pieces of waterproof cloth, &c.; and so while the goods are new, plates put into them show local or general fog. Old and seasoned wood is capable of absorbing the fog-producing agent, and of giving it off afterwards, more or less rapidly according as the temperature is higher or lower. Linseed oil and copal varnish are specially active. Of the materials used to make paper, cotton and hemp are passive; but other substances are active, *e.g.*, straw cellulose, esparto, flax, and mechanical wood pulp—their energy increasing in the order quoted. Bleaching destroys the action, but it sometimes returns, and occasionally the size—a rosin size in particular—gives off peroxide. Thus, in packing up plates, contact between paper and film should be avoided, and the black "needle-paper" often employed should be replaced by (say) paraffined paper. Printers' ink is active, its power decreasing with age, and increasing with temperature; writing ink is inert.—F. H. L.

Latent Image; Luppo-Cramer's Experiments on the ——. Brit. Jour. Phot., 1901, **48**, [2173], 820—821.

The controversy on the nature of the latent image between Abegg, who supports the nascent silver theory, and Eder, who favours the sub-bromide hypothesis, has taken a new turn by the publication of the experiments of Luppo-Cramer. Silver in a finely-divided state obtained by reduction from a Lippmann emulsion does not promote development in a gelatin plate, and when the finely-divided silver was converted into sub-bromide by sufficient bromine, no greater effect was produced. The destruction of the latent image by bromine has no weight in the argument, since such treatment before exposure prevents the formation of an image. On account of the fact that bromine has a tanning action on gelatin, Luppo-Cramer turned his attention to collodion; a weak solution of bromine only reduced the sensitiveness of a collodion plate if dipped before exposure, whilst the image was completely destroyed when dipped after exposure. By adding silver sub-bromide to the collodion emulsion, development was favoured very decidedly, and finely divided metallic silver had the same effect. Luppo-Cramer concludes that the latent image is composed solely of silver bromide in an unstable condition, actual reduction not taking place until a developer is used.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Explosive Powder; Manufacture of ——. H. H. Lake, London. From the Eastern Powder Co., Boston, U.S.A. Eng. Pat. 17,626, Sept. 3, 1901.

The product described in the patent is claimed to be semi-smokeless, flameless, and odourless, and therefore particularly suitable for employment in coal and mineral mines; it is also stated to be non-deliquescent, and to bear storage for long periods of time without deterioration. The special points claimed are the exact order and method of mixing the ingredients, and the use of the gasoline. This hydrocarbon is mostly evaporated during manufacture, but a residue remains which is said to act as a binder, giving great cohesive strength to the cakes during and after the hydraulic pressure. To make a batch of 300 lb, 211½ lb. of sodium nitrate and 46⅔ lb. of a highly gaseous bituminous coal containing from 30 to 40 per cent. of volatile matter, both in impalpable powder, are mixed together, and then incorporated with ⅓ gall. of gasoline. The whole is transferred to a steam-jacketed mill, fed with live steam as hot as possible, and ground with two, three, or even more gallons of boiling water until the mixture is homogeneous. After running for 20 minutes, 38¼ lb. of powdered sulphur are introduced, and the grinding continued for 40 minutes till the product is dark brown and as dry as possible, without letting the wheel of the mill cut through on to the bed. The material is next formed into cakes by means of hydraulic pressure not exceeding 400 lb. per square inch. It is then grained in a corning mill, and the dust removed. The grains are dried at "175°" for 10 hours, and glazed for 10 hours, adding a little graphite when the first four hours have elapsed. Finally the explosive is graded into the commercial sizes.
—F. H. L.

Detonating Composition; Improved Safety ——, *as a Substitute for Fulminate of Mercury.* J. Führer, Vienna. Eng. Pat. 2755, Oct. 16, 1901.

For the detonation of high explosives, the inventor claims the following composition, which is stated to be absolutely safe, and to explode only in an hermetically closed space:—An intimate mixture of copper ammonium nitrate, potassium nitrate, sulphur and aluminium, alone or mixed with an ammonium nitrate explosive which considerably increases its power.—J. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Thermo-Regulator; The Sensitiveness of a ——. A. W. C. Menzies. Proc. Chem. Soc., **18**, [245] 10.

The following details have been recorded, as it is not generally known within what small limits of temperature a bath may be kept constant, using gas heating and the ordinary form of regulator. The glass "horse-shoe" reservoir was of the usual form, with a capacity of 390 c.c. and an outer surface of about 650 sq. cm.; to this reservoir the ordinary U-form regulating tube which contains mercury, was fused on and the glass connections so bent that all the tubes containing enclosed liquid were under the water of the bath. As toluene was used for the expanding liquid, the stopcock that closes one limb of the U-tube was lubricated with syrupy phosphoric acid. The bath held 14 litres and was of enamelled iron, with no jacket. The stirrer was driven by a small electromotor, and care was taken that a portion of the vibration of the motor was communicated to the regulator, thus aiding the free movement of the mercury in response to the pressure of the toluene. The gas supply to the bye-pass was adjusted by a screw-clip in such a way that the bye-pass flame alone was nearly sufficient to maintain the temperature. Using a tube of 3·1 mm. bore for the outer limb of the regulator, the temperature of the bath can be kept constant at 18° within a total range of 0·008°, that is, 0·004° on each side of the middle point. After 24 days, using unfiltered coal-gas, the actual temperature was the same as at starting, and the closeness of regulation was found still within the above limits. If narrower tubes be used, it is well to dry and filter the gas. The inlet tube that leads the gas down to the surface of the mercury is cut off square and should be so wide that on trial the mercury rises higher in it than in the space between it and the regulator tube. A bore of 1·9 mm. for the outer limb of the regulator gave a temperature variation in the bath of not more (though probably less) than 0·0025 (total range). The difference of temperature between bath and room was 6—7°; if the flame were removed, the bath was found to cool 0·1° in 4·5 minutes. With this regulator, a well-tapped calorimetric thermometer by Golaz, divided into fiftieths of a degree, remained apparently stationary to an estimated tenth-division, as also did a "Beckman" thermometer graduated directly to hundredths.

INORGANIC—QUALITATIVE.

Phosphorus in Presence of Alcohol; The Mitscherlich Test for —— J. Habermann and A. Oesterreicher. Zeits. anal. Chem., 1901, **40**, 761—766.

In view of the fact that the characteristic luminosity of traces of yellow phosphorus is prevented by alcohol, while

the detection of phosphoric acid in the oxidised distillate is no proof of their presence, two modifications of the above test are recommended

1. A small separating funnel containing water passes through the cork of the condenser beside the tube from the boiling flask; the distillation is carried out as usual, and when hot vapours are felt to enter the condenser, water is allowed to flow in from the funnel.

2. The distillate is collected in fractions, small at first; these are diluted with water in a dark room.

In each case, the addition of water produces a luminosity not previously observed when phosphorus and alcohol are present together, *e.g.*, in the distillation of 50 c.c. of water containing a little ferrous sulphate and sulphuric acid, 50 c.c. of alcohol, and one match-head which contained 1·6 mgrms. of phosphorus.

With regard to the delicacy of Mitscherlich's test, the authors quote G. Baumert's opinion (Lehrbuch der gerichtlichen Chemie, 161), that 1 mgrm. of phosphorus in 200 grms. causes a phosphorescence which lasts half an hour; and Fresenius, who remarks (Introduction to Qualitative Analysis, 16th German edition) that the glow caused by 1·5 mgrms. of phosphorus in 200 grms. lasts while over 90 grms. are distilled: which is here interpreted to mean that much less than 1 part of phosphorus in 100,000 can be detected, in opposition to Muckerji (Zeits. anorg. Chem., **27**, 74), who states: "Fresenius has proved that the detection of phosphorus by the Mitscherlich test is only just possible when 150 grms. of the mixture contain 1·5 mgrm. of phosphorus."—J. N. G.

Nitrous Acid; Alleged Reaction of Brucine with ——. G. Lunge. Zeits. angew. Chem., 1902, **15**, [1], 1—3.

In L. W. Winkler's paper in Chem.-Zeit., 1901, 586, on the determination of nitric and nitrous acids in natural waters (this Journal, 1901, 937), the statement occurs that a brucine sulphuric acid solution is coloured in the same degree by equivalent solutions of nitrites and nitrates; while Lunge and Levoff, when publishing their method of estimating nitrates with brucine, stated that nitrous acid or nitrosyl-sulphuric acid do not give the colour reaction with brucine.

On reinvestigating the subject, the author found great difficulty in obtaining nitrites for analysis free from nitrates, carefully prepared silver nitrite contained nitrate, while sodium nitrite was found to alter rapidly when its aqueous solution was kept.

Amyl nitrite was found free from nitrate, and a few drops added to a cold mixture of 95 per cent. sulphuric acid diluted with one fifth of its volume of water, and used as nitrous acid solution. "Chemically pure" sulphuric acid was not perfectly freed from nitrates even by boiling with ammonium sulphate for three hours. Brucine dissolved in this acid gave no colour reaction with the above nitrosyl-sulphuric acid solution from amyl nitrite, or with a freshly prepared solution of sodium nitrite in boiled water. If water was added to these mixtures, a colour was at once noticed, due to the nitric acid formed by the reaction $3NO_2H = NO_3H + 2NO + H_2O$.

In mixing nitrite solutions with sulphuric acid, they should be added drop by drop to the sulphuric acid, which is continually shaken, otherwise nitric acid will be formed.

The author concludes that brucine does not react with unaltered nitrous acid.—J. N. G.

Hydroxylamine; New Colour Reaction of ——. W. C. Ball. Proc. Chem. Soc., **18**, [245], 9.

During the course of some experiments on the action of hydroxylamine salts on nickel sulphide, the author obtained an intense purple coloration, which proved eventually to be independent of the presence of nickel or any other metal.

The production of this colour is a very delicate test for hydroxylamine, as solutions so dilute as no longer to reduce Fehling's solution perceptibly, either in the cold or on boiling, easily respond to this test. The best method of applying the reaction is to boil the hydroxylamine solution with one or two drops of yellow ammonium sulphide solution until a precipitate of sulphur is produced; two or three cubic centimetres of 0·880 ammonia solution are then added, and finally an equal volume of strong pure alcohol.

The purple colour thus developed exhibits a characteristic absorption spectrum, consisting of a wide band covering the yellow, orange and part of the green. In stronger solutions, the violet and blue are absorbed, and in very strong solutions the green rays also, so that the only light transmitted is a band in the red.

With a dilution of 1 part of hydroxylamine in 2,000 of water, the coloration is intense and the band very distinct; with a dilution of 1 part in 300,000 of water, the coloration is still strong, and the band perceptible in 3 centimetres thickness of the solution. By means of this test, hydroxylamine may be detected when the dilution does not exceed 1 part in 500,000 of water.

The production of the colour is well adapted for showing the formation of hydroxylamine by the action of metals, for example, tin, on nitric acid. It also serves as a very good means of distinguishing hydroxylamine from hydrazine, as the latter base does not produce the colour. The coloured substance is also produced, and can be obtained in the solid form, by the action of dry ammonia on an alcoholic solution of sulphur monobromide, or an acetone solution of nitrogen sulphide in presence of a little hydrogen sulphide.

The colouring matter seems to be the same as that observed by Fordos and Gélis when nitrogen sulphide containing sulphur, is treated with alcoholic potash.

INORGANIC—QUANTITATIVE.

Sulphuretted Hydrogen in Mineral Waters, &c.; Determination of Small Quantities of ——. L. W. Winkler. Zeits. anal. Chem., 1991, **40**, [12], 772—774.

A colorimetric method available for quantities of sulphuretted hydrogen less than 1·5 c.c. per litre. It is not affected by thiosulphates often present.

The following solutions are required:—

1. 25 grms. of crystallised Rochelle salt, 5 grms. of sodium hydrate, and 1 grm. of lead acetate in 100 c.c.

2. 1 grm. of arsenious acid dissolved in dilute hydrochloric acid is added to 100 c.c. of fresh hydrogen sulphide solution, and the precipitated arsenic trisulphide washed and dried at 100° C.; 0·0367 grm. of this preparation is dissolved just before use in a few drops of ammonia and made up to 100 c.c. (1 c.c. = 0·1 c.c. hydrogen sulphide gas at 0° C. and 760 mm.)

100 c.c. of the water to be analysed are mixed with 5 c.c. of solution 1 in a flask of about 150 c.c. capacity. A similar flask contains 100 c.c. of distilled water and 5 c.c. of solution 1; to this the ammonium thioarsenite solution 2 is added from a small burette till both liquids appear equally coloured. Each c.c. added corresponds to 1 c.c. sulphuretted hydrogen gas per litre in the water.

In analysing water from sulphur springs it is recommended to use stoppered bottles for the samples which are almost filled by 100 c.c., and to add 5 c.c. of solution 1, with a pipette reaching to the bottom of the bottle, which is then violently shaken. The comparison is made with 95 c.c. of distilled water and 5 c.c. of solution 1.

Single results differ by about 0·05 c.c. from the mean value of a series.—J. N. G.

Hydrogen Peroxide; Detection and Determination of Oxalic Acid in ——. D. A. Roche. Monit. Scient., 1901, **15**, [719], 694.

If there be present oxalic acid as an adulterant of commercial hydrogen peroxide, an addition of even 2 grms. per litre would destroy the sharpness of the end reaction with permanganate, and would consequently render the sample open to suspicion. Since, however, the two products are used simultaneously in various bleaching operations, the author gives the following methods for the detection and determination of oxalic acid in hydrogen peroxide.

Detection.—If the sample of hydrogen peroxide is strongly acid (more than 5 grms. of H_2SO_4 per litre), it is partially neutralised with ammonia or carbonate of soda. Ammonium acetate is then added, and finally a few drops

of a solution of calcium sulphate (or a 0·2—0·3 per cent. solution of acetate or chloride of calcium). If oxalic acid is present, a white turbidity appears. If the acidity of the sample is less than 5 grms. of H_2SO_4 per litre, it is not necessary to neutralise before adding ammonium acetate, and if the amount of oxalic acid present is more than 1 or 2 grms. per litre, the addition of ammonium acetate may be dispensed with.

Determination.—An amount of the sample containing 1—2 decigrms. of oxalic acid is made up to about 200 c.c., and the acidity of the liquid is so adjusted by the addition of acetic acid or ammonia, that it corresponds to about 2 grms. of H_2SO_4 per litre. Two grms. of ammonium acetate are added, the liquid brought to gentle ebullition, and then excess of calcium acetate solution run in, drop by drop, but fairly rapidly. The whole is allowed to stand for two or three hours, the clear liquid decanted through a filter and the precipitate washed by decantation. The precipitate on the filter is decomposed by 100 c.c. of hot dilute (1 in 20) sulphuric acid, and the solution which passes through the filter is collected in the vessel containing the main portion of the precipitate. The whole is then heated to 70° C. and titrated with permanganate.—A. S.

Stannous Chloride; Volumetric Determination of Copper, Iron, Antimony, Zinc-dust, Sulphur in Sulphides, Glucose, and Sugar, by means of ——. F. Weil. Comptes Rend., **134**, [2], 115.

These titrations can all be operated in the cold. Into the flask in which the titration is to be carried out are introduced 10 c.c. of the liquid for titration, 30 c.c. of hydrochloric acid, and some fragments of white marble. The carbon dioxide evolved expels the air, and thus prevents re-oxidation of cuprous chloride, &c. When working with boiling liquids, the hydrochloric acid evolved serves the same purpose, but the unpleasantness of working in these acid fumes is avoided by doing the titration in the cold.

—J. T. D.

Cements; Determination of Alkalis in Portland and Natural ——. T. B. Stillman. Chem. Centr., 1901, **2**, [26], 1369.

Klein and Peckham describe in the New York State Journal of May 20, 1901, the methods used by them for the examination of cement, and decide in favour of the author's method (see this Journal, 1894, 278). They, however, propose to omit the determination of alkalis, as it is tedious and is of no special importance. The author states that this view may perhaps be accepted as regards Portland cement, in which the amount of alkali is usually less than 3 per cent., but not in the case of natural cements, containing 5—9 per cent. of alkali. To shorten the method, the author evaporates the filtrate from the lime precipitation, with sulphuric acid, ignites to constant weight, weighs the mixed magnesium and alkali sulphates, determines the magnesium as pyrophosphate, and thus obtains the alkalis by difference.

In view of this modification, the author gives a new scheme for the analysis of cements, the results being calculated to the cement dried at 105° C. Quartz and combined silica are separated by Fresenius' method.—A. S.

Ferro-Silicons of High Percentage, Determination of Silicon in ——, *by means of Sodium Peroxide.* C. Ramorino. Monit. Scient., 1902. **16**, [1], 18.

If ferro-silicon, rich in silicon and carbon, be directly attacked by sodium peroxide, the reaction is too violent. The reaction is gentle and complete if 0·5 grm. of the ferro-silicon, well ground with 10 grms. of a mixture of sodium and potassium carbonates, be treated with 1 grm. of peroxide. The crucible is slowly heated before the blowpipe, and when the attack is complete, it is placed to cool on a steel plate; the melt is then treated in a porcelain dish with water, and afterwards with dilute hydrochloric acid. The liquid is evaporated to dryness with 10 c.c. of nitric acid and 2 grms. of potassium chlorate, the residue heated at 110° C., taken up in hydrochloric acid, the solution boiled, and the silica filtered off.—A. C. W.

Silver; Determination of ——, *in Muffle Residues.* K. Sander. Zeits. angew. Chem., 1902, **15**, [2], 32.

The material left in the muffle after distilling off the zinc, contains most of the lead and all the silver of the original ore, together with 20 or 30 per cent. of unburnt coal. The proportion of silver may be determined either by a wet process, which requires much time and material, or by assay after burning away the carbon. This latter operation, however, is tedious, and the author therefore proposes to remove the carbon instantaneously by treating the sample with an oxidising mixture, composed of 80 per cent. of potassium nitrate and 20 per cent. of sodium peroxide. 20 grms. of the coarsely-powdered residue are mixed with 50 grms. of this powder, and the whole is dropped in quantities of 3 or 4 grms. at a time into a red-hot iron crucible. When the reaction is finished, a sufficient quantity of a flux (sodium carbonate, 14 parts; calcined borax, 8 parts; cream of tartar, 2 parts) is added, and then 10 grms. of litharge, free from silver. After igniting till the mass is in quiet fusion, the metallic button is removed and finally cupelled in the usual way. Results obtained by all three processes agree satisfactorily.

—F. H. L.

Copper, Lead, Antimony, and Tin; Separation of ——, *in Alloys. Solubility of Copper Sulphide in Alkaline Sulphides.* A. Rössing. Zeits. anal. Chem., 1902, **41**, [1], 1—11.

Yellow sodium or potassium sulphide is used to dissolve out antimony and tin when the precipitated sulphides of the above-mentioned metals may contain stannous sulphide; the author has found that this method is inaccurate, as some copper is also dissolved as $Na_2Cu_2S_2$.

The same error is attached to the separation by fusion with sodium carbonate and sulphur, and it follows from the author's results that colourless sodium sulphide must be used for the separation of metals of the sulphuretted hydrogen group when copper is present. The following method is recommended: 2 grms. of turnings are dissolved in the smallest possible quantity of *aqua regia*, the solution warmed with a little potassium chlorate, diluted, and some tartaric acid added, followed by caustic soda till faintly alkaline. The precipitation is effected with the smallest possible excess of colourless sodium sulphide. After warming and allowing the precipitate to settle, it is washed with hot water containing a little sodium sulphide, without bringing it upon the filter, then dissolved in hot dilute nitric acid, and copper and lead separated from the solution as usual.

The filtrate containing antimony and tin is warmed and decolorised by hydrogen peroxide, approximately neutralised by hydrochloric acid, and a hot solution of 25 to 30 grms. of oxalic acid added to the warm liquid, which is now boiled for half an hour in a current of sulphuretted hydrogen, continuing to lead in the gas for 5—10 minutes after withdrawing the flame. The precipitated antimony sulphide, retaining a little tin, is filtered and washed with hot water, redissolved in the least quantity of sodium sulphide or ammonium sulphide, and the treatment repeated with hydrochloric acid, 15 to 20 grms. of oxalic acid, and sulphuretted hydrogen for 15 minutes.

The precipitate of antimony sulphide must be freed from sulphur by washing with alcohol, then with a mixture of alcohol and carbon bisulphide, finally with pure alcohol and ether. After drying, the precipitate is removed from the filter, the residue dissolved in a little hot ammonium sulphide, and evaporated and ignited in a weighed porcelain crucible. The bulk is now added and repeatedly oxidised with fuming nitric acid till all free sulphur is removed. The crucible is fitted into an opening cut in an asbestos plate, and gradually heated by the blowpipe. The antimony is weighed as Sb_2O_4.

Excess of ammonia, ammonium sulphide and acetic acid are added to the united filtrates containing tin, or to an aliquot part if the alloy is rich in tin, which is weighed as SnO_2. The author's method, combined with the above described adaptation of the methods of Clarke and Brunck, gave the following results in four analyses of a white metal for bearings.

Pb	4·62	4·61	4·63	4·63
Cu	8·18	8·17	8·18	8·19
Sb	10·90	10·86	10·94	10·98
Sn	76·12	76·06	75·90	76·10
	99·82	99·70	90·65	99·90

—J. N. G.

ORGANIC—QUALITATIVE.

Vegetable Oils in Animal Fats; Detection of ——, by the Phytosterol Acetate Test. A. Bömer. Zeits. Untersuch. Nahr.-Genussm., 1901, **4**, [23], 1070—1095.

The author gives further particulars of his method of detecting vegetable fats by the phytosterol acetate method (this Journal, 1901, 1147), which he shows by the results of experiments to be two or three times as sensitive as the ordinary phytosterol test.

Melting Points of Phytosterol and Cholesterol Esters.—In former communications the melting points given by the author are all uncorrected. He now gives the following corrected figures, the true melting point being taken as the temperature of complete fusion:—

——	Cholesterol.	Phytosterol.
	° C.	° C.
The alcohols themselves	148·4—150·8	138·0—143·8
Formic acid esters	96·8	105·5—114·3
Acetic acid esters	114·3—114·8	125·6—137·0
Propionic acid esters	96·8	106·0—117·3
Butyric acid (normal) esters	96·8	86·5—90·6
Benzoic acid esters	148·4	145·3—148·4

Of these the author shows by experimental and other reasons that the acetic esters are the most suitable for the test, which should be used in conjunction with the ordinary phytosterol test.

The Phytosterol Acetate Test.—The crude phytosterol or cholesterol is obtained from 100 grms. of the fat in the usual way (this Journal, 1898, 954). The mass is saponified a second time, treated with ether, the ethereal solution shaken repeatedly with water to remove soap, the solvent evaporated, and the residue dissolved in the smallest possible quantity of absolute alcohol, and left to crystallise.

The crystals first separating are examined microscopically to determine whether they consist of phytosterol, cholesterol, or a mixture, after which the alcohol is evaporated on the water-bath, and the residue treated with 2—3 c.c. of acetic anhydride. The dish is then covered with a glass, heated over a wire gauze until the liquid boils, when the excess of acetic anhydride is evaporated on the water-bath. The residue is dissolved in a sufficient quantity of hot absolute alcohol (10—25 c.c for 0·1 to 0·3 grm. of cholesterol), the dish being heated over wire gauze or asbestos. A few c.c. of alcohol are added to prevent immediate crystallisation, and the clear solution allowed to stand at the ordinary temperature.

When half to two-thirds of the liquid is evaporated, and the greater part of the ester has separated, the crystals are brought on to a small filter with the aid of a spatula and 2—3 c.c. of 95 per cent. alcohol. The contents of the filter are dissolved in 5 to 10 c.c. of absolute alcohol, recrystallised, and again collected, this recrystallisation being continued so long as the material lasts.

The melting point of the crystals is determined after the third and each subsequent crystallisation. If, after the last crystallisation the ester is not completely melted at 116° C., the presence of vegetable oil is probable, but if the melting point is 117° C. (corr.) or higher, the author considers that its presence is proved with certainty.

Vegetable oils containing considerable quantities of phytosterol, *e.g.*, cotton-seed, earth-nut, sesamé, rape, hemp, poppy, and linseed oils, can be detected by this test when only present to the extent of 1 to 2 per cent. in animal fats (with the possible exception of egg oil, marine animal oils, and wool fat).

In the case of other vegetable oils, such as olive, palm, and palm-kernel oils, and probably cocoanut-oil, which contain less phytosterol, the presence of from 3 to 5 per cent. can be detected. When added to egg oil, however, not less than 20 per cent. of these oils can be identified with certainty.

—C. A. M.

Methyl Alcohol; Detection of ——, in Alcoholic Liquids. J. Habermann and A. Oesterreicher. Zeits. anal. Chem., 1901, **40**, [11], 721—724.

Cazeneuve's test with dilute potassium permanganate is modified as follows:—Two drops of caustic potash solution (10 per cent.) are added to 10 c.c. of the liquid under examination, and followed by one or two drops of N/10 potassium permanganate solution, and the mixture vigorously shaken. Under these conditions, instead of the colour being immediately discharged (presence of methyl alcohol), or slowly disappearing in the course of 20 minutes (absence of methyl alcohol) the following result is obtained: (*a*) if methyl alcohol is present, the colour becomes yellow within one minute and there is only a momentary appearance of green; (*b*) if methyl alcohol is absent, a distinct series of colour changes to violet, blue, green, and, finally, yellow ensues, the green being specially pronounced; the whole change occupies at least five minutes. If the liquid contains less than 5 per cent. of methyl alcohol, it should be distilled and the first fraction tested in the way described.—R. L. J.

Aldehydes; New Reagent for ——. Erdmann. Chem. and Druggist, 1901, **59**, [1144], 1053.

The author proposes to use dimethylhydroresorcinol in place of hydroresorcinol as a reagent for aldehydes, as it gives condensation products which are much more insoluble in water. The following aldehydes give condensation-products having well defined melting-points:—Formaldehyde, m. pt. 187°—188° C.; acetaldehyde, m. pt. 139°—140° C.; furfural, m. pt. 158°—160° C.; and benzoic aldehyde, m. pt. 193° C. By boiling the condensation-products with acetic anhydride under a reflux condenser, water is abstracted and anhydrides are formed, which again have characteristic melting points. Cinnamic aldehyde and vanillin yield well-defined compounds in this manner.—A. S.

Morphine; Characteristic Reaction for ——. G. Fleury. Ann. Chim. anal. appl., **6**, 417. Chem. Centr., 1902, **2**, [26], 1370.

If a sulphuric acid solution of morphine be treated with lead peroxide and shaken for 6—8 minutes, a faint red coloration is produced. The filtrate, when treated with ammonia, becomes a deep chestnut brown in consequence of the formation of protocatechuic acid; if soda be used in place of ammonia, the colour produced is not so dark. No precipitate is produced, and the coloration remains unaltered for several hours. If only a small quantity of the substance to be tested is available, it is stirred with a drop of sulphuric acid on a porcelain crucible lid for 6—8 minutes, then a clear drop allowed to flow to the side and a drop of ammonia added. In presence of morphine the brown coloration is produced immediately. Lefort has proposed the use of iodic acid as the oxidising agent, but this is not so good, as with the ammonia any excess forms a white precipitate of ammonium iodate.—A. S.

Colloids; Deep Red Gold Solution as a Reagent for ——. R. Zsigmondy. Zeits. anal. Chem., 1901, **40**, [11], 697—719.

When neutral salts, bases or acids, are added to the deep red aqueous solution of metallic gold, a change of colour to blue or dark violet ensues, but this change does not take place if small quantities of certain colloids be present. The author has investigated this reaction as a qualitative and quantitative test for colloids, and for the latter purpose defines the "gold value" as "*that (minimum) number of milligrams of the given colloid which, when added to* 10 *c.c. of a well-prepared deep-red gold solution (containing* 0·0053—0·0058 *per cent. of gold) and followed by* 1 *c.c. of common salt solution (sp. gr.* 1·07) *prevents the colour change to violet or any of its shades.*"

The gold solution must be made with very pure water, redistilled and condensed in a silver worm. 120 c.c. are

heated to boiling in a beaker (Jena glass should be always used for this reagent), 2·5 c.c. of a solution made by dissolving 6 grms. of crystalline $AuCl_4H_3H_2O$ in a litre are added, together with 3—3·5 c.c. of purest potassium carbonate solution (0·18 normal), and the mixture well stirred. 3—5 c.c. of formaldehyde solution (0·3 c.c. of commercial formalin to 100 c.c. of H_2O) are now added, when the deep-red colour develops. This solution contains 0·005—0·006 per cent. of gold, is fairly permanent and should not precipitate when boiled, but if kept for any length of time, it should be tested with gum arabic or dextrin of known value before use.

The qualitative test is made as follows: 5—10 c.c. of the gold solution are placed in a beaker, a few drops of the colloidal solution are added, and then $\frac{1}{2}$—1 c.c. of salt solution. If the colour does not change, one may conclude that a colloid is present. If blue or violet appears, the test is repeated with rather more colloid. If the colour remains unaltered or changes very slowly, the presence of a colloid may be considered proved.

The author has by this method (using 10 c.c. of gold solution and 1 c.c. of salt solution), arranged the colloids in the following classes, just as oils, for instance, might be classified by their iodine values—

No. of Class and Description.	No. of "Mgrms." that prevent Colour Reaction.	Examples.
I. "Most active"	0·005—1	Glue, gelatin, casein, isinglass.
II. "Active"	1—10	Gum arabic, egg-albumin, tragacanth, carrageen moss.
III. "Slightly active"	10—500	Dextrin, potato-starch.
IV. "Inactive"	..	Silicic acid, sodium silicate, quince gum.

The method cannot yet be used for quantitative purposes, as various conditions have considerable influence on the results.

It was found that one gold solution may give twice as great a gold-value as another, but usually within the limits indicated in the table given above. Dilution of the colloid solution also increases the gold-value, whilst very old solutions give enormously increased values. The presence of other electrolytes such as acids and bases also produce great magnification.

When it is possible to bring the colloid into a solid condition, or to eliminate the disturbing factors above indicated, this method, owing to its delicacy, may be employed to detect adulteration or admixture of the supposed pure substance with other materials. A large amount of information bearing on the above points is given in the original paper.—R. L. J.

ORGANIC—QUANTITATIVE.

Calcium Oxalate; Gases evolved on the Decomposition of ——, by Heating. Pellett and Delamare. Bull. Assoc. Chim. Sucr. Dist., 1901, **19**, [6], 730—732.

In the determination of nitrogen by Will and Varrentrapp's soda-lime method, calcium oxalate is used to furnish a gas to sweep out the tube at the end of the combustion. As authorities differ as to the nature of the gases yielded on the ignition of calcium oxalate, the authors have made experiments to determine the point. They find that when that salt is ignited by itself, a mixture of hydrogen, carbon dioxide, and carbon monoxide is produced, but that when heated at the end of a soda-lime tube, the carbon dioxide is absorbed by the soda-lime and the carbon monoxide converted into carbon dioxide in the presence of the sodium hydroxide, and likewise absorbed, so that the tube is swept out with hydrogen only.—C. A. M.

Formaldehyde in Solution; New Gravimetric Determination of ——. L. Vanino. Zeits. anal. Chem., 1901, **40**, [11], 720—721.

In this method, the formaldehyde reduces silver oxide, Ag_2O, produced by the action of caustic alkali on silver nitrate.

Silver nitrate (2 grms.) is dissolved in water and made strongly alkaline with caustic soda (free from chlorine). Dilute formaldehyde solution (5 c.c. of a solution of formalin, 1 part, in water, 10 parts) is added, and the mixture placed aside in the dark for about a quarter of an hour. The clear liquor is then poured off through a tared filter, and the residue is digested several times with dilute acetic acid (5 per cent.) to dissolve the excess of silver oxide, filtered off, washed (with water acidulated with acetic acid) until the filtrate no longer reacts with hydrochloric acid, then dried at 105° C. and weighed as metallic silver. 216 grms. Ag = 30 grms. formaldehyde. A solution containing 34·37 per cent. of formaldehyde gave the following percentages by this method:—34·39, 34·32, 34·45, and 34·40 per cent.—R. L. J.

Fusel Oil; Determination of —— in Alcoholic Liquids. E. Beckmann. Zeits. Untersuch. Nahr.- und Genussm., 1901, **4**, [23] 1059—1064.

The author has previously published a method (this Journal, 1900, 383) for the estimation of fusel oil in alcoholic solutions, but as it has given in some instances discordant results, he has reinvestigated the question and made some alterations.

The isolation of amyl alcohol is effected by placing 20 grms. of pure dry calcium chloride into a separating funnel and then adding to it 50 c.c. of the solution to be analysed. The resulting mixture should not contain more than 50 per cent. of alcohol. After shaking and cooling, 30 c.c. of carbon tetrachloride are added, and the funnel shaken for 10 minutes in a Recklinghausen shaking machine (Ber., 1896, **29**, 2372). The lower layer of carbon tetrachloride is run into another separating funnel containing 20—25 c.c. of water. The supernatant liquid is shaken for 10 minutes with 20 c.c. of carbon tetrachloride, and for a third and fourth time for 15 minutes with a similar quantity. Any alcohol which has been dissolved by the carbon tetrachloride is separated by shaking in the machine for 5 minutes with some water. Since some of the higher alcohols dissolve in this quantity of added water, they are separated by adding 10 grms. of calcium chloride and shaking twice for 5 minutes with 40 grms. of carbon tetrachloride or once with 80 grms. Importance is attached to shaking in the Recklinghausen machine, the extraction being uniform and the results comparable.

The esterification with nitrous acid and the removal of the excess of this reagent is carried out by saturating the dried carbon tetrachloride solution with dry nitrous acid, the excess being removed by shaking with a 5 per cent. solution of sodium hydroxide, or better with dry sodium bicarbonate. An alternative process is to shake the cloudy solution of amyl alcohol in carbon tetrachloride with calcium chloride to remove the water and filter through glass wool into a glass flask provided with a stopper, the filter is then washed with dry carbon tetrachloride. 3 grms. of sodium bisulphate and 3 grms. of sodium nitrite are added to the filtrate; when the reaction has continued for half an hour, the contents of the flask are filtered, the residue on the filter being washed several times with carbon tetrachloride; 3 grms. of sodium bicarbonate are added to the filtrate, the contents of the flask are then well shaken, water added, and the carbon tetrachloride separated by means of a funnel.

The carbon tetrachloride, which now contains only the ester and some water, is vigorously shaken with 10 c.c. of concentrated sulphuric acid, 100 c.c. of water are added, the mixture well cooled, and the liberated nitrous acid titrated with potassium permanganate solution (1 grm. to 1,900 c.c.).

If any aldehyde be present, the carbon tetrachloride solution of the amyl alcohol is treated with sodium bisulphite.

Some results are appended showing the degree of accuracy with which fusel oil can be estimated by this process.—J. L. B.

Wine; Determination of Volatile Acids in ——. X. Rocques and G. Sellier. Ann. Chim. anal. appl., **6**, 414—417. Chem. Centr. 1901, **2**, [26], 1371.

In addition to the sources of error noted by Curtel (this Journal, 1902, 76), the authors point out another possible

one. In wines which contain free tartaric acid and much sulphate, and which may therefore contain potassium bisulphate, the latter may act with formation of ketone acids, which, on distillation, decompose into aldehydes and carbon dioxide.—A. S.

Tartaric Acid in Lees and Tartar; Determination of the Total ——. A. Hubert. Monit. Scient, 1902, 16, [1], 19—22.

The author first discusses the various modifications of Goldemberg's process for the determination of tartaric acid and then gives the following method: 6 grms. of material, in impalpable powder as furnished by a ball-mill, are digested in a 200 c.c. flask with 40 c.c. of hydrochloric acid (25 per cent. strength by volume). The flask is well shaken and then placed in a mechanical agitator for one hour. For this purpose either a turbine agitator (Fig. 1) or Güssefeld's shaking machine (Fig. 2) may be used. The flask is next filled up to the mark and filtered through a small folded filter, 10 cm. in diameter, into a measuring

Fig. 1.

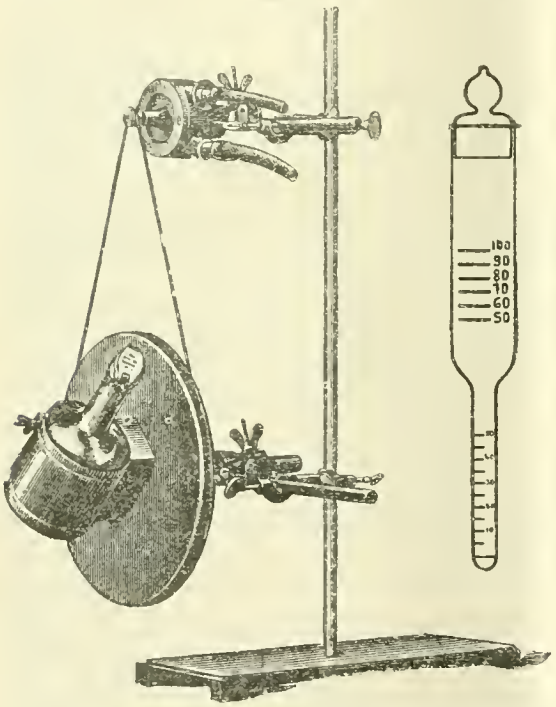


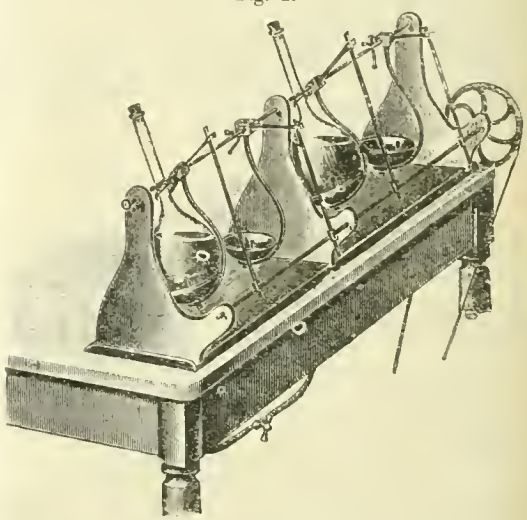
Fig. 3.

cylinder or flask with a graduated neck. After noting the volume of the filtered liquid, (A = this volume + 1 c.c.) 50 c.c. are withdrawn and added little by little to 10 c.c. of a 36 per cent. solution of potassium carbonate contained in a beaker. It is necessary to add the acid solution to the carbonate, and not *vice versâ*. The liquid is now boiled for 15 minutes, and when the calcium carbonate has become crystalline, it is filtered whilst still hot, the filter washed until neutral, the filtrate evaporated on the water-bath to about 10 c.c., 3 c.c. of glacial acetic acid added, and then 100 c.c. of alcohol of 95°, stirring continuously. After standing 30 minutes, the crystals are filtered off with the aid of the pump, and washed with alcohol of 95° until the washings cease to redden sensitive litmus paper. Towards the end of the washing the litmus paper remains blue whilst wet with alcohol, but turns red on drying; the washing must be continued until the paper remains blue when dry. The filter and precipitate are now washed with boiling water, and the solution titrated by seminormal caustic soda in the presence of phenolphthalein.

If B be the amount of tartaric acid found, the real percentage in the lees or tartar is given by $\frac{A + \left(\frac{200 - A}{2}\right)}{200} B$, in which A represents the volume of the filtrate after the treatment with hydrochloric acid *plus* 1 c.c., which is the volume retained by the filter paper. The volume of liquid retained by the insoluble matter is practically equal to $\frac{200 - A}{2}$. Hence the above formula for correcting the result. The author gives a table comparing results obtained by this method and by employing Goldemberg's correction, working on material of all strengths. The results by the author's method are more satisfactory.

The apparatus shown in Fig. 3 is for the purpose of obtaining a rapid and rough result. The stoppered tube

Fig. 2.



has two series of graduations: in the wide part from 50 c.c. to 100 c.c. by 10 c.c. each. The graduations on the narrow portion are obtained by experiment; the mark 50 indicates the height of a deposit obtained from lees containing 50 per cent. of tartaric acid (total); this obtained, the tube is divided into 50 equal parts. The method is as follows: 20 grms. of the lees or tartar in fine powder are introduced into a 200 c.c. flask together with 50 c.c. of water. After well shaking, 30 c.c. of hydrochloric acid are added, and the mixture digested for one hour with occasional shakings. The liquid is made up to the mark, shaken, and filtered through a folded filter. The tube is now filled with the filtrate up to the 50 c.c. mark, saturated solution of calcium acetate added to the 60 c.c. mark, the tube shaken, calcium acetate added to 70 c.c., and so on, until the tube is filled to 100 c.c. The mixture is now allowed to settle, when the height of the deposit at once gives the percentage of total tartaric acid. Crystals which adhere to the sides of the tube are loosened by a glass rod with an india-rubber ring.—A. C. W.

Opium [and its Preparations]; Determination of Morphine in ——. W. Stoeder. Pharm. Weekblad, 1901, 21: through Pharm. Centralh., 42, [34], 518.

Opium.—The official process in the Ph. G. IV., broadly speaking, depends upon the fact that morphine is soluble in lime water, from which solution it is precipitated by ammonium chloride, in presence of benzene and ether. It is modified as follows:—The opium is first dried at 50° C. (not 60° C. as in the official process), thoroughly disintegrated and preserved over quicklime. The dry powder thus obtained should yield to water not less than 50 per cent. of dry extractive, and should contain not less than 10 per cent. of anhydrous morphine when assayed as follows: 3 grms. of the dried powder are mixed with 0·5 grm. of calcium hydrate and 10 grms. of water, the mixture transferred to

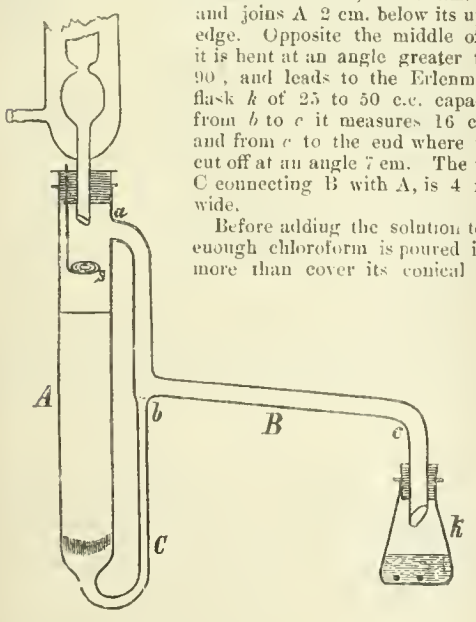
a tared flask, and sufficient water added to bring up the weight to 32 grms. After macerating for two hours, with frequent agitation, 20 grms. of liquid (=2 grms. of opium) are filtered off. To this filtrate 10 c.c. of ether and 5 drops of benzene are added, and the whole well mixed by shaking: 0·2 grm. of ammonium chloride is then added, and the mixture shaken well and frequently at intervals for an hour. The ethereal layer is then withdrawn, the residual liquid washed with another 10 c.c. of ether, which is also removed, and the precipitated morphine collected on a filter, and cautiously washed with water until the washings no longer react with phenolphthalein solution. The morphine is then dissolved in 20 c.c. of N/10 H_2SO_4 solution, and the filter washed with water until free from acid and alkaloidal reaction. Three drops of hematoxylin indicator are added to the liquid, in which the amount of free acid is then titrated back with N/10 alkali. From the amount of acid combined with the morphine, the amount of anhydrous alkaloid is calculated, taking the molecular weight as 285.

Extract of Opium Ph. G.—1·5 grms. are rubbed down to fine powder with 0·5 grm. of calcium hydrate, then made up to 30·5 grms. with water, and allowed to stand with frequent shaking for two hours; 20 grms. (equivalent to 1 grm. of extract) are filtered off and treated as in the process described under opium, using, however, half the quantities of ammonium chloride and of ether. The amount of morphine in the extract should be 18 per cent.

Tincture of Opium Ph. G.—15 grms. of tincture are evaporated to 5 grms. on the water-bath, 0·25 grm. of calcium hydrate is mixed with this residue, and sufficient water to make up the weight to 15·25 grms. After frequent shaking for two hours, 10 grms. of filtrate are collected, and treated as described under extract of opium. The amount of morphine present should be equivalent to 1 per cent.—J. O. B.

Extraction of Aqueous Solutions with Chloroform; Apparatus for ——. F. Pregl. Zeits. anal. Chem., 1901, **40**, [12], 785—787.

The apparatus figured is suitable for Kippenberger's test for alkaloids and generally for extractions with chloroform or carbon bisulphide. The tube A holds 50 c.c. of the solution to be extracted and is 22 cm. long and 24 mm. internal diameter; B is 7 mm. wide and joins A 2 cm. below its upper edge. Opposite the middle of A it is bent at an angle greater than 90°, and leads to the Erlenmeyer flask *k* of 25 to 50 c.c. capacity, from *b* to *c* it measures 16 cms., and from *c* to the end where it is cut off at an angle 7 cm. The tube C connecting B with A, is 4 mm. wide.



Before adding the solution to A, enough chloroform is poured in to more than cover its conical end, and *k* is charged with chloroform and contains two porcelain pearls or a Beckman tetrahedron of platinum to ensure regular boiling.

The drops of chloroform falling from the condenser are distributed by the spirally bent wire *s*.—J. N. G.

Methoxyl Groups; A Modification of Zeisel's Method for the Determination of ——. J. T. Hewitt and T. S. Moore. Proc. Chem. Soc., **18**, [245], 8.

The authors describe a modification of Zeisel's well-known method in which the condenser supplied with water at 40° is replaced by a fractionating column; this is so efficient that the potash bulbs containing water with red phosphorus in suspension may be dispensed with. The time taken in fitting up the apparatus and in carrying out the operation is much less than in Zeisel's original method. Experimental data are given showing the accuracy attainable.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Oxygen; Report on Means for rendering —— *Active.* E. Baur. Zeits. angew. Chem., **15**, [3], 53—59.

A useful compilation of theories and facts on the subject.

Saccharose; Heat of Inversion of ——. P. Petit. Comptes Rend., **134**, [2], 111—112.

The author has determined directly the heat of inversion of saccharose by confining in separate vessels in a closed calorimeter a solution of saccharose, and the requisite sulphuric acid for its inversion. These were previously heated to about 60° C., and the vapour of boiling chloroform (58·5°) or methyl alcohol (63°) was circulated through the double outer envelope, so that the inner vessel with the liquids was situated towards its environment precisely as a calorimeter vessel is to the outer air when working at the ordinary temperature. The heat developed after mixture of the liquids and inversion of the sugar was measured, and the amount of inversion afterwards determined. The heat of mixture of the sulphuric acid and water under the same circumstances was of course determined and deducted. The author's figures for the heat of inversion of a gram-molecule of saccharose in 140 gram-molecules of water are; at 58·5° C., 2·639 cal.; at 63·0° C., 2·675 cal. If it be allowable to assume that differences in the heat of inversion are proportional to temperature differences, this would make the figure at 15° C., 2·3 calories.

It is proposed to extend this calorimetric method to similar reactions caused by enzymes and other ferments.

—J. T. D.

Calcium Hydrogen Phosphate; Solubility of ——, *in Water.* A. Rindell. Comptes Rend., **134**, [2], 112—114.

Varying quantities of the pure salt ($CaHPO_4.2H_2O$) were agitated with 500 c.c. of water for different periods of time, and the electric conductivity as well as the chemical composition of the solution determined. It was proved that the amounts dissolved depend both on the amount of the solid present, and on the time, reaching, however, (more quickly as the amount of solid present is greater) a maximum, when the solution contains, in milligram-molecules per litre, of CaO 1·313 and of H_3PO_4 2·219. There is thus decomposition of the phosphate; but this decomposition is much less at lower dilutions (when CaO=0·763, H_3PO_4 = 0·858), which fact no doubt explains Schloesing's statement that the salt dissolves without decomposition.—J. T. D.

Borax when Distilled with Methyl Alcohol; Behaviour of ——. E. Polenske. Arb. Kaiserl. Gesundheit, **17**, (1900), 564—568; through Zeit. für Untersuchung der Nahr. u. Genussmittel, **4**, (1901), 801, and Analyst, **27**, (1902), 34.

When borax is distilled with methyl alcohol, 57—59 per cent. of the contained boric acid passes over in the distillate; about 30 per cent. readily, and the remainder slowly. From the methyl alcohol remaining in the distillation flask, crystals of $NaBO_2+5CH_3OH$ separate. On fusion, 1 molecule of borax was found to expel the carbon dioxide from 3 molecules of sodium carbonate. The melt obtained by fusing together 1 molecule of borax and 1 molecule of sodium carbonate, and which had the composition of

sodium metaborate, when distilled with methyl alcohol, gave a considerable quantity of boric acid in the distillate. Distillates from the melts containing more sodium carbonate were free from boric acid. When the different melts were dissolved in methyl alcohol, the substance $NaBO_2 + 5CH_3OH$ always crystallized out. Sodium metaborate, distilled with methyl alcohol, gives off boric acid until the residue has the composition $Na_{10}B_8O_{17}$ ($= 5Na_2O + 4B_2O_3$). This residue must be considered a mixture of sodium metaborate and sodium carbonate. The latter prevents the formation of boric esters and the possibility of distillation.—L. A.

Heptacetylmaltose Nitrate [*Acetonitromaltose*] *and Heptacetyl-β-methylmaltoside.* W. Koenigs and E. Knorr. Ber., 1901, **34**, [17], 4343—4348.

Continuing their investigations on this class of bodies (this Journal, 1901, 626) the authors prepared Herzfeld's octacetylmaltose and obtained, by the action of fuming nitric acid on this substance at 0° C. in chloroform solution, *heptacetylmaltose nitrate*, m. pt. 93°—95° C. It is soluble in organic solvents, but only very sparingly soluble in water; it reduces boiling Fehling's solution after some minutes, and its specific rotation in chloroform solution was found to be $[\alpha]_D^{19} = +149° 18'$.

Heptacetylmethyl-maltoside was obtained by boiling acetonitromaltose with 30 times its weight of methyl alcohol in presence of barium carbonate and a few drops of pyridine until a sample, filtered and evaporated, gave a very faint coloration with brucine and acetic acid. The heptacetylmethyl maltoside was extracted from the evaporated filtrate by means of ether, and when purified was obtained as silky needles melting at 128°—129° C. This melting point is 8° higher than that recorded by Fischer and Armstrong (this Journal, 1901, 1151), but the substances are probably identical. Heptacetylmethyl maltoside does not reduce Fehling's solution, and shows a rotation $[\alpha]^{20} = 60° 46'$ in benzene solution. On saponification with baryta water in the cold, it gives a crystalline *methylmaltoside*, m. pt. 93°—95° C., which does not reduce Fehling's solution, and which is split up by emulsin into maltose and methyl alcohol, and by yeast enzymes into glucose and β-methyl glucoside. All the above compounds, therefore, belong to the β-series of sugar derivatives.

Having occasion to prepare Herzfeld's octacetyl cane-sugar, the authors have studied its properties and definitely confirmed the number of acetyl groups by saponification. For this purpose boiling with acids is not satisfactory, but on standing all night with an aqueous methyl alcoholic solution of soda, saponification occurs without destruction of the sugar, and theoretical results are obtained.

—J. F. B.

Oxidising Ferments; The Nature of certain of the ——. J. H. Kastle and A. S. Loevenhart. Amer. Chem. J., 1901, **26**, [6], 539—566.

If tincture of guaiacum be applied to a freshly-cut section of a potato, a blue coloration is at once developed in the layers lying immediately under the skin, but no coloration appears on the section of the main body of the pulp until after it has been exposed to the air for some time. Aqueous extracts both of the cuticle and the pulp give a blue coloration at once with guaiacum, but lose this property on keeping; the presence of certain weak antiseptics preserves the activity of the extracts for a certain length of time. The instability of such extracts is due probably to the action of reducing substances, and the oxidising power is strictly finite and not catalytic. The presence of molecular oxygen is essential for the development of the guaiacum-blueing oxydase. If the skin of a potato be abraded in an atmosphere of a neutral gas, and guaiacum be applied, no coloration appears until the potato is exposed to the air, and if the potato be scratched before introducing it into the neutral atmosphere and applying the guaiacum, only a faint coloration is produced, which rapidly disappears. When the potato extracts or scrapings have lost their power of blueing guaiacum directly, they will still give this reaction if hydrogen peroxide be also added.

The authors conclude that the so-called oxidising ferment of the potato is probably not a true soluble ferment, but an organic peroxide. This peroxide is probably produced by the action of atmospheric oxygen on some of the more readily autoxidisable substances in the cells, in the same way that benzoyl peroxide is produced by shaking benzaldehyde with air. The authors think that in living tissues the autoxidisable substances are oxidised to the peroxide condition by the air, and in turn give up part of their oxygen to less readily oxidisable constituents of the cell; so that the process by which oxygen is rendered active in the living cell is comparable with the way in which autoxidation occurs in the case of phosphorus, benzaldehyde, and other oxygen-carriers.—J. F. B.

The Ink of the Ancients. Chem. and Druggist, Jan. 18, 1902.

M. Leidié examined the contents of two bronze cylinders which were found in the ruins of a Roman villa at Vertault (Côte-d'Or). The cylinders contained a dark substance, which, it was argued, was either an ointment, a paint, or ink. Chemical tests negatived the first two suggestions, and, finally, the substance was identified as lampblack. Traces of copper, tin, iron, and chalk were found in the ash. The ink was, therefore, of a nature like the present-day Indian ink.

Radio-active Emanation produced by Thorium Compounds; Investigation of the ——. E. Rutherford and F. Soddy. Proc. Chem. Soc., **18**, [245], 2—4.

The main questions examined by the authors are (1) Can thoria, the emanating power of which has been largely destroyed by ignition, have this property restored to it by chemical treatment? (2) Is emanating power to be regarded as a specific property of thorium or is it due to the presence of a foreign material? (3) Does the radio-active emanation itself resemble in chemical nature any known substance?

The first question is conclusively answered in the affirmative. After solution and reprecipitation, no difference was observed in the emanating powers of thorium compounds prepared from ordinary thoria and thoria de-emanated as completely as possible by intense ignition. The latter process must therefore be regarded as an obliteration of the effect rather than a removal of the cause. The de-emanation of thoria by ignition leaves the straight line radio-activity quite unaffected.

With regard to the second question, the attempts first made to separate from thorium a substance to which the emanating power could be traced were not successful.

It was found that water vapour increases and desiccation decreases the normal value of the emanating power, the extremes varying in the ratio of 2 to 1. Cooling acts powerfully in the opposite direction to increase of temperature. At −78°, the emanating power was only one-tenth of the normal, but no permanent alteration in value is produced.

An investigation of the third point, the chemical nature of the emanation itself, it is pointed out that since the only known gases which would survive in unaltered amount the action of all the reagents employed are the gases of the argon family, the conclusion may be drawn that the emanation is allied in properties to the elements of this group.

The emanating power of thorium nitrate, which in the solid state is only 1·8 per cent. of that of thoria, is increased 200 times by solution in water. It was also found that the emanating power of the carbonate varies enormously with the method of preparation, and specimens of it have been obtained differing in the ratio of 80 to 1, of which the highest possesses four times the value of thoria.

A remarkable observation has been made on the solutions from which thorium has been precipitated with ammonia; although these should be free from thoria, they still possess both emanating power and radio activity in considerable amounts. This has led to the preparation of substances free from thorium, but possessing radio-activity and emanating power indistinguishable from that of

thorium, many hundred, in some cases over a thousand, times as active.

The chemical examination of the thorium-free active substances prepared, showed the presence of an unknown substance, precipitated from its solutions by sodium phosphate. This the authors regard as merely an accidental impurity. The actual ThX is probably present only in minute quantity, exhibiting the behaviour of being dragged down by precipitates, without reference to its true analytical behaviour.

Another method of separation confirms this view. By evaporation of water with which thoria has been shaken for some time, small deposits are obtained which are often of the order of a thousand-fold more active than the original thoria. The washed sample exhibits a considerable reduction of radio-activity after the process, whilst the character of the radiations, as before, is identical with the ordinary thorium radiation. A careful chemical examination failed to reveal the presence of any other element besides thorium. The view that the radio-activity and emanating power of thorium are to be ascribed to the presence of a minute amount of a constituent ThX of correspondingly great activity is thus confirmed.

The National Physical Laboratory. "Standard," Jan. 18, 1902.

The Prince of Wales has consented to open the National Physical Laboratory, at Busby House, Teddington, on March 19. The difficulty of finding a suitable site has already caused some loss of time, but work, though on a restricted scale, is being carried on at the Kew Observatory, as it has been for several years past. This place will not be abandoned, but in the new establishment, work can be undertaken on a greatly extended scale. Germany, for at least 14 years, has had the advantage of such an institution in its Physikalisch-technische Reichsanstalt, in Berlin, and about ten years ago Professor Lodge, in an address to the British Association, strongly advocated the establishment of similar institutions in this country. The matter, after being considered, was dropped, because it was felt hopeless to ask the Government of the day for money, and impossible to do anything without its aid. Four years afterwards, the late Sir Douglas Galton, in his Presidential address, again raised the question, speaking of such an institution as "a crying need." This time circumstances proved more favourable. Lord Salisbury was approached, a Treasury Committee was appointed, and it was ultimately decided to make a beginning. Bushy House, a place of some historic interest, was allotted as the home of the new laboratory, and 4,000*l.* a year devoted to its maintenance. The two divisions of the Reichsanstalt, at Berlin, cost between them rather over 200,000*l.*, of which 25,000*l.* was a gift from the late Dr. Siemens, and their annual expenditure in salaries, wages, and maintenance amounts to 16,650*l.*, or about four times what we are proposing to expend.

The central block is supported on a very strongly built basement, with a brick vaulting; the four wings, one at each corner, rest on the ground, and in them the more important laboratories will be lodged; thus steady foundations can be secured almost everywhere for instruments of precision. The wing which once contained the dining-room and library has been converted into an electrical and magnetic laboratory, and every precaution has been taken to secure the instruments and currents used in experimenting from any kind of disturbance. Here a valuable piece of apparatus will be placed, which has recently been presented by the Drapers' Company, in memory of the late Professor Viriamu Jones, beside others for measuring current and electromotive force. A second wing will be devoted to observations in high temperature thermometry, where, by the aid of electricity, experiments will be made, and thermopiles, with other instruments for the measurement of temperature up to 1,000° C., or 1,200° C., may be tested. Indeed, as the Director, Mr. Glazebrook, informed an audience at the Royal Institution last year, there is still much to be done in this field, and the construction of thermometers for mere ordinary scientific purposes leaves not a little to be desired. The different kinds of glass employed in the construction of thermometers do not all behave alike under sudden changes from a boiling to a freezing temperature, and the English standard gas thermometer is "incapable of the accuracy now demanded for scientific investigation." Experiments made at the Reichsanstalt and at the Jena glass works, have enabled the latter to produce a glass which is far less readily affected than that we have been able to make. In this case, however, the ground, thanks to past work at Kew, is more familiar, and Mr. Glazebrook believes that one of our own manufacturers—Mr. Powell, of the Whitefriars works—has at last succeeded in making a glass which will be as good as that of Jena. Here, so far as testing is concerned, the Kew Observatory has for years past rendered excellent service, but the present need is to make actual advances, and improve the construction not only of such simple instruments as flasks, burettes, pipettes, &c., but also of lenses, sextants, opera glasses, and telescopes.

A metallurgical laboratory will be lodged in a third wing, in which, among other investigations, will be continued those researches into the structure of metals, which for some years has been pursued with such success by Sir W. Roberts-Austen.

A fourth wing of Bushy House will be used as a chemical laboratory, and the basement will be devoted to some of the many purposes for which the Institution is designed. It will test pressure gauges and various other instruments; it will measure the resistance of materials, and there will be a regular engineering laboratory. The Director and staff aim at doing for this country, so far as their opportunities allow, what has been so well done at the Berlin Reichsanstalt, for Germany.

New Books.

Primary Batteries: Their Theory, Construction, and Use. By W. R. Cooper, M.A., B.Sc. "The Electrician" Printing and Publishing Co., Ltd., Salisbury Court, Fleet Street, London, E.C. 1901. Price 10*s.* 6*d.* nett.

8vo volume, containing preface, table of contents, and 317 pages of subject-matter, with 131 illustrations and the alphabetical index. In the text, the following subjects are treated of:—I. The Simple Voltaic Element. II. Local Action. Polarisation. III. and IV. Theory of the Voltaic Cell. V. Non-Chemical Cells and Thermopiles. VI. Testing Cells. VII. and VIII. One-Fluid and Two-Fluid Cells. IX. Dry Cells. X. Standard Cells. XI. Carbon-consuming Cells, and the Commercial Generation of Electrical Energy.

The Scarcity of Coal. By Bennett H. Brough. Reprint from *Nineteenth Century*, No. 278, April, 1900. Waterlow and Sons, Ltd., 49, Parliament Street, S.W.

Pamphlet of eight pages.

Trade Report.

I.—GENERAL.

Federal Tariff Changes in Australia.

Bd. of Trade J., Jan. 23, 1902.

Tariff Classification.	Original Proposed Rates.	Amended Rates.
	s. d.	*s. d.*
Blue, laundry..... per lb.	0 2	0 1
Salt (except brown rock)..... per ton	20 0	10 0
Earthenware, brownware, and stoneware, n.e.i., and tiles, n.e.i.	6*d.* per cb. ft. and 15 % *ad val.*	20 % *ad val.*
Glassware, n.e.i.....	8*d.* per cb. ft. and 15 % *ad val.*	20 % "

(See also this Journal, 1902, 145.)

Tariff Decisions in Australia.

Bd. of Trade J., Jan. 23, 1902.

Line in Tariff.	Articles.	Decision.
115	Paper, printing, coloured (irrespective of size).	15 % *ad val.*
50	Soap, viz., shaving sticks, each in a tin or paper carton.	Whole weight to be included.
98	Seidlitz powders	25 % *ad val.*
41	Salts in packets	20 % „
125	Bottles containing liquid not subject to *ad val.* duty.	Free.
81	Bronze, in powder	1*s.* per cwt.
108	Films, with photos on, when for use with kinematographs.	20 % *ad val.*
97	Formalin, as a disinfectant	15 % „
	Potash, permanganate of (in bulk), as disinfectants, n.e.i.	15 % „
79	Grease, for stuffing leather	4*s.* per cwt.
60	Gloves, surgeon's, rubber, as gloves	20 % *ad val.*
80	Oil—	
	Coal tar, as mineral oil	3*d.* per gall.
80	Oil, vacuum oil, oil-bricks, as mineral oil, n.e.i.	3*d.* „
	Cod, refined, in bulk	6*d.* „
	„ „ in bottles, as medicine	25 % *ad val.*
115	Paper—	
	Writing, imported in sizes 16 × 13 ins. and over, subsequently cut into smaller sizes and transferred to another state.	Free.
	"Browns" to mean wrapping paper only or such like brown paper.	6*s.* per cwt.
	Typewriting, over 16 × 13 ins.	15 % *ad val.*
55	Tea lead, as foil	Free.
97	Carbolic acid, as disinfectants	15 % *ad val.*
74	Electrical materials, porous pots (charged), as parts of dutiable batteries.	25 % „
	Emery wheels, when not in machines	Free.
91	India-rubber solution, as cement	20 % *ad val.*
99	Muskinol, as perfumery	20 % „
116	Manufactures of paper, n.e.i., such as—	
	Fly paper, not being advertising matter.	25 % „
	Mail plate, stereotyped, in chemical compound or cardboard.	25 % „
97	Rennet tablets, for cheese-making	Free.
41	Starch glaze, as oilmen's stores	20 % *ad val.*

Duties on Drugs in Venezuela.

U.S. Cons. Reps., Jan. 16, 1902.

All drugs, medicines, and patent chemical products imported through the custom houses of Venezuela pay the duties of the sixth class of the tariff (3 bolivars, or 2*s.* 4*d.*, per kilo.). The decree affects articles leaving their port of shipment from Dec. 10, 1901.

Mining and Metal Industries of Germany, in 1900.

U.S. Cons. Reps., Jan. 1902.

The following statement shows (in metric tons) the total output of the principal minerals, during the past three years :—

Minerals.	1898.	1899.	1900.
	Metric tons.	Metric tons.	Metric tons.
Lignite	31,648,898	34,204,666	40,279,332
Rock salt	807,792	861,123	974,784
Kainite	1,103,643	1,108,159	1,178,527
Other potash salts	1,105,212	1,384,972	1,874,346
Mineral oil	25,989	27,027	50,375
Zinc ore	641,706	664,536	639,215
Stone ores	149,311	144,370	148,230
Copper ore	702,781	733,619	747,775
Pyrites	144,849	144,623	169,447

With the exception of zinc ore, the output of 1900 exceeded that of any previous year. The production of metals, during the same three years, was as follows :—

Metals.	1898.	1899.	1900.
	Tons.	Tons.	Tons.
Zinc	154,867	153,155	153,350
Lead	132,742	129,225	121,513
Copper	30,695	34,634	30,929

Tariff Decisions in New Zealand.

Chem. and Druggist, Jan. 25, 1902.

The following decisions, bearing on the New Zealand Customs Tariff, have been recorded :—

Articles, and how Classed.	Rate of Duty.
Eucalyptus, "Sanders," as eucalyptus oil, in bulk or bottle.	20 % *ad val.*
Soap compound, rose, for the manufacture of soaps.	Free.
Weed-killer, "Acme," as "not otherwise enumerated."	Free.
Wine, "beef and malt" and "coca,"* as wine, other than sparkling and Australian.	6*s.* per gall.
Wine, "beef and iron," "quinine," and "quinine and orange,"* as drugs and druggist' sundries, not otherwise enumerated.	15 % *ad val.*

* Whether proprietary or otherwise.

Customs Decisions in New Zealand.

Bd. of Trade J., Jan. 30, 1902.

The following Decisions, dated Dec. 2, 1901, have reference to the Tariff of New Zealand :—

Articles, and how Classed.	Rate of Duty.
Paint, enamelette, as enamel paints	2*s.* per gall.
Paint, "Bon Accord," sanitary,* as enamel paints.	2*s.* „
Naphtha, mineral, including "petrol" or stove naphtha, being equivalent to benzine.	Free.

* Revised Decision.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum in Persia.

Bd. of Trade J., Jan. 16, 1902.

The *Engineering and Mining Journal*, noting the formation of a Belgian company to explore for petroleum in Persia, states that the petroleum region of Persia, so far as known, extends along a line drawn from Shahku, on the Turco-Persian frontier, south-east to the eastern side of the Persian Gulf. The northern part of this basin has its centre at Kasharashirin, near Shahku, where there are numerous pits of a depth of about 32 ft., which the Kurds exploit in a most primitive manner, contenting themselves with collecting an average of ten barrels of oil from the pits every four or five days. The petroleum is fluid and of a greenish colour, and is refined on the spot. In the centre of the basin, parallel to the Bakhtiari Mountains, is the petroliferous district of Lauriston, where the deposits are in the neighbourhood of salt and sulphur deposits Petroleum is also found at Shuster, where the inhabitants collect it on the surface. The Shuster oil is yellow, clear, and almost transparent, and has a specific gravity of 0·773.

South of this are some natural springs, one of which has a regular output of about 22 galls. per day. Natural petroleum springs also exist near the Persian convent of Nuamzady, at Haf-Cheide, with an output of about one barrel per day. These produce an oil of a greenish colour, and of a specific gravity of 0·927.

The south of the basin runs along the shore of the Persian Gulf, Dalike being the most important station. In this district work has been started by a company, which holds the concession of this property. The petroleum of Dalike is heavy and bituminous, and is said to have a specific gravity of 1·016. Investigations are to be made shortly on the shores of the Caspian Sea, near the village of Talisch, where there are abundant traces of petroleum, and where good drinking water, and cheap and abundant liquid fuel from Baku, are obtainable.

IV.—COLOURING MATTERS, Etc.

Indigo in the Punjab (India).

Chem. and Druggist, Jan. 25, 1902.

Owing to the fall in prices, followed by the closing of several factories, indigo planting is greatly on the wane in the Punjab, the sown area having fallen, since 1900, from 115,700 to 71,600 acres. The season has not been favourable, as the rains ceased prematurely after sowing time, and the canals ran short. The yield of dye is only 808,400 seers*, compared with 1,235,500 seers, and the yield of seed is only 1,568,400 seers, compared with 5,807,400 seers. (See also this Journal, 1901, 1156.)

Indigo Fuel of Export Duty in the Dutch East Indies.

Bd. of Trade J., Jan. 30, 1902.

A law, dated Dec. 30, 1901, abolishes the export duty on indigo in the Dutch East Indies.

V.—PREPARING, BLEACHING, Etc. TEXTILES, YARNS, AND FIBRES.

Silk Industry in France.

U.S. Cons. Reps., Jan. 20, 1902.

The manufacture of silk has not increased in France since 1895. During these six years, in which France has remained stationary, other countries of Europe and the United States have made such progress that France, which worked up 24·33 per cent. of all the silk in the years 1895—1897, has utilised only 22·23 per cent. in the last three years.

The export of coloured silks shows a tendency to increase, from 53,100 kilos., in 1898, to 60,200 kilos., in 1899, and 107,900 kilos., in 1900. This branch of French exports represents to-day more than 3,000,000 frs. In six years, the quantity of foreign silks which have been sent to France for dyeing, under the rule for temporary admission, has increased from 572,500 kilos. to 992,000 kilos. In 1900, there was less industrial and commercial activity, yet the quantity increased, in comparison with 1899, when business was good. In 1900, the number of producers of raw silk in France increased from 128,114, in 1899, to 136,214, and the average production was the highest known. The cultivation of the silkworm does not increase in France, despite the bounty paid by the Government. For ten years, the product of silk has remained practically stationary in France. The year 1900 was a very poor one for the reeling of schappe. Whilst the price of threads declined, that of raw material rose. This branch of the silk industry has suffered from the popularity of mercerised cotton. The reelers sent to the factories 1,724,200 kilos. of material, in 1900, as compared with 1,872,300 kilos., in 1899. For the last three years, the exports have been: in 1900, 272,900 kilos., worth about 5,500,000 frs.; in 1899, 213,500 kilos.; and in 1898, 221,800 kilos.

VII.—ACIDS, ALKALIS, AND SALTS.

Kelp Industry of Ireland.

Chem. and Druggist, Jan. 18, 1902.

During the hearing of a case as to the right of toll on the sea-weed collected on Miveenish Island, Mr. T. M. Healy, M.P., made the following remarks about the kelp industry:—

Red weed, that is, kelp or iodine weed, grows in the deep sea or on the rocks far out at sea. At certain seasons of the year, after storm, this red weed becomes detached, and if the tide set towards Miveenish Island or the mainland, a certain amount of weed is occasionally thrown upon the rocks. It is only when the weed is in bloom that it is of any value as drift weed, and that period is ten days at the end of April and ten days at the beginning of May. If the drift weed be thrown up except at that period it is of no value for iodine purposes. Some years ago, this kelp, when manufactured, was worth 10*l.* a ton, but its value now, owing to the syndicates in Chili and Peru, is only 4*l.* a ton. To raise this kelp weed requires two men always in a boat, and two women ashore. Twenty boat-loads are equivalent to 30 tons of the weed, and it takes that quantity to make 3 tons of kelp. Sometimes there is a skilled person called a burner, who gets 5*s.* for his work. The season lasts from April to October, and the highest price obtained is 4*l.*, but it runs as low as 1*l.*, 2*l.*, or 3*l.* at times. In other words, the four persons engaged at the work for six months produce 3 tons at 4*l.* a ton.

* Seer = 1 lb. 13 oz.

Acetate of Soda and of Lime, Duty-free in the Netherlands.

Bd. of Trade J., Jan. 23, 1902.

A law published in the Dutch Official Gazette for the 4th inst., exempts acetate of soda and acetate of lime from duty, on their importation into the Netherlands, when they are for use in the preparation of vinegar or of acetone.

Acetic Acid, Anhydrous: United States Customs Decision.

Bd. of Trade J., Jan. 23, 1902.

The chemical, scientifically known as "acetic anhydride," and, commercially, as "anhydrous acetic acid," is distinct in chemical composition from acetic acid, and is consequently dutiable, under par. 3 of the Tariff, as a "chemical compound, not specially provided for," at the rate of 25 per cent. *ad val.*

IX.—BUILDING MATERIALS, Etc.

Cement Exports of Great Britain.

Eng. and Mining J., Jan. 4, 1902.

Exports of cement from Great Britain, for the 11 months ended November 30, 1901, are reported at 285,349 tons, as against 337,783 tons for the corresponding period in 1900. The exports to the United States were 7,755 tons, in 1901, against 33,860 tons, in 1900, showing a decrease of 26,105 tons.

Fire Tiles: United States Customs Decision.

Bd. of Trade J., Jan. 23, 1902.

Fire Tiles.—A species of unglazed tiles, weighing about 100 lb. each, some measuring 36 by 15 by 3 ins., and some 30 by 15 by 3 ins., are dutiable as tiles, under par. 88 of the Tariff, and not as earthenware, under par. 97.

X.—METALLURGY.

Mercury in Italy.

Chem. and Druggist, Jan. 25, 1902.

According to the *Bollettino delle Finanze*, there is a considerable output of mercury in Italy, especially in Tuscany, where the quality of the ore is said to be as good as that of the Spanish mines of Almaden. The chief deposits are those of San Salvatore and of Comacchio, and of Siele in the province of Grosseto. About 95 per cent. of the Tuscan mercury is sent to the United Kingdom.

Mercury Production of United States.

Chem. and Druggist, Jan. 18, 1902.

The mercury receipts at San Francisco, in Nov., 1901, were 1,374 flasks. For the 11 months ended Nov. 30th, 1901, the receipts were 18,172 flasks, against 18,046, for the corresponding period in 1900, and 21,739, in 1899. These receipts do not include shipments made direct from the mines to consumers. The exports from San Francisco by water, for the 11 months, were as follows:—Siberia, two flasks; Korea, 12; Japan, 24; South America, 20; Central America, 1,008; Mexico, 3,436; British Columbia, 32; New York, 70; total, 4,604 flasks, against 6,588, in 1900.

In 1900, 1,000 flasks were sent to China, but that country procured no mercury from California, in 1901. The supplies of mercury in the United States are now becoming very small, and the producing properties have been unable to materially increase their output. The stocks there, two years ago, were 2,500 flasks, which were reduced to 1,200 flasks, during the following year. The returns of the Boston owned properties, for 1901, were disappointing. The normal output of both the Napa and the New Idria is about 400 flasks a month. The total production in the United States for last year was about 27,000 flasks. The Aetna Company has expended $25,000, in 1901, for prospecting purposes, but failed to discover any new ore bodies of value, whereas the Boston Company has been more successful, its output being 200 flasks a month, which, it is hoped, will be materially increased in future.

Manganese Trust in the Caucasus (Russia).

Chem. and Druggist, Jan. 25, 1902.

After negotiations extending over six months, a trust has been formed to control the output of manganese in the Caucasus. It will include 264 mines, whose total output is about 400,000 tons per annum. The headquarters of the trust are to be in Berlin, and the capital is three million marks. The syndicate is formed for a term of 10 years.

Manganese Bronze for Boiler Staybolts in Hungary.

Eng. and Mining J., Jan. 18, 1902.

The Hungarian State Railways have tried stay-bolts of manganese bronze, which alloy, when tested for tensile strength, has given very high percentages of elongation, and excellent results as regards ultimate stress. The alloy, as specified by the Hungarian State Railways, consists of a mixture of copper and manganese, the minimum quantity of the latter metal allowed by the specification being 3·8 per cent.

Copper in Bohemia (Austria-Hungary).

Bd. of Trade J., Jan. 30, 1902.

According to the *Engineering and Mining Journal* of the 11th Jan., extensive deposits of copper ore have been discovered in the neighbourhood of Graslitz and Klinenthal, in Bohemia, where surveying has been going on for some months. A plant is now being erected, and it is said that the ore is of very high quality. About 100 hands are now employed, and the force is to be increased.

Molybdenite in British Columbia (Canada).

Bd. of Trade J., Jan. 16, 1902.

The *British Columbia Review* of the 28th Dec. reports that deposits of molybdenite have been discovered in West Kootenay, and also near Pitt Lake, on the Lower Fraser. Molybdenite has also been discovered in the Rossland and Nelson mining districts, but has not been developed to any extent. The metal is worth about 5*s.* a pound, and should the present restricted demand be extended, the Kootenay deposits would soon be opened up.

Platinum in Wyoming.

Chem. and Druggist, Jan. 18, 1902.

Professor Wilbur C. Knight has written a report on the discovery of platinum in Carbon County, Wyoming. The indications are that the metal occurs in considerable quantity. The Rambler Mine, from which the platinum comes, yields copper pyrites, and it was only through unaccountable variations in the assays that the rarer and more valuable metal was brought to light. The discovery was made by Dr. L. D. Godshall, manager of the Boston and Wyoming Smelter Company. It is not yet known whether the platinum is in the copper, or in the iron pyrites which accompanies it, or in both.

XII.—FATS, OILS, AND SOAPS.

Cotton-Oil Exports from Marseilles to the United States.

U.S. Cons. Reps., Jan. 2, 1902.

Although Marseilles is the most important market for American cotton-oil, yet cotton-oil of French manufacture has been successfully exported from Marseilles to the United States. The following consignments were made during the last four quarters, and during October 1901 :—

	Dols.
December 31, 1900	1,900
March 31, 1901	None
June 30, 1901	3,680
September 30, 1901	1,753
Month of October 1901	1,000

The f.o.b. price for the last consignment was 125 francs per 100 kilos., whilst, on the same date, American "winter edible" was quoted at 63 francs per 100 kilos.

Three Marseilles firms buy American cotton-oil on the market, refine it, and resell it.—A. S.

Soap and Candles in New Zealand.

Bd. of Trade J., Jan. 16, 1902.

Soap and candle works show no material progress. Though the number of factories has been increased from 19 to 24, the total output shows very little improvement in ten years. Meantime, the imports have grown, and for the year ended 30th September last, show an increase of fully 50 per cent. on the previous year. The advantage of having local supplies of tallow is almost nullified by the fact that the demand runs almost entirely on wax candles, and for these, New Zealand factories have to import the paraffin, and pay an import duty of ¾*d.* per lb., whilst the duty on the imported candle is only 1*d.* New Zealand manufacturers are now threatened with competition from America.

Oil-Nuts and Oil-Seeds in Mozambique (Portuguese East Africa) : Tariff Change.

U.S. Cons. Reps. Jan. 6, 1902.

The following change has been made in the customs tariff of the province :—

Peanuts, sesamé, and other oil-seeds are to be subject to an export duty of 4 per cent. *ad val.* when exported to non-Portuguese countries, and of 2 per cent. when exported to Portuguese countries.

Methylation [Denaturing] of Cotton-Seed Oil : New Australian Customs By-Law.

Bd. of Trade J., Jan. 23, 1902.

1. Imported cotton-seed oil may be methylated in the manner provided by these by-laws.

2. The oil shall be mixed with the methylating substance, in such proportions as the collector shall direct, and in such manner as to render the oil unfit for use as a beverage or in food, and incapable of being converted to that use.

3. The methylating (denaturing) substance to be used shall be approved by the collector, and the mixing shall be done in the presence and to the satisfaction of an officer.

Wax Exports of Abyssinia.

Bd. of Trade J., Jan. 30, 1902.

About one-half of the export of this product, which, two years ago, was sent by way of Addis Ababa and Harrar, now goes by way of the Sudan and Massowah. The quantity exported through the Somali Coast, in the two years 1899 and 1900, is estimated at about 34 tons (valued at about 1,360*l.* per annum). The actual price of the unrefined wax varies from 11 to 12 thalers* per frasila of 37 lb.

* Thaler (Maria Theresa) = 2*s.* (about).

Afridi Wax-Cloth in India.

Times of India, Jan. 4, through *Bd. of Trade J., Jan.* 30, 1902.

Afridi wax-cloth, a kind of raised colour painting on cotton fabrics, is made in Peshawar, Lahore, Calcutta, and Bombay; but ignorance has hitherto prevailed as to the constitution of the medium employed. Mr. Geo. Watt has now ascertained that the medium, known as *roghan*, is a product of safflower seed. The method of preparation is to boil the oil—expressed cold—for 12 hours, and then throw it into pans of cold water, when it swells up into a thick jelly, which is *roghan*. Before being applied to the cloth, it is mixed with some mineral colour and drawn out into fine threads on a pointed style, with which the pattern is traced. The demand for household drapings gives a ready outlet for the Afridi artisan's skill. Tests made in Calcutta showed that, as a waterproofing material, or as a material to be used in the manufacture of linoleum, *roghan* deserves careful consideration, and is in some respects superior to linseed.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Tanning and Wool Scouring in New Zealand.

Bd. of Trade J., Jan. 16, 1902.

As regards fellmongering, tanning, currying, and wool scouring, while the number of works shows a moderate increase, and the quantity of wool treated has more than doubled in the last 10 years, it is noticeable that the number of tanpits has been reduced, since 1895, and the number of skins tanned has fallen to less than one-third of the number for 1895. It would appear that they are now sent forward as salted pelts. There is evidence of other products being evolved, and the value of the total output has increased by over 50 per cent., in the five years since the previous census.

XV.—MANURES, Etc.

Phosphates on Ocean Island.

Bd. of Trade J., Jan. 23, 1902.

The *North China Herald* of the 24th Dec., 1901, states that Ocean Island, in the Pacific, situated about 30 miles from the equator, and 200 miles west of Nonuti, one of the Gilbert Group, is noted for its rich deposits of phosphates. There is no anchorage at the island, but mooring buoys are laid down, one on the north-west side and the other in the south-west corner. Steamers make fast to either of these when loading, the phosphates being lightered off to the ship. There is deep water right up to the shore. The Pacific Islands Company have a large plant at the island, and they export the phosphates in considerable quantities to Australia and New Zealand. The Company holds exclusive rights in connection with the phosphate deposits on the island, employing a staff of 220 hands.

XVI.—SUGAR, STARCH, Etc.

Sugar Production of Germany and the Cartel.

U.S. Cons. Reps., Jan. 14, 1902.

The latest official estimate shows that, exclusive of Denmark, the sugar-growing countries of Europe will produce this year (1901), 5,928,150 tons of raw sugar, an increase of 262,850 tons over the production of the previous year. Of this amount, Germany will, it is estimated, yield 2,073,100 tons, as against 1,974,800, during the preceding campaign.

On Dec. 7, 1901, a high commercial authority estimated the visible supply of raw sugar, now in the principal European markets, at 1,640,812 tons, against 1,297,525 tons on the same date, in 1900, and 1,249,772 tons, in 1899. Adding to these the visible stock of raw sugar in the United States and Cuba, on Dec. 4, 1901, there is found to be in sight 1,825,921 tons, against 1,407,783 tons, on the same date in 1900, and 1,554,790 tons in 1899.

Under these conditions, and in view of the growing production of sugar in the United States, Cuba, Porto Rico, and Hawaii, prices of raw sugar in the German market have sunk until the condition of the whole producing interest would be desperate, were it not for the "Cartel," or secret working combination between raw sugar factories and refineries, by which high prices are maintained for all sugar consumed in Germany, the profits from which, added to the Government bounty paid on exports, enable the manufacturers to pay a proportionately high rate for beets, and at the same time, sell their exported product in foreign markets at prices with which other nations find it difficult to compete, and which, in effect, give the German producer a commanding position in the world's sugar market.

The "Cartel" was organised rather more than a year ago, and includes about 95 per cent. of the sugar-producing interests in Germany. It may be stated that the Cartel guarantees producers of raw sugar a certain minimum price, and takes their entire product. Any difference between this minimum and a lower price which may rule in the world's markets is made up by the refiners. On the other hand, the raw-sugar producers guarantee to pay a fixed minimum price for beets, to produce no raw sugar for consumption in Germany, and to sell their raw sugar only to refineries belonging to the syndicate. Among the results, two may be cited which will explain the present situation, *viz.*: On the one hand, the manufacturers are able to pay for beets about 3*s.* per ton more than the general sugar market price outside of Germany would justify, and on the other, refineries are able to control absolutely the price of sugar for consumption in Germany, and this they do so effectively that ordinary white lump sugar costs to-day, in Berlin, 30—35 pf. ($3\frac{1}{2}d.$—$3\frac{3}{4}d.$) per lb., or nearly three times what is charged for the same grade of German-made sugar in London.

So oppressive have become the exactions of the "Cartel," that the Associated German Chocolate Manufacturers took steps early in September, 1901, to organise at Genthin, in Brandenburg, a scheme for the erection of a factory capable of working up daily 15,000 centners of beets. This break for independence by a union of heavy consumers of sugar has caused some agitation on the part of the Cartel, whose organ warns the chocolate makers of the results of such insubordination, but, according to definite press reports, the latter have gone on making 10-year contracts for beets with the farmers of a large region, and will have their factory and refinery in readiness for the next campaign.

Equally unpromising is the outlook for any important and systematic reduction in the area of beet culture next year. The simple fact is that, under the management of the Cartel, farmers receive for their beets a price considerably higher than is justified by the value of sugar in the world's markets, and consequently sugar beets are about the only crop left to German farmers that is largely profitable.

The principal lesson which American sugar growers have left to study in Germany is the intelligent utilisation of the two principal waste products of beet sugar manufacture — the spent pulp and the crude molasses— which latter contains usually from 40—50 per cent. of sugar that cannot be crystallised out on account of the potash salts which the crude syrup contains. In the early years of German beet culture, the utilisation of these secondary products attracted relatively little attention. It was soon discovered, however, that the spent pulp from sugar factories was a valuable food for cattle; that, by drying, it could be preserved for use throughout the winter; and that by adding to the dried pulp the waste molasses, the food was not only rendered more palatable for animals, but, being fed on the farm, the potash of the syrup was retained on the premises and restored to the land in the form of stable leachings and manure.

For many years, waste beet molasses in Germany was either exported to France or Spain, or used as a raw material for the manufacture of alcohol, the potash salts being in that case recovered, and restored to the land as a separate chemical fertiliser. But the internal revenue laws of Germany are so shaped as to favour the production of alcohol from potatoes on a large scale and at a

small cost, so that the spirit manufacture from beet molasses was gradually abandoned, and the waste syrup used for fodder material. Used for this purpose, spent beet pulp, enriched with waste molasses, helped to meet a pressing want in Germany, and the crude syrup is now worth 4·75—4·80 marks (4*s.* 9*d.*—4*s.* 9½*d.*) per 100 kilos. in car-load lots.—A. S.

Sugar Production of Queensland (Australia).

Bd. of Trade J., Jan. 23, 1902.

The Melbourne *Journal of Commerce* for the 17th Dec., 1901, states that the production of sugar in Queensland, for the season of 1901, amounted to 110,000 tons, as compared with 92,554 tons, in 1900.

Rice for the Manufacture of Starch: New Australian Customs By-law.

Bd. of Trade J., Jan. 23, 1902.

Imported rice may be delivered, for the purpose of being used in the manufacture of starch, on condition that the manufacture is carried on in a warehouse licensed under the Customs Act, 1901.

Dutch Sugars:—U.S. Countervailing Duties on.

Bd. of Trade J., Jan. 23, 1902.

The following is a revised scale of countervailing duties to be levied on sugars produced in the Netherlands.

(1) On raw sugar, produced from beet-roots, 1·38 fl. per 100 kilogs. of hard refined. (The output of refined sugar from raw is computed by deducting from the polarisation of the raw sugar twice the glucose, four times the ashes, and 1½ per cent. for loss in refining.)

(2) On sugar refined from beet-root raw sugar, produced in the Netherlands, 1·57 fl. per 100 kilogs.

(3) On sugar refined from imported raw sugar, ·19 fl. per 100 kilogs. in addition to the bounty, if any, allowed on the raw sugar by the country of production.

The liquidation of entries covering sugars produced in the Netherlands, after 1st September, 1901, may be suspended, at the request of the importers, until the next ascertainment and declaration under the provisions of Section 5 of the United States Tariff Act, and the additional duties on such suspended entries shall be estimated on the basis of the rates given above. (See also this Journal, 1901, 1261.)

XVII.—BREWING, Etc.

"Industrial Alcohol"; Tax on Products with a Base of, in France.

Bd. of Trade J., Jan. 30, 1902.

Products with a base of "industrial alcohol" (*i.e.*, products in the manufacture of which alcohol, other than that of wine, cider, perry, lees, residuum, or fruits, has been used), whether produced in French colonies or in foreign countries, are to be subject on importation to the manufacturing tax ("*droit de fabrication*") on denatured spirits, amounting to 80 centimes per hectolitre of absolute alcohol used. This tax is leviable in addition to the import duty proper.

XIX.—PAPER, PASTEBOARD, Etc.

Paper from Avoavo Bark in Madagascar.

U.S. Cons. Reps., Jan., 1902.

The avoavo is a wild shrub, 9 to 12 ft. in height, with short branches of an average thickness of 4 to 5 ins., the leaf being very similar to a bay leaf. It is met with everywhere, on the coast and in the interior of the island, and the bark can be utilised at any season of the year.

After taking off the outer skin, which is of a greyish tint, the inner part, perfectly white and somewhat sticky, is removed and formed into a big ball, which is placed in running water to soak. This ball is picked to pieces, little by little, and the pieces thus separated are washed and placed in a large pot with a certain quantity of water; the mass is then covered with ashes, followed by a second layer of bark, again covered with ashes, and so on until the pot is three-quarters full. The pot is then filled with water, the lid put on, and the whole boiled for two or three days without interruption, care being taken to add very clean water from time to time to replace the loss by evaporation, always throwing in a handful of ashes.

On the morning of the third day, the bark, completely reduced by cooking, looks like a thick batter, which is then passed through a sieve and washed in fresh water. It is then beaten, briskly kneaded, and under the pressure of the fingers is transformed into a soft dough, which is spread, still damp, on the green leaves of the traveller's tree with a special tool, consisting of two rods about 18 ins. long, joined by slats of raffia wood, the only wood, apparently, to which the pulp will not stick. This is the most delicate part of the whole operation. With the flat of the hand, moistened, the required thickness is given to the sheet; it is then pressed, levelled, smoothed, and put in the sun. As soon as it is dry, it is glazed with weak rice-water, spread with the hand, like starch, on linen. The sheet, still in a damp state, is then flattened out by the hand or with a polished pebble. It is finally dried, peeled off from the green leaf, and the paper is finished. Each sheet thus obtained is worth from 1 to 2 cents; it measures 20 to 23 ins. long and 10 ins. wide, and is finally trimmed for binding.

Surface-coated Paper Articles—Borders; United States Customs Decision.

Bd. of Trade J., Jan. 23, 1902.

Articles, known as "borders," made from paper, surface-coated with metal or a solution of metal, are dutiable as manufactures of paper, under par. 407 of the Tariff, at the rate of 35 per cent. *ad val.*

Articles made from metal surface-coated paper are not dutiable according to the component parts of chief value, but, being made from surface-coated paper, are dutiable as manufactures of paper.

Blue Straw Cardboard: Customs Decision (Germany).

Bd. of Trade J., Jan. 30, 1902.

Blue straw cardboard, composed of several layers of straw-paper pulp, pressed together and painted on one side with blue size colour, is dutiable, as prepared cardboard, under No. 27e of the Tariff, at the rate of 10 M. per 100 kilos. (5*s.* 1*d.* per cwt.).

XX.—FINE CHEMICALS, Etc.

Pharmaceutical Specialties in Turkey.

U.S. Cons. Reps. Jan. 6, 1902.

Prof. T. H. Norton reports from Charput as follows, on the difficulties accompanying the introduction into the interior of Turkey of foreign pharmaceutical preparations:—

An imperial order, issued some time ago, concerning the sanitary examination of imports into the Empire, states that the entrance of pharmaceutical specialities of unknown composition, or not meeting the requirements of the French pharmacopœia, is forbidden. An exception, however, is made in the case of such specialties of these two categories as have been approved by an "official academy" (académie officielle), *i.e.*, a chartered medical society.

In order to secure the entrance of an article of this nature, the importer is required to secure an authorisation from the Imperial Medical College, at Constantinople. The latter requires that the demand for such authorisation should be accompanied by a certificate from the "academy," endorsing the article in question, and either a sample of the article or the formula of its composition, where there is a departure from the requirements of the French pharmacopœia. All the documents in the case should be certified by the Ottoman consul in the country of origin.

The majority of the documents presented in such cases are either so vague or so improperly certified, that the

desired permission cannot be granted. In most cases, a lengthy correspondence has been without result.

In order to avoid future delays and difficulties of this character, the Turkish medical officials urge that care should be taken to secure Ottoman consular certification for all papers submitted in connection with such importations. Further, all formulas should be written either in French or in Turkish. Quantities and proportions should be stated with the utmost clearness. The names of constituents employed should be those used in purely scientific nomenclature, and not those customary in trade. Thus, "acetanilid" should be used, and not "antifebrin"; "iodochloro-oxyquinolin," and not "vioform," &c.—although the trade designations, in parentheses, might advantageously follow the purely scientific names.

In general, formulas and labels should be such that they can be understood by examiners possessing limited scientific knowledge, and no familiarity with commercial terms.

Turkish officials look with suspicion upon anything containing poisonous or explosive constituents. The difficulty of obtaining potassium chlorate in Turkey for use as a gargle is a case in point.

"Terpin Hydrate": United States Customs Decision.

Bd. of Trade J., Jan. 23, 1902.

"*Terpin hydrate*" is dutiable as a medicinal preparation, not containing alcohol, and in the preparation of which alcohol is not used, under par. 68 of the Tariff, at the rate of 25 per cent., *ad val.*

XXII.—EXPLOSIVES, Etc.

Smokeless Powder and Dynamite in Mexico.

U.S. Consular Reps., Jan. 18, 1902.

The Mexican Government has granted a concession for a factory to make dynamite and other explosives in the Republic, the price of which must have the approval of the Government. The concession includes the manufacture of caps, tapers, and quick matches. The company shall also erect a factory for the manufacture of smokeless powder, of a capacity of from 176 to 220 pounds per day. Both plants must be in operation by June 30, 1903. When the company is able to supply the market, there shall be imposed an internal-revenue tax of 21 cents per kilo., on all explosives imported into or manufactured in the Republic; and the Government further agrees not to reduce the customs duties on explosives now in force. Black powder may be exempted from the internal tax, provided that its components are sulphur, carbon, and nitrates of potash and soda, and not nitroglycerin, chlorate of potash, or similar substances.

Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

1902.

1498. G. P. Van Wye. Improvements in filters. Jan. 20.

1519. J. F. Simmance and J. Abady. Improvements in heating apparatus. Jan. 20.

1549. C. S. Lemström. Improvements in cooling apparatus. Jan. 20.

1587. G. Pott and R. Williamson. Improvements in centrifugal machines. Jan. 21.

1613. E. G. Scott. Improvements in apparatus for evaporating liquids. Jan. 21.

1682. G. Mitchell. Improvements in smelting furnaces. Complete Specification. Jan. 21.

1718. S. Puplett. Improvements in ice-making and freezing apparatus. Jan. 22.

1884. E. Lines. *See* Class B.

1911. W. J. Wigg and S. Peers. Improvements in or connected with filter presses. Jan. 24.

1980. T. Hodges. Improvements in smokeless furnaces. Jan. 24.

2100. D. K. Tullis. Improvements in and connected with centrifugal machines. Jan. 27.

2113. W. Kronheim. Improvements in and relating to the construction of drying apparatus. Complete Specification. Jan. 27.

2124. J. W. Garson. Improvements in or appertaining to iron drums or receptacles for oils, varnishes, or the like. Jan. 27.

2144. C. Malmendier and M. Stühler. Improved hydraulic mixing apparatus for saturating liquids with gases. Complete Specification. Jan. 27.

2322. H. Lane and C. H. Schill. Improvements in apparatus for blowing or compressing air and gases. Jan. 29.

2444. T. T. Rutter. Improved apparatus for refrigerating and heating purposes. Jan. 29.

2528. S. Zylherlast. Improvements in apparatus for cooling liquids, applicable also to evaporative condensers. Jan. 31.

2554. J. D. Pennington and C. H. Riches. Improvements in refrigerators. Jan. 31.

2592. B. J. B. Mills.—From A. Prat, France. Apparatus for heating liquid or gaseous bodies under pressure. Jan. 31.

2598. E. Josse. Improvements in air compressors. Complete Specification. Jan. 31.

Complete Specifications Accepted.*

1900.

22,957. W. P. Thompson. Separating salt or other solid matters from their solutions, or separating particles of superior specific gravity from fluids containing them in suspension. Jan. 22.

1901.

592. W. P. Grath. Kilns. Jan. 22.

1999. C. Spiegel. Furnaces for burning naphtha residue. Jan. 22.

2613. R. Snowdon. Kilns. Jan. 22.

3173. E. S. Hermes. Bag filters for clarifying beer, wines, spirits, perfumes, water, and other liquids. Jan. 22.

3266. J. H. Brearley. Generator or regenerative furnaces or kilns. Jan. 29.

4012. W. Brothers. Ammonia absorption process of refrigeration, and apparatus therefor. Jan. 22.

5118. E. J. Clubbe and A. W. Southey. Apparatus for condensing and cooling liquids. Jan. 29.

10,413. The Actiengesellschaft für Zink Industrie vormals W. Grills and M. Schroeder. Process for the production of porous contact substances or masses for use in catalytic processes. Jan. 29.

21,191. E. J. Hess. Method of and apparatus for production of motive power. Jan. 29.

24,928. O. Lindemann.—From E. Körting, Germany. Liquid fuel furnaces. Jan. 29.

II.—FUEL, GAS, and LIGHT.

Applications.

1598. R. Macdonald and W. Rennie. Improvements in and connected with acetylene gas generators. Jan. 21.

1742. S. G. Watson. Improvements in connection with generators for the manufacture of acetylene and other gases. Jan. 22.

1817. J. A. Smith, M. Dick, and D. C. Dick. Improvements in acetylene generators. Jan. 23.

1829. W. J. Crossley and J. Atkinson. Improvements in apparatus for treating the air and gas in gas-producer plants. Jan. 23.

1990. J. E. Dowson. Improvements relating to the production of generator gas, and in the provision of hot air therefor. Jan. 24.

2001. J. McNally. Improvements in appliances or chambers for purifying acetylene or other gas. Jan. 25.

2030. H. Marshall. Improvements in carburetting air or gas and in apparatus employed therefor. Jan. 25.

2056. W. H. A. Sieverts. Improvements in incandescent gas burners. Jan. 25.

2078. J. J. Metgè. Improvements in or connected with the manufacture of fuel briquettes. Jan. 27.

2085. J. A. Purves and W. S. Purves. An improved method and apparatus for the production of combustible gases. Jan. 27.

2117. C. M. Kemp. Improvements in carburetters. Complete Specification. Jan. 27.

2131. J. Lewy. An improvement in illuminants such as are used for making candles and the like. Jan. 27.

2134. P. Pehu-Montaron. Acetylene gas generating apparatus. Jan. 27.

2161. H. H. Lake.—From "Selas" Gesellschaft mit Beschränkter Haftüng, Germany. Improved method of and apparatus for supplying illuminating gas under pressure. Jan. 27.

2174. J. F. Hoyne. Improvements relating to the production of ozone. Jan. 27.

2249. J. Seymour. Improvements in machines or apparatus for mixing gas and air. Complete Specification. Jan. 28.

2276. J. Seymour. Improvements in machines or apparatus for mixing gas and air. Complete Specification. Jan. 28.

2299. W. P. Thompson.—From E. Will, Germany. Improvements in incandescent gas burners. Jan. 28.

2306. D. de Vulitch. A new process for the manufacture of a binding agent for low grade coal, carbonaceous, and other substances. Jan. 28.

2307. D. de Vulitch. A new or improved binding medium for coal and other substances, and process for producing same. Jan. 28.

2374. Sir C. F. Forbes, Bart. Improvements relating to acetylene gas generators. Jan. 29.

2375. C. Pataky. Improvements in acetylene gas generators. Complete Specification. Jan. 29.

2403. H. Salsbury. Improvements in acetylene generators. Jan. 29.

2483. H. Vert. Improvements in apparatus for generating acetylene gas. Jan. 30.

2541. F. Börner. New or improved appliances for preventing drainage or breakage of incandescent gas mantles. Complete Specification. Jan. 31.

2617. R. Dempster and Sons, Ltd., and J. W. Broadhead. Improvements in retort houses for inclined gas retorts and the like. Feb. 1.

Complete Specifications Accepted.

1901.

3849. A. R. Scherding. Heating devices for liquid fuel. Feb. 5.

5730. F. S. Cripps. Covers for gas purifiers. Jan. 29.

5826. A. Vosmaer. Ozonising apparatus. Jan. 29.

5980. A. F. Spooner.—From V. L. Longuemare, *née* A. Lechesne, France. Carburettors. Jan. 22.

6260. G. Hartmann. Process for the manufacture of peat blocks. Jan. 29.

6569. J. W. Ward. Burners for incandescent gas lighting. Feb. 5.

17,494. F. W. C. Schniewind. Manufacture of gas. Jan. 29.

19,826. C. D. Abel.—From J. Saltar, jun., United States. Method of and apparatus for purifying gases. Jan. 29.

21,757. J. Cayrol. Burners for lighting-gas and other combustible gases. Jan. 29.

21,982. W. A. Feurt and H. H. Martin. Acetylene gas generators. Jan. 22.

22,766. F. Paul, jun., and A. F. Gundlack. Generation of gas. Jan. 22.

22,931. The Simon-Carves Bye-Product Coke-Oven Construction and Working Company, Ltd.—From The Société Anonyme de Carbonisation, France. Coke ovens. Jan. 29.

23,206. W. P. Thompson.—From Compagnie Générale d'Incandescence par le Pétrole et l'Alcool, France. Incandescence burners. Feb. 5.

24,570. A. McIntosh. Apparatus for generating and storing acetylene gas. Feb. 5.

25,173. H. H. Lake.—From Kaole Sava Manufacturing Company, United States. Composition for use with coal to increase its efficiency. Jan. 29.

25,810. A. Just. Manufacture of incandescence bodies for electric glow lamp. Jan. 29.

26,271. W. A. Milne. Composite peat blocks. Jan. 29.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

2292. G. Wilton. The manufacture of pitch compounds or substitutes. Jan. 28.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

1561. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of azo colouring matters and of material for use therein. Jan. 20.

1790. W. B. Bishop, A. Bishop, and F. W. Passmore. Manufacture of stable salts from piperidine and analogous bases, and of preparations therefrom. Jan. 22.

2149. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of sulphide colours from nitrosotoluylenediamine. Jan. 27.

2362. O. Lugo and W. M. Callender. Improvements in the separation of the colouring substances from peat moss and other grasses. Jan. 29.

Complete Specifications Accepted.

1901.

4024. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of blue colouring matters and intermediate products. Jan. 22.

4609. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of substantive colouring matters, and of products for use therein. Jan. 29.

5580. R. B. Ransford.—From L. Cassella and Co., Germany. Manufacture of dyestuffs. Jan. 22.

5811. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new anthracene derivatives. Jan. 22.

5880. O. Imray.—From Die Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of black sulphurised dyestuffs directly dyeing cotton. Jan. 22.

6546. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of a new black colouring matter and of a material for use therein. Jan. 22.

6643. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of mordant dyeing colouring matters. Feb. 5.

6651. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Manufacture of colouring matters belonging to the naphthacridine series. Jan. 22.

12,185. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new colouring matters of the anthracene series. Jan. 29.

26,602. O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of fast dyestuffs of the phthalein series. Feb. 15.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

1584. W. Rodger and R. O. Tweedie. Improvements in printing or colouring yarns and fabrics, or the like. Jan. 21.

1609. The Cotton Seed Company, Ltd., and J. C. W. Stanley. Improvements in or relating to the treatment of cotton seed hulls. Complete Specification. Jan. 21.

2060. W. A. E. Crombie. Improvements in the treatment of wild and inferior silk yarns or fabrics. Jan. 25.

2163. T. Jegler. An improved method of producing patterns on fabrics. Jan. 27.

2200. W. Rodger and R. O. Tweedie. Improvements in printing or colouring yarns or fabrics, and the like. Jan. 28.

2202. J. T. Pearson. Improvements in machinery, apparatus, and appliances for bleaching, lustre-mercerising, dyeing, stretching, and drying textile materials. Jan. 28.

2281. H. H. Lake.—From La Société "Aimé Babuin," France. Improved process for the ornamentation of fabrics, paper, or the like. Complete Specification. Jan. 28.

2304. T. Walsh. Improvements in apparatus for steaming, ageing, and drying fabrics. Complete Specification. Jan. 28.

2476. J. Douge. Improvements in the preparation of collodion for the manufacture of artificial silk. Jan. 30.

2524. J. Schneider. Improvements in apparatus for treating warp yarns, tapes, and other narrow goods with mercerising, dyeing, bleaching, or other liquors. Jan. 31.

2634. T. Hardcastle. An improved process of embossing and finishing cotton piece-goods. Feb. 1.

2660. H. White. Improved process of producing designs, patterns, and devices on textile fabrics. Feb. 1.

Complete Specifications Accepted.

1901.

2907. H. H. Lake.—From Farbwerke Mülheim vormals A. Leonhardt and Co., Germany. Manufacturing of colouring matters. Jan. 29.

5516. C. Danilevsky, S. Tourchaninoff, A. Danilevsky, and V. Simonoff. Process of metallising fabrics. Jan. 29.

6429. H. E. Newton.—From The Farbenfabriken vormals F. Beyer and Co., Germany. Preventing the weakening of dyed cotton fibre. Jan. 29.

6543. R. Zierseh. Process and apparatus for producing on woven fabrics a gloss resembling that of silk velvet. Jan. 22.

7923. P. Barboutau. Xylographical printing of colours in graduation on paper and textile fabrics. Jan. 29.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

1758. Salinen-Direction Lüneburg and O. Sachse. Improvements in and relating to the manufacture of common salt. Jan. 22.

2177. R. J. Yarnold and T. H. L. Bake. Improvements in the obtainment of lead salts in solution. Jan. 27.

2260. C. M. Hall. Improvements in the manufacture of alumina. Complete Specification. Jan. 28.

2379. A. Zanner. Improvements in apparatus for concentrating sulphuric acid. Complete Specification. Jan. 29.

2456. A. H. Godwin and F. A. Keil. A new or improved method of treating or dealing with spent gases resulting from the manufacture of sulphate of ammonia, for the recovery of the cyanogen group contained therein. Jan. 30.

2461. H. C. Woltereck. Process of producing ammonia by syntbesis. Jan. 30.

Complete Specifications Accepted.

1901.

1812. C. Enoch. Production of silico fluoride of sodium. Jan. 29.

3071. E. M. Taylor. Alkali creosolate compound for bleaching and scouring. Feb. 5.

3328. G. W. Johnson.—From The Deutsche Gold und Silber Scheide Anstalt vormals Rössler, Germany. Manufacture or preparation of cyanide and its compounds. Jan. 22.

3329. G. W. Johnson.—From The Deutsche Gold und Silber Scheide Anstalt vormals Rössler, Germany. Manufacture or preparation of alkali cyanides. Feb. 5.

5015. F. M. Spence, D. D. Spence, H. Spence, J. J. Hood, and T. J. I. Craig. Manufacture of sodium bichromate. Jan. 22.

6226. E. C, Rossiter, H. W. Crowther, and G. S. Albright. Manufacture of cyanides of the alkalies. Feb. 5.

6795. L. O. Helmers. Production of sulphonic acids and their salts. Jan. 29.

6828. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of porous bodies suitable for use as contact bodies in chemical operations. Feb. 5.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

1599. C. H. Thompson and The Crystalline Company, Ltd. Improvements in or connected with the manufacture of glass tiles, and in the bending of sheet glass to form bullnoses, mouldings, angles, beadings, and the like. Jan. 21.

1973. H. Hilde and E. Kögler. Improvements in the manufacture of hollow glasswares of equal weight and capacity. Jan. 24.

2349. R. H. Smith. Improvements in the production of earthenware ridge and similar tiles. Jan. 29.

Complete Specification Accepted.

1901.

1976. C. Franklin. Method of ornamenting and decorating figured, rolled, or other glass. Feb. 5.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, and CEMENTS.

Applications.

1826. C. E. Hall. Improvements in machinery and appliances therefor. for making concrete or composite slabs, blocks, and the like. Jan. 23.

2522. L. Whittaker and C. Whittaker and Co. Improvements in or connected with the manufacture of bricks or artificial stone blocks, or the like. Jan. 31.

2671. A. M. Clark.—From The Firm of Fellner and Ziegler, Germany. Improvements in apparatus for the manufacture of slag cement. Feb. 1.

Complete Specifications Accepted.

1900.

22,952. G. Clue and E. Biehler. Manufacture of conglomerates for building and other purposes. Jan. 22.

1901.

17,431. W. Wood and H. Bartlett. Manufacture of woodite. Jan 22.

22,314. C. von Forell. Process and apparatus for the preparation of Portland cement from blast furnace slag or cinder. Jan. 22.

23,443. C. von Forell. Manufacture of cement. Feb. 5.

X.—METALLURGY.

Applications.

1815. W. H. Akester and F. A. Ford. Improvements in the treatment of sulphide and similar ores. Jan. 23.

1947. H. J. Phillips and E. R. Blundstone. Improvements in or relating to the dephosphorisation of metals and metallic mixtures. Jan. 24.

2115. G. Kolb. Composition for hardening steel. Complete Specification. Jan. 27.

2231. E. B. Clarke. Improvements in the manufacture of crucible steel. Complete Specification. Jan. 28.

2318. J. J. Morgan. Increasing the electrical conductivity of iron and steel. Jan. 29.

2402. H. H. Lake.—From G. Rambaldini, Italy. Improvements relating to the roasting of pyritous minerals. Jan. 29.

2545. C. Raapke. Converter with flat hearth reversible about a shaft and provided with oxygen-generator and a heater for the blast, and adapted for manufacturing castings of patterns and the like from phosphoriferous iron. Jan. 31.

2667. J. E. T. Woods and G. S. Steven. Improvements in the treatment of refractory ores containing zinc, gold, and other metals, and in apparatus therefor. Feb. 1.

Complete Specifications Accepted.

1901.

930. C. Diesler. Process of smelting and reducing metals. Jan. 22.

1376. D. Davies. Manufacture of iron, steel, and wrought iron. Jan. 29.

4147. W. J. Foster. Introduction of carbon and fluxes and mixtures of carbon and fluxes into blast furnaces in the manufacture of iron. Jan. 29.

4375. W. Pethybridge. Treatment of telluride gold ores. Jan. 29.

4975. M. Römer and J. Schmidheiny. Glaze-melting furnaces. Jan. 29.

5234. S. F. Prest and J. W. Cabot. Treatment of slag resulting from the manufacture of iron and steel. Jan. 22.

5440. A. S. Plews. Process for treating antimony ores containing gold. Jan. 22.

5478. F. H. Cartland. Melting furnaces. Jan. 29.

5693. D. McKechnie and the United Alkali Company, Ltd. Recovery of metallic copper from copper precipitate. Jan. 29.

6519. A. S. Elmore. Separating mineral substances by the selective action of oil. Jan. 22.

14,046. H. V. Bertrand. Method of coating iron with tin, lead, spelter, or the like metals. Feb. 5.

17,580. A. J. Boult.—From A. D. Carmichael. Process for desulphurising sulphide ores. Feb. 5.

23,060. W. Pruszkowski. Manufacture of steel. Feb. 5.

24,234. C. A. Keller. Obtainment of metals and alloys, and furnaces to be employed therein. Feb. 5.

XI.—ELECTRO-CHEMISTRY and ELECTRO-METALLURGY.

Applications.

1684. E. W. Jungner. A method for producing electrodes for electric accumulators. Complete Specification. Filed Jan. 21. Date applied for Jan. 22, 1901, being date of application in Sweden.

1688. H. Paweck. Improvements in the electrolytic separation, deposit, and refining of zinc. Jan. 21.

2376. H. H. Lake.—From G. Rambaldini, Italy. Improvements in and relating to electrolysis. Jan. 29.

2513. E. Bailey and A. Crowther. Improvements in electric storage flexible pressure gas batteries. Jan. 31.

Complete Specifications Accepted.

1900.

23,647. H. C. Harrison and J. Day. Electrolytic deposition of metals.

1901.

1849. A. Brochet and G. Ranson. Process for the electrolytic preparation of the bases of the alkaline earths. Feb. 5.

6102. A. F. Harris. Anodes. Feb. 5.

24,511. A. Bainville. Electrodes for electric accumulators or batteries. Jan. 29.

25,182. G. Brewer.—From E. R. Taylor, United States. Electric furnaces, and production of chemicals in such furnaces. Jan. 29.

XII.—FATS, OILS, and SOAP.

Applications.

1770. The Cotton Seed Company, Ltd., and J. C. W. Stanley. Improvements in or relating to the treatment of cotton seed. Jan. 22.

2613. O. E. Wheeler. An improvement in the manufacture of soap. Feb. 1.

2668. J. E. Bousfield.—From M. Flandrak, France. A process and apparatus for the recovery of glycerin. Feb. 1.

Complete Specifications Accepted.

1900.

22,602. G. C. Warr and W. T. Wright. *See* Class A.

1901.

1387. A. Kronstein. Process for thickening wood oil, and manufacturing viscid bodies therefrom. Jan. 22.

24,603. H. J. Haddan.—From E. R. Edson, United States. Process of reducing or rendering fish-waste or fish and other oil-yieldable material to obtain oil. Jan. 22.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

1936. G. Fry. Improvements in the production of substances for use in the manufacture of varnishes and for other uses. Jan. 24.

2451. J. T. Wicks. Improvements in reclaiming machines for use in the manufacture of india-rubber. Jan. 30.

2653. R. Müller. An improved insulating material, and process for manufacturing same. Feb. 1.

Complete Specifications Accepted.

1901.

2297. J. B. Hannay. Process and apparatus for manufacturing a white pigment of lead. Feb. 5.

21,546. B. J. B. Mills.—From The International Chemical Company, United States. Pigment and process of manufacturing same. Feb. 5.

22,758. A. Combanaire and J. de la Fresnaye. Process and apparatus for the purification of gutta percha. Jan. 29.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

Applications.

1870. L. Masson and J. Sansonnet. Improvements in and relating to the treatment of hides. Jan. 23.

2247. R Parga.—From O. F. de Castro, South America. Rapid tanning process. Jan. 28.

2283. W. H. Moore. Improvements in machines for applying seasoning, colouring, and the like to skins. Jan. 28.

2303. G. F. Bögel. Improvements in or relating to the extraction of tanning substances, and apparatus therefor. Complete Specification. Jan. 28.

Complete Specification Accepted.

1901.

24,604. H. J. Haddan. — From E. R. Edson, United States. Obtaining a congealable glue-yieldable or gelatine-yieldable material from fish-waste or fish and other material. Jan. 29.

XVI.—SUGAR, STARCH, AND GUM, Etc.

Applications.

1792. A. Nodon and J. Piettre. Improvements relating to the purification of sugar juices. Complete Specification Filed, 22 Jan. Date applied for, 7 Aug. 1901, being date of application in France.

1975. J. Y. Johnson.—From the Société des Produits Amylacés, France. Improvements in the manufacture of rice starch. Jan. 24.

Complete Specifications Accepted.

1900.

23,156. J. Robin-Langlois. Refining of sugar. Jan. 29.

1901.

8331. C. D. Ekman. Manufacture of adhesive material suitable for use as a substitute for gum arabic and other soluble gums. Feb. 5.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

1527. H. J. Worssam. An improvement in mashing apparatus. Complete Specification. Jan. 20.

1637. R. C. Scott. Improvements in the manufacture of spirit. Jan. 24.

1852. C. W. Ramsay. Improvements in or relating to the distillation and purification of alcoholic liquids. Jan. 23.

2384. H. A. Hobson. Improvements in brewing. Jan. 29.

2669. A. G. Southby. Improvements in brewing beer and in apparatus therefor. Feb. 1.

Complete Specifications Accepted.

1901.

1599. K. Enzinger.—Of the Filter and Brautechnische Maschinen-Fabrik Actiengesellschaft. Process and arrangement for filling casks. Jan. 22.

4263. E. S. Beaven. Process of drying malt and other substances, and apparatus for use therein. Jan 22.

5219. J Kirkaldy. Portable distilling apparatus. Jan. 29.

5404. R. C. Wild. Connection with solidified spirit. Jan. 22.

5715. J. Heaton. Sparger. Jan. 29.

XVIII.—FOODS, SANITATION, Etc., AND DISINFECTANTS.

Applications.

A.—Foods.

1902.

1788. H. von Rom. Improvements relating to the preserving of meat. Complete Specification. Jan. 22.

B.—Sanitation; Water Purification.

1819. A. S. Goodridge. Improvement in connection with the non-septic purification and utilisation of sewage from country mansions and large houses. Complete Specification. Jan. 23.

1884. E. Lines. Improvements in apparatus for use in the separation from sewage and other liquids of solid matters suspended therein. Jan. 23.

Complete Specifications Accepted.

A.—Foods.

1900.

22,602. G. C. Warr and W. T. Wright. Method of manufacturing edible vegetable fat. Jan. 22.

1901.

3561. J. H. Campbell and C. H. Campbell. Manufacture of condensed or desiccated milk, and apparatus therefor. Jan. 22.

23,141. Seblarb. Process for curing meats. Jan. 22.

B.—Sanitation; Water Purification.

1901.

1913. A. M. Clark. — From O. Fromme, Germany. Method of and means for the pasteurisation of liquids. Jan. 22.

24,602. H. J. Haddan.—From E. R. Edson, United States. Apparatus for reducing or rendering fish-waste, fish, and other material. Jan. 22.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

1650. P. Magnier and P. A. Braugier. Improvements relating to camphor substitutes applicable for the manufacture of celluloid and other purposes. Jan. 21.

2361. O. Lugo and W. M. Callender. A new and improved process for the treatment of peat moss and other fibres to render them suitable for paper making or other purposes. Jan. 29.

2408. T. H. B. Wayne. Improvements in apparatus for distributing pulp into cyanide vats. Jan. 29.

2529. C. H. Stearn and F. T. Woodley. Improvements in the manufacture of filaments, sheets, or films from cellulose. Jan. 31.

Complete Specifications Accepted.

1901.

6534. W. R. Lake.—From C. N. A. Berget, France. Manufacture of paper pulp. Feb. 5.

10,535. C. I. Goessmann. Manufacture of paper and other fabrics. Jan. 29.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Applications.

1939. J. Baxeres de Alzugaray. Improvements in the manufacture of perfumes and the like. Jan. 24.

1982. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of anthranilic acid. Jan. 24.

2129. C. K. Mills.—From The Ampère Electro-Chemical Company, United States. Improvements in the production of derivatives of pinene. Complete Specification. Jan. 27.

2188. Z. von Vammosy. Antiseptic and purgative preparations. Complete Specification. Jan. 28.

Complete Specifications Accepted.

1901.

6771. O. Schütz and G. Dallmann. Process for producing quinate of urea. Jan. 29.

11,783. J. Y. Johnson.—From The Vereinigte Chininfabriken Zimmer and Co., Germany. Acidyl derivatives of the cinchona alkaloids and their manufacture. Jan. 22.

XXI.—PHOTOGRAPHY.

Application

2273. K. Schloemilch and A. Fichte. Improvements in the production of screens for photographic reproduction purposes. Complete Specification. Jan. 28.

Complete Specification Accepted.

1901.

5502. C. D. Abel.—From The Aetienges. für Anilin Fabrikation, Germany. Manufacture of a photographic developer stable in the dry state. Feb. 5.

XXII.—EXPLOSIVES, MATCHES, Etc.

Application.

1578. S. Walker. Improvements connected with the manufacture and boxing of matches. Jan. 21.

Complete Specification Accepted.

1901.

6513. Sir W. Crookes, Knight. Nitro explosives for artillery. Jan. 29.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 5967.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 4.—Vol. XXI. **FEBRUARY 28, 1902.** No. 4.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Robert Irvine.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

E. A. Brotherton.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.
C. Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Otto Hehner. | A. R. Ling.

MANCHESTER.
Dr. J. Grossmann. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Clifford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
Sir Robert Pullar. | Thos. Gray.

YORKSHIRE.
George Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams .....I., XV.
L. Archbutt. I., XII., XVIII. B.
J. L. Baker .....XVI., XVII.
H. Ballantyne .....II., XII.
D. Bendix .....III.
E. Bentz .....IV., V., VI.
J. O. Braithwaite .....XX.
J. F. Briggs.....XVI., XVII.
J. H. Collins .....X.
C. F. Cross.....V., XII., XIX.
J. T. Dunn, D.Sc. .. {VII., X., XI.
Walter C. Hancock, B.A. .... } VIII., IX.
J. W. Hinchley. {I., X., XIII., XXI.
H. Ingle, Ph.D... {V., VI., XII., XIII.
R. L. Jonks.....XIV., XIX.
J. B. C. Kershaw....VII., XI.
M C. Lamb.....VI., XIV.
T. A. Lawson, Ph.D. ..IV., XX.
F. H. Leeds..III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... } IV., V.
J. McCrae, Ph.D. .....IV.
G. W. MacDonald, M.Sc..XXII.
W. G. McMillan {X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ....XV.
C. A. Mitchell, B.A. ..... } XII., XXII.
A. More .....VII., XVIII.
G. T. Morgan, D.Sc. ...IV., V.
F. Neurath, Ph.D. .....IV., V.
J. G. Parker, Ph.D. .....XIV.
H. T. Pentermann..... } XVI., XVII.
T. H. Pope .....XX., XXI.
F. W. Renaut ....Patent List.
G. H. Robertson .....XI.
Chas. Salter..... {I., II., III., XV., XVI.
R. Sandon.....II.
J. Shields, D.Sc., Ph.D. ..... } .....XI.
A. Shonk .....Gen. Chem.
W. P. Skertchley {XII., XVIII., XX.
E. Sonstadt.....III., VII., X.
A. L. Stern, D.Sc. .....XVII.
E. Howard Tripp, Ph.D. ..... } III., VII., XVI.
Charles T. Tyrer..... XX.
L. J. de Whalley, B.Sc...XVI.
E. W. Wheelwright, Ph.D. ..... } XXII.
A. Wingham .....X.
Joseph T. Wood.....XIV.
A. C. Wright, B.Sc., M.A... } IV., XVIII., XX.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.
Committee:

Percy Bateson.
J. Campbell Brown.
A. Carey.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Herbert E. Davies.
D. Herman.
Julius Raschen.
F. H. Tate.
W. Collingwood Williams.

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.
Committee:

J. J. Bowley.
A. C. Chapman.
E. Divers.
H. Hemingway.
E. Grant Hooper.
D. Lloyd Howard.
W. Kellner.
J. Lewkowitsch.
B. E. R. Newlands.
Boverton Redwood.
Walter F. Reid.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

SESSION 1901—1902.

Monday, March 10th, 1902:—
F. R. O'Shaughnessy, A.R.C.Sc. (Lond.), A.I.C. "Birmingham Sewage and its Treatment."
E. G. Clayton, F.I.C., F.C.S. "Remarks on the Technical Examination of Glue."

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

J. Barnes.
W. Brown.
J. Craven.
J. English.
B. W. Gerland.
W. Heys.
J. M. Irving.
M. J. Langdon.
A. K. Miller.
H. Porter.
I. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.
Committee:

A. Allhusen.
P. P. Bedson.
J. T. Dunn.
T. W. Hogg.
H. Louis.
F. S. Newall.
H. S. Pattinson.
John Pattinson.
W. W. Proctor.
G. Sisson.
Harry Smith.
J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.
Committee:

H. C. Aspinwall.
M. T. Bogert.
C. F. Chandler.
A. P. Hallock.
J. Hartford.
E. J. Lederle.
E. G. Love.
R. W. Moore.
T. J. Parker.
R. C. Schüpphaus.
M. Toch.
G. N. Williamson.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.
Committee:

S. F. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
J. J. Sudborough.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.
Committee:

W. Carrick Anderson.
E. M. Bailey.
G. T. Beilby.
H. Bumby.
J. Christie.
W. J. Chrystal.
D. B. Dott.
C. J. Ellis.
W. Foulis.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
W. Ivison Macadam.
J. McCulloch.
T. L. Patterson.
D. J. Playfair.

Hon. Secretary and Treasurer:
Thomas Gray, c/o John T. Taunahill, 44, West George Street, Glasgow.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Pairley.
Committee:

E. A. Brotherton.
A. W. Cooke.
W. M. Gardner.
H. Grandage.
Edw. Halliwell.
A. J. Murphy.
S. G. Rawson.
A. Smithells.
A. Turnbull.
H. A. Watson.
Thorp Whitaker.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members, who are interested in industries in which partially or wholly duty-free spirit would be of advantage, will communicate with the Secretary.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

INDEX, 1901, AND LIST OF MEMBERS.

The Index and Title Page for 1901, and the List of Members, will be issued under separate cover.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections:—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. .....
.....

And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate.....

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....

Profession or Business Occupation .....

Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

List of Members Elected

21st FEBRUARY 1902.

Allen, Charles D., jun., 475, Fourth Street, Brooklyn, N.Y., U.S.A., Chemist.

Baker, C. F., The Technical College, Sunderland, Lecturer in Chemistry.

Carter, John Pim, 626, S. 24th Street, Philadelphia, Pa., U.S.A., Analytical Chemist.

Converse, W. A., 27-34, Rialto Building, Chicago, Ill., U.S.A., Chemist.

Craven, Alfred B., 91, Fielding Terrace, Armley, Leeds, Analytical Chemist.

Dyson, George W., 89, Cowlishaw Road, Sheffield, Analyst.

Ellis, Fred. R., 15, Shadwell Road, Bishopston, Bristol, Chemist and Druggist.

Faill, James, 51, Partickhill Road, Glasgow, Technical Chemist.

Fisher, Fred., Newaygo, Mich., U.S.A., Chemist.

FitzGibbon, Thomas, 36, Averill Street, Fulham Palace Road, Hammersmith, W., Analytical Chemist.

Flinn, Fred. B., Box 91, Newark, N.J., U.S.A., Chemist.

Forster, Ferd. E. P., c/o Bass and Co., 19, Guild Street, Burton-on-Trent, Brewer's Chemist.

Hosford, Roger F., 125, Milk Street, Boston, Mass., U.S.A., Chemical Engineer.

Huntly, G. Nevill, 96, Gower Street, London, W.C., Analytical and Consulting Chemist.

Jones, David Richard, Standard Chemical Co., Deseronto, Ont., Canada, Chemical Engineer.

McFarland, A. R., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.

McKim, William, 69, Linden Street, Yonkers, N.Y., U.S.A., Colour Maker.

Meyer, Dr. Fred. L., 2028, Park Avenue, Philadelphia, Pa., U.S.A., Chemist.

Meyer, James O., Laboratory, C. B. & Q. R. R. Co., Aurora, Ill., U.S.A., Chemist.

Moore, J. H., c/o Central Silica Co., Fortville, Ind., U.S.A., Chemist.

Neave, George B., Technical College, 204, George Street, Glasgow, Chemical Assistant.

O'Neill, Charles, British Dyewood and Chemical Co., Ltd., Dyewood Mills, Parkhead, Glasgow, Chemist and Colourist.

Patch, James A., Syrian Protestant College, Beirût, Syria, Instructor in Chemistry.

Petsche, B. W., 25, Fairview Street, Youkers, N.Y., U.S.A., Chemist.

Reed, Herbert C., c/o The Stamford Manufacturing Co., Stamford, Conn., U.S.A., Chemist.

Schlegel, John Wm., 602, E. 5th Street, New York City, U.S.A., Chemist.

Shoubridge, Sydney Y., The Gas Works, Lower Sydenham, S.E., Gas Engineer, M.I.C.E.

Smythe, J. A., Durham College of Science, Newcastle-on-Tyne, Demonstrator in Chemistry.

Stansfield, Edgar, The Technical College, Sunderland, Lecturer in Chemistry.

Vanwinckel, W. H., c/o Lyman Bros. and Co., Ltd., 71, Front Street E., Toronto, Canada, Chemist.

Walker, James, Knowle House, Mirfield, Yorkshire, Woollen Manufacturer.

Walker, John H., Gourepore Co., Ltd., Bengal, India, Chemist.

Webster, John, Chemical Laboratory, Guy's Hospital, London, S.E., Analyst.

Williams, Percy, The British Uralite Co., Ltd., Higham, near Rochester, Kent, Chemist.

Wilson, G. W., 18, Dinting Vale, Dinting, near Manchester, Works Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Ambler, C. T., l/o Jamalpur; Dharhara Station, E. I. Ry., Bengal, India.

Andreoli, G., l/o Capetown; P.O. Box 3725, Johannesburg, Transvaal.

Bowen, Wm.; Journals to 45, Woodend Road, Erdington, Birmingham.

Cayvan, L. L., l/o 294; 322, W. Monroe Street, Chicago, Ill., U.S.A.

Clifford, Wm, l/o Avondale Road; Sewage Outfall Works, Wolverhampton.

Clowes, Dr. F., l/o Bedford Square; The Grange, College Road, Dulwich, S.E.

Cochran, A., l/o Brooklyn; c/o Parsons Pulp and Paper Co., Parsons, W. Va., U.S.A.

Cochrane, A. L., l/o Boston; Hamilton, Mass., U.S.A.

Colefax, Dr. A., l/o Bradford; all communications to 85, Onslow Square, London, S.W.

Conant, F. M., l/o Niagara Falls; c/o Sanderson and Porter, Mishawaka, Ind., U.S.A.

Craig, Geo., l/o Hampden Terrace; Chemical Laboratory, 95, Bath Street, Glasgow.

Dale, Jas.; Journals to c/o Jas. H. Dale, 1, Dorothy Villas, Cavendish Road, West Croydon.

Dewar, Alex. H., l/o St. Petersburg; c/o The Linoleum Co., Ltd., Staines, Middlesex.

Dreyfus, Dr. W., l/o East 52nd Street; 162, East 95th Street, New York City, U.S.A.

Dunn, Wm. R.; Journals to 157, South Sixth Street, Easton, Pa., U.S.A.

Evershed, F.; Journals to Kenley, Surrey.

Galpin, H. T., l/o 6th Avenue; 55, West 57th Street, New York City, U.S.A.

Gardiner, Hy. J.; all communications to 90, Cannon Street, London, E.C.

Gibbs, D. C.; retain Journals until further notice.

Gibbs, Wm. P., l/o New Brunswick; Fabriken, Hjerpen, Jemtland, Sweden.

Grabfield, Dr. J. P., l/o Medinah Temple; 238, Franklin Street, Chicago, Ill., U.S.A.

Hartley, J., l/o Hamilton Road; 7, Scarsdale Road, Victoria Park, Longsight, Manchester.

Heileman, W. H., (Journals) Elwell, Iowa; (communications) U.S. Dept. of Agriculture, Bureau of Soils, Washington, D.C., U.S.A.

Houlder, B. E.; l/o Ossulton Villas; 11, Portland Road, Southall, Middlesex.

Hudson, Albert W., l/o Spokane; 208, Opera House, Denver, Col., U.S.A.

Johnson, A. E., l/o Lea Road; Claremont, Lyndhurst Road, Wolverhampton (as from March 15).

Johnson, J. E.; Journals c/o John Johnson and Co., 95–97, Liberty Street, New York City, U.S.A.

Johnston, W. E. L., l/o Park Crescent; 49, Mount Street, London, W.

Joslin, O. T., l/o E. 4th Street; Spring Grove Avenue (opposite Bates), Cincinnati, Ohio, U.S.A.

Kenrick, Prof. E. B.; Journals to Winnipeg, Manitoba, Canada.

Kingdon, H., l/o Froghall; 9, Grappenhall Road, Stockton Heath, Warrington.

Leigh, C.; Journals to Birmingham Metal and Munition Co., Adderley Park Mills, Birmingham.

Luxmoore, Dr. C. M.; Journals to Reading College, Reading.

McDaniel, J. J.; Journals to Woodlands, Bandon, Ireland.

Marshall, Dr. H., l/o The University; 12, Lonsdale Terrace, Edinburgh.

Messel, Dr. Rudolf, l/o Lower Belgrave Street; 147, Victoria Street, London, S.W.

Morton, Thos. W., l/o Kew; 8, Luxemburg Gardens, Hammersmith, W.

Peyton, Wm. C., l/o Mutual Life Building; c/o Peyton Chemical Co., Room 30, 4th Floor, Mills Building, San Francisco, Cal., U.S.A.

Roller, H. C., l/o Niagara Falls; c/o Electro-Chemical Co., 44, Broad Street, New York City, U.S.A.

Sadtler, S. S., l/o W. Franklin Street; N.E. corner of 10th and Chestnut Streets, Philadelphia, Pa., U.S.A.

Slade, Hy. E.; Journals to India Rubber Works, Streatham Common, S.W.

Stern, A. L., l/o Ashby Road; Southbank, Stapenhill Road, Burton-on-Trent.

Stocks, H. B., l/o Hooton; Lynwood, Neston, Cheshire.

Waite, C. N., l/o Boston; c/o General Artificial Silk Co., 35th Street and Gray's Ferry Road, Philadelphia, Pa., U.S.A.

Yoshitake, E., l/o Berlin; 18, Tatsuokache, Hongo, Tokyo, Japan.

Death.

Tate, Henry, Boluey House, Ennismore Gardens, London, S.W. Feb. 12.

Report

ON THE PATENT LAW AMENDMENT BILL.

PRESENTED TO THE COUNCIL BY THE PRESIDENT, Mr. IVAN LEVINSTEIN.

(Printed by Authority.)

General Objections.—The Bill is too narrow in its scope. Some most urgently needed reforms are omitted, whilst some of the amendments proposed would accentuate the existing evil and would add further injury to British industries.

Section 1. *Examination of Previous Specifications.*—This section attempts a compromise between American, German, and British methods with regard to granting patents. It is, however, not proposed that inquiry be made as to the novelty of the invention proposed to be patented, but only whether it has been claimed or described in any specification published not more than 50 years before the date of the application. The Comptroller will continue to grant patents, whether the inventions are obviously old or not, so long as they have not been described in previous specifications. If this section embodied the proposals contained in the joint note of Sir Edward Fry and Mr. Herbert Hughes, and also in the separate note of Sir Edward Fry, both on page 10 of the Report of the Departmental Committee, it would certainly be an improvement upon the existing law. (See also this Journal, 1900, 477; 1901, 294.)

Section 2.—Repeals section 22 of the Patents Act of 1883. Section 22 of the Patents Act, 1883, emphasises the fundamental principle of the British patent law, *viz.*, that a patent is granted for the establishment of a new manufacture into the United Kingdom. According to this section, the Board of Trade may order a patentee to grant licences (*a*) if the patent is not worked in this country, or (*b*) if the reasonable requirements of the public cannot be supplied, or (*c*) if any person is prevented from working or using to the best advantage an invention of which he is possessed. This section has been looked upon by all interested as of the greatest importance, but, unfortunately, its language is so ambiguous that for many years no use was made of it, until 1898, when several petitions were lodged. It was then proved that, in consequence of its ambiguity, the legal proceedings required were too protracted and costly.

Now, part of the duty of Sir Edward Fry's committee was to inquire whether any, and, if so, what amendments were necessary in the provisions of section 22. Instead of amendment, the new Bill proposes repeal. According to section 2 of the Bill, the court may order the patentee to grant licenses if it be proved that the reasonable requirements of the public have not been satisfied by reason of the neglect or refusal of the patentee to work the patent or grant licenses on reasonable terms. By subsection 6 it is provided that an appeal shall lie from the order of the court to the Court of Appeal, and by leave of this court to the House of Lords. In other words, by section 2 of Mr. Balfour's Bill the foreign patentee will be allowed to enforce his British monopoly, to employ foreign labour exclusively for the benefit of foreign industries, without contributing one farthing towards our local or imperial taxation. So long as he satisfies the reasonable requirements of the public, no jurisdiction can arise under this Bill. That is to say, the foreign patentee is not to be called upon either to grant licenses or to manufacture in this country a solitary sample of the article for which he has got a British monopoly.

Section 2 not only throws overboard subsection (*a*), but also the important subsection (*c*) of section 22 of the Act of 1883.

There is another disastrous change proposed by section 2 of the Bill. Jurisdiction is to be taken away from the Board of Trade and transferred to the High Court. This transfer makes the Bill, even if the other enactments of section 2 were not diametrically opposed to the interests of British industry, absolutely valueless, as no man in his senses would ever make an application to the courts for a license. He would first have to ascertain whether or not the reasonable requirements of the public are satisfied—in itself a formidable task; he must also prove that the patent is not worked in this country. He may then apply for a license to the foreign patentee, who will raise every obstacle to cause delay. At last the foreign patentee refuses to grant a license; now comes the petitioner's chance. He applies to the court. A regular action at law commences, which clever counsel for the patentee may easily spin out for a couple of years, with a cost varying from 2,000*l.* to 4,000*l.* Assume, now, that the petitioner has been successful; of what value will be the victory to him? He would certainly be extremely foolish to make use of the license, or spend a single farthing in the erection of plant or machinery to work the patent, as there is the constant threat before him that after another delay of two years the Court of Appeal may quash the decision of the lower court; or, if he is again successful, the foreign patentee may appeal, by leave, to the House of Lords. Long before that time, in 95 cases out of 100, the patent will have lost its value. This subsection 6 might have been drafted for the express benefit of wealthy foreign syndicates.

Sir Edward Fry, in a separate note attached to the Departmental report, objects to the grant of compulsory licenses, and prefers forfeiture if the patent is not reasonably used by the patentee (see also this Journal, 1901, 294). Sir Edward states that there is a close precedent for such a course by a provision which exists in all patents for inventions for their determination, if it be made to appear to six Privy Councillors that the grant is prejudicial or inconvenient to His Majesty's subjects in general. There is an unanimous opinion in the industrial centres of the United Kingdom that a patent, if not worked in this country, may be revoked. At a recent meeting of the special committee of the Manchester Chamber of Commerce, the following resolution was passed, which is the simplest and most effective remedy for the abuses now possible under section 22: "That a patent 'may' be revoked if it is proved that the article patented in this country is manufactured abroad, but not in the United Kingdom." The onus of proof that the patent is worked *bona fide* in this country should rest on the patentee or licensee. In the following countries or colonies, a patent may be revoked if not worked:—

Austria, Hungary, Germany, France, Belgium, Russia, Switzerland, Japan, Italy, Canada, Malta, Brazil, Bolivia, Chili, Colombia, Costa Rica, Ecuador, Finland, Guatemala, Tasmania, Newfoundland, Norway, Denmark, Peru, Portugal, Spain, Sweden, Tunis, Turkey, Uruguay, and Venezuela.

It is singular that at least section 2 of the Patent Law Amendment Bill is very much at variance with the opinion prevailing at the Board of Trade in the year 1897, when a representative deputation was received by Sir Courtenay Boyle, in the unavoidable absence of Mr. Ritchie. The deputation was introduced by Sir William Houldsworth, for the purpose of urging the President of the Board to remove ambiguity from section 22, especially as to the working of patents in this country. Sir Courtenay Boyle said there were many instances — Mr. Levinstein had mentioned several—in which it was clear that the default of the patentee to work his patent in the United Kingdom and supply the requirements of the public, had been a public injury, alike to the traders and the industrial interests in this country.

Summary.

Bill of 1902.	Act of 1883.
Section 2—	Section 22—
Compulsory Licences.	*Compulsory Licences.*
Section twenty-two of the principal Act (relating to the grant of compulsory licences by the Board of Trade) is hereby repealed, and the following provisions shall be substituted therefor:— (1.) If, on the application of any person interested, it is proved to the satisfaction of the court that the reasonable requirements of the public with reference to the invention have not been satisfied by reason of the neglect or refusal of the patentee to work the patent or grant licences on reasonable terms, the court may order the patentee to grant licences on such terms as to the duration of the licence, the amount of royalties, security for payment, or otherwise, as the court, having regard to the nature of the invention and the circumstances of the case, may deem just. (2.) On the hearing of any application under this section the patentee, and any person claiming an interest in the patent as exclusive licensee or otherwise, shall be made parties to the proceeding, and the law officer, or other such counsel as he may appoint, shall be entitled to appear and be heard. (3.) In any proceeding under this section the court may, if it thinks fit, and shall, on the request of any party to the proceeding, call in the aid of an assessor specially qualified, and try and hear the case wholly or partially with his assistance. (4.) An order of the court under this section shall, without prejudice to any other method of enforcement, operate as if it were embodied in a deed made between the parties to the proceeding. (5.) In awarding costs under this section, the court shall	If, on the petition of any person interested, it is proved to the Board of Trade that, by reason of the default of a patentee to grant licences on reasonable terms,— (*a*) the patent is not being worked in the United Kingdom; or (*b*) the reasonable requirements of the public with respect to the invention cannot be supplied; or (*c*) any person is prevented from working or using to the best advantage an invention of which he is possessed; the Board may order the patentee to grant licences on such terms, as to the amounts of royalties, security for payment, or otherwise, as the Board, having regard to the nature of the invention and the circumstances of the case, may deem just, and any such order may be enforced by mandamus.

BILL OF 1902—*cont.*

Section 2—*cont.*

have regard to any previous request for, or offer of, a licence made either before or after the application to the court.

(6.) An appeal shall lie from the order of the court to the Court of Appeal; but, except by leave of the Court of Appeal, no appeal shall lie to the House of Lords from any order made by the Court of Appeal.

(7.) If an order granting a licence is subsequently reversed or varied on appeal, the appellate court may impose such terms as they may think just with respect to the validation of things done, and the disposal by sale or otherwise of articles manufactured, under the licence before the order granting it was reversed or varied.

(8.) Subject to the provisions of this section, all matters of practice and procedure in relation to the grant of compulsory licences shall be regulated by rules of court.

(9) This section shall apply to patents granted before as well as after the commencement of this Act.

(10.) In the application of this section to Scotland, "law officer" means the Lord Advocate, and in the application of this section to Ireland, "law officer" means the Attorney-General or Solicitor-General for Ireland.

CHRONOLOGY.

Patents, Designs, and Trade Marks Act, Aug. 25, 1883.

Deputation to Board of Trade, April 8, 1897. (See also this Journal, 1897, 373.)

Test case: Levinstein, Ltd., and Ivan Levinstein *v.* Meister, Lucius und Brüning, July 6, 1898. (See also this Journal, 1898, 711.)

Appointment of Board of Trade Committee, May 24, 1900. (See also this Journal, 1900, 477.)

Report of Board of Trade Committee, Jan. 10, 1901. (See also this Journal, 1901, 294.)

Proposed amendment of Patent Act of 1883, Feb. 10, 1902. (See also this Journal, 1902, 287.)

Liverpool Section.

Meeting held at University College on Wednesday, January 29th, 1902.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE SOLVENT POWER OF PHOSPHORIC ACID.

BY T. H. BYROM.

MY attention was directed to the solvent power of phosphoric acid when searching for the best methods of decomposing ferrosilicon and spiegeleisen. These alloys are readily dissolved in the acid, but the silica is left in such a gelatinous condition that filtration is impracticable. Moreover, there was no advantage in using the acid in these cases, as better methods are available. The fact of their solubility, however, is interesting. I next tried the effect of the acid upon ferro-chromium alloys containing amounts of chromium varying from 10 to 50 per cent. In every case complete solution was effected, and after oxidising the chromium by means of permanganate, and titration with standard ferrous sulphate and dichromate, the results were found to agree exactly with those done by the usual methods depending upon fusion or ignition, and the conversion of the chromium into chromate. Not only is the solution effectual, but it is rapid; 0·3 grm. of the alloy in the finest powder will dissolve in 15 minutes. In the case of chromite (chrome iron ore) also, a complete solution was effected in from 15 to 20 minutes (using 0·3 grm. finely powdered ore). Six c.c. of phosphoric acid syrup, sp. gr. 1·75, are used and a fairly high temperature (about 300° C.) is necessary to bring about decomposition. If the heating be too prolonged, a whitish insoluble substance is formed when glass vessels are used, but this seems to be obviated by adding 2 c.c. of strong sulphuric acid along with the phosphoric acid. If the fusion be effected in platinum vessels, this white deposit is not produced; it is evidently silica obtained from the glass.

SOME OBSERVATIONS ON THE FACTORY AND WORKSHOPS ACT AND THE ALKALI, &c. WORKS REGULATION BILL OF 1901.

BY EUSTACE CAREY.

THE first and principal object of our Society is no doubt the application of chemistry to manufacturing operations, and the investigation and discussion of processes and improvements, but we cannot produce commodities on a manufacturing scale without a manufactory, and with a manufactory or a factory one is at once not only in touch but in serious contact with many subjects of pressing importance. For instance, we employ labour of various kinds, skilled and unskilled. This brings us at once within reach of the Factory Acts and Labour Laws. We wish to sell our commodities, and to sell our commodities we have to send them by land or by sea to our customers. Here we are at once in contact with railway and canal legislation, rates of carriage, and the Board of Trade. If we send our goods over the sea, we do so subject to dues of various kinds, and if to foreign countries, we have to meet opposing and sometimes prohibitive tariffs.

We are also, as a Society, interested in the progress of scientific education. We think, and with good cause, that many proprietors of works, manufacturers, and other leaders of industry require more scientific education than they now possess.

We also, as manufacturers, are perpetually coming in contact with new inventions, either our own or those of other people. In either case we get entangled in the meshes of Patent Law at home and abroad. The absurdities and anomalies of our own Patent Laws, which act so prejudicially upon chemical industry in this country, have been many times exposed by our President, Mr. Levinstein.

I mention these subjects because I have felt for some time that the operations of our Society are too much confined to technology, pure and simple. I admit that technology is our first concern, but we cannot practise technology without being forced to consider other subjects, some of which I have just mentioned. I therefore need not apologise to you for having ventured to bring before you some observations which I propose to make upon the Factory and Workshops Act, 1901, and the Alkali, &c., Works Regulation Bill, 1901.

The Factory and Workshop Acts, 1901.

The author briefly alluded to the history of factory legislation, and drew attention to those parts of the Act of 1901 which are new and which specially affect chemical industry. He pointed out that the definition of a "steam boiler" in the Act is a great improvement upon the absurd definition in the Explosives Act of 1882, and which definition has been repeated so frequently in various Bills brought from time to time before Parliament. He drew attention to the new regulations with regard to the care and registration of steam boilers, and with regard to railway sidings and locomotives in works, and to the tremendous powers entrusted to the Home Secretary for dealing with dangerous trades.

The Alkali, &c. Works Regulation Bill, 1901.

With regard to the Alkali Bill the author went on to say:

Soon after the meeting of Parliament in 1901, we were surprised to see that a Bill to amend the Alkali Acts had

een introduced into the House of Lords by the Lord Kenyon, and when we procured a copy of the Bill we found hat it seemed to indicate a new departure in principle. I nay say, by way of parenthesis, that many members of the Alkali trade felt much aggrieved that the Local Governnent Board had, so to speak, stolen a march upon us, and, nstead of conferring with the trade in a friendly way, as hitherto, and informing them of their intentions, they introluced a Bill in the House of Lords, apparently considering hat to be the best way to slip it through Parliament unobserved. That this was not the intention of the Department am bound to admit, and do freely admit, because at the nterview which Mr. Long was good enough to give to a leputation from the Alkali Association, he said most mphatically that there was no such intention on the part of the Local Government Board.

Before I speak of the Bill, and what I call "a new departure in principle," allow me to say a few words as to the istory and intention of Alkali legislation.

The first Act came into operation on January 1st, 1864, nd continued until July 1st, 1868, when it would have apsed, but that in June 1868 a short Act was passed making it permanent.

Before 1863 a large proportion of the hydrochloric acid evolved in alkali works was not condensed but escaped into he atmosphere, and no doubt did considerable damage to vegetable life. The subject had been a matter of inquiry by a Parliamentary Committee, and much evidence had been given both on the side of the land owners and occupiers and on the side of the manufacturers. The result was the Act of 1863, which begins its preamble by saying:—

> "Whereas it is expedient to provide for the better condensation of the muriatic acid evolved in alkali works, be it enacted, &c., &c.,"

and clause 4 states that—

> "every alkali works shall be carried on in such a manner as to secure the condensation to the satisfaction of the inspector of not less than 95 per centum of the muriatic acid evolved therein, provided always, that nothing herein contained shall entitle the inspector to direct any alteration to be made in the process of manufacture or the apparatus used therein."

The object of the Act was clearly to prevent escapes, and the duty of the inspector was to ascertain that not more than 5 per cent. escaped.

In 1874 Parliament found "that it is expedient to amend the Alkali Act of 1863." Wet-process copper works were added, and in addition to the condensation of 95 per cent. of muriatic acid gas, the condensation was to be carried out in such a manner that in each cubic foot of air, smoke, or chimney gases escaping from the works into the atmosphere there is not contained more than one-fifth part of a grain of muriatic acid.

What is known as the "best practicable means" clause was introduced here for the first time. The "best practicable means" were to be used for preventing the discharge into the atmospbere of all other noxious gases arising from such works or of rendering such gases harmless when discharged, and noxious gases for the purposes of this Act mean sulphuric acid, sulphurous acid (except that arising from the combustion of coals), nitric acid, or other noxious oxides of nitrogen, sulphuretted hydrogen, and chlorine.

The object of the legislation so far is, therefore, clearly to prevent the escape of certain gases into the atmosphere.

In 1876 a Royal Commission, with the late Lord Aberdare as Chairman, was appointed to inquire into noxious gases generally, and to recommend further legislation. An enormous amount of evidence was taken, a committee of alkali manufacturers being appointed by the trade to watch the proceedings, and to give evidence on behalf of the Alkali Association, the result of which was seen in the Consolidation and Amendment Act of 1881.

This Act deals with several new matters, for example, the deposit or discharge of alkali waste, prevention of nuisance from old waste heaps, sulphuric acid works, chemical manure works, nitric acid, sulphate of ammonia and chlorine works.

In addition to these industries, provision was made, for the first time, with regard to salt works. It had long been known that the admitted damage to vegetation aronnd salt works is partly due to an evolution of hydrochloric acid from the salt pans. This evolution of hydrochloric acid arises from leakage from the pan of brine which drops into the furnace, and there is decomposed by the silicic acid in the ash of the coal. A very tentative clause (No. 10) was introduced. The alkali inspector was authorised to "make inquiry as to the methods adopted at salt works, and to ascertain what steps, if any, can be taken to reduce escapes."

In this Act (under which we are working to-day) limits are defined for escapes of hydrochloric acid into the atmosphere, and of escapes of sulphur and nitrogen (in other words, sulphuric acid chamber escapes) "into the chimney or into the atmosphere." Limits are not fixed for other escapes, but the "best practicable means" clause is applied to other gases. This, of course, is reasonable and satisfactory.

I understand the "best practicable means" to be those means, or any means, which will furnish the best results that have been found to be reasonably practicable. In support of my contention as to the true interpretation of the "best practicable means" clause, I refer you to clause 17, which reads as follows:—

> "The owner of any works to which this Act applies shall, on the demand of the chief inspector, furnish him within a reasonable time with a plan (to be kept secret) of those parts of such works in which any process causing the evolution of any noxious or offensive gas, or any process for the condensation of such gas or preventing the discharge thereof into the atmosphere, or for rendering any such gas harmless when discharged, is carried on."

"*The owner of the works shall furnish him (the inspector) with a plan to be kept secret.*"

Now, it is plain from this that the inspector is not expected to give to one manufacturer information as to how a result is obtained by another manufacturer. His business is not to divulge processes and methods, but to ascertain and control escapes. This point is, I think, very important, for I have heard that it has been argued that an inspector should control processes rather than escapes. If this doctrine were to be acted upon, the intention of the Act, as comprised in this clause, to which I have referred, would be ignored.

Of course, it goes without saying that the inspector frequently obtains permission to divulge methods, and I think that manufacturers, as a whole, are not selfishly and short-sightedly reticent about the apparatus they use for the purpose of complying with the Acts. I must also add that, as far as my experience goes, the inspectors have fully merited the confidence which has been placed in them by the manufacturers, but there would be an end to this happy state of things if it were to be the duty of an inspector to prescribe the special form of apparatus which manufacturers shall use.

I think it is clear that an inspector's duty is to watch for and detect escapes, and I hope that it will never be his duty to control processes.

In 1892 a short Act was passed for the purpose of scheduling further industries, and providing in a very peculiar way that certain salt works should be exempted from the operation of the Act. These salts works, I have been informed, were some salt works in Ireland, where brine is made by dissolving rock salt, and the water evaporated off by waste heat from lime kilns. This waste heat, passing under the pans, would be obviously free from the defect I mentioned just now (with regard to ordinary pans, viz., the leakage of brine into the fireplace where the salt in the brine is decomposed by the silicic acid in the ash of the coal. If I have been correctly informed about the method adopted at these salt works, there evidently was good reason for exempting such works, but why the subject was alluded to in such a mysterious way

I cannot comprehend. Surely, it would have been better to have stated what salt works were to be exempted, viz., salt works where the pans are heated by either waste heat or gaseous fuel. Probably, however, the drafting of the Bill was well considered, and there may be reasons for this remarkable obscurity which are unknown to me.

We have now, in a very brief way, reviewed the history of alkali works legislation, and we have seen how Parliament, beginning with hydrochloric acid, has gradually, cautiously, and after painstaking inquiry, placed escapes emanating from processes other than those of alkali manufacture under the inspector's charge, and I think that I may add that these additions to the laws would not have been effected so easily and satisfactorily as they have been were it not for the fact that all along there has been a full and frank exchange of views on the part of the Government and the manufacturers; the manufacturers having loyally consented, in the public interest, to admit restrictions and regulations that are practicable; and perhaps above all due to the fact that the inspectors have done their work with conspicuous tact, patience, and judgment, having followed faithfully the excellent example set by the first chief inspector, the late Dr. Angus Smith.

Dr. Angus Smith was the pioneer inspector. He had, so to speak, to show the way to his successors, and to think out for himself what the Act really meant, and how it could be best worked in the public interest without vexatious interference with the manufacturer. In his reports presented to Parliament every year, he takes the public into his confidence, and tells them, with great frankness, what his intentions and aims are. His reports show him to have been, what all who were privileged to know him will cordially testify, an exceptionally conscientious man, not anxious to magnify his office; in fact, a stranger to display and officialism, laboriously anxious to avoid laxity on the one hand or harshness on the other. It is particularly important, therefore, and useful for my purpose to-night, to ascertain what his views were as to his duty as an inspector, and as to the object and scope of the Acts, in the administration of which he had so large a share.

The object of the Acts was to prevent damage. The inspector's duty was to control escapes. I will give you a few typical extracts from his reports which, I think, will prove to you that this was Dr. Smith's view, and I think it it also important to note that with regard to the prevention of damage, Dr. Smith laid great stress upon the advantage of dilution, even going so far as to say, in one of his reports, that if these gases were to be sufficiently diluted, no damage would be done.*

With regard to sulphuric acid chamber escapes, it has been the practice, as a matter of convenience, to test them at the exit of the Gay-Lussac tower, the amount of acid gases there not generally differing materially from the amount entering the chimney.

But the wording of the Act is clear, viz.: "Delivered into the chimney or into the atmosphere," and if four grains of SO_3 had been found too difficult at the Gay-Lussac, the manufacturers would have claimed—and rightly claimed—to have the escapes tested where the gases enter the chimney. It was, however, so convenient to test at the Gay-Lussac, and so constantly done there, and for such a length of time, that it seems to have been looked upon by most of the parties concerned—inspectors and manufacturers alike—that the exit of the Gay-Lussac was the spot appointed by law, whereas we know that, in practice, there may be hundreds of feet between the Gay-Lussac tower and the chimney, and much catching of acid gases between the two places.

I must in fairness say here, that the present chief inspector has pointed out to me that when the Bill brought in by Mr. Sclater Booth in 1879 was being discussed, the alkali makers had an interview with him (Mr. Sclater Booth), and pointed out that they were unable to assent to be bound under all circumstances to the limitation of acid escapes from vitriol chambers recommended by the "Noxious Vapours commission," but would not object to these limits if excessive escapes arising from unavoidable causes were provided for, the recommendation of the Commission being that the acid gases shall, in each case, be collected from the exit of the chambers before entering the chimney.

Mr. Sclater Booth's Bill was, however, dropped, and the Act of 1881 was passed, as before stated, with the words "escaping into the chimney or into the atmosphere."

There is no doubt, as I have before said, that as a matter of convenience, it had been conceded by manufacturers that the escapes from sulphuric acid chambers might be taken at the exit of the Gay-Lussac towers, and I freely admit that this has been done from 1874 onwards.

The limit of four grains of sulphuric anhydride is easily maintained at the exit of the Gay-Lussac, but I venture to affirm that this custom, convenient though it was, would never have been agreed to by the manufacturers had they foreseen that this isolated instance would have been used as a precedent for application to other processes, and for a departure from the object of all noxious vapours legislation, that is, to regulate escapes, and escapes only.

Now then, after this somewhat long preamble, let us consider the "Alkali Works Amendment Bill" of 1901.

Let us look at clause 1. It says:—"Paragraph B, section 3 of the Alkali Works, &c. Act of 1881 is hereby repealed, and the following paragraph shall be substituted therefor:—

> "All the acid gases of sulphur or of sulphur and nitrogen which are evolved in the process of manufacturing sulphuric acid or sulphates to such an extent that the total acidity of each cubic foot of residual gases after completion of the process and before admixture with air, smoke, or other gases, does not exceed what is equivalent to four grains of sulphuric anhydride."

Now, I submit that this clause provided for a serious change in the law, and I think you will see this at once. The Act of 1881 provides that these acid gases "escaping into the chimney or into the atmosphere" must not exceed what is equivalent to four grains of sulphuric anhydride. The Bill seeks to provide that these gases must be tested, not where they escape into the chimney or atmosphere, but, as the Bill puts it, "after completion of the process, and before admixture with air, smoke, or other gases."

We have seen that the custom has grown up of testing chamber escapes at the end of the Gay-Lussac, but that, as I have before explained, was done as a matter of convenience but not of law, and I think it must be obvious that such an alteration in the law for other than chamber escapes means a very serious increase of stringency, because we all know from practical experience that in many cases it has been necessary to allow noxious gases to be mixed with air, smoke, and other gases before escaping into the atmosphere, and we also know that dilution, in Dr. Smith's opinion, is a useful factor for the prevention of damage. With regard to some existing processes, the alteration contemplated by the Bill will be onerous and, in some cases, impracticable. Take, for instance, the well-known "Hargreaves" process for the manufacture of sulphate of soda. Suppose this clause 1 of the Bill had been passed, we should have first to inquire, with regard to the "Hargreaves" process, where is the end of this process? Surely, it should be at the end of the apparatus where the sulphate of soda is made. If that view is taken, it would be impracticable to work the "Hargreaves" process, for it is an impossibility to do so without frequently over-stepping the four-grain limit at that point. Why is there this difficulty with the "Hargreaves" process, and why do we not find such a difficulty with the

*Third Annual Report by Dr. Angus Smith, page 44, line 41 to line 46.
" " " " 64, " 21 " 28.
Fourth " " " 71, " 28 " 33.
Fifth " " " 5, " 1 " 4.
Eighth " " " 6, " 12 " 38.
Eleventh " " " 3, " 27 " 29.
Fourteenth & Fifteenth " " 8, " 23 " 30.
" " " " 70, " 24 " 27, and line 51.
" " " " 71, line 1 to line 5, and " 19 " 23.
Sixteenth " " " 38, " 30 " 37.
Seventeenth " " " 12, " 38 " 50.
Eighteenth " " " 10, " 35 " 39.
Nineteenth " " " 6, " 5 " 10.
" " " " 6, " 15 " 17.
" " " 6, " 25 " 32.

"chamber" process? The reason appears to be this (and I am indebted to Mr. Arthur Carey for my information on this point). Vitriol chambers allow very nearly 20 times the space for making sulphuric acid which is allowed by the "Hargreaves" plant. The actual space in the "Hargreaves" plant is from 1 to 1¼ cb. ft. per pound of sulphur burnt per 24 hours. The usual space allowed in vitriol chambers is from 20 to 24 cb. ft. per pound of sulphur burnt in 24 hours. With this much smaller space in the "Hargreaves" process, it is obvious that fluctuations in the composition of the exit gases must be much more rapid and more difficult to control than they are in ordinary chambers. Again, the "Hargreaves" process requires much more constant scientific watching as to the oxygen and steam present, the cylinder temperature, the rate of burning pyrites, the mechanical condition of the salt and the quantity of moisture in the salt. These points requiring skilled attention are more numerous than in the case of the chambers, and any failure of skilled attention is more likely to be seen in the escaping gases in the "Hargreaves" process than in the chamber process, probably in the ratio of about 20 to one, and all I desire to say is, that the more points there are in a process requiring constant attention, the more latitude should be allowed for occasional and temporary difficulties.

I may add, also, sulphuric acid concentrating pans. It is not practicable always to keep the escapes from these pans at the end of the process within the four grains, but it is practicable where the gases from these pans escape into the chimney or into the atmosphere where some dilution is practicable.

Serious as these considerations are with regard to existing processes, two only of which I have mentioned, Dr. Mond has pointed out that there are new processes in sight for the manufacture of sulphuric acid, in which there will be no inert gases. The plant for dealing with any given weight of sulphur will be very much smaller than in the case of the chamber process, and the exit gas, though very minute in quantity, may consist of nearly pure sulphuric acid.

If this Bill had become law with no modification of this clause, such a process as Dr. Mond mentions could not be worked, and progress in this direction would be stopped, which would be a public calamity. On the occasion of the visit of the deputation to Mr. Long, to which I have before alluded, Dr. Mond brought this argument forward with great force.

I hope that I have succeeded in making it clear to you that the Bill did provide for increased stringency in the law, a stringency with which we should have no difficulty in complying in the case of sulphuric acid chambers, it having been the practice all along to test these escapes at the "end of the process," but that such increased stringency is not admissible in the case of some other processes now in use, and will delay or prevent the introduction of certain new processes which are contemplated.

I may add that the Local Government Board, with whom, through the chief inspector, we had several very friendly discussions, agreed to modify satisfactorily the clauses in the Bill to which we had shown cause for objection, providing that the "end of the process" phrase should be applied to the ordinary chamber process, but that the "best practicable means" clause should be applied to other and new processes, the possibilities of which cannot be foreseen. The Bill, owing to great pressure of Parliamentary business, was not passed, but we may expect that a new Bill will be brought in this session, which I hope will embody the results of the discussions to which I have alluded.

And now, gentlemen, I fear that I have tried your patience considerably, but it is important, I think, that our great Society, wherever sections may be domiciled, whether in the United Kingdom, United States, in our Dominions beyond the Seas, or elsewhere, should watch Parliamentary proceedings with care and with ever-increasing care, and should take an active interest in all matters, whether technological or otherwise, which affect the progress of chemical industry.

London Section.

Meeting held on Monday, February 3rd, 1902.

MR. OTTO HEHNER IN THE CHAIR.

The CHAIRMAN drew the attention of the members to the bye-law with regard to the nomination of five members of Committee, and stated that nominations must reach the Secretary on or before the 23rd of March.

THE EXPLOSION OF POTASSIUM CHLORATE BY HEAT.

BY A. DUPRÉ, PH.D., F.R.S.

AFTER numerous experiments, Col. Ford and myself came to the conclusion that the St. Helen's disaster was due to the explosive decomposition of the potassium chlorate in the store, brought about by the intense heat produced by the burning of the wooden casks containing it. The experiment which finally led us to this conclusion was the explosion of a bead of chlorate, attached to a thin platinum wire, when introduced into a flame. The flames I had actually used in my experiments were the outer portions of a bunsen flame and of an ordinary gas blowpipe. Col. Ford being out of town, but wishing to see the experiment himself, I, perhaps unfortunately, told him to put the bead into the blue part of an ordinary gas flame.

Some time afterwards, M. Berthelot, in a paper published in the *Comptes Rend.*, Dec. 4, 1899, p. 926, took exception to our explanation on the ground that the explosion of the bead was not, as I had assumed, brought about by heat merely, but was due to, or at least assisted by, the combustible gas present in the flame.

As far as I understand M. Berthelot's explanation, the explosion at St. Helen's was brought about by the combustion of the wood in immediate contact with the chlorate whereby the heat of combustion was directly added to the heat of dissociation, the combined effect being the raising of part of the chlorate to the exploding point. How far, if at all, M. Berthelot, would have altered his opinion, as to the bearing of the experiment with the chlorate bead, had he known that the original experiments were made with a bunsen and gas blowpipe, I do not know, but, from my point of view, it is prefectly immaterial which alternative is adopted. Both explanations assume that some of the chlorate itself, that is, chlorate unmixed with any combustible, exploded. The main difference, it seems to me, between the two explanations is that we left the manner in which the heat was communicated to the chlorate an open question, while M. Berthelot endeavours to supply this deficiency. As far as the St. Helen's explosion is concerned, the main point is, Was some of the chlorate exploded by heat or was it not? and on this both explanations agree.

Before the action against the Alkali Company had been tried, I abstained from any further experiments, as I was very anxious to avoid even the semblance of partisanship. As soon, however, as the trial was over, I resumed my experiments, but have been unable to bring the matter forward before now. My first experiments were on the lines already described, but using an oxygen blowpipe in place of the ordinary air blowpipe. I found that, even when using an enormous excess of oxygen, the bead exploded, if anything even more readily than in the gas flame.

Since, however, anything coming from M. Berthelot, especially on such a subject, naturally requires the highest consideration, I went a step further, and avoiding all flames, heated my wire by means of an electric current, and still the bead exploded.

As the exact method of proceeding is a matter of some importance I will describe it a little more fully. A moderately stout platinum wire (about 0·02 in. thick) was bent into a loop, but without letting the wires touch

where they crossed. This wire was attached to stout copper conductors and heated by an electric current so as to destroy any combustible matter that might be adhering to it. A small piece of potassium chlorate, fused just previously, was then placed on the loop, and the wire gently heated by the current to melt the chlorate. The temperature of the wire was then suddenly raised by increasing the strength of the current, when, after a few seconds, the chlorate almost invariably exploded. It is, however, important to have the wire perfectly clean, as any chloride which may be adhering to it from a previous experiment seriously interferes with the success of the succeeding one. It is, therefore, necessary always to heat the wire by the current until all chloride had been volatilised before proceeding with another experiment. In several of the experiments the platinum wire was surrounded by an atmosphere of pure oxygen. The explosion of the chlorate in this manner is as marked as it is in the gas flame. Indeed, I have not been able to observe any appreciable difference in the readiness with which the chlorate explodes, whatever the manner of heating.

There can, therefore, be no doubt that pure potassium chlorate can be exploded, in the open, by heat alone. All that is necessary to bring about this result is to heat the chlorate rapidly so that it may reach the exploding point before too much of it has been decomposed.

I hope, at some future time, to bring the whole subject of the St. Helen's explosion before the members of this society. To-day I will confine myself to the following remarks concerning it.

In considering this subject it must be borne in mind that the explosion was one of the character of a gunpowder explosion, not a detonation such as would be produced by dynamite or picric acid.* That is, stated shortly, it was characterised by relatively small local effects, combined with very considerable effects at a distance. For example, although the floor of the store consisted of only one course of brick, set in mortar or cement, and was laid on a layer of sand about a foot thick, spread on the top of an old alkali waste heap, by no means a firm foundation, yet this floor was not broken through, or even seriously disturbed in any place. The whole floor had indeed been pressed down, in some places several feet, but no distinct crater had been formed. The bricks of the building itself had been scattered, but not much broken, still less pulverised. The trajectory described by the bricks proved that the explosion had taken place on, or near, the floor, that is in the most favourable position to form a crater.

Discussion.

The Chairman said that any statement which came from Dr. Dupré on a question of this kind was entitled to the greatest respect. The ingenious experiment which he had devised was an important addition to their knowledge.

Mr. Oscar Guttmann, after expressing regret that Dr. Dupré was not present, said he held no brief for Prof. Berthelot, but he had with him the original of his article, which spoke for itself, and he thought showed that Dr. Dupré had misread Berthelot's statements. He did not think M. Berthelot disputed Dr. Dupré's statements in the list; as a matter of fact, he said distinctly that an explosion of chlorate of potash could take place in the open by heat alone. The original passage is in translation as follows: "I have recognised that one can detonate it (chlorate of potash) under ordinary pressure in an open vessel and an inert gas by operating according to a method or rather a principle which I announced a long time ago as applicable in general to the reactions of exothermic systems." Again he said, "It is quite sufficient to place the chlorate suddenly into an enclosure previously brought and kept at a temperature much higher than that at which decomposition begins in order to get an explosion." He further explained in the same article the mode by which chlorate of potash could be exploded in the open by heat alone. He had no doubt that this experiment was at least suggested by what Dr. Dupré had done at the time of making his report. Berthelot took a glass tube, heated it below redness, then took a glass rod, dipped it in molten chlorate, and put it into the glass tube about 10 mm. away from the bottom. The hot melted chlorate dropped off, and every drop that fell exploded, but the explosion was not communicated to the chlorate on the glass rod. That was certainly in the absence of a carbonaceous flame. He concluded by saying the explosion at St. Helen's seemed to have realised on a large scale the conditions he had described, but it seemed also to have been *facilitated* by the combustion of the wood barrels, as is the case by the flame of a combustible gas. It seemed clear, therefore, that Dr. Dupré was under a misapprehension in thinking that M. Berthelot attributed to him something which was not correct. He did not know what had caused the misapprehension on Dr. Dupré's part, because Berthelot stated quite frankly that he thought chlorate of potash could be exploded by itself, though he did not think the explosion at St. Helen's was due to heat alone. He was glad Dr. Dupré had promised to give a further paper dealing with the St. Helen's explosion, as that would relieve him of a task which he had intended to take upon himself, though with some reluctance. He would, therefore, not say more now about that occurrence except this, that there you had a magazine in which there were tiers of casks of chlorate of potash piled up eight and thirteen high, weighing about 2 cwt. each. One side burnt fiercely down to the ground and the chlorate in a molten state ran over the brick floor. The fire was communicated to the tier on the opposite side, and fired it from below. What more natural than that if the lowest row of barrels burnt, the whole would collapse and would fall with a series of violent blows on to the brick floor where the molten chlorate was. He believed that the intense white heat contributed, if not entirely, certainly 99 per cent. to the explosion, but there was that incentive, that priming of the blow on carbonaceous and probably charred matter mixed with chlorate which must have brought about the explosion, and as Berthelot himself said, even a small particle of carbonaceous matter would no doubt assist such an explosion. That was his contention on which he based his experiment in which he succeeded in showing that molten chlorate could be exploded on a hot brick with a broomstick.

Mr. J. W. Kynaston said he was sorry to have to disagree with the conclusions come to by Dr. Dupré, but he could not accept the statement that chlorate of potash *per se* was explosive under any circumstances whatever, and he spoke after great experience in its manufacture and as a chemist engaged in the study of it. The circumstances of the explosion were not explainable by the theory of Dr. Dupré or by that of Mr. Guttmann. Dr. Dupré's statement in the report was that a quantity of five tons of chlorate must have been heated up to the point at which it was caused to explode, but he did not believe that was possible. One must bear in mind that in the first instance the chlorate melted; as soon as it melted it spread itself about on the floor, it did not remain in one place where it could be heated up to the very high temperature suggested. Besides that, the experiments which had been tried with a view to ascertain whether chlorate of potash was explosive or not, had been to his mind conclusive. He might mention one, where the chlorate was heated under varying conditions in contact with thermit, a compound of aluminium metal and ferric oxide in fine powder, which in its reaction when set fire to gave a temperature estimated to be 3,000° C., or about the temperature of the electric arc. Chlorate of potash had been repeatedly treated at that temperature without any trace of explosion. They simply got a puff of the gas which did not exceed in violence or intensity that which they got by heating it over a lamp in an open crucible. That seemed to him conclusive. If it were once accepted that chlorate of potash was explodable by itself it would throw a difficulty in the way of manufacturers which they ought not to be subjected to unless the case were perfectly clear. It had to pass through the hands of dealers, consumers, and others, and if there was a danger of explosion under any circumstances whatever it threw great difficulties in the way of dealing with it. His own

* It is interesting to note that equal weights of gunpowder and potassium chlorate, on decomposition, produce practically equal volumes of gas.

explanation of the genesis of the explosion was this: there was in that store 156 tons of chlorate of potash, about 55 or 60 tons on one side of the central passage, and over 90 tons on the other; the 60 ton pile undoubtedly was seen to burn away, having taken fire at the top. The fire travelled gradually down through the casks and the whole mass of chlorate and the wood at any rate was burnt. When the first lot was burnt through, naturally a large quantity of it melted and ran over the floor of the building. No doubt it ran underneath the pile of casks on the opposite side and in all probability started the fire from the bottom instead of from the top. It was pretty certain that the barrels themselves must have taken fire from the intense heat of the building, but would burn more fiercely at the bottom where they were in contact with the layer of melted chlorate of potash. The only explanation consistent with all the circumstances was that the bottom rows of barrels were consumed and gave way and then the whole mass fell, probably with great violence, to the bottom, and the quantity of carbon in that mass was over five tons. The whole of those barrels were in a charred condition outside, and he believed that when this fall took place, by the attrition caused by the rapid fall, a large quantity of carbon dust was produced which blew into the atmosphere of oxygen which surrounded it. If that were admitted, all the circumstances of the explosion were explained and he could see no other satisfactory explanation. It was not an explosion of chlorate of potash at all, but of carbon in a fine state of division in an atmosphere of oxygen. If that were the true explanation the dangers arising from the handling of chlorate of potash were very much minimised; at any rate you were not dealing with a substance which *per se* was explosive. If that were the true explanation it was almost an impossibility that under any ordinary circumstances such conditions could be produced, and, therefore, this was not the dangerous substance to handle which many persons might be led to believe from what had been said there that evening.

Mr. M. J. Hammill said it was quite a new thing in chemistry to state that chlorate of potash was *per se* explodable by heat because, until the affair at St. Helen's, it was at all events undreamt of. It was rather too bad that the article should be branded as explodable on such a meagre experiment as that made by Dr. Dupré with a very small bead of chlorate in a loop of platinum wire. It would be interesting to study the results of some experiments on the effects of suddenly heating chlorate of potash which had been made by submitting it to the intense heat of a furnace produced by the reaction of "thermit" when ignited.

Experiment 1.—One grm. enclosed in platinum foil was placed on the "thermit," which was then ignited. The platinum fused and the chlorate decomposed without explosive suddenness.

Experiment 2.—The chlorate was enclosed in platinum foil and dropped into molten "thermit." Result same as in No. 1.

Experiment 3.—Crystals of chlorate, and small quantities of powdered chlorate, dropped into molten "thermit" produced a like result.

Experiment 4.—Five grms. of chlorate in a porcelain crucible were embedded in "thermit," which was then ignited. The crucible melted away and the chlorate rapidly decomposed, but not suddenly.

Experiment 5.—Molten chlorate was dropped on to fused "thermit." The chlorate decomposed with a puff, a much nearer approach to explosive effects than in experiments 1 to 4.

Experiment 6.—Two grms. of chlorate enclosed in a pill box of cardboard dropped into fusing "thermit" decomposed in a similar fashion to experiments 1 to 4.

Mr. T. Royle said "some years ago when he was interested in magic lantern work he used the ordinary mixture of chlorate of potash and manganese in the preparation of oxygen. After that he used a tube of chlorate of potash only, and never had any trouble or accident."

Mr. MacNab said it was very desirable to keep to the point before the meeting. It was very difficult on the evidence now brought forward to get away from the conclusion that chlorate of potash would explode by the simple influence of heat, without any carbonaceous matter around it. One gentleman said that under any ordinary circumstances it would not explode, which they would all subscribe to freely; but anyone who had experience of explosives knew that it was generally the extraordinary thing that led to the explosion, and the immense importance of having established once for all that certain things would explode was quite enough to make everyone take care and try to frame legislation and rules with a view to preventing such an accident as happened at St. Helen's. Of course they must not run away with the idea that chlorate of potash by itself was one of the most explosive or sensitive bodies, but they must not neglect the evidence of the experiments which Dr. Dupré and Berthelot had made. The same thing was said once about picric acid. For many years it was looked upon as a perfectly safe thing, but it was now put under the Explosives Act.

The Chairman said Mr. MacNab had struck the right note when he said that no amount of negative evidence could get round a positive experiment. The circumstances that led to a positive result might be subject to criticism, and it might be said that they would not occur in practice, but no one who had listened to Dr. Dupré's paper could get away from the fact that under some conditions chlorate of potash was *per se* an explosive. It was not a satisfactory argument to say that the bead was such a small one. No doubt if it were necessary a larger bead might be employed, but it was not every day that an experiment could be made on the explodability of a bead of 156 tons weight. It was well to bear in mind that substances of that kind under conditions which no doubt had never happened before, would explode, and the sooner manufacturers who made potassium chlorate recognised that, the better. It was no use saying it was hard on an article that had hitherto borne a blameless reputation that it should now be put under a cloud. It was much better to recognise all the facts. He was sure the members would all join in a vote of thanks to Dr. Dupré.

Erratum.—This Journal, 1902, p. 101, col. 2, line 9 from bottom, for "*any*" read "*amyl*."

Manchester Section.

Meeting held on Friday, February 7th, 1902.

DR. GROSSMANN IN THE CHAIR.

THE CHEMICAL CHANGES IN THE RIPENING OF CHEESE.

BY WALTER F. SUTHERST, Ph.D., A.I.C.

Cheese is that portion of milk coagulated by rennet which has undergone more or less decomposition by the combined action of microbes and ferments.

According to the latest investigations, milk consists of water, fat, milk sugar, casein, lactalbumin, lactoglobulin, and mineral matter, this last composed largely of calcium phosphate. When rennet is added to milk the casein undergoes a change, one portion being precipitated and another remaining dissolved. The name given by Hammarsten to the first is paracasein, to the second whey-protein. This paracasein, with the fat and lactoglobulin which are held in the precipitated mass, together with a small amount of milk sugar, constitute the curd or basis of cheese; in the serum or whey remain the whey-protein, lactalbumin, and some of the milk sugar and salts. Since the curd has practically the same composition, no matter from what animal the milk is derived, or at all events contains the same constituents, the question might easily arise, "How is it possible that from the same basis such a number of varieties of cheese can be produced?" It is evident, then, that, during the after-treatment of the curd, some particular flavour-giving microbe is more favoured than others, and by its peculiar action, the taste and appearance of the particular cheese is obtained.

The freshly prepared curd is opaque, practically tasteless, insoluble in water, and whitish in appearance; whilst the ripe cheese is semi-transparent, has usually a strong taste and smell, is partly soluble in water, and yellow in colour. The cheese has undergone some fundamental change, and the passage of the fresh curd to the finished cheese is called the ripening process.

A final explanation of the ripening process is still wanting. Two agencies appear to be the chief causes of the ripening, viz., microbes and enzymes. Of these, the microbic action is the most varied, and on it probably depends the peculiar taste of different cheeses. In cheese ripening, the lactic acid bacilli, the cause of sour milk, play a part, but more important than these are the digestive or peptonising bacteria, which act on the nitrogenous substances of the milk, like the digestive engyme pepsin. This class has been investigated thoroughly by Duclaux, who isolated them from Cantal cheese, and gave them the general name of tyrothrix. According to him these were the most active agents in breaking up the paracasein. A new phase in the study of the causes of cheese ripening was opened up by the discovery, in 1897, by Babcock and Russell, of an inherent milk ferment, which possesses the property of digesting paracasein without the aid of micro-organisms. This ferment, which they named galactase, shows strong resemblance to the pancreatic enzyme trypsin, as well as to the digestive bacteria usually found in cheese, so that these widely different agents together produce the same result. It had been suggested by Duclaux that a ferment similar to galactase, which he called casease, was present in cheese, but that it was of bacterial origin, being produced by a variety of the tyrothrix group. Babcock and Russell, however, proved that the new ferment was not produced by bacteria, and that, moreover, cheese could be ripened by its action alone, without the aid of micro-organisms. They succeeded in ripening, in chloroform, a cheese previously treated with galactase. That the micro-organisms take no part in the actual ripening process is, of course, absurd; and it must be admitted that, although certain substances exist naturally in milk, which are capable of peptonising the casein, it is the combined action of microbes, ferments, and light which bring about this change. It may happen that most of the peptonising action can be brought about by galactase alone, *e.g.*, when the digestive bacteria are not present in large quantities; Frendenreich recently found that ordinary Swiss cheese did not contain many digestive microbes, their growth being retarded by the enormous quantities of lactic acid bacilli present.

Another agent in the ripening process, especially in soft cheeses, is the mould. Johan-Olsen, who has paid particular attention to these, finds that they are capable of ripening cheese alone, and he succeeded in obtaining good qualities of Gorgonzola and Roquefort by inoculating sterilised curd with various pure cultures of moulds obtained from these kinds. The moulds or fungi need air for their growth and find a favourable medium in the soft cheeses, which are not pressed and are often made flat so as to allow the air to act over a large surface. The quantity of lactic acid in these unpressed cheeses greatly assist the rapid growth of the moulds. The most important function of these fungi is the oxidation of the lactic acid to carbonic acid and water, thus destroying the acidity and giving more scope to the digestive bacteria.

It is the micro-organisms, present naturally in, or intentionally introduced into, the curd which determine the numerous varieties of cheeses. Every variety of cheese has its special bacteria and can be prepared by isolating certain dominant bacteria and placing them in the milk before rennetting and then allowing to ripen under the conditions peculiar to the variety.

In the ripening the first constituent of the curd attacked is the milk sugar. The lactic acid bacilli begin as soon as the curd is moulded, and in a few hours completely transform the sugar into lactic acid, which remains as such during the rest of the time, excepting a portion which is neutralised by the ammonia formed. The amount of acidity at this stage has much influence on the final quality of the cheese.

There is very little change in the nitrogenous matter of the curd until the lactic acid fermentation is over, when by the united action of the agents already mentioned, it splits up into crystalline substances soluble in water. Duclaux was the first to isolate the various substances formed, and he showed that first of all an albumose intermediate between the paracasein and peptones—which he named caseone—was formed; this is next split up into peptones, which are later changed into crystallisable bodies, chiefly amido-acids from which leucine, tyrosine, glutaminic acid, diamino-acetic acid, phenylamido-propionic acid have been isolated. The final product of decomposition is ammonia, which is easily detected in ripe cheese. The milk fat does not change perceptibly, but it is supposed that a partial saponification takes place, by which fatty acids, especially butyric, and glycerin are set free. Although glycerin has never been isolated in cheese, still a larger amount of volatile free acids are found in cheese than in milk. These acids must have come chiefly from the butter fat present, though it is possible for butyric acid to be formed by fermentation from lactic acid. One hears occasionally that the total amount of fat is greater in the cheese than in the fresh curd, and the reason generally given is that fat is one of the decomposition products of the albuminoids. But although some fatty acids are formed by the decomposition of paracasein, it is hardly possible for true fats to be formed. It is probable that an error in the analysis gave too high figures, and the ether used in the fat estimation also dissolved some substances other than fat.

Whether the mineral constituents of cheese undergo any radical change during the ripening or not, is not known, and it is evident that their action would be very limited, and only of use during rennetting.

The best explanation of the changes which the constituents of cheese undergo during ripening is by comparing the composition of fresh curd with that of ripe cheese. With this object in view a cheese was prepared for me at the Dairy Institute, Worleston, and from this samples were taken from time to time and analysed at the laboratories of the Agricultural College, Holmes Chapel.

The methods employed in the analysis were those suggested by Stutzer (Zeitschr. Analyt. Chem. 1896, p. 493), as follows:—The ash was determined by incinerating 10 grms. of the cheese in a platinum dish over the free flame till constant weight. For the remaining constituents Stutzer recommends grinding up the cheese with pure sand, so that a homogeneous sample can be taken. Moreover, the finely divided state of the cheese allows of its being more easily acted upon by the various reagents. I then mixed intimately 50 grms. of cheese with 200 grms. of washed and ignited sand, and from this portions were taken for the various estimations.

The water was found by heating 15 grms. of the sand mixture in a water oven till constant weight.

The dried residue from the water estimation was then extracted with anhydrous ether in a Soxhlet's apparatus, and the fat dried at 105° C. and weighed.

The lactic acid was determined by macerating 15 grms. with cold water and filtering, and titrating the filtrate with N 10 NaOH.

The total nitrogen was found by Kjeldahl's method, using 10 grms., the oxidation being carried out with a mixture of 100 parts of conc. sulphuric acid and 20 parts of phosphoric anhydride, together with a little mercury.

For the separation of the nitrogenous decomposition products, several methods have been suggested, none, however, based on purely chemical lines, owing to the lack of knowledge of the albuminoids, and each one merely consists in precipitating them in groups and estimating the total nitrogen in each. There are methods for isolating a few of these compounds, but till they can all be completely separated it is as well to leave them in their respective groups. The general scheme of separation is as follows:—The paracaseïn being insoluble in water, and the albumin rendered insoluble by boiling water, to remove these the cheese is treated first with boiling water and filtered. In the filtrate are the remaining nitrogen compounds, the albumoses, peptones, amido acids, ammonia, &c. Although the albumose and peptones dissolve in water, they are easily

rendered insoluble by the addition of various substances, among which tannic acid, phospho-molybdic acid, phospho-tungstic acid, trichloracetic acid, have been tried with success. In the precipitate obtained in this way the nitrogen is estimated. The filtrate from this group contains the amido acids and ammonia compounds, and in this the total nitrogen is determined, and the amount found for ammonia deducted from this.

I used a solution of 120 grms. sodium phosphate, 200 grms. sodium tungstate, 100 c.c. dilute sulphuric acid (1 : 3) in one litre of water, being the one recommended by Stutzer and others. The nitrogen existing as albumose and peptones was determined by mixing 20 grms. of the sand mixture with 100 c.c. water, boiling in a porcelain dish for half-an-hour, and pouring off the supernatant liquid into a 500-c.c. flask, the same process being repeated with the same amount of water till 500 c.c. of liquid was obtained. After cooling, the flask was filled up to the mark, filtered, 200 c.c. of the filtrate taken, and, after adding an equal volume of dilute sulphuric acid, precipitated with 50 c.c. of the phospho-tungstic acid solution. The liquid was then filtered, the residue well washed with dilute sulphuric acid, and then estimated for nitrogen by Kjeldahl's method.

The amido-nitrogen could of course be estimated in the filtrate from the last experiment, but a safer way is as follows :—20 grms. were mixed with 150 c.c. water and well shaken in a bottle for 15 minutes, then allowed to stand for 15 hours, after which 100 c.c. dilute sulphuric acid were added, then 50 c.c. phospho-tungstic acid solution. The mixture was filtered and washed as before, and in an aliquot part of the filtrate the nitrogen was estimated in the usual way. From the nitrogen found the quantity existing as ammonia was deducted.

The ammonia-nitrogen was determined in 20 grms. of the sand mixture by distilling with barium carbonate (other alkalis, such as magnesia, caustic soda, baryta, cannot be used here, since they decompose the albuminoids present, setting free ammonia), the ammonia being collected in N/10 sulphuric acid.

By subtracting the amount of nitrogen found as ammonia, amides, albumose, and peptones from the total nitrogen, the nitrogen existing as casein and albumin is obtained.

The following tables give the rate of decomposition of the various ingredients, and the various changes during the ripening process of the cheese, beginning with the fresh curd :—

Table I.

	Date of Analysis.		
	July 10th.	August 23rd	October 16th.
	Per Cent.	Per Cent.	Per Cent.
Water	38·07	37·36	36·54
Acid	1·818	1·246	1·116
Fat	31·18	32·08	33·06

Table II.

Nitrogenous Decomposition Products as Nitrogen.

	Date of Analysis.		
	July 10th.	August 23rd	October 16th.
	Per Cent.	Per Cent.	Per Cent.
Total N.	4·824	4·916	5·021
Casein and albumin	..	2·203	1·850
Albumose and peptones	..	1·586	1·288
Amides	..	1·120	1·848
Ammonia	..	0·007	0·025

In conclusion, I wish to express my best thanks to Miss Forster, Lady Principal of the Dairy Institute, Worleston, and Mr. F. H. Billington, one of my students, who helped me considerably in the experimental part of the work.

Discussion.

Dr. Hewitt said that he had been asked at a meeting of the county council by an influential Cheshire agriculturist how it was that in Cheshire the old long-keeping cheese was no longer made to any extent, and that quick-ripening cheese had become so popular. At that time he (Dr. Hewitt) recommended the agricultural committee of the county council to appoint an expert at the Holmes Chapel College to investigate these matters systematically and report to the council, and Dr. Sutherst had availed himself largely of the opportunities afforded him for original research at the College. He looked forward with great interest to the results of Dr. Sutherst's work as likely to prove an immense gain to the cheese industry throughout England. It was absolutely necessary that science should, if possible, aid the farmer in any way by establishing with certainty the different flavours of cheese and its ripening qualities, and he hoped that Dr. Sutherst's investigations might lead to some such results which would be of great commercial value to this country.

The Chairman remarked that Dr. Sutherst was right in examining the intermediary products in the process of cheese-making. No industry could be carried out satisfactorily without adopting some scientific means of ascertaining what action was taking place during the intermediary stages and what was the final condition of the product. There was no reason why, by the application of scientific methods, it should not be possible to produce cheese in this country similar to foreign cheeses.

Newcastle Section.

Meeting held at the Durham College of Science on January 30th, 1902.

MR. W. L. RENNOLDSON IN THE CHAIR.

THE ABSORPTION OF ARSENIC BY BARLEY.

BY S. H. COLLINS, F.I.C.

This investigation was originally designed to observe in what forms and in what way arsenic was absorbed by plants, and what influence, if any, the supply of phosphates had on this absorption; but the investigation had to be modified during its course owing to the unexpected occurrence of arsenic in the soil used. Whilst the experiment must, therefore, be considered in some respects a failure, yet many points of interest have occurred worth noting.

I propose repeating these experiments this season; one of the reasons for reading this preliminary note being to raise a discussion on the subject and obtain suggestions as to the future carrying out of this experiment.

A set of six 10-inch pots were used, being manured respectively with (1) Nothing; (2) Arsenious acid; (3) Arsenic acid; (4) Superphosphate; (5) Superphosphate and arsenious acid; (6) Superphosphate and arsenic acid. The arsenic being in all cases equal to 11 lb. of arsenic (As_2O_3) per acre, and the superphosphate equal to 170 lb. of phosphoric acid (P_2O_5) per acre. The pots were planted with tares and barley, the former reaped green and the latter thinned in July; the barley gathered in September and divided into (1) bottom half of straw; (2) top half of straw; (3) ears and chaff; (4) grain. Samples of soil being also taken after the close of the experiment. All were then examined by Reinsch's test, using all the crop and 100 grms. of soil, subliming the arsenic and comparing the crystals so formed with a set of standards which had been prepared from varying amounts of from nothing up to 5 mgrms. of arsenic, treated in exactly the same way as the crop.

The distribution of the arsenic in the plant was found to be as follows :—

In the six cases of green stuff there were four cases without arsenic and two cases with arsenic, viz., 0·4 and

0·5 mgrm. of white arsenic per pot. In the lower half of straw, five cases without and one case with 0·5 mgrm. In the upper half of straw, five cases without and one case with 0·7 mgrm.

In the threshed ears, five cases without and one with 0·7 mgrm. In the barley grain, all the six cases contained arsenic varying from 0·5 to 3 mgrm. of white arsenic per pot. All the six samples of soil contained arsenic (7 to 22 parts per million), there being no particular agreement between the amounts artificially added and actually found.

Averaging all the results, the soil contained 30 lb. of arsenic per acre to the depth of 8 inches, the grain contained 4 oz. per acre, and the rest of the plants 1¼ oz. per acre.

The superphosphate did not appear to have any definite action.

After these experiments were finished, another sample of the College garden soil was examined for arsenic and yielded amounts equal to 50 lb. of white arsenic per acre (to 8″).

Pending the repetition of these experiments under better conditions, I propose to draw no conclusions, but that (1) soil may contain large amounts of arsenic without any suspicion of that fact: (2) Barley grown on such soil may also contain large amounts of arsenic.

New York Section.

Meeting held at Chemists' Club on January 24th, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

ON THE INFLUENCE OF INDIGO-RED IN INDIGO DYEING.

BY J. MERRITT MATTHEWS, PH.D.

In view of the many differing opinions that appear to be current at the present time, concerning the relative values of natural and synthetic indigos in regard to their dyeing qualities, it becomes a question of considerable interest, both to the chemist and to the practical dyer, to investigate the differences, if any, which may exist between the two. Chemically considered, no distinction can be made between synthetic indigo, as prepared from coal-tar derivatives, and natural indigo, which is obtained from the raw vegetable product by processes of refining. These two bodies are identical in every respect, and hence must be classified together, but the unrefined natural indigo presents a somewhat different character, for, in addition to the pure indigo or indigotin which it contains as a chief constituent, there are also to be found several other substances ordinarily classified as impurities. As the claim has been made that these associated bodies have considerable influence on the dyeing properties of the indigo, it is worthy of careful consideration, for should such be the case, the present methods of using synthetic and refined indigo would have to undergo considerable alteration, in order to make them conform with the most advantageous conditions of dyeing.

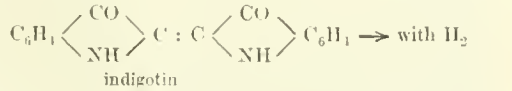
Zaenker (Leip. Farb. Ztg., 1899), assuming the attitude of a practical indigo dyer, rather than that of a chemical theorist or experimenter, claims that synthetic indigo presents several disadvantages in its dyeing qualities over the natural indigo, and that many establishments, after a short trial, have abandoned the artificial product to return to the old method. He claims that these disadvantages are due to the great purity of the synthetic compound, a statement which would appear rather anomalous to a chemist. But we must bear in mind that the natural indigo contains three bodies, already alluded to, in addition to the indigotin; these are indigo gluten, indigo brown, and indigo red, and though they occur in only small quantities, it may be possible that their presence adds somewhat to the good qualities of the indigo. This question, however, appears to be an old one, and extensive scientific researches have been made on this very point by chemists of acknowledged ability, at a period long before any comparison with synthetic indigo was thought of. Zaenker was evidently unaware of these researches, for he leads on to the statement that good results in indigo dyeing are only to be obtained when a certain amount of indigo red is present in the vat. He also makes the statement, to support this claim, that very pure qualities of Java indigo often fall below the dyeing standard of more impure varieties, and that the experienced indigo dyer will pick out those indigos, containing the highest amount of indigo red, as being the best; in fact, a well fixed indigo dye is not considered to be possible without the agency of indigo red. In the face of this statement, however, we have the contrary fact that, for several years past, it has been the aim of indigo dealers to refine their crude product as far as possible, in order to enhance its quality and value, and the indigo red is abstracted from the material at considerable pains and expense, being cast aside as an almost worthless impurity. This practice of refining is growing, showing thereby that the purified indigo is held in good favour. Schwartzenberg and Schwartz, in 1837, in response to a prize offered by the Société Industrielle de Mulhouse, made a thorough study of this very question, and carefully examined the influence of the three substances above mentioned on the dyeings obtained in the indigo vat. Their experiments were of a very practical nature, and their results were decisive and final. It was demonstrated that both indigo gluten and indigo brown played no part in the dyeing process, acting in neither a beneficial nor detrimental manner; in fact, they were altogether indifferent substances in their influence on indigo blue. The indigo red, it appears, is a true dyestuff, being reduced along with the indigotin to a soluble form, and being subsequently fixed on the fibre in conjunction with the blue; but it was found that the beauty of the shade, instead of being enhanced by the presence of this red colouring matter, was deteriorated in proportion to the amount present, the blue colour becoming dull and cloudy as the quantity of indigo red was increased. Zaenker, in fact, admits that in properly dyed indigo, the red dyestuff is mostly removed from the fibre by the acid and rinsing baths to which the goods are subjected after being removed from the vat, and that the majority of this colouring matter can be recovered as a precipitate in these baths, and thus be used over and over again in replenishing the amount of indigo red in the original vat. This fact is hardly in keeping with the statement that the beautiful tone of the blue on goods dyed with the natural indigo is due entirely to the presence of the indigo red in the colour. As far as the fixing qualities of indigo red are concerned, Schwartzenberg and Schwartz, from an extensive series of experiments, both in the laboratory and in the dyehouse, came to the positive conclusion that the presence of indigo red did not increase the fastness of the dyed colour. This question has been studied by other chemists at a later date, and all appear to come to the same conclusion. The assertion that dyeings, produced from indigo not containing any indigo red, possess the disadvantages of being uneven and badly crocking, appears to be either a mistaken conclusion or an unwarranted statement. From the very fact that the indigo red is mostly fixed on the fibre in such a loose condition as to cause it to be removed in the washing processes, is sufficient to demonstrate the absurdity of the idea that its presence renders indigo blue faster. As to the difference in tone obtained by dyeing with different qualities of indigo, it does not appear that the presence of indigo red is at all essential to the production of the highly valued shade of blue given by the most approved qualities of indigo, as chemical analyses of such samples have shown. The value of any indigo appears to be dependent upon its content of indigotin alone; so true is this, and so well has it become recognised by dealers in indigo, that analyses of this dyestuff, which do not differentiate between the indigotin and the indigo red, are considered as unsatisfactory as a basis for comparison of relative values. For one example containing more indigo red and less indigotin might be reported as of higher value than another, if both of these

colouring matters are figured together, whereas a lower value as a dyestuff would actually be the case. It is also well known that some very inferior qualities of indigo contain a relatively high percentage of indigo red; some low grade African indigos, for example, contain as high as 8 per cent. of the red colouring matter; whereas the best qualities of Java and Bengal indigo rarely contain more than 2—3 per cent., and in some cases, even much lower. A comparison of such analyses, together with analyses of refined indigos, where the impurities (including indigo red) have been wholly or partially removed, leads us to the conclusion that the presence of the red colouring matter is in no wise essential to the good quality of a sample of indigo.

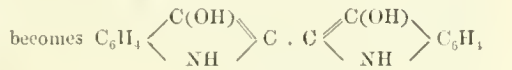
It has been stated that indigo red, beyond its mere colouring and fixing powers, has a distinct influence on the proper working of the vat itself. The fact is, indigo red is much more difficult to reduce than indigotin, and it is highly probable, in consequence, that most of the red body remains in the sediment in the vat, and does not come into action at all; and the idea that it may serve as a regulator in the vat has no foundation either in theory or practice. On the other hand, it has actually been noticed by several observers that under certain conditions the red dye is apparently converted to some extent into indigotin through the operation of the vat; though this conversion is by no means complete, the majority of the indigo red being transformed into brownish substances in the vat, the influence of which appears to be far from beneficial in regard to the beauty of the colour obtained. These observations have only been noticed with respect to certain vats, chiefly those which have been prepared for the dyeing of wool. In the ordinary cold vat, as used for dyeing cotton, there does not appear to be any marked conversion of the indigo red into indigotin. Another point to be observed in this connection is, that the indigo which is recovered from the acid and wash waters, and which is largely contaminated with indigo red (for it has already been mentioned that the indigo red is mostly removed from the fibre by these washings), yields a very inferior vat, and requires to be purified before it is advisable to add it to the vat again.

The fact that superior brands of indigo exhibit a peculiar reddish cast on the surface has been erroneously attributed by some writers to the presence of indigo red. A careful investigation of this phenomenon has led to the conclusion that the reddish or bronze-like appearance is due to a certain crystalline form of the particles of indigo, and consequently, is to be taken as a mark of high purity, and not as an indication of any red colour-matter. We may point out an analogous instance among the artificial dyestuffs; many blue and violet dyes, when in a pure crystalline condition, exhibit a bronze-like metallic appearance on the surface; whereas impure brands, being amorphous in character, do not possess this peculiarity. The bronze reflection is brought about by the action of the crystals on the light falling upon them, and is a well known and thoroughly understood optical phenomenon, capable of the same explanation in the case of indigo as in the case of other dyestuffs. This same peculiarity to be noticed in the appearance of the dyestuff on the fibre is to be attributed to the same cause, that is, the crystalline structure of the particles of dyestuff held in the interstices of the fibre. As is well known, a crystalline structure is one of the best criterions of the chemical purity of a substance; hence, we would expect that the purest indigos (other conditions favouring crystallisation being the same) would exhibit this appearance most strongly. And this is indeed the case, for refined indigo and the synthetic product yield shades which are much redder in appearance than those obtained with the raw indigoes, irrespective of their content of indigo red. In this connection it is interesting to note that the presence of indigo red is considered as detrimental in the preparation of soluble indigo extracts, and the manufacturer is careful to select only those brands known to contain a minimum quantity of indigo red.

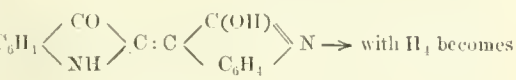
As a crucial test, perhaps, in order to determine the influence of indigo red in indigo dyeing, we might refer to the facts to be observed in the dyeings obtained with indigo red alone. The shades obtained with this colouring matter are far from pleasing, and instead of being bright and full, are dull and greyish in appearance, the actual shade varying from a reddish to a bluish violet. As to the fastness of this colour on the fibre, the shades obtained from the natural product do not appear to equal indigotin in permanence to washing; this defect, however, may be due to the large amount of other impurities necessarily present in these samples, as shades obtained from chemically pure indigo red prepared synthetically, showed a high degree of fastness perfectably comparable with that of indigo. A remarkable fact, however, is to be noticed in the operation of the indigo red vat. As time passes, it appears to undergo a change, and the colours dyed in it gradually become bluer in tone, evidently indicating the presence of indigotin. A greenish fluorescence in the vat is also to be noticed, and this, together with the fact that the colour is developed but slowly on exposure to the air, has led chemists to the conclusion that indoxyl is formed in the vat instead of indigo white, such as might ordinarily be supposed. In fact, Fasal (of the Gewerbemuseums, Vienna) has put forward the idea that indigo red, when subjected to the same conditions as indigotin, instead of being converted entirely into a leuco-derivative, is reduced to indoxyl; and from this fact, he concludes that the presence of indigo red has no effect on the dyeing of indigo blue. From a study of the structural constitution of indigo red, I am inclined to agree with the view advocated by Fasal; for we may compare the reactions of indigotin and indigo red towards reducing agents in the following manner:—



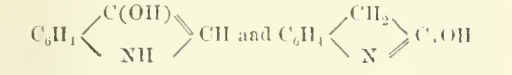
indigotin



indigo white.

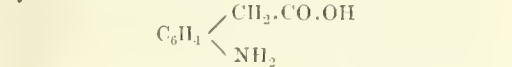


indigo red

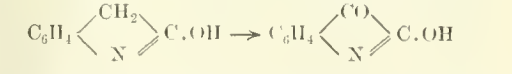


indoxyl.

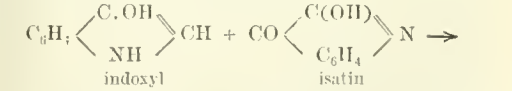
This latter substance is an inner anhydride of amido-phenyl-acetic acid:



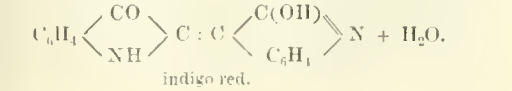
It may be more probable that this body suffers subsequent oxidation, and is converted thereby into isatin:



This appears to be directly in accordance with the observed fact that indigo red may be synthetically prepared from indoxyl and isatin, the combination between the two molecules being effected through the elimination of a molecule of water by means of a solution of caustic alkali, a reaction which can readily be understood by a reference to the following structural scheme:—

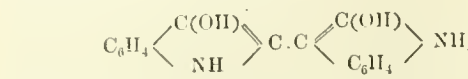


indoxyl isatin

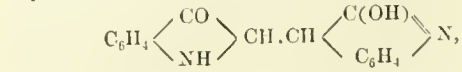


indigo red.

By reference to the above formulæ and reactions, it will at once be apparent why the reduction of indigo red is effected with so much more difficulty than that of indigotin. In the case of indigo red, there is required double the amount of hydrogen for the reaction; and the molecule is split into two separate and distinct portions, whereas with indigotin the only work which is done is the change of a double unsaturated linking to a single bond by the direct addition of two hydrogen atoms, a reaction which is known by all chemists to be comparatively easy, as far as the force of chemical affinity is concerned. There is no alteration in the type of the molecule, but in the reduction of indigo red above given there is a complete rupture between two of the carbon atoms. That portion of the indigo red which is reduced to a leuco-body, and is subsequently re-oxidised to the violet dyestuff, probably undergoes a reduction similar to that of indigotin, and the leuco-body may have the formula:



or possibly the tautomeric formula:—



which would correspond to the tautomeric form of indigo white. Which of these formulæ is the proper one to be assigned to indigo red could no doubt be determined through a study of their acetyl derivatives; the former one would yield derivatives containing two and four acetyl groups, whereas the latter would yield derivatives containing only one and two. However this may be, the leuco compound of indigo red appears to differ from that of indigo blue by its instability in solution, in the presence of reducing agents, and is further decomposed into indoxyl and isatin as above indicated.

From a consideration of these reactions we would naturally expect to find that indigo red would differ very materially from indigotin in its behaviour towards sulphuric acid, in the preparation of sulphonated derivatives. As is well known, indigotin itself is readily converted into a sulphonated product, which forms a soluble dyestuff known as indigo carmine; I have already remarked that for the preparation of this material, it is endeavoured to select those varieties of indigo which contain the least quantity of indigo red, as better results are so obtained. If the sulphonic acid of indigo red itself is prepared, it will be found that the colours which may be dyed with it are not at all permanent, being mostly removed from the fibre by a mere washing with water; hence we can readily understand why the manufacturer tries to avoid as far as possible the presence of indigo red in the material from which the indigo carmine is to be made.

The conclusion which is inevitably forced upon us by a consideration of all the facts above stated is, that the point which has frequently been made in opposition to the use of synthetic indigo instead of natural indigo, viz., that the former does not contain any indigo red, has evidently not been well established. Even if the presence of indigo red were essential to the production of good and fast colours, its absence in the synthetic product could easily be remedied by introducing it in any amount desired, for indigo red can be obtained in large quantities as a by-product from the refining of natural indigo. It is also to be recovered from the acid wash waters in indigo dyeing, mixed with varying quantities of indigotin. And even in addition to this, it has been prepared synthetically in a pure condition, and may be purchased as such in commerce. I fear that the indifferent results obtained by several experimenters in their comparison of natural indigo with pure indigotin (either synthetic or that prepared by refining the natural dye, as I can see no appreciable distinction between the two) has been due more to a lack of the proper conditions of dyeing than to a deficiency in the quantity of indigo red. If there is any appreciable difference between the dyeing qualities of the pure and raw indigos in favour of the latter, the cause, I am certain, will be found to be something quite different than the presence of indigo red in the vat.

THE PRESENCE OF COPPER IN POWDERED DRUGS AND CHEMICALS.

BY E. H. GANE.

From time to time, the author has been somewhat puzzled over the origin of small amounts of copper which have been detected in various powdered drugs and chemicals. Traces of copper have been found by investigators in the ash of various drugs, and have generally been attributed to absorption of copper by the plant from the soil, notwithstanding the fact that the place of growth of the drug may have been far removed from any known source of copper.

That this is not the source of the copper in all cases is shown by the fact that the metal could not be detected in the whole drug, and in the case of chemicals, the process of manufacture precluded copper contamination. As the amount of metal found was extremely small, and its occurrence quite casual, no detailed effort was made for some time to trace the source of the contamination, it being attributed either to careless handling or to the use of copper utensils for transferring the powder from the grinding mill.

The rejection, however, of several consignments of powdered ammonium carbonate, which had developed a blue mottled appearance, rendered it necessary to ascertain definitely the origin of the copper, so as to avoid further trouble from this cause. The search was not without difficulties. Every possible source of copper was eliminated, such as brass work around the mill, and close watch was kept over the grinding and sifting, so as to avoid contamination during these processes. The use of brass sieves and copper or tinned copper scoops was also abandoned in the milling room.

In spite of these precautions the same trouble would crop up at intervals, and it was not until attention was drawn to the driving belts that the source of the copper contamination was definitely located.

The various sections of a driving belt are riveted with copper rivets or stitched together with copper wire, and as the leather wears down from constant passage over the pulleys, the rivet heads are gradually raised flush with the surface of the belt, and are slowly ground down by passing over the pulleys, minute particles and sometimes fair-sized fragments of copper being thrown off from time to time.

The casual occurrence of the copper in the powders is easily explicable when the small size of the hopper feeding the mill is taken into account. Replacing the leather belt by one made of rubber has obviated further trouble.

This note is presented in the hope that it may save some manufacturers from similar trouble, and prevent inaccuracies on the part of investigators, particularly when examining the constituents of the ash of vegetable drugs.

SULPHUR BLACKS, AND THEIR ACTION UPON CELLULOSE.

BY LOUIS J. MATOS.

The discovery of the sulphur colouring matters dates from the success, in 1873, of Croessant and Bretonnens, who produced what is now known commercially as Cachou de Laval, and which discovery has been regarded as the prime starting point from which the subsequent sulphur colouring matters have been developed. It is not my purpose to review the details of the several important discoveries made along that line of research, as such has been very fully recorded in the pages of our journal, but to draw attention to a few main points, bearing upon the practical application of this now extremely important group of cotton colours.

The manufacture of all the sulphur colours is carried out on generally the same principle, that of making a "melt" of certain nitrogenous organic substances with caustic soda, sodium sulphide, and free sulphur. This fusion is conducted in large cast-iron pots, supported in

brickwork, and suitably inserted over a fire. The duration of the fusion depends upon the nature of the raw product, but in nearly all cases it is stopped when a test sample of the melt is found to dissolve completely in water. Some of the commercial products are ready for the market without further treatment, while others are subjected to a subsequent baking in large pans suspended one above the other in a large externally heated oven.

Depending upon the particular process of treatment, and governed by the raw materials, the finished product may be dense and tough, sometimes hygroscopic, whilst, in other cases, it may be porous and brittle, resembling coke.

The technical importance of these new Blacks to the textile industry is their great value in producing shades of the utmost intensity and with a minimum of expense, and combining to a remarkable degree the qualities of extreme fastness to exposure to weather, light, ordinary washing, soaping, acids, and alkalies. Of course these qualities are relative, as all the black sulphur products are not exactly alike in their several properties.

Compared with the ordinary types of Blacks for cotton (excluding those obtained from logwood or other similar sources), we find that, in the sulphur Blacks, we have products yielding shades that more nearly approach those obtained from aniline, and which are, in many respects, equally as fast. We further find that the practical details for producing a high grade black are much simpler than for the same depth of black by the aniline process.

In comparison with the ordinary direct dyeing Blacks, it is found in practice that the dyeings obtained from the sulphur products are always superior in point of fastness; and that when compared with the so-called diazotizing and developing Blacks, there are a number of details in connection with the latter to be carefully watched, in order to guard against off shades, unevenness, and lastly, tendering of the fibres, defects not prominent with the Sulphur Blacks.

This latter complaint has been also made in reference to the Sulphur Blacks, however, and the present paper is intended to direct particular attention to this subject.

As Sulphur Blacks are of importance only to the cotton dyer, the general details as followed in practice will be briefly outlined. The dyebath is made up with a sufficient volume of water, to which dissolved dyestuff is added, together with sodium sulphide—in some cases caustic soda also—and always common salt or Glaubers salt, to increase the density of the dye bath. The material to be dyed is then immersed, the temperature gradually brought to the boiling point, and maintained for about one hour, during which time the cotton is worked, in order to ensure level or even shades.

Other classes of the Sulphur Blacks do not require the addition of sodium sulphide to the dye bath, but the addition of a small quantity of soda ash is regarded as an advantage.

Thus, we are likely to find in the dye bath, besides the dyestuff, one or more of the following substances:—Sodium chloride; sodium sulphate; sodium sulphide; caustic soda (sodium hydrate); sodium carbonate; regarding the action of which, upon cellulose, in the form of chemically cleaned cotton threads the subjoined notes may be of interest. All the experiments were made parallel, and under strictly the same conditions, and upon the same material. Test samples were frequently taken and subjected to tension in the dynamometer, to ensure regularity and uniformity throughout each series.

Action of boiling aqueous solutions on Sulphur Black (St. Denis Black, B).—Ten grms. of fine cotton was boiled for one hour in a simple 1 per cent. solution of the black, loss of water prevented by means of a reflex condenser. After boiling and washing the yarn, drying under normal conditions without the aid of heat, no loss of strength was noticed in an average of 30 tests.

Action of dilute solutions of sodium chloride.—Same apparatus, strength of solution, time, &c.:—27 tests; loss 0·47.

Action of dilute solution of neutral sodium sulphate.—Only 5 tests were made with this salt, the results of which showed no action on the thread.

Action of dilute solution of sodium sulphide.—The commercial crystallised article was used for this series of tests. Solution, 1 per cent. strength. 24 tests were made. Normal yarn, 100; average of 24 tests, 94·2. Maximum, 98·3; minimum, 88·56.

Action of dilute solution of caustic soda.—One per cent. solution. One hour boil. Yarn washed and dried at normal temperature. Average of 21 tests; no practical loss.

Action of dilute solutions of sodium carbonate.—One per cent. solution. One hour boil. Average of 14 tests; no loss.

From these tests we are led to conclude that there is some slight loss in strength of the material dyed, but then it must also be remembered that the treatment received by similar material in actual practice would not be nearly so severe, and that the loss of strength of the dyed material would be very much less.

Operations subsequent to dyeing, as applied to the Sulphur Blacks, may be only washing and soaping, or a "fixing" in a special bath containing certain metallic salts in solution, usually in the presence of some acid. The object of fixing as applied to those sulphur colours that require it is to cause a deposition of the black colour base on the fibre substance. When such dyed and "fixed" fibres are examined under the microscope, however, no evidence of insoluble particles are discernible, but we are safe in assuming that such deposition is the case in view of the well-known reactions of the Sulphur Blacks when in solution.

The fixing baths, as usually made up, contain as a maximum, five per cent. of bichromate of potassium or sulphate of copper; sometimes mixtures of these two salts are employed, in which case the combined amount rarely exceeds six per cent. As a rule, one and one half per cent. to four per cent. of sulphuric acid, or three to six per cent. of acetic acid is used, according to circumstances, all calculations being upon the weight of the cotton. The temperature of the bath is usually kept at 75° C., and the duration of the immersion from one quarter to one half hour.

The influence of this fixing bath upon the black as dyed is to cause it to become almost absolutely fast to the most severe milling, and unless insufficiently washed before fixing will in no instance stain adjacent white material.

The action of the fixing bath upon the fibre substance is of importance. Owing to the character of the ingredients used, we might infer that some distinctive action would take place, but this does not happen.

A series of tests were made upon clean cotton yarn; same yarn, dyed; same yarn, dyed and fixed; and the loss in strength, due to the subsequent fixing, was inappreciable.

The action of the chrome fixing bath, however, when allowed to act for several hours upon either dyed or undyed cotton, has a marked influence upon the strength, but when the immersion is only one half hour at most, and at a moderate temperature, no loss was recorded.

When objections have been raised to the loss of strength suffered by the dyed yarn in cases where it has been "fixed" in the manner described, this loss has been traced directly to insufficient washing *after fixing*, and then when sulphuric acid was used.

Summing up the observations, we note that the several components of the dye bath, either alone or in combination, have no appreciable effect upon the cotton fibre; that the subsequent "fixing" bath, or its several constituents, is likewise free from action, when used at the usual temperature of 75° C.; that failure to wash the dyed and fixed material thoroughly, thereby allowing traces of acid to remain in the fibre, is a cause of fibre weakness; and it has been practically demonstrated, upon large scale tests, that where ample washing was done, the dyed and finished material had lost none of its original strength.

Nottingham Section.

Meeting held at Burton-on-Trent on Wednesday, January 29th, 1902.

MR. LEONARD ARCHBUTT IN THE CHAIR.

EMERGENCIES IN VITRIOL WORKS.

BY F. J. R. CARULLA.

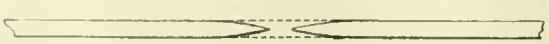
The subject of accidents deserves very careful attention on the part of all who have charge of works if they wish to carry them on with economy. One man, who has the knowledge of some small detail, that in actual practice has proved to be of great importance, may keep a works going that another man without that knowledge would have brought to a standstill.

In the manufacture of oil of vitriol by the chamber process, when conducted on a small scale, much ingenuity is needed to diminish the ruinous cost of repairs and renewals. These cannot be avoided, but the periods between their recurrence may be lengthened by constant watchfulness and skill.

A chamber, which on one occasion seemed destined to come down because several of the joists that carried the bottom began to crack, was very quickly made safe and stronger than it was originally by means of a simple device. Jury joists were put by the side of the defective ones, and iron tie rods as shown in Fig. 1 were fixed through holes bored in the side bearers or baulks, a sufficient number being used so as to allow of one set to be taken down at any time without danger to the structure. These rods could thus be examined at intervals, and any found worn replaced by new ones. It will be readily perceived that iron would be acted upon very rapidly by moisture so near a vitriol chamber. This corrosive action is well illustrated by an iron rod passing through a mass of brickwork, and on which some reliance had been placed, whose continuity was completely destroyed in the manner shown in Fig. 2.

From such facts it will be seen how necessary it is, when designing any structures, whose stability depends on iron stays or rods passing through brickwork or through wood

Fig. 2.

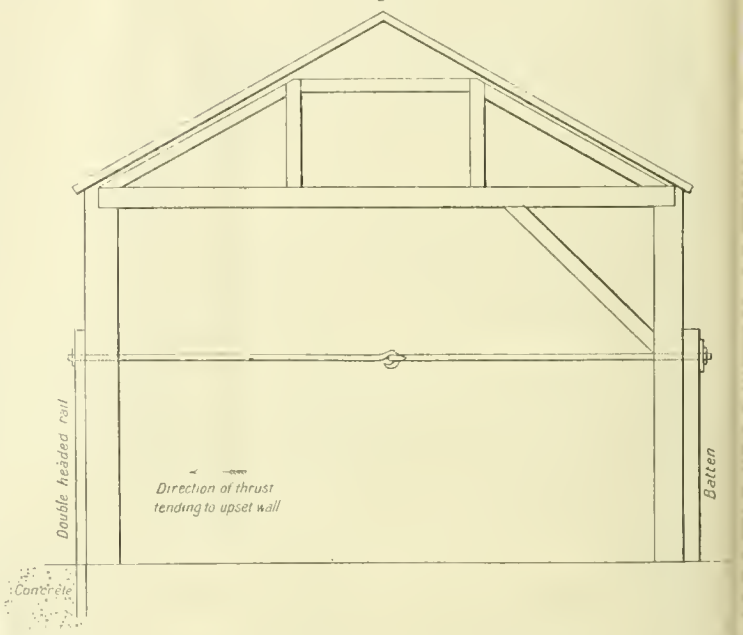


if there is the possibility of their ever coming in contact, with acid, to have them always in duplicate, or at any rate, so arranged that one can at any time be taken out for examination without danger.

The subject of the corrosion of iron by sulphuric acid is also of interest in other respects. An iron tank used for carrying about oil of vitriol must not be left with the dregs of the last load in if it is to remain idle for any length of time.

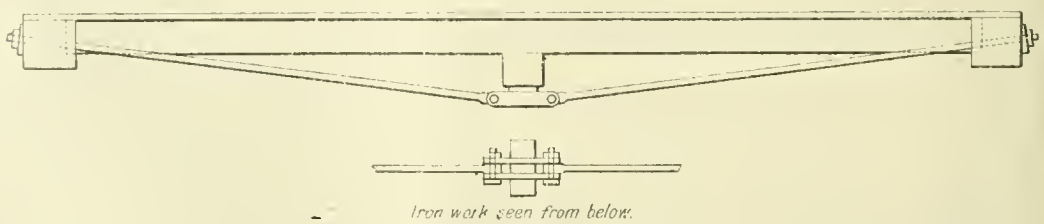
The action of acid on the foundations of a retort house made it necessary to renew a wall very frequently. At a time when it was inconvenient to build a new one, it was very successfully kept within bounds by means of a number of double-headed rails, each held in position by a tie rod going through the building (Fig. 3). The arrangement acted so perfectly that it was left standing for many years.

Fig. 3.



Concrete walls, as recommended in a recent issue of the "Journal of Gaslighting,"* might be frequently employed with advantage in chemical works. At any rate, the lower part of cast-iron columns might often be effectively protected by so casing them. The use of lead for this purpose is only permissible where space forbids the more massive concrete covering, and especially is it undesirable to use lead if the column is likely to be subjected to the action of moisture or weak acid. How powerful an action is set up may be seen in iron railings that have been fixed to stone walls by means of lead. Such railings become completely worn through at the junction of the two metals, unless indeed they have been carefully protected by frequent painting.

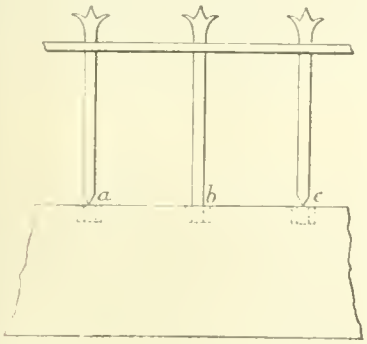
Fig. 1.



* Jan. 14, 1902, pp. 88—9, article "Reinforced Concrete Construction."

A consideration of this circumstance might seem to ondemn the practice of dipping the heads of iron nails in olten lead when required for fastening the projecting gs from the chamber sides to the wooden uprights. No ubt corrosion of the iron is set up within the wood, but is probably not so active as it would be if the naked ou head of the nail were exposed to air and moisture when contact with the leaden lug that it holds.

Fig. 4.



The experience with ordinary brick walls certainly ondemns them for vitriol works. Blue bricks, although ore costly to begin with, are far and away cheaper in the ng run. Good blue bricks will stand such actions as ose mentioned and be none the worse after 30 or 40 ears' time. The only thing is the question of the joints. rdinary mortar will be equally acted on whether it is laced between common or between blue bricks. A mortar r cement made of boiled tar and sand if used with blue ricks makes a wall that will stand any such corrosive ctions as those that we are considering.

Ordinary mortar seems to be much affected by the gases iven off from ammoniacal liquor, *i.e.*, gas liquor during a orm.

A chamber that was threatening to lean over was very ffectively kept vertical by means of long rick poles. Such device should not be despised because of its simplicity.

The occasional shaky condition of chimney shafts is ne to which those in vitriol works must be liable, specially where the escaping gases from the chambers are ent into them. One may therefore refer to the subject of inding or hooping such shafts, which is sometimes done on ncorrect principles. For square shafts the method shown n Fig. 5 is the best to employ. It will be seen that the oops are made up of four flat bars, each having a hole at ne end, and the other end being drawn out so as to form a olt, which is fastened to the next bar by a nut. Such a oop can be tightened up better than if made in two halves. With angle irons at the corners running up a considerable eight, such hooping will make an old chimney almost etter than it was originally, assuming that it has remained erpendicular. The angle irons at the corners, of course, eep away the hoops, if made of straight bars from the face f the chimney. It may be desirable that they should lie gainst the brickwork, in which case the component bars ould be bent as shown at A B (Fig. 5). When this is one the bars should be stronger in proportion than if made raight.

Chambers that are exposed to all weathers may have to esist the whole force of a storm, and except when very ew, not always successfully.

Considerable gaps in the chamber sides may be closed mporarily by so simple a means as pieces of half-inch oard held against the face of the lead and nailed to the prights by strips of wood. A repair like this, however, an only serve a very temporary purpose, but one that will tand a longer time may be effected by covering the wood, efore putting in place, with thin lead sheet, say, 3 or 4 lb. o the square foot. This might be kept up for a comaratively long period if properly luted.

The subject of lutes and cements that will stand the action of acids is one of great importance. Mortar or any ether binding material that happens to be handy will be sometimes used in the most undesirable places. The bricks that protected the sides of a square leaden tunnel to carry

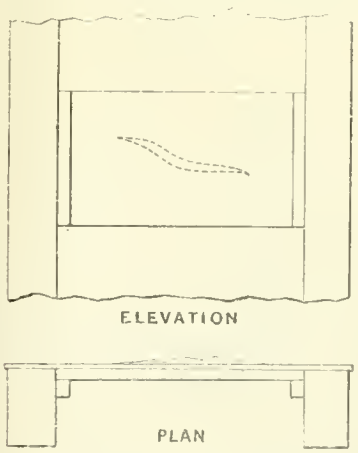
Fig. 5.

away the gases from a kiln would not hold together when it was found that fireclay was used to lay them with. Plaster of Paris was thought of, and it made a more stable joint than any cement previously tried.

This success led the writer further to extend the use of an insoluble sulphate on another occasion when a chamber began leaking at the bottom. Sulphate of baryta, which can be obtained very finely ground and at very little cost, was tried, a few handfuls being thrown into the chamber; the leak was readily stopped.

Having found sulphate of baryta thus useful, it was further applied for stopping leaks from concentrating pans when such occurred, although its employment to be successful in these cases requires great discretion, or clearly if too large a quantity of the material is thrown

Fig. 6.



into the acid lead concentrating pan, the bottom of which is in contact with hot iron plates, the lead may quickly be melted if a large heap of "barytes" has accumulated in any place, and instead of mending matters they may be made very much worse. Evidently it depends on the cause of the leak, whether such a method of ever temporarily stopping it is applicable or not. Nevertheless, in most

cases the flow of acid through a crack will be sufficiently arrested to make it worth while always to have a supply of sulphate of baryta in case of accident.

It is very difficult to say beforehand how a lead pan is going to fail. One of the most recent cases that the author has had occasion to observe was due to a crack in the side wall, which allowed some nitrous gas to get to the outside of the pan. Its action made quite a groove in the lead that soon brought the usefulness of the pan to an end.

In connection with this matter of lead pans for the concentration of chamber acid to B.O.V., it may be noted that very thick lead is still sometimes employed, reaching the thickness of 30 lb. to the square foot. Pan after pan has been known to rapidly fail when using such lead, blame being thrown on the manufacturers of the sheets. Such blame may have been falsely directed.

It is obvious that with a poorly conducting metal like lead, and one melting at so low a temperature, the heat may not always get conducted away from a thick sheet with sufficient rapidity to ensure its safety from fusion. At any rate, experience proves that pans of 10-lb. lead are quite thick enough for all necessary purposes. They last longer than the thicker ones, and are altogether easier to manipulate and put into place.

There is one respect, however, in which the thicker pans have the advantage. This is that the sides hold up better; they keep up of their own accord. Men accustomed to the putting up of such pans, when changing to thin ones are apt to overlook the ready means at hand for providing for the falling over of the thinner lead under unforeseen pressure. Thus the side may gradually fall in, perhaps in some dark corner, the acid flowing out, and the pan being declared leaky when really perfectly sound. This precaution is taken by simply attaching lead strips here and there to the top of the pan and bringing them over the supporting walls.

Some extraordinary results are produced by very small pinholes in the bottom of a leaden concentrating pan. Such a hole may just allow the acid to weep through, which will, nevertheless, act on the iron plate underneath. This action being continued, a hillock of sulphate of iron sometimes forms that gradually lifts the lead up, enlarging the hole, the leak then being discovered. A formation of this character was noticed a short time ago that had a diameter of six inches, and was not less than one inch in height at the centre.

Reference has been made to chambers that are exposed to all weathers. It may be thought that such chambers should have their sides and ends burnt to the bottom lead, and, theoretically, it would no doubt be the best thing to do. Probably experience would prove that this supposition is wrong, for no doubt the shaking of the sides by the wind would be communicated to the bottom if all were soldered together, and leakages of the acid would be more frequent than is now the case.

The consequence of the usual arrangement, however, is that the rain that falls against a side or end of the chamber gets into the bottom acid, usually not a very serious matter. During a period of excessive rain, however, the author has known a most provoking fall in the strength of the acid to occur. To prevent the recurrence of this he has devised an arrangement of channels as shown in the figure which should answer the desired purpose. A channel made of thin lead is placed between each pair of uprights, and extending from one to the other is burnt to the side of the chamber just above the top of the dish containing the acid. From the centre of the channels, which are closed at each end, a pipe, also of lead, leads away the water that comes down the sides. An iron gutter into which the various pipes flow carries the water to a convenient place.

Fig. 7.

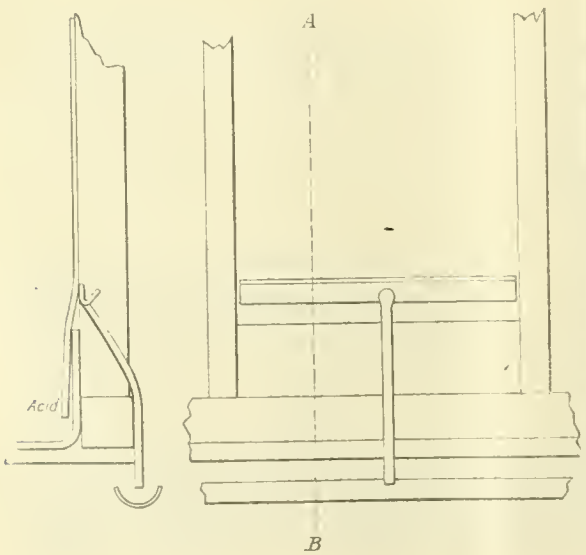
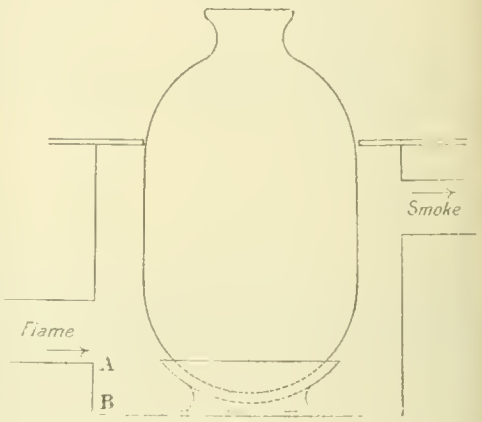


Fig. 8.



Where comparatively small quantities of oil of vitriol have to be rectified the method is still employed of using retorts, against the naked sides of which a coal flame is allowed to play. It is almost incredible that such a process can be conducted with safety, and yet there is very little danger when the furnaces are constructed on correct principles. The retorts are placed on cast-iron saucers, each in its own compartment of brickwork, which is connected by a flue with its furnace so that the retort is exposed on all sides to the heat. Now in the event of a breakage, the space from the floor of the compartment to the top of the furnace flue must first fill with acid to the height A B before any can come out in the liquid form by way of the flue through the furnace door. This gives the attendant time to get out of the way, as fumes, of course, come out immediately when a breakage occurs and give him warning. When the acid reaches the point A it flows out along the flue, then on to the hearth, and into a gutter running along the front of the furnaces, by which it is led away into a sunk cistern. But everyone will ask what becomes of the acid left in the compartment and that does not run out in the way just now described? Well, it is simply absorbed by the brickwork, with which it plays havoc.

This is the weakest spot in the whole arrangement, and the author has thought that a cast-iron pan to form the bottom of the compartment from which the acid could eventually be siphoned would be the true solution of the difficulty, which he offers knowing that the process as described is still in use.

Before concluding, he would urge the importance of having everything in a works as much as possible of standard sizes, as a means of quick repair in case of accident. This is a point of such importance in this connection that it

nnot be too often repeated. A flange from the scrap ap may save the situation in a works conducted on this inciple, when the very same accident might cause a serious day in another works where it is disregarded, although e store might be full of new flanges of many kinds and zes. The manager will frequently have cause to be ankful even if he only follows the rule partially.

The chief object of this paper has been to show how vigilant eryone should be, who is in any way responsible for the ability of structures of whatever kind they may be. The cent case at Belfast shows what can happen in a textile ctory, but the vigilance necessary in such places is small comparison with what is required in chemical works here corrosive actions of the nature described may be set o. The sword of Damocles indeed impends over the hemical manager under such circumstances, and it is well w and then to be reminded of possible danger so that it ay be averted.

Discussion.

Mr. W. G. Timmans concurred with Mr. Carulla in ecommending blue bricks; common bricks were of very ttle use in chemical works. In regard to chimney shafts e had seen one about 80 ft. high that was 14 ins. out of e perpendicular straightened very easily by steeplejacks a few hours. He had found lead sulphate a good thing r stopping leaks in lead acid containers. Sulphate of aryta as recommended by Mr. Carulla was probably also ood. The leakage of acid concentrating pans was a very roublesome thing. A pan would fail and when cleaned ut no defect would be apparent until the plumber would ocate a pin-hole so small that it seemed insufficient to ecount for the damage done. He had expected some eference in the paper to personal accidents. The remedies sed in works are not always those approved by the doctors. A case in point was when once he had occasion to send wo men to the infirmary, who through the bursting of a etort had been splashed with oil of vitriol of 1·8 sp. gr. He used lime water and oil, but at the infirmary they pplied a weak solution of carbonate of soda to the wounds. Again there were the occasional cases of suffocation by ases, against which it was so easy to be prepared. He hought it would be a good thing if a code of rules were rawn up by competent persons for use in all such mergencies.

Mr. J. O'Sullivan asked if lead in the chambers gets ffected locally. He asked this because some years ago in onnection with a lead water-cistern pinholes appeared in arious places, which he was disposed to attribute to electro-hemical action due to impurities in the solder or in the ead itself. He had cut pieces out of this lead, having drops f solder upon them, and kept them in a closet cistern for wo and a half years, but he could not see that the long mmersion had produced any effect. The question why acid ttacks lead in any special place is one of much interest to ll who have to do with this metal.

Mr. F. E. Lott commented upon the general importance f Mr. Carulla's paper to all interested in manufactures—reweries as well as chemical works. Reference had been nade by Mr. O'Sullivan to the local action of lead. He ould give an instance of the copper lining of a tank eacting with an inferior solder that contained too much ead and too little tin. The tank was filled with ordinary rewing water and the electro-chemical action set up was uch that in 48 hours so much sulphate of lead was pro-luced that 3 oz. were scraped off from a space 12 ft. long y 2 in. wide. In regard to what had been said about ccidents, he thought the Society of Chemical Industry ight, with great advantage, form a committee and draw p a short series of immediate remedies for use in the arious works in which the Society was interested. Such a ode, printed and hung up in a conspicuous place n the articular works, would be of the greatest value. He referred o the St. John's Ambulance Classes as having been of mmense advantage in Burton and elsewhere.

Mr. Arthur Shearer said he should like to support the last speaker's statement in regard to accidents. Men so rely upon the managers for instructions that it should be pon their conscience to be able to aid them in cases of need. He also agreed with Mr. Timmans in his statement as to the value of compressed oxygen for suffocation cases. He had seen a man overcome by CO_2 in a carbonator brought round in a marvellous way by such means, a cylinder of oxygen being ready at hand. Olive oil and lime water, made into an emulsion, in cases of burns, and soap suds, in cases of scalds, he had found to be useful remedies.

Mr. John White said, in regard to the question of burns with acids, that an emulsion of equal parts of linseed oil and lime water, a remedy well known as Carron oil, was the best to apply. He always kept it in stock.

Mr. W. A. S. Calder said he thought that either linseed or olive oil might be used. He had tried with beneficial effect the addition of a small quantity of ammonia, about ½ per cent., a quantity that allowed the emulsion even to be applied to the eye. The linseed oil should be raw. Compressed oxygen was useful in cases of "gassing" by H_2S and CO, as well as CO_2, in fact, in accidents with almost any gas. The oxygen seems to bring the sufferer round in an incredible way. He would also emphasise the necessity for only considering an emergency remedy to the plant as a temporary and not a permanent one.

The Chairman said the discussion seemed to have turned on the question of personal accidents. It appeared to him that the best way of dealing with an accident from sulphuric acid would be in the first place to use water in large quantities, so as to wash away the acid as quickly as possible. Still better, if this could be done with lime water. It seemed lamentable that there is not in every works a code of rules hung up, as suggested by Mr. Lott. He thought that such codes were already obtainable.

Mr. Carulla, in his reply, said that it would be very gratifying to him if the discussion should lead to the preparation of special rules for the different works, as suggested. What was applicable to one works was needless in another, and the quicker an instruction could be found the more likely it would be to prove of value. In regard to the localisation of corrosion in lead, there is no doubt that it does occur, and it can only be due to impurities. Notwithstanding what has been said about getting the best results with lead containing a certain admixture of other metals, it seemed to him that, if lead could be got absolutely pure, it would be the most lasting for chemical use.

Scottish Section.

Meeting held at Glasgow, on Tuesday, January 28th, 1902.

DR. WM. FREW IN THE CHAIR.

PEROXIDE OF HYDROGEN: ITS MANUFACTURE, PROPERTIES, AND USES.

BY CHARLES A. FAWSITT, F.R.S.E., F.C.S.

Peroxide of hydrogen (H_2O_2) is a chemical product of considerable importance in the arts and manufactures, and it has come into use because it possesses properties which enable results to be achieved, quite impossible with other reagents. For instance, in the bleaching of ivory, bones, silk, and feathers it could not be replaced. It may be regarded as a "Fine" chemical, as its preparation demands great care, and cannot be conducted except under the superintendence of a competent chemist. Several methods have been proposed for its preparation, but those in use consist in dissolving a metallic peroxide in a mineral acid.

Within the last few years, persulphates, percarbonates, and perborates prepared electrolytically, have been proposed as a convenient source of H_2O_2, as when dissolved in acidulated water it is readily produced. The expense, however, of this mode of preparation quite precludes the possibility of competition with the methods now in use, at any rate for a considerable time.

Peroxides used in the Manufacture of H_2O_2.—Barium, sodium, and calcium peroxides are used for the preparstion of H_2O_2, but the first named has been the most generally adopted.

When sodium peroxide was introduced, it was thought by some that it would supersede barium peroxide, but it has been found more expensive, and dangerous to use. The use of CaO_2 has never got beyond the experimental stage so far as I am aware.

In selecting a barium peroxide it is of importance to procure a quality containing a high percentage of BaO_2 as free as possible from iron and alumina, and very finely ground.

With a BaO_2 of high percentage there is less waste of acid less unnecessary heat evolved when dissolving in acid, and it is possible to get up the strength of the solution more quickly.

Iron and alumina are always present in commercial BaO_2, but it is advantageous to select a quality containing as low a percentage as possible.

The fineness of the BaO_2 is important because its solution takes place more easily, and so allows of the process proceeding more rapidly and with less chance of decomposition.

The usual method employed for the preparation of BaO_2 is to decompose barium nitrate at a full red heat, in fire-clay vessels, into barium oxide, which is afterwards converted into the peroxide by passing over it dry and purified air at a temperature of 300° C. to 350° C., preferably under a slight pressure. As barium nitrate is a fairly expensive salt and yields only a little more than one half its weight of oxide, it follows that BaO_2 is a dear chemical especially when 1 ton of 90 per cent. yields only 381 lbs. of oxygen available for making H_2O_2. To ascertain if a cheaper method for its preparation could be devised a series of trials were made with barium carbonate and also with barium hydrate.

Experiments to prepare BaO_2 from $BaCO_3$ and $Ba(OH)_2$.—100 grms. of finely ground carbonate were mixed with the following substances and heated in an iron tube to a strong red heat for five hours: —

Resulting Product.	Charcoal, 12 Grms.	Lamp Black, 12 Grms.	Coal, 18 Grms.	Mineral Oil, 50 Grms.	Charcoal, 12 Grms. Mineral Oil, 25 Grms.	Charcoal, 12 Grms. Pitch, 12 Grms.
$BaCO_3$	51·9	32·0	13·6	97·0	16·8	29·5
BaO	48·1	68·0	86·4	3·0	83·2	70·5

From the above numbers it will be seen that a considerable quantity of the carbonate was decomposed; and following up these trials a supply of barium oxide was made by reducing the carbonate with coal in the proportion of two parts of the former to one of the latter, which had been found to give the best results.

After the reduction, dried and purified air was passed over the mixture at a temperature of 350° C. to 400° C., but no BaO_2 was found, evidently all the BaO had been reconverted into carbonate owing to the carbon in the coke burning to CO_2. Another trial with the same mixture was made, but in this case passing the air over at a lower temperature, with the result that 18 per cent. of BaO_2 was produced, but these results were unsatisfactory. The product contained a little barium cyanide, which was a dangerous impurity.

Another set of trials was made differing from those just mentioned, in that no carbonaceous matter was used. Dittmar has shown that Barium carbonate when heated strongly in hydrogen gas loses its CO_2 and gives BaO. In order to test this a quantity of finely powdered $BaCO_3$ was placed in an iron tube, heated to a full red heat for three hours, in a current of hydrogen gas; but the resulting mixture gave 89 per cent. of undecomposed of $BaCO_3$. This experiment was repeated, but coal gas substituted for the hydrogen; 87 per cent. of $BaCO_3$ remained undecomposed, the balance being barium hydrate and a little barium sulphide. The mixture had fused into a solid mass, owing to the heat not having been sufficiently high to prevent the formation of hydrate. Experiments were made adding lime to the mixture to keep it from fusing, but the results were not encouraging, and the trials in this direction abandoned as, unless a product containing at least 50 per cent. of BaO_2 could be obtained it would be of no use in the preparation of H_2O_2. It was, finally, resolved to adopt a BaO_2 made in the ordinary way by decomposing the nitrate by heat, and converting the resulting oxide into BaO_2 by passing over it dry and purified air.

At one time the author's firm made their own BaO_2, but as the quantities used were small, it was subsequently found more economical to buy it, and a supply was procured testing about 90 per cent. of BaO_2, containing a smaller amount of iron and alumina than usual, and also very finely ground. The impurities in BaO_2 are BaO, $Ba(OH)_2$, $BaCO_3$, Al_2O_3, Fe_2O_3, SeO_2. The combined percentage of Fe_2O_3 and Al_2O_3 varied from 1 to 2 per cent., and was an impurity derived from the clay pots in which the oxide was made, and which had to be got rid of in the subsequent operations, or the keeping properties of the finished H_2O_2 would have been unsatisfactory.

The BaO_2 could be used as received, or after slaking with water, or after precipitation.

Slaked Barium Peroxide.—In order to render the barium peroxide more easily soluble, it was for a considerable time slaked with two or three times its weight of water in large wooden trays. During this treatment it swells considerably, and must be well stirred to keep it from caking. The water must be cold, or the BaO_2 decomposes. When using this product it was brushed through sieves to ensure a fine state of division. The hydrated barium peroxide thus prepared was found to carry in too much water, and so make it difficult to get the solution of H_2O_2 up to the required strength. Besides, it added too much to the cost of manufacture.

Precipitated Barium Peroxide.—This was made by dissolving the commercial BaO_2 in HCl, and adding the requisite amount of NaHO solution to effect the precipitation, and then pumping the whole through a filter-press. This product is very well suited for the process, as it dissolves very readily in the acid. But although it was used for special purposes, it was rejected for ordinary use on account of its expense, and also because it carried in too much water, the pressed cake containing 50 per cent. of water.

For ordinary work the BaO_2 was used as received.

Possible Acids.—There are several possible acids, H_2SO_4, HF, H_3PO_4, HCl, and HBF_4, and mixtures of one or more of these. The first three are not very suitable when used alone, as the particles of BaO_2 become coated with insoluble sulphate, fluoride, or phosphate of barium, and the reaction, which commences, very quickly slows down. That it is quite possible, however, to use these acids is shown by an almost complete reaction taking place between them and BaO_2 when they are ground together in a mortar. If these decompositions could be readily brought about, it would render the preparation of H_2O_2 easier, and in other respects possess certain advantages which will be mentioned later on.

The other acids are HCl and HBF_4, and they are both suitable as regards the dissolving of the BaO_2, but the former possesses the all-important advantage of cheapness, whilst the H_2O_2 produced by the latter was the more stable.

For some time a mixture of HCl and HBF_4 was used, and the results, as regards the finished H_2O_2, very satisfactory, but to save expense the HBF_4 was latterly replaced by HCl.

The HCl should be commercially pure and contain no arsenic.

Preparation of Hydrogen Peroxide.—Several earthenware vessels of about 50 galls. capacity were used for dissolving the BaO_2, and hand-stirring was adopted.

Into each vessel, 25 ozs. of commercially-pure HCl, 10 galls. of wash water from a previous charge, and 40 lbs. of ice were placed, and into this liquid were sprinkled 3½ lbs. of BaO_2 during constant stirring. The stirring is an important part of the operation, as, if insufficient, the BaO_2 collects at the bottom of the vessel, locally causing an alkaline reaction which brings about decomposition of H_2O_2. The BaO_2 which falls to the bottom should be ground between the end of the stirrer and the bottom of the vessel, which greatly assists solution, especially if there are any coarse particles of BaO_2 contained in the quality being used. It is for this reason that a BaO_2, which is finely ground, is to be desired.

When the 3½ lbs. of BaO_2 are dissolved, 3 pints of dilute H_2SO_4 are added to precipitate the barium. This acid is made by diluting 1¾ galls. of vitriol with 2 galls. of H_2O, and allowing to become quite cold. There is now in solution HCl and H_2O_2 and $BaSO_4$ in suspension, and the above operation is repeated until 54 lbs. of BaO_2 have been added to each vessel. During the charging it is important that the heat evolved from the reaction, *i.e.*, between the HCl and the BaO_2, should not raise the temperature of the liquid above 15° C.—it was very rarely above 13° C.—and for this purpose ice is added, the amount varying from 80 lbs. in the winter, when the temperature of the air was about 0° C., to 200 lbs. in the hottest part of the summer. The fifth and tenth instalments of BaO_2 were somewhat larger than the others, so as to ensure of the liquid being made slightly alkaline. This was rendered necessary to make certain that there was not an undue excess of H_2SO_4 present in the liquid, which might easily occur if the BaO_2 were not being completely dissolved, and in which case the solution of the BaO_2 would be retarded. When all the BaO_2, *i.e.*, 54 lb., had been added, the liquid was slightly acid.

The process should be pushed on as quickly as possible consistent with complete solution of each instalment, as there is from the commencement a slight decomposition going on. The next stage, which embraces the precipitation of the Fe_2O_3 and Al_2O_3, and the pumping of the liquor, which is slightly alkaline, through a filter press, has to be very expeditiously carried through.

To remove the Fe_2O_3 and Al_2O_3, ¾ lb. of sodium phosphate is added in solution, then sufficient BaO_2 or waste BaO to make the solution neutral, and lastly ammonia to make the reaction decidedly alkaline. Then the liquor is pumped through a filter-press as quickly as possible, and the H_2O_2 solution as it comes from the press run into an earthenware vessel in which has been placed a small quantity of H_2SO_4, enough to make the entire filtrate slightly acid. Sodium sulphate (free from iron) is now added to remove all traces of barium, and the H_2O_2 solution allowed to stand overnight to settle when it should be ready for running off into carboys. If a purer H_2O_2 is desired special care is necessary in each stage of the preparation. But H_2O_2 prepared by the method just described is fairly pure. It should not contain above 15 to 20 grms. of solids and 5 to 10 grms. of free acid per gallon. The strength of the solution should be 12 vol. All the $BaSO_4$ precipitate is contained in the filter press, and as it holds a considerable amount of H_2O_2, it is washed by pumping water through the press. The wash water usually tests about 4 vol., and serves for diluting the HCl in the next charge. It is made slightly acid.

An iron filter-press was used, the plates of which were coated from time to time with black varnish, but no doubt a press with wooden or enamelled plates would be preferable.

The loss of H_2O_2 in going through the press was 0·5 vol., *i.e.*, if the strength was 12½ vol. in the vessel before pumping it was 12 vol. when finished and ready for sending out.

The Yield of Hydrogen Peroxide.—The yield of 12 vol. of H_2O_2 for each vessel was 24 galls., besides 130 lb. of $BaSO_4$ paste, containing 50 per cent. of water, and to produce this there was used—

54 lb. of BaO_2 (87 to 90 per cent.),
25 oz. of HCl (34½° T.),
32⅓ lb. of vitriol,
¾ lb. of sodium phosphate,
1½ lb. Glauber's salts,
Ice depending on the time of the year.

The actual, as compared with the theoretical, yield was as follows :—50 lb. of BaO_2 (90 per cent.) should give 24 galls. of 12 vol. H_2O_2, but in practice it required 54 lbs.

Although the HCl was fairly strong when commencing a charge, it gradually became weaker as each fresh instalment of BaO_2, H_2SO_4 and HCl and ice was added, until the liquid measured about 3½ times its original volume, but the time for dissolving the first and last instalment of BaO_2 was very little different.

The Use of H_2SO_4 and H_3PO_4.—If H_2SO_4 and H_3PO_4 had dissolved BaO_2 easily, the process would have been simplified, as very much larger instalments could have been added, and at the same time the solids would have been low.

H_2O_2 is sold, the solids of which consist almost entirely of phosphate, leading to the belief that it has been prepared from H_3PO_4, but the price of such is prohibitive for ordinary uses. It has the advantage, however, of being specially stable. It has been stated that H_3PO_4 is preferable to use, as it evolves less heat in dissolving BaO_2 than in the case of HCl, but this is only true under certain conditions. From the equations—

$$BaO_2 + 2HCl + Aq = BaCl_2 + H_2O_2 + Aq = 220K$$
$$BaO_2 + 2H_3PO_4 + Aq = BaH_4(PO_4)_2 + H_2O_2 + Aq = 224K$$

from which it is seen that H_3PO_4 gives out 224 calories as compared with 220 calories for HCl; but if, say, 100 lb. of 90 per cent. BaO_2 are dissolved in 20 per cent. HCl the rise in temperature of the liquid would be 61° C.; whereas, in the case of 20 per cent. H_3PO_4, it would only be 25° C., which difference is accounted for by the very much larger volume of liquid in the case of H_3PO_4 (20 per cent.), but in this latter case more ice would be required to keep the temperature of the solution at 15° C.

Possibility of increasing the Size of the Apparatus.—Although in the mode of preparation just described small vessels of about 50 gals. capacity were used, no difficulty should arise if vessels of, say, 500 gals. capacity, were employed, if suitable stirring and cooling arrangements could be devised. Of course, hand stirring would be inadmissible. Artificial cooling would also be necessary, and the charges of acid and BaO_2 increased in proportion.

The most Economical Strength.—To save expense in carriage, cost of handling, &c. it may be thought that it would be more economical to make 20 or 30 vol. H_2O_2 instead of 10 and 12 vol., but although it can be prepared at these strengths by taking special precautions, yet it has been found by experience that 12 vol. is the most economical strength both for buyer and seller, as the loss from decomposition and the cost of production is higher in proportion for the higher strengths. There is not much 20 or 30 vol. H_2O_2 sold. 20 vol. H_2O_2 cannot be prepared by the above method, as the addition of ice would make it impossible to get up the strength, and outside cooling must be adopted.

As a 12 vol. H_2O_2 contains, approximately, 96·5 per cent. of water and 3·5 per cent. of H_2O_2, it can be readily understood that carriage from one place to another influences the price, and how difficult it is for makers at a distance to compete with those whose works are situated in close proximity to the users.

Cost of Manufacturing H_2O_2.—In order to ascertain if the process were profitable, careful trials were made from time to time, and below are the full details of two which were made when a mixture of HCl and HBF_4 was used.

In these cost sheets no charge was made for chemist's salary, carriage, or depreciation, and no value was placed on the $BaSO_4$ paste. These trials were confirmed by the annual balance sheet, which sometimes showed a small profit, but oftener a loss.

PROFIT AND LOSS ACCOUNT.

Trial No. 1.—*From August 4th to October 13th*, 1894.

	£ s. d.		£ s. d.	£ s. d.
By 2,000 gals. of 10 volume peroxide of hydrogen at 1*s.* 4*d.* per gal.	133 6 8	To chemicals used :—		
		Barium peroxide, 4,226 lb.	89 9 8	
		Hydrochloric acid, 444 lb.	7 17 11	
		Oil of vitriol, 1,812 lb.	2 13 9	
		Boracic and hydrofluoric acids, ammonia, Glauber salts, sodium phosphate.	2 12 0	102 13 4
		Ice, 10,328 lb.	7 9 9	
		Wages	13 0 0	
		Rent and taxes	0 16 6	
		Sundries	1 16 0	23 1 9
				125 15 1
		Profit		7 11 7
£	133 6 8		£	133 6 8

Trial No. 2.—*From March 13th to April 16th*, 1896.

	£ s. d.		£ s. d.	£ s. d.
By 827 gals. of 12 volume peroxide of hydrogen at 1*s.* 6*d.* per gal.	62 0 6	To chemicals used :—		
		Barium peroxide, 2,296 lb., at 38*l.* 16*s.* per ton	39 15 0	
		Oil of vitriol, 1,200 lb., at 3*s.* 6*d.*, less 5 % per cwt.	1 15 8	
		Hydrochloric acid, 7 gals., at 4*s.*, less 5 % per gal.	0 2 6	
		Ammonia, 1¾ gals., at 1½*d.* per lb.	0 2 0	
		Glauber salts, 20 lb., at 3*s.* per cwt.	0 0 8	
		Sodium phosphate, 91 lb., at 14*s.* per cwt.	0 11 3	
		Hydrofluoric acid, 20½ lb., at 6*d.* per lb.	0 10 3	
		Boracic acid, 6 lb., at 31*s.* 6*d.* per cwt.	0 1 6	42 18 10
		Ice, 3,056 lb., at 23*s.* 6*d.* per ton	1 12 0	
		Rent and taxes	0 16 0	
		Sundries	1 6 0	
		Wages	8 15 0	12 9 0
				55 7 10
		Profit		6 12 8
£	62 0 6		£	62 0 6

In trial No. 1 chemicals cost 1*s.* 0½*d.* per gal. H_2O_2 (10 vol.).
" " wages " 1¼*d.* " " "
" " ice " 1*d.* " " "

In trial No. 2 chemicals cost 1*s.* 0¾*d.* per gal. H_2O_2 (12 vol.).
" " wages " 2½*d.* " " "
" " ice " 0½*d.* " " "

With a larger apparatus fitted with improved method for stirring and cooling, no doubt a considerable saving could be effected in wages, ice, and taking into account that there is now a ready sale for the $BaSO_4$ paste, it could no doubt be worked to better advantage, especially if the manufacture were carried on within reasonable distance of the localities where H_2O_2 is used.

As viewed now, the West of Scotland was not a good locality in which to start operations, but it was expected that several firms might be persuaded to adopt H_2O_2 for bleaching purposes, but such was not the case; after carrying on the process for 10 years it was given up, as the output only amounted to 1,200 gals. per month; value, about 75*l.* To have carried on an active competition in districts far removed would have been ruinous.

The Requirements of H_2O_2.—The chief requirement of a solution of H_2O_2 is that it should be stable, and to ensure this great care is required in its preparation. It is important to remove all the Fe_2O_3 and Al_2O_3, to have sufficient free acid present, and to keep the solids low. It does not follow that H_2O_2 with high solids will necessarily decompose more quickly than one with low solids; it depends more on the method of preparation. But two samples of H_2O_2 prepared by the same method, but one having twice the proportion of solids, decomposition will take place more rapidly in the solution containing the most solid matter.

Stability of H_2O_2.—A series of trials were made in order to arrive at some idea as regards the stability of H_2O_2.

1st. When evaporated under ordinary and reduced pressure.
2nd. When agitated violently.
3rd. When exposed to sunlight.

——	I.	II.	III.	IV.
	Vol.	Vol.	Vol.	Vol.
Original strength	7·8	7·0	7·3	8·1
Strength evaporated 20 c.c.	19·6	16·2	18·0	18·8
Calculated strength	19·6	16·2	18·3	20·3

1st. Took 50 c.c. of four different makes of H_2O_2, and evaporated on a water-bath to 20 c.c.

The loss, except in case of sample IV., was trifling.

Took 4,250 c.c. of 4·8 vol. H_2O_2, solids 5·6 grms. per gal., evaporated on a water-bath to 1,200 c.c., the temperature of the liquid being 78° C.—

	Vols.
Strength found	15·2
" calculated	17·0
Loss	1·8

Continued the evaporation to 400 c.c.—

	Vols.
Strength found	30
" calculated	57
Loss	21

A set of trials by boiling under reduced pressure was made.

Took 120 c.c. of 3·4 vol. and distilled under a reduced pressure of 25 ins. of mercury to 9·4 c.c.—

	Vols.
Strength found	36·6
" calculated	40·5
Loss	3·9

Took 1,900 c.c. of 4·45 vol. H_2O_2 and distilled under same reduced pressure to 700 c.c.—

	Vols.
Strength found	12
" calculated	12·1

The strength of the distillate was found to be 0·19 vol.

Again took 1,000 c.c. of 10 vol. distilled under same reduced pressure to 85 c.c.—

	Vols.
Strength found	80
" calculated	117·5

The distillate (915 c.c.) tested 0·1 vol.

Agitation of H_2O_2.—As it was generally supposed that agitation caused H_2O_2 to decompose, a few trials were made with a view of ascertaining if such were the case.

A bottle containing half a gallon of 7·8 vol. H_2O_2 was placed in a box, which was fastened to the flywheel of a small engine, which revolved rapidly, for six hours; there was no loss. After revolving for 24 hours it tested 7·77 vol.; after 120 hours, 7·7 vols. Another bottle containing the same quantity of 33·4 vol. H_2O_2, which had been prepared by evaporating 10 vol. on a water-bath, and in which the solids would, consequently, be high, was agitated for 120 hours in the same manner as before, and found to be 32·7 vols.; loss = 0·7 vol. In order to gain some idea as to what the keeping properties of H_2O_2 would be in a warm climate, half a gallon of 10 vol. H_2O_2 was kept at a temperature of 30 to 35° C. for one week: loss = 0·1 vol.

As regards the keeping properties of H_2O_2 when in ordinary use, the following will serve as a good example:—3 carboys of 10 vol. H_2O_2 which had been returned by a bleacher after standing 18 months tested 8 vol., and considering they had passed through two summers and might have been exposed to direct sunlight, the result was considered fairly good for a commercial article.

Decomposition of H_2O_2 by Sunlight.—Sunlight is a very potent factor in the decomposition of H_2O_2 solution, and in Table I. are the results of a series of trials, with three samples prepared by different methods.

The composition of the samples as regards strength, solids, and acidity was as follows:—

No.	Strength.	Solids.	Corrected Solids.	Acidity.
	Vols.	Grms. per Gall.	Grms.	Grms. HCl. per Gall.
1	9	18	27·8	9·8
2	9	7·25	12·9	5·6
3	9	18·3	28·3	5·9 Al_2Cl_6 10·0 HCl

The acidity was high in order to favour stability. Six similar 16 oz. bottles of clear glass were filled about three-quarters full with equal quantities of the H_2O_2 solution, *i.e.*, two bottles each of I., II., and III., and these were placed close to a window facing the south-east. One bottle of each sample was left exposed to the light, whilst one bottle of each was shaded from direct sunlight by placing a thick board between them and the window. A cork was fitted into each bottle through which a very small hole was bored, with a needle, to allow of the O_2 escaping. Similar bottles filled with same quantity of water, and into which dipped a thermometer, were placed in sun and shade.

The temperature was read every day at the same time when the heat effect produced by the sun was at its maximum. The bottles remained in position for 457 days, and were never moved except whilst drawing a sample for testing purposes.

TABLE I.

Sun.

Date.	No. I.			No. II.			No. III.		
	Vol.	Loss.	Monthly Loss.	Vol.	Loss.	Monthly Loss.	Vol.	Loss.	Monthly Loss.
1895.		Per Cent.	Per Cent.		Per Cent.	Per Cent.		Per Cent.	Per Cent.
10th June	9·00	..	..	9·06	..	..	9·00	..	..
10th July	7·02	22·0	22·0	5·02	44·4	44·4	7·40	17·7	17·7
10th August	5·20	42·2	20·2	2·10	76·6	32·2	6·50	27·7	10·0
10th September	4·30	52·2	10·0	0·70	92·2	15·6	5·60	37·7	10·0
10th October	3·80	57·7	5·5	0·14	98·4	6·2	5·10	43·3	5·6
10th November	3·40	62·2	4·5	0·00	100·0	1·6	4·80	46·6	3·3
10th December	3·18	64·7	2·5	..	..	..	4·50	49·8	3·2
1896.									
10th January	3·00	66·7	2·0	..	..	..	4·50	49·8	0·0
10th February	2·70	70·0	3·3	..	..	..	4·40	51·1	1·3
10th March	2·64	70·6	0·6	..	..	..	4·38	51·3	0·2
10th April	2·35	73·8	3·2	..	..	..	4·07	54·7	3·4
10th May	1·40	84·4	10·6	..	..	..	3·20	64·4	9·7
10th June	0·90	90·0	5·6	..	..	..	2·80	68·8	4·4
10th July	0·70	92·2	2·2	..	..	..	2·50	72·2	3·4
10th August	0·65	92·7	0·5	..	..	..	2·26	74·8	2·6
10th September	0·53	94·1	1·4	..	..	..	1·92	78·6	3·8

Shade.

Date.	No. I.			No. II.			No. III.		
	Vol.	Loss.	Monthly Loss.	Vol.	Loss.	Monthly Loss.	Vol.	Loss.	Monthly Loss.
1895.		Per Cent.	Per Cent.		Per Cent.	Per Cent.		Per Cent.	Per Cent.
10th June	9·00	..	..	9·00	..	..	9·00	..	..
10th July	8·90	1·1	1·1	6·80	24·4	24·4	8·96	0·4	0·4
10th August	8·70	2·9	1·8	4·90	45·5	21·1	8·93	0·7	0·3
10th September	8·60	4·4	1·5	3·50	61·1	15·6	8·90	1·1	0·4
10th October	8·55	5·0	0·6	3·20	64·4	3·3	8·88	1·3	0·2
10th November	8·50	5·5	0·5	2·70	70·0	5·6	8·86	1·5	4·2
10th December	8·45	5·6	0·1	2·50	72·2	2·2	8·85	1·6	0·1
1896.									
10th January	8·42	6·4	0·8	2·40	73·3	1·1	8·84	1·6	0·0
10th February	8·40	6·6	0·2	2·20	75·5	2·2	8·80	2·2	0·6
10th March	8·25	8·3	1·7	1·85	79·4	3·9	8·70	3·3	1·1
10th April	8·20	8·8	0·5	1·75	80·5	1·1	8·70	3·3	0·0
10th May	7·90	12·2	3·4	1·20	86·6	6·1	8·65	3·9	0·6
10th June	7·80	13·3	1·1	0·79	91·2	4·6	8·65	3·9	0·0
10th July	7·50	16·6	3·3	0·60	93·3	2·1	8·65	3·9	0·0
10th August	7·30	18·8	2·2	0·51	94·3	1·0	8·65	3·9	0·0
10th September	6·79	24·5	5·7	0·12	98·6	4·3	8·56	4·9	1·0

From Table I. it will be noticed that the results are striking, and serve to show that H_2O_2, if carefully prepared, will, under conditions easily attainable, keep its strength for a considerable time.

The samples exposed to the sun gave a very different decomposition rate; for whilst No. II. was entirely decomposed in five months, Nos. I. and III., after standing 15 months, had only lost 94·1 per cent. and 78·6 per cent. respectively. The samples in the shade also showed very different rates of decomposition. No. II., in 15 months, lost 98·6 per cent. of its H_2O_2, whilst I. and III. only lost 24·5 per cent. and 4·9 per cent. respectively. No. III. was shown to be a very stable H_2O_2, and its stability was entirely due to its method of preparation. That the amount of solids did not accelerate the rate of decomposition is shown very forcibly in these trials, as No. II., which decomposed more quickly than I. and III., contained only one-half of the solids.

It will be noticed that, April—May, the loss of H_2O_2 increased very rapidly, especially samples I. and III. in the sun, and this cannot be accounted for by the increase in the temperature, as the heat was greater, May—June, when the decomposition rate was lower. These trials prove that H_2O_2 should be kept out of direct sunlight.

The sun, when shining, commenced to strike the bottles about 8.30 a.m., and passed off the window about 12 o'clock. Directly it shone on the bottles the temperature rose quickly, and gas bells were seen rising to the surface. The maximum time the sun could shine on the window was about 3½ hours. The greatest difference in temperature noticed between the bottles in sun and shade was 10° C., *i.e.*, on same day.

The Uses of H_2O_2.—The most important uses to which H_2O_2 has been applied, are the following:—For the bleaching of wool, silk-straw, bones, ivory, feathers, and hair; also for medicinal purposes. For bleaching purposes it has supplied a distinct want, as it was formerly impossible to get the results now obtained with this reagent.

When bleaching with H_2O_2, the bath is, with very few exceptions, made alkaline, rendered necessary in order to help the decomposition of the H_2O_2, and at the same time accelerate the bleaching process. The bath is also heated. The decomposition is quite visible to the naked eye, and it is therefore of much importance for economical working to make full use of the bath with the least possible delay; and failure in this respect has led a number of firms, who have made trials with H_2O_2, to discontinue its use. They state that compared with the old sulphur bleach, it is much more expensive; whilst if they had used up the H_2O_2 to the best advantage, the result might have been more satisfactory.

The alkali used for the bath, in the case of wool, straw, and silk, is silicate of soda; whilst for feathers, bone, ivory, and hair, it is ammonia.

Bleaching of Wool.—This constitutes one, if not the most important, use of H_2O_2, and it is claimed that by this process—

1st. A purer white can be obtained.
2nd. That the fibre of the wool is not "tendered" to the same extent as with the sulphur bleach.
3rd. That H_2O_2 bleached wool does not turn yellow on soaping.
4th. That H_2O_2 bleached wool does not emit an unpleasant odour when in contact with perspiration.

I wrote to one of the partners in a large firm who have had a long and varied experience in this method of bleaching, asking him if he could confirm the above points of advantage. He replied in the affirmative, and stated that he considered the method more convenient to use, more pleasant for the workpeople, and not corrosive on the machinery; also that this process was used to a certain extent for bleaching previous to dyeing pale clear colours, and it had the advantage of not leaving streaks, which sometimes cause trouble in dyeing goods which have been sulphur bleached. I also wrote another firm who have a special experience in H_2O_2 bleaching, and they replied stating that they considered a very important point in its favour to be that, owing to H_2O_2 bleached wool having less affinity for colour than that bleached by the sulphur process, purer tones could be obtained.

For the bleaching of wool two methods are practicable.

First Method.—The scoured wool is first of all immersed in a dilute solution of silicate of soda (2 lb. to 10 galls. of water), and allowed to remain until it is thoroughly soaked. This allows of the alkali getting thoroughly into the fibre, which assists the bleaching.

When thoroughly saturated the wool is taken out of the alkali bath, wrung out, and thrown into the peroxide of hydrogen bath, which is prepared by adding 3½ galls. of 10 vol. peroxide of hydrogen to 6½ galls. of water, in which has been dissolved ½ lb. of silicate of soda (102° T.). This is a 3½-vol. bath, but the water in the wool and the subsequent addition of alkali reduces the strength to about 3 vol. The wool is kept in the bath for 24 hours at a temperature of 80° F., and during this time the wool is occasionally turned over, and the bath is tested to find out if it is alkaline. This is rendered necessary, as the wool takes up alkali out of the bath gradually, and when once the bath is neutral it does not bleach satisfactorily, and to make it strongly alkaline at the commencement would spoil the wool. Sometimes the wool is kept in the bath a longer time than 24 hours, sometimes shorter; this depends on the quality of the wool and the whiteness aimed at. But when sufficiently bleached it is taken out of the bath, the excess of H_2O_2 solution wrung out, and hung up on frames in warm room until completely dry. This is an important point, as the bleaching action is intensified as the water evaporates. When quite dry the wool is well washed and redried.

This method produces a well-bleached wool, but it has the disadvantage that the H_2O_2 bath gradually becomes too dirty to use owing to the solution which is wrung out of the wool, when taking it out of the bleaching bath, and therefore there is a loss of material.

In the *second method* this is obviated. Into the H_2O_2 bath, made up of 3½ galls. of 10 vol. H_2O_2, 6½ galls. of water, and ½ lb. of silicate of soda, 28 lb. of wool, which have previously been soaked in a dilute solution of silicate of soda and wrung out, are packed, and after standing for one hour, during which time it is turned over occasionally, it is taken out, wrung, and placed in a suitable vessel, then another 28 lb. of wool, which has had the same preliminary treatment as above described, are put in the bath, and this quantity of wool should be sufficient to absorb practically all the solution. The whole 56 lb. of wool are now put into a suitable vessel in a warm room or stove, and kept at 80° F. for 24 hours, when the wool is taken out, completely dried in, washed, and redried. By this method 10 oz. of 10 vol. H_2O_2 are used up for 1 lb. of wool, whilst 12 oz. of 10 vol. are used up for 1 lb. of wool by the first method.

The cost of bleaching 1 lb. of wool in a well-conducted establishment should not amount to more than ¾*d.*, *i.e.*, by H_2O_2 method, and if a manufacturer used a large quantity of H_2O_2 it would be considerably reduced if he prepared his own H_2O_2, as in that case less care would be required in its preparation, as it could be used up when made. A user of H_2O_2, whose works are situated at a considerable distance from the source of supply, is paying 2*d.* or 3*d.* per gallon of carriage on an article that only costs about 1*s.* 3*d.* per gallon. The H_2O_2 bleach for wool has not been largely used in Scotland, but in England and on the Continent considerable quantities are consumed.

Bleaching of Silk.—The principal use to which H_2O_2 has been applied in the silk industry is the bleaching of "Tussah" silk, which has a strong brown colour.

In the first place the "Tussah" silk must be well scoured to remove all gum, grease, and dirt. It is then immersed in a bath made up by adding 1 part of 10 vol. H_2O_2 to 2 parts of water, and for every 1 gal. of 10 vol. H_2O_2 there is added 4 oz. of caustic soda, and 6 oz. of silicate of soda (102° T). The silk is kept in the bath at a temperature of about 120° F., until sufficiently bleached. It is impossible to give anything like an exact time, as the qualities vary so much. In some cases a second bath is required to produce the desired whiteness. Bleached "Tussah" silk is never a pure white, it always has a very pale straw colour, which is very much covered when the silk is tinted with blue or violet. Bleached "Tussah" silk is used mostly for dyed goods.

Silk, like wool, withdraws alkali from the bath, but it is possible in this instance to use such an excess of alkali, at the commencement, as will prevent the bath from becoming neutral, as silk is not so easily affected as wool.

Bleaching Straw.—A large quantity of H_2O_2 is used in the districts where straw hats are made, and for bleaching straw a bath is made up of 1 part of 10 vol. H_2O_2, 2 parts of water, and 4 oz. of silicate of soda (102° F.) for every gallon of 10 vol. H_2O_2.

The bundles of plaited straw are packed closely into the bath, which is kept at 95° F. for about 20 hours. During the operation the straw is moved about occasionally, and the liquid drawn off from the bottom of the bath and poured on to the top of the straw. The straw is then washed and dried.

During the operation the alkalinity of the bath should be tested as the straw removes alkali from the bath.

Bleaching of Bone and Ivory.—The bones or ivory must be first cleansed from fat by a treatment in petroleum spirit or other solvent. Sometimes ammonia is used.

The bath is made up of 1 part of 10 vol. H_2O_2, and 2 parts of water, made slightly alkaline with ammonia, and kept at a temperature of 122° F. until the bones are bleached sufficiently, the time varying with the quality of the bone.

Caustic soda must not be used on any account in the bath as by it the bones are destroyed. Good results were obtained by using a bath of 10 vol. H_2O_2 neutral, and kept at 122° F.

Bleaching of Feathers.—The feathers are first cleaned by a treatment in soap solution and afterwards with ammonia (dilute). The bath is one of 10 vol. H_2O_2, made slightly alkaline with ammonia. The feathers are kept in the bath for 12 hours at 95° F. or until sufficiently bleached. They are then removed and washed with water containing 1 oz. of vitriol to 5 or 6 galls. of water. The acid is necessary to stiffen the quill, which has become soft owing to immersion in the H_2O_2 bath. After 1½ hours in this bath they are washed and dried.

Bleaching of Hair.—The outlet for H_2O_2 for this purpose is small, but it is essential to produce good results.

The experience gained in this direction does not warrant any specific instructions; but no doubt the same strength of bath as is used for wool, and using ammonia as the alkali would be serviceable.

At one time, when auburn hair was fashionable, H_2O_2 was largely used by hairdressers and chemists. It was mixed with rose water or other perfume and sold under various names. When using it for this purpose the H_2O_2 was mixed in a saucer with a few drops of ammonia, then sponged on the hair which was allowed to dry, by preference in sunlight, and the operation repeated day by day until the desired shade was reached.

The Use of H_2O_2 as an Antiseptic.—Peroxide of hydrogen was brought prominently into notice about 1860 by Dr., afterwards, Sir Benjamin Richardson, who did much valuable work in testing its use, and upon which the conclusions detailed in his Asclepaid, 2nd Series, 1891, Vol. VIII., were based.

He found it very serviceable both for internal and external use and at that time it was thought its usefulness would be much extended, but such has not been the case chiefly on account of its irritability and instability.

Irritability of H_2O_2.—If a solution of H_2O_2, even although very dilute, is applied, say, to an ulcer, irritation is set up, and the question arises as to what is the cause. It may be due to the acidity, or the solids, or the contained oxygen, or all these causes combined.

As regards the acidity; as before mentioned H_2O_2 is acid by intention, as the solution would not keep if neutral or alkaline. The amount of free acid varies, but is usually small. Its action can, however, under certain conditions become intensified. An example will explain this. If a towel is wrung out in a 2 or 3 vol. solution of H_2O_2, and hung up in a sick room to purify the atmosphere it becomes rotten after it has been repeated a few times, and the explanation is that the water gradually evaporates, and finally leaves the acid and solids in a concentrated form, and these, especially the former, exert a corrosive action on the fibre of the towel. The same action must take place when a solution of H_2O_2 is applied to the skin, the water evaporates, and irritation naturally arises from the acid and solids remaining behind, and if the free acid were H_2SO_4 or H_3PO_4 it would be more marked.

As no reliable data as regards the acidity in H_2O_2 was available, it was determined in a few samples of qualities made by the leading firms.

Estimation of the Acidity in H_2O_2.—The following was the method, which was found to give satisfactory results:—

As some of the samples contained salts of alumina, an ordinary titration was not applicable, besides the contained H_2O_2 interfered with the indicators, litmus, and methyl orange. Fifty c.c. of the H_2O_2 solution were taken, excess of ammonia added, the solution then boiled to get rid of the excess, the Al_2O_3 filtered off, washed, dried, and weighed. To the filtrate excess (about 20 c.c.) of 1/10 normal KHO solution added, and the liquid evaporated to dryness to completely expel the ammonia. The residue was dissolved in water and the excess of KHO titrated with 1/10 HCl, using litmus as the indicator. The free acid was for sake of comparison expressed in grms. of HCl per gallon. The HCl corresponding to the Al_2O_3 was allowed for, and the remainder called free acid. If no Al_2O_3 were present, the addition of ammonia was omitted, and 20 c.c. of KHO solution added, the solution evaporated to remove the O_2, and the excess of KHO titrated with HCl as above. The acidity of H_2O_2 is sometimes due entirely to an acid salt, such as Al_2Cl_6, but usually there is free acid present in addition.

In Table II. the free acid is expressed in grms. of HCl per gallon, and where Al_2O_3 was found in grms. of Al_2Cl_6 per gallon.

Table II.

—	Strength.	Free Acid in Grms. HCl Per Gallon.	Acidity corresponding to Al_2O_3 found in Grms. Al_2Cl_6 Per Gallon.
	Vol.	Grms.	Grms.
A	10	4·1	None.
B	10	0·3	8·62
C	10	0·0	3·66
D	10	1·47	None.
E	10	6·05	8·08
F	20	1·23	None.
G	30	4·25	Not determined.

It will be noticed from the above numbers that H_2O_2 differs very much as regards acidity, and it is quite reasonable to assume that if solutions of D. and E. were used as antiseptics, that the irritability set up would differ, and in the latter be very marked. But this seems to be a point which is quite lost sight of by ordinary practitioners.

Solids in H_2O_2.—As regards the solids which H_2O_2 contains, and which consist of the salts in solution and also the free acid, the amounts were determined in the same samples as in Table II. The method adopted was to evaporate to dryness on a water-bath, and dry the residue at 120° C., at which temperature it was found Al_2Cl_6 did not decompose. It must be quite well understood that if the H_2O_2 solution contained volatile acid, the solids would be low by the amount of acid lost, and accordingly a correction was made as shown in the last column.

Table III.

—	Strength.	Grms. of Solids per Gallon.	Corrected Solids in Grms. per Gallon.
	Vol.	Grms.	Grms.
A	10	12·7	16·8
B	10	11·0	11·3
C	10	16·0	16·0
D	10	3·6	3·6
E	10	11·4	12·2
F	20	19·1	20·3
G	30	32·0	32·0

The solids usually consist of a mixture of alumina, soda, potash and ammonia salts, occasionally are found traces of barium and iron salts. The combined and free acids are usually H_2SO_4, HCl, and H_3PO_4.

It has often been stated by medical men that if H_2O_2 could be prepared "solid free" it would fill a want in the list of antiseptics.

Accordingly a quantity was prepared. Two methods were tried.

Preparation of Solid Free H_2O_2 by distillation under reduced pressure.—A few trials were made to ascertain if a pure H_2O_2 could be prepared by this method.

To 1,000 c.c. of 10 vol. H_2O_2 were added 200 c.c. of oil of vitriol, thinking that such a non-volatile diluent might retain the H_2O_2 until a part of the water had distilled off. The distillation was carried on under a reduced pressure of 25 inches of mercury, but the result was not satisfactory. The distillate was only 1·6 vol.

Another trial was made substituting glycerin for H_2SO_4 with a like result the distillate testing only 1·5 vol.

In the next trial a volatile liquid non-miscible with the H_2O_2 solution was tried with the idea that in distilling it might carry over the H_2O_2.

To 500 c.c. of 10 vol. H_2O_2 were added 500 c.c. of benzoline or petroleum spirit, and the distillation under a reduced pressure of 25 inches of mercury carried to dryness. The strength of the distillate was 4·3 vol. This was considered so promising that an appartus to distil 50 gallons was erected, but the distillate only tested 0·3 vol. and further work on these lines was discontinued.

Preparation of Solid Free H_2O_2 by Precipitation with Silver Sulphate.—BaO_2 was dissolved in HCl as before described, and H_2SO_4 added to precipitate the barium after each instalment of BaO_2 had been dissolved. When the solution had reached the desired strength, sulphate of silver in exact proportion to the barium chloride present was added, thereby getting rid of the HCl and the barium. After finishing carefully the solids were found to be 1 grm. per gallon, and consisted of phosphoric acid and phosphate. No correction was required in this case for the solids, as the acid was non-volatile. This H_2O_2 was called No. 1 in trials about to be described. This specially prepared sample, along with two samples of what were considered the best makes of H_2O_2, were tested as to their irritability by the author's brother, who had previously had considerable experience in the use of H_2O_2, both in private and hospital practice.

The following are the particulars of the three samples:—

—	Strength.	Solids per Gallon.	Acidity.
	Vol.	Grms.	Grm.
1	7	1·0	0·5
2	7	9·8	0·3
3	7	10·0	0·3

It will be noticed from the above data that the solids in No. 1 were as low as some drinking waters, and all the samples were made practically neutral, so that any beneficial result which might arise from the reduction in the amount of solids might not be obscured by the irritability arising from acidity.

The trials lasted for six months, *i.e.*, two months for each sample, and the H_2O_2 was used in the treatment of ulcers and abscesses, as a throat gargle, nasal douche, and for other purposes which were suitable for the trials. For external use it was diluted with six times, and for nasal douche with 15 times, its volume of water.

The result of the trials was that no difference could be detected between the action of the samples, but all were found to be less irritating than that which had been used formerly, pointing to the effect of the low percentage of free acid.

The result was unexpected, but, when examined more closely, is not surprising, as the difference in composition when in actual use was not striking. For instance, in the case of No. 1, when diluted with six times its volume of water, the solids would not be reduced in the same proportion as in 2 and 3, because the water contains solids. The proportion of solids, instead of being 1 to 10, as in the original H_2O_2 would be about 1 to 3 in the diluted samples, and it is difficult to believe that a solution of H_2O_2 containing 1 to 2 grms. of solids per gallon could be distinguished in its properties from one having a smaller amount. The next point which presented itself was whether or not the O_2, which is in a specially active form in H_2O_2, could produce an irritating effect, and the following trial was made in order to ascertain this:—A sample of 10 vol. H_2O_2, containing 20·3 grms. of solids (corrected), and acidity equal to 1·21 grms. HCl, per gallon was taken, and one-half kept for after use. The other half was boiled until entirely decomposed, *i.e.*, until it contained no H_2O_2. It was then made up to its original volume. The two samples were now identical, except that the latter contained no H_2O_2. They were carefully tested in similar cases as before mentioned. The unboiled sample was found to be more efficient than the one which had been boiled out. The boiled sample caused less irritation, but the difference was very slight. They were used, 1 part to 3 parts of water, which was much stronger than usual. To sum up as regards irritability, it would appear that it is due, not so much to the H_2O_2, or salts in solution, as to the free acid.

Instability of H_2O_2.—As regards the instability of H_2O_2; this property has very much diminished its use because a practitioner may obtain very beneficial results when the H_2O_2 is fresh, but after standing some time he may find that it has lost its effect, and naturally he loses confidence in its use. As the solution is colourless it is not possible to judge as to its strength by the eye, nor yet by the smell as it is odourless, and as very few medical men have the requisite knowledge or time to test it chemically they, after a disappointment or two, give it up in disgust. It has been mentioned previously that low solids do not necessarily mean a stable H_2O_2, and this was forcibly brought out in the three samples which were tested as to their irritability. Sample No. 1 which contained 1 grm. of solids per gal., after standing for a few months had lost 2 vol., whilst samples 2 and 3 which contained 10 grms. of solids per gal. lost only 0·7 vol.

For medical men and druggists it is a mistake to buy 20 or 30 vol. H_2O_2 unless it is diluted on receipt, as it is not so stable as 10 or 12 vol., and they are unconscious when it is losing strength. A large firm of wholesale druggists who had bought a quantity of 20 vol. sent a sample to ascertain if it was as represented. It contained 14·4 vol. H_2O_2 and 78 grms. of solids per gall., so it is quite easy to understand how poor results are obtained.

It may be asked as to what would be a safe H_2O_2 to use for medicinal purposes, and as regards acidity it should not be above 1·5 to 2 grms. of HCl per gal., which quantity is sufficient to render the solution stable if it has been carefully prepared. The solids should not amount to above 10 grms. per gal. These numbers are for 10 vol. H_2O_2. For 20 vol. the acidity might be 2 to 3 grms. of HCl and the solids double those for 10 vol. H_2O_2.

A solution of H_2O_2 should be kept by preference in stoneware bottles, or, if in glass, shaded from direct sunlight. The H_2O_2 should also be diluted when received by a medical man to about the strength at which it is to be used. This will increase its stability very much.

Finally, my very best thanks are due to Dr. Fawsitt for the care he bestowed on the trials he made and also to Mr. Anderson, who had charge of all the work detailed in this paper and which he carried through with much ability.

Discussion.

Dr. T. Gray referred to the recent work of Brühl on the preparation of pure hydrogen peroxide and asked the author if he had made any experiments with the object of determining the influence of the nature of the dissolved salts on the stability of the product.

The Chairman suggested that the rapid decomposition of the hydrogen peroxide during April and May referred to by the author was probably explained by the observation

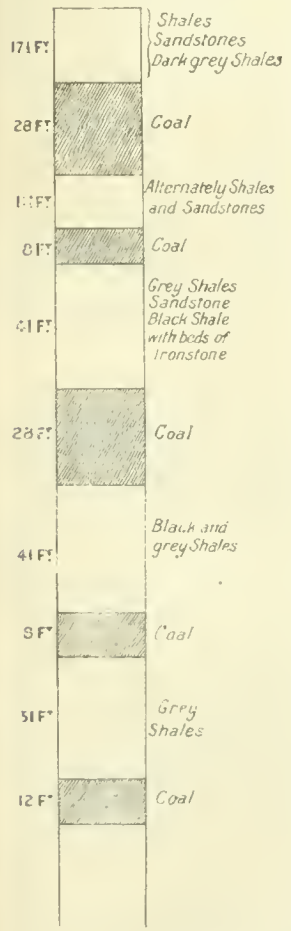
that the actinic power of the sun's rays reached a maximum at that period of the year.

Mr. C. A. Fawsitt, in reply, said that he had little experience as to the influence of the different salts in solution on the stability of hydrogen peroxide. He knew that iron salts favoured decomposition.

He was pleased to hear from Dr. Frew that the actinic rays of the sun were at their maximum, April to May, as the decomposition numbers in sunlight would otherwise have been difficult to explain.

THE COALS OF BENGAL AND JAPAN.

BY W. CARRICK ANDERSON, M.A., D.Sc., AND J. A. RUSSELL HENDERSON, B.Sc.



Section of Coal-bearing Strata.

The coals of India and Japan have, at the present time, a commercial interest over and above the purely scientific one. This reason justifies the publication of the results given in the present paper which have been obtained in the Glasgow University Laboratory, in pursuance of a scheme the ultimate object of which is to increase the stock of facts regarding the composition and structure of this class of minerals.

For much information regarding the Indian coalfields in general, and those of Bengal in particular, we are indebted to Prof. W. R. Dunstan, F.R.S., Director of the Scientific Department of the Imperial Institute, whose "report on the coal supply of India," published in 1898 contains figures showing the calorific values and the proximate analyses of a large number of samples drawn from the various localities in which coal is known to occur throughout the Indian Empire. The statements made regarding the Japanese fields are based partly on the authority of a recent official report of the Japanese Government, kindly translated and abstracted for us by Mr. Konji Satow, formerly a student in the University Laboratory, and partly on private information.

1. *Bengal Coal.*—Coal is found widely throughout India and Burmah, but by far the most important fields in the empire up to the present are those of Bengal, which produce the bulk of the coal raised. During the last five years, these have undergone a very rapid development. In 1896 there were 154 collieries at work in Bengal, which produced 3,037,920 tons, the remaining 18 collieries in India having an aggregate production of 809,093 tons. In 1900 the total output for the Indian Empire had risen to over six million tons, and of this Bengal supplied about five-sixths. The average selling price of Bengal coal in that year is given as 4*s.* 5*d.* per ton. In 1895 India shipped altogether 53,565 tons of native coal; in 1900 Bengal sent to Bombay 864,000 tons; to Colombo 369,000 tons; to Singapore 66,000 tons; to Aden 53,000 tons, and 53,000 tons to other ports.

Localities.—The principal coal districts of the province are the following:—

Karharbari, 200 miles from Calcutta; extent, 8 square miles; estimated to contain 136 million tons.

Raniganj and Barakar, about 130 miles from Calcutta; extent at least 500 square miles; estimated to contain 14,000 million tons.

Jheria, a few miles west of Raniganj; extent, 200 square miles; estimated to contain 465 million tons.

Bokaro, close to Jheria; extent, 220 square miles; in thick seams; estimated to contain 1,500 million tons.

North Karanpura, west of Jheria; extent, 472 square miles; estimated to contain 8,750 million tons.

South Karanpura, estimated to contain about 75 million tons.

Daltonganj, extent, 200 square miles; estimated to contain about 11 million tons.

Ramgahr, a small field south of Bokaro; extent, about 40 square miles; estimated to contain about 5 million tons.

Other fields of lesser account for the time being are Talchir, Rajmahal and Darjeeling, in the last of which there occurs a narrow seam of graphitic coal.

A striking feature of the Bengal coal deposits is the thickness of the seams, which is at times enormous. Those which are worked are rarely less than 8 to 10 ft. thick, and in the Liakdee Mine of the Bengal Coal Company in the Barakar district a bed 80 ft. in thickness is said to have been discovered. The general nature of the deposits may be indicated by the subjoined section disclosed in a bore on the property of the Lodna Coal Company in the Jheria district.

Just as Bengal is the principal coal-producing province of India, so the district comprised within the Raniganj-Barakar-Jheria field is the principal coal-mining area of the province. The district is traversed by the Chord line of the East Indian Railway, and with it the collieries are connected by sidings and branch lines on either side.

Samples.—The samples examined were selected from various parts of this area, along a line about 42 miles in length from west to east. A and B are from the Jheria section; C, D, E, and F from Barakar; and G and H from Raniganj. According to T. H. Ward (Prof. Dunstan's Report) the coal in the eastern part of the field is generally non-caking, while from Belrooi, near Siterampore, westward, caking coals prevail.

Table I.

Ultimate Analyses of Samples.

	A. Lodna.	B. Kussinda.	C. Barakar Begonia.	D. Dezeraghur.	E. Chotdama.	F. Garanghi.	G. Mooshepara.	H. Ghoosick.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Hydrogen	4·77	4·43	4·96	5·23	5·20	3·77	3·43	4·87
Carbon	75·53	72·23	74·13	71·89	72·66	68·13	61·13	74·82
Oxygen and organic sulphur	5·01	4·81	7·95	10·00	5·68	7·66	6·27	4·48
Nitrogen*	1·85	1·86	2·21	1·20	1·95	1·05	1·38	1·66
Moisture	1·40	1·46	1·92	2·64	3·30	2·15	1·61	1·35
Ash	11·44	15·21	8·83	9·04	11·21	17·24	26·18	12·82
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

termined by Kjeldahl method.

TABLE II.

Ultimate Analyses of Dry Organic Matter.

	A. Lodna.	B. Kussinda.	C. Barakar Begonia.	D. Dezeraghur.	E. Chotdama.	F. Garanghi.	G. Mooshepara.	H. Ghoosick.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Hydrogen	5·47	5·82	5·55	5·92	6·08	4·67	4·76	5·67
Carbon	86·67	86·68	83·06	81·40	84·99	84·51	84·65	87·17
Oxygen and organic sulphur	5·74	5·77	8·91	11·32	6·65	9·52	8·68	5·22
Nitrogen	2·12	2·23	2·48	1·36	2·28	1·30	1·91	1·94
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

TABLE III.

Proximate Analyses of the above Coals.

	A. Lodna.	B. Kussinda.	C. Barakar Begonia.	D. Dezeraghur.	E. Chotdama.	F. Garanghi.	G. Mooshepara.	H. Ghoosick.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture	1·40	1·46	1·92	2·64	3·30	2·15	1·61	1·35
Ash	11·44	15·21	8·83	9·04	11·21	17·24	26·18	12·82
Volatile matter	27·88	26·16	31·98	37·57	37·00	26·10	25·95	24·11
Fixed carbon	59·28	57·17	57·27	50·75	48·49	54·51	46·26	61·72
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

TABLE IV.

	A. Lodna.	B. Kussinda.	C. Barakar Begonia.	D. Dezeraghur.	E. Chotdama.	F. Garanghi.	G. Mooshepara.	H. Ghoosick.
	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.
Calorific value (Thompson's calorimeter).	7,260	6,955	7,150	6,847·5	6,735	6,270	5,912·5	6,875
Do. (calculated from formula $H = 8080c + 34460 \times (h - \frac{1}{8}o)$).	7,529·5	7,156	7,358	7,180	7,418	6,473	5,852·5	6,473
Calorimeter value stated as percentage of theoretical.	96·4	97·2	97·2	95·4	90·8	96·9	101	94·1

Mean = 96·1 per cent. of theoretical.

Appearance of coal	Slaty-looking.	Soft.	Hard.	Hard and bright.	Hard and bright.	Hard and slaty-looking.	Hard, dull, and slaty-looking.	Hard and bright.
Appearance of the residue after ignition.	Much swollen, coherent and hard.	Slightly swollen, but firmly coherent.	Much swollen, coherent and fairly hard.	Slightly swollen, bright and metallic-looking.	Slightly swollen, bright and metallic-looking.	Not swollen; soft and black.	Not much swollen, but coherent; black-looking.	Much swollen; dull grey in colour.
Colour of ash	Grey.	Grey.	Grey.	Light brown.	Light brown.	Light grey.	Light grey.	Grey.

To illustrate the variation in composition of the Bengal coal within still narrower geographical limits, we quote the following figures for coal from different parts of the Lodna property, on the authority of analysts of repute. These figures, as well as our samples, we owe to the courtesy of Captain Wm. Corkhill and the Asiatic Steam Navigation Company Limited, to whom we would express our indebtedness.

TABLE V.

Samples of Lodna Coal. Ultimate Analyses.

	(i.)	(ii.)	(iii.)
	Per Cent.	Per Cent.	Per Cent.
Hydrogen	3·82	5·06	5·43
Carbon	75·85	74·60	71·31
Oxygen	7·98	9·34	8·29
Nitrogen	1·81	1·73	2·05
Ash	10·04	9·27	12·92
	99·50	100·00	100·00
Sulphur	0·50		
	100·00		

Evaporative power	13·52 lb.	13·12 lb. of water at 212° F.
Equivalent to	7,260 cal.	7,055·5 cal.

Proximate Analyses of Lodna Coal.

	(iv.)	(v.)	(vi.)
	Per Cent.	Per Cent.	Per Cent.
Moisture	1·50	1·49	1·72
Ash	7·80	5·60	10·35
Volatile matter	25·60	28·80	29·08
Fixed carbon	65·10	64·20	58·85
	100·00	100·00	100·00
Sulphur	0·47	0·45	0·50
Coke	72·90	69·80	69·20

The coke is fairly hard. Caking index of the coal, about 11·5. Ash white in all cases.

Calorific power (calorimeter test) varies from 11 to 13½ lb. of water per lb. of coal, and the calorific power

under boilers is said to be from 7·5 to 9 lb. of water per lb. of coal.

Regarding these coals as a group, we note the following points :—

(i.) The proportion of moisture varies within narrow limits, 1·35—3·30 per cent., and is always low.

(ii.) The percentage of ash is invariably fairly high and sometimes large. When present in normal quantity it does not appear to be capable of much reduction by washing, a large part of it being in, and not merely associated with, the coal.

(iii.) The calorific value varies, but is never high. As determined by experiment with the Thompson calorimeter, it is almost always very much less than that obtained by calculation. Prof. Dunstan's results in this connection are in agreement with our own, as shown by the following figures, in which underneath the results obtained at the Imperial Institute Laboratory we place those calculated from ultimate analyses recorded in the report (p. 24).

TABLE VI.

Name.	Liakdee.	Sodepore.	Kumardubhi.	Karharbari (Lower Seam).	Karharbari (Upper Seam).
Calorific value found (Thompson's calorimeter)	6,721	6,855	6,567	6,644	6,985
Do. calculated ..	7,246	7,065·4	6,941·6	7,758	8,124
Ratio of experimental to calculated result.	94·1 %	94·2 %	94·6 %	85·6 %	86 %

Mean, 90·9 per cent.

(iv.) In caking power the coal shows considerable variation. In sample F it is *nil*; the maximum caking index found is 11—12.

(v.) The nitrogen content, when calculated on the dry organic matter, is very constant. It is lowest in samples D and F which belong to the southern part of the field. The same two samples contain a high percentage of oxygen.

II. *Japan Coal.*—As in India, the coal industry in Japan has advanced rapidly during recent years. In 1875 the output was a little over 560,000 tons; in 1895 it was estimated at about 3½ million tons, and is now probably well over 4 million tons per annum.* Outside the Empire the principal markets are China ports, which in 1899 took 949,000 tons; Hong Kong, which in the same year took 660,000 tons; Singapore and British India, which took nearly 300,000 tons each. Smaller quantities were sent to Eastern Russia, the United States, the Philippines, and Tonquin. Bunker coal was exported in the same year to the extent of 473,919 tons. Coal is found in Japan in the three principal islands, but by far the largest quantity which comes into the market at the present time is raised in Kiushu, the most southerly of the group. That island in 1900 furnished about 3,000,000 tons out of a total output for the Empire of a little over 4,000,000. Coal is known to exist over a large part of the island, but the principal coal district lies in the basin of the river Onga, which enters the sea at the port of Wakamatsu. In the upper part of the basin, the coal is usually of superior quality, but the seams nearer the mouth are, for the most part, of lower grade. In the neighbourhood of Nagasaki are the Takashima deposits, which produce some of the best coal in Japan. The mine is situated in Hizen county, Kumamoto prefecture, and was the first in the Empire to be developed on European lines. The enterprise of the proprietor, Baron Iwasaki, set an example which many other coal owners in time followed. The seams here are 13 in number, of which five are worked. The inclination is generally 15°—20°, but at times as much as 40°—50°. Coal is now being extracted at a depth of 1,000—1,200 ft. under sea level. The system followed is pillar and stall. The seams worked have the following thickness:—Top seam, 8 ft.; 2nd, 5 ft; 3rd, 5 ft.; 4th, 18 ft.; and lowest, 3 ft. The last only is of inferior quality; the others are equal to the best in Japan. The annual output (1900) is 237,506 tons. Electricity is used both for lighting and cutting.

To the Takashima coal the official report of the Japanese Government assigns the following composition:—

Ultimate Analysis.

	Per Cent.
Hydrogen	4·65
Carbon	76·84
Oxygen	13·03
Nitrogen	1·47
Sulphur	0·15
Moisture	0·84
Ash	3·02
	100·00

Proximate Analysis.

	Per Cent.
Moisture	0·84
Ash	3·02
Volatile matter	42·71
Fixed carbon	53·43
	100·00

In the adjoining Higo county are the Hiro-Yama mines, the property of the Kinshu Coal and Railway Company. The bed here is said to be somewhat deep and narrow. The Japanese report gives the following analyses of the product:—

Ultimate Analysis.

	Per Cent.
Hydrogen	3·07
Carbon	64·93
Oxygen	9·82
Nitrogen	0·35
Sulphur	4·07
Moisture	1·21
Ash	16·55
	100·00

Proximate Analysis.

	Per Cent.
Moisture	1·21
Ash	16·55
Volatile matter	9·16
Fixed carbon	73·08
	100·00

The Kanada mine is situated in the same county, and has seams 8 ft. and 4 ft. in thickness. Much of the 8-ft. mineral from this district is "blind coal," but that from the Kanada is bituminous. Inclined shafts are used. The daily output is from 200 to 250 tons.

In the county of Chikugo, to the north of Hizen, lies the famous Miike deposit, the property of Messrs. Mitsu and Co., of Tokio, which has an area of 25 square miles. One of the seams in this deposit has a thickness of from 8 to 20 ft., and a second of from 6 to 10 ft. The beds are inclined at an angle of from 5° to 10°, and access is had by six shafts, 240, 500, and 1,000 ft. in depth. Next to Takashima, the product ranks as the best Japanese coal. Mixed with American anthracite it is employed for marine purposes as well as on the principal railways. A large quantity of "smalls" and dust is obtained, and this is now being converted into briquettes. The system of mining is the British one. Electricity is used for all purposes, including traction.

Miike coal presents peculiarities that have already made it the subject of study. Watson Smith and Chorley (this Journal, 1892, p. 591; and 1893, p. 221) have shown that a considerable proportion of it is soluble in benzene, namely 9·5 per cent., as compared with from 0·6 to 1·6 per cent. in most coals.

We subjoin analyses made by these investigators, as well as that of the Japanese authority (see next page).

To the north-east of Chikugo lies the county of Chikuzen, in which several mines of importance are at work. In the village of Nakama is the Ohtsuji colliery, at which operations were begun about seven years ago. The seams are four in number, two of them having only recently been

* The following figures have been supplied since the above was written:—
Export of Coal from Japan—
In 1900,—4,630,963 tons, valued at 13,703,655 yen.
In 1901,—8,697,705 tons, valued at 17,499,094 yen.
The latter export was abnormal, owing to the extra requirements arising out of the Chinese trouble.

Ultimate Analyses.

	Watson Smith and Chorley.	Japanese Authority.
	Per Cent.	Per Cent.
Hydrogen	5·84	5·05
Carbon	74·22	72·33
Oxygen	5·61	10·28
Nitrogen	1·11	
Sulphur	3·15	..
Moisture	0·62	0·50
Ash	9·45	9·13
	100·00	97·29

Proximate Analysis.

	Watson Smith and Chorley.	Japanese Authority.
	Per Cent.	Per Cent.
Moisture	0·62	0·50
Ash	9·45	9·13
Volatile matter	38·88	40·70
Fixed carbon	51·05	49·67
	100·00	100·00

opened up. Access is obtained by an inclined shaft. The product of the mine is used for general industrial purposes, and is also exported to Chinese and other foreign ports.

The Japanese authority gives the following composition:—

Proximate Analyses.

	Per Cent.		Per Cent.
Moisture	from 4·00	to	6·04
Ash	„ 5·80	„	3·06
Volatile matter	„ 46·70	„	41·66
Fixed carbon	„ 45·50	„	49·24

The sulphur is said to vary from 0·05 per cent. to 2·53 per cent.; sp. gr., 1·33. Coke, coherent and swollen; ash, grey or reddish-grey in colour.

From the same county comes the coal known as Yamano, which is the product of a colliery situated at the village of the same name. Other mines working in this field, which has a total area of 1,000 square miles, are Togawa, Nuri, Onoura, Owachi, Nemeta, Katauma, Togakumi, and Otoku. The Otoku (Taku ?) coal is obtained from a mine at the village of the same name. The seam worked is 3—5 ft. in thickness, and the annual output 43,683 tons (1900).

Outside the island of Kiushu the principal coal area in Japan is in the north island, Hokkaido or Yezo. In the main or Japan island, coal is found at two points—Nagato county in the south, and Ibariki, or Iwani, in the east. In the former of these districts the Onodo colliery is at work, and in 1900 had an output of 200,000 tons. The product is however, compared with much of the Kiushu coal, of inferior quality. The seam is from 2 to 3 ft. in thickness. The Ibariki field is in Ibariki prefecture, and the seam has a thickness of from 4 to 8 ft. The coal is used for general industrial purposes.

The Hokkaido coalfield is officially estimate dto contain 600 million tons, and coal is worked at present on an extensive scale by the Hokkaido Coal Mines and Railways Company. The company operates four mines, namely, Poronai, Sorachi, Ikusumbetru, and Yubari. The Poronai mine is at the village of that name in Ishikari county, and was opened up about 25 years ago. There are four seams, of from 5 to 10 ft in thickness. The production is at the rate of about 170,000 tons per annum. The coal is largely used for railway and marine purposes. The Ikusumbetru mine, in Sorachi county, has a 5-ft. seam. The output is about 50,000 tons per annum. The Sorachi mine property of the Company was opened up in 1890, and has 10 seams of from 4 to 9 ft. in thickness.

The Yubari colliery, situated at the village of Nobarikawa in Ishikari county, started operations in 1890, and is at present worked both above and below the drainage level. Two seams of coal are met with, the upper one 25 ft. and the lower 4 ft. in thickness. The annual production has recently been greatly increased, and now exceeds 1,650,000 tons. The dip of the beds is steep, and much trouble has been occasioned at times through the presence of fire-damp in the workings. The product is an excellent bunker coal.

For the samples of some of these coals which we have examined we are indebted to the courtesy of Oliver Brooks, Esq., of the "Japan Daily Herald," to whom we take this opportunity of expressing our thanks. The following figures show the ultimate analyses and proximate composition.

TABLE VII.

	Kiushu Island.					Japan Island.			Hokkaido Island.	
	I. Kanada (Higo).	J. Miike. (Chikugo).	K. Ohtsuji (Chikuzen).	L. Yamano (Chikuzen).	M. Taku (Chikuzen).	N. Kiushu (Anthracite) (?).	O. Onodo (Nagato).	P. Ibariki (Ibariki).	Q. Poronai (Ishikari).	R. Yubari (Ishikari).
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Hydrogen	5·41	5·91	4·55	5·66	6·19	1·96	4·41	4·27	4·56	5·77
Carbon	76·10	75·62	64·34	77·16	70·11	72·92	58·60	54·98	71·30	77·16
Oxygen and organic sulphur.	7·66	5·16	10·23	7·33	9·54	1·24	16·99	15·61	11·19	7·54
Nitrogen*	2·85	2·54	2·45	3·30	2·75	·65	2·17	·64	1·37	3·40
Moisture	3·40	1·18	4·83	3·46	2·01	1·27	6·33	16·82	6·44	1·87
Ash	4·58	9·59	13·60	3·09	9·40	18·96	11·49	7·68	5·14	4·26
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

* Determined by Dumas method.

TABLE VIII.

Ultimate Analyses of Dry Organic Matter.

	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Hydrogen	5·88	6·62	5·58	6·06	7·00	2·55	5·37	5·65	5·16	6·15
Carbon	82·70	84·75	78·88	82·57	79·32	94·99	71·52	72·83	80·63	82·20
Oxygen and organic sulphur.	8·32	5·78	12·54	7·84	10·57	1·61	20·67	20·67	12·66	8·03
Nitrogen	3·10	2·85	3·00	3·53	3·10	·85	2·64	·85	1·55	3·62
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

TABLE IX.

Proximate Analyses of above Coals.

	I. Kanada (Higo).	J. Miike. (Chikugo).	K. Ohtsuji (Chikuzen).	L. Yamano (Chikuzen).	M. Taku (Chikuzen).	N. Kiushu (Anthracite) (?).	O. Onodo (Nagato).	P. Ibariki (Ibariki).	Q. Poronai (Ishikari).	R. Yubari (Ishikari).
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture	3·40	1·18	4·83	3·46	2·01	4·27	6·33	16·82	6·44	1·87
Ash	4·58	9·59	13·60	3·09	9·60	18·96	11·43	7·68	5·14	4·26
Volatile matter	41·00	39·92	41·97	42·92	46·79	9·20	47·51	42·40	39·89	46·59
Fixed carbon	51·02	49·31	39·60	50·53	41·60	67·57	34·67	33·10	48·53	47·28
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

TABLE X.

	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.
	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.
Calorific value (Thompson's calorimeter).	7,450	7,770	6,297	7,835	7,342·5	5,670	5,650	5,395	6,750	8,030
Do. (calculated from formula $H = 8080c + 34,460(h - \frac{1}{8}o)$).	7,682	7,923	6,325·5	7,868	7,395	6,516	5,525	5,242	6,850	7,899
Calorimeter value stated as percentage of theoretical.	97	98	99·55	99·58	99·29	87	102·26	102·92	98·54	101·66

Mean (omitting the anthracite), 99·86 per cent.

Appearance of the Coal.

I.	J.	K.	L.	M.	N.	O	P.	Q.	R.
Bright and shining. Burns with strong smoky flame.	Peculiar, almost waxy appearance. Very soft. Brown when finely powdered. Burns with a strong bright smoky flame.	Hard and shaley, breaking with uneven surfaces Brown when in powder. Contains translucent flakes of calcium carbonate. Burns with bright smoky flame.	Bright, soft coal, containing crystals of pyrites and also of calcium carbonate. "Mother of Coal" present in leaves of a brown colour. Streng smoky flame.	A bright, soft coal, containing resin in lumps. Chocolate brown when finely powered. Burns with bright smoky flame.	An anthracite, parts having almost the appearance of graphite. Burns without smoke or flame.	A bright brittle coal, containing leaves of both calcium carbonate and calcium sulphate, as well as pyrites and resin. In powder has a dark brown colour. Burns with a very bright smoky flame.	A clean, brittle coal, breaking with even surfaces. Contains resin in lumps and also pyrites in laminæ. Brown when in powder. Burns with a bright flame but with little smoke.	Contains calcium carbonate in thin leaves, also resin in lumps. Burns with a smoky flame.	A bright and brittle coal, containing calcium carbonate in leaves and also pyrites. Brown when powdered. Burns with a very bright smoky flame.

Residue after Ignition.

A hard strong grey coke.	A grey coke, very much swollen and spongy	A soft, black mass, scarcely coherent.	Hard and metallic looking coke, only slightly swollen.	A hard metallic looking coke.	Loose black powder.	Black, scarcely coherent.	Does not cohere.	Soft and friable coke, grey in colour.	A hard metallic looking coke, sligh ly swollen.

Colour of Ash.

Light brown.	Reddish grey.	Light brown.	Light brown.	Grey.	Buff.	Greyish brown.	Buff.	Light brown.	Light brown.

There are several points in connection with these coals which are worthy of comment.

(1.) The presence in many of the samples of a clear, bright resin, in pieces sometimes the size of peas or beans. Such masses are present in the Taku coal from Kiushu Island, the Onodo and Ibariki coals from Japan Island, and the Poronai coal from Hokkaido, so that it would appear to be a widespread accompaniment of the coals of the Empire.

(2.) The nitrogen content is variable, but in most cases exceptionally high, ranging up to 3·60 per cent., reckoned on the dry ashless sample, in the case of Yubari coal. This nitrogen does not appear to be in a form that admits of being accurately estimated by the Kjeldahl method. For the samples described above, results were obtained by the Kjeldahl method, ranging from nil to 1·90 per cent. of nitrogen. Thus :—

Nitrogen by Kjeldahl Method.

	I.	J.	K.	L.	M.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Mean of two closely agreeing experiments.	1·16	Nil.	·08	1·49	1·35

	N.	O.	P.	Q.	R.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Mean of two closely agreeing experiments.	Trace	·93	Trace	·10	1·90

For Miike coal, our results obtained by the Dumas method are 2·56 per cent. and 2·52 per cent. For the same coal, Watson Smith and Chorley (*supra*) give nitrogen = 1·11 per cent. This result, Mr. Watson Smith informs us, was almost certainly obtained by the Kjeldahl method. The low figures, 1·47 per cent. and ·35 per cent., quoted by the Japanese authority for Takashima and Hiroyama coals, may have been got by the same process, but of this we have no assurance. The Indian coals, so far as examined, gave concordant results by the two methods of nitrogen determination.

(3.) The sulphur contents would appear to be frequently high also. Watson Smith and Chorley's figure for Miike is 3·15 per cent. of sulphur, and the result obtained in our own laboratory agrees with this. Systematic determinations of the total sulphur were omitted as likely to contribute little to our knowledge of the composition of the coal itself.

(4.) The close agreement between the experimentally determined calorific values, as fixed by the Thompson's calorimeter, and the calculated values is noticeable. It is the case even where the values are very low. The experimental result is in several instances slightly higher than that calculated from the formula given. This may be ascribed in part at least to the oxidation of the sulphur.

(5.) Our examination of these typical Japanese coals goes to show that the coal from both the north and south islands of the Empire is frequently of high quality, while that from the two coal-bearing districts of the middle island is of inferior value only.

III. *Pyridine as a solvent for Coal.*—A year ago it was suggested to one of us by Prof. P. Phillips Bedson that the effect of pyridine as a solvent might be tried on some of the coals on which experiments had already been made in the Glasgow University Laboratory. Bedson had already shown (Trans. N. of Eng. Inst. of Min. and Mech. Engin., 1899, **48**, [3], 82—87; this Journal, 1899, pp. 738, 739) that from Durham coal this reagent extracts from 16 to 18 per cent., and from New Zealand coal 10 to 13 per cent., and since then his results have been confirmed and extended by Baker (*ibid.*, 1901, **50**, [2], 23—26; this Journal, 1901, p. 789). The experiments of the latter indicate that the removal of certain constituents by pyridine results in a lessening and in some cases complete disappearance of the coking property of the coal.

From the series of Indian and Japanese coals described above we selected the samples from Barakar (Bengal), Poronai and Yubari (Japan), and for comparison chose two well-known Scotch coals, Linrigg Lower Drumgray and Bannockburn Main. The two latter were the samples marked J and N, described in a previous paper (Carrick Anderson and Roberts, this Journal, 1898, p. 1015), the former being a caking coal of low caking index (4·5), and the latter a strong caking coal (index, 15·5).

In each case 12—15 grms. of the coal, finely powdered, was treated in a Soxhlet with commercial pyridine boiling about 110°—120° C. The pyridine was distilled off and the residue digested with hot hydrochloric acid, then filtered and washed with hot water till free from chlorides. It was finally dried at 110° C.

From all the samples pyridine extracted a considerable amount of a dark brown substance with a greenish fluorescence when in solution. After removal of the pyridine this remained as a black lustrous body resembling bitumen.

Table XI.

	Barakar (India).	Poronai (Japan).	Yubari (Japan).	Linrigg (Scotland).	Bannockburn Main (Scotland).
Percentage of original coal extracted.	Per Cent. 10·8	Per Cent 7·0	Per Cent. 21·7	Per Cent. 12·8	Per Cent. 14·5
Effect of removal on caking property.	Ignited residue just cohered and no more. Loss = 39·26 per cent.	Residue did not cohere. Loss = 44·14 per cent.	Residue cohered fairly firmly, but was dull in colour. Loss = 49·14 per cent.	Residue a loose non-coherent powder. Loss = 43·02 per cent.	Residue still a firm, hard coke, but not so strong as the original. Part remained as a loose powder. Loss = 29·6 per cent.

Some of these extracts were analysed and the composition found to be as follows:—

Table XII.

	Barakar (India).	Poronai (Japan).	Yubari (Japan).	Linrigg (Scotland).	Bannockburn (Scotland).
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Hydrogen.....	5·82	?	6·12	5·68	6·05
Carbon.....	82·91	?	81·51	79·93	83·39
Oxygen.....	8·73	?	10·00	?	7·30
Nitrogen*	2·24	1·62	2·17	?	2·86
Sulphur.....	·30	·60	·20	?	·40
	100·00		100·00		100·00

* Determined by Dumas method.

These extracts are similar in appearance and seem to be of like character. They all contain both nitrogen and sulphur, as well as a small amount of inorganic matter (up to ·7 per cent.). The presence of organic sulphur in all the samples confirms the discovery of it by the method of nitric acid oxidation of the coal (Carrick Anderson and Roberts, this Journal, 1898, p. 1018). Comparison of the acid body described there as got from Bannockburn Main coal with the above extract from the same sample shows the same amount of organic sulphur in each. Both that part of coal which dissolves in pyridine and that which remains insoluble yield similar brown acid bodies by nitric acid oxidation, conducted as described in the paper quoted above. Analyses of these have not yet been made.

These pyridine extracts are mixtures, and a partial separation at least may be made by suitable solvents.

From the Linrigg coal amyl acetate, among other solvents tried, extracted a reddish brown resin, which in solution gave a green fluorescence.

The conclusion drawn is that pyridine as a solvent extracts a larger amount from coal than any other reagent hitherto used. In the extracted matter the proportions of carbon, hydrogen, and nitrogen are not unlike those in the dry organic matter of the original coal, but the percentage of carbon in the extract is generally less and sometimes markedly lower than in the original, so that bodies richer in carbon would appear to form the bulk of the insoluble portion. In the case of inferior caking coals, the treatment with pyridine removes the caking property completely, but in strong caking coals a fusible constituent is left undissolved, so that the caking power, though impaired, is not altogether destroyed.

Discussion.

Mr. Satow said he had been greatly interested, and had gained a great deal of information from his former

Professor, Dr. Anderson's paper, and he could add nothing on the subject, except a few things which he saw in a recent Japanese Government report on coals. As regards the Miike coalfield, it had been known to the Japanese for about three hundred years. It runs from north-west to south-east, with an inclination of about 10°. In 1875, it was transferred to the Government, and consequently every recent Western practice was introduced into the mine. After 16 years the Mitsu firm obtained possession of it from the Government, and since that time much improvement has been made, 2,500 tons being the daily output at the present time. The mine is lighted throughout by electricity, and such operations as hoisting and ventilation are likewise performed by electrical power. The largest pump used has a diameter of 90 ins., with 12-ft. stroke; there is also a double-acting steam pump of 250 B.H.P., which is one of the largest pumps in use in such mines; indeed, this mine, from the point of general equipment, is one of the model mines of the world. One thing that struck the speaker when he visited collieries at Hamilton was the fact that the miners of that district were still sticking to the old methods of working. As regards the future of the Japanese coalfield, they had the prospect of discovering some other fields. Although it had no direct connection with the paper, he might mention that recently they had discovered a well of petroleum in the centre of Nippon (Japan) Island, which is said to be not only of such enormous capacity as to supply the internal consumption, but also to contain sufficient for exportation.

Yorkshire Section.

Erratum.—This Journal, 1902, p. 160, col. 1, bottom line, for "A *catechu*," read "*A. catechu*."

Obituary.

WILLIAM MARTINDALE.

Member of the Society of Chemical Industry. Formerly President of the Pharmaceutical Society.

Author of the "Extra Pharmacopœia," &c.

On Sunday, February 2nd, the death took place of Mr. William Martindale, one of the most prominent of English pharmacists. In connection with the Pharmaceutical Society he was for ten years an examiner, and since his resignation has been a member of the council of that body. He was treasurer in 1898, and president in 1899—1900. Mr. Martindale was twice president of the British Pharmaceutical Conference, 1891—1896. He was a Fellow of the Chemical Society, of the Linnean Society, and other scientific bodies. In 1893 he was one of the British delegates to the International Congress of Pharmacy held in Chicago during the time of the Exhibition. In the same year he was Mayor of the quaint old town of Winchelsea, and a Baron of the Cinque Ports. In conjunction with Dr. Wynn Westcott he was author of the "Extra Pharmacopœia," a work which attained great popularity with physicians and pharmacists, and passed through nine editions, and was altogether a work which has attained a unique position in the history of pharmaceutical literature. At the time of his death Mr. Martindale was serving on the committee appointed by the Privy Council last year to inquire into the conditions governing the sale of poisons.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	243
II.—Fuel, Gas, and Light	244
III.—Destructive Distillation, Tar Products, Petroleum	246
IV.—Colouring Matters and Dyestuffs	247
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	249
VI.—Colouring Wood, Paper, Leather, &c.	250
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	250
VIII.—Glass, Pottery, and Enamels	255
IX.—Building Materials, Clays, Mortars, and Cements	256
X.—Metallurgy	257
XI.—Electro-Chemistry and Electro-Metallurgy	259
XII.—Fats, Fatty Oils, and Soap	262
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	263
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	264
XV.—Manures, &c.	265
XVI.—Sugar, Starch, Gum, &c.	265
XVII.—Brewing, Wines, Spirits, &c.	266
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	268
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	271
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	272
XXI.—Photography	275
XXII.—Explosives, Matches, &c.	276
XXIII.—Analytical Chemistry	276
XXIV.—Scientific and Technical Notes	284

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Filtering Liquids, and Apparatus therefor; Method of ——. E. Füllner, Herischdorf, Silesia. Eng. Pat. 22,852, Nov. 12, 1901.

A drum with open end is rotated in a tank, its extremities being tightly packed, by means of rims or flanges, against the ends of the tank. The drum is perforated, and a band of network or permeable felt passes round it and stretching rollers. On this band is a filtering layer. The liquid to be filtered or clarified is introduced into the tank, and by hydrostatic pressure passes through this filtering layer, which retains the impurities, into the interior of the drum, and runs off in a filtered and clarified condition from the open ends of the drum. When the filtering layer has become charged with impurities, it may be removed by means of scrapers or brushes, and the uppermost layer may then be made up by introducing disintegrated fibrous material into the liquid under treatment.—J. A. B.

Separating Solid Particles of Superior Specific Gravity from Fluids containing them; Apparatus for ——. W. P. Thompson, Liverpool. Eng. Pat. 22,957, Dec. 15, 1900.

A MODIFIED cyclone dust separator. Dusty air or other fluid enters tangentially a vertical cylindrical chamber; the base of the chamber contains a flat vertical plate, which supports above it a vertical hollow truncated cone; the dust falls through the annulus formed between this cone and the chamber itself, and is removed by means of a double valve. The air, free from dust, leaves the apparatus by means of a central pipe in the upper cover.—J. W. H.

Refrigeration, and Apparatus therefor; Ammonia Absorption-Producing Process of ——. W. Brothers, Prestwich. Eng. Pat. 4012, Feb. 25, 1901.

A VESSEL containing ammonia is connected, through a condenser, by a pipe with another vessel containing water; a vacuum is always present in one or other of these vessels, and no pressure above that of the atmosphere is permitted in either; both vessels are jacketed, and that containing water also has a suitable vessel in contact, in which the ice is formed. By heating the first vessel, the ammonia is driven off and absorbed by the water in the second; the flame is then removed and cooling water circulated, with the result that the rapid evaporation from the second vessel produces the desired refrigeration. A regulator of the gas for the heating burner is also claimed.—J. W. H.

UNITED STATES PATENTS.

Centrifugal Extraction; Process of ——. J. J. Berrigan, East Orange, New Jersey, U.S.A. U.S. Pat. 689,570, Dec. 24, 1901.

THE centrifugal machine claimed, is intended to separate solids in a dry form from liquids with which they are associated.

A circular drum revolves eccentrically on a vertical axis, so that its contents separate in layers in crescent form; two holes are pierced in its walls to remove the liquid at places where the liquid layers would accumulate, and scrapers carry the separated solids round the walls of the drum, where they become freed from moisture, and are finally discharged through an opening in the wall nearest the axis of rotation.—J. W. H.

Centrifugal Machine. J. J. Berrigan, East Orange, New Jersey, U.S.A. U.S. Pat. 689,571, Dec. 24, 1901.

THIS invention relates to a modification of the machine described in U.S. Pat. 689,570, Dec. 24, 1901 (see preceding abstract). To prevent the holes through which the liquid passes becoming clogged with solid material, tubes are employed which project into the liquid layer; the mechanical arrangement of the scrapers is also simplified.—J. W. H.

Centrifugal Machine. J. J. Berrigan, East Orange, New Jersey, U.S.A. U.S. Pat. 689,572, Dec. 24, 1901.

A SERIES of separating chambers revolve together on a vertical axis and separately on their own axes, which are inclined outwardly to the main axis. A liquid containing solids being introduced into the separating chambers by means of a central vertical pipe, meets a series of baffle plates in the upper part of each separating chamber, which retain the solids; the separated liquid flows out of the chambers through a ring of holes in each separator, and the solids are driven out of suitable openings in the upper cover by centrifugal force.—J. W. H.

Centrifugal Separator Drum. F. O. Nilsson, Waxholm, Sweden. U.S. Pat. 689,620, Dec. 24, 1901.

THE upper edges of separator drums of the type which have journals both above and below, are screwed on the outside and made conical on the inside; the covers screw on the drum, and are provided with lugs, which, when screwed tightly against the conical surfaces, expand the edges of the drums and make a very secure connection.

—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Lignite-Gas; Firing with ——, *for Pottery and Earthenware Kilns.* Baier. Thonind.-Zeit., 25, [146], 2125—2127.

THE generator consists of a bricked shaft with arched cover, generally rectangular in section, and of an area of about 3 sq. m. The front side is fitted with flat and step grates, on to which the coal is fed through a hopper above. The temperature of the gas in the main is rarely higher than 150° C., falling to 80°—60° C. at the entrance to the combustion chamber of the kiln. To ensure perfect combustion, the air has to be heated, and care taken to effect an intimate mixture of the gas and air, the best results being obtained by allowing them to impinge at right angles. For uniform distribution, the gas is led in from below, and passes through a number of upright firebrick pipes, perforated with small circular equidistant apertures, and extending to the top of the chamber. The author has also introduced a form of burner, consisting of short vertical perforated pipes, connected by hollow horizontal blocks, so that the gas is discharged both horizontally between the individual pipes, and vertically through the cover of the burner.

The heating of annular kilns with gas, possesses certain advantages over the employment of heating walls, *viz.*, greater rapidity of heating, reduced outlay on material (the gas pipes representing a weight only about one-tenth that of the heating walls), and a saving in the expense of fuel, and care in firing.—C. S.

ENGLISH PATENTS.

Spirit; Solidified ——. R. C. Wild, Eltham, Kent. Eng. Pat. 5404, March 14, 1901.

SOLIDIFIED spirit is generally prepared by mixing "alcohol or other spirit" with a soap-like mass. "The solid substance thus formed, when ignited, melts, and if the vessel containing it be upset while the material is burning, the ignited mass escapes," and may be dangerous. At present such solidified spirit is supplied in tins, &c. The inventor places in the containing vessel some absorbent material such as one of cotton wool, cellulose, or slag wool, &c., and thus, provision is made for such possible liquefaction and escape of spirit as that referred to.—J. F. B.

Gas in Gas Producers, and its Treatment and Utilisation in Internal Combustion Engines; Production of ——. P. Naef, New York. Eng. Pat. 781, Jan. 11, 1901. (Under Internat. Conv., June 14, 1900.)

THE specification describes a number of combinations, with a gas- or oil-engine, of a series of tubular "temperature interchangers" (heat economisers), whereby the gas and air supplied to the cylinder of the engine are pre-heated by the gases from the exhaust. If the combustible gas be delivered to the engine in a hot state from a producer, the exhaust gases are used to heat the air supplied to the engine, and also to heat the blast supplied to the producer. By introducing water along with the air blast into the economiser, steam is evolved, which is utilised in the producer. The gases from the producer may be cooled in an economiser, and then washed for the recovery of by-products, prior to use in the engine. To remove the smell from the exhaust gases, they may be passed through a revolving washer in which they are sprinkled with oil.

A suitable form of gas producer is also described.—H. B.

Hydrocarbon Burners for Heating Purposes. J. A. Mason, Philadelphia, and C. J. Wilson, New York. Eng. Pat. 18,978, Sept. 23, 1901.

A HYDROCARBON burner, adapted for locomobiles, is described, in which the oil is vaporised by passing it through a serpentine chamber, heated by the flame of the burner itself. The vapour, on its way to the burner, has to pass through a "self-cleaning strainer," which consists of a device filled with shot, the jolting of the vehicle causing a continuous agitation of the shot, and thus preventing any clogging of the strainer.—H. B.

Carbide of Calcium. J. W. Woodall and F. Windham, both of London. Eng. Pat. 524, Jan. 8, 1901.

Calcium carbide, which may or may not have been previously treated with petroleum, is impregnated with naphthalene, by being immersed, whilst hot, in molten naphthalene. This impregnation is said to retard the unduly vigorous action of water on carbide, whilst the heat evolved by that action is utilised in volatilising the naphthalene, which, in the gaseous form, mixes with the acetylene. The illuminating power of the acetylene is stated to be thereby improved.—J. A. B.

Acetylene Gas; Process or Method for Treating and Purifying ——. J. A. Burgess, Bradford, Canada. Eng. Pat. 241, Jan. 3, 1901.

With the object of removing from the gas the matter which fouls the pipes and burners, the gas, after leaving a condenser, is caused to traverse purifiers containing, in order, charcoal permeated with a dry metallic salt (preferably sulphate of iron), calcium carbide, and lava or similar material. The charcoal is saturated with a solution of the salt, and dried. The inventor states that the occlusive property of the charcoal brings the impurities into intimate contact with the metallic salt in the pores; also that he believes that the calcium carbide, in addition to removing moisture, has a purifying action on the gas. The purifier containing lava, is preferably kept at a temperature slightly below the decomposition point of acetylene. The lava is said to remove vesicles of the oily hydrocarbons, otherwise absorbed by the lava tips of the burners, which would thus become fouled. The prepared charcoal and calcium carbide purifiers may be applied both anterior and posterior to the storage gas-holder.—J. A. B.

Acetylene Gas for Household Lighting or other Purposes; Apparatus for Generating ——. T. Rauthmell, Holme, *viâ* Carnforth, Westmoreland. Eng. Pat. 4915, March 8, 1901.

An improved carbide holder for use with the apparatus protected under Eng. Pat. 21,511 of 1900 (this Journal, 1902, 34.) is described. It comprises a number of superposed semi-cylindrical chambers with perforated bottoms, arranged round a central pipe, by which the gas evolved passes away.—J. A. B.

Calcium Carbide; Smelting and Reducing Metals, and Producing ——. C. Diesler. Eng. Pat. 930, Jan. 14, 1901

See under XI. B., *page* 261.

Incandescent Electric Lamps; Glow-Bodies for Nernst ——. B. M. Drake, M. Solomon, and Nernst Electric Light, Ltd., Westminster. Eng. Pat. 5042, March 9, 1901.

In preparing the rods of refractory substance, rods in fairly long lengths are passed through an electric arc at a uniform rate, and are then cut into suitable pieces. The material for making the paste for mounting the rods is either fused in an electric furnace, or the oxides are formed into a thick rod, which is passed slowly through a large arc, so that it melts. The fused material is then ground to an impalpable powder, which serves as the mounting paste. —H. B.

Arc Lamps; Electrodes for ——. [*Metallic Salt.*] H. Bremer, Neheim-on-the-Ruhr, Germany. Eng. Pat. 18,335, Sept. 11, 1899.

A luminiferous metallic salt, or other substance adapted to lengthen the arc, is mixed with the carbon serving as raw material for the electrodes This reduces the noise caused by the re-ignition of the arc, and also prevents the frequent jumping of the arc from one spot of the electrode to another, which occurs with the employment of plate-shaped or other arc-lamp electrodes having a comparatively large sectional area.—G. H. R.

United States Patents.

Coke Oven. R. D. Martin, Alderson, Indian Territory, U.S.A. U.S. Pat. 690,748, Jan. 7, 1902.

The object of this invention is, in a series of coke ovens, to maintain the heat in a drawn oven until it can be recharged, and thus assist in igniting the coal in a newly-charged oven. Each oven is connected with its two neighbours on its opposite sides by two V-shaped passages, opening into the ovens just above the normal level of the coal, while the point of the V extends either horizontally or vertically through the wall in such a position that a damper may be easily worked so as to open or close the passage. If anoven has cooled down before recharging, the gases from its neighbours are directed into it; or the gases may be thus admitted thereto directly after that oven is charged. In either case, the ordinary gas outlet in the neighbours is closed by a tightly fitting stopper, while the outlet in the oven under notice is open.—R. S.

Artificial Fuel; Manufacture of ——. E. Springborn, London. U.S. Pat. 690,888, Jan. 7, 1902.

Carbonaceous material of poor combustible quality is impregnated with sugar, then immersed in "a solution of coal-tar, petroleum, and resin," to which is afterwards added an alkaline solution. The product is afterwards allowed to dry, and is then compressed.—R. S.

Coke-making; Plant for ——. W. Kennedy, Alleghany, Penn., U.S.A. U.S. Pat. 691,148, Jan. 14, 1902.

Two lines of hearths and two or more series of removable ovens are employed. The coal is discharged from cars down a shute to a bucket, which is suspended from a trolly running on overhead rails. The bucket has a discharge opening in the bottom, and by this means the coal is discharged into an oven. Each oven is connected with the gas main, special removable connections being provided. The gas may be washed or otherwise treated, or may be utilised directly for heating purposes, tubular connections being provided for leading it to combustion chambers and flues beneath the hearths. When the fuel is coked in any oven, that oven is connected to an overhead traveller, and bodily shifted or slid on to a car, running on rails, the sides of the car being let down to form a bridge. When the oven and coke are in position on the car, the sides of the latter are raised, and the oven is then lifted off and carried back to a hearth for another coking operation. A cover, carried by another overhead traveller, may be placed over the coke in the car, and the coke quenched by steam introduced through nozzles passing through the sides of the car; or the car may be shifted to discharge the coke into water. The coke may finally be discharged down a chute, from which it may be raised by an endless chain of buckets to elevated store bins.—R. S.

Gas Producer. H. Hyatt, Cleveland, Ohio, U.S.A. U.S. Pat. 689,673, Dec. 24, 1901.

The object of the invention is to provide for the effective agitation of all portions of the mass of incandescent fuel in a gas producer, so as to prevent the formation of clinkers, and insure a uniform flow of air throughout all portions of the mass. The producer is provided above the fuel level with a rock-shaft, extending across it, and composed of a series of sections connected together, each section carrying a poker. The shaft is laterally reciprocated as well as rocked. The shaft and pokers are hollow, and cold water is continuously passed through them.—R. S.

Gas Producer. W. Swindell, Alleghany, Penn., U.S.A. U.S. Pat. 689,660, Dec. 24, 1901.

The gas producer is an improvement on that described in a former patent by the same inventor (U.S. Pat. 674,104, 1901). The producer is rectangular, and the internal side walls begin to slope inwardly and downwardly at about half the height of the producer, and are continued by two side grates, which do not, however, meet at the centre. Longitudinal steam

blast-pipes extend along the lower edges of the grates. Parallel with the side walls, and reaching down from the roof to the level where these walls begin to slope, are two internal walls, forming two side compartments. These compartments are again divided by cross walls into four chambers. The latter form the charging and gas-generating chambers. They are charged alternately, so that a different kind of gas is developed at any moment in the several compartments. The central space between these two parallel walls is divided by a transverse wall. Openings are provided, so that the gas may pass either directly or indirectly from each of the gas-generating chambers to one of these central compartments, from which it escapes below the dividing wall to the other central compartment, and thence passes away to the usual outlet, within which is placed a damper. The arrangement of the two central chambers causes the gases to thoroughly mix before they escape—R. S.

Smoke or Vapour Condenser. S. G. Merrick, Philadelphia, Penn., U.S.A. U.S. Pat. 689,682, Dec. 24, 1901.

The smoke or vapour is led into one chamber of a box divided by a wall into two compartments. This wall extends from the top of the chamber to about half the depth, its lower end dipping in water. Within the box there is mounted, upon a horizontal rotating shaft, a conical vessel, the inside of which is formed into a series of spiral passages, by means of metal ribbon secured to the shaft and to the periphery. The open end of the vessel within the smoke-receiving chamber is the larger, and its edge is notched. The narrower end is placed within the second or outlet chamber, and is provided with a perforated end plate, while its sides may also be perforated near the end plate. The conical vessel, as it rotates, draws in "alternate portions of smoke or gas as the mouth is above water, and of water as the mouth is below water." The water and smoke are passed onwards, and are thoroughly mixed together, especially as the space becomes smaller in consequence of the conical form, the result being that "acid, alkaline, or oleaginous vapours" are absorbed by the water, and may be recovered by distillation, while the purified smoke is allowed to escape from the outlet chamber.—R. S.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Naphtha from Baku and Grosny; Decomposition Products of ——. K. W. Charitschkow. Westn. shirow. weschtsch., 1901, **2**, 183. Chem.-Zeit., 1902, **26**, [2], Rep. 7.

Destructive distillation of the naphtha residue, with the object of obtaining new products and increasing the yield of illuminating oil, proved unsuccessful in the case of Baku naphtha, the kerosene so obtained being of little value. On the other hand, the process appeared promising as a means of working up the residues in the Grosny naphtha industry, where it is very difficult to obtain more than 20 per cent. of kerosene without leaving resinoïd residues, which are difficult to work up subsequently. Part of these products might be subjected to destructive distillation and the decomposition products added to the residual part. This would yield a liquid fuel resembling Baku *masut* in its consistency, ignition point, and other properties. The distillation process could be continued till the residue is either coked, or until a hard resinous mass is obtained. The first method would be disadvantageous, owing to the difficulty of ultimately clearing the still of coke, but the latter method, wherein the coking stage is not reached, could be employed with advantage.

The experiments showed that Grosny naphtha yielded more coke than Baku naphtha on complete decomposition, which pointed to the former containing a higher proportion of substances dissociated by heating. It was also found that the distillates of the decomposition products of both kinds of naphtha consisted of practically identical fractions from a technical point of view. The residues from these distillations might be used to improve the naphtha residues from the ordinary distillation.—C. A. M.

United States Patents.

Sawdust; Apparatus for Distilling ——. E. S. Hutchinson, Washington, Columbia. U.S. Pat. 689,723, June 24, 1901.

The apparatus claimed, is for the continuous distillation of sawdust and the recovery of by-products, and consists of an externally heated retort, which comprises (1) a drying section, heated to a comparatively low temperature to remove aqueous vapours, which are not further treated; (2) a distilling section, located below the drying section, in which the material is subjected to a relatively higher temperature to expel the lighter vapours, which are condensed and suitably recovered; (3) a lower distilling section, heated to a temperature sufficiently high to remove and recover the heavy by-products; and (4) preferably using a part of the fixed gases passing from the condensers, as a means for furnishing heat to carry on the distillation after the retort has been started, and sufficient gas is generated for that purpose. Each section is divided into a plurality of horizontally arranged passages, through which the sawdust is conveyed, and during its passage the distillation is accomplished. Means are provided for circulating heat and producing a uniform temperature in the different sections, thereby preventing loss by decomposition, so common in externally heated retorts. The charcoal on leaving the final section is fed into an exit chamber of special construction, which admits of its continuous removal from the retort without loss of by-products and vapours. 28 claims.—D. B.

Distilling Apparatus. J. S. Roake, Brooklyn, New York. U.S. Pat. 690,611, May 18, 1901.

In certain processes of distillation, notably in the destructive distillation of wood, inflammable hydrocarbon gas is carried over in considerable quantity from the retort with the other products to the receiver. The proposed method of disposal of the gas in such a manner that it may at all times escape freely and safely from the receiver, is claimed, all danger of accident by fire being reduced to a minimum or entirely avoided. The receiver is provided with two escape pipes, one communicating with a heating burner or receiver, in which the gas may be either economically utilised or else stored, if desired, and the other leading to the open air, where the gas may be safely ignited and burned, and a single controlling device so constructed that the flow of gas may be directed through either pipe or divided between them.

—D. B.

Wax; Manufacture of Mineral ——. E von Boyen, Hamburg-Steinwärder, Germany. U.S. Pat. 689,381, April 30, 1900.

The process claimed, consists in producing from bituminous brown coal (lignite), a wax-like substance consisting of an acid and an unsaturated hydrocarbon, by treating the coal with hot petroleum spirit, benzene, or other suitable solvent, and converting the extract into mineral wax by subjecting it to distillation with superheated steam, under diminished pressure. The purified product is a white, hard, crystalline substance, melting at 70° C., which, unlike paraffin, is partly saponified by alkali and completely carbonised by concentrated sulphuric acid.—D. B.

Wax from Bituminous Brown Coal; Manufacture of Mineral ——. E. von Boyen, Hamburg, Germany. U.S. Pat. 690,693, Jan. 3, 1901.

This process differs from that described in the preceding abstract in that the extraction by means of costly solvents is avoided. The lignite is subjected to destructive distillation in the presence of superheated steam, and the product redistilled in the presence of superheated steam under reduced pressure.—D. B.

Acetone; Process for Making ——. J. L. Hawliczek, Liverpool, England. U.S. Pat. 690,724, Jan. 7, 1902.

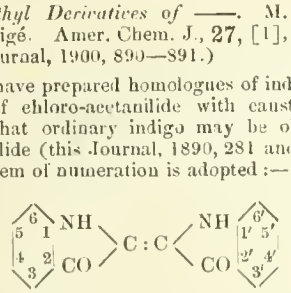
See Eng. Pat. 1898, 15,907 (this Journal, 1899, 824).

—A. C. W.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo; Methyl Derivatives of ——. M. Kuhara and M. Chikashigé. Amer. Chem. J., **27**, [1], 1—15. (See also this Journal, 1900, 890—891.)

The authors have prepared homologues of indigo by fusing homologues of chloro-acetanilide with caustic potash, in the manner that ordinary indigo may be obtained from chloro-acetanilide (this Journal, 1890, 281 and 1121). The following system of numeration is adopted :—



6.6′-*Dimethyl indigo* is obtained by fusing 100 parts of chloro-acet-*o*-toluide with 175 parts of dry powdered caustic potash and 25 parts of potassium carbonate. It is purified by sublimation or by precipitation from a chloroform solution. The sublimed product crystallises in prisms very closely resembling ordinary indigo in appearance. Characteristic is the solubility in alcohol (1 : 2,000), and in chloroform (1 : 500).

5.5′-*Dimethyl indigo* is similarly prepared from chloro-acet-*m*-toluide, m. pt. 141° C., but potassium carbonate is not added to the melt.

4.4′-*Dimethyl indigo*, which is formed, under similar conditions to the above, from chloro-acet-*p*-toluide, is identical with the dimethyl indigo already known (this Journal, 1890, 281; 1891, 758; also Ber., **33**, 2648). The so-called *m*-methyl indigo (Ber., **16**, 817) obtained from *o*-nitro-*m* methylbenzaldehyde is not identical with any of these isomers.

4.6.4′6′-*Tetramethyl indigo* was prepared by fusing chloro-acet-*unsym.*-metaxylide, m. pt. 143° C., with caustic potash; and similarly 3.4.6.3′4′6′-*hexamethyl indigo* was obtained from chloro-acet-pseudocumidide, m. pt. 158·5° C., but only in small quantity.

The methyl derivatives of indigo are all more soluble in organic solvents than ordinary indigo. The best means of characterising them appears to be the observation of the absorption bands in a chloroform solution (Ber., **16**, 2051).

Position of the Maximum Darkness in the Absorption Bands of the Methyl Indigos (Chloroform Solution).

——	λ_1	λ_2	$\frac{\lambda_1 + \lambda_2}{2}$
Ordinary indigo	622·7	587·6	605·1
6.6′-dimethyl indigo.....	643·6	615·7	629·7
5.5′- „	619·2	598·1	608·6
4.4′- „	643·7	622·7	633·2
4.6.4′6′-tetramethyl indigo	662·7	631·7	647·2

With regard to the mechanism of the reaction between chloro-acetanilide and potash, the authors bring a considerable amount of fresh experimental evidence to uphold their view (Amer. Chem. J., **24**, 167), that the reaction depends for its success on the intermediate formation of diphenyldiketopiperazine, and the subsequent transformation of this substance into indigo by more complicated changes.

—H. L.

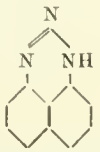
Diazo Compounds; Action of Hypophosphorous Acid on ——. [*Diphenyl and Benzene Hydrocarbons, &c.*] J. Mai. Ber., 1902, **35**, [1], 162—163.

The author finds that, by the action of hypophosphorous acid, diazo compounds are converted mainly into the hydrocarbons, the other decomposition products being formed only in small amount. The commercial acid (sp. gr. 1·15) may be employed, or the calcium salt mixed with the equivalent quantity of sulphuric acid. Thus, *p*-diazotoluene chloride with hypophosphorous acid gives 67 per cent. of the theoretical proportion of toluene; diazobenzene chloride yields 1 grm. of benzene and 0·5 grm. of diphenyl for 3 grms. of aniline diazotised, a dyestuff of the Indophenol type being also formed; tetrazodiphenyl gives 60 per cent. of the theoretical yield of diphenyl, which may be advantageously prepared by this method; α-diazonaphthalene, when treated with hypophosphorous acid, yields naphthalene but slowly, the reaction being hastened by gentle heating.—T. H. P.

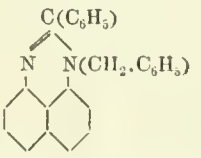
Naphthalene; peri-Derivatives of —— [*Benzimidazole Dyestuffs*]; *Ring Formation from.* E. Noelting. Chem.-Zeit., 1902, **26**, [1], 5.

It was shown by Terrisse many years ago that naphthalic anhydride yields with resorcinol a product resembling ordinary fluorescein in all respects. The author has found that the phenol and pyrogallol derivatives of naphthalic acid can also be readily prepared, but all his attempts to obtain oxynaphthanthraquinone have been unsuccessful, the formation of a ring with seven bonds, being apparently impossible.

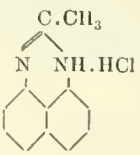
peri-Naphthylenediamine closely resembles the ortho derivative. Thus, on treatment with nitrous acid, it yields an azo-imino compound :—



According to Ladenburg, its hydrochloride, when heated with benzaldehyde, yields hydrochloric acid—a reaction which points to the formation of an aldehydine :—



It does not react, however, with benzil or phenanthraquinone, which again shows its disinclination to form a ring with seven bonds. On the other hand, it readily forms anhydro bases (imidazoles). Thus, on heating finely-pulverised acet-*peri*-nitronaphthylamine (m. pt. 191° C.) for a short time on the water-bath with a mixture of tin chloride and concentrated hydrochloric acid, a yellow granular reduction product is obtained, which, when recrystallised from water containing hydrochloric acid, forms long yellow needles with the composition, $C_{12}H_{11}N_2Cl$. The properties of the compound also correspond with what might be expected from the imidazole hydrochloride :—



The salt is readily soluble in hot water, but only dissolves with difficulty in cold water. It is insoluble in ether and benzene, but readily soluble in alcohol. The free base is precipitated by the addition of alkali or an acetate, but cannot be obtained in a crystalline condition.

On treatment with phthalic anhydride and zinc chloride, it gives a yellow colour—a reaction characteristic of the group N:C(CH$_3$)N.R.

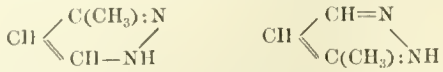
Benzoyl-*peri*-naphthylamine yields an analogous benzenyl derivative on reduction. The methylimidazole (the ethenyl derivative) forms yellow salts, which, however, have no tinctorial power, whereas the phenylimidazole (the benzenyl derivative) dyes silk and cotton a yellow colour.

On treating *peri*-naphthylenediamine with 2 mols. of dimethyl-*p*-aminobenzaldehyde or protocatechuic aldehyde in alcoholic solution, together with a little hydrochloric acid, compounds are obtained, which must be regarded as the

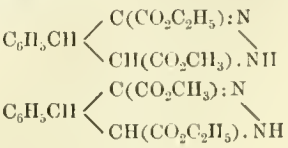
dimethylamino- and dihydroxy-derivatives of Ladenburg's aldehydine. Both have tinctorial properties, the former being a basic yellow dyestuff, and the latter producing a yellow colour with an alum mordant and an olive-brown colour with an iron mordant.—C. A. M.

Pyrazole Derivatives. E. Buchner and C. v. d. Heide. Ber., 1902, **35**, [1], 31—34.

According to Knorr (Annalen, **279**, 190) the decomposition of complicated pyrazole derivatives yields only a single product in place of the 3- and 5-methylpyrazoles—



which theory predicted. On the other hand, Buchner and H. Dessauer (Ber., **26**, 259) found that the condensation of cinnamic ethyl ester and diazo-acetic methyl ester, and of cinnamic methyl ester with diazo-acetic ethyl ester gave two different products—



melting respectively at 76° and 107° C.

The authors have now investigated the behaviour of these isomeric phenylpyrazoline dicarboxylic esters towards an oxidising agent, and find that both derivatives yield the same product, if either of them be dissolved in chloroform and treated with the theoretical quantity of bromine in the cold. Hydrobromic acid is evolved, and after standing two days, the solution is extracted with ether, the ethereal solution washed with sodium carbonate, dried, and evaporated The new product, 4-phenylpyrazole dicarboxylethylmethyl ester, separates in rhombohedral crystals or needles melting at 105° C. On hydrolysis by boiling with hydrochloric acid, 4-phenylpyrazole dicarboxylic acid melting at about 246° C., is obtained, and this product on heating gives off carbon dioxide, yielding 4-phenylpyrazole melting at 228° C.

—T. A. L.

4-Pyrazole Carboxylic Acid from 4-Phenylpyrazole W. Behaghel and E. Buchner. Ber., 1902, **35**, [1], 34—35.

The 4-phenylpyrazole, melting at 228° C. (see previous abstract), is converted by the action of fuming nitric acid into a nitro and a dinitro product. The latter crystallises from water in light yellow needles, melting at 209° C. The crude product of nitration gives, on reduction with tin and hydrochloric acid, a readily oxidisable amino compound, which, on oxidation with permanganate, and separation by means of its copper salt, yields 4-pyrazole carboxylic acid, melting at 275° C.—T. A. L.

Phenylacetylene and Diazoacetic Ethyl Ester. E. Buchner and L. Lehmann. Ber., 1902, **35**, [1], 35—37.

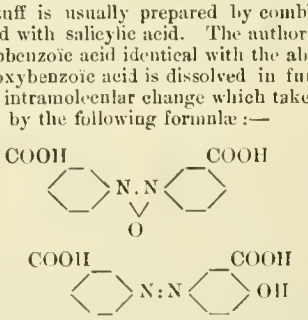
Condensation takes place between these two substances when equimolecular proportions are heated together in a sealed tube, in a water-bath, for eight hours. The product, 5·3-phenylpyrazole carboxylic ethyl ester, crystallises from ether, and melts at 140° C. The corresponding methyl ester melts at 182° C. On boiling with caustic soda lye, and acidifying, both these esters yield 5·3-phenylpyrazole carboxylic acid, which crystallises from water in thin, colourless needles, melting at 234° C. This acid, when heated from 140° to 150° C., so long as carbon dioxide is evolved, and subsequently distilled and fractionated at 307° C. (759 mm.), yields the free base 5(3)-phenylpyrazole as an oil which soon solidifies. It dissolves in much boiling water and separates as a colourless crystalline powder, melting at 78° C. It is doubtful whether the phenyl group is in the 5- or the 3-position.—T. A. L.

5(3)-Pyrazole Carboxylic Acid from 5(3)-Phenylpyrazole. E. Buchner and C. Hachmuian. Ber., 1902, **35**, [1], 37—42.

It has already been shown (see above) that by suitable treatment, 4-phenylpyrazole yields 4-pyrazole carboxylic acid. In a similar manner, the second C-phenylpyrazole yields C-pyrazole carboxylic acid, both of which are known substances. The synthesis by means of diazo-acetic ester (see preceding abstract) does not give a good yield, and 5(3)-phenylpyrazole is obtained, preferably by Knorr's method, from sodium benzoylaldehyde, hydrazine sulphate, and soda lye (Ber., **28**, 697). The product, on treatment with ten times its weight of fuming nitric acid, yields nitrophenylpyrazole, crystallising from alcohol in needles melting at 192° C. (Ber., **28**, 698). A dinitro product is obtained by heating the solution of phenylpyrazole in red fuming nitric acid on the water-bath. The substance separates from alcohol in colourless needles melting at 212° C. The sodium and potassium salts explode on heating. The nitro-compound, on reduction with tin and hydrochloric acid, yields amino-5(3)-phenylpyrazole, which melts at 104° C. and boils at 290°—300° C. (12 mm.). It gives salts and the following derivatives : — Acetaminophenylpyrazole, colourless needles from water, melting at 207° C., benzoyl derivative melting at 227° C., benzylidene derivative melting at about 65° C., and thiourea derivative melting at 202° C. When heated with methyl alcohol and methyl iodide to 120° C., the amino compound yields the di-iodomethylate of trimethylaminophenylpyrazole, which crystallises in colourless needles melting at 211° C., whilst the addition of bromine to a solution of the base in ether, and subsequent treatment with sodium carbonate solution, gives tribromaminophenylpyrazole, melting at 207° C. On oxidising the base with permanganate, and separation of the product by adding copper acetate, a precipitate of basic copper pyrazole carboxylate is obtained, which, on decomposition with hydrogen sulphide, yields 5(3)-pyrazole carboxylic acid melting at 212° C. When heated to a slightly higher temperature, carbon dioxide is evolved, and pyrazole, melting at 69° C., is formed. The authors also find that v. Rothenburg's oily phenylpyrazoline, obtained by heating cinnamic aldehyde with an excess of hydrazine hydrate, on oxidation with bromine in chloroform solution, only yields 5(3)-phenylpyrazole, melting at 78° C.—T. A. L.

Diamond Yellow G [*Azo Dyestuff*] ; *New Method for Preparing* ——. G. Schultz. Färber-Zeit., **13**, [2], 21.

This dyestuff is usually prepared by combining *m*-diazobenzoïc acid with salicylic acid. The author shows that a hydroxyazobenzoïc acid identical with the above is obtained when *m*-azoxybenzoïc acid is dissolved in fuming sulphuric acid. The intramolecular change which takes place may be represented by the following formulæ :—



—H. L.

English Patents.

Sulphur Dyestuffs. [*Sulphide Dyestuffs.*] T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 1644, Jan. 24 1901.

Brown dyestuffs for unmordanted cotton are obtained by the two following methods. Fusing alkali polysulphides with *m*-tolylene diamine and certain dicarboxylic acids, such as phthalic or succinic acid or their anhydrides, thiodiglycollic acid or oxalic acid, or else heating an azo dyestuff obtained from β-naphthol and its sulphonic acids with sodium sulphide to a high temperature. (See also Fr. Pat. 306,655 ; this Journal, 1902, 44.)—T. A. L.

Colouring Matter [*Anthracene Dyestuffs*], *and Derivatives thereof, and the Employment thereof in Dyeing; Manufacture and Production of New* —— J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 3239, Feb. 14, 1901.

See Fr. Pat. 309,503 (this Journal, 1902, 42.).—T. A. L.

Blue Colouring Matters [*Sulphide Dyestuffs*] *and Intermediate Products; Manufacture and Production of* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat 4024, Feb. 25, 1901.

See Fr. Pat. 308,557 (this Journal, 1902, 43).—T. A. L.

Colouring Matters [*Sulphide Dyestuffs*] *containing Sulphur.* J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 6545, March 28, 1901.

If 2.4.1 dinitro-acetanilide (obtained by nitrating acetanilide) be heated with sulphur and sodium sulphide, dyestuffs are formed which give brown shades on cotton from an alkaline sulphide bath. The shades produced are fast to acids, washing, and light, so that a subsequent treatment with chrome compounds or with oxidising agents is unnecessary. Treatment with copper sulphate gives a pure brown shade, whilst the action of chromates turns the shade somewhat yellower, although the fastness to washing is not increased. The shade varies to a certain extent from reddish-brown to pure brown according to the quantity of alkali sulphide employed.—T. A. L.

Black Colouring Matter [*Sulphide Dyestuff*], *and of a Material for use therein; Manufacture and Production of a New* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 6546, March 28, 1901.

Supplementary to Eng. Pat. 20,232 of 1899 (this Journal, 1900, 818). See Fr. Pat. 293,138 (this Journal, 1902, 43). —T. A. L.

Brown Sulphurised Dyestuff [*Sulphide Dyestuff*], *from 2.4-dinitro-para-oxydiphenylamine or 2.4-nitro-amido-oxydiphenylamine; Manufacture of a* ——. O. Imray, London. From The Farbwerke, Hoechst a/Main, Germany. Eng. Pat. 4568, March 4, 1901.

See Fr. Pat. 308,735 (this Journal, 1902, 44).—T. A. L.

Colour Lakes; Manufacture of Fast Double ——. O. Imray, London. From The Farbwerke, Hoechst a/Main, Germany. Eng. Pat. 5167, March 11, 1901.

When the hydroxide of an alkaline earth, of lead, or of zinc, is added, together with aluminium hydroxide, to the solution of a nitro-, azo-, acid-, or resorcinol-dyestuff, combination takes place, and an insoluble lake is obtained fast to water and spirit. The hydroxides of lead and zinc give the best results; lime also works satisfactorily, whereas the hydroxides of magnesium, strontium, and barium do not yield such fast lakes. For example, 146 kilos. of freshly slaked lime and 750 litres of water are mixed with a solution of 50 kilos. of Ponceau 3 R dissolved in 2,000 litres of water, and 52 kilos. of aluminium hydroxide suspended in 200 litres of water are run in. The whole is then heated nearly to boiling, with continual agitation, and, when cold, the lake is separated in the usual manner.—T. A. L.

Black Sulphurised Dyestuffs Directly Dyeing Cotton [*Sulphide Dyestuff*]; *Manufacture of* ——. O. Imray, London. From The Farbwerke, Hoechst a/Main, Germany. Eng. Pat. 5880, March 20, 1901.

See Fr. Pat. 309,322 (this Journal, 1902, 44).—T. A. L.

Dyestuffs [*Sulphide*]; *Manufacture of* ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 5580, March 16, 1901.

Supplementary to Eng. Pat. 16,247 of 1900 (this Journal, 1901, 889). See Fr. Pat. 303,524 (this Journal, 1902, 41).

Dyestuffs belonging to the Diphenylnaphthylmethane Series; Manufacture of Acid ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 5654, March 18, 1901.

See Fr. Pat. 309,101 (this Journal, 1902, 45).—T. A. L.

Colouring Matters [*Acridine Dyestuffs*] *belonging to the Naphthacridine Series; Manufacture of* ——. C. D. Abel, London. From The Actiengesellschaft für Anilin Fabrikation, Berlin. Eng. Pat. 6651, March 29, 1901.

Supplementary to Eng Pat. 16,471 of 1898 (this Journal, 1899, 826; see also Eng. Pat. 1820 of 1900, this Journal, 1901, 37). See Fr. Pat. 280,164; this Journal, 1902, 45. —T. A. L.

Anthracene Derivatives [*Anthracene Dyestuffs*]; *Manufacture or Production of New* ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 5811, March 19, 1901.

See Fr. Pat. 243,315 (this Journal, 1902, 40).—T. A. L.

Nitro Compounds; Reduction of Aromatic ——, *to the Corresponding Amines.* C. F. Boehringer und Soehne. Eng. Pat. 25,100, Dec. 9, 1901.

See under XI. A., *page* 260.

Erratum.—This Journal, 1902, 169, col. 2, line 11 from top. For "*are prepared for*" read "*are prepared by*," &c.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Ramie Fibre, and its Importance in the India-Rubber Industry Gummi-Zeit., 1902, **16**, [16], 275—277.

The author recapitulates the valuable properties of ramie, and points out that the machine-extracted fibre is admirably suited for employment in the rubber industry, although it requires further expensive treatment to fit it for the highest textile purposes.—R. L. J.

Artificial Hair. K. Süvern. Färber-Zeit., 1902, **13**, [1], 1—2.

The artificial horsehair manufactured by the Vereinigte Kunstseidefabriken Actiengesellschaft, of Frankfort-on-Main, is a smooth fibre which can be made of any desired length. As commonly produced, its lustre resembles that of artificial silk, but it can be rendered slightly less lustrous than horsehair. It is probably obtained by the method described in Ger. Pat. 125,309, by combining together several thinner fibres. Under the microscope it presents in section a characteristic appearance (see Fig. 1). Most of the fibres are more or less rounded as *a*, very few of

Fig. 1.

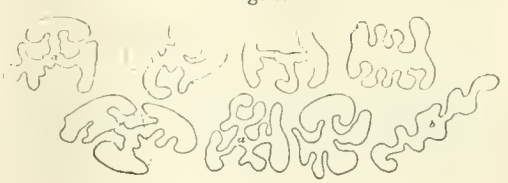


Fig 2.

them being flattened as *b*. The portions of the fibres cut off in the figure by the dotted lines are similar in appearance to the artificial silk fibres of Chardonnet and Lehner.

Another fibre produced by the same firm is also made in several qualities with various degrees of lustre. A non-lustrous quality has the microscopical appearance shown in section in Fig. 2.

A method for producing a substitute for horsehair has recently been patented by Lehner (Eng. Pat. 17,759 of 1900; this Journal, 1901, 1109).—E. B.

Mercerising Cotton; Employment of Refrigeration in ——. C. Kurz. Rev. Gén. des Mat. Col., 1902, **6**, [61], 1—2.

A reply to Lefèvre (Rev. Gén. des Mat. Col., 1901, **5**, [59], 258), who considers refrigeration in mercerising cotton unnecessary. It is unnecessary to cool the caustic soda lye when the cotton fabrics to be mercerised have previously been bleached, since the heat of reaction between cellulose and caustic soda is slight, and the temperature of the lye does not rise appreciably. When, however, fabrics are treated in the unbleached state, as is commonly the case, the fatty, starchy, and other impurities present in them are decomposed by the alkali with the evolution of much heat. It is, consequently, necessary in such a case to employ cooling apparatus, to prevent the temperature of the lye from rising excessively, as, although almost identical results are obtained with caustic soda lye at 0° C. and at 15°—20° C., a different and inferior result is obtained when the temperature of this is 50°—60° C. The addition of cold caustic soda lye to the mercerising bath, for the purpose of renewing the latter, is not in itself sufficient to prevent the rise in temperature, the quantity so added in practice being too small to have much effect.—E. B.

Mercerising Cotton; Employment of Refrigeration in ——. (Comments on the preceding article.) L. Lefèvre. Rev. Gén. des Mat. Col., 1902, **6**, [61], 2—3.

In the case mentioned by Kurz (see preceding abstract), the object of refrigerating is not to cool the lye, but to maintain it at a constant temperature; for instance, at 15°—20° C. It is not likely, however, that a high degree of lustre can be produced upon cotton which is mercerised in an unpurified condition. If the concentration of the lye used were only 15° — 20° B., it would be necessary to employ apparatus to cool it. Whether, in general, cooling of the lye is advantageous or not, is a question which can easily be decided by comparing the cost of caustic soda lye at, say, 15° B. and 0° C. with that of the lye at 35° B. and 15°—20° C.—E. B.

Diazo Compounds; Action of Silk on ——. C. Rossi. Rev. génér. Chim. pure et appl., 1901, **4**, 670; Chem.-Zeit., 1902, **26**, [2], Rep. 7—8.

The author's experiments show that silk acts as a reducing substance upon diazo compounds, in the same way as wool and other organic substances, *e.g.*, albumin. The diazo compounds form diazo-amino- or azo-amino compounds upon the silk, according as the diazotised amine yields stable or unstable diazo-amino compounds. The fibres mechanically retain the colour thus produced.—C. A. M.

Aniline Black; Immedial Blacks as Grey Reserves under ——. E. Justin-Müller. Rev. Gén. des Mat. Col., 1902, **6**, [61], 3.

The various brands of Immedial Black, namely, V, G extra, F F extra, N B, N G, and N R, after being transformed into bisulphite compounds, can be employed in the production of reserves under Aniline Black. Along with these, the Immedial Blues C and C R and Immedial Brown B, as well as Galloeyanine, Alizarin Blue, Anthracene Acid Brown G, &c., can be used for shading purposes. The greys thus obtained lose in intensity in the operation of chroming, especially when this is performed at or near the temperature of boiling point, but the loss may be prevented by adding a small quantity of tannic acid to the printing mixture. The bisulphite compounds are prepared by gradually adding 3 litres of sodium bisulphite solution at 36°—38° B. to 1 kilo. of the Immedial dyestuff, and allowing the mixture to stand for about 12 hours. A printing mixture is made, for instance, from 3 litres of thickening, ½ litre of a sodium bisulphite solution of Immedial Black V, 8 grms. of Prune dissolved in 200 c.c. of water, 800 grms. of sodium acetate, 300 c.c. of chromium acetate at 18° B., and 23 grms. of tannic acid dissolved in 46 c.c. of water. This is printed upon a tissue padded with a prussiate Aniline Black mixture, and dried at a low temperature. The tissue is then dried, steamed in a Mather and Platt steam-ageing machine, chromed, washed, and dried.—E. B.

English Patents.

Washing Calico Printers' Blanketing; Method and Means for ——. S. Bradbury, Rochdale. Eng. Pat. 24,069, Nov. 27, 1901.

A preliminary washing arrangement is interposed between the bowl of a printing machine and the drying chests, for the purpose of removing most of the colour from the blanketing, while it is in a completely undried state. The small amount of it which remains on the blanket, instead of becoming fixed, is softened and rendered more easily removable subsequently, by the heat from the drying chests, close to which the blanket next passes. The latter is then taken through a second washing arrangement, consisting of a light casing arranged below one or more revolving brushes and a cylinder, which serves as a support for the blanket while it is being brushed, and which may also be heated, and then act, like the cylinders, as a drying cylinder.—E. B.

Calico Printing [Imitation Indigo Prints]; Impts. in ——. H. A. Costobadie, Broadbottom, and The Calico Printers' Association Ltd., Manchester. Eng. Pat. 4839, March 7, 1901.

With the object of producing, economically and expeditiously, the style of two blue and white calico print, which is commonly produced entirely with Indigo as the dyestuff, a reserve or a discharge for Indigo is printed along with a mordanting compound—for instance, ordinary iron liquor. After printing the reserve, the tissue is dipped a pale shade of Indigo Blue, and is then dyed, in the mordanted parts, a dark blue, with an Alizarin or other suitable dyestuff. When the discharge method is employed, the tissue, before printing, is dyed a pale Indigo Blue, and after printing and steaming, it is dyed a dark blue, as in the previous case.

Claim is made for the combined operations of Indigo dyeing, reserve or discharge printing in connection therewith, and printing mordants, and dyeing these with dyestuffs other than Indigo.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

United States Patent.

Copying Ink. E. P. Lawton, Charleston, South Carolina, U.S.A. U.S. Pat. 690,862, Jan. 7, 1902.

A writing ink is described from which a copy can be made on tissue paper without the aid of moisture or of a letter press, by merely placing it in contact with the paper, and rubbing with the fingers. The ink can be prepared by adding about 120 grains of ammonium chloride to the fluid ounce of any commercial ink which contains sugar or some equivalent ingredient; but it is preferably composed by mixing together infusion of nutgalls, 30 c.c.; ferrous sulphate, "20 c.c."; ammonium chloride, 120 grains; sugar, 100 grains; phenol, 3 drops. Mucilage or glyceria may replace, or be employed in addition to the sugar, and 20 grains of common salt may be added if desired.

—F. H. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Hydrofluoric Acid; Action of ——, upon Lead, with reference to the Manufacture of Sulphuric Acid. Prost. Assoc. belge des Chim., Dec. 12, 1901. Chem.-Zeit., 1902, **26**, [1], 12—13.

The presence of fluorine compounds in the gases obtained by roasting blendes containing fluorine is very injurious to the leaden chambers used in sulphuric acid manufacture. In whatever form the fluorine is present when the gases

leave the stove, it is in all probability converted into hydrofluoric acid when the hot gases come into contact with the sulphuric acid in the Glover tower. The injury caused by the fluorine does not stand in any relation to the small proportion of fluorine in the ore; for small quantities of hydrofluoric acid have not only an injurious effect in themselves upon the lead, but also accelerate the corrosion of the metal by the sulphuric acid and the nitrogen compounds. The author considers that this point has not yet been taken into account, since blendes containing fluorine are still widely used; and although most of these contain only traces, yet others contain several per cent. In one sample the author found 7 per cent.

The results of a series of experiments are given, in which the action of hydrofluoric acid upon lead was determined, both by itself and in conjunction with sulphuric acid and with nitric acid. The lead used was the ordinary metal of the leaden chambers, cut into strips, and purified before and after each experiment with ammonium tartrate. In no case did the temperature exceed the ordinary temperature of the leaden chambers. From these results the following conclusions were arrived at:—In the case of hydrofluoric acid of from 0·5 to 2·5 per cent. strength, the most dilute acid has the strongest action at the ordinary temperature, whilst at 60° C. there appears to be no difference between the action of acids of 0·5, 1·0, and 2·5 per cent. strength. The addition of 2·5 per cent. of hydrofluoric acid to concentrated sulphuric acid increases by about 50 per cent. the corrosive action of the latter upon lead, when the liquid is kept quiet. On the other hand, when the bath is shaken, the sulphuric acid containing fluorine attacks the lead less than the pure sulphuric acid. The presence of 2·5 per cent. of hydrofluoric acid in sulphuric acid of 60° B. does not change the corrosive power of the latter at the ordinary temperature; but at 60° C. about 45 per cent. more lead is dissolved by the mixture than by the pure sulphuric acid. Concentrated sulphuric acid (66° B.) containing 2·5 per cent. of hydrofluoric acid and 2 per cent. of nitric acid produces much more corrosion of the lead than the mixed acids without nitric acid; in the case of sulphuric acid of 60° B. the action is much weaker. In practice, sulphuric acid of 66° B. is obtained by concentrating acid of 60° B., the concentration to about 62° B. being carried out in leaden vessels. The following results of experiments show the action of sulphuric acid of 60° B., containing fluorine, upon these leaden concentration vessels. The loss in lead per square metre was:—

Sulphuric Acid, 60° B.	Hydrofluoric Acid.	Nitric Acid.	Lead.
	Per Cent.	Per Cent.	Grms.
Acid alone	..	..	27
	0·5	..	30
	1·0	..	27
	0·5	0·5	18
	1·0	0·5	22·5

Action of Gaseous Hydrofluoric Acid on Lead.—In order to obtain an approximate measurement, the author employed a small apparatus in which he brought about the reactions of the leaden chambers, and into which he admitted a measured quantity of gaseous hydrofluoric acid. Before the admission of the latter, the loss of lead was 7·825 grms. per square metre; whilst, after the introduction of 2·05 grms. of gaseous hydrofluoric acid (*i.e.*, a very small quantity in proportion to the total volume of gases), the loss increased to 141·58 grms., and with a larger amount of hydrofluoric acid to 185·191 grms.—C. A. M.

Hydrochloric and Nitric Acids; Relative Strengths of ——. G. Bodländer. Ber. **35**, [1], 99—102.

The author, with P. Breull, has shown that carbonic acid is a stronger acid in salt solutions than in pure water at the same pressure. Working on solutions of chlorides and nitrates which had oxides of heavy metals in suspension, O. Kühling has shown that these oxides change to neutral or basic salts more readily in presence of chloride than of nitrate; from that he concluded that nitric acid was a stronger acid than hydrochloric acid. The author contends that this conclusion is false, and he considers that the phenomenon observed depends upon the slight solubility or dissociation of the neutral or basic chlorides of the metals investigated. The first action of carbonic acid may be represented by the equation—

$$CO_2 + NaCl + H_2O = NaHCO_3 + HCl.$$

The free acid acts on basic oxides present. The author derives the equation $\frac{Pb \times (NaHCO_3)^2}{Na^2}$ = constant, from which it is evident that the amount of $NaHCO_3$, and therefore of acid set free, depends inversely on the lead-ion concentration. This is smaller with chloride than with nitrate, which is due to the low solubility of lead chloride, or basic salt, and also to lead in these solutions being chiefly in the form of complex ions, *e.g.*, $PbCl_4$. With other heavy metals, the lower solubility of the chloride, compared with the nitrate, points to lower electro-affinity, and the formation of basic chlorides again lowers the concentration of the metal ion, with consequent increase of formation of $NaHCO_3$ and of acid in the case of chloride.—A. M.

Potash Industry (Stassfurt); Disposal of Waste Liquors from the ——. C. Przibylla. Zeits. angew. Chem., **15**, [4], 74—78.

The waste liquors of the Stassfurt potash industry, contain about 30 per cent. of magnesium chloride, with small amounts of potassium and sodium chlorides and magnesium sulphate.

The author's suggestion for the disposal of these liquors is to fill the excavated cavities in the rock-salt beds below the potash beds with them. Taking the carnallite, as mined, to contain 18 per cent. of potassium chloride and 26 per cent. of magnesium chloride, and assuming that 15 per cent. of the total potash salts mined are lost in the processes of working up, then a work turning out daily 100 tons of 80 per cent. potassium chloride must mine 522·2 tons of carnallite, containing 137·5 tons of magnesium chloride, which will produce 452·7 tons, or (at 1·30 sp. gr.) 348 cb. m. of waste liquors. The volume of the carnallite excavated will be (at 1·8 sp. gr.) 290 cb. m., and that of an equal weight of the rougher salts excavated for manure (at 2·2 sp. gr.) 237 cb. m. This excavation of 527 cb. m., less, say, 10 per cent. allowed for galleries which must be kept open, or 474 cb. m., will require to fill it by the usual process of throwing into it lump rock-salt mined from the beds beneath, thus preventing the "creep" or collapse of the cavities in the potash beds, the excavation of 190 cb. m. of rock-salt. If 3 per cent. of this must similarly be kept open, we have a cavity in the rock-salt which will engulf 184 cb. m. of waste liquors, leaving 164 cb. m. to be dealt with. As, however, the volume of final-liquors given, is a maximum (for the salt will often contain more potassium chloride without any more magnesium chloride), and that of the cavity in the rock-salt a minimum (for the salt may be worked for other purposes, and sometimes the cavities in the potash-beds must be more solidly filled with dry-wall work in rock-salt), the process will usually be capable of dealing with a larger proportion of the final-liquors than is above shown.

Nahnsen evaporates the waste liquors so far that on cooling they completely solidify. The hot liquors are run into the empty excavations, where, on cooling, they set to a firm and consistent mass, and where, during cooling, their heat can be utilised as a motive power for the ventilating air-current.

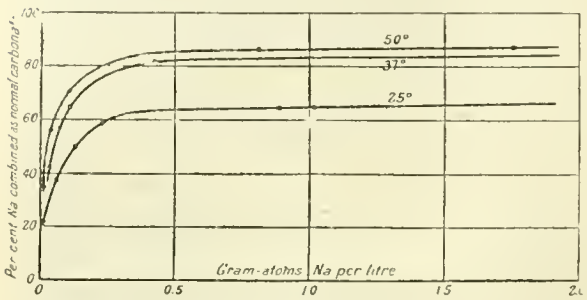
The author suggests a combination of his plan and Nahnsen's, by which the volume of the liquor to be evaporated is reduced. Instead of dealing with the whole 348 cb. m., in the example above, he carries out the process exactly as above described, then concentrates, according to Nahnsen's proposal, the 164 cb. m. of liquor yet undisposed of, and pours this into the chambers already filled with loose rock-salt. As the interstices of this filling afford in all a volume of 474—190, or 284 cb. m., and as the evaporation reduces the volume of the liquor from 164 to 110 cb. m., there is evidently ample room thus to dispose of the whole of the remaining liquor, which cements, consolidates, and

renders much more stable and firm the mass in the chamber. The cost of evaporation is worked out at 1·10 M. per cb. m. of the evaporated liquor; but where this takes the place of excavated rock-salt, the cost of mining and transport of the latter, 1·00 to 1·20 M., is to be set on the other side.

—J. T. D.

Carbonates and Bicarbonates in Aqueous Solution; Equilibrium between ——. F. K. Cameron and L. J Briggs. J. Phys. Chem. (U.S.A.), Nov. 1901, 537—555.

The authors have examined solutions of sodium, potassium, and magnesium carbonates, which were in a state of equilibrium in contact with air, with a view of ascertaining the proportions of the base present as carbonate and bicarbonate respectively. The solutions under examination were arranged in flasks placed in a water-bath, and connected together by a system of stoppers and tubing. Air was aspirated through the flasks until equilibrium was established, and then the contents of the flasks were titrated with standard potassium bisulphate solution, first with phenolphthalein and finally with Methyl Orange as indicators. The results obtained were similar with all three compounds, the results with sodium carbonate being shown in the accompanying diagram.—A. S.



Sodium Sulphate and Sodium Chloride; Solubility of Mixtures of ——. A. Seidell. Amer. Chem. J. **27**, [1], 52—62.

The solubility in water of mixtures of sodium sulphate and sodium chloride in various proportions and at temperatures ranging from 10° C. to 35° C. is given, both in tabular form and in the form of curves. It appears from the latter that the transformation of the decahydrate to anhydrous sodium sulphate at temperatues below 33° C. is quite possible when the crystals are in contact with concentrated solutions of sodium chloride.—H. L.

Alkali Hypochlorite and Chlorate; Attainable Current and Energy Efficiency during the Electrolytic Manufacture of ——. F. Foerster and E. Müller. Zeits. für Elektrochem. 1902, **8**, [1], 8—17.

Hypochlorite.—In order to reduce the evolution of oxygen at the anode to a minimum, and to obtain the maximum yield of hypochlorite, the neutral alkali chloride solution should contain some potassium chromate, and should be electrolysed at low temperatures between platinised electrodes. The subjoined table gives the results which were obtained when a solution containing 280 grms. of sodium chloride and 2 grms. of potassium chromate per litre was electrolysed in this way. The last experiment refers to an electrolyte containing only 100 grms. of sodium chloride per litre:—

Temperature.	Anodic Current Density.	E.M.F.	The Electrolysed Solution contained		Current Efficiency.	Watt-Hours consumed per Grm. of Hypochlorite Oxygen.
			Hypochlorite Oxygen per Litre.	Bleaching Chlorine per Litre.		
° C.	Amp./sq. cm.	V.	Grms.	Grms.	Per Cent.	
13	0·017	2·40	4·20	18·6	96	8·4
13	0·017	2·40	5·24	23·2	90	8·95
10	0·07	3·10	6·8	30·1	96	10·84
13	0·17	3·6	5·28	23·4	99	12·2
13	0·17	3·6	8·7	38·5	87	13·5
14	0·17	4·7	5·20	23·0	95	16·6

It is noteworthy that in the fifth experiment 38·5 grms. of bleaching chlorine were obtained per litre, whilst the current efficiency was satisfactory. This is the best result on record, and is in the neighbourhood of the limiting value. An attempt to push the electrolysis much further would result in the hypochlorite already formed taking part in conveying the current, with the simultaneous evolution of oxygen at the anode and the formation of chlorate.

As regards the energy-efficiency, the authors found that an E.M.F. of 2·2 volts was sufficient to decompose the strong salt solution; hence the minimum quantity of electric energy required to produce 1 grm. of hypochlorite oxygen is 7·2 watt-hours. In the case of the experiments in which the lowest current density was employed, the energy used was only about 1·8 times that corresponding to the theoretical minimum.

Compared with the best results obtained on the commercial scale (this Journal, 1901, 130—132), in which 25·5 and 40·9 watt-hours were consumed per gramme of hypochlorite oxygen (the finished liquor containing only about 2·9 grms. of hypochlorite oxygen, or 13 grms. of active chlorine, whilst the original electrolytes contained 18·35 and 10 per cent. of NaCl), it will be observed that the bleaching value of the liquors is only about one-third of the attainable value, whilst the energy consumed is 3·4—5·5 times that corresponding to the theoretical minimum. There is thus a considerable margin between the results of these laboratory experiments and those obtained on the technical scale. The chief difficulties that have to be overcome before the laboratory results can be realised on the large scale, are the removal of the chromate from the bleaching liquor, and the difficulty connected with the platinising, or, rather, of keeping platinised, the anodes. The removal of the chromate can be effected by careful precipitation with barium chloride. The anodes, however, only remain platinised when very low current densities are employed. When attempts are made to work with increased densities, the platinum black gradually becomes detached from the anode, which means a corresponding increase in the E.M.F. required. The anodes were platinised in the Lummer and Kurlbaum solution. Grey platinising and the mechanical roughening of the surface of the anode by a sand blast were found to be ineffectual.

Chlorate.—Similarly, improved yields of chlorate may be obtained by the use of platinised anodes, by the addition of a small quantity of potassium chromate, and by the further addition from time to time of small quantities of hydrochloric acid. Meanwhile, the addition of the acid has been covered by a French patent by P. Corbin. According to the authors, the production of chlorate is represented by the equation—

$$2HOCl + NaOCl = NaClO_3 + 2HCl.$$

The velocity of this reaction, according to the law of mass action, is proportional to the square of the concentration of the hypochlorous acid, and to the first power of the concentration of the anions of the hypochlorite. The concentration of the hypochlorous acid is therefore of the greatest importance. Full details of the experiments are given In one of these the authors obtained 1 grm. of chlorate

oxygen for an expenditure of 12·5 watt-hours, instead of the theoretical figure 7·4 watt-hours, the current efficiency being 98 per cent., the E.M.F. 3·66 volts, the current density 1,170 ampères per square metre, and the temperature 13° C.—J. S.

Pseudo-catalytic Oxidation Processes [*Metals*]. C. Engler and L. Wöhler.

See under X., *page* 257.

English Patents.

Sulphuric Acid and other Liquids; Apparatus for Concentrating ——. T. G. Webb, Pendleton, and Webb's Patents, Limited, Manchester. Eng. Pat. 1516, Jan. 23, 1901.

This invention relates to the stepped beaker type of apparatus. Each beaker contains an auxiliary vertical vessel, slightly higher than the lip of the former, and it may be bottomless, or provided with ports near the bottom, the inflowing liquid being thus divided into two columns. The liquid is conveyed from one beaker to another by a removable spout, flowing first into the auxiliary vessel and thence, through the ports, into the beaker. The vessels may be arranged in a heated chamber, or upon a furnace, hoods being provided to the beakers in the latter case, connected by elbow pipes to the trunk.—E. S.

Sulphuric Anhydride; Manufacture or Production of ——. G. W. Johnson, London. From the Firm of Verein Chemischer Fabriken, and A. Clemm, both of Mannheim, Germany. Eng. Pat. 4610, March 4, 1901.

This is an improvement on Eng. Pat. 24,748, 1899 (this Journal, 1900, 1014), consisting in substituting for the ferric oxide there directed to be used, copper oxide, chrome oxide, manganese oxide, or a mixture of these, or of the sulphates of the same. These oxides, or the sulphates, can be used both as filtering and contact substances for the hot roaster gases.—E. S.

Noxious Vapours and Sulphurous Fumes; Apparatus for Exhausting and Condensing ——. T. G. Webb, Pendleton, and Webb's Patents, Limited, Manchester. Eng. Pat. 1515, Jan. 23, 1901.

A long, rectangular tank, having a water supply and an overflow, is provided with a box at each end, the boxes being connected by a great number of horizontal tubes, furnished with contracting nozzles at the delivery ends. The box into which the fumes are admitted has a number of pipes, set crosswise, for circulation of the cold water. The second box is connected at the top to the chimney flue, whereby the necessary exhaustion is obtained. The fumes are thus cooled, first in the box in which the cooling tubes are set, and then by passage through the tubes surrounded by the cold water in the body of the tank, on their way to the second box. Each box is provided with an outlet for the products of condensation.—E. S.

Sodium Bichromate; Manufacture of ——. F. M. Spence, D. D. Spence, and H. Spence, all of Manchester; J. J. Hood, London; and T. J. I. Craig, Manchester. Eng. Pat. 5015, March 9, 1901.

Sodium chromate solution, of about 1·30 sp. gr., is treated, with agitation, in a closed vessel, with carbon dioxide and ammonia (or ammonium carbonate) in such proportion as to precipitate about one-half of the sodium present as bicarbonate, and to form ammonium chromate with about one-half of the total chromic acid. The cleared solution is boiled in a suitable vessel, to expel free and combined ammonia, which is collected for re-use, and the solution of sodium bichromate is concentrated to any desired strength. The sodium bicarbonate, obtained as described, is heated to obtain sodium carbonate and carbon dioxide, the former being available in producing the frit from chrome ore, yielding sodium chromate solution for repeating the operation, in which the CO_2 is also utilised.—E. S.

Cyanide of Sodium and of Potassium; Production of Anhydrous ——. W. P. Thompson, London. From Stassfurter Chemische Fabrik vormals Vorster and Grüneberg, Stassfurt, Germany. Eng. Pat. 23,124, Nov. 15, 1901.

It is stated that, although sodium cyanide crystallises from aqueous solution as a hydrated salt, it may be obtained anhydrous by concentration of the solution in presence of potassium cyanide. According to one modification, sodium cyanide solution may be evaporated over solid potassium cyanide, the mixed cyanides obtained being anhydrous. Or hydrated crystals of sodium cyanide may be dried with powdered potassium cyanide. By using the two cyanides in certain stated proportions, an anhydrous mixture is obtained containing 40 per cent. of cyanogen.—E. S.

Cyanide of Potassium and Cyanide of Sodium; Making Briquettes of a Mixture of ——. W. P. Thompson, London. From Stassfurter Chemische Fabrik vormals Vorster and Grüneberg, Stassfurt, Germany. Eng. Pat. 23,125, Nov. 15, 1901.

It is found that briquettes compressed from pure potassium cyanide do not possess the necessary firmness, but that when a mixture of potassium cyanide and sodium cyanide is used to form briquettes under great compression, the needful firmness is attained, and the material does not adhere to the moulds. "Anhydrous sodium cyanide," obtained as described in Eng. Pat. 23,124, 1901 (see preceding abstract), is preferably used in making the mixture.—E. S.

Nickel Ammonium Compound; Process for Producing a ——. H. A. Frasch, Hamilton, Canada. Eng. Pat. 19,035, Sept. 24, 1901.

A solution containing nickel, and, it may be, copper and other metals, is treated with calcium hydrate or an alkali to precipitate nickel hydroxide, &c. The hydroxides are collected and treated with a solution of ammonia or of ammonium chloride or sulphate; the solution thus obtained is filtered, and sodium chloride added, which causes separation of a nickel-ammonium salt to which the formula $Ni(NH_3)_2Cl_2 + 4NH_3 + 2NH_4Cl$ is assigned. This salt differs somewhat from that described in Eng. Pat. 284, 1901 (this Journal, 1901, 580), to which patent reference is made.—E. S.

United States Patents.

Sulphuric Anhydride; Method of Making ——. R. Knietsch, Ludwigshafen, Germany. U.S. Pat. 690,062, Dec. 31, 1901.

The apparatus in its simplest form consists of a pipe charged, as to its lower portion, with contact material, and set within another iron pipe, or in a brickwork chamber, so as to form an annular space about the enclosed pipe. The portion of the latter containing the contact material may differ from the other portion in length and diameter. The apparatus being heated to the requisite temperature, the gases containing sulphur dioxide and oxygen are admitted to the upper part of the enclosed pipe, while cold air enters the annular space by a channel near the bottom, the current being regulated by means of the exit valve at the top. The heat evolved in the reaction is thus controlled, and the excess heat is transferred to the upper part of the pipe. The sulphuric anhydride formed issues from the bottom of the pipe. The invention is also shown applied to an installation of a series of contact tubes, such as that described, set in a chamber in connection by tube plates and covers, above and below, air being admitted, as in the previous case, to the intermediate spaces, so as to flow in opposite direction to the flow of the gases. Means are provided for heating the apparatus during the working, as, when gases poor in SO_2 are used, may be needful. The claims include the use of a "fluid" flowing in a direction contrary to the gases, as well as of air specifically, as a means of regulating the temperature of reaction. (See also this Journal, 1902, 172.)—E. S.

Sulphuric Anhydride; Process of Making ——. A. Clemm and W. Hasenbach, both of Mannheim, Germany. U.S. Pat. 690,133, Dec. 31, 1901.

The pyrites roaster is so constructed that the dried air supplied to it passes, with the sulphurous fumes, through a chamber containing already roasted iron pyrites, heated by the gases from the burners. The sulphurous fumes are thus filtered, and in part converted into sulphuric anhydride, and any arsenic present is stated to be retained by the iron oxide. The gases, after passing up the chamber, and imparting heat to a flue and contact apparatus, leave the furnace near the top, and are conducted to a vertical cylinder, cooled externally by rinsing with water, whence they pass into an absorbing column, down which sulphuric acid flows to absorb the anhydride. The gases are next passed through a vessel charged with pumice stone, asbestos, or the like, and when thus filtered, are conducted back to the furnace, into cast-iron vessels, there heated as described, and thence enter a contact apparatus set in a chamber in the brickwork, and pass therein through screen-like fabrics of platinum, whereby the final conversion is effected. The gases are then passed successively through another set of cooling and absorbing vessels, whence the residual gases are aspired by a ventilator and escape into the atmosphere.—E. S.

Sulphates and Chlorine, Method of Making——. A. Clemm, Mannheim, Germany. U.S. Pat. 689,461, Dec. 24, 1901.

A chloride—for instance, sodium chloride—is made into a plastic mass with clay and water, which is formed into balls; these are dried, and heated to redness in a suitable vessel, in a slow current of sulphur dioxide and of oxygen or air. The chlorine formed is passed through concentrated sulphuric acid "or even through water," to remove any sulphur oxychloride that may be present. According to the second claim, the process may be modified by substituting sulphuric anhydride for SO_2. In either case, a sulphate remains in the retort.—E. S.

Hydrogen Sulphide; Method of Making ——. H. H. Wing, Buffalo, U.S.A. U.S. Pat. 690,502, Jan. 7, 1902.

The gases from a pyrites burner, or other source of SO_2, are passed through a dust chamber and cooler into a coke-packed tower for absorption by water. The sulphurous acid solution is pumped into a "generator," in which it is agitated with an emulsion of calcium carbonate. Insoluble calcium monosulphite is formed, and the carbon dioxide evolved "in a concentrated state" is collected in a gas-holder. When the reaction is completed, the contents of the generator are discharged into a filter-tank, and the liquid, withdrawn by a vacuum pump, is used over again in the coke-absorbing tower. The separated calcium monosulphite is then mixed with coke, and furnaced to reduce it to sulphide. [Magnesium sulphite, if present, is reduced to oxide.] The powdered sulphide is mixed with water to a cream and charged into a pair of "carbonators." The carbon dioxide, produced as described, is then passed into the bottom of one of the vessels to produce calcium carbonate and highly concentrated H_2S, which is stored. The calcium carbonate is used in the "generator" in the first part of the process. The two or more carbonators are worked partly alternately and partly in combination, the effluent gases from one being at a certain stage of the process passed into the contents of the other, so as to obtain the H_2S free from or with a minimum of CO_2. "Instead of using lime salts, any other alkaline earth metal or alkali metal can be used," and also alkali waste.—E. S.

Ammonia; Method of Making ——, *from Waste Products* [*from Beet-Sugar Factories*]. E. R. Besemfelder, Charlottenburg, Germany. U.S. Pat. 689,780, Dec. 24, 1901.

The invention is particularly described in reference to obtaining ammonia and other products from the waste lyes of beet-sugar factories. These are concentrated and mixed with bauxite or alumina and coke. The mixture is supplied to the uppermost of a series of horizontal superposed retorts, connected at alternate ends, moderately heated, in which conveyors impel the mixture in a contrary direction to the flow of the gases, which latter are taken through a tube having a siphon bend and trap for tar, into a set of heated "decomposition retorts." These are charged with alkaline earth oxides or aluminates, but preferably with slag derived from water-gas generators obtained as afterwards described. The nitrogenous gases are thus decomposed with formation of hydrocarbons and ammonia. The gases are then conducted through a seal chamber for collection of the tar, into a tower down which cold brown alkaline waste lye drips, into the seal chamber, where the mixture of tar and lye is boiled, the ammonia thus evolved passing also into the washing tower. Caustic potash is preferably added to the lye, to absorb cyanogen compounds from the gases, which then, after passage through a separating apparatus, are led up a tower down which superphosphate ($CaH_4(PO_4)_2$) solution is streamed, whereby the ammonia is absorbed. The effluent heating gases are stored. The heated material remaining in the distillation retorts is mixed with coke in water-gas generators of a type described in U.S. Pat. 666,257, 1901, in which superheated steam and air are alternately blown through the mass, whereby the excess of alkali combines with alumina to produce an aluminate, and the remaining nitrogen forms ammonia. Also, the oxygen salts present are converted into carbonates. The water-gas, after conduction through the tower connecting the lower retort with the generators, is utilised in heating the apparatus. The residue in the water-gas generators is received in drums for treatment with water, and the solution is filtered from the insoluble alkaline earth aluminate or alumina, which is calcined, and, after being mixed with broken fireclay, is used in the decomposition retorts. The solution, containing soluble aluminates, is freed from iron by an air-blast, and alumina is precipitated by CO_2, preferably by passage through it of the gases issuing from the chamber in which ammonia is absorbed by superphosphate. Potassium carbonate and strontia are recovered as by-products.—E. S.

Magnesium Sulphite; Process of Making ——. H. H. Wing, New Brighton, U.S.A. U.S. Pat. 690,503, Jan. 7, 1902.

Fumes containing sulphur dioxide, after passage through a dust settling chamber, are drawn with air into an absorbing apparatus, fitted with an agitator, nearly filled with a cream of magnesium hydroxide and water. When the transformation into insoluble sulphite and soluble sulphate is complete, the contents of the absorber are discharged into a filter tank, and the magnesium sulphite collected is dried. The solution is crystallised in a suitable tank, the mother-liquor is withdrawn for re-use, and the crystals of magnesium sulphate are dissolved, and the solution mixed with calcium chloride, whereby calcium sulphate is precipitated, and magnesium chloride is found in solution. The calcium sulphate, constituting one of the by-products, is collected. The $MgCl_2$ solution is treated with lime or milk of lime (dolomitic lime is also claimed alternatively), to obtain a precipitate of magnesium hydroxide, available in the first stage of the process, or otherwise, and calcium chloride is regenerated in solution.—E. S.

Aluminium Hydrate; Method of Making ——. H. W. Jordan, Syracuse, U.S.A. U.S. Pat. 691,470, Jan. 21, 1902.

Sodium aluminate solution, contained in a vessel fitted with an agitator, is treated with carbon dioxide, previously heated to above 200° F., and preferably to about 400° F. The aluminium hydroxide precipitated by the gas at the latter temperature is stated to contain only about 0·43 per cent. of insoluble sodium carbonate.—E. S.

Nickel Salts; Producing ——. H. A. Frasch, Hamilton, Canada. U.S. Pat. 689,391, Dec. 24, 1901.

See Eng. Pat. 19,035, Sept. 24, 1901 (page 253).—E. S.

Potassium-Magnesium Carbonate; Method of Making ——. H. Precht, Neustassfurt, Germany. U.S. Pat. 689,907, Dec. 31, 1901.

See Eng. Pat. 2342, 1901 (this Journal, 1902, 117).

Alum; Method of Making ——. E. Everhart, Atlanta, Georgia, U.S.A. U.S. Pat. 690,257, Dec. 31, 1901.

Bauxite or other aluminous substance is stirred in a strong solution of nitre cake (sodium bisulphate) heated by a steam coil. Water, and milk of lime to neutralise free acid, are added after the reaction, and the cleared solution is set for the sodium sulphate to crystallise. The solution of soda alum is drained off, and heated with potassium chloride or sulphate, to obtain potash alum. A second crop of alum crystals is obtained by concentrating the mother-liquors. The residual mother-liquors are used to dissolve the sodium sulphate previously obtained, and the solution, after purification by milk of lime, is crystallised to obtain pure Glauber salts.—E. S.

Alkali Chlorides; Apparatus for the Continuous Electrolysis of ——. W. Gintl. U.S. Pats. 690,365 and 690,141, Dec. 31, 1901.

See under XI., A., *page* 260.

VIII.—GLASS, POTTERY, ENAMELS.

[*Pottery*] *Fusible Tell-tales.* J. Salt. Ceram. 4, [144], 139—140.

In dealing with certain defects exhibited by the Seger cones, the author mentions the presence of iron in the series 01 to 010 as unfavourable, owing to the ease with which it is influenced by furnace gases of different composition. The boric acid employed as flux is volatile, and is attacked by the sulphuric acid vapours from the fuel; and the same vapours also act on part of the calcium carbonate in the cones, with the result that the fusibility of the other constituents of the latter is affected in an irregular manner. Again, it has been found that the fusibility of the Seger cones is liable to vary in accordance with the size of the kiln and the duration of the baking process. For example, the author has observed that cone 04 does not commence to fuse below 40° of the Vieillard pyrometer when used in a small glaze kiln 1½ metres in diameter, whereas it fuses at 30° Vieillard in the large biscuit kiln. Now, as the time required to fire glaze may vary—for some unexplained reason—between 18 and 24 hours, this behaviour of the cones may lead to erroneous indications.

Another somewhat important defect is that the behaviour of the cones at the moment of fusion depends on the manner in which they have been placed in the kiln; cone 06, for instance, set perfectly vertical, fusing after 05, that has been placed in a sloping position. The author, believing in the utility of these cones, notwithstanding the defects mentioned, has endeavoured to obviate the last-named inconvenience, and has succeeded in doing so in the following manner:—The three or four cones used are embedded, by their bases, in a piece of plastic clay, which is provided with a foot at one end, and is then set upright so that the cones are perfectly horizontal, the least fusible of the series being at the top. The whole should be dried several hours before insertion in the saggar. Mounted in this manner, the cones will fuse in regular order, but not at the same temperatures as when set upright, the fusing temperature of cone 1 being reduced from 1,150° C. to 1,110° C., *i.e.*, the fusing point of cone 2 in the vertical position. Another method of setting the cones is by suspending them, point downwards, from a clay support, the fusion being then indicated by elongation instead of bending over; but the author considers the horizontal position the best.—C. S.

Ceramics and Glass Manufacture; Fusibility of Silicates and Borates used in ——. A. Granger. Monit. Scient. 1902, **16**, [722], 81—88.

The relationship between chemical composition and fusibility is by no means simple, and it is thus difficult to select typical silicates for use as pyrometers. This is shown by the following series of typical samples of silicates and borosilicates:—

	C
$0{\cdot}5\ Na_2O$, $0{\cdot}5\ PbO$ } ..... { $2\ SiO_2$, $1\ B_2O_3$ }	590
$0{\cdot}5\ Na_2O$, $0{\cdot}5\ PbO$ } $x\ Al_2O_3$ { $y\ SiO_2$, $1\ B_2O_3$ }	520—920
x varies from 0·1 *to* 0·8; *y from* 2·2 *to* 3·6; B_2O_3 *constant.*	
$0{\cdot}3\ K_2O$, $0{\cdot}7\ CaO$ } $0{\cdot}2\ Fe_2O_3$, $0{\cdot}3\ Al_2O_3$ { $y\ SiO_2$, $z\ B_2O_3$ }	950—1190
y varies from 3·5 *to* 3·95; *z is bound by the relationship* $y + z = 4$.	
$0{\cdot}3\ K_2O$, $0{\cdot}7\ CaO$ } $t\ Fe_2O_3$, $u\ Al_2O_3$ } $4\ SiO_2$	1150—1190
t varies from 0·2 *to* 0·05; *u is bound by the relationship* $t + u = 0{\cdot}5$.	
$0{\cdot}3\ K_2O$, $0{\cdot}7\ CaO$ } $u\ Al_2O_3\ y\ SiO_2$	1210—1670
u varies from 0·5 *to* 20, *and y from* 4 *to* 200.	
$Al_2O_3\ y\ SiO_2$	1690—1850
y varies from 10 *to* 2.	

Each of these types can only be used within certain intervals, and the largest division of the scale (1210—1670) is occupied by an aluminous silicate, in which, as the author shows, the alumina and silica stand in a different ratio to each other at higher and lower fusing-points.

Bischof was one of the first to propose a formula for calculating the fusibility of clays from their chemical composition. Taking a, b, and c to represent respectively the alumina, silica, and fluxing oxides, in molecular quantities; A to represent $\frac{a}{c}$ and B to represent $\frac{b}{a}$, he termed the ratio $\frac{A}{B}$ the "fire-stability quotient" (*Feuerfestigkeits-quotient*). Bischof's formula was strongly criticised by Seger, who proposed the following formula as more correct:—

Fire-stability quotient $= x\left((a + b) + y\frac{b}{a}\right)$, where a and b represent the ratio of alumina and silica respectively to the fluxing oxides taken as unity; x is a coefficient representing the influence of the number and nature of the compounds in the flux, and y is another coefficient representing more exactly the influence of alumina. Kochs and Seyfert (this Journal, 1901, 989) have pointed out that Seger's "fusible cones" do not show a regular ratio between the proportion of alumina and the fusibility quotients at different temperatures, and the author confirms their statements. According to Kochs and Seyfert, the following formula gives satisfactory results:—

$$q = \frac{T^2}{173{\cdot}4\ F\ K}$$

where q represents the stability quotient, K the amount of silica, T the amount of alumina, and F the sum of the molecular proportions of the fluxing substances. Thus, in order to determine what quantity, x, of alumina must be added to bring a silicate to a required fusibility, the following formula could be used:—

$$x = \pm\sqrt{173{\cdot}4\ q\ F\ K} - T,$$

whilst the necessary silica could be found by the formula—

$$y = \frac{T_2}{173{\cdot}4\ q\ F} - K.$$

For the simultaneous addition of silica and alumina, the following equations are given:—

$$x = 102\ q\ v\ (F - T),$$
$$y = 60\ q\ v^2\ (F - K),$$

v in this case representing the ratio of alumina to silica (corresponding to a molecular weight M_z). Lastly, the quantity of fluxing oxides, z, to be added to a silicate of known composition in order to obtain a required degree of fusibility, can be calculated as follows:—

$$z = M_z\left(\frac{T^2}{173{\cdot}4\ q\ K} - F\right)$$

In the author's opinion, the objections offered by Seger to Bischof's formula might also be brought against these formulæ of Kochs and Seyfert. He also considers that the physical state of the material has been too much neglected in all these calculations; for it is unlikely that a compressed argillaceous schist should possess the same degree of fusibility as a soft clay of the same composition.

—C. A. M.

Lignite-Gas; Firing with ——, for Pottery Kilns, &c. Baier.

See under II., *page* 244.

United States Patents.

Glass; Apparatus for Silvering ——. C. Laval, Allegheny, Penn., U.S.A. U.S. Pat. 689,732, Dec. 24, 1901.

In this apparatus the silvering material is fed from a hopper to a distributor, the starting, extent, and stopping of the flow of material being automatically controlled by the movement of the sheet of glass, as it approaches, and passes out of contact with the distributor.—W. C. H.

Enamelling Metal Ware. W. Jankowsky, St. Louis, Miss., U.S.A. U.S. Pat. 691,268, Jan. 14, 1902.

The process consists essentially in applying to the cleaned metal surface, a priming coat of an alkali carbonate, on which is spread a layer of the enamel containing a suitable proportion of potassium bisulphate, which decomposes the priming coat in places, thus producing a mottled effect, where the metallic surface is attacked.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Mortars; Testing the Adhesive Power of ——. R. Feret. Thonind.-Zeit., **25**, [153], 2,213—2,215.

The result of Feret's tests with regard to the adhesive powers of mortar are as follows:

A.—The adhesive power of a given mortar varies with the substance to which it is applied. When the substance consists of sand mortar that has been hardened a long time, the variations in the adhesive power are but small. In the case of stone, the adhesion depends on the fineness of grain, and varies directly with the porosity of the stone; but, with soft stone, the fracture is transmitted through the mass, and the result is the same as with a low adhesive power. The latter seems independent of the dimensions of the inequalities in the surface of the stone, the total breaking load being almost the same whether the surface be smooth or contain irregularities 1 cm. in size. With iron, on the contrary, the adhesive power of the mortar is greater on a roughened surface than a smooth one.

B.—The adhesive power is much lower when the surface of the stone is dirty, or has been insufficiently moistened before the application of the mortar. Only a slight improvement can be effected in the case of plastic mortar by ramming.

C.—In all cases little variation is exhibited when a given mortar is mixed with Portland cement; sometimes the adhesive power is greater with bad cements than with better qualities; for one and the same cement, it is greater the finer the grinding. Taken in the same proportions, quick-setting and hydraulic cements give inferior results to Portland cement. Two samples of Grappier cement gave a higher adhesion than Portland cement.

D.—The fineness of the sand influences the adhesive power, the latter being generally greater as the proportion of coarse grains increases. The maximum, however, seems to be attained when a certain ratio (varying with the conditions of the mixture) obtains between the coarse and fine grains of sand, those of medium size being absent.

E.—The adhesive power does not seem to be proportional to the amount of cement in the mortar, and it does not appear advisable to exceed a certain percentage. In the case of slag cements, little variation is found in mixtures containing the proportions usual in practice.

F.—The influence of the mixing water is insignificant so far as quality is concerned; but the quantity has a great effect, the adhesive power attaining its maximum when the mortar is plastic and inclined to be sloppy, though beyond this point diminution occurs. The maximum of adhesion almost always corresponds with a rather softer consistence than the maximum of resisance, which in turn corresponds to a somewhat stiffer consistence than the maximum of compactness.

G.—On stone the adhesive power, especially in the earlier stages, increases more slowly than the resistance to compression; on iron the increase is nearly parallel with that of the resistance.

H.—In water and moist air, the adhesive power on iron is about the same, and apparently rather lower than in dry air.

I.—On iron the adhesive power of a concrete is smaller than that of the mortar from which it is prepared, and is nearly proportional to the weight of cement present per unit volume of the concrete, other conditions being equal. The increase is, however, slower when the proportion of cement is larger. All concretes prepared from variable proportions of the same cement, sand, and gravel, so as to have an equal compression strength, also exhibit nearly the same adhesive power. The influence of the amount of water used seems to be similar to the case of mortar.—C. S.

Portland Cement; Constitution of ——. T. Ludwig. Thonind.-Zeit., **25**, [142], 2084—2085; [145], 2112—2114.

Referring to the attempts made to set up a constitutional formula for Portland cement, the author expresses the opinion that it is preferable to ascertain, by the examination of good cements, what limits of the various constituents should be maintained in practice. As an objection to existing formulae, he points out that it is erroneous to assume that alumina can be replaced by ferric oxide. This latter is never found in combination with silica, except in very complex silicates; and these furnish, on decomposition, ferric oxide or hydroxide, but not ferric silicate. Neither are the imaginary calcium compounds termed "calcium ferrate" by Meyer, known to exist, since ferric oxide never plays the part of an acid, and therefore does not combine with alkalis or alkaline earths. Meyer's "calcium ferrate" must be merely a mechanical mixture of free lime and ferric oxide. The compound in question is more probably tricalcium silicate containing an inert admixture of iron, perhaps in the form of Fe_2O_3. In view of the colour change to greyish green, it is more probable that the iron in the finished cement is in the form of ferrous silicate; and though the latter cannot be detected as such by titration, this circumstance may be attributed to oxidation during the gradual process of dissolving the ferrous compound in acids.

The chief point in practice is to aim at as large a proportion as possible of $SiO_2.3CaO$ and avoidance of free lime. Pure tricalcium silicate can only be obtained by the use of fluxes to effect the combination of lime and silica. From economical considerations alumina and ferric oxide are the only two fluxes that can be used, the former facilitating the formation of clinker, and combining the excess of lime as aluminates, which assist the hardening of the cement when not too abundant. On the other hand, ferric oxide has the advantage of combining with alumina to form a fusible glass, and thus preventing disintegration; but ferric oxide cannot combine with the excess of lime, nor does it contribute to the hardening of the cement. The most favourable results are therefore obtained by using both fluxes, *e.g.*, in the form of a clay poor in alumina, rich in iron, and free from sand. Such a material is found in washed brick earth.

As a convenient means of expressing the composition of cement, the author recommends that the percentages of the constituents should be divided by their molecular weights, in order to obtain molecular values, Fe_2O_3 and Mn_2O_3 being considered as two molecules of FeO and MnO respectively, and therefore divided by one half their molecular weights.

The resulting values should then be divided by the silica coefficient, which will furnish values showing the ratio between the principal components, and greatly facilitate the comparison of different cements.

An example is given showing how, by the aid of this method, a cement with either a high, medium, or low content of lime, may be produced by varying the proportions of two raw materials—limestone and marl—of known composition.—C. S.

Cement; Magnesia ——. L. Preussner. Thonind.-Zeit., **25**, [145], 2,115.

To remove the sulphuric acid present in commercial hydrochloric acid, magnesium chloride, and in the superphosphate also employed in the manufacture of artificial stone, which acid and its compounds spoil the appearance and durability of the product, Preussner treats the materials with barium hydrate or barium carbonate (witherite), and siphons off the liquid after the precipitate has settled down. In the case of magnesium chloride, the salt is dissolved in water to form a solution of 20—25° B., and the barium hydrate or witherite is added by degrees until the precipitate ceases to increase. The amount of reagent generally required is between 3 and 5 kilos. per centner (50 kilos.). The best method of adding the barium compound is by strewing it over the surface of a board, which is then submerged in the solution, this procedure ensuring a better reaction in the upper layer of the liquid. Finally, the whole should be well stirred.—C. S.

Cements; Action of Sulphate of Lime on ——. L. Deval. Bull. de la Soc. d'Encouragement pour l'Ind. Nat., **101**, [6], Dec. 31, 1901, 784—787.

Cements prepared in the laboratory with compositions similar to ordinary Portland cements, had fixed, at the end of two months, more sulphate of lime than their compositions would indicate as necessary to form sulpho-aluminate. Those cements which gave good results in saline solutions, at the end of four months, had not retained sufficient sulphate of lime to convert the whole of the aluminium into sulpho-aluminate. Cements in which aluminium is replaced by iron do not react with sulphate of lime.

—J. W. H.

Gypsum; Solubility of ——, *in Aqueous Solutions of Sodium Chloride at Different Temperatures.* F. K. Cameron. J. Phys. Chem., Nov. 1901, 556—576.

The solvent action of water on gypsum is greatly increased by the addition of sodium chloride, thus at 26° C. 100 grms. of water will dissolve 0·2126 grm. of gypsum, but if 15·2 grms. of sodium chloride be added, 0·76 grm. of gypsum is dissolved. At temperatures below 37·5° C. the influence of sodium chloride on the solubility of gypsum increases to a maximum (with an addition of 135—140 grms. per litre), but at higher temperatures, the existence of this maximum is doubtful.

It is stated that at 26° C., 1 part of gypsum is soluble in 372 parts of pure water.—A. S.

English Patents.

Bricks, Tiles, and the like; Manufacture of ——. A. J. Keeble, Peterborough. Eng. Pat. 10,160, May 16, 1901.

In order to prevent discoloration or "scum" after firing, in bricks, &c., the articles are when moulded, coated, wholly or partially, with a solution of glue or other animal colloid substance, and then dried and fired. The solution is used warm, and may be prepared by dissolving 25 lb. of glue in 20 gallons of water.—E. S.

Conglomerates for Building and other Purposes. G. Cuel, Paris. Eng. Pat. 22,952, Dec. 15, 1900.

The conglomerates are made by mixing mother-of-pearl waste, previously sorted and washed in acid and water, with cement or the like, and polishing the hardened mass thus obtained.—W. C. H.

Artificial Stone; Manufacture of ——. G. C. F. Boivie, Sodertelje, Sweden. Eng. Pat. 24,923, Dec. 6, 1901.

Slate waste is finely powdered, and moistened with dilute hydrochloric and nitric acids, or with either, with or without a small proportion of alum or water glass, or the like, in the acid solution. The mass is steamed, and compressed into bricks or other forms, which are dried, and then hardened by subjection to the action of steam under high pressure. To obtain facing-bricks, tiles, &c., lime is added to the powdered slate before treatment with the binding solution, the hardness being thereby increased.—E. S.

Portland Cement from Blast Furnace Slag or Cinder; Preparation of ——. C. von Forell, Hamburg. Eng. Pat. 22,314, Nov. 5, 1901.

By this process, Portland cement is made by mixing together liquid blast furnace slag and powdered lime, the apparatus used being a horizontal or slightly inclined rotary furnace or mixing chamber, provided with a fire-resisting lining, and heated internally or externally to keep the slag fluid, and into which heated air or gas can be blown to promote homogeneity of the product, and the fused mass issuing from which can be granulated by steam-blasts forced from jets in the same direction as the issuing fused mass.—W. C. H.

Elastic Plaster for Walls and Ceilings. H. L. Carter, New York. Eng. Pat. 24,475, Dec. 2, 1901.

The plaster is made by thoroughly mixing calcined gypsum, or its equivalent, as lime, marble, &c. with marsh-mallow root (althæa) and dextrin, with addition of gelatin, if necessary. The product is said to be hard enough to take a good polish, and to be elastic, owing to the althæa exerting a retarding, and the dextrin an accelerating effect on the setting of the plaster.—W. C. H.

United States Patents.

Roofing Fabric, and Method of Preparing same. C. S. Bird, Walpole, Mass., U.S.A. U.S. Pat. 690,348, Dec. 31, 1901.

It is stated that the "buckling" frequently observed with roofing-paper, &c. is caused by absorption of moisture, and the object of the present invention is to overcome this defect. The improved roofing paper is made by first waterproofing the paper and then passing it through a bath of water, in order to take up and retain a certain amount of moisture.—W. C. H.

Granite; Artificial ——. McKenzie Arnn, Virginia, U.S.A. U.S. Pat. 691,711, Jan. 21, 1902.

The granite is made by mixing borax, powdered charcoal, black lead, common salt, washed sand, rosin, and powdered baryta, and incorporating this with liquid slag.—W. C. H.

X.—METALLURGY.

Pseudo-catalytic Oxidation Processes. [*Metals.*] C. Engler and L. Wöhler. Zeits. anorg. Chem., **29**, 1—21. Chem. Centr., 1902, **1**, [4], 239—241.

Under the above name the authors class those catalytic processes of oxidation with oxygen or other oxidising agents, in which the active auto-oxidiser or catalytic agent, (A), in consequence of the instability of the oxide formed, is regenerated, the oxygen being taken up by the acceptor (B). This form of reaction may be represented by the equation:— $AO_2 + 2B = A + 2BO$. Oxygen carriers of this kind may be divided into three classes: 1. The noble and semi-noble metals and their oxides formed as intermediate products. 2. The oxides and salts of such elements, (metals) as are capable, by change of valency of taking up molecules of oxygen. 3. Oxidising ferments of animal and vegetable organisms. The authors then give a large amount of evidence in favour of the view that with finely-divided platinum and oxygen or oxidising agents, an oxygen compound of the platinum is formed, and that in catalytic reactions, alternate oxidation and reduction of this

oxide takes place; they are of the opinion that the oxidised compound of platinum which acts in a catalytic process is probably a hydrated peroxide, PtO_3H_2 or $Pt_2O_3H_2$.

In the solution of gold by potassium cyanide in contact with air, the formation of gold peroxide appears to be of the greatest importance. The authors give the following reaction, somewhat differing from that of Bodländer (this Journal, 1897, 45):—$Au_2O_2 + 4KCN = 2KAu(CN)_2 + K_2O_2$.

To the second class of pseudocatalytic agents belong certain oxides and salts of Cr, Mn, Fe, Co, Ni, Cu, and Hg, and the less active oxides of Ti, Zr, Ce, Th, Sn and Mo; also P, C, and NO. In catalytic reactions effected by these, also, the formation of peroxides plays an important part.

—A. S.

Graphite; Temperature Limits for the Separation of ——, from Martensite in Pure Cast Iron. H. P. Tiemann. Metallographist, Oct. 1901, 313—332.

The author draws attention to the great influence of silicon in determining the separation of graphite from cast iron, and states that a large number of the experimental results published, are valueless, owing to this factor having been overlooked. A sample of iron containing no silicon, 0·031 per cent. of phosphorus, 0·002 per cent. of sulphur, 0·040 per cent. of manganese, and 0.030 per cent. of combined carbon, was carburised with sugar charcoal in crucibles free from silica, until it contained 4·271 per cent. of combined carbon and 0·255 per cent. of graphite. With this specimen, the proportion of graphite was quite unchanged by heating up to temperatures as high as 1,116° C., and then quenching in iced brine at −5° C.; by heating to 1,300° C., and allowing to cool to 1,040° C., before quenching, the proportion of graphite was raised to 0·677 per cent. According to Roozeboom's views (this Journal 1900, 1016, 1154), cementite (combined carbon) should be entirely converted into graphite at any temperature above 1,000° C., but from the author's results, it appears that this change does not readily take place in a pure cast iron, unless the temperature be raised far above the "transition point." If, however, the iron contain silicon, not only is the formation of graphite at temperatures above the transition point facilitated, but the transition point is lowered, so that the formation of graphite may take place below 1,000° C. An iron containing 0·75 per cent. of silicon, 3·438 per cent. of combined carbon, and 0·938 per cent. of graphite was found to contain 2·795 per cent. of graphite, after being heated to 1,125° C., and quenched at −5° C., whilst the proportion of graphite was increased to 1·690 per cent., when the iron was heated only to 975° C., a temperature 25° below the transition point.—A. S.

Copper and its Alloys; Refining ——, with Magnesium. Rev. Prod. Chim., 4, [22], 339.

The proportion of copper-magnesium (1:1) alloy generally sufficient for the operation is 50 grms. per 100 kilos. of copper. In experimenting, however, it is advisable to commence with 20 grms., and increase the quantity until the desired effect is produced. An increase in the amount of alloy to 100 grms. and even more, has a very favourable effect on the density and solidity of the copper, the latter becoming harder, and therefore more resistant.—C. S.

Alloys of Aluminium and Magnesium. O. Boudouard. Bull de la la Soc. d'Encouragement pour l'Ind. Nat., **101**, [6], Dec. 31st, 1901, 773—780.

The form of the melting point curve of alloys of magnesium and aluminium points to the formation of two definite combinations of aluminium and magnesium, $AlMg_2$ and AlMg. Alloys containing over 15 per cent. of either metal are brittle, the maximum of brittleness being reached by the alloy 50 Al—50 Mg., which may be crushed between the fingers and powdered in a porcelain mortar. The author has isolated the definite combinations which occur in the alloys. $AlMg_2$ was obtained by treating a 30 Al—70 Mg alloy with a 10 per cent. solution of ammonium chloride; a crystalline powder remained behind, which on analysis yielded almost theoretical numbers. AlMg was obtained in a similar way from the alloys 40 Al—60 Mg, and 50 Al—50 Mg. Al_2Mg was left behind after attacking the alloy 70 Al—30 Mg, with a 10 per cent. solution of hydrochloric acid.—J. W. H.

Alloys of Aluminium with Iron and with Manganese. L. Guillet. Comptes Rend., **134**, [4], 236—238.

By reducing the oxides of iron and of manganese by combustion with metallic aluminium, in varied proportions, the author has obtained the alloys Fe_2Al_3, $FeAl_3$, Mn_2Al_3, $MnAl_3$, and $MnAl_4$. In the reaction with iron there is no loss, but with manganese the losses of material are very great, much of the oxide being reduced only to MnO.

—J. T. D.

Strontium; Metallic —— and its Hydride. Guntz. Comptes Rend., 1901, **133**, [26], 1209—1210.

When strontium amalgam, formed by electrolysis of an aqueous solution of strontium chloride with a mercury cathode, is slowly and carefully heated in a vacuum to full redness, practically all of the mercury is volatilised, and metallic strontium remains. It is very like barium, but does not so easily react with liquid ammonia to form a metall-ammonium.

If the amalgam be heated in a stream of hydrogen, the gas is absorbed (at a temperature above that at which barium absorbs it), and the white fusible hydride SrH_2 is formed; but as this compound coats the remaining amalgam and prevents the escape of the mercury, it is better, if the pure hydride be wanted, to prepare in the first place metallic strontium from the amalgam, as above, and then to react on this with hydrogen.—J. T. D.

Barium; Preparation of ——. E. Stansfield. Mem. and Proc. of the Manchester Lit. and Phil. Soc., 1901—1902, **46**, [4].

The author attempted to prepare pure batium by means of the Goldschmidt process (see this Journal, 1898, 543, 584), according to which oxides are reduced by means of finely divided aluminium intimately mixed with them. The best results were obtained with a charge consisting of 100 parts of barium peroxide and 21 parts of aluminium (corresponding to the equation: $3BaO_2 + 4Al = 3Ba + 2Al_2O_3$), together with 25 parts of the product of a previous experiment; the reaction, however, appears to be reversible, as in no case was pure barium obtained, but only alloys of barium and aluminium containing up to about 60 per cent. of barium.

—A. S.

Manganese in Spiegel; Determination of ——. T. F. Hildreth.

See under XXIII., *page* 279.

Sulphur in Pig Iron; Colorimetric Method for the Determination of ——. W. G. Lindsay.

See under XXIII., *page* 279.

Gold and Iridium; Separation of ——. Mietzschke.

See under XXIII., *page* 279.

English Patents.

Iron and Steel; Treatment of Slag resulting from the Manufacture of ——. S. F. Prest, London, and J. W. Cabot, Johnstown, U.S.A. Eng. Pat. 5234, March 12, 1901.

The slag is finely ground, the magnetic portion separated therefrom, and the non-magnetic portion digested with dilute acid, such as sulphuric acid, and the soluble salts so obtained crystallised for use for various purposes. The soluble silica may be separated by evaporation and heat previous to the crystallisation of the salts by water. The by-products so obtained from the non-magnetic portion of the slag, are claimed, and may consist of salts of manganese, iron, aluminium, magnesium and, if the slag is a basic process one, phospheric acid.—A. W.

Steel; Hardening and Tempering of ——. H. H. Lake. From W. R. Bennett, New Britain, U.S.A. Eng. Pat. 18,230, Sept. 12, 1901.

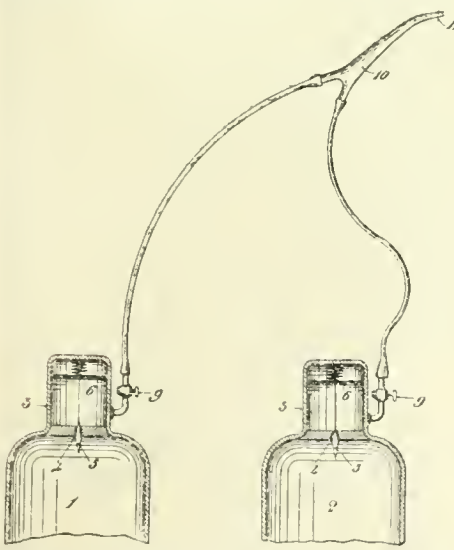
The stock is first heated in any suitable manner, and then cooled in a bath which is kept in motion at its points of contact with the stock by means of freshly inflowing streams, a mode of effecting which is described and illustrated. The stock is then suddenly withdrawn from the bath and immersed in a tank of oil until the oil and the stock are practically of even temperature, after which they are heated together to a higher degree.—G. H. R.

Antimony Ores containing Gold; Process for Treating ——. A. S. Plews, London. Eng. Pat. 5440, March 14, 1901.

The crushed antimony ore is heated in an oxidising atmosphere, in a furnace, preferably of the revolving cylinder type, with smokeless fuel as long as antimony fumes are evolved. The flame is then made reducing, and afterwards alternately oxidising and reducing, until the antimony is completely volatilised, the residue being then in a condition to be crushed and treated with cyanide for gold extraction. The antimony fumes from the oxidising and reducing operations are condensed in separate chambers, preferably provided with a strong induced draught, the oxidising product being fairly pure white oxide and the reducing product an oxide mixed with other substances.
—A. W.

Soldering; Process of ——, *with Oxy-hydrogen Gas.* P. Garuti and R. Pompili, both of Tivoli, Italy. Eng. Pat. 14,306, July 13, 1901.

The process is applicable on a large scale, and effects, without danger of explosion, the mixture of the two gases, before they reach the flame, by submitting them to a sufficiently high pressure to blow them out of the blow-pipe with a velocity superior or at least equal to the velocity of the propagation of the flame to the mixture. The mixture of the gases is in the proportion of 3 or 4 parts of hydrogen to 1 part of oxygen so as to ensure perfect diffusion of the oxygen with the hydrogen, and thus avoid oxidation of the metal to be soldered.



The special apparatus claimed for the said purpose, is shown in the accompanying drawing. It contains a chamber of conical or other adapted shape 10, to which the separate gases are conducted, and in which they are mixed under compression previous to passing through the opening 11 at the necessary velocity to prevent explosion. The pressure of the gases is maintained equal throughout by means of flexible regulators 3 and micrometrical screw taps 9, which regulate the outflow and proportion of the gases. The regulators are of the usual form, and have an opening of conical section 4 for the passage of the gases from the separate reservoirs 1 and 2, the said opening in each case being regulated by a needle 5, fixed on a flexible membrane 6, regulated by a spiral spring. The pressure, which should not be less than 30 centimetres of water, and might be 80 for strong jets, is thus maintained equally, the rate of outflow being regulated by the screw taps. —A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Alkali Hypochlorite and Chlorate; Attainable Current and Energy Efficiency during the Electrolytic Manufacture of ——. F. Foerster and E. Müller.

See under VII., *page* 252.

Magnesium in Electrolytic Rectifiers. A. Campetti. Accad. Sci. Torino, Atti, 1901, **36**, [7A], 251—256.

When magnesium is used as anode to a cathode of platinum in a voltmeter containing caustic potash or soda, there is a marked diminution in the strength of the current passing, which is not due entirely to the opposing E.M.F. of polarisation, but mainly, according to the author, to the formation of a thin badly-conducting layer of oxide on the surface of the magnesium. The phenomena are similar to those observed in the case of aluminium, and the cell, when inserted in an alternating-current circuit, acts as an electrolytic valve. With voltages varying from 18 to 60, and with a frequency of 15, calorimetric measurements show that under the most favourable conditions, the loss in the cell does not exceed from 10 to 15 per cent. of the energy developed.—A. S.

Aluminium; Polarisation of ——. A. Naccari. Accad. Sci. Torino, Atti, 1901, **36**, [12A], 468—481.

In the author's experiments, the aluminium plate which was to form the electrode was placed in a vessel containing dilute sulphuric acid, and this vessel was joined by means of three wide glass siphons with another containing the same liquid and an aluminium electrode. The first vessel was also connected by means of a siphon with another which contained the same liquid and a plate of aluminium. At a certain moment, the latter was connected with an electrometer for measuring the potential of the liquid surrounding the aluminium electrode, whilst the electrode itself was connected to earth. From the results it appears that the polarisation gradually increases, reaching a maximum of 10 volts in about 8 minutes, and then decreasing in about half an hour to about half that amount, at which point it remains constant. This, however, only applies to fresh plates, for on repeating the experiment with the same plate the next day, the final polarisation value was reached almost at once. The author is of the opinion that the resistance created by a thin coating of aluminium oxide is the determining factor in the phenomena described, and this view is supported by the fact that the polarisation diminishes on increasing the concentration of the sulphuric acid, which would facilitate the solution of the oxide or hydrate.—A. S.

English Patents.

Electric Accumulator [*Aluminium Electrode*]. R. Hills, Handsworth. Eng. Pat. 14,501, July 14, 1899.

The negative electrode is formed of a thin plate of aluminium immersed in a solution of zinc sulphate and water, the positive element being an ordinary perforated lead plate pasted with red lead and litharge.—G. H. R.

Electric Insulating Material, and the Application of the same in the Construction of Commutators for Dynamo Electric Machines. The British Thomson-Houston Co., London. From W. Le R. Emmet, Schenectady, New York, U.S.A. Eng. Pat. 17,030, Aug. 24, 1901.

The 17 claims refer to the manufacture of an insulating material by soaking an absorbent refractory substance, such as asbestos paper, in a vegetable varnish, preferably boiled

linseed oil, and gum copal thinned down with "benzine," &c., the sheets being air-dried, pressed together, and "baked to a refractory hardness"; also for the employment of this material between the metallic segments of the commutators of dynamo-electric machines.—W. C. H.

Electric Lead-Zinc Batteries. L. M. G. Rosée D'Infreville, New York, U.S.A. Eng. Pat. 24,627, Dec. 3, 1901.

The zinc electrode, which may be formed of zinc and mercury, or other metal carrying zinc is suspended in the upper strata of a solution of sulphuric acid with its active surfaces approximately perpendicular to the surface of the electrolyte. An electrode carrying peroxide of lead is placed beneath in the lower strata of the solution, a clear horizontal stratum being left between the electrodes, which each have interstices approximately perpendicular to the surface of the electrolyte.—G. H. R.

Aromatic Nitro Compounds; Reduction of ——, to the Corresponding Amines. G. W. Johnson, London. From C. F. Boehringer und Soehne, Waldhof, Germany. Eng. Pat. 25,100, Dec. 9, 1901.

Aromatic nitro-compounds are reduced to the corresponding amines by subjecting them to the action of an electric current in a cathode bath containing an alkali, or an alkali earth, or any of their salts, with or without an organic solvent, "the cathode being of copper, or of copper, or other material, in the presence of finely powdered copper, or of a copper salt."—G. H. R.

Ropes, Hose, Cork, Asbestos, and Textile Fabrics of all kinds; Process and Apparatus for Electrically Treating ——. H. W. Schlomann and A. De Castro, Berlin. Eng. Pat. 2703, Feb. 10, 1900.

Textile materials and the like are electrolytically impregnated by passing them through a bath of any desired metallic salts which produce electrolytic deposits in the materials, and render them more durable and also waterproof and incombustible, by filling the spaces between the fibres of the fabric with the electrolyte. The material is then pressed between broad heavy plates or parts serving as anodes and cathodes, and constructed to correspond to the shape or configuration of the material to be impregnated. After being submitted for a suitable time to the action of an electric current from a source connected with the electrodes, the material is pressed between rollers and automatically drawn forwards along the pressing-table to allow of the following length of material being impregnated, the hydrogen generated by the electrolytic action being blown off by compressed air from a tube arranged near the pressing-table.—G. H. R.

United States Patents.

Electrical Conductor and Anode. L. Hargreaves and W. Stubbs, Widnes. U.S. Pat. 689,877, Dec. 31, 1901.

See this Journal, 1899, 1029.—G. H. R.

Electric Accumulator. A. Pouteaux and A. Wolff, Dijon, France. U.S. Pat. 690,181, Dec. 31, 1901.

The secondary battery consists of an exterior casing containing an electrolyte in which a plurality of positive and negative elements are immersed. Each element is composed of two perforated parallel plates, between which, and connected to both, are placed partition bars which divide the space between them into several compartments. The partition bars are each composed of two parallel strips, perforated in the direction of the plates, so as to afford communication with the compartments, and separated from each other by cross pieces. The active material is charged into the compartments, but not into the spaces between the strips of the partition bars. A horizontal core of any suitable conducting material is arranged in the centre of each compartment, the cores of each element being connected by a collecting bar to a terminal, and there are two terminal bars, one connecting all the terminals of the positive, and the other all those of the negative elements of the battery. The portions containing the active material are made of celluloid coated with a layer of pure caoutchouc.—G. H. R.

Electric Storage Battery. A. De Dion and G. Bouton, Puteaux, France. U.S. Pat. 691,611, Jan. 21, 1902.

The depolarising body consists of a strip of copper which forms the positive electrode, and is embedded in a compressed block of pure oxide of copper which is covered with a piece of copper gauze to facilitate its insertion into a zinc vessel which constitutes the negative electrode, and contains the electrolyte, and which is of a similar shape to the block, gauze, and strip, the latter being of such a size that they conform closely to its inner surface.—G. H. R.

Alkali Chlorides; Apparatus for the Continuous Electrolysis of ——. W. Gintl, Aussegg, Austria-Hungary. U.S. Pat. 690,365, Dec. 31, 1901.

In apparatus of the type having means for holding the liquids present, and a gas-collecting chamber containing the anode, the cathode being outside the chamber, the patentee claims the improvement that the anode is supported, and proportioned to approximately fit the chamber horizontally and divide the space above the anode from that below it, the passage or means of circulation from above to below the anode being restricted to prevent free or rapid circulation. A distributing supply device is arranged to deliver the inflowing electrolyte into the space above the anode, and partly downward over a large area of it, so that the stratification of the electrolytic liquids may be undisturbed.—G. H. R.

Alkali Chlorides; Continuously Electrolysing ——. [*Gravity.*] W. Gintl, Aussegg, Austria-Hungary. U.S. Pat. 690,141, Dec. 31, 1901.

The continuous electrolysis of sodium chloride or of "gas-producing" salts, such as fluorides and some carbonates, is effected by passing a current from anode to cathode through the electrolyte, and gently introducing the fresh electrolytic solution into a space or chamber above the anode in its immediate vicinity and separate from the cathode. A gradual movement of liquid towards the latter is produced by drawing off that in its immediate proximity at a level above the highest level of connection between the cathode and the chamber. The level of the solution is maintained above the anode, and by restricting the downflow of the electrolyte in the vicinity, and causing it to meet and be intimately mixed by the rising bubbles of gas, the rapid downpour and dissemination of the electrolyte in the lower portions of the bath are prevented, and a substantially constant stratification of the solutions is produced and maintained, the solution above the anode being richest in the electrolyte to be decomposed. The process is preferably carried out with the apparatus already described (see preceding abstract).—G. H. R.

Water Purifier and Filter (Electrolytic); Portable ——. C. E. Holland. U.S. Pat. 691,545, Jan. 21, 1902.

See under XVIII., B., *page* 270.

(*B.*)—ELECTRO-METALLURGY.

Aluminium; Experiments on the Manufacture of ——. F. Haber and R. Geipert. Zeits. für Elektrochem., 1902, **8**, [1], 1—8, and [2], 26—33.

A detailed description with drawings, is given of an experimental electric furnace, the use of which has enabled the authors to produce aluminium on a small scale, the current used being 300—400 ampères.

The furnace consists essentially of a block of artificial carbon in which a bath of the proper dimensions is cut. That employed by the authors is circular and is 70 mm. deep. The diameter at the bottom is 113 mm., and at the top, 138 mm. Into this bath is lowered, by means of fine adjustments, a cylindrical carbon anode 66 mm. in diameter. Both carbons were of the best quality, and were made from materials as free as possible from ash.

Two samples of cryolite (artificial and natural) were used, whilst the alumina was a good commercial sample.

In the first experiment, 1,000 grms. of finely powdered cryolite and 200 grms. of alumina were fused in the bath by means of the electric arc. The anode was then lowered to within $\frac{1}{2}$—1 cm. of the bottom of the carbon trough, and the electrolysis started with 7 volts and 400 ampères. The experiment lasted 290 minutes, the current strength being noted every five minutes. During the run, an additional 885 grms. of cryolite and 927 grms. of alumina were added. The average current strength was 310 ampères. 270 grms. of aluminium were obtained, the current efficiency being 54·3 per cent. The E.M.F. was 7 volts at the beginning and gradually rose to 10 volts at the finish, the mean value being 8·5 volts. Consequently the consumption of energy was 63 electrical horse-power-hours per kilogram of aluminium, whilst the published figures vary between 40—45.

The authors consider that the electrolysis can be quite well conducted with a mean voltage of 7·5, the higher figure obtained by them being due to the rounding off of the carbon anode. This would reduce the energy required to 55·6 electrical horse-power hours, which is capable of being still further reduced, as in the above experiment, a considerable quantity of aluminium was oxidised.

The purity of the aluminium obtained and its mechanical properties were satisfactory. In concluding, the authors summarise the results obtained as follows:—

The preparation of pure aluminium, from a mixture of cryolite, aluminium fluoride, and alumina, may be easily accomplished in a furnace as above, using a current of 300—400 ampères at 7—10 volts, the cathode current density (referred to the cross section of the bottom of the trough) being 3 ampères per square cm. In order to obtain a good product, it is most important to start with the raw materials as pure as possible. The electrolysis itself proceeds quietly and uniformly, as is the case with an electrolytic deposition, provided that the dimensions of the furnace are properly chosen and that the position of the anode is carefully and systematically controlled by means of the necessary fine adjustments. The composition of the electrolyte in the neighbourhood of the zone of precipitation, and in the case of the preparation of the purest metal, was found to be in round numbers, one-third sodium fluoride, one-third aluminium fluoride, and one-third alumina. The high percentage of aluminium fluoride facilitates the electrolysis, since the bath is thereby rendered more fluid, the temperature being bright red-heat.

From the results obtained, the authors are of opinion that the modern successful electro-chemical manufacture of aluminium is not due to secret alterations in the electrolytic process, but in the employment of purer raw materials and in the use of anodes containing as little ash as possible.

—J. S.

Tin, Spongy and Crystalline; Electrolytic Formation of ——. W. Pfanhauser. Zeits. für Elektrochem., 1902, **8**, [3], 41—43.

The author describes the conditions which appear to favour the electrolytic production of spongy and crystalline tin. The precipitation of tin in thick deposits is only possible in the presence of highly concentrated tin salt solutions, which contain no cations which can give rise to strongly dissociated solutions in the neighbourhood of the cathode. Further, provision must be made for the presence of a sufficiency of tin ions, or tin salt, near the cathode. This condition is naturally fulfilled by applying low current densities and by circulating the electrolyte or rotating the cathode.—J. S.

Tin; Electrolytic Treatment of ——. P. Nauhardt. Chem.-Zeit., 1902, **26**, [5], 50—51.

A process (Ger. Pat. 118,358) has been discovered by which the well-known difficulties met with in the electrolytic treatment of tin are overcome. It is intended primarily for the recovery of tin from tin-scrap and tinned copper goods, but may also be used for electro-tinning, especially for the tin-plating of objects such as fine copper or brass wire or narrow metal tubes, which cannot well be covered by immersion in melted tin. The tin-scrap to be stripped, is placed in a drum made of reed or osiers, half-immersed in the electrolyte, and provided with leaden plates on the inner end-surfaces, connected with the positive pole of the electrical generator, so that the scrap thus forms the anode in the solution. The drum is rotated slowly within a lead-lined trough-shaped vat, of which the lead lining (joined by autogenous soldering) forms the cathode. The electrolyte consists of 10 parts of sulphuric acid (66° B.) mixed with 100 parts of water, and with a sufficient quantity of an ammonium salt, preferably the sulphate, to prevent the acid attacking the iron or other metal of the objects from which the tin is to be removed. The potential difference used should be 1·7 volt, but should not greatly exceed this, and the current density should lie between 25 and 35 ampères per square metre (about 2 to 3 ampères per square foot). In a very short time the tin will dissolve from the scrap under treatment, and after the solution is saturated, will deposit in the form of a chemically pure crystalline powder. Should any spongy deposit appear, a small quantity of ammonium sulphate must be added to the bath. After the drum containing the stripped scrap has been removed, objects of copper or iron may be tinned satisfactorily in about 10 minutes, by suspending them in the solution, and reversing the connections, *i.e.*, connecting the lead-lining of the vat to the positive, and the suspended objects to the negative pole of the generator.—W. G. M.

Lithium and Antimony; Compound of ——; *and Preparation of Lithium Alloys.* P. Lebeau. Comptes Rend., **134**, [4], 231—233.

Antimony and lithium, heated together, unite readily with evolution of heat, but the violence of the action prevents a definite compound from being obtained. On electrolysing a fused mixture of equal weights of lithium and potassium chlorides, using an antimony cathode, however, a definite, crystallised, slate-grey compound of the formula $SbLi_3$ is obtained. This compound has a melting point much above that of either of its constituents, and decomposes water rapidly in the cold. By a similar electrolytic method, the author has prepared alloys of lithium with tin and with lead.—J. T. D.

English Patents.

Electric (Arc) Furnaces. R. C. Contardo, Sèvres, France. Eng. Pat. 4576, March 4, 1901.

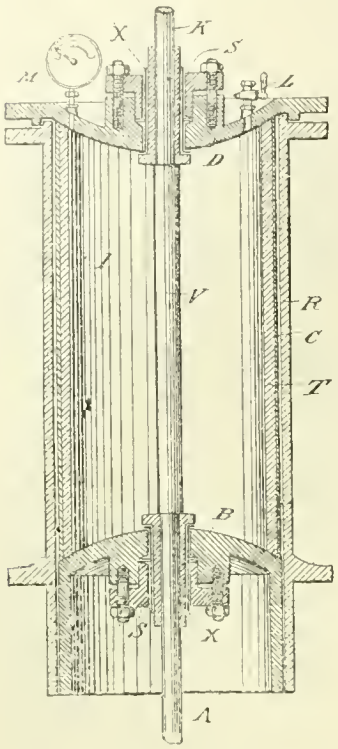
The body of the furnace is carried on hollow trunnions, resting on supports, and provided with stuffing glands, through which fixed, longitudinally adjustable electrodes pass into the heating chamber, which has an inclined portion connected at one end with the horizontally arranged bed for the charge, and at the other with a charging opening. Means are provided for closing the opening, and the chamber is oscillated on its trunnions by a segment carried on it, with which a pinion engages. The furnace has two vertical side walls, and an end one with a tap hole which can be closed. There is a closed roof above the bed for the charge, and the electrodes, which pass through the side walls, project above the bed and below the roof in proximity to the tap-hole, so that while the charge on the bed is being heated by radiation alone, the roof, the end, and the tap-hole, are also raised to a high temperature, and on tilting the furnace, the charge runs over these superheated surfaces and pours out at the tap-hole without any re-cooling.—G. H. R.

Metals [Fe, &c.]; Process of Smelting and Reducing ——, *including the Production of Calcium Carbide.* C. Diesler, Coblenz, Germany. Eng. Pat. 930, Jan. 14, 1901.

The process of smelting and reducing metals, and simultaneously producing oxides of carbon, is carried out by heating with a strong galvanic current, and a resistance inserted in the circuit, metallic oxides or acid compounds and carbon, compressed into airtight retorts in which a vacuum is made, whereby the reducing gases formed in the reaction produce such a pressure that the reductions and combinations are quickly effected at a low temperature.

For carrying out the process, an oven is claimed constructed according to the accompanying sectional drawing. It consists essentially of a cylindrical reservoir R, having

arched top and removable bottom plates D and B, secured thereto, and with central openings for the insertion of stuffing boxes S, provided with an insulating material, so that the reservoir can be perfectly closed; and of an inner cylinder C with a clay tube T for the purpose of receiving the molten material, and insulating the outer reservoir. K and A are the two electrodes, V the resistance, X asbestos sleeves, M a manometer, and L a gas exhaust cock. The space between the two cylinders R and C is preferably filled with asbestos. The apparatus can be used for the reduction of iron and other metals, and for the manufacture of calcium carbide, &c.



—A. W.

Metal Coatings or Deposits; Process for obtaining ——. [*Bath.*] E. Mies and A. H. Mies, Büdesheim am Scharlachberg, Germany. Eng. Pat. 18,518, Sept. 13, 1899.

Metal coatings can be obtained on metals without external supply of current, by the use of boiling baths which contain in solution the salts of the metals to be deposited or obtained by electrolysis, such as lead, zinc, tin, nickel, antimony, iron, and the like, in combination with a salt of the electro-positive metals, iron, zinc, manganese, uraninm, zirconium, aluminium, beryllium, magnesium, calcium, and antimony, so far as the latter have the property of producing an electric current between them and the immersed metal, so that the latter forms the negative, and the bath itself the positive pole, whilst an external application of electric current may take place in the ordinary manner, if it be desired to assist the process.—G. H. R.

United States Patent.

Electrolytic Solution (for Electro-galvanising). [*Zinc and Magnesium Salts.*] O. Meyer, Richmond, U.S.A. U.S. Pat. 691,158, Jan. 14, 1902.

The solution may consist of six parts each of sulphate of zinc and sulphate of magnesia, and one part of dextrin, dissolved in such a quantity of water that the solution has a specific gravity of about 18° B.; or an aluminium salt may be substituted for a part of the magnesium salt, but the inventor does not limit himself to any proportions.

—G. H. R.

XII.—FATS, OILS, AND SOAP.

Linseed; Ground ——, *Adulterated with Mineral Oil.* Lyman F. Kebler. Amer. J. Pharm., **74**, [1], 39—41.

The author finds that the fraudulent admixture of mineral oil with powdered linseed still prevails in American commerce. A specimen recently examined was found to contain 35·5 per cent. of oil, which, when extracted by pressure, was dark-coloured, fluorescent, and abnormal in odour. It had the sp. gr. 0·9055 (as compared with 0·930 to 0·940 for linseed oil), the free acid value 61 and saponification value 99·7, the ester value of linseed oil being between 187 and 200. The oil extracted by ether had the sp. gr. 0·9039; acid value 8·6; and ester value 104·1, figures which would be equivalent to the presence of 14 per cent. of mineral oil in the linseed powder. The fixed oil from another sample of powdered linseed, although the percentage was normal, had the abnormal sp. gr. 0·921; acid value 106; and ester value 155.—J. O. B.

Cotton-seed Oil; Chemistry of Halphen's Reaction for ——. P. N. Raikow.

See under XXIII., *page* 279.

Glycerins, Industrial and Commercial; Analysis of ——. J. Gailhat.

See under XXIII., *page* 280.

English Patents.

Vegetable Fat; Edible ——. *Method of Manufacture.* G. C. Warr, London, and W. T. Wright, Wraysbury, Bucks. Eng. Pat. 22,602, Dec. 11, 1900.

The process claimed, consists in pulverising the kernel of a suitable nut, such as cocoanut, heating it at a temperature varying with the age of the nut, and then subjecting it to pressure. The resulting oil is washed with water, and, after the precipitation of impurities by means of sodium chloride or other suitable reagent, it is passed through a filter-press, flavoured, and coloured as desired.—C. A. M.

Fish Waste, Fish, and other Material; Apparatus for Reducing or Rendering ——. H. J. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 24,602, Dec. 3, 1900.

See p. 263, col. 1, U.S. Pat. (E. R. Edson) 689,471, 1901.

—C. A. M.

Fish Waste, or Fish and other Oil Yieldable Material; Process of Reducing or Rendering —— *to obtain Oil.* H. J. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 24,603, Dec. 3, 1901.

See p. 263, col. 1, U.S. Pat. (E. R. Edson) 689,472, 1901.

—C. A. M.

Whale and Seal Oil; Bleaching of ——. W. P. Thompson, Liverpool and London. From A. N. Nielsen, St. John's, Newfoundland. Eng. Pat. 24,821, Dec. 5, 1901.

The process claimed, consists in forming the oil and the oxidising chemicals into an emulsion before the liberation of the oxygen, thus insuring a more intimate contact between the gas and particles of oil. In order to retain the oxygen in the mixture for as long a time as possible, the temperature is kept low, and is not raised until the bleaching is complete. Suitable oxidising agents mentioned, are solutions of potassium bichromate or permanganate, with the subsequent addition of an acid.—C. A. M.

Chinese Wood Oil; Process for Thickening ——; *and Manufacturing Substitutes for Hard Resins therefrom.* A. Kronstein. Eng. Pat. 1387, Jan. 31, 1901.

See under XIII., B., *page* 264.

Fats; Saponification of ——. H. Delarue, Paris. Eng. Pat. 6622, March 29, 1901.

The object of this patent is to obtain a larger yield of solid fatty acid in the treatment of oleic acid with sulphuric acid of 66° B. This is said to be effected by using sulphuric acid of that strength instead of dilute acid for the decomposition of the lime soap first formed in the treatment of fats, for the production of candle material. The oleic acid is thus subjected to the action of the concentrated sulphuric acid at the moment of its liberation, or whilst in the nascent condition.—C. A. M.

UNITED STATES PATENTS.

Rendering Apparatus. E. R. Edson, Cleveland, Ohio. U.S. Pat. 689,471, Dec. 24, 1901.

THIS apparatus, for the various parts of which 13 claims are made, consists essentially of a closed receptacle provided with means of heating, and containing a reservoir for gas or vapour under sufficient pressure to prevent the ebullition of the material treated. The apparatus is primarily intended for obtaining oil and gelatin from fish waste, and it is stated that emulsification is prevented by thus introducing a gas or vapour under pressure on to the surface. Means are also provided for filtering the gelatin solution from the residual matter in the discharge pipe, and for heating it during filtration so as to prevent fermentation.—C. A. M.

Oil from Fish or other Material; Process of Extracting ——. E. R. Edson, Cleveland, Ohio. U.S. Pat. 689,472, Dec. 24, 1901.

PART of the apparatus here described is essentially the same as that described in the preceding patent, the mass being heated in a closed receptacle under sufficient pneumatic pressure to prevent ebullition. In this case, however, no claim is made for the means of filtering the gelatin solution obtained from the residue.—C. A. M.

[Lard] Rendering Tank. W. C. Marshall, Chicago. U.S. Pat. 690,525, Jan. 7, 1902.

THIS invention is an improvement on the apparatus described in U.S. patent 137,698, April 8, 1873. The rendering-tank in the present patent has an opening at the top, so that high-pressure steam is condensed after contact with the mass, and the lard does not acquire an unpleasant flavour, such as is produced by long-continued contact of the fat with steam under pressure. Separate claims are also made for various combinations of different parts of a special apparatus for carrying out this process.—C. A. M.

Grease from Garbage; Process of Extracting ——. S. H. Brown, Washington. U.S. Pat. 689,535, Dec. 24, 1901.

IN the process claimed the garbage is first heated in a suitable digester with an alkaline salt, such as a solution of soda ash, in insufficient proportion to effect complete saponification. The contents of the vessel are then forced into a tank half filled with water containing a small proportion of sulphuric acid (0·5 per cent.), where the oils and fats rise to the surface, whilst all ammonia present is obtained as crystalline ammonium sulphate. After this the temperature in the digester is raised so as to expel moisture and gas, and leave a carbonised residue suitable for fertilising purposes. The inflammable gas driven off during the final two hours is passed through oil and collected for the purpose of illumination.—C. A. M.

Oil from Cotton Seed; Process of Extracting ——. E. van Winkle, Atalanta, Georgia. U.S. Pat. 690,331, Dec. 31, 1901.

THE seed is broken up, the hulls separated, and the mass "tempered" by being heated either with or without the addition of moisture, before being passed through the crushing rolls. The addition of water is stated to facilitate the extraction of oil from old or dried seed.—C. A. M.

Cotton Seed Oil; Process of Extracting ——. E. L. Johnson, Memphis, Tennessee. U.S. Pat. 691,342, Jan. 14, 1902.

ACCORDING to this invention, a suitable proportion (preferably 10 per cent.) of cotton-seed bran is added before or after the cooking process, and the mixture is formed into cakes and pressed. It is stated that owing to the increased porosity of the cake, a higher yield (about 1·5 per cent. more) of oil is obtained than by the ordinary methods of expression.—C. A. M.

Detergent, and Process of making the same. F. N. Pease and M. E. McDonnell, Altoona, Pennsylvania. U.S. Pat. 690,458, Jan. 7, 1902.

CLAIM is made for a preparation obtained by treating a proteid-containing substance, such as linseed meal or white of egg, with an acid, such as hydrochloric, sulphuric, acetic, or oxalic acid, at a suitable temperature, and diluting the viscid product of the reaction with water. A typical preparation consists of 2·3 lb. of linseed or cotton-seed meal treated with $4\frac{1}{3}$ pints of commercial hydrochloric acid (sp. gr. 1·16), and mixed with sufficient water to form a gallon; the surface to be cleansed is treated with this liquid for at least three to five minutes.—C. A. M.

Toilet Cream. J. C. Fleming. Summit, New Jersey, U.S.A. U.S. Pat. 690,848, Jan. 7, 1902.

THE animal or vegetable fat is heated to a temperature not much above 120° F., and treated with a solution of whey and potash, and the resulting soap solution is boiled with an additional quantity of whey. The soap thus prepared is said to be of finer quality than that manufactured by the ordinary methods.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

ENGLISH PATENT.

Paint Composition particularly applicable for use in Renovating Cane and other Furniture. G. Tüsehel, Odessa, Russia. Eng. Pat. 23,155, Nov. 15, 1901.

THE composition claimed, is prepared by mixing pure white lead (1,000 grms.) and 1 and 2 grms. of soluble Aniline Yellow (or French ochre), with 1,500 grms. of water, and boiling the whole together with 125 grms. of white Russian glue. The paint is used in a hot condition.

An alcoholic solution can be prepared by dissolving 360 grms. of a hard resin, 40 grms. of Venice turpentine, and 5 grms. of ether in 800 grms. of alcohol (95—96 per cent.), and adding 1,000 grms. of pure white lead, and 96 grms. of Aniline Yellow (or clear French ochre) to the solution.—C. A. M.

UNITED STATES PATENTS.

Pigment, and Process of making same. C. B. Jacobs, East Orange, New Jersey, U.S.A. U.S. Pat. 689,882, Dec. 31, 1901.

SOLUTIONS of barium hydroxide and zinc sulphate are mixed together in molecular proportions, so as to produce a precipitate stated to have the composition $Zn(OH)_2 + BaSO_4$. This is stated to form a pigment of a pure white colour, great body, and extreme fineness, resembling "lithopone" (zinc sulphide and barium sulphate), but being more permanent, and capable of admixture with lead paints.

—F. H. L.

Pigment [Ferric Oxide], and the Production thereof from Ferrous Liquors. A. S. Ramage, Cleveland, Ohio, U.S.A. U.S. Pat. 691,324, Jan. 14, 1902.

SEE Eng. Pat. 23,858, 1900; this Journal, 1901, 910.

—F. H. L.

Pigment [White, Barium Sulphate]. C. D. Vreeland, Chicago Heights, Ill., U.S.A. U.S. Pat. 691,421, Jan. 21, 1902.

WHEN aluminium sulphate is manufactured from bauxite by treating that mineral with sulphuric acid, an acid sludge is left in the settling tanks, &c. composed largely of silica and ferric oxide. This material is treated with barium oxide or carbonate to produce barium sulphate, and the white mass is dried and then ground with oil for paint.

—F. H. L.

Pigment [*White*] *and Paint Composition.* C. D. Vreeland, Chicago Heights, Ill., U.S.A. U.S. Pat. 691,422, Jan. 21, 1902.

See preceding abstract. The sludge therein referred to has its free acid eliminated either by copious washing or by treatment with milk of lime; and the resulting material is dried, ground into oil, and tinted if desired.—F. H. L.

Pigment [*White*]. C. D. Vreeland, Upper Montclair, N.J., U.S.A. U.S. Pat. 691,423, Jan. 21, 1902.

See two preceding abstracts. The acid sludge therein mentioned is neutralised with milk of lime, and then mixed with from 15 to 50 per cent. of zinc oxide, calculated on the weight of the dry material. The whole is dried and used as a white pigment. It is stated that the formation of the calcium sulphate in the sludge reduces its opacity as a colouring matter, but that the subsequent addition of the zinc oxide restores this property, and makes it a "meritorious" pigment.—F. H. L.

(*B.*)—RESINS, VARNISHES.

English Patent.

Chinese Wood-Oil; Process for Thickening ——; *and Manufacturing Substitutes for Hard Resins therefrom.* A. Kronstein, Karlsruhe, Germany. Eng. Pat. 1387, Jan. 21, 1901.

If wood-oil be heated, preferably with exclusion of air, for a certain time to a temperature of about 200° or 250° C. with a certain proportion of some resin such as dammar, the mixture eventually becomes viscid and solidifies even while hot; and it finally forms a material which is insoluble in ordinary resin-solvents until after it has been melted at a higher temperature (about 300° C.), resembling copal and amber in this particular, and being a perfect substitute for them. If, however, a proportion of the resin larger than is required to induce solidification at 200° C. be added to the wood-oil, or if the heat be too low or not sufficiently prolonged, the mixture remains liquid and does not solidify till it is cold, when it is still soluble in turpentine, benzene, and oil of camphor, and is distinguished by a high degree of elasticity. Thus the solidified products may be employed in the manufacture of varnishes in place of the usual expensive hard resins; while the non-solidified products can be used to prepare commoner varnishes and japans, or in the manufacture of linoleum. The proportion of resin needed to determine insolubility varies according to the nature of the resin adopted, being about 50 per cent. in the case of dammar, Venice turpentine, amber, gutta-percha, and asphaltum; 70 per cent. in the case of copal; and only 30 per cent. in that of colophony. For certain purposes, mixtures of resins, or of resins and linseed or other drying oils, may be added to the wood oil. Presence of air during the process causes oxidation and decomposition, and renders the finished material dark in colour. Eng. Pat. 17,378, 1900, is referred to (this Journal, 1901, 1123).—F. H. L.

United States Patent.

Matter [*Bottle-Wax*]; *Composition of* ——. H. A. Hughes, Philadelphia, Penn., U.S.A. U.S. Pat. 691,383, Jan. 21, 1902.

This composition consists of an acid solution (preferably acetic acid), 2 to 5 oz.; gluten, dissolved in the same acid solution, 2 to 4 oz.; gelatin, 1 to 3 oz.; glucose, 2 to 4 oz.; kaolin, or similar earth, 1 to 4 oz.; 40 per cent. solution of formaldehyde, 1 to 5 grains; oil of wintergreen, to deodorise; water, to dilute to the consistency of thick paint. The product is suitable for use as a "sealing-closure" for jars or bottles; after drying, it becomes hard, tough, insoluble, and infusible, but is resilient or rubber-like in presence of moisture.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

India Rubber Industry: Importance of Ramie Fibre in the ——. Gummi.-Zeit., 1902, **16**, [16], 275.

See under V., *page* 249.

English Patents.

India-Rubber; Manufacture of Compounded ——. C. O. Weber, Manchester, and A. Cairns, Glasgow. Eng. Pat. 50, Jan. 1901.

Mixtures of cellulose and rubber are claimed, made by incorporating the cellulose in the form of viscose emulsions with the rubber. Plastic emulsions of viscose are prepared by mixing it with either a liquid or solid hydrocarbon, coal tar, fatty oil, boiled, blown, or vulcanised fatty oil, grease, cholesterol, stearine pitch, or any of the soft and pliable resins obtained from various sources, or with any of the terpenes, essential oils, or esters of the fatty series. The above plastic emulsions are seasoned and then washed or purified. The crude or the washed emulsions may be employed in rubber mixings of every description for the production of soft or hard rubber goods. In mixing viscose directly with india-rubber doughs containing hydrocarbons, it is preferable to dissolve the viscose in a little water and add powdered zinc sulphate after mixing.—J. F. B.

"*Woodite*"; *Manufacture of* ——. W. Wood and H. Bartlett, Mitcham, Surrey. Eng. Pat. 17,431, Aug. 30, 1901.

This is a composition of washed Para rubber, *fucus vesiculosis*, wood pulp, mastic or resin, and sulphur, mixed together in the manner and proportions specified.

—F. H. L.

United States Patents.

De-vulcanizing Vulcanized Rubber Scrap. G. E. Heylbia, Warrington, England. U.S. Pat. 689,616, Dec. 24, 1901.

The scrap is treated in a closed tank fitted with an inverted condenser at a temperature not exceeding 50° C. with some liquid such as naphtha, benzene, turpentine, &c., which is capable of dissolving sulphur but not india-rubber, at the temperature employed. When the sulphur is all dissolved, the solvent is withdrawn and distilled off. The devulcanised rubber can then be brought into solution while still in the tank by raising the temperature to about 176° C., and the pressure to not exceeding 45 lb. per square inch, using the same solvent as before. The dissolved india-rubber is then ready for use; but, if it be required in the solid state, it is first exposed to a temperature above the volatilising point of the solvent, till the bulk of the latter has passed off, and is next freed from the last portions thereof by being kneaded under hot water in a machine. The plant may be arranged so that the whole process can be worked continuously.

—F. H. L.

Plastics; Machine for Mixing ——. J. H. Pearce, New Haven, Conn., U.S.A. U.S. Pat. 690,374, Dec. 31, 1901.

Apparatus is claimed for mixing such substances as rubber with "bodying-up" materials like sulphur, resin, whiting, &c., and with binding agents automatically, uniformly, and in the proportions desired. Above the usual pair of rollers stands a box of two compartments fitted with Archimedean screws, sliding inlets and outlets, &c., operated by mechanism in the manner shown.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Gallic Acid in Tanning Materials; Detection and Determination of ——. M. Spica.

See under XXIII., *page* 281.

English Patents.

Casein or other like Material; Manufacture of Buttons Combs, and other like Articles of ——. G. C. Dymond, London. From G. Miglioretti, Milan, and G. Mallei, Casalpusterlengo, Italy. Eng. Pat. 1221, Jan. 18, 1901.

A material capable of being turned or moulded is produced by washing casein, curdled milk, &c., squeezing them, and then treating them in a bath with glycerin or like hygroscopic substances at a temperature of about 90° C.,

whereby a plastic paste is produced, which may be mixed with colouring matter, and either pressed in moulds heated to about 140°—150° C., or turned in a lathe when solid. A process for hardening such materials is also claimed by either subjecting them to the action of formaldehyde vapour, or immersing them in a bath of fatty acids, aldehydes and spirits of turpentine, in about equal proportions.—J. F. B.

Fish Waste, Fish, or other Material; Apparatus for Reducing or Rendering ——. E. R. Edson. Eng. Pat. 24,602, Dec. 3, 1901.

See under XII., *page* 262.

UNITED STATES PATENTS.

Depilating Process. C. Burkhalter, Hosensack, Pennsylvania. U.S.A. U.S. Pat. 690,357, Dec. 31, 1901.

THE hides are placed in a lime liquor at 55° F., which is gradually raised to 80° F.; they are agitated therein for about 12 hours and then allowed to cool very slowly over a long period of time (up to four days).—R. L. J.

Tanning; Process of ——. B. Allen and B. Allen, junr., Buford, Georgia, U.S.A. U.S. Pat. 689,773, Dec. 24, 1901.

THE hides or skins are placed in a comparatively weak tan-liquor contained in a drum or other suitable vessel, and sufficient tanning material to complete the process is added in the form of a solid extract, soluble only with difficulty. The latter dissolves gradually and automatically keeps up the barkometer strength as fast as the hides remove tannin from solution.—R. L. J.

Beating Engines [Scrap Leather]. A. W. Case, Highland Park, Connecticut, U.S.A. U.S. Pat. 690,097, Dec. 31, 1901.

THIS machine automatically discharges finished stock and returns unfinished stock to the tub by means of the following contrivances:—In combination with the tub of a beating engine, a pick-up cylinder with fine teeth submerged in the stock, a break-up cylinder with fine teeth, and an endless apron with cleats passing round rolls.—R. L. J.

Gelatin-yielding Liquid; Process of obtaining a ——, *from Fish or other Material.* E. R. Edson, Cleveland, Ohio, U.S.A. U.S. Pat. 689,473, Dec. 24, 1901.

SEE Eng. Pat. 21,467, 1900; this Journal, 1901, 140.

Rendering Apparatus. E. R. Edson. U.S. Pat. 689,471, Dec. 24, 1901.

See under XII., *page* 263.

XV.—MANURES, Etc.

UNITED STATES PATENTS.

Natural Phosphates; Process of treating ——. L. Cheeseman, sen., Alexandria, Virginia, U.S.A. U.S. Pat. 690,048, Dec. 31, 1901.

NATURALLY occurring phosphates are finely-divided, and after mixture with water and an acid salt, such as nitre-cake, a current of electricity is passed through for a suitable period, and the water is then removed by evaporation. The product is stated to contain "available" phosphoric acid.—E. S.

Phosphates; Method of making Water-soluble ——. L. Cheeseman, sen., Alexandria, Virginia, U.S.A. U.S. Pat. 690,040, Dec. 31, 1901.

FINELY-divided naturally occurring phosphates are mixed with water and so much sulphuric acid as may be needed to convert into sulphates, the carbonates and fluoride present; sodium bisulphate is then added, so that after evaporation, the residue may contain mono- and dicalcium orthophosphates and thus be available as a fertiliser.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Carbohydrates; Method of Drying and Determination of the Water of Crystallisation of ——. E. Schulze.

See under XXIII., *page* 281.

Syrups; Nitrites, and the Foaming of ——. K. Andrlik and V. Stanek. Zeits. Zuckerind. Böhmen, 1902, **26**, [5], 228–236.

THE characteristic features of molasses and massecuites which foam, were found to be high acidity, a considerable amount of nitrites, caramelisation products and a low degree of purity, and a high content of substances containing nitrogen. They contained 0·03—0·04 per cent. of nitrogen as nitrites. The phenomenon of nitrite foaming, in the opinion of the authors, may occur when the beetroots worked up, in case they come from virgin soil rich in nitrogen, have putrefied, or during storage were "scalded," or if the juice has been acted on by micro-organisms, or further, when a large quantity of nitrates were present in the beetroots, and these by the action of bacteria have been reduced to nitrites. Juices from decomposed beetroots are usually rich in invert sugar and give by precipitation with lime, a juice which becomes acid on boiling. In the presence of nitrites, this causes a development of oxide of nitrogen and a swelling and foaming of the massecuite.

In normal non-foaming molasses, neither nitrites nor nitrates were found in notable quantity. The figures obtained were 0·004—0·010 per cent. of nitrogen as nitrites and 0·021—0·056 per cent. as nitrates.

Nitrogen dioxide was recognised both by its smell and the action on potassium iodide and starch paper. The analysis of the gas obtained by boiling a diluted massecuite with weak acetic acid gave 52·3 per cent. of carbon dioxide and 32·3 per cent. of nitrogen dioxide.—L. J. de W.

Starch Syrup; Density of ——. O. Saare. Zeits. Spiritusind., 1902, **25**, [5], 44—45.

FOR a long time starch syrup has appeared in commerce in two concentrations termed respectively syrup of 41° and 42° Baumé.

There appears to be no general understanding as to how the density is to be determined. In some cases it is determined in the warm syrup at 41° R. (55° C.), and in others in the cold syrup at 14° R. (17·5 C.). The author prefers to determine the specific gravity at 14° R. of a 10 per cent. solution of the syrup, as is sometimes done in the case of molasses.

The German manufacturers plead for a latitude of 0·5° Baumé on either side of 41° and 42°, since it is impossible to regulate the density of separate boilings within these limits. Using a Baumé hydrometer graduated at 14° R., the author's experience shows that the readings obtained in warm syrups at 40°—50° R. are practically identical with those calculated from the specific gravity (by weight) at 14° R. Thus the error introduced by the viscosity of the syrup compensates for that due to the difference of temperature.

There are, moreover, four different Baumé scales, two of which, the "old" Baumé and the "new" Baumé, are in general use, such that 41° "old" Baumé correspond to 44·8° "new." Since all these variations actually occur in the present state of affairs, the author proposes to have the question settled on a uniform basis at a meeting of those interested in the trade.—J. F. B.

Saccharine Syrup or Molasses obtained from Light-coloured Peat; Composition of ——. H. Borntträger. Zeits. anal. Chem., 1901, **40**, [12], 787—789.

THE syrups obtained by the saccharification of peat (see Classen's process, this Journal, 1900, 364 and 1028), are far inferior to beet-molasses. Peat syrups differ from beet-molasses in the fact that they contain mere traces of potash salts, and also far less sugar and more gummy matters. Peat syrup is always of a brownish-black colour owing to the presence of caramel and salts of humic acid; it is a lustrous, sticky, non-hygroscopic mass, the hygroscopic

nature of beet-molasses being attributable to the potash salts.

The following analyses of peat syrups are recorded :—

	On the Syrup.	On the Dry Substance.
	Per Cent.	Per Cent.
Water	35·39	..
Organic matters	61·51	95·20
Nitrogen	0·45	0·70
Corresponding to nitrogenous compounds	2·82	4·38
Directly reducing sugar (calculated as glucose).	14·80	22·91
Other non-nitrogenous extractive matters	41·67	64·47
Crude fibre	2·22	3·44
Ash	3·10	4·80

Another sample showed :—

	On the Syrup.
	Per Cent.
Water	2·56
Total nitrogen	1·55
Ammoniacal nitrogen	0·095
Sugar (calculated as glucose)	21·12
Crude fibre	1·33
Ethereal extract	Nil.
Ash	9·15
Carbon	1·90
Humic acid	7·87
Pectic matter, gum, extractive matter, &c.	54·52

—J. F. B.

English Patents.

Saccharine Juices; Process of Obtaining very Pure Concentrated ——, and Nutritious Foodstuffs Poor in Water, from Beetroots without the use of Water, and of Obtaining Syrups, Alcohol and Pressed Yeast from the Juices. C. Steffen, Vienna. Eng. Pat., 10,884, May 25, 1901.

Beetroot pulp, chips or roughly crushed beets are subjected to the action of undiluted heated beetroot raw juice (heating juice), no diffusion process, so far as the extraction of sugar is concerned, taking place, until the mass has reached a temperature of 60°—100° C. (preferably 85° C.), whereupon it is separated into expressed residue and juice in the usual manner. The expressed juice is repeatedly used as heating juice, and the fibres passing from the presses into the juice may be separated indirectly by the beetroot masses to be heated, the juice being discharged from them without or with only a slight pressure. The process is carried out in a diffusion battery with the interposition of tubular heating bodies, the diffusion being carried out systematically. The expressed juice may also be heated with the beetroot masses by external heating arrangements with internal stirrers. The heating juice used for extraction may previously be evaporated to a concentration exceeding that of the normal expressed juice. The process may be carried out at the ordinary temperature or below 60° C. in combination with the lime defecating process, a quantity of the juice equivalent to the beets treated being run off to the defecators, whilst the remainder is pressed out of the mass and used for extracting a further quantity of beets.

—J. F. B.

United States Patents.

Diffusion Process [*Sugar Cane*]. E. B. Williams, Memphis, U.S.A. U.S. Pat. 689,838, Dec. 24, 1901.

The inventor claims the method for extracting sugar from "bagasse" which consists in reducing the bagasse to a finely-divided state, dividing this into separate bulks or masses, supplying water to one of the said masses, subjecting the water-charged mass to centrifugal action, supplying the solution thus obtained to another of the said masses, subjecting this mass also to centrifugal action and repeating the operation throughout the whole number of the separate bulks.—J. F. B.

Sugar; Process of Crystallising ——. H. Classen, Dormagen, Germany. U.S. Pat. 690,014, Dec. 31, 1901.

The claim relates to the method of crystallising sugar from a saccharine solution of a massecuite produced from impure saccharine solutions, which consists in slowly cooling the solution under motion, and gradually adding thereto an increasing proportion of water in such amount as to keep the quotient of supersaturation between 1·05 and 1·25. The apparatus is the usual jacketted cylinder provided with stirrer blades. In the specification the quotient of saturation at any particular temperature is defined as the quotient of the parts of sugar dissolved in one part of water in the impure massecuite as compared with the parts of sugar which would be dissolved in one part of water in pure saturated solutions. For a given massecuite, the quotient tends to decrease as the massecuite cools, but it increases as the purity of the molasses is reduced by the separation of sugar. The limits of supersaturation specified in the claim are such that no new crystals are formed during the cooling, and all the sugar is deposited on the crystals already existing.—J. F. B.

Ammonia from Waste Products [*from Beet-Sugar Factories*]; *Method of Making* ——. E. R. Besemfelder. U.S. Pat. 689,789, Dec. 24, 1901.

See under VII., *page* 254.

XVII.—BREWING, WINES, SPIRITS, Etc.

Enzymes; Action of ——, *One on Another.* A. Wróblewski, B. Bednarski, and M. Wojczynski. Beitr. z. chem. Physiol. u. Pathol., **1**, 290—303. Chem. Centr., 1902, **1**, [4], 272.

The authors obtained the following results :—1. Pepsin has a prejudicial influence on trypsin, as it assists the injurious action of acids. 2. Trypsin weakens the effect of pepsin by favouring the prejudicial influence of alkalis. 3. Pepsin has no influence on the enzyme of rennet. 4. Pepsin, trypsin, and diastase have no action on invertase. 5. Trypsin and invertase have no action on diastase; pepsin has a slight injurious influence, as it favours the prejudicial effect of acids. 6. Pepsin and trypsin have no action on emulsin.

In general, it may be stated that the action of enzymes on one another is a very limited one. Zymase, however, is rapidly destroyed by the proteolytic enzyme of yeast juice. The authors confirm E. Fischer's statement, which has been questioned by Duclaux, that emulsin decomposes milk sugar.—A. S.

Yeast; Presence of Oleolytic Enzymes in ——. Delbrück. Woch. für Brau., 1902, **19**, [3], 25.

The hydrolysis of butter fat by enzymes secreted by micro-organisms has been studied by O. Laxa (see page 268), who found that *Oidium*, *Penicillium*, *Mucor*, and *B. fluorescens liquefaciens* possessed this property in a marked degree, as also did yeast to a less extent. The author discusses these observations in regard to yeast as applied to the fermentation industries. All mashing materials contain fat; in the case of distillery mashes this fat would come into direct contact with the yeast and would be hydrolysed. In bread making also the same action would take place. But in the case of brewery mashes, most of the fat would be left behind in the spent grains, and little if any would appear in the wort. Some, however, might get through, especially lecithin, if not in the dissolved state, perhaps in emulsion, and Berlin "Weissbier" wort certainly contains traces of fat. The presence of fat in the beer would be very injurious to the head-retaining qualities, and it might be worth while taking the oleolytic power of a yeast into account when selecting races for industrial pure-cultivation.

The author suggests that the presence of oleolytic enzymes in yeast may account for the production of glycerin during fermentation, owing to the hydrolysis of the fat which is known to be stored up during the life of the yeast cell.—J. F. B.

Yeast; Trial of Bücheler's Sulphuric Acid Process for the Preparation of Distillery Seed ——. A. Hesse. Zeits. Spiritusind., 1902, **25**, [5], 45—47.

The author has conducted trials on the large scale with Bücheler's process of preparing the seed yeast in mashes acidified with sulphuric acid, instead of by lactic acid fermentation (see this Journal, 1901, 1128). The yeast mash is prepared as follows:—In a yeast tub of about 260 litres capacity, 15 kilos. of malt are mashed with 15 litres of hot water, 150 litres of potato mash are then added, and the mixture allowed to saccharify at a temperature of 62·5° C. for ½—1 hour; 350—400 c.c. of pure sulphuric acid diluted with 3 litres of water are then added, and the mash is cooled to the incubating temperature of 16° C., the mother yeast being added when it is at about 29° C. The usual degree of acidity ranges from 1·5 to 1·7, but even at 1·8° no free sulphuric acid can be detected. The sulphuric acid yeast mash requires to be incubated at a temperature about 2° C. higher than the lactic acid mash, a circumstance which tends to show that the sulphuric acid mash is a less favourable medium for the growth of the yeast. The yeast in the sulphuric acid mash does not look so well and vigorous in the tub as the lactic acid yeast. In the yeast tub, the fermenting mash rises very slowly, and then suddenly falls down with an audible sound. This rising and falling fermentation makes it necessary to provide a greater space above the level of the mash and the same also applies to the main fermenting vats. The preparation of the pitching yeast by this process is very simple, and only requires 24 hours as against 48 hours by the lactic acid method. But the treatment in the fermentation room is not so simple. The pitching temperature of 26° C. is higher, and fermentation sets in earlier and more energetically; great trouble was encountered by the author owing to the frothing over of the vats, especially in mashes to which the saccharifying malt had been added whilst they were warm. On this account it was necessary for the operator to attend to the vats all night and to add petroleum in large quantities and not always with success. The first experiments were made with distillery yeast race II., but subsequently some special yeast was obtained from Bücheler which did not tend to froth so badly. The mashes were pitched at a temperature of 26° C., but they are so sensitive to rise of temperature that it was found that they must never be allowed to get hotter than 29° C., which means a large expenditure of cooling water and constant attention. The high temperatures employed also weaken the zymase of the yeast, so that, although primary fermentation is rapid, the secondary fermentation is very slow. The claim that the whole of the starch in the mash can be attenuated in 48 hours was not confirmed. The mashes were free from bacteria and the rise in acidity was as small as with lactic acid yeast. The conclusion drawn by the author is that, although this process may be of advantage in small distilleries where the lactic acidification of the yeast mash presents difficulties, the disadvantages of night work, frothing and regulation of temperature, which it entails, will prevent its general adoption.—J. F. B.

Yeast; Determination of Potato-starch in ——. A. Hebebrand.

See under XXIII., *page* 281.

Bottom-Fermentation Yeasts; Separation of High and Low Attenuating Types of ——. F. Schonfeld. Woch. für Brau., 1902, **19**, [4], 42—43.

The author gives details of a method he adopted for separating a mixture of high and low attenuating yeasts [Frohberg and Saaz types] by suitable treatment in the fermenting room. The original mixture contained 60 per cent. of the Saaz low-attenuating type, and it required nine successive vat-fermentations to obtain this type in the pure state. The first two fermentations were conducted for fourteen days each, the third for seven days and the fourth for eight days. Up to this point each succeeding vat was pitched with the sediment left in the preceding one. From the fifth vat onwards, fermentation was conducted for five to seven days, and the beer was pumped off whilst still fermenting, the sowings being made from the yeast left behind at the bottom. In spite of the fact that fermentation was not quite complete, very little further attenuation took place after pumping off the beer.

Up to the sixth vat the proportions of the low attenuating yeast in the sediments decreased irregularly, falling as low as 32 per cent. in the sediment from the sixth fermentation. In the seventh fermentation the proportion of Saaz yeast suddenly rose to 90 per cent., and in the ninth it was quite pure. The eighth and ninth fermentations were done in duplicate.—J. F. B.

Beer; Chemical Diagnosis of Pasteurised ——. A. Bau. Woch. für Brau., 1902, **19**, [4], 44—45.

In order to detect whether a sample of beer has been pasteurised, the author proposes to examine it for the presence of invertase, an enzyme which is a normal constituent of unpasteurised beer. Invertase is destroyed at high temperatures, but no definite limit can be fixed, since the temperature necessary for its destruction depends on the conditions. In concentrated solutions and in presence of large quantities of other extractive matters, the temperature required is relatively high; the presence of alcohol, on the other hand, lowers the temperature at which it is destroyed. Consequently the wide variations in the percentage of alcohol and extract in different beers cause variations in the behaviour of the invertase during pasteurisation. The methods for the detection of invertase in beer consist in digesting equal volumes of beer and cane sugar solution, either for 1 hour at 55° C. or for 24 hours at the ordinary temperature, clarifying, making up to a known volume, and determining the invert sugar produced, by polarisation or cupric reduction. It is always necessary to conduct a control experiment under identical conditions with a portion of the beer in which the invertase has been destroyed by boiling. In many cases a qualitative test with 1 c.c. of the solution and 5 c.c. of Fehling's solution will serve to indicate whether invert sugar has been produced during the digestion.

In experiments made at ordinary temperatures for 24 hours, the author found that the polarisation was reduced from + 13·5° in the case of the boiled sample to 0° in the unboiled sample when unpasteurised beers were tested. The results obtained with three different beers, which were pasteurised at various temperatures, are shown in the following table:—

Beer A.			Beer B.			Beer C.		
Temperature of Pasteurisation.	Polarisation.		Temperature of Pasteurisation.	Polarisation.		Temperature of Pasteurisation.	Polarisation.	
	Boiled Test.	Unboiled Test.		Boiled Test.	Unboiled Test.		Boiled Test.	Unboiled Test.
° C.	°	°	° C.	°	°	° C.	°	°
57·5	+ 20·74	+ 16·65	50·0	+ 19·33	+ 8·65	57·5	+ 18·24	+ 17·66
60·0	20·83	20·90	57·5	19·36	18·00	60·0	18·30	18·26
63·0	20·85	20·85	60·0	19·40	19·36	62·5	18·30	18·33
66·0	20·85	20·85	62·5	19·33	19·30	65·0	18·60	18·56
Unpasteurised	20·85	1·33	67·5	19·33	19·36	67·5	18·60	18·66
			Unpasteurised	19·36	0·10	Unpasteurised	18·60	0·00

From the above results it will be seen that pasteurising temperatures of from 50° to 57·5° C. are not sufficient to destroy the invertase, but weaken its action considerably. Since the beers examined were of very different composition, it may be safely concluded that this method can be relied on to show whether a beer has been pasteurised at temperatures exceeding 57·5° C. The best method of carrying out the test is as follows:—Two portions of 20 c.c. of beer are measured out, and one is boiled and the other not; they are each mixed with 20 c.c. of a 20 per cent. solution of cane sugar, and kept for 24 hours at the ordinary temperature; 0·5 c.c. of basic lead acetate is then added to each, and they are made up to 50 c.c., filtered and polarised. If there is a considerable difference between the two readings, the beer is not pasteurised, but if the readings are the same, or only slightly different, it may be concluded that the beer has been pasteurised, probably at a temperature exceeding 57·5° C.—J. F. B.

Fig-Must; Alcoholic Fermentation of Indian ——. G. Ulpiani and L. Sarcoli. Gaz. chim. ital., **31**, [2], 395—413. Chem. Centr., 1902, **1**, [2], 144.

After an extensive series of experiments, the authors arrived at the following conclusions:—The spontaneous fermentation of Indian fig-must under the ordinary conditions is not suited for the industrial preparation of alcohol. By sterilisation of the must and subsequent inoculation with suitable pure cultures, almost theoretical yields can be obtained, but this method will not answer in practice, on account of the great cost of effective sterilisation. Inoculation of the unsterilised must with *Sacch. Pastorianus II.* is also not satisfactory, as the latter is soon overwhelmed by *Sacch. Opuntiæ*. The authors hope to find a ferment which will give a good yield of alcohol and be capable of holding its own against *Sacch. Opuntiæ*.—A. S.

Invertase; Action of ——. V. Henri. Zeits. physik. Chem., **39**, 194—216. Chem. Centr., 1902, **1**, [2], 92.

The author examined the course of the inversion of cane sugar at 25° C. by invertase, obtained from yeast. The usual logarithmic formula does not hold good for the inversion, which can be much better expressed by the empirical formula—$\left(\frac{d\,x}{d\,t} = k_1 (1 + \frac{x}{a}) . (a - x)\right.$, where a is the original quantity of cane sugar, and x the amount of sugar which has been inverted after the time t. The experiments showed that during 24 hours, the action of the invertase is quite constant, and is independent of the invertive action already accomplished. Thus, at any moment of the reaction, the velocity is dependent only upon the concentration of the cane sugar and of the invert sugar, and not upon the condition of the ferment.

—A. S.

English Patents.

Malt and other Substances; Purification of Furnace Gases for Drying ——. E. S. Beaven, Warminster, Wilts. Eng. Pat. 4263, Feb. 28, 1901.

In the drying of malt or other substances to be used for food, or in the preparation of food or drink, where the furnace gases come in contact with the material which is being dried, curtains of woven wire, or any other material having numerous small openings, are suspended vertically from the dispersers of the kilns or other drying apparatus, or otherwise placed in the path of the furnace gases so as to arrest mechanically and separate the arsenical fumes or particles of dust from the latter. It is stated that the dust of the furnace gases, having a basic reaction, materially assists the fixation of the arsenic on the screens.

—J. F. B.

Pasteurisation of Liquids, [Beer]. A. M. Clark, London. From O. Fromme, Frankfort-on-Main, Germany. Eng. Pat. 1913, Jan. 28, 1901.

This is a process for pasteurising liquids in bottles. The bottles are carried in wicker baskets through a closed chamber by means of an endless chain, in such a manner that they are first gradually heated by a stream of warm water, then exposed to a steam atmosphere, and afterwards passed through a bath of hot water, the heat gradually increasing from one end of the bath to the other. The bottles are finally cooled by passing through the upper part of the chamber, and by being sprayed with cold water; the spray being so arranged that on falling from the hot bottles, it passes on to the bottles freshly introduced into the chamber and gradually warms them.—W. P. S.

Solidified Spirit; Improvements in connection with ——. R. C. Wild. Eng. Pat. 5404, March 14, 1901.

See under II., *page* 244.

United States Patents.

Brewing Operations; Construction of Union Casks used in ——. W. Cutler, Birmingham. U.S. Pat. 690,240, Dec. 31, 1901.

See Eng. Pat. 24,253, 1898 (this Journal, 1900, 64).—J. F. B.

Malt Drum. F. Knüttel, Charlottenburg, Germany. U.S. Pat. 691,471, Jan. 21, 1902.

A revolving drum for malting and drying grain is claimed, comprising an outer shell, a central perforated tube closed at one end of the drum, perforated ventilating tubes closed at the opposite ends of the drum and communicating with the air chamber, and means for supplying the ventilating tubes with moist or heated air, the perforations of the ventilating tubes increasing in number in proportion to their distance from the central tube.—J. F. B.

Beer Vats and Pipes; Process of Cleaning ——. S. A. Sjoo and R. V. Tornell, Stockholm, Sweden. U.S. Pat. 691,671, Jan. 21, 1902.

See Eng. Pat. 21,911; this Journal, 1901, 1131.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Fungi, Edible; Composition of ——. A. Zega. Chem.-Zeit., 1902, **26**, [1], 10.

The following table gives the average composition of four kinds of edible fungi:—

——	*Agaricus esculentus.*	*Agaricus arvensis.*	*Lactarius piperatus.*	*Coprinus comatus.*
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Water	93·71	89·55	85·70	91·31
Nitrogenous substances.	1·71	6·68	6·41	2·01
Fat	0·10	0·16	1·07	0·09
N-free extractives	3·29	2·09	2·54	2·95
Crude fibre	0·40	0·81	3·39	0·15
Ash	0·78	0·69	0·98	0·49

—C. A. M.

Butter Fat; Decomposition of ——, *by Micro-organisms.* O. Laxa. Arch. Hyg., **41**, 119—151. Chem. Centr. 1902, **1**, [2], 128.

The author finds that lactic acid bacteria and the different varieties of tyrotrix have no action on butter fat. *Oidium, penicillium, mucor*, and *Bac. fluoresc. liquefac.*, however, effect hydrolysis of the fat, as do also, although to a less extent, the yeasts. The decomposition does not proceed uniformly in the case of all glycerides of butter fat. This is mainly due to two circumstances:—On the one hand, the destructive action of the soluble fatty acids set free, towards the mould fungi increases with rising molecular weight, and, on the other hand, the glycerides of those insoluble fatty acids, which have a high molecular weight, are more readily attacked by the mould fungi. The volatile fatty acids set free are further decomposed by the mould fungi. The cause of the decomposition of the glycerides was found to be due, in the case of *penicillium* and *mucor*, to the

presence of an enzyme. The presence of ammonia had no perceptible influence on the decomposition of the non-volatile acids at the ordinary temperature.—A. S.

Apples, and some of their Products; Analysis of ——. C. A. Brown, jun.

See under XXIII., *page* 282.

ENGLISH PATENTS.

Coffee; Treatment of ——, *and Production of Coffee Substitutes.* Sir H. S. Maxim, London. Eng. Pat. 3129, Feb. 13, 1901.

COFFEE berries are heated in a chamber until the moisture contained in them is driven off; the chamber is then closed, and the heating is continued until the required pressure is attained; the heating is then stopped, and the berries are discharged into another chamber connected with the coffee chamber and containing raw coffee berries, or prepared grains serving as the coffee substitute, which absorb the aroma given off from the roasted coffee during cooling. The preparation of the grains or other coffee substitute consists in heating them in a chamber to drive off most of their moisture, closing the chamber and continuing the heating until the pressure rises to 200—250 lb. per sq. in., then stopping the heating, blowing off the steam, and exposing the grains to the air, until their temperature reaches 150° C., then exhausting the chamber and preserving the grains *in vacuo* until required for use. The point at which the coffee-roasting chamber must be closed is determined by condensing the steam given off and noting the character of the gases. The pressure in the coffee-roasting chamber may be increased artificially by the vaporisation of alcohol placed in the chamber. In certain cases it is advantageous to force a current of air through the roasting chamber after connecting it with the substitute chamber. The apparatus is also described and claimed.—J. F. B.

Wheat and other Grain, or the Hulled Products thereof; Sterilising and Bleaching previously Cleaned ——. C. H. Buchenau, Mannheim, Germany. Eng. Pat. 21,364, Oct. 24, 1901.

THE cleaned wheat or other grain is first subjected to a steam spray in a closed pipe, fitted with a worm conveyor. By the latter the grain is conveyed into a hopper provided with a stirrer, and then passes into an obliquely-mounted drum made of acid-proof material. The wheat is here brought into contact with a current of sulphur dioxide gas, by which it is bleached, and falls by its own weight out of an opening at the lower end of the drum.—W. P. S.

Milk; Manufacture of Condensed or Desiccated ——. J. H. Campbell, New York, and C. H. Campbell, Philadelphia, U.S.A. Eng. Pat. 3561, Feb. 19, 1901.

THE milk is placed in a tank heated by a water-jacket. Heated air is then blown through the milk until the evaporation has produced a fluid of the consistency of ordinary condensed milk. The air blast is so directed as to produce a rolling motion in the milk, and the temperature is kept below 48° C. The milk thus reduced in volume is then run into a rotating drum, and further dried by hot air until a semi-solid material is obtained. This is broken up into small lumps, which, by being forced through a sieve, are converted into small granules. The granulated mass now passes into a canvas drum, where it is completely dried by hot-air currents, and is then ground. The above semi-solid material may be mixed with flour, cocoa, &c., before drying. The plant for carrying out the above process is claimed, together with the method and products.—W. P. S.

Eggs; Process for Preserving ——. E. Teisler, Strehla, Germany. Eng. Pat. 8524, April 25, 1901.

THE process claimed consists in immersing the eggs in a solution of fluosilicic acid or its salts.—W. P. S.

Meats; Process for Curing ——. L. M. Schlarb, Allegheny, Pennsylvania, U.S.A. Eng. Pat. 23,141, June 3, 1901. Under International Convention.

THE process consists in injecting brine and carbon dioxide under pressure into the meat by means of suitable needle-nozzles connected to a tank containing the brine and carbon dioxide, the pressure in the tank being about 2 atmospheres. The meat is now placed in a vessel from which the air is exhausted, and brine is then allowed to flow in. The meat is allowed to remain in the brine for about 10 hours, and may then be subjected to the action of carbon dioxide under pressure.—W. P. S.

Meat Extracts, and Process for Manufacturing same. U. Ciantar and F. W. F. Ross, London. Eng. Pat. 199, Jan. 3, 1901.

MEAT extracts as usually prepared contain only non-nutritive stimulating compounds, termed by the inventors "waste product" compounds, without any of the natural coagulable muscle proteids, which are capable of sustaining life. The present invention relates to the recovery of these latter, by reducing raw meat to the state of a very fine pulp, with or without a freezing process to burst the cells, then subjecting the pulp to the action of a saline solution which renders the coagulable proteids loose and partially soluble, in which condition they are readily floated out. The proteids are then extracted by washing and agitation in copious solution, and separated from the muscle fibres by passing through a filter, the meshes of which will hold back the coarse fibrous matter, whilst allowing the coagulable proteids to pass through, the latter being subsequently congulated, preferably by heat. The fibrous residue may then be boiled with the extraction liquors for the preparation of ordinary meat extracts.—J. F. B.

Food Products [Mixtures of Casein and Fat]. J. H. Hooker, Buckingham. Eng. Pat. 5406, March 14, 1901.

PRECIPITATED casein is dissolved in water made slightly alkaline, and to the warm solution cream, melted butter, margarine, or the like is added. The mixture is well stirred and cooled, when it may be moulded.—W. P. S.

Vegetable Fat, Edible; Method of Manufacturing ——. G. C. Warr and W. T. Wright. Eng. Pat. 22,602, Dec. 11, 1900.

See under XII., *page* 262.

UNITED STATES PATENTS.

Preserving Organic Substances [Foods &c.]; Methods of ——. A. Mészáros, Székesfejérvár, Austria-Hungary. U.S. Pat. 691,402, Jan. 21, 1902.

SEE Eng. Pat. 6371, 1901; this Journal, 1901, 601.—L.A.

Yeast [Bread-making]. G. Heilenman, Louisville, Kentucky, U.S.A. U.S. Pat. 690,279, Dec. 31, 1901.

THE inventor claims a "yeast flour," consisting of corn meal, 24 parts; potato flour, 4 parts; sodium bicarbonate, salt, and anise flour, 1 part each. When required for use, the flour is stirred up with boiling water in a jar, which is then covered and allowed to stand for 12—14 hours at a temperature of 90°—100° F. The contents are then stirred, and, after two hours' further standing, are added to the ingredients of the bread.—J. F. B.

Centrifugal Cream Separator. W. C. Hartmann, Cleveland, Ohio. U.S. Pat. 689,878, Dec. 31, 1901.

THE machine consists of a cylindrical vessel with a conical cover, which extends over the edge of the vessel, and is clamped down to a rubber ring carried by a broad flange thrown off from the outside of the vessel below its upper edge. The milk, which is fed into the lower part of the revolving vessel through a central tube, is separated, the cream being drawn towards the centre and rising up around the central tube to the outlet at the top, and the skim milk being thrown to the outside of the vessel, and being compelled to rise, overflow, and then pass downwards to the

lower edge of the conical cover, where the outlet is situated. Wings carrying sloping plates radiate from the central tube and facilitate the rising of the cream.—L. A.

Centrifugal Liquid-Separator [*Milk*]. P. M. Sharples, Westchester, Pennsylvania, U.S.A. U.S. Pat. 690,883, Jan. 7, 1902.

The invention relates to cream separators in which rotation is caused by a steam jet. The separation is carried out in two concentric chambers, readily removable for cleaning. The exhaust steam is prevented from heating the milk, unless desired, by a special construction of the outer casing. —J. W. H.

[*Lard*] *Rendering Tank*. W. C. Marshall. U.S. Pat. 690,525, Jan. 7, 1902.

See under XII., *page* 263.

(*B.*)—SANITATION; WATER PURIFICATION.

Lead; Action of Water on ——. S. Růžička. Arch. Hyg., **41**, 23—45. Chem. Centr., 1901, **1**, [2], 131.

Simple Solutions of Inorganic Salts in Distilled Water. —The influence of the salt dissolved in the water is not dependent upon the nature of the basic component, the corresponding salts of all the bases examined (K_2O, Na_2O, CaO, MgO, $(NH_4)_2O$) having practically the same effect. The action of the salt is dependent upon the acid component, nitrates having an accelerating, or at the least—at certain concentrations—not a retarding effect; chlorides, sulphates, and carbonates having a retarding influence on the action, that of chlorides being the least, and that of carbonates the greatest.

Solutions of Mixed Salts.—Carbonate added to the solution of sulphate, chloride, or nitrate causes a diminution in the action on lead. Sulphate added to the solution of chloride or nitrate causes a diminution, but added to the solution of carbonate has no influence. Chloride added to the solution of sulphate and nitrate causes a diminution in the action, but added to a solution of carbonate accelerates the action (in one experiment, in which the carbonate was in large excess, the chloride had no influence). Nitrate added to the solution of carbonate, sulphate, or chloride caused, in every case, an increase in the action of the solution on lead. If the lead comes continuously in contact with fresh portions of a carbonate solution, the quantity of metal given up to the liquid decreases.

With lead exposed continuously to fresh portions of a nitrate solution and with free access of air, the amount of metal dissolved decreases to a very small value, if a sufficient quantity of carbonate is added, but without such addition, the weight of metal dissolved increases very rapidly.

Free carbon dioxide contained in the water causes, contrary to the view generally held, a decided diminution in the action on lead.

The presence of organic substances does not, as a rule, accelerate the action on lead (macerations of grass, radish leaves, and fish diminish the action, maceration of peat increases it). Of the bodies examined, those which have the greatest effect in diminishing the action of the water on lead are carbonates, carbon dioxide, and the infusion of grass.

The action of water on lead is explained in the following manner:—With all aqueous solutions and also with distilled water containing air or oxygen, lead hydrate (lead carbonate?) is dissolved from the surface of the lead in the form of a fine powder. If the water contains a salt, the acid set free by dissociation combines with superficial particles of lead to form the corresponding salt. If this salt is soluble in water, a fresh surface of the lead is continually exposed to the water, and a considerable quantity may be dissolved, but if the salt formed is insoluble, it forms—provided the acid is present in sufficient quantity—a protective covering on the surface of the lead, and so hinders the action of the water.—*A. S.*

English Patent.

Noxious Vapours and Sulphurous Fumes; Apparatus for Exhausting and Condensing ——. T. G. Webb and Webb's Patents, Ltd. Eng. Pat. 1515, Jan. 23, 1901.

See under VII., *page* 253.

United States Patents.

Water Purifier and Filter; Portable ——. C. E. Holland, New York. U.S. Pat. 691,545, Jan. 21, 1902.

The purifier consists of two concentric vertical tubes of aluminium, insulated from one another, and fixed to the side of an ordinary table filter. These tubes are connected to the opposite poles of an electric light circuit, and the water enters the filter by passing up between them.—L. A.

Fecal Matter; Apparatus for Clarifying ——. F. W. Dittler, Berlin. U.S. Pat. 691,365, Jan. 21, 1902.

The fecal matter is passed through a series of three closed tanks, provided with outlet pipes for gases, leading into a chimney. The first is a sort of septic tank, the second an aerating tank, and the third a filtering tank containing coke and saprol or other disinfectant.—L. A.

Disinfecting Sewer-Vaults; Apparatus for ——. W. Martin, Chicago, Illinois. U.S. Pat. 690,866, Jan. 7, 1902.

The apparatus consists of two shallow pans, upper and lower, separated from one another by a wire-gauze ring, and slung by a chain. Sulphur and manganese dioxide are placed in the lower pan and ignited. Chloride of lime is placed in the upper pan. The wire gauze ring encloses the flaming sulphur and prevents the ignition of inflammable sewer gases.—L. A.

Grease from Garbage; Process of Extracting ——. S. H. Brown. U.S. Pat. 689,535, Dec. 24, 1901.

See under XII., *page* 263.

(*C.*)—DISINFECTANTS.

Alcohol Vapour; Disinfecting Action of ——. Seige. Arbb. Kais. Ges.-A., **18**, 362—369. Chem. Centr., 1902, **1**, [2], 130.

The author finds that even in the most favourable cases, the destructive action towards spores of alcohol vapours is not so rapid as that of steam in motion at 100° C. He states that the disinfectant action of the vapours of alcohol-water mixtures decreases with increasing proportions of alcohol, until finally it is practically *nil*. The author accepts the explanation of Frank and Brun, *viz.*, that the vapour from strong alcohol causes a shrinking of the outer covering of the spores, and so retards the destructive action, whilst with weak alcohol, the water-vapour softens the outer covering and facilitates the penetration of the vapours. It was observed that spores which had previously been treated with water, were killed more quickly than those which had been kept absolutely dry, whilst, on the other hand, no perceptible difference was observed, when the spores were first soaked for a considerable time in alcohol, and then dried.

The results of the experiments show that it is not advisable to use alcohol vapour in place of steam for disinfecting purposes, in industries in which animals suspected of infection with anthrax are employed.—A. S.

Formaldehyde; Detection and Determination of Methyl Alcohol in ——. Duyk.

See under XXIII., *page* 283.

English Patent.

Vermin; Process and Apparatus for Producing an Inexplosive Gas for Use in Exterminating ——. W. Leybold, Hamburg. Eng. Pat. 20,761, Oct. 16, 1901.

A gas which is free from oxygen and does not form an explosive mixture with air, is prepared for use in

exterminating rats and mice on board ship, &c., by blowing air through anthracite or coke contained in a generator, at such a pressure—in relation to the depth of the fuel, and to the temperature of combustion—as is calculated to avoid the production of more than 5 to 6 per cent. of carbon monoxide in the gas finally obtained. The apparatus described consists of a water-jacketed generator having a slanting grate, beneath which the compressed-air-pipe is fixed, and having a firebrick-lined, or water-cooled, outlet through which the gases are led into a chamber, where a continuous spray of water from the upper part of the chamber cools the gases.—H. B.

UNITED STATES PATENTS.

Disinfecting Purposes; Compound for ——. W. Martin, Chicago, Illinois. U.S. Pat. 690,867, Jan. 7, 1902.

A MIXTURE of manganese dioxide, 1 part, and sulphur, 2 parts.—L. A.

Aseptic Preparation from Pancreas, and Process of Producing the same. W. Weber, Stolberg II, Germany. U.S. Pat. 691,681, Jan. 21, 1902.

PREPARATIONS of pancreas are made by the aid of organic acids, such as salicylic, benzoic, and succinic, which do not exert a destructive action upon the enzymes, and are at the same time antiseptic. Thus, a solution of pancreatin or fresh pancreas juice is made feebly alkaline and mixed with the acid in question, the precipitate is filtered off, washed, and purified with alcohol and ether. By adding alkali or an alkaline salt to the moist precipitate, a soluble preparation is obtained.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENTS.

Sizing Preparation. J. Pate, Barnley. Eng. Pat. 2645, Feb. 7, 1901.

CLAIM is made for the addition of boiled linseed or the juice of linseed to sizing tallow or a sizing mixture, together with one or more of the following substances:—Sodium silicate, formalin, caustic potash, and with or without farina. —C. A. M.

Viscose; Treatment of ——, *for the Preparation of Useful Products therefrom.* C. F. Cross and E. J. Bevan, London, and C. Beadle, Erith. Eng. Pat. 3592, Feb. 19, 1901.

SEE Fr. Pat. 309,548; this Journal, 1902, 65.—J. F. B.

Casein; Process for Obtaining Pure Solutions of ——. J. R. Hatmaker, London, from J. A. Just, New York. Eng. Pat. 4207, Feb. 27, 1901.

THE inventor claims the combined use of sulphuric and acetic acids in the treatment of casein from milk, the former for precipitating the casein from the milk, and the latter for reprecipitating the casein after solution in an alkaline solvent. The separated milk is treated with sulphuric acid, the curd is drained and washed, then dissolved in sodium bicarbonate solution and reprecipitated by acetic acid. The purified casein is drained and washed, and dissolved in a minimum quantity of alkaline bicarbonate. The treatment with acetic acid is stated to have a beneficial effect in removing lime salts thrown down by sulphuric acid. If a very pure solution of casein be desired, it may be clarified by treatment in a centrifugal separator.—J. F. B.

India Rubber; Manufacture of Compounded ——. C. O. Weber and A. Cairns. Eng. Pat. 50, Jan. 1, 1901.

See under XIII. C., *page* 264.

UNITED STATES PATENTS.

Paper-Pulp Strainer. N. L. Vrooman and R. R. Kirkland, New York, U.S.A. U.S. Pat. 689,934, Dec. 31, 1901.

THE patentees claim a screening device comprising a polygonal cylinder, having on each of its sides a series of longitudinal bars with serrated surfaces forming substantially V-shaped teeth with correspondingly shaped intervening recesses and removable screen bars extending transversely of each of the cylinder sides, and adapted to the recesses. The longitudinal bars are carried in radial slots on the end plates of the cylinder. Several sets of variously formed screen bars may be kept to suit the different classes of work required.—J. F. B.

Paper-making Machine. H. Parker, Bellows Falls, Verm., U.S.A. U.S. Pat. 690,030, Dec. 31, 1901.

THIS invention relates more particularly to means for collecting the "stuff" from the pulp on a revolving cylinder from which it is continuously removed and delivered in a concentrated state suitable for the addition of the bleaching agents and the mineral loading materials. The interior of the paper-making cylinder is divided into compartments with means for producing a suction inside from the ends, and for cutting off the compartments, as they come into a certain position, from the action of the suction, so that the web may be removed from the roll. The removal is effected by a doctor of special construction, inside which a suction is produced in order to draw the soft web through the doctor, whence it is discharged into a stack in the desired condition for subsequent operations.—J. F. B.

Paper, Paper Pulp, and Paper Stock; Machine for Tearing up ——. C. Wurster, London. U.S. Pat. 690,505, Jan. 7, 1902.

THIS machine is designed for tearing, rather than cutting up, paper supplied in the sheet form for re-pulping. The paper is first fed into a hopper where two rotary feeding fluted rollers or rollers with very heavy teeth compress the loose paper stock. At the same time thick layers of broken papers as they come from the salle are disarranged by the teeth of the rollers, and opened up so that only a few sheets are presented to the action of the saws. Another fluted roller placed below forces the paper on to the teeth of circular saws where it is torn into strips and bands, and iron fingers in the shape of hooks fixed between the blades of the saws tear the strips of paper into smaller pieces, which are conveyed to the pulping engine. The paper may be prevented from clogging between the saws by forcing compressed air or steam between them.—J. F. B.

Pulping Machine. C. Wurster, London. U.S. Pat. 690,506, Jan. 7, 1902.

THIS pulping machine consists of a trough divided into two portions, a feeding portion and a working portion, and a shaft arranged in the trough carrying kneading and transporting propellers in the working portion, feeding the material in one direction and kneading and transporting propellers in the feeding portion, feeding the material in the opposite direction. The propellers in the working section feed the material towards a discharge outlet, and those in the feeding portion feed it away from the outlet. The feeding portion is open to the hopper and the working portion is closed. The effect of the propellers is to heap the material up at the feeding end so that only that which is turned over from above reaches the working propellers, and the impurities collect at the bottom of the feeding section, which is made shorter than the working section. —J. F. B.

Wood Pulp or Similar Materials for the Manufacture of Paper; Centrifugal Sizing Apparatus for Sizing ——. H. Schiller, Weissenfels, Germany. U.S. Pat. 690,777, Jan. 7, 1902.

IN a centrifugal sizing apparatus for wood pulp and similar materials, the inventor claims the combination of a rotary system of horizontal discs provided within an upright sieve-casing, with upright plates arranged radially between the horizontal discs at a point in juxtaposition to the outer edges of the discs, and forming "compartments" solely adjacent to the outer edges, *i.e.*, on the outer portions of the discs; inclined plates are also arranged radially to the lower side of the bottom horizontal disc in order to throw the material, dropping into the annular channel below the discs, again against the sieve.—J. F. B.

Paper Pulp; Apparatus for Purifying ——. A. Aberg, Hermagor, Austria. U.S. Pat. 691,091, Jan. 14, 1902.

In apparatus for purifying paper pulp and the like, the inclined baffle plates of the "sand-traps" are caused to travel in a direction contrary to that of the pulp. The baffle plates travel on an endless chain in a shallow trough, in contact with the bottom, and sweep the impurities into a recess or collector, whence they are removed by a worm conveyer. Between the baffle plates are situated intermediate brushes or laths, which dip only a short distance into the pulp and remove the scum from the surface, and are cleaned by a sprayer situated over a gutter.—J. F. B.

Paper-making Machine. C. E. Barrett and J. E. Horne, Lawrence, Mass., U.S.A. U.S. Pat. 691,333, Jan. 14, 1902.

The 14 claims of this specification relate to the means adopted for removing the adjusting devices of the shake frame from underneath the front end thereof to a place above it, out of the way of any moisture which is liable to fall on them when in the former position.

The front end of the shake frame is suspended from overhead supports, provided with means for adjusting the shake frame vertically. The shake rails are stiffened by making the shake frame in the form of a truss.—J. F. B.

Peat; Apparatus for the Production of Half Stuff from ——. C. Esser, Wiener Neustadt, Austria Hungary. U.S. Pat. 690,363, Dec. 31, 1901.

See Eng. Pat. 9589, 1901; this Journal, 1901, 830.—J.F.B.

Films [Cellulose]; Art of Making ——. C. N. Waite, Cranford, N.J., U.S.A. U.S. Pat. 690,211, Dec. 31, 1901.

The invention relates to the impregnation of cellulose or cellulose compounds with lactic acid, for the purpose of rendering the films permanently tough and flexible. The use of lactic acid with amorphous cellulose, cellulose esters, nitrates and acetates is specified.—J. F. B.

Cellulose; Manufacture of Threads, &c. from ——. M. Fremery and J. Urban, Oberbruch, Germany. U.S. Pat. 691,257, Jan. 14, 1902.

See Eng. Pat. 6735, 1899; this Journal, 1900, 344. See also this Journal, 1900, 821.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Hydrochlorated Sulphates. C. Baskerville. J. Amer. Chem. Soc., 1901, **23**, [12], 894—897.

By heating mercuric sulphate with hydrochloric acid, drying and subliming at 240° C., the compound $HgSO_4.HCl$ was obtained in small yield. When mercuric sulphate was heated in hydrochloric acid, a small quantity of $HgSO_4.2HCl$ was formed; it is a white, crystalline, very deliquescent substance. Mercuric chloride dissolves without decomposition in strong sulphuric acid; on heating, a crystalline sublimate was obtained. Molecular amounts of mercuric chloride and $H_2SO_4.H_2O$ gave a sublimate of $HgSO_4.2HCl.H_2O$.

At 150° C., $3CdSO_4.8H_2O$ loses $4H_2O$; if the sulphate be heated in hydrochloric acid gas at that temperature, the compound $3CdSO_4.4H_2O.HCl$ is formed. At 200° C., at which the sulphate becomes anhydrous, $3CdSO_4.8HCl$ is formed; this compound is fusible and volatile.—A.C. W.

Carbon Tetrachloride; Method of Manufacturing ——. C. Combes. Rev. Prod. Chim., **4**, [23], 356.

The method consists in introducing any of the chlorides of sulphur into a vertical retort, made of some material not attacked by chlorine and charged with carbon (coke, charcoal, &c.). Heat is applied to the outside of the retort, and the products of the reaction—carbon tetrachloride, carbon bisulphide, and undecomposed sulphur chloride—are collected after passing through a condenser. They are then separated by distillation, the carbon bisulphide being converted into tetrachloride by ordinary methods, whilst the resulting sulphur chloride is added to that already recovered, and the two are returned to the retort.

The conversion of the sulphur chloride into carbon tetrachloride without the formation of any carbon bisulphide, may be effected by introducing free chlorine into the lower part of the retort. Moreover, the employment of a dephlegmator, maintained at a suitable temperature, between the retort and the condenser, enables the distilled sulphur chloride to be collected and returned to the retort through a siphon, in which event the process becomes continuous, and the carbon tetrachloride collected in the receiver will contain only a very small proportion of carbon bisulphide.—C. S.

Glyceroarsenic Acid. V. Auger. Comptes Rend., **134**, [4], 238—240.

When arsenic acid is heated with glycerin, esterification occurs, as is shown by the escape of water, the amount of water so escaping corresponding, according to the proportions taken, with one or two of the hydroxyl groups of the glycerin. When the operation is carried on at 150° C., under a pressure of 20 mm. of mercury, the reaction is very rapid; no glycerin distils over, and a white, amorphous solid remains. On dissolving this, however, it is at once completely hydrolysed, so that no solution of glyceroarsenic acid can be obtained.—J. T. D.

Pyrazolonephenyldimethylsalicylate. B. Tei. Boll. Chim. farm.; through Pharm. Centralh., **43**, [2], 22.

One part of salicylic acid, dissolved in 2 parts of ether, is mixed with a solution of 1 part of phenyldimethylpyrazolone in 2 parts of water or chloroform. By recrystallising from alcohol the compound formed, large crystals of pyrazolonephenyldimethylsalicylate may be obtained.—J. O. B.

Pilocarpine. A. Pinner and R. Schwarz. Ber., 1902, **35**, [1], 192—210 (see also Jowett, this Journal, 1900, 373, and J. Chem. Soc., 1901, 1331); and Pinner and Kohlhammer, this Journal, 1900, 846, and Ber., **34**, 737.

The authors have repeated the work of Jowett (*loc. cit.*) and have confirmed his results; the compounds described by Pinner and Kohlhammer (*loc. cit.*) have also been prepared and analysed again. They find also that if pilocarpine or isopilocarpine is oxidised at the ordinary temperature by about three molecular proportions of potassium permanganate, the main product is a homologue of malic acid having the formula $C_8H_{14}O_5$; whilst if pilocarpine is oxidised with chromic acid at 80°—90°, it yields an acid of the composition $C_{11}H_{16}O_5N_2$, which, with potassium permanganate at ordinary temperatures, undergoes further oxidation, giving another acid, $C_7H_{12}O_5$. These two acids, $C_8H_{14}O_5$ and $C_7H_{12}O_5$, were not obtained by Jowett, who, however, isolated the corresponding lactonic acids of the composition $C_8H_{12}O_4$ and $C_7H_{10}O_4$. The indifferent substance previously obtained by the authors during the oxidation of pilocarpine with permanganate, is now shown to be most probably methylurea. Pilocarpine has been obtained in long needles melting at 34° by removing the last traces of chloroform and water as far as possible from the syrup which, when seeded with crystalline material, gradually solidifies.—T. H. P.

Pyrazole Derivatives. Buchner and v. d. Heide. *Pyrazole Carboxylic Acid from 4-Phenylpyrazole.* Behaghel and Buchner. *Phenylacetylene and Diazoacetic ethyl ester.* Buchner and Lehmann. 5(3)-*Pyrazole Carboxylic Acid from* 5(3)-*Phenylpyrazole.* Buchner and Hachmann. Ber., 1902, **35**, [1], 31—34; 34—35; 35—37; and 37—42.

See under IV., *page* 248.

Laudanine. O. Hesse. J. prakt. Chem., 1902, **65**, [1] 42—45. (See also Pictet and Athanasescu, this Journal 1900, 1036.)

Laudanine is soluble in sodium hydroxide solution, and if a large excess of the alkali is employed, the sodium compound, $C_{20}H_{24}O_4NNa + 4H_2O$, separates out in the form of a white crystalline powder. The interaction of this sodium

compound, or even of laudanine itself, with molecular proportions of either sodium or potassium hydroxide and methyl iodide, in methyl alcohol solution, results in the formation of laudanine methyl chloride, and of the methyl ether of laudanine, and the latter compound is found to be identical with the *i*-laudanosine obtained from papaverine by Pictet and Athanasescu (*loc. cit.*).

When ethyl iodide is used in place of methyl iodide, the ethyl ether of laudanine is obtained, but the yield in this case amounts to 80 per cent. of the theoretical quantity. The hydrochloride of the ethyl ether, $C_{20}H_{24}(C_2H_5)NO_4,HCl + 5H_2O$, separates from water in beautiful colourless prisms which are soluble in alcohol; the aqueous solution is optically inactive, and gives no colour reaction with ferric chloride; the platinichloride, $[C_{20}H_{24}(C_2H_5)NO_4]_2, H_2PtCl_6 + 2H_2O$, separates as a yellow flocculent precipitate quickly becoming crystalline. Ethyllaudanine itself, prepared from the hydrochloride, separates from its ethereal solution in a varnish-like transparent mass which liquefies at 40°—50°; it behaves like laudanine towards both pure sulphuric acid and acid containing ferric oxide, and is readily soluble in ether, alcohol, chloroform, acetone, or benzene; in alcoholic solution it has a basic reaction, and gives no colour reaction with a little ferric chloride. Attempts to decompose the salts of *i*-ethyllaudanine into the *d*- and *i*-constituents have up to the present been unsuccessful.—T. H. P.

Digitoxin in Digitalis Leaves; Determination of ——. W. Stoeder.

See under XXIII., *page* 283.

α- and β-Eucaine; Identification and Properties of ——. C. L. Parsons. J. Amer. Chem. Soc., 1901, **23**, [12], 885—893.

α-Eucaine is *n*-methylbenzoyltetramethyl-γ-oxypiperidine-carboxylic methyl ester; β-eucaine is benzoylvinyldiacetone-alkamine; both are sold in the form of hydrochloride. β-Eucaine is used almost exclusively, and is furnished when "eucaine" alone is demanded. In analysis it would generally be a question of distinguishing β-eucaine hydrochloride from cocaine.

The eucaines are very similar in properties to cocaine, and in general their identification is essentially a separation from each other and from cocaine. The bases are most readily extracted by light petroleum spirit or ether, after making slightly alkaline with ammonia. α-Eucaine melts at 103° C., its hydrochloride at about 200° C. with decomposition; β-eucaine melts at 91° C., its hydrochloride at 268° C. with decomposition. α-Eucaine hydrochloride is soluble at the ordinary temperature in about 10 parts of water and in 1 part of alcohol, the β-eucaine salt in about 33 parts of water and in 9 parts of alcohol; cocaine hydrochloride dissolves in less than its own weight of water or alcohol.

With the following reagents the hydrochlorides of α-eucaine, β-eucaine, and cocaine react alike:—Mayer's reagent gives a light-yellow amorphous precipitate. Wagner's reagent gives a voluminous reddish-brown precipitate even in dilute solutions. Tannic acid (1:10) gives no precipitate, or only a very slight transparent flocculency. Picric acid (1:100) gives a fine lemon-yellow precipitate, soluble in acids; in solution stronger than 1 per cent., the α-eucaine picrate is more insoluble than either of the others. An alcoholic solution of iodine yields a brown precipitate soluble in excess. Sulphomolybdic acid gives no precipitate. Mercuric chloride (1:20) gives a fine, white precipitate in moderately strong solutions, easily soluble in excess. A mixture of ferric chloride and potassium ferricyanide gives no precipitate, except a white one in strong solutions. The author has not been able to obtain the precipitate of Prussian blue, stated by Allen to be given with cocaine. Cadmium iodide gives a white precipitate. Potassium ferrocyanide yields a slight, colourless, gelatinous precipitate in solutions of 10 per cent. strength; this reaction is not given by a saturated solution of β-eucaine, probably because the solution is too weak. Potassium ferricyanide gives a white precipitate in moderately strong solutions, which should be acidified with hydrochloric acid. Potassium bromide, chloride, and bromate give no reaction. On acidifying with strong nitric acid, evaporating to dryness on a watch-glass, and treating with 1—2 drops of alcoholic potash, the characteristic odour of ethyl benzoate is obtained.

The following reactions are characteristic of α-eucaine salts. Potassium iodide (1:10) gives a white, silky precipitate even in moderately dilute solutions. In 1 per cent. solutions all these bases are precipitated by ammonia; β-eucaine and cocaine dissolve immediately in an equal volume of strong ammonia, but α-eucaine is not dissolved by 10 vols. of ammonia. A similar difference exists in stronger solutions, but is not so easily recognised. A strong solution of potassium bichromate, added drop by drop to a 0·5—1 per cent. solution of α-eucaine, gives a fine lemon-yellow precipitate after the addition of 1 or 2 drops; the precipitate is much increased by 1—2 drops of strong hydrochloric acid; it is notably insoluble in water or hydrochloric acid. Cocaine in 1 per cent. solution is not precipitated by potassium bichromate, but the addition of 1—2 drops of strong hydrochloric acid throws down a lemon-yellow precipitate, easily soluble in very slight excess of hydrochloric acid or on dilution. β-eucaine acts like cocaine. The α-eucaine precipitate is quite crystalline; all three bases may give a slight yellow colloidal precipitate, which sticks to the sides of the tube and dissolves slowly, but this does not interfere with the test, and does not appear if the reagents are added slowly.

The following are distinctive reactions of cocaine:—If the hydrochloride be ground with dry calomel and then moistened with alcohol, it rapidly turns greyish-black; α-eucaine hydrochloride slowly turns dark grey whilst the β-eucaine salt is unaltered. In 1 per cent. solutions, cocaine gives with platinum chloride a yellow crystalline precipitate insoluble in hydrochloric acid; α- and β-eucaine are only precipitated in stronger solutions, and the precipitates readily dissolve in hydrochloric acid. If a very small drop of potassium permanganate be added to a drop of the hydrochloride solution, with cocaine the original colour generally remains for 30 minutes, whilst with the eucaines it almost immediately changes to brown. Cocaine hydrochloride is lævo-rotatory; in aqueous solution $S_d = -52·2$, and, in an alcoholic solution of specific gravity 0·9355, $S_d = -68·06$. The hydrochlorides of α- and β-eucaine are inactive.

β-eucaine hydrochloride is characterised by its comparative insolubility in water and alcohol. No distinctive reaction has been found. The hydrochlorides of the three bases, when pure, are easily recognisable under the polarising microscope.—A. C. W.

Stylophorum diphyllum; Chemistry [*Alkaloids, &c.*] *of* ——. J. O. Schlotterbeck and H. C. Watkins. Ber., 1902, **35**, [1], 7—23.

Stylophorum diphyllum, a species of the papaveraceæ known locally as "yellow poppy" or "celandine poppy," grows in certain districts in the United States. According to Lloyd, the roots, under the name of "large golden seal," are occasionally mixed with *Hydrastis*. According to Eykmann and Schmidt (Arch. Pharm., **226**, 622), the principal alkaloid in the plant is identical with chelidonine from *Chelidonium majus*. Schmidt and Selle also announced the presence of two other alkaloids (Arch. Pharm., **228**, 98).

The authors examined the dried roots, which had been collected and examined with the greatest care. The powdered material was moistened with dilute ammonia, dried in the air, and extracted by chloroform in a large Soxhlet apparatus. The chloroform solution was evaporated, and the residue exhausted with hot dilute acetic acid. The chloroform was driven off by steam from the extracted material, which was then percolated with water, in order to obtain the soluble salts and the ammonium salts of the acids previously combined with the alkaloids. The red solution, containing the acetates of the bases, was precipitated by ammonia, the precipitate thoroughly washed with water, dissolved in a little glacial acetic acid, the solution diluted, precipitated by ammonia, and this process repeated until the precipitate was almost white. The mixture of alkaloids was then dissolved in acid, the solution mixed with ether, made alkaline with

ammonia, the mixture vigorously shaken for a short time, and the ethereal solution at once filtered through a plug of cotton wool and set to crystallise. Crystals of two forms were deposited: prisms and needles; by carefully watching the crystallisation, these could be separated. The greater part of the indifferent substances separated as an amorphous powder at the boundary of the two liquids in shaking with ether. In addition to the alkaloids which crystallised out, three others were obtained from the ethereal mother-liquors.

Chelidonine.—The alkaloid present in predominating quantity crystallised in monoclinic prisms, which have the peculiar property of emitting flashes of light when scratched with a glass rod or shaken in a bottle, either alone or with water, ether, or benzene (see this Journal, 1901, 845). The base was purified by dissolving in dilute sulphuric acid, adding strong hydrochloric acid, dissolving in hot water, cooling in ice, and repeating the recrystallisation ten times. The base separated from this salt melted at 136° C.; it is without doubt identical with chelidonine (this Journal 1897, 696). The alkaloid has the formula $C_{20}H_{19}O_5N.H_2O$, and melts at 136° C.; it can be dried to constant weight at 100° C. Henseke dried at 125° C. (Arch. Pharm., **226**, 624), at which temperature the base darkens, which it also does *in vacuo* over sulphuric acid and phosphoric anhydride. The best analytical results were obtained from the nitrate, obtained by decomposing the hydrochloride with silver nitrate. Chelidonine is apparently a tertiary base; it contains no methoxyl group. Wagner's reagent gives a chocolate-coloured precipitate, which, when dissolved in methyl alcohol, and allowed to crystallise, gives bright red needles and almost black prisms—the tri-iodide and penta-iodide respectively. The optical rotation of free chelidonine in solution in absolute alcohol is $[\alpha]_D = + 115° 24'$.

Stylopine, $C_{19}H_{19}O_5N$.—This alkaloid is next to Chelidonine, contained in largest proportion in *Stylophorum diphyllum.* The needle-shaped crystals from the mixture of prisms and needles mentioned above, after purification by the same process as chelidonine, yielded this new alkaloid. It melts at 202° C., is almost insoluble in hydrochloric acid, and insoluble in sulphuric acid, by which property it may readily be separated from chelidonine. The free alkaloid is readily soluble in glacial acetic acid, but with more difficulty in dilute acids. The base contains no methoxyl groups. Its specific rotation when dissolved in absolute alcohol is $[\alpha]_D = - 315° 12'$.

Protopine occurs in the next largest quantity. It is somewhat soluble in ammonia, and hence was obtained approximately pure in only one or two fractions resulting from the recrystallisation of the mixture of alkaloids. The alkaline liquid, from which the alkaloids had been extracted by ether, was acidified by acetic acid, evaporated to a small volume, precipitated by caustic potash, and the precipitate taken up in ether. From the filtered ethereal solutions, protopine separated in prisms and warty aggregates. When pure, it formed large prisms melting at 204°—205° C. A periodide was obtained, which crystallised in fine wine-red rosettes. (See also this Journal, 1898, 791; 1900, 767.)

Diphylline.—This new alkaloid was found in very small quantity in *Stylophorum,* together with chelidonine, from which it was separated by fractional crystallisation from ethereal solution. The pure substance melts at 216° C. In acetic acid solution it behaves towards reagents similarly to stylopine, except that the hydriodide precipitated by potassium iodide is amorphous.

Sanguinarine.—The free alkaloid is very soluble in ether, and was thus obtained after the crystallisation of the bases previously mentioned. The ethereal solution was treated with dry hydrochloric acid gas, the ether poured off, the red salt dissolved in hot water, ammonia added, and the solution extracted by ether. The filtered ethereal solution deposited, when left *in vacuo,* aggregates of white plates, which turned red when air was admitted.

Chelidonic Acid, $C_7H_4O_6.H_2O$.—From the aqueous percolate the free acid was obtained in silky needles. (See Monatsh. für Chem., **29**, 131.)—A. C. W.

Alkaloids; Resistance of Vegetable —— to Decay. T. Panzer. Zeits. Unters. Nahr. und Genussm., 1902, **5**, [1], 8—10.

Portions of two corpses, in which morphine had been found in appreciable quantity, were covered with water and allowed to stand in a loosely covered beaker at the room temperature. At the end of six months, the decomposed mass was examined, and was found still to contain morphine.—A. C. W.

Vanillin; Preparation of —— from Protocatechuic Aldehyde Carbonic Acid Methyl Ester. Pharm. Centralh., **43**, [3], 38—39.

14·2 kilos. of protocatechuic aldehyde are dissolved in concentrated sodium carbonate solution, and mixed, with constant agitation, with 12·6 kilos. of dimethyl sulphate. After standing for some time, combination commences, action being aided by heating on a water-bath. The mixture is then acidified, extracted with ether, the solvent evaporated, and the residue treated with chloroform, which removes the vanillin; the latter is easily purified by recrystallisation. The unattacked protocatechuic aldehyde which remains may be recovered and used again.—J. O. B.

Jasmine Flowers; Essential Oil of ——. E. Erdmann. Ber., 1902, **35**, [1], 27—30.

A reply to A. Hesse (this Journal, 1901, 1137). The two methods for obtaining the jasmine perfumes—*enfleurage* and extraction—lead to different products, which may be regarded as different fractions of one and the same mixture of oils. Readily volatile perfumes, not yet isolated, play a part here.

In regard to the production of perfume during *enfleurage,* the following criticisms are made:—From Hesse's defence of Passy's hypothesis (this Journal, 1901, 1138), and his references to the physiological work of Charabot, a synthetic method of production would be assumed, which the author regards as impossible, since plants cannot produce considerable quantities of oil in 24 hours under natural conditions. Hesse now, however, assumes the perfume to be ready formed in the blossoms, possibly as glucosides. This may be the case, but the perfume would then be produced by a fermentation outside the organism of the plant. Exact parallel experiments on the same material, with all details described, are necessary to substantiate such an hypothesis. In only one case were Hesse's researches conducted on the same material, the distillation with steam (this Journal, 1901, 1137), and the *enfleurage* conducted at Grasse (this Journal, 1901, 275). Hesse does not state how the 620 kilos. of water were quantitatively extracted by ether, and does not describe exactly how the essential oil in the jasmine pomade was determined (this Journal, 1899, 396), so that his results cannot be checked.

Finally, there is a difference between Hesse and the author as to whether extracts of jasmine flowers, obtained by means of volatile solvents, contain methyl anthranilate. The jasmine extract used by the author (this Journal, 1901, 930) was obtained from Roure-Bertrand fils, of Grasse, with a guarantee of purity and freedom of the flowers from orange blossoms. The methyl anthranilate was obtained by distilling with steam and extracting the fluorescent distillate with ether, from which an oil was obtained, which soon solidified and was identified by many properties and compounds with methyl anthranilate. The remainder of the same jasmine extract was that used in the determination of methyl anthranilate by the author's process. (See page 283.)
—A. C. W.

Volatile Oils; Specific Gravities and Coefficients of Expansion for ——. O. Schreiner and W. R. Downer. Pharm. Archives, **4**, [9], 165—173.

Having reinvestigated the change in gravity, at the various degrees of temperature, between 15° and 25° C., for a series of essential oils, the authors have obtained the following figures.

Essential Oil.	Average Change for each Degree between 15° and 25° C.	Coefficient for Expansion between 15° and 25° C.
Bay oil	0·00067	0·000916
Bergamot „	0·00067	0·000944
Bitter almonds „	0·00063	?
Cade „	0·00049	0·000740
Cajuput „	0·00068	0·000969
Caraway „	0·00058	?
Cassia „	0·00063	0·000794
Cinnamon „	0·00067	0·000828
Cinnamon leaf „	0·00070	..
Clove „	0·00063	0·000834
Copaiba „	0·00050	..
Coriander „	0·00073	0·000984
Cubeb „	0·00057	0·000821
Erigeron „	0·00060	0·000903
Eucalyptus globulus „	0·00074	0·000977
Fennel „	0·00072	..
Lemon „	0·00062	0·000957
Nutmeg „	0·00066	0·000959
Orange, sweet „	0·00063	0·000935
Pennyroyal „	0·00065	0·000859
Peppermint „	0·00060	?
Pimento „	0·00068	?
Rosemary, French „	0·00060	..
Rosemary flowers „	0·00067	..
Sandalwood „	0·00053	..
Sassafras „	0·00063	0·000807
Savin „	0·00067	..
Spearmint „	0·00068	0·000867
Star anise „	0·00062	0·000845
Thyme „	0·00063	?
Wintergreen „	0·00082	0·000872
Wormseed „	0·00064	0·000883

The formula used in calculating the coefficient of expansion was $\alpha = 3\beta \frac{p}{p^1} + \frac{p - p^1}{p^1(t^1 - t)}$, where p and p^1 = weights of oil at temperature t and the higher temperature t^1; 3β is the coefficient of cubical expansion of glass, and was taken as 0·000026.—J. O. B.

Methyl Anthranilate; Detection and Determination of ——. E. Erdmann.

See under XXIII., *page* 283.

English Patents.

Cyanamide and its Compounds; Manufacture of ——. G. W. Johnson, London. From the Deutsche Gold- und Silber Scheide-Anstalt vormals Rössler, Frankfort-on-Main, Germany. Eng. Pat. 3328, Feb. 15, 1901. (See also this Journal, 1901, 1139.)

The manufacture of cyanamide is claimed by a process which consists in causing carbon or carbonaceous matter to act on the amide of an alkali metal. Carbon is added to melted sodamide at about 380° C.; during the formation of the cyanamide, the temperature is gradually raised to 550°—600° C. Or sodium is melted, the requisite amount of carbon added, and ammonia passed in. The disodium cyanamide, Na_2N_2C, is converted into other cyanamides by double decomposition in concentrated aqueous solution. Free cyanamide is obtained by decomposing the disodium cyanamide with oxalic acid.—A. C. W.

Cinchona Alkaloids; Acidyl Derivatives of ——, *and their Manufacture.* J. Y. Johnson, London. From Vereinigte Chininfabriken Zimmer and Co., Frankfort-on-Main, Germany. Eng. Pat. 11,783, June 8, 1901.

The process is claimed for the production of acidyl derivatives of the cinchona alkaloids, which consists in heating the alkaloids or their salts with phenol esters at temperatures from 110°—150° C., and removing the phenol *in vacuo* or by dilute acids. Anisylquinine, cinnamylquinine, succinylquinine, the quinine ester of aminocarbonic acid, and other new compounds obtained by the process are claimed as new articles of manufacture, and also their use for therapeutic purposes.—A. C. W.

United States Patents.

Bismuth Oxyiodide Methylenedigallate. S. L. Summers, Philadelphia, Pennsylvania, U.S.A. U.S. Pat. 690, 672, Jan. 7, 1902.

Bismuth oxyiodide methylenedigallate, $Bi_2I_2C_{15}H_{12}O_{12}$, is a reddish-brown impalpable powder, insoluble in water and alcohol, obtained by acting on bismuth oxyiodide or a compound of crystallised bismuth nitrate iodine and potassium iodide, with methylenedigallic acid, washing the precipitate, and drying at a temperature below 60° C. The process and product are both claimed.—A. C. W.

Bismuth Oxyiodide Methylenedigallate. S. L. Summers. Philadelphia, Pennsylvania, U.S.A. U.S. Pat. 690,673, Jan. 7, 1902.

Bismuth oxyiodide methylenedigallate is produced by adding to a solution of bismuth nitrate in glacial acetic acid, an aqueous solution of potassium iodide and sodium acetate containing methylenedigallic acid in suspension, so that the bismuth oxyiodide, at the moment of its formation, is converted into the new salt.—A. C. W.

Hexamethylenetetramine Quinate. G. Wichmann and M. Gabler, Berlin. U.S. Pat. 690,804, Jan. 7, 1902.

Molecular quantities of hexamethylenetetramine and quinic acid are dissolved in a suitable solvent (alcohol) and the solution evaporated *in vacuo*. On stirring, the residue crystallises. The salt melts at 118°—125° C., and is readily soluble in water; it is stated to be of great therapeutic value. The process and product are claimed. (See Eng. Pat. 14,834, 1899; this Journal, 1900, 687.)—A. C. W.

Urea Quinate. O. Schütz and G. Dallmann, Gummersbach, Germany. U.S. Pat. 690,080, Dec. 31, 1901.

The process claimed consists in dissolving separately 1 mol. of quinic acid and 2 mols. of urea, mixing at a temperature below 70° C., and evaporating *in vacuo* below 55° C. to a thick liquid. On cooling, prismatic crystals of the salt separate, which melt at 106°—107° C.—A. C. W.

Quinine Salicylic Ether. F. Hofmann, Elberfeld, Germany. U.S. Pat. Re-issue 11,960, Jan. 7, 1902.

See Eng. Pat. 8165, 1901; this Journal, 1901, 1139.
—A. C. W.

XXI.—PHOTOGRAPHY.

Colour Photography; Lumière Process of ——. Brit. Jour. Phot., 1902, 49, [2176], 52—53.

For the light filters optically worked glass is evenly coated with a 10 per cent. solution of gelatin, 5 c.c. to each 10 cm. of glass surface, and thoroughly dried; the plates obtained are immersed for five minutes in the following solutions at 70° F.:—For the green screen: ½ per cent. solution of Methylene Blue N, 5 c.c.; ½ per cent. solution of Auramine G, 30 c.c. For the blue-violet screen: ½ per cent. solution of Methylene Blue N, 20 c.c.; water, 20 c.c. For the red screen: ½ per cent. solution of erythrosin, 18 c.c.; saturated solution at 60° F. of Metanil Yellow, 20 c.c.. Two plates of each are cemented together, film to film, with Canada balsam to form the screens. The plates to be used with the screens are: with the green, Lumière orthochromatic, series A; with the blue, Lumière extra rapid, blue label; with the red, Lumiere orthochromatic, series B. The printing of the colour records from the negatives obtained is carried out as follows:—A sheet of non-stretching baryta paper is mounted on a glass plate, which has been previously edged with a band of benzol, 1,000 parts; masticated rubber, 15 parts; and when dry coated with a collodion, prepared as follows:—Alcohol, 500 parts; ether, 625 parts; pyroxylin, 12·5 parts; castor oil, 3 parts. The prepared support is sensitised with the following solution (5 c.c. to 13 by 18 cm. plate):—Water, 1,000 parts; gelatin emulsion, 120 parts; Coignet's hard glue, 120 parts; ammonium bichromate, 60 parts; 25 per cent. solution of potassium citrate, 40 parts; cochineal red, 1 part; alcohol,

200 parts. After drying, the sensitive papers are stripped from their supports, printed again, mounted on glass, and soaked first in cold water for two hours, and finally in water at 100° F. for half an hour, when the paper support will leave the print, the development being continued until all the soluble gelatin is dissolved; the plate is then washed, placed for five minutes in alcohol, and allowed to dry. The colourless positives obtained are dyed in the following baths:—For the green record positive: water, 1,000 parts; 3 per cent. solution of Erythrosine J., 25 parts. For the red record positive: water, 1,000 parts; 3 per cent. solution of Diamine F, 50 parts; 15 per cent. solution of hard glue, 70 parts. For the violet record positive: water, 1,000 parts; Chrysophene G, 4 parts; dissolve at 160° F. and add alcohol, 50 parts; immersion for 12 hours is sufficient at ordinary temperatures. The positives are placed together and viewed to determine where correction is necessary; a further immersion in the dye-baths being adopted for intensification, and in water for reduction, with the exception of the blue positive, which may be reduced by a 20 per cent. solution of glue. To finally place the films in superposition, a temporary support coated with hard glue, 50 parts; water, 1,000 parts, is applied to the yellow positive; when dry, the paper is stripped and the yellow film applied to the blue positive by using the following mountant: Water, 1,000 parts; hard gelatin, 120 parts; glycerin, 50 parts. When quite dry, the paper is stripped from the glass, bringing off both the blue and yellow films; the operation is repeated for the red film, and the picture finally transferred to glass in a similar manner. —J. W. H.

Toning Baths. Brit. Jour. Phot., 1902, **49**, [2177], 63.

F. Novak, of the Vienna Technical School, has tested photographic prints quantitatively for the amount of gold and silver they contain after being toned in either the borax, sulphocyanide, or combined baths. A celloidin film requires more gold for a given tone than albumin; the less the quantity of silver in the print, the greater the quantity of gold; the sulphocyanide bath uses more gold than the combined bath, so that if stability has any relation to the amount of gold present, the manufacturers' preference for the sulphocyanide bath is justified.—J. W. H.

English Patent.

Cinematographic and other Photographic Films; Method and Apparatus for Developing, Fixing, and Toning ——. H. J. Haddon, London. From H. T. W. Elsner and P. Latta, Dresden, Germany. Eng. Pat. 21,873, Oct. 30, 1901.

The strip of film is conducted through serially arranged baths of small holding capacity, in which guide rollers have bearings for guiding the strip through the baths, liquid being continuously supplied to and conducted from each bath, the liquid escaping from each series of baths being collected in a vessel common to the series for the purpose of being used again.—J. F. B.

United States Patent.

Films; Art of Making ——. C. N. Waite. U.S. Pat. 690,211, Dec. 31, 1901.

See under XIX., *page* 272.

XXII.—EXPLOSIVES, MATCHES, Etc.

Fulminates; Preparation of ——. F. Angelico. Atti. R. Accad. dei Lincei Roma, **10**, [5], 476—478. Chem. Centr. 1901, **2**, [6], 404.

The author gives a new method for the preparation of fulminates, which may, perhaps, be capable of technical application. For the preparation of mercury fulminate, a solution of mercury in an excess of dilute nitric acid is treated with a concentrated aqueous solution of malonic acid and a few drops of sodium nitrite solution. A considerable rise of temperature takes place and a copious evolution of carbon dioxide, and the mercury fulminate separates out; it can be purified by crystallisation from boiling water. The author regards fulminic acid as the oxime of carbon monoxide, C:NOH, and states that the course of the reaction in the process described, probably consists in the conversion of the malonic acid successively into isonitrosomalonic acid, $C{:}NOH(COOH)_2$; isonitromalonic acid, $C(NOOH)(COOH)_2$; isonitroacetic acid, $CH(NOOH)(COOH)$, isonitromethane, $CH_2{:}NOOH$; and fulminic acid, C:NOH.—A. S.

English Patent.

Sparkling Fireworks. F. J. Bishop, Warmley, Gloucestershire. Eng. Pat. 1508, Jan. 23, 1901.

The composition consists of gunpowder (12 to 20 parts), black sulphide of antimony (3 to 9 parts), sulphur (2 to 6 parts), and aluminium ($\frac{1}{2}$ to 3 parts).—G. W. McD.

United States Patents.

Blasting Agents. H. von Dahmen, Vienna. U.S. Pat. 689,577, Dec. 24, 1901.

Finely divided magnesium or aluminium, preferably the latter, is intimately mixed with ammonium nitrate to form the explosive. It is considered that the exothermic change resulting from the conversion of aluminium into its oxide gives an increased mechanical effect. The decomposition proceeds according to the equation—

$$3NH_4NO_3 + 2Al = Al_2O_3 + 6H_2O + 3N_2.$$

Aluminium is said to be unattacked by the ammonium nitrate, and hence the explosive mixture is safe for storage. No actual proportions are given in the specification. —G. W. McD.

Guncotton; Press for ——. A. Hollings, Chorlton-cum-Hardy, England. U.S. Pat. 690,728, Jan. 7, 1902.

The claim is for "a ram head for guncotton presses having an annular interior water chamber, a helical groove in the periphery of the head, a packing ring in rear of grooved portion thereof, and a plurality of passages connecting said chamber with said groove and with the face of the head." The object of the invention is to prevent guncotton under compression becoming dry and heated, as is sometimes the case in presses with solid rams.—G. W. McD.

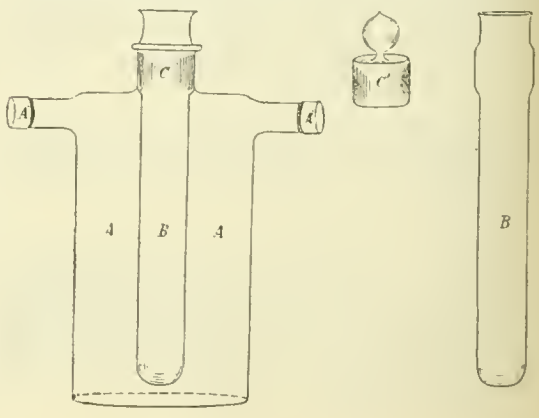
XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Sulphur Trioxide; Apparatus for Experiments with ——. H. Wichelhaus. Ber., **34**, [17], 4135.

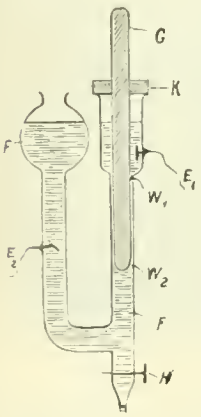
An apparatus for the collection and easy removal, for experimental purposes, of sulphur trioxide prepared in the lecture room or laboratory.

The figure almost explains itself; the test-tube, B, widened near the mouth, has the widened part, C, ground to fit the



neck of the bottle, A, which, when these are not being used, can be closed by the stopper C′. The test-tube is filled with ice, and the sulphuric anhydride contained in the gases passing into the bottle from the contact apparatus by one of the side necks, A′, A′, is condensed upon the cold tube. When enough has been so collected, the tube is removed and replaced, if need be, by another.—J. T. D.

Electrical Liquid Resistance for Laboratories; A Simple ——. R. Abegg. Zeits. für Elektrochem., 1902, **8**, [3], 43—44.



The accompanying figure shows an instrument which has been conveniently employed for obtaining weak currents from a source at high potential. The electrolyte is chosen to suit the particular circumstances, and may vary from sulphuric acid of maximum conductivity to ordinary water. The resistance is obtained by submerging more or less of the glass rod G and by varying its diameter. An especially convenient apparatus contains two resistance pieces W_1 W_2, one of them being provided with a thick rod for coarse adjustment, and the other with a thin rod for fine adjustment, the two electrodes corresponding to E_1 shown in the figure, being connected in parallel.—J. S.

Floats in Burettes; Use of ——. Kreitling. Zeits. angew. Chem., 1902, **15**, [1], 4—6.

The previous trials of Erdmann's cylindrical burette floats and the present determinations made with the spherical ones lead to the conclusion that it is advisable not to use floats at all. The old method of observing the lowest point of the meniscus with the aid of suitable screens is, in the author's opinion, the best way of reading burettes.

—J. N. G.

United States Patent.

Testing Paper, and Method of Making Same. K. Dieterich, Helfenberg, Germany. U.S. Pat. 691,249, Jan. 14, 1902.

The invention relates to the manufacture of test paper which is sensitive to two or more different chemicals at the same time, by first providing the paper with narrow insulating strips of a substance impervious and as far as possible indifferent to the chemicals to be tested, and then applying the various testing substances in parallel separated strips on the paper. Adjacent strips of red and blue litmus colouring matter can thus be applied. Insulating materials, such as paraffin, ceresin wax, or varnish, may be used.

—J. F. B.

INORGANIC—QUANTITATIVE.

Hydrofluoric Acid, Aqueous; Determination of the Strength of ——. F. Winteler. Zeits. angew. Chem., 1902, **15**, [2], 33.

Solutions of hydrofluoric acid cannot be titrated with standard alkali using litmus or methyl orange as indicator, but it is possible to ascertain the strength of the liquid by the aid of phenolphthalein, provided the alkali is free from carbon dioxide. For manufacturing purposes, the sp. gr. of the liquid is a sufficient indication of its strength, but sulphuric and hydrofluosilicic acids must be absent. The author appends a table of the strength of hydrofluoric acid, the figures in which differ materially from those given by Eckelt (this Journal, 1898, 578). They were obtained with the balance, using a platinum bob; all the beakers, pipettes, &c., were carefully paraffined and calibrated, and the alkali was quite free from CO_2.

Strength and Sp. Gr. of Aqueous Hydrofluoric Acid.

HF.	Sp. Gr.	° B.	HF.	Sp. Gr.	° B.
Per Cent.			Per Cent.		
1	1·003	0·5	26	1·092	12·0
2	1·007	1·0	27	1·095	12·4
3	1·011	1·5	28	1·098	12·7
4	1·014	2·0	29	1·101	13·1
5	1·018	2·5	30	1·101	13·4
6	1·023	3·0	31	1·106	13·7
7	1·027	3·5	32	1·109	14·1
8	1·030	4·0	33	1·112	14·4
9	1·035	4·5	34	1·114	14·7
10	1·038	5·0	35	1·117	15·0
11	1·041	5·5	36	1·120	15·4
12	1·045	6·0	37	1·122	15·7
13	1·049	6·5	38	1·125	16·0
14	1·052	7·0	39	1·127	16·3
15	1·055	7·5	40	1·130	16·5
16	1·059	8·0	41	1·133	16·8
17	1·062	8·4	42	1·136	17·2
18	1·066	8·8	43	1·138	17·5
19	1·069	9·3	44	1·141	17·8
20	1·072	9·7	45	1·143	18·1
21	1·076	10·1	46	1·146	18·4
22	1·079	10·5	47	1·149	18·7
23	1·082	10·9	48	1·152	19·0
24	1·086	11·3	49	1·154	19·3
25	1·089	11·7	50	1·157	19·5

—F. H. L.

Phosphoric Acid in Organic Substances [Milk]; Determination of ——. F. Rieger. Zeits. physiol. Chem., **34**, 109—113. Chem. Centr., 1902, **1**, [1], 67.

For the determination of phosphoric acid in milk, the author recommends concentrating a known weight to a syrup in a platinum crucible, and then either igniting, in the usual way, with sodium carbonate and potassium nitrate, or treating the syrup according to Keller's modification of Carius' method. The two methods give concordant results. An alternative method is to precipitate the milk with copper sulphate and caustic soda (Ritthausen), and then ignite the precipitate with sodium carbonate and potassium nitrate. The author states that the precipitate contains the whole of the phosphorus originally present in the milk, thus confirming Schlossmann's assertion that Ritthausen's reagent precipitates not only the albuminoids, but also various other constituents of milk.—A. S.

Boric Acid; Titration of ——. K. Farnsteiner. Zeits. Unters. Nahr. und Genussm., 1902, **5**, [1], 1—8.

The author has investigated the behaviour of boric acid towards alkalis in the presence of phenolphthalein in solutions in methyl and ethyl alcohol. The (semi-normal) alkaline solutions in alcohol were prepared without the addition of water; in the case of baryta, the water of crystallisation was first removed by heating over an open flame. When methyl alcoholic soda or potash is added to a solution of boric acid in methyl alcohol, using phenolphthalein as indicator, as with aqueous solutions containing glycerin, there is no sharp change; a slight red coloration first appears, which becomes deeper on the further addition of alkali. In dilute solutions the limits of this zone of change are near together; when the strength of the solution does not exceed 1 per cent., the end reaction appears when the formation of KBO_2 is almost complete. When methyl alcoholic baryta is used, the end-reaction is sharper, but not absolutely definite; the precipitate produced settles rapidly towards the end of the titration, and does not hinder the observation of the end-point. The formation of an ester, if it really occurs, does not affect the titration: solutions of boric acid in methyl alcohol have exactly the same titre after 24 hours as when fresh. A distillate obtained from methyl alcohol containing boric acid required 8·85 c.c. of alkali to neutralise the free acid and 0·15 c.c. to decompose the ester. A slight addition of water to the methyl alcohol solution of boric acid at once lowers the titre; the end-point obtained in pure methyl alcohol solutions before neutralisation is complete, is to be ascribed to the water present in the alcohol and produced by the reaction.

One grm. of crystallised borax dissolved in methyl alcohol required 10·0 c.c. of semi-normal methyl alcoholic baryta, whilst 1 grm. dissolved in water required 10·5 c.c. of semi-normal hydrochloric acid with methyl orange as indicator. If methyl alcoholic sulphuric acid be added to a methyl alcoholic borax solution until the mixture is acid to methyl orange, the whole of the boric acid may be carried over into the distillate. The determination of boric acid by the distillation method in the presence of much chloride may thus be made possible.

Quite different results were obtained with ethyl alcohol as solvent. In absolute alcohol the end-reaction appears when one-sixth to one-seventh of the boric acid is converted into the normal salt. If water be then added, the coloration disappears, a turbidity is produced, and finally there is a distinct end-reaction. In 95 per cent. alcohol the precipitate appears at once, but the end-reaction indicates about 1 mol. of alkali to 2·36 mols. of boric acid. The precipitate contains approximately K_2O and B_2O_3 in the ratio 1 : 2·18. When boric acid is added to potash, both in ethyl alcoholic solution, the end reaction appears almost at the ratio $K_2O : B_2O_3 = 1 : 2$.—A. C. W.

Boric Acid; Determination of ——. A. Hebebrand. Zeits. Untersuch. Nahr. und Genussm., 1902, **5**, [2], 55—58.

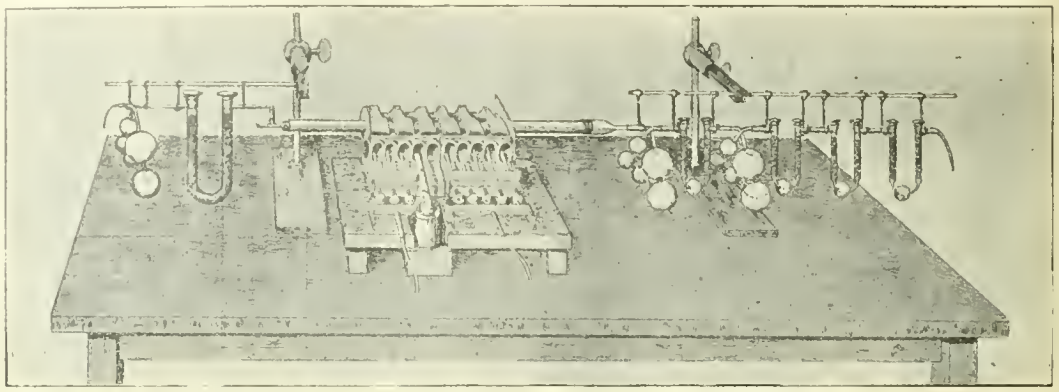
The author describes a method of determining boric acid in which the liquid containing this preservative is evaporated to dryness in a platinum basin, after rendering feebly alkaline with soda. The residue is ignited until all carbon has disappeared, and is then treated with 5 c.c. of water containing about 0·5 c.c. of hydrochloric acid. The solution is transferred to a test tube, and the platinum basin washed out with 15 c.c. of alcohol. 15 c.c. of hydrochloric acid (sp. gr. 1·19) and 0·2 c.c. of a 0·1 per cent. turmeric solution are then added, and the test-tube allowed to stand for half an hour. The colour produced, varying from faint brown to rose-red according to the amount of boric acid present, may be compared with that obtained from tubes containing known quantities of boric acid.—W. P. S.

Steel; Determination of Carbon in ——, *by Direct Combustion.* B. Blount. Analyst, 1902, **27**, 1—5.

In his previous endeavours to burn steel turnings in oxygen without admixture of any oxidising or fluxing agent, the author found that there was a considerable tendency to leave a core of unoxidised metal, which was liable to contain unburnt carbon; and if heating was continued long enough to completely oxidise this core, the operation became unduly prolonged. By mixing the turnings, however, with lead chromate, and by raising the temperature as highly as the porcelain tube will stand, a practicable working process has now been devised.

Five grms. of steel turnings or drillings, mixed with 15 to 20 grms. of re-fused lead chromate, are placed in a porcelain boat within a deep tray of sheet platinum, and pushed into a porcelain tube. The platinum is used to prevent the sticking of the boat to the tube by chromate which may creep over the edge. The front part of the tube contains copper oxide, which is heated, as well as the tube behind the boat, in a Fletcher combustion furnace. The exact spot where the boat lies is more intensely heated by means of a benzoline blast lamp. The complete arrangement is shown in Fig. 1.

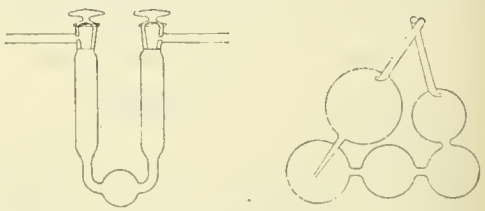
Fig. 1.



Apparatus for Direct Combustion of Carbon in Steel.

The oxygen, purified by passing through the potash-bulb and soda-lime U-tube seen on the left, enters the porcelain tube through the glass T-piece with flattened end, which allows the boat to be seen within the tube during the combustion. The front end of the porcelain tube projects several inches beyond the furnace, in order to cool the gases, and is connected to the absorption train by means of a glass cap fixed over a rubber ring, instead of by a tube passing through a bung. The absorption train finally adopted comprises (1) an empty bulb-tube to cool the gases; (2) a drying-tube of sulphuric acid pumice; (3) the potash-bulb and similar drying-tube in which the CO_2 is weighed; (4) a second drying-tube, which is weighed occasionally to ascertain that no moisture escapes the first; and (5) a guard tube of sulphuric acid pumice, to which an aspirator may be attached. The U-tubes are of special design, having a bulb in the bend containing sulphuric acid, through which the gases bubble. The potash-bulb is also of novel design, shown in Fig. 2, the entrance bulb being extra large and heavy so that the tube hangs naturally in the best position for absorption. With adequate temperature, no difficulty was experienced in burning the whole of the steel in about one hour; even thick turnings left no core. In the earlier experiments, discrepancies occurred between this method and the standard method of solution in double copper salt and separate combustion of the carbon, but these tended to disappear as the necessary conditions became better

Fig. 2.



Potash-Bulb.

understood, as shown in the table of results. The remaining defects are due chiefly to the imperfectly refractory nature of the glaze on the porcelain, which becomes slightly sticky at the temperature employed.

Description of Steel.	Carbon (Percentage) found. By Solution Method.	By Direct Combustion.
Tyre	0·675	0·619
Rail	0·404	0·393
„	0·399	0·407
„	0·378	0·330
Tyre	0·643	0·645
„	0·618	0·557
Rail	0·401	0·419
„	0·432	0·435
„	0·430	0·408
„	0·457	(1) 0·422
		(2) 0·393
		(3) 0·438
„	0·470	0·429
Nickel steel	0·323	(1) 0·324
		(2) 0·324
Tyre	0·459	0·445
Plate	0·288	* 0·277
Rail	0·455	0·467
„	0·568	0·575

* Improved apparatus for cooling and absorption.

—L. A.

Sulphur in Pig Iron; Colorimetric Method for the Determination of ——. W. G. Lindsay. School of Mines Quarterly, 1901, **23**, [1], 24—27.

The method is based upon the formation of Methylene Blue by sulphuretted hydrogen, and the best conditions for the test were found to be the addition to the sulphide solution, in a narrow Nessler tube, of 0·1 c.c. of a 2 per cent. solution of paraphenylene dimethyl diamine hydrochloride (unsymmetrical), which is then oxidised by the addition of 0·05 c.c. of a 10 per cent. solution of ferric chloride in the presence of 1·5 c.c. of dilute sulphuric acid. The tints produced are compared with standards obtained with known quantities of sodium sulphide.

The method was tested with three kinds of iron, a grey forge Durham pig iron, a brittle white cast iron, and a grey pig iron high in sulphur. Five grms. of each were treated with hydrochloric acid, and the hydrogen sulphide absorbed by soda which was then diluted to 250 c.c. Five c.c. of this solution, equal to 0·1 grm. of iron, were measured into a 50 c.c. Nessler tube, diluted to the mark after the addition of the sulphuric acid, and then mixed with the diamine solution and ferric chloride in the above proportions. The results agreed closely with those obtained by Elliot's method, equally with low and high sulphur contents, but of course with both methods only the sulphur evolved as gas is estimated. The result with the grey forge was low for this reason, *viz.*, 0·25 per cent. compared with 0·65 per cent. obtained by other methods. As an evolution method it is simple and rapid. It may be varied by using other diamines, such as paraphenylene-diamine, which produces a violet coloration.—A. W.

Manganese in Spiegel; Determination of ——. T. F. Hildreth. School of Mines Quarterly, 1901, **23**, [1], 27—33.

The author reviews the various methods of estimating manganese in spiegel, and gives the results of experimental tests with each. The following summary of average figures obtained with the same spiegel shows the variations by different methods:—

Gravimetric method (basic acetate, bromine, and phosphate), 22·69 per cent.

Volumetric method (Ford-Williams), 22·73 per cent.

Volhard method (see table in next column).

For each of the three acid solutions 5 grms. were dissolved, diluted to one litre, and divided into five equal parts for the different methods of neutralisation. The

Volhard Method and its Modifications.

——	HCl Solution.	HNO_3 Solution.	H_2SO_4 Solution.
Neutralised by—	Per Cent.	Per Cent.	Per Cent.
1. $NaHCO_3$	22·93	22·94	22·94
2. $BaCO_3$	22·40	22·39	..
3. Na_2CO_3 and ZnO in excess after dilution.	22·47	22·58*	22·73
4. Na_2CO_3 and ZnO, avoiding excess.	22·63	22·78	22·58†
5. Na_2CO_3 and ZnO in great excess at once.	22·39	22·63	22·63

* Stone's method as given by Auchy.
† Original Volhard method.

results show that there are four reliable methods, *viz.*:—Standard Gravimetric, Ford-Williams, Volhard, and Stone. Of these the first is the most accurate and the last the most rapid. The following points are brought out by the investigation:—The precipitation by $(NH_4)_2HPO_4$ without ammonium chloride, as given by Dakin, gives accurate results. Sodium or potassium chlorate can be used equally well in the Ford-Williams method. Särnstrom's method is inferior to any of the zinc oxide methods of neutralisation before titration. Barium carbonate gives low results and an uncertain end point, showing the necessity of zinc salts. The presence of chlorides is undesirable, whilst there is no choice between nitrates and sulphates. The best results were obtained in a sulphate solution to which an excess of zinc oxide was added after neutralisation with the same oxide and dilution. The original Volhard method and Auchy's modification of Stone's method give identical results as shown above, but they are about 0·1 per cent. too low. The results in the table are irregular, although the duplicates agree, and they show that, whilst nothing definite can be deduced in respect to the excess of zinc oxide and the manner of adding it, the neutralisation and standardisation should be exactly the same each time.—A. W.

Gold and Iridium; Separation of ——. Mietzschke. J. Pharm. Chim., 1902, **15**, [2], 68.

When gold containing iridium is fused in a clay crucible in a muffle for 1—2 hours at a high temperature, the iridium is entirely converted into silicate, which forms a brownish-black molten mass on the sides and bottom of the crucible. The gold is poured off, and the adherent mass again fused in the same crucible with a mixture of litharge, reducing agents, and fluxes. The button of lead-iridium is then refined with an addition of silver. The separation of silver and iridium offers no difficulty.—A. C. W.

ORGANIC—QUALITATIVE.

Cotton-seed Oil; Chemistry of Halphen's Reaction for ——. P. N. Raikow. Chem.-Zeit., 1902, **26**, [1], 10—11.

In the author's opinion the active substance producing the red coloration in Halphen's reaction must be an unknown unsaturated acid. Taking into consideration facts recorded in a former communication (this Journal, 1901, 856), there appears to be an analogy between the reaction and changes that aldehydic and ketonic compounds undergo under the influence of free sulphur. These changes may take place in two directions. Thus the sulpho-aldehydes or sulphoketones first produced may be transformed into other sulphur compounds with the liberation of hydrogen sulphide, as in the case of valeric aldehyde:—

$$(a)\ 2C_5H_{10}O + S = C_5H_{10}S + C_5H_{10}O_2;$$

$$(b)\ C_5H_{10}S + 4S = C_5H_6S_3 + 2H_2S;$$

or there may be a condensation to sulphur-free compounds with the liberation of free sulphur after the manner of benzaldehyde:—

$$(a)\ 2C_6H_5.COH + S = C_6H_5.CSH + C_6H_5.COOH;$$

$$(b)\ 2C_6H_5.CSH = C_6H_5.CH{:}CH.C_6H_5 + 2S.$$

Presumably the first part of these reactions corresponds with the formation of the red coloration in Halphen's reaction, and the second part with the disappearance of the colour under the long-continued action of sunlight.

The liberation of hydrogen sulphide, which the author has observed in Halphen's reaction, evidently points to a reaction of the first type; and if a reaction like that of benzaldehyde also occurs, where there is complete regeneration of the sulphur, a small amount of sulphur should be able, after a sufficient lapse of time, to render a large quantity of cotton-seed oil inactive to Halphen's test.

In order to decide this point, 2 mgrms. of flowers of sulphur were added to one of two flasks containing 100 c.c. of cotton-seed oil, and the flasks closed and exposed to direct sunlight for 17 months. In each case the oil then only gave a coloration with Halphen's reagent of a fifth of the intensity of that produced by the original oil. From this it appears that sunlight alone, if its action be continued sufficiently long, is capable of modifying the active substance giving Halphen's reaction.

It was shown before that cotton-seed oil became completely inactive when exposed to direct sunlight with a sufficient quantity of sulphur. From the above experiments the author concludes that this change does not take place under the influence of a slight amount of sulphur, and that therefore reactions of the benzaldehyde type probably do not occur. The presence of hydrogen sulphide was not observed in the flask containing the 20 mgrms. of sulphur, but the decomposing action of light upon that compound would afford a satisfactory explanation of this.—C. A. M.

Oxidising Ferments; Phenolphthalin as a Reagent for ——. J. H. Kastle and O. M. Shedd. Amer. Chem. J., 1901, **26**, [6], 526—539.

Phenolphthalin or dihydroxytriphenylmethane carbonic acid is obtained by reducing phenolphthalin with zinc dust in alkaline solution. It is rapidly oxidised by oxidising agents and slowly by the air to phenolphthalin, the formation of which is made evident on the subsequent addition of alkali. Phenolphthalin is a very convenient substitute for guaiacum in the study of oxidising ferments. The tests are made in tubes by mixing 5 c.c. of the extract under investigation with 1 c.c. of a neutral solution of the sodium salt of phenolphthalin, leaving for some time at the ordinary temperature, and then adding sufficient 1/20th normal alkali to determine an alkaline reaction. Blank tests should always be made, to correct for the slight oxidising action of the air. The authors have devoted most of their attention to the study of the oxydase of the potato tuber; they find, however, that this oxydase is widely distributed in other vegetable tissues, but amongst animal secretions they have so far only found it in human saliva. The oxidation of guaiacum by potato oxydase is very rapid, but not instantaneous; that of phenolphthalin proceeds much more slowly. The rate of oxidation can easily be followed by colorimetric observations, and appears to be proportional to the time of contact up to a certain limit; in the case of extracts of potato cuticle, the maximum coloration is obtained after one hour. The passage of air through the tubes during the tests in no way increases the oxidising action; hence it is concluded that the potato-oxydase is not a catalytic carrier of atmospheric oxygen. All the tests were made in extracts with a faint acid reaction. There appears to be a complete parallelism between the oxidation of guaiacum and that of phenolphthalin by extracts of living tissues, both qualitatively and as regards relative intensity; tissues which possess this property also turn brown when exposed to the air. This oxydase is evidently not identical with Loew's "catalase," which decomposes hydrogen peroxide.—J. F. B.

Milk; Test for Boiled and Unboiled ——. Utz. Pharm. Centralbl., **42**, 149; through Zeits. angew. Chem., 1902, **15**, [1], 12.

Hydrogen peroxide and paraphenylenediamine solution are simultaneously added to the sample (Schaffer's test). Unboiled milk becomes blue at once; boiled milk does not give the reaction. The colour does not appear so quickly if the milk contain a small quantity of formaldehyde.

—J. N. G.

ORGANIC—QUANTITATIVE.

Glycerins; Analysis of Commercial ——, *by the modified Manganese Method.* J. Gailhat. Monit. Scient., 1902, **16**, [722], 89—106.

After describing and criticising the various methods employed or proposed for the determination of glycerin, the author discusses the application of his method (Bull. Soc. Chim., 1901, **25**, 395) to the examination of pure and crude glycerin.

Preparation of Solutions of Pure Glycerin. — The glycerin redistilled *in vacuo* and containing only traces of fatty acids was washed with ether, diluted with four times its volume of water, treated with purified animal charcoal, and filtered. After concentrating the liquid on the water-bath, again diluting it, and again concentrating it, the product contained 80—82 per cent. of pure glycerin, and could be weighed without fear of hydration during the weighing.

Action of the Manganese Solution on Solutions of Pure Glycerin.—On treating 25 c.c. of a solution of pure glycerin (about 6 grms. per litre) with 50 c.c. of potassium permanganate solution (15 grms. per litre), 25 c.c. of a 15 per cent. solution of manganese sulphate, and 25 c.c. of concentrated sulphuric acid, the reaction commences before the boiling point is reached, and reducing substances, including formaldehyde and formic acid, are liberated, and can be detected in the condensed vapours. If, however, the reaction be carried out by boiling the liquid for at least 15 minutes under a reflux condenser, and the liquid subsequently distilled, the distillate is free from reducing substances.

The same facts were noted when the glycerin solution was treated with potassium bichromate and sulphuric acid, as in the methods of Hehner (this Journal, 1889, 4), and of Richardson and Jaffé (this Journal, 1898, 330), showing that the oxidation is incomplete unless the vapours first evolved are condensed and brought into action again.

Determination of Glycerin in Pharmaceutical Glycerins. —A glycerin of known strength is diluted so that a litre contains about 5·9 grms. of anhydrous glycerin. Let this quantity be represented by Q, whilst P represents the weight of a similar quantity of the glycerin under examination, and X the quantity of anhydrous glycerin present.

Three oxidising mixtures are prepared, each containing potassium permanganate solution (50 c.c.), manganese sulphate solution (25 c.c.), and sulphuric acid (20 c.c.) of the strengths given above. The first of these is titrated at 45° C. by adding 50 c.c. of seminormal oxalic solution, and determining the excess of the latter with decinormal permanganate solution. To the other two are added respectively 25 c.c. of the solution of the standard glycerin and 25 c.c. of the solution under examination, and the liquids boiled for 25 minutes under reflux condensers. They are then cooled to 45° C., treated with 10 c.c. of seminormal oxalic acid, and titrated with decinormal permanganate solution. If A represent the amount of oxygen, expressed in c.c. of permanganate, consumed by the standard glycerin solution, and B the quantity consumed by the unknown glycerin, the percentage of glycerin in the latter is calculated by means of the equation—

$$X = \frac{100 \times Q \times \frac{B}{A}}{P}$$

To obtain accurate results it is essential to have the glycerin, oxalic acid, and permanganate solutions at exactly the same temperature during the titration.

Analysis of Crude Glycerins.—The author describes the origin of the impurities found in commercial glycerin, and discusses their influence on the determination of glycerin by the method described above.

Volatile Fatty Acids in Soap Works Glycerins.—The volatile acids usually amount to about 1 per cent. in terms

of sulphuric acid, but in certain cases exceed 2 per cent. The author subjected 500 grms. of these acids to distillation under a pressure of 20 mm. in Henninger's apparatus, and obtained the following fractions:—(1) A mixture distilling below 40° C., and consisting of acetic and butyric acids with traces of formic acid; (2) essentially butyric acid, distilling between 70° and 80° C.; (3) essentially caproic acid, distilling between 125° and 127° C.; and (4) essentially caprylic acid, distilling between 147° and 149° C. The first fraction was too small to be further rectified, and the residue of volatile acids higher than caprylic acid was insignificant in comparison with the quantity of glycerin (225 kilos.) treated.

The influence of each of the above-mentioned acids on the author's manganese method is shown by experiments given in detail, from which the conclusion is arrived at, that their action is negligible, provided that the active oxygen in the solution after the oxidation of the glycerin does not exceed one-tenth of that introduced in the 50 c.c. of seminormal permanganate solution.

Action of Impurities partially eliminated by Treatment with Lead or Silver Salts.—An allowance for this can be made in the following manner:—250 c.c. of a solution of the crude glycerin (about 5·9 × 2 grms. of glycerin per litre) are treated with a slight excess of silver nitrate and lead subacetate, diluted to 500 c.c., and filtered.

A second portion of 200 c.c. of the same solution is treated in the same manner, and also diluted to 500 c.c. and filtered. The first solution will then contain a quantity, X (approximating 5·9 grms. per litre), whilst the second will only contain four-fifths of that quantity; but both will contain in solution the same quantity of the precipitates formed by the impurities. If Z represent the amount of oxygen required for the oxidation of the glycerin in 25 c.c. of the first solution, and z that consumed by the impurities in the same volume of liquid, the proportion of oxygen consumed by the second solution will be represented by $\frac{4}{5}Z + z$.

Further, if $Z + z = A$; and $\frac{4}{5}Z + z = B$;

$$Z - \frac{4}{5}Z = A - B; \text{ and}$$

$$Z = 5(A - B).$$

Again, if C represent the amount of oxygen absorbed by 25 c.c. of the standard glycerin solution containing a grms. (approximately 5·9 grms.) of glycerin, and x represent the amount of oxidisable impurities per litre in terms of glycerin in each of these liquids—

$$\frac{X + x}{a} = \frac{A}{C},$$

and

$$\frac{\frac{4}{5}X + x}{a} = \frac{B}{C};$$

whence

$$\frac{X - \frac{4}{5}x}{a} = \frac{A - B}{C},$$

and

$$X = 5a\left(\frac{A - B}{C}\right).$$

The author states that he has applied this method to the examination of a large number of soap-works glycerins, and has found that, provided the excess of active oxygen in the liquid after oxidation does not exceed one-tenth of that originally added, the action of the impurities not precipitated, may be neglected. It is also essential that the solution should contain a quantity of pure glycerin approximating 5·9 grms. per litre.

The method is illustrated by test experiments, and, according to the author, the results obtained, with the precautions mentioned above, are more accurate than those given by any other method.—C. A. M.

Gallic Acid in Tanning Materials; Detection and Determination of ——. M. Spica. Gazz. chim. ital., 1901, **31**, 201. Chem.-Zeit., 1902, **26**, [2], Rep. 4—5.

On shaking a solution of gallic acid with a solution of potassium plumbite, and then diluting the liquid with water, a scarlet coloration is produced. This reaction is not given by tannin, and can therefore be employed for the detection and determination of gallic acid in tanning materials. The reagent is prepared by treating a solution of lead acetate with potassium hydroxide and dissolving the precipitated lead hydroxide in potassium hydroxide solution, care being taken to avoid an excess of the latter.—C. A. M.

Carbohydrates; Method of Drying, and Determination of the Water of Crystallisation of ——. E. Schulze. Chem.-Zeit., 1902, **26**, [1], 7—8.

After pointing out that many carbohydrates undergo partial decomposition, when heated at temperatures not much above 100° C., the author describes an apparatus with which he has obtained good results. This consists of a copper trough-shaped vessel containing a solution of salt or a mixture of glycerin and water, the boiling point of which is somewhat over 100° C. Through this trough passes a copper tube, about 30 cm. in length by 2·5 cm. in diameter, open at each end. A glass boat containing a weighed quantity of the substance is placed in this tube and a current of dry hydrogen passed through, whilst the liquid in the bath is heated to the boiling point.

In this way maltose is readily freed from its water of crystallisation, as is also the case with stachyose after about 30 minutes heating. Raffinose must first be heated for about an hour in hydrogen at about 75° C. in order to prevent fusion, and the temperature can subsequently be raised to 100° C. Otherwise it fuses, and cannot then be completely freed from water, even by heating at 105°—110° C.

Secalose ($C_{18}H_{32}O_{16}$), a carbohydrate isolated by the author from rye, rapidly became constant in weight in this apparatus. On the other hand, lactose only lost part of its water of crystallisation, which was to be expected, since it is ordinarily necessary to heat this carbohydrate to 130° C. to obtain an anhydrous product.

The author calls attention to the possibility of the temperature of drying influencing the analysis. Thus he found a sample of lupeose dried at 110°—115° C. to have a composition corresponding with the formula $C_6H_{10}O_5$, whereas the preparation dried at 100° C. in hydrogen gave figures corresponding with the formula $C_{12}H_{22}O_{11}$.—C. A. M.

Yeast; Determination of Potato Starch in ——. A. Hebebrand. Zeits. Untersuch. Nahr. und Genussm., 1902, **5**, [2], 58—61.

A weighed quantity (about 1 grm.) of the yeast containing potato starch is rubbed down with 20 c.c. of sodium carbonate solution (containing 7 per cent. Na_2CO_3), and a slow stream of chlorine gas is led through the mixture for one minute. 150 c.c. of water are then added and the starch allowed to settle. Several successive quantities of water are added, each being decanted off, and the sediment of starch is finally brought on to a weighed filter, washed with water, then with alcohol, ether, and light petroleum spirit in succession, dried at 100°.—105° C., and weighed. It may be assumed that the potato meal originally added contained 80 per cent. of dry starch. The process gives accurate results.

—W. P. S.

Malt; Analysis and Valuation of ——. F. Cerny. Oesterr. Brauer- und Hopfenzeit., 1902, [2], 17; through Woch. für Brau., 1902, **19**, [4], 43—44.

The author took samples of malt from the same germinating couch after 5, 7, and 10 days respectively and kilned them. Part of each sample was then put into a corn-tester, and the corns accurately cut into halves; there were thus obtained germ-halves and awa-halves for each period of germination. A comparative study of all these samples gave a very good indication of the gradual progression of the modification of the endosperm towards the point of the corn. The mashing of the whole malt samples showed, as might be expected, very inferior results for the five days' germination as compared with the seven and ten days' samples; the yield from the two latter did not differ very considerably. The maltose content [diastatic power], and the colour of the worts increased with the time of germination. The sifted meal from the whole malts gave paler

worts than those obtained by mashing with the husks, and in this case the maltose content was lower in the 10 days' sample than in the seven days. The cut corns were also ground, and sifted meals were prepared; the awn-aloes were far more difficult to grind than the germ-halves owing to their deficient modification. The germ-halves even of the five days' malt were perfectly modified, in fact the yield of extract from the germ-halves decreased from the 5th to the 7th day, owing to the development of the embryo. The yield of extract from the awn-halves increased very considerably from the 5th to the 7th day, but only slightly from the 7th to the 10th day. The slight difference in the latter case may be attributed to the artificial modification produced by the fine grinding. The maltose content rose in both halves with the time of germination, but it was very deficient in the wort from the awn-halves of the five day malt. The colour of the worts in both cases increased with the time of germination, but was about twice as dark in the worts from the germ-halves compared with those of the awn-halves. The worts from the germ-halves were clear in all cases, but those from the awn-halves were opalescent except in the 10-day sample. The iodine reaction of the mash from the awn-halves of the five-day malt was still blue, in the other cases it was normal.

The colouring matter—apart from the husks—increased with the time of germination, and the author attributes this to the production of some readily caramelised substance, during the development of the acrospire. The colouring matter due to the husks also increased with the time of germination, showing that these undergo some change of a like nature.

The relative weights of the germ-halves and awn-halves showed a considerable difference, the awn-halves of the five-day malt being very heavy.—J. F. B.

Apples and some of their Products; Analysis of ——. C. A. Brown, jun. J. Amer. Chem. Soc., 1901, **23**, [12], 869—884.

The composition of the edible or fleshy portion of the apple is given in the following table :—

——	Water.	Reducing Sugars.	Sucrose.	Starch.	Ash.	Acids, as Malic.
Unripe apples, 2 analyses.	80·67	6·43	2·84	3·92	0·27	1·14
Summer apples, 6 analyses.	85·00	7·10	3·36	1·04	0·28	0·68
Winter apples, 21 analyses.	83·16	8·16	4·16	..	0·26	0·59

These figures, taken together with other determinations made on the combined pulp and marc from different varieties of fruit, give the following approximate average percentage composition of the flesh of the ripe apple :— Water, 84·00; ash, 0·30; reducing sugars, 8 00; sucrose 4·00; starch, 0·00; marc, 1·80, containing cellulose, 0 90, pentosanes, 0·50, and lignin, 0·40; free acid, calculated as malic acid, 0·60; combined acid as malic, 0·20; pectins, 0·40; crude fat, 0·30; proteïn, 0·10; undetermined (tannin, &c.), 0·30. The composition of the ash of the apple is :—K_2O, 55·94; Na_2O, 0·31; CaO, 4·43; MgO, 3·78; Fe_2O_3, 0·95; Al_2O_3, 0·80; Cl, 0·39; SiO_2, 0·40; SO_3, 2·66; P_2O_5, 8·64; CO_2, 21·60.

The composition of apple juice is compared in the next table with that of other fruit juices. "Second pressings" are made by wetting apple pomace with water and re-pressing; they are used extensively for jelly-making and vinegar stock.

Kind of Juice.	Specific Gravity.	Solids.	Reducing Sugars.	Sucrose.	Free Acid, as Malic.	Ash.	Pectins.	Albuminoids.	Optical Rotation.
Summer apples, 5 analyses	1·0502	12·29	6·76	3·23	0·72	0·29	0·12	0·03	− 26·67
Winter apples, 4 analyses	1·0569	13·96	8·57	3·40	0·43	0·27	0·12	0·02	− 45·15
"Second pressings"	1·0376	9·14	6·87	1·49	Undetermined.	0·20	Undetermined.	Undetermined.	− 31·94
Strawberry	1·0420	9·64	5·90	0·89	1·28	0·61	0·63	0·38	− 5·28
Red raspberry	1·0463	11·01	5·13	2·31	1·44	0·60	0·88	0·75	+ 7·32
Black raspberry	1·0567	13·65	9·52	..	1·85	0·60	0·72	0·38	− 25·20
Black cherry, very sweet	1·1034	24·30	16·35	..	1·47	0·79	0·30	0·63	− 29·80
Red cherry, sour	1·0461	11·22	7·33	..	1·32	0·57	0·25	0·56	− 12·96

The composition of samples of cider and cider vinegar of known purity is also given :—

——	Specific Gravity.	Solids.	Ash.	Reducing Sugars.	Acetic Acid.	Malic Acid.	Alcohol.	Pectins.	Albuminoids.	Optical Rotation.
Cider, 6 analyses	1·0006	2·34	0·29	0·32	0·61	0·25	5·51	0·04	0·02	− 2·34
Vinegar, 4 analyses	1·0184	2·200	0·44	0·52	6·19	0·14	None	0·17	0·01	− 2·01

In regard to the analytical methods, the following points are noteworthy :—

Moisture and Solids.—In drying at 100° C. it is impossible to obtain a constant weight, owing to the decomposition of the sugars, levulose in particular. The method adopted was to pack a perforated brass tube, 9 × 2 cm., with asbestos, leaving a central cavity in the upper half, place the tube in a weighing bottle, run about 5 c.c. of the liquid into the cavity in the asbestos, re-weigh, place bottle and tube in a vacuum-drying apparatus, dry at 70° C., first with a slight current of air, and then at a vacuum of 25 ins. Dehydration is generally complete in 8—10 hours. In the case of fruits, the grated pulp was transferred to the perforated tube, which was only one-quarter filled with asbestos.

The percentage of solids in fruit juices may be calculated from the formula :— 245 (s − 1), where s is the specific gravity. The results are generally somewhat nearer to the observed solids than determinations by means of the Brix hydrometer.

Reducing Sugars were calculated as invert sugar from the weight of copper reduced.

Levulose and Dextrose were in many cases separately determined. In the presence of both dextrose and sucrose, the percentage of levulose, l, is given by the formula—

$$l = \frac{v - v'}{G\,(t \times - 0{\cdot}0323)}$$

where $v - v'$ is the algebraic difference between polariscope readings taken in a 200 mm. tube at 15° and 85° C., G is the specific gravity of the liquid, and t the difference in temperature between the readings. The factor − 0·0323 represents the deviation (Ventzke) for 1° C. difference of temperature produced by 1 grm. of levulose in 100 c.c. The percentage of levulose and the copper-reducing power being known, the percentage of dextrose can be calculated. Volumetric determinations by Soxhlet upon solutions of invert sugar have shown that, for the same volume of Fehling's solution reduced, 1 part of levulose corresponds to 0·924 part of dextrose. The author has found by Allihn's gravimetric method that 1 part of levulose is equal to 0·90 part of dextrose.

Starch.—The following process for removal of the reducing sugars, which is combined with the determination of the sugars, is the most expeditious:—100 grms. of the finely grated pulp are washed on a muslin filter with cold water, squeezing the muslin after each addition, until the filtrate amounts to 2 litres. Practically all the starch is then washed out of the pulp. After standing over-night in a tall cylinder, the starch is deposited in a compact mass; the liquid is then siphoned off, and used for the determinations of sugar and malic acid. The starch is transferred to a hardened filter paper and washed; it contains some cellular and albuminoid matter. The author then employed the method of hydrolysis by diastase. If the residue on the linen filter gives a reaction with iodine, the starch in it also should be determined by the diastase method.

The Marc is the portion of the fruit insoluble in water. The residue on the muslin filter is dried at 100° C. in a dish. The marc of apples consists of cellulose, lignin, and pentosans, with traces of ash and albuminoid matter. The cellulose is separated by the chlorination process of Cross and Bevan. The pentosans are best determined by distilling the dry marc with 12 per cent. hydrochloric acid, and precipitating the furfural in the distillate by phloroglucol. The lignin is then found by difference.

Pectins were determined by evaporating the fruit extract, juice, &c., to a small volume, precipitating with a large excess of 95 per cent. alcohol, allowing to stand over-night, collecting the precipitate in a Gooch crucible, and washing with alcohol. After drying at 100° C. to constant weight, the residue was burnt and the loss estimated as pectins.

—A. C. W.

Formaldehyde; Detection and Determination of Methyl Alcohol in ——. Duyk. J. Pharm. Chim., 1902, **15**, [2], 69—70.

Ammonia is added, drop by drop, to 100 c.c. of the aldehyde diluted with 50 c.c. of water, the vessel being cooled. After standing several hours, the liquid should be alkaline to phenol phthalein; otherwise a few more drops of ammonia are added. Sodium carbonate is now added, to ensure the stability of the hexamethylenetetramine produced, and the liquid distilled. The 100 c.c. of distillate are neutralised with sulphuric acid and redistilled under a bulb tube. The fractions boiling between 65° and 100° C. are again distilled in such a manner that finally a fraction is produced containing about three-quarters of its volume of methyl alcohol. This fraction contains, as a rule, traces of the impurities of methyl alcohol—acetone, methyl formate and acetate—or of the substances used to denature it. The methyl alcohol is then converted into methyl iodide by allowing 5 c.c. to stand for some hours with 10 grms. of iodine and 2 grms. of red phosphorus, heating under an inverted condenser, and distilling, the methyl iodide being condensed in a receiver containing water, and its volume measured. It is unnecessary to apply corrections for the impurities which accompany the methyl alcohol; their quantity is small, and they compensate for the inevitable losses of methyl alcohol. By means of this process, commercial formaldehydes have been found to contain 3—10 per cent. of methyl alcohol.—A. C. W.

Methyl Anthranilate; Detection and Determination of ——. E. Erdmann. Ber., 1902, **35**, [1], 24—27.

When methyl anthranilate is precipitated from essential oils by sulphuric acid (this Journal, 1901, 289, 1139), other bases are separated simultaneously. Since methyl anthranilate is the only primary base yet found in essential oils, the property of primary aromatic bases of forming azo dyestuffs may be utilised for its determination. For this purpose a soluble dyestuff, *e.g.*, the compound with β-naphthol disulphonic acid R, may be used, and a colorimetric process adopted. If, however, more than fractions of a milligram of the ester are in question, it is preferable to bring the diazotised solution to a definite volume, and titrate with it an alkaline solution of β-naphthol. The end-point is then exactly obtained by using a diazo compound and naphthol solution as external indicators. The insoluble dyestuff is yellowish-red in colour.

An example is given: 0·3 grm. of methyl anthranilate was dissolved in benzyl acetate to 100 c.c.; 30 c.c. of this solution were diluted with 60 c.c. of ether, and shaken six times with quantities of 4 c.c. of hydrochloric acid (15 per cent.). The hydrochloric acid solution was diazotised, made up to 50 c.c., and titrated against 10 c.c. of 0·5 per cent. solution of β-naphthol, to which the necessary volume of strong soda solution had been added. Found: 0·08913 grm. of methyl anthranilate = 99 per cent. Even 0·3 c.c. of the same benzyl acetate solution (containing 0·0009 grm. of methyl anthranilate), when treated in a similar manner, gave a considerable precipitate.

The determination may be conducted in the presence of the ester of methylanthranilic acid (this Journal, 1900, 848). If nitrite solution be added slowly to the acid solution of the methyl esters of anthranilic and methylanthranilic acids, the primary base is first diazotised, then the solution suddenly becomes turbid, owing to the formation of nitrosomethylanthranilic acid methyl ester, which is, however, soluble in much water. Nitrite solution is added until nitrous acid is in excess, then the oily nitroso compound is extracted by ether, and the determination conducted as before.

An orange flower oil, described as "Essence de Neroli Pétales Bigarade," was found to contain 0·276 and 0·264 per cent. of methyl anthranilate in two experiments. In this case, the diazotised solution was extracted with ether to remove oily substances. A jasmine extract, of the consistency of soft wax, obtained by extraction with light petroleum spirit, was distilled with steam, the distillate (500 c.c. from 20 grms. of substance) four times extracted with quantities of 250 c.c. of ether, the ethereal solution evaporated to 25 c.c., and extracted by hydrochloric acid. 100 grms. of jasmine extract were found to contain 7·34 and 7·41 mgrms. of methyl anthranilate in two separate experiments.—A. C. W.

Digitoxin in Digitalis Leaves; Determination of ——. W. Stoeder. Oesterr. Zeits. für Pharm., **39**, [35], 386.

Twenty grms. of the dried powdered leaves are treated with 200 c.c. of water, and heated on the water-bath in a tared flask for an hour, with frequent and thorough agitation. The mixture is cooled, made up to 220 grms., strained, pressed, and 150 grms. of the liquid (= 15 grms. of the leaves) filtered off. This filtrate is shaken out in a separator with 5 c.c. of ammonia, and 70 c.c. of chloroform, the mixture being well shaken together at intervals for two hours; 1 c.c. of the clear aqueous liquid is then withdrawn, shaken with 5 c.c. of ether, the ethereal layer withdrawn, evaporated, and the residue taken up with 2 c.c. of glacial acetic acid containing a trace of ferric chloride solution. A little of this solution floated over sulphuric acid should not show a reddish zone with a blue colour. 60 grms. of the chloroform extract (= 12 grms. of the leaves) are then taken and filtered, the filter and the containing flask being washed with a little chloroform. The chloroform is then distilled off, until about 2 c.c. of residue is left; when cool, this is treated with 10 c.c. of ether, filtered, the filter washed through with a little more ether, 50 c.c. of light petroleum spirit added to the filtrate and the mixture allowed to stand for 24 hours. The supernatant petroleum spirit is then decanted, the precipitated digitoxin washed with a further addition of 5 c.c. of petroleum spirit, the precipitate dried for half-an-hour at 100° C. and finally to constant weight in an exsiccator. This final weight should be between 0·0375 and 0·0525 grm. and the digitoxin should be of a bright yellow colour. 0·005 grm. of it should give the characteristic colour reaction when treated as above, with acetic acid, ferric chloride, and sulphuric acid.

—J. O. B.

Methoxyl; Determination of ——, *in Substances containing Sulphur.* F. Kaufler. Monatsh. für Chem., 1901, **22**, [10], 1105—1108.

The principle of this method consists in saponifying the compound by boiling potash and passing the alcohol vapour, after drying by means of ignited copper sulphate, into hydriodic acid, kept cool by a mixture of ice and salt; the methyl iodide can afterwards be distilled off and collected in

silver nitrate solution. In this way the formation of mercaptan in the hydriodic acid is avoided, since no hydrogen sulphide or sulphur dioxide can be evolved from the mixture of the compound and potash. The saponification vessel consists of a fractionating flask having a capacity of 15 c.c., and provided with an outlet tube which is bent at right angles and is connected with a U-tube charged with ignited copper-sulphate pumice; next comes a Winkler's absorption apparatus containing hydriodic acid and finally the Zeisel apparatus. In order to allow of a slow current of air being drawn through the apparatus, the methyl iodide is collected in a fractionating flask, the side tube of which passes into a smaller fractionating flask also filled with silver nitrate solution; the side tube of the latter flask is connected with the pump. The air passed through must be freed from acid by means of an alkali washing flask, and then dried by passing through concentrated sulphuric acid. The method is carried out as follows:—When a regular stream of air is passing through all parts of the apparatus, the substance, contained in a weighing tube, is introduced into the saponification flask together with 3 to 6 c.c. of caustic potash solution (sp. gr. 1·27). At the same time the Winkler apparatus containing hydriodic acid (sp. gr 1·7) is cooled by means of a mixture of ice and salt, while the copper sulphate U-tube is placed in a beaker of water at 80°—90°. The saponification flask is slowly heated in an oil or glycerin bath so that gentle boiling takes place and this is continued until the contents of the flask becomes syrupy or solid. The heating bath is then removed and after the flask has cooled in the current of air, more alkali is added and distillation proceeded with as before. When this is complete, the cooling mixture is removed and the Winkler apparatus dried and left at the ordinary temperature for half an hour, after which the hydriodic acid is heated by immersing the lowest winding of the apparatus in an oil or glycerin bath and gradually raising the latter to 140°—150°; during the heating it is advisable to increase the flow of air. When all the methyl iodide has distilled over, the heating bath is allowed to cool and the silver iodide then separated and weighed. The hydriodic acid may be used several times in succession as it only undergoes slight dilution during each operation. Test experiments with potassium methyl sulphate, dimethyl sulphate, methyl benzenesulphonate, mono- and dimethyl sulphobenzoate gave good results. The method can be employed to differentiate between methyl groups of esters and of ethers.—T. H. P.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Partially Miscible Liquids near the Critical Point. J. Friedländer. Zeits. Phys. Chem., 1901, **38**, 385—440.

Most of the experiments conducted by the author were with mixtures of isobutyric acid and water. With such mixtures, the temperatures at which the liquid becomes milky on cooling is usually 0·02° below that at which it becomes clear on warming, and the mean of these two temperatures is taken as the saturation point; this point can be determined within 0·01°—0·02°, provided that the composition of the mixture does not differ by more than 10 per cent. from the critical proportions. Solutions which have approximately the critical composition exhibit a bluish opalescence at temperatures up to 10° above the well-defined saturation-point, but, unlike a colophonium emulsion, this opalescence is not affected by time, and the volume, electrical conductivity, and internal friction of the liquid remain constant during a number of hours. The temperature coefficient of internal friction increases very greatly in the neighbourhood of the critical point, the maximum (34·3 per cent. per degree C.) being attained with a mixture of the critical composition within 0·15° of the critical temperature (25·8° C.). Similar observations were made with mixtures of phenol and water, and of benzene, water and acetic acid. Analogous results were also found for the opalescence, which increases greatly as the liquid approaches the critical mixture. The coefficient of expansion, conductivity, and refractive index of the solutions do not, however, show any marked variation when the critical state is approached, but change quite regularly and continuously.—A. S.

Catalytic Reactions; Mutual Influence of Two ——, in the Same Medium. A. Coppadoro. Gaz. chim. ital., **31**, [1], 425—450; Chem. Centr., 1901, **2**, [6], 386.

The author made a series of experiments in order to ascertain whether, if two catalytic reactions were proceeding in one and the same medium, these had any influence on one another. The experiments comprised the study, on the one hand, of the inversion of sugar by acid in a solution containing methyl acetate, and in one free from that substance, and, on the other hand, the hydrolysis of methyl acetate by acid in the presence and absence of sugar. The results show that with concentrated acid solutions, in both cases, the catalytic reactions are without influence on one another. In dilute solutions, the decomposition of methyl acetate is increased by the presence of sugar, but the author shows that this is due, not to a chemical action of the sugar on the acetate, but to the fact that the presence of sugar in solution diminishes the quantity of water, and so increases the concentration of the acid, and consequently the "reaction-constant." In dilute solutions, also, the inversion of sugar is diminished by the presence of methyl acetate, but this can be explained by the modification in the nature of the medium caused by the presence of the methyl acetate. The author concludes that *if two catalytic reactions proceed simultaneously in the same medium, they are without influence on one another.*—A.S.

Radio-Active Lead. F. Giesel. Ber., **35**, [1], 102—105.

The author describes his radio-active lead, and criticises the deductions of Hofmann and Strauss. From 2,000 kilos. of uranium mineral, he obtained active barium radium bromide, and from this, by separation with ammonia and sulphuretted hydrogen, he got three mgrms. of a radio-active substance which gave an effect equal to the best radium preparations, and which unexpectedly gives a strong emission of rays after a year. The spectrum of this substance, according to Demarçay, shows that it consists almost entirely of lead salt; there are two lines in the spectrum for which no explanation can be given (λ 3659·6 and λ 4116·8), and the radium spectrum is entirely absent. Demarçay suggests that the radio-activity is due to a hypothetical body having these two lines.

Debierne having shown that activity in barium can be induced artificially by actinium, the author supposes that the lead salts may have induced activity from the radium in the original preparations. He also distinguishes between radio-activity and phosphorescence, and states that radio-active substances emit Becquerel rays. Since his radio-lead has remained active for a year, he considers that he has some active substance present, while the radio-lead of Hofmann and Strauss loses its activity in some months. His preparation contains so little of any rare foreign matter as shown by spectrum analysis, that he thinks the preparation of Hofmann and Strauss could not be sufficiently pure for atomic weight estimation. For the varying results of the latter preparation, see this Journal, 1901, 290, 625. He also desires distinction to be made between radio-lead and radio-active lead (induced).—A. M.

Chlorine; Preparation of [Laboratory] —— by means of Permanganates. C. Graebe. Ber., 1902, **35**, [1], 43—45.

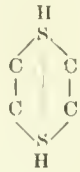
The author finds that the preparation of chlorine by means of a permanganate is most economical when solid potassium permanganate is made use of. The so-called commercial salt is, however, quite unsuitable for the purpose, as it only yields about 15—16 per cent. of the quantity of chlorine obtained from crystallised permanganate. The gas prepared in this way costs about double that obtained by using sodium chlorate, but it has the advantage of containing no admixed chlorine dioxide. The size of apparatus employed is the same for both methods, but when sodium chlorate is used, the salt is added gradually to the acid and is at once decomposed, so that the evolution of gas may be stopped immediately if required. With potassium permanganate, the apparatus previously described by the author is employed (see this

Journal, 1901, 473), the solid salt being placed in the flask and concentrated hydrochloric acid allowed to fall on it from a dropping funnel, the lower end of which is turned up in order to obtain a constant pressure of gas. Chlorine begins to come off in the cold, manganese dioxide separating and the liquid becoming warm; the flask must afterwards be heated to complete the evolution of gas. An excess of hydrochloric acid is necessary, suitable proportions being 10 mols. of acid to 1 mol. of the permanganate or 60—65 c.c. of acid of sp. gr. 1·17 to 10 grms. of the salt; using these quantities, 11·2 grms. of chlorine are obtained.—T. H. P.

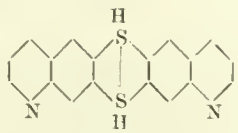
Sulphur; Basic Properties of ——. A. Edinger and J. B. Ekeley. Ber., 1902, **35**, [1], 96—98.

The authors have previously shown (Ber., 1900, **33**, 3769) that the action of sulphur chloride on aromatic amines gives rise to certain chloro-products together with a series of bases which contain a sulphur-ring supposed to have the form—

It is, however, now found that the sulphur present exercises a basic function, as is shown by the following products of the action of moderately concentrated nitric acid on these compounds: Thioquinanthrene tetranitrate, $C_{18}H_{12}N_2S_2,4HNO_3,2H_2O$, and the tetranitrates of *p*-tolutbioquinanthrene, and of the base yielded by *o*-toluquinone. The authors hence consider that the sulphur-ring is of the form—



the formula of thioquinanthrene then being—



This view is supported by the action of acetyl chloride on the bases, whereby the hydrochlorides of the corresponding acetylated bases are obtained; thus thioquinanthrene yields acetylthioquinanthrene hydrochloride, $C_{22}H_{16}O_2N_2S_2$, 2HCl. The acetyl group in such compounds is very loosely combined with the sulphur atom and is removed by gently heating with water. The bases form disulphates, that of thioquinanthrene having the composition, $C_{18}H_{12}N_2S_2$, $2H_2SO_4$.—T. H. P.

Higher Hydroperoxides; Existence of ——. A. Bach. Ber., 1902, **35**, [1], 158—160.

The author points out that Ramsay's criticisms (this Journal, 1901, 1254), of the author's work on this subject (this Journal, 1900, 863), are based on a misunderstanding. In answer to Armstrong's criticisms (Proc. Chem. Soc., 1900, **16**, 134), the author brings forward fresh experimental evidence, showing that mixtures of hydrogen peroxide solution with ordinary sulphuric or acetic acid give, on titration with permanganate, the theoretical quantities of oxygen. Hence the action of ordinary sulphuric acid on hydrogen peroxide gives rise to no compound ("persulphuric acid") which does not react with permanganate. The author concludes that the excess of oxygen found by him in the analysis of a peroxide solution prepared from potassium tetroxide and ordinary sulphuric acid could not be due to the catalytic decomposition of a substance not acted on by permanganate.—T. H. P.

Sodium Hydride; Preparation and Properties of ——. H. Moissan. Comptes Rend., **134**, [2], 71—75.

Sodium hydride, NaH, is obtained by heating sodium in carefully purified hydrogen at 360°—400° C. Transparent colourless crystals, soluble in melted sodium, attacked rapidly, even with incandescence, by the moisture in ordinary air, taking fire in oxygen at 230° C., in fluorine or chlorine at the ordinary temperature, decomposed explosively when heated with oxidisers such as potassium chlorate, or when projected into strong mineral acids. Heated *in vacuo*, it is resolved into its elements below the temperature at which metallic sodium attacks glass.—J. T. D.

Potassium Hydride. H. Moissan. Comptes Rend., **134**, [1], 18—21.

When hydrogen is passed over potassium at 160° C., there is formed a hydride, KH. The substance is white, crystalline, rapidly decomposed by water, takes fire at the ordinary temperature in fluorine, chlorine, or dry oxygen, possesses extremely strong reducing powers, and is very similar, both in appearance and in properties, to calcium hydride.

—J. T. D.

Strontium Hydride; Preparation and Properties of ——. H. Gautier. Comptes Rend., **134**, [2], 100—103.

By carefully heating the strontium-cadmium alloy (this Journal 1902, 121) in an atmosphere of pure dry hydrogen at a low red heat, maintaining a lower temperature in the part of the apparatus not containing the alloy, the whole of the cadmium is gradually expelled, and strontium hydride, SrH_2 formed. If the temperature be now raised till the hydride just fuses, it is rendered more compact and less easily alterable. The hydride is a white solid, which decomposes water with remarkable vigour, and is in all its properties similar to calcium hydride.—J. T. D.

Cupric Hydroxide; Action of ——, *on Aqueous Solutions of Metallic Salts.* A. Mailhe. Comptes Rend., **134**, [4], 233—236.

The author has extended his work (this Journal, 1901, 943; 1902, 173) to solutions of metallic nitrates. Mixed basic salts of the formula $M(NO_3)_2$, $3CuO$, $3H_2O$, were formed with zinc, cobalt, and nickel, all in green hexagonal plates isomorphous with the basic cupric nitrate—

$$Cu(NO_3)_2.3CuO.3H_2O.$$

A similar salt was obtained with manganese, but only in very small amount and with great difficulty. Cadmium gave a salt of the formula $Cd(NO_3)_2.CuO$ $5H_2O$; lead and mercury formed basic lead and mercuric nitrates respectively, while iron and aluminium were completely displaced from their nitrates.—J. T. D.

Alumina and Ferric Oxide at Incipient White Heat; Mutual Action of ——. H. Warth. Chem. News, 1901, **84**, [2196], 305.

In the course of an examination of gibbsite ($Al_2O_3.3H_2O$) from the Madras Presidency, possessing a pale reddish colour due to ferric oxide, the author observed that the mineral turned perfectly white when heated over the blowpipe flame. From further experiments with precipitated alumina and ferric oxide, it was found that even with as much as 7 per cent. of Fe_2O_3 in the mixed oxides, complete decolorisation ensued on heating over the blowpipe flame, but beyond this proportion, there was a slowly increasing brown tint, which was well pronounced with 18 per cent. of Fe_2O_3; the brownish tint continued up to 34 per cent. of Fe_2O_3, without any admixture of red. The absence of ferrous oxide and of magnetic oxide (Fe_3O_4) in the mixture, after heating over the blowpipe flame, was proved. It is worthy of note that whilst ferric oxide by itself has, at the temperature of the blowpipe flame, a decided tendency to change into magnetic oxide (Fe_3O_4), this tendency is checked by the presence of alumina. On the other hand, a mixture of alumina, with 6·8 per cent. of finely-pulverised magnetic

oxide, after careful ignition, also acquired a brown tint, and a test showed that the iron had been completely converted into ferric oxide.—A. S.

Potassium Cyanide and Cuprous Sulphocyanide; Interaction of ——. H. Itzig. Ber., **35**, [1], 106—110.

The author is engaged on the preparation of complex anions with a view to examining their stability. Several double cyanides of potassium and copper have been described, which the author groups under three classes; i. KCy, $Cu_2Cy_2 + H_2O$; ii. 2KCy, Cu_2Cy_2, and iii. 6KCy, Cu_2Cy_2. A double sulphocyanide, CuCNS, 12KCNS, is known, which is only stable in concentrated solution.

By boiling cuprous sulphocyanide with potassium cyanide solution, and filtering, the compound KCy, $Cu_2Cy_2 + H_2O$ was unexpectedly obtained. It cannot be produced by direct action of potassium and cuprous cyanides. By concentrating the filtrate, substances represented by 2KCy, Cu_2Cy_2, and Cu_2Cy_2, 4KCN, 2KCNS + H_2O were obtained. The first two agree with the above compounds i. and ii. got by other means, and the last resembles iii. with 2KCNS replacing 2KCN. It is very soluble in water, and gives peculiar reactions with $CuSO_4$ and $HgCl_2$ which point to the presence of a hitherto unknown anion.

Mercury Sulphocyano-cyanide.—The compound, $Hg(CN)_2$, KCNS, has been described as produced by mixing solutions of mercuric cyanide and potassium sulphocyanide. This, like the above-mentioned double cyanides, gives reactions indicative of complex ions. By boiling mixtures of 1 mol. of mercuric sulphocyanide with 1 mol. and with 2 mols. of potassium cyanide, only the already mentioned $Hg(CN)_2$, KCNS was obtained.—A. M.

Organo-Magnesium Compounds; Action of ——, *on Trioxymethylene.* V. Grignard and L. Tissier. Comptes Rend., **134**, [2], 107—108.

The ethereal solution of magnesium alkyl-bromide is boiled under a reflux condenser with trioxymethylene for one or two days; part of the ether is distilled off, and the boiling again continued for an hour or two. After cooling, the magma obtained is decomposed by ice, the precipitated magnesia dissolved in dilute sulphuric acid, and the alcohol formed is extracted and purified in the usual way. By this means, using, for example, magnesium ethyl bromide, normal propyl alcohol is obtained. The authors have thus prepared (with excellent yields in every case) normal propyl and butyl alcohols, isohexyl alcohol, benzyl alcohol, and α-naphthyl carbinol. The method promises to be very useful for the preparation of homologous alcohols and their derivatives.—J. T. D.

Melibiose. A. Bau. Chem. Zeit., **26**, [7], 69—70. (See also this Journal, 1899, 932.)

Rotatory Power of Crystalline Melibiose.—The rotatory power was determined in a solution after being previously boiled, and the amount of solvent ascertained after cooling. The mean of the results obtained gives the value $[\alpha]_D = + 129{\cdot}641$, equivalent to + 143·27 for anhydrous melibiose.

Identification.—Melibiose furnishes a pure phenyl-osazone, in the form of yellow flakes when fresh, but deep brown when dry; (m. pt. 178°—179° C.). The colour, though darker than that of lactosazone, is not, however, a reliable criterion. From water, the osazone recrystallises as fine needles 9—17 μ in length, and 1—1½ μ in breadth, often slightly bent, and occurring in warty aggregations.

Behaviour towards yeast is a reliable means of identification. Before performing the experiment, it is necessary to ascertain the behaviour towards melibiose of the top-and bottom-fermentation yeasts employed; should the former, when added to a solution of melibiose or melitriose, give, after fermentation, a strong reduction of cuprous oxide on being tested with Fehling's solution, whereas the bottom-fermentation does not give any red precipitate under similar conditions, then both yeasts are suitable for the main test

The substance suspected to contain melibiose must be free from constituents capable of restricting fermentation, in which event the presence of melibiose will be revealed by the results coinciding with those of the above preliminary test. Should, however, dextrins, galactose, pentoses, &c. be present, a quantitative analysis will be necessary. Such sugars as *d*-glucose, *d*-fructose, *d*-mannose, *d*-galactose, saccharose and maltose, can readily be eliminated by fermentation with a pure culture of top-fermentation yeast.

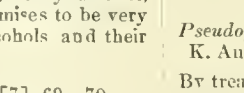
—C. S.

Hydroxy Acids; New Class of Aldehyde Derivatives of the ——, *especially Formal or Methylene Derivatives.* C. A. Lobry de Bruyn and W. A. van Ekenstein. Rec. trav. Chim. Pays Bas, 1901, **20**, 331; through Zeits. Vereins deut. Zuckerind., 1901, [551], 1021—1030.

Tollens and his collaborators have recently described a new series of compounds containing a methylene group, obtained by the condensing action of strong mineral acids upon mixtures of formaldehyde and polyhydroxy organic acids.

The authors have now prepared a somewhat similar class of bodies from hydroxy organic acids generally, by effecting the condensation in simple aqueous solution or better under anhydrous conditions in chloroform solution, the presence of mineral acids being most disadvantageous.

The difference between the compounds prepared by Tollens and those now described lies in the fact that in the former the carboxyl group remains unaltered, whilst in the latter it enters into the reaction together with the neighbouring alcoholic hydroxl. The new compounds are characterised by the grouping:



They are formed by evaporating a mixture of organic acid and formalin to dryness 10 or 12 times, or else by heating an excess of dry, powdered trioxymethylene with the acid and chloroform (with or without anhydrous sodium sulphate) in sealed tubes at 150° C., whereby the trioxymethylene is depolymerised. The reaction being reversible, the yields are small and the products are decomposed by prolonged heating with water and especially with alcohol; they are also resolved by heating to boiling with dilute caustic soda. The di-methylene derivative of α-tartaric acid, which is a neutral body, is fully described, the mono-derivative of citric acid is dibasic, and that of malic acid is mono-basic. The derivatives of many other hydroxy acids have been prepared in small quantities. Acetic and benzoic aldehydes react with hydroxy acids without a condensing agent to give similar compounds, which readily decompose.

—J. F. B.

Pseudophenols from Salicylaldehyde and Salicylic Acid. K. Auwers and L. Huber. Ber., 1902, **35**, [1], 124—131.

By treating salicylaldehyde or salicylic acid with formaldehyde or its derivatives and strong halogen hydrides, compounds having the formulæ $1.2.4.C_6H_3.OH.CHO.CH_2X$ and $1.2.4.C_6H_3.OH.CO_2H.CH_2X$ are obtained, where X = halogen (see also Eng. Pat. 17,118 of 1899; this Journal, 1900, 848). These compounds readily exchange their halogen, sometimes even in the cold, for the radicles of alcohol, water, organic acids and bases, giving products which, unlike the original compounds, are soluble in and are not attacked by aqueous lyes. The chloride, $C_6H_3.OH.CHO.CH_2Cl$ melts at 88° C., the corresponding bromide at 103° C., and the iodide, according to the authors, at 126° C. On boiling with water, or preferably on treatment with a mixture of acetone and water (3 : 1), these compounds are converted into hydroxymethylsalicylaldehyde, $C_6H_3(OH)CHO.CH_2OH$, melting at 108° C. The yellow alkaline or the colourless aqueous solution dyes the skin an intense yellow. The product gives an oxime, $C_8H_9O_3N$, melting at 121° C., whilst the monacetate, $C_6H_3.OH.CHO.CH_2OC_2H_3O$, obtained by boiling one of the above halogen derivatives with sodium acetate in acetic acid solution, forms shining needles melting at 61°—62° C. The oxime of this product crystallises in needles melting at 134° C. Both oximes yield the diacetate of the nitrile of hydroxymethylsalicylic acid, $C_6H_3.OC_2H_3O.CN.CH_2OC_2H_3O$, melting at 58° C., but it was not possible by hydrolysis with hydrobromic acid to obtain the product $C_6H_3.OH.CN.CH_2Br$. By reacting with the equivalent quantity of bromine on the acetate mentioned above, melting at 62° C., dissolved in glacial acetic acid, and finally passing

hydrobromic acid into the hot solution, bromomethylbromosalicylaldehyde, 1.2.6.4.C_6H_2.OH.CHO.Br.CH_2Br, separates on cooling. The product crystallises in shining needles from benzene and melts at 113° C. On boiling with aqueous acetone, hydroxymethylbromosalicylaldehyde is formed, which melts at 85° C. Its aqueous solution colours the skin yellow. When treated with sodium acetate it yields the monacetate melting at 102° C., which, like the acetate above (m. pt. 62° C.), behaves as a true phenol, being soluble in dilute caustic soda lye, from which solution it can be precipitated at once unchanged.

By evaporating a methyl alcoholic solution of chloromethylsalicylic acid, C_6H_3.OH.CO_2H.CH_2Cl, melting at 163° C., the latter is converted into methoxymethylsalicylic acid melting at 119° C. When hydrochloric acid gas is passed through the methyl alcoholic solution of this product, it reforms chloromethylsalicylic acid melting at 163° C. If this compound be digested for some hours with 10 times its weight of methyl alcohol containing 3—4 per cent. of hydrochloric acid, it yields methoxymethylsalicylic methyl ester, C_6H_3.OH.CO_2CH_3.CH_2OCH_3, which is a yellowish oil soluble in alkalis. When dissolved in methyl alcohol and treated in the cold with gaseous hydrochloric acid, it yields chloromethylsalicylic methyl ester, which crystallises from light petroleum spirit in white needles melting at 66° C. As a pseudophenol the compound is insoluble in alkalis and is readily decomposed by alcohols. By treatment with ammonia it is converted into the amide of methoxymethylsalicylic acid, C_6H_3.OH.$CONH_2$.CH_2OCH_3, melting at 108° C., but it has not been hitherto possible to convert this compound into chloromethyl-o-cyanophenol, C_6H_3.OH.CN.CH_2Cl.—T. A. L.

Amines, Aromatic; Thiosulphates of ——. A. Wahl. Comptes Rend., 1901, **133**, [26], 1215—1217.

When a solution of sodium thiosulphate is added to solutions of the hydrochlorides of primary amines (aniline, *o*-, *m*-, and *p*-toluidine, α- and β-naphthylamine), normal thiosulphates, $(NH_2R)_2$, $H_2S_2O_3$, crystallise out. Secondary and tertiary amines do not form similar salts, but sulphur deposits, sulphur dioxide escapes, and after a while the free base separates out. Such a base as paraphenylenediamine also forms a thiosulphate. These thiosulphates are as a rule well crystallised and stable salts; their aqueous solutions are acid in reaction, and decompose when heated. The solid salts also decompose when heated, but at a higher temperature than the solutions, yielding sulphur, sulphur dioxide, and free base.

With nitrosodimethylaniline hydrochloride, no thiosulphate is formed, but the free base is precipitated, and at the same time dimethylparaphenylenediaminethiosulphonic acid is obtained, identical with that obtained by Bernthsen by oxidising a mixture of dimethylparaphenylenediamine and sodium thiosulphate. The yield of this acid only accounts for 12—15 per cent. of the nitrosodimethylaniline which disappears; the other products of the reaction have not yet been investigated.—J. T. D.

Lactic Acid and Glycerin; Assimilation of ——, *by Eurotyopsis Gayoni*. P. Mazé. Comptes Rend., **134**, [4], 240—242.

Experiments on the growth of *Eurotyopsis* when fed with lactic acid or with glycerin, both in a confined atmosphere and with free access of air, shew that a given weight of the plant consumes more lactic acid than it does glycerin or invert sugar; but the ultimate composition of the plant is the same, no matter which of these three substances be its food. From the presence of traces of acetaldehyde when lactic acid is used, as also from the ratio of carbon dioxide produced to oxygen absorbed, the author concludes that the portion of the lactic acid molecule actually assimilated is alcohol, which is perhaps previously oxidised to aldehyde. The assimilation of glycerin takes place in a manner akin to that of sugar, though there is more oxygen absorbed for a given weight of plant produced than with sugar. Probably the glycerin, like mannitol, loses in the first place two atoms of hydrogen by oxidation.—J. T. D.

Opening of the Sir John Cass Technical Institute, Aldgate.

The work of this Institute, which has been established and endowed by the governors of the Sir John Cass Foundation, was inaugurated on Wednesday, January 15th. The founding of this new technical Institute has been effected by means of property bequeathed by Sir John Cass, for the purpose of providing education for the children and young persons of the ward of Portsoken, of the City of London, over which he presided as alderman from 1710 to the day of his death, 8th July 1718. Owing to the increased revenues of the foundation, the Charity Commissioners prepared a new scheme for the administration of the funds, which included provision for the establishment and maintenance of a technical institute. The scheme was approved by Her late Majesty, Queen Victoria, in Council in 1895. The Institute, which has been built from the designs of Mr. Arthur W. Cooksey, is situated in Jewry-street, Aldgate, and is one of the polytechnics aided by the Technical Education Board of the London County Council and by the City Parochial Foundation. The building comprises laboratories, workshops and class-rooms for chemistry, metallurgy, physics, art metal work, drawing, design and modelling; also well-equipped rooms for cookery, laundry-work, and dressmaking. It contains, in addition, a valuable library of technical literature and a reading room, a large gymnasium and social rooms.

The inaugural address was delivered by Sir W. Roberts-Austen, K.C.B., F.R.S. The chair was taken by Sir Owen Roberts, M.A., D.C.L., vice-chairman of the governing body of the Institute. After referring to the scheme of the work set forth in the syllabus of the Institute, Sir W. Roberts-Austen proceeded to the more immediate subject of his address, "Metallurgy." It was, he said, an industrial art depending for its success on what were called the applications of science. He heartily wished that the term "applied science" had never been devised. All his life he had endeavoured to show that there was no essential difference between what was called pure and what was called applied science. In industrial life they simply applied the facts of science to a particular set of conditions or to the solution of a definite set of problems. The man who made a patient and accurate observation in the course of industrial work was just as much advancing science as the one who devoted himself to the solution of problems which seemed to have no immediate bearing on practical efforts or to be in any way practically useful. In concluding his address, Sir William referred to the valuable work that the governors of the foundation had effected by the establishment and equipment of the Institute. The chairman of the governing body, Mr. Alfred Lyon, and the chairman of the Institute Committee, Mr. George Baker, thanked Sir W. Roberts-Austen for his address.

Trade Report.

I.—GENERAL.

Patent Law Amendment Bill.

Times, Feb. 11, 1902.

Mr. Gerald Balfour (Leeds, Central), in moving for leave to introduce a Bill to amend the law with reference to applications for patents and compulsory licences, and other matters connected therewith, said the Bill was based on the recommendations of a committee appointed by the Board of Trade, in 1900, to inquire into the working of the Patent Act respecting certain specific questions. One of these was the question of examining the specifications of letters patent previously granted in the United Kingdom. The other was that of granting compulsory licences. He did not think that it was necessary for him at this stage of the proceedings to explain or justify the provisions of the measure further than to say that they followed very closely the recommendations of the committee, which were unusually detailed, and that those he was asking leave to introduce were a translation in the language of an Act of Parliament. He was aware that the public were of opinion that the committee

were not absolutely unanimous with respect to the recommendations, but he had followed closely the lines of them. It would be well to allow a considerable interval to elapse between the first and second reading of the Bill, in order to give those interested in the question an opportunity of studying the provisions. He would undertake on his part to consider most carefully and with an open mind any considerations that might be made to him.

Mr. Lewis (Flint Boroughs) said he was glad to hear that the right hon. gentleman proposed to follow the recommendations of the Select Committee, and to allow a considerable interval between the first and second reading stages. There could be no doubt that our patent law at the present time was in great need of amendment.

The Bill was brought up and read a first time.

The following is the text of the Bill :—

A Bill to amend the Law with reference to Applications for Patents and Compulsory Licences, and other matters connected therewith.

Be it enacted by the King's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows :—

1.—(1.) Where an application for a patent has been made and a complete specification has been deposited by the applicant, the examiner shall, in addition to the inquiries which he is directed to make by the Patents, Designs, and Trade Marks Act, 1883 (in this Act referred to as the principal Act), make a further investigation, for the purpose of ascertaining whether the invention claimed has been wholly or in part claimed or described in any specification (other than a provisional specification not followed by a complete specification) published before the date of the application, and deposited in the Patent Office pursuant to any application for a patent made within *fifty years* next before the date of the application.

(2.) If on investigation it appears that the invention has been wholly or in part claimed or described by any such specification, the applicant shall be informed thereof, and the applicant may, within such time as may be prescribed, file an amended specification, and the amended specification shall be investigated in like manner as the original specification.

(3.) The examiner shall report to the comptroller the result of his investigations in such manner as the Board of Trade may direct.

(4.) The provisions of subsection five of section nine of the principal Act, as amended by any subsequent enactment, shall apply to reports under this section.

(5.) If the comptroller is satisfied that no objection exists to the specification on the ground that the invention claimed thereby has been wholly or in part claimed by a previous specification as before mentioned, he shall, in the absence of any other lawful ground of objection, accept the specification.

(6.) If the comptroller is not so satisfied, he shall, after hearing the applicant, and unless the objection be removed by amending the specification to the satisfaction of the comptroller, determine whether a reference to any, and, if so, what, prior specifications ought to be made in the specification by way of notice to the public.

(7.) An appeal shall lie from the decision of the comptroller under this section to the law officer.

(8.) Section eight of the principal Act and section three of the Patents, Designs, and Trade Marks (Amendment) Act, 1885 (which regulate the time for depositing a complete specification), shall have effect as if references therein to the period of nine months were references to the period of *six months*.

(9.) The investigations and reports required by this section shall not be held in any way to guarantee the validity of any patent, and no liability shall be incurred by the Board of Trade or any officer thereof by reason of, or in connexion with, any such investigation or report, or any proceeding consequent thereon.

(10.) An invention shall not be deemed to have been anticipated by reason only of its publication in a specification deposited in the Patent Office pursuant to an application made not less than *fifty years* before the date of the application for a patent therefor, or of its publication in a provisional specification of any date not followed by a complete specification.

(11.) The Board of Trade, with the sanction of the Treasury, may prescribe an additional fee not exceeding *one pound* in respect of the investigation mentioned in this section, which shall be payable on the sealing of the patent.

(12.) This section shall come into operation at such date as the Board of Trade may by order direct, and shall apply only to applications made after that date.

2. Section twenty-two of the principal Act (relating to the grant of compulsory licences by the Board of Trade) is hereby repealed, and the following provisions shall be substituted therefor :—

(1.) If, on the application of any person interested, it is proved to the satisfaction of the court that the reasonable requirements of the public with reference to the invention have not been satisfied by reason of the neglect or refusal of the patentee to work the patent or grant licences on reasonable terms, the court may order the patentee to grant licences on such terms as to the duration of the licence, the amount of royalties, security for payment, or otherwise, as the court, having regard to the nature of the invention and the circumstances of the case, may deem just.

(2.) On the hearing of any application under this section, the patentee, and any person claiming an interest in the patent as exclusive licensee or otherwise, shall be made parties to the proceeding, and the law officer, or such other counsel as he may appoint, shall be entitled to appear and be heard.

(3.) In any proceeding under this section the court may, if it thinks fit, and shall, on the request of any party to the proceeding, call in the aid of an assessor specially qualified, and try and hear the case wholly or partially with his assistance.

(4.) An order of the court under this section shall, without prejudice to any other method of enforcement, operate as if it were embodied in a deed made between the parties to the proceeding.

(5.) In awarding costs under this section, the court shall have regard to any previous request for, or offer of, a licence made either before or after the application to the court.

(6.) An appeal shall lie from the order of the court to the Court of Appeal; but, except by leave of the Court of Appeal, no appeal shall lie to the House of Lords from any order made by the Court of Appeal.

(7.) If an order granting a licence is subsequently reversed or varied on appeal, the appellate court may impose such terms as they may think just with respect to the validation of things done, and the disposal by sale or otherwise of articles manufactured, under the licence before the order granting it was reversed or varied.

(8.) Subject to the provisions of this section, all matters of practice and procedure in relation to the grant of compulsory licences shall be regulated by rules of court.

(9.) This section shall apply to patents granted before as well as after the commencement of this Act.

(10.) In the application of this section to Scotland, "law officer" means the Lord Advocate, and in the application of this section to Ireland, "law officer" means the Attorney-General or Solicitor-General for Ireland.

3. In subsection four of section eighty-two of the principal Act (which relates to the performance of the duties of the comptroller by other officers under the direction of the Board of Trade) the words "in his absence" shall be repealed.

4.—(1.) This Act may be cited as the Patents Act, 1902, and may be cited and shall be construed as one with the Patents, Designs, and Trade Marks Acts, 1883 to 1901.

(2.) It shall, except as otherwise provided therein, come into operation on the *first day of January one thousand nine hundred and three*.

(See also this Journal, 1902, 212.)

Imports from Foreign Countries and British Possessions.

Bd. of Trade J., Feb. 13, 1902.

	Month ended 31st January	
	1901.	1902.
	£	£
I.—Animals, living (for food)	697,419	649,882
*II.—(*a*) Articles of food and drink, duty-free.	13,843,506	14,829,213
*(*b*) Articles of food and drink, dutiable.	4,084,853	5,383,665
Tobacco, dutiable	402,322	399,783
III.—Metals	2,855,315	2,609,354
IV.—Chemicals, dyestuffs, and tanning substances.	491,300	525,509
V.—Oils	972,291	1,111,860
VI.—Raw materials for textile manufactures.	9,218,659	10,892,272
VII.—Raw materials for sundry industries and manufactures.	4,073,790	3,872,232
VIII.—Manufactured articles	7,824,748	7,745,243
IX.—(*a*) Miscellaneous articles	1,435,851	1,958,030
(*b*) Parcel Post	87,462	94,305
Total value	45,987,516	50,131,348

*Sugar and cognate articles became liable to duties on the 19th April, 1901, and are included in Section II. (B.) throughout the present Return.

Note.—The values of the imports represent the cost, insurance, and freight. Those of the exports, the cost and shipping charges, and are known as the "free on board" values.

Exports of British and Irish Produce and Manufactures.

Bd. of Trade J., Feb. 13, 1902.

	Month ended 31st January	
	1901.	1902.
	£	£
I.—Animals, living	40,940	47,119
II.—Articles of food and drink	1,018,525	1,232,048
III.—Raw materials	2,877,086	2,392,912
IV.—Articles manufactured and partly manufactured, viz.:—		
(*a*) Yarns and textile fabrics	9,943,086	9,779,079
(*b*) Metals and articles manufactured therefrom (except machinery and ships).	3,622,553	3,589,009
(*c*) Machinery and mill work	1,458,458	1,419,341
(*d*) Ships, new (not registered as British).	449,667	584,240
(*e*) Apparel and articles of personal use.	1,103,788	1,046,532
(*f*) Chemicals and chemical and medicinal preparations.	852,450	756,377
(*g*) All other articles, either manufactured or partly manufactured.	3,092,136	3,118,757
(*h*) Parcel Post	294,842	289,160
Total value	24,753,531	24,254,574

Exports of Bolivia through Antofagasta (Chile), during 1900.

Foreign Office Annual Series, No. 2736.

Products.		Quantity (approximate).	Value (approximate).
			£
Antimony	Tons	302	22,569
Copper bars (small)	„	60	3,659
Tin bars (small)	„	8,721	195,371
"Bismuth of silver"	„	31	6,165
Borate of lime	„	1,491	11,138
Cascarilla (Peruvian bark)	„	2¾	315
Copper bars	„	4	476
Goat skins	„	50	1,887
Chinchilla skins	Dozen	41,849	84,744
Kid skins	Tons	3¾	167

Exports of Bolivia, &c.—*continued.*

Products.		Quantity (approximate).	Value (approximate).
			£
Hides	Tons	239	12,507
Copper ingots	„	3,975	106,880
Tin bars	„	1,568	97,916
Gum	„	2¾	520
Wolfram metal	„	2	120
Alloy minerals	„	13½	2,780
Antimony minerals	„	877	65,510
Copper minerals	„	882	13,182
„ and silver minerals	„	5	94
Tin minerals	„	76	370
Silver minerals	„	23,340	1,742,738
Wolfram minerals	„	125	7,153
Silver and lead minerals	„	102	1,558
Gold minerals	„	1	150
Zinc minerals	„	106	8,077
Gold bars	Troy oz.	93¾	399
Silver bars	„	93,660	11,244
Gold bearing lead bars	Tons	4,731	72,110
Lead bars	„	179	2,733
Sulphide of silver	„	102	124,722
Cinchona	„	62	4,665

Imports and Exports of France (1899—1900).

Foreign Office Annual Series, No. 2737.

Return showing the Principal Articles of Import from the United Kingdom (including Malta and Gibraltar) during the Years 1899—1900.

Articles.	Value.	
	1899.	1900.
	£	£
Chemicals and chemical manures	983,358	926,920
Copper and copper ore	657,801	291,720
Skins, dressed	506,351	647,200
Indiarubber goods	350,762	403,360
Pottery, glass and crystal wares	342,200	342,800
Rubber	307,416	345,560
Coal tar	258,219	319,480
Raw hides and peltries	241,121	357,520
Leather goods and dressed peltries	235,097	111,440

Statement showing Value of Exports from France to the United Kingdom (including Malta and Gibraltar) during the Years 1899—1900.

Articles.	Value.	
	1899.	1900.
	£	£
Brandy, spirits, and liqueurs	938,009	959,000
Raw hides and peltries	896,001	736,520
Sugar, refined	760,439	1,112,800
Pottery, glass, and crystal	718,774	782,320
Oils, essential	185,118	225,040
„ others	183,804	128,520
Caoutchouc, gutta-percha	170,079	326,270
„ manufactures of	139,198	103,840
Margarine	104,696	84,960
Perfumery	103,328	130,040
Sugar, raw	2,196,730	3,868,440
Dressed skins	2,138,712	1,847,120
Chemicals	538,946	515,000
Copper and copper ore	1,145,812	1,195,000
Leather goods and dressed peltries	1,548,028	1,847,120
Rags	373,726	368,200

Imports and Exports of Chile.

Foreign Office Annual Series, No. 2736.

The greatest increases in imports, during 1900, occurred in brown sugar, tallow, empty bottles, glassware, drugs, stearin and matches.

The manufacture of stearin candles seems to be definitely established; an increase in the import of stearin amounted to 264 per cent., corresponding with a decrease of 63 per cent. in the import of candles.

The main increase occurred in the export of nitrate, which totalled 109,945,156 pesos (about 8,245,886*l.*), an increase, over 1899, of 13,294,874 pesos (about 997,115*l.*).

Copper bars showed an increased export of 2,970,927 pesos (about 222,819*l.*), the total shipments amounting to 17,899,200 pesos (about 1,342,440*l.*).

Other increases occurred in wax, auriferous copper bars, copper ingots, guano and trefoil seed.

Of the British exports, over 91,000,000 pesos represented nitrate, copper and copper ores, guano, borate of lime, and quillai bark being also important.

IV.—COLOURING MATTERS, Etc.

Natural Indigo in India.

Manchester Guardian, Jan. 7, 1902.

Fuller particulars are now available of the controversy that has been raging in Calcutta, between indigo planters and buyers, as to what, under present conditions, is the market value of new-crop indigo. Until a few years ago, the extent of the crop, outstanding stocks, and the volume of the demand were the controlling elements. As a general rule, a small crop meant higher prices for the planters, and a large crop, the contrary. When the ordinary trade demand was satisfied, and the estimated requirements covered, enterprising houses were ready to take the residue, and hold for an advance, which always came, sooner or later. Upon occasion, efforts were made to corner the article, and large buyers acting in unison so far monopolised stocks, as to practically control prices for the time being. In those remote times, values of good medium qualities of indigo fluctuated violently between 3*s.* and 6*s.* to 7*s.* per lb., but recently the range has contracted to 2*s.* 6*d.* to 4*s.*, anything above the latter figure being now looked upon as extreme.

To-day artificial indigo practically dominates the Calcutta market. The planters have struggled hard, but vainly, to get higher prices than last season's average for their produce. Buyers have made out an unanswerable case for not meeting planters' desires, pointing out that, if the new Calcutta crop were wholly held over, existing stocks, supplies from other sources, and artificial products would in themselves more than suffice to meet the world's requirements, as shown by the following figures:—

	Chests.
Estimated stocks, England, Continent, and America, January 1, 1902	9,000
Madras crop (say equal)	15,000
Central America "	5,000
Java "	5,300
Estimated total supply of natural indigo, excluding Calcutta crop	34,000
Estimated production of artificial indigo 1902 (say equal)	16,000
Total prospective supply, excluding Calcutta crop	50,000
Estimated world's annual consumption	40,000

If to this is added, say, 28,000 chests for the Calcutta crop, the strength of the buyers' position, as compared with the sellers', is obvious. The planters are now accepting readily last season's average rates, which are rather below London July values.

The gradual growth of the supplies of artificial indigo is shown by the following figures:—1898, equal to 2,760 chests; 1899, equal to 6,850; 1900, equal to 11,000; and 1901, equal to 14,000 chests. A somewhat remarkable fact accompanying this development has been that natural indigo in competition has fully held its own in price. This is accounted for, partly by a sequence of poor crops in 1896—1900, but, chiefly, by the preference still undoubtedly shown for the natural dye by most consumers.

VII.—ACIDS, ALKALIS, Etc.

Nitrate of Soda Statistics for January, 1902.

W. Montgomery and Co., Feb. 3, 1902.

The deliveries in Europe, during January, amounted to 70,000 tons, against 55,000, in Jan. 1901. The shipments were cabled as only 69,000 tons, the loading still being interfered with by the strike at Iquique, which has now lasted for six weeks, without any prospect of termination.

The visible supply amounts to 617,000 tons, against 829,000 tons, on the same date last year. The shrinkage in the supply has produced a very firm market, the few available cargoes being eagerly competed for at 10*s.* 3*d.* to 10*s.* 4½*d.* per cwt.

Position of the German Soda Industry in 1901.

R. Hasenclever. Chem. Ind., 25, [3], 73—75.

The proposed reduction of the import duty on soda is viewed with surprise and alarm by the German soda-makers. In the new tariff scheme, out of 144 chemical products, a reduction of duty is proposed only on five: graphite, crystallised, calcined, and caustic soda, and bleaching powder.

The following table shows the import duties in marks per 100 kilos. on the varieties of soda at different dates:—

	Crystals. Soda Content, 21.	Soda Ash. Soda Content, 57.	Caustic. Soda Content, 70.
1857	6·00	6·00	20·00
1865	1·50	4·00	6·00
1873	1·50	1·50	6·00
1880	1·50	2·50	4·00
Present proposals	0·90	1·50	3·50

The result of the reduction in 1873 (which is said to have been made to appease the papermakers, whose proposal that the export of rags should be prohibited was not approved by the Government) was that the production of soda went down from 58,000 to 42,500 tons. On the other hand, the increase of duty in 1880 greatly benefited the soda-makers, and cannot have been detrimental to the soda users, as the enormous development of German chemical industries since that date shows. The new proposals, if carried, will greatly injure the German alkali trade; for, while even in 1880, it was admitted on all hands (and this was the chief argument for the increased duty) that the German makers were heavily handicapped, as compared with the English makers, in the matters of original cost of raw materials, carriage, &c., there has since that time been no improvement in this respect, but rather the reverse. Coal, which for many years cost the Rhenania works on the average 7 marks per ton, now costs 13·60; and as the profits on State Railways form an important item in the Imperial revenue, and the Government refuse to establish a canal system, reductions in the cost of carriage are not to be looked for. The only well-situated ammonia-soda work is that of the German Solvay Co., in Bernburg, where, besides the brine, there are worked on the spot limestone and lignite; all the other works pay heavy freights on their materials, and this is still more the case with the Leblanc soda works, the raw materials of which weigh eight times as much as their products. Of 21 Leblanc soda works in existence 20 years ago, only five remain; the reduced tariff would inevitably cripple these. It would make Germany the most favourable foreign market for the English and American soda makers; the present tariff just prevents this, as the following table of tariffs (marks per 100 kilos.) shows:—

	Crystals.	Soda Ash.	Caustic.
France	1·54	3·30	5·25
Austria	1·60	2·40	6·00
Russia	11·00	11·00	18·00
Germany	1·50	2·50	4·00
United States	1·85	3·46	6·92

In the only European countries where there is no import duty, Holland and Belgium, the soda industry has died out, with the single exception of Solvay's original work at Couillet.

In 1879, the increased tariff proposals were opposed by the users of soda, who preached a free-trade doctrine; but the makers of dyestuffs did not oppose the higher tariff. Now, however, it would appear that the dyestuff makers have joined with the soap boilers in advocating the reduction. They have no foreign competition to speak of, and hence can afford to advocate a free-trade policy. It would seem that the present proposals are a compromise between the maintenance of the present duty and its total abolition; but the author hopes that the proposals may yet be negatived, and that the soda makers will not suffer for their faith in the permanence of the present duty, which has induced them to sink large capital in additions to works and improved plant.

The following table shows the progress of the industry for 30 years; it will be remembered that, as stated above, changes in the duty came into force in 1873 and 1880:—

Year.	Total Production.	Total.		Excess.	
		Import.	Export.	Import.	Export.
1872	58,000	13,335	2,005	11,330	..
1873	..	16,695	1,651	15,044	..
1874	..	22,276	1,648	20,628	..
1875	..	25,432	1,784	23,648	..
1876	..	27,664	4,067	23,597	..
1877	..	26,684	2,806	23,878	..
1878	42,560	25,101	3,353	21,748	..
1879	..	26,626	2,638	23,988	..
1880	..	22,150	3,615	18,535	..
1881	81,000	20,360	4,256	16,104	..
1882	..	19,823	4,597	15,226	..
1883	..	14,826	6,934	7,892	..
1884	..	10,726	14,630	..	3,904
1885	..	8,591	15,470	..	7,079
1886	135,000	4,469	15,408	..	10,939
1887	..	4,105	19,741	..	15,636
1888	..	3,293	21,096	..	17,803
1889	..	2,275	21,757	..	19,482
1890	..	1,531	30,233	..	28,702
1891	210,000	380	41,489	..	40,609
1892	..	952	42,425	..	41,473
1893	..	1,166	36,772	..	35,606
1894	..	1,404	41,533	..	40,129
1895	..	1,785	36,458	..	34,673
1896	257,000	2,306	47,363	..	45,057
1897	..	2,224	51,571	..	49,347
1898	..	1,428	43,773	..	42,345
1899	..	2,178	45,585	..	43,407
1900	..	6,157	47,055	..	40,898
1901	325,000	..	..	..	..

—J. T. D.

Emery in Greece and Turkey.

U.S. Cons. Reps., Jan. 22, 1902.

Two years ago, an American Company made an offer to the Greek Government to buy 7,000 tons of emery per year, for ten years, at 106½ francs per ton, but the arrangement fell through. The total annual consumption of Naxos emery is 5,000 to 6,500 tons. Of this, the United States takes 1,500 to 2,000 tons, and Europe, 4,000 to 5,000 tons. The Naxos mines have never been leased.

Turkey has emery mines in the neighbourhood of Smyrna. Some mines are the property of the Government, but many are owned locally. The total annual exports of Smyrna emery stone range from 17,000 to 20,000 tons, of which 10,000 tons go to America, and the balance to Europe. The amount of corundum found in Turkish emery varies from 40 to 57 per cent., with the exception of Kuluk stone, which is said to contain about 37 per cent. Corundum in the Naxos stone is reputed to run as high as 60 per cent. The prices of Smyrna stone vary with the quality from 2*l.* 16*s.* to 4*l.* per ton, f.o.b. Smyrna. No emery can be produced f.o.b. Symrna for less than 2*l.* 10*s.* The Kuluk stone is shipped from the port of Kuluk, where it is quoted f.o.b. Kuluk, at 2*l.* to 2*l.* 8*s.* per ton. Turkish stone is not "treated" after leaving the mine, except by hand picking; it is never washed or crushed.

Sulphate of Copper for Greece.

U.S. Cons. Reps., Jan. 21, 1902.

A United States firm has been awarded the contract to supply copper sulphate (500 tons) to the Currant Bank of Greece, to be used in combating the peronospera.

The conditions governing the bids were:—

(1) The quality of the copper sulphate must be 98 to 99 per cent. pure, as determined by a chemical analysis certified by the Greek consular officer of the place of shipment, the right being reserved by the bank to subject it to a second analysis upon its receipt.

(2) It is to be packed in barrels made of dried wood with iron hoops, each barrel to have a net weight of 5 cwts. (English), or 560 pounds.

(3) Prices are to be quoted c. i. f. Patras.

(4) The delivery must be made by the 28th of February, 1902, in one or several shipments at the convenience of the seller, but the entire amount to be in hand at the expiration of the above date.

(5) The Currant Bank will deposit the value of the sulphate with one of the banks of this city, to be selected by the seller, to which he will send the bills of lading, &c. Upon the arrival of the sulphate, the seller will draw upon the bank for the amount.

(6) Every bonâ fide bidder must deposit 10,000 drachmas (250*l.*) in securities satisfactory to the Currant Bank as a guarantee of the fulfilment of the contract.

(See also this Journal, 1901, 1041.)

Hyposulphite of Soda in Chile.

Bd. of Trade J., Feb. 13, 1902.

A law has recently been passed by the Chilean Congress, exempting hyposulphite of soda from Customs duty on importation into Chile.

VIII.—GLASS, POTTERY, AND ENAMELS.

China and Earthenware Trade of Smyrna (Turkey).

Bd. of Trade J., Feb. 6, 1902.

The following particulars relating to the porcelain trade of Smyrna were published in the *Moniteur Officiel du Commerce*, of the 23rd ult.:—

France, Germany, and Austria share the trade of Smyrna in porcelain, the annual value of which amounts to 5,200*l.* to 7,000*l.* The principal porcelain articles which are sold at Smyrna are as follows:—

Table services, tea services, coffee cups, toilet services, night lamps, match-boxes, tankard stands, ash-pans.

"Articles de luxe" do not sell well, cheapness being the chief desideratum. The Smyrna trade requires only articles of low qualities, both white and ornamented.

France exports to Smyrna articles of second quality only, *i.e.*, the best quality sold there, the chief being table services at 2*l.* 16*s.* to 8*l.* per set of 120 pieces, tea services from 8*s.* to 16*s.*, coffee cups from 4*s.* to 9*s.* 7*d.*, and toilet services from 5*s.* 7*d* to 24*s.*, according to quality.

Austria, which formerly had almost a monopoly in the ordinary porcelain article, has been ousted by Germany, and now the value of her trade barely reaches 800*l.* per annum. Austria supplies table and toilet services.

Germany is at the present time the chief supplier of porcelain articles to Smyrna. Her yearly sales reach the sum of about 4,000*l.*, of which 3,200*l.* are of good and second quality, and 800*l.* ordinary articles. Tea and table services, toilet services, and ash-pans are sold c.i.f. Smyrna, as well as coffee cups of good and medium quality, but more especially those of common make, which sell at 4*d.* per dozen, c.i.f. Smyrna.

Russia has no direct trade with Smyrna in porcelain articles, but a small quantity of teapots and saucers of Russian manufacture are sent *viâ* Constantinople, and sold at moderate prices. The value of the trade is estimated at about 80*l.* per annum.

The Smyrna buyer attaches great importance to the rate quoted for goods covering cost in full of freight, insurance, &c., to Smyrna, instead of free to the station of the town of departure.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Cement in the United States.

Eng. and Mining J., Jan. 25, 1902.

In the January number of *Stone* is given a warning against the apparent danger of an over-production of cement in the United States. The production, especially of Portland cement, has been increasing at a very rapid rate, and even at the present time, it is probably in excess of the demand, notwithstanding the great activity in building which has resulted from the prosperity of the past two or three years. The older established companies have undoubtedly built up a very large and prosperous trade, and the present danger is that the newer concerns will be driven to force their product upon the market at all sorts of prices in consequence of the necessity of obtaining cash returns, which many of them must have. This tendency to too rapid expansion is especially apparent in Michigan, where the number of new concerns started during the past year has been very considerable, and where there is a probability that, if all the new companies go into operation, they will not only produce more than can be sold; but it is also possible that the plants operated will be much too large for the supply of cement material in the State. At present there is a tendency to seize upon every deposit of so-called marl; but not all the marl is suited for the manufacture of cement, and it is very probable that too little discrimination has been exercised in this respect.

Scouring-bricks: Customs Decision (United States).

Bd. of Trade J., Jan. 6, 1902.

Scouring bricks, prepared from ground pumice stone and sand, mixed and pressed into different sizes, are dutiable as "pumice stone wholly or partially manufactured," under par. 92 of the Tariff, at the rate of 6 dols. per ton.

X.—METALLURGY.

Mineral Production of Canada for 1901.

Imp. Inst. J., Feb. 1902.

The metallic products of Canada chiefly comprise gold, silver, lead, nickel, copper, zinc, and pig iron; whilst, in the United States, besides these, there are produced mercury, antimony, platinum, and aluminium, which do not appear in the Canadian returns. Antimony is found in one province of Canada, Nova Scotia, and was at one time produced to a small extent, but a lawsuit stopped operations. Aluminium, although not yet produced in Canada, exists in deposits to the extent of millions of tons. Canada also has corundum, but it is too valuable for its abrasive powers to be used to provide aluminium. The production of corundum is this year being undertaken in Canada on a somewhat extensive scale.* Copper mining companies are now in existence in Canada, having an authorised capital exceeding 140 million dollars, only a small proportion of which has so far been actually employed. Eight of these companies—namely, four in Ontario, two in Quebec, and one each in Nova Scotia and New Brunswick—are working mines of copper and pyrites; six companies, all in Ontario, copper and nickel; 32, in British Columbia, gold and copper. In nickel, Canada outstrips the United States and all other countries.

The non-metallic division of the mineral wealth of the United States and Canada comprises fuels, building materials, abrasive materials, chemical materials, pigments, and what one may term "miscellaneous." The fuels include coal, natural gas, and petroleum. In these, as in the metallic division, Canada is gaining rapidly on the United States. The products of the latter country were 31 times greater than that of Canada, in 1890, but fell to 27 times greater, in 1900. The increase, in that period, in the United States was 75·9 per cent., and in Canada, 120·7 per cent. In building materials, such as stone, tiles, clay for brick, and cement, Canada's increase in the same period was 67 per cent., against 19 per cent., in the United States. Canada (Ontario) is unique in that it is the only maker of arsenic on the continent of America. Last year the Canadian Goldfields Company, Ltd., produced 606,000 lb. of arsenic, of an estimated value of 22,725 dols., as a by-product of their gold-milling operations.

* See also this Journal, 1901, 855.

Nickel Mining in Silesia (Germany).

Eng. and Mining J., Jan. 25, 1902.

It is stated in *Stahl und Eisen* that the Martha and Benns nickel mines, in the district of Frankenstein, Silesia, are making steady progress. Whilst, in 1899, only 80 tons of nickel ore were mined, the production rose to nearly 4,000 tons, in 1900, valued at about 4,000*l.* The smelter is installed at the Martha Mine, and has a daily capacity of 20 tons.

XII.—FATS, OILS, Etc.

Copra, Cocoanut-Oil, and Vegetable Tallow in the Straits Settlements.

Imp. Inst. J., Feb. 1902.

During 1900, there was imported into the Straits Settlements 93,074,933⅓ lb. of copra, the import value of which was 4,455,489 dols. Mexican. During the same year there was exported 91,160,026⅔ lb. of copra, valued at 4,416,937 dols. Mexican. Of cocoanut oil, there was imported during 1900, 10,105,733⅓ lb., the import value of which was 1,011,679 dols Mexican. The exports amounted to 14,740,553⅓ lb., the value of which was 1,500,910 dols. Mexican. Imports of cocoanuts amounted, in 1900, to 21,409 dols. in Mexican currency, and the export to 311,773 dols. Mexican, showing a large local production. Of vegetable tallow, imports, during the year 1900, amounted to 52,533⅓ lb., valued at 7,034 dols. Mexican, whilst exports amounted to 91,900 lb., valued at 37,948 dols. Mexican. About 60 per cent. of these imports came from Japan, and the remainder from Burma; all the exports went to Great Britain.

Soap, Oil, and Candle Industry at Salonica (Turkey).

Eng. and Mining J., Jan. 25, 1902.

Soap.—In *Les Corps gras Industriels* the annual importation of Marseilles soaps at Salonica is estimated at 200,000 frs. The sales may be considerably extended in spite of local manufacture.

The local soaps, produced principally at Mitylene and in Crete, owe their extremely low prices to the introduction of a large quantity of talc. If the French manufacturers were to produce a similar quality, so as to compete with the prices of the local soaps, they would secure a large market at Salonica and in Macedonia.

The products employed for the manufacture of the local soaps are talc (296 tons), coming principally from Marseilles, and, in less quantities from Trieste and from Italy; and soda (total importation, 523 tons), 326 tons being imported from England, and 182 tons from Antwerp.

Seed Oils (total importation, 558 tons, valued at 418,000 frs.) come entirely from Marseilles. Italy furnishes almost all the sulphurated oils—1,042 tons, valued at 782,000 frs., out of a total of 1,104 tons, valued at 828,000 frs. The remainder is divided between France and Germany.

Candles.—The sale of French candles at Salonica is insignificant. Holland (140 tons) and Italy (60 tons) are the principal providers. To judge by the figures of importation of French candles at other places in the Levant, it must be possible to increase this figure greatly.

Olive Oils.—French oils of good brands find a sure market at Salonica, where, however, they are sought for by a limited class of consumers. The necessity of shipping to Turkey only absolutely pure olive oils is essential. Those containing cottonseed, arachis, or sesame oil, are barred at

the Salonica custom house. The slightest trace of cotton-seed oil is sufficient to warrant confiscation, or a return to the consignor. This has often occurred, according to importers, when the olive oils have only been transported in barrels which formerly contained cottonseed oil.

XIII. A.—PIGMENTS, PAINTS, Etc.

"Lithopone": Customs Decison (Russia).

Bd. of Trade J., Feb. 6, 1902.

The following decision has regard to the classification under the Russian Tariff:—

Tariff classification of "lithopone."—The white paint known as "lithopone," consisting of sulphate of baryta and zinc sulphide, is dutiable, under section 137 of the Tariff, at the rate of 4 roubles 50 copecks per pood (1*l.* 9*s.* 7*d.* per cwt.), with the addition of the surtax of 10 per cent., laid down by the Imperial Ukase of the 5th August, 1900.

XIII. C.—INDIA-RUBBER, Etc.

Balata in Dutch Guiana.

India-Rubber and Gutta-Percha Trades' Journal (through Imp. Inst. J., Feb. 1902).

The balata industry in Dutch Guiana is flourishing, the revenues from concession fees for these having amounted to 800*l.*, in 1900. Not less than 14,820,000 acres were set apart for the purpose of testing the presence of balata, and concessions have been granted for 395,200 acres. There is a growing request for this article, owing to the higher prices obtained in the market. The chief export of balata goes to the United States and to Great Britain. Through the severe by-laws, prohibiting the felling of balata trees in Surinam, a decrease of the trees will very probably be prevented, although control is very difficult. This is mostly done through journeys of policemen, especially in the district of Nickerie. On Jan. 17th, 1901, the Governor published the conditions, according to which, in future, four months concessions for ascertaining the presence of balata will be granted free of charge. Its wording is as follows:—(*a*) No exploitation must take place. (*b*) The expeditions must consist of a foreman and six workers for every 123,500 acres, or part of it. (*c*) Within three weeks from the day of granting concession, a certificate must be sent to the police at the Government-Secretariat, that the persons named are engaged by contract, and one month after the granting of concession, another certificate that the expedition is on its way. (*d*) The concession will at once be cancelled (i) if the respective papers be not sent in properly in the time mentioned above; (ii.) if it be furthermore evident that the company does not carefully follow the conditions under (*b*) and (*c*), or tries to avoid them, if laws regarding public order, safety, or health be not respected, or if exploitation take place on ground that is only granted for testing.

XIV.—TANNING; LEATHER; GLUE, Etc.

Tannic Acid from Sorrel.

Handels Museum (through Imp. Inst. J., Feb. 1902).

The constantly increasing difficulty of obtaining the necessary tannic acid for the preparation of leather is mostly caused by the fact that the tanning stuffs formerly used have been extracted from the bark or fruit of trees. These grow slowly, and, in consequence, large tracts of land are necessary for obtaining the needed supplies. The endeavours to rectify these conditions, by using a quick-growing plant containing tannic acid, have been successful, through the discovery, in the plains of Mexico and California, of a sorrel (*Rumex hymenosepalus*), in the bulbs of which tannic acid exists. In a dried condition, 35 per cent. of tannic acid is produced. As the wild plants were soon exhausted, plantations were commenced, in 1896, and the large bulbs were used for tanning, and the smaller ones for cultivating new plantations. The tannic acid is much increased by the plentiful use of water. The plants grow to the length of about a metre, and the leaves make an edible vegetable.

(It is interesting to note that the experimental cultivation of *Rumex hymenosepalus* was undertaken some years ago in New South Wales, but no further development appears to have resulted.)

XVI.—SUGAR, STARCH, Etc.

New Sugar Plant in Paraguay.

Ch. of Comm. J., Feb. 1902.

Some time ago, a plant (growing in the north of the country), which is distinguished on account of its sweetness, was examined and described by the Director of the Agronomical Institution, at Asuncion. This plant, which has been christened botanically *Eupatorium Rebaudianum*, is called by the Paraguayan Guarani population caá-héé, or azuca-caá, or cira-caá, which signifies sweet yerba, sugar-yerba, or honey-yerba. It is a plain-looking herb, a few decimetres high, with small leaves and tiny blossoms. It grows in the highly-situated camping grounds which environ the chains of mountains Amambay from the extreme north to the sources of the Rio Monday. Its powerful properties of sweetness are remarkable. A few leaves suffice to sweeten a large cup of tea or coffee. On putting only quite insignificant portions of the leaves into the mouth, the taste of sweetness is retained for an hour after. It does not contain any injurious substance whatever. The director considers that the sweetness is not to be ascribed to the sugary contents, as the sweetening power by far exceeds that of sugar. Moreover, it is stated that the sweet matter contained in the plant cannot, like sugar, be brought to a state of fermentation by adding yeast. He rather assumes that it is a new chemical substance, which must first be examined by a chemical analysis. At the moment a German is trying to cultivate the plant in Nueva Germania. It is also contemplated to bring the leaves, mixed with the Paraguay tea (Yerba), into commerce.

Sugar-cane Cultivation in Mexico.

Bd. of Trade J., Feb. 6, 1902.

The sugar industry of Mexico is beginning to be largely developed. In all parts, capitalists are forming companies for the cultivation of the sugar-cane. There is a marked tendency to abandon the cultivation of maize for the more remunerative one of sugar-cane. It is estimated that the area of sugar-cane plantations has increased by about 22 per cent. during the past season.

Sugar Production in Nicaragua.

U.S. Cons. Reps., Jan. 27, 1902.

During the last twelve months, Nicaragua has exported over 4,000,000 lb. of cane-sugar (not refined). Of this amount, over 3,000,000 lb. were sent to the United States, and about 1,040,000 lb. to Vancouver, British Columbia. Nearly all was produced in the Departments of Chinandega and Leon, and exported from the port of Corinto. Sugar is also produced in the Departments of Managua, Granada, Rivas, Carazo, and Chontales, but not in sufficient quantities for local consumption. Four years ago the production of sugar in Nicaragua was less than half the home consumption. Two years ago the production exceeded the consumption by about 1,000,000 lb., and since then the production has increased over 300 per cent.

Estimated Sugar Production in Europe for Season 1901–2.

U.S. Cons. Reps., Jan. 28, 1902.

The International Union for Sugar Statistics has just published the results of its investigations, made in December 1901, as to this year's beet-sugar crop in European countries (see table on next page). Whilst these figures are approximate estimates, they are considered to be as nearly correct as can be made before the final estimates are prepared at the end of the season.

There will be apparently an over-production of sugar in Europe, amounting to 1,000,000 tons in excess of the normal consumption, and the stock to be carried over to nextseason may be 1,500,000 tons, the effect being un-

Country.	Acreage allotted to Sugar-Beet Culture.		Production of Sugar Beets.		Production of Sugar.	
	1901–2.	1900—1901.	1901–2.*	1900—1901.	1901–2.*	1900–1901.
	Acres.	Acres.	Tons.	Tons.	Tons	Tons.
Germany	1,168,420	1,095,889	15,630,440	13,252,291	2,220,850	1,974,785
Austria	896,132	839,152	8,944,700	7,408,000	1,306,900	1,083,300
France	711,300	718,220	9,278,400	8,717,439	1,080,300	1,100,171
Russia	1,467,527	1,346,942	8,304,545	6,406,024	1,079,550	893,520
Belgium	170,252	167,671	2,509,000	2,463,000	325,000	320,000
Holland	120,091	115,384	1,483,000	1,225,030	200,100	178,100
Sweden	70,424	71,412	876,000	865,800	121,392	115,547
Denmark	37,065	34,594	44,300	398,258	57,500	50,760
Other	..	162,970	..	..	221,009	..

* December estimate.

precedentedly low prices. In December, raw sugar was quoted at the Magdeburg exchange at 1·62 cents per lb.

It would seem that the unprofitable business would check over-production, but the entire beet-sugar industry of Europe is on an artificial basis.

Considerable anxiety is felt here as to the tariff the United States Congress will put on Cuban sugar.

As early as 1893, Cuba produced not less than 1,160,172 tons of sugar, which is about one-half the amount consumed by the people of the United States to-day. The war reduced its sugar crop to 281,420 tons, in 1899, but it has risen, in the face of financial difficulties, to almost treble that quantity within two years, and at the end of another year, it is possible it may again reach 1,000,000 tons. With plenty of capital and labour, and with improved machinery, there is every reason to suppose that Cuba will become the largest producer of sugar in the world.

Sugar Bounties for the 1902–3 Sugar Campaign in Belgium.

Bd. of Trade J., Feb. 13, 1902.

In the official *Moniteur Belge* of 20th—21st ult. is published the text of a law passed by the Belgian Government, modifying the existing legislation respecting sugar, and providing for the grant of a direct bounty on sugar produced during the season 1902—3.

Article 1 of the law states that native raw sugars declared for export, or for deposit in a bonded warehouse, are classed into three categories, and enjoy a rebate from excise duties fixed as follows:—

	Francs.
1st category, Nos. 11 and over, Dutch standard ...	45·00
2nd category, Nos. 8—11 „ „ ...	40·95
3rd category, below No. 8 „ „ ...	38·43

In order to be admitted to exportation or to deposit in a bonded warehouse, with the drawback fixed by Article 1, the sugar must be capable of giving the following yield of refined sugar per 100 kilos. of raw sugar:—

	Kilos.
Sugar of the 1st category, not less than	88
„ 2nd „ „	80
„ 3rd „ „	76

Article 2 states that sugar exported or deposited in a bonded warehouse, which would be known to give on refining a yield of more than 2 kilos. less than the quantity fixed by the category in which it is declared, will be officially classed in conformity with Article 1, without prejudice to the penalties incurred by the person for making a false declaration.

Article 3 states that the Minister of Finance is determining the method of analysis of sugar as regards the yield on refining.

Article 4 states that the words "*non humides*" which terminate section *d* of Article 176, section 1 of the Law of 16th April, 1887, are suppressed.

Article 5 states that Articles 7—9, par. 1, section *b*, and Section 5 of Article 10 and Article 12 of the Law of the 9th August, 1897, are made applicable to sugar used in biscuit manufacture.

Temporary Dispositions.

Article 6.—1. In modification of par. 2 of Article 8 of the Law of 11th September 1895, only that part of the excess of receipts in 1902 above 3,600,000 frs. will be taken into account.

2. A bounty of 2 frs. per 100 kilos. of sugar "*pris en charge*" during the sugar campaign of 1902–3 is granted to manufacturers of raw sugar from beet, but the total amount of bounty paid must not exceed 5,000,000 frs. If the quantity "*pris en charge*" exceeds 250,000,000 kilos., the bounty per 100 kilos. will be reduced proportionately to the excess.

XX.—FINE CHEMICALS, Etc.

Medical and Pharmaceutical Preparations: Customs Regulation (Russia).

Bd. of Trade J., Feb. 6, 1902.

Medical and Pharmaceutical Preparations not mentioned in the List of Preparations authorised to be Imported into Russia.—Applications for leave to import these articles must be accompanied by *two* samples for examination. If imported in special packages, with labels and descriptions, the samples must also be accompanied by these labels and descriptions.

XXII.—EXPLOSIVES, MATCHES, Etc.

"Cordite M.D.": A New Explosive.

Chem. and Druggist, Feb. 1, 1902.

The Explosives Committee, British War Office, which consists of Lord Rayleigh, Sir Andrew Noble, Sir William Crookes, Sir W. Roberts-Austen, and Mr. R. B. Haldane, besides members representing the War Office and the Admiralty, have now made effective trials with the new smokeless powder to be known as "Cordite M.D." The original cordite, patented, in 1889, by Sir Frederick Abel and Professor Dewar, consists of 58 per cent. of nitroglycerin, 37 per cent. of trinitrocellulose (with a small proportion of soluble guncotton), and 5 per cent. of vaseline. Cordite M.D. is not patented, but nitrocellulose is the base, and it contains a percentage of nitroglycerin not nearly so high as that in cordite. The advantage of the new powder is that it is not so erosive as cordite, and in other respects it is far superior.

Matches at Foochow (China).

Foreign Office Annual Series, No. 2738.

The match factory, established here, in 1899, by a British firm, is now actively working. Nearly 2,000 persons, men, women, and children, are employed in it, and the average output is about 20 cases a day, each containing 7,200 boxes of matches. The production could easily be increased to 40 cases a day. These Foochow matches are sold retail at the same price as the imported Japanese article, which they are rapidly superseding, both at Foochow and in the interior, through their superior quality.

Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

Applications.

2697. P. N. Hooper. Improvements in gas or vapour separators. Feb. 3.

2865. H. E. Auman. Improvements in and relating to smelting furnaces. Complete Specification. Feb. 4.

3096. R. S. Brownlow. Improvements in filters. Feb. 7.

3128. A. G. Brookes.—From H. J. Merck and Co., Germany. Improvements in and relating to apparatus for comminuting or disintegrating superphosphates. Complete Specification. Feb. 7.

3295. J. J. E. Bekker and R. Harvey. *See* Class XVI.

3373. F. W. Monteith. Improvements in and connected with furnaces. Complete Specification. Feb. 10.

3492. Siemens Bros. and Co., Ltd.—From Siemens and Halske Aktien Gesellschaft, Germany. An apparatus for filtering liquids and treating them with gases. Complete Specification. Feb. 11.

3752. F. Furstenheim. Improvements in and connected with sterilising apparatus. Complete Specification. Feb. 13.

3831. F. C. Roberts. Improvements in hot blast stoves. Complete Specification. Feb. 14.

3851. T. Kirkland. Improvements relating to heating and cooling apparatus. Feb. 14.

Complete Specifications Accepted.*

1901.

2467. H. S. Hatfield. Gas thermometers and pyrometers. Feb. 12.

5553. B. G. Smith. Apparatus for operating platforms of hoists, gas purifier lids and the like. Feb. 12.

6428. J. Kirkaldy. Portable distilling apparatus. Feb. 12.

7237. Per. W. Lindberg. Centrifugal apparatus. Feb. 12.

7336. C. Groll. Rotary furnaces. Feb. 19.

23,277. H. Koppers. Wall constructions for coke ovens by means of a particularly shaped stone. Feb. 19.

26,165. T. R. Murray. Pumps for pumping or compressing gases or vapours. Feb. 12.

II.—FUEL, GAS, AND LIGHT.

Applications.

2706. M. Graham. Improvements in gas producers and furnaces. Feb. 3.

2751. L. G. Harris. Improvements relating to the manufacture of gas. Complete Specification. Feb. 3.

2752. G. L. Badger. Improvements relating to the treatment of hydrocarbons for the production of fuel. Complete Specification. Feb. 3.

2851. G. V. Foster and E. F. Mackusick. Improvements in acetylene gas generators. Complete Specification. Feb. 4.

2870. T. A. Johnson. Improvements in gas producers. Feb. 4.

2929. W. Udal. Improvements in acetylene gas generator. Feb. 5.

2964. A. G. Bloxam.—From F. Gehre and K. Hoeke, Germany. Improvements in the manufacture of briquettes of fuel ore or the like. Feb. 5.

3206. W. E. Heys.—From L. M. Thompson, United States. Improvements in gas lighters. Complete Specification. Feb. 8.

3217. H. Marshall. Method of lighting trains and other vehicles by means of carburetted air. Feb. 8.

3306. C. Kleyer. Improved heating element. Feb. 10.

3343. A. J. Boult.—From G. Viarme, France. Improvements in or relating to gas generators. Feb. 10.

3363. W. H. A. Sieverts. Improvements relating to gas burners. Feb. 10.

3641. W. P. Warren. Improvements relating to acetylene generators. Feb. 12.

3643. W. P. Warren. Improvements relating to the production of acetylene gas, and end products suitable for use as metal polish and the like. Feb. 12.

3783. F. E. Bowman. Improvements in gas producing plant. Feb. 14.

Complete Specifications Accepted.

1901.

2713. R. P. Pictet. Apparatus for the industrial production of liquid air. Feb. 19.

2750. J. C. H. Kramers and J. G. Aarts. Manufacture of water-gas and semi-water-gas, and apparatus therefor. Feb. 12.

6904. H. D. Shiersant and W. A. Coulson. Apparatus for generating acetylene gas. Feb. 19.

20,282. C. D. Lépine. Acetylene gas generator. Feb. 19.

21,692. H. D. Fitzpatrick.—From F. H. Macpherson, Canada. Vapour generators for incandescent lighting. Feb. 19.

21,756. E. F. Colborn. Production of combustible gas from hydrocarbon oil. Feb. 19.

23,277. H. Koppers. *See* Class I.

24,577. M. Toltz and A. Sipschutz. Acetylene gas lighting system. Feb. 19.

24,837. S. T. Wellman and C. H. Wellman. Coke-ovens. Feb. 19.

25,495. E. D. Holmes.—From O. N. Guldin, of The Western Gas Construction Company, United States. Improvements in mouthpieces and lids of gas retorts, applicable to the lids of other receptacles. Feb. 19.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

3401. H. Danzer. Improvements in and connected with bitumen and asphalt cauldrons. Feb. 11.

IV.—COLOURING MATTERS AND DYESTUFFS.

Applications.

2722. O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of green sulphurised dyestuffs. Complete Specification. Feb. 3.

3152. F. Gaess. A process of preparation of monoformyl-α_1 α_2-naphthyl-diamine β_3- or β_4-monosulpho acid. Feb. 7.

3362. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of new derivatives of the anthracene series. Feb. 10.

3775. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of disazo colouring matters. Feb. 10.

Complete Specifications Accepted.

1901.

6878. T. R. Shillito.—From J. R. Geigy and Co., Switzerland. Manufacture of artificial indigo from α-isatine-anilide. Feb. 12.

7250. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Process for the manufacture of new azo components and azo dyestuffs. Feb. 12.

7632. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of azo colouring matters and their after treatment on the fibre. Feb. 12.

16,409. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of orange-yellow to red mono-azo-dyestuffs suitable for the preparation of lakes. Feb. 19.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

2690. J. Auchinvole, of the firm of Johnston and Farie. Improved method of and means for washing, bleaching, dyeing, sizing, and similarly treating yarns or like fibrous materials and fabrics. Feb. 3.

2891. M. Ge'ssler. Improvements in apparatus for dyeing cloth or other porous materials. Complete Specification. Feb. 5.

3155. F. B. Aspioall, G. H. Wise, and E. S. Wilson. Improvements relating to the treatment of cotton seed. Feb. 7.

3178. F. H. Long. Improvements in processes for bleaching paper pulp and the like. Complete Specification. Feb. 7.

3422. S. W. Wardwell. Improvements in or relating to a method of preparing yarn and like materials for dyeing and finishing processes, and the cop or package produced thereby. Complete Specification. Feb. 11.

3425. R. W. Goddard. Improvements in the method of and apparatus for dyeing warps for weaving. Feb. 11.

VII.—ACIDS, ALKALIS, AND SALTS.

Applications.

2743. A. Krause. Improvements in or relating to the preparation of substances containing peroxide of magnesium. Complete Specification. Feb. 3.

2856 H. H. Lake.—From K. Oehler, Germany. Improvements relating to the manufacture of sodium sulphate and hydrochloric acid. Feb. 4.

2867. G. E. Davis and A. Roland. Improvements in the removal of arsenic from sulphuric acid. Feb. 4.

2916. T. B. Saunders. Improvements in the means or method of manufacturing strong hydrochloric acid. Feb. 5.

2987. R. Threlfall and G. E. Wilson. Improved means for producing chlorates or perchlorates of the alkali or alkaline earth metals. Feb. 5.

3045. E. W. Wheelwright. Improved compounds of phosphorus and sulphur and methods of manufacturing same. Feb. 6.

3161. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Improved manufacture of sulphuric acid and sulphuric anhydride, and apparatus therefor. Feb. 7.

3381. T. Ewan. Improvements in the manufacture of cyanogen compounds. Feb. 11.

3611. O. Imray.—From Die Farbwerke vormals Meister, Lucius und Brüning, Germany. Improved manufacture of sulphuric anhydride by the contact process. Feb. 12.

3891. J. H. Hudson. Improvements in obtaining alkaline compounds. Feb. 15.

3923. H. von Hochstetter. Improvements in and connected with the manufacture of acetic acid and other acids of the fatty acid series. Feb. 15.

Complete Specifications Accepted.

1901.

3327. H. Rabe. Process for the production of anhydrous sulphuric acid. Feb. 19.

6829. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture of sulphuric acid. Feb. 12.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

3355. W. P. Thompson.—From Fontaine and Cie., Germany. Improvements in or relating to the manufacture of glass ware. Complete Specification. Feb. 10.

3514. F. von Poschinger. Improvements in the manufacture of cathedral glass. Feb. 11.

Complete Specification Accepted.

1901.

3100. R. D. Lucas. Decoration of china, earthenware, glass, enamelled iron ware, and the like. Feb. 19.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

2742. G. A. Taylor and W. Macleod. An improved fibrous plaster. Complete Specification. Feb. 3.

3051. F. H. Bruce. Improvement in the treatment of wood for the purpose of rendering the same fire-proof. Feb. 6.

3105. J. L. Gordon. An improved cement for general building purposes. Feb. 7.

3294. J. Bilsbury. Improvements in and appertaining to kilns for drying and burning bricks. Feb. 10.

3300. J. Jackson. Improvements in the manufacture of fire-resisting bricks and blocks. Feb. 10.

3364. G. C. Marks.—From C. Frerichs, Germany. Improvements in connection with glazing for calcareous sandstone and the like. Feb. 10.

3402. G. A. Newton. Granitene. Feb. 11.

3493. F. Jurschina. An improved process for the manufacture of artificial stone. Complete Specification. Feb. 11.

3518. F. Jurschina. Improved process for the manufacture of artificial acid-proof stone. Complete Specification. Feb. 11.

3555. B. Budd. Improvements in the production of concrete artificial or manufactured stone, plaster, and similar substances used for building, for paving, and for other purposes. Feb. 12.

Complete Specifications Accepted.

1901.

4657. J. Steiger. Manufacture of cement. Feb. 19.

1902.

386. A. Wolskel. Preparing asphalt. Feb. 12.

X.—METALLURGY.

Applications.

2805. G. Westinghouse.—From W. J. Knox, United States. Improvements in methods of treating copper ores. Feb 4.

2846. W. McKie. Improvements in or relating to the manufacture of iron, steel, and copper. Feb. 4.

2865. H. E. Auman. *See* Class I.

2971. H. Buderus. Improvements in means for producing iron castings direct from furnaces. Feb. 5.

3331. W. P. Ingham. Improvements in or connected with the manufacture of slag wool. Feb. 10.

3344. O. Thiel. Improvements in or relating to the manufacture of iron. Complete Specification. Feb. 10.

3357. C. Renstrom. Process for hardening copper or the alloys of copper. Complete Specification. Feb. 10.

3483. S. Phelps and W. G. Clark. An improved process for welding or uniting copper and its alloys to iron, steel, and other metals. Feb. 11.

3644. W. S. Simpson. Improved method of hardening, toughening, or improving the quality of metal. Feb. 12.

3650. W. P. Thompson.—From Konrad von Meyenburg and E. R. Butler, Switzerland. Improved method and apparatus for increasing the coherence and resistance to pressure of blocks of ore and the like. Feb. 12.

3724. G. A. Herdman. Improvements in moulding slag wool. Feb. 13.

3834. F. C. Roberts. Blast furnace charging apparatus. Complete Specification. Feb. 14.

Complete Specifications Accepted.

1901.

493. H. M. Taquet. Treatment of zinc ores Feb. 19.

2781. E. Kikut. Blast devices for furnace and for other purposes. Feb. 19.

6322. Sir A. Hickman and W. Hutchinson. Manufacture of steel and ingot iron. Feb. 19.

7568. V. Fattelay. Manufacture of steel. Feb. 19.

14,266. J. S. Wolfe, L. J. Englett, and T. J. Geiger. Composite metal. Feb. 12.

14,306. P. Garuti and R. Pompili. New process of soldering with oxy-hydrogen gas. Jan. 22.

22,233. P. M. Justice.—From C. Davis, United States. Method of treating iron and steel. Feb. 12.

22,730. H. Johnson and G. W. Frier. Process of manufacturing steel. Feb. 19.

24,235. C. A. Keller. Manufacture and treatment of alloys. Feb. 19.

25,671. P. M. Justice.—From C. Davis, United States. Method or process of hardening steel. Feb. 12.

26,595. W. F. Bedell. Amalgamators. Feb. 12.

XI.—ELECTRO-CHEMISTRY and ELECTRO-METALLURGY.

Application.

3819. J. T. Niblett. Improvements in and relating to storage batteries. Feb. 14.

Complete Specifications Accepted.

1901.

5764. L. Mond. Obtaining zinc by electrolysis, and apparatus for that purpose. Feb. 12.

26,729. T. J. Bain and J. O. Hunt. Electric battery. Feb. 12.

XII.—FATS, OILS, and SOAP.

Application.

3164. J. Klimont. An improved process for the purification of fats or fatty substances. Complete Specification. Feb. 7.

Complete Specifications Accepted.

1901.

11,074. G. Dangoise and La Société Générale Belge de Déglycerination. Separating glycerine from oils and fatty matters. Feb. 12.

16,483. J. Rank. Method of separating vegetable oils from ground seeds. Feb. 19.

25,425. F. V. Speltie. Process and apparatus for extracting oil from fish and obtaining dried residues serving as "guano." Feb. 19.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

2782. J. C. Chandler and S. B. Chandler. Compound in substitution of red and white lead when used for joint making. Feb. 4.

3268. W. P. Thompson.—From A. L. Tedesco, France. Improved process for the manufacture of varnishes. Feb. 8.

3168. R. B. Price. Improvements relating to the recovery of rubber from vulcanised rubber waste. Complete Specification. Feb. 11.

3855. E. Zühl. A new or improved process for the regeneration of caoutchouc. Complete Specification. Feb. 14.

Complete Specification Accepted.

1901.

11,337. F. J. Corbett. Apparatus for manufacturing white lead. Feb. 12.

XV.—MANURES, Etc.

Complete Specifications Accepted.

1901.

2335. J. Ostersetzer. Manufacture of artificial manures. Feb 12.

5215. R. Barnard. Manufacture of alkaline superphosphate. Feb. 19.

25,425. F. V. Speltie. *See* Class XII.

XVI.—SUGAR, STARCH, and GUM, Etc.

Applications.

2952. W. P. Thompson.—From G. Reynaud and A. Bonna, France. An improved process for converting vegetable cellulose into glucose and its derivatives. Feb. 5.

3295. J. J. E. Bekker and R. Harvey. Improvements in and relating to mills for grinding sugar cane and like grinding purposes. Feb. 10.

3642. M. Kowalski. A new or improved process for purifying by extraction the syrups, drainings, and molasses obtained in the manufacture of sugar. Complete Specification. Feb. 12.

3930. J. Y. Johnson.—From The Société des Produits Amylacés, France. Improvements in the manufacture of starch from rice, maize, and other amylaceous products. Feb. 15.

Complete Specification Accepted.

1901.

10,884. C. Steffen. Process of obtaining very pure concentrated saccharine juices, and nutritious pulp poor in water from beetroots without the use of water. Jan. 22.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

2708. J. Kirby. An improved apparatus for separating yeast from fermenting liquors in vats, casks, "pieces," or other nearly closed vessels, also for aërating the fermenting liquor. Feb. 3.

2863. J. H. Jewell. Improvements in distilling apparatus. Complete Specification. Feb. 4.

Complete Specification Accepted.

1901.

6428. J. Kirkaldy. *See* Class I.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

3505. F. C. Staender. Improvements in the production of milk powder. Feb. 11.

3646. A. E Bertie-Smith. A new or improved process or treatment for preserving cream. Feb. 12.

3914. C. Steffen. Improved process for the production of saccharine foodstuffs. Complete Specification. Feb. 15.

3924. L. Hochecker. Improvements relating to the manufacture, preservation, and utilisation of fruit paste. Feb. 15.

3949. H. H. Lake.—From Aktieselskabet "Progress," Norway. An improved process for preserving eggs. Complete Specification. Feb. 15.

B.—Sanitation; Water Purification.

2892. W. P. Lincoln and M. S. Greenbaum. Improved process of reducing and deodorizing residues. Feb. 5.

3516. F. J. Farrell. Improvements in apparatus for softening water. Feb. 11.

C.—Disinfectants.

2813. J. B. de Alzugaray. Improvements in and connected with the manufacture of disinfecting and antiseptic fluids and compounds. Feb. 4.

3333. P. Rubeo. Process of preparing a disinfecting material. Feb. 10.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

2713. F. Nemecek. Improvements in or relating to the manufacture of paper. Feb. 3.

3178. F. H. Long. *See* Class V.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

2748. W. M. Binnie. Improvements in the production of artificial camphor. Feb. 3.

2787. C. M. Aikman. Preparation of extract of maté. Feb. 4.

3871. H. H. Lake.—From W. J. Schieffelin, United States. Improvements relating to the preparation of compressed drugs. Feb. 14.

Complete Specification Accepted.

1901.

6937. J. Heron. Manufacture of a vegetable extract. Feb. 12.

XXI.—PHOTOGRAPHY.

Applications

3371. A. J. Boult.—From C. L. F. Freelandt, Russia. Improved manufacture of gelatine films for photographic purposes. Complete Specification. Feb. 10.

3476. T. K. Barnard. Improvements in apparatus relating to colour photography. Feb. 11.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

2724. C. G. Redfern.—From La Société Générale pour la Fabrication de la Dynamite, France. A new explosive compound. Feb. 3.

3144. W. P. Thompson.—From R. H. F. Rennick, India. Improved detonator applicable for use with sensitive explosives. Feb. 7.

3202. W. R. Hodgkinson and J. B. Finlaison. An improved shortened method of manufacture of nitrated celluloses, gun-cotton, and the like. Feb. 8.

3238. F. Hess. Method for the treatment and use of detonating compositions. Complete Specification. Feb. 8.

3334. J. Wetter.—From The Westfälisch-Anhaltische Sprengstoff-Aktiengesellschaft, Germany. Improvements in safety explosives or blasting compositions. Feb. 10.

3951. H. H. Lake.—From Aktieselskabet "Progress," Norway. Improvements relating to the manufacture of wood matches. Complete Specification. Feb. 15.

Complete Specification Accepted.

1901.

17,628. H. H. Lake.—From J. Blake, United States. Machines for making matches. Feb. 12.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 4271.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 5.—Vol. XXI. **MARCH 15, 1902.** No. 5.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Robert Irvine.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

E. A. Brotherton.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.	
C. Longuet Higgins.	Dr. T. Lewis Bailey.
LONDON.	
Otto Hehner.	A. R. Ling.
MANCHESTER.	
Dr. J. Grossmann.	J. Carter Bell.
NEWCASTLE.	
W. L. Rennoldson.	P. C. Garrett.
NEW YORK.	
Clifford Richardson.	Dr. H. Schweitzer.
NOTTINGHAM.	
L. Archbutt.	J. T. Wood.
SCOTTISH.	
Sir Robert Pullar.	Thos. Gray.
YORKSHIRE.	
George Ward.	Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.
Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.
Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Maenab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams	I., XV.
L. Archbutt	I., XII., XVIII.B.
J. L. Baker	XVI., XVII.
H. Ballantyne	II., XII.
D. Bendix	III.
E. Bentz	IV., V., VI.
J. O. Braithwaite	XX.
J. F. Briggs	XVI., XVII.
J. H. Collins	X.
C. F. Cross	V., XII., XIX.
J. T. Dunn, D.Sc.	VII., X., XI.
Walter C. Hancock, B.A.	VIII., IX.
J. W. Hinchley	I., X., XIII., XXI.
H. Ingle, Ph.D.	V., VI., XII., XIII.
R. L. Jenks	XIV., XIX.
J. B. C. Kershaw	VII., XI.
M. C. Lamb	VI., XIV.
T. A. Lawson, Ph.D.	IV., XX.
F. H. Leeds	III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc.	IV., V.
J. McCrae, Ph.D.	IV.
G. W. MacDonald, M.Sc.	XXII.
W. G. McMillan	X., XI., XIV., XXII.
N. H. J. Miller, Ph.D.	XV.
C. A. Mitchell, B.A.	XII., XXII.
A. More	VII., XVIII.
G. T. Morgan, D.Sc.	IV., V.
F. Neurath, Ph.D.	IV., V.
J. G. Parker, Ph.D.	XIV.
H. T. Pentermann	XVI., XVII.
T. H. Pope	XX., XXI.
F. W. Renaut	Patent List.
G. H. Robertson	XI.
Chas. Salter	I., II., III., XV., XVI.
R. Sandon	II.
J. Shields, D.Sc., Ph.D.	XI.
A. Shonk	Gen. Chem.
W. P. Skertchley	XII., XVIII., XX.
E. Sonstadt	III., VII., X.
A. L. Stern, D.Sc.	XVII.
E. Howard Tripp, Ph.D.	III., VII., XVI.
Charles T. Tyrer	XX.
L. J. de Whalley, B.Sc.	XVI.
E. W. Wheelwright, Ph.D.	XXII.
A. Wingham	X.
Joseph T. Wood	XIV.
A. C. Wright, B.Sc., M.A.	IV., XVIII., XX.

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members, who are interested in industries in which partially or wholly duty-free spirit would be of advantage, will communicate with the Secretary.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

INDEX, 1901, AND LIST OF MEMBERS.

The Index and Title Page for 1901 will be issued under separate cover.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections:—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
Signature of Candidate.....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
Profession or Business Occupation .....
Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have now submitted their report, prescribing a method for dealing with the various substances which might contain Arsenic, and the report has been accepted by the Council.

Copies of this, together with the papers, discussions, and abstracts which appeared in the Journal in 1901, and other extracts, may be obtained from Messrs. Eyre and Spottiswoode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held on July 9th, 10th, and 11th next in Liverpool. Full particulars will appear in a subsequent issue.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Allingham, Jno.; Journals to 76, Gayville Road, Wandsworth Common, S.W.

Atkinson, A. J., l/o Loudoun Square; 44, Stuart Street, Cardiff.

Atkinson, R. W., l/o Loudoun Square; 44, Stuart Street, Cardiff.

Barratt, J. T.; Journals to White Lead Works, Morden Wharf, East Greenwich, S.E.

Brown, Geo. E., l/o Wood Green; c/o The Photogram, Ltd., Effingham House, Arundel Street, Strand, W.C.

Brownlie, D., l/o Menton Green; 11, Langford Road, Heaton Chapel, near Manchester.

Campbell, Andrew; Journals to c/o Burmah Oil Co., Ltd., Rangoon, Burmah.

Chaplin, Dr. E. M.; Journals to Public Analyst's Laboratory, Wakefield.

Claudet, F. G.; Journals to 181, Willesden Lane, London, N.W.

Collins, J. H., l/o Broad Street Avenue; 702, Salisbury House, Finsbury Circus, E.C.

Dreghorn, D.; Journals to Greenwood, Pollokshields Glasgow.

Drewson, Dr. V. P.; Journals to 5, Beekman Street, New York City, U.S.A.

Ellis, W. H.; Journals to School of Practical Science Toronto, Ont., Canada.

Elworthy, H. S.; all communications to 239, Dashwood House, New Broad Street, London, E.C.

Grahill, C. A., l/o California; Val Verde, Yavapai Co A.T., U.S.A.

Greenaway, A. J., l/o Hampstead; The Orchard, Chertsey Surrey.

Jackson, Samuel, l/o Madras; c/o Binney and Co., 4 Fenchurch Street, London, E.C.

Journal of the American Chemical Society, c/o Dr. W. Noyes, Terre Haute, Ind., U.S.A.

Lacey, T. S., l/o Pimlico; Gas Works, York Road, King's Cross, London, N.W.

Le Bosquet, M., l/o East Boston; 156, Tremont Street, Boston, Mass., U.S.A.

Phipson, Dr. T. L., Casa Mia (*not* Cara Mia), Putney, S.W.

Quinn, J. C., l/o Hiliesdon; 1, Rock Avenue, Barnstaple.

Ritson, T. N., Journals to 3, Parkside Road, Kendal.

Robertson, A. J.; Journals to c/o Laidlaw, Mackill, and Co., Ltd., 3400, Williamsburg Avenue, Richmond, Va., U.S.A.

Warburton, Thos.; Journals to 48, Hyde Road, Ardwick, Manchester.

White, Wm. G., l/o Chorlton-on-Medlock; 261, Broom Lane, Levenshulme, Manchester.

CHANGES OF ADDRESS REQUIRED.

Hartley, Jos., l/o 7, Scarsdale Road, Victoria Park, Manchester.

Hewitt, T. Lacey, l/o 8, Frodingham Road, Scunthorpe, *viâ* Doncaster.

Additional Report

ON THE PATENT LAW AMENDMENT BILL.

BY THE PRESIDENT, MR. IVAN LEVINSTEIN.

(*Continued from page* 212.)

REASONS WHY A BRITISH PATENT SHOULD BE REVOKED IF WORKED ABROAD BUT NOT IN THIS COUNTRY.

1. There is only one justification for this nation, which especially abhors legal privilege or monopoly, in continuing to grant exclusive monopolies to private individuals in the form of patents, *viz.*, that inventors and others may be encouraged to establish new manufactures in this country.

2. We are bound to increase our exports in order to pay for our constantly increasing imports of foodstuffs and other commodities. In order to do so, we can no longer rely on a few staple industries. The greater the variety of articles we are able to make and sell, the greater becomes our opportunity for gaining new customers and increasing our sales.

3. We not only depend on foreign nations for a food supply for our ever-increasing population in exchange for such goods as we may have to offer, but we depend also to a large extent on foreign inventions. However ingenious we may be, the 40 millions of our United Kingdom have to contend with the 440 millions which represent the population of Europe and America. If, excluding our own people, we grant then the very large number of monopolies we actually do, to foreigners, and allow them to work British patents abroad, what will in the end become of our industrial position?

The foreign patentee is fully entitled to earn his well-deserved reward for establishing new manufactures in this country, by charging to us such prices for his goods as he may be able to obtain under his monopoly, but not otherwise. There must be the *quid pro quo*.

Direct effects of permitting foreign patentees to work British monopolies exclusively abroad, importing into this country our requirements, are:—

1. We foster foreign labour and assist in the development of foreign industries.

2. As the introduction of a new article generally replaces another article hitherto in use, we throw out of employment a certain number of our own workpeople.

3. Very frequently the foreign patentee has either not succeeded in getting patents in his own country, or such patents have already run their course there, whilst his British monopoly remains in full force. The result is, that we stifle inventions and increase the prices of a number of articles by closing the door to our own inventors and manufacturers, whilst our foreign competitors may make and vend abroad the patented article without any restrictions or payments of royalty.

EXAMPLES.

Northrop Automatic Loom.—An American invention patented here and in other countries.

There are about 70,000 looms at work in American weaving sheds and 1,500 abroad, and for certain classes of woven fabrics it is not unlikely that it may effect a revolution in the weaving trade. The American Company, in order to maintain its patent rights, has been compelled to make arrangements to manufacture these looms on the Continent. This loom, when properly introduced into this country, will seriously affect not only our weavers, but also our loom makers. The result will be that some of our own workpeople will be thrown out of employment, and at the termination of the monopoly there will be no workmen forthcoming who have been trained in this special branch of manufacture.

In short, it would seem as if the old adage "*Experientia docet*," whilst still considered of extreme value abroad, were ceasing to possess, in this matter of patents and their operation, any further charm for this country.

Cloth for Stiffening Men's Coating.—This example shows how monopolies are granted in this country which do not exist or have ceased to exist in foreign countries, and how we have to pay for a number of articles much higher prices than those at which our competitors can purchase them.

A Manchester merchant called a week ago at the Chamber of Commerce to get advice under the following circumstances. He had bought for some time a certain cloth from Germany, which he sold here at 1*s.* 4*d.* a yard, leaving him a very handsome profit. As the ordinary price was 1*s.* 8*d.* he established a lucrative trade. To his surprise, a week or two ago, he received a letter from a German lawyer threatening him with proceedings for infringement, if he did not stop the sale of the cloth. It turned out that a German had taken a patent in England for the production of this cloth. The invention, if invention it could be called, was very trivial. In due course his German patent was declared null and void, and everybody is now at liberty to make and sell this cloth except in the United Kingdom, where it remains a close monopoly, with the result that it can be bought on the Continent at very much less than here. British Patent Law was established for the benefit of British industries, but it would be very difficult to show how the foreign patentee in this instance benefits our industrial interests. If he had to work his patent here he would at least employ British labour, &c.

Artificial Alizarin.—This most important dyeware is used very largely by our Turkey red and alizarin dyers and calico printers. It is made from a raw material, of which we are the largest producers.

The technical process for making this dyeware was patented here by a number of foreign patentees, but *no patent was granted* in Germany.

Everyone interested was at liberty to make and sell it there, whilst in this country it was a close monopoly. During the duration of the patent thousands of foreign workmen were employed abroad in the production of the dyestuff, also a number of engineers and chemists; and a trade was established all over the world.

The German makers realised immense profits, which enabled them to further extend and develop the manufacture of coal-tar dyestuffs.

There is no doubt that the unrestricted development of the alizarin industry in Germany laid the foundation of Germany's present supremacy in the production of coal-tar dyestuffs, and gave a very great impetus to the development of their chemical and allied industries.

The patents have lapsed more than 20 years ago, yet still the Germans have maintained their monopoly; and this is in no way surprising, and by no means due to their superior technical education, but solely to our foolish patent laws. They had a start of 11 years in a special industry, not only as far as manufacturing operations were concerned, but also in the distribution of the goods in the various markets of the world.

Artificial Indigo.—Natural indigo is the most important industrial product of India. More than 200,000 natives

are employed in its manufacture, and, in addition, a large number of British clerks and other officials.

British planters have been engaged in its cultivation and extraction for centuries, and fortunes have been made, not only by planters, but by British traders. This great industry is now threatened with utter ruin. Out of 40,000 chests, which is the world's consumption, already a quantity equivalent to 16,000 chests is produced of the artificially prepared product by a German company. The German army and navy cloth must now be dyed only with artificial, but not with natural, indigo. Already works, it is stated, have been erected in France to produce this dyestuff in order to maintain the Company's patent rights, whilst here, of course, the colour neither is nor will be made. The monopoly, after its legal termination, just as in the case of alizarin and many other articles, will remain a German monopoly for many years to come. Let us consider for one moment the anomaly of our law. We have granted to a foreign patentee a British monopoly: he, in return, throws out of employment 200,000 of our native workmen and a large number of British clerks and officials, he ruins an important trade with a turn-over of 3,000,000*l.* per annum, and injures our shipping and carrying trade, besides closing the business of some of our traders and shippers. Was such a state of things as this ever contemplated by our legislators who enacted patent laws for the sole and exclusive purpose of finding employment for our workmen by encouraging inventors to establish new industries in this country for the benefit of our industrial interests?

What would have become of the gas-engine industry if the foreign patents had not been worked in this country? What of the heavy chemical industry if Brunner, Mond, and Co. had not succeeded in getting a license from Solvay? Many more examples might be given of the very great injury which is inflicted on our industries by the anomaly referred to in our Patent Laws.

Every country in the world (including some of our own colonies) has the provision enacted in its patent laws that a patent may be revoked, if not worked in the country. There is only one exception, *viz.*, the United States; but there is no need for such a provision in a country so highly protected. Patentees will take care to work or see that their patents are worked, when duties so excessively high are levied, that imports from abroad are prevented.

The lower import duties a country has, the more necessary is it that at least the conditions for the working of patents shall be established on a sound logical basis. It is worth recording that the Board of Trade, in the year 1897, was of opinion when a deputation was introduced by Sir William Houldsworth, of the necessity of a provision in our patent laws for the working of patents in this country. Sir Courtenay Boyle, who received the deputation on account of the unavoidable absence of Mr. Ritchie, said: "There are many instances — Mr. Levinstein has mentioned several—in which it is clear that the default of the patentee to work his patent in the United Kingdom and supply the requirements of the public, has been a public injury, alike to the traders and industrial interests of the country."

The enforcement of the grant of compulsory licenses is as invidious as it is inconvenient, and in order to accomplish it, heavy legal machinery must be set in motion, and delay and great expense is the consequence. If the Petitioner at last succeeds, either the patent has lost its value, by efflux of time, or the petitioner, not having the experience, which is often the very essence of the practical value of invention, does not succeed in working the patent, whilst the unwilling patentee will take care not to part with any practical knowledge which he may have acquired.

There is only one remedy for this vexed question, which is at once simple and effective, *viz.*, to enact that "A patent may be revoked if it be proved that the article patented, is worked abroad, and not in the United Kingdom, the onus of proof that the patent is worked *bonâ fide* in this country, resting with the patentee or licensee."

If such a provision were made law the patentee would take good care either to work the patent himself or else to grant a license to others. The whole system would then work almost automatically, without litigation, and without any serious expense to either side.

Comparison of French, German, and Belgian Laws regarding the Working of Patents.

French Patent Law.	German Law.	Belgian Law.
Article 32.	*Section* 11.	*Article* 23.
(2.) A patent shall be revoked if the patentee has not worked his discovery or inventions in France within the term of two years from the date of the signature of his patent, or if he has ceased to work during two years, unless in the one case or the other he justifies himself as to the cause of his inaction. (3.) The patent shall be revoked if the patentee has introduced into France articles of manufacture made abroad, and similar to those which are protected by his patent.	(1.) The patent can be revoked after the expiration of three years (1) if the patentee fails to work his inventions in Germany to an adequate extent, or at least to do everything that is necessary to ensure it being worked; (2) whenever the grant of a license to others to use the inventions appears to be demanded in the public interest and the patentee refuses to grant such license upon adequate compensation and good security.	The owner of a patent must work the patented article or cause it to be worked in Belgium within one year from the commencement of working abroad. Nevertheless, the Government may, by a Royal Decree stating reasons, inserted in the Moniteur before the expiration of that term, grant a prolongation of one year at the most. At the expiration of the first year, or of the extension which may have been granted, the patent shall be annulled by a Royal Decree. The annulment shall likewise be pronounced when the patented article worked abroad shall have ceased to be worked in Belgium during a year, unless the owner of the patent justifies the causes of his inaction.

Liverpool Section.

Meeting held at University College on Wednesday, February 26th, 1902.

MR. C. LONGUET HIGGINS IN THE CHAIR.

CATALYSIS AND ITS APPLICATIONS.

BY JAMES T. CONROY, B.Sc., Ph.D.

The subject of catalytic action has been of great interest and attraction to chemists since the year 1835, when Berzelius described a number of reactions of peculiar nature, which he defined as catalytic. At the present time many investigators are busy working in this branch of our science, and during recent years many new instances of catalysis have been discovered, and certain of the older reactions studied in some detail. Prof. Ostwald and his students are to be counted amongst these workers, and the professor chose "catalysis" as the subject on which to deliver an address before the Versammlung Deutscher Naturforscher und Aerzte at their Hamburg meeting in September last. A full report of this address will be found in the Zeits. für Elektrochem., 1901, **7**, 995.

Prof. Ostwald, after an historical introduction, classified catalytic reactions into the following four groups: —

1. Separation in supersaturated solutions.
2. Catalysis in homogeneous mixtures.
3. Catalysis in heterogeneous mixtures.
4. Action of enzymes.

He then proceeded to consider these groups separately and to discuss the various hypotheses brought forward in

explanation of the phenomena. The paper is largely theoretical, and, in addressing a gathering of medical men, Prof. Ostwald, not unnaturally, drew attention to the important part played by certain of these agents in the human organism.

It was only towards the end of the address that he referred to the practical side of the subject, and he did so in the following terms: "That the scientific knowledge and control of catalytic phenomena must also have immeasurable result in a technical direction is even now evident in the several chance applications of this aid. The last great triumph of German technical chemistry, the synthesis of indigo, which even reverses the economic relationship of whole countries, contains as an essential factor a new catalysis; the oxidation of napthalin by sulphuric acid can only be carried out with sufficient smoothness in the presence of mercury. That the sulphuric acid itself is obtained by catalytic agency alike in the old as in the new process I need only recall. If one considers that the acceleration of reactions by catalytic means occurs without expenditure of energy and in this sense gratis, and that in all technical work, including chemical, time is money, it is evident that the systematic use of catalytic aids may lead us to expect the most far-reaching changes in technology."

This paragraph places the importance of the subject in a clear light, and some short account of several of these catalytic processes and reactions may be of interest, and, perchance, of use.

In the first place we require a definition as to what is meant by "catalysis," or by the term "catalytic agent," and probably the shortest and best is that enunciated by Prof. Ostwald, *viz.*: "A catalytic agent is such material which affects the velocity of a chemical reaction without itself appearing in the final products."

This definition is, however, not free from objection, since it implies, and Ostwald emphasized this point, that reaction in any system must be, not only possible, but actually taking place before a catalytic agent can produce effect. In other words, a catalytic substance is, according to Ostwald, incapable of *starting* a reaction; it can only affect the *rate* of change. This may be the case in most instances. If we admit, however, and I think we are bound to do so, that the trace of water, shown by Dixon's classical research to be necessary before explosion can take place in such gaseous mixtures as carbonic oxide and oxygen, acts catalytically, then Ostwald's definition is insufficient. Even Ostwald himself in discussing catalysis in heterogeneous systems, of which the best known example is the action of platinum on combustible gaseous mixtures, says: "Also in all these cases we are concerned with the acceleration of slow reactions, although it must be admitted that, for example, in the case of oxyhydrogen gas, no trace of water formation has been observed at ordinary temperature in the absence of a catalytic agent." He then goes on to say "but the regularity in the alteration of velocity with temperature leads us to the view that even at ordinary temperature a very small reaction velocity exists." Such a view may be justifiable; the fact remains that any such combination is too small to admit of measurement by present means. The definition may consequently in the light of a wider knowledge require alteration in this respect.

For our present purpose the point is not of very great importance; to us the main feature of interest in connection with catalytic phenomena is that by the aid of certain materials we are enabled to, more or less, readily effect reactions which otherwise would be either impossible or impracticable. The number and variety of reactions susceptible to catalytic influence are almost infinite. To quote Ostwald once more: "There appears to be no kind of chemical reaction which cannot be influenced catalytically, and no form of chemical substance, be it elemental or compound, which cannot act as catalyst."

The catalytic agent may be a gas or vapour, a liquid, or a solid. Examples of these varieties are the water (or similar) vapour necessary for certain gaseous explosions, the nitrogen oxides in the lead chamber process, acids in sugar inversion, and platinum or metallic oxides in the numerous cases to be referred to later. For some classes of work the one agent is especially applicable and useful; for other work a second agent is preferable or necessary.

The reactions effected may be those of simple combination or dissociation; reduction; oxidation, which may be partial, complete, or fractional; hydrolysis; substitution, &c., together with combinations of these, and these reactions range over both inorganic and organic chemistry. There are also cases in which the presence of a catalyst alters in a very striking manner the course of electrolysis.

Numerous instances of catalytic action readily come to mind. Amongst others I might mention the well-known accelerating effect produced by the addition of manganese peroxide to potassium chlorate, in the preparation of oxygen, and recently turned to account in the estimation of perchlorate in Chili saltpetre. There is also the classical example of the decomposition of hydrogen peroxide into water and oxygen, in the presence of such materials as gold, silver, platinum, charcoal, &c. A third instance, also one in which oxygen is evolved, is the decomposition of hypochlorite solutions, when heated with a small quantity of cobalt oxide. The addition of a few drops of platinic chloride solution to hasten the dissolution of pure metals in acids is a matter of everyday use. The power of causing chemical combination possessed by platinum black, and still more so by palladium black, is also well known and frequently used. In organic chemistry perhaps the best known instance apart from hydrolysis (sugar inversion, &c.) is the reaction of Friedel and Crafts, in which the presence of aluminium chloride induces combination between an aromatic compound, such as, say, benzene, and an alkyl halogen compound, such as ethyl chloride, chloroform, &c, with elimination of hydrochloric acid. This reaction has proved most valuable in organic research. Ruff (Ber., 1901, 1749) has recently shown that aluminium chloride can also play a catalytic *rôle* in inorganic chemistry. Thus, in its presence, sulphuryl chloride and sulphur chloride react as follows:—

$$SO_2Cl_2 + S_2Cl_2 = SO_2 + 2SCl_2$$

and sulphuryl chloride and iodine react to give sulphur dioxide and iodine monochloride and trichloride according to the excess of SO_2Cl_2, used—

$$SO_2Cl_2 + 2I = 2ICl + SO_2$$
$$3SO_2Cl_2 + 2I = 2ICl_3 + 3SO_2.$$

This power of inducing reaction appears to be capable of application not only to sulphuryl chloride, but to a number of other chlorides also, *e.g.*, thionyl chloride, arsenic and antimony trichlorides, &c. And Ruff has investigated a number of these reactions. Ruff's view is that the aluminium chloride aids in the reaction by forming intermediate double compounds—as in the case of the Friedel and Crafts' reaction—and, in fact, many such compounds, *e.g.*, $Al_2Cl_6.2PCl_5$, $Al_2Cl_6.2SO_2$ are known. Ruff, in this investigation, has added another to the list in the shape of a double chloride of aluminium and sulphur, $AlCl_3.SCl_4$.

Having now given a working definition of catalytic action, and indicated its almost universal applicability, together with the important possibilities from a technical standpoint, I will proceed to a nearer description of certain individual processes and reactions. For the sake of convenience I have divided the reactions into groups, and will consider the inorganic first and the organic later.

Inorganic Processes.

Chlorine and Chlorine Products.—Until comparatively recently, the most important catalytic process operated on a large scale was the well-known Deacon process for the manufacture of chlorine. This process depends on the oxidation of gaseous hydrochloric acid by air, brought about in the presence of copper salts, preferably cuprous chloride, at a temperature of 450°—500° C. This process has been fully described by Lunge and others, and it is unnecessary to enter into further detail here.

A complete reversal of this process, *viz.*, the combination of chlorine and hydrogen to hydrochloric acid has been described within the past few years. Thus Pataky (Eng.

Pat. 1831, 1900) brings about the combination of hydrogen and chlorine in continuous fashion, quietly and without danger, by passing the gases in molecular proportion over coarsely pulverised charcoal, regulating the temperature by means of a water-bath. The process is intended as an adjunct to the manufacture of chlorine and alkali by electrolysis, but it is far from likely that it will ever come into extended use. Pataky is not, however, the only inventor who is looking forward to the day when electrolytic methods will entirely supersede the old Leblanc process, for we find that Lorenz (Eng. Pat. 25,073, 1894) proposes to convert chlorine to hydrochloric acid by interaction with carbon and superheated steam:—

$$C + H_2O + Cl_2 = 2HCl + CO.$$
$$C + H_2O + 2Cl_2 = 4HCl + CO_2.$$

It may be of interest to add that at a works in France, where the Outhenin Chalindre electrolytic process is in operation, a certain amount of the chlorine produced is stated to be converted to hydrochloric acid by burning hydrogen in an atmosphere of chlorine, the acid so formed being admitted to the anode chamber to prevent formation of hypochlorite, and so increase the current efficiency.

Another catalytic process for the manufacture of chlorine, in this case direct from salt, also, perhaps, calls for special note here, on account of the recent Eng. Pat. 15,152, 1899, taken out by Clemm. Briefly, the proposal is to manufacture sulphate and chlorine by passing dried sulphur dioxide and oxygen or air over a chloride, such as salt admixed with clay, to check fusion, and a contact substance, such as copper oxide or ferric oxide, to aid the reaction. So far as I can see, Clemm's proposal is very similar to certain others of earlier date. The effect produced by the presence of iron and copper compounds had been noted by many earlier workers. Thus Robb (Eng. Pat. 788, 1853) speaks of decomposing "common salt in a state of admixture with oxide of iron, pyrites cinder, or oxide of manganese (made up into balls or bricks with clay or alumina) by passing the vapour of sulphurous acid through such compound" heated in a kiln; and Königs and Henderson (Eng. Pat. 1642,-1871) describe a very similar process. In 1872, the latter inventors took out a further patent (No. 571), in which the actions of SO_2 and air were alternated instead of simultaneous, the object in all cases being to obtain chlorine and sodium sulphate. Krutwig (J. Chem. Soc., 1898 A., 2, 24), from experiments in which a mixture of salt (NaCl) and pyrites, with or without ferric oxide, was roasted in dry air, came to the conclusion that the ferric oxide acted as an oxygen carrier, and that the conversion of the sodium chloride to sulphate depended on the quantity of ferric oxide present. With a suitable proportion of ferric oxide he obtained a conversion of 91 per cent., whilst without such admixture, the conversion only reached 27·8 to 29·4 per cent.

Hargreaves and Robinson (Eng. Pat. 828, 1873) appear to have been the first to have found out that the conversion could be effected in the presence of small quantities of a catalytic material, and give as a suitable proportion 1 lb. of copper (as a salt) per ton of sodium chloride, and claim the use of copper, manganese, and chromium, and their salts for this purpose.

In the course of certain experiments made some six years ago I studied the influence of copper and iron salts in this reaction, and had practically finished the work before becoming aware of the patent just alluded to. In the absence of any published data a summary of my results may prove of interest.

The experiments were carried out by heating common salt in a glass tube to a constant temperature, and passing a steady current of sulphur dioxide and air of known composition over the mass. The catalytic agents employed (added in the form of solutions of the sulphates) were well sprinkled over the salt, and the whole well mixed and dried before filling into the tube. The resulting chlorine and excess of sulphur dioxide escaping from the tube were collected and estimated. The conclusions arrived at were as follows:—(1.) Salt is decomposed by a mixture of sulphur dioxide and air at a temperature below 600° to yield sodium sulphate and chlorine. The decomposition in glass vessels is however exceedingly slow. (2.) The addition of certain substances materially increases this rate. With 0·25 per cent. Cu (4·5 lb. Cu per 1 ton NaCl) reaction begins at 400° C. and gradually increases in amount as the temperature is raised above this point. The rate of action at 600° C. was roughly 50 per cent. higher than that at 450° C. Increasing the percentage of copper increases the rate of reaction, 0·5 per cent. Fe producing the same decomposition as 0·25 per cent. Cu. Magnesium and aluminium sulphate were without action. (3.) With a suitable gas speed all the sulphurous acid was retained by the salt, whilst its equivalent of chlorine was evolved. At higher speeds both chlorine and SO_2 escaped. The quantity of chlorine liberated increased with the speed of the sulphurous acid current, and in such manner that the "useful chlorine," *viz.*, that remaining after the accompanying SO_2 had undergone the reaction, $SO_2 + Cl_2 + 2H_2O = H_2SO_4 + 2HCl$, was a constant quantity equal to the maximum produced when no sulphur dioxide escaped reaction. (4.) The conversion of chloride to sulphate could be made complete. I obtained a final product containing only 1·5 per cent. NaCl (0·25 per cent. copper experiment).

The salts of copper and iron probably act by inducing the combination of sulphur dioxide and oxygen to sulphuric anhydride, which then reacts on the salt in the presence of the excess of oxygen to form sodium sulphate. This was readily shown in an experiment, where, after running for some time with sulphur dioxide and air acting upon white salt, the collecting bottle was changed, and at the same time a plug of platinised asbestos was placed in the inlet end of the reaction tube. The ratio of the chemical equivalents of chlorine to sulphur dioxide and sulphur trioxide rose from 1:14 to 1:1. This method of working, *viz.*, passing a mixture of sulphur dioxide and air through vessels containing alternately a contact substance, to produce sulphuric anhydride, and salt, was patented by Deacon in 1871 (Eng. Pat. 1908).

Chlorates.—A very curious instance of catalytic action, as covered by our definition, and one for which it is extremely difficult to find an explanation, is the subject-matter of patents granted to Imhoff in this and other countries. These patents are based on the observation that the addition of a small quantity of a soluble chromate or bichromate to a solution of alkaline chloride or other haloid salt undergoing electrolysis leads to a greatly increased formation of chlorate or hypochlorite per unit of current, according to conditions of temperature.

The yield of chlorate obtained by the direct electrolysis of salt solution (NaCl, KCl) in the processes generally in use is far from perfect; the following figures published by Kershaw will serve to indicate what large room exists for improvement. Kershaw's figures are:—

—	Current Efficiency.	Energy Efficiency.	Volts
Gall and Montlaur, Vallorbe.	35	18	5
Gall and Montlaur, Lunge.	45	22	5
Oettel's figures.....	52	89	3·3

Since the date of Imhoff's patents very full accounts of the improved results obtained by chromate addition have been published by Müller (Zeit. f. Elek., 1899, **5**, 469, and 1901, **7**, 398) and by Müller and Foerster (*ibid.*, 1902, **8**, 8), Müller working on a 30 per cent. NaCl solution and studying the course of the reaction by Oettel's system of gas analysis, found that the current efficiency of 32·8 per cent. obtained without chromate jumped to 69·6 per cent. on the addition of 0·18 per cent. $K_2Cr_2O_4$, and in the paper last published a rise from 65·7 per cent. current efficiency to 88 per cent. was obtained by the same means in the production of potassium chlorate by electrolysis of the chloride under specified conditions. This latter figure brings us very close to the efficiencies obtained in the best types of cell for the production of alkali and chlorine. The following brief explanation will help to make clear the particular action produced by the chromate. As is well known, the

course of electrolysis may be affected by many causes. Thus the current divides itself in definite manner between the salt to be electrolysed and other salts (either purposely added or formed during working) present in the solution. If these salts be of such a nature as, say, caustic potash or potassium hypochlorite the current conveyed through their agency only leads to formation of hydrogen and oxygen, the quantity of potassium hydrate or hypochlorite in solution remaining unchanged. This portion of the current, it is evident, does no useful work, and, from the nature of the products, it is called "current loss due to water decomposition." The result is further complicated in the case of chlorate manufacture by the secondary reaction of reduction, by the evolved hydrogen, of the hypochlorite formed as an intermediate product. Oettel's method of analysis affords a means to distinguish between these two sources of current loss and enables us to estimate the value of each. Müller in his second paper gives an instance where the current loss due to "reduction" was 51 per cent. in the absence of chromate, falling to 4 per cent. in the presence of the small quantity above mentioned; the "water-decomposition" in the latter case was, however, 28·5 per cent., as against 12·4 per cent. in the former. The beneficial effect of chromate addition would thus appear to be due to some peculiar property by which the "reduction at the cathode," which usually accompanies the electrolysis, is almost entirely obviated. According to Müller's observation, and this I can confirm, a deposit containing chromium is formed on the cathode surface. The compound is neither metallic chromium (a chromium cathode is without influence) nor an alloy, but appears to be of the nature of an oxide, and Müller's view is that the effect produced at the cathode is due to this deposit acting as an "ideal diaphragm."

The addition of chromate is equally effective in the preparation of bromates and iodates, and enables a current efficiency of over 90 per cent. to be obtained.

Manganese salts do not produce this effect, which, up to the present, appears to be obtainable by chromates only.

Cobalt salts, on the other hand, have a most disastrous effect on the yield since, according to Brochet, when cobalt oxide is present in the electrolyte, no chlorate whatever is formed at a temperature of 70° C., the hypochlorite being spüt up, with evolution of oxygen, as fast as it is formed. I might here add that these two effects produced by chromates and cobalt salts, respectively, appear to prove conclusively that the production of chlorate by electrolysis takes place through the intermediate formation of hypochlorite.

Sulphur.—(Claus kiln.)—Here, again, we have to do with a process, which, like the Deacon, is worked on a very large scale; in the Claus kiln, however, the catalytic nature of the reaction is, perhaps, not so evident. The reaction effected in the Claus kiln is the partial oxidation, by means of air, of a 25 per cent. sulphuretted hydrogen gas, obtained from tank waste, the admixed gases being passed through a particular form of oxide of iron (or pyrites obtained from this in the process) maintained at the necessary temperature by the heat of reaction.

Possibly, when this working temperature is reached, the reaction would proceed equally well whatever the substance used to pack the kiln; in fact, according to Mr. R. Forbes Carpenter (36th Annual Report on Alkali Works, p. 182), in some works, "broken brick in place of the oxide of iron is employed, successfully, it is stated, if the temperature of the kiln be maintained sufficiently high." Whatever be the nature of the reaction when a kiln is in full operation, catalytic influence certainly plays an important part in the starting of a new and cold kiln; under such circumstances, the nature of the packing material is not without effect. This is evident from the description given by Claus of his process, and is borne out by the experience of many manufacturers. A curious fact in connection with this process, is, that the oxide of iron, originally filled into the kiln, becomes changed, during continued use, to pyrites—a fact evident both from its appearance and composition. Now, although the pyrites so formed allows of the ready restarting of a kiln, a filling of ordinary pyrites is quite worthless for this purpose; there is some property lacking, namely, the catalytic.

Some interesting experiments, also bearing on this point, are recorded by Mr. Carpenter, who, working with the three contact materials named below, came to the conclusions:—

(*a*) With MnO_2 the reaction is characterised (1) at temperatures below 400° F., by formation of "free sulphur," (2) at temperatures above 500° F., by formation of SO_3.

(*b*) With oxide of iron, the reactions, on the whole, are characterised by the formation of SO_3, rather than of free sulphur.

(*c*) With broken brick, the reactions, on the whole, are characterised by large amount of H_2S escaping unoxidised, and by formation of free sulphur in place of SO_3.

As is well known, the reaction in the Claus kiln is far from complete, a state of equilibrium, varying with the temperature of working, being reached between H_2S, SO_2, S, steam and nitrogen resulting from the reaction.

A proposal for the recovery of the sulphur escaping as H_2S and SO_2 from the sulphur chamber, and amounting to some 15—20 per cent. of the whole, has been made by Messrs. A. Carey and O. Heslop, who, in Eng. Pat. 10,317 of 1900, describe a means and apparatus for treating it and for conversion to sulphuric anhydride by the contact process.

To this process we now come.

Sulphuric Acid.—The manufacture of sulphuric acid by the contact process was brought prominently before this Section two years ago by Prof. Lunge, on the occasion of the first Hurter Memorial Lecture, and since that date, articles have appeared on the subject in several foreign publications. In addition to these papers, a very large number of patents embodying the ideas and experience of many workers in this field have been issued in this and in other countries. Many of these are full of interest, and I append a list for those who wish to study the matter in greater detail than I can give here.

Sulphuric Anhydride—Patents.

Patentee.	English Patent.	Year.
Badische Anilin und Soda Fabrik	15,947	1898
	15,948	1898
	15,949	1898
	15,950	1898
	1904	1901
	6828	1901
Meister, Lucius und Brüning	6057	1898
	14,728	1898
	285	1899
	1385	1901
Actien-Gesellschaft für Zink-Industrie vormals Grillo und Schroeder	25,158	1898
	17,034	1900
	10,412	1901
"Verein Chemischer Fabriken," Mannheim	17,256	1898
	1859	1899
	3185	1899
"Verein Chemischer Fabriken," Mannheim, and Clemm	24,748	1899
	4610	1901
Clemm	15,151	1899
Raynaud and Pierron	16,253	1900
	16,254	1900
Babatz	1216	1900
Naef	18,188	1900
	18,191	1900

Many attempts to prepare sulphuric anhydride by catalytic means from sulphur dioxide and oxygen or air have been made, and a record of numerous unsuccessful inventions is contained in Prof. Lunge's work on "Sulphuric acid and alkali."

The first successful methods, namely, those of Messel and Winkler, were only applicable to a mixture of sulphur dioxide and oxygen, obtained from the decomposition of sulphuric acid, and naturally these methods could only be employed where fuming O.V. was the product aimed at. A great step in advance was made by Haenisch and Schröder, who brought out a process for separating sulphur dioxide from burner gas, and obtaining it in a pure and undiluted condition. Here again, however, the process was only intended for manufacturing fuming acid or anhydride. The object of all recent improvements has been to obtain, not

sulphuric anhydride only, but also sulphuric acid of all strengths, and at such a cost as to allow, even with the weakest acids, of competition with such acids of similar strength made by the old lead-chamber process. This has now been accomplished, and in the Badische Anilin und Soda Fabrik the gases resulting from burning 80,000 tons of pyrites are annually converted to sulphuric acid by the contact process, the lead chambers formerly in use having been abolished. (See also curve, this Journal, Class VII., p. 343.)

The processes adopted fall into two groups :—

(1) Those employing platinum as the catalytic agent.

(2) Those employing oxide of iron or similar oxide as the catalytic agent.

Of the methods employing platinum, by far the most complete account is contained in the Badische Anilin und Soda Fabrik, Eng. Pat. 15,497 of 1898, which embodies the three improvements separately covered by the patents bearing the three consecutive numbers to the one just mentioned. Since putting these notes together, a special lecture on this process has been delivered by Dr. Knietsch before the German Chemical Society. The lecture, which contains a *résumé* of earlier work and important tables of physical constants, appeared in the Berichte issued on December 28th of last year (1901, **34**, 4069).

Prior to the date of these patents, the chief difficulties in the way of successful working had been the gradual destruction of the catalytic power of the platinum and the regulation of a correct temperature in the contact apparatus. Further difficulties of a mechanical nature had likewise arisen, from the tendency of the asbestos, used as a carrier for the platinum, to pack together and so block the gas passages.

The first difficulty, apparent even in the old days, when vitriol was used as the source of the sulphur dioxide, is felt still more when burner gases are employed. These gases contain, in addition to moisture, many gaseous and suspended impurities, such as compounds of arsenic, antimony, selenium, lead, &c., and the Badische firm has found that small quantities of some of these compounds, notably those of arsenic and mercury, are particularly harmful, and can render comparatively large quantities of contact material inactive. That the catalytic power of platinum is affected by certain substances was discovered by Faraday, who found that, whilst in some cases (CO, CS_2), its activity was merely checked in the presence of impurity, in other cases (HCl and SH_2), the catalytic power of the platinum was permanently destroyed. A similar injurious effect due to carbonic oxide is mentioned by Mond, in his paper on gas batteries, and also by Lunge, in the estimation of ethylene by reduction with hydrogen in presence of platinum sponge. The small amount of impurity capable of bringing about this destruction is clearly shown in Knietsch's paper, where we find that 1—2 per cent. of arsenic in the platinum renders the latter completely inactive.

The first step, therefore, in the manufacture is clearly the purification of the burner gases, and, whilst it is a comparatively simple matter to remove the greater quantity of the impurities present in the gas, we find that the last traces are held most tenaciously, and can only be removed with difficulty. The impurity most to be feared is the arsenic, and its removal is complicated by the fact that it is found to be present both in the fog of sulphur vapour distilling from the burning pyrites, and in the fog of sulphur trioxide vapour resulting from the roasting. This latter is, perhaps, of all vapours with which we are acquainted, the most difficult to condense, as those who have had to deal with it are well aware. The first treatment to which the gases are submitted aims at the removal of these two impurities, and consists in treating the hot gases immediately after leaving the burners with a jet of steam or air. This causes a thorough mixing of the gases and effects the combustion of the sulphur present, whilst the steam both acts to dilute the sulphuric acid, subsequently condensed to such a strength (15—75 Tw.) that the lead cooling pipes are not attacked, and also causes the solid impurities in the gases to be deposited as a mud, easily removed, instead of as a hard incrustation, as is the case with comparatively dry gases. The gases are next passed through a flue, and then into a system of cooling pipes in which deposition of acid and solid impurities takes place, and it has been found that for efficient purification this cooling process must be conducted slowly, the sulphuric anhydride being apparently much more readily condensed under this condition.

The partially purified gases, now cooled to about 100° C., are next washed with water or weak sulphuric acid, to remove the remaining impurities, and are finally dried by passing through concentrated sulphuric acid. The gases so purified should be free from dust or mist, and from arsenic, &c., and the patent refers to the necessity of optical and chemical tests to demonstrate such freedom.

A second suggested method for the purification of these gases is that of Raynaud and Pierron (Eng. Pat. 16,253 of 1900), who propose to effect this end by first condensing or compressing the gases, and then allowing expansion to occur. These chemists prefer condensation to compression, and bring this about by absorbing the gases in a porous material such as kieselguhr; the expansion of the gas takes place by raising the temperature after a suitable interval. The impurities are said to remain behind in the porous material, which has, consequently, from time to time to be renewed.

Before passing on to the reaction taking place between the now purified gases, I would like to draw attention to the question of the effect of moisture in the gases. The gases are finally dried by passing through concentrated sulphuric acid, and there is not the slightest doubt that, when platinised asbestos is used as the contact substance, a very efficient and thorough drying is necessary, otherwise a rapid deterioration of the contact mass occurs. It would, however, appear from a recent research by Russell and Smith (J. Chem. Soc. Trans., 1900, p. 348), that a certain amount of moisture is necessary to promote the combination, for we read "when sulphur dioxide and oxygen are passed over heated platinised pumice, combination diminishes as the materials are more completely dried, and can be made very small," and further, "the experiments point to the conclusion that sulphur dioxide and oxygen will not combine in contact with heated platinum if moisture be carefully excluded." It would thus appear as if, even after a thorough drying with concentrated vitriol, sufficient moisture is still left in the gases to allow a fairly rapid combination to occur; a knowledge of its amount would be a matter of interest, as is also the question whether, on a manufacturing scale, the drying can be carried too far.

Contact Ovens.—We now come to the second stage, or the operation proper, viz., the conversion of the purified mixture of sulphur dioxide and oxygen diluted with nitrogen. Combination of these to form sulphur trioxide readily takes place when a suitable temperature is reached, and from the patents, we gather that it is advisable to preheat the gases to 250°—300° C. on their way to the converter, and to maintain the latter at a temperature of 450°—500° C. The influence of temperature on the course of the reaction is given very fully in Knietsch's paper, where we find that temperatures below 200° C. and above 900°—1,000° C., may, in a technical sense, be regarded as reactionless, whilst the reaction, slow at 200°, rises to a maximum at 450°, to again fall off with further rise in temperature.

The temperature of maximum conversion appears to rise the poorer the contact material is in platinum; at the same time, the rate of conversion falls. A special method of working, based on this observation, has been patented by Raynaud and Pierron in Eng. Pat. 16,254 of 1900.

It would thus appear that, for good working, the range of temperature permissible is somewhat narrow, but when these limits are not exceeded, a conversion efficiency of 98—99 per cent. is obtainable. It should here be stated that an excess of oxygen over the amount indicated by theory is necessary for successful working.

The combination $SO_2 + O = SO_3$ is accompanied by a large evolution of heat, viz., 22,600 calories, a quantity sufficient to raise the temperature of the contact material and the product to a very high degree. With burner gas of, say, 6—8 per cent. SO_2, the temperature attainable is

very much lower, but it is still sufficient to raise the temperature of the contact oven above that giving the best results, and cooling, therefore, becomes necessary. This cooling is now brought about by the purified kiln-gases, part, or the whole, of which may be caused to pass along the outside of the pipes containing the contact mass before entering these to travel in the reverse direction. It is the old principle of "counter-currents" found in many forms of heat interchanger. In cooling the reacting gases and products, the ingoing kiln-gas naturally takes up a large quantity of heat, and the fuel necessary to raise the gases to the reacting temperature is correspondingly decreased. The construction of the apparatus and the principle of working is contained in Eng. Pat. 15,949 of 1898—a very similar arrangement is described in the Eng. Pat. 6057 of 1898, granted to Meister, Lucius und Brüning; the former describe the arrangement as a means for cooling the contact mass, whilst the latter employ it for heating the ingoing gases. The end attained is the same.

Another proposal for heating the purified gas prior to conversion has been patented by Babatz, Eng. Pat. 1216 of 1900, who describes an apparatus in which the purified kiln-gas is heated by the non-purified gases on their way to the purifying plant. The heat obtainable from this source is probably more than sufficient for the purpose. Of the available heat produced in the kilns, over 90 per cent. is carried away by the gases, and Dr. Hurter, this Journal, 7, 721, stated that the temperature reached was theoretically about 800°—900° C., but practically much lower. Direct measurements made by Krutwig and Dumoocourt (Chem. Zeit. Rep., 1898, 242) in a furnace of the Malétra type, gave, respectively, for the top four shelves, 680°, 750°, 720°, and 650° C. This method of heating the gases is not free from difficulty; it is not nearly so simple and direct as that already described, where the heat evolved in the contact ovens is utilised, nor, to my mind, does it afford the same control in regulating the temperature of the latter.

This regulation of the temperature in the converter has been attempted in many ways, apart from the counter-current principle, and I would now draw your attention to some of these appearing in the Patent literature. Thus Meister, Lucius und Brüning (Eng. Pat. 14,728 of 1898), to further increase the quantity of heat transmitted to the purified burner gases from the sulphuric anhydride, admit superheated steam to the latter to give it a high heating capacity, and so maintain, in the words of the patent, "a considerable difference between the two gas currents, so long as the temperature is above the condensation point of sulphuric acid," whereby "a very much smaller plant is required for the transference of the same quantity of heat in a given time." This process is an addition to No. 6057 of 1898, and describes primarily a method of heating the ingoing gases. To regulate the temperature in the contact oven itself, the same firm, in Eng. Pat. 285 of 1899, describes a method whereby cold currents of the kiln gases may be admitted in regulated quantity at different points of the converter, and so reduce, where required, any excess of temperature caused by the interaction of the warmed gases entering through the main inlet. Grillo and Schröder (Eng. Pat. 17,034 of 1900), working with contact ovens in which the temperature is not regulated by an external gas current, as in the Badische type, divide the converter into a series of chambers and produce admixture of the gases passing from any one chamber to the next in series, by causing them to flow through a narrow passage into a larger space, before traversing the contact material next in turn. By this means a conversion of 96—98 per cent. is said to be effected, in place of only 85—90 per cent. where such distribution is not employed, the lower efficiency being due to excessive heating, in the centre of the contact mass, and cooling to below the reaction temperature, at the walls.

Raynaud and Pierron, in their amended specification 16,251 of 1900, base their process on the observation that, at a definite temperature, there is for each strength of burner gas a special degree of richness of platinum in the contact mass favourable to the reaction. This point has already been referred to. These chemists, therefore, attempt to avoid overheating at the beginning of the reaction, by bringing the burner gas, comparatively rich in sulphur dioxide, into contact material poor in platinum, and when reaction has proceeded to a certain extent, allowing the mixture to pass through a richer contact material, finally conducting again through a poorer contact mass to recombine any gases resulting from dissociation at the second stage.

In a recently published patent (Eng. Pat. 1385 of 1901), Meister, Lucius und Brüning rather appear to suggest that it is a mistake to too carefully regulate the temperature in the converter, and state that it is more economical to use two converters in series (or work the converters in chambers), working the first much hotter than has hitherto been the case. In this method of working, it is impossible to get a complete conversion in the first chamber, as Dr. Knietsch's figures prove; it is stated, however, that, notwithstanding the incomplete conversion, a much larger output of anhydride is obtained from a given weight of platinum. The partially converted gases are, after cooling to the necessary temperature, passed through the second converter, where the combination is rendered nearly complete. In a further patent (Eng. Pat. 2368 of 1901), it is proposed to absorb the sulphur trioxide from the gases leaving the first converter, before completing the reaction in the second. In Eng. Pat. 1385 of 1901 mention is made of the use of different contact materials in the first and second chambers. This method had been previously patented by Clemm and the Verein Chemischer Fabriken, Mannheim, and will be referred to later. What the value of this method of converting in separate stages may be it is impossible to say in the absence of figures; it must, however, be borne in mind that platinum is a very expensive material, and any reduction in the quantity required for conversion means a saving in capital outlay and interest, and also in working losses.

Turning now to the contact material employed, we find that, in the main, platinised asbestos is adopted. This material may be prepared in a variety of ways, each probably giving a product of different activity. The exact method of manufacture, as also the percentage of platinum contained, appear to be secrets jealously guarded by the various inventors. Raynaud and Pierron refer to a contact mass containing 5 per cent. of platinum, and to a richer material containing 40 per cent. of platinum—this latter strength I should say is of very infrequent application. Asbestos makes an excellent carrier for the platinum or other contact material, both on account of its bulky nature and more especially owing to the very extended surface it affords per unit of weight; with platinised asbestos there is very little dead space in the converter. It possesses, however, one disadvantage, viz., that of packing together under such comparatively small pressures as are from time to time inevitable when dealing with large volumes of gas. This difficulty the Badische Anilin und Soda Fabrik overcome by the method of packing, described in Eng. Pat. 15,950 of 1898, in which the mass of asbestos in the converter is broken up into bulks of small depth resting on perforated plates, arranged one above the other, at suitable intervals throughout the length of the converter. This arrangement also tends to mix the gases, though less completely than the method already described (Eng. Pat. 17,034 of 1900).

Asbestos does not, however, form the only carrier available for the purpose; there is one other at present in use, and I believe successfully, in several works. I refer to the use of soluble salts, patented by the Actien-Gesellschaft für Zink-Industrie, Eng. Pat. 25,158 of 1898. The salts available are such as remain unchanged during the reaction taking place in the contact chamber. Thus, for sulphur trioxide, a sulphate is eminently suitable, a phosphate might also be employed, since, under working conditions, conversion to sulphate does not occur. On the other hand, a chloride is unsuitable, since it would be converted, with disintegration, more or less rapidly to sulphate, and the gas passages in the apparatus would become reduced. The great advantages claimed for this "contact mass" are ease of preparation and uniform distribution of the active material, coupled with simplicity in the recovery of the latter, should the contact material become inactive. The mode of preparation is to form a solution of platinic chloride, and the soluble salt to be employed, and to evaporate the whole to dryness, breaking

up the crusts so formed into pieces of uniform granular size. The separation of the metallic platinum in a very fine state of subdivision takes place on heating the contact mass when the process is started. The patentees state that contact masses containing only 0·1 per cent. platinum are very efficacious.

The same firm has obtained a German patent (Kl 12, No. 115,333) for a dry purification of this contact mass, consisting in the removal of arsenic, mercury, &c., in a current of chlorine gas and of oxygen compounds, by means of coal- or other reducing gas.

Methods for obtaining a still more porous contact mass have also been patented by this firm (Eng. Pat. 10,412 of 1901), in which it is proposed to form the pores in the "carrier," whilst this is still in the pasty condition and in process of drying, by forcing a gaseous current through the mass at a rate similar to that employed in the converter during normal working. Suitable substances, in addition to those mentioned in 25,158 of 1898, are clay, gypsum made into a paste with water, also certain salts which melt in their own water of crystallisation. The actual operation of preparing the contact mass may be carried out in the apparatus which, later, acts as contact oven. Neuendorf (D.R.P. 127,846 of 1899) prepares a similar mass by acting on salts of Ca, Ba, and Sr, other than the sulphates, with sulphur dioxide, air, and steam, or sulphuric acid vapour at a high temperature. The Badische Anilin und Soda Fabrik (Eng. Pat. 6828 of 1901) form the carrier by the interaction, in intimate admixture, of an oxide or hydrate of a fixed alkali or alkaline earth metal, or such salt of these as contains a volatile acid (HCl, CO_2, acetic acid, &c.) with a salt of a volatile base such as ammonia, and a more difficultly volatile acid, such as sulphuric or phosphoric acid, at a suitable temperature. At such temperature, double decomposition takes place, and the vapours of the volatile salt so formed are said to impart, in process of escape, a high degree of porosity to the non-volatile salt which results. The platinum may be added to the mass either before or after heating.

Contact bodies, having clay as a carrier for the platinum, have been patented by Efrém (Eng. Pat. 14,339 of 1899) and the Chem. Fab. vorm. Goldenberg, Geromont, & Co. (Eng. Pat. 618 of 1900).

The latest suggested catalytic agent in this field is asbestos impregnated with vanadic acid, and de Haën has obtained a patent in the States (No. 687,834) for the use of this material. Its advantage compared with platinum appears to be one of price; whether it is, similarly to platinum, affected by impurities in the gases, I am unable to say. According to Häussermann, it allows a conversion efficiency of 81 per cent. at 465° C. to be obtained.

Ferric Oxide Process.—Under this heading, we have to deal with the important process carried on at the works of the Verein Chemischer Fabriken at Mannheim. The process itself is described in Eng. Pat. 17,266 of 1898, in which the inventors draw attention to Wöhler's work, in 1852, on the power possessed by the oxides of copper, iron, and chromium of inducing combination between sulphur dioxide and oxygen at a moderate red heat, and, connected with this, to the further fact that, in pyrites gases, from 8—10 per cent. of the sulphur is present as trioxide. Finally they refer to Lunge's work, published in 1877 (Ber., p. 1824). Lunge's best results indicated a maximum limit for the conversion of only 16—18 per cent. when working with pyrites cinder. The reason for this low figure the Mannheim firm finds to be due to the low catalytic power of burnt oxide which has been allowed to grow cold, and they have discovered that, if the pyrites cinder be used fresh, and the air for the combustion of the pyrites dried previous to admission to the burners, a conversion of 60 per cent. is readily obtained, which figure may under suitable conditions rise to 90 per cent. The reaction is said to proceed more completely if the furnace gases, which normally contain 6—8 per cent. SO_2, are diluted to 2—3 per cent. SO_2 by dried and heated air, before admission to the contact mass (Eng. Pat. 3185 of 1899). The apparatus in which the operation is carried out is described in Eng. Pat. 1859 of 1899, and consists of a block of pyrites burners, in the centre of which are placed the contact ovens. Dried air is admitted below the grates in the burners, and the hot gases pass directly from these through the contact mass, maintaining it at the red heat necessary for conversion. Preliminary purification of the gases is unnecessary. Notwithstanding this, a comparatively pure product is obtained, for it has been found that the catalytic agent, whilst effecting the conversion, at the same time abstracts most of the arsenic to form a non-volatile compound with the oxide of iron. The power of the contact mass is reduced as the quantity of arsenic absorbed increases, but this does not form a serious difficulty, since the contact mass is readily replaced, and a large supply of fresh material is always at hand.

It appears to me very doubtful whether, with oxide of iron alone, a complete conversion can be brought about on a technical scale; according to Knietsch's figures, the conversion temperature lies too high (500—600), and the Mannheim patents confirm this by speaking of a red heat. The difficulty is admitted in Eng. Pat. 24,748 of 1899, granted to Clemm and Ver. Chem. Fabr., Mannheim, and it is here proposed to overcome the same by combining the "ferric oxide" and "platinum" contact processes, the partially converted and purified gases leaving the ferric oxide converter being conducted, after first passing through a dry scrubber, into a second converter containing platinum. In this patent, a very neat method of preventing blockage in the converter is described, the platinum being deposited on a grating or network of suitable fabric, supported on a frame. Eng. Pat. 4610 of 1901 is an addition to this, covering the use of other oxides, as well as ferric oxide.

Slight variations on this process have been patented in the States by Frasch (No. 664,630), who burns a substance giving iron oxide over which sulphur dioxide and air are passed, and by Blackmore, who, in No. 686,021, substitutes for the oxide of iron a sulphide prepared by passing sulphur dioxide and sulphur over the oxide, and, in No. 686,022, first passes sulphur dioxide over oxide of iron, and after raising the temperature, follows this with oxygen, after which the temperature is again lowered for further treatment with sulphur dioxide, and so on.

For maintaining the temperature in oxide of iron converters, Briegleb (D.R.P. 121,906) proposes to heat internally by combustible matter free from hydrogen.

As regards Naël's patents, the chief point of interest is the number of claims contained, the figures being 134 in the first, and 154 in the second.

A final point still remains, and that is the absorption of the sulphuric anhydride from the gases leaving the converter. As a rule, this is done by passing the gases through vitriol contained in suitable vessels, the absorption in water being much too energetic. A curious point in this connection is to be found in Knietsch's paper, where we read that the absorption is best effected by an acid containing 97—98 per cent. H_2SO_4, such an acid being much more efficient and rapid in its action than an acid of lower or of higher strength. The absorber is, therefore, started with such acid, and weaker acid is run in continuously and in corresponding quantity to the sulphuric anhydride entering the vessel, so that the strength of acid is maintained constant.

Where iron absorbers or pipes are employed, it is found that a slight action takes place between the acid and the metal, and when acid free from iron is required, it is necessary to absorb in fuming acid containing 27 per cent. free SO_3 (represented by the formula $2H_2SO_4 + SO_3$), the absorbing vessel being of wrought iron. This method has been recently patented by the Bad. Anilin und Soda Fab. (Eng. Pat. 1904 of 1901), and the acid so obtained is said to contain only 0·003—0·001 per cent. of iron.

I have been tempted to describe the contact processes for the manufacture of sulphuric anhydride somewhat fully, not only on account of their importance and the comparatively recent attainment of their present success, but also because such a description affords a very clear insight into the many difficulties inherent to this and similar catalytic processes. These difficulties have already been discussed, and we have also seen how, by careful and often laborious research, first one and then another has been localised and finally surmounted.

In many respects they have closely resembled those met with in the early days of the Deacon chlorine process. In both cases, the temperature of the reaction chambers is a highly important factor, and has to be maintained between comparatively narrow limits, otherwise a poor conversion results. Again, the nature of the contact substance and its concentration, as also the nature of the material used as carrier, are matters of the greatest importance, and we also have, in both instances, to cope with the decay of activity resulting from the action of impurities on the contact mass; these impurities being sulphur trioxide and arsenic compounds in the Deacon process, and arsenic compounds, moisture, &c. in the anhydride process. This decay, always a matter of importance, is especially felt in a process employing the costly platinum as a catalyst, and we have seen that a searching purification of the reacting gases has in this case been found to be indispensable. With a less expensive catalytic material, and one less sensitive to injury, it is usually found cheaper to renew the catalyst from time to time than to submit the gases to so complete a purification.

Organic Processes.

Aldehydes.—To turn now to organic compounds, I will first consider a few catalytic reactions resulting in the formation of aldehydes. Of these bodies, the simplest is formaldehyde, a substance which, as an aqueous solution under the name of formalin, has recently come to be largely used for preservative and antiseptic purposes. Numerous abstracts dealing with its value for such use are to be found in our Journal. The almost universally applicable platinum black again comes into play, and numerous so-called formaldehyde lamps, in which a mixture of methyl alcohol vapour and air is conducted over this catalyst, are described. One such is, for example, to be found in Eng. Pat. 8575 of 1895, granted to Trillat. The method of working is simple, and the reaction proceeds automatically when the sponge is heated to start the reaction, which maintains the temperature at a dull red heat. This oxidation of alcohols by air in the presence of platinum appears to be common to alcohols of widely differing properties. Trillat (Comptes Rend., **123**, [21], 822), using a platinum spiral, has shown that unsaturated alcohols are converted to their corresponding aldehydes, and he has even succeeded in preparing vanillin from isoeugenol by this means.

A very interesting method of preparing aldehyde from alcohol, and, at first sight, apparently by simple dissociation and without oxidation, has recently been described by Ipatiew (Ber., 1901, 3579). Ipatiew, working with ethyl alcohol, shows that, in glass apparatus, very little decomposition takes place below 700° C., and that the decomposition only becomes energetic at 800° C. and upwards, at which temperature, one-fifth of the alcohol is split up to form ethylene and water, whilst the remainder gives rise to hydrogen and aldehyde. Of the latter compound, only one-third, however, remains unchanged, the rest being further dissociated into carbonic oxide and methane. The reaction follows a nearly similar course in a platinum apparatus. The result, however, is very different when the vapour is passed over metallic zinc. In the presence of this metal, dissociation takes place readily at a temperature of 620°—650°, and aldehyde corresponding to a yield of 80 per cent. is found in the product. This property the author finds to be common to metals which readily decompose water, *i.e.*, to such as are capable of easy oxidation and reduction, and he considers the reaction to proceed in such fashion, that the water vapour resulting, together with ethylene, from dissociation of the alcohol, reacts with the zinc to form zinc oxide, which latter is reduced by the alcohol with formation of aldehyde and water, the latter again converting more zinc to oxide, and so on.

The method is one of interest, and from a later communication read before a gathering of Russian scientists (Chem. Zeit., 12 2/02, p. 132), appears to be capable of wide application, primary alcohols giving rise to aldehydes and secondary alcohols to ketones. Ipatiew has prepared by this method isobutyl- and isovaleraldehydes, acrolein, benzaldehyde, and acetone, and he states that oxides act similarly to the metals. In the presence of graphite, however, the decomposition follows a different course, the alcohols at 600° splitting up into the corresponding hydrocarbons of the ethylene series and water.

Still another method, a modification of the Friedel and Crafts' reaction, is described in Küchler and Baff's D. R. P. 126,461, according to which benzaldehyde is obtained from benzol, under the simultaneous action of CO and HCl, in the presence of cuprous chloride and aluminium bromide. The cuprous chloride is required to bring the carbonic oxide into solution, the aluminium bromide being the catalytic agent. The bromide is used instead of the chloride owing to its greater solubility in benzol, the chloride being too insoluble in this liquid to allow the reaction to proceed.

Acetic Acid and Acetone.—An interesting proposal for the purification of commercial acetic acid has been made by Behrens (Eng. Pat. 3392 of 1901), who proposes to remove from the acid all empyreumatic matters, by oxidising the vapours of the crude acid with air under the influence of platinum black. How far such a process is efficacious, I cannot say.

An interesting catalytic decomposition of acetic acid itself has been described by Squibb (this Journal, **14**, 506, and **15**, 612). According to Squibb, acetic acid vapour, passed through a hot tube (500° C.), suffers only a small amount of decomposition. This decomposition is increased when the tube is filled with pumice, and, when in addition to the pumice, barium carbonate is present, the decomposition becomes nearly complete, the products being water, carbonic anhydride and acetone, the yield of the latter being about 90 per cent. of that indicated by theory.

$$2CH_3COOH = (CH_3)_2CO + CO_2 + H_2O.$$

Squibb has performed these experiments on both the laboratory and manufacturing scale, in each case with the same satisfactory result. It fell to my share, some few years ago, to repeat these experiments, and I can fully confirm Squibb's conclusions. This catalytic property appears to be common to all carbonates (and acetates) whose metals form acetates, which give rise to acetone on distillation. The temperature of decomposition appears to vary both with the chemical nature of the carbonate employed, and also with its physical condition.

Carbon Tetrachloride.—This is a substance possessed of strong solvent powers, owing to which, coupled with its comparatively low boiling point (76°·5 C.) and non-inflammability, many proposals have been made during recent years to use it in the arts and manufactures instead of the dangerous petroleum spirit, ether, carbon bisulphide, &c. The ordinary method of preparation is to chlorinate carbon bisulphide, when the following reaction occurs: $CS_2 + Cl_6 = CCl_4 + S_2Cl_2$.

Klason (Ber., **20**, 2376) has shown that at ordinary temperatures these two substances interact but slightly, but that in the presence of chlorine carriers (I, $SbCl_5$, &c.) CCl_4 is rapidly formed. During his research, he isolated a whole series of intermediate products containing C, S, and Cl, one of which, $CCl_3.SCl$, absorbed chlorine in large quantities when no chlorine carrier was present; in the presence of a trace of iodine, however, substitution immediately took place, with completion of the reaction to CCl_4 and SCl.

Lever, Lever and Scott employ this method in Eng. Pat. 18,990 of 1889, passing dry chlorine into carbon bisulphide, in which from 2—12 per cent. of iodine is dissolved: they state that bromine and antimony pentachloride are less efficacious. The latter substance appears, however, according to Eckenroth, to have been largely used in Germany, and considerable quantities of carbon tetrachloride produced by its aid. As will be noticed, the reaction gives rise to one molecule S_2Cl_2 per molecule CCl_4, only two-thirds of the chlorine employed being converted to the tetrachloride. When the sulphur chloride cannot be sold, a more complete utilisation of the chlorine is desirable, and this is effected, according to Müller and Dubois (Eng. Pat. 19,628 of 1893), by the addition of finely divided iron to the mixture of

bisulphide and sulphur chloride. At 60° C., reaction is said to set in spontaneously, and heating is only necessary towards the end of the operation. The reaction taking place is: $2S_2Cl_2 + CS_2 = CCl_4 + 6S$. The sulphur separates out in large crystals on cooling, and may be employed in the preparation of fresh quantities of carbon bisulphide.

The usefulness of these so-called "chlorine carriers" is not confined to the manufacture of carbon tetrachloride; their effect is well marked in quite a number of reactions. The question as to what substances could react in this manner and their mode of action was well studied in 1884–5 by Lothar Meyer, Scheufelen, Page, and others, who discovered a number of interesting and new reactions during the research. A large number of chlorides were investigated, but only $FeCl_3$, $AlCl_3$, $TlCl_3$ $TlCl$, $MoCl_5$, and $SbCl_5$ appeared to assist chlorination. Page considered that the chloride formed a molecular compound with the substance to be chlorinated, such compound being subsequently split up, with liberation of hydrochloric acid, under the action of chlorine. Meyer's experiments on bromination, which is also brought about in similar fashion, certainly indicated that the metallic salt ($FeCl_3$) actually takes part in the reaction.

The accelerating effect produced by antimony chloride in the manufacture of carbon tetrachloride was noticed by Hofmann as far back as 1861.

Before concluding this portion of my paper I might refer to the oxidation of naphthalene to phthalic acid by sulphuric acid in the presence of mercury, mentioned by Ostwald; a reaction forming one of the several stages involved in the production of synthetic indigo. The increased oxidising power exerted by concentrated sulphuric acid, when mercury (or a compound) is present, was noticed by Wilfarth, and such addition of mercury was recommended by him some years ago to hasten the oxidation of the carbonaceous matter in the now well-known Kjeldahl process. In this case, the complete destruction of the organic matter was aimed at; in the oxidation of naphthalene, a partial oxidation is all that is required. A similar useful partial oxidation has been patented by Rosenthal (D.R.P. 127,180), who states that, whilst oxidation of tertiary aromatic amines with sulphuric acid alone at temperatures over 200° C. only gives tertiary bases of the phenyl group, corresponding to a yield of 10 per cent., the addition of mercury or its salts leads to a yield of 60 per cent., and, in addition to this, a yield of 30—40 per cent. of higher melting and more complicated bases. If, instead of mercury, nitrobenzene or benzaldehyde or other substance, which at 200° C. produces SO_2 from sulphuric acid more readily than does the base itself, be employed, a quantitative yield is said to be obtained (D.R.P. 127,179).

This brings me to an end of the methods of preparing special products. The manufacture of glucose and other similar processes of hydrolysis effected by comparatively small quantities of acid are too well known and too frequently described to merit further attention here.

In the cases so far cited it will probably have been noticed that the influence exerted by the catalyst has been in the direction of promoting or accelerating chemical change. Our definition of a catalytic substance, however, is so framed as to indicate that the reaction may also be influenced in the reverse direction, *i.e.*, retarded, and I would briefly refer to a few instances in which this is the case. As an example in which the presence of a small trace of foreign substance is harmful, I might refer to the statement made in this room, a few months ago, by Mr. Orsman, to the effect that the presence of 0·2 per cent. of moisture in *pure* fulminate of mercury so alters the speed of decomposition that what ought to be a detonation is reduced to an explosion. A further point of interest was that the detonating power of the fulminate admixed with potassium chlorate was not affected by moisture, and that such a mixture might be kept in a moist atmosphere indefinitely without losing its properties. As cases in which the presence of a catalyst is beneficial, we have the well-known preservative influence exerted by traces of acid on solutions of hydrogen peroxide, and hydrocyanic acid; such agents also afford a means of causing polymerisation.

Here is a convenient place to mention that in some cases a substance generally regarded as unstable may owe this instability to the presence of some catalytic agent the removal of which will lead to beneficial results. A technical example of such an instance was given by Messrs. Muspratt and Smith, in their paper on high-strength hypochlorite solutions (this Journal, 1898, p. 1096, and 1899, p. 210), in which it was shown that the decomposition occurring in commercial hypochlorite of soda solutions was very largely due to the small quantity of iron present as a ferrate in the liquor. Methods for removing this iron have been devised, and the purified liquor is now a regular article of commerce.

These reactions are not without importance in the realm of analytical work; the estimation of hydrogen in gaseous mixtures, by conducting these, admixed with the necessary oxygen, over gently warmed palladium asbestos, being a very pretty example of fractional combustion by catalytic means. Although this method of estimation has been in use for some time, the following figures, amongst others, obtained by Phillips (J. Chem. Soc. Abs., 1894, **2**, p. 293), are of interest as showing the wide differences in the temperature at which combustion of different gases occurs. He found that, with hydrogen, oxidation takes place at 20°—55° C., with carbonic oxide, at 290°—359°, and with Marsh gas, at 404°—414° C. Analogous to this method is the proposal of Harbeck and Lunge (J. Chem. Soc. Abs., 1898, **2**, p. 166 and 193) for the quantitative separation of ethylene and benzene vapours by fractional reduction, the former compound being reduced to ethane, C_2H_6, when led with hydrogen over platinum black heated to 90°—100° C. Another instance of the greatest importance occurs in the testing for arsenic, by the Marsh method, when selenium compounds are present, Rosenheim having shown (Chem. News, 1901, p. 277) that, under certain conditions, the presence of selenium completely prevents the formation of the arsenic mirror, and in all cases influences the magnitude of the latter. In this case, however, it should be stated that the cause is probably largely mechanical, and so differs entirely from the other cases here described. A further instance of catalytic action is contained in Marshall's method of detecting and estimating minute quantities of manganese, where the manganese is oxidised to permanganate by means of persulphate and a trace of a silver salt; in the absence of the latter, the oxidation usually ceases when the stage of peroxide has been reached (Chem. News, 1901, **83**, p. 76).

Other interesting catalytic effects are those produced by colloidal metals, and Zsigmundy (Zeits. anal. Chem., 1901, p. 697) has devised a method in which, by the aid of a colloidal gold solution, it is possible to detect other colloidal substances in solution, to differentiate these into several groups, the author gives four, and to approximately determine the quantity present.

A new and interesting method of preparing a colloidal platinum solution has been discovered by Bredig, who obtains it by passing the electric arc between platinum wires immersed in cold water. Hitherto such metallic solutions had only been obtained by chemical means, such as in the case of the colloidal gold used by Zsigmundy, the reduction of chloride ($AuCl_3HCl3H_2O$) by formaldehyde after the addition of a small quantity of potassium carbonate.

Further instances of catalytic action which may not be overlooked are those due to the nature of the walls of the vessel in which any given chemical reaction is effected. Numerous instances of such action are cited in van t'Hoff's "Chemical Dynamics," and a further striking example is shown in Ramsay and Young's experiments on the decomposition of ammonia by heat (J. Chem. Soc. Trans., 1884, p. 88). That these effects are felt in large-scale operations is clearly shown in Henderson and Beilby's paper (J. Chem. Soc. Trans., 1901, p. 1245), where we read that the passage of ammonia through heated metallic pipes led not only to destruction of the ammonia, but also to a complete disintegration of the metal, owing mainly to physical change brought about by chemical reaction.

I will now briefly consider the principles underlying these various reactions. To do so completely would be a difficult matter, in fact, I might say, it is, at present, impos-

sible. Our present knowledge of these processes is far too superficial to allow of anything more than a hint at their mechanism being hazarded. One thing, however, is quite certain, and that is, that there is no such mysterious catalytic force, or contact action, as was supposed by chemists—some of them of note—in the earlier days. I feel pretty sure that all catalytic phenomena will find their explanation in the action of forces at present known, imperfectly so, it may be, in many cases.

Although there is no unique catalytic force, there undoubtedly exists a large class of phenomena in which reaction is influenced by the presence of a limited quantity of a third (or additional) substance, which apparently remains unchanged. Such a class requires some special distinguishing mark, and the word "catalytic" may, I think, be used in this connection without misunderstanding and without prejudice. Possibly the name "cyclic action," advocated by some authorities, is more descriptive, and, to such extent, better.

Considering the phenomena according to the four groups of Ostwald's classification, we find that the reactions included in the first group are physical rather than chemical in their character. The separation of a substance from its supersaturated solution amounts, at most, to a very mild form of dissociation when viewed from a chemical standpoint. It is something largely different, though not necessarily so in its essence, from the reactions described in the preceding pages, and I propose to leave it, as also the fourth group, out of my further considerations. The fourth group, *viz.*, that relating to enzymes, is one about which very little is known. The changes effected are always those of hydrolysis, and there is reason to believe that the enzyme combines both with water and the substance undergoing hydrolysis, a mode of action involving the formation of intermediate compounds, and hence analogous to those to be further discussed.

Examining the remaining groups, chiefly in the light of the reactions I have described, we find that these actions fall into the two main divisions :—

(1) Those in which platinum or other substance possessing the power of occlusion is the catalyst.

(2) Those in which the catalyst is a substance capable of combining (or reacting) with one or more of the materials undergoing chemical change.

If the meaning of the word "combining" in (2) be extended to cover occlusion, then all the phenomena fall into this second division.

Considering the first division, we find that, apart from dissociation, the reactions chiefly brought about are reductions or oxidations. The most active agents are platinum and palladium; carbon in various forms may also be used advantageously in certain cases. The rapidity and extent of the reaction depend very largely on the physical condition of the catalyst; probably also on its chemical and physical properties. They may also depend on the physical condition induced in the reacting substances. For some reactions, *e.g.*, the oxidation of alcohol to aldehyde, platinum foil is sufficient; for others, platinum black is necessary, and the mode of preparation of this has considerable influence on the reaction. Also, when platinum fails, palladium may succeed under otherwise similar conditions.

As is well known, both platinum and palladium possess to a remarkable degree the power of occluding hydrogen and oxygen, and it has been shown that in the occluded state these gases are very reactive. The condition in which these occluded gases exist is not yet settled, various chemists arriving at quite opposite conclusions in discussing their own experimental results. The consensus of opinion, however, points to the view that, in the case of oxygen, an oxide (PdO) is formed when palladium is the occluding metal; with hydrogen, on the other hand, the formation of a compound is extremely doubtful, and Ramsay and Hoitsema have independently arrived at the view that the occluded hydrogen exists in the monatomic condition.

If these views be correct, oxidations effected by platinum and palladium black would come into our second division, or that in which, it is commonly said, change takes place through "intermediate reactions." Engler and Wöhler have recently come to this conclusion, and state that the active intermediate compound is a peroxide of platinum (PtO_2). Reductions, on the other hand, would be excluded from this division, and the greater activity of the occluded hydrogen might be due to its existing in the atomic instead of in the molecular state; in other words, in the nascent condition. In this connection it is of interest, in passing, to refer to Gladstone and Tribe's work on the zinc-copper couple, and to their conclusion, based on work arising out of this research (J. Chem. Soc., 1878, T., 306), that hydrogen in the occluded and nascent condition is identical.

Another point to be borne in mind in this class of catalytic actions is the heat liberated during occlusion. This quantity is, in many cases, very considerable, and although it cannot be regarded as the cause of catalysis, it may help to start a reaction by bringing the mixture up to the temperature necessary for incipient reaction. The majority, if not all, these processes are strongly exothermic, and it is the heat of the reaction, when once the process is started, that maintains or assists in maintaining the temperature necessary for rapid action.

Coming to the second division of these reactions, we find that we have to deal with processes which have, so far, found their explanation in the theory of so-called "intermediate reactions." To take concrete cases :—

The combination of sulphur dioxide and oxygen to sulphur trioxide, under the influence of ferric oxide, might be supposed to take place by combination of the reacting gases with the catalyst, to form a sulphate of iron, which, at the temperature of the reaction, is immediately split up, with formation of sulphur trioxide and regeneration of iron oxide.* Again, the production of acetone from acetic acid might take place by momentary formation of barium or calcium acetate from the acetic acid and metallic carbonate acting as catalyst, the acetate then splitting up, in the usual manner, into acetone and carbonate.

Further, if we consider the substances capable of acting as chlorine carriers, we find them to consist of iodine and various metallic chlorides, of which the metal is in all cases capable of forming two chlorides, a higher and a lower, the lower first combining with the chlorine to give the higher, which reacts with the substance undergoing chlorination, chlorinating this, and regenerating the lower chloride to act anew with fresh chlorine. Similar remarks apply to the so-called oxygen carriers, also studied by Meyer. This division might, therefore, perhaps be divided into the two subdivisions :—

(*a*) Reactions in which the catalyst might be considered to combine with all the reacting substances to yield a compound which, under the conditions of temperature, &c., splits up in a different direction to that representing the reverse of the combination.

(*b*) Reactions in which the catalyst combines with only one of the reacting substances to yield a compound capable of reacting with the second substance present.

That a compound should be produced under conditions which brings about its decomposition may, perhaps, appear unlikely. It is, however, not by any means outside the range of possibility. We know a number of cases in which substances combine, at some definite temperature, to yield a compound which, at some other temperature, either simply dissociates, or suffers a more deep-seated decomposition. In some of these cases, the temperatures of combination and dissociation or decomposition lie comparatively near to each other. I might cite the formation and dissociation of barium peroxide and also that of nickel carbonyl. It is thus quite conceivable that, in some instances, these two temperatures should be identical, and Dr. Knietsch's paper proves that oxide of iron effects the combination of sulphur dioxide and oxygen, even at temperatures at which sulphur trioxide is partly, even largely, dissociated.

How far such a representation of these reactions affords a description of what actually happens, it is impossible to say. Ostwald goes so far as to state that all theories are

* This process might also be looked upon as taking place through the direct oxidation of sulphur dioxide by the ferric oxide, and regeneration of the latter by the oxygen present in the gases.

valueless in the absence of exact measurement, and that before accepting any theory of "intermediate reactions," it is necessary to prove that these proceed more rapidly than the direct action. Since the appearance of Ostwald's paper, actual measurements have been made by Brode (Chem. Zeit., 11 12/01, p. 1116) on the oxidation of thiosulphate to tetrathionate by means of hydrogen peroxide, with iodine as catalyst. In the absence of iodine, the reaction proceeds very slowly, in its presence, with ease, and Brode has shown that the two intermediate reactions involved in this case proceed at the same rapid rate.

Whilst agreeing with Ostwald's view as to the value and the necessity of such measurements as those above described, I cannot altogether agree as to the worthlessness of any theory in the absence of measurement. The theory of intermediate reactions is the best definite theory so far offered in explanation of a very large number of catalytic phenomena; it indicates a possible mode of action, and is sufficiently concise to allow a prediction of new reactions. It points out a method of attacking these problems, and indicates in what direction quantitative measurements are required in confirmation or condemnation. Whether we have this alternation of reactions, or whether we have change produced by a simultaneous interaction of all the substances present, it is impossible as yet to say.

There is, however, no doubt but that the catalyst, in the majority of cases, takes part in the chemical changes occurring. It is, as we have seen, usually a substance capable of reacting with one or more of the bodies undergoing change, and the instances are numerous in which definite compounds produced from catalyst and reacting substance have been isolated. For a recent and interesting example, I might again refer to the paper by Beilby and Henderson on the decomposition of ammonia by metals. Until the publication of this work, the decomposition of the ammonia had appeared to be a simple dissociation into its elements, which occurred with greater or lesser ease according to the nature of the material with which it was in contact. We now know that the decomposition is not so simple, and is not confined to the surface of the metal, but that in some way the ammonia penetrates into the mass and finds its way to every part, completely altering the physical nature of the metal in the process. This physical alteration the authors trace to chemical change, and they show conclusively that reaction takes place between the metal and the gas, and that, working under suitable conditions, viz., large excess of ammonia and correct temperature, a nitride of the iron or other metal employed may be isolated. A similar instance in which a metal capable of reacting with ammonia leads to dissociation of the latter is given by Titherley, in his paper on sodium amide (J. Chem. Soc. Trans., 1894, p. 504), where we read that a current of ammonia passed over sodamide, heated to dull redness, is continuously decomposed into its elements, the decomposition taking place through the splitting up of the amide into nitrogen, hydrogen and sodium, which latter, in the presence of the ammonia, reforms sodamides to be again split up. These examples serve to emphasise the fact, that many chemical reactions are not so simple as they appear, and we find chemists to-day stating as a general law that chemical reactions take place by steps, and that the final stage of any change is not reached so directly as has been hitherto supposed. The investigations of Traube, Engler, and others have shown this to be the case in a large number of oxidation phenomena, and some account of their work was given by Dr. Kohn to this section during last session. Prof. Armstrong has expressed it:—"In all cases of chemical change, energy is ultimately degraded, but in most cases a switchback rather than a simple inclined plane, is the graphic analogue of a circuit of chemical change."

In addition to these phenomena it is now a well established fact that reaction seldom occurs between two pure substances, the presence of some third substance, be it only a trace of impurity, is necessary. Very often water, either in traces as vapour, or in larger quantity as solvent, determines reaction, and viewed in this light, it may be looked upon as a catalyst of almost universal application. The important part played by this third substance was the theme of Professor Armstrong's able and suggestive Presidential Address on "The nature of chemical change and conditions which determine it," delivered before the Chemical Society in 1895. Starting from Faraday's statement, that "the forces termed chemical affinity and electricity are one and the same," Professor Armstrong proceeded to define chemical action (exothermic) as "reversed electrolysis," thus necessitating in any reacting system the conditions obtaining in the voltaic circuit and the presence of at least three substances. He stated as his view that "complication, not simplification, precedes most, if not all, chemical changes; that complex molecular systems are first formed by the interacting substances, and that these, on breaking down, suffer rearrangement of the parts—such rearrangement taking place in consequence of elements which were previously separate, being brought into one common "sphere of activity," within which it is possible for them to act." To effect such condensation he defines to be the function of catalysts generally, and the systems so formed may be regarded as closed voltaic circuits. Grove also viewed these actions as voltaic, the catalyst serving to complete the circuit.

Considered from this standpoint, catalytic reactions fall into line with chemical reactions in general, and require no explanation peculiar to themselves. Such a standpoint allows us to picture the reactions as occurring in stages—a mode of explanation which we have seen to be useful, just as in the electrolysis of a solution of caustic soda—the decomposition of water, which so far as the final products are concerned, appears to be the sole reaction, is pictured as resulting entirely from secondary decomposition.

It may even be that, instead of these reactions being, as was formerly supposed, entirely different in their nature to those involved in other chemical changes, and regarded as more simple, they are instances in which the mechanism of chemical change is more clearly indicated, in which case, a fuller knowledge may lead to important results in our science.

This brings me to the end of my paper. The subject is one which, you will see, covers a very wide field, and my difficulty from the start has been rather what to exclude than what to include. Many examples of great interest, from the purely scientific standpoint, have been omitted altogether, or only mentioned in passing—on some of these sufficient work has been done to fill a volume.

I have not even attempted to enter into all the theories proposed in explanation of catalytic action, amongst which may be mentioned that of Mendeléeff, who supposes that some change takes place in the motions of the atoms within the molecules at the points of contact of the latter; and the view propounded by Fitzgerald, that such change, and in fact chemical change generally, may be due to the action of superficial electrical layers at the contact surfaces of different materials. The theory of intermediate reactions which I have described appears to me the most useful, and, when extended on the lines indicated by Prof. Armstrong, the most likely. The course of reaction in the cases where a metallic couple is formed is clearly electrolytic; in other cases, the evidence of electrolysis is not so pronounced, though even here it is probable that the catalyst merely aids by completing a voltaic circuit. Other points upon which I might have enlarged are, the proportionality between the rate of change and the relative quantity of catalyst present, and the effects produced when two catalytic agents act in conjunction—effects in some cases much greater than the sum of the single effects would allow one to infer.

I have endeavoured to confine myself for the greater part to those cases of catalysis having a bearing on industrial chemistry, and therefore to some extent entering into our daily life. That the scope of such processes will widen is hardly to be doubted; the large amount of research now being carried out will lead to a clearer understanding of the laws underlying catalytic processes in particular, and chemical processes in general, and probably also lead to fresh instances of catalytic action. The further work of those engaged in this research will be followed with interest; and in these days of rapid progress in which the research of to-day is the process of to-morrow, we may count on full use being made of any discovery of practical value.

London Section.

Meeting held on Monday, February 3rd, 1902.

MR. OTTO HEHNER IN THE CHAIR.

THE NEW TABLE PHOTOMETER AND STANDARD PENTANE BURNER, PRESCRIBED BY THE GAS REFEREES FOR USE IN THE LONDON GAS TESTING STATIONS.

BY PROFESSOR FRANK CLOWES, D.Sc., F.I.C.

(*Superintending Gas Examiner to the London County Council.*)

Introductory.—The gas supply of London is subjected to frequent periodical examination as regards illuminating power and purity. The testing is compulsory, under the City of London Gas Act of 1868, and the system at present includes twenty-three properly equipped stations, each of which is under the direction of a properly qualified examiner, whose duty it is to carry out daily tests in his station. Twenty of these stations are situated in greater London and are under the charge of the London County Council; three are in the City of London and are under the Corporation of London. Each station is provided, equipped, and maintained at the expense of the gas companies, but the apparatus which is used and the methods employed in the tests are prescribed by gas referees, who are elected under the provisions of the Gas Act, and these referees are also responsible for guaranteeing that the stations and apparatus are in proper and suitable working order.

It is by a recent notification of the gas referees that the new photometer and standard pentane lamp have been prescribed for use in the testing stations, and experience with the new apparatus seems to have commended them not only to the gas examiners, but also to those who use the new apparatus in connection with the gas companies' own tests.

The New Standard Pentane Lamp.—The pentane 10-candle lamp has been designed by Mr. Vernon Harcourt to supersede the old standard candles, which appeared to satisfy no one who was familiar with their use. The new lamp furnishes a more convenient and a much less variable standard than that yielded by the candles. The lamp is arranged to burn air which has been carburetted by admixture with the vapour of pentane, and advantage is taken of the high specific gravity of pentane vapour (2·5, air = 1) in order to make the supply to the flame automatic.

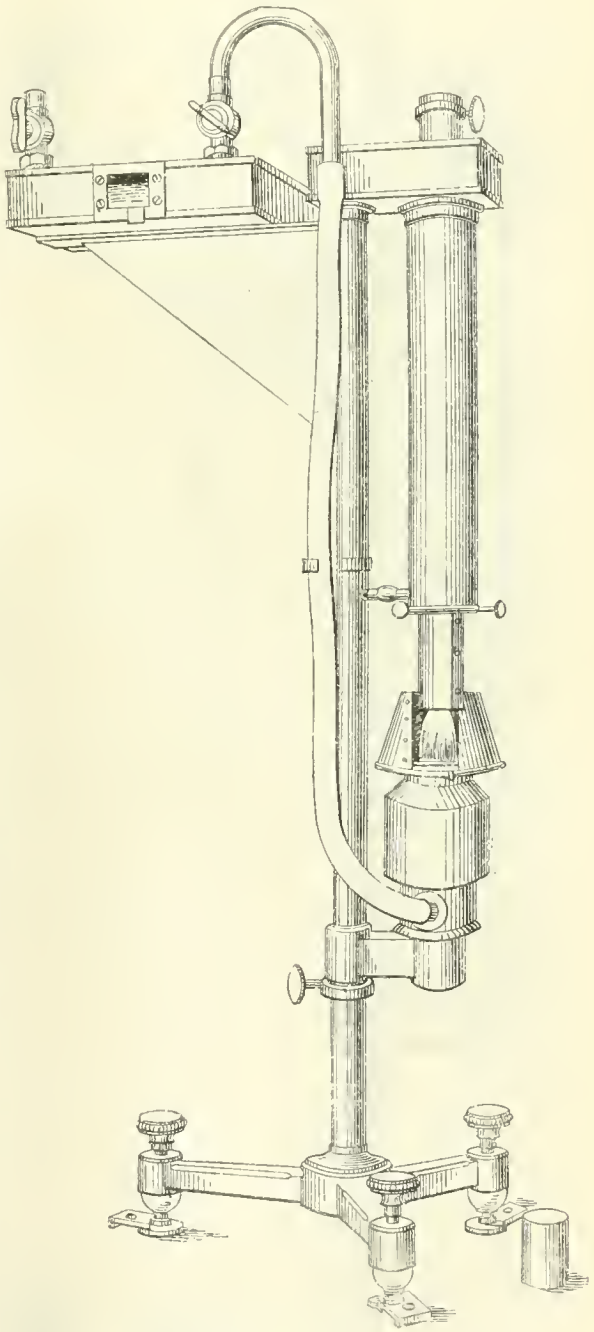
It will be seen from the accompanying diagram (Fig. 1) of the lamp that the carburettor, or flat box containing the pentane, is placed at the top of a tall stand, and that its cover is provided with two short vertical metal tubes which terminate immediately beneath the covers and are controlled by stop-cocks. The one to the left serves for the admission of air into the carburettor, which is only partially filled with pentane; the tube to the right serves for the passage of the air, after it has mingled with the pentane vapour, away to the burner. The heavy mixture of air and vapour passes through the arched tube and down the vertical rubber tube to the burner, which is seen clamped upon the lower part of the stand. In order to cause a constant supply of carburetted air to pass down the burner, it is simply necessary to once fill the rubber tube with the carburetted air, when the long column acts as water does in the longer leg of an ordinary syphon, and constantly draws air through the carburettor and delivers it at the burner. The stream can be regulated by the adjustment of either of the stop-cocks above the carburettor.

The mixture of air and pentane vapour is burnt from a steatite argand ring, and the circular flame is fed inside with air which has been heated by passage between two long concentric chimneys placed immediately over the flame; the heated air passes along a horizontal connecting piece and down the hollow upright of the lamp stand, and from this to the burner. The air which feeds the outside of the flame is also heated by passing through an interconical space beneath the burner.

Before the flame is lighted, the apparatus must be adjusted to the vertical position by the set screws at the base, the burner must be set at the right height from the table, the chimneys must be rendered concentric by set screws, and the space between the burner and the bottom of the chimney must be adjusted until it just passes a boxwood cylinder, which is seen standing near the foot of the stand.

After the lamp has been lighted, its flame is adjusted by one of the carburettor taps, so as to project just above the

Fig. 1.

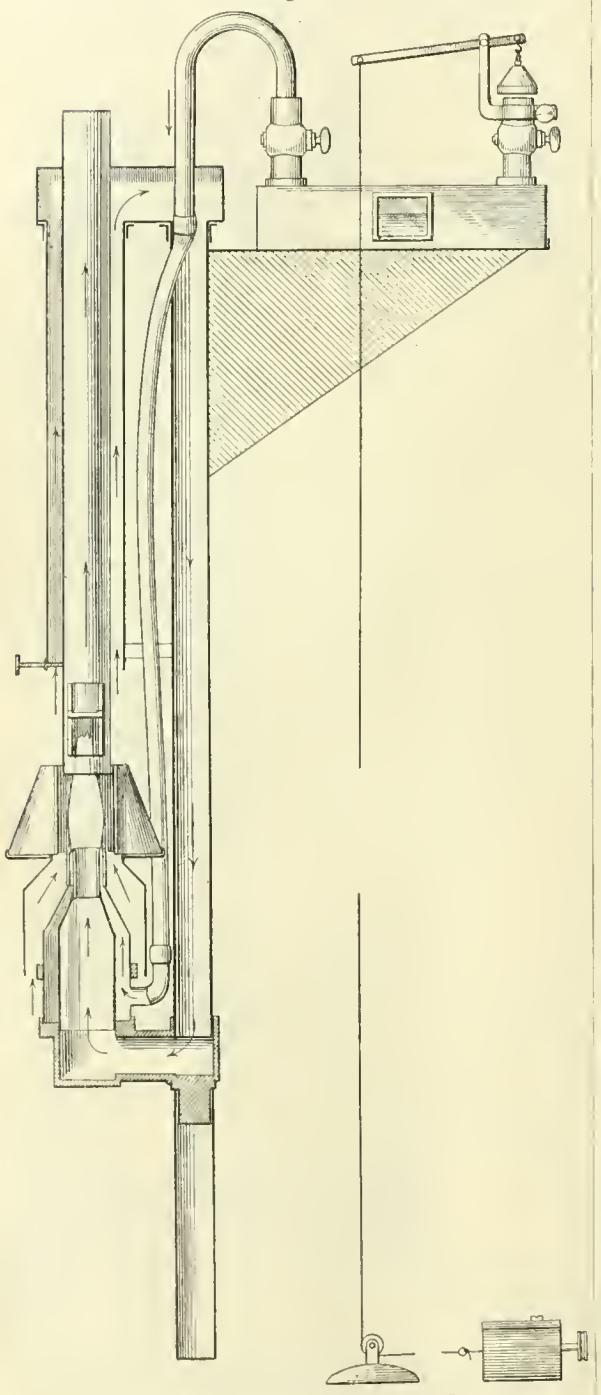


THE PENTANE LAMP.

(Reproduced by permission from the Journal of Gas Lighting.)

bottom of a window at the bottom of the chimney, but not to reach appreciably above a crossbar placed a short distance above. By this adjustment, a uniform surface of illumination is obtained beneath the window for photometric purposes. The lamp should be allowed to burn from twenty minutes to half-an-hour, with occasional adjustment, before it is used for standard purposes. The flame will possibly require occasional adjustment to the dimensions above stated during its use in photometer. This is readily effected from the part of the table where the observer is seated, by opening widely the tap at the entry of air into the carburettor, and controlling the inlet by means of a little metal cone suspended above the end of the pipe; this little cone is slightly raised or lowered by means of a thread moved by a screw near the left hand of the observer (Fig. 2).

Fig. 2.



Sectional Drawing of Pentane Lamp.

The pentane, which is used in the carburettor, is prepared from light American petroleum, by purifying the fraction which distils over at 45° C. The liquid can readily be obtained of constant quality, and can be proved to be suitable for use by appropriate tests. The constancy of the standard light is largely dependent upon the pentane being sufficiently pure. After the liquid has been constantly in use for some time, the specific gravity and boiling point of the residue in the carburettor will be found to be unduly high; it is well to remove this residue and to replace it with fresh pentane about once a month.

It is found that when the lamp is used under the standard conditions, which are generally indicated above, the light is equivalent to that emitted by 10 average standard candles.

The Table Photometer.—The new form of photometer differs in two important respects from the ordinary bar photometer, when it is used for testing the illuminating power of coal-gas. The observer is seated on one side of the semi-transparent screen and both sources of light are placed at fixed distances upon the other side. And, further, the equating of the light from the different sources is effected by the adjustment of the gas supply to the test burner, instead of by altering the distance of either source of light from the screen.

When gas reputed to be of the ordinary standard illuminating power of 16 candles is being tested, it is accordingly burnt from Sugg's standard London argand burner, under the ordinary measured and regulated conditions which have been already indicated; and the illumination which it affords on the screen is seen side by side with that of the standard pentane flame. The illumination from the gas flame is then brought to equality with that of the standard flame by increasing or diminishing the supply of the gas to the test flame; the rate at which the gas is being burnt is then accurately ascertained by the meter, and the illuminating value of the gas is calculated from the rate of consumption of the gas.

This method does not give as wide a range of measurement as is furnished by the bar photometer, but the range is sufficient for measuring the ordinary variations of a gas supply from its standard illuminating power. If the standard is varied to any considerable extent from 16 candles, the estimation cannot be rendered sufficiently accurate by calculation, and the altered standard should be obtained by bringing the illumination from the pentane flame into agreement with the standard. This may be accomplished by suitably adjusting the relative distances of the flames from the screen.

The different parts of the photometer are, as its name implies, arranged upon the surface of a table conveniently arranged for the observer to make his readings whilst seated. The accompanying plan of the table (Fig. 3) will indicate the relative and actual positions of the different parts.

The observer, being seated in the middle of the lower end of the table, sees upon the small semi-transparent screen, which is supported by the photoped, two rectangular strips illuminated side by side, one of these is lighted by the 10-candle lamp on his left and the other by the argand gas lamp on his right. By tracing back the gas supply to the argand burner, it will be seen that, on reaching the table, the gas first passes through the gas meter, which measures its flow, then through a balance-governor, which regulates its pressure, and then through a tap with an arm moving over a measuring graduated arc, on its way to the argand burner. The distances between the screen and the pentane lamp and gas burner are carefully adjusted by means of rods of standard lengths, and the relative positions of the burners are also similarly adjusted. Black wood screens are introduced at points where they are required for shutting off direct or reflected light from the screen or from the eye, or for screening the flames; and two mirrors are so placed that one enables the observer seated before the screen to

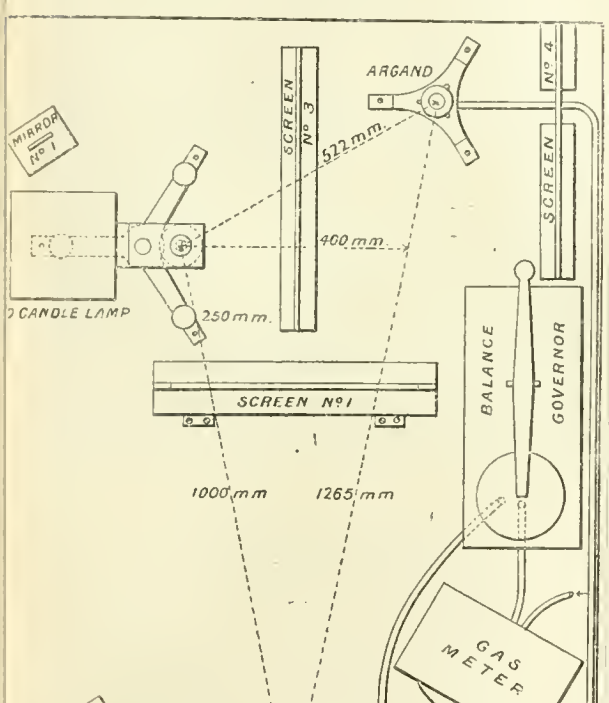
observe the height and condition of the pentane flame, whilst the other mirror illuminates by reflected light the lever and arc of the regulating tap and the face of the meter. All the apparatus is painted dead black to prevent reflection of light from causing interference.

The other apparatus which is seen on the table is the clock for timing the flow of gas through the meter, and the aërorthometer, which gives by one reading the correction for temperature and pressure which must be applied to the gas. The aërorthometer reading may be used instead of the separate readings of the thermometer and the barometer. Another convenient adjunct to the new photometer is the one-twelfth foot cubic measure, a glass vessel of convenient and portable size, by means of which the accuracy of the meter can be easily and rapidly gauged.

Directions for the use of this standard burner and new photometer are now published in the Notification of the Gas Referees, which may be purchased, either directly or through a bookseller, from the Government Stationers. The publication includes the necessary tables for correction.

It may be stated that, by simple alterations, the whole of the above apparatus has now been made in a portable form, and the results of tests made with the portable apparatus are found to correspond precisely with those of tests made with the ordinary stationary apparatus. It has further been found that when the photometer is used with its usual screens, its readings are not appreciably interfered with by subdued daylight or artificial light, and that the temperature of the room, within ordinary limits, and the colour of the walls and ceilings, do not affect the results. The readings have also been concordant when the room is closed, and then when the doors and windows have been opened, provided the flames do not become sufficiently agitated to differentially affect their illuminating power.

Fig. 3.



Plan of Table Photometer.
(Reproduced by permission from the Journal of Gas Lighting.)

Owing to the courtesy of the London County Council, and of Mr. Grimwood, chief assistant chemist of the Council, the photometer was shown in action to those who attended the meeting, and by the kindness of Mr. Vernon Harcourt in lending a sectional drawing of his lamp (Fig. 2), the construction of the lamp was readily seen.

Discussion.

The Chairman said he might congratulate the gas examiners on now being able to work with a precise and accurate instrument of this kind. It had been long felt that candles were utterly inadequate as a standard to the purpose of photometry, and the definite adoption of a gaseous standard was an important event. Immense pains had been taken to establish standards of length, weight, heat, and electricity; but until quite lately the candle was the measure of illuminating power—candles which might and did vary very considerably, as their illuminating power depended not so much on the material of which they were made as on the number and the twist of the strands of the wick. It was not generally recognised what an important thing the photometer was. Vast sums of money were spent on illumination; the demand for more light was constantly increasing throughout the world. Of course, the light which they purchased ought to be at least as exactly measured as a pound of grocery or a yard of cloth, but until lately comparatively little attention had been paid to this matter. In that Society they had had several papers upon the subject from Mr. Dibdin, who had done much to bring about the more happy era at which they had now arrived.

Dr. Kohn, after expressing his thanks to Dr. Clowes for his interesting paper and the exhibition of the apparatus, said he would like to ask how this mode of measurement by the consumption of gas compared with a measurement of the illuminating power of the same gas under the ordinary photometric conditions, with the gas burning at the usual rate of 5 ft. per hour. Would the results be concordant, and if not, to what extent would they vary, and would not such variations depend upon the richness of the gas.

Mr. D. A. Louis said the Chairman had referred to the irregularity of candles, but there seemed also to be some irregularity about the standard before the meeting, for he had been watching the 10-candle pentane flame, and noticed that there was an ever-varying amount of darkness visible in it. He should like to know whether there was a distinct area of illumination taken for the measurement; if not, there could not be much more accuracy in it than with candles, for it danced about considerably, and would, consequently, give a very irregular illumination. Prof. Clowes had informed them that Mr. Vernon Harcourt in his domestic arrangement found that after a certain time the pentane ceased to give the necessary illumination, and he then applied a little artificial heat to improve matters. Now supposing, as did happen occasionally, there was a variation in the temperature of the atmosphere, would that affect the material in the box; would there not be better illumination in warmer weather than in cold weather? It struck him also that probably there might be a variation in the illuminating power, according to the quantity of liquid in the box, for when full, plenty of vapour mixed with little air would pass over, but as the air space increased so would the quantity of air passing over with the illuminant be increased. Was the adjustment which had been pointed out sufficient to correct that? Prof. Clowes emphasised the mode in which the lamp was supplied with heated air; it was rather interesting, but should not the heating be approximately uniform to get uniform results? In the arrangement shown, the inner supply of air would be very well and fairly equally warmed by the circulation round the chimney, but the outer supply

of air would not be so regularly or so well heated. He should think that on a day like that of the meeting, the outer supply would not only be cold compared with the air supplied to the inside of the flame, but would also differ considerably in temperature from the air supplied to the outer part of the flame on a warmer day, and so probably give rise to irregularities.

Mr. T. S. Lacey said it seemed to him that this instrument was as nearly perfect as possible for one based on a flame standard. It was, however, well to note that the photometer was only part of the apparatus necessary for taking light values. The room in which it was used was really a part of the instrument, and this photometer, like all others, would vary in its results according to the way it was used. It was useless to specify a photometer alone unless certain conditions were observed, such as the size of the room, the nature of the ventilation, avoidance of air current, &c. The argand burner used for burning the gas was very sensitive at and under 16-candle power to slight differences in the air supplied. If it burned at about 17 candles, it was not so sensitive. A difference in the temperature of the air must affect the amount of air passing through the heated chimney of the argand, and also the amount of air that passed up the very much longer chimney of the 10-candle standard, but it by no means followed that the difference in the temperature and the necessary difference in the air supply of both burners would affect them both in the same proportion, although it would be in the same direction, yet there were no regulations as to the temperature at which the instrument should be used, and he believed it could be legally used down to freezing point. No one had really succeeded in proposing a practical standard except that of a flame, but it was well known that flames, like gas and pentane, did vary with the conditions of the atmosphere. If tested against a standard unaffected by these conditions, such as an electric lamp with a very constant current, some rather curious differences in the light given out by the flames would be found when the temperature of the air and the amount of carbonic acid and the water vapour in it varied. He had noticed differences of 10 or 11 per cent. in the light given by candles, 5 per cent. by coal gas flames, and of perhaps 6 or 7 per cent. in a flame of the character of this standard. If the two flames were affected in different directions, this difference would be very apparent, but they were affected in the same direction but not to the same degree, and, therefore, the difference might pass unnoticed; one might vary to the extent of 5 per cent. and the other to the extent of 6 per cent. If compared with an electric light large differences would be observed. A good deal of work had been done in this direction abroad, but not much in England, though he had done a little. One good point about this instrument was that it could be standardized so very quickly by means of the standard gauges, and it could be rapidly put together, which could never be done with the old photometers, so that you always had a doubt whether there might not be something wrong. The $\frac{1}{12}$ cb. ft. bottle also was a great improvement; the old-fashioned instrument would have taken a wagon to carry it. A great deal of credit was due to those who had devised it. In this photometer, all the old notions were completely thrown on one side. The idea was to construct an instrument with common sense for its basis, and it was so admirably thought out in every respect, that it really needed one to use it and examine it to see the immense amount of care and scientific thought which had been brought to bear upon it. He noticed it had been improved in one respect, inasmuch as the screens had now a space at the bottom instead of coming right down to the table. He had pointed out to the referees how necessary it was to avoid draughts and currents of air, which very prejudicially affected the flame of the argand burner, and for that reason all draughts must be excluded. The air should be brought through a number of openings in the floor of the room, and all currents should be vertical; there should be no current over the top of either of the burners. He also pointed out that the carburetter was slightly warmed by a plate attached to the copper tube; it was not merely evaporated at the temperature of the air. He also pointed out the method by which the two lines of light were made to strike on the observing screen at the same angle, in default of which no accurate observation could be made.

Prof. Clowes, in reply, said a question had been asked by Dr. Kohn with regard to the testing of gas of varying candle power against the 16-candle standard. Dr. Kohn's suggestion was quite correct. It was not right to test gas of considerably less than 16-candle power by the precise arrangement of the standard shown on the photometer in the room; it would not give the true measurement of the illuminating power. It was required to test gas which professedly was 14-candle gas. The distance of the 10-candle burner ought to be so adjusted that it became a 14-candle standard. With regard to Mr. Louis's remarks, he had been observing the wrong part of the flame. The part in which he saw the variations was only the jagged top, and this part was cut off and not observed. The part from which the measurement was taken was the lower portion, which was shielded from Mr. Louis's observation. There was an apparent objection to the 10-candle standard remaining uniform when the temperature of the room changed considerably. It would appear that there must be a more rapid evaporation of the pentane when the room was warm, as compared with when it was comparatively cold. Mr. Harcourt and others had made numerous tests to ascertain whether any such variations would occur owing to changes of temperature, such as would actually occur in any observing room. It was found that under the conditions mentioned the flame still maintained its standard character. The temperature did not affect it to any appreciable extent, even within a comparatively wide range. The conditions of accuracy which had been insisted upon in the paper must be observed, but the niceties stated as indispensable by Mr. Lacey were found not to be requisite. Of course, flames must not be blown about; but this could not take place when they were screened as was shown on the table photometer. The working of the photometer had been tried under what might be considered extremely severe conditions, and the conditions had been varied from time to time experimentally with the same gas, but the instrument had given absolutely identical readings. The niceties which were spoken of did apply possibly to some of the other forms of candle photometers, but certainly did not apply in anything like the same degree to the latter photometer. Mr. Lacey specially referred to this, and seemed to think that the use of this photometer therefore under any conditions but in a carefully chosen and carefully appointed gas-testing station or room led to absolutely untrustworthy results. Therein he was entirely mistaken. He (the speaker) could speak personally with regard to this, for he had most carefully tried the photometer under conditions which were not usually considered standard conditions, and he could assure them that the readings of the photometer had not varied.

New York Section.

Meeting held on Friday, February 21st, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

ON THE OCCURRENCE OF FREE SULPHUR IN BEAUMONT PETROLEUM.

BY CLIFFORD RICHARDSON AND E. C. WALLACE.

This peculiar petroleum has been examined by a number of chemists, and has been described by us in this Journal for July 1901. All investigators have noticed the high percentage of sulphur which it contains. No one, as yet, has determined, however, the forms in which it is present, beyond the existence of hydrogen sulphide dissolved in the crude oil. We have recently been able to throw some light on this point, so far, at least, as to say that a portion of it probably exists in the free state, in the course of an investigation of the selective action on the oil of the kaolin filter of Dr. W. T. Day, described at the Petroleum Congress in Paris, in 1900.

This filter consists of kaolin, such as is used for clearing refined petroleum, of a size to pass a sieve of 60 meshes to the inch, packed in a glass tube, through which the petroleum is forced from the bottom under more or less pressure. In the instance to be described, the tube was about $\frac{7}{8}$ in. in diameter and 19 ins. long. The oil, after the removal of the hydrogen sulphide with a current of air, was introduced at the bottom under a head, above that point, of 56 ins., so that on reaching the top of the filter, the head was 37 ins.

The oil passed through slowly. In 24 hours, 5 c.c. had been collected, which quantity was water-white and sweet smelling, although the crude oil was dark brown and very rank. Following this, other fractions were collected, which had the following characteristics, as compared with the crude oil :—

	Amount in c.c.	Colour.	Specific Gravity, 25° 25° C.	Sulphur.	Remarks.
			Per Cent.	Per Cent.	
Crude oil	..	Deep brown	0·914	1·75	Rank odour.
1st fraction	5	Water-white	0·8755	0·80	Sweet odour.
2nd „	21	Pale lemon	0·8986	0·91	„ „
3rd „	8	Deep „	0·9038	1·04	„ „
4th „	22	Amber, fluorescent	0·9068	..	„ „
5th „	10	„ „	0·9104	..	„ „
6th „	22	Deep amber „	..	..	„ „
7th „	13	„ „	0·9115	..	„ „
8th „	20	„ „	0·9115	..	„ „

The sulphur, after removing the hydrogen sulphide held in solution, was 1·75 per cent. of the crude oil, that in the first fraction but 0·8 per cent. The selective action, therefore, consisted not only in the removal of the colour from the crude petroleum, but also in a true fractionation, as shown by Dr. Day, and a separation of a large part of the sulphur compounds from the earlier fractions. The last fractions more nearly approached the specific gravity of the original oil, but were quite free from the dark colour or odour of the original oil.

The remarkable fact, however, was that the denser fractions, and, more particularly, the second, on standing for a month or more, deposit beautifully regular crystals of sulphur. They amounted to 0·25 per cent. of the oil. The question arose—could the sulphur have originated in the decomposition of some constituent of the petroleum? As the oil had only been subjected to the action of hydrous silicate of alumina at the ordinary temperature of the laboratory, it seemed improbable, but it has been pointed out that, if the oil contained hydrogen sulphide, this might have been oxidised to H_2O and S, when brought into contact with oxygen in the minute pores of the filter. The oil, however, had been freed from hydrogen sulphide before being passed through the filter, so that that possibility was excluded. On the other hand, the evidence in favour of the possibility of the formation of the sulphur by the filter was strengthened by the fact that the sulphur crystals only separated in the second filtrate. The limestone, however, in which the petroleum occurs contains crystals of sulphur. The evidence, as a whole, therefore, seems to be in favour of the conclusion that free sulphur occurs in Beaumont petroleum as it comes from the wells. Its presence explains that of the hydrogen sulphide of the crude oil, and the fact that hydrogen sulphide is evolved on heating the oil to 200° C., after first freeing it from that found in the crude oil.

The presence of free sulphur also accounts for the peculiarly variable nature of the products obtained, on varying the conditions under which the oil is heated, the amount of hard residue reaching, in some cases, to no more than 10 per cent., and under other conditions, to as much as 35 per cent. The sulphur seems, therefore, to be the cause of the great instability of this interesting oil.

Nottingham Section.

Meeting held on Wednesday, February 26th, 1902.

PROFESSOR KIPPING IN THE CHAIR.

THE PREPARATION AND BEHAVIOUR OF INSOLUBLE FRITS FOR POTTERY GLAZES.

BY WILTON P. RIX.

The relative value of fritted as compared with raw lead in compounding pottery glazes has of late years become a question of increasing interest to manufacturers in consequence of the action taken by the Home Office in their endeavours to mitigate plumbism.

The experience of the Continental potters, who had adopted the use of lead silicate frits in their glazes, led to the belief that these would prove innocuous, and the Home Office expressed its intention of enforcing the exclusion of all other forms of lead in pottery glazes; the manufacturers also expressing their assent.

The results of further inquiry and research, however, proved that the monosilicates and borosilicates of lead are almost as noxious as raw lead. Dr. T. E. Thorpe, in the Government laboratory, therefore endeavoured to ascertain the best means of obtaining innocuous lead frits suitable for pottery glazes.

The principles to be observed in compounding such frits were stated by him in the following terms :—

"Provided the ratio obtained by dividing the sum of equivalent percentages of acidic oxides, calculated as SiO_2, into the sum of equivalent percentages of basic oxides, calculated as PbO, does not exceed 2, the amount of lead, dissolved by 0·25 per cent. of HCl, seldom exceeds 2 per cent., calculated on 100 parts of the frit."

Based on these conclusions, the Home Office have framed a regulation excluding the use of all pottery glazes containing more than 2 per cent. of soluble lead.

The manufacturers, believing that such frits and glazes could not be adopted without serious detriment to their industry, the matter was brought to arbitration in November last, and now stands adjourned for eighteen months, pending more extended experience as to their use.

I. Objections of Manufacturers.

Though the potters had not a full opportunity of stating their case, as far as can be gathered their objections may be divided into two classes :—

(*a*) Economic disadvantages; and
(*b*) Technical or working difficulties.

(*a*.) The former class include greater cost entailed for fuel in fritting, extra power required in grinding, and other commercial considerations which do not lie within the scope of the present paper.

(*b*.) The latter class are based upon the tests made by various potters under working conditions.

It is necessary to bear in mind that the tests on which these objections are based have been made under varying methods. Many have been merely empirical, carried on without attempt to change the glaze formulæ or general conditions; others have been more systematic, but without any precaution in eliminating errors or verifying results.

It is obvious that such tests cannot furnish reliable evidence in the present inquiry.

A consensus of opinion, however, appears to prevail on certain points :—(1.) The lead contents of insoluble frits are said to be too low to produce soft lead glazes for soft

majolica, Rockingham, and jet wares. (2.) The glazes made from insoluble frits are said to appear less rich in texture after firing.

Notwithstanding these statements, the experience is by no means uniform, and some potters appear to have little trouble in overcoming the apparent difficulties of manipulation.

It must, however, be borne in mind that each potter limits himself to a certain class of ware; his experience is therefore only partial. Under varying conditions some fail where others have ensured success.

It is no doubt true that the proposed introduction of insoluble lead frits involves an entirely new method of working on the part of the potter. Hitherto the methods adopted have been chiefly empirical, not only as regards the composition of bodies and glazes, but also in the matter of kiln construction and firing.

The manufacture is now more or less based on the elimination of the unfit and the patient evolution of improved results, often regardless of scientific accuracy. Of necessity this has brought about a set of conditions built upon the assumption that a potter must have a wide working margin for contingencies in each successive stage.

It will, therefore, be seen that the introduction of exact chemical combinations, such as insoluble frits, based upon scientific accuracy, demands a corresponding exactness of technical detail at every other stage, and this involves a readjustment of matters throughout to a new standard of procedure.

The potter is therefore led to question whether the time has yet come for adjusting new methods to a new working basis, involving as it does such radical changes; and, moreover, how far commercial exigencies will warrant such a step.

Perhaps one of the most important objections to the adoption of insoluble glazes for earthenware and china is the change of the physical condition of the glaze.

The raw lead has hitherto acted in these glazes as a flotative for the borax frit in the mill mixture, but the transfer of these into the fritted form also involves the transfer of an equal ratio of the other flotatives from the mill mixture to form insoluble combinations with the lead.

Further than this, the amount of frit being greatly increased, the percentage of flotatives required in the mill is proportionately greater.

Unless considerable care is taken in constructing the new glazes, difficulties arise from settling in the glaze tub, or from trouble in dipping the ware.

II. Limitations of Insoluble Frits.

In approaching this subject I therefore propose to discuss (1) The limit of possible adoption of insoluble frits from the chemical standpoint. (2) The difficulties of their adoption by reason of technical objections.

(1.) *Limits of Use owing to Chemical Composition.*

The introduction of lead to the glaze is chiefly on account of its possessing great fusibility, coupled, however, with other important advantages, viz.: High refractive power, great fluidity, ready combination in compound silicates, as well as the beauty of its effect in coloured glazes.

All these give advantages which prevent the potter from reducing lead contents in his glazes in favour of other fluxes. Hence the lead contents in insoluble frits must be kept as high as possible.

In soft majolica, Rockingham, and jet glazes the lead contents often exceed 65 per cent. But the highest contents of lead yet presented in any frit analysing below 2 per cent. is 64 per cent. Hence it is impossible to produce such glazes with any insoluble frits at present introduced, even if we ignore the usual necessary addition of colouring or flotative ingredients in the glaze.

Therefore, the limit of use of insoluble frits in this class of ware may probably be placed with the compounding of glazes containing less than 50 per cent. to 55 per cent. of lead. The lead contents of earthenware glazes range only from 10 per cent. to about 22 per cent., and in china glazes from 2 per cent. to 21 per cent. In these wares, therefore, the use of insoluble frits so far as lead contents are concerned, is comparatively easy. It is necessary, however, to consider the chemical composition of these frits and their limitations as to fluidity.

The glazed surface for these wares being in many instances fired vertically, any undue fluidity will be liable to cause flowing of under-glaze decoration, and the glaze will also accumulate at the base of the piece. Hence the composition of the glaze usually provides for the introduction of sufficient alumina to check this defect. In some glazes this element is added in the mill mixture almost entirely in the form of Cornish stone, and the frit must then take the nature of a compound silicate of alumina, alkali, and lead. The use of a bisilicate in earthenware and china formulæ of high lead contents causes the glaze to become too fluid before it is matured.

In many of these earthenware and china glazes the flotative portion is formed very largely of lead and stone, these being added to a borax frit. The conversion of such formulæ into insoluble glazes often involves the fritting of almost all the raw material, and it is in deciding the correct ratio of alumina available for combination in the lead frit that the chief limitation exists in this class of glazes.

(2.) *Limits of Use owing to Technical Difficulties.*

In considering the use of lead frits from the technical standpoint the following properties demand attention (*a*) solubility; (*b*) lead contents; (*c*) fusibility; (*d*) fluidity; (*e*) action on colours; (*f*) effect on range of maturing temperature.

(*a*) *Solubility.*—It is obvious that the most insoluble frit is the most desirable, because the higher the solubility the greater the percentage of other materials needed in the glaze to reduce it to the 2 per cent. maximum; the low solubility is of no advantage unless it is also coupled with high.

(*b*) *Lead Contents.*—The advantage of these is obvious. The more the lead in the frits, the less frit is used, therefore the lower the cost for fuel and grinding, also the larger the amount of raw material available for flotative purposes and the less trouble in manipulation. The lower the firing temperature, the more need for high lead contents in the frit; but it is impossible to consider the merits of a good frit apart from the mill mixture, because the ratio of flotatives must be greatly decreased as the fusibility increases, until at last there remains only frit contents in the finished glaze.

It has already been clearly shown that high lead contents are compatible with low solubility; for instance, some frits containing, say, 57 per cent. to 60 per cent. of lead oxide will analyse below 1·5 per cent. solubility when properly manipulated, so that we have next to consider the objections of these and similar frits as to:—

(*c*) *Fusibility.*—A frit for practical use must obviously be fusible at a heat below that at which the glaze matures. It is, therefore, satisfactory to find that insoluble frits are available which fuse at a temperature lower than that required for glazes maturing at cone 010. These frits are also sufficiently fusible to allow of their adoption in earthenware and china glazes maturing between seger cone 06 and 01, in which glazes it is usual to admit borax frit as a part of the fluxing element. It is, however, a disputed point whether such fritted glazes require more heat to mature. If we admit this objection, the limit of insoluble frits in such glaze appears to rest on the extent to which it is possible to increase the lead contents of the glaze without seriously affecting the co efficient of expansion. This I propose to discuss later on.

(*d*) *Fluidity.*—In a paper read before this Society two years ago, I took the opportunity of pointing out the need of controlling the fluidity of frits, as well as the objection to extreme viscosity. At the same time attention was called to the fact that the increase of certain bases added to the viscous properties of a frit, the most important of these being alumina and lime.

It is no small advantage, therefore, that alternative soluble frits are available, the bisilicates being fluid and the double

silicates of lead and alumina being considerably less mobile. The admixture of these in varying proportions, therefore, gives the potter ample means of adjusting his glazes to his requirements, as long as the total lead contents in the glaze are within the limit of the percentage of lead in the frits.

Specimens of bisilicate frits, comparing the effect on fluidity of additions of varying proportions of alumina and flint from 10 per cent. to 30 per cent., are before you on the table.

Table of Mixtures.

DD.	1.	2.	3.
$PbO.2SiO_2$	1·0	1·0	1·0
SiO_2	0·1	0·2	0·3
EE.	**1.**	**2.**	**3.**
$PbO.2SiO_2$	1·0	1·0	1·0
Al_2O_3	0·1	0·2	0·3

Fired at cones 010 and 05 for comparison.

(*e*) *Action on Colours.*—The action of plumbiferous frits on the colour of metallic oxides is obviously similar in result, whether the oxide is mingled with the frit, as in majolica glazes, or used under the transparent glazes, as in the case of printed earthenware and china. The extent of this action is definitely proportionate to the amount of lead in the frit, therefore, in discussing the statement sometimes made that the percentage of lead frits in glazes must be reduced, the effect on colours must be borne in mind, because the reducing of lead contents must entail a proportionate increase of other fluxes to maintain the same fusibility, and under such changes the tone of colour may be entirely altered.

We are, therefore, precluded from making any serious departure from the present proportions as long as the existing palette is to be maintained. The substitution of boracic acid and alkali frits for those of lead cannot for this reason be looked upon as affording the easiest solution of the difficulties caused by any alleged retarding of fusibility, owing to the lead frits present.

It is open, however, to discussion how far the action on the colouring oxides may be reduced when a carefully compounded lead silicate is used in place of raw lead; but it does not appear that any definite data at present exist on this point.

(*f*) *Effect on range of Maturing Temperature.*—This property of lead frits is closely allied to those of fusibility and fluidity, though differing materially as regards its influence and result in the finished ware. The *fusibility* of the frits regulates the heat at which the glaze melts. The *fluidity* regulates the extent to which the glaze flows to the lowest point when brought to that temperature. The range of *maturing temperature* regulates the limits of heat between which the glazes will maintain a satisfactory texture without detriment. Under certain conditions of fire it will be found that insoluble lead frits respond to a range of heat equal to that of raw lead. It may be true that the lowest heat producing a sound fritted glaze is somewhat higher than with a raw lead glaze, but numerous tests show the reverse in some glaze mixtures; and provided that a fully oxidising atmosphere is maintained, the oven temperature can be carried higher than with a raw lead glaze without volatilisation of the lead oxide present.

In close connection with the above question is the comparison of the length of time at which the average maturing temperature can be maintained without detriment. In double silicate frits a considerable benefit results to the texture by holding the oven somewhat longer at the highest heat reached. The property of alumina in responding tardily to a given heat is the obvious cause for this, and is the probable explanation of the assertion made that *greater* heat is required for glazes composed of such frits. This point will be discussed later on.

III. Construction of Insoluble Frits.

(*a*) *Chemical Composition.*—At the outset it is necessary to clearly realise the object of fritting. In the case of borax, alkalis, and soluble salts the purpose of fritting is to render them insoluble in *water*. In the case of lead, the purpose is solely to render it insoluble in *gastric juice*. Unless this is accomplished, lead in the raw state is in all respects far more useful for pottery manipulation. The same principles of chemical combination apply, however, to both groups of materials.

In endeavouring to obtain insoluble lead frits formed of compound elements, the displacement of one base or acid by another becomes an important factor, and has to be considered in its relation to the construction of the frits as well as its influence on the further chemical changes taking place in the glaze during the glost fire.

It has already been fully demonstrated that the property of insolubility does not apply to all silicates of lead. It is necessary, however, in constructing lead frits to avoid such methods as will interfere with constant insolubility. This applies chiefly to the double silicates of alumina and lead, and also to certain compound silicates. The limit of actual composition has not yet been fully ascertained. Beyond this, it is equally clear that monosilicate and borosilicates of lead are extremely soluble, so that any methods which bring about a displacement of the silicic acid in the fritting must be most carefully avoided.

It has for many years been supposed that this displacement was a fact, and as long ago as 1884 Dr. Wilhelm Schumacher, of Berlin, drew attention to it, though he distinctly stated that his surmises were theoretical. After laying stress on the great importance of the correct distribution of the boracic and silicic acids in the grouping of glaze combinations, he goes on to state: "If bisilicate of plumbic oxide, or even of alkalis are present together with lime, barytes, or magnesia, and there is not enough free silica present for the formation of monosilicates, these take the silica from the bisilicates of plumbic oxides or alkalis until they have sunk to monosilicates."

Also in reference to the behaviour of boracic acid under similar conditions, he remarks: "We can assume that the boracic acid removes the silicic acid from bisilicates, displacing one equivalent of silicic acid in the case of alkaline earths to form borosilicates." If the lime present is not sufficient to unite with all the boracic acid, then the plumbic oxide will also become changed into borosilicate.

In reference to this statement, the researches of Prof. Laurie, as contained in his report presented to the Home Department in 1893, are of considerable interest. He then laid down the fact that borosilicates of lead were soluble, and established the principle that "provided the addition of the total contents of lead to those of boracic acid did not exceed 40 per cent., the solubility was sufficiently low." The table which he then produced, and of which a copy is here given, shows the data upon which he based these conclusions:—

Percentages of Borax in Frit.	Percentages of Raw Lead in Frit.				
	10	20	30	40	50
	Percentages of Lead dissolved.				
10	0·3	0·5	2·8	5·0	12·0
20	0·6	2·4	5·0	13·0	15·0
30	1·3	6·0	14·0	20·0	36·0

Note.—In the use of frits in which the percentage of lead and borax added together amount to 60 and upwards, some of the lead chloride formed separates slowly in working, and in the frit containing 50 of lead and 30 of borax the acid is saturated.

We may probably assume for the present, until further light is thrown upon this question by the medical authorities, that frits in which less than 3 per cent. of the lead is dissolved are practically harmless. All such frits have been printed in heavy type in the above table.

It has since been clearly established that the construction of insoluble glazes for earthenware and china involves the separation of the plumbic silicates from the various borates in fritting, and when these are used in the form of simple mechanical mixtures, the insoluble conditions can be

maintained. When, however, a refritting becomes necessary, as in the case of some coloured glazes, the principles referred to become of serious importance.

This question seems worthy of attention as affecting the possibility of dealing efficiently with the construction of many-coloured majolica glazes so far as rendering them insoluble. The construction of certain colours involves refritting of bisilicate and boracic frits in combination. I have endeavoured to ascertain to what extent this displacement of the silicic acid actually occurs in plumbic bisilicates when refritted in the presence of boracic acid and metallic oxides. I have, therefore, prepared the following tables showing the results of various tests and analyses made comparing the solubility. These I have been able to place before you by the courteous assistance of various gentlemen, including Mr. E. J. Parry, B.Sc., who has been good enough to carry out the various analyses occurring in this paper, and to whom I am greatly indebted for his help.

TABLE A.

Addition of B_2O_3 to $PbO\ 2SiO_2$.

Bisilicate frit	100·0	100·0	100·0	100·0	100·0
Boracic acid added	8·52	6·82	5·1	3·41	1·70
Insoluble lead (per cent.)	4·17	19·17	25·17	30·37	32·9
Increase of solubility (per cent.)	15·	6·	5·2	2·6	—

This table shows the effect of refritting a bisilicate frit (analysing at 2·0 per cent. to 2·5 per cent. solubility) with uniform increments of boracic acid. The figures show that with an addition of 8·52 parts of boracic acid to 100 parts of frit, only 4·17 pr cent. of lead oxide remains insoluble out of a total of 64·17 per cent. present, and that the percentage of insoluble lead steadily increases with the decrease of boracic acid.

Another very noticeable feature is the progressive influence of each equivalent of boracic acid added in increasing the solubility of the frit. The table also seems to confirm the fact that the increase of boracic acid above 6 per cent. greatly increases the solubility of the frit.

TABLE B.

Substitution of B_2O_3 for SiO_2.

Increase B_2O_3 to	10·22	8·52	6·82	5·11	3·41
Decrease SiO_2 to.....	12·18	13·10	8·32	6·24	4·20
Insoluble lead present (per cent.)	0·17	7·67	11·17	19·27	22·77
Decrease of solubility (per cent.)	7·5	3·5	7·1	3·5	..
Acidic ratio	1 : 1·63	1 : 1·65	1 : 1·70	1 : 1·73	1 : 1·73

This table shows the effect of adding before fritting increasing equivalents of boracic acid, while at the same time decreasing the silicic acid in the same ratio, but maintaining the amount of lead present at a uniform percentage sufficient to form a bisilicate if no boracic acid were present.

These tests were carried out for the purpose of demonstrating how far it was possible to replace silicic acid by boracic acid while maintaining the acidic ratio within the prescribed limits, and yet to maintain the insolubility of the lead present.

It will be noticed (as in the previous table), the amount of insoluble lead decreases steadily with the introduction of boracic acid, thus demonstrating that this actually displaces the silicic acid in the bisilicate, or rather that a borosilicate is formed in the fritting in preference to a bisilicate. The balance of the silica remaining in solution in a free state.

TABLE C.

Bisilicate Refritted with Metallic Oxides.

Bisilicate frit.....	1·0	1·0	1·0	1·0	1·0
Manganese dioxide	0·1	..	..	..	..
Chromium sesquioxide.....	..	0·1	..	..	..
Cobalt oxide.....	..	..	0·1	..	..
Nickel oxide	..	..	..	0·1	..
Ferric oxide	..	..	..	..	0·1
Solubility of frit, per cent.	0·01	0·01	0·01	0·01	0·01

N.B.—Solubility of bisilicate frit used, 0·01 per cent.

This table shows a series of experiments to determine how far the addition of metallic oxides to bisilicate frit shows *after refritting* any increase of solubility; that is to say, how far there is displacement of the second equivalent of acid from the lead *oxide* in favour of the other metallic oxides. From the figures it will be seen that the solubility of the frit is not affected in any case.

This is a definite advantage in the compounding of coloured Majolica frits.

It must, however, be noted that the fusibility is reduced according to the colouring oxide employed; nickel having the greatest influence, while manganese has the least.

(*b*) *Construction of Compound Silicates.*—It has already been shown that the double silicate of alumina and lead tends to check fluidity in the glaze. The methods of overcoming this property when desired may now be briefly discussed.

The introduction of alkalis or alkaline earths in small quantities and within the limits of basic ratios laid down, greatly assists this object. To accomplish this the potter has two alternatives.

The substitution of Cornish stone for China clay gives a small percentage of alkali dispersed uniformly through the frit but at the expense of increasing the acid contents. The considerable variation of both alkaline and acid contents in the use of these ingredients demands, however, careful analysis of the material before adjusting the mixture.

The use of felspar ensures the greater increase of the alkaline contents of the frit without serious interference with the acid ratio.

There is also a further alternative, namely, the introduction of both potash and soda simultaneously. An illustration of which is to be found in the formula propounded by Dr. Alström, of Copenhagen, as stated below:—

Insoluble Frit.

Potash spar (orthoclase)	10
Soda spar (oligoclase)	10
Silica (ground flint).....	21
Litharge	39

Unfortunately the proportion of lead contents in this frit has, however, been placed so low that the fluidity is still insufficient for ordinary purposes and there appears still room for improvement in its composition.

With the introduction of either felspar, stone, or whitning to the mixture there is a further loss of flotative material, so that it is generally better to substitute a certain portion of bisilicate for double silicate in the glaze, to increase fluidity, rather than to attempt to produce a more complex silicate.

It may here be noticed that by the use of stone and felspar the potter is able to introduce alkaline fluxes into the glaze in an unfritted state. This is an important advantage in constructing insoluble glazes, because in these the proportion of fritted material must necessarily be higher than usual. By the compulsory removal from the glaze of all raw lead there is abstracted the only soft flux insoluble in water, so that in this case the potter has no other flotatives available except those which lower the fusibility.

When constructing frits for soft glazes it is therefore better to absorb the flint and china clay into the frit rather than the stone, felspar, and whitning, because these flotatives, when added, do not tend to harden the glaze to so great a degree.

IV. PHYSICAL CHARACTERISTICS OF INSOLUBLE FRITS.

(*a*.) *Response to Heat.*—The properties of fluidity and effect on colours have already been dealt with.

It may, however, be well to notice more fully the nature of the frit as regards *response to heat.*

In the use of insoluble frits the same laws apply with regard to fusion as in the case of pottery bodies. It is well known that the change of physical condition under the influence of a steadily rising temperature seldom alters in the same ratio as the increase of heat. Up to a certain point no change whatever may be manifest, but at this point the commencement of entirely fresh physical conditions sets in owing to the development of fresh chemical combinations.

This action having commenced, though the heat may be no further increased, the maintenance of the temperature already attained may be sufficient eventually to complete the results.

The phenomena exhibited in the maturing of insoluble glazes is somewhat similar. The different physical condition of the component particles, as well as the various methods of carrying forward the firing, must obviously produce differing results.

The frit portions of the glaze are much more difficult to grind finely, and the proportion is much greater than heretofore. Hence there is a greater tendency to obtain coarser frit particles in the glaze grinding. The coarser the particles, the longer will it take for the fusing action to permeate the glaze mass after incipient fusion has set in. Therefore the finer the glaze is ground, the less the time required to mature the glaze surface after the highest temperature is reached.

I have here pieces of ware fired together under identical conditions showing the comparison of finer and coarser frit, in which the difference of texture is clearly manifest.

The composition of the frit will also greatly affect the need of more or less time to complete the fusing action. The greater the amount of alumina present in the lead frit (all other things being equal) the longer the time required to mature the texture of the glaze on this account.

The viscosity of double silicate frits also tends to make the maturing of the glaze surface more difficult through the entanglement of the bubbles formed in the glaze during the firing.

It has been maintained by some that not only prolongation of heat, but also increase of temperature is necessary where lead frits are used. But a considerable amount of evidence has been adduced to show that such is not the case.

The comparison of the same glaze compounded with identical ingredients (excepting the substitution of fritted for raw lead) can be seen on the pieces of ware here shown. These specimens have been fired under identical conditions, and in all cases the lead frits used are under 2 per cent. solubility. From these it will be seen that the substitution of the frit has not interfered with the quality of the ware.

I also produce here a specimen of soft majolica glaze, fired at seger cone 010, the solubility of which is under 0·02 per cent.

(*b.*) *Influence on Raw Ingredients of Glaze.*—In order to appreciate the influence of the frit in maturing the glaze surface, it is necessary to realise that the development of the complete fusing action of the frit during firing depends largely upon the composition of the mill mixture. Three methods are possible :—

(*a*) The glaze may be composed of ground lead frit only, as in some majolica glazes ; or of

(*b*) lead frits mixed with raw materials, *e.g.*, felspar, stone, flint, china clay, and whiting ; or of

(*c*) Boracic frit added to the lead frit with raw materials as before.

(*a*) In the first case, the materials having been all previously fritted, the firing process only involves a re-fusing of this on the surface of the ware. The maturing of the glaze texture is then chiefly a question of temperature. (*b*) In the second case, where raw material is added, the fusion commences around each frit particle, which is gradually and reciprocally absorbed by the raw material adjacent. Hence, the quantity and size of the frit particles much affect the time needed to complete the fusing action. The increasing heat also has its independent influence on the raw materials present, creating new chemical combinations and disengaging bubbles of gas which remain embedded in the semi-fused mass. These bubbles, expanding with increasing heat, gradually force their way to the surface and eventually burst, leaving small craters. The edges of these become fused away and finally melt into a smooth surface.

The completion of this fusion and the ease with which the bubbles are set free is mostly dependent upon the viscosity of the glaze. (*c*) In the third case, the action on the lead frit is further influenced by the presence of borax frit. Though this may tend to assist the fusing action, it sets up still more complex chemical combinations and generally increases the quantity of bubbles evolved. This is especially so, when (as is often the case), the borax is not compounded in true chemical ratios, a considerable amount of uncombined elements being present.

The diagrams here shown illustrate approximately the conditions of such glazes at various stages of the firing and are founded on microscopic sections of the ware strongly magnified.

In the manufacture of porcelain and many once fired wares, the firing is arrested before the bubbles have burst. While this only destroys the smoothness of texture, the whiteness of the glaze is much increased, owing to the refraction of light from the bubbles which promotes translucency rather than transparency.

I have here samples of ware constructed on this principle.

V. The Preparation of Insoluble Frits.

(*a*) *Mixing of the Frit Materials.*—Thoroughly intimate mixing of the ingredients is absolutely necessary. Unless every particle of one material is brought into absolute contact with equally small particles of the other materials with which it must be combined in their proper ratio, an insoluble frit is not produced. Knowing the extreme difficulty of this mingling and grinding when mixing in a dry state, some Continental manufacturers have reverted to bunging, even at the expense of being compelled afterwards to remove the water before fritting. By these means the only reliable and efficient results are obtained.

The difference between wet mixing and the ordinary methods will cause a difference of solubility of as much as 10 per cent. to 15 per cent., even if the dry mixing is done with ordinary care.

It has been supposed by some that the process of fritting causes sufficient admixture during the fusion, but this is certainly a false impression.

Hence a frit mixed dry gave 16 per cent. soluble lead ; the same mixed wet gave 1·3 per cent. soluble lead. Another sample mixed dry gave 7·59 per cent. soluble lead ; the same wet gave 1·4 per cent. soluble lead.

By any other method than that of wet mixing, the potter is, however, too dependent upon the close attention of the workman, who often does not easily realise the extreme importance of care. Some Continental potters have adopted the plan of sludge mixing, using an ordinary mortar mill. The most economical method, however, appears to be by bunging and evaporating the slop in a double-bottomed steam pan lined with galvanized iron. With care, the ordinary slip kiln may also be adapted to the purpose.

(*b*) *Form of Kiln.*—In preparing frits from lead monoxide the nature of this material must largely decide the best form of frit kiln. Both monosilicates and bisilicates are extremely fluid and exercise a scarching and corrosive influence on the silicious portion of the brick work. Hence the area of the kiln floor over which the frit flows should be limited as much as possible, especially that portion which is submerged in the molten frit. The time during which this is allowed to accumulate should also be limited as much as possible for the same reason. The joints of brickwork, being more liable to the corrosion of the frit, should be kept so thin that the bricks are practically close together. The pug or mortar used should be as aluminous as possible. The bricks should also be very hard fired to prevent further shrinkages, and the exposed face of the bricks should be fine and smooth in finish. Fire-bricks of coarse grain are more liable to be attacked, and as a rule machine-pressed bricks, free from all wind cracks, should be selected. Aluminous bricks of Cornish make are to be preferred if sufficiently hard fired, but as a rule this is not the case.

These precautions become far more necessary in dealing with lead frits than is the case with borax frits, because ordinary fire-bricks being of a highly acid composition, this silicious portion is easily dissolved in frit or combined with any lead oxide present. For this reason, the acid contents of the frit may even exceed the actual ratio in the frit mixture, and the solubility of the frit may vary according to the condition of the kiln bottom.

(C) *Method of Firing and Volatilisation.*—In the firing of lead frits two matters are of importance. The reducing atmosphere in the kiln chamber must be avoided as far as possible, especially when the fusion is commencing; the heat at this stage must on no account be allowed to diminish. These precautions are necessary for two reasons:—

(*a*) The falling of the temperature will cause the reduction of metallic lead in the frit.

(*b*) The reducing atmosphere will also assist this result, but it has also a strong influence on the volatility of the lead.

The experiments of M. Stoermer, lately carried out, show that the volatilisation of the lead in fritting goes on far more rapidly in a reducing flame, and this refers especially to the silicates of lead already formed. Much lead may be dissipated in this way.

It is also important to notice that the metallic lead only is volatilised, the silica being set free, and therefore reducing the fusibility of the remaining frit. It may be doubted therefore whether sufficient weight has been given to these principles in determining the causes of variations in the solubility of frits prepared from apparently identical mixtures.

Conclusion.—I am well aware that many of the points upon which I have touched in this paper still require verifying in a very extended series of tests.

It may, no doubt, be objected that the examples produced are from limited bulk. In reply to such objections I can only say that they are the result of careful personal observation corroborated by the experience of a considerable number of potters working under diverse conditions. I may also add that in no case in which the formulæ in use can be converted from raw to fritted lead, have I found serious difficulty in producing ware equal in quality to the raw glazes.

I quite agree with Prof. Binns in his conclusions expressed in the transactions of the American Ceramic Society, that monosilicate raw glazes are more easily worked, and that they bear a far larger amount of heat without becoming injured.

But it is to be feared that to revert to this basis of glaze composition would inevitably bring about an increase in the amount of lead poisoning, such as would be detrimental to the general welfare of the industry.

Beset as the English potter is with considerable technical difficulties under present conditions, the true solution of these does not appear to rest in merely returning to traditional methods.

True progress can only be ensured by holding to principles based on sound deductions which are the outcome of reliable facts obtained over the widest area.

Discussion.

Mr. P. H. Mellor said, in regard to the presence of silica in a glaze, that he had found the addition of flint caused it to shell off. Could Mr. Rix suggest a remedy?

Mr. G. J. Ward said that as far as monosilicates and substitutes were concerned he had convinced himself that the alumina was present as a base. Some thought it was present as an acid. At any rate, some analyses that he had made showed it to be a base. The addition of alumina in a blast-furnace slag raised the fusion point. Was alumina invariably basic or did Mr. Rix consider it sometimes acid?

Mr. R. M. Caven asked if he understood aright that lead borosilicate was soluble in the gastric juice. Was lead borosilicate a true compound or was it a mixture of lead borate and lead silicate?

Mr. J. Golding, as bearing on the action of silica on glazes, said he had been burning some sand on enamelled iron plates and the enamel had come off, apparently being acted upon by the sand.

Dr. Kipping referred to the addition of the oxides of Mn, Cr, and Co to the glazes, and their non-effect on the solubility of the lead. The displacing effect of an acid oxide, such as Cr_2O_3, was also commented on.

Mr. Rix said that the cause of the glaze shelling off was just the opposite of the crazing of the glaze. It was in both cases a question of the difference in the coefficient of expansion between the material of the ware and the glaze. The proper mean to be maintained could be ascertained from any work on ceramics. In regard to alumina, it generally played the part of a base, but there were certain mixtures forming a light blue that were really an aluminate of cobalt, in which it took the place of an acid. He really regarded alumina as occupying a midway position, and in his calculations did not take it as either an acid or a base. Alumina undoubtedly raised the fusion point. Nevertheless two glazes might have the same fusion point, and yet the one might be fluid and the other viscous, the two properties of fluidity and viscosity being quite of a distinct character. With regard to borosilicates as to whether they were mixtures or true compounds, there were some ceramic chemists who held the latter view, but sufficient data were not at present available to decide positively. As to enamelled iron, with the exception of that used for advertising signs, the enamel used was all made without lead; borax, lime, and alumina being largely employed. He must confess his surprise as to the effect of the oxides on solubility of bisilicate frits, and would like to see a more extended range of experiments as the results seemed to be somewhat contradictory. He desired most distinctly to make it clear that glazes made with insoluble frits had been found perfectly satisfactory if used with proper knowledge. They had been employed in all classes of ware. His method had been to take the total contents of lead in the glazes. He had had no difficulty whatever with any manufacturers in connection with the questions at issue.

Dr. Kipping said that after listening to Mr. Rix's reply, he thought the importance of the subject was made even clearer than when listening to the facts in detail. He would express the hope that Mr. Rix would continue his experiments in the interests of an important industry.

EMERGENCIES IN VITRIOL WORKS.

BY F. J. R. CARULLA.

Erratum.—On p. 227, col. 1, line 21, the words "during a storm" belong to the following paragraph, after the words "to lean over."

Addenda.—P. 226, col. 2, after last line add "(Fig. 4)." P. 227, col. 1, after last line add "(Fig. 6)." P. 228, col. 2, line 13; instead of "the figure" read "Fig. 7."

Yorkshire Section.

Meeting held on February 24th, 1902.

MR. G. WARD IN THE CHAIR.

ON THE ESTIMATION OF ALKALINE HYDRATE OR BICARBONATE IN THE PRESENCE OF MONOCARBONATE.

BY B. NORTH, A.R.C.S., F.C.S., AND W. C. LEE.

In the Journal of the Franklin Institute, c. iii, No. 2, pp. 119—121, is a paper read before the Chemical Section of the Institute, by W. E. Ridenour, on the estimation of hydrate in the presence of alkaline carbonate. Using Thompson's method of titrating half the carbonate and the whole of the hydrate with standard acid, with phenolphthalein as indicator, and finally the remaining half of the carbonate, with methyl orange as indicator, Ridenour finds that it is impossible to obtain correct results, and advises the employment of a factor to compensate for a constant error which he maintains he has found in the method. We have noticed similar discrepancies in analysing various specimens of soda ash, in which, apparently, half the carbonate was greater than half the carbonate and the total hydrate, and, at the time that Ridenour's communication was brought to our notice, were engaged in investigating the cause of the errors.

Robertson, in the Journal of the Society of Dyers and Colorists, July, 1901, states that this result may be brought

about by the presence of large quantities of common salt in the solution which is being tested, but as only a small percentage of salt would be present in a sample of soda ash, it seemed advisable to carefully revise Thompson's method, using carefully purified carbonate and hydrate. For this purpose, bicarbonate of sodium was first treated with small quantities of water, until the washings gave no reaction for chloride, and the bicarbonate, after drying, was ignited until constant in weight. From the pure carbonate thus obtained, a normal solution was prepared, and compared with normal sulphuric acid, the latter being made exactly normal by the usual method of diluting with distilled water until 20 c.c. of the N/1 Na_2CO_3, required exactly 20 c.c. N/1 H_2SO_4, with methyl orange as indicator.

A decinormal solution of caustic soda was prepared by dissolving metallic sodium in distilled water in a platinum dish, the solution being afterwards diluted with distilled water, until 100 c.c. of the N/10 caustic soda solution required exactly 10 c.c. of N/1 H_2SO_4 for neutralisation.

These solutions were mixed in various proportions, such as one would be likely to meet with in samples of soda ash, and carefully titrated with N/1 H_2SO_4, according to Thompson's method. The success of the first part of the operation, when using phenolphthalein, depends on the whole of the carbonic acid remaining in the solution in combination with the carbonate as bicarbonate, and this result can only be brought about by the point of the burette being immersed in the liquid, a fact which, although previously stated, is frequently ignored by many text books in the description of this method.

The following results which we have obtained may be interesting, and shew the necessity for this precaution.

Point of Burette above the Liquid.

N/1 Na_2CO_3	N/10 NaOH.	Results obtained.		Theoretical Amounts.	
		N/1 H_2SO_4 with Phenolphthalein.	N/1 H_2SO_4 with Methyl Orange.	N/1 H_2SO_4 with Phenolphthalein.	N/1 H_2SO_4 with Methyl Orange.
c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
14	15·0	8·75	7·06	8·5	7·0
15	12·5	9·15	7·33	8·75	7·5
16	10·0	9·25	7·95	9·0	8·0
17	7·5	9·82	8·2	9·25	8·5
18	5·0	9·8	9·1	9·5	9·0
19	2·5	9·7	9·3	9·75	9·5
20	Nil	9·95	10·0	10·0	10·0

Point of Burette immersed in the Liquid.

N/1 Na_2CO_3	N/10 NaOH.	Results obtained.		Theoretical Amounts.	
		N/1 H_2SO_4 Phenolphthalein.	N/1 H_2SO_4 Methyl Orange.	N/1 H_2SO_4 Phenolphthalein.	N/1 H_2SO_4 Methyl Orange.
c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
14	15·0	8·45	7·05	8·5	7·0
15	12·5	8·75	7·5	8·75	7·5
16	10·0	9·0	8·05	9·0	8·0
17	7·5	9·23	8·57	9·25	8·5
18	5·0	9·5	9·05	9·5	9·0
19	2·5	9·75	9·5	9·75	9·5
20	Nil	10·0	10·0	10·0	10·0

From the results obtained it will be obvious that, when tested with carefully purified materials, this method of estimating carbonate and hydrate is perfectly reliable if done with proper precautions, and we can therefore only surmise that the materials used by Ridenour were not of sufficient purity to yield correct results; a small quantity of carbonate in the hydrate, or of bicarbonate in the carbonate, used would be sufficient to account for the discrepancies observed by Ridenour.

Although, as we have shown, correct results may be obtained with mixtures of carbonate and hydrate using phenolphthalein and methyl orange, this would apparently appear only to be so when the titration is done in daylight. Possibly this may account for the errors observed by Ridenour, but as one of us is now engaged on an investigation with regard to the effect on iodicators of various artificial illuminating agents, nothing definite can at present be said on this point.

We have carefully repeated Robertson's experiments and, with large quantities of salt in solution, our results entirely confirm his conclusions, but that a small amount of salt has no effect on the titration is shown by the following results :—

Point of Burette immersed in the Liquid.

N/1 Na_2CO_3	N/10 NaOH.	N/10 NaCl.	Results obtained.		Theoretical Amounts.	
			N/1 H_2SO_4 Phenolphthalein.	N/1 H_2SO_4 Methyl Orange.	N/1 H_2SO_4 Phenolphthalein.	N/1 H_2SO_4 Methyl Orange.
c.c.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
13	17·5	14·0	8·3	6·5	8·25	6·5
14	5·0	12·0	8·5	7·0	8·5	7·0
15	12·5	10·0	8·72	7·45	8·75	7·5
16	10·0	8·0	9·0	8·0	9·0	8·0
17	7·5	6·0	9·25	8·5	9·25	8·5
18	5·0	4·0	9·5	9·0	9·5	9·0
19	2·5	2·0	9·75	9·5	9·75	9·5
20	Nil.	Nil.	10·0	10·0	10·0	10·0
14	15·0	2·0	8·5	7·0	8·5	7·0
20	Nil.	14·0	10·0	10·0	10·0	10·0

The method having been proved to be a reliable one, even in the presence of a small quantity of salt, we applied it to the analysis of a sample of soda ash, supposed to contain carbonate and hydrate.

The following results were obtained:—Weight of soda ash taken 11·177 grms.; dissolved in distilled water and made up to 500 c.c.:—

No. 2 Soda Ash.	N/1 H_2SO_4 Phenolphthalein.	N/1 H_2SO_4 Methyl Orange.
c.c.	c.c.	c.c.
100	15·25	16·9
50	7·55	8·4

It is quite evident that there must be something present other than carbonate, hydrate, and chloride to produce such a result, and the idea suggested itself that, if bicarbonate was present in the sample in the place of hydrate, such a result might be obtained, the first part of the titration when using phenolphthalein yielding half the carbonate, and the latter part of the operation with methyl orange yielding the remaining half of the carbonate together with the total bicarbonate.

This seemed to us to be a much more rapid and advantageous method than that devised by Lunge for determining bicarbonate in the presence of monocarbonate, if at the same time it could be proved to be a reliable one with the usual conditions under which it would be applied.

In order to test the method a N/10 solution of pure bicarbonate of soda was prepared, and various amounts of N/1 carbonate, N/10 bicarbonate, and N/10 chloride were mixed so as to imitate the compositions of a variety of samples of soda ash.

The following results were obtained with the tip of the burette immersed in the liquid:—

N/1 Na_2CO_3	N/10 $NaHCO_3$	Results obtained. N/1 H_2SO_4 Phenolphthalein.	Results obtained. N/1 H_2SO_4 Methyl Orange.	Theoretical Amounts. N/1 H_2SO_4 Phenolphthalein.	Theoretical Amounts. N/1 H_2SO_4 Methyl Orange.
c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
15	10	7·4	8·5	7·5	8·5
13	8	6·5	7·2	6·5	7·3
15	6	7·5	8·02	7·5	8·1
17	4	8·5	8·9	8·5	8·9
18	2	8·95	9·2	9·0	9·2

N/1 Na_2CO_3	N/10 $NaHCO_3$	N/10 NaCl.				
c.c.	c.c.	c.c.				
15	10	3	7·5	8·5	7·5	8·5
15	6	5	7·5	8·1	7·5	8·1
18	2	8	9·0	9·1	9·0	9·2

The method is shown, therefore, to be a perfectly reliable one, and when it is applied to the analysis of soda ash, No. 2, from the results obtained above, the amounts of carbonate and bicarbonate are found to be equivalent to—

1. 72·2 per cent. Na_2CO_3; 6·6 per cent. $NaHCO_3$.
2. 71·6 per cent. Na_2CO_3; 6·4 per cent. $NaHCO_3$.

Mean results:—71·9 per cent. Na_2CO_3.
6·5 per cent. $NaHCO_3$.

In order to compare this method of estimating bicarbonate in the presence of monocarbonate with other methods, we made use of the same sample of soda ash, No. 2, and determined the percentages of bicarbonate and carbonate by three other methods.

1. By Lunge's method, in which a known volume of N/1 or N/2 NaOH is added to convert the bicarbonate into carbonate, then precipitating the carbonate with barium chloride, and, after making the liquid up to a known bulk and allowing the precipitate to settle, titrating an aliquot portion of the clear solution with standard acid, so as to determine the excess of N/1 or N/2 NaOH remaining in the solution.

The following results were obtained:—3 grms. of soda ash dissolved in water and made up to 250 c.c.

Soda Ash.	N/1 NaOH (Factor 0·94).	Aliquot Portion taken.	N/1 HCl.	Bicarbonate.	Carbonate.
c.c.	c.c.		c.c.	Per Cent.	Per Cent.
100	5	1/5	0·7	8·4	70·6
100	5	1/5	0·7	8·4	70·6

2. The total amount of CO_2 was found in the soda ash by making use of Schrotter's apparatus, and the total Na_2O by carefully heating the soda ash with concentrated H_2SO_4 in the usual way. Total CO_2 found, 36·49 per cent.; total Na_2O found, 47·95 per cent. From these percentages one may then calculate the percentages of carbonate and bicarbonate present, which in this case are found to be:—5·9 per cent., $NaHCO_3$; 76·1 per cent., Na_2CO_3.

3. The amount of bicarbonate may be obtained gravimetrically, in a mixture of bicarbonate and monocarbonate, from the weight of CO_2 evolved when the sample is heated to about 200° C. Air, freed from H_2O and CO_2, is drawn through a small distilling flask containing a weighed amount of soda ash, the H_2O and CO_2 evolved being collected separately in weighed U-tubes containing sulphuric acid and pumice and weighed potash bulbs.

The following results were obtained by this method:—

	Soda Ash.	CO_2 evolved.	H_2O evolved.	Bicarbonate.	Carbonate.	Moisture.
	Grms.	Grm.	Grms.	Per Cent.	Per Cent.	Per Cent.
1st experiment..	8·0749	0·1443	1·8062	6·82	—	22·13
2nd (more reliable)	5·0088	0·0857	1·1198	6·41	71·8	21·27

The percentages of bicarbonate obtained in this sample of soda ash, No. 2, by the four methods employed may now be tabulated:—

	Per Cent.	
Titration method.....	6·5	Mean.
1. Lunge's method.....	8·4	
2. Deter. of total CO_2 and Na_2O.....	5·9	
3. From CO_2 evolved on heating	6·4	2nd and more reliable.

The titration method gives a result which approximates very closely to that obtained by the gravimetric method, and this is more clearly shown by a comparison of the complete analyses of soda ash, No. 2, obtained by these two processes:—

	Titration Method.	Gravimetric Method.
	Per Cent.	Per Cent.
Na_2CO_3	71·6	71·8
$NaHCO_3$	6·5	6·4
Moisture	20·7	21·3
NaCl	0·6	0·6
	99·7	100·1

To determine the moisture present in the soda ash, about 3 grms. were ignited in a porcelain dish until constant in weight, and a second experiment was made in which about 3 grms. were ignited in a dry current of air. The ignition expels the water in combination with the carbonate, and also breaks up the bicarbonate into monocarbonate and carbonic acid. Knowing the percentage of bicarbonate present, the loss due to bicarbonate on ignition may be obtained by calculation, and this, when deducted from the total loss on ignition, will give the loss due to moisture. The following results were obtained with soda ash, No. 2:—(1) Weight of soda ash taken, 3·002 grms.; loss in weight, 0·692 grm.; moisture, 20·7 per cent. (2) Weight of soda ash taken, 3·164 grms.; loss in weight when heated in a dry current of air, 0·7309 grm.; moisture, 20·7 per cent.

We append the results of six different samples of soda ash, which have been analysed by this method of titration with normal acid:—

Soda Ash.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Carbonate	85·3	71·9	92·7	86·4	90·0	95·9
Bicarbonate	6·9	6·5	1·7	10·6	NaOH 2·4	NaOH 1·2
Moisture	5·2	20·7	4·6	2·4	6·9	2·0
Salt	2·3	0·6	0·6	0·6	1·7	0·5
	99·7	99·7	99·6	100·0	101·0	99·6

The following method is therefore recommended for the analysis of soda ash. Five or ten grms. of the sample are dissolved in distilled water, and made up to 250 c.c. and 50 c.c., after adding phenolphthalein, titrated with N/1 acid with the point of the burette immersed in the solution; then add one or two drops of methyl orange and continue the titration. Should the amount of N/1 acid be greater with phenolphthalein than with methyl orange, NaOH is shown to be present, but if greater with methyl orange, then bicarbonate is present, and calculations for carbonate and hydrate, or carbonate and bicarbonate, are made in the usual way.

The end point of the reaction with phenolphthalein may be determined very exactly, when the colour is scarcely visible in the dish, by pouring a small quantity of the liquid, between each addition of acid, into a test tube, and comparing this, by looking through the depth of the solution, with a similar tube of liquid, in which the colour is known to be absent.

To determine the amount of moisture present, 10 grms. of soda ash are ignited until constant in weight, and the loss due to the bicarbonate, if present, deducted from the total loss on ignition.

The following formula may be made use of for the calculation of the moisture, when 10 grms. of soda ash are used:—

Per cent. of moisture =

$$\left(\text{total loss on ignition} - \frac{0{\cdot}37 \times \text{per cent. bicarb.}}{10}\right) 10.$$

This investigation was made in the Department of Chemistry and Dyeing of the Municipal Technical College, Bradford.

Discussion.

Mr. Ward considered that a reliable method of estimation of the relative proportions of bicarbonate and carbonate in samples of soda ash is of great value, but pointed out that, from a commercial point of view, the most important estimation in the analysis of soda ash was that of the Na_2O present. He also drew attention to the fact that very different grades of soda ash are to be obtained, and asked if the process recommended was equally suitable for all.

Mr. T. Fairley pointed out that, in estimating Na_2O in soda ash, as described, by testing a weighed quantity with sulphuric acid, any sodium chloride would be reckoned in the result as Na_2O.

Mr. North, in reply to the Chairman, said that the process recommended had been found successful with very various grades of soda ash; and, in reply to Mr. Fairley, remarked that the error involved in the conversion of NaCl into Na_2SO_4, in the estimation of Na_2O with H_2SO_4, would be very small, owing to the minute quantity of sodium chloride present, and this small error would not be sufficient to account for the very high percentage of sodium carbonate found by this method.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	326
II.—Fuel, Gas, and Light	326
III.—Destructive Distillation, Tar Products, Petroleum	335
IV.—Colouring Matters and Dyestuffs	336
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	339
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	343
VIII.—Glass, Pottery, and Enamels	347
IX.—Building Materials, Clays, Mortars, and Cements	347
X.—Metallurgy	348
XI.—Electro-Chemistry and Electro-Metallurgy	352
XII.—Fats, Fatty Oils, and Soap	355
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	355
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	357
XV.—Manures, &c.	358
XVI.—Sugar, Starch, Gum, &c.	358
XVII.—Brewing, Wines, Spirits, &c.	359
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	360
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	362
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	362
XXI.—Photography	365
XXII.—Explosives, Matches, &c.	366
XXIII.—Analytical Chemistry	366
XXIV.—Scientific and Technical Notes	368

English Patent Specifications may be obtained by post by remitting 8d. each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C

I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Centrifugal Machines. M. de Marchéville, Paris. Eng. Pat. 15,292, July 25, 1899.

THE machines are for separating material held in suspension in a liquid (*e.g.*, for extracting bicarbonate of soda crystals from an ammoniacal solution), and are of the following construction:—A drum is mounted to rotate within a fixed casing, and is provided with two valve-controlled inlets, one for the substance or mixture to be treated, and the other for a washing liquid. A movable scraper separates the material from the interior of the drum, and directs it into a hopper leading to a normally closed discharge outlet. The shaft upon which the drum is mounted drives a shaft provided with cams, which are arranged and adapted to open and close the valves controlling the inlets, to bring the scraper into operative position, and to open and close the discharge aperture.—R. A.

Separators for Dry Granular Substances; Centrifugal ——. W. J. Hinchey, Ontario, Canada. Eng. Pat. 21,212, Oct. 23, 1901.

THE dried granular material is led on to the centre of a rotating disc, having radial webs, by which it is projected horizontally into two or more concentric compartments.
—J. W. H.

Condensing and Cooling Liquids; Apparatus for ——. E. J. Clubbe and A. W. Southey, London. Eng. Pat. 5118, March 11, 1901.

IN condensers which are formed of discs, corrugated or otherwise, united at their edges, the sections are held together in a frame, rubber washers being used to make the joints, and spacing pins or discs to prevent the collapse of the separate chambers.—J. W. H.

Condensing Steam or Cooling Fluids; Methods of, and Apparatus for ——. H. H. Lake, London. From The Cosmopolitan Power Company, New Jersey, U.S.A. Eng. Pat. 23,439, Nov. 19, 1901.

IN condensers of the tubular type, air which has been cooled by water sprays is used; the expansion of this air is also made to contribute to the cooling effect, and ammonia may be added to the water used for spraying, in order to enhance the result.—J. W. H.

Gas Thermometers and Pyrometers. H. S. Hatfield, Brighton. Eng. Pat. 2467, Feb. 5, 1901.

THE first claim is for "A new kind of thermometer or pyrometer, in which the indication of temperature is given by the difference in pressure between the gas in two bulbs or chambers, both exposed to the temperature to be measured." Two bulbs, intended to be exposed side by side to the temperature to be measured, are connected by means of capillary tubes with a glass U-tube of fine bore, in the bend of which is situated a three-way stopcock. In preparing the apparatus, each bulb is in turn filled with gas at the desired pressure through the three-way stopcock; mercury is then introduced through the same stopcock, and when the cock is set so that the two limbs of the U-tube are in communication, the levels assumed by the mercury will be such as correspond with the different pressures in the two bulbs. When the bulbs are exposed to the temperature to be measured, the levels of the mercury will, it is stated, alter according to the temperature, which may then be read off on a scale placed behind the tube. The second claim is for correcting the errors due to uncertain and unknown variations in the temperature of those parts of the apparatus not exposed to the temperature to be measured, by so constructing the instrument that certain relations hold between the pressures of the gas in the bulbs and the volumes of the bulbs and connecting tubes, formulæ being given for making the required calculations.—H. B.

Taps, Cocks, or Stoppers, Safety ——, for Preventing Explosion of Inflammable Fluids. J. Timar, Berlin. Eng. Pat. 5740, March 19, 1901.

STOPCOCKS, &c. for vessels containing combustible liquids are provided with perforated diaphragms or an insulating piece of non-conducting material in the outlet channel, to prevent the striking back of a flame.—J. W. H.

Heat; Apparatus for Effecting the Transference or Exchange of ——, between Fluids. F. E. Bennett, London. Eng. Pat. 6146, March 23, 1901.

A SERIES of concentric tubes provide annular spaces for the circulation of the fluids under treatment; the inlets and outlets for the liquid communicate with alternate wide spaces, and the inlets and outlets for the vapour with narrow ones. Wire in spirals or otherwise may be arranged in the spaces to baffle the circulation of the fluids.—J. W. H.

Centrifugal Separators. P. W. Lindberg, Sweden. Eng. Pat. 7237, April 6, 1901.

THE driven pinion on the spindle of the improved centrifugal separator has spiral teeth such that the pressure on the footstep is diminished by the driving forces; a nut capable of free rotation or otherwise, which fits the spiral teeth of the pinion is placed above the pinion, so that, should the spindle rise in its bearings, contact of the pinion with the nut prevents further movement, although the spindle can be removed readily, the pinion passing through the nut.
—J. W. H.

Pumps for Pumping or Compressing Gases or Vapours. T. R. Murray, Melksham, Wilts. Eng. Pat. 26,165, Dec. 21, 1901.

THE invention relates to an air-pump in which oil is used to fill up the clearance spaces, and in which certain disadvantages of the usual form are overcome. An annular projection on the lower side of the piston fits into a recess on the cylinder end, and the design is such that ready access is obtained to the valves.—J. W. H.

UNITED STATES PATENTS.

Floats for Steam or Water Traps; Process of Forming ——. W. F. Patton, Toledo, Ohio, U.S.A. U.S. Pat. 691,803, Jan. 28, 1902.

THE floats are formed as hollow, seamless spheres, by the electro-deposition of copper to the desired thickness on a hollow sphere of paraffin. The paraffin sphere is fitted with a flanged metallic nipple, and is coated first with plumbago, then with "iron by hydrogen," and finally with copper sulphate, preparatory to the electro-plating. The copper shell formed on the sphere is joined by the process to the nipple, which is threaded for engagement with the lever of the trap.—R. A.

Distilling Apparatus. J. H. Jewell, Chicago, Illinois. U.S. Pat. 692,788, Feb. 4, 1902.

THE boiler of the distilling apparatus claimed, is supported on the condenser, a chamber being formed between the upper plate of the condenser and the lower plate of the boiler; the latter is pierced and provided with a steam-gathering tube, having its upper end above the water line of the boiler. Controlling devices are described.—J. W. H.

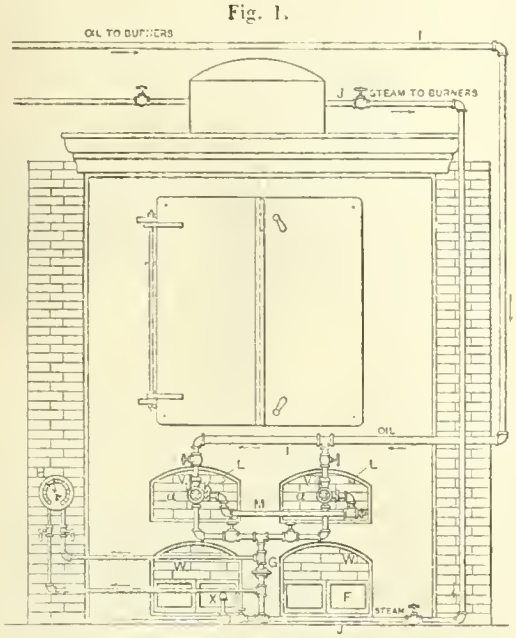
II.—FUEL, GAS, AND LIGHT.

Petroleum, Beaumont [Texas], as Fuel; Tests of ——. J. E. Denton. Eng. and Mining J., 1901, **73**, [5], 169—173.

THE tests were made in connection with a return tubular boiler, 6 ft. in diameter and 18 ft. long, containing 100 tubes, 2½ ins. in diameter, employed for operating ice-making machinery, under a very steady load, throughout each 24 hours. The average composition of the oil used was: Carbon, 84·60; hydrogen, 10·90; sulphur, 1·63; oxygen, 2·87 per cent. Sp. gr., 0·920; flash point, 142° F.; burning point, 181° F.; cold test, −6° F.; calorific value per lb. by oxygen calorimeter, 19,060 B.T.U.

Arrangements for Burning the Oil.—The modifications of the boiler furnace and the general arrangements for the tests are shown in Figs. 1 (end view) and 2 (longitudinal section). Four ducts of hollow tile, F, 10 by 6 ins., were laid in the ash-pit, extending nearly to the bridge-wall and to the ash-pit door openings, closed by brickwork, W, around the outer ends of the tile. The forward bearer of the grate bars, X (Fig. 2), was dropped, about half of the forward set of bars removed, and a course of firebrick, O,

Fig. 1.

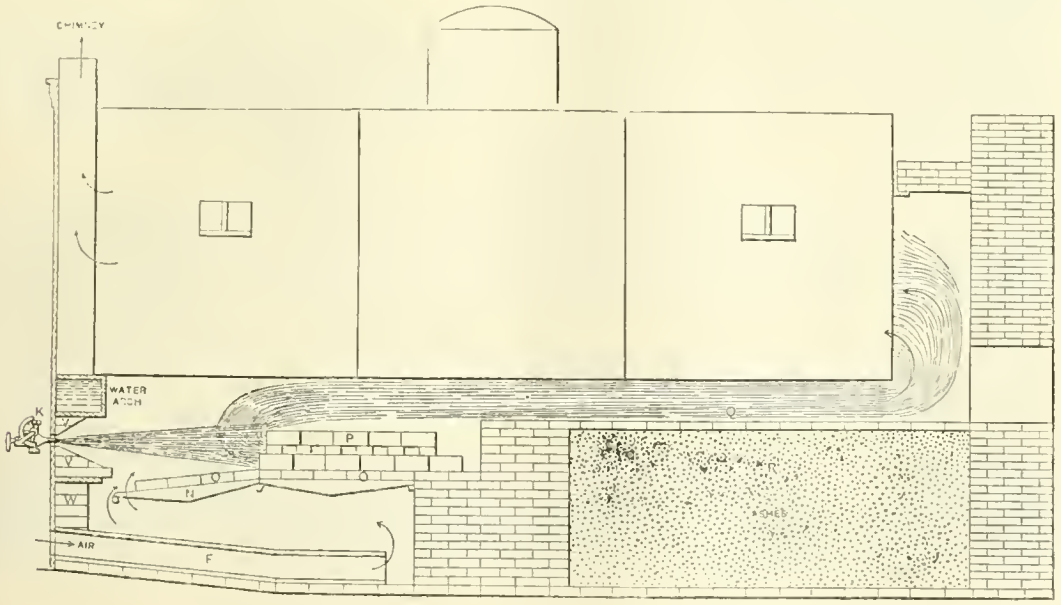


laid with fireclay over the whole upper surface of the grates, so that air entering through the tile ducts could flow back along the outside of the latter, and then around and up between the front end of the grate bars through an area a little greater than that of the aggregate cross section of the tiles. A checker work, P, of about 50 loose firebricks was built over the grates; the space at the back of the bridge was filled with ashes, R, flush with the top of the bridge-wall; and a single-course floor, Q, of firebrick laid over the ashes. An iron bar, *a*, was bridged across the middle of the fire-door opening, and the remainder of the latter closed with firebrick, V, flared on the inside, a small opening, L, being left for applying the torch to the burners. Into the iron bar across each door was screwed the burner, K, the construction of which is shown in Figs. 3 (vertical section) and 4 (horizontal section). Oil enters the burner vertically through the opening, *b*, under control of the cock, *c*, regulated by the handle, *d*. Steam enters the opening, *e*, and flows through the conical opening, *f*, regulated by the hand-wheel, *g*, to meet the oil as the latter falls between the vertical flanges, *h*. Through a third opening, *i*, in the burner, air is drawn in from the back of the furnace through a firebrick duct built on top of the grate, and connecting with the bottom side of the latter at its rear, whilst the front end communicates with the iron pipe, I, connected to both burners. Thus a mixture of steam, oil, and heated air is blown out of the burner, and this is joined with the main current of air flowing up around the front end of the grate bars, somewhat heated by its passage along the under side of the grate. The arrangements for the supply of oil to the burners from the storage tank, which was sunk in the ground, are described and illustrated. The pipe, X (Fig. 1), is a blow-off for draining the burner steam-supply pipe of water in starting the burner. The air enters the tile ducts under the natural draught of the chimney, which was 70 ft. high by 42 ins. square, and connected to the boiler by a 40-in. flue about 30 ft. long. In order to measure the steam consumed by the burners, the opening in the flange union, G, on the steam pipe, J, was reduced to $\frac{3}{8}$ in. by diaphragm, and the pressure each side of this opening measured by the differential steam gauges, H. After the tests, the readings of the differential gauge were duplicated, while the steam flowing, was condensed and weighed. The amount of oil consumed was determined by weighing the barrels before and after emptying them into the storage tank, and by means of a float in the latter, operating over a scale calibrated for the tests. The boiler was regularly cleaned internally every 10 weeks, and the period of the tests was at the middle of one of these intervals.

Time required to raise Steam.—With the oil, the time required to raise 85 lb. of steam was 59 mins., as against 1 hr. 17 mins., under similar conditions, with a coal fire started with a very liberal amount of dry wood.

Evaporative Tests.—The tests with the oil were made at capacities varying from 112 horse-power—which was con-

Fig. 2.



sidered to be about the horse-power at which the boiler was operated in its regular use with coal—to 220 horse-power, which represented the limit of satisfactory air-supply available. The tests with coal were made at 93 and 119 horse-power. The results of the tests are given briefly (see Table I.), and also in detail for one oil and one coal test:—

TABLE I.

Dimensions of Boiler: 6 ft. diameter, 18 ft. long; 100 Tubes, 2¾ ins. diameter; Grate Surface, 45·5 sq. ft.	Beaumont Crude Oil.					"No. 1 Buckwheat" Coal (Anthracite).	
	Nov. 27.	Night of Nov. 27—28.	Nov. 28.	Night of Nov. 28—29.	Nov. 29.	Dec. 12.	Dec. 13.
1. Duration, hours	3·5	8	11	13	11	12	12
2. Horse-power	146·9	112·7	189·7	138·0	220·1	92·6	119.1
3. Steam pressure (gauge), lb.	87	86	86	86	86·5	84·5	86·5
4. Feed temperature, ° F.	69	90	70	90	74	68	72
4a. Chimney temperature, ° F.	374	360	398	370	425	389	396
5. Quality of steam	Dry	Dry	Dry	Dry	Dry	Dry	Dry
6. Moisture in coal, per cent.	..	..	..	..	..	6·2	6·2
7. Ash in coal, per cent.	..	..	..	..	..	16·2	18·0
8. Times fire was cleaned	..	..	..	..	..	Once	Twice
9. Coal per hour per sq. ft. of grate, lb	..	..	..	..	..	7·66	10·10
10. Coal per hour per sq. ft. of heating surface, lb.	..	..	..	..	..	0·182	0·247
11. Oil per hour per sq. ft. of heating surface, lb.	0·181	0·135	0·226	0·163	0·263	..	..
12. Dry steam per hour from and at 212° F. per sq. ft. of heating surface, lb.	2·73	2·09	3·52	2·56	4·08	1·72	2·21
13. Heating surface per h.-p., sq. ft.	12·6	16·5	9·8	13·5	8·45	20·1	15·6
14. Total dry steam per lb. of fuel, as fired from and at 212° F., lb.	15·29	15·55	15·55	15·71	15·49	9·17	8·94
15. Per cent. of steam used by burner	3·6	3·1	4·8	3·5	4·8	..	..
16. Net lb. of dry steam per lb. of fuel, as fired from and at 212° F.	14·74	15·05	14·80	15·16	14·75	9·17	8·94

TABLE II.

	Bituminous Coals mined west of Ohio and used in Western and South-Western States.	Small Sizes of Anthracite.				Pittsburg Bituminous used in Mills of Pennsylvania and on Great Lakes.	Best Semi-Bituminous. Atlantic Ocean Traffic and Mills of Eastern and Middle States.		
							Hand-fired.	Mechanical Stokers and Patent Furnaces introducing Air over Fire.	
		Culm.	No. 3 Buckwheat or Barley.	No. 2 Buckwheat or Rice.	No. 1 Buckwheat and Pea.			Ash 10 %	Ash 5 %
1	2	3	4	5	6	7	8	9	10
1. Pounds evaporation per lb. of wet‡ coal from and at 212° F., at about 10 sq. ft. of heating surface per boiler horse-power.	7·5	7·75†	8·25†	8·50†	8·75	9·50	10·00	10·50	11·00
2. Pounds evaporation per lb. of Beaumont oil from and at 212°, at about 10 sq. ft. of heating surface per boiler horse-power.	14·8	14·8	14·8	14·8	14·8	14·8	14·8	14·8	14·8
3. Ratio of evaporation of oil to coal = line 2 ÷ line 1 = R.	1·97	1·91	1·79	1·74	1·69	1·56	1·48	1·41	1·35
4. Number of barrels of oil equivalent to a 2,240-lb. ton of wet coal = 2,240 ÷ (322° R) = N.	3·54	3·64	3·90	4·00	4·12	4·46	4·70	4·94	5·15
	Equivalent Price of Oil per Barrel of 42 U.S. galls. = Pe ÷ N = Po.								
	Price of coal per ton of 2,240 lb. Pe								
5.	Dols. 1.00	Dols. 0.29	Dols. 0.28	Dols. 0.26	Dols. 0.25	Dols. 0.25	Dols. 0.23	Dols. 0.21*	Dols. 0.20	Dols. 0.19
6.	1.50	0.43	0.41	0.39	0.38	0.36	0.34	0.32	0.30	0.29
7.	2.00	0.56	0.55	0.51	0.50	0.49	0.45	0.43	0.40	0.39
8.	2.50	0.71	0.69	0.64	0.62	0.60	0.56	0.53	0.50	0.49
9.	3.00	0.85	0.82	0.77	0.75	0.73	0.67	0.64	0.60	0.58
10.	3.50	0.99	0.96	0.90	0.87	0.85	0.78	0.75	0.71	0.68
11.	4.00	1.13	1.10	1.02	1.00	0.97	0.90	0.85	0.81	0.77
12.	4.50	1.28	1.23	1.16	1.13	1.09	1.01	0.96	0.91	0.87

* Weight of oil per gall. = 7·66 lb. Weight of oil per barrel of 42 U.S. galls. = 322 lb.
† These figures refer to net evaporation after allowing for steam consumed to produce the forced draught necessary for burning the fuel.
‡ By "wet coal" is meant coal containing 3 per cent. of water.

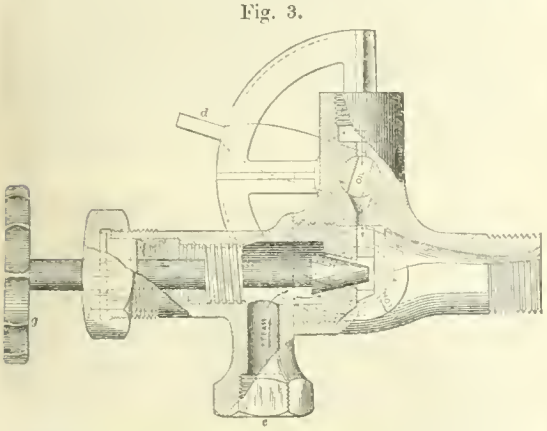
The results obtained, lead to the following conclusions:—

The combustion of the oil by the burner was practically perfect, since the heat accounted for by the steam production, the hot gases flowing to the chimney, and a reasonable allowance for radiation, represents about 98 per cent. of the total heat of combustion of the oil. The boiler utilised about 78 per cent. of the heat of the oil fuel, which represents the best average boiler practice, and the percentage of steam consumed by the burners was a minimum for steam-jet burners. For the tests at 189 and 220 horse-power, there was no excess of air over that necessary for complete combustion; consequently the net evaporation of 14·8 lb

of water per lb. of oil may be considered to represent the best economy that is to be expected from the use of oil as a fuel with steam-jet burners.

The coal used, afforded 11·6 per cent. of ash, and 14,680 B.T.U. per lb. of combustible when burned in oxygen in a calorimeter, and in the tests, practically complete combustion was effected. The results correspond to an evaporation of 11·79 lb. from and at 212° F. per lb. of combustible,

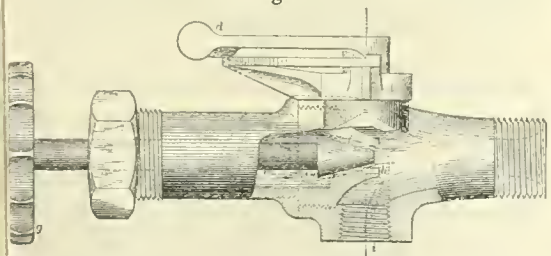
Fig. 3.



corresponding to the excellent boiler efficiency of 77·6 per cent. Had the draught been sufficient to burn enough coal per hour to produce about a horse-power per sq. ft. of heating surface, as in the case of the 189 horse-power test with oil, the boiler efficiency would probably be reduced, on account of the greater velocity of the heated gases over the heating surface, resulting in a higher chimney temperature, and hence, the waste of a greater proportion of the heat of combustion. Such reduction would probably have made the evaporation per lb. of wet coal only about 8·5 lb., but had the percentage of moisture in the coal been the average amount, 3 per cent., the evaporation would have been about 8·75 lb.

Comparison of Fuel Cost of Oil and Coal.—In Table II. is shown the price at which the oil should be sold to be equivalent in cost of fuel to the coals described, at assured

Fig. 4.



prices for the latter. The evaporative figures represent the best average results from the coals with the best boilers, when the latter yield a horse-power with about 10 sq. ft. of heating surface.

Advantages of Oil Fuel.—The author considers that, apart from the difference in the cost, the chief advantages of oil fuel are saving of labour, and in furnace repairs, and he considers that there need be no apprehension of shortening the life of boilers by the use of oil.—A. S.

Carbides that are Decomposed by Water. H. Moissan. Zeits. für Elektrochem., 1902, 8, [3], 46—48.

Lithium carbide, Li_2C_2, obtained by heating a mixture of charcoal and a lithium salt for a short time in the electric furnace at 400 volts and 50 ampères, is transparent and crystalline. 1 kilo. yields 587 litres of acetylene on decomposition with water. Lithium carbide is a very strong reducing agent.

Potassium carbide, K_2C_2, cannot be obtained in the electric furnace; it is prepared by passing acetylene into a solution of potassium in liquid ammonia at $-40°$ C. It behaves like sodium carbide.

Barium carbide, BaC_2, and strontium carbide, SrC_2, behave like calcium carbide. Aluminium carbide, Al_4C_3, and beryllium carbide, Be_2C, are prepared by heating a mixture of charcoal and the metal in the electric furnace. They are decomposed by water, with formation of the corresponding hydroxide and methane.

Manganese carbide, Mn_3C, gives with water a mixture of methane and hydrogen. Yttrium carbide, YC_2, and thorium carbide give a mixture of acetylene, ethylene, methane, and hydrogen, as does also uranium carbide, U_2C_3, but together with liquid and solid hydrocarbons. Cerium carbide, CeC_2, and lanthanum carbide give a mixture of acetylene, ethylene, and methane, with liquid and solid hydrocarbons. Neodymium, praseodymium, and samarium carbides give with water, methane, acetylene, and ethylene.

Certain metals, such as gold, bismuth, tin, do not dissolve any carbon in the electric furnace. Molten copper takes up only a small quantity, but sufficient to modify its properties. Silver, at the temperature of evaporation, dissolves some carbon, but, on cooling, the latter, for the most part, separates out. Like iron, it increases in volume on passing from the liquid to the solid condition. Aluminium behaves in a similar manner. The platinum metals at the temperature of evaporation readily dissolve carbon, but, on cooling to the solidification point, the latter separates out as graphite.—A. S.

[*Motor*] *Spirit; Determination of Benzene and Alcohol in Denatured* ——. O. Saare and H. Hanow.

See under XXIII., *page* 367.

English Patents.

Gas Densifying and Exhausting Apparatus. A. Scholl, Mannheim, Germany. Eng. Pat. 25,521, Dec. 13, 1901.

In gas exhausting apparatus where "liquid packing" and valves are used, zig-zag pipes or other resistances for the liquid are interposed between the suction conduit and the suction valve, and between the connecting pipe and the pressure valve.—J. W. H.

Smoke-preventing Apparatus. R. H. Burns, Brooklyn, U.S.A. Eng. Pat. 8934, May 15, 1900.

The claims are for the use, in the upper casing or hood of a vertical boiler, of an inlet chamber, which conforms to the shape of the hood, for the admission of air, or other medium for assisting combustion, which is distributed by outlet pipes connected by universal joints to the inlet chamber, and having shields at the discharging ends.—W. C. H.

Smoke-consuming Apparatus for Steam-boiler and other Furnaces. J. Alves and The British Fuel Economiser and Smoke Preventer, Ltd., both of London. Eng. Pat. 3050, Feb. 12, 1901.

In the known kind of smoke-consuming apparatus wherein heated air is supplied to the furnace under the action of steam jets, the bridge is formed with alternate passages for cold and heated air. The cold air is heated by the hot surfaces of the bridge, and is delivered close to the steam jets. The superheater for the steam is formed separately from the bridge, so as to be easily removable. The perforated steam outlet pipe may be combined with the superheater pipe. The steam-supply cock and the air-admission regulator may be connected together by a hand lever, so that the supply of each may be simultaneously regulated.—R. S.

Kilns; Improvements in Coke ——. A. Gobiet, Ostrau, Moravia. Eng. Pat. 9294, May 19, 1900.

In an arrangement of contiguous kilns, worked in pairs, in order to ensure the equal distribution of the heating gases, the bottom channel common to two kilns is divided longitudinally by a partition, and the part nearer the stoke-hole is again divided by a transverse partition into two parts, which communicate through openings in the longitudinal

partition. The inventor also claims the arrangement of a common gas-collecting channel above the vault of each pair of kilns, which is divided by a transverse partition, and communicates, on the one hand, with the vertical channels in the walls leading the gases from the bottom channel, thus heating the upper part of the kiln, and, on the other hand, this common gas connecting channel communicates with the main discharge channel of the series of kilns.

—W. C. H.

Ovens; Improvements in or relating to Coke ——. Simon-Carvés By-Product Coke-Oven Construction and Working Co., Ltd., Manchester. From Société Anonyme de Carbonisation, Paris. Eng. Pat. 22,931, Nov. 13, 1901.

The sole and walls of the coke-ovens are provided with separate groups of heating passages, the groups not being common to each other, but all communicating at their ends with a common outlet flue. The length of each section or group is such that the gas introduced therein is completely burned before its exit, each group being provided with a controllable gas inlet or inlets and an air-supply passage or passages. These heating passages form separate horizontal heating zones, whereby varying degrees of heat may be applied at will to different levels in the ovens. Three different arrangements of such flues are described and claimed.—R. S.

Peat Blocks; Process for the Manufacture of ——. G. Hartmann, Munich. Eng. Pat. 6260, March 25, 1901.

Air-dried peat is first finely divided or ground to a powder, and then roasted in an open vessel, in the presence of air, at a temperature rising slowly to about 220° C., whereby the organic substances are preserved, and only the easily volatile products of decomposition are removed. The material is finally pressed in moulds without the addition of any binding agent, so as to form the blocks required.

—R. S.

Fuels or Briquettes. H. A. Costerton, Brighton. Eng. Pat. 17,828, Sept. 6, 1901.

Coal-dust, coke-dust, or similar material, is worked in with a matrix composed as stated below, and the mixture is moulded into briquettes. From 3 to 5 parts of the dust to 2 parts by weight of the matrix, after evaporation of water, are suitable proportions. The matrix is formed by softening wood shavings or waste by means of boiling water or steam, and then reducing to pulp in a disintegrating machine, which is also supplied with a considerable proportion of waste paper or fibrous material. The coarse pulp produced in the disintegrator is transferred to a mixing machine, wherein a further quantity of sawdust or other wood waste is introduced. The whole mass becomes of the consistency of batter, and constitutes the matrix. After incorporation with the coal-dust, &c., surplus water is drained off before moulding. The disintegrator or pulping machine should have a tearing- rather than a chopping action, as it is important not to break the length of the fibre of the paper or wood, &c. employed.—J. A. B.

Peat Blocks; Composite ——. W. A. Milne, York, Ontario, Canada. Eng. Pat. 26,271, Dec. 23, 1901.

The blocks are made of about 50 per cent. of air-dried peat, 25 to 40 per cent. of artificially dried peat, and about 2½ per cent. of a cereal flour, or of any suitable binding medium.—R. S.

Combustible Substances; Process of Increasing the Heating Power of ——, *and the Manufacture of said Substances.* A. Kahn, Helmstedt, and M. Heberlein, Eisenach, both in Germany. Eng. Pat. 19,499, Sept. 30, 1901.

It is stated that after the following treatment, poor fuels, such as brown coal, peat, rubble, sawdust, &c., ignite more easily, and have a higher heating effect, whilst even the heating power of good fuel, such as coal, is increased. A mixture is made, having in the case of the poor fuels about the following composition:—Calcium carbonate or sulphate, 50 per cent.; coal dust, 15 per cent; the poor fuel, 35 per cent. To 50 kilos. of this mixture is added a solution of 100 grms. of nitric acid in 10 litres of water, and the whole is thoroughly mixed. Then 100 grms. of crude glycerin diluted with 10 litres of water are added, and the whole is again mixed. There is said to be thus formed a nitroglycerin compound (not a pure nitroglycerin), enclosing or surrounding, in the presence of the calcium salt, the coal substance. The mixture is slightly pressed together and dried in the air to render it ready for use.

When ignited, this combustible is stated to behave as follows:—The gases, derived from the nitroglycerin-like combinations, burn at first on the surface, and produce an intense heat, by which the carbonaceous constituents in the interior are coked, and the enclosed water molecules are vaporised and superheated. The water-vapour combines with the glowing coked coal to form a gas similar to Dowson producer gas, which produces very strong combustion.—J. A. B.

Coal; An Improved Composition for Use with ——, *to Increase its Efficiency.* H. H. Lake, London. From Koale Sava Manufacturing Co., Boston, U.S.A. Eng. Pat. 25,173, Dec. 19, 1901.

A composition is prepared consisting of a mixture of 2,000 lb. of "coarse fine" salt, 100 lb. of copperas, 25 lb. of powdered charcoal, 15 lb. of saltpetre, and 15 lb. of bicarbonate of soda. This composition is sprinkled upon burning coal, about 3 lb. of the composition being sufficient for 1 ton of coals.—R. S.

Furnaces Burning Naphtha Residue. C. Spiegel, St. Petersburg. Eng. Pat. 1999, Jan. 29, 1901.

The hearth is constructed with a central vertical channel, into which the naphtha residues are led by a pipe, and with a number of hemispherical protuberances, each perforated with an air passage, funnel-shaped at top, and supplied with air under blast from a chamber beneath the hearth. The pipes can be disconnected and the hearth lowered by means of levers, so that it can be lifted out for cleaning and temporarily replaced by another. The residues, ignited on the hearth, yield a flame having unburnt particles, which are projected by the air blast against a vault arranged above. Air is supplied in regulated quantities from slit air-supply tubes, which traverse the walls of the vault and the posterior circulating chamber, in which the working flame is formed. The purpose of the air tubes is to ensure an intimate and progressive mixing of air with the gases of the naphtha residue. The hearth is intended for application to furnaces for annealing, warming, tempering, welding, smelting, glass manufacture, &c.—J. A. B.

Liquid Fuel; Heating Devices for Use with ——. A. R. Scherding, Paris. Eng. Pat. 3849, Feb. 22, 1901.

The apparatus comprises a series of injectors, in which steam or compressed air enters from an annular passage into a central tube, provided with a liner, with screw adjustment, by means of which the width of the annular opening into the central tube may be accurately set, according to the pressure, &c. of the steam or compressed air. By means of one such injector, the liquid fuel is drawn into a central tube, and the mixture of steam or air and fuel passes from the end of this tube into an annular space, with helical guides, surrounding a tube at right angles to the first. It enters this second tube by an annular passage (forming a second injector), and a further supply of air is injected, by means of steam or compressed air, through a second annular passage, forming a third injector a little in advance of the first passage. Air is drawn in through a row of openings still further in advance, and the mouth of the tube passes into the firebox of the boiler or furnace. The opposite end of this tube is either fully open, so that air may be drawn in to mix with the combustible mixture, or a steam- or air-injector is fitted in front of it. The annular spaces and the tubes have their walls suitably inclined to direct the streams of air, &c. in the proper course. The aim is to provide perfect regulation of the composition of the combustible mixture, so that liquid fuels of very varying composition may be employed. Examples are given of installations of the apparatus on different types of boiler.—J. A. B.

Furnaces or Kilns; Generator or Regenerative ——. J. H. Brearley, Longwood, near Huddersfield. Eng. Pat. 3266, Feb. 15, 1901.

THE waste gases from the furnace pass through a number of horizontal passages formed by tiles, slabs, or bricks on each side of the furnace, and finally escape at the bottom to the exit flue. The air required for combustion passes up a number of vertical tubes or passages which traverse the waste gas passages, and thus absorbs heat from the waste gases. Dampers at the top of the air passages regulate the amount of air admitted. The vertical air-tubes are made of short lengths, with reduced or recessed ends, which fit into sockets in the dividing walls of the waste gas passages; and the joints are sealed with a little fireclay. The invention is described by reference to a drawing of a gas-retort furnace.—J. A. B.

Liquid Fuel Furnaces. O. Lindemann, London. From E. Körting, Hanover. Eng. Pat. 24,928, Dec. 6, 1901.

THE liquid fuel is heated, by passing it through a coil in a box through which superheated steam circulates, to a temperature above that at which it develops vapour under atmospheric pressure, but below that at which it gives off vapour under the considerable pressure at which it is forced through the coil and pipe leading to the spraying nozzle in the front of the furnace. Thus the oil as it issues from the spraying nozzle is split up into small particles by the vapour formed, and these become intimately mixed with the air supplied through openings in the front of the furnace and deflected against the stream of oil particles. The latter are said to enter into perfect combustion without any production of smoke.—J. A. B.

Furnaces; Improvements in ——. F. Weber, Junr., Berlin. Eng. Pat. 25,152, Dec. 10, 1901.

Two secondary air supplies are used to consume the smoke. The furnace has two grates, a back one which is horizontal, and a front one which slopes upwardly towards the door, through which the primary air supply enters. The top wall curves downwards so as to form a narrow passage at the back of the inclined grate; and a fire-bridge rises above the horizontal grate to form another narrow passage at its upper extremity. One or more air-admission tubes at the bottom of the ashpit communicate with a vertical tube which opens into a chamber above the top wall. From this chamber the air escapes through a number of short passages to the part of the furnace above the inclined grate. Other air-supply tubes pass below the ashpit to the interior of the fire-bridge, from which the air passes, by means of short passages, to that part of the furnace above the horizontal grate.—R. S.

Bunsen Burners. W. Kappel, Berlin. Eng. Pat. 18,260, Sept. 12, 1901.

THE burner tube is made with the mouth-end slightly curved and is mounted in a stem in which it slides or turns round as required. The stem can also be fitted adjustably in any one of a number of holes in a stand, or the burner tube may be fitted directly into one of these holes. In either case, a set-screw or set-screws may be used to fix the burner tube in the desired position.—J. A. B.

Bunsen and like Burners. W. Schaefer, Hamburg. Eng. Pat. 26,599, Dec. 30, 1901.

A BUNSEN burner, in which the size of the mixing chamber and the number and area of the air inlets can be reduced. The lower part of the mixing chamber consists of a hollow inverted truncated conical body, which can be screwed up and down upon the externally threaded gas nipple, and is provided with three series of air-inlet perforations at different heights. Inside the chamber are two loosely placed, superimposed hoods, arranged base downwards in such positions that the air-inlet holes coincide with the annular passages between the hoods, the top of the gas nipple, and the conical top of the mixing chamber, above which the usual Bunsen mixing tube rises. By screwing the whole burner up or down upon the gas nipple, the volume of air admitted can be regulated as desired.—H. B.

Water Gas and Semi-Water Gas; Manufacture of ——, *and Apparatus therefor.* J. C. H. Kramers, Mastricht, and J. G. Aarts, Dongen, Holland. Eng. Pat. 2750, Feb. 8, 1901.

Two generators, each having a regenerator behind and above it, are placed side by side, the regenerators opening at the top into a common chamber which communicates through a valve with an economiser. Air, blown through the economiser, is led by a four-branched pipe into the generators, both above and below the fuel therein. Steam-pipes enter the generators below the fire-bars, and pipes are provided for leading off the water-gas from the same place. A four-way distributing cock controls, by means of a single lever, the valve between the regenerators and the economiser, the hot-air inlets to the generators, the steam-inlets, the water-gas exits, and the governor of the blowing engine. When the apparatus is in operation, both generators being in use, with the economiser valve and all the air-valves open (the carbon monoxide formed being burned by the air admitted above the fuel), the fuel in the first generator only is covered with a layer of fresh fuel from the charging hopper. The economiser- and air-valves are all closed; steam is admitted to the first generator; the gas produced is led up through the first regenerator, down the second, through the incandescent fuel in the second generator, and out through the gas-pipe of the latter to the purifiers. After another period of hot blow, the second generator is charged with fresh fuel, and the above operations are repeated in the reverse direction.

In making semi-water gas, the two regenerators are omitted. A mixture of air and steam is blown upwards through the generator which has just received a fresh layer of fuel; the gas produced is passed downwards through the incandescent fuel in the second generator, and then through an economiser and a preliminary air heater.

—H. B.

Carburettors for Hydrocarbon Motors. M. Foidart, Antwerp. Eng. Pat. 5156, March 11, 1901.

A CYLINDER, the lower end of which is attached to a pipe leading to the explosion chamber of the motor, is provided with numerous perforations in its upper half, and is surrounded by a circular wick, the lower portion of which rests in an annular chamber filled with petrol. Within the cylinder is arranged a non-perforated cylindrical sleeve, which may be adjusted to any desired height, thus covering over any desired number of the perforations in the walls of the cylinder. A valved piston works up and down within the cylindrical sleeve, the piston rod passing out through a stuffing-box forming the top of the cylinder. Each time the piston is depressed, air is drawn through the petrol-saturated wick and through the perforations in the upper part of the cylinder; on the return stroke, the carburetted air passes through the valves of the piston; and the next stroke forces the mixture into the explosion chamber of the motor. The reservoir communicating with the carburettor is provided with a float, which, when the level of the petrol has fallen to a predetermined point, depresses a lever, the other end of which opens the valve controlling the main petrol supply. When the reservoir has filled sufficiently, a counter-weight presses down the valve end of the lever, cutting off the supply.—H. B.

Gas; Manufacture of ——. F. W. C. Schniewind, New York City. Eng. Pat. 17,494, Aug. 31, 1901.

THE invention relates to an improvement of the method of gas manufacture protected under Eng. Pat. 10,588 of 1900 (this Journal, 1900, 814), and is carried out by the aid of plant described in a simultaneous application for letters patent (Eng. Pat. 17,510 of 1901; this Journal, 1901, 1197). Water-gas is added to the richer of the two portions, into which the gaseous products from coke-ovens are separated; and the producer-gas, which is made intermittently with the water-gas, is added to the poorer. The water-gas serves to increase the volume of the first portion, which is for use as illuminating gas, and also to reduce the proportion of sulphur impurities in it. The producer-gas serves to increase the volume of the second

portion, which is used for heating the coke-ovens. The poorer or second portion of the gas from the coke-ovens may be washed with oil, and the benzol so recovered, used for enriching the illuminating gas.—J. A. B.

Gases; Method of and Apparatus for Purifying ——. C. D. Abel, London. From J. Saltar, Philadelphia, U.S.A. Eng. Pat. 19,826, Oct. 4, 1901.

The gases are passed through a drum, rotated by belt and pulley or other means, having rigidly fixed within it a diaphragm extending nearly to its periphery. The diaphragm has on one side a number of radial blades, so that the gases entering the drum on the blade side of the diaphragm are propelled in a radial direction at nearly the same speed as the parts of the apparatus, and then over the periphery of the diaphragm and back to the central outlet pipe. Solid, liquid, or semi-liquid impurities are thrown out of the gas by centrifugal force into the periphery of the drum, whence they are removed, either periodically, by drawing apart the two halves of which the drum is built up, or continuously, by means of water or other liquid, which is supplied to the annular trough which seals the joint between the fixed gas-inlet pipe and the drum-inlet socket, and is removed charged with the impurities by an overflow at the periphery.—J. A. B.

Gas; Generation of ——. F. Paul and A. F. Gundlack, both of Sorel, Canada. Eng. Pat. 22,766, Nov. 11, 1901.

Air is driven by a blower, actuated by weight-operated mechanism, into a floating box, the lower part of which has lateral perforations, by which the air escapes through the upper portion of the liquid hydrocarbon in which the box floats. Thus the air is carburetted. The level of the hydrocarbon in the carburettor, in which the float is, is controlled and kept nearly uniform by a valve on the pipe, by which the liquid enters from a supply tank, the said valve being operated by levers attached to the floating box. Means are provided for diminishing the proportion of hydrocarbon vapour in the air-gas by admitting some air above the level of the liquid in the carburettor; while the proportion may be increased by forcing some air through pipes, which deliver it through perforations at a greater depth in the liquid than those on the floating box. A collapsible air-tank, filled with air at a slightly lower pressure than that at which the blower delivers it, automatically takes up the supply of air to the carburettor when the weight-operated mechanism runs down, thus affording time for the latter to be re-wound. —J. A. B.

Gas Lighters. F. Juhász, Berlin. Eng. Pat. 24,120, Dec. 4, 1899.

A pellet of porous substance impregnated with platinum black, and surrounded with platinum wire, is mounted centrally in a bell, which is surrounded by an outer and deeper hood. Both bell and hood have perforations for the escape of gas. The device is held by means of an arm and handle, and is brought over the chimney of the burner which is to be lighted. The gas passing out of the chimney into the bell is ignited by the action of the pellet, whereupon the lighter is removed.—J. A. B.

Gas Ignition Devices; Automatic ——. A. J. Boult, London. From P. Lehmann and T. A. Scheele, Berlin. Eng. Pat. 6611, March 29, 1901.

When the tap of an incandescence gas burner is opened, the chimney is not filled uniformly with an explosive mixture of gas and air, the zone of the mixture which acts most readily on an automatic igniting body varying more or less from the centre of the chimney according to the shape of the mantle, &c. To provide means for adjusting the position of the igniter, a narrow cross-bar, having corrugations, notches, or the like, is arranged across the chimney, and upon this bar is hung the automatic igniting device. The latter consists of a small frame, in which the igniting ball and threads are suspended; at the top is a loop or handle, by means of which the whole can be moved from one point to another along the bar; and at the foot of the frame is a small horizontal guard-plate, which prevents the overheating of the igniter while the lamp is alight. The cross-bar may either rest across the top of the chimney, or it may be held adjustably in a screw-clamp which is attached to the top of the chimney. According to a modification of the invention, a notched cross-bar is attached by means of a downwardly bent extension to a horizontal guard-plate which can be arranged upon the two prongs at the upper end of the mantle support. The igniting body, the carrier of which has in this case no guard-plate, is suspended in the desired position upon the cross-bar.—H. B.

Gas Burners [Self-extinguishing]. H. Hinckley, Washington, U.S.A. Eng. Pat. 2250, Feb. 1, 1901.

The burner described, is designed to shut off automatically the gas supply when the flame is extinguished accidentally or otherwise. A casting, which is adapted to screw on to any ordinary gas pipe or the like, is provided with two gas passages, the one communicating with the supply pipe, the other with the burner jet, the other ends of the two passages opening laterally into a side chamber attached to the casting. Within this chamber a valve, consisting of a thin disc of rubber or other flexible material, normally closes the ends of the two passages, being pressed against them by a coiled spring, and beyond the valve is fixed a resilient rubber cup, perforated by one or two minute holes. When, by means of a lever attached to the outside of the side chamber, the rubber cup is crushed inwards, the air within it is expelled through the minute holes; and when the pressure is relieved, the resilient cup springs back into its former shape, thus creating a partial vacuum inside the cup. The suction withdraws the flexible valve from the ends of the gas passages, and gas can now pass from the lower passage to that leading to the burner jet. Unless the gas is lit at the jet, the air rushing into the resilient cup through the minute holes soon destroys the partial vacuum, and the valve again closes the passages. A thermostatic strip, consisting of an inner layer of brass and an outer layer of iron, is arranged in the neighbourhood of the flame, and, when heated, presses a rod, which passes through one of the gas passages, against the flexible valve and keeps it open. Thus, when the valve is opened by means of the lever, as above referred to, if the gas be lit, the thermostat keeps the valve open even after the partial vacuum within the resilient cup is destroyed; but whenever the flame is extinguished, the valve is closed by the spring, and no gas can pass.—H. B.

Acetylene Gas Purifiers. G. F. L. Giles, Belfast. Eng. Pat. 17,376, Aug. 28, 1899.

The gas is passed through a box, provided with deflecting plates, and packed with cotton-wool, peat moss, or other fibrous material.—J. A. B.

Acetylene Gas Generators. J. L. Harris, Jacksonville, U.S.A. Eng. Pat. 4792, March 6, 1901.

A generating tank, with conical top, forms the base of the tank of a bell gasholder. There is a central tube depending from the bell, and through this tube runs a carbide chamber, which communicates by an opening controlled by a valve with the generating tank. Means are provided for actuating this valve, and for disintegrating carbide which may have caked in the chamber, in correspondence with the movements of the bell into which the gas generated, passes.—J. A. B.

Acetylene and other Gases; Apparatus for Generating ——. W. A. Feurt and H. H. Martin, both of Maryville, U.S.A. Eng. Pat. 21,982, Oct. 31, 1901.

Carbide is discharged from cells in a hopper into a generating vessel containing water. The cells have hinged bottoms operated independently through a shaft extending outside the hopper, so that they are discharged in turn. The hopper has a lid with double seals, means for cutting it off from communication with the generating vessel, and an air chamber and air-relief valve for controlling communication between the outer air and the interior of the hopper.

The generating vessel comprises a main compartment and a separate water chamber, from which water overflows into the main compartment. Water is supplied to the water chamber though a funnel, provided with a lid, connected with an air-vent cock fitted to the generating vessel, and operated through a handle synchronously therewith. The gas-exit pipe issues from a hood which dips into the water chamber, and forms a gas pocket. Within the generating vessel is a grate, carrying a scraper blade, which sweeps the bottom of the vessel when the grate is rocked, and thereby effects the discharge of residuum into a drain connection. The apparatus is specially designed to avoid escape of gas, ingress of air, and damage from over-production.—J. A. B.

Acetylene Gas; Apparatus for Generating and Storing ——. A. McIntosh, Bridge of Allan, N.B. Eng. Pat. 24,570, Dec. 3, 1901.

A BELL gasholder operates, through chains and weighted levers, taps on the water-supply pipes to horizontal generating chambers charged with carbide, so that water is supplied to an unexhausted chamber whenever the gasholder descends to a given point. The chambers taper; the mouthpiece being at the wide end, so that when the lid is removed, any water within at once flows out. The removal of the lid automatically closes a cock on the pipe, by which the gas passes from the chamber to the gasholder. A central purifying chamber is placed within the gasholder tank.—J. A. B.

Electric Incandescent Lamps and other Glass Apparatus; Sealing Wires into ——. Società Edison, &c., Ing. C. Clerici and Co., Milan. Eng. Pat. 21,827. Under Internat. Conv., June 16, 1900.

IT has been impracticable to use wires of iron, nickel, or the like as conductors for glow lamps, because of the formation of a porous coating of oxide on attempting to fuse the wire into the bulb. According to this specification, the wires are coated with a material "adapted to dissolve and combine with the metallic oxide formed thereon . . . said material upon hardening forming a cement and effecting an impervious connection between the metal and the glass." For example, a readily fusible enamel, composed of silica, red lead, and potash, is applied as a coating to the red-hot wire, which is then fused into the bulb as in the case of platinum wire. Another form of the invention, which is separately claimed, consists in first sealing the red-hot wires into the glass without any cement, then applying a liquid or viscous mastic to the projecting parts of the wires, and next exhausting the bulb, so that the atmospheric pressure forces the mastic into the pores of the oxide surrounding the wire, thus producing a perfectly tight joint. The mastic is preferably made by boiling into a homogeneous varnish, a mixture of boiled linseed oil and caoutchouc or Para rubber dissolved in carbon bisulphide.
—H. B.

Incandescent Vapour Lamps. R. E. Walther, Werdau, Germany. Eng. Pat. 3472. Feb. 18, 1901.

THE claim is for a vaporising device for lamps adapted to burn without wicks, consisting of a metallic pillar arranged within the mantle and extending downwards through two superposed chambers, in the lower one of which liquid spirit, supplied in any convenient manner, is vaporised by the heat from the pillar, the vapour being superheated in the upper chamber before mixing with air and burning beneath the mantle. A screw-valve controls the flow of vapour from the upper chamber.—H. B.

Incandescent Vapour Lamps. T. Landi, Bayonne. Eng. Pat. 4593, March 4, 1901.

TO the top of a closed reservoir, containing petroleum spirit, is screwed a tubular socket which supports a Bunsen tube, burner top, and mantle. The socket encloses the upper portion of a cotton wick, which is surrounded by a fine gauze tube and extends down into the petroleum spirit. Within the burner top is a transverse perforated partition, and a central metallic rod which extends up into the centre of the mantle and serves for conducting heat down to the wick, causing the evolution of vapour. The lamp is started by burning some alcohol in an annular trough attached to the burner, and thereafter the flow of vapour to the burner is regulated by means of a screw-valve. The reservoir is fitted with a safety-valve to prevent the development of a dangerous amount of pressure.—H. B.

Incandescent Gas Burners. J. W. Blakey, Bradford. Eng. Pat. 5022, March 9, 1901.

THE mixing tube of the burner described, is in the form of a truncated cone, to the upper and narrower part of which is joined the base of a conical tube the sides of which converge at a different angle from that of the lower conical tube. Holes in the sides of the upper tube allow the mixture of gas and air to issue into the annular burner top which surrounds and is attached to it. The gas nipple which enters the lower end of the mixing tube is not attached thereto; a rigid rod rises from it, the upper, pointed end of the rod entering the apex of the conical mixing tube, and thus the mixing tube, carrying the burner top, mantle, &c., rests upon a pivotal support, and can rock freely. Instead of the vertical rod being rigidly fixed to the gas-supply nipple, its lower portion may take the form of a coiled spring, so as to act as an "anti-vibrator."
—H. B.

Filaments for Incandescing Electric Lamps. W. L. Voelker, London. Eng. Pat. 5592, March 16, 1901.

IN patentee's English specifications, Eng. Pats. 6149 of 1899 and 11,341 of 1900 (this Journal, 1900, 335; 1901, 977), are described processes for making carbide filaments. According to the present invention, a thread of carbonisable material is soaked in a solution of the salt or salts or organic compound of the metal selected (titanium, uranium, zirconium, &c.); the saturated filament is baked at a temperature rising to about 400° F.; it is then carbonised by packing it in carbon dust and heating it to a high temperature, whilst coal-gas or other suitable hydrocarbon gas is passed through the crucible; and, finally, it is mounted in an atmosphere of inert gas containing, preferably, the vapour of the metal selected, and a current is passed through it, of such voltage as to raise it to the point of softening, or incipient fusion, so that a carbide of the metal is formed.

The thread may be soaked with the metallic solution either before or after being baked, or after being carbonised; or even the finished filament may be so treated.—H. B.

Burners for Incandescent Gas Lighting. J. W. Ward, Wylde Green. Eng. Pat. 6569, March 29, 1901.

A CHEAP form of gas burner is described, having a detachable mantle support for convenience in packing for transport, all the component parts of the burner being made from sheet metal in such wise that they can be fitted together without soldering.—H. B.

Incandescent Oil or Spirit Burners. W. P. Thompson, London. From Compagnie Générale d'Incandescence par le Pétrole, &c., Paris. Eng. Pat. 23,206, Nov. 16, 1901.

CIRCULAR-WICK burners of the type defined in Eng. Pats. 3769 of 1899 and 12,524 and 12,525 of 1900 (this Journal, 1899, 572; 1900, 1094), are described. The mantle to be used with the burner is made short, and is so placed that its base does not come into contact with the metal parts of the top of the burner, and the "upper periphery" of the blue flame only reaches the lower edge of the mantle. In order that the mantle may be fixed rigidly to the central support, to prevent oscillation, the top of the former is made of a steatite cap, with a cavity or socket on its under side, and the upper end of the rod fits into the socket, the expansion of the rod when the burner is in use causing it to hold the top of the mantle firmly.—H. B.

Incandescence Bodies for Electric Glow Lamps. A. Just, Vienna. Eng. Pat. 25,810, Dec. 17, 1901.

THIS relates to incandescence bodies composed of conductors of the first class (carbon, boron, or silicon) mixed with

boron nitride or silicon nitride. A mixture of 55 parts of boron nitride or silicon nitride, 3 parts of boron or silicon, 2 parts of amorphous carbon, and 40 parts of coal-tar diluted with hot xylol, is formed into rods or tubes, which are imbedded in carbon and burnt without the admission of air. They are then subjected, in a highly rarefied atmosphere of inert gas, to an electric current of such a high potential as to raise them to a temperature at which partial electrolytic decomposition of the nitride takes place, the nitrogen being liberated and leaving an equivalent amount of boron or silicon in the incandescence body. The current is maintained until the proper proportion of the conductors of the first class to the boron nitride or silicon nitride is arrived at, this being accurately ascertainable by measuring the resistance: the specific resistance diminishes in accordance with the quantity of boron or silicon which has been set free.—H. B.

Electric Arc Lamps. J. H. Hallberg, New York. Eng. Pat. 26,743, Dec. 31, 1901.

The lamp is designed for use in series arrangement in an alternating circuit, and is provided with means to close the circuit round the lamp in event of the mechanism so failing to act as to break the circuit between the lamp carbons. Upon the central tube which carries the mechanism is pivotted a lever or balance rod, carrying a counter-weight at one end, and at the other, the armature of a shunt-magnet which is in circuit round the arc. The latter end of the lever is also linked to the vertically-movable clutch which holds the upper carbon pencil. The connections for the current are so arranged that, when the lamp is in operation, the arc is maintained between the carbons by the varying action of the shunt-magnet acting against the counter-weight, the armature of the magnet, and the clutch holding the carbon pencil, moving upwards or downwards simultaneously.

In the top of the lamp is fixed an impedence coil, which is normally in open circuit round the lamp. It is connected at one end to one terminal of the lamp and at the other to a contact-plate which is placed a short distance above the counter-weight referred to above. If, for any reason, the arc is not properly struck between the carbons, the shunt-magnet acts so powerfully as to raise the counter-weight so far that a spring contact fixed to it makes contact with the contact-plate of the impedence coil. This shunts the current through the coil, which has a resistance equal to that of the arc, and thus maintains the integrity of the circuit in which the other lamps in series are included.

—H. B.

Lamps Burning Paraffin Wax or like Hydrocarbons. D. Ballardie, Glasgow. Eng. Pat. 6487, March 28, 1901.

The paraffin wax or similar hydrocarbon is contained in a closed annular reservoir, up the central space of which pass the products of combustion from the burner, which is suspended below by two tubes. One of these tubes, provided with a regulating tap, conveys the liquefied hydrocarbon from the bottom of the reservoir to the wick tube of the burner, while the other leads from the burner to the closed air-space above the hydrocarbon in the reservoir, and carries up heat by which the hydrocarbon is melted. When, however, the liquid hydrocarbon in the wick tube chamber rises above the mouth of this pipe, the air supply through the tube to the reservoir is cut off, and the liquid hydrocarbon ceases to flow to the wick tube. Thus an automatically balanced feed of hydrocarbon to the burners is secured.—J. A. B.

Electrodes for Electric Arc Light. [*Carbides.*] The British Thomson-Houston Co., London. From H. H. Read, Schenectady, U.S.A. Eng. Pat. 17,194, Aug. 27, 1901.

The electrode, which is formed of a granular, finely-divided conducting carbide, preferably insensitive to moisture, is moulded in sticks of the desired size by mixing it with a carbonisable binder, and, after drying and heating, the pores may be filled with carbon. An admixture of a small percentage of carbon with the carbides also improves the light and the stability of the arc. Finely-divided carbide of aluminium, either alone or mixed with a carbonaceous binder, gives good results.—G. H. R.

Photometer whose Adjustment depends on Observing the Distinctness of a Diagram. F. W. Carter, Birmingham. Eng. Pat. 8705, May 11, 1900.

A diagram marked with figures of varying size is combined with two adjacent surfaces illuminated by the two lights under comparison. Equality of illumination is judged by the distinctness of equal figures on the diagram, as seen against the two illuminated surfaces. Such figures of the diagram are selected for the comparison as are on the point of becoming indistinct from lack of illumination. This indistinctness may be secured in other ways besides that of having figures of varying size on the diagram itself, such as by varying the apparent size of the figures by optical methods. Two forms of the photometer are described, one being intended chiefly for the comparison of lights differing in colour, the other for comparing illuminations at different places and the brightness of different objects.—J. A. B.

United States Patents.

Blast-Furnace Gases; Apparatus for Cooling and Cleaning ——. B. H. Thwaite. U.S. Pat. 690,795, 1902.

See under X., *page* 352.

Liquid-Heating Furnace. D. Laird, Forfar, N.B. U.S. Pat. 691,266, Jan. 28, 1902.

See Eng. Pat. 18,151, 1901; this Journal, 1902, 108.

—R.A.

Carbides; Process of Producing ——. J. L. Roberts. U.S. Pat. 690,319, Dec. 21, 1901.

See under XI. A., *page* 353.

Gas; Method of Manufacturing ——. L. G. Harris, U.S.A. U.S. Pat. 693,008, Feb. 11, 1902.

A mixture is made of 50 galls. of water, 15 galls. of mineral oil, 5 lb. of caustic potash, 4 lb. of nitrate of soda, 2 lb. of common salt, and 3 lb. of slaked lime. After thorough admixture, the liquid is "distilled" at about 1,300° to 1,500° F., and the produced gas passed through a superheater. The proportions are only approximate, and some ingredients may be omitted.—R. S.

Gas; Apparatus for the Manufacture of Illuminating ——. C. W. Isbell, New York. U.S. Pat. 693,137, Feb. 11, 1902.

This invention relates to the manufacture of illuminating gas from bituminous coal in vertical retorts. Each retort is provided with a movable bottom, and with a pan for collecting and retaining for further distillation, the tar that runs downwards from the charge. Additional liquid hydrocarbon may be supplied to these pans from the outside for the purpose of enriching the gas. The retorts are grooved vertically from the top to the bottom. A chamber is provided below each retort, from which air or steam can be passed into the retort. This air or steam, passing upwards between the coke and the retort at the end of the ordinary distilling process, helps to form more gas and also loosens the coke, so that it falls out easily. A superheater is provided to heat the steam used, the superheater being heated by the furnace that heats the retorts. The retorts are arranged within the heating chamber in two rows, and the last retort in each row receives no solid fuel, but acts as a fixing chamber only. To cause the gas to travel first down and then up this retort, it is provided with a hanging partition reaching nearly to the bottom. Before reaching the fixing retort, the gas from the ordinary retorts passes into a dry main, in which it may receive an additional charge of carburetting liquid, which is rapidly evaporated. From the fixing retort the gas passes to the hydraulic main.—R. S.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Wood-Tar; Chemical Composition of Norwegian ——. J. A. Mjöen. Zeits. angew. Chem., 1902, **15**, [5], 97—111.

The author has examined two typical varieties of Norwegian wood-tar, one produced by the dry distillation of sawdust (pine and fir tree), the other obtained as a by-product in charcoal burning. In the former case the sawdust is dried in rotating drums until it contains about 1—3 per cent. of moisture, and is then pressed into briquettes. These, on dry distillation, yield charcoal, crude acetic acid, wood spirit, acetone, &c., and about 5 per cent. of tar. This served for the investigation. The author has attempted to identify the various constituents present in the tar by exposing the latter as little as possible to the action of heat, light, and air. For this purpose the tar was distilled in a copper retort under diminished pressure, the products obtained were kept in the dark and, where necessary, dried in an atmosphere of carbon dioxide. It was formerly held that the dry distillation of wood gave rise at first to acetylene, which was then polymerised at higher temperatures to more complex substances. It is now certain that this is not the case, but that aromatic compounds are formed directly. The author is, however, of opinion that by choosing suitable temperatures, it will be possible to convert several of the products obtainable into valuable substances. He gives in the following table a summary of the results obtained, and a comparison with wood-tars from other sources :—

——	Retort Tar from Sawdust.	Wood-Charcoal Tar from Gudbransdalen.	Beechwood Tar from Austria.	Bohemian Pine Tar.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Aqueous distillate	4·45	5·0	7·2 Strongly acid.	3·7
Acetone	0·4	0·07	.. ..	.. ..
Total aldehydes and ketones	0·8	0·5	.. ..	.. ..
Acetic acid	0·36	0·37	.. ..	.. ..
Total fatty acid	3·64 (Acetic, propionic, butyric, and valeric acid were identified.)	1·78	.. ..	.. ..
Guaiacol and creosote	Creosote about 20 per cent.	Creosote not determined.	Guaiacol, 10·5 per cent.	Creosote, about 7·5 per cent.
Total phenols and phenolic derivatives	44·7	21·5	41·0	17·0
Retene	None found	1 to 5	.. ..	.. ..
Pitch	20·6	10·1	21·0	29·0
Total hydrocarbons and other indifferent substances.	22·5	46 per cent., of which 20 per cent. aliphatic and 80 per cent. aromatic hydrocarbons.	18·0	40·0
Esters	.. ..	1·4	.. ..	.. ..
Alcohols	About 1 per cent. of methyl alcohol and allyl alcohol also present.	.. ..	.. ..	.. ..

Both tars are free from nitrogen bases and sulphur compounds, whilst unsaturated compounds (besides allyl alcohol) were recognised by their smell and bromine absorption.

—T. A. L.

Petroleum; New Theory of the Formation of ——. H. Moissan. Zeits. für Elektrochem., 1902, **8**, [3], 48.

The author proposes a new theory of the formation of petroleum. He believes that the whole of the carbon on the earth was originally combined as carbides, and that, on subsequent cooling with condensation of water, the latter suffered decomposition, and as this took place partly at high temperatures and under pressure, liquid hydrocarbons were formed. He adds that carbides cannot be regarded as the sole source of petroleum, as some beds of petroleum are manifestly of organic origin, but he believes that this theory is capable of application in many instances (See also under II., page 329.)—A. S.

Petroleum, Galician; Investigation of ——. A. Zalozieckі and G. Frasch. Ber., 1902, **35**, [2], 386—391.

Nitration of the Iso-Hexane Fractions.—A barrel of light petroleum spirit (gasoline) from crude Kryg oil was fractionated in copper vessels, and, finally, in glass flasks, yielding a series of 42 fractions boiling at intervals of 2° from 16° to 101° C. The fractions with boiling points from 42° C. upwards were nitrated with a mixture of 1 part of nitric acid (sp. gr. 1·04) and 3 parts of sulphuric acid (sp. gr. 1·84), and yielded crystalline nitration products which separated either during the nitration, or on cooling or diluting the liquid with water.

The table in next column shews the results obtained with the fractions boiling at 45° to 65° C.

These nitro-derivatives formed voluminous masses of pale yellow flocculent crystals, which were readily soluble in alcohol and dissolved to some extent in boiling water, but were only sparingly soluble in petroleum spirit. By fractional crystallisation from alcohol, they were separated into four apparently distinct substances :—

Fraction Boiling at	Sp. Gr. of Fraction. $\frac{20°}{4°}$	Amount Nitrated.	Weight of Nitro-Derivative.	Yield.	Melting Point of Nitro-Derivative.
° C.		Grms.	Grms.	Per Cent.	° C.
45—47	0·6528	100	1·03	1·03	87
47—49	0·6561	70	0·32	0·46	87
49—51	0·6618	50	..	..	..
51—53	0·6637	68	0·44	0·66	87
53—55	0·6662	60	0·69	1·15	87
55—57	0·6700	60	1·35	2·25	85
57—59	0·6714	118	4·80	4·15	81
59—61	0·6733	170	7·86	4·62	76
61—63	0·6750	250	17·70	7·08	76
63—65	0·6809	281	27·38	9·74	76

1. A substance sparingly soluble in cold absolute alcohol and crystallising in needles (m.pt. 89·5° C.) from more dilute alcohol.

2. A substance soluble in cold absolute alcohol and crystallising from dilute alcohol in short pointed needles (m. pt. 67° C.).

3. A substance dissolving very readily in alcohol, obtained from the mother liquor from (2). It crystallised in broad flat needles melting at 65° C.

4. A substance obtained in small quantity from the mother liquor of (3). It was crystallised in hair-like crystals (m. pt. 94·5—95° C.) from boiling water.

A fifth substance (0·45 grm.) was obtained by crystallisation of the fraction of the petroleum boiling at 51°—53° C. This melted at 87° C., and after recrystallisation from dilute alcohol at 85° C.

More than 20 grms. were obtained of (1), 4 grms. of (2), and only slight quantities of (3) and (4).

Aromatic nitro-derivatives were not present, for the amounts of nitrogen in the five substances were:—(1) 19·38, (2) 19·07, (3) 19·12, (4) 20·25, and (5) 18·42 per cent. This high proportion of nitrogen corresponds with the composition of trinitro derivatives of hexane, which contain theoretically 19·05 per cent. The author suggests that these compounds are of a tertiary character, and may be produced by the tertiary and two secondary H atoms in the two hexanes, ethylisobutyl $CH_3.CH_2.CH_2.CH(CH_3)_2$ and methyldiethylmethane $(CH_3.CH_2)_2CH.CH_3$, being replaced by nitro groups. These two hexanes were both present in the fractions of the petroleum examined, especially in those of higher boiling points.—C. A. M.

Petroleum, Beaumont (Texas), as Fuel; Tests of ——. J. E. Denton.

See under II., *page* 325.

White Spirit. A. and P. Andouard,

See under XXIII., *page* 366.

United States Patent.

Tar; Production of Solid Materials from ——. C. Dörr. U.S. Pat. 691,934, Jan. 28, 1902.

See under IX., *page* 348.

IV.—COLOURING MATTERS AND DYESTUFFS.

m-Hydroxyphenyl-p-tolylamine; Derivatives of ——. R. Gnehm and L. Veillon. J. prakt. Chem., **65**, [2], 19—81.

The authors have carried out several typical reactions with this substance (see Hatschek and Zega, J. prakt. Chem. [2], **33**, 209), which has long found technical employment in the manufacture of dyestuffs (see Ger. Pats. 46,869, 47,451, 48,528, 50,612, 62,539, 63,260, 64,217), and have prepared numerous derivatives. By sulphonation with concentrated sulphuric acid, a monosulphonic acid was obtained, which yielded a new disulphonic acid of *p*-Tolylrhodamine (Amer. Pats., R. Gnehm and J. Schmidt, 413,048, 413,049, 413,050) on fusion with phthalic anhydride. Probably the same disulphonic acid (which dyes animal fibres a dull violet) is formed by directly sulphonating *p*-Tolylrhodamine; and a much better yield is thus obtained. The authors regard the latter method as preferable not only in this case, but in general, consider the formation of sulphonated rhodamines from sulphonated derivatives of *m*-aminophenol (*vide* Ger. Pat. 80,065, Class 22) to be impracticable. By the action of nitrous acid on the sulphonic acid of *m*-hydroxyphenyl-*p*-tolylamine, the nitrosamine is obtained, and this is converted into *p*-Tolyl-*m*-hydroxyphenazine-sulphonic acid by means of alcoholic hydrochloric acid. This substance dyes wool in fine blue shades.

Formaldehyde reacts with 1 mol. of a secondary base to form a derivative of aminobenzyl alcohol; with 2 mols. a derivative of diphenylmethane (Kalle, Ger. Pat. 97,710, Class 12). *m*-Hydroxyphenyl-*p*-tolylamine in the first case yields *p*-tolylamino-*m*-hydroxybenzyl alcohol, $CH_3.C_6H_4.NH.C_6H_3(OH).CH_2OH$ (m. pt. above 300° C.), in almost the theoretical amount. This body is an amorphous yellow insoluble powder: the hydrochloride is cinnabar red. With 2 mols. of the base to one of formaldehyde, di-*p*-tolyldiamino-di-*m*-hydroxy-diphenylmethane is obtained, which is likewise an amorphous, but readily soluble, grey powder melting (not definitely) at about 118° C.

Only one bromine derivative of *m*-hydroxyphenyl-*p*-tolylamine could be obtained, namely, a pentabromo derivative, m. pt. 203°—204° C.; and a penta-nitro-derivative is also described, m. pt. 230° C. The latter is not explosive.

m-Hydroxyphenyl *p*-tolylnitrosamine, m. pt. 127° C. (*not* 107 as given by Hatschek and Zega, J. prakt. Chem. [2], **33**, 216), is readily converted into the isomeric *p*-nitroso-*m*-hydroxyphenyl-*p*-tolylamine $(OH)(NO).C_6H_3.NH.C_6H_4.CH_3$, m. pt. 162·2° C., by means of alcoholic hydrochloric acid (Fischer and Hepp's reaction). This substance crystallises in dark red needles readily soluble in alcohol and in aqueous alkalis. By condensing it with *m*-hydroxyphenyl-*p*-tolylamine, a blue dyestuff, $C_{26}H_{21}N_3O_2$, a hydroxylated phenoxazine derivative, was obtained.—H. L.

Mono-hydroxybenzalbromindanone. K. Miniat. Bull. Soc. Chim., **27**, [3], 77—79.

Kostanecki and the author have shown that the three monohydroxybenzaldehydes combine with bromindanone in presence of caustic soda. But while the reaction occurs sharply with salicylic or *m*-hydroxybenzaldehyde, it is difficult to carry out with the *p*-aldehyde, and the yield is very small. If, however, *p*-hydroxybenzaldehyde and bromindanone be dissolved in alcohol, and strong hydrochloric acid to the extent of one-third of the volume of the mixture be added, the whole being heated for a while under a reflux condenser, the compound is produced as a voluminous yellow precipitate, which can be readily purified by recrystallisation. The three compounds all form yellow or reddish-yellow crystals, their melting points being for the *o*-, 220°; *m*-, 239°; and for the *p*- compound, 252° C. They dissolve in caustic soda solution, excess of which precipitates orange sodium salts. Sulphuric acid colours them deep orange or red. They are similar to the monohydroxybenzal-indandiones prepared by Kostanecki and Laczkowski, but their colour is less intense as they contain but one chromophoric CO group. The author has prepared condensation compounds of bromindanone with other aldehydes, all of which are much less strongly coloured than the corresponding compounds of indandione.—J. T. D.

Leucauramines; Some New Reactions of ——. R. Möhlau, M. Heinze, and R. Zimmermann. Ber., **35**, [2], 375—383.

(1) On heating molecular quantities of leucauramines and sulphur, tetramethyl-diamino-thiobenzophenone is formed.

(2) Tetramethyl-diamino-diphenylmethylsulphide—

$$[(CH_3)_2N.C_6H_4]_2CH]_2S,$$

which crystallises in rhombic plates, m. pt. 172° C., is obtained by passing sulphuretted hydrogen into an alcoholic solution of leucauramine, or by treating arylleucauramines with freshly-prepared ammonium sulphide. Polysulphides of ammonium react with arylleucauramines to form the corresponding disulphide $[(CH_3)_2N.C_6H_4]_2CH.S.]_2$, which crystallises in prisms, m. pt. 207° C.

(3) Leucauramine reacts with carbon bisulphide in the cold to form the leucauramine salt of tetramethyldiamino-diphenylmethyl-dithiocarbaminic acid—

$$CS\begin{cases} NH.CH[C_6H_4.N(CH_3)_2]_2 \\ S.NH_3.CH[C_6H_4.N(CH_3)_2]_2, \end{cases}$$

m. pt. 167° C., which readily loses ammonia on boiling with alcohol, and is converted into the tetramethyldiamino-diphenylmethylester of tetramethyldiamino-diphenyl-methyl-dithiocarbaminic acid—

$$CS\begin{cases} NH.CH[C_6H_4.N(CH_3)_2]_2 \\ S.CH[C_6H_4.N(CH_3)_2]_2 \end{cases}$$

Tetramethyldiaminodiphenylmethyl sulphide is formed on heating leucauramine with CS_2 under pressure at 100° C., and arylleucauramines (which do not react in the cold), under similar conditions, yield the disulphide (see above), which melts at 207° C.—H. L.

Leucauramines; Synthesis of Arylated ——. R. Möhlau and M. Heinze. Ber., **35**, [2], 358—375.

Arylleucauramines can be obtained (1) by treating tetramethyldiamino-diphenylcarbinol with primary aromatic amines (mono- or diamines or amino carboxylic acids), when the following reaction takes place:—

$$Aryl.NH_2 + HO.CH[C_6H_4N(CH_3)_2]_2 = Aryl.NH.CH[C_6H_4.N(CH_3)_2]_2 + H_2O,$$

or (2) by the action of primary aromatic amines on leucauramines—

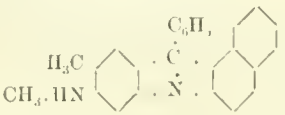
$$Aryl.NH_2 + NH_2.CH[C_6H_4.N(CH_3)_2]_2 = Aryl.NH.CH[C_6H_4.N(CH_3)_2]_2 + NH_3$$

They are very readily split up by dilute acids into the carbinol and aromatic amine. Aliphatic amines do not react

with the carbinol, nor do acid amides with the exception of urea, which combines with two molecules. Tetramethyldiaminodiphenylcarbinol, m. pt. 95°—96° C., is best prepared for laboratory purposes by reducing Michler's ketone (tetramethyldiaminobenzophenone) with sodium amalgam in alcoholic solution. The yield is quantitative. The carbinol is completely converted into its anhydride, tetramethyldiaminodiphenylmethyloxide $[(CH_3)_2N.C_6H_4]_2.CH.O.CH[C_6H_4.N(CH_3)_2]_2$, crystallising in colourless prisms, m. pt. 195° C., when heated to 105° C. for one hour. (See O. Fischer and K. Weiss. Zeits. f. Farben u. Textil Chem., **1**, [1], 1.)—H. L.

3′-Alkylamino-9-phenyl-1.2-naphthacridines. F. Ullmann, M. Rozenband, B. Mühlhauser, and E. Grether. Ber., 1902, **35**, [2], 326—340.

The authors have prepared a number of alkylaminophenylnaphthacridines by the interaction of benzaldehyde, β-naphthol and alkyl-*m* diamines (see Eng. Pat. 6651 of 1901; this Journal, 1902, 249), and characterise the various derivatives. The bases required when not already known were obtained by nitrating and reducing the corresponding alkylated-*o*-tolnidines except in the case of the 2-benzyl-*m*-tolylene diamine, which was prepared by benzylating and then reducing 4-nitrotoluidine. The condensations yield leuco compounds, which, on oxidation with ferric chloride, give the corresponding dyestuffs. For instance, 7·9 grms. of 2-methyltolylene-diamine ($CH_3:NHCH_3:NH_2 = 1:2:4$, obtained by nitrating and reducing methyl-*o*-tolaidine) and 6·4 grms. of benzaldehyde are heated on the water-bath for a short time. When cold, the powdered mass is slowly added to 15 grms. of β-naphthol, heated to 120° C., and the whole melt is then further heated for a short time to 200° C., until it solidifies to a crystalline mass. After extracting with alcohol, the residue consists of crude 2′-methyl-3′-methylamino-9-phenyl-1.2-hydronaphthacridine, which, when crystallised from benzene, forms a white crystalline powder, melting at 247° C. When alcoholic ferric chloride is added to a solution of the leuco compound in hot acetic acid, it deposits, on cooling, red needles of the hydrochloride of 2′-methyl-3′-methylamino 9-phenyl-1.2-naphthacridine, the base having the formula—



and crystallising from benzene in yellow plates, melting at 270° C. The product dyes tannined cotton orange shades from a weak acetic acid bath.

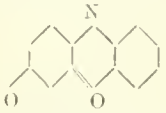
In the case of 2′-methyl-3′-dimethylamino-9 phenyl-1.2-naphthacridine, the effect of the presence of a methyl group ortho to a dimethylamino group on the shade of the solution is very marked, for whilst the salts of the naphthacridine from 2-dimethyl-*m*-tolylene diamine give orange-red solutions, those from dimethyl-*m*-phenylene diamine are bluish red.—T. A. L.

Azo-Dyestuffs from Methylphenylglycine. J. Mai. Ber., 1902, **35**, [2], 576—582.

Diazo compounds readily combine with methylphenylglycine, $C_6H_5.N(CH_3)CH_2CO_2H$, which is closely allied to dimethylaniline. The resulting products owing to the presence of a carboxyl group are more soluble in water, and are faster to soap than those obtained from dimethylaniline. Methylphenylglycine, however, decomposes, evolving carbon dioxide, when the aqueous solution of its hydrochloride stands for some time, and the resulting products obtained in such a case are derivatives of dimethylaniline. The compound from diazobenzene chloride and methylphenylglycine is very unstable. Diazotised sulphanilic acid forms with methylphenylglycine the analogue of Heliantbine, to which it is very similar, but is much more soluble. The analogue of Metanil Yellow from metanilic acid is much less basic, the hydrochloride being dissociated by hot water. The three diazo-benzoic acids were also combined with methylphenylglycine, but in all cases the yields were small. On combining tetrazodiphenyl chloride with the base in presence of sodium acetate, it was found that only equimolecular proportions combine, the product having the formula, $C_6H_5.C_6H_4.N:N.C_6H_4.N.CH_3.CH_2CO_2H$. The author has also combined phenylglycine with various diazo compounds. The product from diazobenzene chloride forms golden yellow crystalline plates, melting at 140° C., whilst that from diazotised sulphanilic acid gives a violet hydrochloride. The free acid obtained from this, decomposes above 250° C. and gives an acid sodium salt, separating from water in bronzy plates and a neutral brick-red sodium salt. The compound from tetrazo-diphenyl and phenylglycine is analogous to that from the methyl derivative.—T. A. L.

Azoxone; The Simplest ——. F. Kehrmann and A. Saager. Ber., **35**, [2], 341—342.

Phenazoxone—



the mother substance of resorufin and gallocyanine, is obtained by the oxidation of phenoxazine by means of ferric chloride. The substance crystallises in golden-brown flakes, m. pt. 216°—217° C., which are insoluble in alkali, but dissolve in benzene, alcohol, and boiling water. Salts are formed with acids, but are completely dissociated by water. —H. L.

English Patents.

Indigo from α-Isatineanilide; Manufacture of Artificial ——. T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 6878, April 2, 1901.

See Fr. Pat. 309,768; this Journal, 1902, 38.—T. A. L.

Dialkylrhodamines into their Alkyl Esters; Process for Converting ——. [*Rhodamine Dyestuffs.*] Farbwerke Hoechst, Germany. Eng. Pat. 16,067, Aug. 5, 1899.

Dialkylrhodamines are transformed into their alkyl esters by heating them with alkyl esters of alphylsulphonic acids. Dimethylrhodamine base (40 parts) is heated to 100° C. for two hours together with ethylbenzene sulphonate (20 parts). The benzene-sulphonate of dimethylrhodamine ethyl ester is obtained, from which the free ester is easily prepared by the addition of cold caustic soda, and from this the readily soluble hydrochloride.—H. L.

Azo-Dyestuffs; Process for the Manufacture of New Azo-Components and ——. O. Imray, London. From the Farbwerke Hoechst, Germany. Eng. Pat. 7250, April 6, 1901.

See Fr. Pat. 309,794; this Journal, 1902, 43.—T. A. L.

Colouring Matters [Azo Dyestuffs]; Production of Substantive ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 4609, March 4, 1901.

The tetrazo compounds of benzidine, tolidine, dianisidine, *p*-phenylene diamine and 1.4′-naphthylenediamine combined with 2.4′.2′-phenylaminonaphthol sulphonic acid (termed phenyl-I-acid) form symmetrical, or with this substance and other components, mixed disazo dyestuffs. The phenyl-I-acid can be obtained according to Eng. Pat, 18,726 of 1900 (this Journal, 1901, 981). The patentees claim specially as valuable, with regard to their fastness to light and to dilute boiling sodium bisulphite solution, the blue cotton dyestuffs obtained from tetrazotised dianisidine, one molecular proportion of phenyl-I-acid and one molecular proportion of 1.1′.4-or of 1.1′.4′-amidonaphthol sulphonic acid.—T. A. L.

Colouring Matters [Azo-Dyestuffs]; Manufacture and Production of Mordant Dyeing ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 6643, March 29, 1901.

See Fr. Pat. 309,573; this Journal, 1902, 43.—T. A. L.

Azo-Colouring Matters and their after-treatment on the Fibre; Manufacture and Production of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 7632, April 13, 1901.

See Fr. Pat. 311,722; this Journal, 1902, 43. See also Eng. Pat. 11,348 of 1900; this Journal, 1901, 468.
—T. A. L.

Colouring Matters of the Anthracene Series; New ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 12,185, June 14, 1901.

See Fr. Pat. 309,503; this Journal, 1902, 111.—T. A. L.

Acridinium Series; Colouring Matters [*Acridine Dyestuffs*] *of the* ——. Actiengesellschaft für Anilin Fabr., Berlin. Eng. Pat. 17,426, Aug. 28, 1899.

Alkyl halides are allowed to react, in neutral solution, upon acetylamino derivatives of the acridine series, by which means the corresponding acetylamino acridinium compounds are obtained. These substances are easily soluble in water and may be directly employed as dyestuffs (yellow to orange yellow). By hydrolysis they are converted into the free amino derivatives which dye tannin-mordanted cotton in redder shades than the acetyl derivatives do. The dyes are completely fast to soap.—H. L.

Colouring Matters [*Triphenylmethane Dyestuffs*]; *Manufacture of* ——. H. H. Lake, London. From the Farbwerk Mühlheim vorm. A. Leonhardt and Co., Mühlheim, Germany. Eng. Pat. 2907, Feb. 11, 1901.

Tetramethyl or tetra-ethyl-diaminodiphenyl carbinol is condensed in sulphuric acid solution with *p*-toluene sulphonic acid. The leucomonosulphonic acid thus obtained is sulphonated with fuming sulphuric acid and the leucodisulphonic acid produced, is oxidised with lead peroxide, yielding a greenish blue or blue dyestuff for wool.—T. A. L.

Dyestuffs of the Phthalein Series; Manufacture of Fast ——. O. Imray, London. From The Basle Chemical Works, Basle, Switzerland. Eng. Pat. 26,602, Dec. 30, 1901.

The unsymmetrical dialkylrhodamines obtained according to Eng. Pat. 4985 of 1895 (this Journal, 1895, 567) require, in order to convert them into sufficiently fast products, to be heated with alcohols and hydrochloric or sulphuric acid. The patentees now find that it is possible to produce Rhodamine esters directly by employing as a condensing agent a mixture of sulphuric acid monohydrate and methyl alcohol. For instance, 56 kilos. of diethylaminohydroxybenzoylbenzoic acid are added to a mixture of 360 kilos. of sulphuric acid monohydrate and 80 kilos. of methyl alcohol and heated to about 100° C. whilst stirring. After a short time, 24 kilos. of *o*-amino-*p*-cresol ($CH_3:NH_2:OH = 1:2:4$) are added, and the whole melt is heated for a short time to 160° C. until the condensation is complete. On pouring into water, the sulphate separates as a brilliant green crystalline precipitate, and after dissolving in hot water it is reprecipitated as Rhodamine ester hydrochloride by adding 80 kilos. of hydrochloric acid. The dyestuff contains a free amino group, and after diazotising can be combined with α-naphthol, giving a bluish-violet dyestuff. The dyestuffs obtained according to the specification give vivid red shades on cotton and wool mordanted with tannin and tartar emetic, the shades being bluer than those produced by the esters of the corresponding symmetrical dialkylrhodamines.—T. A. L.

United States Patents.

Indigo Paste. P. Seidel, Ludwigshafen. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 692,720, Feb. 4, 1902.

See Eng. Pat. 889, 1900; this Journal, 1901, 116.
—T. A. L.

Acetyl-phenyl-glycocoll-ortho-carboxylic Acid [*Indigo*]; *Process of making* ——. F. Bender, Frankfort-on-the-Main, Germany. Assignor to Farbwerk Mühlheim, Mühlheim, Germany. U.S. Pat. 690,346, Dec. 31, 1901.

See Eng. Pat. 16,565 of 1900; this Journal, 1901, 803.
—T. A. L.

Phenyl-glycocoll-o-carboxylic acid, and Process of Making Same; Acid Salt of [*Indigo*] ——. P. Seidel, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 690,325, Dec. 31, 1901.

See Eng. Pat. 21,821 of 1900; this Journal, 1901, 1205.
—T. A. L.

"Acylated Indoxylic Acid" [*Indigo*], *and Process of Making Same.* D. Vorländer and B. Drescher, Halle-on-the-Saale, Germany. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 690,332, Dec. 31, 1901.

See Fr. Pat. 311,562; this Journal, 1902, 38.—T. A. L.

Brown Sulphur Dye [*Sulphide Dyestuff*], *and Process of Making Same.* R. O. F. Hailer, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 690,271, Dec. 31, 1901.

See Fr. Pat. 311,190; this Journal, 1902, 43.—T. A. L.

Anthraquinone Dye [*Anthracene Dyestuff*], *and Process of Making Same.* M. H. Isler, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 690,292, Dec. 31, 1901.

See Fr. Pat. 311,103; this Journal, 1902, 42.—T. A. L.

Red Carbon Dye Lake [*Azo Dyestuffs*]. P. Julius, Ludwigshafen. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 690,294, Dec. 31, 1901.

See Eng. Pat. 2784 of 1900; this Journal, 1901, 240.
—T. A. L.

Black Sulphur Dye [*Sulphide Dyestuff*], *and Process of Making Same.* J. Abel, Mannheim, and F. Kalkow, Ludwigshafen. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 692,174, Jan. 28, 1902.

See Fr. Pat. 313,773; this Journal, 1902, 169. The copper salt may be replaced by finely divided copper.
—T. A. L.

Diazo Dye [*Azo Dyestuff*], *and Process of Making Same.* P. Julius and A. Tkatsch, Ludwigshafen. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 692,675, Feb. 4, 1902.

The new dyestuff is obtained "by combining *o*-diazophenol-*m*-sulphonic acid with 1.1′.4-aminonaphthol sulphonic acid." It dissolves in water, "yielding a red-violet solution, which on addition of hydrochloric acid becomes redder, and on the addition of sodium carbonate bluer, and dissolves in concentrated sulphuric acid with a violet-red colour." It "dyes wool direct, violet shades, these shades becoming blackish on treatment with potassium biehromate, and blue on treatment with copper sulphate."—T. A. L.

Disazo Wool-Dye, and Process of Making Same. [*Azo Dyestuff.*] P. Julius and F. Günther, Ludwigshafen. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 692,676, Feb. 4, 1902.

See Fr. Pat. 312,899; this Journal, 1902, 112.—T. A. L.

Blue Sulphonated Dye [*Anthracene Dyestuff*]. R. Bohn, Mannheim. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 692,762. Feb. 4, 1902.

See Fr. Pat. 309,503; this Journal, 1902, 111.—T. A. L.

Nitro Compounds; Process of Reducing ——. H. Gerresheim, Cologne-Ehrenfeld, Germany. U.S. Pat. 691,132, Jan. 14, 1902.

See Eng. Pat. 15,706 of 1901; this Journal, 1901, 1108. —T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Wool; Influence of Assistant Mordants on the Spinning of ——. A. Flögl and R. Koller. Färber-Zeit. **13**, [4], 53—55.

The experiments of S. Kapff (this Journal, 1900, 659) were repeated and extended to lignorosin (obtained from sulphite cellulose lyes, this Journal, 1898, 45). In Sydney wool, which was first washed and showed entire uniformity, was used, and mordanted and dyed in the following manner:—

1. Mordanted, with 3 per cent. of lignorosin, 1·25 per cent. of bichromate, and 1 per cent. of sulphuric acid of 66° B.

2. Mordanted with 3 per cent. of lignorosin, 1·25 per cent. of bichromate, and 3 per cent. of acetic acid of 50 per cent. strength.

3. Mordanted with 3 per cent. of lactolin (this Journal, 1898, 923), and 1·5 per cent. of bichromate.

4. Mordanted with 3 per cent. of bichromate and 2·5 per cent. of tartar.

In each case the goods were mordanted at the boil for 1½ hours; after cooling, thoroughly rinsed and then dyed with 1 per cent. of Alizarin Orange R, and 2 per cent. of Anthracene Brown W, the amount of water, the temperature and length of time employed, being exactly the same in each trial. They showed nearly the same shade, and a good, full, and uniform appearance. The sample mordanted with tartar and bichromate did not feel as soft as 1—3, and was therefore inferior for spinning.

The portions of dyed wool were greased with 8 per cent. of elain, each under exactly the same conditions as the others, and combed. They showed practically no differences.

As an average of 15 tests made, the strength of each piece is shown in the following table:—

Piece.	Mordant.	Stretching of the Yarn.	Strength.
		Per Cent.	Kilos.
1	Lignorosin-sulphuric acid.	14·0	19·45
2	Lignorosin-acetic acid	13·4	18·31
3	Lactolin	11·9	18·69
4	Tartar	11·8	17·16

These results agree with those obtained by Kapff, but show that, for spinning purposes, lignorosin gives superior results to lactolin—F. N.

Cotton; New Discharge Effects on ——. G. Stein. Färber-Zeit., **13**, [4], 55.

Most of the benzidine dyestuffs and of the various similar substantive dyestuffs can be discharged on cotton with tin crystals. An exception must be made in the case of some of the yellows, such as Primuline Yellow, Direct Yellow R, Mikado Yellow A, Chloramine Yellow, &c. The author describes a method of obtaining new discharge effects by combining dischargeable dyestuffs with the various sulphide dyestuffs, which cannot be discharged by means of tin crystals. The goods are first dyed in the jigger, with the sulphide dyestuffs referred to, in light shades. These are then washed and dyed in another jigger with a benzidine dyestuff, rinsed, dried, and afterwards discharged with the usual acetic acid tin-salt preparation.—F. N.

Cotton in Dyed Union Fabrics; Method of Preserving ——. R. Loewenthal. Farber-Zeit., 1902, **13**, [3], 37—39.

Formerly the only method available for dyeing bright colours upon both the wool and the cotton in union tissues, consisted in first dyeing the wool with acid dyestuffs, and then mordanting the cotton with tannic acid and tartar emetic and dyeing with basic dyestuffs. The disadvantages of this method, which is still practised to a limited extent, are the lack of fastness of the dyes to rubbing and the expense of the process on account of the numerous washings required.

The introduction of such dyestuffs as the Diamine colouring matters marked a great step in advance. The application of these is simple and inexpensive. The dyes produced are fast to rubbing and are obtained from the same bath upon both wool and cotton. Although this method is much employed for union tissues in general, there are certain classes of these, for instance, alpaca and serge-unions, which are liable to be torn when treated in neutral baths at the high temperatures at which the dyeing is performed. For such fabrics it is preferable first to dye the wool in an acid bath, and afterwards the cotton in a cold or tepid, slightly alkaline, bath.

The best results are obtained by dyeing the cotton with dyestuffs fast to acid, before spinning or weaving with the wool, and then dyeing the latter in the tissue with acid dyestuffs. Until recently the only colours available for this purpose for the cotton were Aniline Black, Turkey Red, Catechu Brown, and Indigo Blue. Latterly the list has been extended by the discovery of the numerous sulphur dyestuffs. The range of colour of these is not yet, however, sufficiently comprehensive. This is also the case with the milling dyestuffs, for example, Diamine Milling Black, which dye the cotton during the process of milling the mixed tissue, the woollen portion being dyed subsequently in an acid bath. Of this class only black dyestuffs are at present known.

In applying the acid dyestuffs to the wool, a large proportion of an acid or acid salt, for instance, 20 per cent. of the weight of the tissue of sodium bisulphate, is commonly used. Much of this remains in the wool, even after prolonged washing. It often gives rise to the destruction of the cotton during the storage of the tissue. In an experiment it was found that the wool in a sample of a mixed tissue, weighing 10 grms., which had been dyed in a bath containing the above proportion of sodium bisulphate, after boiling three times for half an hour each time in 100 times the weight of water, still retained 0·169 grm. of sulphuric acid, as determined by treating it with an excess of standard alkali solution and titrating back with acid. Treating the dyed fabric with soda to neutralise the acid is impracticable on account of the damage this would cause both to the wool and to the dye. A method recommended by Cassella and Co. is said to give satisfactory results. This consists in rinsing the dyed tissue, after washing it repeatedly, in a bath containing 5—10 grms. of sodium acetate per litre and then drying it. The dried tissue is quite free from acid, and neither the wool nor the cotton is in the least degree injured.—E. B.

Printing Colours; Determination of the Covering Power of ——. E. Valenta. Oesterr. Chem.-Zeit., **4**, [32]. Chem. Centr., 1901, **1**, [6], 382.

The method proposed by the author depends upon the following principle:—If a printing colour be distributed in a uniform layer of definite thickness on a black surface, which absorbs all light, then, if the thickness of the layer does not exceed a certain limit, the quantity of coloured light reflected from a unit of surface, will be less than that which is reflected from an equal quantity of the colour spread in a layer of the same thickness on a white surface of the same size. The greater the covering power of a colour, then the greater will be the amount of coloured light reflected, under similar conditions, by the layer of colour on a black ground, as compared with that on a white ground, as, in the first case, all the light which penetrates the layer of colour is absorbed, whilst in the latter case, it

is reflected. If, therefore, the amount of coloured light reflected in each case be measured, the covering power of a colour can be expressed as the ratio between the two quantities.

The colour to be examined is rubbed to a suitable consistence with a definite quantity (the same in all cases) of thin varnish, and is printed by means of a lithographic stone or an earthenware plate in the press, on a piece of white or on a piece of dull black paper, either of which is subsequently examined in a Stammer's colorimeter (see this Journal, 1900, 914). The white porcelain plate of the apparatus is placed in a horizontal position, and then in that half of the cardboard frame which comes below the "liquid tube" is pushed a piece of white paper, whilst in the other half is placed a piece of the same paper covered with the printing colour. The tube is filled with a solution of a dyestuff of a tint similar to that of the colour under examination. The height of dyestuff solution is then noted which is required in order that, apart from clearness, both halves of the field of vision, may appear coloured to the same extent. The number W obtained as the mean of several readings, corresponds to the amount of coloured light reflected by the layer of colour on a white ground. The piece of white paper covered with the colour is now replaced by the piece of black paper covered with the same amount of colour, the brightness of the light reflected by the other half of the cardboard frame is dimmed until both halves of the field of vision appear equally clear, and then the height of the column of dyestuff solution is adjusted till the field is equally coloured. The number, S, obtained corresponds to the amount of light reflected by the layer of colour on a black ground. The ratio S : W expressed as percentage of W, is a measure of the covering power of the colour.—A. S.

Turkey-red Oil; Analysis of ——. W. Herbig.
See under XXIII. *page* 367..

ENGLISH PATENTS.

Bleaching and Scouring; Improved Compound for ——. E. M. Taylor, Manchester. Eng. Pat. 3071, Feb. 13, 1901.

THE inventor claims the use of crude or saponified cresol or creosote in combination with sodium carbonate or with the addition of sodium hydroxide, fatty acids and colophony for scouring and bleaching cloth, yarns, vegetable fibres or garments.—J. F. B.

Dyeing, Bleaching, and Treatment of Cotton and other Textile Materials; Method of, and Apparatus for ——. J. Lindley and E. Ashworth. Eng. Pat. 14,528, July 14, 1899.

THE apparatus to which the improvements claimed have been applied, is described in Eng. Pat. 10,678, 1891 (this Journal, 1892, 680).—H. L.

Dyeing, Bleaching, or otherwise Treating with Liquids Cops of Yarns; Apparatus for ——. J. Major and T. J. Wood. Eng. Pat. 16,422, Aug. 12, 1899.

IMPROVEMENTS upon the apparatus described in the Eng. Pat. 25,525, 1898, of the same authors are claimed.
—H. L.

Dyeing Loose Material, Fabrics, Hosiery, &c.; Method and Apparatus for ——. O. Venter, Chemnitz, Saxony. Eng. Pat. 23,055, Nov. 14, 1901.

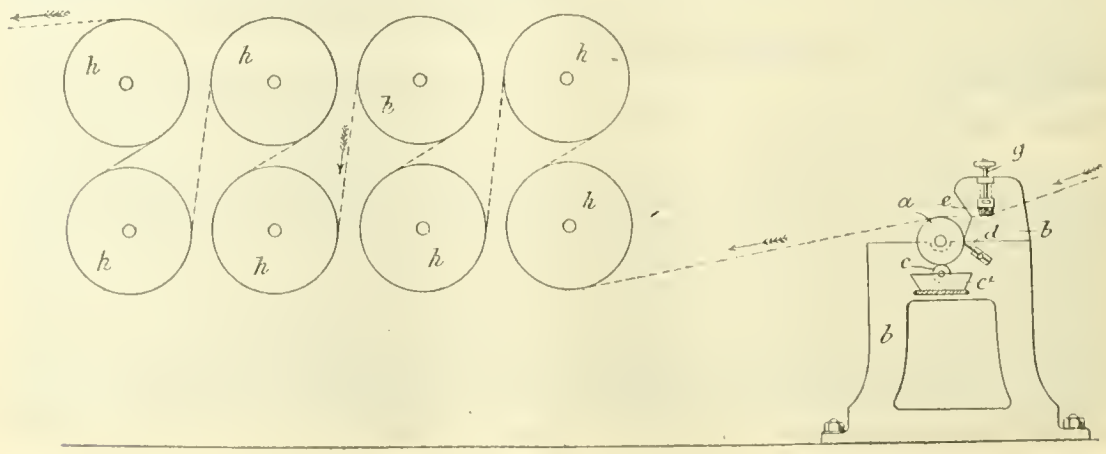
A DYE-VAT is fitted with a central vertical chamber communicating with a number of horizonal hollow cylinders, arranged in vertical series, which support the materials to be dyed. The central chamber is also connected with a subjacent reservoir containing the dyeing solution in such a manner that this liquid may be driven through the vertical chamber and the material under treatment, and then partly sucked back again by the employment of air under increased and diminished pressure. The fibres of the material having been freed from air by this preliminary treatment, the vat is disconnected from the reservoir and placed in communication with a circulating pump working alternately in opposite directions, the rapidity of the action being diminished as the operation continues, whilst the amount of dyeing solution passing through the goods is increased by gradually opening a regulating cock placed in the circuit.—G. T. M.

Dyed Cotton Fibre [*Sulphide Colours*]; *Preventing the Weakening of* ——. H. E. Newton, London. From The Farbenfabriken vorm. Fr. Bayer and Co., Elberfeld, Germany. Eng. Pat. 6429, March 27, 1901.

COTTON fabrics which have been dyed with sulphur dyestuffs colours, *e.g.*, Immedial or Katigen Black, and treated with potassium bichromate, copper sulphate and acetic acid, are found to become considerably weakened in strength, when they are subjected, in the process of finishing, to steaming or hot pressing. No diminution in strength occurs, if the fabrics after being dyed, treated as above described and washed, are treated in a bath of sodium carbonate (1 : 1000) for 10 minutes, and are then washed and finished. As a mixture of an acetate and acetic acid does not give the same result, it would appear that the action is not simply the neutralising of the mineral acid contained in the fibre.
—E. B.

Printing of Textile Fabrics. W. Rumney and Co., Ltd., and A. S. Young. Eng. Pat. 15,866, Aug. 3, 1899.

THE object of this invention is to produce an imitation of colored woven or tapestry effects on textile fabrics. A small roller *a* (see figure) is mounted in a suitable frame *b*. The roller *a* is supplied with colour by means of a furnisher *c*, revolving in a colour trough c^1, and can be cleaned by means of a doctor *d*. The fabric to be printed is first passed under a tension rail *e*, then it touches lightly the top of the said roller and receives therefrom a light coating



of the colour. The tension rail is adjustable by means of a screw *g*, and the pressure of the cloth on the roller can be so arranged that only the tops of the threads of the fabric receive a coating of the colour, thus producing an imitation of coloured weaving. After leaving the small roller *a*, the cloth passes on to the drying cylinders *h*, where it is dried in the usual manner. The speed of the fabric is so arranged that it travels faster than the surface speed of the small roller *a*. The apparatus may be used in conjunction with an ordinary calico printing machine. One or more colours may be printed on the fabric in the ordinary manner with engraved rollers, either before or after it passes the above-mentioned small roller. The latter may be either a plain unengraved roller having a porous surface, or it may contain designs arranged on the surface in relief. If a plain roller be used, it is preferable to use a fabric, which is woven in figured designs, which stand up more or less above the general surface of the fabric.

—H. L.

Printing of Colours in Graduation on Paper and Textile Fabrics. P. Barbontan, Paris. Eng. Pat. 7923, April 17, 1901.

Textile fabrics, paper or the like are passed in a continuous band from one roller to another over a table containing a number of plates, engraved in relief and bearing the colours to be printed, upon which, after being damped, they are pressed. The plates are coated by a brush with the desired colour or colours in those parts which are to reproduce the picture or design in its greatest intensity, the parts immediately surrounding these being smeared by a damp cloth with the same colour or colours, to produce graded tints. Several different colours may be applied to the same plate, provided they do not come into contact with one another. By this method, a design may be obtained by means of three plates, which could be produced by the method in use only by the employment of at least twelve plates.

The use of a device for lifting the material which is being printed away from the table, is claimed. The purpose of this is to facilitate the unrolling of the material and the re-coating with the necessary colours of the plates, after these have been used, the plates for convenience being placed in slides which are drawn from under the material, while the re-coating is being done.—E. B.

Metallising Fabrics; Process for ——. C. Danilevsky, S. Tourchaninoff, A. Danilevsky, and V. Timonoff, St. Petersburg. Eng. Pat. 5516, March 15, 1901.

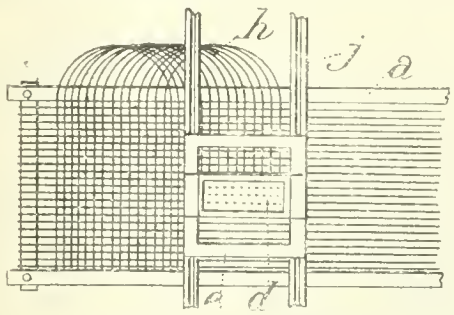
The fabric to be metallised through its whole thickness is first treated with acids or alkalis to eliminate from its pores foreign matters, which would interfere with the deposit of the metal. An adherent metallic foundation is then applied to one face of the fabric, and forms a cathode which is connected to the negative pole of some source of electricity, and an anode in the form of a plate of the metal to be deposited is arranged on the opposite face of the fabric, which is then subjected to metallisation in an electrolytic bath, various formulæ for which are given.—G. H. R.

United States Patents.

Fabric [*Textile, from Gums, &c.*] J. Mugnier, Lyons, France. U.S. Pat. 692,467, Feb. 4, 1902.

Light fabrics, resembling in appearance muslins, crape, gauze, tulle, &c., are produced by forcing, in the form of threads, a hot, thick, fluid mucilaginous preparation through apertures in the bottom of a suitable receptacle, *d* (see figure) upon a light framework *a* placed upon a carriage mounted on rails. The threads are deposited both in the direction of the length and in that of the width of the fabric to be produced. While laying the threads in the latter direction, the receptacle travels a little beyond the edges of the fabric, leaving loops *h* as its motion is reversed. These are subsequently removed. The two layers of threads obtained being adhesive, unite together. Many layers can be superposed, enabling the thickness and strength of the fabric to be increased at will. The design can also be varied in several ways. When dry, the fabric is removed from the framing, which is kept slightly greased to facilitate this.

The mucilage employed is prepared from "lichenin," an extract of lichens, the gelatinous principles found in the fleshy parts of various plants, in fruits and certain roots, the extract of Iceland moss, "gelose" (from various algæ) and similar substances, with which may be mixed isinglass,



gelatin, casein, gluten, borax, glycerin, &c. The following bath is used at a temperature of 70° C.:—"A solution in hot water is prepared of well-washed 'gelose' containing 5 to 6 per cent. of the latter. To this is added from 3 to 4 per cent. of borax, 1½ per cent. of gluten diluted in three times its weight of alcohol, and 1 per cent. of gelatin and as much glycerin." This may be coloured by the addition of dyestuffs or pigments for the purpose of producing a coloured fabric.—E. B.

Electrically Dispersing Fluids [*Fibres or Threads from Fluids*]; *Apparatus for* ——. J. F. Cooley, Boston, Massachusetts. U.S. Pat. 692,631, Feb. 4, 1902.

See Eng. Pat. 6385, 1900; this Journal, 1900, 659.

—J. W. H.

Waterproof and Air-tight Fabrics. W. A. Durrin, Wisconsin. U.S. Pat. 690,250, Dec. 31, 1901.

Cotton, linen burlap, or other unsized fabric is drawn through a paste containing 80 per cent. of potters' clay, 8 per cent. of rye-flour, and 12 per cent. of wood-pulp intimately mixed in the presence of water. In this way the filling material enters the interstices of the fabric, the superfluous paste being removed by means of scrapers. The fabric when thus treated, is thoroughly dried, and then passed through a bath of melted paraffin wax, which gives it a waterproof surface.—G. T. M.

Waterproof Fabrics. J. Menzies, London, England. U.S. Pat. 690,868, Jan. 7, 1902

The fabrics are rendered waterproof by immersion, first, in a solution containing potassium stearate and oleate, sodium silicate, and paraffin wax, and subsequently in a fixative solution of aluminium acetate. To prepare the first solution, certain fatty acids are saponified with caustic potash and water in a steam-jacketed boiler or soap-pan. The mixture is then boiled for an hour, sodium silicate and paraffin wax being added in convenient quantities, and the boiling being further continued for, say, another hour.

—G. T. M.

Stiffening Fabrics; Composition for ——. J. D. Graber, Pennsylvania. U.S. Pat. 691,462, Jan. 21, 1902.

An alcoholic solution of lac, ricinolein, or any other non-drying oil and sodium borate is used in stiffening woollen or cotton fabrics; these articles, after drying, being thus rendered waterproof and antiseptic. The finished materials may be moulded into any shape whilst hot, but they harden on cooling.—G. T. M.

Bleaching-Keir. J. C. Tyms, Garfield, New Jersey, U.S.A. U.S. Pat. 692,091, Jan. 28, 1902.

This is essentially a vessel consisting of a lower chamber and an upper tank, the former communicating with the latter by means of a pipe and check valves controlled by floats. The liquor when boiled by steam is forced through the pipe from the lower chamber into the upper part of the

tank, percolates through the goods and returns through the valves into the lower chamber. Numerous details are referred to in the specification which contains drawings of the plant.—T. A. L.

Multi-coloured Fabrics. F. Meyer, Aix-la-Chapelle, Germany. U.S. Pat. 189,559, Dec. 24, 1901.

See Eng. Pat. 15,386, 1898; this Journal, 1899, 681. —G. T. M.

Discharging Indigo-Dyed Wool. W. Berns. From The Badische Anilin und Soda Fabrik. U.S. Pat. 690,347, Dec. 31, 1901.

Indigo-dyed woollen goods are discharged by printing with a paste containing tragacanth and ordinary gum mixed with sodium bichromate, steaming, passing through a bath containing an aqueous solution of oxalic and sulphuric acids and finally bleaching by means of solutions of hydrogen peroxide, sulphurous acid, sodium bisulphite or "potassium percarbonate."

Coloured discharges on Indigo-dyed wool are produced by adding suitable dyestuffs to the discharging paste. Red discharges are obtained by the use of Indulin Scarlet or Rhodamine Extra; Azoflavin 3 G and 3 R give yellow shades, whilst Methylene Blue produces a blue effect.—G. T. M.

Hydrosulphites; Process of making ——. Max Baslem. U.S. Pat. 692,760, 1902.

See under VII., *page* 346.

French Patents.

Yarn Mercerising Machines. J. Dolder. Fr. Pat. 312,957, July 24, 1901.

Yarns, in the form of long hanks, are placed upon a pair of rollers, mounted side by side a convenient distance apart, one of them being stationary, the other movable horizontally. The latter, by means of suitable starting and driving mechanism, is made to travel automatically a definite distance, limited as desired, in order to stretch the hanks. Simultaneously with this action, the outer one of two troughs, fitting one inside the other, is raised until a projecting plug upon the bottom of it comes into contact with a valve in the inner trough which is fixed immediately below the rollers. The mercerising solution contained in the outer trough then enters the inner one and saturates the hanks of yarn which, while this is proceeding, and for some time afterwards, are kept in continuous movement round the supporting rollers. The outer trough is next lowered, causing the excess of the mercerising solution to be withdrawn from the inner trough, a further quantity being squeezed from the hanks by a roller which is pressed down upon one of the yarn-supporting rollers. The valve leading to the outer trough is then closed, a water-escape valve in the inner trough is opened and the hanks are washed by means of a spray of water which descends upon them. After this, the water spray is shut off, and the hanks are squeezed. Finally, the squeezing roller is raised, the movable roller is brought nearer to the stationary roller, to relax the tension upon the hanks, and the hanks are removed.—E. B.

Bleaching Cotton and other Fibres by means of Electrolysed Solutions; Apparatus for ——. C. Martin. Fr. Pat. 311,580, June 8, 1901.

Textile materials, for instance cotton yarns packed in bundles as they come from the spinner, are treated in one and the same vessel, first with a solution of caustic soda, then with a bleaching solution, and lastly with a dilute solution of sulphuric acid, each operation being followed by a rinsing with water. They are then hydro-extracted, and dried by means of hot air.

The apparatus employed for these processes, comprises a pump, tanks for the preparation and storage of the necessary solutions, a kier, a hydro-extractor, a hot air drying chamber, and an improved electrolysing apparatus. This consists of a tank through which a solution of common salt is slowly passed upwards and downwards between partitions formed of the electrodes, which are blocks of slate covered with a layer, 0·03 mm. or so in thickness, of platinum or platinum-iridium foil. The extent of the electrolytic action is conveniently measured by the rise in temperature which takes place in the solution. This should be 10°—12° C. The density of the current employed is about 50 ampères per square cm. of electrolysing surface.—E. B.

Bleaching, Dyeing, &c., Textile Materials; Apparatus for ——. Roesch and Co. Fr. Pat. 312,424, July 5, 1901.

Two cylinders are arranged concentrically one inside the other and are surmounted by a cover. The outer cylinder is fixed, and communicates on opposite sides with a pump. The inner one, which is perforated, is revolvable and serves to hold the materials to be dyed, &c. The annular space between the cylinders is divided into two water-tight chambers by projections from the inner side of the outer cylinder. Dye liquors are forced into one of these chambers and, after passing through the inner cylinder, are drawn from the other chamber by the pump. The materials are thus thoroughly permeated by the liquids which are presented to them in constantly varying directions as the inner cylinder is revolved.—E. B.

Dyestuffs on Vegetable Fibres; Printing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 313,772, Aug. 24, 1901.

The blue dyestuffs obtained according to Fr. Pat. 309,503 of March 29, 1901, and its supplement of July 10, 1901 (this Journal, 1902, 42 and 111), have in themselves no affinity for fibres, but can be fixed under certain conditions. The process consists in printing the dyestuffs with a reducing agent and alkali, and subsequently steaming; or else printing the mixture of the dyestuff and the reducer and passing the fibre through an alkaline bath; or finally the colour and an alkali can be printed and the fabric steamed, in this case no reducing agent being employed. Suitable reducing agents are stannous chloride, glucose, hydrosulphite and ferrous sulphate. Bright and fast shades are obtained by these methods.—T. A. L.

White Reserve under Indigo on Unbleached Tissues. The Badische Anilin und Soda Fabrik. Fr. Pat. 313,926, Aug. 13, 1901.

A mixture of finely ground lead dioxide (400 grms.), glycerin (300 grms.), and gum thickening (300 grms.) is printed upon an unbleached tissue and dried at about 35° C. The tissue is then dyed with Indigo, either upon a champagne frame or in a continuous dyeing machine. After being washed in cold water, it is treated with dilute hydrochloric acid (20 grms. of concentrated acid per litre) at 45° C., until the printed portions have been completely whitened by the bleaching action which takes place in them.—E. B.

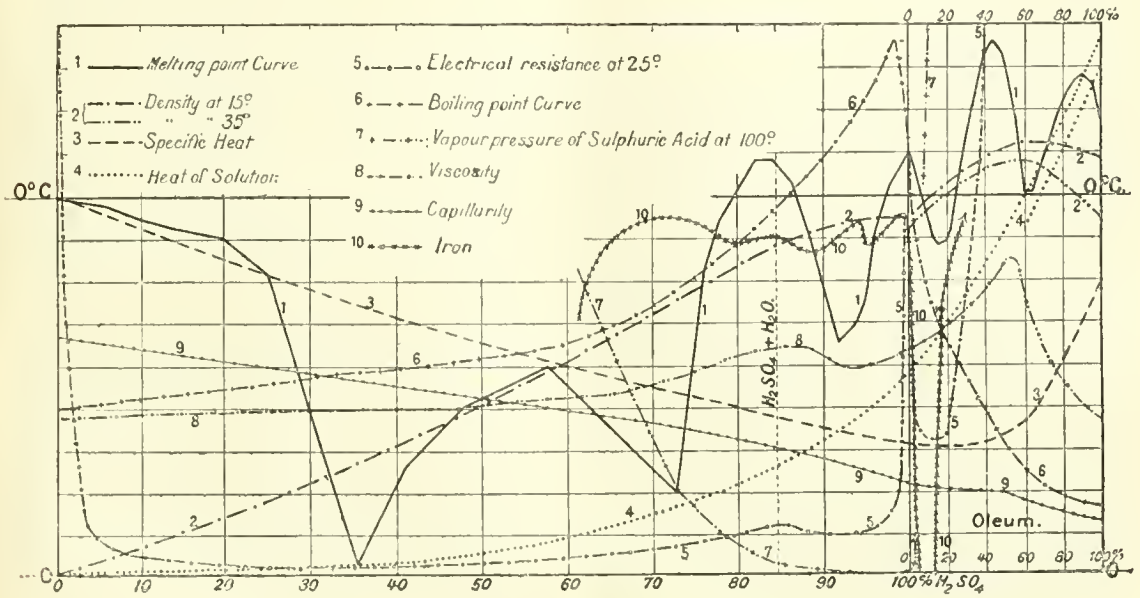
Discharges upon Paranitraniline Red and Analogous Dyestuffs; White and Coloured ——. The Clayton Aniline Co., Ltd. Fr. Pat. 314,048, Sept. 6, 1901.

The processes of discharging Paranitraniline Red described in Fr. Pats. 255,997 and 267,205 and Ger. Pat. 94,174 have not been much practised, owing to the tendering of the fibre and the dulling of the red in the undischarged parts of the tissue, which occur in the production of a satisfactory white discharge. The tendering is often greater in the unprinted than in the printed parts. This is due to the destructive action upon cotton of the gases evolved from the stannous sulphocyanide in the printing mixture employed. To overcome these drawbacks, and to shorten as much as possible the time necessary for steaming, the tissue to be printed is prepared with a solution containing sodium acetate (50 grms.) or ammonium citrate or tartrate, and tartaric acid (25 grms.). It is then printed with a mixture said to be more concentrated than those hitherto used, consisting of 100 grms. of stannous chloride, "700 grms." of ammonium sulphocyanide, 150 grms. of tartaric or citric acid, and 650 grms. of gum tragacanth paste (13:100). The tissue is dried, steamed for 1½—3 mins., treated with acid, as usual, washed, treated, if the red be dull, with chlorine water, soaped, passed through a dilute solution of bleaching powder, if necessary, and dried. Suitable dyestuffs are added to the above mixture, to obtain coloured discharges. —E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid; Manufacture of ——, *by the Contact Process.* R. Knietsch. Ber., **34**, [17], 4069—4115. (See this Journal, 1902, 172—173.)

Each of the tables of constants in this treatise is illustrated graphically by a curve; and these curves are collected together and summed up in the accompanying figure, the number of each curve corresponding with the number of the table, as already quoted.



The chief features of these curves may be noted in their order:—

1. *Melting Point.*—This curve shows a very obvious series of sharply defined maxima and minima, the most important of which are the maxima at $H_2SO_4.H_2O$ (84·5 per cent. H_2SO_4), at H_2SO_4, and at $H_2SO_4.SO_3$ (44·9 per cent. SO_3). The other maxima or minima also occur at points corresponding with definite molecular proportions of H_2SO_4 to H_2O or to SO_3.

2. *Density.*—This (measured at 15° C.) rises almost proportionally with the concentration, till it reaches a limit at about 96 per cent. of H_2SO_4; then from H_2SO_4 onwards it again rises to a maximum at about $H_2SO_4.2SO_3$ (62 per cent. SO_3). The density of "Oleum," or fuming acid, is also shown at 35° C.; the general form of the curve is obviously similar to that at 15° C.

3. *Specific Heat.*—This steadily falls, without any break at H_2SO_4, to 20 per cent. SO_3, and then sharply rises.

4. *Heat of Solution.*—A steady rise from end to end, the *rate* of rise also increasing, as is shown by the increasing steepness of the curve. No indication of any hydrate or anhydro compound is given by this curve.

5. *Electrical Resistance.*—The remarkable features are: first, the great increase of conductivity caused by the addition to water of even a little of the acid; second, the slight indication of the hydrate $H_2SO_4.H_2O$ by the small maximum of resistance (or minimum of conductivity) there; and, last, the enormously rapid variations caused by the addition to H_2SO_4 (maximum resistance) of even 2 or 3 per cent. of either water or anhydride, and the rapid increase from the minimum at 10 per cent. SO_3 as the proportion of SO_3 increases.

6. *Boiling Point.*—The one feature of this curve is the maximum at 98 per cent. H_2SO_4. This is the composition of the acid distilling at a constant temperature; if we heat a weaker acid it will lose water, if we heat a stronger acid it will lose SO_3, till the residue reaches this composition. Necessarily, the curve 7, *Vapour Pressure*, runs, in a general sense, in an opposite direction to this curve.

8. *Viscosity.*—This curve shows slight maximum and minimum values at a little below and above 90 per cent. H_2SO_4, and a very sharply defined maximum at about 55 per cent. SO_3. The *Capillarity* curve 9 needs no additional remark.

10. *Action on Iron.*—The most important point here is the remarkable action of fuming acid, containing less than 20 per cent. of SO_3; the sudden variations in the action, with the maximum at 10 per cent. of SO_3, are well seen by an inspection of the curve. (This curve is to be read from the top of the diagram, not, like the others, from the bottom.)

—J. T. D.

Persulphuric Acid and its Salts; Action of Colloidal Platinum upon ——. T. S. Price. Ber., **35**, [2], 291—294.

Colloidal platinum does not appear to decompose solutions of potassium or ammonium persulphate; also persulphuric acid is not attacked, even after standing for several hours in contact with the platinum.

The decomposition of hydrogen dioxide in the presence of persulphates was next investigated, it being thought possible that reaction might take place according to the equation $K_2S_2O_8 + H_2O_2 = K_2SO_4 + H_2SO_4 + O_2$.

The results showed, however, that the decomposition of hydrogen dioxide was only slightly accelerated by potassium and ammonium persulphates, whilst free persulphuric acid slightly retarded it.

Caro's acid, which was proved to have the composition H_2SO_5, is only slowly decomposed by colloidal platinum, but when mixed with hydrogen dioxide the decomposition is very rapidly effected by the platinum.—H. F. C. G.

Acetic Acid Series: Solubilities of the Calcium Salts of the Acids of the ——. J. S. Lumsden. Proc. Chem. Soc., **18**, [246], 31.

It is well known that many calcium salts diminish in solubility with increase of temperature, and in order to obtain further information on this subject, the solubilities of the salts of the acids of the acetic acid series have been carefully determined.

Calcium formate is anhydrous when in contact with its saturated solution and gives a simple ascending curve of solubility. The calcium salts of the other acids of the series contain water of crystallisation and all diminish in solubility with rise of temperature until a minimum point is reached after which the solubility increases.

Of the salts of the normal acids, only calcium acetate changes from one crystalline state to another between 0° and 100° C., whilst both calcium isobutyrate and calcium isovalerate have double curves. With the exception of calcium formate, all the salts which have been examined, when in contact with their saturated solutions at 100° C., consist of crystals which contain 1 molecule of water.

The salts of the normal acids increase in solubility from formate to acetate and propionate, then decrease quickly with the growth in the number of carbon atoms, the salts of the iso-acids being more soluble than those of the corresponding normal acids.

Solid and its Saturated Solution at various Temperatures; Equilibrium between a ——. J. S. Lumsden. Proc. Chem. Soc., 18, [246], 31.

The solubilities of the calcium salts of the acids of the acetic acid series were found to be all represented by curves convex to the temperature axis, indicating at first decrease and then increase of solubility.

A curve of this shape is in no way anomalous, for by considering the action of heat on each of the factors which condition the equilibrium in a saturated solution, it is seen to be typically a normal curve.

The factors which produce equilibrium in a saturated solution are: the affinity between solid and solvent, the thermal energy of the solid, and the pressure of the dissolved particles. By resolving the solubility curve, which is an exact representation of the resultant of these forces at different temperatures, into component curves representing the forces, the influence of temperature on each can be studied.

When each force varies directly as the temperature, the solubility curve is a straight line; when the rate is different it is a curve convex to the temperature axis.

Some experimenters have given curves of solubility concave to the temperature axis, but examination of several curves of that kind has shown that they have been produced by the joining of points on two convex curves, so cutting out the transition point.

By estimating the heat of solution at two points on a convex curve where the solubility is the same, it was found that the sensible heat was much less at the higher point. It was also found that the heat of solution at any temperature diminishes with the concentration, and that the direction of the solubility curve indicates the heat of solution in a saturated solution only, being positive on a descending and negative on an ascending curve.

English Patents.

Contact Bodies [For Sulphuric Acid]; Manufacture of Porous Bodies suitable for Use as ——, *in Chemical Operations.* J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-am-Rhein. Eng. Pat. 6828, April 1, 1901.

These bodies, which are very porous, and have considerable power in resisting pressure and chemical action, are made by incorporating a catalytic substance with a mixture of a non-volatile metallic base or a salt of a non-volatile metallic base, which contains the radicle of a volatile acid, with a salt of a volatile base and an inorganic acid which is non-volatile or volatile with difficulty. The mixture is then heated so that double decomposition takes place and the volatile elements escape.—W. C. H.

Sulphuric Acid; Manufacture of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Germany. Eng. Pat. 6829, April 1, 1901.

Sulphuric anhydride, or a gaseous mixture containing it, is passed into an absorption apparatus of cast-iron, charged with acid containing 97 to 99 per cent. of H_2SO_4, but preferably of 98 per cent., which percentage is maintained by simultaneous introduction of steam, water, or dilute sulphuric acid. It is stated that acid of the indicated strength absorbs the anhydride so rapidly that a multiplicity of vessels may be dispensed with; and also that such acid does not sensibly attack iron. The process may be combined with that described in Eng. Pat. 1904, 1901 (this Journal, 1902, 116) "thus making it possible, in one operation, to obtain fuming sulphuric acid and highly concentrated sulphuric acid, as well as highly concentrated acid alone, both technically free from iron."—E. S.

Catalytic Processes [Sulphuric Acid]; The Production of Porous Contact Substances or Masses for Use in ——. The Actien-Gesellschaft für Zink-Industrie, vormals W. Grillo; and M. Schroeder, both of Oberhausen, Germany. Eng. Pat. 10,412, May 20, 1901.

The invention consists in the preparation of porous contact substances, for use in the manufacture of sulphuric anhydride in the contact process, from liquid, pasty, or oozy materials, or materials which wholly or partly melt in the water of their crystals, the object being attained by passing a gas through them whilst they are being dried. Reference is made to Eng. Pat. 25,158, 1898 (this Journal, 1899, 584), in which such suitable substances are described. In every case a catalytic body, such as platinic chloride or the finely-divided metal, is added. The preparation of the material may be conducted in the contact apparatus itself. The apparatus is a blower which forces air through a series of pipes heated in a furnace, whence the air, at about 200° C., passes into the bottom compartment of a cylinder, below a grating on which is spread a thin layer of, say, anhydrous magnesium sulphate, covered by crystals of the salt moistened by $PtCl_4$ solution (or mixed with platinum powder), more of the so moistened salt being added successively as each layer dries, until the compartment is sufficiently charged. Another compartment is then bolted or secured on, and the process is repeated, and in like manner with other compartments until the chamber is fully charged, and ready, after the material is thus dried, for the production of SO_3. To increase the formation of blow holes or bubbles in the mass of the material, sugar, gum, or the like may be added to it, the carbon formed from which subsequently burns away.—E. S.

Alkaline Earths; Electrolytic Preparation of the Bases of ——. A. Brochet and G. Ranson. Eng. Pat. 1849, Jan. 26, 1901.

See under XI. A., *page* 352.

Brine; Multiple Effect Apparatus for use in Evaporating ——. E. J. Duff and the United Alkali Company, Limited, both of Liverpool. Eng. Pat. 17,691, Sept. 1, 1899.

Brine is fed by a pipe and branch pipes, separately, into a series of evaporating chambers, and does not flow from chamber to chamber. Each chamber is provided with an arrangement of tubes through which the brine circulates, the tubes being surrounded by a belt through which steam is passed, preferably in the manner described in Eng. Pat. 17,689, 1899 (this Journal, 1900, 745). The steam arising from the evaporation of the brine in the first chamber passes from the top downwards to communicate from outside with the arrangement of pipes in the second chamber, and so through the series, which is shown as constituted of four evaporators, the outgoing pipe from the last of these conducting the steam into a closed chamber, prolonged below by a long, narrow, pipe, the flow of water of condensation through which gives the needful vacuum for working the system. Each evaporator has a funnel-shaped bottom, with a prolonged pipe or "leg" entering a boot, in which the deposited salt collects, and whence it is withdrawn by an elevator. The evaporators are thus arranged in pairs, the legs from two of them entering the same boot; but more than two may be thus arranged.—E. S.

Silicofluoride of Sodium; Production of ——. C. Enoch, Hamburg, Germany. Eng. Pat. 1842, Jan. 26, 1901.

Dilute solutions of silicofluoric acid, such as occur as waste liquors, which may also contain small proportions of hydrofluoric and sulphuric acids, are titrated, and a proportion of solid sodium chloride, equivalent to the acids present, is dissolved in the solution. The gelatinous sodium silicofluoride that precipitates is separated. Waste liquors containing a relatively considerable proportion of hydrofluoric acid, are first treated with a compound containing silicic acid, such as water-glass, to form silicofluoric acid,

and then with sodium chloride as described. But if only hydrofluoric acid be present, fine sand may be added to form the silicofluoric acid, which may then be precipitated as before.—E. S.

Alkali Cyanides; Manufacture or Preparation of ——. G. W. Johnson, London. From the Deutsche Gold- und Silber-Scheideanstalt vormals Rössler, Frankfort-on-the-Main, Germany. Eng. Pat. 3329, Feb. 15, 1901.

Ammonia is passed through a mixture of sodium and carbon in stated proportions, heated in a crucible to 160° C., and as cyanamide slowly forms, the temperature is gradually raised to 550°—600° C. More carbon is now added, and the temperature increased to 750°—800° C., to convert the cyanamide first formed into cyanide. Instead of carbon, a liquid or gaseous hydrocarbon may be used, by passage through the same inlet as that for ammonia, or through a separate inlet, into the molten metal. This invention is an improvement on that described in Eng. Pat. 21,820, 1900 (this Journal, 1901, 1113), from which it differs in effecting the reaction without the aid of added cyanide, the temperature being kept in the early part of the process so low that the sodium amide, as it forms, is converted into cyanamide, thus, $2(NaNH_2) + C = Na_2N_2C + 2H_2$, and after completion of this reaction, with further addition of carbon at a higher temperature, cyanide is formed, $Na_2N_2C + C = 2NaCN$. —E. S.

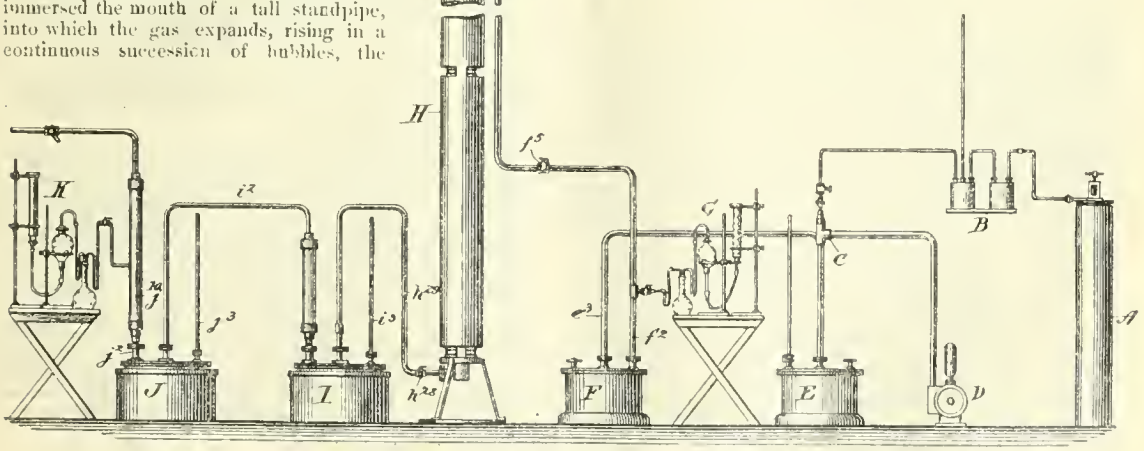
Cyanides of the Alkalis; Manufacture of ——. E. C. Rossiter, Birmingham, H. W. Crowther, West Bromwich, and G. S. Albright, Edgbaston. Eng. Pat. 6226, Mar. 25, 1901.

This is an improvement on Eng. Pat. 4403, 1901 (this Journal, 1902, 173), as the treatment of cuprous sulphocyanide to obtain HCy there described, is now found to be applicable in the cases of other sulphocyanides (except those of the alkali metals), cyanides and ferrocyanides (including those of the alkali metals). The dry salt, which, if a sulphocyanide, is mixed with finely-divided metal, is heated in a closed vessel fitted with an agitator, through which hydrogen is continuously passed, at first below 150° C., then to 200° and gradually to 450°, and when the reaction is nearly complete, to a temperature not exceeding 650°. The mixture of hydrocyanic acid and hydrogen evolved is passed through caustic alkali, and the hydrogen is stored for re-use. The cyanide solution is evaporated in vacuum pans to obtain the solid salt. Instead of hydrogen, coal gas or the like, dried, and freed from oxygen and carbon dioxide, may be used.—E. S.

Gases; Cooling and Liquefaction of ——, *and the Separation of Oxygen and Nitrogen.* H. A. Strong, London. Eng. Pat. 9142, May 17, 1900.

The gas is compressed, subjected to preliminary cooling, and led through a coil in a counter-current chamber to a closed reservoir containing a liquid, in which is immersed the mouth of a tall standpipe, into which the gas expands, rising in a continuous succession of bubbles, the diameter of the pipe being such that each bubble may fill the space, forcing before it a short column of liquid, as in the Sprengel air-pump. The mechanical work thus done by the expansion of the gas against "a counter resisting liquid piston" effects further cooling. The standpipe opens at the top into a reservoir having two outlets; one for the gas which passes into the counter-current chamber; and the other for the overflow of liquid, which descends by gravity a vertical pipe having exit to the reservoir, the liquid actuating a turbine or other motor in its descent, the shaft being geared to the compressor. From the counter-current chamber or "inter-cooler" the gas passes to the compressor. The standpipe and other parts of the apparatus are suitably jacketed. When air is to be refrigerated for ice-making, the priming liquid may be brine, glycerin and water, or other mixture, and the inter-cooler need not be used; but for liquefaction purposes, the apparatus is primed with liquefied gas, and the cycle is continuously repeated. When air is thus liquefied, owing to the greater volatility of nitrogen over oxygen at equal pressures, the nitrogen may pass as gas from the inter-cooler, while liquid oxygen may be withdrawn from the reservoir into which the standpipe dips.—E. S.

Fig. 1.



Air (Liquid); Method of and Apparatus for the Production of ——, *and for the Production of Motive Power.* E. J. Hess, Rio de Janeiro, Brazil. Eng. Pat. 21,191, Oct. 22, 1901.

Air is forced under pressure through a coil in the outer of two concentric vessels containing liquid air; the liquid air evaporated is allowed to drive a rotary engine which in turn drives the air compressor and a feed pump; the compressed air after passsing through the coil in the outer vessel enters a similar coil in the inner vessel and expands from a relief valve first into a heat exchanger (a jacket on the coil) and then into the inner vessel itself, becoming liquid in the process; the feed pump transfers the condensed air from the inner vessel to the outer as required.—J. W. H.

[*Carbon Bisulphide*] *Electric Furnaces and the Production of Chemicals in such Furnaces.* G. Brewer. Eng. Pat. 25,182, 1901.

See under XI. A., *page* 353.

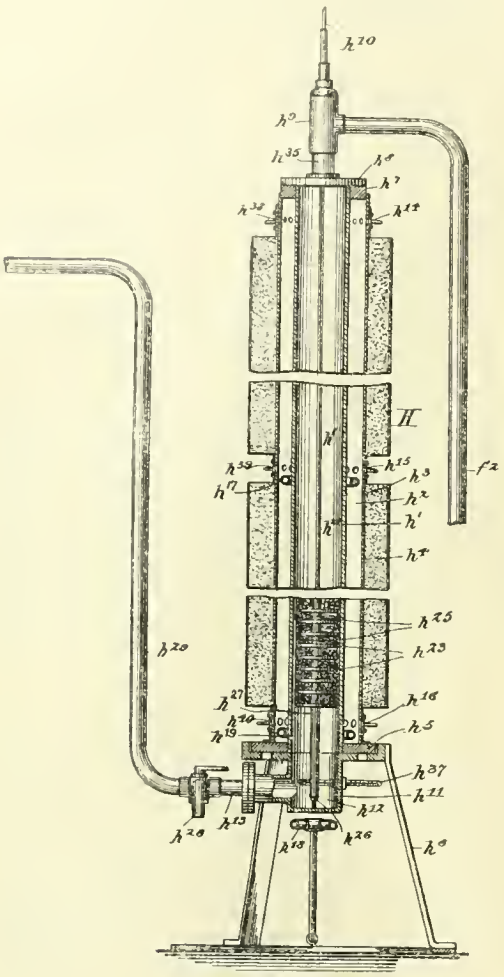
United States Patents.

Sulphuric Anhydride; Apparatus for Making ——. R. Knietsch, Ludwigshafen, Germany. U.S. Pat. 692,018, Jan. 28, 1902.

The principal parts of the apparatus are shown in Fig. 1. The sulphur dioxide passes from the supply, A, through the drying train, B, into an "induction distributor," C, in which the gas is mixed with air from the pump, D, and whence the mixed gases enter the washer, E, a leaden vessel from the top of which is suspended a hood having serrated edges dipping into sulphuric acid of 66° B.; a pressure gauge connected to the entrance and another to the exit show

the respective pressures. The gases next traverse the "stripper," F, similarly formed to the washer, but containing no liquid, except such sulphuric acid as may be deposited by the gases, which next enter the contact chamber, H, to be presently described, the sulphuric anhydride therein formed being received in the absorber I, of wrought iron (having a serrated suspended hood of the same) containing sulphuric acid of 66° B., which by absorption of the anhydride becomes the fuming acid. The absorber is immersed in a cooling vessel. The second absorber, J, is of similar construction, except that it is of cast-iron. It contains sulphuric acid of 58° B., which, when strengthened to 66° B. by the anhydride that reaches it, is available for recharging the first absorber. G and K are testing apparatus.

Fig. 2.



In the contact furnace, H, Fig. 2, h^1 is a central tubular contact chamber, jacketed by the annular passage, h^2, and surrounded by insulating material, h^4. The sheet-iron tube, h^3, forming the annular passage, is pierced to form a series of port-holes, h^{14}, h^{15}, and h^{16}, each series being provided with two independent semicircular covers governing separate halves of the series, h^{38}, h^{39}, and h^{40}, by which admission of air for regulating the heat is controlled, the heat being supplied from the gas-burner, h^{18}, and the annular burners, h^{17} and h^{19}. The mica-covered peep-holes, h^{22}, enable observation to be made of the colour attained within, which should be a dull red opposite the upper portion of the contact material. Directions are given for regulating the temperature as indicated by the thermometers at h^{10}, h^{11}, and h^{37}.

In the contact-material holder, the rod, h^{24}, removable from the top on withdrawing the cover, h^8, has strung upon it a series of perforated wrought-iron plates, h^{23} (Figs. 2, 3, and 4), distanced by sections of piping, h^{25}, and the bottom plate is distanced from the nut, h^{26}, on the bottom of the rod by the section of piping, h^{27}; this latter section, in charging the apparatus, is dropped down the rod, followed by a perforated plate, on to which is scattered a certain quantity of 10 per cent. platinised asbestos; one of the piping sections is then dropped into position, and a perforated plate, and so on until the apparatus is charged, the pressure of the layer of contact material on one plate not being borne by the other similar layers, with which arrangement the process may be conducted at or about atmospheric pressure. The process and apparatus is stated to have "accomplished an average conversion of 95·9° per cent. while making sulphuric anhydride" at a stated rate, the gases used containing 11·5 per cent. of sulphur dioxide. —E. S.

Fig. 3.

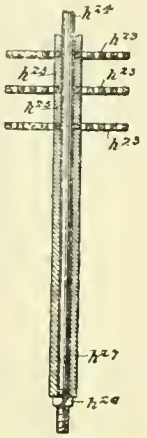
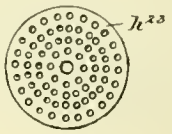


Fig 4.



Electrolytic Cell. [*Decomposition of Alkali Salts.*] E. A. Le Sueur. U.S. Pat. 692,531, 1902.

See under XI. A., *page* 353.

Hydrosulphites; Process of Making ——. M. Bazlen, Ludwigshafen, Germany. U.S. Pat. 692,760, Feb. 4, 1902.

Solution of sodium bisulphite is treated with sulphurous acid or with gaseous SO_2 in proportion "equal to one-half the sulphurous acid otherwise contained in the said bisulphite," and to the solution, zinc dust is gradually added, the temperature being kept between 30° and 40° C. After stirring and settling, milk of lime is added, and after settling for some hours, the mixture is filter-pressed. Other bisulphites, such as potassium, ammonium, calcium, and chromium bisulphites, may replace the sodium salt.—E. S.

Chlorates and Perchlorates; Electrolytic Manufacture of ——. P. L. E. Lederlin, Chedde, France. U.S. Pat. 693,035, Feb. 11, 1902.

Highly soluble chlorates or perchlorates can be produced from a solution capable of yielding the same by the addition of chromic acid in suitable form to it, and passing an electric current from an anode to a cathode through the liquid thus formed, adding hydrochloric acid to the electrolyte to maintain the greater part of the chromic acid in the state of bichromate during the passage of the current, and then cooling the electrolysed liquor to deposit the chlorates or perchlorates in crystalline form. This process is applicable to all electrolytic operations where it is necessary to utilise the action of the chromic acid to increase the electrochemical yield, any suitable mineral acid being added to the electrolyte to maintain the chromic acid in the state of bichromate.—G. H. R.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

Glass or Mirrors; Manufacture of ——, *to adapt same for Adhering to Surfaces.* W. P. Thompson, Liverpool. From La Société Anonyme Belge pour la Fabrication des Émaux Artistiques, Brussels. Eng. Pat. 19,116, Sept. 22, 1899.

Glass or mirrors adapted for attachment by their rear surfaces to walls, &c. are made by pouring molten glass into a mould, on the bottom of which are placed fragments of glass of the same composition, and passing the moulds immediately into a furnace at a high temperature, to remelt the mass, thereby imparting lustre and smoothness of surface to it, and causing it to combine with the partially melted fragments of glass, the whole being gradually cooled in a slightly cooler furnace.—W. C. H.

Glass; Partially or Entirely Opaque and Coloured ——. H. E. Knöspel, Hillemuhl, Bohemia. Eng. Pat. 8309, May 4, 1900.

The claim is for the use of barium or its compounds as a fusing material in place of potassium carbonate in the manufacture of partially or wholly opaque and coloured glass containing calcium phosphate.—W. C. H.

Furnaces [*Glass*] *burning Naphtha Residue.* C. Spiegel. Eng Pat. 1999, Jan. 29, 1901.

See under II., *page* 330.

Filter-Presses [*Potters'*]. J. Critchlow, J. Aynsley, and H. Aynsley, Staffordshire. Eng. Pat. 7457, April 10, 1899.

The filter press is provided with a carriage, mounted on rails. The carriage is moved backward and forward by handles, the movement of the filter-trays being effected by catches or arms adapted to slide over and engage with the trays. The movable press-head has a rapid movement to and from the trays. A wheel and screwed shaft and a holding device are provided for increasing the pressure between the filter trays, and a further increase of pressure can be effected by a pinion, wheel, and lever arrangement. The trays may each consist of a cast, rolled, or stamped grooved metal non-corrosive plate, secured by bolts, &c. to a wooden frame. A slip-hole is provided between the centre of the plate and its upper edge, and the filter cloths are sewn together on a non-corrosive metal ring, situated between the cloths around the feed hole, to keep the cloths in position.—R. A.

Glaze-melting Furnaces. M. Römer, Florence, Italy; and J. Schmidheiny, Heerbrugg, Switzerland. Eng. Pat. 4975, March 8, 1901.

In a flat-topped furnace, the melting dish is supported on an axle lying on a bearing piece mounted on the fire bridge. The dish has guide pieces on its bottom to secure it against lateral displacements, and is adjustable as to inclination by a wedge, movable upon rails fixed in the walls of the furnace, and having a curved groove with which a rod provided with projections engages, the rod being operated from outside. A recess in the back-wall of the dish enables it to be tilted by one of the projections of the rod, as in discharging the melted glaze, which is effected through an aperture in the front wall of the dish, the glaze being received in a conveying vessel below, running upon wheels. The glazing material is introduced through a conical funnel in the roof of the furnace; and in a modified form of dish in which the latter is covered, the tube entering the cover, into which the funnel projects, is of such diameter as not to interfere with the adjustment of the dish. The furnace is of ordinary construction, and the flames pass over the top of the dish.—E. S.

Plate Glass and other Transparent Bodies; Production of Films on ——. J. E. Reynolds and G. R. Grubb. Eng. Pat. 4420, March 1, 1901.

See under XXI., *page* 366.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Gypsum Cement; The Hardening of ——. Leipziger Färber u. Zeugdrucker-Zeit., 1902, **51**, [2], 72.

The question sometimes arises as to the additions by which the hardness of gypsum cement may be increased:—

(*a*) 2—4 per cent. of finely ground marsh mallow root (Eibischwurzel) are intimately mixed with powdered gypsum, and the mixture kneaded to a dough with 40 per cent. of water. The mass resembles rich clay, hardens in about one hour, and becomes hard enough to cut, file, or bore. A harder and tougher mass is obtained by the addition of 8 per cent. of marsh-mallow root, for which dextrin, gum, or glue may be substituted, or shellac if the objects are to be subjected to rather higher temperatures.

(*b*) Six parts of gypsum are mixed with one part of freshly washed lime, and the product soaked with a concentrated solution of magnesium sulphate. In preparing the mass, too much gypsum must not be poured into the water, and it must be stirred quickly so that lumps do not form. The smaller the quantity of water, the thicker and firmer is the cement, which loses its binding power with long stirring. The porosity caused by the loss of water can be obviated by soaking with a solution of ozokerite or wax in oil of turpentine, varnish, or hot tar, or by a coating of shellac.

—W. C. H.

English Patents.

Cement; Manufacture of ——. C. von Forell, Hamburg. Eng. Pat. 23,443, Nov. 19, 1901.

Molten slag is driven by a jet of steam or air against a chilled and, if necessary, moving, surface, and the slag clinkers, formed by the sudden process of chilling, when ground, produce cement.—W. C. H.

Grindstones; Artificial ——. W. O. Rooper, Stafford. Eng. Pat. 26,339, Dec. 24, 1901.

The grindstones are made by moulding blocks of the required shape, from material consisting of sand, emery, and an alkali silicate, and afterwards treating the blocks with a solution of chloride of calcium, aluminium, or iron. The claims also include the building up of grindstones or wheels, composed of a number of segments held in position by two side discs, the spaces between the segments being filled with Portland or other cement with less resistance to wear than the segments.—W. C. H.

Heat-Insulating Board, Tile or Slab. G. Kelly, Mineral Point, Iowa, U.S.A. Eng. Pat. 24,798, Dec. 5, 1901.

Mineral wool of itself is not suitable for the formation of heat-insulating slabs for cold storage; the inventor uses wood-pulp as a binding agent in suitable proportions, and claims to produce a satisfactory slab.—J. W. H.

Asphalt; Preparing ——. A. Wolskel, Australia. Eng. Pat. 386, Jan. 6, 1902.

The claim is for roasting sand, grit, or particles of siliceous or like matter, with constant stirring in a reverberatory furnace, at a temperature of about 800° F., sufficient to bring about complete incineration of the adhering organic matter, then cooling the mass, preparing the same by milling methods, according to the purpose for which the resulting asphalt is intended, and afterwards warming to about 350° F., and mixing intimately with the mass, melted bitumen, or asphaltum.—C. S.

United States Patents.

Wood; Fireproofing ——. K. Rücker, Zernsdorf, Germany. U.S. Pat. 691,812, Jan. 28, 1902.

In a vessel from which the air can be exhausted, wood, paper, fabrics, &c. are treated, at a temperature rising from 60° to 100° C. for some hours, with a solution of magnesium ammonium sulphate, to which boric acid is sometimes added; the materials and liquid are afterwards subjected to a pressure of several atmospheres.—W. C. H.

Roofing Material; Chemical ——. J. M. Wright, Bloomington, Indiana, U.S.A. Assignor to H. Blakely and J. M. Wright, Indiana, U.S.A. U.S. Pat. 691,882, Jan. 28, 1902.

The material is made by impregnating paper or cloth with a composition consisting of coal-tar (1 gall.), slaked lime (2 oz.), sodium carbonate ($\frac{1}{2}$ oz.), gum-acacia ($\frac{1}{4}$ oz.), zinc oxide ($\frac{1}{4}$ oz.), litharge (5 oz.), and gypsum (6—8 oz.). —W. C. H.

Solid Materials [*Artificial Stone*]; *Production of* ——, *from Tar.* C. Dörr, Germersheim, Germany. U.S. Pat. 691,934, Jan. 28, 1902.

See Eng. Pat. 13,146, 1899; this Journal, 1899, 918. —W. C. H.

Stone, Artificial; and Process of Manufacturing same. F. M. Emerson, Brookline, Massachusetts. U.S. Pat. 692,644, Feb. 4, 1902.

Blocks of artificial stone made according to this invention consist of an inner core and an outer shell; the inner core is composed of 3 parts of broken stone, 2 parts of sharp sand, and 1 part of Portland cement. To imitate granite the outer shell consists of broken marble, 2 parts, Portland cement, 1 part; water being added to give a suitable working consistency; for sandstone, 2 parts of sharp sand, of suitable colour, and 1 part of Portland cement are mixed, and in the case of artificial limestone the shell is composed of sharp sand, $1\frac{1}{2}$ parts; Verona marble, $\frac{1}{2}$ part; Portland cement, 1 part.

The core and shell are built up together and pressed layer by layer until the block is completed.—J. W. H.

Tiles or Plates; Manufacture of ——. F. Gehre, Zurich, Switzerland. U.S. Pat. 692,197, Jan. 28, 1902.

See Eng. Pat. 6311, 1899; this Journal, 1899, 687. —W. C. H.

Plastic Materials [*Heat-insulating Materials*]; *Machine for Moulding* ——. W. Borrowe and J. Lumley, San Francisco, California. U.S. Pat. 692,778, Feb 1, 1902.

The invention relates to a moulding machine in which the plastic material is treated in a very gentle manner. A series of bottom forms for supporting the material are carried on a continuous band, and rollers shape and finish the upper surface; the material is fed without compression in graduated quantity.—J. W. H.

X.—METALLURGY.

Iron; Cementation of ——, *by Silicon.* P. Lebeau. Bull. Soc. Chim., **27**, [3], 44—45. (See also this Journal, 1902, 119.)

Moissan has found that a cylinder of iron, imbedded in silicon, and heated to the temperature of a forge, becomes uniformly converted into a silicide containing about 2 per cent. of silicon, though neither substance fuses at the temperature of the reaction. The author's experiments show that a similar phenomenon occurs at a lower temperature, quite analogous to the "cementation" process of steel-making. A mixture of reduced iron and silicon heated *in vacuo* or in hydrogen to 950° C., gave a substance not greatly changed in appearance, but which dissolved completely in nitric acid, showing that the whole of the silicon had entered into combination. Facts of the same kind have been observed with cobalt and nickel.—J. T. D.

Cyanide Solutions [*Au*] *containing Copper; Titration, Use, and Precipitation of* ——. W. H. Virgoe. Inst. Min. and Met., Dec. 19, 1901.

The author discusses the question of the reactions of cupric and cuprous salts with potassium cyanide, and the influence of the reaction products upon the titration with silver nitrate, both without an indicator and in the presence of various small quantities of potassium iodide. He points out that titration with silver nitrate alone is incorrect when copper is present, and that titration after the addition of a minimum quantity of potassium iodide is best, since it gives a clear end reaction and, in the presence of copper, indicates the point when all the free cyanide has been titrated, and when the cyanide in the less stable copper compound, is about to be attacked. This compound is probably a triple salt, cuproso-cupric potassium cyanide, of the formula, $Cu_2Cy_2.2KCy$, $CuCy_2.2KCy$. In the practical extraction of gold, he found that when using no indicator in titrating his solutions, the extraction commenced to fall off, and titration in the presence of iodide showed that the solutions were below normal strength for extraction purposes. Upon adopting the iodide test, the extraction again became normal. He is convinced that the accumulation of copper was the cause of the irregularity, and experiments have been since carried out which prove that the following reactions take place between cuprous potassium cyanide and silver nitrate:—

$$2(Cu_2Cy_2.2KCy) + AgNO_3 = 2(Cu_2Cy_2.KCy) + AgKCy_2 + KNO_3;$$

$$2(Cu_2Cy_2.KCy) + AgNO_3 = 2Cu_2Cy_2 + AgKCy_2 + KNO_3.$$

The proportion of iodide used as an indicator also influences the quantity of silver nitrate solution, which may titrate 0·13 per cent. KCy with a small crystal and only 0·09 per cent. with a large one, corresponding to a difference of 0·8 lb. per ton. Furthermore, free alkali in quantity also causes an error in titration, both with or without an indicator.

The fouling action of copper upon the extracting efficiency of cyanide solution is very marked with 0·3 per cent. present, even alone, and would be more so in practice, where the accumulation of such an amount would be accompanied by the accumulation of other metals. On the other hand, copper salts in the absence of free cyanide to some extent act as solvents for gold and silver, but cuproso-potassium cyanide is not so active in this respect as the corresponding zinc salt. In practice it is found that copper is precipitated from weak solutions of cyanide, such as 0·05 to 0·08 per cent., upon the zinc shavings, which then become less active in precipitating gold and silver. This can be remedied by making the solution stronger with cyanide before entering the zinc boxes, whereby the precipitation of the copper is prevented. But then the copper accumulates in the solution, and the increase renders the solution less effective in extracting gold from the ore. The difficulty has been met in some cases by precipitating the copper with a lead-zinc couple after the precipitation of the bulk of the gold. At the plant at Minas Priestas, Mexico, the solution from the zinc launders, containing 3 to 4 lb. of copper per ton, is run over zinc shavings which have been steeped in lead acetate solution, by which the quantity is reduced to about 1·25 lb. per ton, and any gold which has escaped previous precipitation also recovered. The product so obtained runs about 2 dols. per lb. in gold and silver and 25 per cent. of copper.

Another remedy, which is now suggested by the author, consists in agitating the solution containing the copper with metallic zinc fume, or very fine metallic zinc, by means of compressed air. The copper is thus precipitated from both the double and triple cyanide salts, and settles down with the remainder of the zinc fume. The zinc taken up into solution is then precipitated as sulphide by a soluble alkali sulphide, and the cyanogen originally combined with the copper recovered as alkali cyanide. Any excess of alkali sulphide is decomposed by lead carbonate or other lead salt. By this scheme 2·01 lb. of the 3·07 lb. of potassium cyanide consumed by 1 lb. of copper would be theoretically recovered.

Finally, in assaying large volumes of cyanide solution, a rapid method consists of adding excess of copper sulphate to 1 litre, and acidifying with hydrochloric or other acid to obtain a white and flocculent precipitate. This contains all the gold as double cyanide of gold and copper, and is washed, dried, and scorified with metallic lead.—A. W.

Bronze [*Copper-Tin-Zinc*]; *Influence of Temperature on the Strength of* ——. C. von Bach. Stahl und Eisen, 1901, **21**, 1876; through Chem.-Zeit., 1902, **26**, [10], Rep. 25.

The author has measured the ultimate tensile strengths at different temperatures of two samples of ternary

bronzes, I. containing 87 per cent. of copper, 8·7 per cent. of tin, and 4·3 of zinc; II. containing 91·4 per cent. of copper, 5·5 per cent. of tin, and 2·8 per cent. of zinc. The figures, expressed as kilos. per square cm., are given in the annexed table:—

Temperature.	I.	II.
C.		
20	2,491	2,395
100	2,477	2,424
200	2,381	2,245
300	1,610	1,358
400	1,113	625
500	693	442

These results show that although such bronzes are useful materials at ordinary temperatures, they are not suitable for the construction of pipes for highly superheated steam.
—F. H. L.

Platinum; Investigation into the Composition of Brittle ——. W. N. Hartley. Proc. Chem. Soc., **18**, [246], 30.

In investigating the composition of brittle platinum in the form of fragments of pins used for dental purposes, their average weight being under 20 mgrms. each, the absence of metallic impurities, and also of silicon, was proved spectrographically. The brittle and crystalline character of the metal was shown to be, in all probability, caused by minute quantities of phosphorus or carbon, and by remelting in a lime crucible under the oxyhydrogen flame, its malleability was greatly improved, thus confirming the accuracy of the conclusion arrived at.

The difficulty in deciding beyond question whether there were iron lines in the platinum, or platinum in the iron spectrum, or lines of some impurity common to both metals, shows the importance for practical purposes of determinations of wave-lengths made with the greatest accuracy attainable, particularly in the case of such spectra as these, where large numbers of lines are so closely grouped together as to have approximately the same wave-lengths.

ENGLISH PATENTS.

Sulphide Ores; Treatment of ——. J. Swinburne and E. A. Ashcroft, London. Eng. Pat. 14,278, July 11, 1899.

The process is particularly adapted to the treatment of mixed lead-zinc-silver sulphide ores, such as are found at the Broken Hill Mines. The crushed ores are mixed with salt or other fused chlorides and chlorine is passed through the mixture in a converter, whereby free sulphur is given off; the resulting chlorides are treated electrolytically for the production of metal, free chlorine being given off and used again. As a step in the process, oxides of iron and manganese are separated by precipitation.

The chlorine from the electrolytic vat may be pumped direct to the converter, or it may be cooled, compressed, and stored in the liquid state.—J. H. C.

Sulphide Ores, [Pb. &c.]; Process for Desulphurising ——. A. J. Boult, London. From A. D. Carmichael. Broken Hill, Australia. Eng. Pat. 17,580, Sept. 2, 1901.

The sulphide ores, such as of lead, are heated with calcium sulphate or gypsum, &c. in a converter until the lower portion attains a dull-red heat, whereby the metal sulphide is sulphated and the calcium sulphate reduced to sulphide. An induced current of air is maintained through the mass, which oxidises the calcium sulphide and regenerates the sulphate. This reaction being exothermic, sufficient heat is evolved to complete the concurrent desulphurising reactions between the metallic sulphides, sulphates, and oxides for the production of the metal.
—A. W.

Mineral Substances by the Selective Action of Oil; Separating ——. A. S. Elmore, London. Eng. Pat. 6519, March 28, 1901.

In separating metallic substances from the earthy matter associated with them by mixing oil, such as heavy petroleum, with the pulp formed by pulverising the ore with the addition of large volumes of water, the inventor claims that the addition of acid facilitates the process. When the acid is added to the oil, oleic acid is preferred, but if the addition be made to the pulp, sulphuric acid or "acid cupreous liquors" are used.—J. W. H.

Steel; Manufacture of ——, *and Alloys containing Steel or to be used therewith.* J. G. Lorrain, London. From G. Thomson, Elizabeth, U.S.A. Eng. Pat. 1099, Jan. 16, 1901.

The claims are for an alloy of copper and nickel, and its use in forming a compound plate with steel by the following method. The molten steel is first granulated in water and re-smelted with carbon and sand, or it is poled with wood or carbon blocks. It is then run simultaneously with the copper-nickel alloy and in a combined stream or through the same entrance, into a mould, and also for some time after the alloy has ceased running, so that a compound plate consisting mainly of steel with a steel-copper-nickel facing is formed. Molten nickel can be employed in a similar manner instead of the copper-nickel alloy, to produce a steel-nickel facing.—A. W.

Steel; Manufacture of ——. W. Pruszkowski Schodnica, Austria. Eng. Pat. 23,060, Nov. 14, 1901.

The claims are for steel, and the process of making it, which combines the two usually uncombinable properties of being hardened in a high degree by chilling, and of being welded and forged as easily as wrought iron, wherein cobalt (2·5 per cent.) is added to a steel or steel mixture which contains 1·532 per cent. of carbon and about 1·5 per cent. of titanium or a metal of the chromium group (Cr,Mo,W,Ur), the proportions of the latter elements varying slightly to produce a steel of a definite empirical formula.—A. W.

Iron, Steel, and Wrought Iron, Manufacture of ——. D. Davies, Newport. Eng. Pat. 1376, Jan. 21, 1901.

The iron ore, mixed with the necessary reducing agent and flux, is placed in one or more ingot moulds, which are cracked or unfit for use as such, or in other iron or steel containers such as casings, crucibles, and the like, which moulds or containers are fusible at the smelting temperature of the ore. The containers and their contents are placed bodily on the hearth of an open-hearth furnace and the whole melted down and treated for the production of iron and steel of the required character. The containers may be inserted through the side doors of the furnace, but a claim is made for charging them vertically through openings in the roof, the said openings being provided with conical or tapering cup linings and kept airtight with suitable iron covers or caps.—A. W.

Iron; Introduction of Carbon and Fluxes and Mixtures of Carbon and Fluxes into Blast Furnaces in the Manufacture of ——. W. J. Foster, Darlaston. Eng. Pat. 4147, Feb. 26, 1901.

In the manufacture of iron from ore in the blast furnace, solid carbon is heated or superheated in a suitable outside retort or retorts to at least the temperature of the hot blast, and is injected by and with the blast through the tuyères into the furnace. The retorts are so arranged as to discharge the heated carbon into the blast mains or trunks feeding the tuyères, and may also be used in conjunction with a cold blast. Fluxes or fluxes with carbon may be similarly heated and introduced into blast furnaces through the tuyères, the temperature to which they should be previously heated being at least 1,000° F.—A. W.

Gold from Sea-Water; Extraction of ——. [*Amended Specification.*] H. C. Bull and A. Watling, London. Eng. Pat. 14,097, July 8, 1899.

A quantity of milk of lime sufficient to precipitate the gold is mixed with the sea-water as it flows into a tank; this reacts upon the iodide of gold present in the sea-water so as to form iodide of calcium and free gold. The gold settles

in the sludge formed by the reaction, which is removed from time to time for separate treatment by amalgamation or other suitable methods.—J. H. C.

Telluride Gold Ores; Treatment of ——. W. Pethybridge, London. Eng. Pat. 4375, March 1, 1901.

The process is for the decomposition of telluride of gold in ores, and for the recovery of the tellurium and gold by the following treatment, claimed in parts and as a whole:—The pulverised ore is treated with a solution of ferric sulphate alone, which dissolves the tellurium and sets free the gold. The solution is separated from the residue by filtration, and the tellurium precipitated by metallic iron and boiling, the solution of ferrous sulphate then being oxidised by potassium chlorate or by other means into ferric sulphate for re-use. The auriferous residue is treated in any known manner for the recovery of the gold.—A. W.

Copper; Recovery of Metallic ——, *from Copper Precipitate.* D. McKechnie and The United Alkali Co., Ltd., both of Liverpool. Eng. Pat. 5693, March 18, 1901.

The copper precipitate is moulded into bricks, briquettes, or the like, which are dried and charged with the fuel into a cupola or blast furnace, to be smelted therein. The molten copper and slag produced run from the cupola through a short passage direct into a reverberatory furnace, which keeps back the slag and allows the copper to pass to the outlet or into a refining furnace. The slag is held back in the reverberatory furnace by a wall built across the interior, with a passage or space below to allow the copper to flow under, and a passage above to permit the flames to pass over, the exit for the metal being on one side of the wall and for the slag on the other.

The gases from the top of the cupola are led into a dust-separating chamber, and thence to a scrubber or scrubbers so as to recover the copper dust and copper salts from the same, and a claim is made for the cupola, dust chamber, and scrubber to work in combination with the said process of copper recovery.—A. W.

Squirting Heated Metals; Apparatus for ——. A. K. Huntington, London. Eng. Pat. 17,289, Sept 4, 1899.

The object of this invention is to construct a cylinder for metal-squirting at high temperatures in such a manner that, while it has the necessary strength to withstand the internal pressure, it has also sufficient freedom to allow for expansion. The apparatus consists of an inner cylindrical lining provided with a plunger and surrounded by a series of perforated annular plates standing within an outer cylindrical casing; the perforations of the plates being aligned to form continuous channels from end to end, thus serving as ducts for the passage of heating or cooling liquids whereby the temperature of the cylinder wall can be controlled throughout.—J. H. C.

Furnaces for Heating Drills and the like by Means of Liquid Fuel or Gas. D. Laird, Forfar. Eng. Pat. 10,155, June 1, 1900.

The furnace proper consists of a channel, the top and bottom surfaces of which are inclined so as to deflect the flame towards the back of the furnace, and having a closed combustion chamber at one end, the mouth of which has converging surfaces for deflecting the flame through the surface in a zigzag direction. The claims also include the combination of this furnace with a table on which the drills are laid, and a pusher for moving them along, which has a greater movement at one end than the other; and also a passage behind the furnace for heating the air supply.

—W. C. H.

Smelting Furnaces. A. Spies, Seigen, Germany. Eng. Pat. 17,659, Aug. 31, 1899.

Sieves, nets, screens, or other devices moistened with water are arranged horizontally, vertically, or obliquely at the mouth of the furnaces, so as to cool the escaping gases, thereby ensuring their more perfect combustion.—J. H. C.

Melting Furnaces. F. H. Cartland, Birmingham. Eng. Pat. 5,478, March 15, 1901.

The flames from an ordinary rectangular fire-place pass through a perforated wall on one side of it to a second chamber, in which a rectangular melting pot rests upon a perforated fire-brick. The flames pass completely around the pot and through the perforated brick below, and thence pass to an outlet flue on the opposite side to the entrance. The exit flue is provided with a damper, and may also have a checkered or perforated wall adjoining the melting-pot chamber. Removable slabs are placed over the fire-place, the pot, and the outlet flue, so that easy access may be had to each part.—R. S.

Furnaces; Melting ——. H. J. J. Charlier, Philadelphia, U.S.A. Eng. Pat. 22,627, Nov. 9, 1901.

The furnace for melting copper alloys, &c., consists of a body acting as a storage chamber, preferably horizontal and cylindrical, and is mounted to turn on its horizontal axis by means of trunnions at either end. One or both of the trunnions may be hollow, so that fuel, as vapour or gas, can be supplied through them to the interior of the said chamber. The furnace is also provided with a hopper which receives the metal to be melted, and through which the products of combustion escape from the chamber, thus heating the fresh charge. A lateral opening, through which the metal can be poured by rotating the chamber, is also provided. If both trunnions are hollow, the furnace is mounted on shoes, and the hopper is placed in the top centre. If open at one end only, the closed end is held on a pivot shaft or spindle with a fixed bearing, whilst the hollow end is suspended on and revolved by a chain running over a pulley, the hopper in this case being near the end farthest from the fuel supply. The neck towards the hollow trunnion is contracted, so as to meet the full effect of the flame from an external nozzle protruding and discharging through the same. The said nozzle consists of an air supply pipe with a hydrocarbon supply pipe terminating therein, both pipes having hinged sections, so that their ends can be turned away from the furnace to gain access to the neck.—A. W.

Furnaces [Annealing, Tempering, &c.], Burning Naphtha Residue. C. Spiegel. Eng. Pat. 1999, Jan. 29, 1901.

See under II., *page* 330.

Metallic Alloys for Dental Purposes. T. Dill, Liestal, Switzerland. Eng. Pat. 26,376, Dec. 24, 1901.

The claim is for "metallic alloys in the form of pills, tablets, or the like, for use for dental purposes, consisting of powdered or finely-divided metal particles compressed, without the addition of a binding material, to an aggregated form in which they remain until they are mechanically disintegrated, when required for filling purposes.—A. W.

Alloy [Copper, &c.]; Improved ——. J. S. Wolfe, L. K. Englert, and T. J. Geiger, all of Catasauqua, U.S.A. Eng. Pat. 14,266, July 12, 1901.

The claim is for a composite metal composed of copper, tin, iron, and salt, in the specified proportions of 83, 4, 6, and 5 parts respectively. The copper and iron are melted separately, added together, and the tin and salt added to the mixture previous to stirring and casting.—A. W.

United States Patents.

Minerals or Ores; Process of Disintegrating and Comminuting ——. E. L. Graham, Upper Warlingham, Surrey (Eng.). U. S. Pat. 689,959, Dec. 31, 1901.

See Eng. Pat. 14,291, 1900; this Journal, 1901, 1221.

—W. G. M.

Ores; Process of Treating Metallic ——. S. G. C. Currie, Manhattan, N.Y., U.S.A. U.S. Pat. 690,361, Dec. 31, 1901.

The ore is laid on a filtering medium placed on a false bottom within a vat. Communicating with the space

beneath the false bottom is a pipe with an outlet cock at one end, and with inlet valves connecting, each with a reservoir containing a suitable liquid. For example, there may be four such reservoirs, each with its own valve, one containing water, two sodium hypochlorite solutions of different strengths, and the fourth an acid. By means of this apparatus, ore may be leached with water, or treated with solutions of different kinds and of different strengths or degrees of acidity. A pump is so connected at one side of the vat, that the liquid beneath the false bottom may be constantly raised and discharged into the vat above the layer of ore, or *vice versa*, so that circulation may be effected in either direction.—W. G. M.

Reducing Ores; Process of ——. H. Niewerth, Berlin. U.S. Pat. 692,539, Feb. 4, 1902.

The ore to be reduced is crushed and heated; a heated reducing gas obtained from a carbonaceous material is then forced through it; the resulting decomposed gas is regenerated by passing it through a second mass of heated carbonaceous material, and again made to pass through the ore until its reduction is complete.—J. H. C.

Ores [Cu, Ni, Fe, &c.]; Separating Process for ——. O. Frölich, Charlottenburg. Max Huth, and A. Edelmann, Berlin. U.S. Pat. 692,008, January 28, 1902.

The ore, containing iron and other metals in a combined form, is heated to a temperature of from 500° to 1000° C., and a heated mixture of sulphur dioxide and air or oxygen passed over it, whereby the two gases by the aid of the oxide of iron are converted into sulphur trioxide and combine with the oxides of the other metals and form sulphates, which sulphates decompose again at different higher temperatures. If the ores are pyritic, they are first roasted sweet and any sulphate leached out, thus leaving the metals as oxides. The process is claimed for the extraction of one, or the separation of two or more metals from the same ore by first heating the ore to a temperature below the decomposition point of the sulphate of the metal to be sulphated, but above the decomposition point of the sulphates of the other metals, then passing over it the heated mixture of gases and leaching out the sulphate so formed with water. The operation is repeated at a lower temperature to obtain the sulphate of the next metal and so on. Thus an iron pyrites containing copper and nickel is roasted, and the oxides are treated in the above manner, first at a high temperature at which only the nickel sulphate remains undecomposed, which is then leached out practically free from the other metals. The residue is then similarly treated at a lower temperature, at which the copper sulphate remains undecomposed, this salt being afterwards leached out, when the solution contains practically copper only. The heated mixture of sulphur dioxide and air is preferably dry.—A. W.

Metals; Extraction of ——, *from Sulphide Ores by Treatment with Chloride of Sulphur and Electrolysis.* J. Swinburne and E. A. Ashcroft, both of London. U.S. Pat. 691,822, January 28, 1902.

See Eng. Pat. 17,611, 1900; this Journal, 1901, 907.
—A. S.

Steel Process; Open-Hearth ——. J. L. Smith and R. Bedford, jun., Eaglescliffe, Durham, Eng. U.S. Pat. 691,297, January 14, 1902.

See Eng. Pat. 13,299, 1900; this Journal, 1901, 724.
—W. G. M.

Pig Iron; Manufacture of ——. J. A. Potter, Camden, New Jersey, U.S.A. U.S. Pat. 693,062, Feb. 11, 1902.

A bath of molten pig-iron is formed upon one portion of a continuous revolving hearth, and beneath this successive additions of iron ore and basic and flux material are carried, portions of the molten bath being removed from time to time.—J. H. C.

Precious Metals from their Ores; Process of Extracting ——. H. Davis, Dayton, Nevada, U.S.A. U.S. Pat. 692,634, Feb. 4, 1902.

The metals are converted into chlorides by the application of chlorine gas or chlorine water to the crushed ore; any excess of chlorine may be removed by forcing air through the mixture or by other suitable means; the metals are then dissolved out by a solution of alkali cyanide and subsequently precipitated by any suitable method.
—J. H. C.

Ores [Gold and Silver]; Process of Treating ——. E. B. Parnell, Carshalton, Surrey. U.S. Pat. 693,148, Feb 11, 1902.

The crushed ores are oxidised by the action of chromic acid, then roasted—the free acid neutralised if necessary—and finally boiled in water under pressure, so as to dissolve out the soluble constituents and leave the gold and silver free.—J. H. C.

Copper; Process of Extracting ——, *from Ores.* G. H. Waterbury, Denver, Colorado, U.S.A. U.S. Pat. 689,835, Dec. 24, 1901.

The ore is leached with acid, or suitable solvent, in a tank so arranged that a current of hot air is forced, preferably through a horizontal coil of perforated pipe, close to the bottom of the vat. The copper solution is then run into another vat, provided with a similar coil, and here it is subjected to the precipitating action of a mass of loosely-stacked iron, while a current of hot air is constantly forced in from below. The action of the hot air is found greatly to expedite the precipitation.—W. G. M.

Sodium Amalgam: Process of Making ——. E. B. Smart, Florence, Colorado, U.S.A. U.S. Pat. 689,926, Dec. 31, 1901.

Paraffin is melted and heated to about 130° C. in a porcelain or agate-ware vessel; one part by weight of sodium is then added, and the mixture is maintained at 130° until the metal has completely melted into globules, whereupon 53 parts by weight of mercury are added, the paraffin is decanted off and the mercury and sodium are stirred together until the amalgam is cool. The amount of paraffin used must be sufficient to cover the sodium when melted. Potassium amalgam may be prepared in the same way.—W. G. M.

Zinc from Waste Products of Roasted Pyrites; Process of Extracting ——. C. Kellner, Vienna. U.S. Pat. 690,295, Dec. 31, 1901.

See Eng. Pat. 7028, 1900; this Journal, 1901, 367.
—W. G. M.

Zinc; Process of Recovering ——, *from Sulphide Ores.* H. F. Kirkpatrick-Picard, London. U.S. Pat. 692,148, Jan. 28, 1902.

See Eng. Pat. 2151, 1900; this Journal, 1901, 130.—A. S.

Lead and Zinc Fume; Furnace for Refining ——. F. L. Bartlett, Colorado, U.S.A. U.S. Pat. 692,972, Feb. 11, 1902.

A flat hearth or retort is employed, having a feed opening at one end and a discharge opening at the other, a fire-box on each side of the discharge opening below the level of the hearth, and flues leading from the fire-boxes to the hearth and bridge walls. The raw fume is passed to the retort through externally-heated pipes, together with air or sulphur dioxide, while continually stirring and scraping the fume from the walls of the retort. The effect of this process is to remove the carbonaceous matter, reduce the sulphates and sulphides, and to volatilise the arsenic and other volatile impurities, leaving pure zinc and lead in the form of stable compounds, suitable for a white pigment.—J. H. C.

Lead Ores; Process of Obtaining Metallic Lead from ——. A. Germot, Asnières, France. U.S. Pat. 690,520, Jan. 7, 1902.

See Eng. Pat. 23,014, 1899; this Journal, 1900, 154.
—W. G. M.

Tin; Process of Regaining ——. P. Bergsöe, Copenhagen, Denmark. U.S. Pat. 691,101, Jan. 14, 1902.

See Eng. Pat. 7026, 1900; this Journal, 1901, 368.
—W. G. M.

Blast-Furnaces Gases; Apparatus for Cooling and Cleansing ——. B. H. Thwaite, London. U.S. Pat. 690,795, Jan. 7, 1902.

The blast-furnace gases are led by a large flue to the bottom of a long closed chamber divided transversely by partitions communicating with one another only by large apertures alternately at the top and the bottom of successive partitions, so that the gases flow through the compartments by a zig zag course, escaping by a main at the other end of the chamber. The bottom of the chamber is sloping, and is covered with a fairly deep layer of water, an outlet being provided at the lowest point for the removal of mud or sludge. Above the chamber is a second smaller chamber divided into compartments corresponding with those below, but not communicating with them. A number of vertical pipes closed at the bottom depend from the upper compartments within the lower ones, and within each of these pipes is an inner pipe open at the bottom. These are so connected with the upper chamber that air passing in at one end of the chamber is caused to pass out of one (upper) compartment into the inner tubes of the upright pipes within the next (lower) compartment; passing to the bottom of these, it escapes into the annular space between the pipes, and so into the upper compartment, whence it is conveyed to the next series of pipes, and so on to the end. The direction of the gases in the lower chamber is opposite to that of the air in the upper compartments. The gases and air are, of course, never allowed to commingle. Scrapers, with mechanism for operating them, are provided to cleanse the exteriors of the vertical pipes.—W. G. M.

Alloy. G. W. Gesner, Brooklyn, U.S.A. U.S. Pat. 692,198, Jan. 28, 1902.

The claim is for an alloy of iron, hydrogen, and copper, made by fusing the alloy of iron and hydrogen with the copper in varying proportions, according to the strength and hardness required.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO CHEMISTRY.

Daniell's Cell; Variations of Electromotive Force and Temperature Coefficient in the ——, *with the Concentration of the Zinc Sulphate.* J. Chandier, Comptes Rend., **134**, [5], 277—279.

The following figures were obtained in a Daniell's cell composed of two separate glass vessels, joined by a glass siphon filled with cotton, wetted in one limb with the zinc sulphate, and in the other with the copper sulphate used in the cell. The latter was in all cases a saturated solution:—

$ZnSO_4$ per 100 H_2O.	E.M.F. at 15° C. volts (e).	Temperature-Coefficient $\left(\frac{de}{dT}\right)$.
0	1·0570	− 0·00240
½	1·1138	− 0·00015
¾	1·1151	− 0·00013
2	1·1368	+ 0·00005
1	1·1331	+ 0·00005
2	1·1263	+ 0·00030
4	1·1249	+ 0·00030
6	1·1208	+ 0·00016
10	1·1188	− 0·00003
30	1·1054	− 0·00020
60	1·1003	—
200 (saturated)	1·0902	− 0·00026

The maximum E.M.F. at ½ per cent., and the variation of the temperature-coefficient through two null-points near ½ per cent, and 7 or 8 per cent., are visible from the table. If these experimental results be inserted in Nernst's formula—

$$e = KT\left(\log\frac{P}{p}\log\frac{P'}{p'}\right) + T\frac{de}{dT},$$

where P, P′ are the solution—pressures of the two metals in their respective sulphates, p, p', the osmotic pressures of the respective metallic ions, it is found that the solution-pressure of zinc diminishes rapidly in very dilute solutions; while the same results in Lord Kelvin's formula—

$$e = KW + T\frac{de}{dT},$$

show that W (the heat evolution due to the actions in the cell) does not always vary in the same sense as the variation of concentration—there is a minimum at 4 per cent.
—J. T. D.

Solutions; Transport Number of very Dilute ——. B. D. Steele and R. B. Denison. Proc. Chem. Soc., **18**, [246], 29.

The object of this research was to see if it were possible to obtain by the investigation of sufficiently dilute solutions, a value for the transport number for solutions of salts such as calcium chloride, which would result in a constant specific ionic velocity when calculated from different salts of the same cation, thus bringing these salts into line with others, such as potassium chloride, to the ions of which definite specific velocities can be assigned. In order to test this question, it was first necessary to develop a method by means of which the transport number could be determined for very dilute solutions. The method employed is a simple modification of that originally used by Hittorf and lately modified by Noyes; it permits of the electrolysis of a practically unlimited volume of solution being carried out in a vessel of reasonable size.

Measurements have been made for calcium chloride, nitrate and sulphate, and for potassium chloride, in concentrations of 1 grm. equivalent in 250 litres; and, by combination of the transport numbers found with the conductivity at infinite dilution, identical values are obtained for the velocity of the chlorine ion from solutions of the calcium and potassium salts, and for the calcium ion from solutions of the chloride and nitrate. The velocity of the calcium ion, calculated from measurements of calcium sulphate solution is, however, about 3·5 per cent. higher. The transport number of potassium chloride agrees with the best determinations made in solutions up to 1/10 normal, and confirms Kohlrausch's assumption that this remains constant with further dilution.

English Patents.

Electrodes or the Wires or Conductors connected thereto in Electrolytic Cells, Meters, or other Electrolytic Apparatus —— The Bastian Meter Co. and C. O. Bastian, London. Eng. Pat. 21,228, Nov. 23, 1900.

The overheating or melting of the electrode conductors at the upper surface of the electrolyte in electrolytic electricity meters, electrolytic cells or other electrolytic apparatus, may be obviated by preventing the access of air or other gas to one or both of the conductors at such point. This may be effected by insulating one or both of them locally, *i.e.*, at the point where they enter the surface of the electrolyte, or by a local enlargement at the same point.
—G. H. R.

Anodes; Nickel ——. A. F. Harris, Walsall. Eng. Pat. 6102, March 23, 1901.

The anode is composed of a wrought nickel metal back or support, to which is affixed a front surface of cast nickel having projecting cones or the like.—G. H. R.

Alkaline Earths; Electrolytic Preparation of the Bases of ——. A. Broehet and G. Ragson, Paris. Eng. Pat. 1849, Jan. 26, 1901.

A mixture of the sulphides of the alkaline earths with chlorides is electrolysed, whereby the hydrate of the alkaline earth is formed at the cathode, and sulphur is deposited at the anode without evolution of chlorine. A diaphragm

is employed, and the cathode liquid consists of an aqueous solution of soluble chloride. An insoluble anode of carbon is immersed in a concentrated aqueous solution of the alkaline earth sulphide with the addition of a soluble chloride, and the concentration must not fall below approximately 90 grms. of the former per litre. The sulphur deposited at the anode combines with the excess of sulphide to produce a solution of polysulphides rich in sulphur. If a soluble anode of iron is employed, a metallic sulphide will be recovered in the anode compartment, mixed more or less with sulphur according to the richness of the anode solution in it.—G. H. R.

Ozonising Apparatus. A. Vosmaer, Haarlem. Eng. Pat. 5826, March 19, 1901.

Two separate electrodes are employed, one of which, the discharger, has pins or points connected by insulating supports to a metal bar which constitutes the other electrode, in such a way that the two electrodes form a complete removable arrangement, independent of the box or casing containing them. The insulating supports keep the dischargers at the requisite distance from the metal bars, and tubes are arranged horizontally in which the bars supporting the dischargers are introduced.—G. H. R.

Electric Furnaces and the Production of Chemicals [Bisulphide of Carbon] in such Furnaces. G. Brewer, Leeds. From E. R. Taylor, New York, U.S.A. Eng. Pat. 25,182, Dec. 10, 1901.

The furnace comprises a base, body walls and a dome, and a metallic shell common to all. A working chamber, whose lower part constitutes the ashpit, is within the base walls in which are located passages which extend downwards and discharge above and on the electrodes which are opposed to each other within the chamber, and are connected by conductors to a suitable supply of electricity. Pipes communicate with the passages at the top, and supply them by gravity with carbon fragments to direct and and regulate the electric current. The electrodes which are composed of body portions and conductor rods, pass through openings in the metallic shell which are surrounded by metallic frames attached externally to the shell. Metallic closure plates are also attached externally to it, and have means for sealing the conductors and are insulated to prevent leakage of electricity. Pipes extending downwards, discharge fusible material on to the conductor rods to cool them. The working chamber is supplied with material for treatment through passages communicating with it within the surrounding walls, so that when filled with fusible material, the passages form a non-conducting jacket for the furnace and act as heat economisers. A charcoal chamber in the body walls is in connection with the working chamber, and sulphur passages extend downwards through the walls. Means are provided for introducing the materials into the charcoal chamber and into the sulphur passages at the top, and ducts connect the latter at the bottom with the working chamber, while suitable pipe connections lead from the dome, whereby the gaseous products may be removed and collected. In operation the charge is introduced into the furnace, and a suitable electric current passed through it by means of relatively permanent electrodes. Fragmentary conducting material is continuously fed on them and between them and the charge, and the electric current is regulated by it. The improvement consists in fusing in contact with the electric conductors fusible material on its way to the interior of the furnace, thereby cooling the conductors. The fusible material is gradually melted for a given reaction outside the wall of the working chamber by heat of the furnace which would otherwise be lost by radiation, and it is then combined with less fusible material within the chamber. Carbon bisulphide can be continuously produced by feeding carbon and sulphur continuously into the working chamber and towards the heat zone, and there passing a suitable current through the charge until the reaction is effected, when the CS_2 vapour is carried off and condensed. The electric current can be regulated by feeding a non-conducting liquid, such as melted sulphur into contact with more or less of the working surface of the electrodes. The path of the current through the furnace may be changed occasionally to burn out any piers of the charge that may prevent its regular descent, and to prevent the formation of such piers.—G. H. R.

Battery; Electric ——. T. F. Bain and J. O. Hunt, both of Cairo, Ill., U.S.A. Eng. Pat. 26,729, Dec. 31, 1901.

In order to prevent the creeping of liquid over the edges of a battery cell, the elements are so disposed that they are supported entirely from the bottom, and are not in any way supported from the upper edge. The copper (or negative) electrode is conical, its base resting on the bottom of the cell, and a vertical copper wire is attached to the cone at the base, extending upwards to form the positive pole. Into the apex of the cone is fitted a vertical rod of wood or hard rubber, with a copper sleeve and flared hood over the lower portion of the rod and the upper portion of the cone. To the top of this non-conducting rod is attached the zinc (or positive element), circular in shape, with four radial slots cut right through the metal (nearly, but not quite to the central hole) at right angles to one another. The sector-shaped pieces of zinc between the slots are not flat, but are so shaped that the lowest point is at the circumference halfway between successive slots, the metal sloping upwards in all directions from this point, to facilitate the flow of liquid from the zinc, when the latter is lifted out of the liquid. A central vertical stem attached to the zinc forms the negative pole of the battery.—W. G. M.

United States Patents.

Carbides; [Electric] Process of Producing ——. J. L. Roberts, Brooklyn, New York. U.S. Pat. 690,319, Dec. 31, 1901.

A mixture of unslaked lime and carbon ground together in suitable proportions, which may or may not be moulded by the use of bitumen or other binding material into sticks, is fed into a V-shaped space between two flat electrodes. These electrodes swing on their upper ends, and may thus be drawn apart more or less at the lower ends. When starting work, a feeble current is used and the lower ends are in contact; these ends are then gradually drawn apart and the strength of the current is increased until the ends of the electrodes are at a white heat. The mixture of lime or other oxide and carbon, which passes between them is converted into carbide, which in a fused state drops into a space below, from which it is from time to time withdrawn through a valve.—J. A. B.

Fluorine; Apparatus for Producing [by Electrolysis] ——. M. Meslans, Paris. U.S. Pat. 692,688, Feb. 4, 1902.

See Eng. Pat. 21,557, 1900; this Journal, 1901, 259.—F. S.

Insulating and Packing Material and Process of Manufacturing the same. M. Raphael and L. Elias, both of Breslau, Germany. U.S. Pat. 691,871, Jan. 28, 1902.

See Eng. Pat. 16,010, 1900 (this Journal, 1901, 582).
—W. C. H.

Chlorates and Perchlorates; Electrolytic Manufacture of ——. P. L. E. Lederlin. U.S. Pat. 693,035, 1902.

See under VII., *page* 346.

Electrolytic Cell. [Decomposition of Alkali Salts.] E. A. Le Sueur, Maine, U.S.A. U.S. Pat. 692,531, Feb. 4, 1902.

The cell contains an anode and a cathode which consists of a horizontal amalgated reticulated or foraminated metallic sheet or wire gauze, one side of which receives the alkali metal, and is in contact with the solution to be decomposed, while the other side discharges the metal into a body of water. Means are provided for supplying fresh mercury to the sheet so as to maintain it free from impurities.
—G. H. R.

Positive Electrode for Accumulators with Constant Electrolyte. E. W. Juogner, Stockholm. U.S. Pat. 692,298, Feb. 4, 1902.

The active material is formed by mixing finely-divided silver, or silver compounds, with chloride of silver, com-

pressing and drying the mixture on a suitable grid, and heating the mass to fuse the silver chloride. The chlorine is removed by using the material as cathode in an electrolytic cell containing an alkali-metal hydrate bath, and the resulting silver is then oxidised by using it as an anode in a similar cell and solution.—G. H. R.

Primary Battery. J. W. Frees, Reading, Pennsylvania. U.S. Pat., 693,001, Feb. 11, 1902.

A POROUS receptacle, open at the top, is placed in a lead casing or jar which is also uncovered, and the interspace between the two is filled with pulverised lead chloride. A corrugated zinc plate stands in the receptacle in contact with a small quantity of mercury at the bottom of it, and is surrounded by a solution consisting of hydrochloric acid, and a chloride of an element whose oxide unites with water to form a hydrate. The solution is covered with paraffin oil to prevent evaporation.—G. H. R.

Voltaic (Dry) Cell. W. McA. Johnson, Cambridge, Massachusetts. U.S. Pat., 693,274, Feb. 11, 1902.

THE cell, which is hermetically sealed, contains one electrode of zinc, and the other is formed of several layers of oxidised copper gauze. The electrolyte consists of an alkaline solution and of a salt capable of forming a soluble double salt with zinc.—G. H. R.

FRENCH PATENT.

Bleaching Cotton and other Fibres by means of Electrolysed Solutions; Apparatus for ——. C. Martin. Fr. Pat. 311,580, June 8, 1901.

See under V., *page* 342.

(*B.*)—ELECTRO-METALLURGY.

ENGLISH PATENTS.

Metals; Electrolytic Deposition of ——. [*Sprayed Electrolyte.*] H. C. Harrison, Putney, and J. Day, Weston-super-Mare. Eng. Pat. 23,647, Dec. 27, 1900.

THE rapid electro deposition of tough homogeneous metal with smooth surface, is effected with high current density by employing a revolving cathode of circular cross section, around which is arranged the anode in elements consisting of one or more anode bars. Surrounding the cathode concentrically, and between it and the anode, is a series of pipes spaced equidistant from each other, and provided with holes or nozzles in such a way that they may direct the jets of electrolyte issuing from them in a direction tangential to the surface of the cathode, and so that the greatest action of the jets on the cathode takes place at those points on it nearest the elements of the anode where the resistance between the electrodes is least, and consequently the current density is greatest. By revolving the cathode, a rapid and continuous change of the electrolyte, immediately contiguous all round its surface, is effected. —G. H. R.

Metals and Alloys; Impts. in the obtaining of——, *and in Furnaces to be employed therein.* C. A. Keller, Paris. Eng. Pat. 24,234. Under International Convention. July 6, 1901.

A COMBINATION of two electric furnaces is employed, one at a higher level than the other, the former serving to produce the metal, and the other for its refining or further treatment. The lower furnace may be of the type described in Eng. Pat. 22,584, 1900. The electrodes are in two groups, the electrodes of each being in parallel, while the two groups work in series, the number of the electric foci thus formed being equal to the number of the electrodes, and the arrangement of the foci being such that the substances being treated which are charged between the electrodes, act as intermediate conductors between the two groups. The electrodes are arranged at the angles or sides of a figure circumscribing the section of the charging column, so as to leave a space between the face of the electrodes into which the substances to be treated are introduced, thus enabling the latter to be supplied and subjected to the action of the foci, without their properties being altered by the carburation caused by the electrodes, and the verification of these components, after a trial tapping of the furnace, is therefore reliable. There is a passage around the wall of the charging column, and a communicating passage over the roof of the furnace proper, allowing the reaction gases to pass through and be treated in them before passing into a chamber at the bottom of the furnace, where the introduction of air effects the combustion of the gases, which assists the heating of the furnace and increases the thermal efficiency of the apparatus. A method is described by which, when tapping off the molten metal, it is acted on by long electric arcs having a powerful stirring effect and a high calorific action, so as to obtain simultaneously a reheating of the molten mass, a volatilisation of the impurities, and the elimination of the carbon.—G. H. R.

Iron; Methods of Coating ——, *with Tin, Lead, Spelter, or the like Metals.* H. V. Bertraud, West Bromwich. Eng. Pat. 14,046. July 10, 1901.

IRON articles can be coated with tin, lead, spelter or similar metals, by first cleaning them in any well known manner, and then immersing them in an electrolytic bath of salts of ammonia with swarf, with or without the addition of bromide of iron, employing iron anodes, and finally dipping them in the molten coating metal.—G. H. R.

Iron and Steel; Cementation or Hardening of [*by Electrical Means*] ——. P. M. Justice, London. From C. Davis, Washington, D.C., U.S.A. Eng. Pat. 22,233, Nov. 4, 1901.

CARBON electrodes, contained within air-tight insulated boxes, are placed close together over the surface of the iron to be carburised. These carbons are attached to the positive pole of a powerful electrical generator, the iron being connected to the negative pole; the time of the operation depends upon the depth of carburisation required. If preferred, a small section may be treated at a time, a spray of water being caused to play on the surface outside the box containing the electrodes, if required, to prevent the annealing of these parts by heat conducted through the metal. Another alternative is to cover the whole surface of iron to be carburised with fragments of carbon connected with larger positive electrodes contained within an air-tight box, packed (above the layer of carbon) with refractory material.—W. G. M.

Steel; Hardening [*Electrothermally*] ——. P. M. Justice, London. From C. Davis, Washington, D.C., U.S.A. Eng. Pat. 25,671, Dec. 16, 1901.

A CARBON block is suspended by springs within an air-tight insulated box, resting upon the surface of the steel to be hardened, in such a way that the greater part of the weight of the carbon is borne by the spring, and the surface is not in close contact with the steel. The steel rests on insulated girders, and is connected to the negative terminal of a powerful electrical generator, while the carbon is connected to the positive terminal. When the current is passed, the metal beneath the carbon is heated to the required temperature for quenching, the block and its air-tight cover are slid along the surface of the steel, to heat a fresh surface, and the part thus uncovered is quenched by means of a spray. The carbon may be supported in an insulating frame without a cover; or a number of separate carbon rods (covered) may be used to produce arcs between themselves and the metal; or, lastly, the metal (for example a steel rail) may be slid while the carbons are stationary. A carbon positive electrode is not essential, but is preferred, especially when the steel is to be carburised.—W. G. M.

Zinc; Obtaining ——, *by Electrolysis, and Apparatus for that Purpose.* L. Mond, London. Eng. Pat. 5764, March 19, 1901.

IN order to obtain zinc in a solid, instead of a spongy form, when deposited electrolytically, the cathodes are made cylindrical, two or more drums being pressed against each other by springs. The cylinders, preferably of slightly different diameters (to avoid synchronism during rotation),

are caused to revolve whilst the current is passing, and an axial reciprocating motion is also imparted to them, so that the zinc immediately after it is deposited on the cylinders becomes compressed while passing the successive lines of contact of the cylinder with those next adjoining. The cylinders may be rotated separately, or one or more may alone be revolved, the others being rotated by frictional contact with them. Similarly, the traversing action need not be imparted to each of the cylinders. The anodes are preferably shaped with corrugations corresponding to the contour of the cathode drums, so that the inter-electrode spaces are fairly uniform. Different arrangements of vertical and horizontal cathode cylinders are described and protected.—W. G. M.

Metallising Fabrics; [Electrolytic] Process for ——. C. and A. Danilevsky, S. Tourchaninoff and V. Timonoff. Eng. Pat. 5516, March 15, 1901.

See under V., *page* 341.

UNITED STATES PATENTS.

Ore; Machine for Extracting Metal from ——. A. I. Irwin, Cripple Creek, Colorado, U.S.A. U.S. Pat. 689,674, Dec. 24, 1901.

THE crushed ore is carried by a conveyor through a washing tank, and is then delivered into a shallow tank containing a suitable electrolyte. Through this tank it is carried on an endless horizontal band, so connected to the positive pole of an electric generator, that the moving mass of ore acts as an anode. A cathode is placed below each under-side of the travelling belt. The ore is taken out of the tank by a removeable conveyor placed along the upwardly-sloping end of the vessel. It is then passed over a guide plate into another electrolytic tank, or washing or other vessel.—W. G. M.

Floats for Steam or Water Traps; Process of Forming ——. W. F. Patton. U.S. Pat. 691,803, 1902.

See under I., *page* 326.

XII.—FATS, OILS, AND SOAP.

ENGLISH PATENTS.

Glycerin from Oils and Fatty Matters; Separating ——. G. Daooise and La Société Generale Belge de Deglycerination, Brussels. Eng. Pat. 11,074, May 29, 1901.

A SMALL proportion (say 5 per cent.) of the products of a previous separation is introduced before each operation. It is claimed that in this way the commencement of the reaction is greatly accelerated and that it is possible to obtain the glycerin and unaltered fatty acids under half the pressure (4½ to 5½ atmospheres) of that usually employed.
—C. A. M.

Soap Granulating Apparatus. O. Imray, London. From R. W. Cavenaugh, New York, U.S.A. Eng. Pat. 224, Jan. 3, 1902.

THIS apparatus consists of a cylinder provided with toothed blades revolving in a casing and meeting the soap which is introduced into a feeding tube fixed above the casing. After being cut, the soap is discharged in fine granular particles through an opening below the blades. Claim is also made for the inclination of the teeth of the different cutting blades in opposite directions, and for the use of a weight to press down the soap in the tube, and a central guiding rod with a head, to prevent the weight sinking too far.
—C. A. M.

UNITED STATES PATENTS.

Oils; Process of Refining [Rape-Seed and other "Sweet" Oils]. F. Linde, Dortmund, Germany. U.S. Pat. 692,157, Jan. 28, 1902.

SEE Eng. Pat. 13,201; this Journal, 1901, 591.—C. A. M.

Oils; Process of Refining ——. J. N. Harris, South Norwood, Surrey. U.S. Pat. 692,283, Feb. 4, 1902.

SEE Eng. Pat. 9252; this Journal, 1899, 502.—C. A. M.

Oil, Vegetable; Process of Obtaining ——. G. C. Warr, London and W. T. Wright, Wraysbury, Bucks, U.S. Pat. 692,743, Feb. 4, 1902.

SEE Eng. Pat. 22,602, Dec. 11, 1900; this Journal, 1902, 262.—C. A. M.

Soap Cake. W. E. Robinson, Malden, Massachusetts. U.S. Pat. 692,481, Feb. 4, 1902.

CLAIM is made for a soap cake consisting of a main portion of one kind of soap inclosing an intermediate layer of a harder soap, (*e.g.* pumice soap) which extends along one edge and partly across the ends of the cake. In use this intermediate layer wears down more slowly than the softer soap and projects slightly, so that it can be conveniently applied where required.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Prussian Blue, Soluble in Water; Preparation of a ——. J. Matuschek. Chem.-Zeit., 1902, **26**, [9], 92.

WHEN a mixed solution of potassium ferrieyanide (10·245 grms.) and oxalic acid (12·3 grms.) is evaporated on the water-bath, the colour of the liquid gradually changes from brown to blue, and a copious evolution of hydrocyanic acid is observed. The reaction proceeds slowly; but, by evaporating to dryness and taking up the residue in water, production of HCN will finally cease, and the whole of the ferricyanide be decomposed. The blue product is in a state of solution, not suspension; but on boiling the liquid for a long time and constantly making good the loss by evaporation, it eventually settles as a blue precipitate, leaving a clear supernatant liquor of a yellowish colour which contains a ferric salt. The precipitate cannot be washed on a filter with water, for its solubility therein increases as the washings become purer; it is, however, insoluble in alcohol, and may be washed with dilute spirit, for potassium ferricyanide is only insoluble in absolute alcohol. In order to ascertain the nature of the reaction taking place, and the composition of the blue substance, some of it was prepared and washed with dilute alcohol until the washings ceased to give a test for iron, although they still contained potassium hydrogen oxalate. The product was then dried at 100° C., and the iron and cyanogen in it determined. In two samples the Fe. was 32·53 and 34·06 per cent., the CN being 38·79 and 40·76 per cent. Potassium also was present in both cases; this was determined and calculated into potassium binoxalate, the yields being 19·33 and 15·64 per cent. respectively. These figures add up to 90·65 and 90·46 per cent., leaving 9·35 and 9·54 per cent., which represent six molecules of water. Therefore, according to the author, the blue obtained in the manner described, may be considered as a "Prussian blue" having the composition $Fe_7(CN)_{18} + 6H_2O$, and the whole reaction between the ferricyanide and the oxalic acid may be represented thus:—

$$7[Fe_2(CN)_6.6KCN] + 42C_2O_4H_2 + 3H_2O = 2Fe_7(CN)_{18} + 42C_2O_4HK + 48HCN + 3O.$$

On mixing a ferric solution with an excess of ferrocyanide, or a ferrous solution with an excess of ferricyanide, a water-soluble Prussian blue is also formed, but this contains four molecules of water when dried in the air, and 1¾ molecules when dried *in vacuo*. On treatment with alcohol, such a blue eventually becomes insoluble in water, but $Fe_7(CN)_{18} + 6H_2O$ remains soluble in water, even if treated with spirit for a day. At 105° C. the latter gradually loses water, and changes to a brown colour, which is due to separation of ferric oxide.

When a solution of ferrieyanide is mixed with the proper quantity of oxalic acid and the whole is exposed to direct sunlight, the liquid begins to appear blue-violet, and after a time the front of the flask, but not the back, is coated with a precipitate which exhibits a fine brownish-violet

colour by reflected light. By reflected light the liquid also looks brown-violet, and by transmitted light emerald-green. Only light or warmth induces this decomposition, the oxygen of the air playing no part in it.

(See Parry and Coste, Analyst, 1896, **21**, 225; this Journal, 1897, 263. Also Leeds, Analyst, 1897, **22**, 9, for the composition of commercial "Prussian blue.")—F. H. L.

Printing Colours; Determination of the Covering Power of ——. E. Valenta.

See under V., *page* 339.

ENGLISH PATENTS.

Sulphate of Lead Pigment; Manufacturing a White ——. J. B. Hannay, Dumbartonshire, N.B. Eng. Pat. 2297, Feb. 1, 1901.

Two methods of preparing lead sulphate, of a sufficiently good colour to be useful as a pigment, from galena by high temperature processes are known. In one, air is blown through incandescent coke and galena so as to produce a mixture of lead sulphide vapour and carbon monoxide, which is subsequently oxidised by air in a separate vessel; in the other, galena is fused in a crucible and oxidised by a current of air. The first has the defect that some of the lead sulphate already formed, may be reduced by the CO, causing the product to have a bad colour; the second is practically impossible, because molten galena cannot be handled in the manner described without occasionally breaking the crucible. In the present process, galena is melted on slabs of coke, which act mainly as "wicks" or shelves, and then oxidised by air, the necessary heat coming principally from the combination of the lead sulphide with oxygen. In this way reduction to the metallic state is avoided, and the consumption of coke is only 28 lb. per cwt. of galena, instead of six times that amount in the former processes. A vertical cylindrical furnace is fitted with a basic lining. Its bottom is an iron plate covered with coke breeze. On this is arranged a thick layer of coke in the form of long slabs. Twenty inches below the top of the coke are tuyères for the admission of air, and further up the furnace are other air apertures; the apparatus, however, works at a diminished pressure, owing to the suction of a fan placed in a subsequent part of the plant. Near the top of the furnace is an inclined feed hole for the galena, which is introduced mechanically in small quantities and spread over the coke. It then fuses, wets the coke slabs and burns to lead sulphate in the current of air. Rather more galena is fed in than the air can oxidise, the excess melting and protecting the coke from oxidation, and afterwards sinking into the breeze, where it collects the silver, &c. of the ore; but the air inlets higher up the furnace ensure the oxidation of all the vaporised sulphide, as well as that of any CO, so that the final product contains nothing but oxidised materials and an excess of oxygen (which is essential). From the furnace the fume is aspirated through a dust-box and a set of vertical condensers to the fan, whence it is driven into hoppers fixed over the barrels in which the pigment is ultimately packed. The upper parts of these hoppers communicate with a chamber in which hang a large number of cylindrical bags, and the uncondensed fume is made to pass through the material of the bags from outside to inside. These bags are suspended so as to be capable of agitation. All the condensers are made of sheet metal, in order that deposited sulphate may be loosened by striking them; and they are provided with doors for recovering the yield. The furnace itself is fitted with a vertical chimney shaft, and the outlet to the condensers is protected with a damper; by this arrangement it is fired up in the ordinary way, the shaft being afterwards closed.

—F. H. L.

White Pigment; Composition for use as a ——, *Painter's Filling and the like; and Process of Manufacturing the same.* B. J. B. Mills, London. From the Internat. Chem. Co., Jersey City, U.S.A. Eng. Pat. 21,546, Oct. 26, 1901.

THE pigment claimed consists of $Zn(OH)_2 + BaSO_4$, and may be prepared either by mixing solutions of barium hydroxide and zinc sulphate in molecular proportions (see U.S. Pat. 689,882; this Journal, 1902, 263), or by the following process. A quantity of one of those ores which consist essentially of the sulphides of lead and zinc is finely powdered, mixed with six or seven parts of sodium bisulphate and roasted at such a temperature that the ferrous sulphate first formed is decomposed. The product on being leached with water, yields an insoluble residue of lead sulphate and ferric oxide (which can be treated as may be desired), and a solution of zinc sulphate and sodium sulphate. The latter is then precipitated with the necessary amount of barium hydroxide solution. After the pigment has been filtered off, the solution of normal sodium sulphate may be reconverted into the acid salt by means of the sulphuric anhydride which is given off from the furnace as the ferrous sulphate is being oxidised into ferric oxide. The claims are for the pigment itself, and either process of manufacture, with or without the regeneration of the sodium hydrogen sulphate.—F. H. L.

Paints and the like; Compositions for Removing ——. E. Geoffroy, Brussels. Eng. Pat. 7258, April 6, 1901.

THIS is a mixture of wheat flour, water, caustic soda, caustic potash, black soap, American potash, lime water, ammonia, glycerin, and essence of mirbane, compounded in the manner specified. Special properties are ascribed to each of the ingredients separately. The composition is applied with a brush to the painted surface, and finally scoured off when the paint has become rotten.—F. H. L.

White Lead; Apparatus for Manufacturing ——. F. J. Corbett, South Yarra, Australia. Eng. Pat. 11,337, June 3, 1901.

APPARATUS is described whereby a weighed quantity of litharge and a measured quantity of a "solvent liquid" are automatically introduced into a carbonating chamber in which they are agitated in contact with carbon dioxide. From this chamber the product drops into one of a set of settling cylinders in which the clear portion of the liquid enters a floating siphon, and is thus removed; while the thick liquor is filtered through a bag. The solid residue then falls into a jacketed vacuum pan fitted with an agitator, where the last of the "solvent liquid" is distilled off, and the resulting dry white lead is incorporated with oil, to be run off into suitable receptacles. The vapours from this vacuum still, as well as the fluids from the settling cylinders, pass together through a condensing worm into a receiver at the base of the plant, whence by pumps the liquid is returned to a store tank overhead ready for use once more.

—F. H. L.

UNITED STATES PATENTS.

Red Lead Furnace. H. M. Gabel, Cincinnati, and T. E. Kearns, New Kensington, Pa., U.S.A. U.S. Pat. 689,868, Dec. 31, 1901.

THE furnace consists of a metallic cylinder, lined with refractory material, mounted with its axis horizontal, upon flanged wheels, which, on being rotated by bevel gearing, cause the cylinder to revolve upon its axis. Each end of the cylinder is closed except for a central aperture, that at the one end serving for the admission of the products of combustion from a furnace, which may be disconnected by withdrawing its supporting carriage resting on rails, and that at the other end connected with a flue leading to a chimney stack. Ports are provided at the firing end of the cylinder, through which air is blown, along with the furnace gases, into the rotating chamber. A charging door is provided in the middle of the cylinder, and a discharging door at the end. In use, the dross is charged in until the cylinder is about one-sixth full, and the cylinder is rotated at the rate of about one revolution per minute, until the colouring is complete, which is usually accomplished, with the charge of about two tons, in about 10 hours.—W. G. M.

Cellulose Lakes, and Process of Making Same. M. C. L. Althausse, Billwärder-an-der-Bille, Assignor to Fabrik Chemischer Präparate von R. Sthamer, Hamburg, Germany. U.S. Pat. 692,775, Feb. 4, 1902.

THE acetyl derivatives of hydrocellulose produced, according to U.S. Pat. 679,204, by reacting on cellulose with

chlorinated glacial acetic acid, are soluble in alcohol and acetone. They are not precipitated by water, but can be thrown out with salt. On mixing the concentrated solution with an alcoholic solution of Safranine G, for example, diluting with water, and then adding salt, a voluminous carmine coloured precipitate is obtained, which, after drying, is absolutely insoluble in water. The lakes thus obtained are valuable for printing cloth or paper, and can also be formed on the fabric by treating the latter first with an alcoholic or aqueous alcoholic solution of the acetyl hydrocellulose derivatives, and subsequently with a suitable dyestuff.—T. A. L.

(*B.*)—RESINS, VARNISHES.

United States Patents.

Protecting and Indurating Porous Materials; Compound for ——. A. Wolf. Paris. U.S. Pat. 692,961, Feb. 11, 1902.

See Eng. Pat. 15,204, 1901 ; this Journal, 1902, 56.

—F. H. L.

Zein [for Varnish]; Process of Extracting ——. T. B. Osborne and R. W. Cornelison. U.S. Pat. 691,966, 1901.

See under XIV., *page* 358.

(*C.*)—INDIA-RUBBER, &c.

Vulcanised Caoutchouc; Method of Regenerating Old ——. H. Kessler. Rev. Prod. Chim., **5**, [2], 19—20.

The caoutchouc under treatment is finely pulverised and placed in a cast-iron vessel fitted with stirrers and heated by steam, a vacuum pump and a reflux condenser also forming part of the apparatus. The caoutchouc is covered with carbolic acid, a vacuum is produced, and the mixture heated, with stirring, till the caoutchouc is dissolved (about 4—5 hours). To ensure the complete elimination of the sulphur, an excess of finely powdered lead acetate is next added, and the whole is distilled *in vacuo* for three hours. One half of the carbolic acid is then removed by distillation, the residue is neutralised with soda, and the lead sulphide and sodium phenate are afterwards eliminated by the ordinary methods of purification.—C. S.

English Patents.

Gutta-Percha; Process and Apparatus for the Purification of ——. A. Combaudaire and J. de la Fresnaye, Paris. Eng. Pat. 22,758, Nov. 11, 1901.

The process for purifying crude gutta-percha consists in eliminating the resin by extraction with petroleum spirit, the temperature being limited to 35° C., and the time of contact to that at which the coloration of the solvent commences, such coloration indicating a destruction of the cellular constitution of the gutta-percha. The apparatus consists of a mixing chamber with a false bottom and inspection window, a receiving vessel for the dissolved resin placed at a lower level, a distilling apparatus to recover the solvent, and a reservoir for the distilled spirit, connected by pipes with interposed stop cocks.—J. F. B.

India-rubber Tubes; Manufacture of Long ——. W. P. Thompson, London. From the Kölner Akkumulatoren-Werks, Cologne, Germany. Eng. Pat. 22,744, Nov. 11, 1901.

By the process hitherto adopted, lined rubber tubes can only be constructed in lengths which are less than those of the mandrels and the vulcanising boiler available. This specification describes a method of constructing the tube in short pieces, and then joining them together. Each length of tube is made with the innermost layer of rubber projecting beyond the lining, and with the lining projecting beyond the outer rubber layer. The lining of each length is so cut that at one end it forms an exposed helix with right-handed turns, at the other a helix with left-handed coils. In joining, the two lengths are butted together on a mandrel, a piece of quickly vulcanising rubber is used to connect the two ends of the inner tube, a portion of lining material in the shape of a truncated cone, the angle of which coincides with that of the helix, is wrapped round the exposed ends of the main lining, and finally a piece of rubber to match the outer layer of the tube is applied. The whole joint is then vulcanised under a press in the usual manner. By repeating this operation, a tube of indefinite length may be formed, with the aid of a mandrel and boiler of reasonable dimensions.—F. H. L.

Electric Furnaces, and the Production of Chemicals [Carbon Bisulphide] in such Furnaces. G. Brewer. From E. R. Taylor. Eng. Pat. 25,182, Dec. 10, 1901.

See under XI. A., *page* 353.

United States Patents.

Vulcanised-Rubber Waste; Reclaiming Rubber from ——. R. B. Price, Chicago, Ill., U.S.A. U.S. Pat. 693,151, Feb. 11, 1902.

The finely divided rubber waste is brought into a jacketed vessel fitted with agitator, pressure gauge, thermometer, safety valve, &c., and is treated with "a superheated fluid, such as steam or other vapors" at a temperature of from 150° to 230° C. A bath of some substance which has an affinity for sulphur, such as a 5 to 20 per cent. solution of sodium thiosulphate, may be employed, if desired, to soak the rubber in; in this case the steam is made to bubble through the liquid. The feature of the invention is the use of a comparatively high temperature coupled with a comparatively low pressure.—F. H. L.

Insulating Covering Material for Electric Cables, Conductors, &c. G. E. Heyl-Dia, Manchester. U.S. Pat. 692,013, Jan. 28, 1902.

See Eng. Pat. 11,217 ; this Journal, 1901, 593.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patents.

Leather [Substitute]; Material suitable as a Substitute for ——, and Process for the Manufacture of the same. G. L. Lippold, Dresden, Germany. Eng. Pat. 10,069, May 31, 1900.

The process consists in fastening together layers of raw hemp by means of steel wire, as in the binding of a woven fabric. The layers may then be impregnated with a suitable liquid, such, *e.g.*, as glue solution.—J. L. B.

"*Glue-yieldable or Gelatin-yieldable Material; Obtaining a Congealable ——, from Fish-waste or Fish and other Material.*" H. J. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 24,604, Dec. 3, 1901.

The fish waste or other similar material is heated in a closed vessel under pneumatic pressure high enough to prevent ebullition or agitation of the mass during the treatment, and the liquid is drained or flowed off from the vessel during the heating under pressure. The digestion takes place at a temperature of 212° F., and the absence of ebullition prevents the fat from becoming emulsified with the liquor. As the mass liquefies, the liquor is drained off from below through a filter, which is placed in connection with the vessel in such a way that the liquor is kept hot during filtration so as to prevent fermentation.—J. F. B.

United States Patents.

Casein [Glue Substitute]; Process for making Adhesive ——. J. A. Just, Syracuse, New York, U.S.A. U.S. Pat. 692,450, Feb. 4, 1902.

The substance, adhesive casein, claimed is prepared by intimately mixing powdered casein with powdered calcium tannate. On moistening this mixture with water, or water

containing a little ammonia, a thick viscous paste is obtained, having marked adhesive properties. The calcium tannate is prepared by adding excess of milk of lime to a solution of tannic, filtering off the precipitate formed, drying it in a current of air at a temperature of 75° F., and reducing it to powder. The process is also claimed.

—W. P. S.

Zein; Process of Extracting ——. T. B. Osborne, Connecticut, and R. W. Cornelison, New Jersey. U.S. Pat. 691,966, Jan. 28, 1902.

This specification deals with a process for extracting zein, a proteid soluble in alcohol and capable of a variety of uses, for example, as glue, size, varnish, an insulator of electricity, &c. The raw or uncooked residue remaining after the manufacture of starch from Indian meal, is treated with dilute aqueous alkali, the alkaline solution separated from the insoluble residue left after such treatment, the proteids precipitated from this solution, and the zein extracted with a suitable solvent. The zein may be made use of in the form of a solution in moderately concentrated alkali.—T. H. P.

XV.—MANURES, Etc.

English Patents.

Artificial Manures; Manufacture of ——. W. and H. M. Goulding, Ltd., and J. Ostersetzer, Dublin. Eng. Pat. 2335, Feb. 4, 1901.

A mixture of 10 parts of magnesium carbonate, 20 parts of sodium bisulphate, and of 70 parts of calcium carbonate; or of 20 parts of sodium bisulphate and 80 parts of calcium carbonate, is used to mix with artificial manures containing soluble phosphates, with or without nitrogen or potash salts, in the proportion of about 17 parts to 100 parts of the manure. The addition of this "carbonated sodium powder" to an ordinary superphosphate manure is stated to render it fit for use in poor and exhausted soils, deficient in lime; and to be beneficial in combating the disease known as "finger and toe."—E. S.

Town Refuse; Quick Removal to a Distance of ——, *and its Conversion into Manure.* H. Sefton-Jones. Eng. Pat. 15,988, 1899.

See under XVIII. B., *page* 361.

XVI.—SUGAR, STARCH, GUM, Etc.

English Patent.

Syrups, Molasses, and the like; Process for the Decolorization of ——. W. P. Thompson, Birmingham. From T. C. Boot. Eng. Pat. 6761, April 10, 1900.

This process consists of treating the syrup with sulphurous acid in order to effect the decolorising of the liquid, and the employment of a soluble ferrocyanide to precipitate the traces of iron and also certain organic impurities, the presence of which in the liquid may bring about recoloration.

—J. L. B.

Sugar; Refining of ——. J. Robin-Langlois, Paris. Eng. Pat. 23,156, Dec. 18, 1900.

See Fr. Pat. 306,294; this Journal, 1902, 130.—J. F. B.

Adhesive Material, suitable for use as a Substitute for Gum Arabic and other Soluble Gums. C. D. Ekman, Northfleet, Kent. Eng. Pat. 8331, April 23, 1901.

The inventor claims the manufacture of an adhesive material resembling gum arabic, by treating dry starch with commercial sulphuric acid (containing 79—80 per cent. of monohydrate) for a certain time at a temperature not exceeding 35° C., and neutralising with a base, such as carbonate of lime or magnesia.

One hundred kilos. of dry rice starch are mixed with 30 litres of sulphuric acid, in small quantities at a time, precautions being taken to avoid rise of temperature. The mixture is allowed to stand for a period of from 1 to 4 days, samples being taken out frequently and tested for the presence of sugar; as soon as this appears, a little water is added, the acid is neutralised and the solution diluted and filtered, the gum being obtained by evaporation of the solution.—J. F. B.

United States Patent.

Sugar; Process of Dissolving Low Grade ——. M. Lambert, Toury, France. U.S. Pat. 692,020, Jan. 28, 1902.

See this Journal, 1902, 58.—T. H. P.

French Patents.

[Sugar] Juice; Diffusion Process for obtaining Highly Concentrated ——. W. J. Otfinowski. Fr. Pat. 312,302, July 1, 1901.

This process comprises two operations which may be used either separately or together: (1) This consists in withdrawing from the last diffuser a quantity of juice depending on the amount of sugar in the beets and on the conditions under which the operation of diffusion is carried out; this is done by means of a pipe which extends along the battery to the reheaters, and which is connected by a valved branch with each diffuser. The juice is thus led into a special saturating apparatus, then filtered, cooled by means of cold water passing to the diffusion battery and finally led into the ordinary diffusion apparatus where it is mixed with the molasses. In factories where separation is not carried out, however, the juice is either led through a special vaporiser into a vacuum apparatus for low products or else washing water is employed in the second operation, and the juice thus obtained led again into the separator or into the vacuum apparatus for low products. (2) In the second operation, the first diffuser, containing fresh slices, is not charged directly with juice from the preceding diffuser, but with water previously heated, whilst the residue from the preceding diffuser passes into the measuring apparatus. A diagrammatic sketch of apparatus suitable for carrying out the process is given.—T. H. P.

Sugar; Process of Extraction of ——, *from Dried Saccharine Matters.* R. y Pompino. Fr. Pat. 312,635, July 12, 1901.

Claim is made for a process allowing of the extraction of sugar from all materials which contain it, and which have been previously dried, either for storage purposes, or for the application of the process. The powdered material may then be treated in one of several ways to separate the sugar from the cellulose and other foreign matter. (1) It may be moved slowly along on an endless cloth band on which falls a fine shower of water which exhausts the material of its sugar. (2) It may be treated in either an intermittent or continuous centrifugal, the sugar being separated as a thick syrup. (3) The sugar may be separated by means of the action of air currents directed on to the finely powdered material.—T. H. P.

Saccharine Juices; Decoloration and Defecation of ——. F. Woestelandt and L. Mouraux, Lille. Fr. Pat. 312,647, July 16, 1901.

Claim is made for the use, as a decolorising and defecating agent for saccharine juices, of an organic acid, such as oxalic, tartaric, citric, malic, formic, or acetic acid, the liquor then being treated with one of the following compounds prepared either by precipitation or in the dry way:—basic carbonate or oxide of zinc, strontium or barium, alumina, magnesia, or oxide or carbonate of cadmium. The decolorising action is instantaneous, and the filtered juice deposits very pure sugar when evaporated in the usual way.—T. H. P.

Sugar; Process for converting Wood and other Cellulose Material into ——. A. Classen. Addition to Fr. Pat. 295,847, June 21, 1901.

See this Journal, 1901, 1008.—T. H. P.

Glucose; Process and Apparatus for the Refining of ——. The Cereal Sugar Co. Fr. Pat. 312,500, July 8, 1901.

See this Journal, 1901, 824.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Seed-Yeast [Distillery]; Bücheler's Process for the Acidification of ——, *with Sulphuric Acid.* G. Heinzelmann. Zeits. Spiritusind, 1902, **25**, [7], 72.

The author gives curves illustrating the experiments described in Hesse's paper (this Journal, 1902, 267). The curves show at a glance the temperature and the percentage of sugar in the mash throughout the course of fermentation, and illustrate the cases respectively of:—

(*a.*) Vat pitched with sulphuric acid yeast at a temperature of 26° C.

(*b.*) Vat pitched with lactic acid yeast at a temperature of 26° C.

(*c.*) Vat pitched with lactic acid yeast at a temperature of 20° C. and warmed up next morning to 28·75° C.

—J. F. B.

Yeasts of the Saaz and Frohberg Types; Comparative Observations on the Behaviour of ——, *in Primary Fermentation with Bottom Fermentation Beers.* F. Schönfeld. Woch. für Brau., 1902, **19**, [5], 57—59.

The author has previously tried to brew bottom fermentation beers of slight attenuation by fermentation with yeast of the Saaz type, but without satisfactory results (see this Journal, 1900, 759). The present paper deals with the behaviour of such yeast during primary fermentation, as compared with that of the usual Frohberg yeast in the same wort. The Saaz yeast showed a considerably lower reproductive power than the Frohberg, the increase of the latter being 1:4·5, as against 1:3 or 3·2 in the case of the Saaz. The period during which the yeast increased was only three days with the Saaz, as compared with five days with the Frohberg. During the period of increase, the extract fermented by the Saaz yeast was much lower than that fermented by the Frohberg, but the fermentation was more intense with the former, since more extract disappeared in three days with it than was fermented in the first three days by the Frohberg. Consequently the rise of temperature was more rapid with the Saaz, but it did not go so high in the end as with the Frohberg. The froth of the fermenting beer in the case of Saaz yeast falls as soon as the period of growth is over and the cells immediately begin to clot together and settle to the bottom, so that from 70—90 per cent. of the cells were found in the sediment on the fourth day. On this property the author has based a method for separating Saaz yeast from admixture with Frohberg.

—J. F. B.

Diastase; Influence of Carbonic Acid on the Action of ——. O. Mohr. Zeits. Spiritusind., 1902, **25**, [7], 69—71.

The varying saccharifying power of very small quantities of diastase on relatively large quantities of starch in the absence of carbonic acid appears not to depend exclusively on the reaction of the starch employed. Out of six samples of potato starch tested, one neutral, one faintly alkaline, and one acid-reacting starch, all underwent a slight but distinct saccharification, whilst one neutral and two alkaline samples only gave traces of reducing sugar in the absence of carbonic acid. An acid reaction of the starch appears to be the most favourable for saccharification. In the presence of carbonic acid on the other hand, under similar conditions, all the samples of starch yielded the same quantity of reducing sugar, equal to 30—32·5 per cent. of maltose. The favourable action of asparagine on the diastatic action is increased by the presence of carbonic acid only when small proportions of asparagine are used; in the case of larger quantities of the amide, it is decreased. Lactic acid, which in small quantities is very favourable to the saccharification, is rendered less so by the presence of carbonic acid, as soon as the optimum limit of lactic acid is exceeded. The optimum quantity of lactic acid varies greatly according to the nature of the starch.

The favourable action of all these substances on saccharification only holds good when the proportion of diastase to starch is very small. The effect of carbonic acid will therefore not have much importance from the practical point of view, since a proportion of diastase is used in practice sufficient to produce the highest saccharification independently of such factors; moreover, all mashing materials contain substances such as amides, phosphates, &c., which have an effect similar to that of carbonic acid.

—J. F. B.

Casein as a Fining Agent for Wines. A. Müntz. Rev. de Viticulture, 1902, Jan. 4, [420].

In the author's opinion, fining well carried out can, in most cases, effect the purposes of pasteurisation without imparting the flavour often produced in the latter process. In addition to gelatin and white of egg, milk is frequently used as a fining agent, the coagulation of the casein effecting the clarification of the wine; but milk can only be used in particular cases and with small quantities of wine. A process of extracting casein from milk without alteration has recently been devised by Hatmaker, and the product thus obtained is a light white powder which is readily soluble in tepid water, forming an opalescent solution resembling white of egg, for which it can be used as a substitute. For fining wines, the casein is dissolved in 10 or 20 parts of water, the 5 per cent. solution effecting a somewhat slower though more complete clarification. Compared with commercial albumin, the price of the casein required for fining is more than 50 per cent. cheaper. The prices of gelatin and casein are practically the same, but the latter is free from all flavour, such as is found even in the purest gelatin. A further advantage is that if, in fining wines with white of egg, albumin, or gelatin, too large an excess in proportion to the tannin be added, this excess remains in solution, and may lead to turbidity and alterations in the wine; whereas the casein, even when added in considerable excess is completely eliminated, being coagulated by the acid in the wine.—C. A. M.

Wine; New Apparatus for Determining Volatile Acids in ——. G. Sellier.

See under XXIII., *page* 367.

Fusel Oil; Determination of Ethyl Alcohol in ——. O. Saare and H. Hanow.

See under XXIII., *page* 367.

English Patents.

Beer Brewing; Wet Bruising Mill for ——, *and Process for Preparing Mash by the Use of this Mill.* Schmitz and G. Kreutzer, Cologne. Eng. Pat. 12,583, June 16, 1899.

The mill consists of a box-shaped reservoir, fitted inside with two toothed cylinders, with proportionately large teeth of rounded-off shape, adjustable to each other in a horizontal direction. There are also situated below the toothed cylinders, two smooth and adjustable cylinders, one of which is larger in diameter and passes with a lateral collar closely past the smaller cylinder. Two guide-plates or shoots conduct the entire mash, after having passed the first set of cylinders, to the second set.

The second claim is for the application of the above-described mill. The mill corn is sprinkled with water on its way to a soaking box; it is then left in the box until it swells, and is guided to the actual mash tun. Before arriving there, the grist has to pass through the mill. By this procedure the malt is entirely crushed without destroying the husks, which must be preserved, in order to act as a filter layer for the clarification.—J. L. B.

Beer that is to be quickly Tapped; Process for Producing Malt for ——. P. Vollmann, Altenburg, Germany. Eng. Pat. 9595, May 24, 1900.

The barley, after being steeped for three or four days, is spread out on the floor, and repeatedly worked, the temperature not being allowed to exceed 20° to 22° C. The partially

germinated barley is then arranged in heaps of about 2 metres in height, left standing for a day, and spread out to cool for about six hours. After cooling, the malt is again arranged in heaps and left standing for a day, being subsequently taken to the kiln. By this treatment the malt is well stirred up and loosened, and the formation of sugar induced, a raw malt being thus obtained which the patentee states is specially suitable for producing an aromatic kiln-dried malt, and for promoting the fermentation, the consequence of which is, that, within 14 days, the beer obtained with barley treated in this manner acquires the quality of a fully matured article.—J. L. B.

Distillers' Spent Residue or Wash Treatment of —— and Apparatus therefor. J. M. J. Thierry, Paris. Eng. Pat. 7410, Apr. 10, 1901.

The essential feature of this invention lies in the fact that instead of spreading the concentrated residues or wash in a thin layer—in some cases mixed with lime or neutralised—on one or more nearly horizontal platforms (or trays) and heating with a circulating fluid, the wash is spread as a thin layer over the interior surface of the walls of the vessel wherein the treatment is carried out. The claims, 16 in number, relate to the various appliances by which this may be effected, and to improvements in details arising out of this principle.—J. F. B.

Malted Grain; Drying ——. C. R. Wilkinson, Newport, Mon. Eng. Pat. 7443, April 11, 1901.

An arrangement for partially drying the grain malt prior to kilning proper, according to which the grain, when germination is completed, is transferred to a raised, perforated platform or grate, adjoining the malting floor. Hot air (preferably the flue-gases from the kiln) is forced below the platform, and passing through the perforations, dries the malt above. A device is provided for collecting the hot air above the grate and using it over again.—H. T. P.

Vegetable Extract; Process for the Manufacture of a ——. J. Heron. Eng. Pat. 6937, 1901.

See under XVIII., A., *next column.*

United States Patents.

Malt Kiln. J. F. Dorufeld, Milwaukee. U.S. Pat. 693,121, Feb. 11, 1902.

This invention relates to means for regulating the temperature of the heated air passing upwards through a two-floor malt kiln, so that, in spite of a very high kilning temperature being necessary on the lower floor, the wet green malt on the upper floor may be dried by air which is sufficiently cool to prevent damage. The cooling is effected by diluting the hot air, after passing through the malt on the lower floor, with a regulated quantity of cold air admitted through a conduit.—J. F. B.

Wort; Apparatus for Aërating ——, and Improving the Quality of Yeast. M. Wallerstein and H. H. Freund, New York. U.S. Pat. 692,170, Jan. 28, 1902.

Claim is made for an aërating faucet for fermenting vats, comprising a casing having a plug-seat and adapted to be secured to the vat, the casing having a single passage leading outward from the plug-seat and adapted for connection with an air-supply; and two passages leading inward from the plug-seat toward the vat, one of the passages having a relatively large orifice at the vat end and the other a number of small orifices; also for a plug mounted to turn on the plug seat and having two parts adapted to connect the outward passage with one or other of the inward passages.

When the wort has been pitched with the yeast, filtered air is passed into the wort through the large orifice, until a white scum appears on the surface and the yeast is in a state of vigorous fermentation, after which the air is introduced through the smaller apertures, the air-supply being kept up for two or three hours longer, according to the quality of the yeast and the character of the beer. By this means a very healthy, vigorous yeast of great purity is obtained in increased yield. The time of fermentation is diminished by two or three days, besides which the beer clarifies quicker, so that finings need not be used. Further, the quantity of nitrogenous matter is reduced, and a beer of a higher keeping quality consequently obtained.—T. H. P.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Milk; Decrease in the Acidity of ——. A. Kirsten. Zeits. Untersuch. Nahr. Genussm., 1902, **5**, [3], 97—109.

As the result of numerous experiments, the author finds that the acidity of milk decreases when the milk is allowed to stand in open vessels; also when it is boiled or subjected to centrifugal action. The decrease is due to loss of free carbon dioxide dissolved in the milk. He further states that the acidity of fresh milk is not alone due to acid phosphates, but in part to dissolved carbon dioxide.

The so-called "incubation stage" of milk observed by Soxhlet, which up to the present has been understood as the period of time during which the acidity of the milk remains constant, should now be considered as the time in which the lactic acid bacteria produce only as much lactic acid as will balance the loss of free carbon dioxide. During the "incubation stage," the acidity of the milk can either remain constant or decrease.—W. P. S.

English Patents.

Foods; Process for Preparing Preserved ——. P. G. Richter, U.S.A. Eng. Pat. 3043, Feb. 12, 1901.

The 18 claims relate to a process for obtaining the essential constituents of liquids, such as tea, coffee, meat extract, pharmaceutical preparations, &c., in a solid form, only requiring re-solution in water before use. To this end, about 1 per cent. of gelatin is added, and the liquid evaporated in pans, or preferably on flat plates, so as to leave the solids in sheet form. The solid may be granulated in order to facilitate re-solution. Particular claims refer to a mixed food produced by evaporating with gelatin, a mixture containing as basis, meat juice (prepared with the aid of dilute acids) together with yolk of eggs, milk, sugar, flour, and the like.—H. T. P.

Vegetable Extract; Process for the Manufacture of a ——. J. Heron, London. Eng. Pat. 6937, April 2, 1901.

An extract of malt culms, to be used as yeast-food and for other purposes. The culms are digested with acidulated water (½ to 1 per cent. of hydrochloric acid) for one hour at the ordinary temperature; then heated for 1—2 hours under a pressure of 10 lb., or for 20—30 minutes at 50 lb. pressure per square inch. The extract is neutralised with potassium, sodium, or calcium carbonate, filtered through bone-char, slightly acidified with sulphurous acid, and evaporated to syrup *in vacuo*.—H. T. P.

United States Patents.

Baking Powder ——. J. A. Just, Syracuse, New York, U.S.A. U.S. Pat. 692,451, Feb. 4, 1902.

The claims are for a compound of calcium acid phosphate [$Ca(H_2PO_4)_2$] and casein, and for a baking powder containing this compound, sodium bicarbonate, and a "filler," such as starch. The above acid substance is prepared by grinding together syrupy calcium acid phosphate and casein, previously washed and freed from fat. The ground-up mass is dried and powdered.—W. P. S.

Baking Powder ——. J. A. Just, Syracuse, New York, U.S.A. U.S. Pat. 692,452, Feb. 4, 1902.

The baking powder claimed consists of a mixture of sodium bicarbonate, starch, and casein phosphate. The latter contains 24 parts of phosphoric acid, and 76 parts of casein. —W. P. S.

Baking Powder ——. J. A. Just, Syracuse, New York, U.S.A. U.S. Pat. 692,453, Feb. 4, 1902.

For the purpose of neutralising any free acid or alkali in baking powder (that is, the amount which remains uncombined after the action has taken place), the patentee adds to the powder about 7 per cent. of partially neutralised casein. The latter is prepared by neutralising two-thirds of the acidity of casein with soda, the product, which is neutral to phenolphthalein but acid to litmus, being capable of combining with either more acid or more alkali.—W. P. S.

Casein Phosphate [*for Baking Powders*]; *Method of Making* ——. J. A. Just, Syracuse, New York, U.S.A. U.S. Pat. 692,454, Feb. 4, 1902.

To an aqueous solution of 24 parts of phosphoric acid, 12 parts of casein, or compounds of casein with alkalis or alkaline earths, are added. The mixture is heated until the curdy condition of the casein disappears, and is then concentrated to a syrupy consistency. 64 parts of casein are now added, the composition is dried and ground to a powder. It is intended for use as the acid ingredient of baking powder.—W. P. S.

Egg Contents; Process of Preserving ——. N. M. Goodlett, South Orange, New Jersey, U.S.A. U.S. Pat. 692,268, Feb. 4, 1902.

An improvement on Eng. Pat. 15,762, 1893 (this Journal, 1894, 897), consisting in using a larger proportion of sugar (66—100 per cent.), heating to a higher temperature (about 185° F.), and reducing the amount of evaporation.

—W. P. S.

Evaporating [*Drying Eggs*] *Apparatus.* J. Macredy, London. U.S. Pat. 692,465, Feb. 4, 1902.

The eggs for desiccation are placed in a barrel-shaped cylinder, which revolves on a horizontal axis; air, warmed at one end by coils, is drawn through the apparatus by means of an air propeller at the opposite end.—J. W. H.

(*B.*)—SANITATION; WATER PURIFICATION.

Drinking Water, Sterilisation of ——, *with Chlorine.* V. Rabs. Hyg. Rdsch., **11**, 1085—1088. Chem. Centr., 1902, **1**, [6], 361.

The author has carried out a series of experiments with a view of determining the efficacy of chloride of lime and sodium hypochlorite for the sterilisation of drinking water (see this Journal, 1896, 45; 1900, 920; and 1901, 828). Cultures of cholera and typhus bacilli were used, and it was found that with the quantities of reagents prescribed, a considerable effect could be observed at the end of 10 minutes, but for sterilisation, this length of time is not sufficient, and must be extended to 20 minutes; and even this period is not long enough in many cases, owing to the varying amount of available chlorine contained in the reagents used.—A. S.

Water; Determination of Organic Matter in ——. G. de Ridder.

See under XXIII., *page* 368.

English Patents.

Furnaces; Improved Refuse Destructor ——. E. Willshear and E. C. Amos, both of London. Eng. Pat. 15,629, July 31, 1899.

The destructor consists of two primary cells, in which the refuse is partially burnt, and a third cell—immediately under the steam generator—which is fed by the two above-mentioned, where complete combustion takes place, and from which alone the clinkering is done.—W. C. H.

Dirt and Refuse of Towns; Furnace for Incinerating ——. G. C. Marks, London. From The Compagnie Générale de Travaux Sanitaires, Brussels. Eng. Pat. 8670, May 10, 1900.

The claims are for the interposition of a boiler between the furnace and the condenser of the products of combustion, the water in the boiler being evaporated by the heat of the products of combustion, part of the steam generated being injected under the grate of the furnace, the other part serving to work ventilators to increase the draught through the apparatus; and for the interposition of a smoke-box between the boiler and condenser.—W. C. H.

Town Refuse; Quick Removal to a Distance of ——, *and its Conversion into Manure.* H. Sefton-Jones, London. From La Soc. Anon. des Engrais Complets, Paris. Eng. Pat. 15,988, Aug. 4, 1899.

The refuse is collected into carts or tumbrils and placed in pits, where it is forked on to horizontal transporters of the endless-belt type, which circulate in a tunnel covered by hatches adapted to be raised periodically to enable the transporters to be charged. These transporters deliver the material on to an inclined transporter, discharging into a trough, which distributes the material into two suitable crushers adapted to crush and tear up the material into a form more suited for rapid fermentation, and suitable for use as a fertiliser. The inclined transporter is formed of sheet-iron plates and strips of belting connected together by rivets, &c., and is kept stretched automatically by the weight of cast-iron drums supported on pivoted arms. This transporter may in some cases be arranged horizontally, or omitted. Another transporter may be employed to deliver the material discharged from the crushers into carts, &c., or, when possible, the crushers may discharge directly into such vehicles. Partitions are employed between the driving pulleys and belts and the transporters, to protect the driving gear from fibrous or very hard substances which may exist in the refuse.—R. A.

Inhalable Gases; Apparatus for Supplying Persons with Pure ——, *when Situated in Localities Charged with Deleterious Gases.* C. D. Abel, London. From Sauerstoff-Fabrik, Berlin. Eng. Pat. 21,872, Nov. 1, 1899.

The apparatus consists of a flexible gasholder divided into two compartments, connected together through a chamber containing an absorbent of carbon dioxide, and fitted with mouthpiece, &c., in such a manner that oxygen gas, say, inhaled from one compartment is exhaled into the other, and the excess passes back into the first through the purifying chamber.—L. A.

Sewage and other Foul Liquids and Water; Purification of ——, *by Biological Means and Construction Arrangement, and Working of Filters for Use therein.* F. Tomlinson, Kingston-on-Thames, Surrey. Eng. Pat. 16,880, Aug. 19, 1899.

Filters formed of a number of comparatively shallow beds of coke breeze or other material, so packed as to have a large interstitial area, are arranged at different levels, the uppermost bed being open to both light and air, the others being covered so as to exclude light. The flow of liquid to the several beds is regulated so that the filtering material is never wholly submerged, and provision is made for the passage of air through the upper portion of the covered beds when fully charged with liquid, and through the whole of the beds when empty of liquid. The sewage passes on to the filter from pipes or distributing troughs supported above the surface of the uppermost bed, and flows from the lower part of this bed to the one below, carrying air with it. Each covered bed is provided with a pipe for the escape of gases. The object of the whole arrangement is to encourage the development and growth of small animals as well as bacteria.—L. A.

Distributing Liquids evenly over Large Areas, more especially for the Bacterial Purification of Sewage; Apparatus for ——. W. D. Scott-Moncrieff, London. Eng. Pat. 1070, Jan. 16, 1901.

The apparatus consists of a horizontal pipe, made in sections, which rotates on a vertical axis formed by the supply pipe; each section is provided with a trough on its upper side, communicating with the pipe by an adjustable orifice; the water flowing through the pipe enters the troughs according to the adjustment of the orifices, and overflows in one sheet on to the filter-bed or other area below.—J. W. H.

Apparatus for Moistening Air. G. Richter, Bohemia. Eng. Pat. 5678, March 18, 1901.

Air forced through a jet or nozzle situated in a water-tank produces a vacuum in one or more pipes or channels arranged near the nozzle, so that the water from the tank is drawn up through the pipes or channels and dispersed in a fine mist.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Paper Pulp; Manufacture of ——. W. R. Lake, London From C. X. A. Berget, Paris. Eng. Pat. 6534, March 28, 1901.

See U.S. Pat. 683,836; this Journal, 1902, 64.—J. F. B.

Paper and other Fibrous Material; Treatment [*Water- and Grease and Acid-proofing*] *of* ——. G. I. Goessmann, Amherst, U.S.A. Eng. Pat. 10,535, May 21, 1901.

The treatment claimed consists in immersing the material (paper pulp in sheets, finished paper, or other fibrous substance) in a bath of glutinous material, preferably animal glue, then in a bath of formaldehyde, drying, subjecting to the action of hot water or steam, and again drying.
—A. C. W.

Stereotyping; A Turf Matrix Pulp for ——. E. Sauder, W. Migula, and R. Krafft, Karlsruhe, Germany. Eng. Pat. 5295, March 13, 1901.

The claim is for a matrix pulp for stereotyping, in which the intermediate layer is composed of a mixture of finely-ground turf, glycerin, starch, paper-pulp, and an antiseptic. It is stated that any number of casts may be taken without injuring the matrix.—A. C. W.

United States Patents.

Digesters [*Wood-Pulp*]; *Gas Separator for* ——. C. W. Milts, Rumford Falls, Maine. U.S. Pat. 691,958, Jan. 28, 1902.

The apparatus is designed for cooling and separating the gas which is discharged from sulphite wood-pulp digesters. It consists of a closed tank, having a gas outlet at the top and a horizontal inlet pipe extending through the tank. Discharge openings are provided along the top of the horizontal pipe, and branch pipes of different lengths depend from the bottom of the inlet pipe. Water inlet and discharge pipes are also provided, the latter extending from the bottom of the tank upwards, and being provided with several branches at different elevations. The action of the water on the heated liquor which escapes from the digester serves to cool the gas, and to liberate the gas contained in the liquor.—J. F. B.

Wood-Pulp Press. J. S. Hughes, Chesley's Corners, Canada. U.S. Pat. 691,770, Jan. 28, 1902.

This invention relates to a machine having confined spaces into which the fluid pulp can be run intermittently, and the water and air pressed out automatically, so as to leave a solid sheet of pulp in each space. The machine comprises a double-headed cylinder, with a double-ended piston rod having a plunger at each end fitting into a rectangular press chamber in each cylinder. The press chambers are divided transversely by sliding strainer partitions forming the spaces into which the pulp is forced, and then drained and pressed. A special form of strainer plate is described and claimed, and means for loosening the sheets of pulp and discharging them by way of a hinged false bottom are provided. The two ends of the machine are designed to work consecutively.—J. F. B.

Wood-Pulp; Process of Forming —— into Sheets. J. S. Hughes, Chesley's Corners, Canada. U.S. Pat. 691,771, Jan. 28, 1902.

The process consists in forcing the fluid pulp simultaneously into a series of spaces formed between hollow partitions with porous surfaces, placed transversely in a press-chamber of rectangular cross-section equal to the size of the sheets to be made. When each space contains sufficient pulp for a sheet the supply is cut off, and pressure is applied to the sliding end partition. Each hollow partition constitutes a strainer by which the water is drained off, and the removal of water is assisted by maintaining a suction, during the whole process, through the hollow drainage plates.
—J. F. B.

Pulp Screen; Centrifugal ——. J. H. Barker, G. F. Sheolin, and F. H. Barker, New York. U.S. Pat. 693,215, Feb. 11, 1902.

The inventors have found that currents of air passing through the centrifugal separator materially assist the separation of the pulp from the slivers and prevent the loss of fibres. These currents are produced by the motion of the machine itself, by providing openings in the cover of the pulp screen between the segmental casing and the screen plates, and covering these openings with perforated metal plates forming gratings. Air is drawn in over the edges of the slivers trough and beneath the blades of the lower centrifugal device, thus forcing the fibres along with it through the screen plates.—J. F. B.

Paper; Water- and Grease-proof ——. A. D. Little, Brookline, Mass., for Cellulose Products Co., Wilmington, Delaware. U.S. Pat. 691,951, Jan. 28, 1902.

The invention consists in coating one side of any sort of paper, preferably unsized, with recovered cellulose by spreading upon it a continuous film of viscose solution, decomposing the viscose, and then filling the other side of the paper with a waterproofing material, such as paraffin.
—J. F. B.

Paper; Waxed ——. A. D. Little, Brookline, Mass., for Cellulose Products Co., Wilmington, Delaware. U.S. Pat. 691,952, Jan. 28, 1902.

The inventor claims the manufacture of paper having a coat or face composed of recovered cellulose and paraffin. This is made by coating the paper with an emulsion of paraffin and viscose, and decomposing the viscose by heat. Paraffin is caused to form an emulsion with viscose by mixing the wax with a small proportion of melted tallow soap and stirring with water.—J. F. B.

Acetyl-Cellulose [*Acetylated Cellulose*]; *Process of Making* ——. M. C. L. Althausse, Hamburg. U.S. Pat. 692,497, Feb. 4, 1902.

See Fr. Pat. 308,506; this Journal, 1902, 64.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Formic Acid; New Synthesis of ——. M. Moissan. Comptes Rend., **134**, [5], 261—264.

Potassium hydride, in a stream of carbon dioxide, rapidly absorbs the gas with considerable evolution of heat, and formation of potassium formate:—$CO_2 + KH = HCO_2K$.

Carbon monoxide, heated in a tube with potassium hydride (actually, a mixture of 1 vol. of hydrogen and 2 vols. of carbon monoxide was heated with metallic potassium, and after complete absorption, more of the gaseous mixture was introduced till absorption was complete), also yields potassium formate; but along with this there is also formed a deposit of carbon. No oxalate is produced. $2CO + KH = HCO_2K + C$. Sodium hydride may be substituted for potassium hydride in either of these reactions.
—J. T. D.

Guaiacolsulphonic Acid. Hähle. J. prakt. Chem., **65**, [2], 95—96.

The author points out that the substance described as guaiacolsulphonic acid in the Ger. Pat. 109,789, is in reality an alkali salt of guaiacolsulphonic acid. Sulphonation may be readily effected by dissolving crystallised guaiacol in two parts of monohydrate of sulphuric anhydride at 20°—30° C., and allowing the solution to stand for several hours.—H. L.

Guaiaform. F. G. Ehlert. Pharm. Rev., **20**, 15. Pharm. J., 1902, **68**, [1648], 61.

GUAIAFORM, which was first introduced by G. H. Henning in 1898, under the name "geoform," is produced by the condensation of two molecules of guaiacol and one of formaldehyde. It contains 95·38 per cent. of guaiacol, and forms a tasteless, yellow, non-irritant, and non-toxic powder, possessing general antiseptic properties. It is odourless when freshly prepared, but soon acquires a vanilla-like odour on keeping. It is insoluble in water and petroleum spirit, but readily soluble in alcohol, ether, and hot benzene. It dissolves in alkali and can be precipitated unchanged therefrom by acidifying. With tannin, it gives a compound, which has been named tannoguaiaform.—A. S.

Thio- and Selenoantipyrine and the constitution of Antipyrine. A. Michaëlis. Annalen, 1902, **320**, [1], 1—51.

KNORR'S structural formula for antipyrine is considered to be well founded, but as antipyrine gives, with methyl iodide, compounds which Knorr designated pseudo-alkyl iodides, and in which it acts similarly to certain phenolbetaïnes, the question arises whether antipyrine should not be represented by the betaïne formula. Knorr did not hold this view, but new facts discovered by the authors induce them to consider the betaïne formula highly probable. They do not, however, agree with the name "Betaïne formula," and suggest the name "2·5 pyrazole formula" instead. This view is confirmed by the majority of the methods of formation of antipyrine.

Thioantipyrine or Thiopyrine (*1. Phenyl 2.3 dimethyl 2.5 thiopyrazole* $C_{11}H_{12}N_2S$).—Prepared by treating the metho-chloride or iodide of antipyrine chloride with potassium hydrosulphide. Crystallises from water and alcohol in large thick crystals and melts at 166° C. With acids it forms salts. From the physiological point of view, thiopyrine is likely to be of service.

Selenopyrine (*1. Phenyl 2.3 dimethyl 2.5 selenopyrazole,* $C_{11}H_{12}N_2Se$).—Prepared by treating antipyrine chloride with potassium selenide or potassium hydroselenide. Crystallises from alcohol in hard, glistening light yellow crystals. Melts at 168° C., and forms salts with acids.—H. F. C. G.

Ecgonine. O. Hesse. J. prakt. Chem., **65**, [2], 91—95.

AN addition product of ecgonine is readily obtained by heating ecgonine with excess of methyl iodide in methyl alcoholic solution under a reflux condenser. The substance—

$$C_9H_{15}NO_3.CH_3I + H_2O$$

crystallises in colourless prisms of m. pt. 218° C. The chloroplatinate, $(C_9H_{15}NO_3.CH_3)_2PtCl_6 + H_2O$, melts at 194° C. The hydroxide, $C_9H_{15}NO_3.CH_3OH + H_2O$, crystallises in colourless prisms. Ecgonine combines less readily with ethyl iodide. Ecgonine ethyl iodide, $C_9H_{15}NO_3.C_2H_5I + 2H_2O$, melts at 192° C. if heated slowly, and at 185° C. if rapidly heated. The corresponding hydroxide $C_9H_{15}.NO_3.C_2H_5OH$, decomposes at 202° C. It contains a molecule of water of crystallisation, which is lost at 120° C.—H. L.

Cinchona Bark; Assay of the Tincture of ——. F. H. Alcock.

See under XXIII., *page* 368.

Lemon, Orange, and Bergamot Oils; Physical Properties of ——. G. H. Ogston Moore. Chem. and Druggist, 1902, **60**, [1148], 154.

DURING the past few years, the author has examined a large number of commercial samples of these essential oils, and has collected the results into a series of tables.

Oil of Lemon.—As a rule, the sp. gr. lies between the limits 0·856 and 0·858, though genuine oils are met with giving figures greater or less than these. The sp. gr. varies according to the time of the season, becoming greater as the season goes on. The machine-made essence, which is not often met with in London, has a higher sp. gr. than the hand-made.

The chief point to be observed in the optical rotation values is the marked difference between the oils of different years. The optical rotation of Palermo oil (+58° to +62°) is generally lower than that of Messina oil (+59° to +65°); an abnormal sample of Palermo oil was met with, having an optical rotation of only +52·5°.

Oil of Bergamot.—The most notable point brought out by the figures obtained, is that a consistent relation occurs between the sp. gr., percentage of linalyl acetate, and optical rotation of pure oils, and any considerable departure from this relation must be regarded as indicating impurity. A variety of oil, which is made from a bastard fruit, is characterised by a very high sp. gr. (up to 0·898), and a low percentage of linalyl acetate. Distilled essence has a high optical rotation (exceeding +20°) and a very low ester content (2—5 per cent.) and sp. gr. (about 0·865). The author states that with both lemon and bergamot oils, it is important in laying down limits for the sp. gr. and optical rotation of pure oils, to have regard to the general characteristics of the season in which they are produced, as figures which would excite suspicion in one year, might be perfectly normal in another.

Sweet Orange Oil.—In general, the sp. gr. is between 0·848 and 0·850, and the optical rotation between +96° and +99°. Pure orange oil is characterised by the fact that when distilled, the first 10 per cent. has an optical rotation greater than that of the original oil by at least 1°. It has been stated that the first 10 per cent. distilled, may have a lower rotation than the original oil, but the author considers this to be impossible, except in the case of adulterated oil. During the past season the rise in optical rotation of the first 10 per cent. varied from 1·1° to 2·5°, average 1·6°.—A. S.

Eucalyptus Oils; The Sesquiterpene of ——. H. G. Smith. Paper read before the Royal Soc. N.S. Wales, Nov. 6, 1901. Chem. News, 1902, **85**, [2197], 3.

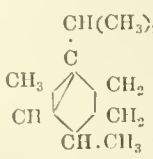
THE author finds that the pink coloration given by many eucalyptus oils, when testing for eucalyptol with phosphoric acid, is due to the presence of a sesquiterpene. The sesquiterpene, for which the name *aromadendrene* is proposed, occurs in large amount in the oil of *E. hæmastoma*, and when isolated by repeated fractional distillation, finally over sodium, boils at 260°—265° C., and has a sp. gr. 0·9219 at 19 C°. The results obtained by analyses indicated the terpene formula, and a vapour density determination showed it to be a sesquiterpene. It gives a characteristic colour reaction with bromine. When bromine vapour is allowed to fall into a tube containing the sesquiterpene dissolved in glacial acetic acid, immediately it touches the liquid, a crimson colour is formed, quickly changing to violet and finally to a deep indigo-blue.—A. S.

Oil of Sage, German; New Constituent of ——. H. Seyler. Ber., 1902, **35**, [2], 550—552.

ON distilling a large quantity of the oil, the author invariably obtained from 1 to 2 per cent. of a substance distilling at 155° C., and possessing physical properties pointing to the presence of a hydrocarbon other than pinene ($C_{10}H_{16}$). This was separated by fractional distillation into three fractions, boiling respectively at 142°—145° C., 145°—150° C., and 150°—155° C.

The composition of the first fraction was $C_{10}H_{18}$, and it was termed "salvene" by the author. Its molecular refraction was 45·9, as against 45·63, the calculated value. Its physical characteristics pointed to its being a saturated body. The presence of tanacetone to the amount of 50 per cent. in sage oil led the author to infer that it might have a similar constitution; and this assumption was strengthened by the facts that on treatment with dilute sulphuric acid, the melting-point was raised to 160° C., and that on oxidation with potassium permanganate it yielded an acid the semicarbazone ($C_{10}H_{16}O_2.CON_3H_3$) of which melted at 204° C. The melting points of the semicarbazones of α- and β-tanaceto-ketonic acids were found by the author to be respectively 198·5 and 202° C., and he considers it not impossible that the salvene ketonic acid may be identical with α-tanaecto-

ketonic acid. The following constitutional formula is regarded as the most probable for salvene:—



This hydrocarbon could not be isolated from a specimen of Spanish oil of sage.—C. A. M.

Ylang-ylang; Essence of ——. G. Darzens. Bull. Soc. Chim., **27**, [3], 83—85.

Reychler and others have shown that ylang-ylang contains benzoic, acetic, and higher fatty acids, linalool and geraniol, a sesquiterpene (cadinene), and methoxy-paracresol. By saponifying with aqueous potash, the author has found in the aqueous portion, methyl alcohol and the potassium compound of paracresol, 7 per cent. of benzoic acid, and 5 per cent. of acetic acid. Probably the paracresol exists in essence as an acetyl-derivative.—J. T. D.

English Patents.

Diethyl ether. G. H. Benjamin, New York, U.S.A. Eng. Pat. 14,233, July 10, 1899.

The processes claimed for the manufacture of diethyl ether consist in subjecting a mixture of ethyl hydrogen sulphate, ethylene, hydrogen, and oxygen to the action of heat, and in subjecting a mixture of ethyl hydrogen sulphate, ethylene, and water to the action of an electric current.—A. C. W.

Carbamic Ethers [*Urethanes*]. H. E. Newton, London. From the Farbenfabriken vormals F. Bayer & Co., Elberfeld, Germany. Eng. Pat. 18,802, Sept. 18, 1899.

The urethanes of certain secondary alcohols are claimed as new articles of manufacture, and their use (as soporifics) for therapeutic purposes, viz., the urethanes of methylethyl-, diethyl-, methylpropyl-, methylisopropyl-, ethylpropyl-, ethylisopropyl-, methylbutyl-, ethylisobutyl-, dipropyl-, methyl-α-methylpropyl- and methyl-α-ethylpropylcarbinol. The processes claimed for the manufacture of these urethanes consist in subjecting the alcohols to the action of urea, its salts or carbamic chloride, and in treating the chlorocarbonic esters of the alcohols with ammonia.—A. C. W.

Urea Quinate. O. Schütz and G. Dallmann, Gummersbach, Germany. Eng. Pat. 6771, April 1, 1901.

See U.S. Pat. 690,080, 1901; this Journal, 1902, 275.
—A. C. W.

Sulphonic Acids [*Ichthyol*] *and their Salts; Production of* ——. L. O. Helmers, Hamburg, Germany. Eng. Pat. 6795, April 1, 1901.

The product obtained by the action of sulphuric acid on mineral oils, tar oils, and similar hydrocarbons is neutralised by organic bases (*e.g.*, aniline, piperazine, &c.), which form in each case soluble and insoluble salts; the solutions of the former, which contain more sulphur than the latter, are evaporated. The salts of the sulphonic acids may also be precipitated by salts of organic bases. These two processes are claimed.—A. C. W.

United States Patents.

Hydrogen Dioxide [*Peroxide*]; *Method of Making* ——. P. L. Hulin, Clavaux, France. U.S. Pat. 692,139, Jan. 28, 1902.

According to this process a pure solution of hydrogen peroxide is obtained by decomposing sodium peroxide with hydrofluoric acid in the presence of water and removing the sodium fluoride produced, by converting it into an insoluble precipitate of cryolite by the addition of aluminium fluoride. If preferred, an excess of hydrofluoric acid may be used in the first instance and aluminium hydrate may be added to the acid liquid; or, after converting the sodium into an insoluble precipitate, an alkaline earth such as baryta or lime may be added to remove the reagents that may be in excess.—J. F. B.

Cinnamylquinine Hydrochloride; Process for Making ——. G. Fuchs, Biebrich, Germany. U.S. Pat. 692,437, Feb. 4, 1902.

The process is claimed for the manufacture of cinnamylquinine hydrochloride, which consists in acting on quinine suspended in benzene or other indifferent solvent with a solution of cinnamyl chloride in benzene. The product, which is also claimed, crystallises in white needles, melting at 235°—236° C.; it is readily soluble in alcohol, with difficulty in water, and is stated to be absolutely tasteless, and to have "considerable antipyretic effect."—A. C. W.

Sodium Sulphoguaiacolate [*Sodium o-Guaiacol Sulphonate*]; *Process of Making* ——. W. C. Alpers, Bayonne, New Jersey, U.S.A. U.S. Pat. 692,588, Feb. 4, 1902.

Guaiacol is treated with strong sulphuric acid, the product neutralised with calcium carbonate, calcium sulphate filtered off, and the solution treated with sodium carbonate. After filtering, the solution is evaporated, and the two guaiacol sulphonates separated. The process and product are claimed. Sodium guaiacol sulphonate is stated to be a fine crystalline greyish-white powder, readily soluble in water, sparingly in alcohol and insoluble in ether.
—A. C. W.

Orthotoluene Sulphochloride; Process of Separating —— [*For "Saccharin"*]. A. Baur, Mulhouse, Germany. U.S. Pat. 692,598, Feb. 4, 1902.

After sulphonating toluene and allowing the *p*-sulphonic acid to crystallise out, a little water is added, and the solution kept at about − 5° C. for 48 hours. The *o*-sulphonic acid then separates; *o*-toluene sulphochloride is now obtained by the action of chlorosulphonic acid on the magnesium salt of the sulphonic acid, at a temperature not exceeding 15°—18° C. These improvements are claimed.
—A. C. W.

Sulphinide ["*Saccharin*"], *Substituted* ——; *and Process of Making.* J. Koetschet, St. Fons, France. U.S. Pat. 692,863, Feb. 11, 1902.

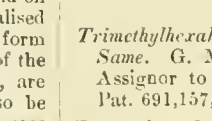
The patentee claims the process for manufacturing *p*-aminobenzoyl sulphonic-imide (sulphinide), which consists in boiling *p*-nitro-*o*-toluene sulphamide with a solution of sulphur in caustic alkali, then acidifying and extracting the precipitate with ether. The process is also applicable to the manufacture of other substituted sulphonic-imides from substituted sulphamides.—A. C. W.

Acetonalkamins [*Anaesthetics*], *and Process of Making same; Acidyl Derivative of Unsymmetrical* ——. C. Harries, Berlin, Assignor to Chemische Fabrik auf Actien vorm. E. Schering, Berlin. U.S. Pat. 692,656, Feb. 4, 1902.

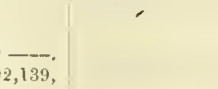
See Eng. Pat. 26,666 of 1896; this Journal, 1897, 1038.
—T. A. L.

Trimethylhexahydroöxybenzylaniline, and Process of Making Same. G. Merling, Frankfort-on-the-Maine, Germany. Assignor to The Farbwerke Hoechst, Germany. U.S. Pat. 691,157, Jan. 14, 1902.

The action of ammonia or amines on formyl or hydroxymethylene ketones of the simple type—



yields aminomethylene cycloketones of the general formula—



where R represents hydrogen or a fatty or aromatic radical. On reduction with sodium in alcoholic solution, these

substances are converted into hexahydro-hydroxybenzylamine bases of the formula—

$$\begin{array}{l} CH_2.CH_2.CH.CH_2.NR_2. \\ \quad\quad\quad\

Films [of Lead Sulphide] on Plate Glass and other Transparent Bodies; Production of ——. J. E. Reynolds and G. R. Grubb, Dublin. Eng. Pat. 4420, March 1, 1901.

The patentees claim the production of uniform amorphous transparent reflecting films on plate glass and other transparent bodies by a process, which is substantially as follows:—A solution, A, contains 15 grms. of thio-urea in 1 litre of water; solution B contains in 1 litre, 75 grms. of (wet) well-washed freshly precipitated lead tartrate and 40 grms. of caustic soda. Four vols. of A are mixed with 6 vols. of water, about $\frac{1}{10}$ vol. of B is then added; the glass to be coated is heated in this mixture at 140° F. until the liquid acquires a dark sherry colour, 2 vols. of B are then added, and the vessel placed in a water-bath at 120° F. and allowed to cool. The transparent body obtained, which can both reflect and transmit light, is also claimed.

—A. C. W.

Photographic Prints; Process for Obtaining ——. C. D. Abel, London. From The Actien-Gesellschaft für Anilin-Fabrikation, Berlin. Eng. Pat. 5879, March 20, 1901.

The process claimed is the modification of that described in Eng. Pat. 12,313, 1900 (this Journal, 1901, 608), which consists in employing an aqueous solution of two or more organic compounds capable of being oxidised by chromium dioxide. These compounds may enter into reaction simultaneously or separately, thus producing a single dyestuff or a mixture. For example, *p*-phenylenediamine, pyrocatechol, and *p*-aminophenol hydrochloride give the shade of a platinotype.—A. C. W.

XXII.—EXPLOSIVES, MATCHES, Etc.

Wind-Proof Matches; Manufacture of ——. F. M. Garber. Technolog, 1901, **4**, 2; through Chem.-Zeit., 1902, **26**, [12], Rep. 34.

Two mixtures are prepared separately: (1) Gum Senegal, 65 parts; bone glue, 25 parts; dissolved in water, 235 parts; to this being added powdered potassium chlorate, 275 parts; powdered glass, 60 parts; gypsum, 25 parts; zinc-white, 25 parts; and umber, 25 parts. (2) Wheat starch, 75 parts; boiled in water, 57 parts; amorphous phosphorus, 6 parts; cascarilla root, 80 parts; dry sifted sawdust, 50 parts. These two compositions are finally mixed together and run through an ordinary paint mill. The wooden matches are then dipped into it to a depth of 2·5 cm., dried thoroughly, and tipped with the usual Swedish igniting composition.—F. H. L.

English Patent.

Matches; Machines for Making ——. H. H. Lake, London. From F. Blake, Passaic, U.S.A. Eng. Pat. 17,628, Sept. 3, 1901.

The machine claimed is characterised by rotary cutters, which cut a strip of veneer into splints, the strip being cut from a roll by a knife moving transversely to it; and a dipping frame, consisting of opposite plates with interlocking fingers, movable beneath the cutters and placed to receive the splints. Two sheets of drawings accompany the specification.—A. C. W.

United States Patents.

Powder; Semi-Smokeless ——. P. G. Stire, Seymour, U.S.A. U.S. Pat. 691,919, Jan. 28, 1902.

The explosive consists of prussiate of potash (12 parts), chlorate of potash (16 parts), dry grain meal (2 parts), sawdust (1 part).—G. W. McD.

Nitrocellulose. D. Bachrach, Baltimore, U.S.A. U.S. Pat. 692,102, Jan. 28, 1902.

The claim is for "a nitrocellulose or similar compound protected against corrosive chemical action by the addition of graphite and bitumen." To the ordinary celluloid mixture, consisting of pyroxylin and camphor, is added about 10 per cent. or more of graphite or bitumen, the former predominating when it is desired that the surface should resist corrosive chemicals, the latter when pliability is more essential.—G. W. McD.

Gunpowder; Method of Treating ——. F. W. Jones, Barwick, England. U.S. Pat. 692,142 and 692,143, Jan. 28, 1902.

See Eng. Pat. 15,553, 1898; this Journal, 1899, 858.

—G. W. McD.

Fire-Cracker. A. Delgrande, Petersburg, U.S.A. U.S. Pat. 692,769, Feb. 4, 1902.

The claim is for a "fire-cracker containing a charge of powder, a charge of illuminating material separated therefrom by a non-combustible substance, and a holder embedded in the said substance and in the powder, and containing a whistling compound (picrate of potash), the illuminating material operating to ignite the said compound, and the latter to ignite the powder."—G. W. McD.

Pyrotechnic Compound. A. Delgrande, Petersburg, U.S.A. U.S. Pat. 692,770, Feb. 4, 1902.

The composition claimed consists of picric acid (20 parts), saltpetre (70 parts), magnesium carbonate (5 parts), dissolved glue (5 parts), Paris-green (3 parts), powdered gunpowder (4 parts). The above are mixed with boiling water to a pasty mass, the excess of water pressed out, and the paste dried and granulated.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Organic Matter; Destruction of ——, *in Testing for Phosphorus, Arsenic, and Toxic Metals.* M. G. Meillère. J. Pharm. Chim., **15**, [3], 97—99.

Gautier effected an almost complete destruction of organic matter by employing nitric and sulphuric acids alternately. Pouchet has shown what portions may be destroyed by the use of potassium bisulphate. The author states that it is possible to obtain in two hours the complete destruction of 250 grms. of organic substance by modifying the details of the above methods.

A mixture of 100 c.c. of sulphuric acid and 400 c.c. of nitric acid is prepared. 250 grms. of organic matter divided into small pieces are placed in a porcelain dish of 3 to 4 litres capacity, with 5 grms. of potassium sulphate and 100 c.c. of the acid mixture. The dish is carefully warmed until liquefaction is complete. The delivery of the remainder of the acid mixture is regulated in such a manner as to add the next 200 c.c. in one hour, and the final portion so as not to cause too great ebullition, with consequent loss of acid. Under these conditions, the destruction of organic matter proceeds very rapidly. From time to time, 1 c.c. of the liquid is taken and evaporated to dryness in a small capsule; if the product blackens, more acid must be added. The operation being finished, the heat is increased in order to separate the greater part of the acid, but finally a few drops more of the acid mixture are added about the centre of the mass in order to complete the oxidation.

This method makes it possible to estimate the total phosphorus in various organic products, milk, grain, vegetable and animal tissues, &c. It can also be applied to the estimation of lead, arsenic, mercury, copper, and zinc.

—C. T. T.

INORGANIC—QUANTITATIVE.

Cyanide Solutions containing Copper; Titration, Use, and Precipitation of ——. W. H. Virgoe.

See under X., *page* 348.

ORGANIC—QUALITATIVE.

"*White Spirit.*" A. and P. Aadenard. J. Pharm. Chim., **15**, [3], 99—101.

The authors state that the adulteration of turpentine by petroleum is on the increase in France, six samples out of nine submitted to them being thus adulterated. The petroleum used for this purpose is sent from America under the name of "white spirit."

It is a colourless liquid, with blue fluorescence. Sp. gr. at 15° C., 0·807; optical rotation − 1°·2 in a 200 mm. tube. It

commences to boil at 150° C., continuing to 160°. From this point, with the thermometer immersed in the liquid, a regular elevation of temperature occurred up to 205° C. The distillation residue at this point represented 42 per cent. of the original volume; it was slightly yellow, and had an empyreumatic odour in which the odour of petroleum was distinctly apparent; it produced a deviation of only − 0°·2.

The employment of "white spirit" in the adulteration of turpentine should have the following results:

A more or less pronounced blue fluorescence; an appreciable lowering of the rotatory power; incomplete vaporisation at the ordinary temperature; a marked increase in the volume of the residue from distillation.

The characters were compared in the samples with the following results:—

Kind.	Specific Gravity at 15°.	Percentage of Residue at 205°.	Deviation of the Product.	Deviation of the Residue
White spirit	0·807	42	− 1°·2	− 0°·2
Pure turpentine.	0·871	6	− 63·1	− 6·4
Adulterated sample	0·864	16	− 57·3	− 8·5
" "	0·860	19	− 52·2	− 9·6
" "	0·865	17	− 57·0	− 8·6
" "	0·861	21	− 54·2	− 8·2
" "	0·863	18	− 55·6	− 8·0
" "	0·867	19	− 54·8	− 9·3

It is remarkable that the deviation of the distillation residue is stronger for the adulterated samples than for the pure substance, when the contrary would be deduced from their respective components. Also the volume of the residue does not give the exact proportion of the added petroleum; but the notable increase in volume is a good indication of the presence of "white spirit" or analogous substances.

In order to determine accurately the amount of the adulteration, it is necessary, after having determined the physical constants of the sample, to destroy the terebene hydrocarbons with fuming nitric acid by Aignan's method. The petroleum remains unaltered or nearly so; it can then be easily identified.—C. T. T.

Erratum:—This Journal, 1902, 280, col. 1, l. 37 and l. 39 from top, for "phenolphthalin" *read* "phenolphthalein."

ORGANIC—QUANTITATIVE.

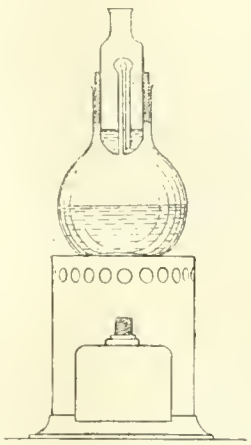
Turkey-Red Oil; Analysis of ——. W. Herbig. Chem. Rev. über die Fett- und Harz-Ind., 1902, **9**, [1], 5—8.

Fatty-sulphuric Acids. — Satisfactory results are obtained in the determination of these, by boiling sulphated oils with dilute hydrochloric acid under an inverted condenser. About 4 grms. of the sulphated oil ("acid oil") are weighed into an Erlenmeyer flask and boiled, with frequent shaking, with 30 c.c. of dilute (1:5) hydrochloric acid during about 40 minutes. The contents of the flask are then allowed to cool, poured into a separating funnel, treated with ether, the aqueous solution removed, and the ethereal solution washed three times with a small quantity of water each time. After the ether has been expelled from the aqueous solution and washings by heating on the water-bath, the sulphuric acid is estimated by precipitation with barium chloride. The results accord with those obtained by decomposing the sulphated oil under pressure.

Glycerin.—After precipitating, as described, the sulphuric acid, the aqueous solution may be used in the determination of the glycerin which has been separated from the sulphated oil. To this end, the barium sulphate is filtered off and the barium removed from the filtrate by the addition of sulphuric acid. The solution is then neutralised with pure caustic potash, diluted to 500 c.c., and a measured volume taken for the estimation of the glycerin, preferably by the Benedikt-Zsigmondy method. The quantity of glycerin found, however, especially when the sulphated oil has been decomposed by mineral acid under pressure, is greater than is theoretically obtainable from pure triolein. Further research is, therefore, necessary to elucidate the reaction which takes place.

The author finds that on boiling a fatty oil with dilute hydrochloric acid, hydrolysis into glycerin and fatty acid occurs to some extent.

Total Fatty Matters—The simplest method for the estimation of these is the Finsler-Breiul method. 30 grms. of the Turkey-red oil to be tested are placed in a narrow-necked flask of 210—250 c.c. capacity, the neck of which is graduated in $\frac{1}{10}$th c.c. divisions, 100 c.c. of water, and 25 c.c. of dilute sulphuric acid are added, and the flask is then heated until the oily layer which forms is perfectly transparent. A hot solution of common salt or sodium sulphate is then added to bring the oily layer into the neck of the flask. After half-an-hour the volume of this is observed. Each c.c. of it corresponds with 3 per cent. of fatty matters. A correction should be made on account of the variation in density of the latter. The author found in three samples variations from 0·9435 to 0·9480. He suggests 0·945 as an average density.—E. B.



Wine; New Apparatus for the Determination of Volatile Acids in ——. G. Sellier. Ann. Chim. anal. appl., **6**, 451. Chem. Centr., 1902, **1**, [6], 372.

The construction of the apparatus is shown in the diagram. 10 c.c. of the wine are placed in the upper flask, and 50—60 c.c. of distilled water in the lower one. The water is boiled briskly till only about 5 c.c. are left, when the flame is removed. As the apparatus cools, the wine is drawn over from the upper flask into the lower one; the former is rinsed with a few c.c. of water, and the liquid titrated in the usual manner.—A. S.

Benzene and Alcohol in Denatured Spirit; Determination of ——. O. Saare and H. Hanow. Zeits. Spiritusind., 1902, **25**, [7], 68.

The spirit examined was that employed for propelling motors, and contained a certain proportion of benzene. 10 c.c. of the spirit were shaken in a Rose's tube with 30 c.c. of a 50 per cent. solution of calcium chloride; the volume of the undissolved benzene was then read off. The alcohol was determined by extracting 25 c.c. of the spirit with 75 c.c. of calcium chloride solution in a separating funnel. After washing the residue repeatedly with calcium chloride solution, the extracts were mixed and 100 c.c. were distilled for the estimation of the alcohol. The sample of motor spirit was thus found to contain: benzene, 10; alcohol, 73; and water (by difference) 17 per cent. by volume. The accuracy of the benzene determination was confirmed by the analysis of artificial mixtures.—J. F. B.

Ethyl Alcohol in Fusel Oil; Determination of ——. O. Saare and H. Hanow. Zeits. Spiritusind., 1902, **25**, [7], 68.

Crude fusel oil when shaken in a Rose's tube with three times its volume of a calcium chloride solution of 1·225 sp. gr. ought to show not less than 75 per cent. of real fusel oil (insoluble), the remainder being ethyl alcohol and water. The following method is proposed for the determination of the ethyl alcohol:—50 c.c. of the crude fusel oil are shaken in a separating funnel with 100 c.c. of the above calcium chloride solution. After running off the latter, the residual oil is washed twice with 50 c.c. of the calcium chloride solution each time. The extract and washings are then mixed and 100 c.c. are submitted to

distillation. The volume of the ethyl alcohol can then be calculated from the specific gravity of the distillate. A sample of crude fusel oil showed: fusel oil, 71·0; ethyl alcohol, 14·9 and water (by difference) 14·1 per cent. by volume. The accuracy of the method was proved by adding known quantities of ethyl alcohol and of water, and the above percentage of water was confirmed by extracting the fusel oil and ethyl alcohol with chloroform in a Rose's tube. —J. F. B.

Water: Determination of Organic Matter in ——. G. de Ridder. Rev. intern. falsific., **14**, 149. Chem. Centr., **1**, [6], 373.

The author describes experiments showing that by oxidising in alkaline solution according to the Schulze-Trommsdorf method, the presence of chlorides does not interfere, as is the case, according to Duyk (this Journal, 1901, 756), when the Kubel-Tiemann method of oxidising in acid solution is used.—A. S.

Cinchona Bark; Assay of the Tincture of ——. F. H. Alcock. Chem. and Druggist, 1902, **60**, [1148], 110.

The author proposes a modification of the B.P. process for the assay of tincture of cinchona bark, and also for the assay of the marc.

Tincture.—10 c.c. are mixed with 0·2 —1 grm. of potassium hydroxide and the alkaloid extracted with 20 c.c. of benzolated amyl alcohol, the residue being washed with a further 10 c.c. of the solvent. The official process is then followed. It is stated that by this method, all emulsification is avoided, the separation being clear and well defined. Chloroform may be used for extracting the alkaloids.

Marc.—5 grms. are triturated in a mortar with 10 c.c. of alcohol and 5 grms. of caustic potash, and after standing for 20 minutes, the mixture is extracted with benzolated amyl alcohol and the analysis proceeded with according to the B.P. directions.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-Active Thorium. K. A. Hofmann and F. Zerban. Ber., **35**, [2], 531—533.

Thorium preparations, exhibiting radio-activity, have been described by Hofmann and Strauss (this Journal, 1901, 76, &c.) and others. The authors having found that the activity of thorium compounds, derived from bröggerite and pitchblende, was increased on fractional precipitation with various reagents, it was hoped that the active substance would be isolated by repeated fractionation. When, however, the most active preparations, in the form of oxide, had been kept in closed vessels for five months, it was found that their activity had fallen off greatly; they had hardly any appreciable effect upon a photographic plate, and but slightly influenced the rapidity of the electroscopic discharge. It must therefore be concluded that thoria, derived from these minerals, possesses only an induced, and not a primary, activity. The original induction was found to be due to uranium contained in the mineral. Thoria obtained from uranium-free Brazilian sand was quite inactive; it became strongly active, however, when left for some time in contact with weakly active uranium compounds. The radio-activity of various thorium preparations was observed to vary in degree according to the proportion of uranium in the minerals from which they were obtained. (See also this Journal, 1902, 143 and 196.)—H. B.

Cerium Group; The Metals of the ——. H. Behrens. Archives néerland. sc. exact. et nat., **6**, [2], 67—93. Chem. Centr., 1902, **1**, [5], 296.

The author first describes the characteristic properties of the metals of the cerium group, and refers to the uncertainty as regards their positions in the periodic system. He recommends, as a preliminary to the re-determination of the atomic weights of the several metals, the careful micro-chemical examination of as many as possible of their crystalline compounds. He then describes the crystalline salts — formates, oxalates, succinates, benzoates, salicylates — of the different metals, and discusses and criticises the various methods which have been proposed for their separation.—A. S.

Nitric Acid on Metals; Action of ——. A. J. Ewart. Nature, **65**, 128. Pharm. J., 1902, **68**, [1649], 82.

Contrary to the statements usually given in text-books with regard to the action of nitric acid on metals, the author finds that under certain conditions of temperature, and dilution of acid, hydrogen is produced. For example, if magnesium be added to cold dilute nitric acid ($\frac{1}{6}-\frac{1}{8}$), an active evolution of nearly pure hydrogen takes place at first, though as the solution becomes warm, and the percentage of magnesium nitrate increases, the production of hydrogen rapidly diminishes.

At low temperatures (below −10° C.), strong nitric acid is without action on metals (copper, zinc, magnesium), and on allowing the temperature to rise slowly, little or no action occurs until a certain point is reached, when a sudden and violent reaction takes place, with an abrupt rise of temperature. The critical point for this violent reaction varies with different metals; for zinc, it lies between 0° and 2° C.; for magnesium between 17° and 19° C.; and for copper between 19° and 21° C.—A. S.

Red Phosphorus. R. Schenck. Ber., **35**, [2], 351—358.

Red and yellow phosphorus are regarded by Ostwald as dimorphous modifications, while Schaum, Wegscheider, and Kaufler regard both forms as chemical isomers, red phosphorus being held by them to be a polymerisation product of the yellow variety.

The results of the author's experiments go to show that the transformation of yellow phosphorus into the red variety is a bimolecular reaction, two molecules of the yellow variety going to form one molecule of the red, and, from the results obtained, the formula of the red phosphorus molecule may be inferred to be $(P_4)_2 = P_8$.

The red phosphorus obtained by the author is of a bright red colour, similar to cinnabar. The difference in colour between it and the commercial article is very probably due to its very much finer state of subdivision.—H. F. C. G.

Boron Nitride. L. Moeser and W. Eidmann. Ber., **35**, [2], 535—539.

When boron nitride is prepared by heating a mixture of borax and ammonium chloride, or by heating borax in ammonium chloride vapour, the yield is small—in the former case owing to volatilisation of the ammonium chloride, and in the latter because the reaction is limited to the surface of the fused borax. The authors have effected much higher conversions (about 50 per cent. of the theoretical) by first mixing the borax with an equal amount of an infusible, indifferent substance, such as tricalcium phosphate, dehydrating the mixture in a Hessian crucible, and then passing ammonium chloride vapour through the porous mass while heated to redness in a combustion tube. The essential reaction may be considered to be:—$B_2O_3 + 2NH_3 = 2BN + 3H_2O$.

If boric anhydride is heated in a stream of ammonia gas, only a superficial formation of BN occurs; but by first mixing the boric anhydride with tricalcium phosphate, the authors obtained an average yield of 65 per cent. The reaction proceeds slowly at the temperature of a combustion furnace, but rapidly in a blow-pipe furnace. To obtain considerable quantities of the nitride, a mixture of one part of pulverised boric anhydride with two parts of tricalcium phosphate is dehydrated by heating it in a Hessian crucible, when a porous mass is obtained. Through a perforation in the crucible lid, a long earthenware tube is inserted; the whole is placed in a blast gas furnace, giving a temperature of about 1200°—1400°, and ammonia gas is led in in a copious but not too rapid stream. After cooling, the mass is ground into a cream with water and boiled with dilute HCl to extract the tricalcium phosphate; it is washed by decantation with acidified water, and then washed on a filter with cold water until free from acid. Finally, it is spread on a porous plate and dried at the room temperature in a

vacuum desiccator. Of the B_2O_3, 80 to 90 per cent. is thus converted into BN.

The nitride is a white, infusible, amorphous substance, which is quickly decomposed by boiling, concentrated KOH solution. It is insoluble in water, but decomposes slowly on boiling with it; even at ordinary temperatures it suffers a slight decomposition, so that when the damp preparation is kept in a closed bottle, it gives a distinct smell of ammonia when the bottle is opened. When the nitride is heated in SO_2 or CO_2, a slight reduction of the gas, with separation of sulphur or carbon, ensues, the formation of B_2O_3 in both cases preventing the further progress of the reaction. On heating the nitride with sodium fluoride and concentrated sulphuric acid, it is completely decomposed, with formation of ammonium sulphate and volatile boron fluoride.—H. B.

Hydrogen Selenide and Hydrogen Sulphide; Comparison of Properties of ——. De Forcrand and Fonzes-Diacon. Comptes Rend., **134**, [5], 281—283.

The authors have made determinations of various physical constants of these two substances; their results, together with those of former observers where these have obviously deserved confidence and have not been repeated, are given in the following table:—

	H_2S.	H_2Se.
T: boiling-point at 760 mm. (absolute)	211°·4	231°·0
Tc: critical temperature	373°·2	410°·0
T/Tc: ratio of these	0·566	0·564
Pc: critical pressure	92 atm.	91 atm.
T': melting or freezing point (absolute)	187°·0	209°·0
D: density of liquid at b.p.	0·86	2·12
Molecular volume of liquid	39·53	38·11
L: heat of vaporisation	4230 cal.	4740 cal.
L/T: Trouton's relation	20·01	20·52
C: heat of formation of hydrate	16340 cal.	16820 cal.
t: temperature at which hydrate has vapour-pressure of 760 mm. (absolute).	273°·35	281°·0
S: solubility at 4°·00 C.	4·04 vols.	3·77 vols.
„ „ 9°·65	3·60 „	3·43 „
„ „ 13°·2	3·35 „	3·31 „
„ „ 22°·5	2·75 „	2·70 „

Examination of these figures shows that the two substances are, as was to be expected, very closely analogous; and comparison with the corresponding figures for water, shows a very much wider difference. The authors are extending their observations to hydrogen telluride.—J. T. D.

Lithium Antimonide; Properties of ——. *Action of Lithium-ammonium on Antimony.* P. Lebeau. Comptes Rend., **134**, [5], 284—286.

Lithium-ammonium reacts on antimony, producing a compound $SbLi_3$, identical with that obtained by electrolysis (this Journal, 1902, 261). The substance dissolves in liquid ammonia, forming the compound $SbLi_3NH_3$. Lithium antimonide has powerful reducing properties, and (like aluminium antimonide) melts at a temperature above the melting-point of either of its constituents.—J. T. D.

Hydroxyisopropylhypophosphorous Acid. C. Marie. Comptes Rend., **134**, [5], 286—288.

The author has prepared this acid in the pure state (see this Journal, 1901, 944) and examined some of its salts and esters. It appears to be a monobasic acid, analogous to the hydroxybenzylhypophosphorous acid of Ville, and to have the constitution $(CH_3)_2C(OH).PO(OH)H$.—J. T. D.

Veratrol; Action of Nitric Acid on Trihalogen Derivatives of ——. H. Cousin. Comptes Rend., **134**, [5], 290—291.

Fuming nitric acid reacts on the trichloro- or tribromo-derivative of veratrol (the dimethyl ether of pyrocatechol) to form a nitro-substitution compound of formula $C_6R_3NO_2(OCH_3)_2$, where R stands for Cl or Br. The trihalogen compounds thus behave like the dihalogen compounds, and quite differently from the tetrahalogen compounds, which give tetrahalogen orthoquinones, by saponification of the ethereal groups and oxidation of the resulting phenolic hydroxyl groups. These trihalogen mononitroveratrols give no colour reaction with ferric chloride (phenolic) or caustic potash (quinonic). The corresponding monomethyl compound, trihalogen-guaiacol, also behaves quite differently with nitric acid, forming quinonic derivatives of diphenyl, which contain no nitrogen.

J. T. D.

Fatty Matters into Sugars during the Germination of Seeds; Transformation of ——. P. Mazé. Comptes Rend., **134**, [5], 309—311.

The author's results show that the digestion of fatty matters in seeds during germination proceeds by progressive fixation of oxygen with probably a slight loss of carbon, resulting finally in sugars.—J. T. D.

New Books.

Class List and Index of the Periodical Publications in the Patent Office Library. [Patent Office Library Series, No. 8.] [Bibliographical Series, No. 5.] Darling and Son, Ltd., 34–40, Bacon Street, London, E. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1902. Price 6*d*.

Small handbook in pamphlet form. It is divided into three sections: (*a*) An abstract of the classification adopted; (*b*) a classified catalogue; (*c*) a brief alphabetical title index; it further contains preface, 158 pages of matter, and the index referred to under (*c*).

An Introduction to Chemistry and Physics. Volumes I. and II. By W. H. Perkin, Jun., Ph.D., F.R.S., and Bevan Lean, D.Sc., B.A. (Lond.). Macmillan and Co., Ltd., London. 1901. Price 2*s*. each. The Macmillan Company, New York.

Vol. I.—Small 8vo volume, containing prefaces, table of contents, 193 pages of subject-matter, four pages of examination papers, two pages devoted to practical examinations, and five to answers. An alphabetic index ends the work. There are 100 illustrations.

Vol. II. contains 183 pages of subject-matter, illustrated with 67 wood engravings. Then follows a series of Public Examination Papers in Chemical and Physical Science, pages 184 to 194; an Appendix devoted to Laboratory Fittings, pages 195 to 203; Notes on Apparatus, 204—207; Answers to Examination Questions, 208—209; and the Alphabetical Index.

Enzymes and their Applications. By Dr. Jean Effront, Professor in the New University in Brussels and Director of the Fermentation Institute. English Translation by Samuel C. Prescott, S.B., Instructor in Industrial Biology, Massachusetts Institute of Technology, Boston. Vol. I. The Enzymes of the Carbohydrates. The Oxydases. John Wiley and Sons, New York, U.S.A. 1902. Price 12*s*. 6*d*. Chapman and Hall, London.

8vo volume, containing author's preface and translator's note, table of contents, 318 pages of subject-matter, a table of bibliography, and the alphabetical index. The subject receives the following treatment:—

I. Work of the Living Cell. Definition of Enzymes. II. General Properties. III. Action of Diastases. IV. Individuality of Enzymes. V. and VI. Sucrase. VII. Fermentation of Molasses. VIII. Amylase. IX. Chemical Work of Amylase. X. Amylase of Different Sources. XI. Industrial Applications of Amylase. XII. Rôle of Amylase in the Brewery. XIII. Manufacture of Maltose. XIV. Primary Fermentation. XV. Rôle of Amylase in the Distillery. XVI. Quantitative Study of Malt. XVII. Maltase. XVIII. and XIX. Industrial Applications of Maltase. XX. Enzymes of Carbohydrates. XXI. Ferments of Glycerides and Glucosides. XXII. Zymase. XXIII. Oxydases.

Trade Report.

I.—GENERAL.

Board of Trade Notice.

Feb. 28, 1902.

The Board of Trade desire to suggest that British manufacturers and traders, who wish to obtain any special information relating to trade in foreign countries, should, before addressing His Majesty's Consular Officers, make inquiry at the Commercial Intelligence Branch of the Board of Trade (50, Parliament Street, S.W.). By taking this course, much delay will be avoided, in cases in which the Intelligence Branch is already in possession of the required information; whilst, in other cases, steps will at once be taken to forward the questions to the proper quarter.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum in Kansas (United States).

Bd. of Trade J., Feb. 20, 1902.

According to the *Engineering and Mining Journal* of 25th Jan., what promises to be a great oil field has suddenly sprung into prominence in the vicinity of Chanute, Kansas, and excitement, at first local, has extended rapidly.

It is vastly superior in percentage of light oils to Beaumont petroleum—three or four to one; it can be refined to great advantage, and now finds a ready sale. These wells do not gush, but yield a heavy flow under compressed air pumps, and the superior quality of the Chanute oil, with the extensive area, suggests great ultimate possibilities.

The oil sand is found from 700 to 800 feet from the surface. Underlying the oil strata, gas is found, some wells flowing from 5,000,000 to 8,000,000 cubic feet per day. The gas has been offered free to manufacturing plants, and the oil is now selling at from 90 cents to 1 dol. 25 cents (3*s.* 9*d.* to 5*s.* 2*d.*) per barrel.

Petroleum Prospecting in Mexico.

U.S. Cons. Reps., Feb. 10, 1902.

A law has been issued to encourage prospecting for oil in Mexico. Among its provisions are the following:—

The Federal Government is authorised to issue concessions for the exploitation of deposits of petroleum or gaseous hydrocarbons in vacant or national lands. Permits to explore may be issued either to private parties, or to companies, and shall be good for one year. During that period, no one but the person or company will be entitled to prospect in the territory. Prospecting permits will be subject to a tax of 5 cents per hectare, payable in stamps on the document.

The sources or wells discovered must each be capable of producing at least 2,000 litres (528 galls.) of petroleum per day, or, in the same time, 20,000 litres of gaseous hydrocarbons, suitable for fuel.

The concessions for exploitation will be good for 10 years. Concessionnaires will enjoy the following franchises:—

The right to export, duty-free, the natural, refined, or prepared products resulting from the exploitation.

The right to import duty-free, on a single occasion, machinery to refine petroleum or gaseous hydrocarbons, and to prepare products of all kinds having crude petroleum as their base; the necessary piping for this industry and the attachments for said piping; pumps, iron or wooden tanks; iron or wooden barrels; gasometers and material for the buildings destined for the exploitation of the industry; all these importations to be subject to the rules and regulations to be enacted by the Department of Finance.

The capital invested in the exploitation of petroleum or gaseous hydrocarbons will be free, for 10 years, from all federal taxation, with the exception of the stamp tax.

All the products of the exploitation will be entitled to a similar exemption, until they become the property of third parties.

The first persons who, in any State, or in the territories of Tepic and Lower California, discover deposits or wells of petroleum or gaseous hydrocarbons, provided that each well yields at least 2,000 litres every 24 hours, will be privileged in such form, that, for a diameter centering at the well where the original discovery was made, and varying in length in proportion to the capital invested in the discovery, and other expenses incidental to the commencement of exploitation, no other person will be entitled to bore wells or to exploit the same products. The length of the diameter within which this privilege is to be enjoyed cannot exceed 3 kilometers (1·8 miles) and shall be fixed in each case by the Department of Finance, in accordance with the rules of practice that are to be issued.

The privilege alluded to in the foregoing section will hold good for a length of time proportionate to the capital invested in the discovery of the deposit or well of petroleum, and in the expenses incidental to the commencement of the exploitation. The duration in question shall not exceed 10 years, and shall be fixed in each case by the Department of Finance, in accordance with the regulations mentioned in the foregoing section.

IV.—COLOURING MATTERS, Etc.

Dye-Plants in Annam.

U.S. Cons. Reps., Vol. LXVIII., No. 257, *Feb.*, 1902.

Various kinds of dye-plants are grown in Annam; mention is first made of the cunao, or "false gambier." This tuber, found throughout the forests of Annam, furnishes, after maceration in water, a yellowish dye, somewhat approaching chestnut in colour, used to colour the cotton stuffs of which the ordinary clothing of the people is composed. The value of the cunao is from 2.92 dols. to 3.89 dols. per thousand head. It is produced in sufficient quantities for home consumption, with a small balance for export. In 1896, the exports of cunao was valued at 13,821 dols. Sapan is very common; the infusion of the bark gives an excellent colour. There are two varieties of the indigo tree which give a fine and lasting dye. The mountainous districts of the north of Annam produce a sufficient quantity of lac for a considerable trade in this article. There remain to be mentioned Indian saffron, gardenia, and the dang-dang, which all yield a yellow colour; the *Quercus ilex*, of which the macerated leaves furnish a black dye; the pastel employed for dyeing blue; the cây dun and the tufa essence, which yield a red dye; and, finally, the kien-kien, which is very abundant in Hué, and the bark of which gives, by infusion, a red colour, which is held in high esteem throughout the district. These plants have not hitherto contributed much toward the commerce and industry of the country, but it is thought that with perfected methods, such plants as, for example, lac and indigo, would be of value for European consumption.

VII.—ACIDS, ALKALIS, SALTS, Etc.

Sulphate of Copper Exports from Great Britain.

Eng. and Mining J., Feb. 1, 1902.

For the full year 1901, the exports of copper sulphate from Great Britain were 36,016 long tons, against 42,900 tons, in 1900, showing a decrease of 6,884 tons, or 16 per cent., last year.

Salts Duty-free for Industrial Purposes in France.

Bd. of Trade J., Feb. 20, 1902.

Three Decrees of the French Government, dated 13th December last, amend the original regulations so far as regards the methods prescribed for the denaturing of salts for use in the manufacture of soap, and further prescribe the methods to be adopted in the denaturing of salts for use in the manufacture of biscuits and of silicate of soda.

The Decrees, in the original, may be consulted by persons interested, on application at the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W. (See also this Journal, 1901, 1039.)

VIII.—GLASS, POTTERY, Etc.

Lead Poisoning in Earthenware and China Works.

Parliamentary Paper, Feb. 12, 1902.

A Parliamentary paper has been issued, giving a return of the cases of lead poisoning reported as occurring in earthenware and china works, during 1899, 1900, and 1901. It also shows the number of cases in each month, with the corresponding figures for all other industries under the Factory and Workshop Acts, the number of cases in the several classes of works, the severity of the attacks, and other details. Thus, in 1899, the total reported as occurring in earthenware and china works was 249; in 1900, it was 200; and 106, in 1901. As regards the other industries, the totals were respectively 1,009, 853, and 757. The total for 1899 includes at least 50 reported cases among house painters, but the totals for the two following years do not include the cases of 199 and 169 painters, as they were not then under the Factory and Workshop Acts.

IX.—BUILDING MATERIALS, Etc.

Artificial Clay in Germany.

U.S. Cons. Reps., Feb. 7, 1902.

Artificial clay is receiving increased attention in Germany. This ceramic novelty, which is used for the manufacture of artificial stone, tiles, gutters, &c., is composed of sand, chalk, cement, liquid glue, and petroleum. The substances are mixed in certain proportions, and a clay-like mass results, which can be formed, and which acquires hardness on being heated.

Tiles are made of it. They have an even surface and sharp edges, are fireproof, resist weather, and absorb no moisture.

The clay is also used for the manufacture of artificial stone. Tests of this clay have been made at the laboratory of the Technical Experimental Station at Charlottenburg, with favourable results.

Portland Cement Industry of the United States.

Bd. of Trade J., Feb. 27, 1902.

In a volume recently issued by the "Geological Survey," regarding the mineral resources of the United States, for 1900, significant information is given of the growth of the Portland cement industry in that country. At the present time the most important of the cement plants are established in Pennsylvania and New Jersey, whilst the industry is rapidly becoming more extensive in Illinois, Michigan, New York, Ohio, Colorado, Indiana, and Texas. Other States in which preparations are being made for the manufacture of Portland cement are Kansas, Virginia, Georgia, and West Virginia.

In 1890, there were 16 works in the United States, producing over 335,000 barrels. In 1894, 24 works produced over 789,000 barrels. In 1899, 36 plants produced over 5,600,000 barrels, whilst, in 1900, there were 50 works, producing 8,482,020 barrels, which is more than the total domestic products and imports combined, in 1899. The average rate of increase from year to year has been over 40 per cent., and the value of the product, in 1900, was 9,280,000 dols. The imports of Portland cement have remained practically constant for the past 11 years, the total, in 1900, being 2,300,000 barrels. (See also this Journal, 1902, 292.)

X.—METALLURGY.

Manganese Ore from Spain.

Eng. and Mining J., Feb. 7, 1902.

Exports of manganese ore from the province of Huelva, Spain, in 1901, are reported by the *Revista Minera* at 91,672 metric tons, against 129,916 tons, in 1900, a decrease of 38,244 tons, or 29·4 per cent. Of these, in 1901, there were 918 tons to Great Britain, 2,361 tons to France, 2,442 tons to Germany, and 85,951 tons to Belgium and Luxemburg.

Metal Scraps and Clippings of Dutch Metal: Customs Decisions (United States).

Bd. of Trade J., Feb. 20, 1902.

Metal Scraps.—Old scraps of metal, consisting of the shells of exploded cartridges, and the scrap metal from which the same were originally cut, collected around arsenals, and composed of copper and nickel, with traces of lead, but containing no zinc, copper being the component material of chief value therein, are specifically included within, and entitled to free entry under, par. 533 of the Tariff.

Clippings of Dutch metal, fit only for remanufacture, are specifically mentioned in par. 505 of the Tariff, and are therefore free of duty, even though specially manufactured to order, for the sole purpose of further manufacture into bronze powder and flitters.

XII.—FATS, OILS, AND SOAP.

Cotton-seed Oil; Manufacture of ——, in Russia.

"*J. S.*" *Westn. shirow. Weschtsch.* 1901, **2**, 252; *Chem.-Zeit.*, 1902, **26**, [10], *Rep.* 26.

Owing to the increased cultivation of the cotton plant in the Russian territories of Central Asia and Transcaucasia, a new industry is springing up, and locally manufactured cotton-seed oil is appearing on the Russian market for the first time. The average composition of the seeds is similar to that of American specimens, being: seales, 45 per cent.; fat, 20 per cent.; other ingredients, 35 per cent. From data supplied by the two existing Russian factories, the actual yield from the seeds is: husk, 55·2 per cent.; oil-cake, 31·3 per cent.; oil, 12·5 per cent. The author considers this output ought to be increased, for in America 13·6 per cent. of oil is obtained. The cost of transport being too great, the oil must be manufactured and refined on the spot; and since the high tax prevents the cakes from being exported, they ought to be exhausted.

Earth-Nut Crop of Madras (India).

Chem. and Druggist, Feb. 22, 1902.

In Madras, there has been a marked recovery, in the area sown with earth-nut, from the depression of recent years. In South Arcot, the area reported far exceeds that of any previous year, and is nearly three times the average of recent years, chiefly attributable to the favourable character of the sowing season, but also to the introduction of a new variety. The season's crop at Pondicherry has also been an excellent one, and it is expected that a million and a half bags will be available for exportation to Marseilles in the course of the current year.

XIII. C.—INDIA-RUBBER, Etc.

Waterproofed Woollen Cloths; Tariff Classification (Spain).

Bd. of Trade J., Feb. 20, 1902.

The *Gazeta de Madrid*, for the 7th inst., contains the text of a Royal Order, relative to the tariff classification of woollen cloths and tissues, similar to cloths rendered waterproof (*a*) by a chemical process, and containing no india-rubber, and (*b*) by combination with india-rubber. The tissues referred to under (*a*) are held to be dutiable, under No. 194 of the Tariff, as "cloths and similar tissues of pure wool, hair, or waste wool," and those under (*b*), under No. 404, as india-rubber tissues combined with other materials.

Rubber Trade of Brazil.

U.S. Cons. Reps., Feb. 15, 1902.

The shipments from Pará, for 1901, show a steady increase over the business of 1900, the total gain being 3,255 tons, of which the increase to Europe was 500 tons, and to the United States, 2,755 tons. In other words, Europe took 14,254 tons of rubber from the Amazon, in 1900, and the United States 12,621 tons, during the same

time; but during 1901, Europe took but 14,755 tons and the United States took 15,376 tons.

Another significant feature shown by these statistics is the enormous growth of the rubber trade at Manaos, amounting to almost 100 per cent. During 1900, there were shipped from Manaos a total of 8,012 tons of rubber, and 18,467 tons, from Pará. During the year just closed, however, Manaos shipped 15,469 tons, and Pará, but 13,639 tons. This change was caused by the passage of a law, in January, 1900, enacting that thereafter, all rubber extracted in the State of Amazonas, and all other products of that State, should be shipped direct from Manaos. A large portion of this rubber had formerly been sent from Pará.

Another feature of these statistics is the large increase in shipments from Iquitos. During 1900, Iquitos shipped 920 tons of rubber direct, and, in 1901, 1,391 tons, a gain of more than 50 per cent. Next year will probably witness a still greater gain, and within a few years the Upper Amazon and its affluents may produce as much rubber as the lower river.

Exports from Pará and Manaos, in 1901.

State.	Europe.	United States.	Total.
	Tons.	Tons	Tons.
Pará	14,755·097	15,376·758	30,131·855
Manaos	7,336·846	8,132·549	15,469·395
Total	..	..	45,601·25

XV.—MANURES, Etc.

Market for Phosphates in Spain.

U.S. Cons. Reps., Feb. 5, 1902.

The trade in phosphates keeps steady pace with the manufacture of fertilizers.

Up to the present, Algeria has furnished almost the entire supply from its vast deposits, near the Tunisian frontier, phosphates being shipped from the port of Bône, usually in a ground state, as only one or two firms in Spain possess the necessary grinding plant.

Small sailing vessels bring the phosphate to this country in the two strengths of 58 to 63 per cent. and 63 to 70 per cent. of tribasic phosphate of lime; and as with a favourable wind these vessels can be depended on to reach a Mediterranean port in three or four days, and can be chartered at freights varying from 6 to 7 francs (1·158 dols. to 1·351 dols.) per ton, the advantage of the Algerian over the American phosphate in this respect is at once apparent. Manufacturers are at the same time fully alive to the value of the Florida rock phosphate, but as this is at present shipped in the rock only, consumers of phosphate, unprovided with grinding plant, are unable to use it—a fact worthy of consideration on the part of shippers from the United States.

Notwithstanding the drawbacks of distance and heavy freights, the Florida article has a certain consumption in Spain, and has given such good results in one or two instances that some manufacturers have decided to use it altogether in future.

Business in phosphates is likely to increase, and important works are said to be in course of construction in one of the North-West Provinces, which will require a large supply of the article. Shippers should therefore carefully study the question of freights, and if these can be reduced so as to compete with those from Algeria, America may look forward to a good share of this trade.

XVI.—SUGAR, STARCH, Etc.

Beet-Sugar Industry of Denmark.

U.S. Cons. Reps., Jan. 31, 1902.

The following data relate to the beet-sugar industry of Denmark for the year 1900—1901 :—

All beet-sugar factories in Denmark are under one management, except that at Nyköping, Falster, which is a co-operative factory; but as it sells all its product to the greater company, the beet-sugar producers of Denmark are united as far as the market is concerned. The acreage under beet cultivation during the year was 30,000 acres, producing 398,000 tons of beet, or about 13 tons per acre. The total receipts for the year were 3,271,249 kroner (876,695 dols.), and the bonus to beet growers amounted to 148,606 dols.

Sugar Imported from Italy; Countervailing Duties on ——, in India.

Bd. of Trade J., Feb. 27, 1902.

A Customs circular, dated Jan. 17, 1902, notifies that the additional duties imposed upon sugar imported from Italy will not be levied from the above date, and until further notice. (See also this Journal, 1901, 949.)

XIX.—PAPER, PASTEBOARD, Etc.

Paper in Formosa (Japan).

U.S. Cons. Reps., Feb. 5, 1902.

The manufacture of paper in Formosa is carried on wholly by hand, and the methods in use are very crude. The chief raw material consists of the young branchless stalks of a small variety of bamboo, and the product is a thick, rough, coarse, straw-coloured paper, abounding in partly macerated bamboo fibres. The production does not meet the demand, common Chinese paper valued at over 175,000 dols. being imported, during 1899. Water power is obtainable in the higher reaches of the Tamsin river, and raw material is more abundant than in China and Japan, and it is suggested that with modern appliances it would be quite possible to build up an export trade.

Another raw material is the paper mulberry plant (*Broussonetia papyrifera*, Vent.), the product from which is used for paper umbrellas, lanterns, &c. The paper mulberry is employed, in Japan, for the manufacture of "mino" paper, a strong, clean-coloured, unglazed paper of fine texture.

Other raw materials in Formosa suitable for paper manufacture, but which have not, up to the present, been utilised, are the fibrous stalk of the banana plant, a considerable amount of jute refuse, and the small shrub, *Wikstroemia indica*.—A. S.

Paper in France.

U.S. Cons. Reps., Feb. 7, 1902.

France manufactures some fine writing paper and a great deal of a very poor quality, used mostly for business correspondence. It is not the quality, however, that gains or loses buyers; it is the tint, often the shape, and especially the manner in which the paper is prepared for this market. The American manufacturer fails to give it the artistic finish desired. In the matter of boxed papers France is as far ahead of the United States in attractiveness of presentation as the latter is ahead of that country in quality. For this reason, the American manufacturer would doubtless be more successful in the sale of paper for commercial correspondence. As a general rule, paper for French business correspondence is of a very inferior quality, and the average business envelope would often be considered too poor for use in America.

One of the needs of this country is a good blotting paper. The article in general use is very poor.

The duty on paper from the United States is rather high, but is no greater than that levied on the English and German productions. The rates for each 220·46 lb. are as follows :—

Paper :—	Dols.
Fancy, coloured, marbled, enamelled	6·95
All other	2·89
Cardboard :—	
In sheets	2·51
Pulped (papier-mâché)	3·32

XX.—*FINE CHEMICALS, Etc.*

Peppermint Oil and Crystals in Japan.

U.S. Cons. Reps., Vol. LXVIII., No. 257, Feb., 1902.

A recent edition of *Nachrichten für Handel und Industrie* says:

The export of peppermint oil from Japan is figured, for the years 1897—1899, as follows:—

Year.	Quantity.	Value.
	Grms.	*Dols.
1897	16,125,600	27,868
1898	11,886,600	25,917
1899	18,363,000	36,415

* $4·86⅔ = 1*l.* sterling.

The export of mint-oil crystals, for 1898 and 1899, is shown in the following table:—

Country.	1899.		1898.	
	Grms.	Dols.	Grms.	Dols.
British India	2,065,800	9,510	1,317,600	5,216
France	2,604,000	9,722	327,000	1,016
Germany	6,301,200	21,875	2,997,000	10,337
Great Britain	4,522,200	14,744	2,079,000	6,949
Hongkong	5,737,800	21,294	7,204,200	24,776
United States	6,120,600	21,634	1,377,000	4,419
Other countries	11,400	36	52,200	176
Total	27,363,000	98,815	15,351,000	52,889

The peppermint plants, called hakka, in Japanese, are best cultivated in fields some 2,000 ft. above the level of the sea, where they are subjected to a primitive process of distillation, after which the oil is sent in an impure state to the export markets. Yokohama is the most important of these. Here, by a simple method, some 40 per cent. of the oil is separated as mint-oil crystals, the residue being exported as "still oil," containing about 10 per cent. of pure mint oil.

Essences and Essential Oils: Tariff Modifications in Belgium.

Bd. of Trade J., Feb. 27, 1902.

A Royal Decree, taking effect on the 1st. inst., exempts the following essences and essential oils from Customs duty, on importation into Belgium:—

Vegetable essences or natural essential oils of bitter almonds, bergamot, cananga (*ylang-ylang*), citrons and their varieties, geranium, iris, jasmine, lemon grass (*Indian verrain*), "linaloe," oranges and their varieties, marjoram, sandal, sassafras, and tuberose.

Saffron oil.

Perfumed unguents imported in receptacles of at least 10 kilos.

Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

4137. W. P. Thompson.—From G. Bevilacqua and G. Bevilacqua, Italy. Improvements in rust-proof and fire-proof compositions specially adapted for preventing the irradiation of heat. Feb. 18.

4190. H. L. Hook. Improvements in filters or strainers for liquids. Feb. 19.

4170. C. Hird. Improvements in filters. Feb. 22.

4549. V. L. Longuemare (*née* A. A. Lechesne). Improvements in and relating to carburettors. Complete Specification. Feb. 22.

4579. C. Hird. Improvements in filtering apparatus. Feb 24.

4693. S. Zylberlast. Improvements in apparatus for cooling liquids, applicable also to evaporative condensers. Feb. 25.

4735. The Edison Ore Milling Syndicate, Limited.—From T. A. Edison, United States. Improvements in calcining apparatus. Feb. 25.

4786. C. A. E. Andersen. Improvements relating to centrifugal separators. Complete Specification. Feb. 25.

5001. C. W. Gould. Improvements in apparatus for storing and delivering condensed gases. Feb. 27.

5015. H. Untiedt. Improvements in boiling, evaporating, and distilling apparatus. Complete Specification. Feb 27.

5150. R. Brown. Improvements in utilising waste heat in connection with smelting furnaces. March 1.

5193. H. S. Bleckly, T. Atberton, and E. Massey. Improvements in and connected with furnace charging and distributing apparatus. March 1.

Complete Specifications Accepted.*

1901.

4126. E. Passburg. Vacuum drying apparatus. March 5.

7063. K. Enzinger. Filter presses. Feb. 26.

15,760. G. Machlet, jun. Carburetting apparatus. March 5.

22,455. M. Blake and R. H. Smart. Vacuum pans, and apparatus heated by steam worms. Feb. 26.

24,399. J. A Elsner and G. F. Knox. Apparatus employed for refrigerating by compression. Feb. 26.

1902.

464. E. M. Knight and J. Hawkbridge. Filters. March 5.

II.—FUEL GAS, and LIGHT.

Applications.

3997. W. P. Gibbons and G. B. A. Gibbons. Improvements in apparatus for charging gas producers for gas retorts. Feb. 17.

4002. J. S. Daniels and F. L. Daniels. Improvements in gas producers. Feb. 17.

4071. G. M. Lauder. Improvements in and relating to burners for acetylene and other illuminating gas. Feb. 18.

4153. A. Spranger. Improvements in fixing ozone in liquids and solutions. Feb. 18.

4353. Sir C. S. Forbes, Bart. Improvements relating to the manufacture of acetylene gas. Complete Specification. Feb. 20.

4371. J. de Dios Tejada. Improvements in acetylene gas generators and portable lamps. Complete Specification. Feb. 20.

4534. S. Biheller. Improvements in the means or apparatus for use in lighting by incandescent mantles. Complete Specification. Feb. 22.

4569. G. Scott-Snell. Improvements in and relating to self-intensifying pressure lamps for incandescent gas lighting. Feb. 22.

4646. C. F. Mayhluh. *See* Class VII.

4762. W. P. Gibbons and G. B. A. Gibbons. Improvements in apparatus for facilitating the emptying and refilling of gas purifiers. Feb. 25.

4842. P. Burt. Improvements in and relating to gas producers or generators. Feb. 26.

4901. A. H. Godwin, F. A. Keil, and J. Dougall. Improvements in the manufacture of coal gas. Complete Specification. Feb. 26.

4902. J. Dougall and H. Godwin. A new or improved condenser washer for use in connection with the condensing and washing of gases. Feb. 26.

4918. J. S. Daniels and F. L. Daniels. Improvements in gas cleaning machines, and apparatus for purifying gas obtained from gas producers and the like. Feb. 26.

5052. A. Holt and E. Holt. Improvements in and relating to gas retorts. Feb. 28.

5053. H. G. Hills of The Industrial Engineering Company. Improvements in gas producing plant. Feb. 28.

5110. V. Schwaninger. Improvements in gas densifying or rarefying apparatus. Complete Specification. Feb. 28.

5123. A. Abraham. Improvements in and relating to incandescence burners and mantles. Feb. 28.

5187. C. Still. Oven for making coke, with recovery of by-products. March 1.

5188. The Acme Sunlight Gas Syndicate, Limited, and H. Baumgarten. Improvements connected with acetylene gas generators. March 1.

5221. W. G. Potter. Improvements in and relating to intensifying apparatus for use in gas lighting. March 1.

Complete Specifications Accepted.

1901.

3671. L. Youbascheff. Manufacture of artificial blocks of ore or fuel. Feb. 26.

5235. P. Naef. Treatment of bituminous fuel. March 5

5845. W. James. Anti-vibration apparatus for gas fittings used for incandescent gas lighting. March 5.

11,714. H. Kinsey, G. Challenger, and J. H. Nott. Improvements in apparatus for generating and storing acetylene gas. Feb. 26.

15,537. A. Meydenbauer. Acetylene apparatus. Feb. 26.

1902.

1049. T. Bradshaw Jack. Apparatus for the production and storage of acetylene gas. Feb. 26.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

4028. C. D. Abel. From Actien-Gesellschaft für Anilin Fabrikation, Germany. Manufacture of mordant dyeing monazo dyestuffs and of intermediate products for use therein. Feb. 17.

4034. J. Y. Johnson. From the Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of azo colouring matters. Feb. 17.

4035. J. Y. Johnson. From the Badische Anilin und Soda Fabrik, Germany. The treatment of colouring matters of the anthracene series and the production of derivatives thereof. Feb. 17.

4280. J. Y. Johnson. From the Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new azo colouring matters and colour lakes. Feb. 19.

4434. J. Y. Johnson. From the Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of aromatic derivatives of certain amido compounds. Feb. 21.

4550. O. Imray.—From The Dye Works, formerly L. Durand, Huguenin, and Co., Switzerland. Manufacture of new derivatives of gallocyanides. Complete Specification. Feb. 22.

4551. O. Imray.—From The Dye Works, formerly L. Durand, Huguenin, and Co., Switzerland. Manufacture of new leuco-gallocyanines. Complete Specification. Feb. 22.

4552. O. Imray.—From The Dye Works, formerly L. Durand, Huguenin, and Co., Switzerland. Manufacture of new leuco-derivatives of gallocyanines. Complete Specification. Feb. 22.

4653. R. B. Ransford.—F. Cassella and Co., Germany. The manufacture of sulphur colours and of materials for producing the same. Feb. 24.

4708. W. G. Thompson and Co., Ltd., and L. E. Vlies. Improvements in the manufacture of azo-compound and sulphurised dyestuffs therefrom. Feb. 25.

4886. L. Landsberg. Improvements in processes for producing acetyl derivatives of cellulose and oxy-cellulose. Feb. 26.

4950. I. Levinstein, H. Levinstein, and Levinstein, Ltd. Improvements in the manufacture of blue sulphur dyestuffs. Feb. 27.

Complete Specifications Accepted.

1901.

7541. O. Imray.—From The Farbwerke vormals Meister, Lucius, and Brüning, Germany. Manufacture of dyestuffs of the anthracene series. March 5.

7919. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of *p*-mono-alkylamido-*p*-oxidiphenylamines and dyestuffs therefrom. March 5.

8800. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of mordant-dyeing monoazo dyestuffs. Feb. 26.

9613. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture of indigo. March 5.

1902.

569. Vidal Dyes Syndicate, Ltd.—From H. R. Vidal, France. Manufacture of dye. March 5.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES

Applications.

4175. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the treatment of animal fibres intended to be dyed. Feb. 18.

4379. C. N. Holmes. Improvements in or connected with fibrous or filamentary materials. Complete Specification. Feb. 20.

4405. W. A. Openshaw and N. Openshaw. Improvements in or relating to condensers for preparing fibrous materials. Feb. 21.

4683. J. H. Houghton. A new or improved composition for rendering fabric non-inflammable. Feb. 25.

Complete Specifications Accepted.

1901.

6644. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Treatment of raw silk and fabrics containing raw silk. March 5.

6666. E. Hindley, S. Walker, and M. Rose. Cop-dyeing machine and extractor. March 5.

24,856. A. Born. Process and apparatus for cleansing, scouring, and removing oil from wool, hair, bristles, and other materials. Feb. 26.

1902.

1609. The Cotton Seed Company, Ltd., and J. C. W. Stanley. Treatment of cotton-seed hulls. March 5.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

4346. S. Trivick. Process for the production of certain sulphates of sodium, potassium, and ammonium. Feb. 20.

4373. G. Beil. An improved process for hydrating oxides, more particularly alkaline earths, and apparatus therefor. Feb. 20.

4646. C. F. Maybluh. Process and apparatus for the de-sulphurisation of sulphurous substances and the treatment of the spent substances in the purification of gas. Complete Specification. Filed 24 Feb. Date applied for, 25 Sept. 1901, being date of application in France.

4797. M. Muspratt, O. Heslop, and The United Alkali Company, Ltd. Improvements in the manufacture of hypochlorites. Feb. 25.

Complete Specifications Accepted.

1901.

6057. D. Crispo and A. Molo. Manufacture of alkaline meta-silicate. Feb. 26.

6857. J. Swinburne and E. A. Ashcroft. Treatment of fused chlorides. Feb. 26.

8545. J. Wetter.—From The Firm of E. Haën, Germany. Catalytic bodies, and manufacture of sulphuric anhydride. March 5.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

4561. E. W. Brock. Improvement connected with kilns for firing, annealing, or otherwise treating glass, china, earthenware, and other material. Feb. 22.

4959. J. O. O'Brien.—From H. Lavollay and J. Lavollay, France. An improved process for strengthening glass, Feb. 27.

Complete Specification Accepted.

1901.

24,468. O. Imray.—From J. A. Chambers, United States. Manufacture of glass articles, and apparatus therefor. Feb. 26.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

4166. A. J. Boult. — From H. Fargues, France. Improvements in or relating to continuous gas furnaces for burning lime and cement materials. Feb. 18.

4298. A. T. MacFarlane. Improvements in and relating to basic fire-resisting material. Feb. 20.

4517. P. Rudolph and H. Kasiske. Improved process for preparing wood or the like. Feb. 22.

4604 J. L. Ferrell. Improvements in wood preserving. Feb. 24.

4644. W. E. Evans.—From H. Croizier et Cie, France. Improvements in and relating to the manufacture of artificial stone. Feb. 24.

4914. E. Schwob. Improvements in or connected with the colouring of stone to imitate marble. Complete Specification. Feb. 26.

4917. G. C. Marks. — From C. Frerichs, Germany. Improvements relating to the manufacture of fire-proof bricks. Feb. 26.

5022. H. J. Haddan.—From Société H. Croizier and Co., France. A new or improved process and apparatus for preparing mortar for the manufacture of bricks or artificial sandstone. Feb. 27.

Complete Specifications Accepted.

1901.

6199. G. E. Clare. Combined metal and concrete walls, floors, and roofs for buildings and the like. March 5.

1902.

383. N. Brooke and W. Glossop. Artificial stone, and manufacture thereof. Feb. 26.

X.—METALLURGY.

Applications.

3989. J. B. de Alzugaray. Improvements in the mode of and means for extracting gold, silver, and other metals from their ores. Feb. 17.

4026. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Method of restoring the activity of platinum used in catalytic processes. Feb. 17.

4027. E. Adamson. Improvements in the purification of pig iron. Feb. 17.

4085. T. V. Hughes. Improvements relating to the treatment of metals during manufacture into various articles, Feb. 18.

4094. G. Harrison.—From The Standard Steel Car Wheel Company, Incorporated, United States. A furnace chiefly intended for treating cast-iron articles to convert them into steel. Complete Specification. Feb. 18.

4172. G. Hopkins and E. Casper. Improvements in smelting iron and other ores, and apparatus therefor. Feb. 18.

4269. A. E. Webb. Improved manufacture of aluminium solder. Feb. 19.

4509. A. I. Irwin. Improved method of and means for extracting metal from ore. Feb. 22.

4621. G. Lieussou. Improved process for production of bronze. Complete Specification. Feb. 24.

4662. S. Deutsch and O. Hochhauser. A new or improved process for the manufacture of magnetic iron and steel castings. Feb. 24.

Complete Specifications Accepted

1901.

4099. A Smallwood. Muffles or furnaces for annealing and like purposes. Feb. 26.

4917. R. A. Hadfield.—From H. D. Hibbard, United States. Furnaces or apparatus for treating manganese steel and other metals for toughening and other purposes. Feb. 26.

7084. D. Bates and G. W. Peard. Annealing of metals. March 5.

26,379. G. Huth.—From F. Pich, Germany. Flux for brazing. Feb. 26.

26,689. G. Teichgraeber. Apparatus for heating the air for supplying blast furnaces. March 5.

1902.

1146. C. V. Potter. Solution to be used in and process for the separation of metals from sulphide ores. Feb. 26.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

4054. H. Ramsbottom and J. M. Richardson. Improvements in terminals for secondary batteries. Feb. 18.

4254. H. H. Lake.—From Société Anonyme "Le Carbone," France. Improvements in or relating to electric cells or batteries. Feb. 19.

4274. H. H. Lake.—From Société Anonyme "Le Carbone," France. Improvements in or relating to electric cells or batteries. Feb. 19.

4520. V. G. Apple. Improvements in or relating to electric batteries. Complete Specification. Feb. 22.

4521. V. G. Apple. Improvements in or relating to storage batteries. Complete Specification. Feb. 22.

5018. J. W. Mackenzie.—From La Société Anonyme L'Eclairage Electrique sans Moteur, Belgium. Improvements in the construction of two-fluid electric batteries. Feb. 27.

5129. W. Loewen. Improvements in electric commutators. Complete Specification. Feb. 28.

5134. S. Cowper-Coles and Co., Ltd., and S. Cowper-Coles. Improvements in the electro-deposition of metals. March 1.

Complete Specifications Accepted.

1901.

4422. C. A. Hussey and S. G. Clarke. Electric primary batteries. Feb. 26.

7397. A. Brochet and G. Ranson. Process for the electrolytic production of caustic alkalies. Feb. 26.

10,191. A. d'Arsonval and G. Vaugeois. Apparatus for the manufacture of the plates of electric accumulators. Feb. 26.

XII.—FATS, OILS, AND SOAP.

Complete Specification Accepted.

1902.

393. G. Sandberg. Method for obtaining an odourless product from train oil for use as a substitute for tallow. Feb. 26.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

3985. E. D. de Liebhaber. A new composition for removing paint, varnish, and similar deposits from wood, iron, and the like. Feb. 17.

4003. P. A. Guye. Improvements relating to the manufacture of zinc oxide. Feb. 17.

4391. J. B. Scammell and E. A. Muskett. Improvements in and relating to the manufacture of artificial rubber. Feb. 21.

4660. The Runcorn White Lead Company, Ltd. G. V. Barton, T. Jones, and C. W. S. Crawley. Improvements in or connected with the production of lead oxide and the treatment of rough litharge and residues from the precipitation of white lead processes. Feb. 24.

Complete Specification Accepted.

1901.

7921. H. Langbein. Chemical purification of graphite. Feb. 26.

XIV.—SCIENTIFIC AND TECHNICAL NOTES.

Applications.

4,000. R. Thomlinson and G. F. Stainton. Improvements in connection with the process for dressing or treating skins and hides. Feb. 17.

4001. R. Thomlinson and G. F. Stainton. Improvements in processes for pickling or preserving hides, skins, and the like. Feb. 17.

4193. J. Straiton. Improvements in machines for cleaning, scudding, or burring skins or hides. Feb. 19.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

7246. A. J. Boult.—From Trenckmann and Co., Germany. Manufacture of waterproof leather and articles therefrom. Feb. 26.

21,863. M. Honig. Manufacture of tanning extracts. March 5.

XVI.—SUGAR, STARCH, AND GUM, ETC.

APPLICATIONS.

4433. J. Wetter.—From M. Weinrich, United States. Apparatus and process for cleaning and washing "massecuite" or raw sugar, and generally applicable for separating or washing crystals or other solid particles from adhering liquids. Feb. 21.

4455. G. M. G. Partridge.—From Le "Trust Chemique" Société Anonyme, France. An improved sweetening substance, and process of manufacturing the same. Feb. 21.

4815. A. R. Ling. Process for the preparation of soluble starch for use as a brewery material, or other purposes. Feb. 26.

COMPLETE SPECIFICATION ACCEPTED.

1901.

12,588. A. Classen. Process for converting wood and other cellulose material into sugar. Aug. 28.

XVII.—BREWING, WINES, SPIRITS, ETC.

APPLICATIONS.

3959. H. Myers. The manufacture of cattle meal from millers' and brewers' bye-products. Feb. 17.

4008. C. V. Thierry. Improvements in the treatment of distillers' spent residues, or wash and like material, and in apparatus therefor. Feb. 17.

4152. J. Schneible. Improvements in the manufacture of malt liquors. Complete Specification. Feb. 18.

4418. E. Oram. An improved apparatus for the disposal of liquid by-products of distilleries and breweries and the like. Feb. 21.

4750. W. H. Prestwich. An improved method for accelerating the maturing of wines and spirits. Feb. 25.

4788. M. Malotaux. Improved process for brewing beer and the like. Complete Specification. Feb. 25.

4815. A. R. Ling. *See* Class XVI.

5105. J. Knox, R. R. Ranger, and G. Thornley. Improvements in apparatus for use in brewing and distilling with unmalted or imperfectly malted grain. Complete Specification. Feb. 28.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

5936. A. J. Oxford. Process for utilising yeast. Feb. 26.

8122. A. G. Southby. Brewing barley malt beers. Feb. 26.

8526. A. M. Clark.—From L. Nathan, Switzerland, and H. Bolze, Germany. Method of and apparatus for brewing beer and the like. March 5.

8722. R. B. Rausford.—From L. W. Gans, Germany. Process for obtaining the contents of yeast cells. March 5.

16,032. P. Meura. Brewing appliances. March 5.

1902.

1527. H. J. Worssam. Mashing apparatus. Feb. 26.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

APPLICATIONS.

A.—Foods.

4329. W. Manasse. An improved process for preserving foods. Complete Specification. Feb. 20.

4921. E. Markovits and F. Guthmann. A new or improved process for the manufacture of a preparation for preserving meat, fish, game, and the like. Feb. 26.

B.—Sanitation; Water Purification.

4120. L. Amiot. Improved process of and apparatus for sterilizing liquids. Feb. 18.

4410. G. H. Bamber Improvements in filters for treating sewage and other foul liquids. Feb. 21.

4622. E. Pollacsek. Process for desulphurising and purifying furnace gases. Feb. 24.

COMPLETE SPECIFICATIONS ACCEPTED.

A.—Foods.

1901.

5525. H. Popper. Manufacture of food preparations. Feb. 26.

16,207. C. de Beck. Process and apparatus for sterilising and pasteurising milk, butter, and other substances. March 5.

B.—Sanitation; Water Purification.

1901.

7170. R. Scott and W. Paterson. Water softening and liquid purifying apparatus. March 5.

XIX.—PAPER, PASTEBOARD, ETC.

APPLICATIONS.

4383. E. Zühl. A new or improved process for the manufacture of a celluloid like substance. Complete Specification. Feb. 20.

4759. S. H. Tibbetts. Improvements in screens for paper pulp. Complete Specification. Feb. 25.

4913. J. L. Perkins and C. E. Pope. Crepe paper. Complete Specification. Filed, Feb. 26. Date applied for March 28, 1901, being date of application in the United States.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

3656. A. Kalmann. Manufacture of peat fibre pulp. Feb. 26.

24,381. J. White. Apparatus for straining pulp and like material. March 5.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

APPLICATIONS.

4450. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture and production of a new pharmaceutical compound. Feb. 21.

4909. E. L. Froger-Delapierre. An improved process for the manufacture of vanilline and other analogous bodies. Feb. 26.

XXI.—PHOTOGRAPHY.

APPLICATIONS

4365. A. Bauermeister. Process for the production of colour filters for taking photographs. Complete Specification. Feb. 20.

5108. F. S. Ogilvie.—From C. A. Ogilvie, New Zealand. An improved solution for intensifying photographic negatives. Feb. 28.

XXII.—EXPLOSIVES, MATCHES, ETC.

APPLICATIONS

4031. F. M. Hale and G. W. Bell. Improvements in and products for denoting explosive compounds. Feb. 17.

4108. A. T. Dawson and G. T. Buckham. An improved percussion primer. Feb. 18.

4781. W. C. Quinby, H. B. Sharps, and D. J. Greger. Improvements in the manufacture of explosive compounds. Complete Specification. Feb. 25.

5205. C. Holmström and G. A. Köhler. An improved percussion primer or detonator. March 1.

COMPLETE SPECIFICATION ACCEPTED.

1901.

25,788. H. J. Richards. C. B. Dougherty, M. Williams, and A. L. Williams. Squib for blasting purposes. March 5.

PATENT UNCLASSIFIABLE.

APPLICATION.

4142. C. Sureties and P. P. Harvey. A process for the solidification of vegetable matter. Feb. 21.

Printed and Published by EYRE and SPOTTISWOODE, East Harding Street, London, E.C., for the Society of Chemical Industry.—F 4336.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 6.—Vol. XXI. **MARCH 31, 1902.** No. 6.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

E. A. Brotherton.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.
C. Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Otto Hehner. | A. R. Ling.

MANCHESTER.
Dr. J. Grossmann. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Clifford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
Sir Robert Pullar. | Thos. Gray.

YORKSHIRE.
George Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Roht. Adams ..... I., XV.
L. Archbutt. I., XII., XVIII.B.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. .... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw .... VII., XI.
M C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. .. IV., XX.
F. H. Leeds .. III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .. XXII.
W. G. McMillan X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. .... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ... IV., V.
F. Neurath, Ph.D. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann..... XVI., XVII.
T. H. Pope ..... XX., XXI.
F. W. Renaut .... Patent List.
G. H. Robertson ..... XI.
Chas. Salter..... I., II., III., XV., XVI.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
A. L. Stern, D.Sc. ..... XVII.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. ... XVI.
E. W. Wheelwright, Ph.D. ..... XXII.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.
A. C. Wright, B.Sc., M.A... IV., XVIII., XX.

Canadian Section.

Chairman: W. R. Lang.
Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.
Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. Hodgson Ellis.
M. C. Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.
Committee:

Percy Bateson.
J. Campbell Brown.
A. Carey.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Herbert E. Davies.
D. Herman.
Julius Raschen.
F. H. Tate.
W. Collingwood Williams.

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.
Committee:

J. J. Bowley.
A. C. Chapman.
E. Divers.
H. Hemingway.
E. Grant Hooper.
D. Lloyd Howard.
W. Kellner.
J. Lewkowitsch.
B. E. R. Newlands.
Boverton Redwood.
Walter F. Reid.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

SESSION 1901—1902.

Monday, April 7th, 1902:—
E. Sanger Shepherd. "Some Recent Improvements in the Photography of Colour."

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

J. Barnes.
W. Brown.
J. Craven.
J. English.
B. W. Gerland.
W. Heys.
J. M. Irving.
M. J. Langdon.
A. K. Miller.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.
Committee:

A. Allhusen.
P. P. Bedson.
J. T. Dunn.
T. W. Hogg.
H. Louis.
F. S. Newall.
H. S. Pattinson.
John Pattinson.
W. W. Proctor.
G. Sisson.
Harry Smith.
J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Cohlentz.
Committee:

H. C. Aspinwall.
M. T. Bogert.
C. F. Chandler.
A. P. Hallock.
J. Hartford.
E. J. Lederle.
E. G. Love.
R. W. Moore.
T. J. Parker.
R. C. Schüpphaus.
M. Toch.
G. N. Williamson.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.
Committee:

S. F. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
J. J. Sudborough.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Mustera Road, West Bridgford, Nottingham.

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.
Committee:

W. Carrick Anderson.
E. M. Bailey.
G. T. Beilby.
H. Bumby.
J. Christie.
W. J. Chrystal.
D. B. Dott.
C. J. Ellis.
W. Foulis.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
W. Ivison Macadam.
J. McCulloch.
T. L. Patterson.
D. J. Playfair.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hopo Street, Glasgow.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Fairley.
Committee:

E. A. Brotherton.
A. W. Cooke.
W. M. Gardner.
H. Grandage.
Edw. Halliwell.
A. J. Murphy.
S. G. Rawson.
A. Smithells.
A. Turnbull.
H. A. Watson.
Thorp Whitaker.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members who are interested in industries in which partially or wholly duty-free spirit would be of advantage, will communicate with the Secretary.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections:—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
Signature of Candidate.....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
Profession or Business Occupation .....
Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have now submitted their report, prescribing a method for dealing with the various substances which might contain Arsenic, and the report has been accepted by the Council.

Copies of this, together with the papers, discussions, and abstracts which appeared in the Journal in 1901, and other extracts, may be obtained from Messrs. Eyre and Spottiswoode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held on July 9th, 10th, and 11th next in Liverpool. Full particulars will appear in a subsequent issue.

List of Members Elected

21st MARCH 1902.

Armstrong, Edward E., Pennsylvania Salt Manufacturing Co., Natrona, Pa., U.S.A., Manufacturing Chemist.

Auchinachie, Peter, 23–24, Victoria Mansions, 32, Victoria Street, Westminster, S.W., Consulting Chemist and Metallurgist.

Austin, J. H., Allscott, Wellington, Shropshire, Analytical Chemist.

Bennett, Arthur E. J., P.O. Box 369, Ayer, Mass., U.S.A., Leather Manufacturer.

Bennie, P. McN., c/o International Acheson Graphite Co., Niagara Falls, N.Y., U.S.A., Foreign Representative.

Bruce, A., Explosives Committee's Laboratory (Proof Butts), Royal Arsenal, Woolwich, S.E., Chemist.

Brunner, Roscoe, c/o Messrs. Brunner, Mond, and Co., Ltd., Northwich, Alkali Manufacturer.

Butterworth, F. J., P.O. Box 54, Newark, N.J., U.S.A., Chemist.

Charlton, Thomas, Pacific Ammonia and Chemical Co., Webster and Francisco Streets, San Francisco, Cal., U.S.A., Manufacturing Chemist.

Cripps, R. A., The Laboratory, Hayward's Heath, Sussex, Analyst.

Cutbush, Chas. G., 149, Westcombe Hill, Blackheath, S.E., Electrical Engineer.

Dickerman, Judson C., 10, Minot Street, Woburn, Mass., U.S.A., Chemical Engineer.

Eckel, Edwin Clarence, State Museum, Albany, N.Y., U.S.A., Geologist.

Fergusson, Donald MacE., c/o Acadia Sugar Refining Co., Ltd., Halifax, Nova Scotia, Analytical Chemist.

Franklin, Chas. R., Gibbstown, Gloucester Co., N.J., U.S.A., Analytical Chemist.

Frederick, Geo. E., jun., P.O. Box 762, New York City, U.S.A., Chemical Merchant.

Geldard, Julius, 120, Park Field Terrace, Otley Road, Bradford, Yorks., Dyeworks Chemist.

Goltz, H. F. C., 155, Brixton Hill, London, S.W., Analytical Chemist.

Gray, John, Port Credit, Ont., Canada, Starch Manufacturer.

Horsfall, L. H., c/o Binny and Co., Madras, India, Chemist.

Ihart, John P., 427, West 38th Street, New York City, U.S.A., Technical Chemist.

Kessler, Henry W., Brandt, Susquehanna Co., Pa., U.S.A., Manufacturing Chemist.

Mabee, H. C., Deseronto, Ont., Canada, Chemist.

Marx, Joseph S, California Powder Works, Pinole, Cal., U.S.A., Chemist.

Mellor, Percy H., Burton Road, Woodville, near Burton-on-Trent, Pottery Manager.

Milligan, Robert E., c/o New York Continental Jewell Filtration Co., 40, West Quincy Street, Chicago, Ill., U.S.A., Chemical Engineer.

More, Andrew, 18, Tunley Road, Harlesden, N.W., Government Analyst.

Neal, Thomas, c/o Acme White Lead and Colour Works, Detroit, Mich., U.S.A., Secretary.

Patchett, Isaac, 11, Field Hill, Batley, Yorks., Science Master.

Robertshaw, Chas. D., 22, Hemstall Road, West Hampstead, N.W., Analytical Chemist.

Scott, Walter, c/o Crossley Bros., Ltd., Openshaw, Manchester, Chemist.

Shaw, W. Ratcliffe, 12, Commercial Brow, Newton, near Hyde, Cheshire, Chemist (Tennants and Co.).

Siebold, Alfred, Eglinton Dyewood Mills, Alloa, N.B., Technical Chemist.

Storar, John; Journals to Coniston Lodge, Hornsea; and c/o Messrs. Reckitt and Sons, Hull, Chemical Engineer.

Werner, Dr. David T., 114, South Ninth Street, Lebanon, Pa., U.S.A., Teacher.

Young, Chas. C., 40, Stone Street, New York City, U.S.A., Colourist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Alexander, D. Basil W., l/o Los Angeles; c/o The Alcatraz Co., 124, Sansome Street, San Francisco, Cal., U.S.A.

Bain, J. Watson; Journals to 90, Charles Street, Toronto, Ont., Canada.

Bassett, Wm. H., l/o Passaic; Torrington, Conn., U.S.A.

Brown, R. B., l/o Headingley; Uplands, Sanderstead Hill, South Croydon.

Chemical and Metallurgical Society of South Africa; Journals to Box 4375, Johannesburg, Transvaal.

Focht, L.; Journals to 105, East Hanover Street, Trenton, N.J., U.S.A.

Fritchle, O. P., l/o Denver; c/o Boston and Colorado Smelting Co., Argo, Col., U.S.A.

Hall, Wm. F.; Journals to c/o The Barrett G. M. Co., Kaapoche Hoop, Transvaal.

Hawdon, H. S.; all communications to Westoe Village, South Shields, Chemical Works Manager.

Holden, A. A.; Journals to c/o Hardman and Holden, Ltd., Miles Platting, Manchester.

Journal of the Fed. Inst. of Brewing; Journals to A. R. Ling, The Institute of Brewing, Brewers' Hall, Addle Street, E.C.

Lewin, H. Jas., Royal Victoria Yard, Deptford, S.E., Analytical Chemist.

Lippincott, Warren B., l/o Argentine; 3616, Genesee Street, Kansas City, Mo., U.S.A.

Luxton, Thos., l/o Spring Street; 28, Albany Street, Hull.

Lynne, Miss Daisie; Journals to Miss Mary S. Lynne, 326, 4th Avenue, Pittsburg, Pa., U.S.A.

Mellon, W. W., l/o Dublin; 9, Glenart Avenue, Blackrock, Co. Dublin, Ireland.

Neilson, Thos., l/o California; c/o Progresso Mining Co., Triunfo B., City of Mexico (*via* Nogales).

O'Connor, Chas. P., l/o 38; 149, Clinton Street, Brooklyn, N.Y., U.S.A.

Remington, J. P., jun., l/o Brooklyn; 417, Bourse Building, Philadelphia, Pa., U.S.A.

Ridsdale, C. H., l/o Southfield Road; Ferndale, Linthorpe, Middlesbro'.

Royal-Dawson, H., l/o Oulton; 3, Eshold View, Woodlesford, near Leeds.

Rücker, Dr. H. von, l/o New York City; 493, Twelfth Street, Brooklyn, N.Y., U.S.A.

Shepard, Dr. C. U., l/o Charleston; P.O. Box 42, Summerville, S.C., U.S.A.

Sindall, R. W., l/o Canada; 80, Manor Road, Brockley, S.E.

Sperry, E. S., l/o Colorado Avenue; P.O. Box 656, Bridgeport, Conn., U.S.A.

Watkins, E. J., l/o 224; 540, Green Street, Upton Park, E.

Deaths.

Hudson, Jos., Rawdon Lodge, Headingley, Leeds.

Irvine, Robert, Royston, Granton, Edinburgh. March 20.

Manchester Section.

Meeting held on Friday, March 7th, 1902.

DR. G. H. BAILEY IN THE CHAIR.

MOISTURE TESTS OF WOOD PULP.

BY J. H. LESTER, M.Sc., F.I.C.

INTRODUCTION.

If any reason be needed for bringing this subject forward just now, it will be sufficient to state that the British Wood Pulp Association are anxious to adopt some universal method of sampling, and that their committee are now sitting to decide upon the methods they will recommend. The practice of analysts differs considerably, and in many cases the result will depend upon the method adopted.

General Description of Wood Pulp Bales.—Wood pulp comes into market under the following heads:—

Mechanical pulp	Moist.
	Dry.
Chemical pulp or "cellulose"	Moist sulphite.
	Dry „
	„ soda.
	„ sulphate.

The timber used may be pine, white or black spruce, aspen, poplar, and, occasionally, maple, birch, or willow. Mechanical pulp is disintegrated by splitting, sawing, and boiling, to remove resinous bodies, whilst chemical pulp is treated in addition with calcium sulphite, caustic soda, or sulphate of soda, and receives the distinctive name due to each. Mechanical pulp is of short fibre and forms the fibrous base of ordinary newspaper, the chemical pulps being longer and softer in fibre, and are used for improving mechanical pulp and for better class papers. "News" seldom contains any other fibrous matters nowadays. The advantages of reducing pulp to air-dry weight for reduction of freights are nearly balanced by the cost of drying and

the possible deterioration of fibre; this accounts for our finding both moist and dry pulps on the market. Pulp is now almost universally made into sheets on a paper machine and packed up into bales for shipment. The main supply to this country still comes from Scandinavia, the remainder from Canada and the United States; the Canadian mills have a combined capacity of over 1,000 tons per day. But little pulp is now made in this country.

The bales may weigh from 100 lb. to 4 cwt., but all the bales in one consignment are supposed to be of the same weight. The separate sheets are held together by means of wires, steel bands, rope, or canvas.

Contract between Buyer and Seller.—According to the terms of the usual contract relating to the sale of a parcel of wood pulp, the buyer is entitled to make a claim if he believes the amount of air-dry pulp received is less than that invoiced. "Air-dry" pulp is now always understood to contain 10 per cent. of moisture, and the pulp is generally sold on this basis, or as containing 50 per cent. of moisture in addition to the air-dry pulp. The latter, known as "moist," then contains 45 per cent. of absolutely dry pulp.

When a claim is made, either on the ground of excess moisture or of short weight, the contract note provides that an analyst shall be called in to make a test of the parcel, and to state in his certificate the amount of moisture contained in at least 2 per cent. of the bales comprising the parcel; he is held responsible for the correct weighing of the bales sampled, and if he uses the form of certificate recommended by the Wood Pulp Association, he will declare the correct invoice weight of the whole parcel as calculated from his results.

Development of Moisture Testing.—As a further introduction to the methods of testing pulp, I may briefly describe the development of moisture tests of this material, as well as of other commodities of similar industrial importance, particularly as regards silk, wool, and cotton.

There must have been a time when but little attention was devoted to moisture contents, or when the materials would be bought according to their apparent condition judged by the more or less expert buyer. The first real test, necessitated by the natural proclivities of traders, would be the institution of some rough and ready system of "conditioning," to which word we owe the title of some of the existing testing establishments, a still prevalent idea being that the samples are exposed to conditions of moisture which reduce or increase the material to their true air-dry weight. Many of the primitive conditioning tests were very simple affairs, generally consisting of exposure to the "ordinary conditions of the air" with or without previous drying. I am not sure that such tests are quite obsolete yet in paper mills, and they are still in use at a few cotton mills. I need scarcely say that the results would vary according to the time and place of exposure, the state of the barometer, and any other conditions determining the hygroscopic state of the atmosphere.

The amount of abnormal or excessive moisture could not be expressed until the average found in air-dry samples was ascertained. This may be considered the second advancing step towards a satisfactory test.*

When analysts and others had ascertained the normal percentage of moisture in the several fibres, they were often called upon to decide whether samples contained an excess of moisture.*

Then it was that the trouble with the analyst began. First the seller complained because the pulp-bales or wool-packs had not been weighed on a beam scale, then the buyer said that the calculation was wrong, repudiating the statement that the sample had lain overnight on his office table, and so on until they agreed to "split the difference." It is to put an end to such troubles as these that the British Wood Pulp Association are attempting to regulate the methods of sampling, &c. As in many other cases of sampling large consignments, the difficulty of obtaining reliable results in the laboratory was and is as nothing compared with the difficulty of obtaining large, representative, and properly authenticated samples of raw material and products.

It was but natural that the most valuable fibre—silk—first received attention on a finally satisfactory basis, and the establishment of the Lyons Silk Conditioning House was the result, the full certificate being only issued when the whole consignment under test was submitted for examination. Other establishments sprang up in continental cities, and when wool and cotton arrived at the same stage of development, the Bradford Conditioning House and the Manchester Chamber of Commerce Testing House followed suit. The returns of the Lyons House represent so large a proportion of the transactions of silk merchants that they are quoted to indicate the activity of the silk trade, and the business of the Bradford House is such that no less than 120 drying ovens are necessary to deal with the material submitted. In face of these facts, and of the many points of likeness between the testing of the several fibres, I think the pulp-testing analyst may perhaps profit by devoting some attention to the methods of such establishments as have gained the entire confidence of the traders they are intended to assist. The suggestion to institute such a thorough system of testing as would require the drying of whole bales is, I think, scarcely likely to be carried into effect, mainly because it would clearly be preferable to dry, say, the tenth part of each of 10 bales, than to dry one whole bale. In the former case we should of course select every tenth sheet from the bale.

"Outside" and "Inside" Pulp.

In order to show the means whereby we may best secure properly representative samples, it will be well to devote a few words to the condition of the pulp before it reaches the paper mill or other place of storage in this country.

Bales of air-dry pulp are generally fairly uniform in moisture from the centre to the edge of the bale when packed, but this is by no means the case after long storage, nor is it true of bales of moist pulp. Since the latter are always packed under pressure, and in many mills the moisture is regulated by the pressure, they contain, just after packing, a greater amount of moisture at the edges than at the centre, and those who have had the misfortune to becalled upon to test frozen bales will remember how they have often found a zone of ice, somewhat like Fig. 1, the middle of the bale not having contained sufficient moisture to form a solid block of ice, although the water is frozen. It is very important that we should satisfy ourselves by observation that when bales have other than perfectly uniform appearance the moisture is distinctly seen to assume the forms shown at Figs. 1, 2, and 3.

Both dry and moist bales may arrive at the paper mill in a very different state to that in which they left the pulp mill. Sometimes the dry bales have been stored in a damp place, or have been exposed to rain or snow; the moist bales may have been stacked for months and have lost weight, or they may have been carried as deck cargo, and the analyst is asked to do the best he can with them. It is well to note that any such influence at first affects only the outside of the bale, and in very few cases is the pulp at the exact centre in any way changed. We find, then, that it is of paramount importance for us to secure a sample containing

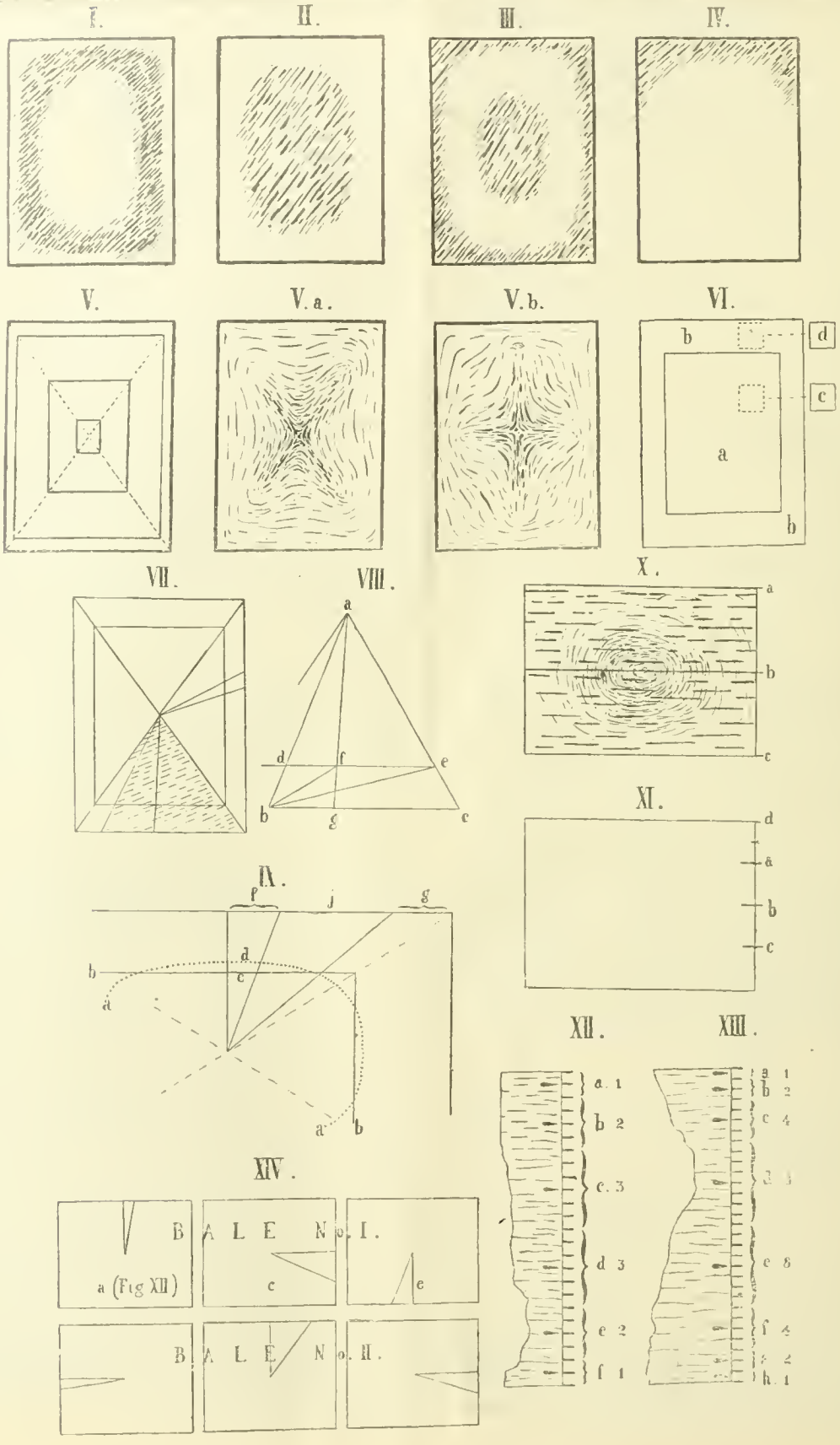
* Instead of stating the percentage of moisture contained in the various fibres, the conditioning houses adopt a system of "regain," but I am unable to say whether their figures are based upon the loss in weight resulting from taking down to absolute dryness, or upon the regain when dried samples were exposed to average conditions of the air. However this may be, the accepted standards are as follows:—

"Regain."	Contents of Moisture when in "correct Condition."
Silk is sold at 11	would be 9·909 per cent.
Wool „ 18¼	„ 16·85912 „
Cotton „ 8½	„ 7·83410 „
Pulp would be 11·1	is sold at 10 per cent.

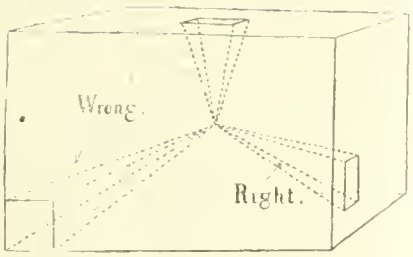
We may consider ourselves fortunate in having to deal with a much less clumsy system than that applied to other fibres.

An attempt was made some years ago to raise the standard of moisture for pulp to 12 per cent., but without success.

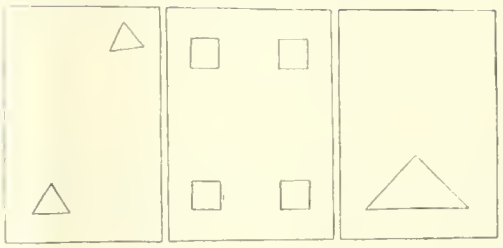
* For normal moisture in pulp, see Readman and Gemmell, J. Soc. Chem. Ind., Vol. II., 1893, pp. 1005–9.


I.
II.
III.
IV.
V.
V.a.
V.b.
VI.
b
d
c
a
b
VII.
VIII.
a
d
f
e
b
g
c
X.
a
b
c
XI.
d
a
b
c
IX.
f
j
g
d
b
c
a
a
b
XII.
XIII.
a. 1
b 2
c. 3
d 3
e 2
f 1
a 1
b 2
c 4
e 8
f 4
XIV.
B
a (Fig XII)
A L E N o. I.
c
e
B
A L E N o. II.

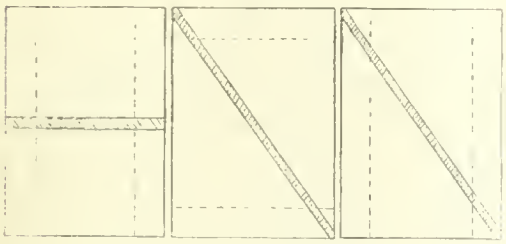
XV.



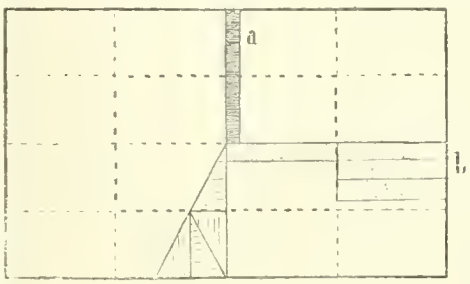
XVI



XVII.



XVIII.



proper proportions of inside and of outside pulp, and that the outside must receive our special attention.

Before going further, I should point out a difference between pulp tests and tests for moisture in some other materials. It is frequently assumed that samples taken from the middle of a parcel, bag, or bale will represent the amount of moisture that was contained when the goods were packed, and the altered weight of the package through drying or wetting need not be considered. In pulp testing, however, the weights are always taken, so that any loss or gain must be balanced by a corresponding loss or gain in moisture contents. Again we see the importance of careful sampling at the outside of the bale.

The "Wedge" Method.

Among other methods of sampling pulp bales, that of cutting wedges from the sheets is already fairly well known in this district, but is not universally acknowledged to be correct. It is true that a casual observer will often say, "Anyone can see that your sample includes too much outside pulp." Perhaps this is the result of an optical illusion, or is due to the difficulty the eye finds in comparing dissimilar areas. This may be illustrated by drawing rectangles, one within the other, so that the inner area is equal to the area between the two; casual observers will generally declare the centre figure to be the larger. Fig. 6 has been drawn in this manner.

There is but little to be said of the origin of the "wedge" method. It is probably very old in its simplest form, and was suggested to me by a Yorkshire paper-maker in January, 1896, and Dr. Alèn, of Gotheuburg, must have been using it about this time, according to his letters to "Wood Pulp" in May, June, and July of that year. My sole claim to originality consists in the method of selection of the sheets, and in properly proportioning the size of the separate "wedges."

Geometrical Treatment of the "Wedge" Method.

We must have seen already that samples taken exclusively from the centre or exclusively from the edge of bales could not be expected to yield a correct result, and the only general condition we have to satisfy is that the sample must contain the same proportion of outside and inside pulp that was contained in the whole bale.

Bales are frequently found to be wet on one side only, or not equally wetted on all sides, and a little consideration will show us that a "composite photograph" of several sheets, or other suitable means, would prove the "general condition" to be as in Fig. 2. The corners of the composite sheet would, if anything, show more moisture than the rest of the edges.

To accurately describe the terms "inside" and "outside," we are compelled to express ourselves in the language of geometry, and to submit our methods of sampling to geometrical proof. The terms have only a relative meaning, until a distinct line of separation can be described.

Dr. Alèn's letters to "Wood Pulp" state that if the sheets be cut into equal halves or quarters a correct sample will result, nor can this be disputed, but he does not discuss the proportions of inside and outside pulp as such.

I have to suggest, to postulate perhaps, that if lines be drawn parallel to the sides of a sheet, joining at the diagonals, and thus forming a rectangular figure, we have a proper geometrical separation of inside from outside, as at Fig. 5, where three such lines of separation are shown; and again that this gives us a close approximation to the actual conditions shown at Figs. 1, 2, 3. The slight difference must be discussed later.

The lines shown in Figs. 5A and 5B are possible lines of separation, but though I have seen many thousands of bales similar to Figs. 1, 2, and 3, only one resembled Fig. 5A. These two figures have a curious interest because they represent conditions under which the "diagonal strip" and the "transverse strip" methods (to follow) respectively would be almost correct, and so furnish the key to a *reductio ad absurdum* proof against such methods.

Having now defined the line of separation, it remains for us to state and prove a geometrical problem. We are called upon to prove that the sample taken from the sheet contains the same proportion of inside to outside pulp that was contained in the whole sheet; *i.e.*, in Fig. 6, that $a : b :: c : d$, the proof being applied to a "wedge"-shaped sample.

The proof is simplified by considering only one of the triangles formed by the diagonals at Fig. 7, since they are of equal area, and the triangles within the line of separation are also equal. (Prop. XXXVIII., Bk 1.)

In Fig. 8 let $a\ b\ c$ represent one of the triangles formed by the diagonals of a sheet or rectangular figure, a

representing the centre of the rectangle (*a b c* may equally represent any *part* of such triangle cut by lines through *a*). Let *d e* be drawn parallel to *b c*, representing the line of separation. Let the triangle *a b g* represent the "wedge" sample.

Join *b f* and *b e*.

It is required to prove that:—

$$d e c b : a d e :: d f g b : a d f.$$

PROOF.

$d e b : d e a :: b d : d a$ and
$d f b : d f a :: b d : d a$ (Prop. I., Bk. VI.)
Therefore, $d e b : d e a :: d f b : d f a$ (Prop. XI., Bk. V.)..... 1.
$a b : a d :: b g : d f$ (Prop. IV., Bk. VI.)
and similarly, $a b : a d :: b c : d e$.
Therefore, $b g : d f :: b c : d e$ (Prop. XI., Bk. V.)
and $d e : d f :: b c : b g$ (Props. XVI. and I., Bk. V.).....
.....2.
$d e : d f :: a d e : a d f$ (Prop. I., Bk. V.)
and similarly, $b c : b g :: b c c : b f g$.
Therefore, $a d e : a d f :: b e c : b f g$ (Prop. XI., Bk. V. and .....2.)
$b e c : a d e :: b f g : a d f$ (Props. XVI. & I., Bk. V.).....3.

Now in .....1 we have—
$A : B :: C : D$;
and in .....3 we have—
$E : B :: F : D$.
Therefore $A + E : B :: C + F : D$ (Prop. XXIV., Bk. V.)
that is—
$d b e + b c c : a d e :: d f b + f b g : a d f$
but $d b e + b e c = d e c b$
and $d f b + f b g = d f g b$ (construction).
Therefore—
$d e c b : a d e :: d f g b : a d f.$ Q.E.D.

To sum up, if our line of separation be correct, we have proved that any wedge drawn from the centre of a plane rectangular figure to the edge must contain the same ratio of inside to outside area that the whole figure contained. The above does not of necessity apply to whole bales, but it does apply to sheets or laminated structures where all horizontal sections have their edges and lines of separation directly superimposed.

I must point out that the wedge would be equally correct whether the line of separation were near the centre or edge of the sheet, also that any zones of intermediate moisture would be correctly sampled; we also see that when testing a single sheet the base width of the wedge is immaterial, and that a sample may be taken either from the side or end of the sheet.

We have now to consider what circumstances occur in practice which may modify the conclusions already arrived at. The most important are as follows:—

1. *Thickness of Sheets.*—If we were called upon to sample a number of bales by taking a single sheet from each bale, it is fairly clear that each sheet should be of the same thickness, though the actual variation is considerable, especially in moist pulp. In an ordinary test, there is no need to do more than bear this in mind whilst sampling, and as far as possible to select sheets of uniform thickness.*

2. *Curvature of Line of Separation.* — It has been already noted that I am not quite correct in taking the line of separation as a rectangular figure, but that it is slightly, or it may be considerably, rounded at the corners, as at Figs. 2, 3, and 4. The question we have to decide is, in what way will this influence the conclusions already arrived at? In Fig. 9, we have both lines of separation drawn, the actual *a*, and the line we have thus far assumed correct *b*. The figures are so drawn that the areas of inside and outside are the same, whichever line be considered. Now taking the wedge *f*, the line of separation would be at *c*, if it were straight, whereas, in practice, it is at *d*; it follows that the wedge *f* is not strictly correct, but includes *too much inside* pulp. Similarly, we may show that the sample at *g* would include *too little inside* pulp. We may conclude that it would be possible to find some intermediate point about *j* where the sample would be correct. This brings us very near to becoming guilty of unnecessary refinement, and the sampler may perhaps be left to his own devices; he may choose the correct point, or if he take the point *f* he will at least be able to say that he is *not* "taking too much outside pulp," as the detractors of the wedge method have frequently averred.

3. *Position in Bale of Selected Sheets.*—In ordinary course, we have to choose our sheets from the bales before sampling them, but it has been convenient to reverse the natural order. There is little or no difficulty in obtaining representative sheets, if we are at liberty to take 10 or 20 at equal distances throughout the bale, but when we consider the selection of one, two, or three sheets we find our task to be very different. A glance at Figs. 10 and 11 will emphasise this point, showing that, whilst the position of the inner sheets selected is of little moment, the exact position of the outer sheets may make a considerable difference. I am taking a bale much drier outside than inside for illustration. Three sheets are taken at *a*, *b*, and *c* by the two methods shown at Figs. 10 and 11, representing vertical or "translaminate" sections of the bale. The sample from Fig. 10 contains two sheets of outermost or driest pulp, and, therefore, assumes two-thirds of the entire bale to be in the same condition of dryness; of course, this is not correct. In Fig. 11, we select *a*, *b*, and *c*, at equal distances apart again, but since the outermost pulp is unrepresented, we have again drawn a false sample. Unfortunately our difficulties are not at an end if we select a point half-way between *d* and *a*, since the outermost pulp is again neglected.

To show that this is no mere "hair splitting," the following results are given of moisture tests made upon full sheets taken from a bale after some weeks' exposure to the open air:—

Sheet.	Moisture.
	Per Cent.
Outside	16·15
No. 2	20·16
„ 3	..
„ 4	28·73
„ 5	33·98
„ 6	43·08
Middle	51·16

I must at once admit that theoretical accuracy had to be abandoned as impracticable in case of ordinary pulp tests, but I hope to show how a satisfactory selection can be made by the application of geometrical principles. I cannot, however, go much further without discussing:—

"*Equal weights*" *or* "*Equal volumes.*"—It is not, on first thoughts, quite clear whether we should collect equal weights of samples from each bale or equal volumes. This may be discussed on general grounds, but I think a stated case will show that volume and not weight must be considered. Let us suppose that two bales are to be tested together; each contained 100 lb. of air-dry pulp when packed, but one of them had been afterwards increased to 200 lb. by wetting.

We should have:—

	No. 1 (200 lb.).	No. 2 (100 lb.).
Absolutely dry pulp contained ...	90 lb.	90 lb.
Total moisture.....	110 lb.	10 lb.
Total moisture per cent.	55	10
Total weight of bales	300 lb.	
Total moisture	120 lb., or 40 *per cent.*	

* It has been suggested that the samples should be cut by means of the guillotine, so that they may be strictly of the same size, and this is undoubtedly theoretically correct for sheets of uniform thickness, but there are many cases when the pulp has to be sampled in the dock or other warehouses, and no machine is available for the purpose.

This is the result that would be obtained if the sampling were correct.

Taking equal *weights* of sample we have :—

	No. 1.	No. 2.
Weight taken, say	100 grms.	100 grms.
Since total moisture is	55 per cent.	10 per cent.
The loss is	55 grms.	10 grms.
Loss on both samples together is	65 grms., or *32½ per cent.*	

but this does not agree with the actual known contents (40 per cent.).

Taking equal *volumes* of sample, and assuming that the bale has not swelled enough to affect the results, we have :—

	No. 1.	No. 2.
Weight taken, say	200 grms.	100 grms.
Since total moisture is	55 per cent.	10 per cent.
The loss is	110 grms.	10 grms.
Loss on both samples together is.	120 grms., or *40 per cent.*	

agreeing with the known correct amount.

We may now lay down the following principles :—

1. Since the bales are all of approximately the same volume in a consignment, the samples representing the separate bales should all be of the same volume.

2. The volume of any single sample or wedge must be proportional to the volume of pulp it represents.

Selection of Sheets.—The following are applications of the above principles.

Let Fig. 12 represent the edge or vertical section of a bale. At *a f* is a scale divided into 24—say a 24-inch bale—and we wish to find three points where sheets may be selected as samples. First divide the scale into such spaces that a simple ratio exists between them, *e.g.*, 1 : 2 : 3 as in *a b c* and *f e d*, the two halves of the bale being considered similar. Now remembering that our method of sampling single sheets is supposed correct, and considering *a b c d e f* as separate areas, it is clear that if samples are taken from the middle of those areas they must be proportional to the bulk of pulp represented ; *b* must be twice the size of *a* and *c* must be three times *a*. This proportion is easily obtained in practice by varying the base lengths of the wedges accordingly.*

If four samples may be taken from the bale, a greater degree of accuracy can be attained, since we can approach to within half an inch of the outside sheet as shown at Fig. 13, still retaining very simple proportions ; the samples are drawn from *a b d* and *f*, their base lengths being 1 : 2 : 8 : 4 (since *a* : *b* : *c* : *d* :: *h* : *g* : *f* : *e* :: 1 : 2 : 4 : 8).

If a still nearer approach were required to the edge of the bale, the ratio 1 : 4 : 9 : 4 : 1 might be taken, or if a works test on a few hundred bales be required, we may proceed as in Fig. 14 (and 12), cutting the wedges from three sides of the bale, and alternately from end and side of the separate sheets. In more complete tests, samples should be taken from both ends and sides of all selected sheets, and, if but few bales have to be tested, quarter, half, or full sheets will be required to represent the largest wedge from the bale.

In deciding upon the size and number of wedges to be selected, regard must be paid to the conveniences for drying, making it a rule to obtain the heaviest sample suitable for the oven.

It may be thought that the foregoing methods will be tedious and cumbersome in practice, but they are intended rather as models to be followed as closely as may be than as very hard and fast rules. Thus there is no need to measure up the bale or wedges with a two-foot rule, though this might be useful for novices. I have found it possible to weigh and sample bales at the rate of 100 per hour, and this could certainly not be done by any other method involving the same number of sheets per bale.

The samples may be conveniently stored in large tin cases with "air-tight" or "lever-top" lids.

* The bases of triangles are of course only proportional to their area when the altitude is constant, and it follows that wedges taken from the side of a sheet are not of equal area to those taken from the end of the same if their bases are equal. We shall find, however, without much trouble that the wedges are equal in area when their bases are proportional to the sides they are drawn from. It is doubtful whether there is any need to apply this extension of theory to practice, but it should not be entirely forgotten.

Sampling by "Solid" Methods.

Many attempts have been made to sample bales of pulp by cutting out blocks with an axe, or to drill cylinders with an auger, but these methods have failed chiefly through mechanical difficulties. If, however, such obstacles were overcome, there are reasons why some such practice would be preferable to existing methods, and since many kinds of merchandise are not packed in sheets, it is worth while to refer to the correct means of sampling such material. I do not intend to treat this subject with the detail it really deserves, as it would involve a proof in solid geometry of greater length than I can undertake in this paper. It is fairly clear that a proof may be based upon that already given for the plane figure, showing that if any solid wedge be taken from the bale with the point of the wedge at the centre and with straight edges to the outside of the bale, a correct sample will result. The same exception already seen in the sampling of sheets has its counterpart in the solid, whereby the base of the wedge should not be close to the corner nor yet at the centre of any of the sides, but somewhat in accordance with Fig. 15. The rule may be applied to anything packed in bale or box form, when it is necessary to obtain a fair proportion of the outer and of the inner substance, it may be wool, raw cotton, rags, soap, &c.

Comparison of Wedge Sampling with Other Methods.

Under geometrical treatment it is now possible to compare different methods of sampling, but we are compelled to assume that whatever method has been used, the intention has always been to select *sheets* of average moisture ; in other words, that the selection of sheets from the bale has been considered apart from the selection of samples from those sheets.

Methods such as those in Fig. 16 must at once be condemned as containing no outside pulp. In one case a difference of 5 per cent. was shown between one of these methods and the wedge method.

Of course the methods at Fig. 16 will sometimes give a correct result, either owing to the existence of a zone of average moisture at the sampling point, or to the uniformity of the moisture throughout the sheet.

Comparisons have been made between the various methods of sampling, but as they do not appear to me to have been made upon suitable bales, I cannot find that it is worth while to discuss them. The differences shown are not large, and I would point out that any comparative tests should be made upon bales which show considerable differences in moisture between the centre and outside, otherwise the variation in results may be due to actual differences of moisture in different parts of the bale.

Two methods have been suggested where some of the outside pulp is included in the sample (Fig. 17), and one of these, which I may call the transverse strip method, may be made so striking an example that Fig. 18 is devoted to showing how far it is incorrect. Let us take a line of separation at the heavy dotted line, so that we have twelve outside rectangles surrounding four inside, all 16 being of equal area. The sample should, of course, contain inside pulp to the extent of one quarter of its bulk ; it actually contains no less than half its bulk of inside pulp by this method ! In other words the transverse strip should contain three times more outside pulp, as at *b*. At *c* we have additional proof of the correctness of the wedge method.

We can see at a glance that the strip method would be correct if the dotted lines at Fig. 17*a* be taken as "lines of separation," but it is necessary to add that the strip *must* be transverse to the lines of separation, and no additional sample must be cut from the same sheet. Fig. 17*b* is practically the same so long as the width of the diagonal strip is not considerable.

A Scandinavian pulp mill informed me that they have found 2 per cent. difference when tests are made by the wedge and the transverse strip method on freshly packed moist pulp. It would seem that pulp mills adopting the methods at Fig. 17 may be invoicing their pulp 2 per cent. over dry. Since there is no other method of sampling short of taking full sheets, where so large a proportion of outside pulp is included as in the wedge method, it seems to follow that any other method favours the buyer when the pulp is externally dry, and favours the seller when externally wet.

I am informed that the British Wood Pulp Association consider the inclusion of abnormally heavy bales in a test to be a most reprehensible practice, and this is easily understood so long as the methods of sampling do not pretend to deal with such bales, and I should add that all writers have been most careful to state that their method is not applicable to bales that have been much wetted. I have no wish to advocate the inclusion of all or any bales in a test, but to point out to analysts that they will do well to use their own judgment in the rejection of bales. A very serious injustice may be done to the pulp mill by the rejection of such heavy bales as recently came under my notice; the bales varied considerably in moisture, many being quite moist to the touch, and others were unusually dry. Finding some of them so abnormally heavy that objection might be taken to my including them in the test, I looked for, but could find no evidence of, external wetting; in fact, these bales were the driest of the lot, and the lighter bales were found to be those with excessive moisture. It is easy to see what had happened. The great variation in moisture from bale to bale had tended to equalisation by contact of the bales with one another, but the dry bales were still appreciably "dry," though of course wetter than when packed. I considered myself fully justified in rejecting none of these dry bales, although they were unusually heavy. The opinion of the British Wood Pulp Association raises the question as to what the analyst is to do when *all* the bales are wet. Surely the buyer is not to be deprived of the right to a test? I venture to suggest that if tested by the wedge method the result will be as nearly correct as any test can be made under such adverse conditions.

Drying the Sample.

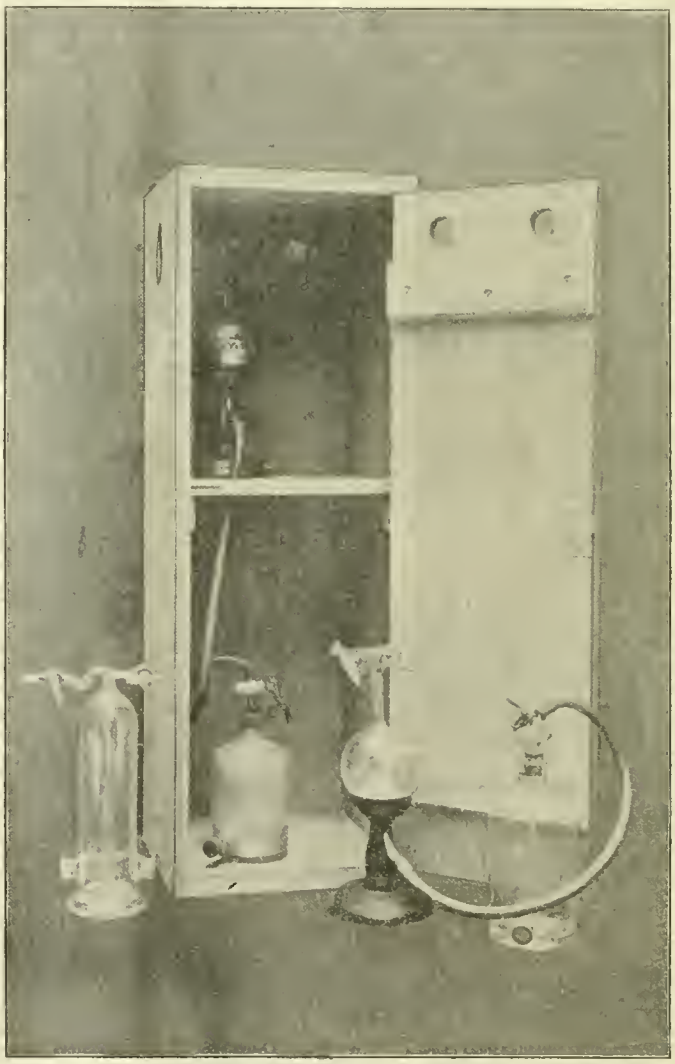
I have already drawn attention to the necessity for drawing large samples whenever bulk of any kind is to be tested, and this brings me to the conclusion of my paper in the consideration of larger samples than those very often considered sufficient by analysts. It was certainly the custom some years ago to take very small samples, mainly because there were no conveniences for the drying of greater quantities. Another difficulty arose in the great length of time required to dry even half a pound of pulp in the usual water-jacketed oven, and several check weighings were necessary. If, in addition, the process was carried out with the use of a desiccator, the time and trouble involved was seldom worth what the analyst could charge for a mere "moisture determination." The use of the laboratory hot-air oven does not improve matters much by hastening the drying, unless it be properly jacketed, and I should therefore like to suggest the use of such appliances as are used for similar purposes in the conditioning houses. The oven in question is merely the outcome of exactly the same troubles experienced by those who have had to test wood pulp, and answers its purpose admirably. A constant temperature of 100° C. is readily obtained, the sample remains in the oven until absolutely dry, and it is only necessary to leave it there until the balance remains constant for half an hour or so. A very common error is the supposition that the final weighing must be very inaccurate because the weighing is done whilst the sample is still hot, but we must not forget that the conditions are by no means comparable to weighing a hot substance on a pan exposed to the cold air. All draughts are cut off from the sample, and the only error remaining is quite negligible or can be allowed for. The error is, of course: (weight of air displaced by pulp at temperature of room) — (weight of air displaced at temperature 100° C.).

AN IMPROVED GAS-SAMPLER.

BY J. H. LESTER, M.SC., F.I.C.

For some years I was in the habit of using the Stead gas-sampler for the collection of flue gases, but I found that it had the following disadvantages:—

1. That it was impossible to obtain a strictly representative sample of gas, because the mercury ran out of the holder much more rapidly at the commencement than at the end of the sampling period. The head of mercury was something like six inches at the commencement and only perhaps one inch at the end.



An Improved Gas Sampler.

2. The construction of the T-piece was such that unless the sample was drawn off very rapidly, an eddy must have been formed at the entrance to the holder, and part of the contents must have been drawn off.

3. The mercury trap in the T-piece of all the samplers I used—half a dozen or more—would not work, owing to faulty construction.

After making and trying several differently constructed samplers, I found that a very efficient instrument could be made by fixing a three-way tap with millimetre bore tubes to the top of a Hempel mercury reservoir. It is important to have the vertical part of the T-tube of sufficient length to prevent the possibility of eddying of gas at the entrance to the bulb. The rubber tube connecting the bulb with the mercury bottle should be of pump tubing, or what I find is better still, the tubing sold by the Oxygen Co. for use with their lantern jets. This tube should be not less than 12 ins. in length, in which case the head of mercury will be about 16 ins. when the sample is commenced, and about 14 ins. at the end of the sampling period. It will follow that the rate of flow will be almost constant and the contents of the bulb will represent, with fair accuracy, the composition of the gases that have passed along the top of the T-piece.

The rate of flow of mercury may be ascertained by collecting it in a small graduated tube, and very little practice will enable the operator to collect 100 to 150 c.c. of gas for analysis during an hour's continuous sampling.

At the end of the sampling period, a few drops of mercury are caused to follow the gas along the horizontal part of the T-piece in order to fill the tube and to "seal" the three-way tap. The lower tap is shut, the air outlet in the stopper closed, and the sampler taken to the laboratory. The T-piece is now connected in the usual manner with the gas analysis apparatus, and the mercury bottle raised above the bulb and inverted. If then the cork be taken from the bottom of the mercury bottle the gas can be transferred to the gas apparatus.

The sampler might be improved by a connecting tube and tap between the rubber tube and the lower opening of the mercury bottle, but I have not found this worth doing in practice. I have used it many times for sampling flue gases and producer gases, and find it quite satisfactory.

All the materials for construction can be had from dealers in gas apparatus, and the only difficulty is the connection of the T-piece to the bulb, which had better be left to an experienced glass blower.

If the sampler be used for carrying the sample some considerable distance, it is better to put the gas under some pressure by means of the mercury bottle, disconnect the lower tap from the bottle, and tie it on to the three-way tap.

A STRENGTH TESTING MACHINE FOR FINE YARNS.

BY J. B. LESTER, M.Sc., F.I.C.

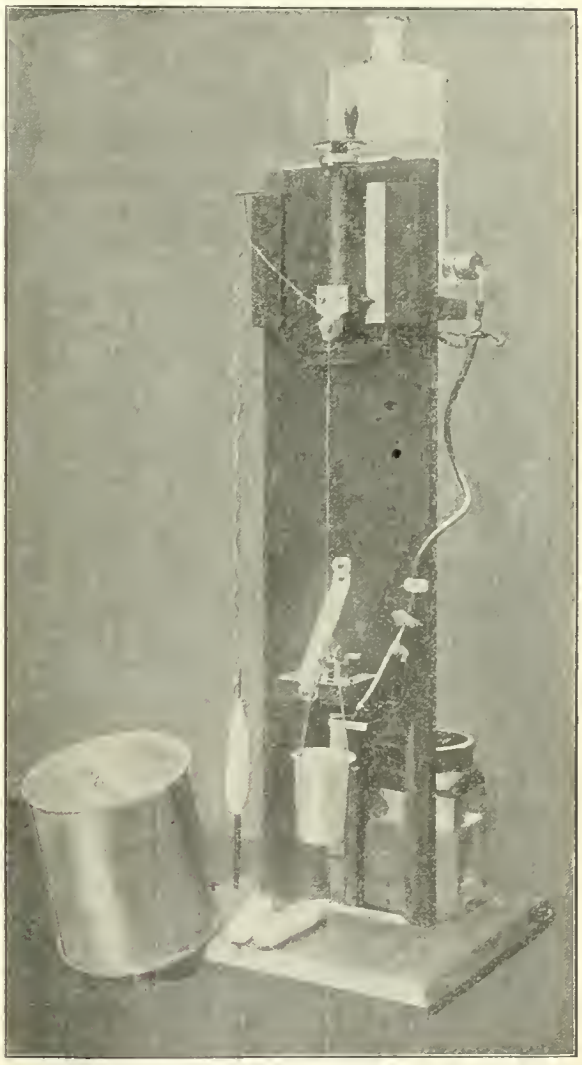
Most, if not all, of the machines used for testing the strength of yarns and textile fabrics are provided, at one end of the specimen with an arrangement intended for extension at a constant speed, whilst, at the other end, the strain is recorded by various means. One effect of the use of the coiled spring or quadrant lever type of recorder is to make it impossible to extend the specimen at a constant speed, so that these types have neither a constant rate of extension nor a constant increase of load; these conditions vary with the elasticity of the specimen.

It is well known that concordant results cannot be obtained with varying rates of extension slightly greater than those rates in common use, but at much lower speeds, this error is eliminated and may generally be neglected.

In any test pretending to accuracy or intended for comparison with *more* or *less* elastic material, it is clear that the speed of extension should be so slow that moderate variations of speed will not affect the result. Unfortunately, considerations of time saving have compelled the use of the highest speed compatible with "reasonable accuracy," and such speed is admittedly too high for anything beyond a rough "works test."

It was with the object of overcoming this objection and of having a machine admitting of rapid and accurate testing that I designed the present instrument.

Like all other machines for this purpose, it has the essential extension and recording apparatus at opposite ends of the specimen. The extension gear is improvised from a micrometer with the optical attachment replaced by a small clamp for one end of the specimen. The readings on the scale give the extension or elasticity. From the other and lower end of the specimen a bucket is suspended by a clamp and wire; these should hang freely from the specimen, the only friction being caused by the twist of the sample pressing a projecting wire from the bucket against a vertical support. The testing stress is obtained by running water into the bucket from a reservoir at a higher level, so that the increase of load is added at a constant rate. This ensures the accuracy of the test depending simply upon the speed of the water supply, and not in any way upon the elasticity of the sample. During the running of water into the bucket, the lower clamp is caused to remain directly opposite a fixed point on the supporting framework, by turning the screw of the micrometer, and so raising the upper clamp. This is easily done in practice. As soon as the thread breaks the lower clamp and bucket fall on to a trigger, immediately cutting off the water



STRENGTH TESTING MACHINE FOR SINGLE YARNS.

supply and turning it into the waste trough and jar at the back of the stand. During the test, the water is supplied to the bucket through a rubber tube with glass jet, this being pushed over the waste trough by the fall of the trigger. The breaking strain is found by adding the weight of water in the bucket (by measurement in a graduated vessel) to the weight of the bucket and its attachments. The measurement of all threads and yarns is very unsatisfactory unless the tension is stated, and since the aluminium bucket and fittings are very light in proportion to the breaking strain of the specimen, it is convenient to take all initial measurements under the load of the empty bucket, &c.

The large bucket in the accompanying figure is for use with samples requiring from 500 grms. to 2 kilos. Still stronger samples would require the addition of a lever attachment.

One advantage this machine has over many others is that it can be worked by hand power without being open to the objections generally urged against this method; there is no need for very great regularity in turning the micrometer screw. The cost of production need not approach that of any of the existing reliable machines.

THE HYGROSCOPIC NATURE OF COTTON.

BY J. H. LESTER, M.Sc., F.I.C.

Having been frequently called upon to declare the percentage of sizing matters added in course of manufacture to cotton cloth, and estimating this size by the usual method of washing or boiling out, it was clearly necessary to ascertain whether pure cotton contained any substance which would otherwise be declared as "size." On determining the amount of this substance by boiling with distilled water and evaporating to dryness, I was somewhat surprised to find as much as 2 per cent. in some samples and never less than 1½ per cent.

I have tried to find any published matter on the subject, but without success, exeept so far as the following paragraph from Dr. Schunk's paper, in the Memoirs of the Manchester Lit. and Phil. Society (Vol. IV., 3rd series), is concerned:—

"Whether cotton contains naturally any substance soluble in water, or which, being originally insoluble, is rendered soluble by the prolonged action of alkalies is a question upon which I pronounce no decided opinion, though I am inclined to believe that there exists in it at least one such body."

The paper in question goes on to deal at length with the matter thrown up by acid, after boiling out cotton with alkali, the "cotton wax," as Dr. Schunck called it, being especially dealt with.

The "Water Extract," as I think I may call it, is undoubtedly of a very complex nature, and no doubt much will depend upon the precise method of extraction. It is likely that much will depend upon the state of the fibre extracted, upon its origin, and upon whether the fibres are entire or broken.* The present paper must be considered as quite a preliminary investigation, since I have only thus far examined fibres as they exist after spinning, and they were of unknown origin. Since, however, a large number of samples from different sources have been examined, I have no reason to doubt the accuracy of the conclusions already arrived at.

The following is an explanation of the table of results. About 60 grms. of cotton yarn, known to contain no added size or other extraneous matter, was mixed in such a manner that, when divided into three parts, each third would have the same composition. The three samples of 20 grms. each were exposed to the air for 24 hours so that the contents of moisture would be the same in each (found to be 7·62 per cent.). The samples were named A, B, and C, and treated as follows:—

A. *Original sample.*—This was exposed to the air and weighings were taken from time to time.

B. *Extract sample.*—This was boiled repeatedly with distilled water, the extract taken down to dryness and found to weigh 1·73 per cent. on the weight of the yarn. Both extracted yarn and extract were exposed to the air and repeatedly weighed as shown.

C. *Dried sample.*—This was dried at 100°, weighed, and exposed to the air along with the other samples.

The columns in the table are as follows:—

I. Date.

II. Weight of original sample A merely exposed to the air of the laboratory under same conditions as the other samples. The weight of the sample is taken as 100 at the first weighing.

III. Weight of extract sample B. The first weight taken as 100 is the weight before extraction. The second weight is after partial drying and exposure to the air. The subsequent weights are after further exposure to the air.

IV. Weight of "dried sample" C. The first weight is before drying, the following, after exposure to the air.

V. This is the weight of sample C on the basis of 100 absolutely dry. It is given in this form because the standard or official "regain" for cotton is 8½. Thus 100 parts of absolutely dry cotton are supposed to take up or "regain" 8½ parts by exposure to the "ordinary conditions of the air."

VI. This is the weight of the water extract, commencing with the absolutely dry weight as 100.

VII. This is the weight of the water extract, based on the weight of yarn taken as 100.

VIII. Weight of extracted yarn plus extract based on 100 of yarn originally taken.

IX. Wet bulb reading.

X. Dry bulb reading.

XI. Percentage of moisture in the original sample calculated from column II.

XII. Percentage of moisture in sample C.

XIII. Percentage of moisture in water extract.

Deductions.—It appears quite clear that the absorption of moisture by cotton is not entirely due to cellulose, and that, although the water extract may only amount to about 2 per cent., the matters composing the extract are largely responsible for the hygroscopic nature of cotton. This fact is very strongly brought out in columns V. and VI., where the "regain" for cotton is almost normal,† or in column XIII., where we find that the extract will absorb moisture up to 28·71 per cent., whilst cotton only absorbs about 8 per cent.

I. Date. 1901.	II. Original Sample.	III. Extd. Sample.	IV. Dried Sample.	V. Abs. Dry as 100.	VI. Ext. as 100.	VII. Ext. on 100. Yarn.	VIII. Extd. Yarn + Ext.	IX. Wet Bulb.	X. Dry Bulb.	XI. H_2O per Cent. in Original Sample.	XII. H_2O per Cent. in Dried Sample.	XIII. H_2O per Cent. in Ext.
	100·00	100·00	100·00	100·00	100·00	1·73	100·00					
2.30, Jan. 17 ..	100·57	95·01	96·05	104·62	106·44	1·85	96·86	..	..	8·14	4·42	6·05
5.00, „ 17 ..	100·56	95·11	97·77	105·83	111·27	1·93	97·04	..	..	8·13	5·51	10·13
9.30, „ 18 ..	100·24	95·12	98·52	106·64	126·81	2·20	97·32	..	..	7·85	6·23	21·14
10.0, „ 19 ..	100·14	95·05	98·58	106·70	128·19	2·23	97·28	..	..	7·75	6·29	21·99
10.0, „ 22 ..	100·85	95·71	99·29	107·47	139·47	2·42	98·13	..	..	8·39	6·95	28·30
10.0, „ 25 ..	100·85	95·89	99·57	107·77	141·88	2·46	98·35	..	..	8·39	7·22	29·53
12.30, „ 26 ..	100·77	95·97	99·66	107·90	139·43	2·41	98·38	..	..	8·32	7·32	27·76
10.0, „ 28 ..	99·93	95·27	98·87	107·02	126·90	2·20	97·47	7·7	9·5	7·55	7·49	21·21
10.0, „ 30 ..	100·93	96·37	99·95	108·18	140·27	2·43	98·80	8·5	10·5	8·47	7·59	28·71
10.0, „ 31 ..	99·50	95·00	98·67	106·80	119·67	2·08	97·08	11·0	14·5	7·15	6·38	16·67
10.0 Feb. 1	99·26	94·82	98·52	106·64	116·80	2·05	96·07	8·5	11·0	6·93	6·23	15·22

* A comparative test gave 1·73 per cent. water extract from yarn, as against 2·11 per cent. from the same, cut to an average length of a quarter of an inch.

† *Cf.* 8½ normal regain and 8·18, on Jan. 30, against a "regain" of the extract 40·27.

Column IV., compared with II., is an illustration of the length of time required for a sample of dried cotton to absorb the amount of moisture contained in undried cotton, under the same conditions of exposure.

The wet and dry bulb readings are not quite satisfactory, and, if the experiment were repeated, should be taken along with barometric readings.

I believe the subject to be worthy of further investigation, particularly as regards the composition of the water extract, and the possibility of modifying the conclusions arrived at by Dr. Schunck in his classical paper on Cotton Wax.

THE ESTIMATION OF VANADIUM.

BY D. T. WILLIAMS.

After reading the interesting paper on vanadium by Mr. Procter Smith in the Journal for December 31st, 1901, it occurred to me, as the metal has been hitherto somewhat neglected, and the methods of estimation are in consequence but little known, that the volumetric determination I had occasion to use on similar (lead vanadate) ores, about two years ago, might not only interest some members, but be useful as being equally accurate and quicker than the one given, inasmuch as it saves a tedious evaporation and fusion.

The assay given by Mr. Smith, summarised, is :—solution of the ore in acids, separation of lead by sulphuric acid, evaporation of filtrate to dryness, fusion for separation of iron, solution of vanadate in water, reduction by sodium sulphite (Na_2SO_3), and titration with potassium permanganate. This method gave very good results, but the main objection to it was the inconvenience resulting from inability to fuse directly in platinum crucibles owing to the presence of lead, thus necessitating separation by sulphuric acid, and, in consequence, loss of time in evaporation before fusion was possible.

Sutton mentions in his "Volumetric Analysis" that a ferrous solution reduces vanadium pentoxide (V_2O_5) to vanadium tetroxide (V_2O_4). This reaction seemed to me a suitable one to apply to this kind of ore. If it could be used successfully, the tediousness of evaporation and of fusion for separation of iron would be avoided. After some consideration of this reaction, I evolved the following method, which is here stated generally :—Solution of the ore in acids, separation of lead by sulphuric acid, oxidation of iron and vanadium by nitric acid, and titration by standard solution of ferrous sulphate or ferrous ammonium sulphate. I found that this produced good results, which practically confirmed those obtained by the fusion and sulphur dioxide method.

The details are as follows :—Take 1 or 2 grms. of the ore (according to richness), and treat with about 6 c.c. of nitric acid; after thorough decomposition evaporate to dryness, heat with 4 c.c. of sulphuric acid until all nitric acid fumes are expelled, dilute with hot water, and boil; filter off lead sulphate, oxidise filtrate with 4 c.c. of nitric acid; boil well. If excess of acid should be used, make alkaline with ammonium hydrate and reacidify with dilute sulphuric acid. Cool solution to about 10° C., and titrate with decinormal solution of ferrous sulphate containing free sulphuric acid (standardised by decinormal potassium bichromate or permanganate), using potassium ferricyanide as indicator. The yellow solution of the assay is converted into a bluish colour by the ferrous sulphate, which colour, however, is too faint to affect the indicator. The iron value of ferrous sulphate solution used, multiplied by 0·914 = Vanadium.

$$V_2O_5 + 2FeSO_4 + H_2SO_4 = V_2O_4 + Fe_2(SO_4)_3 + H_2O.$$

In the case of alloys, it is advisable to dissolve half a grm. in aqua regia, or hydrochloric acid and potassium chlorate, evaporate to dryness, and heat with 6 to 8 c.c. of sulphuric acid until all nitric fumes are evolved, the chlorides at the same time being destroyed, the presence of which is detrimental to the titration. Dilute with water, filter, oxidise with about 6 to 8 c.c. of nitric acid, boil well, and titrate as before.

As a check, the reduced solution may be again titrated back with N/10 or N/20 potassium permanganate, until a faint pink colour is obtained for 20 or 30 seconds. This confirms, with generally a little higher result.

I should like to suggest that Mr. Smith's method of checking the titration by reducing the second time with sulphur dioxide could be done in very much less time by retitrating his titrated solution direct with ferrous sulphate.

Experiments showing the Effect of excessive Nitric Acid.

4 c.c. HNO_3.	4 c.c. HNO_3, making alkaline and acidifying with dilute H_2SO_4.	10 c.c. HNO_3, making alkaline and acidifying with dilute H_2SO_4.	20 c.c. HNO_3, making alkaline and acidifying with dilute H_2SO_4.
$FeSO_4$ 4·35 c.c.	$FeSO_4$ 4·40 c.c.	$FeSO_4$ 4·5 c.c.	$FeSO_4$ 4·45 c.c.

—	Lead Ore. No. 1 sample.	Lead Ore. No. 2 sample.	Oxides of Iron and Vanadium.	Residue.	Lead Ore, poor in Vanadium.
	Percentage of Vanadium.				
$FeSO_4$ method ..	1·86, 1·84	3·24	10·4, 10·5	0·43, 0·47	0·174, 0·18
Fusion, SO_2 & $KMnO_4$ method ..	..	3·20	..	..	..

Sample of Iron and Vanadium Alloy.

Check by titrating back with $FeSO_4$.

(1) Solution in HCl and $KClO_3$, evap. fusion SO_2, and titration by $KMnO_4$ = Vanadium. 13·87 per cent.... 13·56 „ .... Vanadium. 13·62 per cent. 13·40 „

—	$FeSO_4$ method.	Check by titrating back with $KMnO_4$.	Remarks.
	Vanadium Per Cent.	Vanadium Per Cent.	
(2) Solution in H_2SO_4 and oxidation by HNO_3 acid	13·30, 13·54	.., 14·1	
(3) Solution in aqua regia, evaporation in H_2SO_4, and oxidation by HNO_3	13·72, 13·36, 13·57	14·14, .., ..	
(4) Solution in aqua regia, evaporation in H_2SO_4, and oxidation by potassium chlorate	17·08	13·98	Nos. 4 and 6.—High results are due probably to the excess of $KClO_4$ not being decomposed. It is interesting to note that the checking of those assays by $KMnO_4$ confirm original results.
(5) Solution in HCl and $KClO_3$, evaporation in H_2SO_4, and oxidation by HNO_3	13·30	13·76	
(6) Solution in HCl and $KClO_3$, evaporation in H_2SO_4 and oxidation by potassium chlorate	16·68	14·0	
Sample of lead ore	2·01, 2·07	2·30, 2·37	

If potassium permanganate be preferred as a titrating solution, I do not see what objection there is to the reduction of the oxidised solution (obtained as explained above) by ferrous sulphate, avoiding excess by using potassium ferricyanide as indicator, and then titrating.

The point of the whole process is the reduction of the vanadic acid by a reagent passive to the ferric compounds simultaneously present, so avoiding the necessity of separating the iron by fusion or otherwise. Copper has no detrimental effect on the assay. The results obtained on various samples are given on page 389.

In conclusion, I may say that I am very much indebted to Mr. J. H. Clutton, of Messrs. Elliott's Metal Company, Burry Port, for suggestions and revision of this short paper.

DISCUSSION.

Dr. GERLAND said that, with regard to Mr. Williams' separation of vanadium, the separation of lead was not reliable. Fluxing with alkaline carbonate or with alkaline bisulphates he considered to be the safest way of separating lead from vanadium. He had used the permanganate test some 40 years ago, and had always found it very accurate for standardising. Permanganate he used as a standard solution of vanadium, reduced the tetroxide by sulphur dioxide, or hydrogen sulphide, and such a solution was permanent when exposed to the air. After the addition of permanganate, and treatment with sulphurous acid, it would then be ready to be used again for standardising permanganate.

Newcastle Section.

Meeting held at the Durham College of Science, on February 27th, 1902.

MR. W. L. RENNOLDSON IN THE CHAIR.

THE DENSITY OF AQUEOUS SOLUTIONS OF FERROUS CHLORIDE.

BY J. T. DUNN, D.Sc.

Communication from the Laboratory of J. and H. S. Pattinson, Newcastle-on-Tyne.

In the course of investigations, in which we were engaged last autumn, into a modification of the Hunt and Douglas process for the treatment of copper ores, it became necessary for us to work with solutions of ferrous chloride of various (and known) strengths. The most convenient way of preparing such solutions is, of course, to make a saturated solution of the salt and dilute it appropriately, and the requisite dilution is most speedily ascertained by taking the density with the hydrometer.

I could not find, however, any figures giving the strengths of ferrous chloride solutions of different densities, and had, therefore, to determine directly the strength of each of the solutions we used. I thought it might be useful to future workers to put on record the figures I obtained, and I therefore extended the work beyond the limits of our immediate requirements.

A nearly pure steel wire was dissolved in hydrochloric acid, the solution was filtered and evaporated to crystallisation, slight excess of acid and some of the wire being always present. The crystals, after rinsing, were dissolved in water again, and more crystals added to the solution until it was saturated. A very few drops of hydrochloric acid in a litre of the solution, and a fragment of the wire, were enough to prevent any oxidation of the solution in the closed flask in which it was contained. The densities of this solution and of solutions made by diluting it to different extents were determined at 15·5° C. by a specific gravity bottle, and the iron was then determined in a measured portion, after appropriate dilution, by means of standard potassium dichromate solution. The results of the actual observations are given in Table 1, in which I have calculated the iron both as anhydrous and as crystallised ferrous chloride, and have expressed its amount both as grms. per 100 c.c., and as grms. per 100 grms. of the solution.

From these results a curve was plotted, and the figures in Table 2, giving the content in ferrous chloride of solutions of densities increasing by regular differences of 0·01, are taken from the curve. The curve was exceedingly regular and very nearly straight, that is to say, the amount of ferrous chloride contained increases almost proportionately with the density.

The solution of density 1·4439 was saturated; it contained 54·20 grms. of the anhydrous salt in 100 c.c., or would be obtained by dissolving 37·53 grms. of the anhydrous salt in 62·47 grms. of water, or 58·82 grms. of the crystallised salt in 41·18 grms. of water. This represents, of course, the maximum solubility of ferrous chloride in water at 15·5° C.; calculating from the figures just given, it is seen that, at that temperature, 100 grms. of water will dissolve 60·06 grms. of anhydrous, or 142·85 grms. of crystallised ferrous chloride.

TABLE 1.

Specific Gravity.	Weight in grms. of $FeCl_2$.		Weight in grms. of $FeCl_2.4H_2O$.	
	In 100 c.c.	In 100 grms.	In 100 c.c.	In 100 grms.
1·0459	5·19	4·96	8·13	7·77
1·0892	10·27	9·43	16·09	14·77
1·1255	14·64	13·02	22·92	20·37
1·1385	16·08	14·13	25·20	22·15
1·1688	19·73	16·88	30·91	26·43
1·2103	24·95	20·62	39·09	32·30
1·2528	30·16	24·07	47·26	37·72
1·2625	31·55	25·00	49·03	38·86
1·2916	34·92	27·03	54·72	42·36
1·3010	36·38	27·97	57·00	43·82
1·3289	39·80	29·95	62·36	46·92
1·3674	44·65	32·66	69·97	51·18
1·4065	49·39	35·13	77·39	55·04
1·4319	52·80	36·87	82·73	57·79
1·4439	54·20	37·53	84·93	58·82

TABLE 2.

Specific Gravity.	Weight in grms. of $FeCl_2$.		Weight in grms. of $FeCl_2.4H_2O$.	
	In 100 c.c.	In 100 grms.	In 100 c.c.	In 100 grms.
1·05	5·66	5·40	8·87	8·45
1·06	6·82	6·43	10·69	10·09
1·07	7·99	7·47	12·51	11·69
1·08	9·16	8·48	14·35	13·29
1·09	10·34	9·49	16·20	14·86
1·10	11·52	10·47	18·05	16·41
1·11	12·71	11·45	19·92	17·86
1·12	13·91	12·42	21·80	19·46
1·13	15·11	13·37	23·68	20·96
1·14	16·31	14·31	25·56	22·41
1·15	17·52	15·24	27·45	23·87
1·16	18·73	16·15	29·36	25·31
1·17	19·95	17·05	31·27	26·73
1·18	21·17	17·94	33·19	28·13
1·19	22·41	18·83	35·12	29·51
1·20	23·62	19·68	37·02	30·85
1·21	24·81	20·50	38·89	32·14
1·22	26·10	21·30	40·91	33·53
1·23	27·35	22·24	42·85	34·84
1·24	28·58	23·05	44·78	36·11
1·25	29·82	23·86	46·73	37·38
1·26	31·09	24·68	48·72	38·67
1·27	32·31	25·44	50·64	39·87
1·28	33·52	26·19	52·53	41·04
1·29	34·81	26·98	54·55	42·29
1·30	36·08	27·75	56·54	43·49
1·31	37·33	28·49	58·49	44·65
1·32	38·59	29·23	60·47	45·81
1·33	39·84	29·96	62·43	46·94
1·34	41·11	30·68	64·43	48·08
1·35	42·38	31·39	66·40	49·18
1·36	43·65	32·10	68·41	50·30
1·37	44·92	32·79	70·41	51·39
1·38	46·19	33·47	72·40	52·46
1·39	47·45	34·14	74·37	53·50
1·40	48·72	34·80	76·37	54·55
1·41	50·00	35·46	78·36	55·57
1·42	51·25	36·09	80·32	56·56
1·43	52·52	36·73	82·30	57·55
1·44	53·76	37·33	84·26	58·51

Dr. DUNN also gave an account of "Some Recent Progress in the Manufacture of Sulphuric Acid."

New York Section.

Meeting held on Friday, February 21st, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE MANUFACTURE OF SOLUBLE BARIUM COMPOUNDS FROM BARYTES IN THE ELECTRIC FURNACE.

BY CHARLES B. JACOBS.

Barium occurs in nature practically in but two ways. The sulphate of barium, known as barytes, and the carbonate, known as witherite. Though witherite is widely distributed in nature, its occurrence in sufficient purity for the manufacture of barium salts is extremely limited, especially in the United States. So that the natural sulphate or barytes is the raw material upon which manufacturers of barium compounds are dependent. Its wide distribution, large quantity, and extreme purity, make it the only reliable source of supply for products which at a moderate price have a large consumption in the arts.

The old method of working barytes into other barium compounds consists in treating it with coal or coke in reverberatory or retort furnaces. By this method from 65 to 75 per cent. of the available barium sulphate is converted into soluble sulphide of barium, which is then manufactured into the other salts of barium. By a patented process, owned and operated by the United Barium Company, of Niagara Falls, N.Y., barytes is treated in an electric furnace, whereby from 97 to 99 per cent. of the available barium sulphate is converted into soluble form.

The electrical process is based upon a discovery made in the experimental laboratory of the Ampère Electro-Chemical Company, that brought to light a new chemical reaction which takes place beyond the range of temperature attainable in combustion furnaces, and which has had the effect of introducing the electric furnace into the field of industrial chemistry for the production of old and well-known products by a new and economical process.

When a mixture of three molecular equivalents of barium sulphate and one molecular equivalent of barium sulphide is introduced into the electric furnace, and the mass brought to a state of fusion, a reaction sets in, according to the following equation :—

$$3BaSO_4 + BaS = 4BaO + 4SO_2$$

The reaction takes place so completely that not more than 2 or 3 per cent. of unconverted sulphate is left in the charge, and taps have frequently been made from the furnace in which the amount of barium sulphate present was found to be less than 1 per cent.

The product, however, does not consist wholly of barium oxide, as indicated by the equation, some barium sulphide always being formed. Since it is necessary to operate in carbon-lined furnaces on account of the high temperature involved, enough of the barium sulphate of the charge is always reduced to barium sulphide by the carbon linings to destroy the equilibrium of the reaction between the sulphate and sulphide. This is to be expected when operating in the presence of carbon, since the reaction between barium sulphate and carbon takes place at lower temperatures and proceeds with greater rapidity than the reaction between barium sulphate and barium sulphide.

In the factory practice, instead of making barium sulphide in a separate operation, and mixing this with the necessary amount of barium sulphate, it has been found more economical to make the furnace charge up of a mixture of ground barytes and coke, in the proportion of four molecular equivalents of barium sulphate to four molecular equivalents of carbon. When this mixture is heated, there is an immediate reaction between the carbon and the barium sulphate, according to the following equation :—

$$4BaSO_4 + 4C = BaS + 3BaSO_4 + 4CO,$$

which, as indicated, reduces but one part in every four of barium sulphate to barium sulphide, and there is produced a mixture containing approximately three molecular equivalents of barium sulphate and one molecular equivalent of barium sulphide, which react in the electric furnace according to the equation first set forth, producing barium oxide.

The process has been found to operate best with mixtures very nearly those required by the theory set forth in the following equations :—

$$(1)\ 4BaSO_4 + 4C = 3BaSO_4 + BaS + 4CO.$$

$$(2)\ 3BaSO_4 + BaS = 4BaO + 4SO_2.$$

The furnaces used in this process are a new type of continuous electric furnaces, of the tapping variety, and were designed and developed to meet the conditions of this particular industry. They are tapped periodically, similarly to an iron blast furnace, and have a maximum power consumption of 500 kilowatts and a maximum output of eight tons of furnace product every 24 hours.

The product tapped from the furnaces is dissolved in hot water, and the insoluble impurities filtered off. The filtrate consists of a saturated solution of barium hydrate containing a small amount of barium sulphydrate. The barium hydrate is crystallised out as $Ba(OH)_2 + 8H_2O$, by cooling, the sulphydrate remaining in solution in the mother liquor, and after separation from the crystals is carbonated, or converted into some of the salts of barium. The barium hydrate crystals are freed from the last traces of sulphydrate liquor by washing with a spray of cold water, and after drying are melted, and the fused mass cast into thin iron drums where it solidifies on cooling into a solid log of crystallised barium hydrate, weighing about 500 lb., and containing less than 1 per cent. of impurities. The sulphur dioxide which is given off by the reaction in the furnace is, at present, obtained as such, but steps are being taken for converting these gases into sulphuric acid.

Barium hydrate is the chief product of the process, and on account of its extreme purity and cheap production by the electrical process, has met with a ready market in fields which have heretofore been closed to it on account of price.

The old methods of working barytes do not produce the hydrate at a cost which admits of its large consumption. Barium hydrate has properties in common with other caustic hydrates; it also has individual properties which make it extremely valuable in certain of the arts.

The fields into which it is finding its way are the tanning industry, the white pigment and dry colour trades, the purification of water for industrial purposes, and general manufacturing chemistry. Its largest consumption, however, lies in the beet sugar industry, for the recovery of the sugar remaining uncrystallised in the molasses. Barium hydrate has the property of forming an insoluble compound, barium sucrate, with the sugar in the molasses, which when filtered and washed free from the impurities of the molasses can be suspended in pure water and decomposed by passing carbon dioxide through the solution, thereby liberating the sugar in a pure solution of water from which it may be obtained as crystallised sugar by evaporation. The barium process when applied to sugar is almost theoretical in its yield. Its price heretofore has been prohibitive of its use in that field. Lime is the substance now used in the beet sugar industry, but the great reduction in the cost of producing barium hydrate by the electrical process, together with its high efficiency, and the fact that the barium sucrate can be decomposed by carbon dioxide in the presence of so little water that the resulting sugar solution has a brix of about 50 and a purity of 96 to 97 per cent., while the sugar solutions obtained by the lime treatment have a brix of but 14 to 15, makes the cost of evaporating the sugar solutions—which is one of the large items in producing beet sugar—so much less in the barium than in the lime process that barium hydrate has every possibility of entirely replacing lime in the beet sugar industry, especially since, with the use of barium, the present serious loss of sugar in the beet molasses will be entirely obviated.

It is applicable in the same manner in cane sugar production, for the treatment of the "black strap" of the plantation sugar houses, and certain grades of Louisiana molasses produced in the refineries, which, whilst rich in sucrose, cannot be crystallised, and are unfit for domestic use.

In addition to the use of barium hydrate in the sugar industry, another large field for its consumption which has heretofore been closed to it on account of price and limited production, is in the purification of water for steam boilers. At present, particularly in connection with water purification for railway locomotives, when it is not always convenient or expedient to build permanent water-purifying plants, soda ash is largely used. This, however, whilst it precipitates most of the scale-forming impurities, produces at the same time soluble salts of sodium, which pass over into the boiler, and are apt to induce "priming," that is, frothing, and the passage of water and froth over into the steam chest, often giving more trouble than the scale-forming compounds of the water to which it has been applied. This is almost invariably the case with water containing magnesium sulphate. Thorp, in his "Outlines of Industrial Chemistry," published in 1898, in speaking of this difficulty, mentions barium hydrate as being the most effective compound to use, but remarks that it is too expensive for the purpose. Its cost of production by the present method makes it applicable to the solution of some of the difficulties met with in the purification of boiler waters.

Some experiments have recently been made with barium hydrate which indicate its value as a depilatory agent. Hides immersed in dilute solutions of the hydrates show that the hair is loosened at the roots, so that the hides may be worked on the "beam" in from three to five hours after being put into the vats, and longer immersion did not appear to injure the hides. The hides plumped well and took the tan liquor freely, and after going through the usual process of tanning, compared in all respects favourably with leather from which the hair had been removed with lime and other depilatory agents.

Perhaps one of the most important fields for cheap barium hydrate is in the colour and white pigment trades. Its strong affinity for the sulphuric acid of soluble sulphates, and the fact that it interchanges its hydroxyl, precipitating in many cases insoluble hydrates simultaneously with barium sulphate in intimate molecular mixture, make it especially adapted for these purposes.

Already some valuable and rather striking results have been obtained in the manufacture of colour lakes by the simultaneous precipitation of various hydrates and barium sulphate, by treating soluble sulphates with a solution of barium hydrate in molecular equivalent proportions.

Along these same lines a great deal of work has been done in the production of a permanent white pigment, which shall combine the valuable covering properties of white lead and the stable white colour of zinc white, and a new permanent white pigment has been produced which seems to fulfil these conditions. It is not affected by the action of hydrogen sulphide, which blackens white lead; it can be mixed with other pigments which contain arsenic, copper, and lead. It is superior to blanc fixe or ground barytes in covering power, and equally permanent in colour. It is more dense than zinc white, has greater covering power, and is more durable for outside work. It is superior to pigments composed of oxy-sulphide of zinc and precipitated barium sulphate, for the reason that these pigments cannot be mixed with other pigments which contain substances that form dark-coloured sulphides, and are affected by the action of hydrogen sulphide. At the same time it contains a sufficient admixture of precipitated barium sulphate to render it almost impervious to 'moisture' and non-porous when mixed in linseed oil.

In the manufacture of blanc fixe, barium hydrate offers great advantages, since, by its action on sulphates whose bases form soluble hydrates, not only blanc fixe, but valuable hydrates may also be obtained, such for instance as caustic soda and caustic potash, in the treatment of the sulphates of soda and potassium.

In addition to the production of barium hydrate, the electrical process, on account of its high efficiency in the conversion of barytes into soluble form, offers the most economical means of producing the other compounds of barium. So rapidly, however, has the demand for barium hydrate increased, that after less than a year's commercial operation it has been found necessary to increase the capacity of the plant to a basis of 60 tons of hydrate per day, and very little attention has been paid to the production of other barium compounds except in so far as they are produced from the waste liquors of the hydrate process.

Discussion.

Mr. Maximilian Toch said that if a double precipitate of $BaSO_4$ and ZnO could be made, it would form a valuable paint material. Lithopone, as made, contained theoretically $29\frac{1}{2}$ per cent. of ZnS and $70\frac{1}{2}$ per cent. $BaSO_4$, and a zinc oxide compound of this kind would contain a smaller percentage than $29\frac{1}{2}$ per cent. He would like to know what the characteristics of the new pigment were, and if it were possible to make the percentage of ZnO larger than it would be by double precipitation. There were some zinc sulphides made which contained more zinc than the theoretical percentage indicated, and experiments in this line with zinc oxide would be highly interesting. The advantage of a zinc oxide and barium sulphate composition would be apparent to paint manufacturers, provided it was equal to lithopone in covering property. In other words, it would possess all the good qualities with none of its disadvantages.

THE COMPOSITION OF COMMERCIAL CYANIDE OF POTASSIUM.

BY RUSSELL W. MOORE, A.M., M.SC.

The extensive use of potassium cyanide, and its increased importance as an import into the United States, was recognised in the Tariff Act of 1897, generally known as the Dingley Act, by a separate paragraph (paragraph 66), in which a duty of $12\frac{1}{2}$ per cent. *ad valorem* was imposed, this being one half of the usual rate of 25 per cent. on chemical salts.

After the passage of the Act, the question was raised as to whether mixtures of the cyanides of potassium and sodium could be considered to be cyanide of potassium in a tariff sense, or not rather as a chemical salt dutiable at the higher rate. The case on this point was tried before the Board of General Appraisers, who have jurisdiction on customs appeals, on four samples of the following composition:—

	Cyanide of Potassium.	Cyanide of Sodium.
	Per Cent.	Per Cent.
1	73·25	14·24
2	70·58	22·36
3	76·65	18·00
4	75·86	18·28

The decision of the Board of General Appraisers (Treasury Decision No. 22,521, General Appraisers 4778, Oct. 1, 1900) is in favour of the lower rate of duty, on the ground that the ordinary commercial cyanide of potassium often contains impurities, and especially a mixture of sodium compounds, and on the further legal ground that the commercial designation or denomination of an article in the markets of a country when the law was passed will control its tariff classification without regard to its scientific designation, or the material of which it may be made, or the use to which it may be applied. While this case was under consideration by the customs authorities a large number of importations of cyanide were tested to ascertain their contents of sodium cyanide, and the results have been deemed of sufficient value and interest to be worthy to be brought before the New York Section of the Society of Chemical Industry.

The various brands of cyanide are indicated by numbers in the subjoined list :—

I.

—	Potassium Cyanide.	Sodium Cyanide.
	Per Cent.	Per Cent.
1	59·21	27·46
2	62·33	26·02
3	61·67	26·40
4	75·86	18·28
5	71·87	19·03
6	73·84	20·64
7	72·73	18·82
8	76·03	18·74
9	74·33	18·50
10	78·75	15·94
11	65·98	23·72
Maximum	78·75	27·46
Minimum	59·21	15·94
Average	70·51	21·23

II.

	Per Cent.	Per Cent.
1	80·61	13·77
2	75·08	20·09
3	76·72	18·50
4	76·05	18·01
5	75·46	20·13
6	70·58	22·26
7	76·03	18·32
8	77·02	18·55
9	78·74	16·38
10	81·81	13·36
11	82·30	12·30
12	76·81	18·62
13	74·33	18·95
14	75·54	18·07
15	87·68	9·84
16	79·20	16·81
17	76·26	17·09
18	79·06	15·73
Maximum	87·68	22·26
Minimum	70·58	9·84
Average	77·77	17·07

III.

—	Potassium Cyanide.	Sodium Cyanide.
	Per Cent.	Per Cent.
1	59·17	25·13
2	54·56	29·07
3	58·06	30·81
4	56·07	29·66
5	56·07	29·66
6	56·70	28·05
7	68·14	21·84
8	63·93	24·97
9	49·84	36·85
Maximum	68·14	36·85
Minimum	49·84	21·84
Average	58·07	28·45

IV.

	Per Cent.	Per Cent.
1	73·45	14·24
2	64·40	24·60
3	55·52	35·71

V.

	Per Cent.	Per Cent.
1	55·69	29·61
2	55·69	29·61
3	67·45	20·48

VI.

	Per Cent.	Per Cent.
1	71·85	19·23
2	75·21	18·85

VII.	29·50 — 52·29
VIII.	63·56 — 19·04
IX.	47·74 — 31·90
X.	45·25 — 10·02
XI.	78·43 — 11·70
XII.	76·03 — 15·26
XIII.	76·03 — 19·25
XIV.	30·28 — 54·29
XV.	51·10 — 35·56
XVI.	71·47 — 18·09
XVII.	Twenty-two lots, none containing sodium cyanide.
XVIII.	Two lots, neither containing sodium cyanide.

The following are analyses described simply as cyanide :—

—	Potassium Cyanide.	Sodium Cyanide.
	Per Cent.	Per Cent.
1	64·34	26·57
2	26·95	K_2S, 4·29; NaCl, 68·76
3	None	Entirely.
4	None	75·88
5	57·51	28·74

It will readily be seen from the above figures that commercial cyanide of potassium varies greatly in its composition, though there is no reason to suppose that the presence of sodium cyanide causes any lessening in value of the salt.

THE DETERMINATION OF ARSENIC IN IRON AND STEEL.

BY GEORGE L. NORRIS.

The usual method of determining arsenic in iron and steel is probably that of Lundin. This method, whilst accurate, is disagreeable and lengthy of operation, owing to the large amounts of sulphuric acid which have to be evaporated. The old and well-known method of determining arsenic in copper, by distillation with ferric chloride does not appear to have been applied to iron and steel. This method, first published by Dr. Odling in the *Chemical News*, in 1863, has been described, with various modifications, by a number of chemists since then. The recent paper by Allan Gibb (this Journal, 1901, 181) gives a very good outline of these modifications.

A trial of the method to determine the arsenic in steel gave such satisfactory results, and was so much easier of manipulation than any of the other methods, that I have used it exclusively now for over a year. The details of the method are as follows :—

It being practically impossible to obtain ferric chloride and hydrochloric acid free from arsenic, it is necessary to purify these reagents before using. 100 grms. of ferric chloride (U.S.P.) are dissolved in 150 c.c. of strong hydrochloric acid and 2 grms. of pure powdered zinc added. As soon as the zinc is dissolved, the solution is boiled for about 10 minutes, which is sufficient to free it of arsenic. The zinc serves two purposes—first, to purify the ferric chloride and hydrochloric acid, and, second, as zinc chloride, to raise the boiling point of the solution.

A 500 c.c. Erlenmeyer flask is provided, fitted with a separatory funnel and an outlet tube, which dips into a beaker containing about 300 c.c. of cold distilled water. The outlet tube is arranged to trap or return to the flask most of the ferric chloride and hydrochloric acid distilled over. Ten grms. of iron or steel are weighed into this

flask, and the purified ferric chloride solution described above is added. A gentle heat is applied until the sample is all dissolved, when the heat is increased and the solution boiled hard for about 15 minutes.

The arsenious chloride is precipitated as sulphide as fast as it is distilled, either by means of a current of hydrogen sulphide passing into the beaker of water, or through the reaction with zinc sulphide placed in the beaker before the test was started. The sulphide of arsenic may be weighed as such, or boiled with 400 or 500 c.c. of water, and, when dissolved, the resulting arsenious acid titrated with iodine (F. Platten, this Journal, 1894, 234). If preferable, the sulphide of arsenic can be dissolved, and precipitated as ammonium magnesium arsenate for final weighing as magnesium pyro-arsenate. The time required for the solution and distillation of a 10-grm. sample of iron or steel is about one hour or less, and the results I have found very accurate.

Journal and Patent Literature.

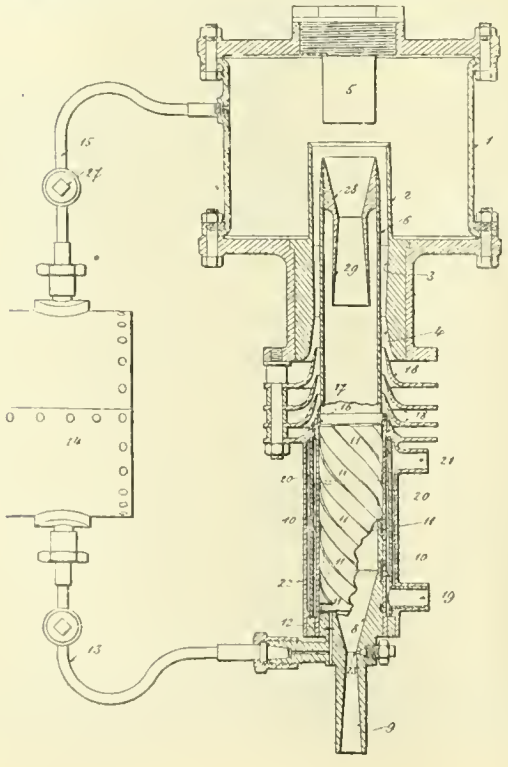
Class.	Page.
I.—General Plant, Apparatus, and Machinery	394
II.—Fuel, Gas, and Light	395
III.—Destructive Distillation, Tar Products, Petroleum	398
IV.—Colouring Matters and Dyestuffs	398
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	403
VI.—Colouring Wood, Paper, Leather, &c.	—
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	406
VIII.—Glass, Pottery, and Enamels	408
IX.—Building Materials, Clays, Mortars, and Cements	409
X.—Metallurgy	409
XI.—Electro-Chemistry and Electro-Metallurgy	411
XII.—Fats, Fatty Oils, and Soap	413
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	414
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	415
XV.—Manures, &c.	415
XVI.—Sugar, Starch, Gum, &c.	416
XVII.—Brewing, Wines, Spirits, &c.	417
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	420
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	422
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	422
XXI.—Photography	424
XXII.—Explosives, Matches, &c.	425
XXIII.—Analytical Chemistry	426
XXIV.—Scientific and Technical Notes	428

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Gaseous Currents; An Improved Apparatus for Generating ——, chiefly designed for Motive Power Purposes. P. Mallet, Paris. Eng. Pat. 6816, April 1, 1901.



Liquid hydrocarbon under pressure is passed from a vessel, 14, through a passage, 12, to helical grooves, 11, which are heated by directing the flame, say, of a soldering lamp, into the lower mouth, 19, of a flue, 20, which surrounds the sleeve, 10, and which is provided with an outlet aperture, 21, at its upper part. The combustible vapours formed, pass rapidly through the slot, 17, and induce air to enter through the conical air-nozzles, 18. The mixture passes up through the bi-conical nozzles, 4, 3, to the vessel, 1, wherein the pressure rises. As the only escape therefrom is through the central double cone, 28, 29, the gases tend to flow out there, the pressure in the chamber, 1, acting as a cushion. The gases burn in the tube, 6, in a continuous manner, and escape through the double cone, 8, 9, as a current of cooled expanded gases flowing at a high speed, the energy of which may be utilised in any suitable manner. A baffle or spreader, 5, is placed a short distance above the discharge nozzle, 2. The gases are ignited through a lateral hole, 23.—R. S.

Water; Purifying the ——, contained in Steam Generators. C. Dutordoir, Lècluse, Nord, France. Eng. Pat. 18,951, Sept. 23, 1901.

The water in a steam generator is purified by forcing or withdrawing it from the generator through any suitable filter, and is then re-injected, by means of a pump, back into the generator.—R. A.

English Patents.

Taps; Laboratory and other like ——. F. Davis, Todmorden, Yorkshire. Eng. Pat. 6693, March 30, 1901.

To prevent the joints of laboratory taps from leaking through the action of chemical reagents, &c., the joints are provided with rings or washers, secured by keys or wedges.—J. W. H.

Ammonia and like Compression Refrigerating Machinery and Refrigerators. J. A. Elsner and G. F. Knox, both of Dortmund, Germany. Eng. Pat. 24,399, Nov. 30, 1901.

In this apparatus, between the liquid ammonia reservoir and the refrigerating chamber, is placed a double-surface

refrigerator surrounding the return tube for the vaporised ammonia, in which a special filter and pressure-regulator are inserted, the latter aiding in obtaining a uniform temperature. For the same purpose, the tubes of the refrigerator are surrounded by "accumulators," made up of corrugated or ribbed tubes filled with salt water, so arranged that the cold of these accumulators increases towards the base, and since the air sinks as it cools, it encounters a cooling surface. The refrigerating chamber is separated by partitions into two chambers: the upper and smaller one where the cooling is effected, and the larger one containing the stores. The two chambers communicate, except when the door is opened, an automatic device then closing the passages between them. The ammonia vapours coming from the refrigerator pass first into a coil in the lower part of a condenser and immediately over the liquid ammonia reservoir, which they cool, as well as the surrounding water, which latter rises over a vertical separating partition, to flow downwards, cooling the wall of a high-pressure chamber.—E. S.

Liquids of Different Densities, such as Oil and Water; Device for Separating ——. E. Pravicha and E. Douillett. Eng. Pat. 20,170, 1901.

See under XII., *page* 413.

II.—FUEL, GAS, AND LIGHT.

Peat for Briquettes and other Purposes; Process for Treating ——. G. Kroupa. Oesterr. Zeits. Berg- und Hüttenw., 1902, **50**, 57 and 79. Chem.-Zeit., 1902, **26**, [16], Rep. 55.

Compressed peat and peat-charcoal are frequently used in furnaces on the Continent, and may replace part of the coke in blast furnaces and for copper smelting. The author describes Ziegler's peat-carbonising oven, in which the gases evolved, are used for heating the oven, and the tar, acetic acid, and ammonia are recovered as by-products. The manufacture of peat-charcoal by Jebsen's electrical process is also described. In the preparation of compressed peat, the proportion of moisture in the peat is reduced from 85 per cent. to 50—60 per cent., by means of hydraulic pressure, and then further reduced to 12—15 per cent. by treatment in plate-drying ovens. Each press is capable of treating 162 cb. m. of crude peat per hour.—J. F. B.

Explosion Limits of Combustible Gases and Vapours with Air. P. Eitner. J. für Gasbeleucht., **45**, [2], 21—24; [5], 69—72; [6], 90—93; and [7], 112—115.

In studying the explosive power of mixtures of combustible gases and air, the results are found to vary considerably with the experimental conditions. Thus the explosion limits are commonly found to be much wider apart when a round flask is used as the explosion vessel than when a narrow tube is employed. The results recorded, relate to experiments in which the explosions were made in a Bunte burette of 110 c.c. capacity and 19 mm. internal diameter, and the ignition was brought about by the spark from a powerful induction coil. Only those combustions were accepted as explosions in which the flame was seen to pass through the entire length of the explosion vessel, or a contraction corresponding to the perfect combustion of the mixture, was observed. In preparing the gases, the absence of air was ensured by first washing out the generating flask with carbon dioxide, the gas obtained being subsequently freed from the latter by means of potassium hydrate. The "water-gas" used was prepared by mixing together equal volumes of hydrogen and carbon monoxide. The coal-gas had the following composition:—

	Per Cent.
H	50·75
CH_4	31·30
CO	7·05
Heavy hydrocarbons	4·25
CO_2	1·95
N	1·70
	100·00

In the case of alcohol, which does not at ordinary temperatures give off sufficient vapour to reach its upper limit of explosion, direct measurement of the air and spirit vapour was not attempted. The explosion burette, containing air and 10 to 12 c.c. of alcohol, was warmed in a capacious water-bath, and sparks were passed through the gaseous mixture from time to time, the air being renewed after each explosion. From the temperature of the tube prior to the explosion, and the barometric pressure, the percentage of alcohol present in the gas was calculated by Regnault's alcohol vapour-tension tables.

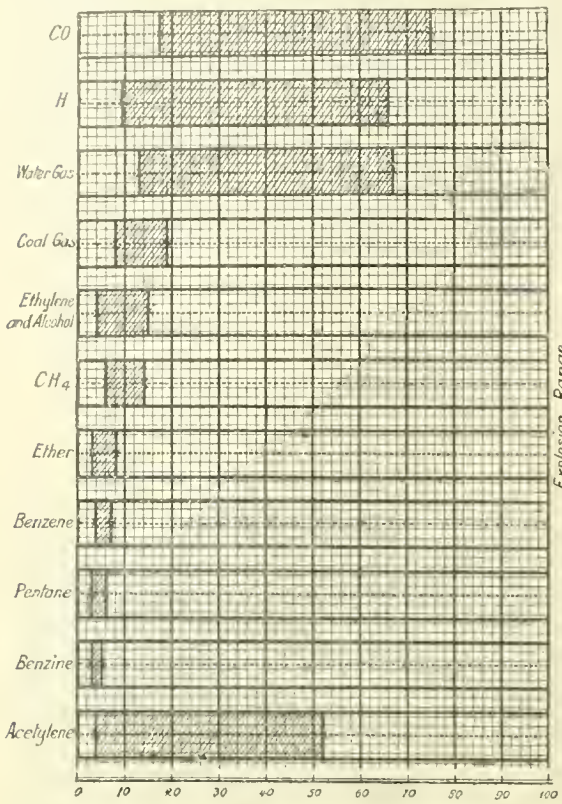
The following table gives the explosion limits found in the Bunte burette, the results being stated in percentages of moist combustible gas in the mixture:—

Kind of Gas.	Lower Limit.	Upper Limit.
CO	16·5	74·95
H	9·45	66·4
Water-gas	12·1	66·75
C_2H_2	3·35	52·3
Coal-gas	7·9	19·1
C_2H_4	4·1	14·6
Alcohol	3·95	13·65
CH_4	6·1	12·8
Ether	2·75	7·7
Benzene	2·65	6·5
Pentane	2·4	4·9
Benzine	2·4	4·9

The composition of the gaseous mixtures, calculated from the tension of aqueous vapour under the conditions existing when the above experiments were made, was as follows:—

Kind of Gas.	At Lower Limit.			At Upper Limit.		
	Combustible Gas.	Air.	Water Vapour.	Combustible Gas.	Air.	Water Vapour.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
CO	16·0	80·9	3·1	72·65	24·25	3·1
H	9·25	88·85	1·9	65·1	33·0	1·9
Water-gas	12·1	85·8	2·1	65·4	32·5	2·1
C_2H_2	3·25	94·85	1·9	51·3	46·8	1·9
Coal-gas	7·75	90·65	1·6	18·8	79·6	1·6
C_2H_4	4·0	94·1	1·9	14·3	83·8	1·9
Alcohol	4·0	96·0	..	13·6	86·4	..
CH_4	6·0	91·7	2·3	12·5	85·2	2·3
Ether	2·7	94·7	2·6	7·55	89·85	2·6
Benzene	2·6	95·8	1·6	6·4	92·0	1·6
Pentane	2·35	96·45	1·2	4·85	93·95	1·2
Benzine	2·3	96·4	1·3	4·8	93·9	1·3

The following table shows the same results graphically, the shaded portion indicating the explosion range :—



The following table shows the lower limits found when an open cylinder of 62 mm. internal diameter was used as the explosion vessel, ignition being effected by applying a flame at the top of the cylinder :—

	Per Cent. in Mixture.
H	8·5
Water-gas	12·3
C_2H_4	3·4
CH_4	6·3
Ether	1·6
Benzene	1·4
Pentane	1·3
Benzine	1·1
Alcohol	3·7

—H. B.

Acetylene; Decomposition of ——, during its Combustion. F. Gaud. Comptes Rend., **134**, [3], 175—177.

The fouling by a deposit of carbon, observed in the case of acetylene burners having very small orifices, has been attributed by some to the decomposing action of the high temperature of the burner—and hence burners in which air is drawn in and mixed with the gas have been invented with the object of reducing this action—and by others to the presence of impurities in the gas. By using, at first, chemically pure acetylene, and afterwards acetylene contaminated with each of the ordinary impurities, the author found that under conditions otherwise favourable, the presence of sulphuretted hydrogen and sulphur compounds promoted the decomposition of the acetylene into its elements through the heat of the burner.

Bullier attributes the separation of carbon to the decomposition of polymers of acetylene which have formed in the interior of the burner. Now, as acetylene is generally admitted to polymerise from 100° C., the author endeavoured to ascertain the preliminary temperature attained by the gas in the interior of the burner. He used carefully purified acetylene, and determined the temperature of the burner itself, the capacity of the burner chamber, and the rate of outflow of the gas, and calculated therefrom the temperature attained by the gas during its passage through the burner, which was a 30-litre Manchester pattern. The results were as follows :—

Gas consumed per hour...	Litres	2	4	10	20	30
Temperature of gas.....	°C.	231	115	46	23	16

These results indicate that polymerisation only becomes possible when the rate of discharge of gas from the burner falls below 5 litres, or below one-sixth of the normal rate of 30 litres per hour. Hence Bullier's theory must only be accepted with this reservation.

The author found that with thoroughly purified acetylene, there was no fouling or obstruction of the burner passages, provided the normal rate of consumption of 30 litres per hour was observed; but that, if the consumption was reduced to a minimum, fouling rapidly ensued.

—J. A. B.

Asbestos, Behaviour of ——, in Non-luminous Flames. S. Saubermann. Chem.-Zeit., 1902, **26**, [17], 180—181.

The author calls attention to the behaviour of asbestos yarn when heated in non-luminous flames. This yarn is prepared by arranging pure serpentine asbestos, as free as possible from iron, in the roving machine in such a way that, after carding, it is spread out between two layers of cotton. By this means it becomes mixed with a certain definite percentage of cotton, and can be spun into very thin threads, in which the asbestos fibres lie approximately parallel to one another. When a yarn composed of such fibres is placed in a Bunsen flame, the cotton is first burned away, after which the asbestos fibres give up water and become brittle. They then begin to soften, and finally fuse together to form apparently homogeneous rods, which become welded in the flame, and give out a constant bright white light; this takes place even in the less hot parts of the flame. When cold, the threads are white, hard, brittle, and porous, and in general resemble unglazed porcelain; the fracture shows no signs of the fibrous formation of the asbestos. Microscopic examination proves that the fusion is not confined to the surface, and it is only at those parts where knots have been left in the fibre that there occur little nests of externally fused matter containing asbestos fibres. The composition of serpentine asbestos is changed by this treatment from $H_4Mg_3Si_2O_9$ to $Mg_3Si_2O_7$, whilst that of hornblende asbestos remains as before, *viz.*, $Mg_3CaSi_4O_{12}$. The light emitted by this material when heated, can be greatly increased by soaking it in solutions of salts of the alkaline earths, or better, of nitrates of the metals of the beryllium group. A thread prepared in this way and weighing 0·02 grm., when heated in the non-luminous flame of acetylene burning at the rate of 10 litres per hour, emitted a light of 12·5—13·5 normal candles. The complex silicate forms a very intimate mixture with the basic oxide, traces of which are retained, even on treatment with various solvents.

—T. H. P.

Osmium Lamp of Auer von Welsbach. R. Gabriel. Oesterr. Zeits. Elektrotech., 1902, **20**, 65. Chem.-Zeit., 1902, **26**, [16], Rep. 56.

The osmium raw material is made into a pasty mass by a special process, and spun into threads under pressure. When dry, the threads are brought to the state of pure metal by means of an electric current. The lamp itself is a vacuum lamp, possessing a practically constant economy of 1·5 watts for 1,000 burning hours. The osmium lamp gives, with equal current consumption and for the same lifetime, about 2·3 times as much light as an ordinary carbon filament lamp, or, for the same duration and the same lighting power, it effects a saving of 55—60 per cent. of current. It is not adapted for high tensions, and 50—60 volts are as much as it will stand; 100-volt lamps have been constructed, but not yet on a practical scale.—J. F. B.

Hydrogen and Oxygen; Union of ——. H. B. Baker.
See under XXIV., *page* 428.

ENGLISH PATENTS.

Coke Ovens. S. T. Wellman and C. H. Wellman, Cleveland, U.S.A. Eng. Pat. 24,837, Dec. 5, 1901. (Under Internat. Conv.)

RETORT coke ovens are formed by employing some bricks made of magnesite or magnesia, and others of clay or silica, or by using bricks formed of a mixture of magnesite or magnesia with clay or silica. In a form illustrated in the specification, the inner walls forming the sides of the retort are constructed of alternate courses of silica brick and magnesite brick.—R. S.

Gas Burners. W. L. Durban, London. Eng. Pat. 5892, March 20, 1901.

BUNSEN burners for use with incandescent mantles are formed with an air- and gas-mixing and heating chamber more or less of the shape of an inverted, truncated cone, inside which there may be a heat radiator, consisting of a helical spring or of vertical rods or strips. The gas inlet at the bottom of the tube is regulated by a needle-valve, operated by an exterior handle or the like; and the air inlet is regulated by a perforated sleeve, also provided with an exterior handle. The actual burner may be formed simply of wire gauze placed across the top of the tube, or of flat metal ribbon corrugated within three annular concentric spaces formed by the outer wall and three rings.
—R. S.

Gas from Hydrocarbon Oil; Production of Combustible ——. E. F. Colborn, Salt Lake City. Eng. Pat. 21,756, Oct. 29, 1901.

IN Eng. Pat. 5757 of March 19, 1901 (this Journal, 1902, 109), is described a vaporising burner, adapted for use with kerosene and such like heavy hydrocarbons, in which a tubular jacket which surrounds the mixing tube of the burner leads a small proportion of the combustible mixture down to an annular burner arranged round an oil jet, so that the spray issuing from the latter upwards into the mixing tube has to pass through a cone of flame, which serves to vaporise it and to render the gas permanent. According to the present invention, the oil is not introduced directly into the chamber to which the jet is attached. An annular oil-containing chamber, fed with oil by forcing it up through a pipe, is arranged round the burner, so as to be directly exposed to the heat of the flame above referred to. The chamber is thus heated above the boiling point of the oil, and the vapour generated is led to the lower chamber of the burner, whence it is discharged upwards through the vapour jet and through the cone of flame into the mixing tube. The main portion of the combustible gas is used for heating, lighting, &c.—H. B.

Acetylene Gas; Apparatus for Generating and Storing ——. H. Kinsey, G. Challenger, and J. H. Nott, Swansea, Wales. Eng. Pat. 11,714, June 7, 1901.

A GENERATOR of the mechanically-fed "shoot" type, in which the carbide is stored in a number of boxes running round the upper part of the apparatus on a horizontal railway. By trip gear, driven by the fall of the holder bell, the bottom of each box is caused to fall as it comes over the mouth of the shoot. Preferably, the rising holder is fixed above the decomposing chamber. From the latter, the gas passes through a water-seal and a purifying vessel on its way to the holder, the seal and purifier being placed within the holder itself.—F. H. L.

Acetylene Generating Apparatus. A. Meydenbauer, Berlin. Eng. Pat. 15,537, July 31, 1901.

THIS is a mechanical generator of the carbide-to-water type. Inside the rising holder-bell, but not supported by it, is a funnel-shaped carbide receptacle, the bottom of which is a rectangular tube. Normally, this tube is closed by two flaps, hinged at one side, and pressed upwards, at a depending angle of 50° with the horizontal, against suitable stops on the opposite side of the tube. When the bell falls, it presses a lever downwards, compressing a spring, and so operates two other levers, which open the two flaps aforesaid, leaving a clear passage from the funnel for the falling carbide. The lower flap, which is designed as a safeguard against all the carbide falling into the water, should the spring of the upper one break, &c., is so arranged as to open before, and wider than, the upper flap. A chain, slack when the upper flap is shut, hangs from the top of the funnel, and is fastened to the flap, the movement of which prevents any carbide lodging on the said flap.
—F. H. L.

Acetylene Gas; Apparatus for the Production and Storage of ——. T. B. Jack, Ballymena, Ireland. Eng. Pat. 1049, Jan. 14, 1902.

THIS is an apparatus of the hand-fed carbide-to-water type. Above a cylindrical water jacketed vessel stands a cylinder open at both ends, the lower communicating with the decomposing space, the upper with the air. In this cylinder works a piston rod bearing three pistons at certain distances apart, the whole being actuated by a hand lever. On depressing this lever, the pistons rise in the cylinder, and carbide is dropped in between them. On raising the lever, the lower pistons fall clear of the cylinder walls, and the carbide drops into the water. From the generator, the gas passes into a purifier, so arranged that the acetylene first bubbles through oil, then travels through a layer of chloride of lime and iron oxide, and then through coke wetted with sulphuric acid. At its top, the purifier has an air-vent cock. Finally, the acetylene enters a rising holder sunk in the ground.
—F. H. L.

Acetylene Gas Generator. C. D. Lépine, Oran, Algeria. Eng. Pat. 20,282, Oct. 10, 1901.

THIS is an automatic apparatus working on the water-to-carbide, flooded-compartment system. A vertical cylindrical vessel is divided, by a horizontal partition, into a store tank for water at the top and a displacement holder at the bottom. Outside it is fastened the decomposing chamber, which is a cylindrical casing containing subdivided, superposed trays of carbide, every subdivision in each of which is successively attacked by water, always in excess. The water passes from the store-tank to the carbide through a hydraulic seal, its rate of supply being governed by the pressure in the apparatus; but it can be cut off altogether by means of a hand valve. The liberated acetylene passes first through a purifier, then through a coil of pipe in the water store, and finally enters the holder, the water in the latter being entirely separate from that used for decomposition.—F. H. L.

Acetylene Gas [Compressed] Lighting System. M. Toltz and A. Lipschutz, St. Paul, Minnesota, U.S.A. Eng. Pat. 24,577, Dec. 3, 1901.

PLANT is described wherewith acetylene at high pressure may be employed for railway carriage lighting, or for the illumination of country towns, without any danger of explosion arising should the gas become hot, or the mains be subjected to the heat from a fire in the vicinity. The essential feature of the invention is the employment of a fusible valve on the chief storage cylinder, and of lengths of fusible pipe at all exposed situations of the service mains, which fusible fittings melt below the dissociation point of acetylene, and allow the gas to escape and burn freely, instead of exploding disastrously inside the apparatus. Acetylene, generated, purified, and dried by any usual process, is forced by a water-jacketed pump into a storage cylinder, which is set in brickwork, except at the end where the fusible plug is; from that vessel it is led through underground mains to a service cylinder, which is fitted with stopcocks, so that it may be isolated from the compressing plant before the gas is lighted.
—F. H. L.

Incandescent Lighting; Vapour Generators for ——. H. D. Fitzpatrick, Glasgow. From F. H. Macpherson, Windsor, Ontario. Eng. Pat. 21,692, Oct. 29, 1901.

A VAPORISER, consisting of an oil chamber containing a wick, with a vapour chamber at the top of the wick, is

arranged on the same level as a closed reservoir, with which it is connected by two pipes. The reservoir is filled almost, but not quite, full with gasoline, so as to leave an air space between the surface of the gasoline and the top of the reservoir. The upper pipe places the vapour chamber of the vaporiser and the air space of the reservoir in communication, while the lower pipe serves for the passage of gasoline from the reservoir to the bottom of the vaporiser. Through a jet in the top of the reservoir, air can be pumped into the latter, and the carburetted air thus produced is led to a starting burner, the flame of which plays upon the vaporiser. The vapour chamber of the vaporiser is connected with an upright mixing tube, at the base of which air is admitted, and the mixed gases pass up a main service pipe to the various burners to be supplied. A branch from the service pipe returns to a burner arranged round the vaporiser, this burner keeping the apparatus in operation when once it is started. A valve on the branch pipe is automatically controlled by a pressure regulator communicating with the air space of the reservoir, any undue production of gas causing a diminution of the vaporising flame.—H. B.

Electric Lamps; Preparation of Nernst Conductors for ——. C. C. Garrard and Nernst Electric Light, Ltd., London. Eng. Pat. 5039, March 9, 1902.

In firing glow-bodies by means of a Deville wind furnace, the temperature is so high that a containing crucible, made of ordinary fireclay, would be melted. The claim is for a crucible made of magnesia, lined first with thoria and then with zirconia.—H. B.

Vegetable Charcoal or Carbon; Methods for the Manufacture of a New or Improved ——. E. W. Cooper. Eng. Pat. 7902, 1901.

See under XVIII. B., *page* 421.

III.—DESTRUCTIVE DISTILLATION. TAR PRODUCTS. PETROLEUM.

Scottish Shale Oil; The Bases Contained in ——. *Part I.* F. C. Garrett and J. A. Smythe. Proc. Chem. Soc., **18**, [247], 47.

The authors are continuing the examination of the bases contained in the Broxburn shale oil, of which a short account has been already given (Proc. Chem. Soc., 1900, **16**, 190), and have completed the investigation of the portion boiling below 164°. The following bases have been isolated and identified:—

	B.pt.
Pyridine	115°—116° C. (in very small quantity).
α-Picoline	129·5° (bar. 763 mm.).
αγ-Dimethyl pyridine	159°—159·5°.
αβ'- „ „	154°—155°.
αα'- „ „	142·5° (bar. 760 mm.).
αγα'-Trimethyl pyridine	170·5° (bar. 760 mm.)

αβ'-Dimethyl pyridine is a colourless liquid with a strong pyridine-like odour; it gives a picrate, m. pt. 151°—152°; a gold compound, m. pt. 156°—157°; a platinichloride containing 2 molecules of water and melting (when *anhydrous*) at 238° with decomposition; and a mercurichloride (C_7H_9, HCl, $6HgCl_2$) in very small, heavy crystals, m. pt. 163°.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigotin; Polymerised Condition of Ordinary ——, *and the Isomeric Conversion of Indigotin into Indirubin.* L. Maillard. Comptes Rend., **134**, [8], 470—472.

When potassium indoxylsulphate is decomposed by hydrochloric acid and the mixture is shaken with chloroform, the chloroform acquires a blue tint, much deeper than can be produced by dissolving ready-formed indigotin in chloroform. If the chloroform solution be separated and washed with very weak soda solution, then, on standing, indigotin slowly separates; but if the washing with soda be omitted, the solution never crystallises, but passes slowly from a violet to a red colour, and if now the chloroform be distilled off, the residue is indirubin. Previously-formed indigotin, will neither dissolve in chloroform to such an extent as when produced in the above fashion, nor will it in chloroform solution, either neutral or faintly acidified, undergo this transformation into indirubin. The author concludes that the very soluble and transformable indigotin is represented by the usual formula of Baeyer, whilst ordinary indigotin is a polymer, probably a di-indigotin, $C_{32}H_{20}N_2O_4$. The cryoscopic determination of the molecular weight of indigotin by Vaubel confirms this view.

A solution of indirubin in chloroform, rendered slightly alkaline, does not undergo transformation into indigotin; but the author hazards the suggestion that a "nascent" indirubin might do so, and that ordinary indirubin is very probably a polymer or di-indirubin.—J. T. D.

Nitro- and Amino-Xylene [Xylylene Diamines] Derivatives. E. Noelting and G. Thesmar. Ber., 1902, **35**, [3], 628—650.

The eleven possible xylylene diamines given in the table were obtained by reducing the corresponding dinitroxylenes or nitroxylidines, or the amine-azo compounds, and the authors describe certain of these derivatives. Trinitro-*m*-xylene [$(CH_3)_2:(NO_2)_3 = 1:3:2:4:6$], melting at 182° C., gives dinitroxylidine [$(CH_3)_2:NH_2:(NO_2)_2 = 1:3:4:2:6$], melting at 192° C., and nitroxylylene diamine [$(CH_3)_2:NO_2:(NH_2)_2 = 1:3:2:4:6$], melting at 213° C. An isomeric dinitro-*m*-xylidine has been obtained from *v*-meta-xylidine, and this by acetylating, nitrating, hydrolysing, and partial reduction with ammonium sulphide, yields a product having the constitution $(CH_3)_2:(NO_2):(NH_2)_2 = 1:3:6:2:4$ (nitroxylylene diamine), and crystallising from hot water in orange-yellow needles, melting at 152° C. It follows from these and from other examples, that ammonium sulphide in reacting with polynitro compounds, always attacks first that nitro group which has the fewest or no ortho substituents. The nitration of 1.2.4-nitro-*o*-xylene gave 4.5-dinitro-*o*-xylene, white needles melting at 116° C., and the 4.6-isomeride, thick white needles melting at 76° C., the first, on heating with alcoholic ammonia, and the second, on partial reduction with ammonium sulphide, giving respectively 5.4-nitro-amino-*o*-xylene (Ber., **34**, 2248) and 6.4-nitro-amino-*o*-xylene, the latter melting at 75° C., and yielding, on further reduction, *o*-xylylene-*m*-diamine, melting at 67° C. The authors were unable to prepare a trinitro-*o*-xylene.

The table on next page gives some characteristics and derivatives of the eleven xylylene diamines theoretically possible.

The *o*-xylylene diamines combine readily with phenanthraquinone in glacial acetic acid solution, yielding 1.2, 2.3-, 1.3-, and 1.4-xylophenanthrazines, melting respectively at 224°, 292°, 207°, and 286° C. The *p*-xylylene diamines give, with bleaching powder and acetic acid, quinone dichlorodi-imines, and the authors have also obtained 1.2-xyloquinone-4.5-dichlorodi-imine from the *sym*-*o*-xylylene *o*-diamine, melting at 126° C., by the same reaction. This latter substance also reacts in alcoholic solution with monamines and diamines, aniline giving a red similar to, but different from, *o*-xylosafranine, whilst with dimethylaniline, a violet dyestuff is produced which gives bright bluish-violet shades on tannin. Certain of the *m*-xylylene diamines which conform to Witt's rule (*i.e.*, contain a free position ortho to one and para to the other amino group), yield chrysoïdines, and it is noteworthy that the dyestuffs derived from *m*-xylene give the deepest and brightest shades. Those from *p* xylene are inferior, whilst in general the dyestuffs from o-xylene have little value. This effect of the position of the methyl groups on the character of the dyestuffs from the various xylenes is very remarkable.

Three of the *m*-xylylene diamines conform to a further rule of Witt's with regard to the formation of eurhodines by the action of nitrosodimethylaniline hydrochloride on *m*-diamines, for which purpose it is necessary that a position para to one of the two amino groups shall be free. The *m*-diamines, melting at 67°, 66°, and 103° C. respectively,

$(CH_3)_2:(NH_2)_2$.	Crystalline Form.	M. Pt.	Reaction with				M. Pt. of Diacetyl Derivative.
			Ferric Chloride.	Potassium Bichromate.	Sodium Nitrite in Acetic Acid Solution.	Bleaching Powder in Acetic Acid Solution.	
		° C.					° C.
1:2:3:4	Quadratic plates.	89	Strong red coloration, becoming violet on acidifying.	Red coloration and brownish-red precipitate, soluble in dilute sulphuric acid to a violet solution. Smells of quinone on heating.	Brown solution, which becomes milky, and deposits a white crystalline precipitate of the azimide.	Yellow flocculent precipitate, very easily soluble in ether.	197
1:2:4:5	Nacreous plates.	126	Bluish green coloration, becoming green on acidifying.	Yellow coloration, becoming brown on acidifying. Smells of quinone on heating.	Yellow solution, then white precipitate.	Yellow precipitate, crystallising from ether in yellow needles. Detonates at 87° C.	228
1:3:4:5	Flat white needles.	78	Cherry-red coloration.	Brown precipitate in the cold, red solution on warming, with quinone smell.	„	Yellow precipitate, very easily soluble in ether.	..
1:4:5:6	Small white needles.	75	„	Cherry-red coloration. Smells of quinone on warming.	„	„	..
1:2:3:5	„	67	No coloration in neutral solution. In sulphuric acid solution, no coloration in the cold, cherry-red colour on heating, and quinone smell.		Dark brown precipitate, dyeing tannined cotton.	Brown gummy precipitate, very easily soluble in ether.	241
1:3:2:4	White needles.	66	„	„	„	„	..
1:3:4:6	Faintly yellowish needles.	105	No coloration in neutral or sulphuric acid solution; orange-yellow coloration on prolonged heating.		Faint orange-yellow coloration; dyes tannined cotton very faintly.	„	..
1:4:3:5	Long yellowish prisms.	103	No coloration in the cold in neutral or sulphuric acid solution; cherry-red coloration on warming, and quinone smell.		Brownish-red coloration, dyeing tannined cotton.	„	..
1:2:3:6	Thick, faintly yellowish needles.	116	In neutral or acetic acid solution: Green coloration, becoming bluish-violet and red on adding more ferric chloride. In sulphuric acid solution, no coloration even on warming.	Green coloration and precipitate, becoming reddish-brown on warming, and smelling of quinone. Quinone smell.	Dark green solution, then suddenly light yellow. Quinone smell on heating. Formation of diazo compound in hydrochloric acid solution.	Yellow flocculent precipitate, crystallising from ether in needles; m. pt. 105°·5.	276
1:3:2:5	Nacreous plates.	104	In neutral or acetic acid solution: Green coloration, becoming yellow on heating or with an excess of ferric chloride. In sulphuric acid solution, no coloration. Smells of quinone on heating.	Green coloration and precipitate, becoming violet-black and smelling of quinone on heating.	„	„ m. pt. 112°.	..
1:4:2:5	Faintly yellowish needles.	150	„	„	„	„	..

react in this manner, and yield eurhodine dyestuffs which give red to violet shades on tannined cotton and on silk.

The authors have also prepared *o*-, *m*-, and *p*-xylosafranine. The first-mentioned dyes tannined cotton and silk scarlet, the shade being yellower than that from Phenosafranine. The *m*- and *p*-xylosafranines give much the same shade, that of the former being somewhat darker. The shades produced are bluer than those from Safranine and brighter than those from Aposafranine. The *p*-xylylene diamines also yield indophenols on oxidation with β-naphthol, the products possessing the general characteristics of this class of dyestuffs.—T. A. L.

Acid Nitriles [Indigo]; New Method for the Preparation of ——. H. Bucherer. Zeits. f. Farben- und Textil-Chem., 1902, [3], 70.

The phenylglycines of the general formula—

$$R.NH.CH(R_1)COOH$$

which figure prominently in the various syntheses of artificial Indigo, can be advantageously obtained from the compounds which are formed from the so called Schiff's bases with aqueous sulphurous acid or sulphites. Such compounds are described by A. Eibner (Annalen, **316**, 89—143), and in the Ger. Pats. 68,707; 70,541; 105,862, and Ger. Pat. appl. F. 9784.

By allowing potassium cyanide to act upon these bisulphite addition products, acid nitriles of the probable constitution $R.N.C.CN$ can be obtained in good yields (see

$$\begin{array}{l} | \\ \| \end{array}$$

v. Miller and Plöchl, this Journal, 1892, 911), the reaction most likely being—

$$\begin{array}{l} R.N.C.SO_3Na \\ | \\ \| \end{array} + KCN = \begin{array}{l} R.N.C.CN \\ | \\ \| \end{array} + KNaSO_3.$$

The yield is a good one, though it is known that bisulphite and cyanide of potassium act upon each other at higher temperatures (see v. Pechmann and Manck, Ber., **28**, 2374; this Journal, 1896, 301), forming aminomethane disulphonic acid.

It is intended to use this method for the production of synthetic Indigo, since phenylglycines can easily be

transformed into indoxyl and Indigo by fusion with sodamide (Fr. Pat. 301,339 and 312,763; this Journal, 1902, 111 and 169).

The Schiff's bases can either be used in the crude state or after separation. Excess of bisulphite or sulphurous acid is essential, and the mixture must be neutral before the molecular proportion of cyanide is added. The mixture is heated on the water-bath till the formation of the nitrile proves to be complete.

The author's experiments were started last July. (See Fr. Pat. 313,872; this Journal, 1902, 170.)—F. N.

Esterification of Carbinols [Dyestuffs] by means of Alcohols. O. Fischer and K. Weiss. Zeits. f. Farben- und Textil-Chem. **1**, [1], 1—3.

The author has previously shown (this Journal, 1901, 33) that the base of Malachite Green is readily esterified on treatment with alcohols. Other aminocarbinols, such as the bases of Brilliant Green and Crystal Violet, and also tetramethyldiaminodiphenylcarbinol, are now shown to be also esterified on boiling with alcohols, or even on long standing with alcohols in the cold. In general the esters are colourless, well-crystallised substances, which turn blue (owing to hydrolysis) on treatment with acids, even with carbonic acid. The methyl ester of tetramethyldiaminodiphenylcarbinol is obtained in needles melting at 71°—72° C. when the carbinol is boiled with methyl alcohol under a reflux condenser; but the ethyl ester is an oil which, on long standing, decomposes into the anhydride of tetramethyldiaminodiphenylcarbinol, m. pt. 200°—201°. The latter is converted into the carbinol on boiling with acids. (See also Möhlau and Heinze; this Journal, 1902, 336—337.)—H. L.

Anthraquinones; Hydroxyamino- and Nitroso ——. L. Wacker. Ber., **35**, [3], 666—669.

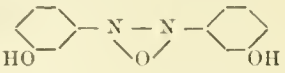
1-Nitro-anthraquinone-2-sulphonic acid is converted into *1-hydroxyamino anthraquinone-2-sulphonic acid* by reduction with grape-sugar and caustic soda at 40°–50°. The monosodium salt of this substance dissolves in water with a brown colour; the disodium salt is green, and reduces ammoniacal silver nitrate. When treated with concentrated sulphuric acid at 70° C., an intramolecular change takes place, and it is converted into *1-amino-4-hydroxy-anthraquinone-2-sulphonic acid.* This substance has been previously obtained by reducing 1-nitro-anthraquinone-2-sulphonic acid with sulphur sesquioxide (Ger. Pat. 101,919). It dissolves in alkalis with a blue-violet colour, and the alkali salts dye wool a violet shade. *1-Nitroso-anthraquinone-2-sulphonic acid* was prepared by oxidising the hydroxy-amine with potassium ferricyanide. The sodium salt crystallises in small yellow to yellow-red leaflets, sparingly soluble in cold water, that give the nitroso reaction. On gentle reduction with caustic soda and glucose, the hydroxy-amine is regenerated.—H. L.

o-Chloro-p-Nitraniline. P. Cohn. Mitt. des Techn. Gew. Mus., Wien, **11**, [11, 12], 205—213.

o-Chloro-p-nitraniline may be prepared (Ger. Pat. 109,189, L. Cassella) from p-nitraniline by chlorination with sodium hypochlorite. It crystallises in fine yellow needles, which are very sparingly soluble in cold water, and melt at 105° C. On reduction with stannous chloride it is quantitatively converted into *o-chloro-p-phenylenediamine*, which crystallises in shining white needles, m. pt. 63°—64° C., that gradually turn brown on exposure to the air. The hydrochloride is easily soluble in water, but the sulphate very sparingly in the cold. If the aqueous solution of the base be treated with sulphuretted hydrogen and ferric chloride, a thiazine dyestuff is obtained, which is analogous to and slightly redder in shade than Lauth's Violet (Ber., 9, 1035). On oxidation together with an equimolecular quantity of aniline by means of potassium bichromate and sulphuric acid, *chloro-indamine* is obtained; and *chloro-indophenol*, by oxidising together with phenol in alkaline solution. (Ann., 69, 302, &c.) Bleaching powder and hydrochloric acid convert *o*-chloro-*p*-phenylene-diamine into *mono-chloro-quinonedichlordi-imide*, m. pt. 83°—84° C. This substance crystallises in faintly-coloured brown-yellow needles, which possess a very disagreeable odour, and are converted into a dark violet dyestuff when warmed with resorcinol in acetic acid solution.—H. L.

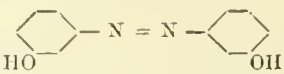
m-Hydroxy Derivatives of Azo- and Azoxybenzene. E. Noelting and Federmann. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, 188.

Di-m-hydroxy azoxybenzene—



is a pale yellow compound, melting at 183° C., and devoid of dyeing properties.

Di-m-hydroxy-azobenzene—



crystallises in orange-yellow plates, m. pt. 207° C., and dyes silk a very pale yellow.

The above compounds were prepared by diazotising the corresponding diamino compounds and boiling the resulting products with water.—E. B.

Azo Dyestuffs; New Artificial Method of Classification of ——. H. Bucherer. Zeits. f. Farben- und Textil-Chem., **1**, [1], 8—10.

The author's object is to meet the difficulty universally felt by those who desire, with the least expenditure of time, to find out whether a particular dyestuff is already known, patented, or manufactured. The system advocated is therefore to be regarded, not as a scientific classification, such as Bülow (Chem. Technologie der Azofarbstoffe, Vol. I.) has laboriously drawn up, but as a practical method of registration. Introduced into works of reference, &c., it should make it possible, without special practice, to find the place where this particular dyestuff may be expected. The starting point of the system is azobenzene, which is represented by the symbol $b.b$. The two benzene nuclei are signified by the letter b, the azo group merely by a point. Amino-azobenzene is expressed by the symbol $b.b_1$; amino-azobenzene sulphonic acid (from sulphanilic acid + aniline) by the symbol $b_1.b_1$; amino-azobenzene disulphonic acid, $(SO_3H)_2.C_6H_3.N_2.C_6H_4.NH_2$, by the symbol $b_1.b_2$. Under the symbol $b.b_1$ would come, not only *para*-, but also *ortho*- and *meta*-amino-azobenzene, benzene-azo- *o*-, *m*-, and *p*-toluene, azobenzene-*o*-, *m*-, and *p*-sulphonic acid, *o*-, *m*-, and *p*-chloro- (bromo-, nitro-, hyroxy-, &c.) azobenzene—in short, all dyestuffs derived from azobenzene by the substitution of one hydrogen atom in the phenyl ring. The arrangement of the substances collected under the heading $b.b_1$ may be carried out in any appropriate sequence. The same holds good for the other symbols and the various dyestuffs they severally represent. For instance, a diamino-azobenzene would be found either under the heading $b.b_2$, or under the next heading, b_1b_1, according as it is constituted according to the formula $C_6H_5N:N.C_6H_3(NH_2)_2$ or to the formula $NH_2.C_6H_4.N:N.C_6H_4.NH_2$. The dyestuff from aniline (diazotised) + tolylene diamine—

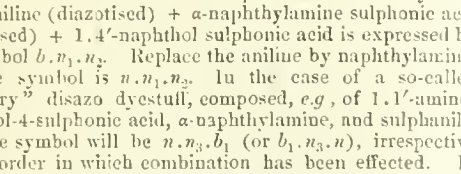
$$C_6H_5.N:N.C_6H_2CH_3(NH_2)_2$$

comes under the heading $b.b_3$; the isomeric dyestuff from toluidine (diazotised) + phenylene diamine—

$$CH_3.C_6H_4.N:N.C_6H_3.(NH_2)_2$$

under the heading $b_1.b_2$. The grouping of mono-azo dyestuffs in this way is perfectly simple, and disazo dyestuffs are grouped in an wholly analogous manner. The so-called "secondary" disazo dyestuff from aminoazobenzene + R-salt, $C_6H_5.N_2.C_6H_4.N_2.C_{10}H_4.OH(SO_3Na)_2$, comes under the symbol $b.b.n_3$. The same symbol represents the dyestuffs which contain, in the place of R-salt, either G-salt or any naphthylamine disulphonic acid, or aminonaphthol monosulphonic acid, or dihydroxynaphthalene monosulphonic acid, or, briefly, any substance derived

from naphthalene by the substitution of three hydrogen atoms (not including the one displaced by the azo group). The sequence in which the different disazo dyestuffs of the general formula $b.b.n_3$ are to be given depends upon the naphthalene residue. The generally accepted arrangement may be followed which is observed in Täuber and Norman's work, "Die Derivate des Naphtalins." The dyestuff from aniline (diazotised) + α-naphthylamine sulphonic acid (diazotised) + 1.4′-naphthol sulphonic acid is expressed by the symbol $b.n_1.n_2$. Replace the aniline by naphthylamine, and the symbol is $n.n_1.n_2$. In the case of a so-called "primary" disazo dyestuff, composed, *e.g.*, of 1.1′-amino-naphthol-4-sulphonic acid, α-naphthylamine, and sulphanilic acid, the symbol will be $n.n_3.b_1$ (or $b_1.n_3.n$), irrespective of the order in which combination has been effected. In registering the two isomeric dyestuffs, however, the first place will be given to the one in which the sulphanilic acid (b_1) was first combined, *viz.*, to the dyestuff—



—H. L.

Azo Dyestuffs; Presence of Diazo-amino and Diazohydroxy Compounds in ——. W. Vaubel. Zeits. f. Farben- und Textil-Chem., **1**, [1], 3—4.

The presence of such compounds in azo dyestuffs may be readily explained, since it is well known that the introduction of the azo group in the *p*- or *o*-position of an amine or phenol is preceded by the formation of diazo-amino- or diazo-oxy compounds. These bodies are converted into the required amino azo- or hydroxyazo-compounds under conditions which vary for different substances. The reaction proceeds very slowly in some cases, and to this may be partly ascribed their presence in azo dyestuffs. The determination was made by heating the dyestuffs with concentrated hydrochloric acid, and measuring the volume of nitrogen evolved in accordance with the equation—

$$C_6H_5N{:}N.NH.C_6H_5 + H_2O = C_6H_5OH + C_6H_5NH_2 + N_2.$$

The following dyestuffs gave off more or less nitrogen under these conditions:—(1) Diazotised 1.4 naphthylamine sulphonic acid + 2.6.8-naphthol disulphonic acid (Brilliant Ponceau 4 R) gave 20 c.c. of nitrogen. (2) α-Naphthylamine (diazotised) + 2.6.8-naphthol disulphonic acid gave 50 c.c. (3) 1.4-Naphthylamine sulphonic acid (diazotised) + 1.4-naphthylamine sulphonic acid gave 120 c.c., which corresponds to just 50 per cent. of diazo-amino compound. (4) 1.2-naphthylamine sulphonic acid (diazotised) + 1.4-naphthol sulphonic acid gave 80 c.c. (5) 1.4-Naphthylamine sulphonic acid + α-naphthol carboxylic acid gave 30 c.c. (6) Amino-azoxylene sodium sulphonate gave 25 c.c. In each case 5 grms. of dyestuff were used. No nitrogen was evolved from the following dyestuffs, which therefore contained no diazo-amino or diazo-oxy compounds:—(1) 1.4-Naphthylamine sulphonic acid + α naphthol. (2) 1.4-Naphthylamine sulphonic acid + β-naphthol (Roccellin). (3) β-Naphthylamine + 2.6.8-naphthol disulphonic acid. (4) 2.1-Naphthylamine sulphonic acid + 1.4-naphthol sulphonic acid. (5) 2.1-Naphthylamine sulphonic acid + β-naphthol. (6) Sulphanilic acid + β-naphthol (Orange II.). (7) Sulphanilic acid + β-naphthol sulphonic acid B (Croceïne Scarlet). (8) Benzidine (tetrazotised) + 1.4-naphthylamine sulphonic acid (Congo Red). (9) Amino-azobenzene sulphonic acid (New Yellow G M).

The presence of diazo-amino- or diazo-oxy-compounds in azo dyestuffs is naturally deleterious, both with regard to their purity of shade and to the durability. The author further proposes a new method of estimating diazo-amino compounds by means of a solution of potassium bromide and potassium bromate. The reaction, which may be represented by the following equation,—

$$C_6H_5N{:}N.NH.C_6H_5 + 3Br_2 + H_2O =$$
$$C_6H_5N{:}NBr + C_6H_2Br_3OH + 2HBr + NH_3,$$

is quantitative, but its application is limited, since many dyestuffs contain substances other than diazo-amino bodies which absorb bromine.—H. L.

English Patents.

Anthracene [Anthracene Dyestuffs] Derivatives; Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 7398, April 10, 1901.

For the production of new acridine derivatives of the anthracene series, α-alphylamino-anthraquinones or derivatives thereof are treated with dehydrating agents, such as zinc chloride, phosphoric acid, hydrochloric acid, sulphuric acid, &c. (see also Fr. Pat. 309,612; this Journal, 1902, 40).—T. A. L.

Monazo Dyestuffs; Manufacture of Mordant-dyeing ——. [*Azo Dyestuffs.*] C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 8800, April 29, 1901.

See Fr. Pat. 310,410; this Journal, 1902, 45.—T. A. L.

Orange-Yellow to Red Monazo Dyestuffs [Azo Dyestuffs] suitable for the Preparation of Lakes; Manufacture of ——. O. Imray, London. From The Farbwerke Hoechst, Germany. Eng. Pat. 16,409, Aug. 15, 1901.

See Fr. Pat. 313,593; this Journal, 1902, 169.—T. A. L.

United States Patent.

Acidyl Dialkylrhodamine [Pyrone Dyestuff], and Process of making same. C. Hoffmann, Hoechst-on-the-Maine, Germany, Assignor to The Farbwerke Hoechst. U.S. Pat. 694,149, Feb. 25, 1902.

See Fr. Pat. 311,815, 1901; this Journal, 1902, 44.
—T. A. L.

French Patents.

Indigo; Purification of Crude ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 314,681, Oct. 2, 1901.

Crude natural or artificial Indigo is extracted and washed with pyridine bases until the mother-liquors are colourless or only slightly bluish.—T. A. L.

Phenylamino-acetonitrile [Indigo] and its Homologues; Manufacture of ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 315,269, Oct. 22, 1901.

On heating together in aqueous (150—200 litres) or alcoholic solution, aniline (9·3 kilos.), hydrocyanic acid (13·5 kilos. of a 20 per cent. solution), and formaldehyde (7·5 kilos. of a 40 per cent. solution), phenylamino-aceto-nitrile separates out on cooling, and crystallises from ether and petroleum spirit, the crystals melting at 13° C. In place of hydrocyanic acid, potassium cyanide and an acid, or aniline hydrochloride may be employed. The product serves for the formation of phenylamino-acetic acid, from which Indigo can be obtained.—T. A. L.

Indigo Dyestuffs; Manufacture of Halogen ——. Badische Anilin und Soda Fabrik. Fr. Pat. 315,180, Oct. 19, 1901.

Phenylglycine *o*-carboxylic acid can be converted into its halogen derivatives by treatment, in glacial acetic acid solution, with chlorine or bromine. These products can also be obtained by the action of halogens on ω-cyano-methylanthranilic acid, and subsequent hydrolysis. Bromo-phenylglycine *o*-carboxylic acid crystallises from alcohol in yellow prisms melting at 228° C., the chloro derivative melts at 210°—215° C., whilst the dichloro derivative melts at 238° C. For the production of halogen indigos, the halogen phenylglycine *o*-carboxylate of soda is boiled with acetic anhydride until it no longer evolves carbon dioxide. In the case of the bromo derivative, the diacetylbromindoxyl so obtained is separated in the pure state, forming needles melting at 225° C. This substance, on hydrolysis with caustic soda and subsequent oxidation with air, yields dibrom-indigo. The chlorodiacetyl indoxyl melts at 115° C., and the dichloro derivative at 228° C. The latter gives

tetrachlor-indigo, which approaches the Aniline Blues in brightness. It is very stable to oxidising agents, and is not decolorised by nitric acid. It can be very readily reduced, and by means of caustic soda can be printed without a mordant, and is said to be perfectly fast to light.—T. A. L.

p-Chloro-o-Salicylic Acid and a Disazo Dyestuff Derived from it; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 314,134, Sept. 9, 1901.

On chlorinating salicylic acid in nitrobenzene solution, extracting with dilute sodium carbonate solution, and precipitating with a mineral acid, *p*-chlorosalicylic acid is obtained, which, when nitrated in sulphuric acid below 0° C., gives chloro-nitrosalicylic acid—

$$(OH : CO_2H : Cl : NO_2 = 1 : 2 : 4 : 6).$$

This product, on reduction, is converted into the corresponding chloro-aminosalicylic acid, a new substance. For the preparation of a diazo dyestuff, the compound is diazotised and combined with 1.2′- or 1.3′-naphthylamine sulphonic acid, rediazotised and combined with β-naphthol. The dyestuff gives blackish-violet shades on wool, becoming black with a bluish reflex on treatment with chromates or chromium salts.—T. A. L.

Colouring Matter [Azo Dyestuffs] from 4-Chloro-2-anisidine and β-Naphthol; Production of a ——. Badische Anilin und Soda Fabrik. Fr. Pat. 314,135, Sept. 9, 1901.

The dyestuffs usually produced from diazotised anisidine and β-naphthol are not sufficiently fast to alkalis on washing and rubbing. Moreover, they stain the whites and sublime on ironing. The patentees have obtained an anisidine derivative free from these defects by combining diazotised 4-chloro-2-anisidine with β-naphthol. The new product $1.2.4.C_6H_3.OCH_3(NH_2)Cl$ is readily formed by boiling nitro-*p*-dichlorobenzene with methyl alcohol and caustic alkali and reducing the chloro-nitranisol formed, melting at 94° C., with iron and acetic acid. The chloranisidine produced, melts at 84° C., and its acetyl derivative melts at 106° C. Its colourless diazo compound is very soluble, and is stable in presence of mineral acids, and the combination with β-naphthol can take place outside or in the fibre. In presence of barium sulphate, aluminium hydrate, kaolin, &c., the azo dyestuff gives bright scarlet lakes which, owing to their fastness to water and light, can be employed as pigments.—T. A. L.

Dyestuffs Derived from Anthraquinone; Manufacture of New —— [Naphthalene Dyestuffs]. F. Bayer and Co. Fr. Pat. 243,315, Sept. 6, 1901. Supplement.

According to the chief patent, Purpurin (1.2.4-trihydroxyanthraquinone) gives valuable products when condensed with amines. The patentees now find that the corresponding naphthalene derivative, naphthopurpurin (1.2.4-trihydroxynaphthoquinone) can be condensed in an analogous manner with primary amines. The resulting products after sulphonation are valuable wool dyestuffs, which give darker shades on chromed wool.—T. A. L.

Dyestuffs [Sulphide Dyestuffs]; Production of Substitution Products of Sulphurised ——. Fr. Bayer and Co. Fr. Pat. 305,800, Aug. 31, 1901. Supplement.

According to the chief patent of Nov. 28, 1900, alkylated or alphylated derivatives of sulphurised dyestuffs are obtained by the action of alkylating agents on the dyestuffs or on the dyed fabrics. The patentees now find that chloro- or bromo-acetamide may be used as alkylating agents for this purpose, and owing to their solubility in water and non-volatility, they are preferable to ethyl bromide, dimethylsulphate, &c.—T. A. L.

Blue Cotton Dyestuff [Sulphide Dyestuff]; Production of a ——. Manuf. Lyon de Mat. Col. Fr. Pat. 303,524, Oct 3, 1901. Supplement.

The products obtained according to the chief patent by the action of polysulphides on a dialkylaminohydroxydiphenylamine yield compounds of the pure dyestuffs with sulphites or bisulphites which are soluble in water and readily crystallisable. These compounds on digestion with dilute soda lye, yield the pure dyestuffs, which give Indigo blue shades on wool from an acid bath and subsequent treatment with an oxidiser.—T. A. L.

Dyestuff [Sulphide Dyestuff] containing Sulphur; Manufacture and Purification of a ——. Kalle and Co. Fr. Pat. 314,570, Sept. 28, 1901.

The condensation product analogous to thiourea obtained from *p*-nitro-*o*-amino-*p*-hydroxydiphenylamine is heated with sulphur and sodium sulphide together with a little glycerin. The melt may be employed directly for dyeing, but the dyestuff is preferably purified by dissolving the mass in water, adding salt and precipitating by means of a current of air. The precipitate is then dissolved in very dilute sodium bisulphite solution and reprecipitated by salt and a current of air. The new dyestuff dissolves to a greyish-blue in water, the colour becoming pure blue on adding sodium sulphide. It dyes cotton greyish-blue, which becomes pure blue on treatment with hydrogen peroxide or on air oxidation in presence of certain metallic salts.
—T. A. L.

Dyestuffs of the Acridine Series [Acridine Dyestuffs]; Manufacture of New ——. Manuf. Lyon. de Mat. Colorantes. Fr. Pat. 314,266, Sept. 14, 1901.

Acridine Yellow is heated under pressure with formaldehyde in presence of a mineral acid. For this purpose, it is unnecessary to use the pure or finished Yellow, and the melt obtained by the condensation of tetra-aminoditolylmethane may be employed for the purpose. The new product dyes tannined cotton and leather reddish-yellow shades, fast to washing and light. Somewhat redder shades are obtained by employing the tetra- and di alkyl-diamino-acridines.
—T. A. L.

4.1.3-Nitrophenylene Diamine; Production of ——. Actien-Gesellschaft für Anilin Fabrikation. Fr. Pat. 314,468, Sept. 24, 1901.

When *p*-nitraniline sulphonic acid ($NH_2 : SO_3H : NO_2 = 1:3:4$) is heated under pressure with ammonia to about 180° C., it is converted into the nitro-*m*-phenylene diamine melting at 161° C., which is identical with the product obtained by nitrating and subsequently hydrolysing diacetyl-*m*-phenylene diamine.—T. A. L.

Dyestuff from Cotton Pods or Husks and New Products obtained in the Process; New Method for the Extraction of a ——. American By-Products Co. Fr. Pat. 314,629, Oct. 1, 1901.

The process consists in extracting cotton-seed or cotton cake, after expressing the oil, with a hydrocarbon (naphtha) under pressure, in order to remove oils, fatty acids, and gummy matters. The residue is then extracted with water and steam under pressure, which removes the colouring matter. This solution is then evaporated to a convenient strength.—T. A. L.

Reduction by means of Iron and an Alkali; Process for ——. Weiler-ter-Meer. Fr. Pat. 314,699, Oct. 4, 1901.

See Eng. Pat. 15,706 of 1901; this Journal, 1901, 1108.
—T. A. L.

Flavopurpurin [Anthracene Dyestuffs] alone or mixed with Isopurpurin and of Alizarin with the Simultaneous Production of Pure Anthraflavic Acid or its Mixture with Isoanthraflavic Acid and Oxyanthraquinone; Manufacture of ——. R. Wedekind and Co. Fr. Pat. 314,914, Oct. 9, 1901.

The process depends upon the discovery that the lime salt of Flavopurpurin is soluble in presence of a small, but insoluble in presence of a large quantity of alkali, and, once separated, it cannot be redissolved on washing, whilst anthraflavic acid behaves in the opposite manner, remaining in solution in presence of a large quantity of alkali, and is

then not precipitated on dilution. As an example of such a separation, the melt from 200 kilos. of commercial sodium α-anthraquinone disulphonate and caustic soda is boiled in about 2·5 cb. m. of water, together with 100 kilos. of calcined lime. The lime lake of the Flavopurpurin is filtered off hot and washed, whilst the mother liquor is concentrated to 20 B. and the sodium anthraflavate crystallised. The Flavopurpurin lime-lake after decomposition with acid, gave 67 kilos. of 99 per cent. Flavopurpurin, whilst the sodium anthraflavinate gave 38 kilos. of anthraflavic acid. The proportions may be varied within limits, all that is necessary being the employment of a sufficient quantity of soda and of lime.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mercerising Cotton Tissues; Tension Exerted in ——. H. Grosheintz. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, 187.

Dynamometric measurements show that the contractile force exerted by a cotton tissue when acted upon by a solution of caustic soda, is almost directly proportional to the density of the latter.

The tension exerted by a tissue which is undergoing treatment with caustic soda, upon the clips or pins of a stentering machine, varies according to the nature and weight of the tissue. If the tissue be sufficiently stretched in the machine before being impregnated with the alkali, the strain upon the clips or pins is not increased when this takes place.—E. B.

Mercerising Cotton Yarns under Tension. F. Beltzer. Rev. Gén. des Mat. Col., 1902, **6**, [62], 25—33.

A study of the conditions necessary for obtaining the highest degree of lustre on cotton which is mercerised in the form of yarn.

Nature of the Yarns used.—Long-stapled, glossy fibres, *e.g.*, Egyptian and Georgian cottons, should be selected for the manufacture of yarns which are to be mercerised. These should be spun moderately tightly and in fine counts, and should be doubled or twisted. Before being mercerised, they should be carded and gassed.

Operations preparatory to mercerising.—More lustre is obtained with cotton which is mercerised in the bleached state than with unbleached cotton. The bleaching should be thorough, the scouring accomplished with caustic soda only, without the use of soap; the washing performed in soft water; and the whitening effected by means of sodium hypochlorite and sulphuric acid.

The mercerising process.—Caustic potash gives a little more lustre than caustic soda. The difference is too slight, however, to compensate for the greater cost of the former. Sodium peroxide, at a low temperature, gives a good result. A very fine lustre may be obtained by the addition of carbon bisulphide (100 c.c. per litre) to the caustic soda bath. Difficulties are met with in applying this mixture. The duration of the treatment of the yarns with it must be regulated very closely. If too short, no effect is observed; if too long, the cotton is weakened or even partially dissolved. Further, owing to the carbon bisulphide not being soluble in the alkali solution, the bath must be energetically agitated to keep it in a state of emulsion in this. The process is more practicable in the case of tissues, which can be passed upon a stentering machine, first through the caustic soda-lye, then through the carbon bisulphide, in such a manner that a thin layer of viscose is produced upon them.

The temperature of the caustic soda solution must be regulated according to the density of the latter. Although excellent results are obtained at the ordinary temperature with a solution at 35° B., very good results may be obtained at higher temperatures. Indeed, a solution at 36° B. gave, at 90° C., a gloss equal to, if not slightly better than that which was obtained from the same solution at the ordinary temperature.

The method of mercerising cotton fabrics in the free state, using chemical reagents, such as glycerin and sodium silicate (this Journal, 1898, 452), to prevent them from shrinking, does not appear to be practised. The gloss obtained, is greatly inferior to that which is produced by mechanical action.

One of the methods of mercerising cotton yarns, consists in introducing these, in the form of hanks, in a moist condition (wetted-out and centrifugated) into caustic soda-lye at 36° B., working them in this until they are completely saturated and shrunk, and then at the same time washing and stretching them. The tension needed to produce the highest lustre is very considerable. In the case of a skein 0·68 metre in diameter, and weighing 70 grms., which was treated during two minutes with caustic soda-lye at 21° B., and at a temperature of 12° C., and then squeezed between rollers, it was found that a force of 228·4 kilos. was required to bring it to its original length.

The method which is commonly employed, is to stretch the hanks of yarn before treating them with caustic soda, and to maintain them at a uniform length throughout this and the subsequent operations. Although the highest degree of lustre is not obtained in this way, the yarns are not much damaged, and the apparatus required, being constructed merely to resist the contraction of the hanks, is of a simple and inexpensive kind.

A much better lustre is produced by stretching the hanks during the treatment with alkali, and increasing the stretch (to the extent of 5—15 mm.) during the subsequent washing operation. A disadvantage attached to this method, however, is that the additional stretch varies for each kind of yarn, and it must be very exactly determined in each case, to avoid breaking the threads. Moreover, the yarns are rendered rather harsh to the touch, but they can easily be softened afterwards. The lustre may be further improved by placing a fairly heavy metal roller upon the upper one of the two hank-carrying rollers during the mercerising process. This thus acts at the same time, as a squeezing and as a lustreing roller. Care must be taken, however, that the yarns shall not be too strongly pressed and, in consequence, damaged, when this arrangement is employed.

Operations after Mercerising.—In dyeing mercerised yarns, only easily soluble dyestuffs, such as Brilliant Geranin, Diamine Scarlet, Dianil Blue, Chlorophenine, Oxamine Violet, &c., should be used. These are applied in a bath containing olive oil soap. After dyeing and washing, the yarns are passed into a dilute solution of tartaric, lactic, or boric acid, and are then dried. Finally, they are singed and placed for a while in the drying-room in order to restore to them the scroopy feel imparted by the acid used in the previous operation.—E. B.

Mercerising. P. Bourcart. Rev. Gén. des Mat. Col., 1902, **6**, [62], 34—35.

The author shows mathematically that cotton yarns, consisting of single threads, cannot be satisfactorily mercerised, owing to the want of cohesion of the individual fibres when submitted to tension. A high degree of lustre can be produced only upon yarns composed of two or more threads twisted together.

Yarns intended for mercerising must be very thoroughly gassed to remove from them projecting loose fibres.—E. B.

Mercerising. [*Comments on the two preceding Notes.*] L. Lefèvre. Rev. Gén. des Mat. Col., 1902, **6**, [62], 35—36.

Beltzer's observation that cotton may be mercerised at a temperature of 100° C., solves the question whether refrigeration is necessary in the mercerising process (this Journal, 1902, 250). The lustre of the cotton so treated is quite equal to that of cotton mercerised at 15° C. The only precaution necessary to take in mercerising at the higher temperature, is to keep the cotton immersed in the caustic soda lye as much as possible, in order to avoid the action of the air upon it. It is impossible as yet to decide

whether any industrial application can be made of the new method of mercerising. Beltzer considers that it cannot.

Both Beltzer and Bourcart lay stress upon the importance of thoroughly singeing yarns which are destined to be mercerised.

Bourcart describes a method of mercerising cotton in the form of sliver (Eng. Pat. 21,645 of 1901; this Journal, 1902, 171).—E. B.

Indigo Vat, and the Application of Artificial Indigo; New ——. Leipziger Färber- u. Zeugdrucker-Zeit., **51**, [37], 100—103.

The manufacture of synthetic indigo on the large scale is now also carried out by the Farbwerke Hoechst, who have patented a new method of dyeing woollen goods with indigo from the hydrosulphite vat. The materials used in setting this new vat are 3,000 litres of water, 10 litres of a freshly-prepared 10 per cent solution of gelatin (size), 10—15 litres of hydrosulphite 20° B., 5—10 litres of indigo paste I. (20 per cent.). Before adding the other ingredients, the water is heated to 50°—55° C., and is made faintly alkaline by the addition of 1—2 litres of ammonia. The liquid should have a greenish-yellow colour; a pure yellow colour denotes excess either of alkali or of hydrosulphite; whilst a green colour, on the other hand, shows a deficiency of the latter substances. In a mechanical dyeing apparatus, about 100 kilos. of woollen yarn, cops, &c. may be entered. After working for 5—10 minutes, bisulphite solution is run in from a drop-funnel, until the liquid is *faintly* acid to blue litmus paper. 1—2 litres of bisulphite solution (38° B.), diluted with an equal volume of water, suffice to bring on to the fibre 80 per cent. of the indigo contained in the vat. The whole operation of dyeing lasts for 20—30 minutes, and the colour is then greened as rapidly as possible, preferably by treating with cold water. The vat must be rendered *faintly* alkaline to phenolphthaleïn solution after each operation and before using again. For the second operation, half the quantity of gelatin size used in the first is sufficient; and for succeeding operations, no further addition of size is necessary. Otherwise, the vat is made up till it has the same appearance as previous to dyeing For dyeing loose wool in an open vessel provided with some kind of squeezing arrangement, the following recipe is given:—About 60 lb. of well wetted wool are slowly worked in the vat for 15—20 minutes, and then removed and thoroughly squeezed out. The loose wool is allowed to green in the air, and then replaced in the vat (to which no fresh addition of indigo is made) and treated just as before. Much more indigo is taken up by the wool during the second dyeing, so that most shades can be obtained by means of two passages. If a very dark blue be desired, 1—2 litres of bisulphite solution are diluted with water and gradually poured on to the wool while it is being worked in the vat for the second time. By means of bisulphite (as mentioned above), the greater part of the indigo in the vat is brought on to the wool, and, one passage through the vat would suffice for producing the darkest shades, even for loose wool, were it not for the unevenness of the shades so produced. For the next dyeing operation, the vat must again be neutralised (as described above) if bisulphite has been used. Woollen yarns, piece goods, cloth, &c. may be dyed (except for the difference in working the goods) essentially by the method given for loose wool. The chief advantages claimed for the process over the fermentation vat are: (1) The absence of lime. The lime salts contained in the fermentation vat are a frequent source of trouble, combining with the wool-fat to form calcium soaps, which render the wool sticky, and interfere with the subsequent operations of spinning, weaving, and finishing. The material becomes odorous on keeping, owing to the fat becoming rancid. (2) The materials dyed, lose far less colour during the subsequent washing and milling operations. (3) The effluent from the dyeworks is less contaminated. (4) The output is three times as great as with a fermentation vat. Compared with the old strongly alkaline hydrosulphite vat, the chief point of advantage possessed by the new vat is, that the vat, being but faintly alkaline at the commencement of the process, and subsequently neutral or faintly acid, does not tender the wool.—H. L.

Dyestuffs, Cotton; Efforts to Increase the Fastness to Light of ——. P. Krais. Zeits. f. Farben- und Textil-Chem., **1**, [1], 22—23. (See Ger. Pat. 121,504.)

Impregnation of the fibre, in the cold, with sodium thiosulphate, copper sulphate, nickel sulphate, or cobalt sulphate, exercises a favourable influence on the fastness to light of a series of direct colours. Copper sulphate affects the shade to some extent, and so also do the sulphates of nickel and cobalt; but neither a molecular mixture of nickel and cobalt sulphates (which is practically colourless) nor thiosulphate, alter even the most delicate shades. The colours most suited for impregnation are: all Diamine and Benzo Blues; Benzo and Diamine Green; Benzo and Diamine Violet; Benzoazurine; Rosazurine; Direct Black and Direct Orange. Treatment of the Benzo and Deltapurpurins is of little effect, and, strangely enough, none of the Yellows tried were influenced at all. The value of thiosulphate is to be explained by its property, as an "antichlor," of neutralising the oxidising influence of light; but the action of the metallic salts is not clear. The impregnation is effected in the cold, and no salt of the dyestuff (according to the author) is formed. In spite of assertions to the contrary, there is no difference in the fastness to light of one and the same dyestuff, whether dyed on mercerised or on ordinary cotton, if both dyes be of the same strength. The fugitive basic dyestuffs remain unaffected by impregnation, and also all dyes on wool. However, the fastness to light of dyes with Malachite Green, Methyl Violet, or Victoria Blue (which are extremely fugitive basic dyestuffs) may be indirectly increased by impregnation with ferrocyanide of potassium. Methyl Violet changes to a dull red, whilst Malachite Green becomes a dirty yellow when exposed to light; but ferrocyanide is gradually converted into Prussian blue. The combined effect is the production of a shade, which if not identical with the original, is of the same character. It must be understood that the above salts are completely removed from the fibre by washing with water, and that the beneficial effect of impregnation is therefore limited to such articles as upholstery and curtain materials, which do not require to be washed or treated in the wet way. —H. L.

Azo Colours on the Fibre; Possible Methods for the Production of ——. G. G. Hepburn. J. Soc. Dyers and Colorists, 1901, **17**, [12], 279—285.

A research undertaken with the object of determining whether the process in use for the production on the fibre of insoluble azo colours can be modified, to permit the employment of more stable diazo compounds than the acetates, and so to render it possible to print such compounds along with Aniline Black and Alizarin and other dyestuffs, for the development or fixing of which steaming is necessary.

Of a number of compounds tried to this end, the diazo chromates were the first to give results of any interest. These may be prepared by adding one or two molecular proportions of sodium chromate, with the necessary quantity of hydrochloric acid, to a solution of a diazotised monamine or diamine. When the solution is concentrated, the diazo compounds in question in most cases crystallise out. For the isolation of the *p*-nitraniline derivative, it is necessary to saturate the solution with common salt. All the diazo chromates are explosive (compare Caro and Griess; Ball. Soc. Chim., **7**, [2], 270), especially when dry, the xylidine derivative in the impure state being so in a high degree. Their tendency to explode is reduced by washing with a saturated solution of common salt before drying.

With the exception of the derivatives of Magenta, Safranine and *p*-nitraniline, all the compounds prepared were found to be capable of being kept a considerable length of time without decomposition. The dianisidine compound, probably of the formula $[C_6H_3(OCH_3)N:N.CrO_4H]_2$, possesses most technical interest. A 2 per cent. mixture of it, thickened with starch or gum tragacanth, printed, and dried at 60°—65° C., gives an azo colour when treated with an alkaline solution of a phenol. With the F. and Schaeffer naphthol sulphonic acids in alkaline solution, it yields blue dyestuffs which resist 20 minutes' soaping at 60° C., but which are very fugitive to light. The

sulphonic acids named may be printed in conjunction with the diazo compound, and the formation of the azo colours effected by treating the printed tissue with dilute caustic soda solution. The yellow dyestuff from salicylic acid and the diazo chromate derivative of *p*-nitraniline is fast to soap. The red obtained from the same diazo compound and β-naphthol is dull, but after treatment with hydrochloric acid, it becomes bright, as usual.

The stability of the diazo chromates is ascribed to the balanced structure of the molecules of such compounds; thus, the compound, represented by the formula $C_6H_4(NO_2).N:N.CrO_4H$ has on one side of "the centre of gravity" between the two azo nitrogen atoms, a relative atomic mass of 136 and, on the other side, one of 131·4. This view led the author to prepare the antimonious acid (from tartar emetic, antimony fluoride double salts giving no precipitate), ferricyanic acid and tungstic acid salts of the diazo bases, but no results of technical value were obtained, as the compounds produced, though very stable, were very sparingly, or not at all, soluble in water.

By varying the method, namely, printing salts of the above acids, drying, passing into solutions of the diazo chlorides, washing, and then combining with β-naphthol, results in some cases of a certain value were obtained. In most cases diazo compounds were precipitated on the printed tissue. In several instances, these were removed on washing. In others, where the precipitates remained after washing, traces only of azo colours were produced, owing to the transformation of the diazo compounds by the alkali of the sodium naphtholate into nitrosamines. A fairly satisfactory result was obtained with aminoazobenzene. A mixture of sodium tungstate (100 grms.), gum tragacanth paste (600 grms.), and water (300 grms.), was printed along with a rather acid Aniline Black mixture. The printed tissue was steamed for 2½ minutes, then passed into a bath of diazotised aminoazobenzene (23·4 grms. per litre), washed, and passed into a 1 per cent. solution of sodium β-naphtholate (see this Journal, 1900, 822).

As the diazo chromates when printed upon the fibre and dried give, on treatment with sodium β-naphtholate, azo compounds, while, when they are formed upon the fibre in the manner described, and are treated in the undried condition with sodium β-naphtholate, they are changed into nitrosamines, it would seem that a combination between them and the fibre substance takes place at the temperature of drying, and that this is of a nature to preserve the azo nitrogen atoms from the terminating influence of the alkali.—E. B.

Fibres dyed with Sulphide Colours; Notes on the Causes of Tendering of ——. W. Elbers. Zeits. f. Farben- und Textil-Chem., 1902, **1**, [4], 92. (*Vide* Fr. Pat. 309,281; this Journal, 1902, 50.)

The author is of the opinion that, in the operation of hot-pressing or steaming of cloth, dyed with sulphide colours, sulphur compounds are given off, which oxidise in the air to sulphuric acid, tendering the vegetable fibre (this Journal, 1888, 322). If metallic compounds are used, the tendering of the fibre will often be greater on account of the catalytic action set up.—F. N.

Oxycellulose in Calico Printing. C. Kurz. Zeits. f. Farben- und Textil-Chem., 1902, [2], 46.

Damask effects on cotton, especially on satin as obtainable with viscose, are not much in use, in consequence of the difficulties in producing viscose. The author obtains similar effects with oxycellulose, prepared in the following manner: A mixture of 65 c.c. of soda lye of 7° B. with a solution of 12 grms. of potassium permanganate in 1,750 c.c. of water, is stirred together with 85 grms. of white, loose cotton, and boiled till the red colour of the permanganate has gone, then filtered, and washed on the filter with boiling water. The residue is treated with soda lye of 25° B., the paste heated to 50° C. and allowed to stand till the next day, then diluted with about three times its volume of cold water, and filtered. The oxycellulose can be precipitated from the filtrate with hydrochloric acid, and then be filtered off, 1 litre of oxycellulose paste being obtained, which can be used for printing.

125—250 c.c. of this paste can be mixed with 1 litre of tragacanth solution and 125 c.c. of albumin solution. The duration of steaming varies from two minutes to half an hour or an hour, according to the material and the dyestuff used. Relief effects can be produced by adding 50—100 grms. of zinc oxide paste. Specially good results can be obtained on mercerised cotton.—F. N.

Printing of Textiles; New Process for ——. F. Haber. Zeits. f. Farben- und Textil-Chem., **1**, [1], 10—22.

A. Hoz has constructed a machine for printing uncut goods continuously without the use of engraved or raised rollers. The author discusses in great detail the scientific principles underlying the process of Hoz, which he has improved, and its industrial value; but of the process itself only a bare outline is given. Briefly, the principle is similar to that involved in certain lithographic methods, and the machine of Hoz is an adaptation of that used for rapid lithographic work. The process of lithography depends on the mutually repellent action of fatty substances and water. The design is sketched on a roller (or plate) in a special, greasy composition, the rest of the roller being moistened with water. The colouring matter employed is an homogeneous mixture of a varnish with insoluble pigments. Such a medium is repelled by the moist parts of the roller, but adheres to the greasy design, which is reproduced by pressing the roller on the paper. For textile printing, pigments are inadmissible, since they have no affinity for the fibre. The essential feature of the new process lies in the employment of homogeneous mixtures of soluble aniline dyestuffs, with thickening material, varnish, and a small amount of water. A typical mixture contains 76 per cent. of varnish, 17 per cent. of water, 2 per cent. of thickening material, and 5 per cent. of dyestuff. This preparation will not "bleed" into the moistened parts of the roller, and may be printed on the textile material, as in the lithographic process. The dyestuff is only combined with the fibre after the next step, which consists in steaming the goods. Finally the greasy varnish is removed (if necessary) by means of an organic solvent. On animal fibres good results are obtained; the process is less suited for vegetable fibres. The special advantages of using flat rollers are: (1) The facility with which designs may be produced on and removed from the rollers, thus obviating the necessity of keeping a large stock of the latter; (2) Delicate lines may be more sharply reproduced; and (3) the design may be drawn directly on the roller.—H. L.

Agar-agar [*Cotton Printing*]; *Industrial Value of* ——. N. W. Sokolow, N. W. Schmelling, and S. J. Lewites.

See under XVIII. A., *page* 420.

English Patent.

Wool, Hair, Bristles, and other Material; Process and Apparatus for Cleansing, Scouring, or Removing Oil and Fat from ——. A. Born, Berlin. Eng. Pat. 24,856, Dec. 5, 1901.

The material to be cleansed is powdered with dry absorbent earth distributed by means of air from the vanes of an agitator or otherwise, and the earth subsequently removed by beating or by means of water. A special apparatus, claimed for the purpose, comprises means for introducing the absorbent powder, a device for producing a current of air, a hood to prevent dust escaping, and beating machinery. —C. A. M.

French Patents.

Mercerising, Scouring, Bleaching, Dyeing, &c.; Improved Machinery for ——. W. H. Crompton and W. Horrocks. Fr. Pat. 313,176, Aug. 2, 1901.

See Eng. Pat. 11,077, 1900; this Journal, 1901, 985.

Stiffening Material for Fabrics employed in the Production of Artificial Flowers and Foliage; New ——. L. L. Rochet and G. L. Giraudeau. Fr. Pat. 314,353, Aug. 29, 1901.

Silk, cotton, or other fabrics employed in the preparation of artificial flowers are coated with a "solution" of starch and

gutta-percha or caoutchouc in an essential oil ("essence"), and the prepared surface, while yet moist, is sprinkled over with fecula. The fabrics, after this treatment, may be subsequently printed or dyed.—G. T. M.

Textile Fabrics; Machinery for Dyeing, Printing, Bleaching, Scouring, and Treating ——. P. Schirp. Fr. Pat. 314,274, Sept. 16, 1901.

The movable receptacle holding the textile materials can be raised or lowered, so that in the latter position it covers and encloses the subjacent dye-vat; it can also be turned about a horizontal axis supported on adjustable bearings, which can be moved in a vertical plane by means of a double hydraulic elevator.

In one form of the apparatus, the receptacle is either cylindrical or rectangular and the articles to be treated are confined between two horizontal perforated partitions placed at convenient distances from the top and bottom of the containing vessel. A rotary pump connected with the vat and the top of the receptacle ensures a circulation of the dyeing solution through the whole apparatus.

A second form of apparatus is indicated in which the perforated partitions are arranged vertically; these are four in number, two lateral partitions held in position by means of springs, so that a small space is enclosed between each of them and the adjacent side, and two central partitions, forming a small chamber into which the dye-liquor is pumped. The articles under treatment are placed in the two compartments formed by the central and lateral partitions.

In this modification of the apparatus, the top and sides of the receptacle are hermetically sealed, and, moreover, the sides project beyond the bottom of the vessel, so that they dip into the dye-bath when the receptacle is lowered; in this way any access of air is avoided. The liquid in the receptacle passes into the chamber formed by the lateral perforated partition and the sides of the vessel, and thence into the vat through orifices between the bottom and sides of the receptacle. These orifices can be enlarged or diminished, so that the resistance to the flow of liquid through the receptacle may be varied at will.—G. T. M.

Sulphur Dyestuffs; Printing with ——. Farbenfabriken vorm. F. Bayer and Co. Fr. Pat. 315,230, Oct. 21, 1901.

The employment of the sulphur dyestuffs in printing has hitherto been greatly restricted, owing to the fact that the inorganic sulphur compounds, sodium sulphide, &c., added to facilitate the fixation of these colouring matters on the fibre, blacken and corrode the copper or brass printing rollers. This inconvenience is completely overcome by the use of nickel or nickel-plated rollers. In this way a sulphur dyestuff (Katigene Blue-Black R or Green 2 B Immedial Black V, extra) mixed with a solution of sodium sulphide and carbonate and made into a paste with starch thickening may be conveniently printed on the fabric, and the material subsequently treated with a mixture of potassium bichromate and copper sulphate or alum.

—G. T. M.

VII.—ACIDS, ALKALIS, AND SALTS.

Equilibrium Between Carbonates and Bicarbonates in Solution. F. K. Cameron and L. J. Briggs. J. Phys. Chem., 1901, **5**, 537.

In contact with air, aqueous solutions of sodium carbonate always contain some bicarbonate, and *vice versâ*, the equilibrium or definite distribution of the base as carbonate or bicarbonate being dependent upon the concentration, temperature, and the partial pressure of the gaseous carbonic anhydride. For a given degree of concentration, the proportion of carbonate increases with the elevation of temperature. It also increases with the concentration, except for very strong solutions. The same conditions hold good in the case of the potassium salts. It appears that not more than 3 per cent. of calcium can exist, as the normal salt in solutions of the carbonates of this base when they are in contact with a gas containing as much or more carbonic anhydride than there is in the air. The carbonates of magnesium are in contrast to those of calcium. If the pressure of gaseous carbon dioxide is less than in atmospheric air, more than 50 per cent. of the magnesium base can exist as normal carbonate, provided the solution is not in contact with any of the solid salt; if so, the proportion falls to less than 35 per cent.—A. W.

Lime whilst in a State of Fusion; Some Properties of ——. H. Moissan. Comptes Rend., **134**, [3], 136—142.

By means of an arc of 1,000 ampères at 50 to 70 volts, the author was able to maintain 500 grms. of pure quicklime in fusion at a constant temperature, *viz.*, at the boiling point of quicklime. On the cooler parts of the electric furnace, crystals, some 2 to 3 mm. in length, were deposited. The crystals were either transparent cubes or rectangular parallelopipeds, or needles partly opaque, partly transparent; they were inactive towards polarised light, but when prepared in Canada balsam and broken six months later, the fragments were powerfully active. This fact appeared to indicate that anhydrous lime is dimorphous.

The mean density of the lime employed in the researches was 3·30; that of the crystals, 3·40; hence it would seem that a polymerisation of the lime had occurred, analogous to, but poorer than, that observed by Ditte in the case of magnesia (Comptes Rend., **73**, 111 and 191). No appreciable difference was found in the heat of neutralisation of amorphous and crystallised lime.

The reactions of lime in a state of fusion, with other bodies, were studied by the author. *Carbon* reduced the lime and formed calcium carbide and carbon monoxide; but if the lime was in excess and the action prolonged, the carbide was oxidised, and carbon monoxide and vapours of calcium were produced.

Silicon was oxidised in a few moments to silica, which formed a basic silicate with the excess of lime.

Boron fused and formed a borate; but if the experiment was of brief duration, the residual boron was surrounded with small black crystals of calcium boride, CaB_6 (see Comptes Rend., **124**, 629).

Titanium dissolved in fused lime with the formation of basic titanate of lime.

Chromium, containing a little carbon, formed a well crystallised double oxide, Cr_2O_3, 4CaO (see Dufau, Ann. Chim. et Phys., 7th Series, **12**, 257).

Manganese was volatilised to a large extent, but was partly converted to manganous oxide.

Iron was oxidised.

Nickel and *Cobalt* were rapidly attacked and oxidised. The fused lime in these cases showed as powerful oxidising properties as potassium or sodium.

Platinum fused and boiled in admixture with the fused lime, and crystals of platinum several millimetres long were formed. On suddenly cooling the molten mixture, little cylindrical chimneys formed in the midst of the mass, and platinum vapours escaped therefrom. The existence of these cylindrial passages indicated that the liquid lime passed through a pasty state before becoming solid. The boiling platinum fixed some calcium, as the unvolatilised metal was found to contain 2·54 to 3·01 per cent. of calcium.—J. A. B.

Calcium Carbophosphate. A. Barillé. Répert. de Pharm., 1901, 145.

Dicalcium phosphate suspended in water is partially dissolved (25 to 50 per cent.) when subjected to the action of carbon dioxide under a pressure of 13 kilos. The solution, when exposed to air, deposits crystals of pure dicalcium phosphate. Calcium phosphate when similarly treated dissolves to a less extent (10—25 per cent.), and the solution deposits a mixture of calcium diphosphate and carbonate (1 mol. P_2O_5 to 3 mols. CaO). The conclusion is drawn that the solutions of calcium phosphate in water containing carbon dioxide contain a very unstable calcium carbophosphate, having the composition indicated by the formula $P_2O_8H_2Ca_2.2CO_2$. In the case of tricalcium phosphate, the biphosphate and calcium bicarbonate are first formed.

Attempts to isolate the carbophosphate by means of low temperatures or with alcohol failed. Dry carbon dioxide does not act on dry calcium biphosphate.—N. H. J. M.

Chromic Oxide; Crystallisation of ——. A. Ditte. Comptes Rend., **134**, [6], 336—343.

When a mixture of potassium bichromate and common salt is heated to bright redness, and the cooled mass treated with water, the insoluble residue consists of chromic oxide in the form of minute shining green crystals, greasy to the touch, and sticking to the fingers or to paper as black lead does. This crystalline chromic oxide is not formed when a mixture of potassium bichromate and potassium chloride is heated, though it is when the mixture is sodium bichromate and potassium chloride. The author ascribes it to the formation and decomposition of sodium chlorochromate. The chlorochromates are formed by the action of chromic anhydride on alkali chlorides ($CrO_3 + MCl = CrO_2(OM)Cl$); but while the potassium salt is stable, even at a high temperature, the sodium salt is not, but gives off chromyl chloride, oxygen, and chlorine. When the bichromate is heated, it forms normal chromate and chromic anhydride, which then reacts with the alkali chloride. If this be potassium chloride, stable chlorochromate is formed; but if it be sodium chloride (either originally present, or formed by exothermic reaction between sodium chromate and potassium chloride), chromyl chloride is given off, and decomposed at the high temperature into chromic oxide, chlorine, and oxygen. The chromic oxide so formed is deposited in the crystalline condition observed.—J. T. D.

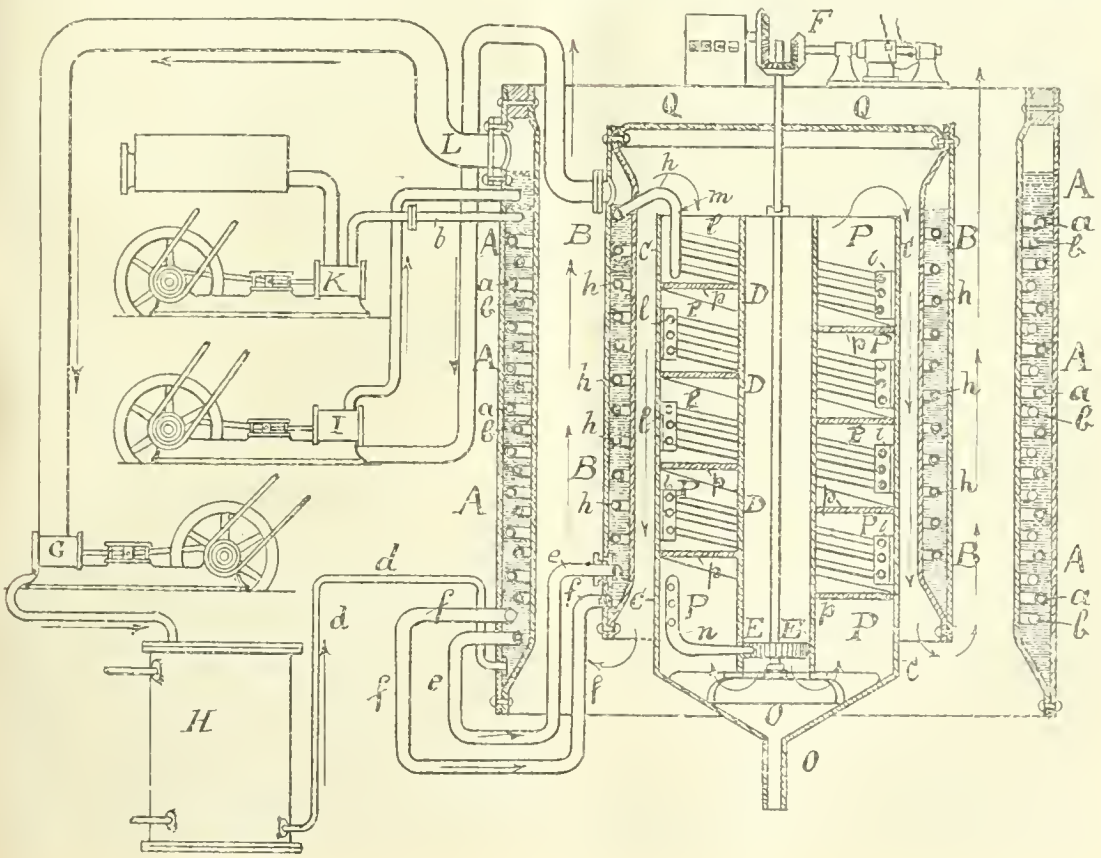
English Patents.

Anhydrous Sulphuric Acid; Production of ——. H. Rabe, St. Petersburg. Eng. Pat. 3327, Feb. 15, 1901.

The invention relates to the purification of the roaster gases intended for use in the contact process for producing sulphuric anhydride. The gases, after leaving the dust chamber, are sprayed with water or with sulphuric acid in a porcelain-lined conduit, "until the temperature is reduced to a point at which condensation of the fluid constituents cannot yet take place." The gases are then led through a kind of Glover's tower, in which they are finally cooled by streams of sulphuric acid. Next, the gases pass through filter-beds constructed of layers of granular substances or fibrous materials of successively diminishing size, the surface of which may be washed from time to time. When the gases are shown to be free from dust by Tyndall's testing apparatus, they are freed by suitable reagents from "non-neutral elements of a gaseous nature," and, especially, from HCl, by means of bisulphites in the solid form or in concentrated solution, and are dried. Reference is made to Eng. Pat. 15,948, 1898 (this Journal, 1899, 831).—E. S.

Liquid Air; Apparatus for the Industrial Production of ——. R. P. Pictet. Geneva, Switzerland. Eng. Pat. 2713, Feb. 8, 1901.

The apparatus consists of an outer cylindrical vessel, having a double casing to contain a cooling liquid, such as a mixture of compressed sulphur dioxide and carbon dioxide ("Liquide Pictet"), enclosing a second vessel, also with a double casing to contain liquid ethylene or its equivalent, within which is a third vessel, in the centre of which is a metallic cylinder and a turbine. In the drawing, showing the apparatus partly in side elevation and partly in vertical section, L is the pipe through which the compressor G aspirates the vapour or gases arising from the "Liquide Pictet" contained in the casing-space of the outer cylinder A, whence they pass through the condenser H, cooled by water circulation, and return as liquid through the pipe *d* into the bottom of the casing-space, this process being continuous. The same casing-space contains two separate worms, *a* and *b*; *a* receives vapours from the ethylene contained in the casing-space of the interior vessel B, conveyed by a pipe to the compressor I, and returned thence under a pressure of from 5 to 15 atmospheres into the worm as a liquid; and the worm *b* receives dried air under a pressure of from 50 to 53 atmospheres from the compressor K, and is cooled in the worm to from $-60°$ to $-80°$ C., and passes thence into the worm *h* in the casing-space of



the cylinder B. The ethylene liquefied in the worm *a* passes into the casing-space of the vessel B by the pipe *f*, while the vapour is being aspirated by the compressor I and returned to the worm. The compressed air becomes totally liquefied in the single worm *h*, and passing into the third space, C, enters a "labyrinth or kind of descending spiral composed of a large number of metallic tubes of small calibre," having fixed supports *l* in a spiral channel P, and united in a single pipe *n*. The channel P is so disposed as to lead the cold air ascending from the bottom, into contact with the tubes throughout their length. The highly-compressed liquid air issues as a jet from two conduits *n* (one only of which is shown) against the curved vanes of the turbine E, which actuates a dynamo showing the rate of passage, and the energy of which is also utilised in the compressors. As the liquid air comes to atmospheric pressure, part is volatilised, with great reduction of temperature, aided also by the work done on the turbine, and part remains liquid, but now cooled to −195° C., and flows out through the channel O. The vaporised portion, after impinging against the small tubes in the channel P, takes the downward and then upward course shown by the arrows, cooling thereby the casing-spaces, and then escapes to the atmosphere. The turbine is described as an important feature of the invention, and it is stated that its axle "may be made to give off power equal to as much as a quarter or a third of the work expended in the air-compressor, and furthermore, the production of this work obviates to a very great extent the heating, and consequent evaporation of the liquefied air, which would be caused if the liquefied air issuing from the tube *n* "were subjected to the shock of striking against fixed or stationary walls."—E. S.

Caustic Alkalis; Process for the Electrolytic Production of ——. A. Brochet and G. Ranson, Paris. Eng. Pat. 7397, April 10, 1901.

Caustic alkalis are produced by electrolysing, in an apparatus provided with a diaphragm, a solution of a sulphide of an alkali in the anode and cathode compartments, in such a manner that, by the action of the electric current, liberated sulphur, which combines with the excess of sulphide, is produced at the anode, and an alkaline lye, which may contain sulphur, at the cathode. Or, by substituting a chloride of an alkali in the cathode compartment, an alkaline lye free from sulphide is produced there, and liberated sulphur, which combines with the excess of sulphide, is produced at the anode. When the precipitation of the sulphur can no longer be prevented, the density of the current is increased at the anode, with the object of precipitating it rapidly, and abstracting the alkaline lye from the sulphide of sodium, and obtaining the sulphur with a minimum of oxidation.—G. H. R.

Alkaline Metasilicate; Manufacture of ——. D. Crispo and A. Mols, Antwerp. Eng. Pat. 6057, March 22, 1901.

Sodium sulphate, sand, and carbon, in the proportions of 71, 30, and 24 parts respectively, are mixed, and heated in a sandstone retort, until sulphur in any state of combination ceases to be evolved; the heat is then increased, and a current of steam passed through, whereby the sodium sulphide formed is decomposed, with production of sodium "oxide" and hydrogen sulphide, the former combining with the alkaline polysilicate already present to form a metasilicate.—E. S.

Alkaline Superphosphate; Manufacture of ——. R. Burnard, Plymouth. Eng. Pat. 5215, March 12, 1901.

Finely-ground quicklime is intimately mixed with acid superphosphate in such proportion as not only to neutralise the acid present, but also to produce alkalinity. The percentage of moisture in the finished product is thus much reduced.—E. S.

Graphite; Chemical Purification of ——. H. Langbein, Dresden. Eng. Pat. 7921, April 17, 1901.

Graphite is ground with ammonium fluoride, and introduced with sulphuric acid (both in calculated proportions) into a suitable still; the silicon fluoride that forms by attack on the silica present is passed into ammonia water, to regenerate ammonium fluoride with separation of gelatinous silica. The treated graphite is separated from the acid solution, washed, and heated with an alkaline solution, to free it from fluorine. The mixture of sulphuric acid and sulphates is neutralised with ammonia to obtain ammonium sulphate.—E. S.

United States Patents.

Nitre Oven. A. P. O'Brien, U.S.A. U.S. Pat. 694,024, Feb. 25, 1902.

The nitre oven is a brick-lined metal casing, cylindrical in its upper part, but conical for about two-thirds of its length below, converging to a small opening, closed by an automatically-acting valve, to permit accumulated dust to escape when it attains a certain weight. A horizontal pipe enters the oven below the cover, conveying sulphur dioxide from a pyrites burner, the sulphurous gases being impelled by a fan so as to acquire a whirling motion within the oven, in the lower part of which the accompanying dust collects. A series of nitre pots is fixed in the oven, each having an outwardly curved tapering bottom or end, projecting through the walls of the oven, and valved externally. A nitre-cake pan is arranged outside the oven, beneath the discharge ends of the pots, to receive the fluid sodium or potassium bisulphate remaining when the charges are worked off. A sleeve is movably mounted in the upper end of each nitre pot, having an aperture for passage of nitric acid vapour, registering with an aperture in the wall of each pot, so that, on recharging, gaseous connection with the interior of the oven may be closed. Devices are also described and claimed for introducing sulphuric acid, &c., without allowing escape of gases. A wide pipe passes through the cover to about half the depth of the oven, which conveys the mixture of sulphur dioxide and nitric acid vapour formed to a Glover tower or denitrating column, "and other chambers of the apparatus."—E. S.

Liquids; Apparatus for Saturating ——, *with Gases.* J. B. Weis and L. C. Anderson, U.S.A. U.S. Pat. 694,081, Feb. 25, 1902.

The mixer comprises a tank having a tubular head on its upper end, through which a pipe conveying chlorine (or other gas) from an electrolytic apparatus passes, the gas issuing into the tank immediately below a downward-flaring flange, covered by a numerously perforated diaphragm, from which a water spray issues, supplied through a valved pipe fixed in the tubular head. The bottom of the tank is connected by a pipe to a reservoir below.—E. S.

Oxygen Gas; Pastile for Making ——, *and Process of Producing Same.* G. F. Jaubert, Paris. U.S. Pat. 691,058, Jan. 14, 1902.

See Eng. Pat. 11,466, 1901; this Journal, 1901, 931.

—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Mechanical Action of Gelatin on Solids, especially on ——. L. Cailletet. Comptes Rend., **134**, [7], 400—402.

When glass is covered with a thick coating of strong glue, the glue, on drying, detaches itself from the glass, bringing away with it thin scales from the surface of the glass. The remaining glass shows a sort of engraved design, like hoar-frost. A similar effect is produced by gelatin on toughened glass, polished marble, calcspar, fluorspar, or rock-crystal. In the case of rock-crystal, the design is rectilinear; in the case of glass it is curvilinear. Glue containing dissolved salts which do not act on the gelatin (6 per cent. of potassium alum, sodium thiosulphate, potassium chlorate, &c.), applied similarly to glass, leaves, after drying, highly decorative fern-like designs. This method has already been applied to the decoration of glass. The application of glue in this way to sheets of cardboard or lead, or to metallic gauze, shows, by the curvature of the sheets as the gelatin contracts that a considerable force is exerted. This force is sufficient to

crush a thin glass cylinder which has been covered with glue. The examination, by polarised light, of blocks of glass covered with glue also shows that the glass is in a state of stress.—J. T. D.

Glazes; Analysis of Porcelain ——. V. de Lugnes.
See under XXIII., *page* 426.

English Patent.

Glass; Improved Method of Colouring ——. F. Scherbag, Vienna. Eng. Pat. 24,128, Nov. 27, 1901.

The method consists in covering the glass with a ground coating, and applying to the latter a coating of a coal-tar colour, soluble in water or fat, which is fixed, when dry, by a coat of varnish; or the colour may be mixed with the ground coating. For the latter, the inventor proposes "collodium solution," or a 4 per cent. solution of india-rubber in benzine, or the following mixture:—1,000 parts of water, 225 parts of gelatin, 75 parts of animal gluten, 22 parts of oxalic acid, $\frac{1}{2}$ part of chrome alum, and 8 parts of acetic acid.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Brickwork; Destruction of ——, *by Alkali Sulphates.* A. Cajo. Thonind.-Zeit., **26**, [12], 115—117.

A number of cases are reported by the author, partly from his own observation and partly communicated by others, of destruction produced in Italian brickwork, and traceable to the presence of incrustations of alkali sulphates in some instances and magnesium sulphate in others. In certain of the cases, a portion of the alkali compounds was traced to alkali sulphides in the clay, and a further quantity to the sulphur in the lignite used for heating the kilns. In view of these circumstances, it is considered desirable to lay down a maximum limit for the presence of such impurities in bricks, and to reject all showing excess over this limit. The author found the Brard test a suitable method for ascertaining the resistance of brick-earth to the sulphates; and he also cites the following methods recommended by the chief of the Laboratory of Public Works at the Royal Roman Academy.

(1) *Determination of Sulphur Trioxide.*—About 1 kilo. of the powdered sample of brick is extracted with boiling distilled water, filtered, and the solution tested in the usual manner.

(2) *Direct Test for the Influence of Sulphates.*—Prismatic samples of the brick, about 6 × 6 × 12 cm., are treated in a copper vessel with a saturated solution of sodium sulphate, by boiling for half an hour, and are then exposed to a current of air until an incrustation appears. This is repeated 40 times, after which the residue is dried at 100° C. and weighed. The results, which are expressed in percentages of the original weight of the prisms, give the coefficient of susceptibility to attack by sulphates.—C. S.

Cement; Chemical Decomposition of ——, *in Sea Water.* H. le Chatelier. Thonind.-Zeit., **26**, [11], 105—108.

As the result of his experiments, the author expresses a desire that, in marine constructions, tests should be made with ferruginous cements containing no alumina, and that mixtures of Portland cement and pure alumina dehydrated at 600° C., should be prepared and tested. Comparative tests should also be made with the products at present employed in marine constructions, in conjunction with the aforesaid new cementing agents. Other desiderata are the performance of experiments with blocks submerged in the sea, after the conditions of their preparation have been accurately determined, especially as regards the porosity and penetrability of the mass. Further laboratory experiments should be made, according to the Vicat method, with cements mixed to normal consistence and with 50 per cent. of water, with or without the cementing material having been previously ground to fine powder.—C. S.

Clay; Rational Analysis of ——. A. Sabeck.
See under XXIII., *page* 426.

English Patent.

Cement; Manufacture of ——. J. Steiger, London. Eng. Pat. 4657, March 5, 1901.

The claims are for "the manufacture of a silicated magnesia cement in dry form, by mixing a concentrated hot solution of magnesium chloride with a powdered silicious material," as slag, trass, Puzzuolana earth, &c., "heating the mixture to and above 150° C., reducing the mass to a dry powder by continued heating and adding calcined magnesite."—W. C. H.

X.—METALLURGY.

Silver; Presence of Tellurium in Ingots of American ——. C. Vincent. Bull. Soc. Chim., **27**, Jan. 20, 1902, 23—24.

The author has proved that the bad and hard qualities of some American high standard silver is due to tellurium, and not, as was at first supposed, to selenium. On melting the metal two or three times with 5 per cent. of nitrate of potash, it resumed its normal malleability. On extracting the scoria with hot water, filtering, acidifying with hydrochloric acid, evaporating to dryness, and re-dissolving in water, the filtered solution gave a greyish precipitate with bisulphite of sodium and hydrochloric acid. The precipitate was practically pure tellurium with a mere trace of selenium, and gave the characteristic violet coloration with hot concentrated sulphuric acid, and also the anhydride when heated in an open tube.—A. W.

Cyanide Solutions; Notes on ——. T. L. Carter. Eng. and Mining J., 1902, **73**, [7], 237.

The author considers that for practical work, the gold content of cyanide solutions can be determined rapidly and with sufficient accuracy by the nitrate of silver method. If the solution be strong in cyanide, it is best to add sufficient sulphuric acid to obtain a convenient precipitate upon adding the silver nitrate solution. The addition of silver nitrate is continued till a precipitate is no longer produced, the precipitate filtered off on a strong filter paper; the latter is rolled up and scorified with a sufficient amount of lead. The lead button is cupelled, the resulting bead carefully parted, and the gold residue weighed.

The author also refers to the saving effected in the consumption of cyanide by working with alkaline solutions. It is stated that the best method is to work so that the tailings are always slightly alkaline.—A. S.

English Patents.

Steel and Ingot Iron; Manufacture of ——. A. Hickman, Wolverhampton, and W. Hutchinson, Bilston. Eng. Pat. 6322, March 26, 1901.

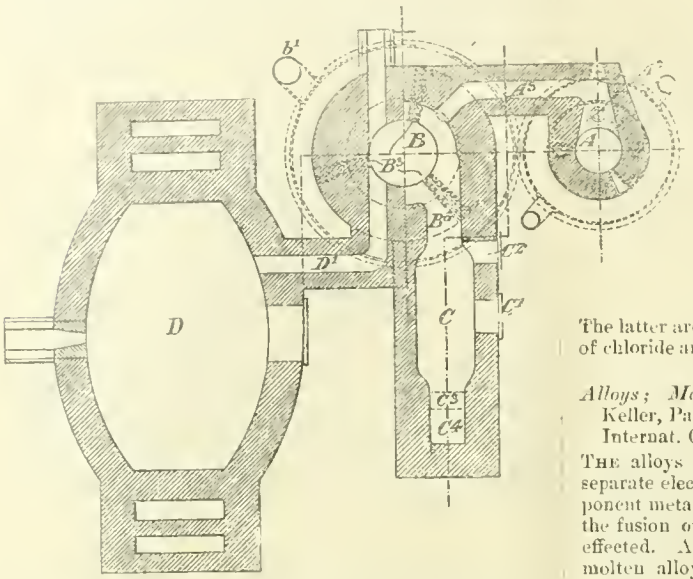
Phosphate of lime or of aluminium, or a mixture of both, is added to the molten pig-iron in a cupola or ladle, &c., whereby the amount of silicon normally in the metal is reduced, and the amount of phosphorus increased. The addition is preferably made in a mixer vessel, or furnace, lined with basic material.—A. W.

Steel; Manufacture of ——. V. Fattelay, St. Etienne, France. Eng. Pat. 7568, April 12, 1901.

In the manufacture and composition of steel, refractory substances, such as tungsten, chromium, titanium, &c., either alone or mixed, are introduced with graphite into the steel. In the example given, the proportions, which, however, may be varied, are: iron 73·4 per cent., tungsten 15, chromium 8, titanium 2, graphite carbon 1, and carbon 0·6 per cent. The process of manufacture may also vary, but preferably the refractory elements are first melted into a ferro mass, which is then cast, broken up, and mixed with the necessary proportion of iron, the whole being re-fused to obtain the final metal.—A. W.

Steel; Process of Manufacturing ——. H. Johnson, Brunswick, and G. W. Frier, Glenferrie, both in Australia. Eng. Pat. 22,730, Nov. 11, 1901.

The claims are for the combination of a cupola or blast furnace having a trapped outlet for the metal, a refinery or converter, a feed-metal heating furnace, and a grader or regenerating furnace, these working as a whole or in parts for the production of steel, and arranged according to the accompanying sectional plan. Vertically, the levels of the



parts vary, so that the metal runs from the cupola A to the converter B, and thence to the open-hearth furnace D. The cupola is provided with a siphon trap A^2, through which the metal only can run into the channel, A^3, leading to the converter, where it is blown by a blast through tuyères, B^3, supplied by b^1. Thence the metal is tapped and run through the channel D^1 to the usual regenerative furnace D. In connection with the converter is a feed-metal heating furnace C, which is provided with charging doors C^1 and C^2, and through which the products of combustion from the channel B^2, connected with the converter, pass on their way to the outlet flue C^3 into the stack C^4.

—A. W.

Manganese Steel and other Metals; Furnaces or Apparatus for Treating ——, *for Toughening and other Purposes.* R. A. Hadfield, Sheffield. From H. D. Hibbard, North Plainfield, New Jersey, U.S.A. Eng. Pat. 4917, March 8, 1901.

A heating apparatus is arranged as an elongated chamber heated from without, and which may be converted into a series of consecutive heating zones, having temperatures increasing gradually, by means of movable partitions. The chamber has also a movable bottom carrying the articles to be treated, and consisting of unattached, but closely adjoined sections, which are made to move through the furnace by means of rails and anti-friction devices. The articles to be treated are placed on this bottom, and moved on through the series without coming into contact with the products of combustion. Finally, the articles are withdrawn from the hottest zone and plunged into a cooling bath.

—J. H. C.

Steel Projectiles; Manufacture or Production of Hardened ——, *and other Hardened Steel Articles.* R. A. Hadfield, Sheffield. Eng. Pat. 6089, March 22, 1901.

The projectile or other steel article is hardened by heating it to a high temperature, 900° C. or more, and subsequently cooling the same by the direct action of a blast or current, or blasts or currents, of air. Cast projectiles may be annealed before the above treatment, which is claimed for use in conjunction with steel articles produced in accordance with English patents 27,753, 1897, and 6090, 1901.—A. W.

Projectiles; Manufacture of ——. R. A. Hadfield, Sheffield. Eng. Pat. 6091, March 22, 1901.

In the hardening of the point, or of the point and shoulder or of the point, shoulder, and a portion of the body, the use is claimed of an internally applied pyrometer so as to observe the temperature of the interior of the projectile and to control the heating. The coil of the pyrometer is placed in the interior of the projectile, which is then heated and treated according to the English patents 3543, 1898, and 6089, 1901. (See foregoing abstract.)—A. W.

Zinc Ores; Treatment of ——. H. M. Taquet, Argenteuil, France. Eng. Pat. 493, Jan. 8, 1901.

The process consists of the production, in one operation, of metallic zinc and alkaline earth sulphides by distilling, in zinc furnaces and in the presence of carbon, the compounds of zinc composed of oxide of zinc and the sulphate of an alkaline earth. The latter are produced by precipitating the mixed solutions of chloride and sulphate of zinc with lime, baryta, or strontia.

—A. W.

Alloys; Manufacture and Treatment of ——. C. A. Keller, Paris. Eng. Pat. 24,235, Nov. 28, 1901. (Under Internat. Conv.)

The alloys are made by fusing the component metals in separate electric furnaces, and afterwards running a component metal or metals into the electric furnace in which the fusion of the other component or components is being effected. Alloys can also be enriched in this manner, the molten alloy from one furnace being run into the molten mass of enriching material and carbon, in suitable proportion, in another, the results being homogeneity, high percentage of enriching metal, and low percentage of impurities. Thus, a high ferro-silicon is made from a low one by pouring it into a molten mass of silica and carbon in definite proportions. Ferro-chrome, ferro-tungsten, &c., can be similarly enriched in chromium, tungsten, &c.—A. W.

Metals from Sulphide Ores; Solution to be used in, and Process for the Separation of ——. C. V. Potter, Victoria. Eng. Pat. 1146, Jan. 15, 1902.

Dilute acid, preferably sulphuric, is applied to the crushed ore, which has been placed in a vat or other suitable vessel provided with stirrers. Heat is then applied until the metals rise upwards from the bottom of the vat and float on the surface of the liquid. They may be withdrawn by an automatic flow or by skimming, and reserved for separate treatment by any convenient process. The residue contains any gold or silver present in the ore, and may be further treated by cyanide or other means. The acid required varies from 1 to 10 per cent. of the water employed, and it may be applied in successive portions. About 250 galls. of solution are required for each ton of ore, but it may be used over and over again in most cases.

—J. H. C.

Ore or Fuel; Manufacture of Artificial Blocks of ——. L. Yonsbasheff, St. Petersburg. Eng. Pat. 3671, Feb. 20, 1901.

Ore material is crushed, mixed with hydraulic cement, and moistened. Fuel material, such as fine coal, is mixed with mineral oil and hydraulic cement. In each case the prepared material is then pressed into blocks of suitable shape.

—J. H. C.

Brazing; Flux for ——. G. Huth, London. From F. Pich, Berlin. Eng. Pat. 26,379, Dec. 24, 1901.

Phosphoric acid in a combined form, such as will permit it to be set free at the temperature of brazing, is used. For instance, the flux may consist of a mixture of sodium phosphate and boric acid, or of sodium phosphate and silica.

—E. S.

Muffles or Furnaces for Annealing; Improvements in ——. A. Smallwood, Coventry. Eng. Pat. 4099, Feb. 26, 1901.

The arrangement consists of a fire-grate, a combustion chamber, and a heating chamber. The latter consists of an inclined tube or arch, with passages for the hot gases and baffles suitably arranged around it. The fire-grate is sometimes mounted on wheels or rollers, and the heating chamber may be extended beyond the flues, and separated by an intermediate door, so as to form a cooling chamber.
—J. H. C.

United States Patents.

Cyaniding; Agitating Machine for ——. G. Rubseh, jun., Los Angeles, California, U.S.A. U.S. Pat. 690,375, Dec. 31, 1901.

A cylindrical tank having a conical bottom and valved outlet, fixed in a wooden frame, has a heating chamber, formed by continuation of the vertical sides of the tank downwards, surrounding the conical bottom, into which chamber, steam may be admitted. A rotary pump is centrally disposed in the tank, to the upper part of which, above the tank, are affixed a conical deflecting plate and, immediately below, a conical deflector, the periphery of which dips a little way into the tank, and nearly reaches its inner surface. When the apparatus is charged with the pulp to be treated and the cyanide solution, the pump, continuously elevating the solution, discharges it upward against the deflecting plate, from which it flows over the deflector, thereby exposing much surface to the atmosphere (stated to be advantageous) and returning to the tank, the process being continuous. Should free gold be present in the ore, it is made into a thin magma with water only; the deflector is coated with amalgamating plates, and the process conducted as described until the free gold is taken up. The plates are then removed, and cyanide solution is added for continuation of the process.
—E. S.

Carbonaceous Ores; Process of Reducing ——. R. McKnight, Pa., U.S.A. U.S. Pat. 693,982, Feb. 25, 1902.

The process consists of heating the ores, containing precious metals and carbonates, with sulphur until the carbonates are converted into sulphur compounds, and continuing the heating in the presence of a haloid salt of an alkali or alkaline earth metal with access of air, whereby the latter metal is converted into a non-volatile sulphate, and the liberated halogen unites with the precious metal to form a haloid or oxyhaloid salt of the same, which is then separated by volatilisation.—A. W.

Alloy. J. S. Wolfe and L. K. Englert, both of West Catasauqua, U.S.A. U.S. Pat. 694,224, Feb. 25, 1902.

The claims are for a composite metal and the process of making it, which consists of fusing the components in approximately the proportions by weight as follows:—Copper, 85 parts; tin, 4 parts; iron, 6 parts; and salt, 5 parts.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Lead Accumulators; Determination of Acetic Acid in ——. C. Formenti.

See under XXIII., *page* 427.

English Patents.

Electric Primary Batteries [*Constant Current*]. C. A. Hussey and S. G. Clarke, New York. Eng. Pat. 4422, March 1, 1901.

The battery consists of an exterior jar containing a tubular carbon, with an exterior flange, which rests on the rim of the cell. The upper end of the carbon is funnel-shaped, and the lower end has an interior flange, which supports the exterior flange of a porous cylinder within it. A zinc, composed of an upper and a lower ring, connected by parallel bars or hangers, and with segmental pieces below the lower ring, is suspended in the cylinder. An exciting solution is contained in the jar, and a practically insoluble oxidising salt is placed between the carbon and the porous cylinder, in such a manner that the products of decomposition can pass off and collect in the lower part of the jar.—G. H. R.

Zinc Chloride for Electrolytic Purposes; Treatment of ——. J. Swinburne, London, and E. A. Ashcroft, Milton. Eng. Pat. 6857, April 2, 1901.

Zinc is reduced from the fused chloride by electrolysis, after the zinc chloride has been dehydrated and purified by a preliminary electrolysis.—G. H. R.

United States Patent.

Zinc Element for Primary Batteries. [*Jointed Electrode.*] H. J. Brewer, New York. U.S. Pat. 694,089, Feb. 25, 1902.

The zinc electrode is made in two sections, the opposed ends of which are united electrically by a coupling-piece of conducting material, and a covering of insulating material protects the joint. Various methods of jointing and protecting the zinc are described.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Iron Alloys: Electrical Conductivity and Magnetic Properties of ——. W. F. Barrett, W. Brown, and R. A. Hadfield. Electrician, 1902, 48, [1240], 689—691.

The authors have examined upwards of a hundred different alloys of iron.

Electrical Conductivity.—The results of these tests have already been given (see this Journal, 1900, 911). In all cases annealing was found to diminish the specific resistance of the alloys. The anomalous conductivity shown by certain specimens of manganese steels may probably be explained by the fact that the effect of heat treatment on the alloys of iron containing a large percentage of manganese is different from that produced on most other steels. The slow cooling of a high manganese steel hardens it, whilst rapid cooling softens it.

Magnetic Properties.—In manganese steels, a sudden drop in the permeability and a corresponding increase of the coercive force is observed when the amount of manganese present rises from 2½ to 4 per cent. When the quantity present reaches 7 or 8 per cent., further additions have a much less effect on the magnetic properties of the alloy, which becomes practically non-magnetic when the quantity of manganese rises to 13 per cent. The conductivity of manganese steels decreases rapidly up to about 7 per cent. Mn, and then falls very slowly. The carbon content has a considerable influence on the magnetic properties of manganese steels. When the amount of manganese does not exceed 3 or 4 per cent., a large proportion of carbon injuriously affects the magnetic properties, but when the quantity of manganese is 10 per cent. or more, increase of carbon causes an improvement of the magnetic properties of the alloy. In this connection, it is interesting to note that when suddenly quenched from a bright red heat, a low-manganese steel behaves like a carbon steel, and is hardened; but a high-manganese steel so treated, is not hardened, but is rendered tougher and less hard; slow cooling, in fact, hardens the high-manganese steels.

With nickel-iron alloys, it was found that an alloy with only a small percentage of nickel was nearly as good, magnetically, as a specimen of Lowmoor iron, but the permeability rapidly decreased with increase of nickel, until about 20 per cent. was present, when a further increase improved the permeability.

A composite alloy containing chromium and aluminium is worse than iron or mild steel, but better than a chrome steel. Silicon behaves similarly to, but less vigorously than aluminium, causing an improvement in the magnetic properties. Addition of chromium to nickel steel makes the alloy harder, and injuriously affects its magnetic properties. With tungsten steel, addition of a small amount of chromium has practically no effect, but addition

of manganese causes a considerable decrease in the magnetic permeability, and eventually makes the alloy non-magnetic. When a chromium-manganese steel or a 12 per cent. nickel steel, containing 2 per cent. of chromium, with high carbon is annealed, the alloy is strongly magnetic, but when unannealed, is practically non-magnetic.

Non-Magnetic Alloys of Iron.—A remarkable magnetic change is produced by the addition of a comparatively small quantity of another element to certain alloys of iron, and by this means, alloys can be prepared which are practically non-magnetic (see Eng. Pats. 7442 and 24,703 of 1896; Journal, 1897, 444, 806).

Alloys of Iron more Magnetic than the Purest Commercial Iron.—Silicon-iron and aluminium-iron alloys are highly permeable, and have very low hysteresis with high induction. An alloy containing 2½ per cent. of silicon or of aluminium is the most remarkable magnetically, being better than the best and purest Swedish charcoal iron. In a field of 2 units, the induction B of 12,000 was produced in the 2½ per cent. aluminium-iron.—A. S.

Cerium Metals from Fused Salts; Electrolytic Production of the ——. W. Muthmann, H. Hofer, and L. Weiss. Annalen, 1902, **320**, [2], 231—269.

In the production of metals from their fused salts by electrolysis, the temperature must be high enough for the separated metal to fuse together at once into a regulus, and electrical heating from within the mass is the only practicable means of attaining such a temperature. The authors used carbon resistance rods to effect the fusion, the temperature of the arc being much too high. The electrolysis crucible used is illustrated in Fig. 1. It was made of sheet copper, 1 mm. thick, and was open above and below. The cylindrical tube R, of 2·5 cm. internal diameter, expanded in the upper part to 5 cm. diameter, forming a conical vessel T, which was surrounded by a jacketed space *u*, 0·5 cm. across. Cold water was circulated through the jacket, causing a thin film of solidified material to form all over the walls of the crucible, and protecting the copper entirely from the molten metal and electrolyte. The cathode K was surrounded several times with asbestos string B, and thus fastened elastically in the tube R. The cathode K and anode A, of which the former was always the thinner, consisted of pure, homogeneous arc-lamp carbons, which, though often troublesome on account of cracks, were the best electrodes obtainable. No formation of carbides was observed. Using iron electrodes, the products were always contaminated with iron. The incandescence rod W, about 3 mm. thick and 20 mm. long, was held between the electrodes simply by the downward pressure of A. The upper end of the cathode was about 1·5 cm. above the asbestos wrapping. The apparatus was mounted on a stand in such a manner that the anode could be readily raised or lowered as required.

Fig. 1.

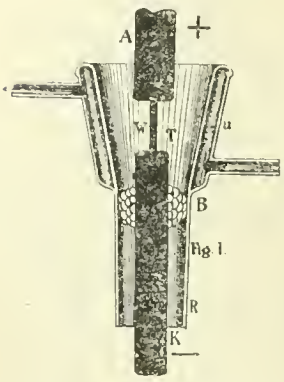


Fig. 1.

In a preliminary trial of the apparatus with cryolite, a current of 40 ampères and 10—12 volts was used. The cryolite was added gradually till the crucible was full of the clear molten substance, the cooling water flowing away at a temperature of 25°—30° C. The resistance rod W was then removed by means of a carbon rod, whereupon electrolysis began, the heat generated by the passing of the current being enough to keep the electrolyte molten. The anode was gradually raised, to prevent short-circuiting with the accumulating metal, until it was all but lifted out of the melt; the current was then stopped, and, after cooling, the mass was removed from the crucible by pressing lightly on the cathode. Using cryolite free from silica, a button of pure aluminium, weighing 9—10 grms., was obtained in three hours. Lead chloride was electrolysed very readily in the apparatus, yielding 25—30 grms. of metallic lead in a quarter of an hour.

Production of Metallic Cerium. — Anhydrous cerium chloride, $CeCl_3$, was used. With the apparatus as in Fig. 1, the yield of metal was unsatisfactory: owing to the good conductivity of fused cerium chloride at comparatively low temperatures and to the considerable cooling effect of the water in the neighbourhood of the cathode, the electrolyte gradually solidified round the latter, enclosing the metallic cerium, which was liberated in the non-molten condition. This trouble was overcome by raising the temperature in the neighbourhood of the cathode. The apparatus shown in Fig. 2 was used, in which the water jacket was reduced by one half, and the cathode was so thin (9 mm.) that the current kept it at a red heat. The packing of asbestos paper *s* and string B prevented the too rapid combustion of the carbon. The first portions of the hygroscopic cerium chloride introduced into the crucible were fused as quickly as possible, being covered with anhydrous potassium sodium chloride to prevent the absorption of moisture. A current of 30—40 ampères at 12—15 volts was used, the experiments lasting about two hours, before the cathode had burned out. The yield was 23 to 29 grms. of iron-grey metallic cerium, containing 99·92 per cent. of Ce. The metal can be cut with a knife, but is considerably harder than lead. Its sp. gr. was 6·786. When clean and dry, it is little attacked in the air, and retains its metallic glance for hours; but on touching it with the moist hand, a black film of oxide forms immediately. It is slowly attacked by cold, more quickly by hot water, evolving hydrogen, and is quickly dissolved by dilute acids. In nitric acid it becomes coated with brownish ceric hydrate, the proportion of water in the hydrate varying with the concentration of the acid.

Production of Metallic Neodymium.—The apparatus shown in Fig. 2 was used, pure neodymium chloride, obtained as described below, being fused in it by means of a current of 40 ampères and 15 volts. Neodymium chloride melts more readily and is a better conductor than cerium chloride; moreover, the liberated metal has a higher melting point than cerium. After removing the incandescence rod, therefore, it was necessary to reduce the conductivity of the electrolyte, and this was effected by adding barium chloride from time to time, in quantities of about 0·5 grm. This caused a great rise of temperature, the current showing 35 ampères and 25 volts. After 2½ hours a yield of 14·5 grms. of metallic neodymium was obtained. The metal differs from cerium in being silver white, harder, more readily oxidised in the air, and of higher melting point. It is ductile. At its melting point it attacks porcelain, forming a silicide. Almost all acids, including concentrated and fuming nitric acid, dissolve it. KOH solution does not attack it. It forms a tribromide with bromine, and combines with iodine only when heated.

Fig. 2.

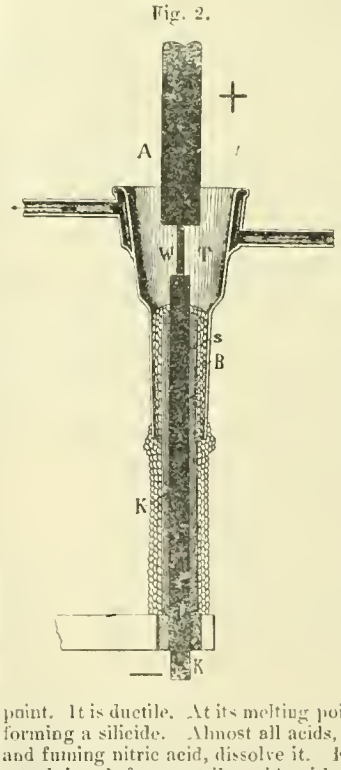


Fig. 2.

By electrolysing mixtures of the rare earth chlorides, and of these with lead chloride, alloys of the metals were

obtained; and on dissolving the earths in fused cryolite, electrolysis yielded alloys of the metals with aluminium.

The authors describe a modified apparatus, suitable for dealing with larger quantities of materials—up to over 1 kilo. of the chlorides. The crucible is oval, instead of circular, in section, and has a water jacket all over. Two parallel, horizontal resistance rods, held between corresponding carbon conductors, are arranged in the crucible, on opposite sides of the cathode. These resistances are provided solely for heating, and not for electrolytic purposes, and are, therefore, supplied with an alternating current. Several successful experiments with this apparatus are detailed. The value of barium chloride, as a means of varying the voltage and strength of current, is emphasised. No barium passes into the metallic products.

The pure $NdCl_3$ used in the above experiments was prepared by dissolving the oxide in hydrochloric acid and evaporating to dryness after addition of ammonium chloride, the ammonium chloride being then expelled by gently igniting the product in a platinum capsule, with constant stirring. From ceric oxide, either pure or containing the usual small amount of phosphoric acid, pure cerium chloride can only be obtained by troublesome and roundabout methods. The process devised by the authors consisted in first converting the oxide, containing some phosphate, into carbide, CeC_2, by fusing it in admixture with carbon in a graphite crucible by means of a current of 110 ampères and 30 volts, the anode, which was vertically adjustable, consisting of carbon, and the crucible itself serving as the cathode. The carbide obtained was then dissolved in a minimum quantity of hydrochloric acid, when any phosphorus present was expelled as phosphoretted hydrogen, not a trace of phosphoric acid being found in the solution. The combustible gas evolved consisted of acetylene, 84 per cent., and ethylene, 16 per cent. A small amount of iron, derived from the carbon and the crucible employed during the fusion, was removed by first oxidising the solution by means of bromine and then cautiously adding dilute ammonia to the neutralised solution until a filtered test portion showed iron to be absent. The liquid was then evaporated, with the addition of ammonium chloride, the residue dried, ignited gently in a platinum capsule, with constant stirring, and the extremely hygroscopic $CeCl_3$ obtained was preserved in stoppered flasks provided with tubes of phosphorus pentoxide.—H. B.

United States Patent.

Electro-deposition; Process of forming Bodies by —— [Metal Matrix.] C. Steinweg, Lüdenscheid, Germany. U.S. Pat. 693,918, Feb. 1902.

See Eng. Pat. 13,365, 1901; this Journal, 1901, 968.

—G. H. R.

XII.—FATS, OILS, AND SOAP.

Taxiric Acid; Constitution of ——. Arnaud. Comptes Rend., **134**, [8], 473—475.

When this acid (this Journal, 1892, 619) is oxidised, either by alkaline potassium permanganate or by nitric acid, it yields adipic acid and lauric acid, according to the equation $C_{18}H_{32}O_2 + H_2O + 3O = C_6H_{10}O_4 + C_{12}H_{24}O_2$. Hence it contains an acetylenic linking between the twelfth and thirteenth carbon atoms, as shown by the formula—

$$CH_3.(CH_2)_{10}.C{:}C.(CH_2)_4.CO_2H.$$

—J. T. D.

Beeswax; Determination of Resin in ——. F. Jean.

See under XXIII., *page* 428.

English Patents.

Oils, Vegetable; Separating ——, from Ground Seeds. J. Rank and W. Trantom, Hull. Eng. Pat. 16,483, Aug. 16, 1901.

The mass of oil and seeds exuding from between the pressing plates during the crushing of the seeds is passed through a centrifugal machine so as to separate the oil, and the residue returned to the kettle. It is stated that an increased yield of oil is thus obtained.—C. A. M.

Oil from Fish; Process and Apparatus for Extracting —— ; and obtaining Dried Residues serving as "Guano." F. V. Speltie, Amsterdam. Eng. Pat. 25,425, Dec. 12, 1901.

In this process the fish is cut up and heated in direct contact with steam under pressure in a closed vessel whilst continually agitated. The mass is then transferred by means of the pressure to another closed vessel, where it separates into an oily layer, an aqueous layer, and the solid fish paste. By admitting water into the vessel below the oily layer, the latter is forced up into a receiver. The aqueous layer and added water can then be drawn off, the last portions in and above the fish paste being forced by steam pressure through a filtering surface. Finally the paste is dried by passing it through a hot conveyor, where it meets a current of hot air.

Separate claims are made for various mechanical appliances in connection with this process.—C. A. M.

Oil and Water; Device for Separating Liquids of Different Densities, such as ——. E. Pravicha and E. Douillet, La Garenne-Colombes, France. Eng. Pat. 20,470, Oct. 12, 1901.

One type of apparatus claimed consists of a cylindrical or prismatical vessel, into which the mixture of oil and water is pumped. The water, on separating, is forced through an internal tube, which has its opening towards the bottom, and delivers the water into the upper part of a second receptacle, whence it escapes by means of a similar tube. The oil passes through a tube at the top of the first receptacle.

Claim is also made for a device, especially adapted for steamers, for effecting the separation without pressure, the mixture being pumped in and the overflow pipe placed in the centre of the surface of the liquid, with its opening made to oscillate so as to correspond with the movements of the liquid.—C. A. M.

Train Oil; Method for obtaining Odourless Product from ——, as a Substitute for Tallow. G. Sandberg, Moscow. Eng. Pat. 393, Jan. 6, 1902.

The oil is treated with nitrous and sulphuric acids at a temperature not exceeding 60° C., or with sulphuric acid at a temperature preferably above 60° C. It is stated that in this way the glycerides are decomposed into free "sebacic acids" and glycerin, whilst the oleic acid yields sulphohydroxystearic acids. The product, which is free from all disagreeable odour, can replace tallow in the manufacture of hard soap and candles, and possesses the advantage of not becoming rancid.—C. A. M.

Soap-stamping Machinery. C. J. D. Dodwell, Liverpool, and R. Dodwell, Rock Ferry. Eng. Pat. 5544, March 16, 1901.

In this invention, the soap tablets are carried by means of a band into position beneath an endless running chain, provided with projections at intervals, by means of which, each soap tablet is in turn conveyed towards revolving drums carrying the dies. The feeding chain is driven through an intermediate shaft by means of a chain or otherwise, whilst a spring pressure plate delays the delivery of the first tablet until it has been forced into position. In order to obtain a better impression, vent holes are provided in the dies to allow the excess of soap or air to escape.—C. A. M.

Oil and Fat from Wool, Hair, Bristles, &c.; Process and Apparatus for Cleansing, Scouring, or Removing ——. A. Born. Eng. Pat. 24,856, 1901.

See under V., *page* 405.

United States Patent.

Grease-containing Material; Treating ——. J. J. Seldner, Baltimore, U.S.A. U.S. Pat. 692,922, Feb. 11, 1902.

Claim is made for a "method of treating animal or vegetable material to extract oil or grease from it, which consists in heating the material to expel liquid therefrom,

separating out from said liquid the oil and grease therein, and returning the remaining liquid to the material under treatment to serve as a vehicle for conveying further oil and grease from said material."—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

United States Patents.

White Lead: Process of Manufacturing ——. F. J. Corbett, Prahan, Victoria, Australia. U.S. Pat. 694,138, Feb. 25, 1902.

In this specification the inventor describes a process of making white lead in the apparatus claimed in Eng. Pat. 11,337, 1901 (this Journal, 1902, 356). The "solvent liquid" therein mentioned consists of from 30 to 90 per cent. of "aldehyde" mixed with from 70 to 10 per cent. of commercial 35 per cent. acetic acid. If, however, only 30 per cent. of aldehyde is used, part of the balance is made up with water. See following abstract.—F. H. L.

White Lead; Apparatus for Manufacturing ——. F. J. Corbett, South Yarra, Victoria, Australia. U.S. Pat. 694,139, Feb. 25, 1902. See Eng. Pat. 11,337, 1901; this Journal, 1902, 356.

The aldehyde employed is specified as acetaldebyde.
—F. H. L.

Paint-Oil. E. K. Zingg, New York. U.S. Pat. 694,085, Feb. 25, 1902.

The paint-oil claimed is a substitute for linseed oil, and consists of "a gum mixture," 42 parts; boiled linseed oil, 25 parts; petroleum (sp. gr. 0·757), 33 parts. The "gum mixture" is prepared by dissolving 1·7 grms. of sodium carbonate in 25 or 50 c.c. of water, adding 100 grms. of colophony, and evaporating the whole to dryness at a temperature not exceeding 38° C.—F. H. L.

(B.)—RESINS, VARNISHES.

English Patent.

Polish for Leather, Linoleum, and other Materials; and Method of Producing Same. J. Lorenz, Eger, Austria. Eng. Pat. 8270, April 22, 1901.

Equal parts of Carnauba wax, paraffin, ceresin, and stearine are melted together, cooled, powdered, and dissolved in alcohol or turpentine. For certain purposes shellac or other resin may be added, and the ceresin and stearine may be replaced by Japan wax.—F. H. L.

(C.)—INDIA-RUBBER, &c.

India-Rubber and Gutta-Percha: Methods of Extracting ——, by Solvents or Mechanical Treatment. M. Gerber. Monit. Scient., March 1902, **16**, 161—170.

In the first part of this paper, the imports of rubber to some of the leading markets for the last eight years and the exports from several of the chief areas of production, are recorded, in order to show the magnitude of the industry. A brief account follows of the steps being taken by various Governments to meet the present deficit in the supply of raw material and of their efforts to promote artificial cultivation. Meanwhile the recovery of rubber from waste portions of the plants (leaves, twigs, &c.) is being attempted in order to increase the supply. These methods are chiefly modelled on the attempts made to recover gutta-percha, the supply of which has for some time been so scanty that many processes have been devised for treating the refuse-portions of the plants producing it. The following chronological table gives most of the facts collected by the author, in a concise form.

Patents for Extracting Gutta-Percha from Leaves (Chiefly).

1892. D. Rigole. Fr. Pat. 219,643, and a supplement.—Extraction of leaves and twigs of *isonandra* and *dichopsis*, &c. (1) by hydrochloric acid or zinc chloride to destroy chlorophyll and fatty matter; (2) by carbon bisulphide to obtain the gutta. (See this Journal, 1892, 829.)

Sérullas. Fr. Pat. 220,810, with supplement.—Treatment (1) with caustic alkali or ammoniacal cupric oxide as in Rigole patent; (2) extraction of residue by toluene and precipitation of the gutta by acetone, ether, acetic ether, &c. (See this Journal, 1893, 700.)

Sérullas. Fr. Pat. 225,507.—The whole of the vegetable tissue is destroyed by suitable means and the gutta left behind, as any process of solution is considered to impair its electrical properties.

1893. Arnaud and Houséal. Fr. Pat. 228,869.—A mechanical process: the leaves are macerated in water and the particles of gutta collected from the surface with the help of sheet-gutta and a thick oil. The product is heated to 110—120° C. under pressure and the oil removed by saponification.

Arnaud and Houséal. Fr. Pat. 233,982.—A method for extracting india-rubber is claimed.

Sérullas. Ger. Pat. 6744.—Purification of gutta-percha.

1894. Blanchard and Vivier. Fr. Pat. 240,648.—Extraction (1) by a solvent (such as alcohol) of the resins, chlorophyll, &c.; (2) by carbon tetrachloride to obtain the gutta.

F. Hourant. Fr. Pat. 25,417.—Very similar to Sérullas' second patent in 1892.

1895. Sérullas. Ger. Pat. 9138.—Purification of gutta-percha.

1896. Siemens Bros. and Co., E.F.A. Obach. Eng. Pat. 19,046. (See this Journal, 1897, 816.)

1897. F. Maurice. Fr. Pat. 269,034.—The vegetable tissues are destroyed by putrefactive bateria (*bacillus amylobacter*) and the gutta washed out. (See this Journal, 1900, 673.)

Mauny ——. Extraction of gutta and obtaining oxalic acid as a by-product.

R. T. Friswell and Brooke, Simpson and Spiller, Ltd. Eng. Pats. 19,727 and 19,728.—These include most of the points already mentioned, viz., drying, crushing, treatment with alkali, extraction with carbon bisulphide or toluene, precipitation by acetone, and washing in alcohol, water, &c. (See this Journal, 1898, 775.)

Extracted gutta-percha is less valued than natural gutta. Best gutta is said to be worth 16—17 francs per kilo; "green" or extracted gutta realises 12—14 francs, but very little has been sold (in France), probably not more than 200 kilos. altogether. One kilo. of gutta represents as much as 60 kilos. of raw material (leaves), and as the trees are very scattered and grow in very small clumps, the labour of collection appears to be nearly prohibitive.

Patents for Extracting India-Rubber.

1898. O. Zurcher. Fr. Pat. 279,534.—This deals with the extraction of a rubber-like substance from plants belonging to the *musaceæ*, this substance appearing in the plant at a definite stage of maturity only.

G. Deiss. Fr. Pat. 285,901 and 109,457 of 1899.—The bark is crushed, treated for 5—6 hours with sulphuric acid (50° B.) drained, washed, and passed through rolls fed with water. The rubber then agglomerates between the cylinders and the bark washes away. (See this Journal, 1899, 927.)

Bapst and Hamet. Fr. Pats. 290,430 and 294,799 of 1899.—Improved preparation of rubber from incision-latex.

Krusmann. A chemical method similar to that of Blanchard and Vivier for gutta.

1900. Bapst and Hamet. Fr. Pat. 296,512.—Dried bark is heated to 130—140° C under 2½ kilos. pressure, with caustic soda solution (10 per cent.) and the disintegrated product is passed through rolls.

Godefroy, Lebeuf, Wehry, and Verneuil. Fr. Pat. 296,147 and Ger. Pat. 116,914.—The bark is crushed and sifted, 40—50 per cent. of rubber-free powder being thus removed. The remainder is crushed in cold water and placed on a sieve and the rubber agglomerated by beating.

The article concludes with an account of the method used by the Kaffirs of Longa, Quiriri and Kampuluvé to

extract rubber from the roots of certain lianes, the product being distinguished as "rnot" rubber (see this Journal, 1901, 135), and the possibility is discussed of extending this mechanical method to the thin bark of rubber-yielding trees.

(See also this Journal, as follows:—W. Ramsey, 1897, 816; Sérullas and Hourant, 1897, 52: Arnaud and Verneuil, 1900, 256; and Arnaud, Verneuil, Wehry, and Lebeuf, 1901, 373.)—R. L. J.

Caoutchouc; Two Indo-Chinese Lianas yielding ——. G. Quintaret. Comptes Rend., **134**, [7], 436—438.

The author describes two varieties of rubber-yielding plants which he has examined, both belonging to the order *Apocyneæ*. The first, *Ecdysanthera micrantha*, is called by the natives, *Mak-khao-ngua*, and grows in fair abundance in the peninsula. It gives a latex rich in caoutchouc; on coagulating the latex with citric acid, a blackish-brown caoutchouc of excellent quality is obtained. This caoutchouc already forms an article of export. The second plant, a new species of *Michrechites* called by the author *Napeensis*, has no distinctive native name. It gives an excellent reddish-brown caoutchouc, the value of which was estimated in August 1901 at 8 fr. per kilo.—J. T. D.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Leather; Manufacture of Buff and Buck ——. Leather Trades Review, Feb. 12, 1902, 116. (Compare this Journal, 1902, 56.)

Hides, which are to be converted into buff leather are limed for 10 days with liquors of gradually increasing strength, then unhaired on the beam and returned to fresh and stronger lime solutions to increase their firmness. A very light grain is removed by splitting or "frizing," and the hides are again placed in lime liquor. They are then hung on lines to dry, and if the time be winter, in a specially warmed atmosphere. The drenching process is omitted, as it weakens the leather. The hides are milled for about two hours to distribute their moisture evenly, drawn out to cool, sprinkled with cod-oil (3 galls.) into which freshly-sifted slack-lime (1 quart) has been well stirred, milled again for 3—4 hours, and dried in a warm stove fitted with a blast fan. The oiling, milling, and drying processes are repeated for several days, the temperature of the stove being increased each time. The hides are then heated off, not in bins as in the case of chamois, but by hanging on hooks in a very hot stove heated by a large coke fire, or preferably by furnace pipes laid on bricks. When hard and dry and of a dirty brown colour, the skins are ready for washing, to effect which they are laid out flat in bins containing 3 lb. of soda ash and 1 lb. of soda crystals per hide, in a sufficiency of water at 112° F. for 12—14 hours, and are then scudded on a beam. The alkaline liquor is heated up to 120°—130° F., strengthened with a second quantity of soda ash and soda crystals and the hides are drummed in it for 1½—2 hours. They are then drummed for 1½ hours in a fresh weak liquor containing ¼ lb. of soda ash and ½ lb. of soda crystals and heated to 130° F. They are afterwards fat-liquored in the same way as chamois linings (*loc. cit.*), dried in warm air and finished on emery wheels or special hide machines in order to put a fine smooth face on them. Buck or deer skins, like hides, are limed for 10—14 days, washed in water, drenched with bran liquor, and then pressed like chamois skins (*loc. cit.*). The milling is also similar. No lime is added to the oil, but the time required is rather longer, as, unlike chamois, the grain is still present. After milling, they are heated off and then allowed to lie and "feed" on oil before the washing process. In the wash house, the skins are plunged into hot water, pressed like chamois skins, and put loosely into a solution of soda-ash and lime until the grain almost rots away. The scudder then removes the grain on a very narrow beam (10—12 inches wide), taking off narrow strips or shavings in straight lines up and down from neck to tail. The skins are then drummed in water at 120°—128° F., containing soda ash (30 lb. per 100 skins), fat-liquored like chamois, dried and finished off on emery wheels or special buck-machines made for the purpose.—R. L. J.

English Patent.

Leather; Manufacture of Waterproof ——, and Articles therefrom. A. J. Boult, London. From Trenckmann and Co., Berlin. Eng. Pat. 7246, April 6, 1901.

The material claimed is made by tanning the outer peritoneal coating of oxen (blind-gut or cæcum), then impregnating it with rubber solution, and finally vulcanising the whole. It is stated to be specially suitable for the manufacture of surgeons' or electricians' gloves, which are said to be aseptic and cool to wear. As the rubber solution acts as a cement to hold the strips of gut together, the finished gloves are absolutely water-tight, being free from the needle holes found in most articles of the kind.

—F. H. L.

United States Patents.

Tanning Process; Rapid ——. W. K. F. G. Sommer, Hamburg. U.S. Pat. 694,034, Feb. 25, 1902.

See Fr. Pat. 297,475, Feb. 21, 1900; this Journal, 1901, 1006.—R. L. J.

Adhesive Cement, and Process of making same. R. H. Willis, Chicago, Illinois, U.S.A. U.S. Pat. 694,045, Feb. 24, 1902.

A cement, specially suitable for securing canvas to iron, wood, or composition, is made as follows:—

Crude turpentine (½ gall.), pine tar (½ gall.), and rosin (8 lb.), are melted together in an earthen vessel, and then thoroughly mixed with a hot solution of glue (12 lb.), which has been swelled in cold water and completely dissolved in boiling water. This mixture cools and congeals in about 12 hours. The material to be covered is thoroughly cleaned, painted with a thin hot solution of the cement, and allowed to dry; the canvas is then pasted to this prepared surface by a hot solution of the cement, of the consistency of thick molasses.—R. L. J.

French Patents.

Ellagic Acid; Extraction of ——, from Tanning Materials. A. Heinemann. Fr. Pat. 314,375, Sept. 10, 1901.

An aqueous extract of the material is evaporated to a sp. gr. of about 1·2, and allowed to cool, when a part of the ellagic acid present separates in a crystalline state; the mother-liquor is then heated with sulphuric or other suitable acid to break up glucosides or other compounds, and the ellagic acid so liberated is recovered, preferably by the method described in Ger. Pat. 123,128.—R. L. J.

Gallic Acid; Manufacture of ——. A. Heinemann. Fr. Pat. 314,863, Oct. 10, 1901.

An aqueous extract of galls, containing 15—30 per cent. of tannin, is boiled with 5 per cent. by weight of sulphuric acid for about five hours. The process is complete when a test sample of the liquor, neutralised and diluted to a strength of about 1 per cent. of gallic acid, no longer gives a precipitate when two or three drops of gelatin solution (1 per cent.) are added to 15 c.c. of it.—R. L. J.

XV.—MANURES, Etc.

Soils; A Study of the available Mineral Plant-Food in ——. C. C. Moore. J. Amer. Chem. Soc., **24**, [1], 79—110.—C. S.

English Patent.

Alkali Superphosphate; Manufacture of ——. R. Burnard. Eng. Pat. 5215, March 12, 1901.

See under VII., *page* 408.

XVI.—SUGAR, STARCH, GUM, Etc.

Reducing Sugars of the Cane. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [7], 831—839.

The reducing sugars of the cane consist of a mixture of unequal parts of dextrose and levulose, the proportion of the latter being less as the cane is riper or richer. In addition to the reducing sugars contained in the juice, molasses contains invert sugar formed in course of manufacture, and 0·2—0·8 per cent. of mannose and 2—3 per cent. of glutose produced by the action of alkalis and heat on the reducing sugars. On fermenting a molasses under favourable conditions, the author obtained 97 per cent. of the reducing sugars fermented, allowing for non-fermentable glutose, or 89·4 per cent. on the ordinary analysis. Similar results are obtained in practice when the operations are well conducted, 27—33 litres of alcohol of 100° per 100 kilos. of molasses being recovered, the molasses showing 50—60 per cent. of total sugars, among which 15—25 are reducing sugars.—L. J. de W.

Sugar Juices: Treatment of ——, with Aluminium Powder and Ammoniacal Sulphiting. Besson. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [7], 800—804.

The aluminium powder used alone on sugar juices did not give a very complete decolorisation. Slight acidity of the juice rendered the effect more complete, the best result being obtained with oxalic acid. This acid was found to cause inversion; the author therefore endeavoured to obtain the effect in alkaline liquors, and found that ammonia or ammoniacal salts reacted on aluminium powder and caused a strong decolorisation. The proposal to use ammonium oxalate was not favourably received in the sugar works, and this salt was abandoned in favour of ammonium sulphite, which may be added as the normal salt—the preferable way—or the juice may be rendered alkaline with ammonia, and then treated with sulphurous acid until nearly neutral. One kilo. of ammonia at 22° B. is used per ton of liquor at 28·3° B., and 30—40 grms. of aluminium powder. The juice is then heated to 100° C. for 15—20 minutes and filtered. The improvement in the purity is dependent on the lime salts which are precipitated. The increase in purity may be from 0·5—2. To judge of the improvement effected by these reagents, it is necessary to act on virgin syrups. Where sodium carbonate has been added at the second carbonating to remove lime salts, the subsequent heating of the syrups produces caramel—fixed colouring matters—which can only be destroyed by very large amounts of the above reagents. The process is only of interest when lime salts are abundant. At the beginning of the season, it should be applied to the running syrups only.

—L. J. de W.

Diffusion Process; Investigations on the Alkaline Lime ——. K. Andrlik. Listy cukrovarnicke, 1901, **20**, 201. Chem.-Zeit., 1902, **26**, [16], Rep. 55.

In the alkaline lime diffusion process, the author has studied the effect of the degree of alkalinity on the quality of the juice, and the question of the further purification of the latter. The best results, so far as the composition of the massecuite was concerned, were obtained with 0·4 per cent. of lime and heating for only three-quarters of an hour at a temperature of 45° C. After several experiments with varying proportions of lime and temperatures of digestion, the author comes to the conclusion that the alkaline process of diffusion has no advantages. With low alkalinities, the juices obtained cannot be filtered, and although, when higher alkalinities are employed, it is possible to filter the juices, it is almost impossible to purify them.—J. F. B.

Diffusers [Sugar]; Gases in the ——. A. Dubos. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [7], 822—823.

The development of gas in the diffusers is a great source of trouble in sugar works, by impeding the circulation of the juice, restricting the quantity and quality of the work, and producing irregularities in the exhaustion of the pulp. The author found the work reduced from this cause from 240 to 200 tons of beetroots per 24 hours, and the loss in diffusion increased by 0·15. Lime and soda recommended in such cases were found of no avail, and the mischief was traced to the water used. This was the condensed vapour from the triple-effect and the pans, and the presence in it of entrained sugar had engendered a development of a butyric organism and chains of cells of viscous ferment. The gas in the diffusers contained 40 to 66 per cent. of carbon dioxide, and hydrogen was also detected. Close to the air-pump the alkalinity of the condensed water due to ammonia was 0·10, while on leaving the condenser, the acidity was 0·15, due to the butyric fermentation in the condenser, the temperature there being favourable to the development. As the condenser could not be cleaned while at work, the water was treated with potassium permanganate, which maintained the alkalinity of the water, and diffusion proceeded with regularity. 200 grms. of permanganate per day were found sufficient.—L. J. de W.

Cane Molasses. H. Pellet.

See under XXIII., *page* 428.

Indole; Occurrence of ——, in Molasses Tar. J. Boes.

See under XXIV., *page* 429.

Starch (Granulose); Determination of Potato ——. A. Kaiser.

See under XXIII., *page* 428.

English Patents.

Vacuum Pans Heated by Steam Worms. M. Blake and R. H. Smart, Greenock. Eng. Pat. 22,455, Nov. 7, 1901.

The inventors claim the employment, in a vacuum pan, of one or more worms, each composed of a number of separate coils or groups of coils, and connected at their one extremity to a steam-distributing box or branch pipe, and at their other extremity to a condensed water collecting box or branch pipe, there being one steam-distributing box and one condensed water collecting box for each worm.

—J. F. B.

Adhesive Mediums; Processes of Manufacturing ——. G. Schmalfuss, Cologne, Germany. Eng. Pat. 23,802, Nov. 23, 1901.

The claims relate to the manufacture of adhesives in the form of solid blocks, consisting of dextrin, gum arabic, and the like. The adhesive is kept always in a state for immediate use, and the formation of hard crusts on the used surface is avoided by incorporating with the gum, substances (such as sugar, soap powder, and the like) which facilitate solution.—J. F. B.

French Patents.

Sugar in Dried Beetroot; Process for the Direct Refining of the Natural ——. J. Lafeuille. Addition to Fr. Pat. 308,236, July 12, 1901.

The process described in the original specification comprises the following four operations:—(1.) Extraction of the sugar from the beet slices in the form of syrup. (2.) Defecation. (3.) Boiling followed by centrifugating, yielding white crystals. (4.) Boiling with continuous adding and drawing-off. The present addition consists in the statement that no special apparatus is required for the saturation of the juice, which may be carried out by any arrangement allowing of methodical extraction, or by any combination giving an intermittent or continuous exhaustion.—T. H. P.

Sugar; Improvements in the Manufacture and Refining of ——. J. Schweitzer. Fr. Pat. 312,995, July 20, 1901.

The process described in this specification consists in subjecting the hot massecuites, on removal from the pans, to treatment with concentrated alcohol, preferably in a vacuum, and to subsequent cooling. In this way the amount of crystals separated is increased by the sugar

dissolved by the hot alcohol and deposited on cooling. After centrifugating, the mother-liquor, which has a less sugar content than ordinary molasses, may be treated in either of two ways: (1) The alcohol may be distilled off for future use, the residue being a molasses of low value. (2) It may be treated with milk of lime or with powdered slaked lime, by which means a sucrate of lime is obtained, which is insoluble in the alcohol present, and can hence be filtered off. In this case the alcohol is recovered by distillation from both the sucrate of lime and the mother-liquor. A diagrammatic sketch of apparatus suitable for carrying out these operations is given.—T. H. P.

Charcoal of Great Decolorising Power; Process for Manufacturing ——. R. Ostrejko. Addition to Fr. Pat. 304,807, July 23, 1901.

See Eng. Pat. 18,040; this Journal, 1902, 58.—T. H. P.

Molasses; Process for Utilising ——, *by Incorporating them with the Marc or other Ligneous Material.* J. Lafeuille. Fr. Pat. 313,118, July 30, 1901.

Claim is made for a process of incorporation of the sugar of molasses with marc or other ligneous material. The molasses is first concentrated and superheated, after which the marc is saturated with it, and then cooled so as to cause the molasses to set. The resultant mass, which may be regarded either as denatured beet or as denatured molasses, is of use in the transport of a dense syrup from one medium to another without sensible dilution occurring. —T. H. P.

Filtration [Sugar]; System of Improved ——. P. Louis. Addition to Fr. Pat. 291,712, Aug. 1, 1901.

The original specification describes a system of filtration for use under either increased or diminished pressure. The present addition is for an arrangement of the filter in such a manner as to avoid or diminish the possibility of entrance of air, the control and stoppage cocks being thus done away with.—T. H. P.

Sugar Juices; Improvements in Apparatus for the Continuous Carbonation of ——. L. Prangey and J. Grobert. Fr. Pat. 313,242, Aug. 5, 1901.

The principle of the apparatus described in this specification is as follows:—A float, dipping into the liquid in the carbonation vessel, and also controlling entry and exit valves, is so adjusted that when the juice present is normally carbonated, it is allowed to flow away, and at the same time fresh juice enters the vessel. If, however, the content of carbon dioxide of the carbonating gas diminishes, carbonation becomes less active, and the volume of the lime remaining unacted on will increase, as also will the volume of the juice. Hence the float will rise, and in doing so it actuates valves which prevent both the exit of the liquid present and the entry of fresh juice; carbonation then goes on until it reaches its normal value, when the float sinks and fresh juice again runs in, while the carbonated juice flows out. A sketch and description of the details of the device are given.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeasts; A Study of English ——. R. Grey. J. Fed. Inst. Brewing, 1902, 8, [1], 97—120.

The author has made a complete study of samples of English industrial yeasts obtained from five different breweries. A complete analysis was made of each sample, the foreign germs were identified, and the various yeasts isolated as pure cultures. From these samples there were isolated 19 different varieties, consisting of 12 "culture" yeasts and seven "wild" yeasts, the latter having the characteristics of distillery yeasts. Fermentation experiments were carried out with pure cultures of each variety in wort prepared by the English infusion process. The purest industrial yeast was one used for fermenting porter, and the predominance of "culture" yeasts in the cask sediments pointed to the probability that the cask fermentation is conducted by the "culture" yeasts. The "wild" yeasts behaved like the bottom-fermentation yeasts of lager beer breweries, giving little or no head of yeast. The "wild" yeasts also produced the highest attenuations after primary fermentation. The chemical and biological behaviour of the yeasts were fully studied, and fermentations on a larger scale were carried out with five selected varieties of yeast, the beers produced being bottled. From the chemical study of the fermentations, it is concluded that types of "culture" yeast exist, as well as types of "wild" yeast, which can break down the maltodextrins.

In conclusion the author advocates the application of single-cell pure culture methods to English fermentation industries, and enumerates the advantages to be gained thereby. Pure yeast should prove of greater value to top-fermentation industries than it is to the bottom-fermentation industries, because of the higher temperatures employed in the former.—J. F. B.

Pressed Grain Yeast and Bottom-fermentation Beer Yeast; Differentiation of ——, *by Determination of the Fermentative Power at Different Temperatures.* A. Marbach. Zeits. Spiritusind., 1902, 25, [9], 100.

The author refers to a method devised for the above purpose by Lintner (see this Journal, 1901, 1128), and has studied the behaviour of pressed yeasts prepared by different methods as regards their fermentative powers at 30° and 45° C. respectively. The results are shown below:—

Description.		c.c. of Gas evolved At 30° C.	c.c. of Gas evolved At 45° C.
Beer yeasts	Vienna	560	575
	Prague	520	650
Pressed yeast, old Viennese method	No. 1	340	390
	No. 2	240	530
Wort yeasts	1. Grain wort	358	495
	2. Fresh molasses yeast	420	510
	3. Molasses yeast, five days old	295	470

It will be seen from the above table that the author failed to confirm Lintner's observation as to the inferior power of resistance of beer yeast towards the action of higher temperatures, since the beer yeasts behaved in exactly the same manner as the top-fermentation yeasts.

The author suggests that an addition of 0·25 per cent. of lactic acid to the fermentation liquid might bring out a difference between the two classes of yeast, since the grain yeast is accustomed by long culture to do its work in an acid medium of that nature.—J. F. B.

Distillery Seed Yeast; Trials with Bücheler's Method of Preparing ——, *with Sulphuric Acid.* E. Moritz. Zeits. Spiritusind., 1902, 25, [10], 107—108.

An account is given of a further series of trials of the above process in another distillery, and under conditions comparable with those already described (this Journal, 1902, 267).

The conclusions drawn from these trials are very similar to those arrived at in the former series. The preparation of the seed yeast by this process was effected in 24 hours, with very rarely any appreciable increase in acidity. A higher space must be left above the fermenting mash, to allow of the rise of the liquid during fermentation, than is necessary with lactic acid yeast.

At lower pitching temperatures, the commencement of fermentation was somewhat later with the sulphuric acid yeast, but primary fermentation was more intense at all pitching temperatures. In spite of the violence of the primary fermentation, in no case was there any tendency to "boiling over," even when distillery yeast "race H." was employed. This is the only important point on which this series gave different results from the last. With sulphuric acid yeast, no advantage was gained either in the duration of fermentation or in the yield of alcohol as compared with lactic acid yeast. On the other hand, it is admitted that the task of preparing the seed yeast is very much simplified by Bücheler's process.—J. F. B.

Diastases; Important Cause of Error in Investigating ——. M. E. Pozzi-Escot. Comptes Rend., **134**, [8], 479—480.

The blue coloration of tincture of guaiacum produced by oxydases, or by other diastases when a little hydrogen peroxide is added, is widely used as a test for these ferments. But the group of hydrogenases, which the author has studied, whilst they reduce hydrogen peroxide vigorously, do not give the blue reaction with guaiacum and hydrogen peroxide; and consequently, in a mixture of diastases containing hydrogenases, this reaction may not be observed. Certain work on diastases and their localisation in special cells, where the conclusions depend upon this colour reaction, may consequently need revision.—J. T. D.

Barley; Theoretical and Practical Observations in the Steeping of ——, *by alternate Treatment with Water and Air.* W. Windisch. Woch. für Brau., 1902, **19**, [7] 81—82 and [8], 93.

The author lays stress on the fact that the vital processes of germination already begin during the steeping process. In order that these processes may take place in a healthy manner, a supply of air is absolutely necessary. In the ordinary method of steeping under water all the time, the barley first uses up the small amount of air dissolved in the water. When this is exhausted, respiratory carbon dioxide is still evolved, but the conditions under which it is formed are comparable with those under which respiration is continued when a plant is placed in an atmosphere devoid of oxygen. The process then taking place is known as "intramolecular" respiration, where the oxygen of the carbon dioxide given out is derived from the substance of the grain itself. Intramolecular respiration is a pathological phenomenon, and is accompanied by the production of poisonous by products which weaken the grain. The respiration which takes place during the aeration-steeping process, on the other hand, is "normal," and invigorates the growing plant in a healthy manner. Hence in the aeration-steeping process, the grain sprouts much earlier than when it has been submerged all the time.

There is a distinct rise in temperature during the aeration process, especially if the grain be left too long without water; this would tend to force the growth. In the preparation of Munich malt, a "full steep" is necessary, but it is quite possible to effect this with the author's process by continuing to steep after the corn has sprouted. In such cases a rise of temperature should be prevented, either by injecting cold air or else by curtailing the time during which the grain is allowed to remain without water. It is always advantageous to cool the grain thoroughly before taking out of the steep, and to spread it at once in thin couches without piling it first as a thick, wet piece. In the author's process of steeping, the grain arrives at the fully-steeped condition quite as soon as by the old immersion process, and, owing to the healthy vitality of the grain, the oversteeped or sodden condition is never encountered.—J. F. B.

Malt-making; Experiments in ——. A. G. Salamon. J. Fed. Inst. Brewing, 1902, **8**, [1], 2—15.

The author has made experiments in connection with different systems of floor and pneumatic treatments, as actually practised, to ascertain the progressive accumulation of diastatic power in the grain from day to day, and to study this in conjunction with the water absorbed by the grain, with notes of the variations in the daily amount of this water as compared with that absorbed in the steep. Similar observations were made during the process of kilning according to the time of exposure and the temperatures existing.

Tables and curves are given indicating the diastatic power of the malt (reduced to a uniform content of 2 per cent. of moisture) during both flooring and kilning, so that these curves are made to illustrate the whole history of the diastase in the malt. All the systems investigated show a constant increase of diastase up to the maximum flooring time allowed by the maltster. The diastatic power varies with the system of flooring adopted, and is different in the case of a forced growth from that of a slow one. The cumulative amount of diastatic power is in nearly every case more than double the amount of that ultimately presented to the brewer in the form of kilned malt. The behaviour of the diastase on the kiln, with due reference to the temperature and amount of moisture present, is very characteristic. In several cases the diastatic power was observed to increase in the earliest stages of kilning, when the temperature was low and the moisture high. The subsequent increase of temperature, however, is attended by a remarkable diminution of the diastatic power, until the finished and cured product is left with only a small proportion of the converting power which it originally possessed. Records such as these ought to enable the maltster so to arrange his conditions of flooring, and especially of kilning, as always to deliver a product of a constant converting power.—J. F. B.

Saké Brewing in Japan. U.S. Consular Reports, Jan. 22, 1902.

The preparation of saké has been previously described (see this Journal, 1890, 754; 1895, 670; 1900, 763; and 1901, 378). Analyses made by R. W. Atkinson of saké and some of the intermediate products gave the following results:—

"*Koji*," two samples:—Dextrose, 25·02 and 58·1; dextrin, 3·88 and 1·41; soluble albuminoids, 8·34 and 6·4; insoluble albuminoids, 1·5 and 1·83; soluble ash, 0·52 and 0·54; insoluble ash, 0·09 and 0·04; starch, 56 and 26·02; cellulose, 4·2 and 1·94; and fat, 0·43 and 0·5 per cent.

A sample of the mixture of steamed rice, koji, and water, just before heating, in the preparation of the "*moto*" gave:—Dextrose, 12·25; dextrin, 5·69; glycerin, ash, albuminoids, &c., 0·48; fixed acid, 0·019; volatile acid, 0·008; and water (by difference), 81·553 per cent.

"*Moto*:—Alcohol, 10·5; dextrose, 0·2; total acid, 0·56; starch and cellulose, 16·58; and water (by difference), 72·16 per cent.

Saké:—Alcohol, 11·14; glycerin, resin, and albuminoids, 1·992; fixed acid, 0·13; volatile acid, 0·02; and water (by difference), 86·718 per cent.

Residue from the filtration of the saké:—Soluble solids, 1·43; starch and cellulose, 32·07; ash, 0·7; alcohol, 6; and water, 59·8 per cent.—A. S.

Cellulose; Hydrogen and Methane Fermentation of ——. W. L. Omelianshy. Chem.-Zeit., 1902, **26**, [13], 133.

The experiments were made with pure Swedish filter paper, which was suspended in a suitable alimentary solution at 35° C. in flasks, provided with tubes for collecting the gases evolved. Chalk was added for the purpose of combining with the acid produced, and fermentation was started by infection with mud or horse-dung. The period of incubation, or the time from the moment of infection to the appearance of the first bubbles of gas, varied from one week to several months. In the course of the fermentation, the chalk dissolved, and numerous fine openings appeared in the paper, giving it the appearance of being corroded. In time the paper disappeared almost completely. In one series of experiments, the gaseous products of fermentation consisted of methane and carbon dioxide, and in another of hydrogen and carbon dioxide. The hydrogen fermentation took place if the culture to be used for infection was previously warmed; if this were not done, the methane fermentation took place. Once started, each kind of fermentation preserves its character unaltered in a whole series of cultures; in further generations, warming exercises no influence on the chemical character of the fermentation. Tests in which the contents of the flask were infected with mixed cultures, showed that the methane fermentation is the stronger, the hydrogen fermentation being suppressed. But if a culture such as that used for the double infection be employed, in one case after warming to about 75° C. for 15 minutes, and in another without this preliminary warming, then in the former case, the hydrogen fermentation takes place, and in the latter, the methane fermentation. The bacilli which cause these two kinds of fermentation are very similar morphologically. The course of the fermentation in each case is shown in the following table:—

	Hydrogen Fermentation.	Methane Fermentation.
Cellulose :—		
Quantity taken	3·4743 grms.	2·0815 grms.
Undecomposed residue	0·1272 „ (3·6 per cent.)	0·0750 „ (3·6 per cent.)
	3·3471 „ (96·4 per cent.)	2·0065 „ (96·4 per cent.)
Fermentation products :—		
Volatile organic acids	2·2402 grms. (64·5 per cent.)	1·0223 grms. (49·1 per cent.)
Carbon dioxide	0·9722 „ } (28·4 per cent.)	0·8078 „ } (48·3 per cent.)
Hydrogen or methane	0·0138 „ }	0·1372 „ }
Total products of fermentation	3·2262 „	2·0273

(See also this Journal, 1896, 129 ; 1898, 60, 171 ; 1900, 679.)—A. S.

Butyl Alcohol ; Occurrence of Normal ——, in Corn Fusel Oil. O. Emmerling. Ber. 1902, **35**, [3], 694—695.

The quantity and composition of the fusel oil produced in alcoholic fermentation vary with the nature of the raw material, the species of yeast, and the presence of certain species of bacteria. Whilst amyl alcohol is always the main constituent, the quantity of other higher alcohols varies in a very large degree.

Normal butyl alcohol was more often found in the old method of fermentation with impure yeast ; it is now of very rare occurrence. Isobutyl alcohol, on the other hand, is met with in greater or smaller quantities.

The author failed to detect normal butyl alcohol in potato fusel oil, but found small quantities of it in the fusel oil from a corn-brandy distillery in Westphalia. The fusel oil was fractionated in a small column apparatus, and the suitable fraction was converted into iodide, and thence into acetate, and back into alcohol. In this way 2·5 grms. of normal butyl alcohol, boiling at 116° C., were isolated from 10 kilos. of fusel oil. Fusel oil is naturally of no use as a source for the preparation of normal butyl alcohol ; the best method for this is by the fermentation of glycerin. The butyl alcoholic ferment is obtained from cow-dung, which, in the dry state, retains for several years its power of setting up this fermentation of glycerin. The yield of butyl alcohol from glycerin, moreover, amounts to 6—8 per cent., so that the high price charged for this alcohol seems to be unreasonable.—J. F. B.

Enzyme Action. A. J. Brown. Proc. Chem. Soc., **18**, [247], 41.

The author has already shown (this Journal, 1902, 257) that in alcoholic fermentation, a constant weight of sugar is decomposed in unit time by a constant amount of yeast in solutions of equal volume containing different amounts of sugar, and has called attention to the fact that in this respect the action of fermentation differs essentially from that of inversion, which, according to C. O'Sullivan and Tompson (this Journal, 1890, 816, 1049), follows the law of mass action. At the time the author described his work, the phenomenon of fermentation was believed to be a life function inseparable from the living cell, and therefore it did not appear remarkable that the order of progression of its action should differ from that of inversion ; but since Buchner has shown that fermentation, like inversion, is an enzyme action, this point of difference required further investigation, as the simple mass action of invertase demonstrated by O'Sullivan and Tompson is often regarded as typical of all forms of enzyme action.

The author has examined the action of invertase on cane sugar, and finds that the velocity of its action differs essentially from that of a mass action, and resembles that of fermentation. The velocity of its action represented graphically approximates a straight line when not influenced by the accumulation of inversion products. The retarding influence of inversion products occasions the curve found by O'Sullivan and Tompson, and these authors were mistaken in regarding the curve as the logarithmic curve of mass action.

But although the action of inversion does not follow the law of mass action, it cannot be independent of mass influence, and therefore the effect of mass during inversion change must be restricted by some other influence. This influence the author believes to be due to the existence of time as a factor in the complex changes which probably accompany inversion.

There is good reason to believe that during the inversion of sucrose, this sugar enters into molecular combination with invertase previous to change, which presupposes a complex change and the existence of a time factor of some magnitude. Under these conditions it therefore appears more probable that this factor limits the effect of mass action in inversion changes in solutions of ordinary concentration. But if this be so, there must be a point of dilution in cane sugar solutions when invertase, acting in the dilute solutions, should exhibit an order of change in conformity with simple mass action. The author shows by direct experiment that this point is reached in a solution containing about 1 per cent. of cane sugar, so far confirming the conclusion that a time factor accompanying molecular change limits the action of inversion in all but very dilute solutions of cane sugar.

The action of alcoholic fermentation follows the same order of progression as that of inversion, and the work of Kastle and Loevenhart (Amer. Chem. Jour., 1900, **24**, 491) indicates that the action of lipase progresses in the same manner ; it therefore appears probable that both these enzyme actions are regulated, like inversion, by a time factor. With regard to the actions of such enzymes as diastase, glucase, and peptase, there is not at present sufficient evidence on which to base an opinion.

Starch ; Velocity of Hydrolysis of ——, by Diastase, with some Remarks on Enzyme Action. H. T. Brown and T. A. Glendinning. Proc. Chem. Soc., **18**, [247], 43.

The rate of change during the hydrolysis of starch by diastase does not conform to the simple logarithmic law of a unimolecular reaction. Throughout the hydrolysis there is a steady augmentation of the coefficient of velocity ; in other words, within any given time interval there is more of the residual substance hydrolysed than there should be according to the logarithmic formula.

The results are in the wrong direction to be accounted for by a gradual accumulation of the products of change with a consequent tendency to chemical reversion, nor can they be explained by the intermediate products of change exhibiting a differential resistance to hydrolysis.

If the time curves expressing the rate of hydrolysis of a 3 per cent. solution of soluble starch are critically examined, it is found that up to a hydrolysis of 30 to 40 per cent., the amount of transformation is very nearly a linear function of the time. A further analysis of the curve shows that the remainder is approximately logarithmic.

In all essentials the progress of the hydrolysis of starch coincides with that of the inversion of cane sugar by invertase, as shown by Adrian Brown (this Journal, 1901, 1129). The rate of hydrolysis also conforms closely with the empirical formula of Henri for the inversion of cane sugar.

The authors are inclined to adopt a somewhat different explanation of the time curves of hydrolysis from that suggested by Adrian Brown, and one which does not

postulate any difference in the time intervals between the successive stages of the reaction other than those due to variations in the respective masses of the reacting substances existing in unit volume.

ENGLISH PATENTS.

Beers; Brewing Barley Malt ——. A. G. Southby, Forest Gate, Essex. Eng. Pat. 8122, April 20, 1901.

ACCORDING to this process the germination of the malt is not carried beyond the earlier stages; the malt is then crushed without kiln-drying, and mashed with or without an addition of malt prepared in the usual way. The resulting mash or wort is then superheated in a closed vessel at temperatures ranging from 230°—270° F., in order to impart an empyreumatic flavour and colour, and is subsequently boiled with hops and fermented in the usual way. It is remarked that this deficiently germinated green malt requires a far more thorough grinding than is usual in the case of kilned malt.—J. F. B.

Yeast; Treatment for Utilisation of ——. A. J. Oxford. Eng. Pat. 5936, 1901.

See under XVIII. A., *page* 421.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Arrowroot: Preparation of ——. E. Leuscher. Zeits. öffentl. Chem., 1902, **8**, 23. Chem.-Zeit., 1902, **26**, [16], Rep. 53.

THE genuine arrowroot is obtained from shrubs of the genus *Maranta*. The plant is cultivated in a similar manner to the potato in well-manured, deeply-ploughed land. It requires a year to come to maturity, after which the roots are collected, washed, and peeled. The peeling requires considerable care, since the peels contain a resinous, very bitter substance. The roots are washed again, and then either rapidly ground or, preferably, crushed to a fine pulp between rollers. The pulp falls into a finely perforated cylinder beneath the rollers, in which, by means of a current of fresh water, the starch is separated from a milky liquid. This liquid is conveyed by pipes to a settling tank, being strained through muslin before it enters. After settling, the water is run off, and the washed moist starch is then dried. In Bermuda the drying is effected in copper pans, covered with gauze, in the sun. In Jamaica the starch is placed on wooden trays with cloth bottoms and covered with gauze. Analysis of several roots obtained from Jamaica showed, on an average: moisture, 63·42; starch, 27·84; dextrin and sugar, 2·08; crude fibre, 3·94; ethereal extract, 0·19; albumin, 1·64; ash, 0·89 per cent. The ash consists principally of phosphoric acid and potassium carbonate; the crude pulp, the finished starch, and the ethereal extract yield a volatile oil on distillation with steam. Canna starch also behaves in a similar manner.—J. F. B.

Agar-Agar; Industrial Use of —— in Russia. N. W. Sokolow, N.W. Schmelling, and S. J. Lewites. Zap. imp. techn. obschtsch., 1901, **35**, 815; through Chem.-Zeit., 1902, **26**, [18], Rep. 63.

IN Russia agar-agar is mostly consumed in manufacturing sweets, marmalades, and fruit jellies, as a partial substitute for gelatin, as it cheapens marmalade by adding sugar to it, and, unlike gelatin, does not putrefy in the damp state. Agar-agar contains an easily soluble carbohydrate of high nutritive value, and it is always free from lead and sulphuric acid, which impurities often accompany even high grades of gelatin. The authors do not see any reason why agar-agar should not be thus employed in place of gelatin.

It is stated that with a 2 per cent. solution of agar-agar, very thin cotton goods may be printed exceptionally well. Mixed with glycerin agar-agar is employed to make a pomade for the hands.—F. H. L.

Cocoa and Milk; Sterilized ——. A. Beythien. Jahresbericht des chemischen Untersuchungs-Amtes Dresden, 1900, 10; through Zeits. Untersuch. Nahr. und Genussm., 1902, **5**, 170.

MENTION is made of a new food product consisting of skimmed milk, to which a little cocoa has been added. The food value of the milk is thus increased, but the article will not keep more than two days after the tin is opened.

—W. P. S.

Food [Milk] Preservative; Hydrogen Peroxide as a ——. Jablin-Gonnet. Ann. chim. analyt., 1901, **6**, 129—133. Zeits. Untersuch. Nahr. und Genussm., 1902, **5**, 169.

THE author suggests the use of hydrogen peroxide for preserving articles of food, especially milk. A solution containing 12 volumes per cent., and previously neutralised with calcium carbonate, was found to be most suitable. One litre of milk with 1 c.c. of this solution can be preserved at a temperature of 20° C. for two days; with 2 c.c., for four days; and with 6 c.c., for six days. With these quantities the temperature can even rise to 30° C., without effect on the keeping qualities of the milk. The hydrogen peroxide cannot be tasted in the milk, and, according to a series of physiological experiments given in the original paper, is harmless to the human system. It can be detected in the milk serum, by the chromic acid test, after shaking out with ether.—W. P. S.

Edeolin; A Hydrolytic Derivative of the Globulin, ——, and its Relation to Weyl's Albuminate and the Histon Group. T. B. Osborne, J. Amer. Chem. Soc., **24**, [1], 28—29.

—C. S.

Protein Molecule; Basic Character of the ——, and the Reactions of Edestin with Definite Quantities of Acids and Alkalis. T. B. Osborne. J. Amer. Chem. Soc., **24**, [1], 39—78.

ACCORDING to the author, the proteins are basic bodies, and enter into ionic reactions with acids, with which they form true salts.

So far as ascertained, the crystals of edestin and its salts are isomorphous, the mass influence of the protein molecule preventing any change by the combined acid. It thus behaves like hæmoglobin. The solvent action of hydrochloric acid on free edestin suspended in pure water closely corresponds to a complete reaction between 1 mol. of the base and 2 mols. of the acid.

Edestin sulphates are less soluble than the corresponding chlorides; and preparations obtained from solutions containing ammonium sulphate are insoluble in water.

Phosphoric acid acts like a monobasic acid with edestin, in accordance with its dissociation into the ions H and H_2PO_4. Only a little in excess of the calculated quantity is required to effect solution.

With nitric acid edestin forms a salt corresponding to the bichloride.

The reaction of edestin with caustic potash or soda is in a proportion equivalent to that with which it forms the monochloride with hydrochloric acid. The amount dissolved by 100/N caustic alkali is in about equal molecular proportions of protein and base. Solutions of potassium and sodium edestin become turbid on standing, and part of the protein is gradually deposited, probably as the result of hydrolysis.

The amount of ammonia required to dissolve edestin is about 13 times that of caustic potash or soda.

The monochloride also behaves in a similar manner, but the bichloride and potassium or sodium-edestin are soluble in pure water, though insoluble in presence of a small quantity of a neutral salt. If the amount of the latter be increased, however, they are soluble, and then show the properties of globulin.

Edestin behaves like a true globulin, being insoluble in pure water, but readily soluble in sufficiently strong neutral solutions of sodium chloride.

The fact that edestin, and its salts with strong acids, are soluble in perfectly neutral solutions of sodium chloride

shows that—contrary to the opinion of Starke—the solubility of a globulin does not depend on the presence of alkali.—C. S.

Papayotin; Digestion of Albumin by ——. O. Emmerling. Ber., 1902, **35**, [3], 695—699.

It is well known that many of the higher plants secrete proteolytic enzymes, most of which have found no practical application. But one of these enzymes is utilised industrially in the manufacture of certain meat preparations. This enzyme is present in the various organs, especially in the fruits, of the papaw tree, *Carica papaya*, and liquefies and peptonises meat to a considerable extent. The records with regard to this enzyme, generally called papayotin, are of a somewhat conflicting nature. The author has, therefore, endeavoured to settle the question of its nature by a study of the products formed in the digestion of blood fibrin, by a commercial preparation of papayotin.

The action of the enzyme on the fibrin was extremely slow, and frequent additions of fresh papayotin were necessary before any considerable quantity of the fibrin was digested. It was established that the action was distinctly favoured by an alkaline condition of the liquid, but even then the digestion, after a month, had not proceeded very far. The products of the digestion consisted of large proportions of albumoses and peptones, and only very small quantities of amino acids. Still, the formation of these last and their nature led to the definite conclusion that the enzyme papayotin is specifically of a tryptic nature.—J. F. B.

English Patent.

Yeast; Treatment for Utilisation of ——. A. J. Oxford, Walton-on-Trent, Derbyshire. Eng. Pat. 5936, March 21, 1901.

The inventor claims the manufacture of a food material or fodder by heating yeast, to burst its cells and liberate their liquid albuminous contents, then separating the liquid constituents from the solid matter, and combining them, with or without concentration, with suitable meal. A top dressing or fertiliser may also be prepared from yeast, which may have undergone decomposition before heating to burst the cells, the product being dried or mixed with some absorbent, as kiln dust or desiccated malt culms. In the case of undecomposed yeast, the liquid constituents may be used for the preparation of food, and the solid matter dried for use as a fertiliser. A fertiliser may be prepared directly from the yeast by mixing the latter with quicklime.

—J. F. B.

United States Patents.

Flour; Ageing and Bleaching ——. J. Andrews and S. Andrews, Belfast, Ireland. U.S. Pat. 693,207, Feb. 11, 1902.

The process claimed consists in subjecting the flour or other like material to the action of gaseous peroxide of nitrogen (N_2O_4). Other oxidising gases may be employed, with the exception of ozone, which is not suitable. Sulphur dioxide is not claimed, as its action is injurious to the flour. The peroxide of nitrogen is prepared by the action of nitric acid (sp. gr. 1·42) on a solution of ferrous sulphate (2·25 lb. to 80 oz. of water). The flour to be treated is rotated in a drum, where it is acted on by a very small quantity of the above gas. The plant for carrying out the process is also claimed.—W. P. S.

Table Salt; Manufacturing ——. G. Weddell, Newcastle-upon-Tyne. U.S. Pat. 690,126, Dec. 31, 1901.

See Eng. Pat. 15,589, 1900; this Journal, 1901, 828.

—E. S.

(B.)—SANITATION; WATER PURIFICATION.

Lead; The Chemical Change produced by the Immersion of —— in Distilled Water. F. Clowes. Proc. Chem. Soc., **18**, [247], 46.

The author finds, when very pure lead and ordinary distilled water were employed, that much of the lead which underwent change passed into solution, most probably as hydroxide, and was removable to a large extent from solution by passage through filter paper, from which it could again be entirely extracted by cold acetic acid. The compound of lead which remained undissolved by the water was found to have the formula, $3PbCO_3$, PbH_2O_2.

In order to ascertain the respective parts played by atmospheric oxygen and carbon dioxide in solution, distilled water freed from dissolved gases by boiling was employed. When such water was placed in contact with lead in a vacuum, or in an atmosphere of hydrogen, action only took place to the extent of 0·3 part of lead per million of water. When the water employed had been boiled in glass vessels, and again exposed to air, it never regained its full activity. This inhibitive effect varied with different glass vessels, being most marked in those kinds of glass which gave most dissolved matter to the water; contact of cold water and glass did not produce this effect, which was eliminated, however, in the experiments, the results of which are given below, by boiling the water employed in copper vessels.

The average results, expressed as percentages of lead in terms of the water employed, are shown in the following table:—

	24 hours.	48 hours.	72 hours.
Oxygen alone	0·013	0·023	0·229
Carbon dioxide alone	0·005	0·008	0·017
Equal volumes of carbon dioxide and oxygen	0·003	0·003	0·003
Eight volumes of oxygen to one volume of carbon dioxide	0·015	0·018	..

This shows clearly that oxygen is the principal and primary agent, and the carbon dioxide exerts a restraining action in proportion to the volume present. It was found that carbon dioxide acted similarly in preventing solution of litharge.

The first action of aerated water apparently consists in oxidation and formation of hydroxide, which is precipitated as hydroxycarbonate by the carbon dioxide. The action is prevented or retarded by the presence of carbon dioxide in the initial stages. Total immersion of the lead also retards the action in presence of air, although the final result is the same whether the lead be wholly or only partially immersed in the water.

Of the substances which prevent this action, sulphuric acid and soluble sulphates are most effective, soluble carbonates are less so, whilst calcium hydroxide is still less so, but when present in larger quantity actually promotes the action.

Waters; Detection of Fatty Acids in Polluted ——. H. Causse.

See under XXIII., *page* 427.

Albumin-digesting Bacteria. O. Emmerling and O. Reiser.

See under XXIV., *page* 429.

English Patent.

Vegetable Charcoal or Carbon; Methods for the Manufacture of a New or Improved ——. E. W. Cooper, Coventry. Eng. Pat. 7302, April 17, 1901.

Vegetable fibre, such as cotton, cotton fabric or waste, threads, or the like, is charged into drums, which are then loosely covered, and placed, one by one, into the upper part of a slightly inclined oven, down which they roll to the lower end, until the oven is filled, an upper and a lower door being provided, one for admitting and the other for withdrawing the drums after carbonisation is completed. The fire-gases admitted are supplemented in heating by the inflammable gases evolved from the drums. When gases cease to be given off, the drums are withdrawn and emptied into water, and the charcoal, when cold, is washed with clean water. Charcoal thus obtained is stated to be flexible as well as porous, and adapted for many applications ("filters, respirators, and as a wick for candles or lamps"); mixed with sand, it is said to be available for horticultural purposes.—E. S.

UNITED STATES PATENTS.

Purifying Water; Process of ——. C. O. Brueckner, Fort Wayne, Indiana. U.S. Pat. 692,979, Feb. 11, 1902.

THE water to be softened and clarified is treated successively with 3 grains of soda ash per gall., $4\frac{3}{5}$ grains of lime per gall., and $1\frac{2}{5}$ grains of sodium phosphate per gall., agitated for 10—20 minutes, and allowed to settle.—L. A.

Purifying Sewage; Process of ——. L. Tralls, Charlottenburg, Germany. U.S. Pat. 693,316, Feb. 11, 1902.

A MIXTURE of calcium carbonate and calcium hydrate in about equal proportions is added to the sewage in sufficient quantity to produce a heavy precipitate of large flakes.
—L. A.

Carbonometer. E. S. Downs, New Haven, Connecticut, U.S.A. U.S. Pat. 690,409, Jan. 7, 1902.

THE "carbonometer" consists of an ordinary thermometer and a wet-bulb thermometer attached side by side on a plate or frame. Two scales are made for the wet-bulb thermometer, one on one side marked "Bad," and the other on the opposite side marked "Good." To construct these scales, a series of observations is made in an artificially-heated room during the whole range of conditions between good and bad ventilation, or between ordinarily pure air and that much fouled by carbon dioxide from respiration. As the carbon dioxide evolved in breathing is accompanied by a practically constant proportion of moisture, the measure of the latter is taken as a measure of the former. In such trials, the temperature shown by the two thermometers is noted, and that indicated by the wet-bulb thermometer is, if the trial be made in pure air, marked "Good," and if otherwise, "Bad," and so over a convenient range of temperature, in each case, and for every probable variety of condition as to impurity. Thus the carbon dioxide is indirectly inferred from the moisture associated with it in ordinary respiration.—E. S.

(C.)—DISINFECTANTS.

Formaldehyde; Investigation of ——. P. N. Raikow. Chem.-Zeit., 1902, **26**, [13], 135.

THE author has succeeded in obtaining formaldehyde in a liquid condition, and also in a new solid modification. If anhydrous potassium carbonate be added to a 40 per cent. solution of formaldehyde, the solution acquires a light violet-blue coloration, changing gradually to greyish-yellow. When the solution is completely saturated with potassium carbonate, it separates, after a short time, into two distinct colourless layers, the lower one consisting of the aqueous solution of potassium carbonate, and the upper one of the formaldehyde (probably a mixture of polymeric modifications). In one experiment with 350 c.c. of 40 per cent. formaldehyde solution, about 200 grms. of potassium carbonate were required for complete saturation, and after the mixture had stood for half an hour, the upper layer of formaldehyde amounted to about 150 c.c. The liquid formaldehyde was separated, agitated with anhydrous potassium carbonate, and filtered through a dry filter, when it formed a mobile liquid, sp. gr. 1·1902 at 16° C., which mixed in all proportions with water, alcohol, and ether to clear solutions. It can be distilled at the ordinary pressure, some carbon dioxide being evolved; the chief quantity distils at about 91° C. If the liquid formaldehyde be dried with potassium carbonate or calcium chloride and distilled, then, between about 110° and 112° C.—after the main quantity of liquid has come over—a colourless, gelatinous, very voluminous body solidifies in the condenser. If the cooling water be allowed to run out of the condenser, the gelatinous body liquefies and collects in the receiver as a somewhat turbid liquid. When the temperature rises above 112° C., the distillate no longer shows a tendency to solidify, but forms a tolerably mobile liquid. When the original liquid was dried with quicklime, no trace of a solid body was obtained on distillation. The distillation residue is brown, solidifies on cooling, and has an odour of caramel. The portion of the distillate which solidified in the condenser became converted, after standing several months, into an amorphous, gelatinous body, soluble in water.—A. S.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENT.

Peat-fibre Pulp; Manufacture of ——. A. Kalmann, Rabenstein, Austria. Eng. Pat. 3656, Feb. 20, 1901.

THIS invention relates to two machines, in the first of which the raw material is washed and opened, and in the second of which it is squeezed and disintegrated. After passing through the first machine, the material is transferred to settling tanks. In the second machine the pulp is beaten with a cutting action, and a pneumatic pressure of 2·5 to 3 atmospheres is employed to squeeze the fibres rapidly between the cutters, with bursting of the fibre cells.
—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Ceria from Mixtures of Rare Earths; Separation of ——. R. J. Meyer and M. Koss. Ber., **35**, [3], 672—678.

THE separation of cerium from lanthanum and didymium is a matter of difficulty, owing to the tendency of ceric oxide, hydrate, and basic salts to combine with the oxides of the trivalent metals. No method is known whereby all the cerium, in a solution containing the three metals, can be precipitated in the pure state at one operation. The authors' process is based upon the precipitation of the basic acetate of ceric oxide, when a neutral ceric solution is boiled with magnesium acetate. Pure lanthanum and didymium salts are not precipitated by this reagent, even after prolonged boiling, whereas ceric salts are precipitated completely. On separating cerium from a mixture containing didymium and lanthanum, the ceric precipitate always contains some didymium (3—4 per cent. in the authors' experiments); but as the precipitate is readily soluble in acids, the further purification is facilitated. In carrying out the process, a 10 per cent. solution of magnesium acetate in hydrogen peroxide (2·5 per cent. strength) is added drop by drop to the boiling solution containing the ceric salt, until a filtered test portion gives a pure white precipitate with ammonia and hydrogen peroxide. The boiling is then stopped, the precipitated basic ceric acetate settles down quickly, and it is then filtered off with the aid of the pump, and converted into the nitrate. For the separation of the small proportion of didymium which it contains, Wyroubuff and Verneuil's process (this Journal, 1899, 711) is recommended.—H. B.

Bismuth Trichloride and Tri-Iodide; Some New Compounds of ——. L. Vanino and O. Hauser. Ber., 1902, **35**, [3], 663—666.

IN continuation of their former work (Ber., 1901, **34**, 416—420) on the compounds formed by organic bases with bismuth haloids, the authors have prepared a number of similar bodies which, in general, yield well crystallisable salts with the halogen hydracids.

Bismuth tri-iodide pyridine hydrochloride, BiI_3, C_5H_5N, HCl, is obtained in the form of fine, ruby-red prisms. With hydriodic acid, bismuth tri-iodide pyridine yields the compound, $2BiI_3$, $3C_5H_5N$, HI.

The other substances prepared have the compositions: BiI_3, C_9H_7N, HI; BiI_3, C_9H_7N, HBr; $BiCl_3$, $2C_6H_5N(C_2H_5)_2$, HCl; $BiCl_3$, $3C_6H_5N(C_2H_5)_2$, HCl; and $BiCl_3$, $2C_6H_5N(CH_3)_2$, HCl.—T. H. P.

Phenazone (Antipyrine), Sodium Salicylate and Magnesium Sulphate; Interaction between ——. W. J. Woolcock. Pharm. J., 1902, **68**, [1652], 143.

GILMOUR observed (Pharm. J., 1902, 22) that a preparation containing magnesium sulphate, antipyrine and sodium salicylate deposited white crystals. The author dissolved separately each of the compounds mentioned, in water, mixed the solutions, and allowed to stand. The crystalline deposit was washed free from sulphate and dried at 100° C. The author agrees with Gilmour's statement that the crystals consist of a compound of magnesium, antipyrine and salicylic acid; and he rejects Shuttleworth's contention

(Pharm. J., 1899, 332; 1902, 50) that the crystalline deposit is really salipyrine (antipyrine salicylate). Salipyrin is soluble to the extent of 1 in 1 of 90 per cent. alcohol, whereas the new compound, which contains about 3·79 per cent. of magnesium, is only sparingly soluble in that medium.

—A. S.

Iodo-Derivatives of Phenols; Preparation of ——, and Determination of Resorcinol. E. Richard. J. Pharm. Chim., 1902, **15**, [5], 217—221.

The formation of an iodo-phenol and hydriodic acid from a phenol and two atoms of iodine being an endothermic reaction, an exothermic secondary reaction is necessary in order to prepare iodo-phenols by this method. In the process proposed by the author, the reaction is carried out in presence of a salt capable of acting on the hydrogen iodide, such being sodium acetate or disodium phosphate, or, when the reaction proceeds at the ordinary temperature, sodium bicarbonate. Thus, by heating aqueous iodine in suitable proportions, with a solution containing a phenol and disodium phosphate, the author has prepared iodo-phenols and mono-, di-, and tri-iodosalicylic acids; the iodo-compounds are precipitated and can be readily purified. Other iodo-derivatives have also been prepared with the help of the above-named salts.

Determination of Resorcinol in Solution.—In this method, depending on the formation of tri-iodoresorcinol by the action of excess of iodine on resorcinol in presence of sodium acetate, the following solutions are required:—(1) 34·20 grms. of iodine dissolved in just sufficient potassium iodide solution and made up to 1 litre. (2) 68·40 grms. of sodium thiosulphate dissolved in 900 grms. of water, the solution being adjusted so as to exactly correspond with (1). (3) 10 per cent. sodium acetate solution. To the resorcinol solution, are added a few drops of starch paste, then some of the sodium acetate solution, and finally a measured quantity, in excess, of the iodine solution. After shaking for a few moments, a volume of the thiosulphate solution, equal to that of the iodine solution used, is run in, and the excess of thiosulphate then determined by titration with the iodine solution; each c.c. of the latter corresponds with 0·01 grm. of resorcinol. The equation representing the reaction is—

$$C_6H_4(OH)_2 + 6I + 3CH_3CO_2Na = C_6HI_3(OH)_2 + 3NaI + 3CH_3CO_2H.$$

—T. H. P.

Lactic Acid by the Action of Caustic Potash on Pentoses; Formation of ——. K. Katsuyama. Ber., **35**, [3], 669—671.

The author shows that lactic acid, which is obtained by the action of aqueous caustic alkalis on hexoses and hexobioses, may be similarly obtained from *l*-arabinose (see also Araki, Zeits. physiol. Chem., **19**, 463) and from xylose. 10 grms. of *l*-arabinose gave 3·35 grms. of zinc lactate, whilst 10 grms. of xylose gave 4 grms. of the same substance.

—H. L.

Stylophorum Diphyllum; Contribution to the Chemistry of ——. J. O. Schlotterbeck and H. C. Watking. J. Amer. Chem. Soc., **24**, [1], 1—18.

Stylophorum diphyllum, known as yellow poppy, and also as celandine poppy, is a perennial, herbaceous plant (Papaveraceæ). Leaves, flowers, and fruit of this plant exude a yellow juice when bruised.

The dried root, which was the material under examination, is found to contain chelidonine, $C_{20}H_{19}NO_5.H_2O$, m.pt. 136° (uncorr.); stylopine, $C_{19}H_{19}NO_5$, m.pt. 202° (uncorr.); protopine, $C_{20}H_{19}NO_5$, m.pt. 204°—205° (uncorr.); diphylline, m.pt. 216° (uncorr.); sanguinarine; chelidonic acid, $C_7H_4O_6 + H_2O$; chelidoxanthin (?).

Method of Extraction.—The powdered drug was moistened with ammonia water of about 5 per cent. strength, to separate the bases from the acids, and was then dried in thin layers at the ordinary temperature. The extraction was effected with chloroform in a copper Soxhlet apparatus, until a sample of liquid from the percolator ceased to give the usual alkaloid reaction. After expelling the solvent from the percolate, the dark, waxy residue was repeatedly digested with water, acidified with acetic acid on the steam-bath, until exhausted of alkaloid, the combined reddish transparent filtrates containing the whole of the latter as acetates.

The chloroform in the marc was expelled by steam, and the residue immediately extracted with distilled water to remove the soluble salts present and the ammonium salts of the originally combined acids; the aqueous extract was then concentrated, mixed with 10 per cent. of alcohol, and set aside for later study.

On rendering the red solution of acetates alkaline with ammonia water, a bulky greyish precipitate came down, and this was well washed with water on a Buchner filter. The colour change to yellow shows that the red colouring matter is precipitated by ammonia. This, and other coloured filtrates, were set aside for the colouring matter examination. The alkaloid precipitate was redissolved in a little glacial acetic acid, diluted with water, reprecipitated with ammonia, and re-washed, the operations being repeated until the mass was nearly white.

Isolating the Alkaloids.—Portions of the alkaloid were dissolved in acetic acid, treated with about an equal volume of ether, and rendered alkaline with ammonia. The solution of the bases in ether is only temporary, and hence separation and filtration through cotton must be effected quickly, to avoid premature crystallisation. Wide-mouthed Erlenmeyer flasks are suitable for crystallising. When the crystallisation is complete, the supernatant solvent is used over again, if colourless; otherwise it must first be purified by distillation. When no crystals separated from nearly, or quite, colourless solutions after several hours, they were concentrated to small volumes and set aside again. Where chelidonine (monoclinic prisms) and stylopine (needles) crystallised out together, they were separated by fractional recrystallisation, the whole operation extending over several months. The chelidonine exhibited the phenomenon of "triboluminescence," especially when the crystals were crushed; and this phenomenon is connected in some way with a crackling sound emitted during very active crystallisation. It is probably electricity of cleavage, and forms a good special test for this alkaloid.

The other three alkaloids mentioned above were separated from the later mother ethereal liquids by a tedious routine of fractional crystallisation.

Organic Acids.—The extraneous matter in the aqueous percolate from the marc was removed, as a sticky mass, by strong alcohol (96 per cent.), and the residual solution gradually deposited a mass of fine bulky needles, the deposition being facilitated by adding alcohol. The compound (potassium chelidonate) was purified by precipitating the aqueous solution with lead acetate, and the precipitate was suspended in water and decomposed with hydrogen sulphide, the solution being then filtered and heated to drive off the excess of the latter reagent. The hot solution was next treated with precipitated calcium carbonate, until effervescence ceased, and set aside for the deposition of calcium chelidonate, which, after repeated recrystallisation from hot water, was redissolved, precipitated with silver nitrate, and treated with an excess of hydrochloric acid. On cooling, the free chelidonic acid separated out in silky needles, which were purified by several recrystallisations. The alcoholic liquid from the potassium chelidonate afterwards yielded crystals of the ammonium salt of this acid.

Colouring Matter.—The coloured alkaline aqueous liquid left after the removal of the alkaloids by ether was shaken up with several portions of acetone, the resulting solution being filtered and distilled. The residue, taken up with a little water, was precipitated with lead acetate, and the colouring matter extracted by boiling with water. On concentration, this solution furnished yellowish-red crystals, too small in quantity to be identified, but believed to be chelidoxanthin. C. S.

Corydalis Alkaloids. J. Gadamer. Archiv der Pharm., 240, 19—52.

The following six alkaloids have been isolated in the course of an investigation of the constituents of the root of *Corydalis*

cava by various workers: Corydaline, $C_{22}H_{27}NO_4$, m.p. 134·5° C. corybulbine, $C_{21}H_{25}NO_4$, m.p. 238°—239° C. corycavine, $C_{23}H_{23}NO_4$, m.p. 216°—217° C. bulbocapnine, $C_{19}H_{19}NO_4$, m.p. 199° C.; corytuberine, $C_{19}H_{25}NO_4$, m.p. above 200° C.; and corydine, an amorphous base, m.p. 65°—75° C., which is not homogeneous, but which has marked physiological action. The author has further succeeded in separating the following alkaloids by fractional salt formation; iso-corybulbine a weak base, corycavamine more strongly basic; a base melting at 135° not identical with corydaline; and two amorphous bases, one of which gives a crystalline, the other an amorphous hydrochloride. There are, therefore, at least eleven alkaloids present in the roots of *Corydalis cava*. All these are removed from alkaline solution by shaking out with ether, except corytuberine, which is removed by means of chloroform. The analogy between the alkaloidal constituents of *Corydalis* and of *Papaver somniferum* is striking. Although protopine has not been isolated from corydalis root, its presence in the herb has already been reported by Battandier, and its place among the root derived alkaloids may be taken by corycavamine, $C_{21}H_{21}NO_5$, which may prove to be homologous to protopine, $C_{20}H_{19}NO_5$.

Corydalis alkaloids may be classed into three groups. The first or corydaline group, including corydaline, corybulbine and iso-corybulbine are oxidised by alkaline solutions of iodine into berberine-like compounds, combining with 4 atoms of iodine and losing 4 atoms of hydrogen, as shown by the equation:—$C_{22}H_{27}NO_4 + 4I = C_{22}H_{23}NO_4HI + 3HI$.

The second, or corycavine group, includes that base and corycavamine, the behaviour of which towards iodine solution is not constant. The third or bulbocapnine group comprising bulbocapnine, corydine, and corytuberine, which are all strong bases, and are oxidised by iodine solution, but probably, on account of the presence of free hydroxyl groups in the molecule, have not yet yielded definite oxidation products. It has been found that dehydrocorybulbine in the presence of nascent hydrogen again takes up the lost four atoms of H, but the reconstituted base, iso-corydaline, differs from corydaline in being optically inactive; attempts to separate this into dextro and lævo-corydaline have not been successful.—J. O. B.

Pinene; Action of Crystallised Arsenic Acid on ——. P. Genvresse. Comptes Rend., **134**, [6], 360—362.

When pinene is heated with arsenic acid, there is obtained, together with a little cymene and terpineol, either a substance identical in chemical and physical properties with pinene, but having a different odour, or terpinene. If to 1 kilo of pinene, 25 grms. of arsenic acid be added, and the whole be heated for 3 hours under a reflux condenser, steam-distilled, separated, dried, and rectified, about 600 grms. are finally obtained, boiling between 156° and 161° C. This has all the properties of pinene, but has an agreeable, slightly lemon-like odour. If to 1 kilo of pinene 250 grms. of arsenic acid be used, similar treatment yields about 600 grms., boiling between 177° and 180° C., at 740 mm. pressure. This was shown conclusively to be terpinene; though it was lævo-rotatory (−10° 47′ and −10° 21′ in a 2 decimetre tube), while terpinene is usually described as inactive. The liquid coming over at 170°–175° contains terpinene and cymene, and that coming over above 180° contains terpineol (about 10 grms. for each kilo. of pinene operated on).

This action of arsenic acid affords a basis for the industrial preparation of terpinene.—J. T. D.

Oil of Rue; Algerian ——. Von Soden and Henle. Chem. and Druggist, 1902, **60**, [1152], 304.

The authors find that the ketones present in Algerian oil of rue are identical with those contained in ordinary oil of rue. About 90 per cent. of a mixture of normal methyl-nonyl and methyl-heptyl ketones were found to be present. The oil also contains a small amount of esters, consisting apparently of the acetic acid ester of the secondary alcohol, and of the fatty alcohol corresponding with either one or both of the ketones.—A. S.

Oil of Ylang-Ylang in Formosa (Japan). Chemist and Druggist, March 8, 1902.

The ylang-ylang tree (*Cananga odorata*, Hooker, or *Unonia odorotissima*), common to many localities south of Manila, is found chiefly in the well-populated provinces, where it thrives best. It is propagated by planting seedlings or cuttings about 20 ft. apart each way, when they grow rapidly in almost any soil. The first flowers appear in the third year and in the eighth year; a tree yields as much as 100 lb. The blossom grows in every month of the year, but the greatest yield is from July to December. The petals are subjected to the simplest form of distillation, and the best quality of oil is as clear as distilled water and fragrant, whilst the second quality is yellowish and somewhat empyreumatic in odour. About 75 lb. of flowers yield 1 lb. of oil; flowers are worth from 8 c. to 15 c. gold per lb., and the cost of manufacturing is about 4 dols. per lb. There are flowering groves in many parts of South Luzon and the Visayan Islands, but the vicinity of Manila is also well adapted to the growth of this tree. The Spanish-American war greatly interfered with the industry, but as affairs have been practically settled for some months past, distillation has been taken up on the same scale as before. Last year there was a great scarcity of fine ylang-ylang oil on the European markets, with an abundance of medium and cheaper quantities. Although Java produces ylang-ylang oil in small quantities, the latter has not the commercial importance of Manila oil, which is much sought after by soap-makers and perfumers.

English Patent.

Oxygenated Water; Preparation of ——. P. L. Hulin, Paris. Eng. Pat. 5240, March 12, 1901.

See U.S. Pat. 692,139; this Journal, 1902, 354.—E. S.

French Patents.

Xanthine; Process for the Preparation of Homologues of ——. C. F. Boehringer und Söhne. Fr. Pat. 305,984. Certificate of Addition, Sept. 21, 1901.

The patentees claim the process for the production of further homologues of the 8 alkylxanthines claimed in the main patent (this Journal, 1902, 68), which consists in treating the dry salts of the alkali or alkaline earth metals, silver or lead, with the corresponding halogen halides. The products are also claimed as new articles of manufacture.—A. C. W.

Thioxanthine (2.6-dihydroxy-8-thiopurine); Process for the Preparation of ——. Boehringer und Söhne. Fr. Pat. 314,409. Sept. 21, 1901.

The process claimed differs from that described in Eng. Pat. 1901, 18,976 (this Journal, 1902, 188), in prescribing the use of uric acid or its alkali salts in aqueous solution, or in suspension in water.—A. C. W.

XXI.—PHOTOGRAPHY.

Mercuric Thiocyanate; Intensification with ——. G. Hauberrisser. Phot. Rund., 1902, **16**, 29; through Chem.-Zeit., 1902, **26**, [18], Rep. 64.

The effect of treating a photographic plate with the mercuric thiocyanate intensifier known as "Agfa" (this Journal, 1901, 387), is not simply to produce silver thiocyanate and metallic mercury as might be expected; for were this the case, on immersing the negative in ammonia or in sodium thiosulphate, the silver thiocyanate should dissolve, and the picture be weakened. Thiosulphate does reduce the image in this manner, but ammonia darkens it, which points to the presence of some mercurous compound and the formation of an amino body. Experiments show that an excess of "Agfa" reacts with finely-divided mercury to yield a mercurous salt; and the practical result of employing this intensifier is therefore first to produce elemental mercury, and then white mercurous thiocyanate, which is afterwards blackened by ammonia, or dissolved by sodium thiosulphate. In the course of time, "Agfa" completely bleaches a nega-

ive. It is accordingly only suitable for a slight intensification, which can be effected without prolonged immersion of the film in the solution.—F. H. L.

ENGLISH PATENT.

Chloride of Silver Printing Emulsions; Production of Photographic ——. H. Lüttke, Hamburg. Eng. Pat. 17,950, Sept. 7, 1901.

ACCORDING to the inventor, attempts to prepare a self-toning chloride printing-out paper have hitherto proved unsuccessful, because the gold has been added to the emulsion as a chloride; for that chloride, reacting with the silver salts, has given rise to a compound of gold incapable of exerting a toning influence during simple fixation. This defect may be overcome by introducing into the emulsion, gold combined as auryl sulphate, $AuOH.HSO_4$, or as "sulphuric acid aurinitrate, $(AuNO_3+3HNO_3+3H_2O)$," or as the corresponding complexes with the alkali metals, especially lithium; calculating the amounts of the various ingredients so that between 30 and 50 per cent. of the total silver present may exist as chloride. On exposing such emulsions to light, it is stated that the image is directly formed partly in silver and partly in gold. A suitable formula is (*a*) 4 per cent. celloidin-collodion, 620 c.c.; ether (0·720), 100 c.c.; 96 per cent. alcohol, 30 c.c. (*b*) silver nitrate, 25 grms.; water, 25 c.c.; alcohol, 120 c.c.; lithium aurinitrate, 1·4 grms.; auryl sulphate, 0·9 grms.; lithium auryl sulphate, 1·3 grms. (*c*) anhydrous calcium (or lithium) chloride, 3 grms. (*d*) citric acid, 5 grms.; alcohol, 30 c.c. Gelatin, albumin, starch, and the like may also be used as the binding material of the emulsion.—F. H. L.

UNITED STATES PATENT.

Photographic Plates; Process of Bronzing ——. C. P. H. Ahrle, Frankfort-on-the-Maine, Germany. U.S. Pat. 694,227, Feb. 25, 1902.

SEE Eng. Pat. 6246, 1901; this Journal, 1902, 139.

—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

Chlorate Explosives of the "Street" Type: Manufacture of ——. Mémorial des Poudres et Salpêtres, **11**, 22.

THE explosives tested had the following composition:—

——	Type 60.	Type 41.
Potassium chlorate	80	80
Mononitronapl thalene	12	12
Castor oil	6	8
Picric acid	2	..

With type 41 the rapidity of propagation of inflammation was only 2·5—5 mm. per second in a trough 18 mm. wide; type 60 was equally slow, while with other chlorate mixtures the rate varied from 117 mm. to 250 mm. The explosive was prepared by dissolving the mononitronaphthalene alone or with picric acid in the castor oil; the materials were heated in a jacketed enamelled iron pan to 70° C., powdered potassium chlorate was gradually added at a temperature of 55—60° C., and stirring continued until all white particles had disappeared. The mass was then spread on a table, and, when the temperature had fallen to 30°—35°, was crushed by a wooden roller, and passed through a 0·6 mm. sieve.

Experiments in the pressure bomb gave for type 60 a force of 5,492, and for type 41, one of 5,718, the force of black mining powder being 2,919; taking this as unity, the force of the chlorate explosive is 1·9.

In blast holes the explosive 41 corresponded to explosives of the type P, while 60 was about as powerful as dynamite No. 1. It was found that in similar tests, the nature of the mononitronapthalene, the fineness of the potassium chlorate, or the size of grain of the explosive had practically no effect on the results. In lead blocks there was little difference between 41 and 60, but the effect of dynamite was about twice as great as that of 60.

Transmission of detonation took place between cartridges 4 cm. apart, but never when 6 cm. apart. When experimenting as to sensitiveness to explosion from a blow, it was found that the explosion extended beyond the portion struck. Type 60 was as sensitive as dynamite, but 41 was much less sensitive.

When ignited unconfined, 41 caught fire with difficulty, and frequently went out; 60 burned regularly. No change was noticed after the explosives had been kept for eight months.

The manufacture is considered to be relatively safe if care be taken to avoid any mechanical arrangements which might give rise to shocks.

Granulation should only be carried out when the mass is somewhat plastic, before it has quite cooled, and dust should not be allowed to accumulate. These explosives may be transported under the same conditions as black gunpowder.—W. M.

Dynamite; New Types of ——. Mém. des Poudres et Salpêtres, **11**, 51.

THE specimens examined had the following composition:—

——	A.	B.	C.	D.
Ammonium nitrate	90·45	94·000	88·00	80·00
Resin	1·55	..	..	..
Nitroglycerin	4·85	5·875	11·75	19·50
Soluble nitrocotton	0·15	0·125	0·25	0·50

These explosives were authorised to be manufactured, and in regard to carriage were classed as other dynamites.

—W. M.

Tamping of Boreholes. Mémorials des Poudres et Salpêtres, **11**, 1.

EXPERIMENTS were undertaken with the object of deciding if sand should be prohibited as tamping material for blast holes. Attention was also paid to the value of the different tamping materials in relation to the utilisation of the explosives, the dangers of blow-out shots, and the dangers of ignition by friction.

The explosives employed were safety dynamite, containing 12 per cent. of nitroglycerin; grisoutine couche Favier, with 4·5 per cent. of trinitronaphthalene; grisoutine roche Favier, with 8·5 per cent. of dinitronaphthalene; and blasting gelatin, with 92 per cent. of nitroglycerin.

Under the conditions of the tests, plastic clay gave the best result in regard to the force developed. When the lead block was imbedded in brickwork, and a rough borehole formed through the brickwork to the hole in the lead block, then tamping with sand gave the best results; the conclusion in this respect being that the best materials for tamping vary with the conditions, but that in practice, ordinary sand is preferable to clay.

Experiments for blow-out shots were made in blocks of cement sunk in and level with the ground, the borehole being 30 mm. in diameter and 0·45 m. in depth. The minimum tamping necessary to prevent a blow-out was about 30 cm., and ordinary sand gave the best results.

The liability to ignition through friction was tested by placing sensitive explosives, such as dynamite No. 1 and black powder, with various tamping materials in an open cylinder in which a piston moved rapidly, and the results showed that the risks of ignition by friction during tamping of boreholes appear to be very slight.—W. M.

Explosion Limits of Combustible Gases and Vapours with Air. P. Eitner.

See under II., *page* 395.

ENGLISH PATENT.

Match-making Machinery; Improvements in ——. J. H. White and E. L. White, Washington, U.S.A. Eng. Pat. 26,350, Dec. 24, 1901.

STRIPS or sheets of veneer are fed between cutters, made in the form of dies, having alternating parallel ribs and recesses, which, when the dies close upon the blanks, sever

the latter into splints and force them into the recesses of the opposing dies, thus separating them. The splints thus formed are then pushed endwise into a dipping frame or carrier, and held by frictional contact while being conveyed to the proper points for heating, paraffining, dipping, &c. Illustrations are given.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Colloidal Metals; Barium Sulphate as a Reagent for Solutions of ——. L. Vanino. Ber., 1902, **35**, [3], 662—663.

When barium sulphate is added to a liquid, in which is suspended a very finely-divided substance, the whole of the latter is quickly precipitated, and can be removed by filtration. Compounds existing in a liquid, in a state of true solution, are unaffected by this treatment. Thus solutions of gentianin or fuchsine retain their colour, when barium sulphate is added to them, but on shaking a ruby-red colloidal gold solution with this reagent, the liquid is rapidly decolorised, and afterwards gives no reaction for the presence of gold. Similar actions take place when solutions of colloidal silver or arsenic sulphide are treated with barium sulphate. This property of the latter depends entirely on a mechanical action. For the complete removal of the barium sulphate and the suspended matter, Schleicher's blue-band filter papers are recommended. Other compounds, such as aluminium phosphate and tin oxide, possess this clearing property, but to a less degree than barium sulphate.—T. H. P.

INORGANIC—QUANTITATIVE.

Cobalt and Nickel: Modification of Rose's Method of Separating ——. R. L. Taylor. Read before the Manchester Lit. and Phil. Soc., Feb. 18, 1902. Chem. News, 1902, **85**, [2206], 117.

Rose's method, as improved by Henry, consists in adding barium carbonate and chlorine (or bromine) to the rather dilute solution of the two metals, and allowing to stand, with frequent shaking, for from 12 to 18 hours. The cobalt is precipitated as sesquioxide, whilst the nickel remains in solution. According to the author, the slow separation of the cobalt is due to the free carbon dioxide, which is produced in the solution, when the barium carbonate is added to the acid liquid. It is stated that, if a neutral solution be used, the precipitation of cobalt is complete in a few minutes, and excellent quantitative results can be obtained. If the solution be acid, it should be neutralised with sodium carbonate, boiled to expel all free carbon dioxide, and then cooled before adding the barium carbonate and bromine water.—A. S.

Potassium Ferrocyanide: Titration of ——, *with Potassium Permanganate.* B. Gruetzner. Archiv der Pharm., **240**, [1], 69—73.

The author finds that the equation—

$$5K_4FeCy_6 + KMnO_4 + 8HCl = 5K_3FeCy_6 + 6KCl + MnCl_2 + 4H_2O.$$

does not perfectly represent the reaction which takes place when ferrocyanide is titrated with permanganate by the method of Haën. As noted by Mohr, when the titration takes place in the presence of free sulphuric acid, a turbidity occurs. The author, considering this precipitation to be due to a secondary reaction has investigated the composition of the insoluble substance formed, which is found to be $K_2MnFeCy_6 + 1\frac{1}{2}H_2O$, the equation $MnSO_4 + K_4FeCy_6 = K_2SO_4 + K_2MnFeCy_6$ explaining its formation.

The method of titration has not been found to give very satisfactory results. In order to obviate inaccuracies as far as possible, the permanganate should first be titrated against pure potassium ferrocyanide, the solution to be titrated freely diluted (1 : 1000), a large excess of sulphuric acid should be present, and the titration continued till the tint produced is similar to that obtained when standardising the permanganate.—J. O. B.

Molybdenum Lower Oxides, and Metallic Molybdenum; Analysis of ——. C. Friedheim and M. K. Hoffmann. Ber., **35**, 791—795.

The authors prepare pure molybdenum dioxide by reducing the trioxide in hydrogen under conditions in which no metallic molybdenum will be formed, and removing any molybdenum trioxide which may not be reduced by heating in a current of hydrochloric acid gas. The following methods of analysis give good results:—

(*a*) *Volumetric Method.*—The quantity of molybdenum dioxide present in the insoluble oxide is determined by treating it with a sufficient quantity of 10 per cent. solution of ferri-ammonium-sulphate, and double this volume of dilute (1:5) sulphuric acid. This is boiled until the solid is all dissolved, the molybdenum dioxide being oxidised to trioxide at the expense of the ferric sulphate, and the molybdenum trioxide kept in solution by the sulphuric acid. The ferrous sulphate produced can be determined by the usual methods, and gives a measure of the oxygen consumed.

In solutions containing the lower molybdenum oxides, excess of potassium permanganate can be used, and the excess titrated back with decinormal oxalic acid.

Metallic molybdenum behaves in the same way as the insoluble dioxide.

(*b*) *Gravimetric Method.*—For similar tungsten compounds, the amount of silver deposited from excess of ammoniacal silver nitrate solution gives a measure of the amount of lower oxide present, but this method gives unsatisfactory results with molybdenum compounds, silver nitrate being formed besides silver, and the precipitated silver containing molybdenum trioxide, and sometimes also silver molybdate. These defects are to a great extent overcome by heating the molybdenum compound, or metal, with very dilute ammoniacal silver sulphate solution for about an hour, with constant shaking, on the water-bath, allowing to stand for 12 hours in absence of air, filtering off the silver, washing with a 10 per cent. solution of ammonium nitrate, made slightly ammoniacal, and estimating the silver.—A. M.

Glazes; Analysis of Porcelain ——. V. de Luynes. Comptes Rend., **134**, [8], 480.

The chief difficulty in the analysis of glazes lies in their separation from the object which they cover. This the author effects by slightly roughening the surface and then giving it a coat of glue. This is dried and heated, and can then be detached. The fragments of glue are soaked in water, when the glue gradually dissolves, leaving behind the glaze which has been torn off with it, and which can now be collected on a filter.—J. T. D.

Clay, Rational Analysis of ——. A. Sabeck. Chem. Ind., 1902, **25**, [4], 90—99.

Owing to the fact that different chemists carry out the rational analysis in different ways, apparently inaccurate results have been obtained, and it was to clear up these differences that the author undertook the present work. The clays used for the experiments were: (1) pure white, with large grains of sand, "poor;" and (2) black, with very fine particles of sand, "fat." The main points investigated were:—

1. *The proper Concentration of the Sulphuric Acid, and the proper Boiling.*—By brisk boiling with strong acid, particles of the clay are lost by the spirting of the acid. For 5 grms. of clay, 50 c.c. of acid are necessary, and if diluted with 300 c.c. of water, the mixture boils quietly. Further experiments proved that the aluminium sulphate was practically insoluble in concentrated sulphuric acid, and that, by treating the clay for four hours with the mixture of 100 c.c. of water to 50 c.c. of acid, it was completely decomposed, but the felspar was not attacked.

2. *Double Decantation.*—This is proposed, in place of either filtration or single decantation, to separate the insoluble residue obtained in the acid treatment. The

liquid is diluted with water and poured into a 2,000 c.c. beaker. All the decanted liquids arising from the repeated treatment with 10 c.c. of 33 per cent. soda solution and 5 c.c. of concentrated hydrochloric acid, after boiling for five minutes, are brought while hot into the beaker. The hot alkaline liquid produces a precipitate of aluminium hydroxide in the upper layers of the liquid, which carries down particles as it settles. The liquid is clear in about one hour, and is then decanted off. The main bulk of the undissolved residue is washed from the dish on to a filter with dilute hydrochloric acid. The clear liquid in the beaker to be decanted is poured off carefully from the sediment, the 50—100 c.c. of liquid usually left are poured into the dish, and the treatment with soda and hydrochloric acid repeated, but the alkaline and acid wash-waters are kept separate. From the former the precipitate easily settles, and is washed with water after the decantation. The residue is brought on to the same filter and washed.

3. *Oxidation of Admixed Organic Substances.*—For this the author recommends the use of nitric acid, instead of potassium chlorate.

In the case of clays with larger admixtures of sand and felspar, the average sample should be not merely crushed, but ground up in a mortar.

The results of a number of other experiments are included in the article, with regard to the experimental errors involved in the "rational analysis," especially those introduced by the decomposition of felspar and mica. The conclusion arrived at was that in clays with 10 per cent. of felspar, the latter is practically unattacked by the treatment with sulphuric acid, hydrochloric acid and caustic soda, the error only amounting to about one-tenth per cent.; and the error is less when 5 grms. are operated upon with 50 c.c. of sulphuric acid and 100 c.c. of water than it is with 25 c.c. of acid and 100 c.c. of water.—W. C. H.

Acetic Acid in Lead Accumulators; Determination of ——. C. Formenti. Chem.-Zeit. 1902, **26**, [14], 150.

The author recommends the following method:—The acetic acid, which may become detrimental to the working of the accumulators, is always present as normal lead acetate. An average sample of the plates, together with the deposits on them, is cut in small fragments from various parts thereof. These are heated with solution of pure potassium carbonate, to convert the lead acetate into potassium acetate. The fragments are removed and thoroughly washed with distilled water, and the solution concentrated to a smaller bulk, and this residue is then filtered. This filtrate, evaporated to dryness, and dried at 150° C., is extracted with absolute alcohol; the alcoholic extract is evaporated, and re-extracted once or twice to purify. The final extract is weighed as potassium acetate, and the results calculated to the quantity of acetic acid or of lead acetate per 1 kilo. of plates.—A. M.

"*Lithopone*"; *Analysis of* ——. P. Drawe. Zeits. angew. Chem., 1902, **15**, [8], 174.

"Lithopone" is prepared by mixing together solutions of barium sulphide and zinc sulphate, the precipitate of ZnS, $BaSO_4$ being then washed, dried, and ignited. During this process part of the zinc sulphide is converted into zinc carbonate by the carbon dioxide of the air; but although this change does not appreciably affect its utility as a pigment, lithopone is valued commercially according to the proportion of zinc sulphide it contains. As the whole of the zinc is not extracted by treatment with dilute acid, and as there are difficulties in separating zinc oxide and sulphide, the author has devised the following method of examination. About 1 or 1·5 grm. of the sample is mixed with 10 c.c. of hydrochloric acid (sp. gr. 1·19) and a pinch of potassium chlorate, and evaporated on the water-bath till half the liquid has disappeared; the solution is then diluted, treated with a little dilute sulphuric acid, and the insoluble matter collected. The filtrate is cautiously neutralised with sodium carbonate, the zinc precipitated, washed, ignited, and weighed as oxide, this being the total zinc in the pigment. Another 1 or 1·5 grm. is digested at ordinary temperatures for half an hour with 1 per cent. acetic acid; the undissolved portion is collected and washed, and next treated as above described with acid and chlorate. The yield represents the zinc oxide corresponding with the zinc sulphide of the original; whence by deduction, the zinc existing as oxide or carbonate may be calculated. Carbonic acid and any [soluble] sulphuric acid are determined by the usual methods, and the results are recorded also as zinc compounds. The residue insoluble in hydrochloric acid is the barium sulphate.—F. H. L.

Phosphoric Acid; Citrate-insoluble ——. *Determination of* ——. C. D. Harris. J. Amer. Chem. Soc., **24**, [1], 25—27.

The inconveniences arising in the usual method of filtering the substance after heating with citrate solution, may be obviated by employing a carbon filter, into the bottom of which is tightly fitted a perforated porcelain disc connected to a small wire extending down below the small end of the filter. A rubber stopper is then fitted tightly in a pressure bottle, and the carbon filter passed through it; a layer of asbestos is placed on the porcelain disc, and pressure is applied. By this means the time required for filtration and washing is reduced from 1½—2 hours to 30—40 minutes.

A saving of time is also effected by neutralising the excess of acid with ammonia and adding 10—12 grms. of ammonium nitrate, to cool down the solution to a safe point, before adding the molybdic solution.—C. S.

ORGANIC—QUALITATIVE.

Waters; Detection of Fatty Acids in Polluted ——. H. Causse. Comptes Rend., **134**, [8], 481—483.

Fatty acids may occur in waters from sinks or household drainage, from the waste waters of certain industries, from bleach-works, or from the anaërobic decomposition of albuminoids. To their presence are due the facts that certain waters deposit little or no calcium carbonate on boiling, that the calcium and magnesium they contain is more than corresponds with the carbonic and sulphuric acids and chlorine present, and that iron and sulphur are sometimes present in a soluble form. The author treats 2 to 5 litres or more with 25 c.c. per litre of a mixture of equal volumes of saturated baryta water and one-fifth saturated barium chloride solution; after well shaking in a closed vessel, the liquid is left in repose, and when the precipitate has settled, it is collected and well washed, to remove soluble barium compounds. It is then treated in one of two ways:—(*a*) It is distilled with excess of dilute sulphuric or phosphoric acid under diminished pressure, with a slow stream of air passing through the liquid; after one-fourth is so distilled, the distillation is interrupted, the whole cooled, and the distillation then begun again and a second fourth distilled. A milky distillate indicates fatty acids; portions of it are tested with basic acetate of lead, ammoniacal barium chloride, and mercuroso-mercuric nitrate, each of which gives a precipitate if fatty acids be present, and the remainder of the distillate is extracted with chloroform, the extract evaporated, and the residue examined microscopically. (*b*) The precipitate is heated on the water-bath for an hour with sodium carbonate solution, the liquor cooled and filtered, and the precipitate treated similarly a second time. The united filtrates are strongly acidified with sulphuric acid and extracted with chloroform, the chloroform evaporated, the residue again taken up with as little chloroform as possible, the solution evaporated on a tared watch-glass, and the residue weighed. This residue is a somewhat buttery-looking crystalline mass, melting at 40°—60° C., and showing under the microscope a mass of long flexible needles. Part of the substance volatilises when kept for some time at 100° C., and a white mass is left, in which prismatic needles are easily distinguished.

Fatty acids in the water are an indication of contamination. If their amount reaches "0·01 mgrm. per litre," they begin to influence the quality of the water. When their amount rises beyond this, the dissolved oxygen is usually found to be low, and, in hot weather, products of putrefaction make their appearance in the water.—J. T. D.

Nitro- and Amino-Xylene Derivatives and Reactions of the Eleven Possible Xylylene Diamines. E. Noelting and G. Thesmar.

See under IV., *page* 398.

ORGANIC—QUANTITATIVE.

Lactic Acid; Indirect Method for the Determination of ——. H. Weigmann. Jahresbericht, 1899/1900 der Versuchsstation für Molkereiwesen in Kiel, 3—4; Zeits. Untersuch. Nahr.- und Genussm., 1902, **5**, 171—172.

The solution (serum) containing the lactic acid is treated with barium hydroxide and filtered. The precipitate consists mainly of barium phosphate, whilst the lactic acid passes into the filtrate in combination with baryta. The baryta is removed by the addition of dilute sulphuric acid, and the excess of sulphuric acid, by adding barium carbonate, the lactic acid at the same time being reconverted into its barium salt. After filtering, a determination of the amount of barium in solution gives the quantity of lactic acid in the original serum. The method is useful for ascertaining the amount of lactic acid formed by pure cultures of lactic acid bacteria.—W. P. S.

Resin in Beeswax; Determination of ——. F. Jean. Ann. Chim. Anal., 1901, 148. Chem. and Druggist, 1902, **60**, [1152], 304.

One grm. of the wax is heated on the water-bath, with 80 per cent. alcohol; when the wax is melted, the mixture is well shaken, allowed to cool, filtered through a tared filter, and the insoluble portion washed with cold alcohol till free from acid. The filtrate, which contains any resin and stearic acid present, is heated till most of the alcohol is expelled, the residue extracted with ether, and the ethereal solution agitated with excess of zinc oxide. The precipitate of zinc stearate and the excess of zinc oxide are filtered off and washed with ether, the zinc resinate contained in the filtrate is decomposed with water and hydrochloric acid, and the free resin extracted with light petroleum spirit, dried and weighed.—A. S.

Cane Molasses; Analysis of ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [7], 830—834.

Owing to the varying richness of the canes, and of the purity of the juice, also owing to the method followed in the purification of the juice, the mode of working, and the proportion the levulose bears to the total reducing substances present, it is impossible to give a typical average analysis of cane molasses, as may be done in the case of beetroot molasses.

It is necessary, therefore, to determine the water directly, and not by the hydrometer; to determine the sugar by inversion, and the reducing bodies gravimetrically in the original liquid, whether molasses or partially exhausted syrups, in order to be able to control operations in the works, and judge correctly the value of any process or method of treatment of juice, syrups, or massecuites. Moreover, the total quantity of molasses per cent. of sugar in the juice worked is also required before the loss of sugar can be gauged correctly.—L. J. de W.

Caramel [Burnt Sugar]; Determination of the Fermentable Matter in ——. De Luynes. Rev. univ. de la Brass. et de la Malt. 1901, [1364—1365]; through Zeits. Spiritusind, 1902, **25**, [9], 100.

In France the use of caramel in breweries is permitted duty-free if the proportion of matter which would yield alcohol on fermentation does not exceed 7 per cent. The author describes the following officially recognised method for its determination:—

100 grms. of caramel are dissolved in 300 grms. of water, the solution is neutralised with sodium carbonate, 15 c.c. of normal sulphuric acid are added, and the solution is boiled for three minutes. After cooling, it is made up to 1 litre and placed in a fermentation flask of 2 litres capacity, 10 grms. of pressed yeast being added. The liquid is allowed to ferment for three days at a temperature of 27°—28° C., and it is then distilled from a flask of 2 litres capacity, furnished with a Le Bel's tube. The distillate is collected in a 100 c.c. flask up to the mark, and contains all the alcohol produced. The alcohol is determined from the sp. gr. of the distillate, and the result, divided by 0·6, gives the percentage of glucose in the caramel. If antiseptics be present in the caramel, the sugar must be determined by other methods.—J. F. B.

Starch (Granulose); Determination of Potato ——. A. Kaiser. Chem.-Zeit., 1902, **26**, [17], 180.

This process, which depends on the complete precipitation of starch paste by iodine in presence of sodium acetate, and the subsequent conversion of the iodide of starch into starch by means of alcoholic potash, is carried out as follows:—In case the starch is not in solution, it is gelatinised, the best concentration being 1 per cent.; the starch paste should not be kept at the ordinary temperature for more than 24 hours, owing to the changes which set in. 50 c.c. of the starch solution are mixed with 10 grms. of sodium acetate, and, after heating to 50° C., 25 c.c. of a solution containing 5 grms. of iodine and 10 grms. of potassium iodide to the litre are stirred in. (The amount of iodine in the precipitating solution must not exceed that given.) After the precipitated iodide of starch has settled down, the liquid is filtered through a weighed filter, and the residue thoroughly washed with a solution of 3 grms. of sodium acetate in 100 grms. of water. After draining, the precipitate is washed into a porcelain basin by means of alcohol, and is then gently heated with about 5 c.c. of a 5 per cent. alcoholic solution of potassium hydroxide, the iodine being thereby removed and amorphous starch left behind. After acidifying with a moderately strong alcoholic acetic acid solution, the liquid is allowed to stand for some time, and is then filtered through the above-mentioned weighed filter, on which it is washed eight times with hot spirit, afterwards with absolute alcohol, and finally with ether. The starch is then dried for four hours at 120° C., and is weighed in the form of a white, amorphous powder which, after gelatinisation, should give a clear solution with water; if this is not the case, any insoluble residue is dried and its weight deducted from that of the starch. Owing to the hygroscopic properties of starch, the precipitate should be weighed in a weighing bottle. This process may be employed for the determination of starch in presence of dextrin and sugars. The numbers obtained by the saccharification method of determining starch are, in general, higher than those yielded by the above-described process.—T. H. P.

Resorcinol; Determination of ——, *and Preparation of Phenol Iodo-Derivatives.* E. Richard.

See under XX., *page* 423.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Hydrogen and Oxygen; Union of ——. H. B. Baker. Proc. Chem. Soc., **18**, [247], 40.

Experiments have been made during the last ten years by H. B. Dixon, Victor Meyer, and by the author, with the object of seeing if the presence of moisture had any influence on the union of hydrogen and oxygen. These experiments have led to negative results. By the use of a new method of preparing very pure hydrogen and oxygen, namely, by the electrolysis of a solution of very pure barium hydroxide, the author has succeeded in preparing these gases so pure and dry that tubes containing them can be heated to redness without union of the gases, whilst tubes containing the undried gases, heated side by side with the dried tubes, readily explode. On the introduction of a small quantity of distilled water into the dried tubes, explosion follows at once. In gases which had been allowed to stand for two days only, in contact with distilled phosphorus pentoxide, only a slow combination took place, so slowly that in one case ten minutes' heating in the flame of a Bunsen burner caused the union of only one-third of the partially dried gases. It seems, therefore, that water is not the only determining factor in the explosion of the

heated mixture. In order to see if a still higher temperature would bring about the union, coils of very pure silver wire were heated by an electric current in the dried mixture, when it was found that the silver could be heated to its melting point without causing union.

Experiments have also been made with the object of finding out if the moist gases were measurably dissociated whilst the dry gases were not. By a device of Edward Morley's, used for another purpose, gases were sealed up in tubes in which a contraction of less than 1/7000th of their volume could be detected. The gases were dried before their introduction into the tubes by simply passing them through a phosphorus pentoxide tube. They were then left in contact with the pentoxide for six months. No contraction, even to the small extent above noted, could be observed. The gases tested thus, were hydrogen, oxygen, nitrogen, air, and a mixture of hydrogen and oxygen. These tubes were kept in a dark room during the whole period.

It was found that a moist mixture of hydrogen and oxygen united slowly in sunlight, which may perhaps account for some previous failures to get the gases dry enough not to unite. In the first series of experiments above described, the mixed gases were kept in darkness during their contact with the phosphorus pentoxide, lest the action of the drying agent should not be sufficiently rapid to cope with the water being produced by their union.

Radio-active Lead. K. A. Hofmann and V. Wölfl. Ber., **35**, [3], 692—694.

A continuation of the controversy with F. Giesel (this Journal, 1902, 76, 143, and 284).

Calcium Carbophosphate. A. Barillé.

See under VII., *page* 406.

Magnesium Amalgam; Some Reactions of ——. L. Meunier. Comptes Rend., **134**, [8], 472—473.

Magnesium amalgam reacts on ethyl alcohol in the cold, with regular evolution of hydrogen, and formation of magnesium ethylate, obtainable as a white powder by washing the residue from the reaction with ether and drying on a porous plate.

Magnesium amalgam and alcohol form a powerful reducing combination; the reaction can be moderated to any extent by adding benzene to the alcohol. The mixture reacts readily on alkyl iodides to produce the corresponding paraffins, and with acetaldehyde yields β-γ-dihydroxybutane, $CH_3.CHOH.CHOH.CH_3$.—J. T. D.

Silver Bromide and Iodide; Solubility of ——, *in Water.* F. Kohlrausch and F. Dolezalek. Sitzungsber. k. Akad. Wiss., Berlin, 1901, 1018—1028.

The solubility was measured by the increase in conductivity of water shaken up with the compounds in question. It was found that saturated solutions of silver bromide and iodide (at 21° C.) contain, respectively, 0·107 mgrm. and 0·0035 mgrm. of the salt per litre. These values are smaller than those previously obtained by Kohlrausch and Rose, but agree fairly well with the values based on the potential differences between a silver electrode and the saturated solutions.—A. S.

Brown Colour of the Solution obtained in precipitating Nickel by Ammonium Polysulphide; Cause of the ——. U. Antony and G. Magri. Chem.-Zeit., 1902, **26**, [14], Rep. 37. Gazz. chim. ital., 1901, **31**, [2], 265.

The authors have evaporated the brown solution in a vacuum. Ammonium sulphide decomposes first, and, when this decomposition is complete, the nickel is precipitated as a black powder, which, on analysis, corresponds to NiS_4. It is only slightly attacked by concentrated, and hardly at all by dilute hydrochloric acid. Concentrated nitric acid attacks it violently, liberating sulphur. Heated to 300° C. in CO_2, it gives off sulphur and leaves NiS.

—A. M.

Azobenzene and Hydrazobenzene; Some Properties of ——. P. Freundler and L. Béranger. Comptes Rend., 1902, **134**, [8], 465—467.

The authors applied the method of Friedel and Crafts to the preparation of azoketones and azo-aldehydes, by condensing with azobenzene or with acetyl derivatives of hydrazobenzene, acetyl chloride or bromide, acetic anhydride, or benzoyl chloride. In no case were they successful; the azo-derivative simply formed a compound with the aluminium chloride, from which, on treatment with water, the original azo-derivative was regenerated.

In preparing diacetylhydrazobenzene, however, by heating with acetic anhydride a sample of commercial hydrazobenzene which contained azobenzene, they formed a crystallised molecular compound of diacetylhydrazobenzene with azobenzene,

$$2[C_6H_5.N(COCH_3).N(COCH_3).C_6H_5].C_6H_5N:NC_6H_5,$$

in large orange prisms, melting at 98·5°—99° C., soluble in acetic acid, carbon bisulphide, or hot alcohol, sparingly soluble in cold alcohol or petroleum spirit. These solvents do not dissociate the compound, which is, however, dissociated by a temperature of 190° C., *in vacuo*, at which temperature the azobenzene distils off. Neither hydrazobenzene itself, its monacetyl derivative, nor acetanilide forms a similar compound with azobenzene.

—J. T. D.

Indole; Occurrence of —— *in Molasses Tar.* J. Boes. Pharm.-Zeit., 1902, **47**, 131. Chem.-Zeit., 1902, **26**, [16], Rep. 51.

The author has discovered the occurrence of indole in molasses tar, which is a decomposition product of the non-sugar constituents of the beet. Indole was isolated from the fraction of the tar boiling between 250° and 260° C.—J. F. B.

Secondary Alcohols; Synthesis of Acetylenic ——. *Condensation of Acetylene Hydrocarbons with Aldehydes.* C. Moureu and H. Desmots. Comptes Rend., **134**, [6], 355—357.

An ethereal solution of an aldehyde is digested at −5° C. with the sodium-derivative of the acetylene hydrocarbon in suspension in ether. The whole dissolves. The liquid is then thrown on broken ice, the ethereal portion separated, dried, and the ether distilled off. In this way alcohols were obtained, which form, like all acetylene derivatives, insoluble precipitates with mercuric chloride in strong aqueous solution, and reduce warm silver nitrate solution with formation of a mirror of silver. The constitution of these alcohols is represented by the formula $R.C{:}C.CHOH.R'$, and they are no doubt formed by the reaction $R.C{:}CNa + CHO.R' = R.C{:}C.CHONa.R'$, and the subsequent decomposition of the sodium derivative by the water. Butyl-acetylene, œnanthylidene, caprylidene, and phenylacetylene on the one hand, and acetaldehyde, chloral, valeral, œnanthal, benzaldehyde, and furfural on the other, have been used by the authors, who give the densities and boiling points of ten of the alcohols so obtained.—J. T. D.

Albumin-digesting Bacteria. O. Emmerling and O. Reiser. Ber., 1902, **35**, [3], 700—702.

The authors have investigated the nature of the proteolytic action of *B. fluorescens liquefaciens*, an organism which is extremely prevalent in putrefying liquids. This organism rapidly liquefies gelatin, with the production of a brown liquid with a green fluorescence. After some months it was found that at least 25 per cent. of the gelatin had been converted into ammonia. No gases were evolved during the action, and none of the characteristic products of putrefaction, such as phenols, indole, skatol, or sulphuretted hydrogen, were detected. Consequently *B. fluorescens liquefaciens* is not a putrefactive agent, neither

does it bring about the production of poisonous ptomaines; its main function is to peptonise the albuminoids, and then slowly to break them down into simple amines and ammonia.

The study of the nature of the proteolytic enzyme secreted by this organism was carried out on blood fibrin in presence of toluene. Even after long digestion, considerable quantities of peptones were still present. The lower products included tyrosine, leucine, arginine, aspartic, and other amino acids, so that the enzyme is evidently of a tryptic character. Urea is converted by this bacillus into ammonium carbonate. Most of the polysaccharides are unaffected, but starch and trehalose are hydrolysed slowly by the enzyme in presence of toluene. In spite of its strong reducing properties, *B. fluorescens liquefaciens* does not reduce malic acid—as does *B. aërogenes*, which likewise occurs in putrefying liquids—to succinic acid, but it converts it, with loss of water, into fumaric acid.

In old cultures, in broth, *B. fluorescens liquefaciens* forms a tough, slimy mass, which is apparently of a chitin-like nature.—J. F. B.

NATIONAL PHYSICAL LABORATORY.

REPORT OF THE EXECUTIVE COMMITTEE, FROM OCTOBER 1, 1900, TO DECEMBER 31, 1901, SUBMITTED TO THE GENERAL BOARD AT THEIR MEETING ON MARCH 19, 1902.

At the date of their last Report the Committee were able to announce that the Government, with the approval of Her late Majesty, proposed to allot Bushy House for the purposes of the Laboratory.

The details of the scheme under which the site and buildings are held were shortly afterwards settled, and arrangements made to carry out the necessary alterations and to erect some further buildings. This work is now practically complete; its cost has been largely in excess of that originally estimated. Twice during the year it has been necessary for the Executive Committee to ask H.M. Treasury to sanction additional grants amounting in all to 5,000*l.*, and the Committee are glad to recognise the liberality with which their approaches were met. The accounts are not yet complete, but the total sum expended will reach about 19,000*l.* In addition to this, the Committee have authorised the expenditure of over 3,000*l.* on apparatus and fittings. This has been provided out of the sum saved during the past two years from the grant for annual expenditure.

The Committee are indebted to the officials of the Office of Works, and particularly to Mr. E. G. Rivers, Surveyor-in-charge, for their care and attention in giving effect to the plans.

The basement and ground floor of Bushy House have been transformed into a Physical Laboratory, while the upper floors form offices and a residence for the Director.

One wing, containing the original dining room and library, has been fitted as an electrical and magnetic laboratory. All iron has been, as far as possible, removed from the structure, and, with a view of preventing a stray magnetic field from any currents which may be used, concentric wiring has been employed for all large currents, while the wires for smaller currents have been twisted.

In this room will be placed the Lorenz apparatus which the Drapers' Company have recently with great generosity given to the Laboratory in memory of the distinguished services to science and to education of the late Principal J. V. Jones, F.R.S., of Cardiff.

Along with this, there will be other apparatus for the absolute measurement of current and of electromotive force.

Another wing has been fitted for thermometric work. A special study will be made of high temperature thermometers, and the Laboratory owes to the generosity of Sir A. Noble the means for installing a number of electric ovens for testing thermopiles and other instruments for the measurement of temperature up to 1,000° or 1,200° C.

In a third wing a metallurgical laboratory has been fitted in which to continue the work begun at the Mint by Sir William Roberts Austen and the Alloys Research Committee. For this purpose apparatus for cutting and polishing sections and further photo-micrographical examination has been obtained. The Committee have to thank Mr. Steal for his assistance in arranging this.

The fourth wing is fitted as a chemical laboratory.

In the basement are a number of constant temperature rooms.

Sir Andrew Noble's fund, referred to in the last report, has provided a measuring machine, a dividing engine, and a comparator, which will be placed in some of the basement rooms. In an adjoining room the resistance measurements of the B. A. Committee will be continued, while in another, apparatus for the production of liquid air is being set up.

The testing of pressure gauges will form an important branch of the work, and for this a mercury column some 50 feet in height has been erected in one corner of the house.

Gas and water have been laid on freely throughout the building—also electricity. A 100-volt circuit is connected to the main dynamo and battery in the power-house, and supplies light. Numerous plug points enable a supply to be taken off for lights for experimental purposes or for small motors. For experimental work a special battery of fifty-five cells has been installed. This is divided into groups of five. Wires run from the switchboard to the various rooms in such a way that one or more of these groups can be switched on to any circuit. Thus voltages between 10 and 110 volts can be obtained as required.

The house is heated on the Webster low-pressure system by steam from a Lancashire boiler in the boiler house at a distance of about 100 yards.

The boiler also supplies steam to one of Parson's 60-Kilowatt Turbo-generators, which is the main source of power. The power-house also contains an 18-h.p. Crossley gas engine, driving a 12-Kilowatt dynamo by T. Parker and Co. This serves as a stand-by, and for charging the main battery of 58 chloride cells.

The Engineering Laboratory, a building 80 feet by 50 feet, adjoins the power-house. This is divided into two bays; a shaft, driven by a motor supplied by Mather and Platt, runs along one, and in it will be placed the lathes, drilling machine, planing machine, and other tools.

The other bay is for experimental work. It is traversed by a 2-ton crane, and will contain a testing machine and machinery for testing steam-pressure gauges, indicators, and such instruments. For this purpose a valuable instrument has been given by Messrs. Willans and Robinson.

During the year work has been continued at the Kew Observatory, now the Observatory Department of the Laboratory, and further details of this are given in the Director's report. The number of instruments tested was 29,184, about 1,100 in excess of those tested last year, and very greatly in excess of any previous year. The increase has been chiefly in ordinary thermometers, telescopes, and sextants. Vessels used in the Babcock milk test have been examined for the first time, The number of these has been 527. There has been a fall in the number of lenses, watches, and chronometers examined.

A considerable amount of time was occupied during the year in testing apparatus for the Antarctic Expedition, and in giving instruction to some of the observers, and arrangements have been made during the coming year to co-operate with the Expedition in special magnetic observations.

The Drapers' Company have undertaken to provide the sum of 700*l.* to meet the cost of a Lorenz apparatus. This will be placed in the Laboratory in memory of the late Principal Viriamu Jones, and will bear a tablet stating that it has been given by the Company for this purpose. Messrs. Willans and Robinson are providing apparatus for testing steam-pressure gauges and indicators, while in a number of cases very advantageous terms have been granted to the Committee by manufacturers of tools and machinery. The Committee have to thank Lord Rayleigh, Lord Kelvin, Mrs. Hopkinson, and the Syndics of the Cambridge University Press for gifts of valuable books.

The financial position continues to cause the Committee considerable anxiety.

The accounts for the year, which accompany this report, show a balance of 1,528*l.* 13*s.* 3*d.*,* but no additional members of the staff, beyond the Director, were appointed until September last, and Bushy House has been occupied for only one quarter of the year. Moreover, the number of the staff is not yet complete, and the occupation of the house is only partial.

Still, enough experience has been gained to show that the expenditure on internal maintenance, cleaning, heating, and lighting will be very heavy, while the receipts from fees can grow but slowly. Hence the Committee can only conclude by again expressing their opinion, in the words of their resolution of last year, to the effect that—

"The Committee cannot, however, conceal from themselves that it will be very difficult for them to maintain and administer a National Physical Laboratory on the Bushy site for the amount annually allowed by the Treasury, and they fear that it may be necessary for them to press in the near future for an addition to that allowance."

In accordance with a resolution adopted at the last Meeting of the General Board, this report is made up to December 31, 1901.

Staff of the Laboratory.

Director.—R. T. Glazebrook, D.Sc., F.R.S.

Observatory Department.

Superintendent.—C. Chree, D.Sc., F.R.S.

Chief Assistant.—T. W. Baker.

Senior Assistants.—E. G. Constable, W. Hugo, J. Foster, T. Gunter, W. J. Boxall.

Junior Assistants.—E. Boxall, G. Badderley, with eight other assistants.

Physics Department.

Assistants.—J. A. Harker, D.Sc.; A. Campbell, B.A.; H. C. H. Carpenter, M.A., Ph.D.

Junior Assistants.—B. F. E. Keeling, B.A.; F. E. Smith, Roy. Coll. Sci.

Engineering Department.

Superintendent.—T. E. Stanton, D.Sc.

Junior Assistants.—C. Jakeman, S. W. Melsome, with four mechanics and engineers.

Clerk and Accountant.—G. E. Bailey.

Statement of Work for the Year 1902, submitted to the General Board at their Meeting on March 19, 1902.

Work at Bushy House.

The new staff is now settled at Bushy House, and work in the various departments has begun.

The first task appears to be to set up and test the new apparatus. Much of this will require careful examination and calibration before it can be used for standard investigations.

With regard to research work, in accordance with the scheme approved last year, the first place will be given to continuing the investigations of the Alloys Research Committee.

Dr. Carpenter, who will be in charge of the chemical side of this, has had the great advantage of working, during the past four months, in Sir William Roberts Austen's laboratory. Unfortunately, the funds at the disposal of the Committee have not been sufficient at present to purchase the complete outfit of apparatus required. The automatic recording instrument devised by Sir William Roberts Austen and his assistants has yet to be bought, as well as some high-temperature furnaces. The apparatus for cutting and polishing sections and for their photo-microscopical examination is reasonably complete. On the mechanical and magnetic side of the investigation Dr. Carpenter will have the assistance of Mr. Keeling, who, after a distinguished course with Prof. Ewing, at Cambridge, has, by the kindness of Sir W. G. Armstrong, Whitworth & Co., spent some months in their works at Openshaw.

Another investigation referred to in the last report was the measurement of wind pressure. Dr. Stanton hopes before long to attack this problem.

In thermometry, Dr. Harker will continue his investigations. During the past year Sir A. Noble's air thermometer has been set up at Kew, and a number of mercury thermometers have been standardised for the range 100° C. to 200° C. It was not possible with the arrangements at Kew to work above this range, but a bath giving temperatures between 200° C. and 600° C. has been constructed. It is proposed now to set up the air thermometer and the baths at Bushy, and to proceed with the construction of electric ovens suitable for the range between 500° C. and 1,200° C. When this is done it will be possible to standardise platinum thermometers, thermopiles, and other apparatus for the measurement of high temperatures up to about 1,200° C. Some means of measuring temperatures up to, say, 2,000° C., remains to be found.

The electrical and magnetic work will, for the present, consist chiefly in making and testing the standards to be used in the standardising work. Mr. Campbell and Mr. Melsome have for some time been busy with this, and there is much to be done in setting up standards of induction and capacity, and for the magnetic testing.

Apparatus has been provided for the measurement of resistance, current, and electromotive force, and it is hoped before long that the Laboratory will be able to undertake the measurement of resistance and insulation tests, as well as the usual magetic tests, on iron and steel.

For some time past Mr. F. E. Smith has been making preparations for the construction of mercury resistance standards. This work will be pushed on, and the new Lorenz apparatus, given by the Drapers' Company, set up and got into order under the personal supervision of the Director.

In the engineering department again, work is required to fit the gauge-testing apparatus for use. The mercury column enables pressures up to 250 lbs. to the square inch to be read directly. Messrs. Willans and Robinson's apparatus will carry the pressure to 400 lbs. For the measurement of pressures above that amount apparatus has to be constructed. Mr. Jakeman will probably attend to this branch of the work.

As to the commercial testing work, the following list will indicate its scope, though until the Laboratory standards have been more thoroughly studied it is hardly possible to do much on a large scale:—

- Tests of pressure gauges and steam indicators.
- Tests of measuring appliances and gauges for use in engineering shops, &c.
- Test of screw gauges.
- Tests of thermometers for the measurement of high or low temperature, the platinum thermometer, thermopiles, &c.
- Photo-micrographic tests on metals, steel rails, &c.
- Measurement of the insulation resistance and dielectric capacity of insulators.
- Measurement of the electrical resistance of conductors.
- Tests of capacity and induction and of various forms of electrical measuring apparatus.
- Tests on the magnetic properties of iron, &c.
- Standardisation of glass vessels, flasks, burettes, &c., used in chemical laboratories and in various industries —*e.g.*, the dairy trade.
- Standardisation of weights and scales for laboratory purposes.
- Testing of photographic and other lenses.

The Director hopes before long to issue a pamphlet giving some account of these various tests, together with a statement of fees charged.

* This sum, as already stated, has been devoted to the scientific equipment.

Work in the Observatory Department.

The testing of meteorological and other apparatus, which is described in the Annual Report of this department, will be continued.

The attention of the Committee is called to the Test Pamphlet, which was issued last year, and gives a full account of the work done.

The various magnetic and meteorological observations will also be continued; although, in consequence of the electric trams, the former have lost much of their value, it is desirable to continue them until the new magnetic observatory, the establishment of which is engaging the attention of the Committee, is in working order.

Investigations into some matters connected with terrestrial magnetic measurements will be continued. There are also some questions of thermometry under discussion.

Opening Ceremony.

Among those present were :—

The Lord Chancellor, Mr. Gerald Balfour, M.P. (President of the Board of Trade); Mr. Akers-Douglas, M.P. (First Commissioner of Works); the Duke of Northumberland; Viscount Esher; Lord Kelvin, F.R.S.; Lord Blythswood; Lord Lindley, F.R.S.; the Lord Mayor; Mr. W. L. Jackson, M.P., F.R.S.; the Right Hon. W. J. Pirrie; Mr. S. E. Spring Rice, C.B.,; the Master of the Drapers' Company; the Master of the Haberdashers' Company; the Astronomer Royal; Mr. Bigwood, M.P.; Mr. Skewes-Cox, M.P.; Sir F. Abel, F.R.S.; Sir B. Baker, F.R.S.; Sir F. Bramwell, F.R.S.; Sir J. Crichton Browne, F.R.S.; Sir E. Busk; Sir W. Crookes, F.R.S.; Sir J. Durston; Sir W. Thiselton Dyer, F.R.S.; Sir J. Kirk, F.R.S.; Sir J. Hooker, F.R.S.; Sir N. Lockyer, F.R.S.; Sir G. G. Stokes, F.R.S.; Admiral Sir W. J. L. Wharton, F.R.S.; Colonel Crompton; Professor Dewar, F.R.S.; Colonel Holden, R.E., F.R.S., Principal Lodge, F.R.S.; Professor S. P. Thompson, F.R.S. (President of the Physical Society); Mr. McKinnon Wood, Mr. P. Watts, F.R.S.; Mr. C. T. Yerkes, Professor D. S. Capper, Mr. Kempe (Treasurer of the Royal Society); Sir M. Foster, M.P.; and Dr. Larmor (Secretaries of the Royal Society); Dr. Thorpe (Foreign Secretary of the Royal Society); Mr. Hawksley (President of the Institution of Civil Engineers); Mr. Maw (President of the Institution of Mechanical Engineers); Mr. Langdon (President of the Institution of Electrical Engineers); Mr. Ivan Levinstein (President of the Society of Chemical Industry); and the following Members of the Executive Committee:—Sir F. J. S. Hopwood (Permanent Secretary of the Board of Trade; Captain Creak, R.N., F.R.S.; Professor Perry F.R.S.; Sir J. Wolfe-Barry, F.R.S.; Sir E. Carbutt, Mr A. Siemens, Sir William Roberts-Austen, F.R.S.; Mr. G. Beilby, Dr. F. Elgar, F.R.S.; Professor Clifton, F.R.S.; Principal Rücker, F.R.S.; and Sir A. Noble, F.R.S. The Earl of Glasgow (President of the Institute of Naval Architects) was prevented by the Annual Meeting of the Institution from being present.

Sir William Huggins first called upon Lord Rayleigh, as Chairman of the General Board, to make a statement of the objects for which the laboratory has been founded, and also of the work which it is proposed to carry on in it.

Lord Rayleigh said :—

The idea of a national physical laboratory was not new. It was many years since Dr. Lodge forcibly advocated the establishment of such an institution In the year 1896, he thought it was, Sir Douglas Galton made it a principal subject of his presidential address before the British Association. He took some pains to inform himself of what was being done in the kindred institutions in Germany, and was very much impressed with the importance of our following in those steps. He thought it was Sir Douglas Galton's address that led to the deputation to the Prime Minister, he was sorry to say as much as five years ago, in which the importance of that work was laid before him, and he presumed it was in consequence of the representation then made that a Treasury Committee was appointed by the Chancellor of the Exchequer of which he (Lord Rayleigh) had the honour to be the chairman, although the bulk of the work fell upon Professor Rücker. That committee examined witnesses representing both the scientific side and also the industries, of which there were many, depending on scientific discoveries. They visited the German institution, and reported unanimously in favour of the establishment of such an institution as was being celebrated that day. After detailing the circumstances which led to the establishment of the laboratory at Bushy House, Lord Rayleigh said that he considered that Bushy House was an ideal place for a laboratory. There was a good surrounding of ground within which they might do as they pleased without being brought to account; but the scale of the building and the works necessary to adapt it for the purposes of a laboratory had sorely tried, he was afraid, the patience of the Treasury, and he thought it was highly probable that that patience would be still further tried in the future. One of the first businesses of the committee that was appointed by the Royal Society to manage the institution was the selection or appointment of a director. That appointment was offered to Mr. Glazebrook. They were well acquainted, not merely with his scientific abilities, but with his business capacities and powers of organizing, before he gave up a position of importance and considerable independence in order to take up that work which he felt well qualified to do. And now they had the National Physical Laboratory. It was national in the proper sense of the word, and it was the laboratory of the nation. (Cheers.) He had been struck, and he dared say many others had been, in reading the life of Pasteur to find how very largely the feeling figured in the motives that directed his work, that he was working for the honour and glory of France, and how, when the disasters overtook France in 1870, he felt that he must do all that he could in order to raise France again from the position into which she had fallen. He certainly succeeded in that attempt. Now they had their opportunity. The presence of their Royal Highnesses there that day testified to the sympathy felt in that work by the Royal House. The Treasury, he was going to say for the Treasury, had shown themselves sympathetic. He thought that would hardly do them justice, because he must say that those officials of the Treasury with whom they had been directly concerned had entered most warmly into the idea, and had given it their heartiest support. In this country, as things went, we must not expect the Government to do everything. We must look for assistance from those especially who had made fortunes out of industries which depended upon recent scientific discoveries. Some little while ago he heard the lamented Bishop Creighton tell an anecdote which he thought it was appropriate to repeat. He was speaking of the president of an American University who had received financial favours from a local financier of wealth, upon whom he called to obtain, if possible, further extensions of that bounty. When he was shown into the room the great man looked up for a moment only from his books and papers, and said, "I have no time to talk to you, but I know what you have come for. There's my cheque-book. Fill it up!" That was the right spirit. They hoped there were others who would allow them to use their cheque-books in a particular manner, by making presentations of machines, or even giving them orders for testing which would bring in useful fees. In that way he thought the deficiencies, which were at present considerable, might be filled up. Finally he might appeal, although he knew it was not necessary to do so, to the workers in the establishment itself, that they each one of them should do all that lay in them to make the work which they had undertaken a success, a credit to the country, and a justification of the name which that institution bore.

Mr. Gerald Balfour, M.P., then spoke, after which The Prince of Wales said:—

I am glad that my first duty as a Fellow of the Royal Society should be to join with my distinguished brethren in opening this institution, the direction and administration of which have been entrusted to the society by the Government. It is also a great pleasure to assist in the inauguration of what may fairly be called a new departure, for I believe that in the National Physical Laboratory we have almost the first instance of the State taking part in scientific

research. The object of the scheme is, I understand, to bring scientific knowledge to bear practically upon our every-day industrial and commercial life, to break down the barrier between theory and practice and to effect a union between science and commerce. This afternoon's ceremony is not merely a meeting of the representatives of an ancient and world-renowned scientific society for the purpose of taking over a new theatre of investigation and research. Is it not more than this? Does it not show in a very practical way that the nation is beginning to recognize that if her commercial supremacy is to be maintained, greater facilities must be given for furthering the application of science to commerce and manufacture? In the profession to which I am proud to belong there are, perhaps, special opportunities of gaining a certain insight into the general trade and commerce of the world and of comparing the commercial vitality of the different countries. And certainly abroad one finds an existing impression, which was confirmed by the experience of my recent and interesting colonial tour, that the superior technical and scientific knowle lge of our foreign competitors is one reason why our hitherto pre-eminent position in manufactures and commerce is so considerably threatened. As a simple example I may quote the opinion of an expert authority in Australia, that the aniline dyes of Germany had given to a certain class of German-made goods a decided superiority over those of British manufacture. In Germany and America much valuable work has been carried out by the State. In this country the Government have provided these buildings and found machinery for the supply of light, heat, and power. They are at present not inclined to spend more money upon equipping the laboratories. It is therefore to the liberality of the public that we must look not only for money, but for presents in machinery and necessary appliances. Already the institution has benefited in the latter respect by gifts from Sir Andrew Noble, the Drapers' Company, Messrs. Willans and Robinson, Lady Galton, and others. The old established Kew Observatory now forms part of the laboratory. Important and growing work is carried out in the testing of telescopes, binoculars, sextants, and, more particularly, teleseopic sights for the navy. Most of the scientific outfit supplied for the Antarctic expedition was tested at Kew. The laboratory will also supply a want which is much felt for standardising and testing the many other forms of apparatus in daily use, while investigations will be carried out on points of importance to the manufacturer or the merchant from the solution of which valuable results may be expected to accrue. I am particularly pleased to know that it is possible that within the precincts of this laboratory there will be established a work of the utmost importance—namely, a tank after the design of the late Mr. Froude, in which the performance of a ship can be predicted from experiments on a model. At present there is such a tank at Haslar, which is fully occupied in Government work. The Institution of Naval Architects, impressed with the demand for this work, have proposed to raise the sum required to erect the tank, and for the necessary appliances. But the funds at present at the disposal of the laboratory will require to be considerably supplemented if they are to undertake this much-needed work. No doubt the working expenses of the tank will ultimately be met by fees. But a difficulty may arise in tiding over the interval which must elapse before such fees are available. I am confident that, through the generosity of the public, the necessary means will be forthcoming to meet these difficulties and to secure that which is almost an essential to the shipbuilding industry of a country possessing the largest mercantile marine in the world. Before such an audience I have not presumed to speak of the value to science of this institution. Though the navy has given many notable names to scientific theory, it is the practical results which naturally appeal more to the mind of the sailor, and I am sure you will accept this as my excuse for having ventured to make my few remarks upon the future of this institution from merely a utilitarian point of view.

The representatives of the Society of Chemical Industry on the Council of the National Physical Laboratory are Messrs. G. Beilby, R. Forbes Carpenter, and W. F. Reid.

New Books.

THE ELEMENTS OF PHYSICAL CHEMISTRY. By HARRY C. JONES, Associate Professor of Physical Chemistry in the Johns Hopkins University. The Macmillan Company, New York, U.S.A. Macmillan and Co., Ltd., London. 1902. Price 17*s.* nett.

8vo volume, with preface, table of contents, subject-matter filling 549 pages, illustrated with 67 engravings, and the alphabetical index. The subjects treated of in this volume are the following:—I. Atoms and Molecules. II. Gases. III. Liquids. IV. Solids. V. Solutions. VI. Thermochemistry. VII. Electrochemistry. VIII. Photochemistry. IX. Chemical Dynamics and Equilibrium. X. Measurements of Chemical Activity.

THE SOAP BRAND RECORD AND TRADE MARK MANUAL. By L. L. LAMBORN, B.S., B.S., Member of the American Chemical Society and of the Society of Chemical Industry. Chas. S. Berriman, 108, Fulton Street, New York. 1902. $5.00.

8vo volume, containing table of contents, preface, index to advertisers, introduction, and 76 pages of text. Then follow, in tabulated form and alphabetical order, the various copyrighted trade marks for soap.

The work is divided into three parts, Part I. being devoted to a general enunciation of the Laws regulating Trade Marks and Designs and Names; Part II., Trade Marks, &c., as applied to Soap; and Part III., List of Soap Firms, alphabetically arranged and consecutively numbered. Also List of Trade Marks, copyrighted and uncopyrighted, in present use and claimed ownership. The entire text fills 178 pages.

Trade Report.

PATENT LAW AMENDMENT BILL.

DEPUTATION TO MR. GERALD BALFOUR.

(*See this Journal*, 1902, 287.)

MEMBERS OF DEPUTATION TO THE RIGHT HON. G. W. BALFOUR, M.P., PRESIDENT OF THE BOARD OF TRADE. (THURSDAY, MARCH 20, 1902. INTRODUCED BY SIR W. H. HOULDSWORTH, BART., M.P.)

Chambers of Commerce.

Associations.	Representatives.	Number of Associated Firms.	Number of Work-people.
Manchester Chamber of Commerce.	Ivan Levinstein, H. Grimshaw, S. W. Royse, Elijah Helm.	Members, 1,800	
Blackburn.....	W. E. Bickerdike.		
Bury	Arthur Ashworth.		
Dewsbury	W. Runciman.		
Halifax.....	J. H. Whitley, M.P. F. Whitley Thomson, M.P.		
Keighley	John Brigg, M.P.		
Leicester	W. Taylor, President; C. B. Carver.		
Macclesfield	W. R. Cameron.		
Newcastle-on-Tyne	Geo. Renwick.		
Newport...	Joseph Lawrence, M.P.; W. J. Orders.		
Nottingham	J. Evans-Jackson.		
Sheffield.....	The Rt. Hon. C. B. Stuart Wortley, K.C., M.P.; Sir C. E. Howard Vincent, C.B., M.P.; J. T. Hope, M.P.; Samuel Roberts, M.P.; B. Langley, M.P.; Sir Frederick Mappin, M.P.		
Tynemouth.....	F. L. Harris, M.P.		
Walsall	T. L. Smith.		

Associations.	Representatives.	Number of Associated Firms.	Number of Work-people.
Manchester District Engineering Trades Employers' Association.	R. Matthews, also representing Sir W. G. Armstrong, Whitworth, and Co.	71	30,000
Manchester Association of Engineers.	E. G. Constantine, M.I.M.E.	500	..
United Alkali Co. (8,000,000*l.*).	Max Muspratt ...	25	12,000
Bradford Dyers' Association.	A. Hoegger	50	4,000
Calico Printers' Association (8,000,000*l.*).	Neville Clegg	64	22,000
Society of Chemical Industry.	Dr. Squire, ... G. Beilby, Max Muspratt, W. F. Reid.	20 different branches of cognate industries, 3,600 members (scientific, analytical, technical, and manufacturing).	..
United Turkey Red C.	Unable to be represented specially, but warmly approves the aims of the deputation.	4	5,000
Manchester Guardian Society.	Sir W. H. Bailey (also representing Albion Iron Works, Salford), George Hahlo. G. S. Woolley.	6,030 (Manchester and surrounding district).	(Albion Works) 4,000
Bleachers' Association.	John Stanning, Henry Allen, F. Hardcastle.	70	13,000

Trade Unions.

Associations.	Representatives.	Unions.	Membership.
Manchester and Salford Trades and Labour Council.	G. D. Kelley	46	22,439
United Machine Workers' Association.	M. A. Arrandale .	..	3,948
Bristol Federation of Trade and Labour Councils.	John Curle	16 (South Wales and West of England).	53,300

Individual Firms.

—	Representatives.	Number of Work-people.
Edison Ore Milling Syndicate; Machinery Trust; Westinghouse; Linotype Co., Ltd.	J. Lawrence, M.P. (representing a capital of 7,000,000*l.*)	..
Sir W. G. Armstrong, Whitworth, & Co., Ltd.	R. Matthews.....	30,000
F. Steiner and Co.	John Robertson	2,560

Members of Parliament.

W. Abraham.
Lord Balcarres.
R. H. Bromley Read.
John Burns.
R. W. Bousfield, K.C.
F. Cawley.
David Crossley.
C. Disraeli.
Alfred Emmott.
C. A. Cripps, K.C.
Major Evans Gordon.
Ernest Flower.
J. G. Groves.
E. Gray.
Sir A. J. Haslam.
Sir W. H. Hornby.

Members of Parliament—cont.

Sir J. F. Leese.
Sir Joseph Leigh.
Dr. Macnamara.
Col. F. C. Morgan.
D. J. Morgan.
T. P. O'Connor.
Hon. W. Peel.
Col. Pryce-Jones.
Sir A. K. Rollit.
John Rutherford.
Louis Sinclair.
Alfred Thomas.
J. H. Whiteley.

Not Members.

J. W. Gordon, Barrister. Roger Wallace, K.C.

Manchester Guardian, March 21, 1902.

Mr. Joseph Lawrence, M.P., said he attended as one of the delegates of the Newport Chamber of Commerce, and also at the invitation of the Manchester Chamber of Commerce, because out of some four large engineering and electrical industries with which he was connected, employing or about to employ some 6,000 men, representing over seven millions of capital, and owning and controlling over 4,000 British and European patents, two were situate adjacent to Manchester. He therefore desired to associate himself with the representations which had already been made concerning especially one serious defect in the Patent Laws Amendment Bill now before Parliament. He, however, congratulated Mr. Balfour upon the excellent clause providing for the examination of previous specifications, since it would lead to the diminution of bogus or worthless patents. He would like to see it go further, and the examination extended to novelty. In common with everyone engaged in manufactures, he was sorely disappointed with the omission of a clause providing for the effective and *bona fide* working in this country of English patents held by foreigners. Without this, no Bill professing to cure the evils of the present patent system could be said to be in the least degree satisfactory. The present Bill left this, the greatest evil of all, untouched. It was the kernel of the whole case, and in view of the grave and increasing competition which was besetting them from different parts of the world, they were very modest in their demands when they asked for the restoration and recognition of the old principle, which was, in truth, the corner-stone of their patent law policy, *viz.*, to grant patents only to such new inventions as led to the introduction of new manufactures which gave employment to labour. In the Meister, Lucius patents case nobody laid down this doctrine in more forcible language than Mr. Fletcher Moulton, a member of the Patents Committee, upon whose report this Bill was founded. Mr. Moulton said the peculiarity which reigned dominant in English law was that the merit consisted in the introduction of a new trade into England, and when monopolies were condemned by the English courts in the past, exception was made in favour of new inventions which gave employment to labour in this country. Clause 2 of the present bill, providing for the granting of compulsory licenses, would not meet their case. If, for example, a German or American firm owning an English patent made goods in pursuance of such patent, and shipped them to England, they thereby sufficiently complied with what was termed the "reasonable requirements of the public," which meant the consumer, but in the meantime they might by such favoured treatment destroy or seriously cripple an existing analogous industry, and instead of giving more employment to British labour, absolutely result in giving less employment, whilst, on the expiry of the patent itself, a native industry might have been destroyed without a new British industry having been established to take its place. No labour, moreover, would have been trained in this country to carry on that special industry. In the last three years, in one branch of industry alone, 88 per cent. of the patents had been granted to Germans and other foreigners.

Illustrations from the Machinery Industry.

In his own special case—that of machinery—he would present a phase of the case which would show what advantage a country possessed which had the power of compelling foreigners to work their patents in that country and giving employment to the inhabitants of that country. When the linotype composing machine, of which nearly ten millions sterling-worth were now in use, was invented 15 years ago, he sought the power to manufacture the machines in

England on paying a royalty. This was refused. He could not obtain a compulsory license because the patentees were ready to, and actually did, ship machines within two years after these negotiations to England. He accordingly had to organise a combination to buy their rights, and his company gave 800,000*l.* for those rights. The Germans, on the other hand, had the legal power to force the inventors to manufacture the machines in Germany, or to give the rights to others to build the machines on payment of a royalty, and the patentees were compelled to sell the rights to a German combination for a royalty equal to less than 6 per cent. on the selling value of the machine, and even this was to cease when 185,000*l.* in the aggregate had been paid. In other words, the absence of the power to compel the American inventors to work their patents in this country and establish a new industry cost his company five times as much as it did the Germans, and that over a series of years. To take another case of an American company, which shipped electrical appliances and gas engines to England. They neither sought a royalty, nor were they willing to grant a license, but shipped machinery and appliances direct to England. To locate this new and growing industry in England and secure employment for our workpeople, it was necessary to constitute a company of two and a half millions sterling capital, and give the American company a million of ordinary stock, and raise in England a million and a half of cash to erect and equip the works. The same company sold precisely the same patents in France to cover France, Belgium, Spain, and Portugal for three million francs, or 120,000*l.*, as against a million sterling in England. The German patents had not yet been sold. Notwithstanding the outlay of a million and a half by this same company on works in Manchester, a German firm manufacturing electric appliances in Berlin, who employed cheap labour and were not obliged to erect works in England, were enabled recently to undercut the American company to the tune of 36,000*l.* in an order of about 130,000*l.* in a tender for some electric work for the Manchester Corporation. When an industry was already established the troubles of English patentees only began. Other patentees poured in from abroad with their so-called latest inventions—often gross impostures. In the case of the Linotype Company, they were pestered with an invention which he would call the X machine. The owners of the X tried their hardest to induce his company to purchase their patent. They were not obliged to work it in England, they would not sell on royalty, and his company could not apply for a compulsory license, as the patentees were willing to ship the machine from America. All the same, the patentees advertised the machine, frightened their stockbrokers, knocked their stocks down in the market to the extent of 30 per cent. in value, and checked orders from their customers. To protect themselves, the company bought the invention finally for a total of 97,350*l.* In Germany, these X people, who were obliged to work the machine or forfeit their patents, had not the capital to do it with, and were obliged to sell it to Germans on a royalty basis, which did not amount to a tenth part of what his company had to pay in England. The machine not having proved a success in Germany, his company had abstained from manufacturing it, although some of the same parties came over and tried to force their hands by asking for a compulsory license, which the company only averted, by undertaking to build the machine in return for a specific cash order, which the company never got. It was thus proved that the parties did not want the machines at all. In patents for four other classes of machinery and appliances which his company were now manufacturing, they had to pay 160,000*l.* The same people had failed to sell the patents for the same machine in France, Germany, &c., at any price, because of the liability to work the patent in those countries. These facts proved that the absence of the power to compel the effective working of English patents owned by foreigners was a tremendous shackle on British industry, and a serious menace to their future prosperity.

The Case of Two Edison Patents.

He would just mention two of Mr. Edison's great patents —one for the crushing of minerals, especially iron ore, and extracting the iron by magnets. Mr. Edison would neither let this be worked on royalty, nor give a license for his patents, and was prepared to supply plant from America. He and others had to form a combination to buy Mr. Edison's patents, gave him 66 per cent. of the stock of the company, and were now about to spend one million sterling to work these patents, from which Mr. Edison and his associates in America and Germany would draw ultimately large profits. The German and French patents had not been sold, because the Germans knew they had only got to "lie low" for a short time, and the vendors would have to sell for a smaller sum than the company, or license them on royalty. Mr. Edison, again, had invented an electric accumulator for motors. They in England would probably have to pay five or six times as much for the advantages of this accumulator as the Germans or other Continental countries would have to pay for it, simply because they could not compel Mr. Edison to let them work it on royalty. Mr. Edison was erecting works in America to ship the parts on a wholesale scale to England. He might multiply instances to show that Englishmen were "held up" —to use the language of the highwayman—by foreign inventors and charged larger prices than other people had to pay by reason of there being no law in this country to compel foreigners to work their patents here. To show the disadvantage an Englishman was under who owned patents in France, Germany, or other European countries, if he made patented goods here, and shipped them abroad, he practically forfeited his foreign patent, in addition to which, he had to pay heavy import duties in these various countries. On the other hand, a foreigner owning patents in England had two advantages which English manufacturers had not. He had no fiscal duties to pay, and he was under no obligation to go to any expense in order to sell his wares. He could manufacture them at home and dump them down here. They urged, therefore, that is was only the minimum concession to the English manufacturers to provide that foreign owners of patents should be compelled effectively and *bona fide* to work their patents in England, a reasonable time being allowed—say three years—either by erecting works themselves and employing British labour, or by selling their patents outright or on royalty to English firms, so that they might be worked in England by English labour and with British capital if possible. The future outlook for English manufacturers was a matter of the greatest national concern, and his close connection with the United States and his constant visits to that country showed him that they had hardly touched the fringe of the competition with which they were likely to be faced in the future.

Mr. I. Levinstein (the President of the Society of Chemical Industry), Sir W. Houldsworth, M.P., who introduced the deputation, Sir W. H. Bailey, and Messrs. G. D. Kelley, Saml. Roberts, M.P., and Evans Jackson also spoke.

Mr. Gerald Balfour, in reply, said: As you are aware, although this Bill is founded upon the report of the majority of the Committee appointed by the Board of Trade, in introducing it into the House of Commons, I stated that I was prepared to receive any representations that might be made by you on the subject with an open mind. It was in pursuance of that invitation that this influential deputation has met me here to-day. I do not think the case which they desire to urge could have been stated with greater fulness or greater force than it has been by the speakers this afternoon, especially by Mr. Levinstein (see this Journal, 1902, 212 and 301) and Mr. Joseph Lawrence. Of course you will not expect me to say at the present time what the decision of the Government may be respecting the changes which you wish to see introduced into the Bill, but I will undertake to give them my most careful consideration, with a view to seeing, at all events, how far it may be possible to meet your wishes. The main differences, as I understand, between the deputation and the Bill which the Government has introduced are these:—First of all, in the place of compulsory license the Manchester Chamber of Commerce and those who think with them would desire to see compulsory working under a penalty of revocation substituted; and secondly, they consider that the machinery provided in the Bill for the obtaining of a compulsory

license is too complicated and too elaborate. With regard to the last point, I will certainly consider and see whether it may not be possible, to some extent, to simplify it. With regard to the first point—I take it the more important point—I would say that I am not prepared to-day to express any opinion, but at the same time I feel bound to tell you that I do see considerable difficulties in the way. Nevertheless, I should like, so far as it is possible, to meet what I have recognised is, in some instances, a very real grievance, namely, a case where a patent has been taken out in this country and in a foreign country, and where it is worked only in the foreign country, and obstacles are deliberately thrown in the way of working it in this country. I do think that that is a real grievance, and so far as possible I should be anxious to meet it. Some opinion has been expressed, both by Mr. Levinstein and by Mr. Lawrence, as to the precise meaning of the first subsection of the second clause in the Bill. My impression is that, even in its present form, the interests of the public referred to in that clause implied something very much wider than Mr. Levinstein and Mr. Lawrence have interpreted them as meaning. I should be ready to make the point as clear as anybody could desire. The proposal to substitute the compulsory working subject to the penalty of revocation for compulsory license is not one, I think, which has commended itself to the Associated Chambers of Commerce in this country, though no doubt there are a great many Chambers of Commarce, in addition to the Manchester Chamber of Commerce, which favour that policy. I was looking at the resolutions passed by the Associated Chambers last year, and I find that their resolution with respect to this matter runs "that in the opinion of this Conference no amendment of section 22 will be satisfactory which does not provide the granting of compulsory license in default of the *bona fide* manufacture of the patented article in the United Kingdom, and therefore this Conference disagrees with the conclusions of Sir Edward Fry's Committee on the second question submitted to it." I have little hesitation in saying that I should be prepared to go so far as to introduce words into the second clause of the Bill showing clearly that the refusal of a foreign patentee to work his patent in this country would be among the grounds on which an application for a compulsory license would properly be made. If it be possible for us to come to an agreement upon that basis so much the better. Meanwhile, I am not prepared to make any definite statement. I will consider the further and more extreme proposals made to me, but I feel bound to say that there are certain difficulties in accepting them, but possibly a compromise may be found possible. If a compromise be found possible, so much the better; if it be not, then I think there is a great deal to be said in favour of the suggestion made by Mr. Roberts, namely, that we should pass the Bill with the first clause only, and leave the subject matter of the second clause for further discussion, and possibly a further measure.

Sir William Houldsworth having thanked the right hon. gentleman, the deputation withdrew.

I.—GENERAL.

Tariff Valuations in India.

Bd. of Trade J., Feb. 20, 1902.

A Customs circular, issued by the Finance and Commerce Department of the Government of India, on the 20th ult., fixes the valuations, for tariff purposes, of various classes of goods imported into India.

The following is the text of the circular:—

"In exercise of the powers conferred by sections 22 and 23 of the Sea Customs Act, 1878 (8 of 1878), in modification of the tariff values fixed by the Indian Tariff Act, 1894 (8 of 1894), as amended by the Indian Tariff Act, (1894) Amendment Act, 1896 (3 of 1896), and as further altered from time to time by notifications of the Governor General in Council, the Governor-General in Council is pleased to fix, with effect from the 25th Jan., 1902, for the articles specified in column 2 of the schedule hereto annexed, the tariff values stated in column 4 of the said schedule."

"Provided that nothing in this notification shall affect any additional duty imposed under the powers conferred by section 8A of the Indian Tariff Act, 1894 (8 of 1894), as amended by the Indian Tariff Act Amendment Act, 1899 (14 of 1899)."

The detailed list of Tariff Valuations may be seen in the *Board of Trade Journal*, Feb. 20, 1902.

Imports of Switzerland in 1900.

Ch. of Comm. J., March, 1902.

Druggists' sundries and chemicals (total imports, 1,236,000*l.*). Imports from the United Kingdom, 50,700*l.*; decrease, 3,800*l.* Imports of drugs and chemicals from Germany, France, and Belgium all show a substantial increase. Colouring materials (total imports, 299,000*l.*). Imports from the United Kingdom, 11,000*l.*; decrease, 6,000*l.*, being in varnishes, 3,800*l.*, and various colours, 2,200*l.*

India-rubber and gutta percha goods (total imports, 123,000*l.*). Imports from the United Kingdom, 25,500*l.*; decrease, 2,800*l.* The decrease in the imports of india-rubber threads was due to the reduced requirements of elastic factories, whose exports decreased last year. Within the last 10 years, this industry has lost one-third of its exports.

Pottery and china goods, glassware, oils, soaps and fats, and writing materials all show a slight decrease in the imports from the United Kingdom.

Tariff Amendment in Mauritius.

Bd. of Trade J., Feb. 27, 1902.

An Ordinance, dated Dec. 27, 1901, repeals and replaces items in Schedule B., of the Consolidated Customs Tariff, Ordinance No. 29 of 1895 relating to glass, bottles, manures and fertilisers, disinfectants, chemicals for local industrial purposes, insecticides, and moulding sand.

Full particulars may be seen in the *Board of Trade Journal*, Feb. 27, 1902.

Trade of Naples (Italy) for 1901.

Foreign Office Annual Series, No. 2744.

Imports.

Articles.		Quantity.	
		1897–1900 (average).	1901.
Olive oil	Tons	10,050	9,350
Petroleum	,,	41,230	43,350
Sugar	,,	52,850	34,270
Nitrates	,,	17,060	31,270

The decrease in sugar is due to the home production of the article, whilst the heavy increase in nitrates is accounted for by the more abundant use of chemical manures.

Exports.

Articles.		Quantity.	
		1897—1900 (average).	1901.
Olive oil	Tons	35,070	33,420
Essences	,,	427	375
Tartaric acid	,,	360	270
Tartar	,,	13,340	9,170
Fruit juices	,,	2,980	2,240
Tanning and dyeing materials	,,	29,780	25,700

The decrease in the export of wine, in 1901, affected also the tartar products, and the decrease in the export of materials for tanning and dyeing is decidedly serious, and affects the trade in sumach particularly.

Customs Decisions in Switzerland.

Ch. of Com. J., March 1902.

The following Decisions have been come to by the Swiss Customs Department as to the classification of certain articles under the Tariff :—

Description of Articles.	Tariff No. under which Classed.	Tariff Rates of Duty.	English Equivalents.
		Per 100 kilos. Frs. cts.	Per Cwt. *s. d.*
Bromoform ; lysoform	15	8 00	3 3
Benzyl chloride	47	1 00	0 4½
Bismuth nitrate	48	1 00	0 4½
Antimony fluoride	74	2 00	0 9¼
Pans, reservoirs, boilers of sheet iron for chemical works.	250	4 00	1 7½
Asbestos paper	337	10 00	4 6¾
Milk preserved by evaporation.	431	7 00	2 10
Pegamoid, "pluviusine" ...	531	30 00	12 2

Customs Decisions in Madagascar.

Bd. of Trade J., March 6, 1902.

The *Journal Officiel de Madagascar* for Dec. 25 last contains the text of proclamations modifying the general Customs Tariff of France, which is also, with certain exceptions, in force in Madagascar. The following are the principal of these Decrees and Laws :—

Law of July 10, 1899, fixing the duty leviable on permanganate of potash, under the General Tariff, at 55 francs per 100 kilos., and, under the Minimum Tariff, at 35 francs per 100 kilos.

Law of Dec. 29, 1900, article 1, par. 5, fixing the consumption duty on spirits at the rate of 220 francs per hectolitre of absolute alcohol.

Articles for Scientific Purposes, Duty-free in St. Lucia (B.W.I.).

Bd. of Trade J., March 6, 1902.

The following articles are added to the table of exemptions from import duty in the second schedule to the Customs Tariff Ordinance, No. 12, of 1895 :—

1. Alcohol (pure), chemicals, materials and apparatus imported exclusively for medical or other scientific investigations, upon a statutory declaration being made to the satisfaction of the Treasurer that they have been so imported.

Contract for Chemicals in Spain.

Bd. of Trade J., March 13, 1902.

The *Gaceta de Madrid* of 6th inst. contains a Royal Order authorising the Grenada powder factory to purchase, by private negotiation, 87 tons of gun-cotton, 115 tons of sulphuric ether, and 10 tons of raw cotton from certain German firms, and the following, without indication of market, *viz.*, 85 tons of alcohol, 4 tons of acetic ether, 40 tons of nitric acid, and 40 tons of sulphuric acid.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Output in Burma (India),

Bd. of Trade J., March 6, 1902.

The total output of petroleum in Burma (according to *Indian Engineering*) last year was close on 37 million gallons, valued at a little over 21½ lakhs of rupees. The output from the Yenangyaung wells increased by about five million gallons, whilst at Yenangyat and in the Arakan Division the output was less than for the previous year.

VII.—ACIDS, ALKALIS, Etc.

Acetate of Soda and of Lime Duty-free in the Netherlands.

Bd. of Trade J., March 6, 1902.

A Dutch Royal Decree exempts these acetates from duty on importation into the Netherlands, when required as ingredients in the dyeing and printing of textile fabrics. (See also this Journal, 1902, 199.)

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Cement Trade of Germany.

Economist ; through Eng. and Mining J., March 1, 1902.

The cement companies in Upper Silesia have begun to issue their annual reports for 1901, and they show far less satisfactory results than for 1900. The Oppeln Company (formerly Grundmann) pays 3 per cent., as against 7 per cent., in 1900 ; the Oberschlesische (Schottländer), 3 per cent., as against 8 per cent., in 1900 ; and the Groschwitzer Company, 6½ per cent., as against 13 per cent., in 1900. Bad as these results are, they are much better than those of factories in Central and North-western Germany, many of which will have to pass their dividends altogether. The conditions of production are more favourable in the Silesian District than in these latter. There is a slight improvement in the cement trade just now, which is connected with an improvement in the building trade. The reports of the cement companies complain of the loss of trade in the United States, but they dwell upon the prospects, which are declared to be very favourable, of finding new markets in South Africa after the war is over.

X.—METALLURGY.

Mineral Exports of Spain.

Eng. and Mining J., March 1, 1902.

Exports of minerals, for the eleven months ending Nov. 30 last, are reported by the *Revista Minera* as below, in metric tons :—

	1900.	1901.	Changes.
Copper ore	1,629,140	1,001,400	D. 27,740
Zinc ore	61,199	72,476	I. 11,277
Lead ore	5,170	1,874	D. 3,296
Salt	205,561	304,804	I. 99,243

Exports of metals, were 27,383 tons of copper, against 20,083 tons, in 1900 ; 2,391 tons of zinc, against 2,080, in 1900 ; 148,492 tons of lead, against 153,954 tons, in 1900.

Nickel-Plated Tin Plates : Customs Decision (United States).

Bd. of Trade J., March 6, 1902.

Tin plates coated or plated with nickel are dutiable as tin plates, under par. 131 of the Tariff, at the rate of 1½ cents per lb.

XII.—FATS, OILS, Etc.

Quillaya or Soap-Bark Siftings : Customs Decision (United States).

Bd. of Trade J., March 6, 1902.

Siftings, which are a by-product resulting from the process of cutting up soap bark by machinery, and which are less valuable than the crude bark from which they are derived, are duty-free, under par. 548 of the Tariff, as crude drugs "not advanced in value or condition by refining or grinding, or by other process, and not specially provided for."

Linoleum Industry in Germany.

Chamber of Com. J., March, 1902.

The capital invested in this industry, inclusive of debentures and mortgages, amounted, in 1899–1900, to 32,000,000 marks, the net profits to 875,000 marks, equal to a 4·3 per cent. return on the aggregate share capital of all enterprises. This unsatisfactory result is attributed to dearer linseed oil, jute, coal, labour, and to over production. Previous to 1898, four factories with 15,000,000 marks invested had a turnover of about 10,000,000 marks, but the present nine factories, with 32,000,000 marks, only had an aggregate turnover of 14,000,000 marks. The new tariff fixes high duties for the more important raw materials, whilst the duty on linoleum is lowered. The result will undoubtedly be competition of foreign makers on the German home markets, and a complete suspension of exports, foreign makers being able to produce more cheaply, because the German makers, using about 3½ million marks worth of imported raw materials per annum, would be burdened with about 400,000 marks more than the English factories. Apart from the capital invested, the existence of about 200 employees and 3,000 labourers is at stake, as well as orders to the amount of about 12,000,000 marks per annum placed with oil mills, jute factories, cork cutters, dye works, coal dealers, mould and machinery makers, &c. The German makers are now petitioning (1) that the duty on linseed (section 15) be lowered, also on linseed oil (section 164) as well as on jute fabrics; (2) to admit ochre, which does not occur in Germany in the required quality and colour, duty-free (section 327); to state clearly, as in the former tariff, that cork shavings are admitted "duty-free," as was apparently meditated in the project of, but is not clearly defined in, the new tariff (section 634 reading "cork in pieces or powder to pay three marks") which might be wrongly applied to the raw material employed in linoleum making; and, finally, that the duties on linoleums (section 508–510) be increased to 12, 18, and 54 marks respectively.

XVI.—SUGAR, STARCH, Etc.

Chicle Gum in Mexico.

Chem. and Druggist, March 8, 1902.

The *Achras Sapota*, known to the Maya Indians of Yucatan as "Ya," yields a milky sap, which exudes when wounds are made in the rough bark. It is found growing all over Yucatan, especially in the rich north-eastern and southern section of the peninsula. From May to June, bands of "chicleros" extract the gum from the tree, by cutting channels in the bark, down which the sap flows into receptacles below. These channels, if cut by unskilful hands, may not only fail to answer this purpose, but may ruin the tree. A healthy, well-grown tree may be tapped once every three years, but even then, and under expert handling, at least 15 per cent. of the trees die. Large tracts of sapota forests near Tuxpan, the original base of supply, have become of late years practically unavailable from this cause. The average tree will yield about 6 lb. of gum, but often tree after tree will be tapped and not yield enough to pay for the work. When the sap is collected, it is brought in pails to the central camp for boiling and moulding. First-class well-cooked chicle is nearly white when fresh and clean. Red gum is produced when the gum is over-cooked, though some trees yield a gum which has a distinctly red colour, even when well baked. The perfect chicle gum is tenacious, firm, aromatic, and very elastic. It is estimated that the production this season (1901) will reach 1,000,000 lb. During 1900, 900,000 lb. of chicle were exported from Mexican ports. Ninety-eight per cent. went to the United States; the remainder to France, England, and Germany.

Drawback on Exported Castor and Icing Sugars in the United Kingdom.

Bd. of Trade J., March 6, 1902.

According to a General Order (No. 12 of 1902) recently issued by the Commissioners of His Majesty's Customs, castor and icing sugars made in the United Kingdom from duty-paid foreign refined sugar may be exported on drawback, as well as those made from home-refined sugar, subject to compliance with the regulations as to shipment laid down by General Order, No. 65 of 1901.

Sugar from Holland: Countervailing Duty on, in British India.

Bd. of Trade J., March 13, 1902.

A Customs Circular (No. 5 of 1902), issued by the Finance and Commerce Department of the Government of India on 7th Feb. last, revises the rate of *additional* duty on bounty-fed sugar imported into India from Holland, with effect from March 1, 1902, as follows:—

Kinds of Sugar.	Additional Duties Levied.	
	Old Rate.	New Rate.
	R. a. p.	R. a. p.
Raw sugar produced in Holland from beet ..... per cwt.	0 15 3	0 14 0
Sugar refined from beet sugar produced in Holland.. per cwt.	1 1 5	0 15 11
Sugar refined from imported raw sugar ..... per cwt.	0 2 3*	0 1 11*

* In addition to countervailing duty, if any, on the raw sugar.

Sugar Valuation Tariff in Egypt.

Bd. of Trade J., March 6, 1902.

The Egyptian *Journal Officiel* contains the following Valuation Tariff* for imported sugars, which came into force on the 12th ult., and will remain in force for three months, or until denunciation:—

Kinds of Sugar.	Valuation per 100 Kilos.†
	Milliemes.‡
Crystallised or moist, in single or double bags (gross weight).	850
Powdered or centrifugal, in single or double bags (gross weight).	890
Crushed, in single or double bags (gross weight) .	930
Cubes, in boxes (net weight)	970
Loaves	1,050

* For particulars as to the nature of these Egyptian Valuation Tariffs, and as to the conditions under which they remain in force, see the *Board of Trade Journal* for the 19th December last, p. 551.
† Duty is levied on these valuations at the rate of 8 per cent.
‡ Milliemes of the Egyptian £, which = 17. 0s. 6*d.* sterling.

Sugar Production in Italy in 1901–2.

Bd. of Trade J., March 6, 1902.

According to the *Bollettino delle Finanze* of 16th ult., the production of sugar in Italy, during the sugar campaign of 1901–2, amounted to 754,900 quintals (76,600 tons), approximately.

Case Spirits: Tariff Amendment in Australia.

Bd. of Trade J., March 13, 1902.

The proviso respecting the mode of charging duty on case spirits has been amended, and reads as follows:—

"Case spirits, in cases of 2 galls. and under, to be charged as 2 galls.; over 2 galls., and not exceeding 3 galls., as 3 galls.; over 3 galls., and not exceeding 4 galls., as 4 galls.; and so on."

Sugars from Austria-Hungary: Countervailing Duties on, in the United States

Bd. of Trade J., March 13, 1902.

The following is a copy of a circular issued by the Treasury Department of the United States on the 30th Jan. last respecting the rates of the additional duties to be levied on sugars produced in Austria-Hungary.

"In pursuance of the provisions of section 5 of the Act of the 24th July, 1897, the following amounts of bounties

paid or bestowed by Austria-Hungary on the export of sugars are hereby declared for the assessment of additional duties, *viz.*:—

"1. On sugar under 99·3 per cent., and not less than 90 per cent. polarisation, 2·47 crowns per 100 kilos.

"2. On sugar of at least 99·3 per cent. polarisation, 3·55 crowns per 100 kilos.

"The liquidation of entries covering sugars produced in Austria-Hungary on or after 1st Aug., 1901, may be suspended until the next ascertainment and proclamation, under the provisions of the said section 5. The duties on such entries will be estimated on the basis of the bounties herein specified, and will be liquidated on the basis of the bounties to be declared hereafter."

According to the same circular, in the assessment of additional duty, under section 5 of the Tariff, the amount of such additional duty must equal the net amount of bounty paid on the merchandise imported, regardless of any change in its condition after exportation and prior to importation. Consequently, in order to ascertain the amount of bounty paid on a cargo of sugar, the weight upon which bounty was paid, and not the landed weight, must be taken as a basis. A difference between the exported weight and the landed weight is not *prima facie* evidence of the non-importation of the merchandise upon which the bounty was paid, and the burden of proof is on the importer to show that the amount of bounty estimated by the liquidating officer was not paid on the merchandise imported.

Sugar Conference at Brussels.

Parliamentary Paper, March 5, 1902.

(Despatch from the British Delegates inclosing Copy of the Convention signed on March 5, 1902.)

British Delegates to Sugar Conference to the Marquess of Lansdowne.

My Lord, Brussels, March 6, 1902.

We have the honour to inclose a copy and translation of the Convention relative to sugar, signed yesterday by the Delegates of Great Britain, Germany, Austria-Hungary, Belgium, Spain, France, Italy, the Netherlands, and Sweden.

We have, &c.

(Signed) E. C. H. Phipps.
H. W. Primrose.
H. G. Bergne.
A. A. Pearson.
E. C. Ozanne.

Inclosure.

His Majesty the German Emperor, King of Prussia, in the name of the German Empire; His Majesty the Emperor of Austria, King of Bohemia, &c., &c., and Apostolic King of Hungary; His Majesty the King of the Belgians; His Majesty the King of Spain, and, in his name, Her Majesty the Queen-Regent of the Kingdom; the President of the French Republic; His Majesty the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India; His Majesty the King of Italy; Her Majesty the Queen of the Netherlands; His Majesty the King of Sweden and Norway;

Desiring, on the one hand, to equalise the conditions of the competition between beet and cane sugar from various countries, and, on the other hand, to promote the consumption of sugar;

And considering that this twofold result cannot be attained otherwise than by the abolition of bounties, and by the limitation of the surtax;

Have resolved to conclude a Convention to this effect:

Article I.

The High Contracting Parties undertake to suppress, from the date of the coming into force of the present Convention, the direct and indirect bounties by which the production or export of sugar might benefit, and not to establish bounties of such a kind during the whole duration of the Convention. For the application of this provision, sugar products, such as preserves, chocolates, biscuits, condensed milk, and all other analogous products containing, in a notable proportion, sugar artificially incorporated, are assimilated to sugar.

The preceding paragraph applies to all advantages resulting directly or indirectly for the different categories of producers from the fiscal legislation of the States, including—

(*a.*) The direct bounties granted to exports;

(*b.*) The direct bounties granted to production;

(*c.*) Total or partial exemptions from taxation granted for a part of the manufactured output;

(*d.*) Advantages derived from excess of yield;

(*e.*) Advantages derived from the exaggeration of the drawback;

(*f.*) Advantages derived from any surtax in excess of the rate fixed by Article III.

Article II.

The High Contracting Parties engage to place in bond, under the permanent supervision, both by day and by night, of the Revenue officers, sugar factories and sugar refineries, as well as factories for the extraction of sugar from molasses.

For this purpose, factories shall be so arranged as to give every guarantee against any surreptitious carrying away of sugar, and the said officers shall have power to enter all parts of the factories.

Controlling books shall be kept in connection with one or more of the processes of manufacture, and finished sugars shall be placed in special storehouses giving all proper guarantees of security.

Article III.

The High Contracting Parties undertake to limit the surtax to a maximum of 6 fr. per 100 kilog. for refined sugar and assimilable sugars, and to a maximum of 5 fr. 50 c. for other sugars. The surtax is the difference between the rate of duty or taxation to which foreign sugars are subject and that imposed on the home product.

The provisions of this Article do not apply to the rates of import duty in the case of countries that do not produce sugar, nor do they apply to the by-products of sugar manufacture and refining.

Article IV.

The High Contracting Parties agree to impose a special duty on the importation into their respective territories of sugars from countries that grant bounties either on production or export.

This duty shall not be less than the amount of the bounties, direct or indirect, granted in the country of origin. The High Contracting Parties reserve to themselves, as far as each of them is concerned, the option to prohibit the importation of bountied sugars.

In order to calculate the amount of the advantage eventually derived from the surtax specified in paragraph (*f*) of Article I., the figure fixed by Article III. is deducted from the amount of this surtax; the half of the difference is considered to represent the bounty, and the Permanent Commission instituted by Article VII. will have the right, on the demand of a Contracting Party, to revise the figure thus fixed.

Article V.

The High Contracting Parties mutually undertake to admit at the lowest rate of import duty sugars of any of the contracting countries or of any Colonies or Possessions belonging to them that do not grant bounties and to which the obligations imposed by Article VIII. apply.

Cane and beet sugars shall not be subjected to different rates of duty.

Article VI.

Spain, Italy, and Sweden are exempt from the obligations imposed by Articles I., II., and III., so long as they do not export sugar.

These States engage to adapt their legislation in the matter of sugar to the provisions of the Convention within a year—or earlier if possible—from the time when the Permanent Commission notifies that the above-mentioned condition has ceased to exist.

Article VII.

The High Contracting Parties agree to establish a Permanent Commission charged with watching the execution of the provisions of the present Convention.

This Commission shall be composed of Delegates of the different Contracting Powers; a permanent Bureau will be connected with it. The Commission will elect its President; it will sit at Brussels, and will assemble at the summons of the President.

The duties of the Delegates will be—

(*a.*) To ascertain whether in the Contracting States any direct or indirect bounty is granted on the production or export of sugars.

(*b.*) To ascertain whether the States referred to in Article VI. continue to conform to the special condition laid down in that Article.

(*c.*) To ascertain whether any bounties exist in the non-signatory States, and to estimate the amount for the purposes of Article IV.

(*d.*) To pronounce an opinion on contested points.

(*e.*) To consider requests for admission to the union made by States not having taken part in the present Convention.

The permanent Bureau shall collect, translate, arrange, and publish information of all kinds respecting legislation on and statistics of sugar, not only in contracting countries, but in all other countries as well.

In order to insure the execution of the preceding provisions, the High Contracting Parties shall transmit, through the diplomatic channel to the Belgian Government, which shall forward them to the Commission, the Laws, Orders, and Regulations on the taxation of sugar which are or may be in force in their respective countries, as well as statistical information relative to the object of the present Convention.

Each of the High Contracting Parties may be represented on the Commission by a Delegate, or by a Delegate and Assistant Delegates.

Austria and Hungary shall be considered separately as Contracting Parties.

The first meeting of the Commission shall be held in Brussels, under the auspices of the Belgian Government, at least three months before the coming into force of the present Convention.

The Commission shall have only the duty of examination and report. It shall draw up a report on all questions submitted to it, and forward the same to the Belgian Government, which shall communicate it to the Powers interested, and, at the request of any one of the High Contracting Parties, shall convoke a Conference, which shall take such decisions or measures as circumstances demand.

The examinations and valuations referred to in paragraphs (*b*) and (*c*) will, however, be binding on the Contracting Powers; they will be determined by a majority vote—each Contracting Party having one vote—and they will take effect in two months' time at the latest. Should one of the Contracting Parties consider it necessary to appeal against a decision of the Commission, the said Party must, within eight days of the receipt of the said decision, require a fresh meeting of the Commission, which will hold a special meeting, and will pronounce its final decision within one month of the date of the appeal. The new decision shall take effect, at latest, within two months of its promulgation. The same course will be followed with regard to the consideration of demands for admission provided for in paragraph (*e*).

The expenses incurred on account of the establishment and working of the Permanent Bureau and of the Commission—excepting the salaries or expenses of the Delegates, who will be paid by their respective countries—shall be borne by all the Contracting States, and shall be divided among them in a manner to be determined by the Commission.

Article VIII.

The High Contracting Parties undertake for themselves and for their colonies or possessions, an exception being made in the case of the self-governing colonies of Great Britain and the British East Indies, to take the necessary measures to prevent bounty-fed sugars which have passed in transit through a contracting country from enjoying the advantages of the Convention on the market to which it is being forwarded. The Permanent Commission will make the necessary proposals with regard to this provision

Article IX.

States which are not parties to the present Convention will be admitted to adhere to it at their request, and after approval by the Permanent Commission.

The request shall be addressed through the diplomatic channel to the Belgian Government, who will undertake, should occasion arise, to notify the adhesion to all the other Governments. It will entail agreement to all the charges and admission to all the advantages stipulated by the present Convention, and will produce its effects from the 1st September following the despatch of the notification by the Belgian Government to the other Contracting States.

Article X.

The present Convention will come into force on the 1st September 1903.

It will remain in force for five years from that date, and in the case of any of the High Contracting Parties not having notified 12 months before the expiration of the said period of five years its intention of ceasing to abide by it, it will continue to remain in force for a year, and so on from year to year.

In the event of one of the Contracting Parties denouncing the Convention, such denunciation will only have effect on the Party in question; the other Parties will retain, until the 31st October of the year in which the denunciation is made, the right of notifying their intention of withdrawing on the 1st September of the succeeding year. If one of these latter Powers desires to withdraw, the Belgian Government will summon a Conference at Brussels within three months to decide upon the course to be taken.

Article XI.

The provisions of the present Convention will apply to the oversea provinces, Colonies, and foreign Possessions of the High Contracting Parties. The British and Dutch Colonies and Possessions are excepted, save as regards the provisions forming the subject of Articles V. and VIII.

The position of the British and Dutch Colonies and Possessions is, moreover, regulated by the Declarations inserted in the Final Protocol.

Article XII.

The fulfilment of the mutual engagements contained in the present Convention is subordinated as far as it is necessary to the completion of the formalities and requirements established by the Constitutional laws of each of the Contracting Parties.

The present Convention shall be ratified, and the ratifications shall be deposited at the Ministry of Foreign Affairs at Brussels on the 1st February 1903, or earlier if possible.

It is agreed that the present Convention shall only become binding if it is ratified at least by those of the Contracting Powers who are not included in the exceptional provision of Article VI. Should one or several of these Powers not have deposited their ratifications by the date mentioned, the Belgian Government shall immediately take steps to obtain a decision on the part of the other Signatory Powers as to whether the present Convention shall come into force among themselves.

In faith whereof the respective Plenipotentiaries have signed the present Convention.

Done at Brussels, in single copy, March 5, 1902.

(Signatures of the Plenipotentiaries follow.)

Final Protocol.

In proceeding to the signature of the Sugar Convention concluded this day between the Governments of Germany,

ustria-Hungary, Belgium, Spain, France, Great Britain, aly, the Netherlands, and Sweden, the undersigned lenipotentiaries have agreed as follows :—

As regards Article III.

Considering that the object of the surtax is the efficacious rotection of the market of each producing country, the igh Contracting Parties reserve to themselves the right, ach one as concerns itself, to propose an increase of the irtax, should considerable quantities of sugar from one of ie Contracting States find their way into their territories. his increase would only apply to sugars coming from iat State.

Such a proposal must be addressed to the Permanent ommission, which will decide, as quickly as possible, by majority vote, whether there is good ground for the roposed measure; as to the period for which it shall be nforced; and as to the extent of the increase; the latter hall not exceed 1 fr. per 100 kilos.

The assent of the Commission shall only be given when ie invasion of the market in question is the consequence f an actual economic inferiority, and not the result of a ictitious increase in price brought about by an agreement etween producers.

As regards Article XI.

(A.) 1. The Government of Great Britain declares that o bounty, direct or indirect, shall be granted to sugars of ie Crown Colonies during the duration of the Convention.

2. It also declares, as an exceptional measure, and eserving in principal entire liberty of action as regards the seal relations between the United Kingdom and its olonies and Possessions, that during the duration of ie Convention no preference will be granted in the United Kingdom to Colonial sugars as against sugars from any f the Contracting States.

3. It finally declares that the Convention shall, by its ntermediary, be submitted to the self-governing Colonies nd to the East Indies, so that they may have an opportunity f giving their adhesion to it.

It is understood that the Government of His Britannic Majesty has the power to adhere to the Convention on ehalf of the Crown Colonies.

(B.) The Government of the Netherlands declares that uring the duration of the Convention no bounty, direct r indirect, shall be granted to sugars from the Dutch Colonies, and that such sugars shall not be admitted into he Netherlands at a lower tariff than that applied to ugars from any of the Contracting States.

The present final Protocol, which will be ratified at the ame time as the Convention concluded this day, will be egarded as forming an integral part of the Convention, nd will have the same force, value, and duration.

In faith whereof the undersigned Plenipotentiaries have lrawn up the present Protocol.

Done at Brussels, the 5th March 1902.

(Signatures of the Plenipotentiaries follow.)

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt Industry of Denmark.

Bd. of Trade J., March 6, 1902.

The *Danish Export Review* for January, in an article on he malt industry of the country, notes that, in Denmark, nalt for brewing semi-fermented beer has been the object of manufacture ever since this beer was introduced, partly n malt-houses attached to the consuming breweries, partly by special malt manufacturers. Energetic efforts to produce a high-class quality of Danish barley, pre-eminently suitable for the manufacture of malt for lager beer has been attended with success; the extent of the Danish isles being very imited, their climate in a high degree participates in the nature of a sea climate, a very important agent in growing high-class barley for the above purpose, and the soil has proved to be exceedingly well adapted for this cereal.

On Lolland, Falster, Moen, Langeland, and various parts of Zealand and Jutland, barley of excellent quality is being raised, which meets with a ready market not only at home but also in Norway, Finland, and Germany.

The malt produced has proved of good quality, yielding a great amount of extract, and an ale, which will keep for a long time even under great climatic changes, and has, little by little, acquired a ready market in Denmark and neighbouring countries. To ports in transatlantic countries, such as, for instance, Brazil and Mexico, as well as to Australia and Japan, considerable quantities of Danish malt are annually exported for brewing lager beer, as well as for the light Pilsener beer, and a flourishing Danish industry has arisen in this branch of late years.

XVIII. A.—FOODS.

Beverages and Foodstuffs in Brazil.

Bd. of Trade Notice, March 4, 1902.

The Board of Trade are informed that, under a clause in the Brazilian Budget Law for the present year, all imported beverages and foodstuffs, without exception, must, before clearance through the Customs, be officially analysed. All such goods found to contain ingredients likely to be injurious to health, *e.g.*, boric or salicylic acid, alcohol of inferior quality, sulphuric and other free mineral acids, &c., in whatever quantity, will be condemned, the consignees being required to re-export the goods, or submit to their destruction by the authorities. In addition, when re-exportation is not effected, the consignee will be fined.

As the slightest trace of prohibited admixtures is sufficient to cause the condemnation of the articles containing them, even though present only as preservatives, or inseparable from their production, merchants and others should be on their guard against shipping on consignment to Brazil, any articles which may be liable to be challenged by the Analytical Department.

XVIII. B.—SANITATION.

Ozone for Sterilising Water in Germany.

Imp. Inst. J., March 1902.

Ozonised air has long been known to be a very efficient steriliser for water, although the dry gas has been found to possess little bactericidal power. Its use has, therefore, been suggested for the purification of potable waters, but the early experimental installations, which were erected at Blankenburg, Oudshorn, and Paris, are reported to have been abandoned, and, at present, the process is only known to be in operation at Lille in France, at Bole in Mexico, and at Moscow in Russia. The method is a simple one, but hitherto the cost has been a considerable factor against it. One of the London water companies is at present conducting experiments with a view to introducing the process here. Considerable interest, therefore, attaches to the publication of details regarding the working of the small experimental installation which was erected by Siemens and Halske, at Martinikenfelde, near Berlin, in 1898.

The ozonisers employed here are of the Siemens and Halske plate and tube type, and yield from 20 to 25 grms. of ozone per E.H.P. hour, with an E.M.F. of 12,000 volts. Air is first forced through a drying chamber, and then passes into the ozonisers, on leaving which it contains from 2·5 to 3 grms. of ozone per cubic metre. It is then led to the base of the sterilising tower, a square structure packed with flints, and as it rises through these, it meets a descending stream of the water to be sterilised, which has undergone preliminary filtration through sand. The plant in question is capable of treating 240 cb. m. of water in 24 hours (1 cb. m. is equal to about 220 gallons), and the results of the exposure to ozonised air will be seen from the following tests made with water from the River Spree. With a consumption of 2 grms. of ozone per cubic metre of water, the number of bacteria per cubic centimetre was reduced from 600,000 to 10; the permanganate absorption figure was diminished by 18 per cent., and the aëration of the water was increased from 10 to 12 per cent.

The capital outlay for an installation capable of treating 150 cb. m. of water per hour is estimated to be 6,750*l.*, of which total the ozonisers and sterilising tower absorb 3,750*l.* The actual cost of treatment for a plant of this size is given as 1·726 pfg. per cubic metre, and the total cost, including

interest and depreciation, amounts to 5·031 pfg. per cubic metre, the latter figure being equivalent to about 1*l.* per million gallons.

In addition it may be noted that Siemens and Halske have recently patented a method of clearing turbid water by the combined action of ozone and iron.

XIX.—PAPER, PASTEBOARD, Etc.

Hand made Printing Paper : Customs Decision (United States).

Bd. of Trade J., March 6, 1902.

Hand-made printing paper is dutiable as hand-made paper, under par. 401 of the Tariff, and not as printing paper, under par. 396.

Printing Paper in Canada.

Bd. of Trade J., March 13, 1902.

The Official Gazette contains an Order in Council, dated 11th Feb, 1902, reducing, under the provisions of sub-section 3 of section 18 of "The Customs Tariff, 1897," the Customs import duty on news printing paper in sheets and rolls, including all printing paper valued at not more than 2¼ cents per lb., from 25 per cent. *ad val.* to 15 per cent. *ad val.*

[*Note.*—If the "printing paper" so imported enjoys the benefits of the British Preferential Tariff Act, a further reduction of one-third of the duty is allowed.]

XX.—FINE CHEMICALS, Etc.

Export of Tartaric Material from Italy from October 1, 1900, to September 30, 1901.

Foreign Office Annual Series, No. 2744.

Articles.	To	Quantity.	Total.	Value.
		Tons.	Tons.	£
1. Half refined tartar.	United States.....	5		
	United Kingdom	154		
	Germany	323		
	France	121		
	Austria-Hungary, &c.	244		
			847	49,000
2. Vinaccia argols.	United States	755		
	United Kingdom	200		
	Austria-Hungary, &c.	1,372		
			2,327	123,000
3. Crude argols	United States.....	1,637		
	United Kingdom	27		
	Germany	185		
	Austria-Hungary, &c.	361		
			2,210	94,000
4. Wine lees ...	United States..... ..	188		
	Austria-Hungary, &c.	1,616		
			1,804	26,000
	Total	..	7,188	292,000

Dentists' Cement: Customs Decision (United States).

Bd. of Trade J., March 6, 1902.

"*Formagen*," consisting of two separate compounds, one a powder, and the other a mixture of formaldehyde, oil of cloves, and creosote, designed to be used together, and known commercially as "*dentists' cement*," is dutiable at the rate of 20 per cent. *ad val.*, under par. 89 of the Tariff, as "other cement."

A compound of formaldehyde, oil of cloves, and creosote, intended for use as an ingredient in "*dentists' cement*," and also serving as an antiseptic, is, if separately imported, dutiable, under par. 68, as a non-alcoholic medicinal preparation, at the rate of 25 per cent. *ad val.*

Citrate of Lime and Concentrated Lime Juice in the West Indies.

F. Watts. West Indian Bull., 2, [1], 308—318.

The author discusses the advantages of citrate of lime over concentrated lime juice as a material for export, and states that the former has entirely superseded the latter in shipments from Palermo. For the manufacturer of citric acid, citrate of lime possesses the following advantages over the concentrated lime juice. It can be stored without loss, while juice is liable to leak from the casks; the first stage of the manufacture of the acid has been already completed and there will consequently be a considerable economy of space and of labour; the citrate is purer than the concentrated juice, and the crude citric acid first obtained therefore needs less refining, which means a further saving both of labour and material. In view of these facts, it is highly probable that well-prepared citrate of lime will supersede concentrated lime juice as the raw material for the manufacture of citric acid. The market value of citrate of lime is now about the same as that of the concentrated juice, and it is probable that, for West Indian producers, as matters stand at present, citrate will prove more expensive in preparation than concentrated juice, as the cost of erecting steam-heating apparatus and drying chambers, and of importing and transporting lime or chalk will more than counterbalance the saving of fuel, the reduction in cost of packages, and the saving of the acid destroyed in the process of concentration. It must be borne in mind, however, that the production of citrate is making steady headway in Italy and Sicily, the principal sources of supply, and it is highly probable that when citrate of uniform and dependable quality comes steadily on the market, it will begin to command higher prices than concentrated juice. The exports of citrate of lime and of concentrated lime juice from Messina and Catania have recently been as follows:—

Dec. 1, 1899, to Sept. 30, 1900:—	Pipes.
Concentrated juice.....	1,671
Citrate of lime, 635½ tons, equivalent to	2,085
Total	3,756

Dec. 1, 1900, to Sept. 30, 1901:—	Pipes.
Concentrated juice.....	549
Citrate of lime, 590½ tons	1,969
Total	2,518

—A. S.

Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

5433. D. Jacob and T. Kirk, jun. An improved appliance for cleaning or removing scale from boiler tubes. March 5.

5493. V. Krafft. Improvements in or relating to air or gas compressors. March 5.

5546. A. E. Hulbert. Improvements in connection with lids of retort mouthpieces for gas-producing pipes. March 6.

6014. P. M. Parouty and E. Delbende. *See* Class XVII.

6051. J. G. Graham. *See* Class VII.

6285. O. Löffler. An improvement in filters. March 14.

6362. J. M. Adam. Improvements in and relating to centrifugal separating apparatus. March 15.

6380. A. Merckx. An improved device for the drums of centrifugal separators. Complete Specification. March 15.

Complete Specifications Accepted.*

1901.

5509. R. Axer. Drying kilns. March 12.

7186. S. C. Early. Refrigerating apparatus. March 12.

26,667. H. Duncan, R. R. Sherriff, and The Gold Recovery from Slimes Syndicate, Ltd. Apparatus for separating liquids from solids. March 12.

1902.

312. C. A. Hult and O. W. Hult. Centrifugal apparatus. March 12.

728. W. Ingham and B. Langton. Bottom for Hoffmann iln. March 19.

940. C. W. Vollmann. Freezing apparatus. March 19.

2113. W. Kronheim. Construction of drying apparatus. March 19.

II.—FUEL, GAS, AND LIGHT

Applications.

5260. W. T. Stainton. The application of oxygen gas O. or ventilating purposes. March 3.

5326. G. J. Stock and A. Putnam. The treatment of ases for furnace combustion. March 4.

5424. P. Gilgan. Improvements in automatic acetylene as generators. March 4.

5905. E. Springhorn. Improvements in and relating to e manufacture of peat fuel. March 10.

5912. W. M. Simpson. Improvements in Bunsen burners r use with liquid fuel. March 11.

5954. T. H. Lewis. Improvements in carbide of calcium rtridges. March 11.

6153. E. K. Carmichael and C. A. Sahlström. The eatment of peat for the production of fuel, and utilisation the bye-products obtained. March 13.

6167. F. McNamee. Improvements in artificial fuel and e like. March 13.

6178. W. A. Sims.—From F. L. H. Sims, Canada. The he acetylene gas machine. March 13.

6179. C. J. Sutton and J. Rudd. Improvements in or lating to apparatus for preventing shock to incandescent as mantles. March 13.

6200. J. Fielding. Improvements in gas producers. arch 13.

6221. Jean Baptiste Macquet. An improved acetylene nerator. Complete Specification. Filed March 13. Date plied for Sept. 13, 1901, being date of application in rance.

6291. C. F. Brodin and H. A. Schepeler. Improved vice for feeding acetylene gas generators. Complete ecification. March 14.

6314. Falk, Stadelmann, and Co., Ltd. From A. Barella, ermany. Improvements in the manufacture of incan- scent mantles. March 14.

Complete Specifications Accepted.

1901.

4707. W. K. L. Dickson. Incandescent gas mantles. arch 12.

4828. E. A. Le Sueur. Process and apparatus for parating fluids rich in oxygen from air. March 12.

4830. A. E. Tucker and C. Cory. Manufacture of ificial fuel. March 12.

7715. W. P. Thompson. Obtaining and utilising hydro- rburetted air, and apparatus therefor. March 19.

8449. L. Mond. Gas producers. March 12.

9733. W. K. Dickson. Mantles for incandescent gas hting. March 12.

24,218. J. L. Muller and J. Bonnet. Machines for the nufacture of mantles employed in incandescent lighting. arch 12.

26,103. W. T. Lancaster. Inclined retorts of gas-pro- cers. March 19.

26,330. B. J. B. Mills.—From J. R. Taylor, United tes. Process and apparatus for generating producer gas. arch 19.

1902.

51. O. H. Bayldon and H. E. Morriss. Generators of s from petroleum or paraffin oil, and means for consum- same for heating purposes. March 12.

384. S. Pergeline. Manufacture of smokeless coal cks. March 12.

2851. G. V. Foster and E. F. Mackusick. Acetylene gas generators. March 12.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

5482. A. B. F. Ludwig. Process and apparatus for melting coal. March 5.

IV.—COLOURING MATTERS AND DYESTUFFS.

Applications.

5277. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Improved process for reducing indigo. March 3.

5638. I. Levinstein, J. L. Rose, and Levinstein, Ltd. Manufacture of new dis-azo dyestuffs for wool. March 7.

5895. O. Imray.—From The Society of Chemical Industry in Basle, Switzerland. Manufacture of substantive azo-dyestuffs. Complete Specification. March 10.

7194. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters of the anthracene series. March 12.

Complete Specifications Accepted.

1901.

8924. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture and production of anthracene derivatives. March 19.

12,578. T. R. Shillito.—From The Aniline Colour and Extract Works, formerly J. R. Geigy, Switzerland. New sulpho acids and sulphur dyestuffs. March 12.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

5508. P. P. Faure. Improved method of and apparatus for decorticating ramie and other textile plants and leaves. Complete Specification. Filed March 5. Date applied for Oct. 17, 1901, being date of application in France.

5921. F. Milan. Improved machine for dyeing, mordanting, scouring or washing off and drying or extracting moisture or superfluous liquor from hair or skin mats, rugs, and analogous skin, hair, or pile goods. March 11.

6322. W. H. Perkin, Junior, and Whipp Bros. and Tod, Ltd. Improvements in the treatment of raw cotton and cotton goods, to reduce the inflammability thereof. March 14.

6323. W. H. Perkin, Junior, and Whipp Bros. and Tod, Ltd. Improvements in the treatment of raw cotton and cotton goods, to reduce the inflammability thereof. March 14.

6421. W. H. Perkin, Junior, and Whipp Bros. and Tod, Ltd. Improvements in the treatment of raw cotton and cotton goods to reduce the inflammability thereof. March 15.

Complete Specifications Accepted.

1901.

5076. J. E. Bousfield, of the Firm of G. F. Redfern and Co.—From La Société Anonyme de Produits Chimiques de Droogenbosch, Belgium. Treatment of nitrocellulose to be used for the manufacture of lustrous yarns. March 12.

4441. J. A. Sackville. Apparatus for use in the bleaching, dyeing, drying, and like treatment of textile fabrics, especially fabrics having a pile. March 12.

5326. F. Moll and M. Dickhuth. Washing and bleaching processes. March 19.

5655. F. T. Könitzer. Centrifugal machines for dyeing purposes. March 12.

13,375. O. Imray.—From The Firm of C. Roesch et Cie., Germany. Apparatus for bleaching, dyeing, washing, and otherwise treating fibres, filaments, and woven fabrics by means of circulating liquids. March 12.

18,561. H. Ryder. Manilla rope. March 19.

20,401. A. Barraclough and H. Barraclough. Manufacture of textile fabrics. March 19.

26,155. O. Imray.—From the Firm of C. Roesch et Cie., Germany. Apparatus for treating fibres, fabrics, or the like with bleaching, dyeing, or like liquors. March 12.

VII.—ACIDS, ALKALIS, AND SALTS.

Applications.

5371. A. H. Godwin, J. Dougall, and F. A. Keil. A new or improved apparatus for the extraction of the cyanogen group contained in the spent or waste gases given off in the saturator in the process of manufacturing sulphate of ammonia. March 4.

5559. J. O. O'Brien. From L. Palestini, Italy. Process for the chemical treatment of leucite and material containing the same. March 6.

6051. J. G. Graham. Improvements in apparatus for breaking up, mixing, and condensing gases in the manufacture of acids, especially sulphuric acid. March 12.

6132. W. L. Wise.—From C. H. Honan, Norway. Improvements in the treatment of silicates of alumina. March 12.

6145. E. Naumann. Treatment of natural soda for rendering possible the production of sodium carbonate from the same, entirely free from the discolouring substances contained in the raw material. Complete Specification. March 12.

6169. F. Winkler. Process for the production of fine soda. March 13.

6259. W. Garroway. Improvements in the manufacture of sulphuric acid. March 14.

Complete Specifications Accepted.

1901.

7932. J. Hargreaves. Treating and obtaining metallic chlorides and oxides. March 19.

8257. G. W. Johnson.—From The Stassfurter Chemische Fabrik vormals Vorster und Grüneberg, Germany. Purification of potassium cyanide. March 12.

1902.

2260. C. M. Hall. Manufacture of alumina. March 19.

2379. A. Zanner. Apparatus for concentrating sulphuric acid. March 12.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

5242. R. Zsigmondy. A process for producing pure gold-ruby glass for pressed, blown, and moulded glasswares. March 3.

6228. L. Rembaux. Improvements in or connected with tables for the manufacture of plate or sheet glass. Complete Specification. March 13.

6381. E. de France. An improved kiln for firing ceramic ware. March 15.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

5392. J. H. McLean. Improvements in the production of artifical blocks and slabs. March 4.

5710. O. H. Anderson. Improvements in the manufacture of artificial stone or brick and the preparation of lime therefor. March 7.

5835. T. Ryan. Improvements in and appertaining to the manufacture of materials for asphaltic pavements and the like. March 10.

5898. H. Schön and B. Krieger. Improvements in connection with the manufacture of artificial stone. March 10.

6032. A. Bremer. Improvements in fireproof ceilings or floors. Complete Specification. March 11.

6127. E. Dubois and O. Chatel. Artificial marble. March 12.

6368. A. Speck. Improvement in asphalt plate paving. March 15.

6378. G. P. Wallis. Improvements in steaming chambers for the production of artificial stone and the like. March 15.

6400. G. F. Thomson. Improvements in the manufacture of artificial stone and in apparatus therefor. March 15.

Complete Specifications Accepted.

1901.

6623. I. Isserliss. Lime, cement, and like kilns. March 19.

6800. G. Butchard. Apparatus for the manufacture of cement. March 19.

8556. G. Weber. Production of imitations of stone. March 19.

10,857. A. M. Clark.—From The Firm of Fellner and Ziegler, Germany. Apparatus for the manufacture of cement and the like. March 19.

12,272. H. H. Lake.—From The Firm of Fried, Krupp, and Grusonwerk, Germany. Manufacture of artificial stone blocks, slabs, and the like. March 12.

18,163. W. Schwarz. Machine for preparing materials for the manufacture of artificial stone. March 12.

25,239. C. Heap and T. Oddy. Manufacture of Portland slag cement and hydraulic lime. March 19.

X.—METALLURGY.

Applications.

5473. H. R. Angel. Improvements in the concentration of zinc from slags and ores. March 5.

5487. D. Guillod. Improvements in or relating to the treatment of sulphide ores. March 5.

5506. B. Debey. Improvements in hardening, tempering, or toughening iron and steel. March 5.

5525. H. R. Betinger. A process for the treatment of residue and low grade ores containing copper, tin, and other metals. March 5.

5604. R. A. Hadfield. Improvements in the toughening of manganese steel. March 6.

5796. W. White, jun. Improvements in the manufacture of steel. Complete Specification. March 8.

5860. W. Galbraith. Improvements in the manufacture of steel. March 10.

6095. C. Wilmotte and M. Goddyn. Improvements in the manufacture of iron and steel. Complete Specification. March 12.

6310. W. P. Thompson.—From T. Ulke, Canada. Improvements in the refining of composite metals. Complete Specification. March 14.

Complete Specifications Accepted.

1900.

21,623. H. W. Wallis. Treatment of ores. March 12.

1901.

6090. R. A. Hadfield. Manufacture of Steel. March 19.

26,667. H. Duncan, R. R. Sheriff, and the Gold Recovery from Slimes Syndicate, Ltd. *See* Class I.

1902.

898. T. Stapf. Blast furnaces. 12 March.

1003. L. Lincoln, D. B. Lincoln, and C. S. Gooding. Process of and apparatus for drawing off molten metal from cupolas, blast furnaces, and the like. March 19.

2115. G. Kolb. Composition for hardening steel. March 19.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

366. J. E. G. Méran. Improvements relating to electric accumulators. Complete Specification. March 4.

5538. The Calico Printers' Association, Ltd., and W. Cotsworth. Improvements in apparatus for the electro-deposition of metals. March 6.

5715. P. A. Guye. Improvements relating to electrolytic cells. March 7.

6304. Accumulator Industries, Ltd., and J. J. H. Hunte. Improvements in and relating to the manufacture of electric accumulator plates. March 14.

Complete Specifications Accepted.

1901.

5265. J. F. Webb and J. E. Lilley and J. Chapman. Recovery of precious metals by electrolysis. March 12.

9187. C. P. Elieson and V. de Bobinsky. Electrical accumulators. March 12.

XII.—FATS, OILS, and SOAP.

Complete Specifications Accepted.

1901.

9039. J. Hogarth. *See* Class XVIII. A.

1902.

1430. A. J. Boult.—From L. B. Lehmann, Germany. Apparatus for use in the manufacture or treatment of soap or other plastic composition. March 12.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

5357. S. J. von Romocki. Improvements in and relating to the devulcanisation of india-rubber. March 4.

5402. E. H. Strange, E. Graham, and E. R. Burrell. Improvements in the manufacture of varnishes. March 4.

5403. E. H. Strange, E. Graham, and E. R. Burrell. Improvements in the manufacture of varnishes. March 4.

5404. E. H. Strange, E. Graham, and E. R. Burrell. Improvements in the manufacture of varnishes. March 4.

5637. C. J. Charlier. Improvements in the manufacture of lead pigments and lead or other metallic compounds and in apparatus therefor, also suitable for aerating or saturating liquids with gases. March 7.

5787. J. H. W. Stringfellow. Improved varnish for metals and similar materials. March 8.

Complete Specifications Accepted.

1901.

4702. E. Hecht and G. Poulenc. Process for the manufacture of lacquers and varnishes. March 12.

4803. O. F. J. Duwez. Process for the devulcanisation of india-rubber. March 12.

9920. J. Thame and The South-Western Rubber Company, Ltd. Treatment of crude rubber. March 19.

21,914. T. A. Cunningham. New protective composition paint. March 19.

24,590. A. Gentzsch. Manufacture of a substitute for gutta-percha. March 19.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

Application.

5470. C. Dreher. Improved process for producing fast colours upon leather by the employment of titanium salts and mordant colours. March 5.

Complete Specification Accepted.

1901.

26,261. T. C. Fawley. Method of and means for preparing and tanning hides and the like, applicable also to dyeing and analogous purposes. March 19.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

5303. M. Henius. Improvements in or relating to brewing. March 3.

5794. E. Gillaume. Improvements in processes for purifying phlegms, wines, fermented wort, and dilute alcoholic liquids generally and apparatus thereof. March 8.

6014. P. M. Parouty and E. Delbende. Improvements in distilling apparatus. March 11.

Complete Specifications Accepted.

1901.

4943. H. A. Hobson and The Concentrated Beer Company, Ltd. Brewing. March 19.

7131. L. Briant, The Conversion Company (Billing's Machinery and Process), Ltd., and H. C. Rigaud. Manufacture of beer. March 12.

9357. F. G. Riley. Mash tuns for brewing purposes and boiling liquids by steam. March 19.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

6303. W. McDonnell. Improvement in edible compounds of the nature of butter. March 14.

6305. G. Eichelbaum. Improvements in and relating to meat extracts. March 14.

B.—Sanitation; Water Purification.

5260. W. T. Stainton. *See* Class II.

5847. T. Melvin and J. H. Muir. Improved automatic alternating valves and valve gear for the bacteriological treatment of sewage or other liquid refuse. Complete Specification. March 10.

6021. R. England. A method of treating sewage sludge for the production of manure. March 11.

C.—Disinfectants.

5238. T. Unsworth and J. P. Miller. Improvements in disinfecting and deodorising compositions, and in their application. March 3.

5360. R. H. Page. Improvements in antiseptic compounds, and methods of producing the same. Complete Specification. March 4.

Complete Specifications Accepted.

A.—Foods.

1901.

3043. P. G. Richter. Preserved food products, and process of preparing same. Feb. 12.

9039. J. Hogarth. Treatment of alimentary substances and beverages, oils, and other oxidisable materials. March 19.

9648. A. E. Cressall. Food preparations. March 19.

1902.

648. J. Sutter-Collin. Processes of preparing condensed milk. March 19.

XIX.—PAPER, PASTEBOARD, Etc.

Application.

5870. R. C. Wild. Improvements in the treatment of vellum, parchment, vegetable parchment, and similar materials. March 10.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

8063. A. Browne.—From J. B. G. Bonnaud, Belgium. Treatment of nitro-cellulose for various useful purposes. March 12.

11,453. H. H. Lake.—From F. B. How, United States. Apparatus for making carbon paper. March 12.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

APPLICATIONS.

5293. K. A. F. Lingner. Manufacture of and relating to a menthol derivative. Complete Specification. Filed March 3. Dated applied for, March 8, 1901, being date of application in Belgium.

6065. S. A. Jackson and A. J. Pennington. Improvements in the process of manufacturing or purifying saccharine. March 12.

XXI.—PHOTOGRAPHY.

APPLICATION.

5884. H. Perrin. Improvement in processes for producing enamelled polychrome photographs and artistic stained glass and other like decorations. March 10.

XXII.—EXPLOSIVES, MATCHES, ETC.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

10,994. A. J. Boult.—From F. Säfström, Sweden. Ignition composition for matches. March 19.

1902.

1074. A. Purgotti and L. Purgotti. Process for manufacturing non-poisonous mixtures for matches of every description, ignitable on any surface. March 12.

Printed and Published by EYRE and SPOTTISWOODE, East Harding Street, London, E.C., for the Society of Chemical Industry.—F 4379.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 7.—Vol. XXI. APRIL 15, 1902. No. 7.—Vol. XXI.

Subscription of Members 25/- per annum ;
Entrance Fee 21/- ;
Election by the Council.

Price to Non-Members 36/- per annum ;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each ; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents :

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President : Ivan Levinstein.

Vice-Presidents :

George Beilby. | J. M. C. Paton.
Forbes Carpenter. | Dr. Boverton Redwood.
C. F. Chandler, D.Sc., LL.D., Ph.D., LL.D. | Walter F. Reid.
A. Gordon Salamon.
G. G. Henderson, D.Sc. | Dr. Jos. W. Swan, F.R.S.
R. Messel. | R. C. Woodcock.

Ordinary Members of Council :

A. Bretherton, M.P. | David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Horace Carey. | Max Muspratt.
Edw. Divers, F.R.S. | Dr. F. B. Power.
Jos. Fairley. | Dr. W. S. Squire.
W. R. E. Hodgkinson, Ph.D. | Thos. Tyrer.
Grant Hooper.

Sectional Chairmen and Secretaries.

CANADIAN.
W. R. Lang. | Alfred Burton.

LIVERPOOL.
Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Ivo Hehner. | A. R. Ling.

MANCHESTER.
J. Grossmann. | J. Carter Bell.

NEWCASTLE.
L. Rennoldson. | P. C. Garrett.

NEW YORK.
Herd Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
Archbutt. | J. T. Wood.

SCOTTISH.
Robert Pullar. | Dr. Thos. Gray.

YORKSHIRE.
George Ward. | Prof. H. R. Procter.

Honorary Treasurer :
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary :
Dr. Ludwig Mond, F.R.S.

General Secretary : Charles G. Cresswell.

Offices : Palace Chambers, 9, Bridge Street, Westminster, S.W.
Telegraphic Address : 59, Palatable, London.

THE JOURNAL.

Publication Committee :

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor :

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors :

Robt. Adams ..... I., XV.
L. Archbutt. I., XII., XVIII. B.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. .... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw .... VII., XI.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. .. IV., XX.
F. H. Leeds .. III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .. XXII.
W. G. McMillan X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. .... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ... IV., V.
F. Neurath, Ph.D. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann..... XVI., XVII.
H. S. L. Polak .... Patent List.
T. H. Pope ..... XX., XXI.
F. W. Renaut ..... Index.
G. H. Robertson ..... XI.
Chas. Salter..... I., II., III., XV., XVI.
M. J. Salter..... XIII.
R. Saudon..... II.
J. Shields, D.Sc., Ph.D. XI
A. Shonk ..... Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
A. L. Stern, D.Sc. ..... XVII.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer..... XX.
L. J. de Whalley, B.Sc. .. XVI.
E. W. Wheelwright, Ph.D. ..... XXII.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.
A. C. Wright, B.Sc., M.A... IV., XVIII., XX.

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. .....
.....

And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate.....

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....

Profession or Business Occupation .....

Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have now submitted their report, prescribing a method for dealing with the various substances which might contain Arsenic, and the report has been accepted by the Council.

Copies of this, together with the papers, discussions, and abstracts which appeared in the Journal in 1901, and other extracts, may be obtained from Messrs. Eyre and Spottiswoode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held on July 9th, 10th, and 11th next in Liverpool. Full particulars will appear in a subsequent issue.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Binney, Harold, l/o Nassau Street; Washington Life Building, 141, Broadway, New York City, U.S.A.

Carey, Arthur, l/o Gateacre; 1, Grassendale Road, Cressington, near Liverpool.

Goodchild, W. H., l/o Cronch End; Elmwood Lodge, Long Lane, Finchley.

Gray, Dr. Thos.; Journals to 204, George Street, Glasgow. Sectional copy as before.

Holden, A. N. (*not* A. A.); Journals to c/o Hardman and Holden, Ltd., Miles Platting, Manchester.

Huxley, Jas. H.; Journals to c/o Vickers, Son, and Maxim, Ltd., River Don Works, Sheffield.

Jackson, Alf. Geo.; Journals to George Street, Brisbane, Queensland, Electro-chemical Engineer.

Job, Robt., l/o North 6th Street; 109, Windsor Street, Reading, Pa., U.S.A.

Kellner, Dr. Wm., l/o 13; 135, Victoria Road, Old Charlton, Kent.

Kirkpatrick, S. F., l/o California; 96, Barrie Street, Kingston, Ont., Canada.

Lazell, E. W., l/o Stephen Girard Building; 1715, South Pennsylvania Square, Philadelphia, Pa., U.S.A.

Levinstein, Ivan; Journals to Hawkesmoor, Fallowfield, Manchester.

Little, J. G., l/o London; Panulcillo, Coquimbo, Chile.

Noyes, Henry; subscriptions, c/o J. C. Lanyon and Sons, Gresham House, Old Broad Street, E.C.; Journals as before.

Smith, Francis P., l/o San Francisco; 119–121, Elizabeth Street, New York City, U.S.A.

Spoor, J. L., l/o Gravesend; Rede Court, Rochester, Kent.

Steel, R. Elliot; Journals to 38, East Park Parade, Northampton.

Sutro, H. H., l/o West 49th Street; Sherman Square Hotel, Broadway and 71st Street, New York City, U.S.A.

Trantom, Dr. Wm., l/o Hull; 10, Field Road, New Brighton, Cheshire.

Wallan, E. C., l/o Long Island City; 646, West End Avenue, New York City, U.S.A.

Weigall, A. R., l/o Pahang; No. 70 C., Settlement, Yokohama, Japan.

White, A. Dowler, l/o West Drayton; 65, Deodar Road, Putney, S.W.

Wingate, Hamilton M., l/o New Zealand; retain Journals until further notice.

Death.

Cotterill, Thos., The Poplars, West Bromwich. March 23.

Canadian Section.

Meeting held on Thursday, March 6th, 1902.

PROF. W. R. LANG IN THE CHAIR.

ELECTROLYTIC MANUFACTURE OF CAUSTIC SODA AND BLEACHING POWDER AT SAULT STE. MARIE, ONTARIO.

BY H. E. F. RHODIN.

The water power developed at Sault Ste. Marie, where the St. Mary's river has a fall of 19 ft., is at the present moment being used in connection with the operation of a great many industries, of which the electrolytic manufacture of caustic soda and bleaching powder, although at present the smallest one actually in operation at Sault Ste. Marie, is destined to become an important factor amongst the industries of Canada.

As is well known, the electrolytic manufacture of caustic soda and bleaching powder is carried out by the decomposition of common salt by means of the electric current. A great many different processes and forms of apparatus are, at the present moment, in use, and it seems almost certain that the electrolytic production of these commodities will in time supersede the chemical manufacture of them, at least in countries where water power exists and can be developed cheaply.

The process employed at Sault Ste. Marie is what is known as a mercury cathode process. The electrolytic cell itself is a circular vessel of vitrified earthenware, of a peculiar design. The bottom surface of this cell has a number of depending openings, and the top surface also has openings corresponding to those on the bottom surface. The appearance of the cell resembles that of a wheel, the openings above referred to corresponding to the spaces between the spokes. With a view of strengthening the resemblance mentioned, it will have to be supposed that the width of the spokes of a wheel be equal to the distance between them. The anodes consist of carbon blocks, which fit into the openings of the top surface of the electrolytic cell. Into these carbon blocks there are fitted, by means of a screw thread combination, a number of carbon rods, which hang downwards into the openings of the bottom surface of the cell. It will be understood that, when these anodes are placed in position, the top surface of the cell is closed and, of course, made tight by means of a special cement. Now this electrolytic cell is suspended inside a shallow cast-iron dish, the diameter of which is 5 ft. The bottom of this cast-iron vessel is covered with a layer of mercury, which layer of mercury seals the interior of the electrolytic cell from the annular space of the cast-iron vessel surrounding the cell itself. The cell is suspended by means of a vitrified earthenware pipe, which is bolted to a circular flange, of the same diameter as the pipe, in the centre of the top surface of the cell. When the electrolytic cell is in operation it is, of course, filled with brine, whilst the annular space of the cast-iron vessel is filled with water. It will be understood that the mercury on the bottom of the cast-iron vessel forms a seal between the brine and the water, and prevents communication between these liquids. The carbon anodes are connected up to a metallic ring contact, which is connected to the positive pole of a dynamo, whilst the cast-iron vessel is connected to the negative pole of the dynamo. When the current is on, the electrolytic cell itself is being rotated inside the cast-iron vessel, the brine is being decomposed, the chlorine going off at the surface of the brine through the pipe by means of which the cell is suspended, and the sodium depositing on the mercury inside each opening of the bottom surface of the cell. The mercury, through the rotation of the cell, and through the depending flanges dipping into it, is being put into motion towards the periphery of the cast-iron vessel, which motion is greatly accelerated by radial ribs placed on the bottom of the cast-iron dish. It will consequently be seen that the mercury, after having received a certain quantity of sodium, and having amalgamated with it inside the openings of the electrolytic cell above referred to, is being continuously thrown out into the annular space of the cast-iron dish which contains water, with which the sodium contained in the mercury amalgam reacts into sodium hydrate and hydrogen. The very essence of a mercury cathode cell is to remove the mercury amalgam from the actual field of decomposition as soon as it is formed, afterwards to extract the sodium from the amalgam, and again to have the mercury ready to amalgamate with more sodium.

The above description of the cell in use at Sault Ste. Marie clearly shows how the mercury at first is amalgamated with the sodium, and is afterwards put in motion towards the combining space, where the sodium hydrate is formed. When the mercury amalgam leaves the openings of the electrolytic cell, fresh mercury is always ready to enter the actual field of decomposition. The mercury amalgam, on its journey towards the annular space, is somewhat lighter than pure mercury, on account of its contents of sodium, and consequently remains on the surface of the total body of mercury in the annular space. As the sodium is being extracted from the amalgam, the mercury becomes pure and sinks to the bottom, whilst fresh amalgam is continuously being supplied on the surface. The mercury, just relieved of its contents of sodium owing to the motion imparted to same, travels towards the centre of the cast-iron vessel, between the ribs of the bottom of the vessel, and, after a little while, it is again amalgamated with sodium in the actual field of decomposition, which, in this case, is constituted by the openings of the bottom surface of the electrolytic cell.

This brief description is intended to illustrate the mercury's capacity as the amalgam conveyer in the cell, *i.e.*, its continuous amalgamation with sodium, its continuous giving up of sodium, and its continuous readiness to be again amalgamated with sodium.

With a view of making the operation of the cell continuous, there must be a constant supply of brine into the actual field of decomposition, and also a continuous drawing off of the sodium hydrate solution formed. The latter factor is a very simple matter. At the surface of the water in the annular space of the cast-iron vessel there is a draw-off pipe. When the sodium hydrate solution reaches a desired strength, the draw-off pipe is opened, and the sodium hydrate solution runs out, whilst a corresponding quantity of water is being fed in through a supply pipe. A constant supply of strong brine is a very difficult matter, and of utmost importance to the successful working of an electrolytic process. In the cell employed at Sault Ste. Marie, there is, in the centre of same, provided a cup or receptacle, which receives the incoming electrolyte (concentrated brine), and from this cup the electrolyte is conveyed, by means of suitably arranged ducts, to the bottom of the openings of the electrolytic cell, which are in the actual field of decomposition. The cup is placed above the level of the brine in the electrolytic cell. In use, the electrolyte flows into the cup, and thence, by means of the ducts above referred to, into the actual field of decomposition, which is the region between the carbon rods and the mercury surface. In this region, the salt in the electrolyte is broken up into its elements, chlorine and sodium. The electrolyte gets weaker and flows upwards and out of the electrolytic cell through a pipe placed underneath the cup above referred to. It will consequently be understood how strong brine is constantly being fed into the actual field of decomposition, whilst the brine, weakened by decomposition, is being continuously taken away from the cell to be strengthened and afterwards used again.

In connection with the decomposition of salt for the production of caustic soda and bleaching powder by electrolysis, the following factors are of extreme importance:—

1. The cell must be made of material that resists the action of free chlorine and sodium hydrate solution.

2. Power consumption must be reduced to a minimum.

3. High current density is essential with a view of reducing working costs and initial outlay to a minimum.

4. Recombination of final products or secondary reactions must be prevented as much as possible.

In the electrolytic cell in use at Sault Ste. Marie, carbon and vitrified earthenware are exposed to the action of free chlorine, and vitrified earthenware, mercury, and iron to the action of sodium hydrate solution. These materials are the very best for their respective purposes, and the apparatus is consequently lasting. In connection with the manufacture of chemicals in general, the depreciation of the apparatus employed is a very serious item, and commercial success can only be obtained by paying the utmost attention to the quality of the material employed.

The theoretical potential difference in connection with the decomposition of a concentrated solution of common salt (sp. gr. 1·20078) is 2·30 volts. Electrolytic mercury cathode cells at present in use are operated with a potential difference of from 4 to 5 volts. At Sault Ste. Marie, owing to the very high current density employed, a potential difference of 5 volts is required. Power costs there, under the above conditions, 0·136 cent per pound of product made. This item could be reduced by 0·027 cent per pound of product made by diminishing the current density, and consequent utilisation of a lower potential difference.

However, the use of a high current density is advantageous, as, by having a very large output per cell, the working cost and the initial outlay are reduced to a degree which, from a commercial point of view, exceeds the above-mentioned possible reduction of the cost of power. A current of from 800—1,000 ampères per cell is used at Sault Ste. Marie, and the passing of this enormous current through a cell that is only 3 ft. in diameter has only been made possible by the discovery of the Acheson graphitised carbon electrode, the conductivity of which is four times as great as that of ordinary carbon, and also by the system of the circulation of the electrolyte employed, whereby a concentrated solution of salt always is present in the actual field of decomposition.

When a solution of sodium chloride is being electrolysed the following chemical changes take place:—

$$2NaCl = 2Na + 2Cl$$
(cathode) (anode).

If the mercury amalgam were not immediately removed from the actual field of decomposition, as above described, a recombination of final products or secondary reactions would take place as follows:—

$$2Na + 2H_2O = 2NaOH + H_2.$$
$$2NaOH + 2Cl = NaClO + NaCl + H_2O.$$

If a heated electrolyte be used, chlorate is formed. Apart from losses, which would be caused by such secondary reactions, there would be great danger owing to the explosive nature of a mixture of chlorine and hydrogen. It is, of course, impossible to prevent secondary reactions altogether, but the mercury in the cell employed at Sault Ste. Marie does its work so well, that during the year 1901, the quantity of hydrogen produced by secondary reactions amounted to less than 3 per cent. of the total quantity of chlorine made.

The factory, erected at Sault Ste. Marie, Ontario, by The Canadian Electro-Chemical Co. Ltd., has a power installation of 660 kilowatts, consisting of three 220 kilowatt dynamos, each driven by a separate water wheel. The electrolytic installation consists of 120 cells such as above described. The evaporation plant consists of stock tanks, weak liquor evaporation apparatus, and six finishing kettles. The bleach plant consists of 10 bleach chambers, each of the following dimensions, length 55 ft. 6 ins., width 17 ft., and height 6 ft. 6 ins. The chambers are made of No. 6 sheet lead, and are provided with a 2-in. tile floor. The lime plant consists of disintegrator and dressing machinery for a daily output of 14 tons of slaked lime.

During the first year of its existence, only part of the factory was operated, with a daily output of 4 tons 800 lb. of bleaching powder and 2 tons of caustic soda. The products made were liked by the consumers in Canada, and as soon as commercial conditions permit, the factory will be worked to its full capacity, as will be referred to later.

An electrolytic alkali factory requires very careful analytical superintendence. The analytical work can be divided into three classes, viz., testing of raw materials, factory control, and testing of finished products. Raw materials, which are lime and salt, must be of very pure quality, and each lot supplied at the works has to be subjected to complete analysis before being utilised. The factory control comprises frequent determinations of caustic liquor and chlorine gas produced. In connection with finished products, determinations of free chlorine in the bleaching powder and total contents of sodium oxide in the caustic soda are the only ones really necessary.

The composition of an average sample of the burned lime used for the manufacture of bleaching powder at Saulte Ste. Marie is as follows:—

	Per Cent.
Silica	0·51
Ferric oxide and alumina	0·41
Lime	94·01
Magnesia	1·03
Carbonic acid	trace
Water	3·89

The composition of an average sample of the salt used is as follows:—

	Per Cent.
Insoluble in water	0·013
Calcium sulphate	0·339
Magnesium sulphate	trace
Sodium sulphate	0·113
„ chloride (by diff.)	99·535

The composition of an average sample of the bleaching powder produced at Sault Ste. Marie, during 1901, would be 37 to 38 per cent. of free chlorine. The composition of an average sample of the caustic soda produced at Sault Ste. Marie, during 1901, would be 74 to 76 per cent. of sodium oxide.

It is often held up against a mercury cathode process for the decomposition of brine, that there must be a loss of mercury, and that such loss must be a very serious matter, owing to the great value of the mercury. As may be deduced from the description of the electrolytic cell given above, the chance of the mechanical loss of mercury is very slight owing to the construction of the cell. The mercury is covered with a liquid throughout, and the hydrogen, given off in the combining chamber, is not given off from the mercury surface, so that the hydrogen going into the atmosphere in the cell room carries no mercury. Regarding the solubility of the mercury in the sodium hydrate solution, it might be interesting to know that it has been found, as a result of careful research work on the subject, that one pound of mercury is dissolved by the alkali solution for every 27,500 lb. of caustic soda produced. The electrolyte, on account of its contents of free chlorine, always carries mercury to the extent of 5 100ths of 1 per cent. of its contents of salt. The electrolyte in the circulation system is changed once every four to six weeks. The loss of mercury resulting thereby amounts to approximately 20 lb. in the period of time stated. It will thus be seen that the loss of mercury, in connection with the electrolytic manufacture of caustic soda and bleaching powder by means of a workable mercury cathode process, is entirely negligible from a commercial point of view.

As already stated, as soon as commercial conditions permit, the total plant at Sault Ste. Marie, consisting of 120 cells, will be operated at its full capacity, each cell utilising a current of 1,000 ampères, at a potential difference of five volts, and with an A.H. efficiency of 90 per cent.; the total output would then be, per working day, 9 tons 211 lb. of bleaching powder, and 4 tons 565 lb. of caustic soda.

This output would meet the total demand for bleaching powder in Canada, and to a great extent the present demand for caustic soda.

(See also this Journal, 1897, 745; and 1900, 417.)

A number of photographs were exhibited showing the interior of the works, and Prof. W. H. Ellis explained the attached diagrams by means of lantern slides.

Discussion.

Prof. W. Lash Miller showed an experiment illustrating the production of alkali by electrolysis with a mercury cathode, and congratulated the Society on the nature of their first paper. The hearty support which the manufacturers had given to the proposed American Electro-Chemical Society, and the frankness with which Mr. Rhodin described the processes in use at the Sault, showed that the policy of obscurantism in electro-chemical industry had been abandoned.

Dr. W. H. Ellis congratulated the Canadian Section of the Society of Chemical Industry on the character of the first paper read before it, and thought that the fact that a gentleman like Mr. Rhodin had been willing to come forward and give an account of this new development of a new industry augured well for the future of the branch. The Rhodin process, like the Castner-Kellner process, which had been for several years in successful operation at Niagara Falls, was based upon the use of mercury as a cathode. It would appear that electrolytic cells of this type were proving more satisfactory than those with a porous diaphragm. There was a third type of cell in which the anode products were separated from the cathode products by the specific gravities of the solutions operated on. In such a cell, saturated brine was fed continually into the anode compartment and caustic soda solution overflowed at an equal rate from the cathode compartment. By Mr. Rhodin's arrangement of a distributing cup and ducts and an overflow pipe, some of the advantages of these gravity cells were combined with the use of the mercury cathode. One great advantage of the latter was the purity of the solution of sodium hydroxide obtained. How far this, and its other good points, would enable the mercury cell to compete successfully with the greater simplicity of the gravity cell, it must be a matter for experience to decide.

Prof. Rosebrugh drew attention to the importance of the potential difference at which the process was carried on as one of the factors which determined the amount of power required for a given daily output. The author gave 2·3 volts as being "theoretically" required, presumably referring to the formula:—

$$E = 0{\cdot}004298\ H,$$ where—

E = Electromotive force in volts,

H = Heat of reaction in 100-grm.-degree units.

Taking this expression, which embodied Thomson's Law (thus omitting the term introduced by von Helmholtz), there resulted for the reaction—

$$NaCl,Aq + Hg_6 = NaHg_6 + Cl + Aq.$$
$$964 \quad - 21 \quad = \quad 943$$

Now $943 \times 0{\cdot}004298 = 4{\cdot}06$ volts,

whilst, for $NaCl,Aq + H_2O = NaOHAq + H + Cl.$

$$964 \quad + \quad 684 \quad - \quad 1118 \quad = \quad 530,$$

and $530 \times 0{\cdot}004298 = 2{\cdot}28$ volts.

The latter equation, though representing the final result of the process, was clearly inapplicable even to an approximate calculation of the E.M.F., as the second part of the process, namely, the recovery of the sodium from the mercury as hydrate, does not occur within the "cell," strictly speaking. From the agreement of the latter calculated value with that given by the author, it would appear that this was the source of the error. Confirmation of the former value, 4·06 volts, might be found in the values given recently by Prof. Dr. W. Nernst for electrode potentials, namely:—

	Volts.
Na	+ 2·82
Cl	− 1·42
Difference	1·21

These values also agreed very well with the author's statement that, in practice, a pressure of 4 to 5 volts was required. The author had drawn attention to the great practical importance of the choice of current density in determining capital outlay and cost of working. Assuming for simplicity that the excess above 4 volts was due to and proportional to the current density; then if $4\frac{1}{2}$ volts be used, this would correspond to one half the output per cell obtainable at 5 volts, and therefore for the same output, would require twice as many cells, with corresponding increase in floor and roof area, piping, and attendance; whilst, to offset this large increase in expense, there was only the reduction of 10 per cent. in the power, the amount by which $4\frac{1}{2}$ was less than 5.

Mr. Bain said that he had recently had the pleasure of listening to some lectures on electrolytical processes by a famous authority on the manufacture of soda, Dr. Lunge, of Zurich. The latter pointed out that these methods could hardly be expected to supplant the old processes for at least some time, because a simple calculation showed that about 2·4 tons of bleaching powder was produced per ton of caustic soda, and that there was no market for such an enormous quantity of chlorine as would be obtained were electrolytic processes only used for the manufacture of soda.

The Chairman compared the three processes of alkali making, and indicated the cost of soda twenty years ago and now. There was little danger, he said, of the electrolytic process ousting the Leblanc or Solvay processes from their present position, on account of the output of bleaching powder being so great in comparison with that of alkali. In this he endorsed the former speaker's remarks, adding that, when coal and common salt were to be had cheaper than water-power, the older processes would continue to be employed. The thanks of the meeting were accorded to Mr. Rhodin for his paper, and also to Prof. Ellis and Prof. Miller for their demonstrations.

New York Section.

ERRATUM.

THE COMPOSITION OF PAINTS AND PIGMENTS.

BY MAXIMILIAN TOCH.

In the Journal for Jan. 31st, 1902, p. 103, col. 1, under "*Zinc Oxide*," it is stated that "the difference in whiteness is *soon* apparent", whereas it should be "the difference in whiteness is *not* apparent in a very short time between the two oxides."

Nottingham Section.

Meeting held on Wednesday, March 26th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

THE RÔLE OF ALUMINA IN BLAST FURNACE SLAGS.

BY G. J. WARD.

Several papers* have appeared lately dealing with the constitution of slags, and the author thought that the following series of analyses, together with the specimens from

Mark.	1. SiO_2.	2. Al_2O_3.	3. FeO.	4. CaO.	5. MgO.	6. O in acid / O in base.	7. O in SiO_2 / O in CaO, MgO and FeO.	8. Order of basicity.	9. O in SiO_2 and Al_2O_3 / O in CaO, MgO and FeO.	10. Order of basicity.
A	27·55	20·25	0·73	13·20	18·31	0·587	1·30	1	2·53	3
B	30·17	33·23	0·65	32·48	0·66	0·635	1·63	7	5·15	8
C	29·94	27·61	0·85	37·87	1·81	0·650	1·36	3	2·45	2
D	33·52	44·87	0·92	18·85	1·19	0·657	2·94	17	6·40	18
E	31·81	38·87	0·97	27·06	0·87	0·662	2·04	13	4·25	14
F	31·27	27·93	0·52	39·51	0·98	0·668	1·41	4	2·53	3
G	31·64	31·08	0·78	35·10	0·33	0·668	1·63	6	3·07	7
H	31·63	25·72	1·21	43·78	0·57	0·669	1·30	1	2·23	1
I	30·45	28·52	..	34·51	1·28	0·682	1·56	5	2·85	5
J	32·67	32·61	0·84	32·70	1·09	0·688	1·75	10	·24	10
K	34·31	36·53	0·70	28·86	0·92	0·706	2·10	14	4·00	13
L	32·10	30·99	0·52	31·93	0·72	0·710	1·71	8	3·34	11
M	32·75	29·71	0·94	32·85	1·57	0·720	1·71	8	3·01	6
N	33·36	30·64	0·31	33·17	1·25	0·727	1·77	11	3·26	9
O	34·81	30·14	0·31	32·25	0·25	0·733	1·98	12	3·50	12
P	36·96	33·62	1·32	25·96	1·03	0·822	2·48	15	4·46	15
Q	38·14	40·48	1·19	15·48	1·82	0·828	3·74	19	7·29	19
R	36·56	34·21	0·71	20·70	2·02	0·848	2·83	16	5·18	17
S	44·01	27·74	1·96	21·13	0·91	1·180	3·43	18	4·95	16

which they were made, might be of interest to the Section, especially as the amount of alumina present is abnormally high in most of them, higher than is shown in any printed analyses which he has hitherto seen.

The following table of silicate from Joustorff's paper should be borne in mind:—

Oxygen Ratio. Acid / Base.	Metallurgical Description.	Molecular Formulæ. Monoxide Basis.	Sesqui-oxide Basis.
1 : 1½	Sub-silicate	R''_3SiO_5	$R''_3Si_2O_7$
1 : 1	Mono-silicate	R''_2SiO_4	$R''_4Si_3O_{12}$
1½ : 1	Sesqui-silicate ...	$R''_4Si_3O_{10}$	$R''_8Si_5O_{20}$
2 : 1	Bi-silicate	$R''SiO_3$	$R''_2Si_3O_9$
3 : 1	Tri-silicate.....	$R''Si_2O_5$	$R''_4Si_9O_{24}$

Gehlenite = $(3R''O.Al_2O_3)(SiO_2)_2$.
i.e., $R''_8SiO_{20}Al_2SiO_5$.
Spinel = $RO.Al_2O_3$.

*Ledebur gives two methods for calculating the proportion of furnace charges to give slags of a desired acidity.

In the first—that of Mrazek—the oxygen present in the SiO_2 is divided by that in the Al_2O_3, MnO, CaO, MgO, and FeO, and the result is called the oxygen ratio

The second—Platz's—is the simpler; the percentage quantity of SiO_2 and Al_2O_3 are added together and the sum divided by the sum of the percentages of the monoxide bases, and the proportions of the charge are arranged to give a fraction of $\frac{5}{4}\frac{1}{9}$. This sounds very rough and ready, but the error introduced by not taking the oxygen contents is not very serious. For, whilst a molecular quantity of alumina amounts to 34 per atom of oxygen, silica is 30 (thus Al_2O_3 $\frac{10}{3}\frac{2}{2}$ = 34 SiO_2 $\frac{6}{2}\frac{0}{0}$ = 30), and usually the quantity of the other bases is small compared to that of the CaO.

In short, Mrazek considers Al_2O_3 to be a base, Platz calls it an acid, whilst Blum, in his recent paper, suggests that it is neutral.

In the table, the analyses are given in the order of their basicity, reckoning the Al_2O_3 as a base, and column 6 gives their oxygen ratios.

Column 7 gives the oxygen ratio on the assumption that the Al_2O_3 is neutral, and the corresponding order is shown in column 3.

In 9 is given the ratio calling Al_2O_3 an acid, and in 10 the order on that basis.

The MnO was not determined, but is known to be very low.

Sample A was a piece of slag which fell to dust on cooling; assuming the Al_2O_3 to be basic, it shows a much lower oxygen ratio than any of the others.

If the Al_2O_3 be neutral, it must be bracketed first with H; if acid, then it comes third on the list.

The sample was taken whilst still warm, and kept in a stoppered bottle. A weighed portion was well washed with

*Handbuch der Eisenhuttenkunde. II., p. 536.

* The Constitution of Slags and the part they play in the Metallurgy of Iron, by Baron Jüptner von Jonstorff, Journ. Iron and Steel Inst., 1900, II., p. 276; Composition of Blast Furnace Slags, L. Blum. Abstracted, Journ. Soc. Chem. Ind., 1902, p. 118.

ot water, and the washings titrated with standard acid olution showed an alkalinity equivalent to 1·56 per cent. f CaO. Whether the unusual quantity of MgO (magnesian mestone was being used as a flux at the time) has anything o do with the falling it is hard to say, but this does not eem probable, and it has been impossible to obtain another ample of a "fallen" slag.

There is then an excess of lime or magnesia proved to be resent, and only by taking the Al_2O_3 as a base can this ample be considered more basic than some of the other nore stable slags.

Samples B to N are average working slags obtained nder ordinary conditions; experienced men are constantly vatching the furnaces and regulating the amount of lime-tone added to the charge, with the object of obtaining a lag of as constant a composition as possible. The egularity of the figures in column 6 as compared with hose in 7 and 8 is therefore remarkable. The last five amples were taken at exceptional times, such as on blowing ut a furnace, and do not throw much light on the ubject.

Looking down columns 8 and 10, the most striking lterations in the order are B, D, E, and H. In fact the whole question may be summarised—Are D and E to be considered as of practically the same basicity as H, or are they several times more acid?

An examination of the samples themselves and of their history seems to point to the conclusion that they must be considered as equally basic; in other words, Al_2O_3 and CaO can replace one another as bases.

In appearance, D and E have none of the glassy structure so characteristic of Q and R, and they were produced from a furnace making Nos. 2 and 3 foundry iron. If the slag were of an acid character, the sulphur in the burden would go into the iron and make it hard, but the reverse was the case.

Turning to individual specimens, F will be noticed to be highly crystalline, and it was chosen for analysis on this account; the oxygen ratio shows it to be a nearly pure sub-silicate $(3R''O.Al_2O_3)\ (SiO_2)_2$.

Specimen Q is also curious, as it shows numerous basic crystals formed in a glassy matrix.

Jonstorff, in the paper quoted above, gives a method for calculating the proportion of sub-silicate and mono-silicate in a slag. Take for instance K.

$$\text{The } \frac{\text{Oxygen in acid}}{\text{Oxygen in base}} = \frac{18.30}{25.88} = 0.707.$$

Assume the composition to be—

$$x\ (RO)_3SiO_2 + y\ (RO)_2SiO_2.$$

If s be the oxygen in the silica and b the oxygen in the bases—

$$2x + 2y = s.$$
$$3x + 2y = b.$$
$$\therefore x = b - s = 25.88 - 18.30 = 7.58$$
$$\text{and } y = \frac{3s}{2} - b = 27.45 - 25.88 = 1.57$$

and the slag is $7.58\ (RO)_3SiO_2 + 1.57\ (RO)_2SiO_2$.

Samples D, E, F, G, and H are almost pure sub-silicates, and are similar chemically to gehlenite—

$$(3CaO.Al_2O_3)\ (SiO_2)_2,$$

in which lime and alumina replace one another as base.

By a very similar method given by Jonstorff, sample A can be calculated out to consist of—

$$10(3RO.Al_2O_3)\ (SiO_2)_2 + RO.Al_2O_3,$$

or 10 parts of gehlenite and one of spinel, but as in this particular case there is apparently present free lime (or magnesia), this formula must be incorrect.

Some attempts made by the author to separate the various minerals in the slags by solution in weak acids and alkalis gave no definite results.

*Akerman has worked out a series of curves showing the total heat of formation of various silicates.

* Ledebur, Eisenhuttenkunde, I., p. 185; Wedding, Eisenhüttenkunde, I., p. 1033.

Taking samples B to H, and considering them as sub-silicates, which is approximately correct, we have—

Mark.	Oxygen in Al_2O_3 / Oxygen in CaO.	Total Heat of Formation.	Melting Point.
		Cal.	°C.
B	1·6	375	1210
C	1·1	355	1183
D	3·6	405	1409
E	2·3	410	1280
F	1·1	355	1183
G	1·4	363	1171
H	0·95	372	1240

and for S, if we call it a mono-silicate,

S	2·0	430	1344

The high melting points of D and E are more or less confirmed by the fact that they were taken for analysis because it was found difficult to separate properly the iron from the slag, as some of the metal was carried away with the slag in a "shotty" condition. In sample D, and also in B, some of these small shot-corns may be seen. They were of course removed by a magnet before analysis.

Finally, I may say that my firm opinion is that in a blast-furnace making grey foundry iron from a burden rich in alumina, this substance is found in the slag as a base replacing an equivalent quantity of lime.

Of course it is quite possible that in furnaces working under entirely different conditions, such as a furnace making white iron for conversion into steel, the results may be that the Al_2O_3 is present as an acid. Other people think so, at any rate.

My thanks are due to Mr. A. H. Longden, who has made the greater part of the analyses, and to the Stanton Iron Works Co., for their kind permission to publish the results of these analyses.

Discussion.

Mr. F. J. R. Carulla said Mr. Ward had made reference to some tables on alumina, &c., that had appeared in the *Iron and Steel Institute Journal*, and which were embodied in a paper by Baron Juptner von Jonstorff, and were prepared by Paul Gredr. He was extremely interested and surprised at the results, and some of the points brought out in that table, in which it was shown that, whilst the lime was replaced by the alumina, the slag remained the same all the time. The melting-point curve fell considerably as the alumina replaced the lime, but when it reached a certain point, the curves began to rise with rapidity. From the table, it might easily be seen how curves rose. In view of that result, could the author explain why alumina seemed to be so desirable in blast-furnace slags, whilst the melting point of slags containing much alumina was so extremely high? A small quantity of alumina was present in slags which were extremely fused; but he understood that blast furnaces wore out very fast; yet, with slags which were comparatively infusible, blast furnaces seemed to last very much longer. His experience had been entirely in connection with steel-making furnaces.

Mr. R. M. Caven said Mr. Ward had made reference to a neutral alumina. He should like to know if it existed in any combination, or what it meant exactly.

Mr. Wood inquired how the temperatures or melting points were measured.

Mr. Ward: They are calculated.

Mr. Ward said, in reply, with regard to Mr. Carulla's question about the melting curve, which was higher at either end than at the middle, that that was practically the case with most alloys. The melting point of the alloy was less in nearly every case, he thought he was correct in saying, than that of either of the two metals themselves, and there was some point in it, the minimum in which often appeared to have reference to some definite chemical composition. As far as the practice was concerned, they did not want to waste fuel on an infusible slag, and, therefore, they tried to get a slag which would melt at

the lowest temperature. If they got too much alumina, there was no doubt that the melting point would go up. Mr. Carulla seemed to think that he suggested that the alumina was desirable, but he did not think that he suggested it. The real point was, they had certain stones to work, and some of those stones contained alumina. It was there, and they could not get it out. It had to go into the furnace. His own impression was that alumina did replace lime, and that, with aluminous ironstones, they could get slag of a definite composition by leaving out lime. It was not so much the proportion of alumina and lime, as the proportion of silica. If they got a large amount of silica, they got a slag which had a tendency to eat itself into the joints of the furnace, and that was bad for the furnace. Mr. Caven asked what he meant by neutral alumina. It was the word employed by the gentleman who wrote a paper. He took it that the alumina was present in solution. He did not see why the alumina should be dissolved in a silicate, though some people seemed to think that that was the most likely way the alumina was present. Practical experience with the furnace seemed to show that the variations in the fusing point were correct. He took it that the figures given were taken from actual experiments, and the actual working in the furnace seemed to agree perfectly with the curves made.

Yorkshire Section.

Meeting held on Monday, March 24th, 1902.

MR. G. WARD IN THE CHAIR.

A COMPARISON OF METHODS USED TO DETERMINE THE IODINE VALUES OF OILS.

BY F. W. HUNT, B.SC.

(Contribution from the Leather Industries Department, Yorkshire College.)

The object of the series of experiments, which is set forth in this paper, was not to add anything of a theoretical nature to the literature bearing upon the iodine values of oils, but was an endeavour to find out how far the two methods of Wijs and Hanus agreed with the Hübl method, and if this latter could be replaced by either of the two former, especially as regards marine oils.

Solutions of the various types were made up as follows:—

Hübl.—12·5 grms. of iodine dissolved in 250 c.c. of absolute alcohol were mixed with a solution of 15 grms. of mercuric chloride in a like quantity of the same solvent. This was allowed to stand 24 hours before using.

Wijs.—The method of making this solution was no strictly that of the original paper by Wijs (Ber., 1898, p. 752), but was on the lines of a suggestion by Lewkowitsch in a discussion on a paper by Marshall (Journ. Soc. Chem. Ind., 1900, 213). This suggestion, it may be said, has been taken up by Wijs himself, who now makes his solution in this manner, as he states in a private letter to a student of the Leather Industries Department.

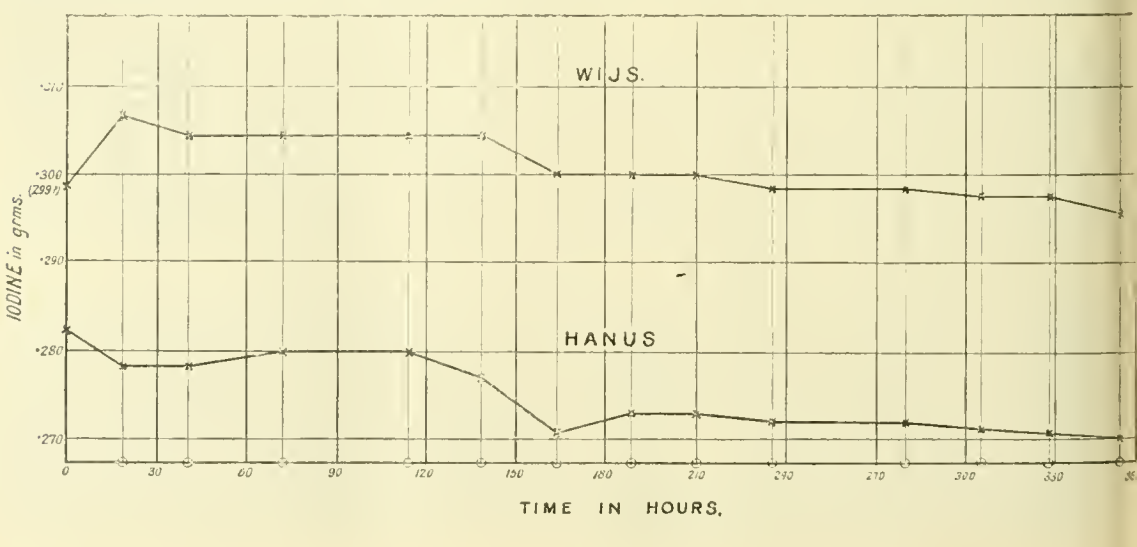
Five grms. of iodine trichloride were weighed out and dissolved in 500 c.c. of glacial acetic acid, 5·4 grms. of iodine were added, and the whole dissolved to a clear port wine coloured solution. Several of these solutions were used and the results did not appear to be affected by the order of solution.

Hanus.—This was also modified. Hanus (Zeits. Unters. Nahr. Genuss., 1901, **4**, 913) recommends making iodine bromide by dropping bromine on to iodine kept at a temperature of 5° C. and constantly stirred, but the solution adopted was made by dissolving 6·6 grms. of iodine in glacial acetic acid, either in the cold or by gentle warming over the water bath (in the latter case the solution is cooled), and adding 1·5 c.c. of bromine, finally making up to 500 c.c. Bellier (Chem. Centr., 1900, 1109) used an analogous method, but added mercuric chloride to the solution.

The Wijs and Hanus solutions were both subjected to tests in regard to keeping qualities. Two solutions were made up on March 5th, and 10 c.c. were withdrawn each day and run into a stoppered bottle; 4 c.c. of 10 per cent. potassium iodide solution were added, and distilled water to make up to about 300 c.c. The iodine was titrated with N/10 $Na_2S_2O_3$. The results as shown on the two curves are almost constant, but have a downward tendency.

Solutions were also placed in various conditions of light with but little effect. The method used to determine the iodine value was as follows:—

A weight of oil was taken which was so arranged that excess of free iodine would remain at the end of the reaction. This weight varied as the iodine value was known to be large or small, and also as the titre of the solution used. In some cases it would be about 0·1 grm., whereas in others 0·4 grm. was used. The oil thus weighed off into a stoppered bottle was first dissolved in 10 c.c. of pure chloroform, and then 25 c.c. of the iodine solution were run in, accurately measured from a burette. The whole was allowed to rest in a cupboard for periods, five hours for the Hübl method and one hour each for Wijs and Hanus methods. These periods were chosen from experiments made in the Leather Industries Department by Messrs. Blockey and Borghstijo, and were found to give the best results. In the case of the Wijs solution, the following are



the periods which Wijs himself states, in the private letter above referred to, to be the best:—For non-drying oils and fats, 15 mins.; for half-drying oils, ½ hour; for drying oils, 1 hour. In this series, however, 1 hour was adopted for all oils.

When the period of standing was over, 10 c.c. of 10 per cent. potassium iodide solution were added to the Wijs and Hanus solutions, but 20 c.c. to the Hübl solution. They were then titrated for the iodine by $N/10$ $Na_2S_2O_3$.

Starch must be added near the end of the titration, and the whole well shaken after each addition of thiosulphate. When the colour of the starch disappears, the end of the reaction is reached. The blue colour returns, however, after even a few seconds, which may be due to oxidation. The titration should therefore be done as rapidly as possible, so that no time is allowed for this change to take place during titration, and so introduce an error.

The following oils were treated, duplicates being done in each case. Pale seal, whale, castor, olive, linseed, cottonseed, Newfoundland cod, coast cod, pale rape, arctic shark, arachis (earthnut), and dogfish liver.

The results are tabulated in Table I.

Table I.

Method.	Hübl.			Hanus.			Wijs.		
Name of Oil.	No. 1.	No. 2.	Mean.	No. 1.	No. 2.	Mean.	No. 1.	No. 2.	Mean.
Pale seal	117·8	117·2	117·5	120	121·5	120·7	125·2	124·5	124·8
Whale	120	120·3	120·2	120·5	120·7	120·6	123·2	124·2	123·7
Olive	81·7	82·8	82·3	81·7	82·1	81·9	83·1	83·8	83·4
Castor (cold-drawn)	83·5	84·7	82·6	85·4	83·5	84·4	85·6	85·6	85·6
Dogfish liver	135	134·5	134·7	140·9	141·4	141·2	144·3	142·2	143·2
Arachis (earthnut)	92	91·6	91·8	91·8	91·4	91·6	93·4	93·4	93·4
Arctic shark	89·8	88·2	80	93·2	94·4	93·8	98·3	98·6	98·9
Pale rape	103	103	103	102	101·8	101·9	103	101·2	102·1
Coast cod	149	148	148·5	147·8	147·2	147·5	155·3	154	154·6
Newfoundland cod	144·5	145·2	144·8	150·5	149·6	150	154	155·5	154·7
Linseed	174·8	...	174·8	174·2	174·8	174·5	177·7	177·0	177·3
Cottonseed	108·3	108·6	108·5	107	107·1	107	110·1	109·8	110

Considering these results, it will be seen that in every case but one, *i.e.*, pale rape, the Wijs solution gave results which are high as compared with the Hübl solution, and which vary from the figures given by the latter, the greatest variations being in the fish oils, the least in the seed oils.

The Hanus solution gave figures which are higher than the Hübl figures in the case of the fish oils, but which are not so high as the Wijs. With the seed oils, this method gave results closely approximate to the Hübl.

All the solutions gave duplicates in close agreement, and thus, so long as one method is retained, the results will be comparable. The Hübl solution is the method which might be described as official, but it has serious disadvantages. On account of the use of absolute alcohol, the making of the solution is very costly. It reacts very slowly, and owing to the mercury present, requires twice as much potassium iodide as the other two methods.

Compared with this, the Wijs solution gives higher results, but is cheaper, more constant, and the reaction is rapid. But even this has disadvantages. Iodine trichloride is difficult to obtain and is not very cheap, whilst the method involving the passing of chlorine into a solution of iodine in acetic acid is not very easy to work in actual practice.

The Hanus method compares favourably with both the Hübl and Wijs methods. The solution is by far the cheapest, and is equally as constant and rapid in reaction as the Wijs. It is very easy to make up, and the materials required, glacial acetic acid, bromine, and iodine are readily obtained, if not actually at hand. The solution made up, either according to Hanüs' recommendation, or according to the modification herein contained, acts equally well.

The results it gives are more nearly comparable to the older Hübl figures than are the Wijs results, and this is a point in its favour.

The result of this series, therefore, shows that the Hübl method can be replaced by either of the other solutions, but, in the opinion of the author, the Hanus method is to be preferred. Of course, in making comparisons of iodine values, one method must be observed throughout.

Experiments were also made using, in place of acetic acid, commercial carbon tetrachloride. Two solutions were made up as follows:—

No. 1.—3·3 grms. of iodine were dissolved in CCl_4 and 0·75 c.c. of bromine added. The whole was made up to 250 c.c.

No. 2.—2·5 grms. of iodine trichloride were dissolved in CCl_4 and 2·8 grms. of iodine added.

Marshall (Journ. Soc. Chem. Ind., 1900, 213) found that a solution of ICl_3 in CCl_4 acted well, whilst the iodine-bromine solution would not react to a sufficient extent. In these experiments, however, the reverse seems the case, for whilst No. 1 gave satisfactory results (see Table II.),

Table II.

Name of Oil.	Iodine Value.	Substitution.	Corrected Iodine Value.
Olive oil	81·2	..	..
"	82·5	..	..
"	82·3	..	..
Coast cod oil	153·6	..	..
"	154·2	..	..
Linseed oil	178·8	0·7	177·4
"	180·6	1·16	178·3
Arachis oil	90·4	0·6	89·2
"	91·3	0·76	89·8
Pale seal oil	125·4	0·15	124·5

No. 2 solution would not give a clearly defined endpoint. That this is the case may be due to the fact that, whereas Marshall used a pure and dry CCl_4, the solvent in this case was the ordinary commercial CCl_4. Another point is that whilst Marshall only allowed 30 minutes, the writer allowed a full hour.

The experiments were carried out exactly as before, except that no chloroform was used. In three cases the amount of substitution was calculated by adding 10 c.c. of KIO_3 solution after the first titration was over. Substitution was found to have taken place to a small extent, and if really due to reaction with the oil, would constitute an error in the direction of too high a result. The real iodine value is thus the total iodine value less twice the amount of substitution. This is shown in Table II.

The results, as shown, closely approximate to the Hübl figures with olive and arachis oils, but in the case of the two fish oils and linseed oil, the value comes nearer the Wijs.

Carbon tetrachloride is not, however, to be preferred to acetic acid as a solvent, for not only is it more difficult to obtain, but the endpoint is not so easy to determine as with acetic acid, since the last traces of iodine are difficult to withdraw from the carbon tetrachloride.

Discussion.

The Chairman (Mr. Ward) referred to the difficulty of deciding as to the relative merits of the different solutions, and emphasised the desirability of adhering to one particular solution throughout a series of experiments in order to secure comparable results.

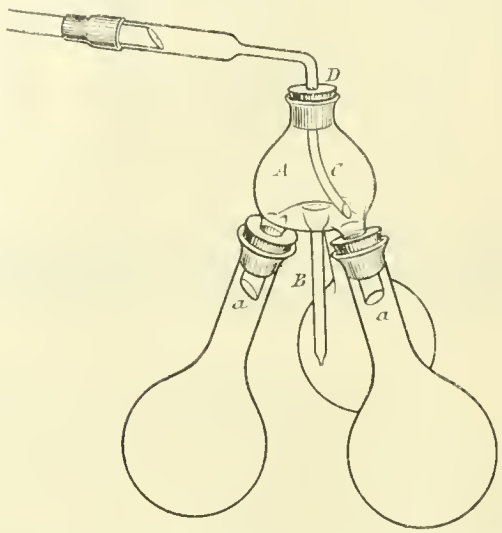
Mr. Fairley said that he gladly welcomed a substitute for the unstable Hübl solution, and thought that its adoption would lead to results of great comparative value.

MODIFIED FORMS OF THERMO-REGULATOR AND ADAPTOR FOR VACUUM DISTILLATION.

BY T. S. PATTERSON, Ph.D.

A Simple Form of Adaptor for Vacuum Distillation.—The accompanying sketch shows a form of adaptor for vacuum distillation which is very simple in action. It is

Fig. 1.



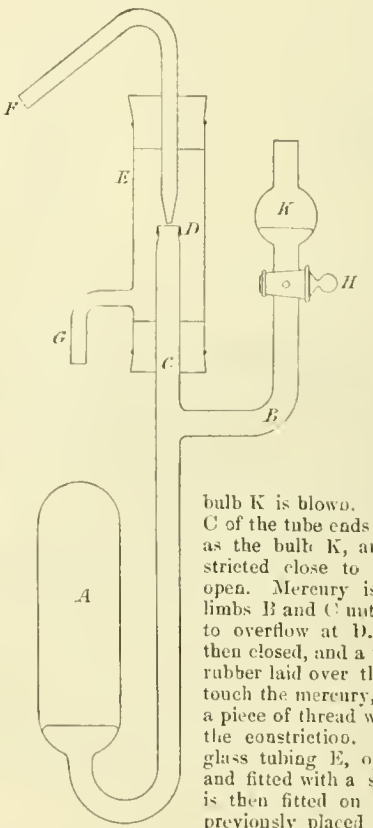
made by blowing on the end of a fairly wide and thick piece of soft glass tubing (20 mm. diam.) a bulb, A, about 55 mm. in diameter. A small portion of the end of the bulb is then carefully heated and sucked gently inwards. The glass just in the centre of this depression is then heated with a small flame and blown out again, and the narrow glass tube, B (7 mm. diam.), sealed on. This gives a bulb with a circular channel surrounding the small central tube, and on to this channel are then sealed the tubes, *a*, *a* (10 mm. diam.), of which there may be any desired number, three or four being most convenient. The thick tube is then cut so as to leave a short neck for the insertion of the rubber cork, D, through which passes the tube connecting the apparatus to the condenser or distilling flask. To the tubes, *a*, *a*, are fitted round-bottomed flasks, and the whole apparatus is evacuated through the tube B. In use, when a sufficient fraction has been collected in one flask, the next is brought under the end of the tube C by rotating A round C, the india-rubber tube to the pump, which hangs vertically downwards from B, not interfering with this motion in any way.

This adaptor may be recommended on account of its simple construction and the ease with which it may be taken to pieces and cleaned.

An Adjustable Thermo-regulator.—Most of the simpler forms of thermo-regulators are constructed in such a way that they can only be used at or near some particular temperature. An attempt to remedy this defect may be made by the addition of a movable side-piece, by which the level of the mercury in the tube may be raised or lowered as desired; but this is usually unsatisfactory, owing to the readiness with which the surface of the mercury fouls. A thermo-regulator which can be used between 20°—60°, and can easily be adjusted to any intermediate temperature, is of considerable value for many purposes, for instance, in determining the density of a solution at several temperatures; in which case, as in other similar ones, it is only necessary to be able to bring the thermostat to three or four different temperatures, and to keep it constant at each for a short time.

The subjoined diagrammatic sketch shows a form of thermo-regulator which has proved useful to the author for this purpose. The principle of the instrument was originally suggested by D'Arsonval, but his design, according to Ostwald (Physico-Chemical Measurements, English edition, p. 61), did not prove satisfactory.

Fig. 2.



The bulb A is made from an ordinary test tube 6 × ¾ in., and is filled, as in the ordinary forms, with toluene (air would probably do as well for most purposes), which is shut into the tube by mercury as usual. Some inches above the top of the bulb A the side tube B is fixed. This tube is sent vertically upwards, and is fitted with a stopcock H, just above which a bulb K is blown. The other portion C of the tube ends at the same level as the bulb K, and is slightly constricted close to the end which is open. Mercury is filled into both limbs B and C until it just threatens to overflow at D. The stopcock is then closed, and a piece of thin sheet rubber laid over the end D so as to touch the mercury, and then tied with a piece of thread wound firmly round the constriction. A wide piece of glass tubing E, open at both ends, and fitted with a short side tube G, is then fitted on to a rubber cork, previously placed in position on the tube C. The top end of E is closed by another rubber cork through which passes the gas inlet tube F. This latter is tapered as shown in the figure, and the end cut off with a very slight slant. The tapered end of the tube is pushed through the upper cork until it reaches to within about half a millimetre or less of the rubber membrane. The regulator is then ready for use. The gas pipe is connected with F, and that to the burner with G. A small hole may be blown in F to act as a bye-pass, or an external bye-pass may be arranged if preferred. The apparatus is then fitted into its proper position in the thermostat, the stopcock H being left open, as should always be the case when the regulator is not in use.

If now a temperature of about 30° for instance be desired, the burner is lit under the bath, and the heating allowed to proceed until the thermometer marks 29·7° or thereabouts. During this time, the expansion of the toluene in A has caused the expulsion of mercury through the cock H into the bulb K. The stopcock H is then shut, and the further heating of the bath by the flame produces an expansion of the toluene in A, which, however, is only allowed for by a bulging of the membrane at D, which shuts off the supply

slowly and very regularly. The temperature will settle down in the neighbourhood of 30°, and if the contain a stirrer, and the ordinary simple precautions ken, it should not vary more than $\frac{1}{100}$° in an hour. ore exact setting to a desired temperature may be ied by carefully opening H and allowing a very small ity of mercury to pass into K. This slightly releases ressure in A and causes a slight increase in the size flame. Temperatures may thus be easily adjusted to $\frac{1}{10}$° of any desired value and kept constant there. e apparatus once fitted up will last for a long time, depending to some extent upon the quality of the r used for covering D. The flame increases or nishes very regularly, and entirely without the sudden s so difficult to avoid when the contact is between ury and glass only. Finally, the apparatus is one n may very easily be constructed; it is perhaps a more complicated than the simplest form of regulator, s still well within the powers of any amateur glass er.

Discussion.

ie Chairman (Mr. Ward) considered the thermo-lator to be very ingeniously constructed. He referred e somewhat unreliable character of rubber membranes, ially when they were brought into contact with coal-and imagined that the membrane would be liable to ure after prolonged use.

r. Fairley referred to the very general utility of no-regulators. He thought that a more suitable mem-e than rubber might be devised. The deleterious on of coal-gas upon rubber was to be ascribed mainly ie action of hydrocarbon vapours, and he imagined benzol enriched gas would be specially destructive.

r. Murphy enquired whether the instrument had n used in a cold room for maintaining temperatures as as 15° C.

r. Turnbull (in the absence of Dr. Patterson) stated, nswer to Mr. Murphy's question, that he had no doubt the instrument could be used at as low a temperature 15° C., but that it had not been so used by Dr. erson.

Obituary.

ROBERT IRVINE,

A Vice-President of the Society of Chemical Industry.

Mr. Robert Irvine died rather suddenly on Thursday, arch 20, at his residence at Royston, near Edinburgh. Mr. Irvine was born in Edinburgh, in 1839. During s school days, he developed a great fondness for emistry, and on leaving school, became a pupil and sistant of the late Prof. George Wilson, Professor of echnology in the University of Edinburgh. He after-ards held the post of chemist in the paper mills of essrs. Cowan, at Penicuick, and later on, he was emist to Messrs. Wm. Taylor and Co., of Leith, at eir Magdalen Bridge Works. About 30 years ago, he ecame associated with the firm of Messrs. A. B. leming and Co., printing ink manufacturers. This association was maintained till the time of his death. When the works of Messrs. Fleming were transferred from Leith to Caroline Park, near Granton, Mr. Irvine went to reside at the old house of Royston, on that estate. Under his fostering care, as resident director, the works grew and prospered, and became, in many respects, a model of all that a chemical works and its workpeople may become under enlightened and sympathetic management.

Whilst making his home in the very midst of his daily occupation, Mr. Irvine did not allow this fact to narrow or limit his interests and sympathies. The proximity of the Granton Marine Biological Station, in which, from the first, he took a keen and active interest, kept him in touch with a department of science very far removed from that involved in his daily avocations, and his occasional communications to the Royal Society of Edinburgh showed that the tendency of his scientific thought had been largely influenced by his association with the naturalists and others who were engaged in working up the results of the *Challenger* Expedition at the Marine Station.

It is understood that Mr. Irvine's interest in the study of bacteriology led him to devote a considerable sum to the founding of a professorship of bacteriology in the University of Edinburgh.

Mr. Irvine was a Fellow, and, for some time, a Member of Council of the Royal Society of Edinburgh, took an active interest in its affairs, and contributed various papers to its Transactions.

Mr. Irvine's connection with the Society of Chemical Industry dates from its foundation, and he took a leading part in the establishment of the Scottish Section, in 1884. In 1894, he was elected Chairman of that Section, and in that capacity, he acted as host to the Society during its reception in Edinburgh, in July of that year. In 1901, he was elected a Vice President of the Society.

From his earliest connection with the Society up to the time of his death, he was its warm friend and a faithful upholder of its best interests. Whilst he from time to time published papers in the Journal, it was always a matter of dissatisfaction to him that the interests of his business connections compelled him to withhold his best technical work from publication; but, to those who had the privilege of knowing him personally, it was quite obvious that his skill and ability as a technical chemist were of a very high order. His published papers, including his address as Chairman of the Scottish Section, show how thoroughly he was alive to the need which exists for constant watchfulness on the part of the chemical manufacturer, in order that the latest results in pure science may be immediately utilised. In this respect, his career ought to provide a most valuable object-lesson to the younger generation of chemists.

He was a loyal friend, and a most kindly, cultured gentleman, who, through a long, and sometimes trying, business life, preserved a stainless record for honour and probity. Such a man cannot drop out of the ranks without leaving a serious blank, and it is good that this should be so, and that we who are left should feel to the full the loss we have sustained by his death.

Journal and Patent Literature.

ass.	Page.
I.—General Plant, Apparatus, and Machinery	458
II.—Fuel, Gas, and Light	459
III.—Destructive Distillation, Tar Products, Petroleum	466
IV.—Colouring Matters and Dyestuffs	466
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	471
VI.—Colouring Wood, Paper, Leather, &c.	475
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	475
VIII.—Glass, Pottery, and Enamels	477
IX.—Building Materials, Clays, Mortars, and Cements	477
X.—Metallurgy	480

Class.	Page.
XI.—Electro-Chemistry and Electro-Metallurgy	483
XII.—Fats, Fatty Oils, and Soap	486
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	487
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	488
XV.—Manures, &c.	488
XVI.—Sugar, Starch, Gum, &c.	489
XVII.—Brewing, Wines, Spirits, &c.	490
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	49
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	49
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	49
XXI.—Photography	497
XXII.—Explosives, Matches, &c.	498
XXIII.—Analytical Chemistry	498
XXIV.—Scientific and Technical Notes	504

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, post included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Liquid under Pressure; Machinery for the Production of ——. A. Vogt and M. von Recklinghausen, both of London. Eng. Pat. 24,565, Nov. 28, 1900.

The working liquid is forced, under considerable pressure, from a low-pressure chamber into a compression and explosion chamber, thereby compressing a previously introduced mixture of air and combustible matter. By the pressure due to the ignition of the latter, the working liquid is forced into a high-pressure chamber, whence it is led to the motor or place of consumption where it does work, the liquid then being led back to the low-pressure chamber for re-use. After each explosion, a sweeping out charge of air is forced through the explosion chamber, in order to clear it of burnt gases.—R. S.

Liquid in a Closed or Inaccessible Vessel; Method of Ascertaining, Exhibiting, or Recording the Depth of a ——. J. G. Childs, London. Eng. Pat. 4096, Feb. 26, 1901.

An inverted bell jar is placed in the vessel, the depth of liquid in which it is desired to know; the pressure of the air in the bell jar is indicated by a manometer or Bourdon gauge, which communicates with the jar by a tube; from the readings of the gauge, the level of the liquid can be ascertained.—J. W. H.

Liquids from Solids; Apparatus for Separating ——. H. Duncan, R. R. Sherriff, and The Geld Recovery from Slimes Syndicate, Ltd., all of Glasgow. Eng. Pat. 26,667, Dec. 31, 1901.

The material to be filtered is fed on to the upper side of an endless revolving band of filtering cloth, which, in course of its progress, passes over a vacuum chamber, into which the liquid is drawn by suction, leaving the solid material to be removed automatically at the point at which the band of cloth passes downwards over a roller at the far end of the apparatus. The edges of the cloth band are gripped by means of a special device to facilitate the action of the vacuum box, and whilst passing over this chamber, the cloth is supported by the upper side of an endless belt of wire gauze, which is caused to travel over rollers, at the same speed, and in the same direction, as the cloth band. The solid material from the filter is passed into a mixing tank, where it may be treated with water or any required solution, and the mixture from this chamber is then fed on to a filtering arrangement, similar to the first.—W. G. M.

Filters. C. E. Chamberlain, Paris. Eng. Pat. 25,606, Dec. 14, 1901.

A series of filtering cylinders are placed with their closed ends downwards in a container, which receives the water to be filtered; the open ends of the cylinders are flanged, packing being inserted to form a joint with the container and with the cover, which is placed on the top, and serves as the outlet. The whole is held together by means of set screws, &c.—J. W. H.

Filters. E. M. Knight and J. Hawkridge, London. Eng. Pat. 464, Jan. 7, 1902.

The invention relates to the construction of frames f carrying the woven material which forms the filteri medium; the skeleton frame has a groove into which t edges of the filtering medium are packed; between t inner walls of the frame a perforated plate is supporte also carrying filtering medium.—J. W. H.

Refrigeration; Process of and Apparatus for Artific ——. P. M. Justice, London. From The Dry A Refrigerator Company, New York. Eng. Pat. 3495, Fe 18, 1901.

The invention relates to that system of refrigeration which "aqua ammonia" is distilled under pressure, allow to expand into the cooling coils, and reabsorbed by wea liquor from a previous distillation. A series of vessels used, so that as one vessel ceases to absorb, the pressu rises and brings the next into action by the opening of a che valve, and so on. To begin with, the vessels are render vacuous by distillation, the ammonia in an anhydrous for being collected in a receiver at a pressure of 120 lb.; the the vessels in turn absorb the ammonia after it h expanded into the refrigerator coils.—J. W. H.

Drying Apparatus; Vacuum ——. E. Passburg, Berli Eng. Pat. 4126, Feb. 26, 1901.

Usually, in vacuum drying apparatus, the heating shelv or pipes have separate inlets and outlets passing throug the walls of the chamber; in the improved syster "vacuum drying apparatus is fitted within with heati shelves, pipes, or other heating elements placed one abo the other, characterised by an arrangement of chambe near the door of the dryer to receive within the vacuu vessel, near the door, the heat service pipes to be co nected with the heating elements, by means of heat-distri bution pipes for the sake of avoiding the piercing of the sh of the vacuum drying apparatus." For the same purpo "pockets are fitted on the door casting of the vacuu drying apparatus in combination with heat-distributi pipes fitted to the said pockets."—J. W. H.

Heat; Apparatus for Effecting Exchange of ——, *betwe Liquids or Fluids.* C. W. Ramstedt, Kungsange Sweden. Eng. Pat. 25,183, Dec. 10, 1901.

The apparatus consists of a rotating conical vessel partition, with stationary vessels or walls located on eac side of it, a jacket for containing heating or cooling flui and inlets and outlets for the liquid under treatment situate on opposite sides of the rotating partition. Sever different arrangements of the apparatus are described, o having several vessels rotating between stationary ones. all forms, the heated liquid serves to heat the freshl supplied liquid, and thus becomes cooled.—R. A.

Filter Presses. K. Enzinger, Worms-on-the-Rhine, Germany. Eng. Pat. 7063, April 3, 1901.

In filter presses in which "the inlet and outlet tubes a formed by the coincidence of openings in the separa plates and frames," the connections between these tub and the interior of the plates are made by removing t projecting edges round the particular openings in the plat forming the tubes. These openings are made unsymmetric in shape, to increase their sectional area.—J. W. H.

United States Patents.

ids; Apparatus for Concentrating ——. W. Venuh, Darmstadt, Germany. U.S. Pat. 691,210, Jan. 14, 02.

EAM-heated roller is made to rotate in the liquid to be ntrated by evaporation, a fixed scraper continually ving the material which may adhere to its surface.
—J. W. H.

r Press [Rotary]. E. Wernecke, Gerstewitz, Germany. U.S. Pat. 691,030, Jan. 14, 1902.

invention consists of an automatic rotary filter press. A of chambers, provided with pistons and outer covers, e on a central hollow shaft, by which the liquor to be ed is admitted to the several chambers in turn. The ations gone through during one revolution of the bers consist of admission of liquor, compressing of the pitate by the advance of the pistons, release of outer s, discharge of cake of separated solids, and refixing of s.—J. W. H.

Kiln; Dry ——. J. J. Curran, Chicago, U.S.A. U.S. Pat. 691,606, Jan. 21, 1902.

VE the drying chamber of a drying kiln, an "exhaust partment" is provided, which automatically communi- with the drying chamber, as long as moisture is being n off. This automatic action is obtained by balanced s covered with absorbent material, the moisture taken y them being sufficient to upset the balance and cause to open. Automatic ventilators are fixed to the exhaust partment.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

s; Fusibility of the Ashes of ——. H. Le Chatelier d Chantepie. Bull. de la Soc. d'Encouragement, 1902, 02, [2], 223—229.

authors have determined the composition and fusing ts of the ashes of different coals, &c. The Seger cone hod proved to be a very simple one to carry out in connection, the ground ash being mixed with water aining an organic binding substance, which is destroyed he fire, leaving no ash, and the pasty mass moulded to shape required. With rare exceptions, the fusing points e ashes of coals lie between 1,100° C. and 1,500° C. s, even from the same pit, vary greatly in regard to the g points of their ashes.—J. W. H.

t; Calorific Power of ——. Andersson and Dillner. Oesterr.-Zeits. Berg- u. Hüttenw., 1902, **50**, 103.

calorific power of peat samples, even from the same r, may range from 6,140 to 4,490 cals. Moor peat, the t recent deposit, which occurs in large tracts in Sweden, vs a range of calorific power between 3,740 and 4,480 , whilst the percentage of ash lies between 1·98 and , or more usually between 2 and 4. Eleven tests of grass (*carex*) peat showed a variation of from 2·23 0·95 (mostly from 2·3 to 4) per cent. of ash, whilst the rific power was from 4,140 to 5,460 (average 5,000) cals. l peat is formed by the deposition of organic matter t water by the agency of iron- or lime-salts; its calorific er was from 4,360 to 4,560 cals., and the percentage of from 13·77 to 30·5. The calorific power of the lower rs of a peat-bog is usually higher than that of the top ion. The Laxa moor is one of the largest and best Sweden; the value per hectare is as follows:—Mosjö r, 3,930 kronen; Mossäng, 3,340 kronen; and Askeröd, 0 kronen.—W. G. M.

Retorts; Comparison between Inclined and Horizontal —. E. Drory. J. für Gasbeleucht., **45**, [12], 201—204.

author discusses the economy in retort-house wages ted by the use of inclined retorts, as shown by five rent systems of gas-making in use at the four Berlin works of the Imperial Continental Gas Association. The comparison is based on the treatment of 10,000 tons of coal in a period of 17½ days, and the economy of the inclined retort system is shown by the following table:—

System.	Men employed per 24 hours.	Total Retort-House Wages	
		Per 10,000 Tons treated.	Per Ton treated.
		Marks.	Marks.
1. Inclined retorts, with mechanical conveyors for coal and coke	78	7,280	0·728
2. Inclined retorts, without mechanical conveyors for coal and coke	100	9,010	0·901
3. Horizontal retorts, with Hasse-Didier regenerative settings and Arrol-Foulis charging machines	136	13,080	1·308
4. Horizontal retorts; Hasse-Didier regenerative settings; hand charging	226	20,485	2·0485
5. Horizontal retorts; ordinary 7-retort ovens, with hand charging	267	25,025	2·5025

The use of inclined retorts involves no heavy muscular work and calls for no special manual dexterity, and the area occupied by the retort house is less than in the case of horizontal retorts. The first system mentioned in the table is in use in the new Mariendorf works, where the retort house was specially designed, with improved ventilation, &c., for this system; and this, in conjunction with the De Brouwer conveyor for hot coke, renders the work so much more comfortable for the workmen, that 22 men less per day are required than at the works using the second system referred to.—H. B.

Potassium Ferrocyanide in Spent Gas-Purification Material; Determination of ——. O. Bernheimer and F. Schiff.

See under XXIII., *page* 500.

English Patents.

Fuel [Block Fuel]: Artificial ——. A. E. Tucker, Birmingham, and C. Cory, Swansea. Eng. Pat. 1830, March 7, 1901.

FINELY-divided solid fuel is caused to adhere together by an agglutinant consisting of sago flour, or the medullary matter of sago-yielding plants, in a gelatinised condition.
—R. S.

Fuel; Treatment of Bituminous ——. P. Naef, New York, U.S.A. Eng. Pat. 5235, March 12, 1901.

THE objects of this invention are to obtain from bituminous fuel, a gas free from tar and ammonia, the plant being intended to be of very large capacity. Former patents are referred to (see this Journal, 1901, 235 and 349). The fuel is passed through a shaft, in the upper part of which it is treated for the production of by-products, by conducting hot gases through the same and by introducing steam. The gases thus obtained are separately withdrawn and treated for the recovery of the by-products. In the lower part of the shaft, the fuel is consumed and converted into gas, which is conducted away for direct use. There are 14 modifications of the apparatus used and 103 claims.
—R. S.

Coal Blocks; Smokeless ——. S. Pergeline, Nantes, France. Eng. Pat. 384, Jan. 6, 1902.

COAL is mixed with from 15 to 30 per cent. of rosin or coal tar, or of a mixture of the two, and, if desired, with 1 to 5 per cent. of carbonate or nitrate of soda. The blocks are heated in a closed vessel, the volatile bodies being driven off and burned. The blocks are finally allowed to cool out of contact with the air.—R. S.

Furnaces and the like; Apparatus for Increasing the Combustion in Boiler ——. J. Apsey, London. Eng. Pat. 4571, March 4, 1901.

The invention consists in introducing a secondary air-supply, by means of steam injectors, above the fuel, so as to consume the smoke. In rectangular furnaces, two or more perforated iron tubes are longitudinally fitted to or built in the side walls, so as to have their perforations facing inwards, and at about 2 ins. above the working top of the fire. Steam injectors cause air to pass through these tubes and perforations into the furnace. In cylindrical furnaces, one or more tubes are fixed so that their closed ends project through the front into the furnace. Centrally fixed within each tube is a smaller tube having an open end near the closed end of the first tube, while its other end is bent round so as to enter the furnace above the working top of the fire, and is provided with a steam injector. By this arrangement, the supply of air has to pass through the outer tube to reach the tube connected with the injector, and is thereby heated.—R. S.

Furnace Gases and the Abatement of Smoke; Apparatus for the more Complete Combustion of ——. H. B. Phillips and H. L. Godden, London. Eng. Pat. 7117, April 4, 1901.

An air passage is made through the bottom of the fire-bridge, either by an opening in the bridge wall or by a tube passing through the base of the fire-bridge. This opening leads to a space behind the fire-bridge, the space being formed by a perforated bent plate. Through the perforations therein, heated air passes to the partially-burnt gaseous products coming over the fire-bridge to complete their combustion. This plate also supports a series of hollow fireclay or like cones or polyhedra, which serve to break up and distribute over the flue area the gases passing over the bridge.—R. S.

Furnaces or Apparatus for Burning Refuse Matter or other Material. H. Heenan, Manchester. Eng. Pat. 7041, April 3, 1901.

In a twin-cell destructor, the gases are caused to always pass in the same direction. For this purpose, an arch is formed over both the cells, with an opening at one end leading to the flue. A secondary arch hangs down a short distance from the first arch, between the two cells. When the cell near the outlet has been clinkered and refilled, the hot gases from the other cell are directed by the cross, or secondary, arch on to it, whereby the cooler gases of the first-mentioned cell are entirely burned. When the cells are reversed, the cool gases from the other cell are directed on to the hot cell, whereby they are completely burned.
—R. S.

Carburetting Apparatus for Internal Combustion Engines. F. C. Blake, London. Eng. Pat. 7731, April 15, 1901.

This invention consists in devices for feeding the oil to the chamber where it is mixed with air. The oil is fed to a closed chamber, the top of which is a flexible diaphragm, having a central nozzle projecting into the chamber above. The upper chamber is provided with adjustable air inlets, and is connected with the engine. The lower end of the nozzle is normally closed by a valve. When the piston makes its suction stroke, the resulting vacuum causes the diaphragm to rise, and a quantity of the oil from the chamber below is sprayed into the upper chamber by the nozzle.—R. S.

Carburetting Apparatus and Burner for Liquid Hydrocarbons. G. Machlet, jun., New Jersey. Eng. Pat. 15,760, Aug. 3, 1901.

Through the centre of the bottom of an upright cylindrical casing, there passes an inlet jet for compressed air, and over the jet is arranged the vaporising burner, up through which the compressed air can blow. An open helical channel passes round the exterior of the burner, and receives at its upper end, from a pipe which enters through the outer cylindrical casing, a supply of the oil to be vaporised. The vaporising burner is open at its lower end, and has a number of outlet passages at its upper en Above the burner is an annular retort, supplied with from a pipe which enters through the casing. An air bla from an injector nozzle directed horizontally across t upper part of the casing, carries off the vaporised hydr carbons through an outlet pipe on the opposite side of t casing. When the generator is to be used, light hydr carbon from an auxiliary reservoir is admitted into t helical channel, down which it flows, meeting at the foot blast of compressed air entering at the central inlet je The carburetted air produced passes up through the burn and is ignited at the burner top, heating up the annul retort. The passages at the burner top are so arrang that part of the hot gas passes down round the burn vaporising the light hydrocarbon and carrying it to the ba of the burner, up through which it is then blown by t air-blast. When the burner is sufficiently heated, the lig hydrocarbon is turned off and petroleum is admitted simu taneously to the vaporising burner and the retort, t action of the burner continuing as before.—H. B.

Furnaces of Steam Boilers; Consumption of Smoke a the Production of Forced Draught in ——. H. Hamilto Port Glasgow. From J. Hamilton, Cape Town. E Pat. 610, Jan. 9, 1902.

The smoke generated by combustion of the fuel in t furnaces, or any desired proportion of such smoke, is wit drawn from the uptake funnel, and is forced by n jet steam or other gaseous fluid into the ash-box or lower pa of the furnace.—R. S.

Electric Furnaces for Heating or Re-heating Objects a Predetermined Degree. A. Grobet, Vallorbe, Switze land. Eng. Pat. 9350, May 6, 1901.

The furnace consists of one or more retorts of refracto material of any suitable form, and of a suitable resistanc connected to a source of electricity, both retort and resi ance being coated by a heat-insulating material. Wh several retorts are arranged in the same casing, each provided with a resistance connected to a suitable rheost intended to control the heating of the corresponding retor —G. H. R.

Furnaces for Heating Annealing Boxes, Glass-melti Pots, and other Articles. W. S. McKenna and Whiteley, U.S.A. Eng. Pat. 15,611, Aug. 1, 1901.

To enable annealing boxes, muffles, pots, and the like be quickly moved into and out of a furnace, without inju to the mechanism necessary for carrying on these actio the furnace is formed with a recess extending along hearth. The recess is provided with a track, and with ledge along each side, below the level of the hearth. truck is constructed to run along this track, and the tru carries a movable furnace bottom, which is vertica adjustable thereon, and is provided with seats or projecti for engagement with the ledges of the furnace recess. power-driven sprocket- or driving-wheel is journalled at e end of the track, and a pulley at the other. Motion communicated from the driving wheel to the truck by me of an endless chain or rope.—R. S.

Gas Producers. L. Mond, London. Eng. Pat. 8449 April 24, 1901.

This is an improvement upon the producer described Eng. Pat. 12,440, 1893 (this Journal, 1894, 938), designe to yield a gas freer from tarry condensable matters wh certain classes of fuel are being employed. Downwa through the centre of the producer already figured exte a hollow shaft, capable of being revolved, carrying agitat arms, and having a steam injector inside, so arranged t gases and vapours are aspirated from the top of the p ducer just by the charging hopper and delivered again i the producer at its base immediately above the fire-b By this device the tarry matters distilled off from the f in the charging hopper are compelled to pass through a body of the incandescent coal, thus being almost entir converted into permanent gases.—F. H. L.

Gas from Petroleum or Paraffin Oil, and Means for Consuming same for Heating Purposes; Generators of ——. O. H. Bayldon and H. E. Morriss, London. Eng. Pat. 51, Jan. 1, 1902.

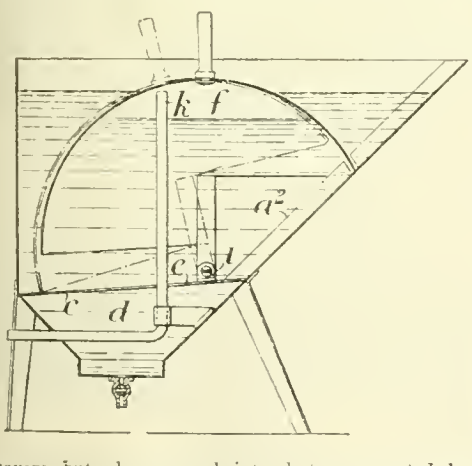
The inventors claim, as regards the generator, the use of a coil situated in the usual delivery tube between the oil tank and the main burner, which coil is heated over a suitable oil burner for the purpose of vaporising the oil therein. In connection with the mixing chamber and burner, the claim is for the employment of one or more jets of steam, the rush of which carries with them the requisite quantity of air into the mixing chamber; and the employment of one or more separate jets of air under pressure, for supplying air to the mixing chamber; also the use of an improved automatic valve for controlling the admission of steam or air to the mixing chamber, which valve consists of an outer case, with inlet and outlet, and is provided with a sliding plunger having a central bore and side outlet with sloping slot or groove, in addition to which there are supplementary outlets leading into a space between the plunger and the valve case, in which space the steam or air can collect and thrust forward the plunger, and so limit or stop the supply of steam that is passing from the bore in the plunger to the outlet in the valve case.—C. S.

Calcium Carbide or the like, or for Melting Steel, Brass, or other Metals or Alloys; Furnace for the Manufacture of ——. J. Ward and Internat. Oil Furnace Co., Ltd., Newcastle-on-Tyne. Eng. Pat. 4231, Feb. 27, 1901.

Crude or refined petroleum, paraffin, or other suitable mineral oil, is placed in trays on a vehicular framing, such as is described in Eng. Pats. 5319 (this Journal, 1901, 344) and 23,428, 1900, and the vehicles are run into a vaporising chamber, from which the vapour passes through one or more openings to a mixing chamber, where the vapour is guited, air for the purpose being admitted through flues passing along the two sides of the furnace and entering on either side of the mixing chamber. The flames pass through openings to one or to a series of melting chambers, one or more openings being provided in the dividing wall. If there are several melting chambers, the communicating openings are alternately near the top and near the bottom of the dividing walls.—R. S.

Acetylene Gas; Apparatus for Generating ——. H. de Thiersant and W. A. Coulson, London. Eng. Pat. 6904, April 2, 1901.

This is a hand-fed, carbide-to-water apparatus. A semi-cylindrical displacement holder, *f*, oscillates on a horizontal axis, *l*, inside a water-tank, and is so constructed that when in the position of the full lines shown in the diagram,



it covers, but when moved into that represented by the dotted lines, it exposes a hole, *e*, in the partition, *c*, through which carbide, dropped on to the sloping side of the generator, falls into the decomposing space, *d*. *k* leads to the burners.—F. H. L.

Acetylene Gas Generators. G. V. Foster and E. F. Mackusick, New York City, U.S.A. Eng. Pat. 2851, Feb. 4, 1902.

This is a mechanically-fed carbide-to-water generator, the carbide being made up into cubes wrapped round with pasted paper and muslin, and inserted into perforated hemispherical vessels which are screwed together so as to form balls. These are stored on a spiral platform and are collected one at a time by mechanism attached to the rising holder bell of the generator in such fashion that they fall through a water-sealed shoot at the side of the apparatus, and finally enter a space beneath the holder, where the water softens the paste and attacks the carbide. After decomposition, the shells drop into a sump containing a bucket by means of which they can be lifted out ready for recharging. An alternative arrangement suitable for hand-charging is also described.—F. H. L.

Incandescent Gas Mantles. W. K.-L. Dickson, London. Eng. Pat. 4707, March 5, 1901.

The top and bottom edges of mantles are strengthened "by means of refractory material, locally applied, having a coefficient of expansion so near to that of the material of the mantle as not to cause rupture of the mantle in use." A cream composed of ground fireclay and a 10 per cent. solution of silicate of soda may be used as the strengthening material. One or more vent holes are punched in the upper part of the collodionised mantle, the holes having their edges strengthened by refractory material.—H. B.

Incandescent Gas Lighting; Mantles for ——. W. K.-L. Dickson, London. Eng. Pat. 9733, May 10, 1901.

Ordinary mantles are to be strengthened by means of silicate of soda or potash, uniformly distributed, and forming from 0·5 to 5 per cent. of their weight. According to the preferred method of treating the mantles, the latter, in the collodionised condition as purchased, are sprayed with a 1 per cent. solution of silicate of soda in methylated spirit, the solution being coloured in order that the amount on the mantle may be judged by the depth of tint produced. The best result is obtained when the mantle contains 1 per cent. of silicate. To prevent the development of pressure within the mantle on ignition, the upper parts may be punched with vent holes, or the opening at the top of the mantle may have a "frog mouth" shape, instead of the usual circular form. The lower edge of the mantle and the edges of the vents are strengthened locally by painting them with a preparation of pipeclay or fireclay and silicate of soda solution.—H. B.

Incandescent Lighting; Machines for the Manufacture of Mantles employed in ——. J. L. Müller and J. Bonnet, Paris. Eng. Pat. 24,218, Nov. 28, 1901.

Relates to improvements in the apparatus for making incandescent mantles, described in Eng. Pat. 83 of 1901, in which the mantles were suspended in series of any suitable number, 10 for example, upon rods which passed through the machine and stopped at various positions in succession, where the operations of burning off, calcining, immersion in collodion, and drying were effected. A stoppage is now provided for, during which the mantles are trimmed to the desired length by means of horizontal knife blades, and the speed of output from the machine is increased by limiting the periods of stoppage to one minute each. Thus, instead of a four-minute stoppage over a single calcining burner (limiting the feed to one rod in four minutes), the mantles stop for one-minute periods over four successive calcining burners, the rate of feed being one rod per minute.—H. B.

Incandescent Electric Lamps. Sir H. C. Mance and Nernst Electric Light, Ltd., London. Eng. Pat. 5038, March 9, 1901.

Two or more separate contacts are provided at each end of the Nernst filament, between the conducting wire and the filament. "Thus one wire is twisted or wound round the rod and carried away sideways. A little further along a second wire is attached in the same way. The two wires are twisted together at a small distance from the rod."

—H. B.

Incandescent Electric Lamps; Nernst ——. C. C. Garrard and Nernst Electric Light, Ltd., London. Eng. Pat. 5040, March 9, 1901.

The glow bodies and heaters of Nernst lamps are usually supported by the conducting wires, and troubles arise owing to the softening of the wires at the high temperature. The patentees form the filaments and heaters with an extension at each end, beyond the platinum contact, to such a distance that the end is cool. The end is then attached to a support so as to take the strain off the conducting wires.—H. B.

Glowers for Pyro-electric Lamps, and Process of making the same. British Thomson-Houston Co., Ltd., London. From C. P. Steinmetz, Schenectady, U.S.A. Eng. Pat. 26,133 of 1901, Jan. 20, 1902, under Section 2 of Act of 1888.

In lamps of the pyro-electric (Nernst) type, the glow-body usually has fine platinum leading-in wires wrapped round its ends, and, as the ends of the glower waste away during use, the winding becomes loose. The patentees sprinkle powdered magnetite (Fe_3O_4) on to the wire-wound ends, and then fuse the magnetite, preferably by heating the ends for a moment in a small electric arc between carbon points. The bead of magnetite improves the contact and increases the conductivity at these parts, tending to keep them cool and preventing the wearing away of the stick.—H. B.

Arc-Lamps, and Electrodes therefor. British Thomson-Houston Co., Ltd., London. From W. T. Dean, Schenectady, U.S.A. Eng. Pat. 26,139 of 1901, Jan 20, 1902, under Section 2 of Act of 1888.

Each electrode consists of a rod of refractory material (such as magnesia or zirconia), which only becomes a good conductor when heated to incandescence, surrounded by a loose tube or sleeve of carbon. The carbon sleeve of the upper electrode is provided with clutch mechanism, operated by a regulating coil, which serves to raise the sleeve and strike an arc between it and the lower electrode when the circuit is closed. The top of the upper refractory core is enlarged so as to form a shoulder, the arrangement being such that when its carbon sleeve has been lifted a short distance and an arc has been struck, the top of the sleeve engages the shoulder and the core is also lifted.

When no current is flowing, the upper sleeve and core rest on those of the lower electrode. On closing the circuit, an arc is struck between the carbon sleeves, and then the upper core is raised. Both cores are heated so highly in the arc, that their resistance becomes less than that of the carbons, whereupon the arc forms between the cores, the increased current lengthening the arc and raising the candle-power of the lamp.—H. B.

United States Patents.

Hydrocarbon Oils; Apparatus for the Vaporisation, Combustion, and Utilisation of ——. T. Tomlinson, Bray, Ireland. U.S. Pat. 690,486, Jan. 7, 1902.

See Eng. Pat. 25,629, 1899; this Journal, 1899, 1005.

—A. S.

Oil Burner. B. G. Devoe and C. W. Dailey, Lima, Ohio, U.S.A. U.S. Pat. 693,502, Feb. 18, 1902.

The invention, the object of which is to provide a cheap, durable, and efficient oil burner, which may be conveniently applied to an ordinary stove or furnace without materially changing the construction thereof, is characterised by the combination of an oil chamber having an upwardly projecting and concentrically-arranged tubular flange projecting from its bottom to form an air inlet, with ribs arranged on the outer walls of said flange, a bell-shaped wick-support carried thereby and resting on the ribs, means for supplying oil to the wicks, and an adjustable hood arranged above the support and surrounding the same.—A. S.

Regulator; Automatic Oil and Air —— [*for Oil-burning Furnaces*]. F. W. Parfitt, Louisville. U.S. Pat. 694,886, March 4, 1902.

Within the reservoir, in which it is desired to keep the oil and compressed air at a certain level, is placed a ball-float cock, the end of which is pivoted upon the plugs of two cocks, so arranged that when the float sinks, one of the cocks is opened to let compressed air escape from the reservoir, and when the float rises, the other cock is opened, admitting air to the injection pump, whereupon air is pumped into the reservoir. While the oil is at the proper level in the reservoir, neither of the cocks is open. The speed of the injection pump is controlled by the pressure inside the reservoir.—H. B.

Portable [*Oil*] *Furnace.* J. Ward, Delaval, Northumberland. U.S. Pat. 695,015, March 11, 1902.

The furnace, which is carried upon wheels or rollers, consists of two chambers, one behind the other, communicating through a flue at the bottom of the partition between them. The oil is fed into one or more shallow troughs, mounted on a frame, which is run upon wheels into the front chamber, the troughs being provided with sliding tops for regulating the vaporisation of the oil. A flue at the end of the back chamber conducts the vaporised oil to the boiler or other object to be heated. In the side walls of the furnace are tortuous passages, through which air, entering through slides in the front of the furnace, flows, the heated air passing out by a flue at the end of the back chamber, and mingling with the vaporised oil in the combustion chambers of the boiler, &c.—H. B.

Vaporiser for Hydrocarbon Engines [*for Motor Vehicles, &c.*]. A. Krastin, Cleveland, Ohio. U.S. Pat. 695,060, March 11, 1902.

The casing, through which air is drawn into the explosion cylinder, is covered with wire gauze at its open end, and is provided with a cock for controlling the air admission, and an inlet for the liquid fuel, which is controlled by a needle valve. A relief valve is attached to the head of the cylinder. The operating arms of the cock and valves are connected to a single oscillating rod, by means of which all three are operated simultaneously, the cock and valves being so set that the movement of the rod opens and closes them in proper sequence.—H. B.

Liquid Fuel and Air Burner. A. J. Fowler, London, Canada. U.S. Pat. 689,954, Dec. 31, 1901.

The burner comprises the following features:—A vaporising chamber; a superheating chamber in which a central opening is formed; a coiled pipe, extending from the vaporising chamber to and around the superheating chamber; a burner-pipe fitted with a burner-tip, and communicating with the coiled pipe, from which burner-pipe the vapour is discharged; in combination with an annular air-chamber, in which perforations are formed, and which is located below and extends around the opening in the superheating chamber; a superheating air-chamber communicating with said annular air-chamber; a high-pressure air-reservoir communicating with said superheating air-chamber; and an air-pressure regulator on the pipe which extends from and communicates with the high-pressure air-chamber and the superheating air-chamber.

—C. S.

Crude-Oil [*Petroleum*] *Burner.* G. E. Witt, Fresno, Cal. U.S. Pat. 693,938, Feb. 25, 1902.

The inventor claims, in a crude-oil burner, the combination of an inlet chamber, an oil-feed pipe communicating therewith, a steam pipe having an injector nozzle extending into said inlet chamber, a perforated tubular mixing chamber extending from the inlet chamber, an atomising chamber inclosing the mixing chamber, and a plug in the outer end of the latter, to centre the same in the atomising chamber, which plug is channelled for the discharge of commingled steam and atomised oil from the atomising chamber.—C. S.

Burner; Combination Illuminating and Heating ——. V. K. Coffill, Brooklyn. U.S. Pat. 690,700, Jan. 7, 1902.

A vertical burner tube, fitted at the top with an illuminating burner tip, is surrounded by a Bunsen or outer tube which can slide up and down, its motion being guided

by a vertical slot, which engages a pin or stud fastened rigidly to the burner tube. Lateral slots extending from the vertical slot enable the Bunsen tube to be fixed at any desired height. When the burner is to be used for illuminating purposes, the outer tube is lowered till its upper edge is below the burner-tip; when used for heating purposes, the Bunsen tube is raised until a sufficient area of the slots is uncovered to admit the proper proportion of air to the gas to produce a non-luminous flame. A lever, pivoted on the outer tube and fitted with a handle, facilitates the adjustment of the outer tube.—H. B.

Bunsen Burner. C. W. Taylor, Sioux City. U.S. Pat. 690,792, Jan. 7, 1902.

In a Bunsen burner of ordinary construction, the usual gas-inlet nipple is replaced by a horizontal perforated diaphragm. An annular collar is arranged on the interior of the burner tube a little above the diaphragm, pressing upon the outer edge of a metal disc which rests upon the diaphragm. A handle attached to the disc projects through a horizontal segmental slot in one side of the burner tube, enabling the disc to be partially rotated in a horizontal plane. A central perforation in the diaphragm, and a similar one in the disc, always coincide, whatever the position of the disc handle may be. Other perforations in the diaphragm are eccentrically disposed in relation to apertures in the disc, so that, by rotating the disc, a greater or smaller volume of gas can be admitted as desired, the central perforations always permitting some gas to pass.—H. B.

Bunsen Gas Burner. B. M. Hanna, Pittsburg. U.S. Pat. 694,746, March 4, 1902.

The burner is adapted to be regulated for either high-pressure or low-pressure gas. The gas-inlet orifice, which is arranged at the foot of the mixing tube, consists of a central perforation in a metal plug, which may be screwed up or down slightly in the tubular base attached to the gas-pipe. Inside the metal plug is a fixed needle valve, the point of which projects upwards into the central perforation, any rotation of the plug opening or closing the orifice as the case may be. A pin attached to the plug projects laterally through a slot in the outer burner tube, to facilitate the adjustment of the plug.—H. B.

Separator; Gas and Water ——. I. L. Neely, Fairmount, Indiana, U.S.A. U.S. Pat. 690,986, Jan. 14, 1902.

A vertical cylindrical reservoir has a water inlet near its middle and a gas outlet in its top cover; a valve in the water outlet below is controlled by means of a float, to which it is attached by a spiral spring. Normally the valve is closed, but on the level of the water in the reservoir rising, the float, stretching the spring, finally lifts the valve, and allows the water to escape, when the valve again closes.—J. W. H.

Carburetter. J. G. Clark and G. Cothran, Indiana, U.S.A. U.S. Pat. 689,460, Dec. 24, 1901.

The carburetter consists of a vertical cylindrical vessel, heated by a burner beneath, through which passes vertically downwards a blast pipe, ending in radiating perforated branches near the bottom of the vessel. The vessel is charged with the carburetting liquid. Two valved eduction pipes are connected to the vessel, one passing to near the bottom, the other only passing a short distance below the cover. These two unite outside the vessel, and lead to a vertical helical heating tube, enclosed in a vertical cylinder, and heated by a burner. The other end of the coil leads to the distributing pipe, which is provided with branches for supplying the two burners used in the process.—R. S.

Carburetter. J. St. C. Legge, London. U.S. Pat. 690,303, Dec. 31, 1901.

The air is forced upwards through a vertical drying cylinder, within which are holders, having perforated bottoms, containing quicklime or calcium chloride. The dried air then passes through a tube which has two branches. One branch leads to a perforated coil, which is immersed in the carburetting liquid contained in the bottom of the carburetting vessel. The other leads to a perforated coil, which is situated above a perforated diaphragm in the same vessel, and beneath a quantity of porous material. The quantities of air which pass through the respective coils can be regulated according to the weather, &c. The carburetted and uncarburetted air mix thoroughly in passing through the porous material, and the mixture passes out through an opening in the top to the distributing main. The carburetting vessel is immersed in a water tank, and a coil, which is immersed in the liquid hydrocarbon, is open at both its ends to the water in the tank. The supply of hydrocarbon is regulated by a float operating, through levers, a needle valve on the supply pipe.—R. S.

Carburetter [Oil-Gas]. O. A. Lane and H. A. Davenport U.S.A. U.S. Pat. 690,444, Jan. 7, 1902.

The oil is brought by a tube provided near its exit with a gravel filter, and at its exit with an adjustable needle valve. It then passes to a vertical tube, at the bottom of which is a quantity of wick, while, higher up, the tube is surrounded with a burner adjustable in vertical position, and arranged to heat, not only the vertical tube, but an upper horizontal retort into which the vertical tube opens. The oil vapour is "fixed" in this retort, and passes from the retort to a vertical tube having two branches, a lower one leading to a needle-valved outlet supplying gas to the burner surrounding the vaporising tube. This valve is initially heated by means of an external oil cup. The burner referred to consists of an annular casing, divided by an annular foraminiferous diaphragm into two compartments, an outer or mixing chamber and an inner combustion chamber. The upper branch of the vertical tube leads to a horizontal mixing tube supported upon the top of the retort, and the entrance to which is regulated by another needle valve.—R. S.

Carburetting Air; Apparatus for ——. P. R. van der Made, Breuleken, Netherlands. U.S. Pat. 690,681, Jan. 7, 1902.

Air is forced through a horizontal perforated pipe which is immersed in liquid hydrocarbon contained in a horizontal cylinder. A tier of these boiler-like cylinders is used, and the cylinders are employed in series, that is, the oil is supplied by a pump to the top one only, overflow pipes carrying it to the others in succession, whilst air is supplied to the bottom one only, the perforated tube in each higher vessel being connected with the vapour- and air-space in the chamber below.—R. S.

Carburetter or Mixing Valve for Explosive Engines. A. L. Kull, Camden, New Jersey, U.S.A. U.S. Pat. 690,112, Dec. 31, 1901.

The valve is adapted to thoroughly vaporise a liquid hydrocarbon, and to intimately mix the vapour thus obtained with air, at each suction stroke of the piston of the engine. The device consists of a lower part having air and oil inlets, and an upper part, forming a mixing chamber, which is separated from the lower part by a spring-controlled lift valve. The lower part has a large air inlet, and a narrow oil inlet regulated by a needle valve. The main valve is of an inverted conical shape, and its seat is a correspondingly shaped bushing fitting on the conical wall of the casing. The air enters beneath the valve; the oil is fed to an annular groove beneath the bushing. The latter is perforated to allow the oil to escape in fine jets when the valve is raised, whereby the oil mixes with the air just before the latter reaches the mixing chamber.—R. S.

Wax-burning Lamp. A. J. Pursall and H. D. Jackson, Birmingham. U.S. Pat. 689,747, Dec. 24, 1901.

The lamp consists of a body, a removable base, a reservoir divided by a perforated vertical partition into two compartments, one of which is charged with a cake of wax, whilst the other terminates below in a passage leading to the burner, which is situated below and close to the reservoir, and contains a wick that extends down to a point near the bottom of the burner receptacle.—C. S.

Gasoline Lamp. F. E. Shortt, Carthage, N.Y. U.S. Pat. 689,656, Dec. 24, 1901.

The features in this lamp comprise the combination, with the oil-reservoir, of an air cylinder connected therewith, a spring-operated piston for forming a vacuum in the air cylinder, a handle for retracting the piston against the power of the spring, an air tube dipping below the surface of the liquid in the oil reservoir, a draught tube extending from the air cylinder into the upper part of the reservoir and fitted with a valve to prevent the outflow of the fluid from the air cylinder, a generator, an oil pipe connecting the oil reservoir with the generator, an initial heater near the generator, a valve-controlled conducting pipe connecting the air cylinder and initial heater, and a pipe for delivering gas from the generator to the lamp burner.—C. S.

Lamp; Vapour-burning Street ——. J. C. Craniger, U.S.A. U.S. Pat. 690,237, Dec. 31, 1901.

Gasoline, contained under pressure in a reservoir situated at the base of a lamp-post, is led up a pipe to a two-way valve situated in the upper part of the lamp, the ports of the valve being so arranged that the gasoline can be supplied either to the main burner, to the auxiliary burner, or to both burners simultaneously. The vaporiser of the main burner consists of a conical coil, composed of coils of pipes ½ in. and ⅛ in. in diameter, situated above the burner, one end of the coil being connected with the two-way valve, and the other end with a vapour chamber arranged horizontally below the coils and above the burner. The auxiliary burner, which also comprises a vaporising coil connected to the two way valve, is situated centrally within the upper part of the vaporising coil of the main burner. The vapour from the main vaporiser is led through a perforated air-mixing chamber and then down to the burner, which is surmounted by a mantle and surrounded by a chimney. The lower parts of the lamp are contained within a glass globe, and the upper parts are covered by a metal dome, the lamp being suspended from a bracket on the lamp-post. The auxiliary burner is always kept lighted when the main burner is not in use, and it thus keeps the vaporising coils of the latter hot. The two-way valve is actuated by a clockwork mechanism in such a way that, when the lamp is to be lit up, the valve is first set for a short time in that position which allows gasoline to flow into both burners, and next, when the main burner has lit, is set so as to extinguish the auxiliary burner. A metal diaphragm and cylindrical casing serve to confine the heat of the burners to the vaporising coils and protect the valve mechanism.
—H. B.

Burner; Vapour ——. H. F. Smith, Philadelphia. U.S. Pat. 690,327, Dec. 31, 1901.

In this burner device, adapted for the production of a luminous flame from gasoline or the like, the vaporised hydrocarbon enters a vapour chamber which communicates, through a vapour jet, with a mixing tube, wherein the gas mingles with air admitted in regulated quantity by a screw-threaded valve situated at the side of the mixing tube. The device is arranged horizontally, the end being turned up to receive the burner-tip; a detachable cap at the other end facilitates the cleaning of the vapour chamber and jet.
—H. B.

Hydrocarbon Lamp. S. B. Morss, N.J., U.S.A. U.S. Pat. 691,068, Jan. 14, 1902.

The inventor claims, in connection with a hydrocarbon lamp or heater, the combination of a burner having a wick tube; a tube or duct having a portion overlying the wick tube and two depending portions lying on opposite sides of the wick tube and opening downwardly; and a wick extending continuously from the wick tube to an oil container, thence up into and through the duct and depending therefrom into the oil, the overlying portion of the duct having means to permit the escape of vapour; a guide for the wick below the burner, and a shield surrounding the said means of escape and extending upwards.—C. S.

Incandescent Gas Burner. W. H. A. Sieverts and J. F. C. Juergens, Germany. U.S. Pat. 689,657, Dec. 24, 1901.

The burner is designed to permit of the vertical adjustment of the burner top (which is covered with wire gauze and surmounted by a flame-spreader) relatively to the gas inlet at the base of the mixing tube, whilst the burner is in operation. The outer burner-tube, which carries the burner top, rests upon a nut, which may be screwed up and down upon a screw-threaded ring or sleeve resting upon the shoulder of the mixing tube.—H. B.

Incandescent Burner for Oil Lamps. J. McFarlane and E. D. Sterne, Washington. U.S. Pat. 690,117, Dec. 31, 1901.

An oil lamp of the circular-wick type is described, in which means are provided for adjusting the air currents passing up the interior of the lamp.—H. B.

Incandescent Gas Lamp. W. Tice, New York. U.S. Pat. 694,695, March 4, 1902.

Reference is made to patentee's U.S. Pat. 538,344 of 1897. The mixing tube of the burner, round which is fitted closely a slotted, rotatable sleeve for regulating the air-inlets, is provided with a bead, flange, or other external stop just above the top of the rotatable sleeve. On this stop rests the tube, carrying the burner top, gallery, &c., which is slipped over the upper end of the mixing tube. When once the rotatable sleeve has been adjusted so as to pass the proper amount of air, any accidental disturbance of it through the rotation of the upper parts of the burner is prevented by the stop.—H. B.

Incandescent Gas Burner. C. A. Bluhm, Michigan City. U.S. Pat. 694,824, March 4, 1902.

A conical valve is arranged, point downwards, in the gas-inlet orifice of the burner. The point is adapted to screw upon a fixed threaded stem, which projects upwards centrally through the gas orifice. The upper end of the conical valve is attached to a stem, of angular cross-section, that engages loosely an angular perforation in a cross-plate fixed in the head of the burner. When the burner is rotated, the latter stem is caused to turn likewise, and the conical valve is raised or lowered in the gas orifice, regulating the flow of gas accordingly.—H. B.

Acetylene Gas Generator. C. E. Colomy, Virginia, U.S.A. U.S. Pat. 689,540, Dec. 24, 1901.

This is a mechanically-fed carbide-to-water generator. The flexible connection between a rising holder and its counterpoise runs over a wheel fastened to a shaft, at the other end of which is a clutch gear and pulley. The latter drives, by means of a belt, another pulley on a horizontal shaft, which passes through a stuffing box into the gas space of the generator. Inside, this shaft transmits its motion to a vertical shaft carrying a conical disc at the aperture of the usual carbide hopper, which serves to feed granulated carbide into the water as it moves round; while below the water level, the shaft also bears a distributing plate, which is swept clear of lime, &c., by a fixed brush. Owing to the clutch, the mechanism only works when the holder bell is travelling downwards.—F. H. L.

Acetylene Gas Generator. C. Sebelle, Vienna. U.S. Pat. 689,756, Dec. 24, 1901.

This is a mechanically-fed carbide-to-water generator in which the carbide hopper is fastened to, and rises with the holder-bell. The apex of the cone is formed by a pair of flaps, each connected to a counterweighted lever, which normally join together, V-fashion. When the bell falls, stops fixed to the walls of the generator trip up these horizontal levers, opening the carbide hopper to the descent of the material. In order to prevent a large lump of carbide jambing open the flaps and permitting smaller pieces to enter the water when the hopper should be closed, each flap is composed of a large number of flexible steel wires, like a brush, which engage together, and secure the opening.—F. H. L.

Acetylene Gas Generator. A. M. Dimmick, U.S.A. U.S. Pat. 689,858, Dec. 31, 1901.

MECHANICALLY-FED carbide-to-water apparatus. The bide container is a separate cylindrical vessel, which is ided internally by means of two partitions into a haped space for the carbide, one wall of which is vertical, the apex of the V, in the vertical wall, there is a round e covered by a movable box, which collects a certain rge of carbide. As the holder bell falls, mechanism nes into action which upsets this box, allowing its nts to run down an inclined plane through a layer of into the water of the generator, the box afterwards uming its normal position. The decomposing chamber a false bottom with a central aperture in it, which is able of being covered by a flap-valve connected to an side lever; this hole is usually open, and the carbide s into the space beneath; but when it is desired to ove the lime sludge, the flap can be shut and a manhole ned without permitting gas to escape. Above the omposing chamber is a rising holder working in an ular seal. The lid of the carbide store is water-jacketed, l any quantity of material can be kept in it without tage.—F. H. L.

etylene Gas Generator. J. A. Mosher and W. S. Hamm, Chicago, U.S.A. U.S. Pat. 690,173, Dec. 31, 1901.

GENERATOR of the drip pattern. Inside a vertical indrical vessel are placed superposed carbide receptacles sisting either of hemispherical basins with perforated toms or of wire cages. The base of each serves as the er for the cage immediately beneath, while the topmost e has a cover of its own, also provided with a number of tributing holes. The water enters and the gas escapes the top of the generator, and therefore it is claimed t overheating is minimised, since the action takes place ween liquid water and carbide, the water-vapour passing with the gas. Heat distribution is also assisted by king the generating cylinder large in comparison with the tracted area within which acetylene is evolved. U.S. . 652,974, granted to J. A. Mosher, is referred to.

—F. H. L.

etylene Gas Generator. T. A. Bryan, Baltimore, U.S.A U.S. Pat. 690,356, Dec. 31, 1901.

SELF-CONTAINED, mechanically-fed, carbide-to-water erator, with displacement-holder, the supply of carbide ag governed by the pressure in the apparatus. The tom of the carbide hopper terminates in a tube, the uth of which enters into a movable scoop capable of ag closed by a movable door. At the top of the whole paratus is a small chamber in connection with the gas ce, which contains a flexible diaphragm fastened to a er; this lever opens or closes the door of the carbide op. The lower end of the carbide tube also communicates h the air by a tube pointing downwards, and closed by a ew cap, through which carbide can be removed from the rage hopper when necessary. When the generator is in ion, this tube is shut off at its internal end by a movable or operated by the above-mentioned mechanism. On the in service pipe is a three-way cock, communicating either ween the generator and the burners, or between the erator and the safety pipe; this cock is controlled by a d lever, the other end of which locks over the screw at the top of the carbide hopper, through which the d is fed in. Said cap, accordingly, cannot be unscrewed hout disconnecting the service, and at the same time king a connection between the gas space of the generator l the escape pipe. The last-mentioned lever also locks nlocks the main water-inlet and the sludge cock at the tom. The apparatus works with granulated carbide.

—F. H. L.

etylene Gas Generator. J. J. Hendler, Missouri, U.S.A. U.S. Pat. 690,425, Jan. 7, 1902.

ts is a small apparatus of the contact type, intended to immersed bodily in a large mass of water, such as a lake, the illumination of parks, &c., or in the sea for buoying. consists of a closed cylindrical vessel containing carbide, h a cock and burner mounted on top, and having an upright pipe arranged concentrically within it, closed at the top, with a side hole half-way up, and open at the bottom. Inside this tube is an inverted funnel tube, through which either water enters to attack the carbide, or the excess of gas passes down to collect in the funnel. Small tubes with returned heads also pass from below the bottom of the cylinder to near its upper part, serving also to remove surplus gas. Beneath the bottom of the cylinder is a spreading base, open at the bottom, which acts as a stand; and near the top of the cylinder is a ring-shaped float, either of cork or the like, or of rubber, which can be distended by acetylene escaping from the cylinder through a non-return valve. From underneath the base hangs a weight to maintain the whole in a vertical position when floating in water. The inverted funnel and the stand of the apparatus behave as displacement-holders.—F. H. L.

Lamp; Photographic Flash-Light ——. J. L. Zweck. U.S. Pat. 690,508, 1902.

See under XXI., *page* 497.

Acetylene Gas Generator. J. H. Ross, Aston, England. U.S. Pat. 690,773, Jan. 7, 1902.

THIS is a self-contained table lamp. See Eng. Pat. 9537, 1900; this Journal, 1901, 564.—F. H. L.

Acetylene Gas Generator. W. W. Cozins, California. U.S. Pat. 691,357, Jan. 21, 1902.

THIS is an automatic drip generator with displacement-holder, the supply of decomposing water coming from the displacement chamber, and being accordingly cut off when a store of gas accumulates. The carbide is contained in a large number of small pots, arranged partly "in series" and partly "in parallel," which are slung on lengths of barrel extending horizontally from the holder, which is a rectangular tank, with a purifying vessel in its centre.

—F. H. L.

Acetylene Gas Generator. L. T. Stephenson, Trinidad, Colorado, U.S.A. U.S. Pat. 694,587, March 4, 1902.

THIS is an automatic generator of the flooded-compartment system. The store of water for decomposing purposes is separate from that in which the holder floats, said water being admitted to the carbide by the opening of a valve each time the bell falls. Should the holder-bell rise above a certain point, it brings into operation a series of levers, which open blow-off cocks on the decomposing chamber and on the holder, thus enabling surplus gas to be removed. The carbide is contained in a number of subdivided superposed vessels, which communicate with one another in such fashion that the water, entering from beneath, attacks the carbide in each in succession.—F. H. L.

Acetylene Gas Generator. J. Harris, Cleveland, Ohio, U.S.A. U.S. Pat. 694,916, March 4, 1902.

AN apparatus of the automatic water-to-carbide type, with separate store of decomposing water, a rising holder, the falling of which opens a cock on the water inlet, and a horizontal carbide vessel of one tier only, divided radially into a number of compartments.—F. H. L.

Incandescent Electrode Vapour Electric Lamp. P. C. Hewitt, New York. U.S. Pat. 690,952, Jan. 14, 1902.

IT has been found that in lamps enclosing certain gases of proper density, and electrodes of suitable material, a current of moderate E.M.F. will cause the gas to emit light, and will raise the negative electrode to incandescence. In the lamps described, the resistances are so adjusted that the cathode emits intense light, that emitted in the gaseous path being relatively small. To prevent the current from passing round to the back of the cathode and damaging the leading wires, the latter are enclosed in tubes of glass, porcelain, or other material which will remain a non-conductor when hot. In Fig. 1, the cathode, 5, situated in the centre of the globe, is held by the porcelain tube 14, through which the leading wire 8 passes, the tube being held by the glass stem 12. The anode, 2, is seated in the glass column 10, enclosing the wire 7. The electrodes are made of iron or other conducting

material, or even of light-emissive material, such as the rare earths. "Gas of the proper density is placed within the globe." "With attenuated nitrogen . . . and with iron electrodes separated a distance of about one and one-half inches, the lamp may be started with a direct current having a pressure of seven hundred and fifty volts or less," and the

Fig 1

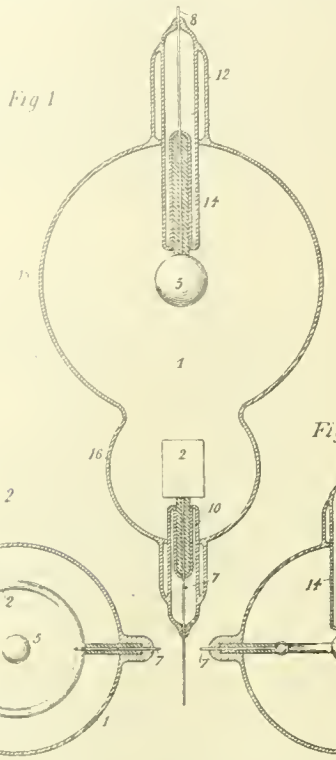


Fig 2

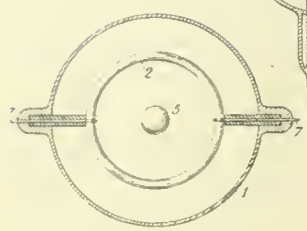
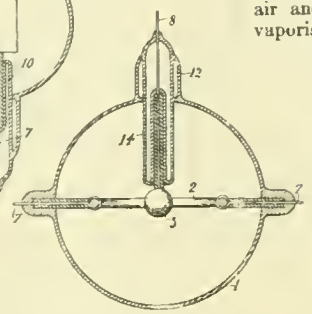


Fig 3



cathode becomes incandescent. If, while the lamp is in action, the current increases, the resistance of the gas decreases; but this is compensated for by an increase of the resistance between the gas and the cathode, so that the temperature of the cathode remains steady, and the lamp is self-governing. By correctly adjusting the gas density, the lamp may be made to start on the same current as it is designed to operate on. Figs. 2 and 3 show a modification in which the cathode is surrounded by an anode, 2, made in the form of a ring.

In this patent the claims are for the apparatus (see following abstract).—H. B.

Method of Electric Lighting. P. C. Hewitt, New York. U.S. Pat. 690,953. Jan. 14, 1902.

The text and drawings of this specification are substantially identical with those of the preceding. The claims are for the method of lighting, by rendering luminous the cathode of a lamp of the kind described above; and for the method of adapting lamps for use with currents subject to slight variations, by the compensating arrangement of the resistances. Reference is made to U.S. Pats. 682,690, 682,691, 682,692, and 682,699 of 1901.—H. B.

[*Incandescent*] *Gas Arc-Lamp.* J. K. Russell and W. F. Clausen, Sheboygan, Wisconsin. U.S. Pat. 691,001, Jan. 14, 1902.

The invention refers to a suspended incandescent gas lamp, constructed so as to resemble an arc lamp. A cluster of burners supplied with gas from a common central gas pipe, is enclosed within a globe, each burner having a draught chimney, about 20 ins. long, arranged above it, the mantle being hung from a horizontal rod held in slots at the base of the chimney. The chimneys are held in position within an outer casing by means of two perforated discs, which prevent any circulation of air outside the chimneys. The outer casing and globe resemble externally those of electric arc lamps, an exit being provided at the top of the casing for the hot waste gases. The central gas pipe is provided with a pilot jet.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

United States Patents.

Distilling Oil. J. A. Dubbs, Pittsburg, Pa. U.S. Pat. 694,621, March 4, 1902.

Air is forced through the oil while the latter is maintained at a vaporising temperature, the vapours are condensed, the distillate is heated to a vaporising temperature, and air is forced through it while in that condition. It is stated that the products will burn without smoke or smell.—C. S.

Distilling Oil. J. A. Dubbs, Pittsburg, Pa. U.S. Pat. 694,622, March 4, 1902. (See preceding abstract.)

To produce distillates that will burn with a smokeless, inodorous flame, the inventor proposes to distil the oil by vaporisation under the combined action of heat and air forced through the oil, the influx of air being so controlled as to maintain a pressure in the still substantially higher than atmospheric pressure, in consequence of which the air and oil are subjected to a temperature exceeding the vaporising temperature of the latter.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Light and Colouring Matters. H. Silbermann. Zeits. f. Farben.- u. Textil-Chem., 1902, **1**, 152—155.

The author advances the proposition that decomposition of dyestuffs by light is a process analogous to that produced by the action of the electric current; in both cases the destruction of the colouring matter may be due either to reduction or oxidation.

The formation of a dyestuff is generally an exothermic process, whilst its decomposition is due to an endothermic reaction, the latter change being brought about either by the application of light or electrical energy.—G. T. M.

Tetramethyldiaminodiphenylcarbinol; Condensation Products of ——, with Primary Amines substituted in the Para-position. A. Guyot and M. Granderye. Comptes Rend., **134**, [9], 549—551.

It was expected that this condensation would result in the attachment of the amine to the carbinol residue by a linking in a position ortho to the NH_2 group; but this was not the case with the amine derivatives tried (*p*-nitraniline sulphanilic acid, and *p*-phenylenediamine).

p-Nitraniline yields a Phenyl-leucauramine—

$NO_2.C_6H_4.NH.CH[C_6H_4.N(CH_3)_2]_2$; ($NH : NO_2 = 1 : 4$)

and on longer heating, the *p*-nitro-derivative of *p*-dimethyl amidobenzylidene-aniline. Sulphanilic acid yields the sulphonic derivative of the same substituted aniline, without intermediate formation of leucauramine; with this there is a small quantity of another substance, possibly the product of the normal or expected condensation. *p*-Phenylene diamine yields, similarly, the *p*-amino derivative of the same substituted aniline.—J. T. D.

Sym-dimethyldiamino di-o-tolylketone (Auramine G). R. Gnehm and R. G. Wright. Ber., 1902, **35**, [4], 913—915.

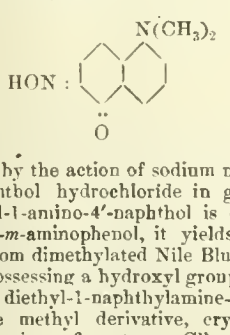
Auramine G is obtained by treating a hot mixture of *sym* dimethyldiaminodi-o-tolylmethane (from methyl-o-toluidine and formaldehyde), sulphur, ammonium chloride, and salt with dry gaseous ammonia (U.S. Pat. 488,430). When this product is heated in aqueous solution with hydrochloric acid, it yields dimethyldiaminoditolylketone, which crystallises from acetone in faintly-yellowish needles, melting a

1° C. The base of Auramine G forms light yellow rystals, melting at 120° C. and soluble in organic solvents. he picrate crystallises from alcohol in shining orange eedles, melting at 234° C.; the sulphate also forms orange eedles and melts at 182° C., whilst the oxalate is a light ellow crystalline powder, melting at 210° C. The ketone, n reduction in alcoholic solution with sodium amalgam, elds colourless needles (from acetone) of the carbinol, elting at 161° C., and giving a deep bluish-violet solution ith acetic acid. The carbinol condenses with *p*-aminoazo-enzene (Möhlau and Heinze; this Journal, 1901, 570) form benzene-azophenyl-leucauramine G, crystallising in ick orange plates, which melt at 170·5° C. Similarly, enzene-azo-α-naphthylamine yields benzene-azo-α-aphthylleucauramine G. Leucauramine G itself is readily btained by treating Auramine G in aqueous solution with nc dust and hydrochloric acid. It forms straw-yellow eedles from benzene, melting at 208° C.

On treating the carbinol described above with sulphuretted ydrogen in warm alcoholic solution, it is converted into e thiocarbinol, a colourless crystalline powder, melting at 4° C. If the Auramine base be similarly treated, it yields e corresponding thioketone, which separates from alcohol bluish-red crystals, melting at 177° C. The thioketone ves two salts with hydrochloric acid, $C_{17}H_{20}N_2S,2HCl$ and $_7H_{20}N_2SHCl$, the former readily passing into the latter on posure to air. The authors also find that the carbinol d leucauramine described give crystalline derivatives ith diazonium compounds, and that the lower homologues act in the same way.—T. A. L.

Naphthylamine Derivatives; Some ——. V. Fussgänger. Ber., 1902, **35**, [4], 976—984.

CCORDING to Friedländer and Wellmans (Ber., **21**, 3123). methyl-α-naphthylamine gives a sulphonic acid when armed with sulphuric acid. The product of the reaction now shown to be a mixture of two sulphonic acids, one which is sparingly, and the other easily, soluble in water. he former is also obtained, and with much better yield, by ethylating Laurent's 1.4′-naphthylamine sulphonic acid. he author also obtained 1.4-dimethyl-α-naphthylamine lphonic acid by reacting with methyl alcohol, methyl dide and caustic soda on naphthionic acid in a sealed be, at about 100°—110° C. The product combines with azo compounds, giving dyestuffs similar to those from aphthionic acid, but the combination takes place more owly. The 1.4′-dimethyl-α-naphthylamine sulphonic acid, fusion with potash, gave 1.4′-dimethylaminonaphthol, elting at 110° C., sparingly soluble in water, but readily luble in alkalis, acids, and organic solvents. This product ondenses in acetic acid solution with *p*-nitrosodimethyl-iline, giving tetramethyldiaminonaphthophenoxazonium loride. The dyestuff dissolves in concentrated sulphuric id with a violet colour, becoming bluish-green on dilution. he presence of alkylamino groups renders the product rongly basic, and readily soluble in water. It gives pure ligo-blue shades on cotton mordanted with tannin and tar emetic. The same dyestuff is obtained by reacting th dimethyl-*m*-aminophenol on 3′-nitrosodimethyl-1-iino-4′-naphthol, which may also exist as dimethyl-1-iino-4′.3′-naphthoquinone-oxime—

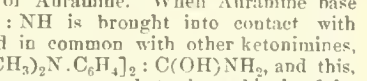


d is obtained by the action of sodium nitrite on dimethyl-amino-4′-naphthol hydrochloride in glacial acetic acid. hen dimethyl-1-amino-4′-naphthol is condensed with *p*-rosodimethyl-*m*-aminophenol, it yields a blue dyestuff, hich differs from dimethylated Nile Blue (New Methylene ue GG) in possessing a hydroxyl group. The author has so prepared diethyl-1-naphthylamine-4′-sulphonic acid, hich, like the methyl derivative, crystallises with one lecular proportion of water. Clève's 1.3′-naphthyl-ine sulphonic acid, on methylation, only yields methyl-naphthylamine sulphonic acid, whilst the 1.2′ and 1.1′-naphthylamine sulphonic acids are both converted into dimethyl derivatives when treated with methyl iodide, as described above. The sodium salts of all these three last-mentioned acids crystallise with one molecular proportion of water.—T. A. L.

Aromatic Aldehydes and Amines; Condensations between ——. O. Dimroth and R. Zoeppritz. Ber., 1902, **35**, [4], 984—992.

It is generally assumed that the first stage in the condensation of aldehydes and ketones consists in an addition to the CO group, followed by elimination of water. Hitherto it has not been possible to isolate these intermediate compounds in the reaction between aldehydes and ketones, and aromatic amines. The authors, however, find that, although these products are very unstable and are readily converted into benzylidene compounds, they are capable of forming hydrochlorides which, generally, are very sparingly soluble in hydrochloric acid. Benzaldehyde and aniline do not react in aqueous solution even on warming, but, on adding in the cold a few drops of concentrated hydrochloric acid, a white precipitate of benzaldehyde-aniline hydrochloride, $C_6H_5CH(OH)NHC_6H_5HCl$, is formed, which, however, is only stable in presence of an excess of hydrochloric acid. The compound from β-naphthylamine and benzaldehyde is more stable, and melts at 163° C. When added to dilute sodium carbonate solution cooled to 0° C., it loses water and is converted into benzylidene-β-naphthylamine, melting at 103° C. Benzaldehyde and *p*-nitraniline in presence of hydrochloric acid give a light yellow precipitate, melting at 188° C. This product, when added in small quantities to dilute sodium carbonate solution at 0° C., yields the hydrate $C_6H_5CH(OH)NHC_6H_4NO_2$, which can be dried in the air, and melts at 86° C. When dried *in vacuo* over sulphuric acid it yields benzylidene-*p*-nitraniline, melting at 118° C. Corresponding derivatives have also been obtained from salicylaldehyde and *p*-hydroxybenzaldehyde, and aniline.

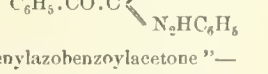
The same reaction has been applied to the phenylimine of benzophenone $(C_6H_5)_2C:N.C_6H_5$ (cubes from acetone, melting at 116° C.), which, on treatment with aqueous hydrochloric acid, is converted into the hydrochloride of benzophenone-aniline $(C_6H_5)_2C(OH)NHC_6H_5HCl$ (white crystals melting at 191°—194° C.), and this has a bearing on the constitution of Auramine. When Auramine base $[(CH_3)_2NC_6H_4]_2:C:NH$ is brought into contact with acids, it is converted in common with other ketonimines, into the hydrate $[(CH_3)_2N.C_6H_4]_2:C(OH)NH_2$, and this, according to the authors, corresponds to the carbinols of the other di- and triphenylmethane dyestuffs; such, for example, as Benzaldehyde Green $[(CH_3)_2N.C_6H_4]_2:C(OH)C_6H_5$. The formation of a salt from this compound leads to the quinonoid formula—



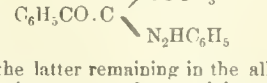
as the more probable one for Auramine, rather than the imino formula suggested by Graebe (this Journal, 1899, 752).—T. A. L.

Formazylphenylketone. E. Bamberger and H. Witter. J. prakt. Chem., 1902, **65**, [3 and 4], 139—149.

By reacting with an alkaline diazobenzene solution on benzoylacetone, a mixture of formazylphenylketone—

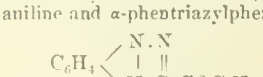


and of "phenylazobenzoylacetone"—

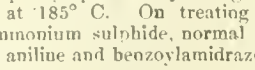


is obtained, the latter remaining in the alkaline filtrate, the former separating as a scarlet precipitate, and crystallising from alcohol in red matted needles. The same product is also obtained by reacting with an alkaline diazobenzene

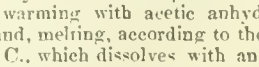
solution on an alcoholic solution of phenylazobenzoylacetone, or else on an alkaline solution of benzoylacetic acid. In this latter case, benzoylformaldehyde hydrazone is formed as an intermediate compound and can be isolated. Formazylphenylketone crystallises from alcohol in matted red metallic needles, melting at 142° C., readily soluble in ether, benzene, chloroform, glacial acetic acid, and hot alcohol, sparingly soluble in cold. It dissolves in mineral acids with a reddish violet colour, and gives a silver and a sodium salt. The acetyl compound separates from alcohol in orange-yellow needles, melting at 154° C. This substance, reduced with sulphuric acid and zinc dust, gives, among other products, acetanilide, showing that the acetyl group was originally attached to nitrogen. When formazylphenylketone is carefully heated with sulphuric acid, it is converted into aniline and α-phentriazylphenylketone—



which crystallises from water in golden-yellow silky needles, melting at 114° C. The substance is soluble in concentrated mineral acids, and is precipitated on adding water. It combines with phenylhydrazine, yielding the phenylhydrazone, melting at 185° C. On treating formazylphenylketone with ammonium sulphide, normal azo fission takes place, yielding aniline and benzoylamidrazone—



This compound separates in golden-yellow plates, melting at 152° C., or crystallises from petroleum spirit in woolly needles. On warming with acetic anhydride it yields an acetyl compound, melting, according to the rate of heating, at 143°—150° C., which dissolves with an eosine colour in concentrated sulphuric acid. On prolonged heating on the water-bath with acetic anhydride, inner condensation takes place, yielding phenylmethylbenzoyltriazol—



which separates from benzene in silky needles, melting at 55·5° C., and gives a hydrazone with phenylhydrazine.

—T. A. L.

Carmine Blue. P. Sisley. Rev. Gén. Mat. Col., 1902, 6, [63], 57—59.

Carmine Blue, Superfine or Patent Blue (see this Journal, 1890, 53), is prepared by successively condensing *m*-nitrobenzaldehyde with diethylaniline, reducing the product, transforming the amino group of the triamine thus produced into hydroxyl by means of the diazo-reaction, sulphonating the leuco-base, and, finally, oxidising the sulphonic acid obtained, with lead peroxide and sulphuric acid. It comes into commerce in the form of the calcium salt, a dyestuff having the property of resisting the action of alkaline solutions.

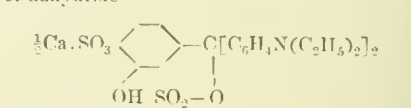
Prudhomme (see this Journal, 1896, 267) assumed that this valuable property depends on the presence of the hydroxyl group in the meta position with respect to the methane carbon atom. This hypothesis is confirmed by the fact that the green acid salts of the unsulphonated dyestuff, when treated with ammona, yield a base of the same colour. Nevertheless, a colourless modification of the base may be obtained by the use of excess of alkali.

These phenomena resemble those exhibited by Ethyl Green, a dyestuff containing no hydroxyl, and the results indicate that the fastness of Carmine Blue towards alkalis is not due to its *m*-hydroxyl group.

Suais and Sandmeyer (see this Journal, 1896, 706), by synthesising ortho-sulphonated Malachite Green and Ethyl Green from *o*-sulphobenzaldehyde, have shown that this resistance to alkalis is due to the presence of the sulphonic radicle in the orthoposition with respect to the methane carbon atom. These sulphonated dyestuffs, although containing no hydroxyl groups whatever, closely resemble Carmine Blue in their behaviour towards alkalis.

The *calcium* salt, when purified from sodium and calcium sulphates by boiling with dilute alcohol containing calcium chloride, has the composition $Ca(C_{27}H_{31}N_2S_2O_7)_2$; it crystallises with 10 or 14 molecules of water, and the dried salt from the two hydrates are dissimilar, for on exposure to the atmosphere, each regains its appropriate amount of water. This salt, although containing only one atom of calcium combined with 2 mols. of the disulphonic acid, is neutral, and this property is explained by supposing, either that a linking together of the sulphonic group and one of the nitrogen atoms occurs—

or that the sulphonic and carbinol radicles condense to form an inner anhydride—

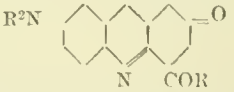


The free acid, isolated by treating an alcoholic solution of the calcium salt with sulphuric acid, crystallises in pale yellow needles; it dissolves in water or alcohol to a bluish green solution, from which the coloured form of the acid is deposited; this variety is, however, always mixed with a large proportion of the colourless modification.

The *ferrous* and *magnesium* salts, obtained by the action of the colour acid on the corresponding metallic sulphate, crystallise in indigo-blue scales.—G. T. M.

Gallocyanines. C. Vaucher. Bull. Soc. Ind. Mulhouse, 1901, 403—409.

By virtue of their quinonoid constitution—



(R^2 being CH_3, C_2H_5 &c., and R being NH_2, OH, OCH_3, &c.) the dyestuffs of the Gallocyanine group react readily with aromatic amines, phenols, sulphurous acid, and reducing agents.

Condensation with phenols is best effected in the presence of acids. The products (Phenocyanines) are leuco compounds, which are readily oxidised to dyestuffs, and are of special value in calico printing. They dissolve in concentrated sulphuric acid with a pale-brown colour, which is changed to a deep blue by the addition of a small quantity of an oxidising agent.

Sulphurous acid, in the form of sodium sulphite or bisulphite, under the influence of heat and pressure, transforms the Gallocyanines into pale-grey or greenish-colour monosulphonic acids of leuco derivatives, along with simple leuco compounds. The latter are also formed by the action of various reducing agents. Their hydrochlorides are characterised by ready solubility, and find extensive application in the foulard style of calico printing, being padded along with a mordanting salt upon the tissue, which is then printed in pattern with a discharge mixture. Unlike the dyestuff, the leuco compounds can be easily sulphonated by means of sulphuric acid, giving the same derivatives as are obtained by the action of sulphites upon the dyestuffs.

Alkali bisulphite compounds of the Gallocyanine, analogous to Alizarin Blue S, are readily prepared, as have long been known.

The chromium colour lakes of all of these dyestuffs are of greater importance in dyeing and printing than the lakes produced upon other mordants. The sulphonic acid derivatives dye upon chrome-mordanted wool colours which are faster to milling than those yielded by the unsulphonated Gallocyanines. The sulphonic acid dyestuffs derived from

allanilide, when applied to wool and fixed by after-ordanting with chromium fluoride, give colours which are st to bleaching (sulphur dioxide) and carbonising.

The following is a list of the principal members of the roup :—

ear of Dis-overy.	Name of Dyestuff.	Preparation from :—	Patentee.
[illegible]	Gallocyanine	Nitrosodimethylaniline and gallic acid (H. Koechlin).	L. Durand, Huguenin, and Co.
1887	Prune	Nitrosodimethylaniline and gallic methyl ester.	Kern and Sandoz.
1889	Gallamine Blue	Nitrosodimethylaniline and gallaminic acid.	Geigy.
1889	Gallanilic Violets.	Nitrosodialkylanilines and gallanilide (sulphonic acids).	Industrie Chimique.
1889	Dauphin Blue	Sulphonation of the Gallocyanine-anhydride-anilide discovered by Nietzki.	Kern and Sandoz.
1890	Gallanilic Indigo P S.	(Addition to Ger. Pat. 56,991 for manufacture of Gallanilic Violets.)	L. Durand, Huguenin, and Co.
1891-2	.. ..	Action of primary and secondary alkylamines on Gallocyanine.	"
1893	Coreine 2 R	Dialkylaminoazo-benzenes and gallaminic acid.	"
1893	Celestine Blue	Nitrosodiethylaniline and gallaminic acid.	P. Bayer and Co.
1893-4	Gallazines	Phenolsulphonic acids and Gallocyanines (oxidation products).	L. Durand, Huguenin, and Co.
1893-5	Phenocyanines	Resorcinol and Gallocyanines.	"
1894	(Sulphonated Gallocyanines.)	Dialkylaminoazo-benzenedisulphonic acids and gallic acid.	"
1895	Gallanilic Green	Nitration of Gallanilic Indigo P S.	"
1895	Coreine A B	Anilidation and sulphonation of Coreine 2 R.	"
1898	(Sulphonated Gallocyanines.)	Action of sulphurous acid, free or combined, on Gallocyanines.	"
1898	(Leuco-gallocyanines.)	Reduction of Gallocyanines.	"
1900	(Sulpho-alphyl-gallocyanines.)	Action of aromatic sulphochlorides on Gallocyanine, Prune, Phenocyanine, &c.	Sandoz and Co.
1900	(Sulphonated Gallocyanines.)	Sulphonation of leuco-gallocyanines.	L. Durand, Huguenin, and Co.
1900	(Sulphonated Gallocyanines.)	Action of sulphurous acid on Gallanilic Violets, &c.	"

—E. B.

llocyanines. (*Observations on the preceding Article.*) . Noelting. Bull. Soc. Ind. Mulhouse, 1901, 402—403.

e list of dyestuffs of industrial value belonging to the llocyanine group, has been greatly extended during recent rs. They are obtained by methods depending upon the lowing steps :—

Reduction.—Although their existence has long been own, it has only recently been discovered that the leuco-locyanines are capable of advantageous industrial appli-ion. On account of their solubility, darker shades are ained with them than with the Gallocyanines from ich they are derived, especially when these are sparingly uble.

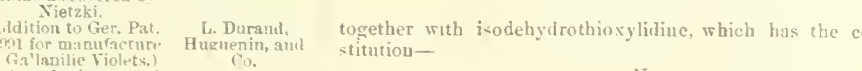
Sulphonation.—Besides their insufficient solubility, the tral dyeing character of certain Gallocyanines has been obstacle to their employment in wool dyeing. Both of se defects have been overcome by sulphonating them. many cases direct sulphonation is impracticable. The co compounds are, however, sulphonated with ease. The co-sulphonic acids produced, can be applied as such, and dised into dyestuffs upon the fibre. This is done in the e of cotton fabrics. In wool dyeing, it is preferred first ransform the leuco compounds into dyestuffs.

Sulphonation can also be directly effected by the action on the dyestuffs, of sulphites and bisulphites under ssure.

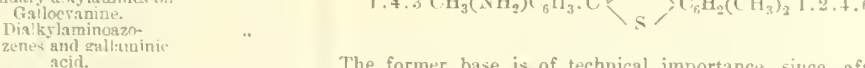
Action of Phenols.—Phenols possess the interesting property of uniting with Gallocyanine dyestuffs, forming leuco compounds of unknown constitution. These are converted into the corresponding dyestuffs, when they are printed upon cotton fabrics and steamed. The dyestuffs of this class have gained an important place in the calico-printing industry, on account of their brightness of colour and fastness.—E. B.

Erica Base; Some Isomerides of ——. G. Schultz and M. Tichomiroff. J. prakt. Chem., 1902, **65**, [3 and 4], 150—160.

By heating four atomic proportions of sulphur with rather more than two molecular proportions of *m*-xylidine to 185° —195° C., the chief product formed, is dehydrothioxylidine—

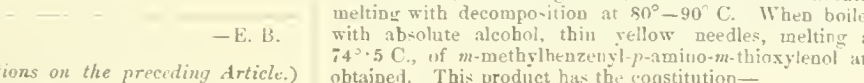


together with isodehydrothioxylidine, which has the constitution—



The former base is of technical importance, since, after diazotisation and combination with α-naphthol-ε-disulphonic acid, it yields the valuable pink cotton dyestuff Erica (Eng. Pat. 17,333 of 1888; this Journal, 1889, 980). The azo dyestuffs from the isomeric base do not dye cotton directly, and have little value as wool dyestuffs. The object of the present research was to ascertain whether it would be possible to convert the iso into the Erica base, or into a technically valuable isomeride. Isodehydrothioxylidine base, separated by means of its hydrochloride, crystallises from alcohol in yellow needles, melting at 121° C. The acetyl derivative separates from benzene in white needles, melting at 198° C. Two series of experiments were made with the iso base, the first comprising the following reactions: diazotisation of the iso base, replacement of the diazo group by hydrogen, nitration of the thio base so obtained, and reduction of this nitro compound to the corresponding amino derivative; whilst the second series consisted in nitrating the isodehydrothioxylidine, diazotisation, replacement of the diazo group by hydrogen, and reduction of the nitro group.

The diazo chloride of isodehydrothioxylidine separates from alcohol, on adding ether, in brownish-red needles melting with decomposition at 80°—90° C. When boiled with absolute alcohol, thin yellow needles, melting at 74°·5 C., of *m*-methylbenzenyl-*p*-amino-*m*-thioxylenol are obtained. This product has the constitution—



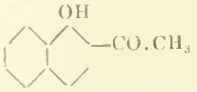
and gives on nitration two nitro compounds, one melting at 152° C., and the other at 146° C., the former being less soluble in alcohol than the latter. The nitro compound melting at 152° C. gives on reduction an amino base melting at 95° C., yielding an acetyl compound melting at 244° C. The base, after diazotisation and combination with sodium α-naphthol ε-disulphonate, gives a cotton dyestuff inferior in all respects to Erica. Since the amino compound gives *m*-toluylic acid and a diaminothioxylenol on fusion with potash, it follows that the nitro group enters the thioxylenol ring, either between the two methyl groups or ortho to one only.

When, according to the second series of experiments, isodehydrothioxylidine is nitrated in sulphuric acid solution, it yields a nitro product crystallising from alcohol in yellowish-red needles melting at 192° C. On diazotisation and boiling with alcohol, the product gives a nitro compound, melting at 146° C., identical with that obtained by nitrating the thio base described above, melting at 74°·5 C. The corresponding amino base is obtained by reduction with stannous chloride, and forms reddish needles melting at

89° C. Diazotised and combined with sodium α-naphthol ε-disulphonate, it gives a dyestuff very similar to that from the corresponding base melting at 95° C.—T. A. L.

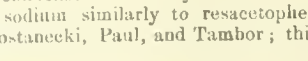
α-Naphthochromone. v. Kostanecki and G. Froemsdorff. Ber., **35**, [4], 859—861.

2-Aceto-1-naphthol—

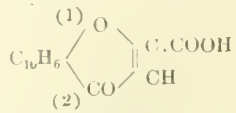


may be condensed with ethyl oxalate in the presence of metallic sodium similarly to resacetophenone mono-ethyl ether (Kostanecki, Paul, and Tambor; this Journal, 1901, 1106).

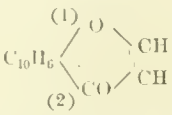
o-Hydroxy-naphthoyl-pyruvic acid ethyl ester—



m. pt. 114°—115° C., is thus obtained, which is converted into *α-naphthochromone carboxylic acid*—



m. pt. 277°—288° C., on boiling with alcoholic hydrochloric acid. By distillation, carbon dioxide is lost and—

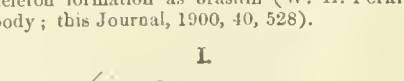


α-naphthochromone is obtained. This crystallises from dilute alcohol in white shining needles, which become dull and powdery when exposed to the air. It dissolves in concentrated sulphuric acid with a yellow colour, and the solution shows an intense blue-green fluorescence.—H. L.

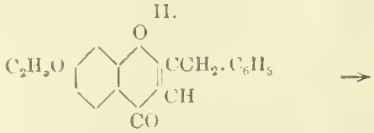
3-Hydroxy-β-benzylchromone; Synthesis of ——. O. Hannach and v. Kostanecki. Ber. **35**, [4], 866—869.

Phenylacetic ester may be readily coupled with resacetophenone diethyl ether in the presence of metallic sodium. The β-diketone so obtained (formula I.) reacts in an analogous manner to those described above (see preceding abstracts). On boiling with hydriodic acid for a short time, it is converted into *3-ethoxy-β-benzylchromone* (formula II.), m. pt. 154° C., which crystallises in long, broad needles that fluoresce when dissolved in sulphuric acid. The ethyl group is removed on prolonged boiling with hydriodic acid, and *3-hydroxy-β-benzylchromone* (formula III.) is obtained in white prisms melting at 183° C. The solution of this substance in sulphuric acid fluoresces but faintly. These chromone derivatives are of interest, since they contain the same skeleton formation as brasilin (W. H. Perkin, jun., and Gilbody; this Journal, 1900, 40, 528).

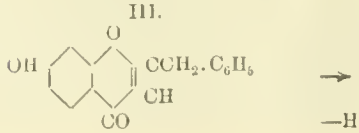
I.



II.



III.



—H. L.

Azo-Dyestuffs; Action of Sulphides, Sulphites, and Hyposulphites (Hydrosulphites) on ——. A. Rosenstiehl and E. Suais. Comptes Rend., **134**, [9], 553—554.

When glucose acts on the nitro-derivatives of azo-dyestuffs, the nitro group alone is attacked, two molecules losing three atoms of oxygen to form a derivative of the corresponding azoxyamine, and giving rise to a new series of dyestuffs, dyeing unmordanted cotton. By carrying the action farther, the azo-group also is attacked, and a series of azoamines is obtained. Other reducing agents were examined, as it was not desired to act at once on the nitro-group and the azo-group.

Sulphides give very complex products, save in the case of bisulphides, when the reaction—

$$RNO_2 + CaS_2 + H_2O = RNH_2 + CaS_2O_3$$

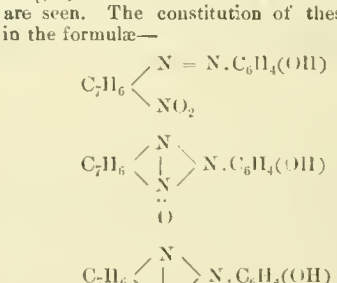
occurs sharply.

Sulphites attack the azo-group, giving nitramines in almost quantitative amounts, whether para- or meta-derivatives be acted on. With para-derivatives of azoxyamines, sulphites behave similarly, but meta-derivatives are not attacked.

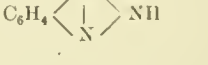
Hyposulphites act more powerfully than sulphites; from azoxyamine derivatives, whether para- or meta-, the azoxyamine is separated.—J. T. D.

Nitrated Azo-Dyestuffs; Reduction of ——. A. Rosenstiehl and E. Suais. Comptes Rend., **134**, [10], 606—608.

The sharp reactions by which, from azo-dyestuffs derived from meta- and para-nitramines, we can obtain at will the nitramines, azoxyamines, azoamines, or dyestuffs derived from the azoxyamines or the diamines (this Journal, 1901, 570), cannot be carried out with the corresponding derivatives of the orthonitramines. The reaction of reducing agents on the substance obtained by coupling phenol with the diazo-derivative of orthonitro-paratoluidine is typical of the general reaction of such compounds. Whether the reducing agent be glucose or sodium sulphide, the colour disappears, and a compound of formula $C_{13}H_{11}N_3O_2$ is formed; further reduction by zinc-dust and caustic soda yields a substance of formula $C_{13}H_{11}N_3O$. These bodies are still phenolic; they do not contain the group $-N:N-$, characteristic of azo-dyestuffs, for they are colourless; and the second atom of oxygen in the earlier product is combined with nitrogen, for on its combustion in oxygen, nitrous fumes are seen. The constitution of these substances is shown in the formulæ—



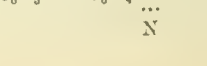
The last substance is hydroxyphenylpseudo-ortho-azimino-toluene, a derivative of Ladenburg's pseudo-azimmo-benzene—



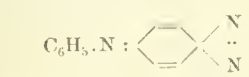
and the method is a general one for obtaining similar substances.—J. T. D.

Diazo Bodies and the so-called Triazolenes; Quinoid ——. A. Hantzsch. Ber., **35**, [4], 888—896.

The diazo salts (with acids) of *p*-aminodiphenylamine possess the usual diazonium structure—

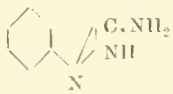


ording to the author's view (see Jacobson, Annalen, 7, 131). But they differ from diazonium compounds in neral in their behaviour to caustic alkalis; for they do form diazotates, but lose a molecule of water, and are nverted into an insoluble, extremely unstable, and explo- e compound of the following formula :—

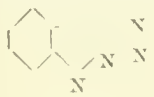


henylimino-quinone diazide). This substance is analogous "diazophenol"—

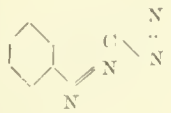
inone diazide) obtained similarly from the diazonium ts of *p*-aminophenol, for which the quinoid structure ms well established (Wolff, Annalen, 312, 126). The hor would range into the class of quinoid diazo com- unds the triazolenes obtained by Bamberger by diazotising ino-indazene—



placing his formula for the simplest triazolene—



the isomeric—



e triazolenes are well crystallised stable substances which e volatile without decomposition in steam, and yet readily mbine with phenols and amines to form azo dyestuffs. dazol triazolene is converted into a diazonium salt by eans of hydrochloric acid.—H. L.

English Patents.

diqo; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 9613, May 8, 1901.

E Fr. Pat. 310,880; this Journal, 1902, 38.—T. A. L.

olouring Matters [Anthracene Dyestuffs] of the Anthracene Series; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin and Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 7194, April 4, 1901.

E Fr. Pat. 309,761; this Journal, 1902, 42. The specification is supplementary to Eng. Pats. 8051 and 19,531 of 99 (this Journal, 1900, 341 and 817), and to 20,718 of 00 (this Journal, 1902, 37).—T. A. L.

nthracene Derivatives [Anthracene Dyestuffs]; Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 8924, April 30, 1901.

EE Fr. Pat. 310,329; this Journal, 1902, 40.—T. A. L.

yestuffs [Anthracene Dyestuffs] and Intermediate Products of the Anthracene Series; Manufacture of ——. O. Imray, London. From the Farbwerke Hoechst, Germany. Eng. Pat. 7541, April 12, 1901.

EE Fr. Pat. 309,772; this Journal, 1902, 44.—T. A. L.

Dyestuffs [Sulphide Dyestuffs]; New Sulpho Acids and Sulphur ——. T. R. Shillito, London. From J. R. Geigy, Basle, Switzerland. Eng. Pat. 12,578, June 20, 1901.

See Fr. Pat. 310,809; this Journal, 1902, 44.—T. A. L.

Dyestuffs [Sulphide Dyestuffs] therefrom; Manufacture of p-Monoalkylamido-p-oxydiphenylamines, and ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 7919, April 17, 1901.

See Fr. Pat. 309,898; this Journal, 1902, 42.—T. A. L.

Dye [Sulphide Dyestuffs]; Manufacture of ——. Vidal Dyes Syndicate, Ltd., London. From H. R. Vidal, Paris. Eng. Pat. 569, Jan. 8, 1902.

The action of sulphur and caustic alkalis on *m*-dinitrobenzene, *m*-dinitro-toluene, and on 1.4'-dinitro-naphthalene at about 100° C. produces brownish substances, which, when heated with sodium sulphide to about 250° C., are converted into direct yellowish-browns for cotton. Subsequent treatment with potassium bichromate solution turns the shade redder.—T. A. L.

United States Patents.

Blue Sulfur Dye [Sulphide Dyestuffs], and Process of making same. A. Weinberg and R. Herz, Frankfort. Assignors to L. Cassella and Co., Frankfort-on-the-Main Germany. U.S. Pat. 693,632, Feb., 18, 1902.

See Eng. Pat. 16,247 of 1900; this Journal, 1901, 889. —T. A. L.

Blue Sulfur Dye [Sulphide Dyestuffs]; Process of making ——. A. Weinberg and R. Herz, Frankfort. Assignors to L. Cassella and Co., Frankfort-on the-Main, Germany. U.S. Pat. 693,633, Feb. 18, 1902.

See Fr. Pat. 303,524; this Journal, 1902, 41.—T. A. L.

Dyeing Sulfur Colors [Sulphide Dyestuffs]; Process of ——. A. Kertesz, Frankfort. Assignor to L. Cassella and Co., Frankfort-on-the-Main, Germany. U.S. Pat. 693,653, Feb. 18, 1902.

In order to prevent tendering of the fibre in goods dyed with sulphide dyestuffs, the patentee passes them finally through a bath containing a weak solution of sodium acetate (5—10 grms. per litre) after coming from an acid bath. —T. A. L.

Disazo Wool Dye [Azo Dyestuffs], and Process of making same. K. Schirmacher, Soden. Assignor to the Farbwerke Hoechst, Germany. U.S. Pat. 693,670, Feb. 18, 1902.

See Fr. Pat. 313,748; this Journal, 1902, 169.—T. A. L.

Ferro-Chrome Color, and Process of making same. A. Haagen, Cologne, Germany. U.S. Pat. 693,703, Feb. 18, 1902.

See Eng. Pat. 7560 of 1901; this Journal, 1901, 728. —T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Strength and Stretch of Cotton Yarns; Effect of Moisture, Acids, and Alkalis on ——. G. R. Smith. J. Soc. Dyers and Colourists, 1902, 18, 55—59.

The results obtained by mercerisation depend chiefly on the alteration in the physical properties of the cotton fibre. The lustre imparted to the yarn by this process is due to the joint action of the alkaline solution and the tension; the former renders the fibres more flexible and plastic, whilst the latter causes them to lie more closely together. The result is a surface capable of reflecting more light than was the case with the fibre before treatment. American cotton is less lustrous and shorter in

staple than the Egyptian and Sea Island varieties, and it is least benefited by mercerisation. Steeping and stretching in water alone slightly increase the lustre, but the full effect is obtained only in the presence of the alkali. American, Egyptian, and Sea Island cotton yarns, when steeped for eight minutes in caustic soda solution of 50° Tw., shrink to the extent of 20·9, 17·7, and 16·1 per cent. respectively. The shrinkage is greatest in the case of the American cotton, because, on account of the shortness of the fibres, a greater number is required to make up a given length of thread.

The increase in strength of dried Sea Island cotton yarns, due to mercerisation with an alkaline solution of 50° Tw., varies from 12·3 to 25·8 per cent.; this increase is due to the coalescence of the fibres in the thread, rather than to the thickening of the walls of the fibre. The mercerised yarns, when subjected to the breaking load, stretch less than the untreated material, the reduction in elongation varying from 12·3 to 25·8 per cent.

Experiments made with alkaline solutions of varying strength, show that with dilute solutions, the time of immersion does not materially affect the result, whereas, at higher concentrations, this factor becomes important. In the wet state, yarns steeped in strong alkaline solutions are weakened to a greater extent than those immersed in the more dilute solutions.

The strength and stretch of unmercerised cotton yarns increase with the amount of water present, the wet yarn being stronger than the dried material, whilst the yarn containing its normal amount of moisture occupies an intermediate position in this respect. Mercerised yarns, on the other hand, are found to be weaker in the wet state than in the dry. This is probably due to the fact that the friction between the mercerised fibres, which have been forced by tension to take up constrained positions, is greater in the dry than in the moist condition.

Acids, especially in concentrated solutions and at high temperatures, have a very weakening effect on the fibres and considerably diminish the stretch of the yarn.—G. T. M.

Silk; The Fibroïn of ——, E. Fischer and A. Skita Zeits. Physiol. Chem., 1901, **33**, 177—192; through Zeits. Untersuchung der Nahrungs- u. Genussmittel.

Silk may be separated into two components, soluble silk glue and fibroïn, by treatment with hot water. Fibroïn is very sensitive towards alkali, so much so, that it does not even withstand prolonged heating with water in glass vessels. The material used by the authors for their experiments was therefore prepared by heating silk in a porcelain beaker in an autoclave to 117°—120° C. When heated with mineral acids, fibroïn is split up into certain amino acids, which were separated by esterification, and subsequent fractional distillation of the esters. The authors succeeded in isolating *l*-leucin and *l*-phenylalanin in addition to the decomposition products of fibroïn, previously described (tyrosin, aminopropionic acid, glycocoll). Several other amino acids were also obtained, which have as yet not been identified. The amino-propionic acid, proved to be optically active, and identical with *d*-alanine. 100 parts of fibroïn yielded 10 per cent. of *l*-tyrosin, 21 per cent. of *d*-alanine, 36 per cent. of glycocoll, about 1·5 per cent. of *l*-leucin, and about 1·5 per cent. phenylalanine.
—H. L.

Textile Fabrics; Spots on ——, *caused by Aspergillus Fumigatus.* C. Wehmer. Chem.-Zeit., 1902, **26**, [22], 241.

A number of small dull grey circular spots, each of about 1 sq. cm. area, occurring in patches, on certain dyed woollen goods, which had been stored in Singapore, were examined. The microscope detected *hyphæ*, and a few spores which, by cultivation, were shown to be those of *aspergillus fumigatus*. This fungus is known in Europe, occurring as mould on vegetable matter at its most favourable culture temperature (38°—40° C.); but in the tropics, it may be as abundant as *penicillium glaucus* is in temperate climates, and may thus occur, as in the present case, even in the midst of bales of cloth, where the conditions for its growth would appear to be most unfavourable.—W. G. M.

2.7-Dihydroxynaphthalene; Dyeing of Artificial Silk with ——. B. Settl'k. Zeits. für Farben- u. Textil-Chem., **1**, [5], 121—122.

2.7-Dihydroxynaphthalene dyes artificial silk silver grey; but if the material be previously mordanted with metallic salts, a variety of mode shades may be obtained. A fine dark brown in particular may be obtained by the addition of pyrogallol. 1—2 per cent. solutions of the required salts are taken, together with a 1 per cent. freshly prepared and faintly alkaline solution of dihydroxynaphthalene in warm water. After dyeing, which must be performed below 60° C., since all kinds of artificial silk are injuriously affected by heating above this temperature, the material is soaped, washed, and dried. The characteristic feel of natural silk is imparted by passing through a bath of dilute acetic acid. Artificial silk, as is well known, loses its gloss on drying, unless it be gently stretched during this operation.
—H. L.

Tissue Printing; Use of Formic Acid and Formates in ——. A. Scheurer. Bull. Soc. Ind. Mulhouse, Procès verbaux, 1902, [2], 6—7.

The comparatively high price of formic acid has hitherto prevented its employment in dyeing and printing. The acid is now being manufactured at a cost which will allow of its application, in many instances, in place of acetic acid, in these industries.

The author remembers some experiments which were made, before the year 1868, with the formates of aluminium and iron as mordants in dyeing. The results showed that these salts do not decompose so readily as the corresponding acetates, when goods treated with them are exposed to the air.

In extract printing, in view of the fact that the coefficient of affinity of formic acid is 14 times greater than that of acetic acid, and that the vapour pressures of the formates are, therefore, probably lower than those of the acetates, the latter decompose much the easier in the fixing process. This condition, unfavourable with mordants fixed by exposure of the goods to the air, can offer advantages in favour of the formic acid in other cases. Such a case occurs, for example, with mixtures containing Alizarin Orange and aluminium salts. When aluminium acetate is employed, these become unfit for use after the lapse of a few hours, owing to the combination of the dyestuff with the alumina, which takes place even in the presence of a large excess of acetic acid; with aluminium formate, however, and an addition of 100 grms. per litre of formic acid, the printing mixtures keep well.

Formic acid serves as an efficient substitute for acetic acid in the preparation of tin compounds, and of certain thickenings employed in printing. As a solvent for basic dyestuffs, *e.g.* Methylene Blue, in admixture with tannic acid, it is inferior to acetic acid.—E. B.

Paranitraniline Red; Coloured Resists under ——. J. Langer. Zeits. f. Farben-für u. Textil-Chem., **1**, [5], 116—119.

Coloured resists under Paranitraniline Red are best produced by printing a paste containing a basic dyestuff and an excess of tannin (sufficient not only to fix the basic colour, but also to precipitate and therefore to reserve the diazotised paranitraniline) upon cloth prepared with β-naphthol. (1) The author gives detailed and complete recipes for producing a bright and heavy blue and an olive reserve on this principle, together with a pattern. (2) Peculiar effects difficult or impossible to produce by printing directly may be obtained by printing on a naphthol ground, a white discharge containing both potassium sulphite and also tartar emetic, and then printing over this a tannin colour, with excess of tannin. This white resists not only the red bottom, but also the overprinted tannin colour. A pattern is shown with a white resist in conjunction with blue, green, and pink, under Paranitraniline Red; and a detailed recipe for carrying out the same is given. (3) Prussian blue may be used as an alternative method for the production of a blue resist.—H. L.

Discharges with Powdered Aluminium and Magnesium. R. Weiss. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [2], 4—6.

CLAIM for priority in the discovery that aluminium can be employed in place of zinc in the production of discharge effects in tissue printing.

The author, in the year 1891, experimented with powdered aluminium and magnesium, in conjunction with zinc powder and sodium sulphite, and also with a mixture of aluminium powder and potassium oxalate thickened with gum, with a view to obtaining discharges upon wool dyed with the following dyestuffs:—Methyl Green 3 J (Durand and Huguenin), Green X A (Geigy), Violet 170 (Poirrier), Benzoazurin, Erika B, and Milling Yellow.—E. B.

ENGLISH PATENTS.

Decorated Fabric, and Process of Producing same. E. Roussell, France. Eng. Pat. 4304, Feb. 28, 1901.

PROCESS of decorating stuffs is claimed, which consists in successively submitting the fabrics to:—(1) a first dyeing operation; (2) a printing operation with any design, by means of a material capable of discharging the colour; (3) a second dyeing operation, when the discharge has produced the desired decolorisation (complete or partial) of the parts on which it has been applied. These operations of dyeing and printing with the discharge may be effected by ordinary means, care being taken, of course, to employ for the first dye only dyestuffs susceptible of being attacked by the discharge which is used. The second dye matches with the first dye, and being produced on the parts affected by the discharge as well as on the body of the fabric, blends and softens the contours, so that soft designs are obtained and not designs with a hard outline as in ordinary printed fabrics. The softened or stumped outlines give to the fabric an appearance different from that of ordinary printed stuffs and prevent it being seen that the decorative effect has been obtained by printing.—H. L.

Raw Silk and Fabrics containing Raw Silk; Treatment of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 6644, March 29, 1901.

SEE Fr. Pat. 286,961; this Journal, 1902, 49.—A. S.

Textile Fabrics, Paper, &c.; Machines for Moistening ——. H. H. Lake, London. From F. B. Comins, Massachusetts, U.S.A. Eng. Pat. 22,331, Nov. 5, 1901.

THE base of the perforated mouthpiece of the nozzle of the dampening machine fits loosely in a chamber fixed on to the stand-pipe supplying the fluid to be ejected. The fixed chamber contains a vertical cleaner stem terminating in a fine acicular clearer. The pressure of the fluid passing through the nozzle forces up the movable mouthpiece so that it is held clear of the cleaner; when the pressure is reduced, however, the mouth-piece falls back by its own weight, and the clearer needle penetrates the orifice, removing any obstacle. The backward movement of the mouth-piece is also effected by external mechanism consisting of a journalled collar, with projecting cam finger and arm carried on a cam shaft. The cam arm is raised by the action of a tripper carried on the collar of another shaft. The cam finger is accordingly depressed and forces the mouth-piece on to the cleaner stem.—G. T. M.

Rust; Compounds for Removing [from Fabrics, &c.] ——, and for Similar Purposes. J. Hammer and N. Coleman, Washington, U.S.A. Eng. Pat. 1862, Jan. 23, 1902.

THE composition, which is for removing "rust," or more particularly for imparting a fresh, clean appearance to fabrics which have become rusty-looking, consists of a mixture of 10 parts of oxalic acid and 2 parts of borax.—A. S.

Bleaching, Dyeing, Washing, and otherwise Treating Fibres and Textile Fabrics by Means of Circulating Liquids: Apparatus for ——. O. Imray, London. From C. Roesch and Co., Mülheim-am-Rühr, Germany. Eng. Pat. 13,375, July 1, 1901.

SEE Fr. Pat. 312,424, 1901; this Journal, 1902, 342.

—G. T. M.

Fibres, Fabrics, or the like; Treating with Bleaching, Dyeing, or like Liquors: Apparatus for ——. O. Imray, London. From C. Roesch and Co., Mülheim-am-Rühr, Germany. Eng. Pat. 26,155, Dec. 21, 1901.

A ROTATING cylindrical boiler, with perforated sides, and mounted on a vertical axis, contains a perforated pipe or shaft concentrically arranged within it. The boiler is surrounded by a vessel which fits it closely, except on one side, where it is expanded into a lateral chamber connected with the conduit supplying the dyeing or bleaching liquor. On the floor of the boiler, within the area enclosed by the perforated pipe, are a number of perforations leading to an annular chamber formed between the floor of the outer vessel and a recess in the bottom of the rotating boiler; this compartment communicates in turn with the outlet pipe. The whole apparatus is closed in by a lid fitting on the upper edges of the central pipe, boiler, and enclosing vessel, and the liquid is circulated through the materials contained in the rotating boiler by means of a rotary pump.

—G. T. M.

Bleaching, Dyeing, Drying, &c. of Textile Fabrics, especially Fabrics having a Pile; Apparatus for Use in ——. J. A. Sackville, Pendleton, England. Eng. Pat. 4441, March 2, 1901.

SEE U.S. Pat. 693,446, Feb. 18, 1902; see page 474.

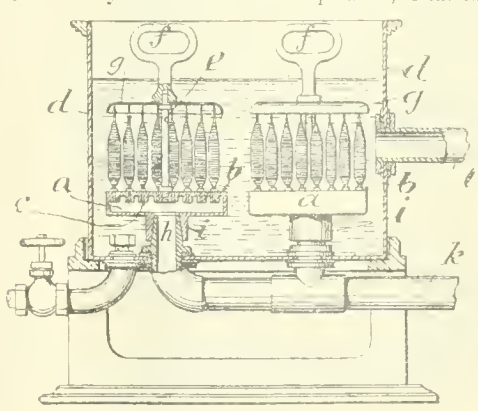
—G. T. M.

Dyeing and otherwise Treating Fibrous Materials; Centrifugal Machines for ——. F. F. Könitzer, Zittau, Germany. Eng. Pat. 5655, March 18, 1901.

(COMPARE this Journal, 1902, 171.) The materials under treatment are contained in a rotating cylinder with perforated sides mounted on a vertical axis and having an extended base. The lower edge of a cylindrical hood is pressed down upon this projecting base and secured in position by suitable clamps, so that a closed chamber is formed from which the air is exhausted and into which the required liquid is subsequently pumped. The hood and receptacle are contained in a cylindrical vat and a series of pipes leading from the bottom and sides of the closed chamber conducts the liquid back to the circulating pump. When the operation is complete, the clamps are released, the hood is hoisted out of the vat, and the liquid allowed to drain off; the vat-cover is then replaced and the materials under treatment washed by means of a spray inserted through the cover, the centrifugal cylinder being rotated during the process.—G. T. M.

Dyeing, Scouring, Bleaching, and otherwise Treating Yarn in Cop or other similar Compact Form; Apparatus for ——. E. Hindley, S. Walker, and M. Rose, Stockport. Eng. Pat. 6666, March 30, 1901.

THE improvement on the existing cop-dyeing machines consists in the construction of oblong or square portable chambers *a* (see figure). In the top plate *b* of these chambers are a number of holes *c*, in which are placed the tubes (or skewers) which hold the yarn in position during treatment. The chambers are placed in an open liquor vessel *d*. They are formed with two pillars *e*, to the top of



which are screwed the handles *f*, whereby they can be readily placed in and taken out of the vessel *d*. A plate *g*, which is secured to the top of the pillars *e*, by the handle-shaped nuts *f*, bears against the points of the tubes or skewers. To the tube connection *h*, and to the side of the vessel *d*, are connected respectively the pipes *k* and *l*, which are connected to a pump, whereby the liquor can be forced into or drawn from the chambers *a*, through the yarn and returned into the vessel *d*. By these means, force and suction can be used at any temperature without the aid of a lid and cover as generally used, ensuring safety from accidents that occur with closed vessels.—H. L.

United States Patents.

Waterproof; Process of Treating Materials to Render them ——. A. H. Hipple, Nebraska. U.S. Pat. 694,859, March 4, 1902.

The inventor claims the manufacture of compressed waterproof asbestos by incorporating oil in its fibres, vulcanising the oil and compressing. The asbestos is mixed with linseed oil and sulphur, the mass being vulcanised at a temperature of about 300° F.—J. F. B.

Metal; Method of Covering Textile and Porous Materials with ——. J. A. Daly, Washington, U.S.A. U.S. Pat. 694,946, March 11, 1902.

Pyroxylin, celluloid, or the like is dissolved in amyl acetate or rubber in benzene or chloroform, and the solution is worked up into a paste by the addition of finely-divided metal, such as bronze-powder. The fabric to be treated is then saturated with this mixture and dried, and metal is deposited upon it by electrolysis. The process is especially applicable to lace.—W. G. M.

Mercerising; Apparatus for ——. A. Rüner, Oberdollendorf-on-Rhine, Germany. U.S. Pat. 694,109, Feb. 25, 1902.

See Fr. Pat. 306,826; this Journal, 1902, 48.—G. T. M.

Dyeing; Apparatus for ——. J. Rhodes, Bradford, England. U.S. Pat. 693,443, Feb. 18, 1902.

See Eng. Pat. 25,823, 1898; this Journal, 1900, 44. —G. T. M.

Dyeing; Apparatus for ——. J. A. Sackville, Manchester, England. U.S. Pat. 693,446, Feb. 18, 1902.

The apparatus is intended for use in the treatment of piled fabrics; it consists of a vat *b*, c (see figures) fitted with a horizontal shaft *e*, carrying two wheels *j j*, having arms furnished with grooves *k*, the ends of these grooved arms being cut obliquely in the manner indicated. The inclined cradle or frame *l* contains a number of loose rods, and as the wheels rotate, the ends of each pair of grooved arms come into contact with the frame, and pick off the lowest rod which falls down the groove. The piece of cloth under treatment, which is fed into the machine between the rollers *t*, has its end looped over the first loose rod, and as the succeeding rods drop into the grooved arms, they come automatically between the several convolutions of the fabric, holding it in position and preventing it from coming into contact with the machine. A piled fabric is fed in with its pile turned away from the axis. The loose rods are furnished with enlarged ends or caps, in order that the adjacent folds of the spiral of cloth do not touch one another. As an alternative method, the fabric in batch form, with rods inserted in each lap or fold, may be held taut in a frame fixed in a rotating holder placed in a dye-vat.—G. T. M.

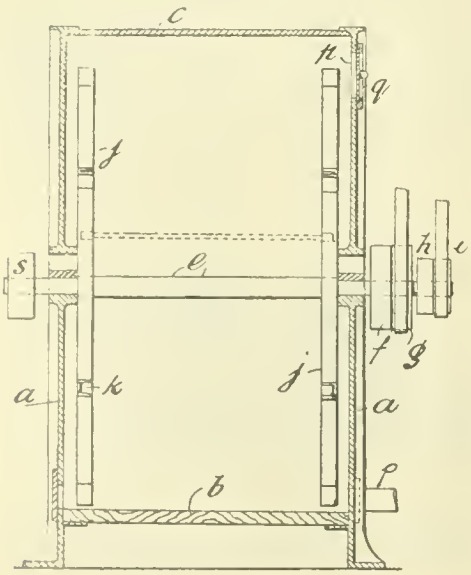
Ageing Apparatus. J. C. Hebden, Providence, R.I., U.S.A. U.S. Pat. 694,640, Dec. 20, 1901.

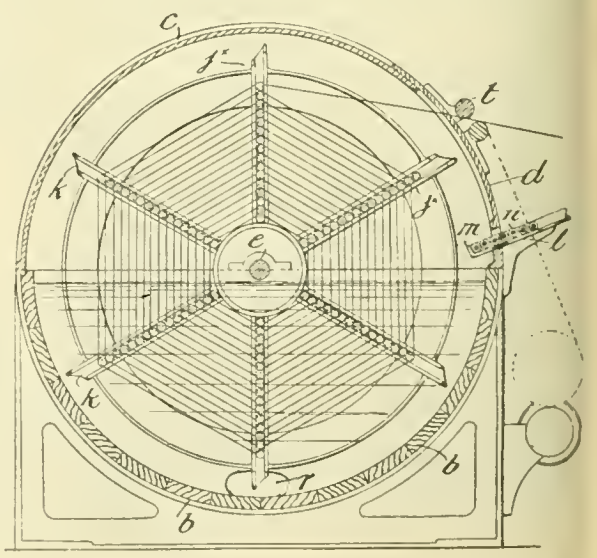
An endless, travelling apron is arranged horizontally near the bottom of an ageing chamber. The textile materials to be treated, namely, yarns or tissues, are fed in continuously at one end of the chamber, and are withdrawn at the opposite end, after having been carried through the chamber by the apron. Steam and air are supplied to the chamber by means of air injectors. To prevent irregularity in the action upon the dyed or printed yarns or tissues, which occurs in the ageing process, the position of the latter upon the apron is frequently changed, while they are passing through the chamber, by drawing them over rollers placed at intervals above the apron, and allowing them to fall back again upon this. The apparatus is specially designed for use in ageing fabrics dyed with Sulphur dyestuffs, which are passed through it in the wet state immediately after dyeing.—E. B.

Carpets, Mats, &c.; Apparatus for Printing ——. A. F. Lundeberg, Stockholm, Sweden. U.S. Pat. 690,746, Nov. 1, 1900.

The apparatus in question is designed for use in printing carpets in through-coloured patterns.

The carpets are placed between pressure blocks containing cells or depressions, corresponding with each other. The edges of these form the outlines of the pattern which is to be produced. Dye liquors, steam and hot air, are drawn as required into the cells and through the carpets, by means of a vacuum pump connected with the cells in the upper block, through supply pipes communicating with the cells in the lower block.—E. B.





VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Metals; Colouring of ——, *by Rieder's Electrochemical Process.* Zeits. Elektrochem., 1902, **8**, [7], 101.

See under XI. B., *page* 485.

UNITED STATES PATENT.

Hides; Apparatus for Colouring ——. A. Rigaud, St. Junien, France. U.S. Pat. 691,075, Oct. 25, 1900.

THE hides to be dyed are secured to a platform which is moved upon rails under a spraying apparatus. When the hides are treated with different liquors, "as in carrying out different steps of a process," these are applied by means of two or more sets of the spraying apparatus, separate gutters and tanks being provided underneath the several sets, to receive for use again the excess of the liquors which drains from the hides.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture; Comparison of Costs and Profits of ——, *by the Contact Process and the Modern Chamber Process.* F. Lüty and H. H. Niedenführ. Zeits. angew. Chem., **15**, [11], 242—257.

THE bulk of the paper consists of an account of recent improvements in the chamber process, all having for their aim the concentration of the process into smaller space and shorter time, including modern developments of the Glover and Gay-Lussac towers, fans or blowers for increasing the draught, cooling arrangements, Meyer's tangential chambers, and the Lunge-Rohrmann plate towers. Concentrating apparatus is also discussed. The authors arrive at the following as the cost of acids of various strengths, including depreciation of plant and interest on capital:—

	Chamber Process.		Contact Process.
	In its Old Form.	With New improvements.	
	Marks.	Marks.	Marks.
Chamber acid (containing 100 kilos. H_2SO_4)	2·69	2·33	2·53—2·91
	Platinum Concentration.	Kessler Concentration.	
100 kilos. of acid of 93 per cent. of H_2SO_4 ..	2·74	2·56	2·52
100 kilos. of acid of 97—98 per cent. of H_2SO_4	3·22	..	2·65

So that, for chamber acid, the old process has nothing to fear from the contact process. Even for 93 per cent. acid, if Kessler's apparatus be used for concentration, the old process is still almost on a level with the contact process; but for more concentrated acids still, the contact process is in the better position. Under present circumstances, however, a 93 per cent. acid (and perhaps 97 per cent. acid) would be most cheaply made by dissolving anhydride or fuming acid from the contact process in chamber acid from the old process; the figure for this would be 2·52 marks per 100 kilos.; and in the case of small works the author suggests the association of a number of makers by the old process in the erection and working of a contact plant, which cannot be profitably carried on on a small scale. Further improvement in the chamber process is still to be looked for, too, in the more scientific utilisation of the heat of reaction. A step in this direction has recently been taken by Zanner, whose apparatus for concentrating chamber acid by the heat of the gases from the burners as they pass to the Glover towers (this Journal, 1901, 717) has already given excellent results.—J. T. D.

Sulphuric Acid; Physical Chemistry of ——. O. Sackur. Zeits. Elektrochem., 1902, **8**, [6], 77—82.

THE article summarises the work of Knietsch (see this Journal, 1902, 172—173, and 343) on the catalytic process for the manufacture of sulphuric acid. The author, however, differs from the statement that dilution with indifferent gases exerts no influence on the yield. Since

$$\frac{(SO_2)^2.O_2}{(SO_3)^2.v} = k,$$

where v = the total volume, and the expressions within brackets represent, respectively, the quantities of the substances—

$$\frac{SO_3}{SO_2} = \sqrt{\frac{O}{v.k}}$$

Hence dilution with air containing nitrogen must give rise to a diminished yield. Attention is drawn to the special characteristic properties of the 98 per cent. acid, which might be explained by assuming that it has a definite chemical formula, $nH_2SO_4 + mH_2O$, an assumption which derives support from the fact that acid of this strength, and of this strength alone, distils over unchanged. But, as it is not proved that at a different pressure, some other strength of acid might not have this property, and as the formula of such an acid would be very complex, it is probably safer to assume that the strong acids are liable to dissociation, according to the expression $2H_2SO_4 \rightleftarrows H_2SO_4.H_2O + SO_3$. It is shown how, although this is, at first sight, opposed to the work of Lidbury (Zeits. physikal Chem., **39**, [4], 464), it may not really be so; whilst it is in conformity with the observations of Gahl (Zeits. physikal Chem., **33**, 208) on the partial pressure of H_2SO_4 in 100 per cent. and slightly diluted acids; and also of Schenk (Annalen, **316**, 1; and this Journal, 1901, 577—578) and Oddo (Gaz. chim. Ital., **31**, II., 158), showing the existence of polymeric modifications of SO_3.—W. G. M.

Ozone; Formation of ——. A. de Hemptinne. Bull. Acad. roy. Belgique, 1901, 612—621. Chem. Centr., 1902, **1**, [7], 391.

THE following conclusions are arrived at, as to the most favourable conditions for the formation of ozone by the electric discharge. The distance between the electrodes in the ozoniser has a considerable influence on the yield, which reaches a maximum when these are at a certain definite distance from each other. The pressure of the air has no appreciable influence, but the volume of air is of importance, although with an increase of the latter, the yield of ozone does not increase in the same ratio. A maximum amount of ozone is also produced when the bright sparks attain a definite length, but this maximum varies with the distance between the electrodes, the velocity of the current of air, and the intensity of the electric current. The use of oxygen instead of air causes an increase of the yield of ozone, but not to such an extent that it can be recommended in practice. With regard to the influence of the intensity of the electric current, it is advantageous with a definite amount of electrical energy, on the one hand, to work with low tension, in order to attain a greater strength of current, which is favourable for the formation of ozone; on the other hand, low tension necessitates a decrease of the distance between the electrodes, and this affects the yield injuriously. The conditions necessary for the attainment of the best yield must be fixed experimentally.—A. S.

Base between Two Acids; Method of Determining the Ratio of Distribution of a ——. H. M. Dawson and F. E. Grant.

See under XXIV., *page* 504.

ENGLISH PATENTS.

Sulphuric Anhydride; Catalytic Bodies and the Manufacture of ——. J. Wetter, London. From the Firm of E. de Haen, Hanover, Germany. Eng. Pat. 8545, April 25, 1901.

ASBESTOS or other porous mineral matter is impregnated with solution of ammonium vanadate, or of other soluble

vanadium compound, and is then dried and calcined, for application as a catalytic agent in the production of SO_3 from SO_2 and oxygen.—E. S.

Sulphuric Acid; Apparatus for Concentrating ——. A. Zanner, Brussels, Belgium. Eng. Pat. 2379, Jan. 29, 1902.

See U.S. Pat. 693,635, 1902; see below.—E. S.

Potassium Cyanide; Purification of ——. G. W. Johnson, London. From The Stassfurter Chemische Fabrik vormals Vorster und Grüneberg, Stassfurt, Germany. Eng. Pat. 8257, April 22, 1901.

Raw cyanide is heated in a tunnel-shaped crucible, having near its tap-hole at the bottom, a filter of refractory material, and as the cyanide melts and flows through the filter, access of air is obstructed by continual additions of cyanide into the upper compartment of the crucible.—E. S.

Separating Fluids rich in Oxygen from Air; Process and Apparatus for ——. E. A. Le Sueur, Ottawa, Canada. Eng. Pat. 4828, March 7, 1901.

The apparatus is constructed on a counter-current system, in one passage of which the air is reduced in temperature, and a portion of it liquefied. At the low temperature end of the system, the liquefied portion is separated from the unliquefied portion, and the latter is allowed to expand through a motor to abstract heat from the system prior to its rejection from the apparatus. Preferably, the aqueous matter is discharged by a preliminary refrigeration of slight intensity. The liquefied portion of the air, with or without a preliminary treatment by fractional distillation to increase its oxygen strength, is either withdrawn as a liquid or is caused to vaporise at the expense of the latent heat of fresh incoming air. In the latter case, the product of its vaporisation travels through a passage in the counter-current system, so that it is raised to ordinary temperatures before its withdrawal.—R. A.

United States Patents.

Sulphuric Acid; Apparatus for Concentrating ——. A. Zanner, Brussels. U.S. Pat. 693,635, Feb. 18, 1902.

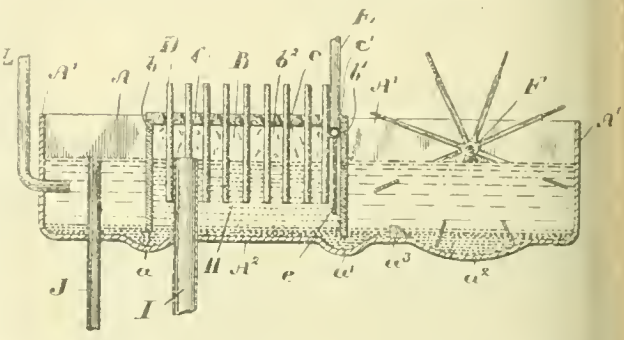
The apparatus consists of a rectangular cast-iron vessel, covered internally by earthenware plates cemented to the iron surfaces by a mixture of water-glass and asbestos, and divided into compartmentss by cross partitions of similarly protected plates, perforated alternately at opposite ends to admit of a serpentine circulation of the acid to be concentrated. The partitions are arranged to impinge upon the joints in the plates lining the sides. The cover is similarly protected. A pipe for exit of the acid distilling off is provided near the top of the vessel, and other pipes near the bottom serve as inlet and outlet passages.—E. S.

Sulphuric Anhydride; Apparatus for Cooling and Absorbing ——. G. C. Stone, Jersey City, U.S.A. U.S. Pat. 695,180, March 11, 1902.

A number of pipe sections, inclined with respect to each other, and joined by ∪-shaped intermediate connections, enter, both at the upper and the lower ends, into a "multiform," the upper multiform receiving the water or sulphuric acid for absorbing the SO_3, and the lower receiving the gases and vapours from the contact apparatus, which thus pass upwards against the flow of liquid. Each pipe-section is provided with a dam extending transversely across its lower end, an aperture being left for passage outwards of the absorbing liquid, which has exit by a side tube in the lower multiform. The apparatus is immersed in water, or may be otherwise cooled. The uncondensable gases escape from the upper multiform.—E. S.

Chlorine Gas and Caustic Soda from Common Salt; [Electrolytic] Machine for Producing ——. G. M. Wilson, Sault Ste. Marie, Canada. U.S. Pat. 693,678, Feb. 18, 1902.

A rectangular metal chamber, open at the top (shown in section in the drawing), is provided with the bottomless inner cell B, having non-conducting sides, and a carbon cover C, with numerous perforations, in which perforations the carbon electrodes D are inserted, a few only of which can be shown in the section. The two wells or depressions in the bottom of the chamber, a and a^1, are immediately below the side walls of the inner cell (which rests on the bottom of the chamber, near the edges); and the third well a^2 is shaped to the paddle F. The two wires from the source of electricity are connected respectively to the cover plate C and to the metal wall of the outer cell. Water is continuously admitted through the pipe L, the overflow for the outer cell being through the pipe J. Brine passes into the inner cell through the pipe E, having branches e reaching to near the bottom, the overflow being through the pipe I, which also conveys the chlorine liberated. Mercury at the bottom of the chamber has a sufficient depth to lute the inner from the outer cell. As the paddle-wheel rotates, it sweeps the mercury from the well a^2 over the guide-wall a^3, and so into the well a^1, and under the inner cell into the



opposite side of the chamber, whence it is forced by the pressure to the side walls, and returns to the well a^2, and so continuously. The sodium taken up by the mercury from the decomposition of the brine yields caustic soda to the water in the outer cell, the solution having outflow through the pipe J.—E. S.

Chlorine and Alkaline Hydrates; Production of —— Electrolytically. E. D. Chaplin, Winchester, and H. G. Halloran, Boston, both of Mass., U.S.A. U.S. Pat. 695,033, March 11, 1902.

The electrolytic cell is preferably, but not necessarily, circular in form, and consists of two superimposed parts. The lower is a shallow circular tray; the upper part is of stoneware, porcelain, or other impervious material, and is also circular, fitting on to the lower tray and forming a continuation of its side walls upwards. The walls of the upper vessel are turned over inwards at the top for a short distance, and then downwards again to the level of the joint with the lower tray, so that the upper portion consists of an annular vessel of ∩-section, having its outer wall resting on the wall of the tray below. Between the upper and lower divisions is stretched an asbestos-cloth or other diaphragm, held firmly in place by clamping the two parts of the apparatus together. Within the annular chamber, graphite or other carbon anodes are suspended symmetrically, passing air-tight through holes in the roof of the compartment. A ring of copper, connected with the positive pole of the generator, rests on pins attached to the projecting carbon rods, and thus makes contact with them, all outside the cell. The cathode, consisting of a horizontal spiral of copper, is supported in the inner chamber, which may be covered or left open, according as the hydrogen produced is to be collected or not. An inflow pipe for the solution of chlorides of the alkali metals is provided below the asbestos diaphragm, and a specially devised overflow pipe, for the removal of the hydroxide solution at will, is connected to the top of the inner cell. A vent for the chlorine and a manometer-tube are passed through the top of the annular cell. The asbestos diaphragm is held in place by the inner as well as the outer wall of the annular chamber, so that it effectually screens (by a porous division) the anode from the cathode compartment.—W. G. M.

ple Salt, and Method of making same. E. Courant, Berlin. U.S. Pat. 693,378, Feb. 18, 1902.

: patented triple salt consists of two cyanides and a salt other than a cyanide, having an alkali or alkaline h base. To obtain $Ag_2Cy_2BaCy_2BaCl_2$, one molecule silver oxide is dissolved in a solution of two mole- s of barium cyanide to form the soluble substance Cy_2BaCy_2BaO, which is then treated with hydrochloric , not in excess. Or, barium hydroxide is added to a tion of silver-barium cyanide and then hydrochloric to form the triple salt. Other triple salts may be ilarly produced, and are stated to be more stable than corresponding double cyanides. It is proposed that in ositing copper electrolytically, a certain proportion of copper triple salt Cu_2Cy_2, $4KCy$, K_2SO_3 should be loyed in the electrolyte, using a copper anode, and the article to be coated as cathode.—E. S.

aline Cyanides; Apparatus for Obtaining ——. G. aig, Glasgow, N.B. U.S. Pat. 695,037, March 11, 1902. Eng. Pat. 22,482, 1900; this Journal, 1901, 809. —E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Pottery] *Biscuit Bodies.* H. Hegemann. Sprechsaal, **35**, [9], 313—314.

e chief consideration in preparing biscuit bodies is to d the materials exceedingly fine, to prevent discoloration ue to excessive porosity—in the muffle. This is icularly necessary in bodies containing sand, or they not be sufficiently compact when fired. A high per- age of kaolin, and low proportion of quartz will give a -grained biscuit with a marble like structure; *e.g.*, lin, 50; felspar, 35; quartz, 15 parts. A good body dolls' heads is prepared from kaolin, 46½; felspar, 38½; rtz, 15¼ parts; the firing temperature is that of Seger e 12, and the ware is very strong.

ther bodies suitable for the same firing temperature are inable from: (1) Kaolin, 40; felspar, 25; quartz, 35 's. (2) Kaolin, 46; felspar, 7; quartz, 40; lime or gated chalk, 7 parts. (3) Kaolin, 48¼; felspar, 13¾; tinroda sand, 36; calc-spar or chalk, 2 parts. (4) Kaolin, ; felspar, 6¼; quartz, 29¾; calc-spar or chalk, 9¼; aice, 10½ parts.—C. S.

English Patents.

ss Articles; Apparatus for Manufacturing ——. O. mray, London. From J. A. Chambers, Pittsburg, Pa., U.S.A. Eng. Pat. 24,468, Dec. 2, 1901.

his apparatus, molten glass is supplied from a tank to a igh in a heated chamber or from a front extension of the s. The trough can be raised by a lever, and immediately r it, when raised, is a hole in the top of the chamber, rounded by a water-cooled ring, for chilling, by radiation, glass cylinder that is being drawn. Above the hole is echanism for drawing the glass, which mechanism by movement opens a valve and automatically increases the supply as the cylinder increases in length.—W. C. H.

amelled Vessels; Manufacture of ——. C. A. Allison, London. From The Dubuque Enamelling Company, owa, U.S.A. Eng. Pat. 23,280, Nov. 18, 1901.

s process of manufacturing vessels, especially army teens, consists in assembling certain parts, and coating the parts with enamel, which is allowed to dry and is nt on, then adding the remaining parts, and again lying coats of enamel internally and externally, allowing m to dry, and finally heating to cause the coats to fuse fill all cracks and crevices.—W. C. H.

y; Apparatus for Moulding Articles in ——. W. B. Rowley, S. H. Rowley, M. J. Adams, and T. Till, all of wadlincote, Derby. Eng. Pat. 7030, April 3, 1901.

E apparatus comprises a mould having externally the pe of the interior of the article to be moulded, two ulding rolls to mould the exterior of the article, a table carrying the mould between the rolls, and a means by ch the rolls are made to revolve.—W. C. H.

Annealing Boxes, Glass Melting Pots, &c.; Furnaces for Heating ——. W. S. McKenna and H. Whiteley, U.S.A. Eng. Pat. 15,611, 1901.

See under II., *page* 460.

United States Patents.

Glass Articles; Manufacture of Hollow ——. P. T. Sievert, Dresden. U.S. Pat. 694,685, March 4, 1902.

Molten glass, in sufficient quantity to produce the article desired, is spread on a plate, and a ring or rim pressed on to it; the plate and ring are inverted together, when the glass inside the ring sags; the plate is then removed and the glass allowed to sag either until it ceases to be plastic or until it reaches a mould placed under the ring to determine its ultimate shape. The inventor claims this method of making glass, by its own weight, mould itself into articles of definite form.—J. W. H.

Tile; Process of Glazing ——. H. C. Mueller and K. Langenbeck, Zanesville, Ohio, U.S.A. U.S. Pat. 693,420, Feb. 18, 1902.

The tiles are spaced and fixed on a base, such as paper, which is disintegrated by the heat of the kiln; finally they are coated in any convenient manner with the glazing material, and fired.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Building Materials; Testing of ——. M. Gary. Report of the International Association for the Testing of Trade Materials. From the third meeting, held at Budapest, 1901. Mitt. aus den königl. t. Versuchs-Anst. zu Berlin, 1901, **19**, [4], 189—211.

The Association of German Portland Cement Manufacturers defined Portland cement as a product made by burning, at a sintering temperature, an intimate mixture of calcareous and argillaceous materials, as essential constituents, the resulting mass being afterwards ground to a fine powder. Steps were subsequently taken to prevent the admixture of foreign bodies, especially blast-furnace slag.

The report deals with the following points:—

Purity of Portland Cement.—The chief injurious admixtures are lime, magnesia, and gypsum; the proportions present can be determined with certainty only by chemical analysis. Other admixtures are, colouring matters, clay, sand, ashes, hydraulic lime, trass, blast-furnace slag, &c., which, except the last, can be detected by noting the sp. gr., loss on ignition, and action of dilute acid; the alkalinity of the aqueous solution and amount of carbon dioxide give evidence of the addition of hydraulic lime (0·5 grm. of cement require 4—6·25 c.c. of N/10 HCl, and 3 grms. of cement should not give more than 1·8 mgrms. of CO_2). For the detection of blast-furnace slag, Fresenius proposed a comparison with the following values for pure cement:—(*a*) Sp. gr. at least 3·125. (*b*) Alkalinity of aqueous extract, as above. (*c*) 1 grm. of cement, treated direct, requires 18·8—21·67 c.c. of N/10 acid. (*d*) 1 grm. of cement reduces 0·79—2·8 mgrms. of potassium permanganate. Details for carrying out the determinations are given, including sp. gr. separations by means of methyl iodide.

Rules for Cement-testing. I. *Weight.*—No values are given in the Prussian rules for the weight of a unit volume. A full cask (the size of which is not given) to be taken at 180 kilos. (400 lb. English) gross and 170 kilos. nett. For determining the weight on an experimental scale, methods in use in different places of filling the vessel are discussed, *e.g.*, spreading the powder on a surface inclined at a definite angle and allowing it to flow into the vessel. The author recommends the simple French apparatus, consisting of a funnel with a sieve bottom, described in the proposals of the sub-committee B. of the International Association for Testing Trade Materials, Dresden, Sept. 27, 1899, together with a cylindrical litre vessel in which the diameter is to the height as 3:2.

II. *Time of Hardening.*—In the Prussian rules, cements are described as slow- or quick-hardening cements, the former being those which set only after two hours or more. The method of testing cements in this particular, consists in making a thick paste, which is spread on a glass plate, the cement being considered "set" when the finger-nail no longer makes an impression on it. For more exact experiments, the paste is pressed into a shallow ring, and a "normal needle," weighing 300 grms. and having a cross section of 1 sq. mm., placed on it; the time in which this is no longer able to penetrate the paste is taken as the "beginning of setting," the "time of hardening" being the interval that elapses before the needle makes no appreciable impression. The temperature of the air, and of the water used for mixing the paste, should be 15°—18° C. The author adds some observations on these determinations, and mentions some pieces of apparatus that have been made for the purpose. The hygrometric condition of the air in the "setting room" should also be noted. Many freshly-made cements which are "slow-hardening," in time become "quick-hardening," and then again get slower. This and other points are under the consideration of committees.

III. *Constancy of Volume (Raumbeständigkeit).*—A cake of cement, laid under water after 24 hours, should during further observation show no crumbling or cracks; these show a tendency of the cement to "fly." The time of observation should be from 3—28 days. This is a serious objection to the method, for which quicker methods have been proposed by Michaëlis, Heinzel, Tetmajer, &c., though it is pointed out these are not absolute, and cannot replace practical trials. The author regards them as useful for control tests.

IV. *Fineness.*—According to the Prussian rules, a Portland cement should leave at the most 10 per cent. of residue on a sieve of 900 meshes to the square centimetre, the thickness of the wire being half the width of the mesh. The author points out that most German cements on the market leave less than 10 per cent. residue on such a sieve, cements with 20 per cent. residue on a sieve of 5,000 meshes per 1 sq. cm. being rare.

V. *Strength.*—1. *Composition of the Bodies.*—(*a*) *Cement-Sand Mixing:* The strength of a cement is determined on a mixture of three parts by weight of normal sand (described below) and one part by weight of the cement to be tested. The shape and cross-section of the test bodies must be equal, and the tensile and compression strengths must be determined by a uniform method. Owing to the recent advances in cement manufacture, it is desirable to obtain greater differentiation by this test, and the author suggests the addition of a number expressing the cementing limit between the cement and sand.

(*b*) *Normal Sand:* The Prussian normal sand is a pure quartz-sand from Freienwalde, from which the larger particles are separated by a sieve of 60 meshes to the square centimetre, and the finer particles by a sieve of 120 meshes. The author mentions differences in the strength tests when other normal sands are used, even when they have been prepared as directed, and gives an account of work that has been done on this subject at Charlottenburg and elsewhere.

(*c*) *Method of Mixing:* The cement and sand are mixed on a plate, with the addition of 10 per cent. of water, and thoroughly worked up. This amount of water is almost always too much, and experiments show that machine mixing is preferable to hand mixing. The following official method is described:—500 grms. of cement and 1,500 grms. of normal sand are mixed, dry, for half a minute, with a light spoon, on a dish, and after the addition of water, for a further half-minute, and then in a Steinbrück-Schmelzer machine. Of this mortar, 860 grms. are put in the blocks (of which a sketch is given; see also Mitt. aus den königl. t. Versuchs-Anst., 1896). Eight and ten per cent. of water is then added, and from the behaviour of the mass the proper amount to use is estimated; the proper amount is found when 90—110 strokes begin to force the cement paste out of the channels; the mean of three experiments is taken. The samples for the strength tests are made with the addition of water thus determined.

2. *Ramming Process (Rammverfahren).*—(*a*) *Normal Mortar:* This may be either by hand or with a Böhme apparatus provided with a 2-kilo. hammer, which gives 150 beats to each sample.

(*b*) *Pure Cement:* The determination of the strength of pure cement is useful for comparing Portland cements with mixed cements and other hydraulic cementing materials, apart from the influence of the admixed sand. According to the Prussian rules, 1,000 grms. of cement are worked up with 200 c.c. of water for five minutes with a pestle, and pressed into a mould with an iron spatula 5—6 cm. wide, 35 cm. long, and of about 250 grms. weight, till the cement is elastic, and when sufficiently hard is taken out and kept in a moist atmosphere. This quantity of water is often too much, but if too small, the tensile strength will diminish and not increase after a certain time.

3. *Injurious Influences on the Strength of Samples.*—(*a*) *Testing Apparatus:* That used at Charlottenburg is described in "Mitt.," 1896, p. 155 *et seq.* For mortar mixing, &c., are mentioned the Steinbrück-Schmelzer, and Böhme's with Martens' filling contrivance; for a tearing machine, the Frühling-Michaelis; and for compressing, a 32-t. Amsler-Laffon press.

(*b*) *Form of the Samples:* For breaking tests, bodies with a breaking-surface of 5 sq. cm., and for compression tests, cubes of 50 sq. cm. surface are used. The form of figure 8 is used for the tensile tests.

(*c*) *Value of Tensile and Compression Tests:* Though the relation of these in hydraulic cements is different, the latter is often taken as a measure of the value, and gives rise to erroneous conclusions. Again, the results of strength tests by 28-day tests may be equal, whereas 7-day tests may be different. The compression test is again coming to be considered the more reliable, and with it the differences between individual values and the mean value are less than is the case with tensile tests.

(*d*) *Examination of Tests:* For tensile tests the pull should amount to 100 grms. per second during the breaking, and the mean of 10 determinations taken. For compression tests the pressure is applied to the sides, and not to the bottom and upper smoothed surface. Other influences must be noted, as renewal of the water, shaking, possibility of the sample drying by evaporation or draughts during the first 24 hours, and also the temperature of the air and water.

4. *Values for Portland Cement.*—Slow-hardening cement should, by the test with 3 parts by weight of normal sand to 1 part by weight of cement after 28 days' hardening—1 day in the air, and 27 days under water—have a minimum tensile strength of 16 kilos. per sq. cm. and a minimum compression strength of 160 kilos. per sq. cm. For quick-hardening cements, the strength in general is somewhat less.—W. C. H.

Limestone; Chemical Composition of Dalmatian Bituminous ——. J. Slaus-Kantschieder. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [3] 54—55.

According to the author, Dalmatian bituminous limestone has been employed in large quantities for building purposes in Venice, especially on the islands of Brazza and Bua.

In determining the amount of bitumen, the finely-pulverised, dried material was repeatedly extracted with carbon bisulphide in a small beaker, and then with benzene, and the residue transferred, with the aid of alcohol, to an asbestos filtering tube, and dried at 90° C. until constant in weight.

The following partial analyses were made with samples of different origin:—

Origin.	Moisture.	Residue on Ignition.	Carbonic Acid.	Bitumen.	Organic Substances.
	Per Cent.	Per Cent.	Per Cent	Per Cent.	Per Cent.
Luke (Brazza)	0·248	51·28	43·05	4·97	0·45
„ „	0·352	53·36	39·02	6·91	0·36
Dolac (Sinj) .	trace	73·21	..	12·01	..
Knin	1·140	49·72	38·56	9·93	0·65
Dalmatia	0·752	49·65	40·08	5·22	0·30
Sinj district..	trace	50·40	42·77	6·77	0·46

A fuller analysis of four other samples of bituminous limestone gave the following results :—

Origin.	Moisture.	Residue on Ignition	SiO_2	$Fe_2O_3+Al_2O_3$.	CaO.	MgO.	SO_3.	Carbonic Acid.	Bitumen.	Organic Substances.
	Per Cent	Per Cent	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent	Per Cent.
motiu.....	0·56	47·98	1·90	trace	45·93	trace	0	36·09	14·04	1·33
is.....	0·324	53·40	4·75	0·59	48·01	0	trace	32·21	13·80	0·26
e (Montenegro)	0·43	51·63	5·92	3·20	32·26	1·75	..	28·40	1·67	17·87
.....	0·68	40 50	..	..	..	..	..	24·42	3·58	30·81

The third sample (Ploce) also contained 5·21 per cent. alkali chloride, expressed as sodium chloride. Both the last samples yielded on dry distillation, a considerable portion of dark brown viscous oil resembling crude hatha.—C. A. M.

Slaked Lime ; Preparation of ——. W. Michaelis. Ger. Pat. 128,050, March 13, 1900.

order to produce slaked lime of suitable moisture ent for special purposes, *e.g.*, the manufacture of icial sandstone, the inventor takes suitable proportions colloidal calcium hydrate (pit-slaked) and dry hydrate, es them together, and introduces the mixture (packed osed iron chests) into a high-pressure steamer. The steam in the latter cannot convert the dry calcium rate into the colloidal modification ; but at the same the excess water in the pit-slaked lime is prevented evaporating, and is compelled to act upon the cent particles of dry hydrate, and complete the slaking ame, under the influence of the prevailing high perature in the apparatus. The product is a fully- ed paste suitable for mixing with sand to make icial stone, and will not be liable to any subsequent cts caused by after-slaking.—C. S.

English Patents.

ficial Stone, and Manufacture thereof. N. Brooke, ghtcliffe, and W. Glossop, Hipperholme, Yorks. g. Pat. 383, Jan. 6, 1902.

waste obtained in quarrying York stone is ground to wder, and the impalpable dust removed by washing. powdered stone is mixed with Portland cement or binding material, moistened with water, placed in us moulds and subjected to great pressure.—W. C. H.

ficial Stone ; Machine for Preparation of Materials ——. W. Schwarz, Zürich, Switzerland. Eng. Pat. ,163, Sept. 11, 1901.

machine for the manufacture of artificial stone from and lime consists of a mixing vessel, with a steam t, an appliance for introducing a regulated quantity of or steam, with or without an appliance for exhausting mixing vessel ; and in some forms an appliance is d for leading off vapours arising from the slaking of ime.—W. C. H.

s ; Rotary Burning or Roasting ——. H. H. Lake, ndon. From Fellner and Ziegler, Frankfort-on-the- aine. Eng. Pat. 9369, May 6, 1901.

tary kilns, fired with coal-dust, a better heating effect tained when the fire-jet is directed slightly to one and downwards. Consequently in these kilns, the jet ovided, on the outside of the kiln, with a cylindrical mounted on a shaft, by which means it can be inclined y desired angle to the axis of the kiln. The jet is mounted in a flanged guide-ring, to be capable of g any radial position. The nozzle is flattened, and the of the aperture can be varied by means of movable —W. C. H.

United States Patents.

l ; Method of Creosoting ——. C. S. Friedman, ladelphia, U.S.A. U.S. Pat. 693,697, Feb. 15, 1902.

mixture for creosoting wood is applied in the usual and consists of glue, 1 lb. ; water, 2 qrts. ; potassium bichromate, 3 oz. ; zinc chloride, 4 oz. ; creosote, 2 galls. The creosote becomes minutely diffused in the solution after the manner of an emulsion.—J. W. H.

Wood ; Process of Producing Artificial ——. E. Helbing, Hamburg. U.S. Pat. 694,014, Feb. 25, 1902.

The process for producing artificial wood from turf consists in first thoroughly washing the turf, and retaining as far as possible its natural fibre, then adding a mixture of hydrate of lime and sulphate of aluminium, then pressing whilst moist for a short time and allowing it to harden in the atmospheric air. (See Eng. Pat. 13,136, 1901 ; this Journal, 1901, 991.)—J. F. B.

Wood ; Process of Preserving ——. I. B. Sprague, Everett, Washington, U.S.A. U.S. Pat. 694,212, Feb. 25, 1902.

Pieces of rusty iron are driven, about 2 inches apart, into the wood, and iron borings pressed into the intervening spaces. Finally, immersion in an oxidising liquid ("a salt solution containing rust") completes the treatment, which is especially intended to prevent the destructive attacks of teredoes.—J. W. H.

Stones, Tiles, &c. ; Manufacture of Artificial ——. E. Rott, Dassel, Germany. U.S. Pat. 693,906, Feb. 25, 1902.

Natural clay is mixed with cream or milk of lime, and the mass which becomes hot and finally, dry and crumbled, stored for use. This mass is made into a paste with water and formed into articles, which are hardened by steam at a pressure of not more than 25 atmospheres.—J. W. H.

Concrete Joint. E. L. Ransome, New York. U.S. Pat. 694,578, March 4, 1902.

Layers of concrete are bonded into each other by means of small pieces of honeycomb slag.—J. W. H.

Magnesia ; Compound of ——. E. Rueff, New York. U.S. Pat. 694,424, March 4, 1902.

One part of powdered calcined magnesite, mixed with 20 parts of water, is agitated under a stated pressure with carbon dioxide "until the mixture has absorbed less than one part, by weight, of the gas." The mixture is then gradually heated to about 160° F., is drained, dried, and shaped into desired forms under a pressure of from 200 to 1,000 lb. per square inch. This compound, as stated in the second claim, "contains at least twice as many molecules of magnesia as of carbon dioxide, and more molecules of water than of magnesia, said compound being very finely-divided and light, forming porous lumps in presence of water, being a bad conductor of sound and heat, and possessing when pressed or moulded great tensile strength and elasticity." It is stated to be suitable for lining interior walls, for fireproofing, and for covering boilers and pipes, &c.—E. S.

Cement ; Composition of Matter for ——. J. D. Mac-Donell, Littleriver, Florida, U.S.A. U.S. Pat. 691,397, Jan. 21, 1902.

The composition consists of three barrels of crushed calcareous rock, one barrel of calcium sulphate, one barrel of cement (any manufacture), 4 oz. of nitric acid, 4 oz. of

nitro-hydrochloric acid, 1 quart of crude carbolic acid, and 10 gallons of water. The ingredients are thoroughly mixed, dried, and screened.—W. C. H.

Cement; Manufacture of ——. J. Steiger, London, England. U.S. Pat. 694,802, March 4, 1902.

Hydrated silicic acid is produced by heating powdered silicates with a solution of magnesium chloride (at 130° C. or over) until the mass stiffens; it is allowed to cool, crushed, powdered, and finally mixed with powdered calcined magnesite.

The proportions given are:—80—90 parts of a 50 per cent. solution of magnesium chloride, 20—30 parts of siliceous matter (slag or granite, say), and 150—200 parts of calcined magnesite. (See Eng. Pat. 4657, 1901; this Journal, 1902, 409.)—J. W. H.

Kiln; Lime, Cement, or like ——. I. Isserlis, Kiew, Russia. U.S. Pat. 691,145, Jan. 14, 1902.

The kiln consists of several compartments arranged in line. The compartments communicate at the bottom, and are provided with chimneys at the top. Hearths are arranged on the opposite sides of each compartment. The claims also include the arrangement of feeding doors, fire-grates, with auxiliary grates, ash-pans containing liquid, and means for supplying fuel.—W. C. H.

X.—METALLURGY.

Clay Slimes; Treatment of ——, *by the Cyanide Process, with Agitation.* A. H. Tays and F. A. Schierz. Chem.-Zeit. Rep., 1902, 72.

At San José de Garcia, Sinaloa, Mexico, the ores of the Guadeloupe mines were at first only treated by the amalgamation process, when gold to the value of 80 marks per ton remained. The tailings were then profitably treated with cyanide. Finally, the authors were confronted with the problem of treating 16,000 tons, consisting of 75 per cent. of clay slimes and 25 per cent. of sand slimes. The material contained ferric oxide, pyrites, small quantities of lead and copper sulphides and carbonates, and 52 marks of gold and 40 grms. of silver per ton. The copper amounted to 0·11 per cent. Preliminary experiments showed that 90 per cent. of the noble metals could be extracted by twice treating with cyanide and lime; by 24 hours' action, only 75 per cent. was regained. Vats provided with stirrers were then erected. The best results were obtained with a 0·15 per cent. cyanide solution, the consumption of cyanide being 7 lb. per ton; 78·56 per cent. of the gold was extracted. The slimes were mixed with 1·5 times the quantity of cyanide solution and brought into a vat containing more cyanide solution, 18 tons being used to 10 tons of slimes. The agitation lasted 5 hours; 30 minutes before the end, 5 lb. of slaked lime per ton were added. After settling for 7 hours, 70 per cent. of the solution could be drawn off quite clear; without lime, there was practically no settling. When a smaller proportion of slimes to the cyanide solution was taken, the settling was much slower. When the sand slimes were mixed with clay slimes, 80 per cent. of the solution could be drawn off. The residue was again washed with water or dilute cyanide, and then emptied out. About 0·9 lb. of zinc was used per ton of slimes. The fine particles of zinc and the slimes from the zinc boxes were taken to a filter-press, and thence to the furnace. The coarser particles of zinc were first treated with sulphuric acid. In smelting, 34 kilos. of borax, 24 kilos. of sodium bicarbonate, 5 kilos. of sand, 3 kilos. of ashes, 6 kilos. of clay, and 5 kilos. of hematite were used to 100 kilos. of the gold slimes. The cost of the treatment per ton of slimes amounted to 20 marks, composed of potassium cyanide, 8 marks; zinc, 0·80 mark; labour and management, 4 marks; taxes, 2 marks; other expenses, 5·20 marks.—A. C. W.

Gold and Silver; Detection and Determination of Small Quantities of ——. L. Wagoner.

See under XXIII., *page* 501.

Platinum Metals; Detection by the Action of Sodium Peroxide on the ——. Leidié and Quinnessen.

See under XXIII., *page* 499.

Mercury Ores (Dalmatian), and their Determination. C. Ehrmann and J. Slaus-Kantschieder.

See under XXIII., *page* 501.

Metals; Distillation of ——. G. W. A. Kahlbaum, K. Roth, and P. Siedler. Zeits. anorg. Chem., **29**, 177—294; Chem. Centr., 1902, **1**, [9], 519.

By aid of Kahlbaum's mercury air-pump (see this Journal, 1894, 760), the authors have succeeded in distilling *in vacuo* a series of metals. The distillation apparatus was constructed of porcelain, and the course of the distillation was followed by means of Röntgen rays. The metals purified by distillation were examined as to their specific gravity, specific heat, and crystalline form. The specific gravities and specific heats of the distilled metals are shown in the following table:—

Table.	Specific Gravity at 20°/4° C.		Specific Heat.	
	Unpressed.	Pressed.	Unpressed.	Pressed.
Cu.....	8·93258	8·93764	0·09272	0·09266
Ag.....	10·4923	10·5034	0·05608	0·05623
Au.....	18·8840	19·2685	0·0309	0·03087
Pb.....	11·3415	11·3470	0·03053	0·03083
Zn.....	6·9225	7·12722	0 0939	0·0940
Cd.....	8·64819	8·64766	0·0559	0 0560
Te.....	6·23538	..	0·04878	..
Sb..... ..	6·61781	6·69090	0·04973	0·04957
Bi.....	9·78143	..	0·03055	..

—A. S.

Steel; Want of Homogeneity of Soft Basic Martin ——. A. Riemer. Stahl u. Eisen, 1902, **22**, 269.

In running ingots of low-carbon ingot-iron, platy crusts are apt to form (from 2 to 4 cm. thick), and to float on the surface. When the metal is thick-flowing, the heavier metal of high fusing point first crystallising out is liable to cling to the sand in the channel leading to the mould. This accounts for the higher percentage of silica found in these crusts. The want of homogeneity of these ingots is due entirely to physical causes.—W. G. M.

Steel; Study of the Transformations of ——, *by the Method of Expansibility.* G. Charpy and L. Grenet. Comptes Rend., **134**, [10], 598—601.

The expansion method has the advantage over the pyrometric method, that the temperature may be raised as gradually as desired, and the results of heat-absorption or evolution during transformation thus eliminated. The authors' results may be summarised as follows:—In steels and cast-irons containing but traces of elements other than iron and carbon, expansion is regular up to 700° C. Then transformation begins, evidenced by a contraction, the extent of which increases with the carbon-content up to a maximum about 0·85 per cent. of carbon, and persists during a temperature-range of from 5°—15° C. Then, as the temperature rises, expansion begins again, slowly diminishes, and is followed by a second (but very gradual) contraction, extending over 190° for a steel of 0·08 per cent. of carbon, 80° for one of 0·25 per cent., and becoming impereeptible with steel of 0·65 per cent.

The temperature of the first contraction agrees closely in all cases with the critical point a_1 (700° C.), observed pyrometrically, and that of the upper limit of the second contraction (perhaps, for steels above 0·85 per cent. of carbon a dilatation) with the point a_3 (800° to 890° C.); but these experiments show no indication of the pyrometric point a_2.

These observations agree with the hypothesis that the transformation at 700° corresponds to the resolution of

eutectic (perlite) of iron (ferrite) and iron carbide ementite), and the gradual transformation above 700° to olution of the ferrite in excess (with contraction) in o-eutectic, or the cementite in excess (with expansion) per-eutectic steels.—J. T. D.

Steels; Expansion of ——, at High Temperatures. G. Charpy and L. Grenet. Comptes Rend., **134**, [9], 540—542.

The following figures were obtained for annealed steels over various temperature-ranges:—

Composition of Steels.					Mean Coefficients of Expansion from				
C.	Mn.	Si.	P.	S.	15° to 200° C.	200° to 500° C.	500° to 650° C.		
·03	0·01	0·03	0·013	0·023	$11·8 \times 10^{-6}$	$14·3 \times 10^{-6}$	$17·0 \times 10^{-6}$	$24·5 \times 10^{-6}$	880° to 950° C.
·25	0·04	0·05	0·010	0·010	11·5	14·5	17·5	23·3	800° to 950° C.
·64	0·12	0·14	0·009	0·010	12·1	14·1	16·5	23·3	720° to 950° C.
·93	0·10	0·05	0·005	0·010	11·6	14·9	16·0	27·5	" "
·23	0·10	0·08	0·005	0·009	11·9	14·3	16·5	33·8	" "
50	0·04	0·09	0·010	0·010	11·5	14·9	16·5	36·7	" "
·50	0·03	0·07	0·005	0·010	11·2	14·2	18·0	33·3	" "

low the transformation-temperature, the coefficients most the same for steels containing up to 3·50 per cent. rbon (about 50 per cent. of cementite). Even above temperature the coefficients vary but little for steels up 85 per cent. of carbon; the great variations for steels er in carbon than this are, perhaps, partly due to the formation in these steels extending over a considerable range of temperature, so that the figures may not be coefficients of expansion pure and simple.

In the case of nickel steels (all of them the "reversible steels" of Guillaume, the transformation-points of which are below the temperatures employed), the following results have been obtained:—

Composition.			Mean Coefficients of Expansion from				
Ni.	C.	Mn.	15° to 100° C.	100° to 200° C.	200° to 400° C.	400° to 600° C.	900° to 909° C.
3·9	0·35	0·30	$11·0 \times 10^{-6}$	$18·0 \times 10^{-6}$	$18·7 \times 10^{-6}$	$22·0 \times 10^{-6}$	$23·0 \times 10^{-6}$
3·9	0·35	0·36	10·0	21·5	19·0	20·0	22·7
3·1	0·35	0·34	9·5	14·0	19·5	19·0	21·3
3·7	0·36	0·36	2·0	2·5	11·75	19·5	20·7
3·1	0·39	0·39	1·5	1·5	11·75	17·0	20·3
3·8	0·29	0·66	8·0	14·0	18·0	21·5	22·3
3·8	0·31	0·69	2·5	2·5	12·5	18·75	19·3
3·4	0·30	0·69	2·5	1·5	8·5	19·75	18·3
3·4	1·01	0·79	12·5	18·5	19·75	21·0	35·0
3·4	0·99	0·89	11·0	12·5	19·0	20·5	31·7
3·5	0·97	0·84	3·0	3·5	13·0	18·75	26·7

low temperatures, it will be seen, great differences ; but all the coefficients increase so rapidly with erature, that at temperatures above 500° C. these ences hardly exist.—J. T. D.

olybdenum Steel; Volumetric Determination of ——. F. T. Kopp.

See under XXIII., *page* 502.

Copper; Analysis of Industrial ——. P. Truchot.

See under XXIII., *page* 501.

and Aluminium; Thermal Investigation of Certain loys of ——. W. Louguinine and A. Schukareff. ch. Sc. phys. nat. Genève, **13**, [4], 5—29; Chem. ntr., 1902, **1**, [9], 521.

heat of formation of zinc aluminium alloys was deterd by measuring the heat evolved on dissolving the in hydrochloric acid of the composition, HCl + O, and comparing it with the quantities of heat evolved ssolving the pure metals under the same conditions. eats of formation for 1 grm. of each of the alloys were llows:—

Zn	Al_4Zn	Al_3Zn	Al_2Zn	AlZn	Al_2Zn_3	$AlZn_2$	$AlZn_3$
1·7	−5·0	+1·4	+23·4	+9·1	+2·3	−4·0	+15·2 cals.

in the case of the Al_3Zn alloy is the amount of heat ed greater than that possibly due to experimental , and consequently the results cannot be said to point e formation of definite compounds of the metals.

—A. S.

Tungsten, Molybdenum, Uranium, and Titanium. A. Stavenhagen and E. Schuchard. Ber., **35**, [4], 909—911.

These metals were prepared by Stavenhagen by reduction of their oxides by means of aluminium (this Journal, 1899, 687, and 1900, 52). The authors have now obtained the following alloys of these with other metals:—WCo; WMo; MoU; MoFe; MoSb; UFe; UCo; UMn; TiFe; TiCo; TiCu; PbW; PbMo; FeBa; CrCoWMo; TiWMo; MoUCrTi; FeMnU. In the case of oxides reduced with difficulty, the oxide was mixed as intimately as possible with aluminium powder and filings; but with easily reducible oxides it was necessary to use also some fluxing material, such as fluorspar, as otherwise the reaction proceeded so violently as to cause an explosion. The ignition was effected sometimes by Goldschmidt's method, sometimes electrically, and sometimes by means of smokeless powder. The alloys obtained always contained some aluminium.

When the slags obtained as by-products were subjected to cathode rays, it was found that certain metals, when present, imparted characteristic colours to the luminescence. Thus lead gave a blue, iron and manganese a green, chromium a red, uranium a yellow to brownish-green, and tungsten a violet colour to the light, these colours being more intense if fluorspar was present.—H. B.

English Patents.

Ores; Treatment of ——. H. W. Wallis, London. Eng. Pat. 21,623, Nov. 29, 1900.

The process is intended to be applied chiefly to refractory sulphides, and to ores containing, in addition to precious metals, titanium or tungsten with iron, selenium, tellurium,

chromium, manganese, or the like. The ore is to be mixed with an alkaline earth (or its carbonate) in suitable proportion, to be determined by a preliminary test which is described in the specification, and is then ignited, air being as far as possible excluded during this process. The mixture, after cooling, may be amalgamated, the ore being now free-milling, and free from any tendency to cause sickening of the mercury. After the extraction of the precious metals, the ore is concentrated for the separation of other reduced metals, &c.—W. G. M.

Blast Furnaces. C. I. Rader and E. E. Smeeth, U.S.A. Eng. Pat. 25,596, Dec. 14, 1901.

The objects of this invention are (1) to prevent the formation of corrugations or ridges in the bosh lining, (2) to reduce the expense of constructing the bosh portion of the furnace, (3) to prevent the formation of openings and the consequent forcing out of gases at the junction of the jacket and the mantle, in cases where a bosh jacket is used, and (4) to improve the action of the furnace and to prolong its life. There are arranged vertically-extending cooling plates embedded in the masonry of the furnace at the junction of the bosh and the mantle, and the bosh jacket is cooled by a circular spray-pipe discharging water directly upon the jacket. Between the bosh jacket and the tuyères there is a row of horizontal cooling plates.—R. S.

Blast Furnaces. T. Stapf, Ternitz an der Südbahn, Lower Austria. Eng. Pat. 898, Jan. 13, 1902.

To enable blast furnaces to be used continuously, there are provided below the tuyères, a slag-discharge passage consisting of a siphon-trap, and lower down, and preferably on the opposite side, a crude-iron discharge, similarly constructed. By these passages, the slag and the crude iron are continuously and automatically discharged.—R. S.

Metals; Annealing of ——. D. Bates, Huyton, and G. W. Peard, Prescot, both of Lancs. Eng. Pat. 7084, April 4, 1901.

The arrangement is intended primarily for the annealing of wire, rods, strips, or sheets of copper. The annealing oven is provided at each end with a descending mouthpiece which, dipping below water or other suitable liquid, provides a water-seal. The wire to be annealed is fed from, or over, a drum at one end, partly immersed in the sealing liquid, and after passing through the furnace is delivered to a similar drum at the other end. The oven is charged with an inert gas, and the metal, passing directly from this gas in the furnace mouthpiece into water, is prevented from oxidation.—W. G. M.

Metals; Tank for Precipitating ——. A. Berry, Leeds. Eng. Pat. 8752, April 29, 1901.

A tank for the precipitation of cement copper is made in two parts, superposed, and separated by a perforated grid, with holes tapering inwards from below upward, and with projecting pieces on the upper side to prevent the blocking of the perforations. Just above the grid is an exhaust pipe provided with a cock, from which the spent liquor is drawn off after precipitation is complete. The lower division has the shape of an inverted pyramid, and is provided with a valve at the apex (bottom), through which the precipitated copper is withdrawn at the end of the operation; and immediately beneath the grid is a single coil of perforated pipe through which steam (with a little injected air) is forced during the operation. The scrap-iron is placed in the upper portion of the tank, and the copper is swept from its surface constantly by the scouring action produced by the injection of steam and air, and as it separates it settles through the grid into the space below the steam pipe and collects there. The tank is intended for other precipitations as well as that of copper.—W. G. M.

United States Patents.

Precious Metals; Cyanide Process for Extracting ——, *from Ores.* B. W. Begeer, Colorado. U.S. Pat. 694,521, March 4, 1902.

For the solution of 2 atoms of gold by potassium cyanide solution, it is necessary to supply 1 atom of oxygen. In cases where the quantity of gold is large, the oxygen dissolved in the water will not be sufficient. According to this invention, an excess of oxygen is preserved in the liquid by circulating the cyanide solution in an endless path through a centrifugal pump, and providing, at the place where the suction pipe enters the centre of the pump, an inlet for air, which is thus thoroughly incorporated with the liquid.—J. F. B.

Sulphide Ores; Extracting Metals from ——. J. Swinburne and E. A. Ashcroft, London, England. U.S. Pat. 695,126, March 11, 1902.

This process is practically the same as that covered by Eng. Pat. 14,278, of July 11, 1899 (this Journal, 1902, 349). A fireclay vessel, glazed inside, is heated to a dull-red heat by means of a coke fire; a little zinc chloride is then fused separately, and run in; a small quantity of crushed sulphide ore follows; chlorine is then introduced, which decomposes the ore, producing chlorides of the metals present, and free sulphur; more ore is then introduced, and the process continued until the vessel is sufficiently full of the chlorides produced, which remain fluid, the reaction being exothermic. The temperature is controlled by regulating the supply of chlorine. Iron and manganese may afterwards be precipitated as oxides by the addition of zinc oxide, and the action of chlorine or air; they are allowed to deposit with the gangue, and the chlorides are drawn off from the above precipitate, to be treated, first, with metallic lead to collect the precious metals for subsequent recovery, and then with zinc, to deposit the lead; or, instead of treating the chlorides successively with lead and zinc, they may be submitted to fractional electrolysis. Alternative wet methods are described, involving the electrolysis of aqueous solutions. The chlorides left with the gangue may be recovered from it, by a process analogous to that adapted to the treatment of the fused chlorides. The sulphur formed during the treatment is distilled off. If the temperature employed be too high, some metallic chlorides will pass over with the sulphur, but they may be separated by gravitation, if the mixed product be fused at a low temperature.—W. G. M.

Steel; Manufacture of ——, *by the Open-Hearth Process.* W. B. Hughes, Pa. U.S. Pat. 694,752, March 4, 1902.

This invention, which is described in 12 claims, consists essentially in avoiding the waste of time hitherto required for heating the basic additions on the hearth of the furnace, by previously melting the iron oxide and lime in a separate furnace, so as to form a highly oxidising molten basic slag, and then adding this molten slag to the bath of molten iron, on the hearth of the furnace, thereby effecting the removal of silicon and phosphorus, without any risk of injury to the hearth or lining, and at the same time obtaining a more efficient action of the slag constituents.—J. F. B.

Alloys containing Copper and Zinc; Method of Improving Castings of ——. E. S. Sperry, Bridgeport, Conn. U.S. Pat. 694,688, March 4, 1902.

The process claimed consists in adding to the alloy, whilst in a molten condition, a predetermined quantity of arsenic, and then pouring in the usual manner. The resulting casting will be wholly free from arsenic, and without dross or scale.—J. F. B.

Armour-Plates [Tempering]; Manufacture of ——. B. K. Jamieson, Philadelphia, U.S.A. Assignor to National Steel Refining Co., Wilmington, U.S.A. U.S. Pat. 690,961, Jan. 14, 1902.

The plate is heated to a bright red, and then submerged in a bath of hardening liquid to a depth corresponding with the depth to which it is required to harden the plate, while maintaining the bath at a temperature of about 60° or 70° F. The back portion of the plate is subsequently annealed by placing upon it a plate heated to a white heat.—J. H. C.

nour-Plates [Tempering]; Treatment of ——. B. K. amieson, Philadelphia, U.S.A. Assignor to National teel Refining Co., Wilmington, U.S.A. U.S. Pat. 90,962, Jan. 14, 1902.

e plates are heated to a bright red, and then partially or rely plunged into a bath containing 3 oz. each of sweet its of nitre, aqua-ammonia, sulphate of zinc, and ground n, 6 oz. of chloride of ammonium and 8 oz. of glycerin ach gallon of water. Sometimes 1 oz. each of sulphate copper and nitrate of soda are added.—J. H. C.

el; [Tempering] Solutions for the Treatment of ——. K. Jamison, Philadelphia, U.S.A. Assignor to National Steel Refining Co., Wilmington, U.S.A. U.S. at. 690,963, Jan. 14, 1902.

z. each of "ground alum" and sulphate of zinc are olved in 1 gall. of water; after about 12 hours, 8 oz. lycerin, 6 oz. of chloride of ammonium, 3 oz. of "aqua-nonia," and 3 oz. of "sweet spirits of nitre," are added. metimes also 1 oz. each of sulphate of copper and nitrate soda are added. The solution is used as a tempering h, and, in order to prevent its too rapid evaporation in sufficient machine oil may be added to cover its surface. —J. H. C.

n Scrap; Method of Treating ——. M. L. Sly, Medina, New York State, U.S.A. U.S. Pat. 695,177, March 11, 1902.

obtain purified iron from scrap, a plate of old sheet or ap iron is laid flat upon the coke in a cupola furnace, a ture in equal proportions of alumina and iron oxide is osited on the plate, then a charge of fuel, and a succes-n, in the same order, of other layers to the desired height. hen the mass is melted, the charge is withdrawn in the al manner.—E. S.

e-treating Furnace. A. M. Beam and H. S. Bailey, Denver, Col., U.S.A. U.S. Pat. 689,946, Dec. 31, 1901.

E claim is for a combination of a furnace with inclosing lls, a muffle supported by the said walls, and flues sur-nding the muffle, and a combustion chamber adjacent he flues, which are led into a chimney. Swinging-door titious are placed within the muffle, so arranged as to ide it into compartments; sometimes there is a second ffle contiguous to and below the first, with swinging-door titious at its ends. In such cases there is an ore-chute m one muffle to the other at one end, and a hopper and ugh at the opposite end, with an arrangement for feeding x into the ore.—J. H. C.

rnace; Ore-roasting ——. J. P. Cappeau, Joplin, Missouri, U.S.A. U.S. Pat. 691,112, Jan. 14, 1902.

E long rectangular hearth is supported by standards so to permit of a free circulation of air beneath it. The or has an adjustable longitudinal opening or slot through ich an external carrier moves a stirring rake. This ening is controlled by a series of gates or shutters, which automatically opened and closed.—J. H. C.

nc; Process of Smelting ——. S. Davies, Iola, Kansas, U.S.A. U.S. Pat. 694,947, March 11, 1902.

WDERED zinc oxide ore, mixed with fragments, of about e size of a pea, of old retorts or the like, is placed in orts set in a furnace of the Belgian type, a pipe open at e end being previously inserted into each retort to near e bottom, the outer end of the pipe being turned down to ss through the side of the condenser, which, with the pipe, then suitably luted on. Each pipe has connection to a in pipe conveying hydrocarbon gas, which is passed in en the retorts are strongly heated. The mouth of each ndenser is partially closed with some suitable porous bstance, that may allow the gas to pass, but not the stilled zinc. The connecting gas pipes are so arranged as be readily detachable from the pipes entering the retorts, r facility in charging and discharging.—E. S.

Furnace; Brass-founder's Melting ——. A. J. and E. H. Weatherhead, Cleveland, Ohio, U.S.A. U.S. Pat. 691,213, Jan. 14, 1902.

THE furnace is built on two beams over a pit, as is usual; the cover is dome-shaped and provided with a counter-balancing arm, by means of which it can be easily rotated; it rests upon a seating-ring, which takes all the heat exposure. The grate also is peculiarly hinged or pivoted, but no claim is made on account of this.—J. H. C.

Copper-smelting Furnace. G. Mitchell, Los Angeles, Cal., U.S.A. U.S. Pat. 691,648, Jan. 21, 1902.

THE furnace is preferably water-jacketed. A rectangular air-chamber is constructed over the furnace proper, which is provided with a series of horizontal metal plates or partitions so arranged as to form a zigzag air passage. The air is supplied at the top of this chamber, and on reaching the bottom is driven through pipes, which pass down outside the furnace to the tuyères, thus becoming strongly heated in its passage. Vertically arranged metallic flues pass up through the air-chamber with its horizontal plates or partitions, and lead into a dust-chamber which is constructed above the air-chamber. The fine furnace material which settles in this dust-chamber is automatically returned to the furnace.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Chlorine with Carbon; Direct Combination of ——. W. v. Bolton. Zeits. für Elektrochem., 1902, **8**, [12], 165—170.

MANY gaseous compounds are decomposed by the action of the electric arc in closed vessels, and the behaviour of hydrocarbons in this respect is utilised in the arts. Hydrochloric acid vapour may also be dissociated up to a certain point, at which recombination takes place with explosion. Carbon tetrachloride vapour, exposed to the action of an arc 4 mm. long, playing between carbon poles with a current of 3·5 ampères at 57 volts, is also decomposed; the arc is unsteady, and its luminosity is small, and in one case the carbon points in three hours had burnt away to some extent, while a carbon deposit had formed on their edges and on the walls of the vessel, the deposit being thickest on those parts of the carbon where the temperature was highest. On opening the stopcock of the vessel, a strong smell of chlorine was observable. The arc was next passed between carbon poles in a stream of chlorine, prepared from manganese dioxide and hydrochloric acid. After six hours, with a current of 5 ampères and 43 volts, the carbons were found to have been burnt away a little, but no chlorine compound of carbon was to be discovered in the escaping gas. The laboratory vessel was therefore filled with pure dry chlorine gas, an arc was struck, the excess pressure produced by the expansion of the gas owing to the heating effect of the arc was removed by opening one of the cocks momentarily, and the arc was continued in the closed vessel, with a current of 5·5 ampères at 42 volts. After half an hour, a crystalline deposit was noticed at the lowest part of the glass vessel, and this increased, until after four hours, a crop of fine silky needles was formed. As no further increase in the crop was observable, the circuit was broken. It was found that the positive carbon had gained 0·0012 grm., in weight, while the negative carbon had lost 0·0252 grm. The crystals melted at 225° C., and contained both carbon and chlorine, and probably consisted of hexachlorbenzene (C_6Cl_6). By means of a modified apparatus, a larger crop of fern-like crystals was collected. In six hours, with a current of 6 ampères and 43 volts, 0·6 grm. of a crystalline substance with camphor-like smell, melting and boiling at 184°—186°, was obtained. Analysis and confirmatory tests showed it to be perchlorethane, C_2Cl_6, not C_6Cl_6 as found in the experiment with the smaller closed vessel. The positive carbon had after the experiment a smooth crater, whilst the surface of the negative carbon was covered with a number of symmetrical pittings of about equal size,

giving the whole the appearance of caviare. Bromine and iodine appear to act in the same way as chlorine, but the experiments with them are still in progress.—W. G. M.

Platin-iridium Anodes in the Electrolysis of Alkali Metal Chlorides; Chemical Resisting Power of ——. P. Denso. Zeits. f. Elektrochem., 1902, **8**, [10], 147—150.

Alloys containing from 7·6 to 15 per cent. of iridium were used as anodes in strong solutions of KCl (with an addition of about 2 per cent. of potassium chromate) without a diaphragm, in strong sodium chloride solutions with a diaphragm, in each case at temperatures of 20° and 80° C., and also in 20 per cent. solutions of hydrochloric acid at 80° C. The thickness of the electrodes was, in all cases, 0·007 mm., the area of anode surface exposed ranged from 0·5 to 1·2 sq. dcm., the weight of electrode from 4·8 to 9·9 grms., the current density from 10·5 to 30 ampères per sq. dcm., and the ampère hours of an experiment from 80 to 1,200, with intermediate weighings. The maximum loss of weight in any one experiment was 0·0042 grm. In all cases, the loss of weight was greatest at first, and afterwards was little or nothing; in some instances, where electrodes that had been used in one experiment were employed in a second trial, the loss in the latter experiment was *nil*. In one case in which the loss of weight in the second period of the test was greater than that in the first, the result was traced to local impurities, and the irregularity ceased after the faulty parts had been cut out. It is remarkable that, although the alloy with 7·6 per cent. of iridium is soluble in *aqua regia*, whilst that containing 15 per cent. is not, there was little difference observable in their power of chemical resistance to attack as anodes. Most of the alloys were prepared from the purest iridium, but in one case a commercial pure iridium was used, which contained slightly more Rh, Ru, Fe, and Cu, but the result was quite satisfactory. There appears to be no reason why platin-iridium should not be used economically in the industrial electrolysis of chlorides of the alkali metals.—W. G. M.

p-Toluic Acid; Electrolytic Oxidation of ——. H. Labhardt and R. Zschocke. Zeits. f. Elektrochem., 1902, **8**, [7], 93—96.

The author draws the following conclusions from his experiments: (1) In the oxidation of *p*-toluic acid, and probably in that of other organic bodies, other conditions besides those of current density and anode potential influence the result; for example, concentration of solution, presence of other substances in greater or less quantity (in this case caustic potash), and nature of anode. Probably in other instances temperature must also be taken into account. For example, bright platinum anodes caused the greatest absorption of oxygen; platinum black was less satisfactory; mercury formed mercuric oxide; copper remained bright, but yet passed into solution; iron and nickel were not attacked, but exerted an unfavourable influence on the yield. (2) It was not found possible to obtain a theoretical yield of terephthalic acid from the *p*-toluic acid. With high current density, much oxygen is absorbed at the anode, but it is largely used up in energetic oxidation. The best yield of terephthalic acid was obtained when the conditions were such that a large proportion of the oxygen escaped without action.—W. G. M.

Anode Materials; Artificial Graphite and Platin-iridium as ——. F. Foerster. Zeits. f. Elektrochem., 1902, **8**, [10], 143—147.

Graphite made by the Acheson process and supplied by the International Acheson Graphite Co. was experimented with. The material had a true sp. gr. of 2·14, and an apparent sp. gr. (excluding water from the pores) of 1·65, so that the volume of the pores was 22·9 per cent.; the percentage of ash was 0·83. Apparently the interior was completely converted into graphite. The anodes tested consisted of plates 0·7 cm. thick, and 4 × 6·5 sq. cm., cut from prismatic blocks which measured 7 × 7 sq. cm. originally. In a neutral 20 per cent. solution of sodium chloride, in the presence of chromate, at 60° C., the anodes, under the action of a current density of 0·04 ampère per sq. cm., were but little attacked, the energy absorbed in the attack on the anodes being, in two separate experiments, 6·3 and 8·4 per cent. respectively, of the total energy of the current. This is much less than in the case of amorphous carbon, and less also than in the case of French graphite. Moissan has, however, shown that the oxidising effect on the anodes varies with different specimens, and depends largely on the conversion-temperature employed in the production of the graphite. In another experiment, a current density of 0·12 ampère per sq. cm. was applied for 100 hours at 45° C., for the production of chlorate from a neutral potassium chloride solution containing chromate. With a pressure of 3·25 to 3·4 volts, the yield showed a current efficiency of 57 per cent., as against 66 per cent. with platinum anodes under like conditions. The potassium chloride was coloured grey by small particles of graphite, which were easily removed on recrystallisation. At ordinary temperatures the graphite anodes were practically unattacked in bi-normal caustic soda solution, and none of the brown oxidation products, soluble in alkali, found when amorphous carbon anodes are used, were produced. Even at 60° to 70° C., when 30 per cent. of the energy applied was used in oxidising the graphite, the electrolyte became only slightly yellowish. The graphite anodes were badly attacked when used in the electrolysis of sulphuric acid, and much disintegration was noted, the current density used being 0·04 ampère per sq. cm. The following table gives comparative numbers for the Acheson graphite and amorphous carbon (*cf.* Sprösser's experiments, Zeits. Elektrochem., **7**, 975).

Electrolyte.	Percentage of Energy used up in the Oxidation of the Anode.	
	With Graphite Anode.	With Amorphous Carbon.
Caustic soda, 8 per cent. sol. at 20° C.	2	50—78*
Pure NaCl, 20 per cent. sol. at 60° C. (containing chromate).	7·4	12—41
Sulphuric acid, 20 per cent., at 18° C.	94—96	85—97

* In exceptional cases, 14 per cent.

Hence the difference between graphite and amorphous carbon is by no means constant: the higher the hydroxyl concentration in the electrolyte, and the lower the anode potential at which oxygen appears at the anode, the more the graphite excels in its power of chemical resistance. In the electrolysis of alkali chlorides, the superiority of the graphite is greater when bleach is being prepared than in the production of chlorine. But graphite anodes are not altogether unattacked in the electrolysis of alkali chlorides, and platin-iridium anodes can now be made with so small a weight of platinum in them that they rival graphite anodes in cost.

The chief difficulties formerly met with in producing thin platin-iridium anodes were the brittleness of the alloy then obtainable, and the low conductivity of the metal.

The firm of Heræus discovered that the brittleness was due to the presence of ruthenium, and, having found a process for eliminating this impurity, produce a platin-iridium of great strength and toughness, capable of being rolled into very thin sheets. The defects due to the want of stiffness of such sheets, and to the low conductivity, are met by altering the shape of the anodes; platin-iridium wires are sealed through a glass tube closed at one end, platin-iridium strips 0·0075 mm. thick and 2 cm. wide are welded to these wires outside the tube, whilst within is a copper cable, to which the wires are attached, each by a drop of solder. Such an electrode, with a total available area of 2 sq. dm., may only require 2 grms. of a 90:10 (Pt:Ir) alloy, or about from one-fourth to one sixth of the weight required for an ordinary plate anode of the same material. Experiment has shown that such electrodes, whether as anodes or as cathodes, showed no deterioration after 2,500 ampère-hours in the production of potassium

hlorate from a neutral solution of potassium chloride ontaining chromate at 45° C., with a current density of t least 1,000 ampères per sq. m.—W. G. M.

United States Patents.

Electrode for Purifying Liquids by Electrolysis. [*Water.*] W. F. Chipman, New York. U.S. Pat. 694,933, March 4, 1902.

The electrode is composed of a combination of metallic nagnesium and aluminium from which oxyhydrates may e developed by electrolysis with one or more metals, erving as binding material, and one or more metals to arden the compound, together with a suitable flux. An lectrode which answers particularly for the purification of ater consists of 20 parts of metallic magnesium, 40 parts f aluminium, 15 parts of "Straits" tin, 10 parts of cad-ium, 5 parts of nickel, and 10 parts of ferrosilicon, ombined by a suitable flux, such as resin or borax.

—G. H. R.

Separator for Storage Battery [*Glass Wool*]. G. M. Willis, Chicago. U. S. Pat. 693,676, Feb. 18, 1902.

The separator is made of glass wool, through the fibres of which binding threads of insulating material, such as sbestos, are passed to form it into an unwoven fabric, and naintain it in the required shape. The fibres of the glass vool extend to the exterior, so as to be interposed between he binding threads and the battery plate to be separated, nd thus prevent their contact.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Nickel Steels; Magnetostriction of ——. Remarks on a recent Note by Nagoaka and Honda. F. Osmond. Comptes Rend., **134**, [10], 596—598.

Guillaume, in discussing Nagoaka and Honda's paper, emarked that their results did not accord with Dumas' heory, according to which the magnetic properties of ickel steels, "reversible" or irreversible, are simply the um of those of the nickel and iron they contain. The uthor points out that Dumas' theory does not accord with acts which he has already established. His measures of he coefficients of expansion of these steels already indicate hat; and direct determinations of the sustaining powers of a series, compared with those calculated from the figures for the iron and nickel they contain, show that reversible ickel steels, which at the ordinary temperature are above heir transformation point, and which are not affected by ysteresis, behave magnetically like mixtures of the iron nd nickel they contain; but others, which exhibit hyster-sis, and in which therefore we may conclude that the ransformations are incomplete at the ordinary temperature, ehave quite differently. It may be possible, by similar neasurements, to determine whether nickel steels contain-ug higher percentages (80 to 90) of nickel consist of mixed rystals of iron and nickel, or contain such a compound as, ay, Ni_2Fe, which a maximum in the curve of transforma-ion-points suggests.—J. T. D.

Zinc-, Iron-, and similar Plates; Process for covering ——, *with Copper or Brass by Electrolytic Means.* Popp. Ger. Pat. 122,072, Feb. 27, 1900. Through Zeits. Elektrochem, 1902, **8**, [7], 104.

In coppering a plate in the ordinary way, the surface of the plate is matt, and can only be polished when the deposit is fairly thick, or there would be danger of the film stripping from the basis-metal. In this process the plate is first coated with a thin film of copper, next with a light coat of nickel, and then with copper again. The copper or brass le posited on the nickel is thoroughly adhesive and takes a good polish even though it is very thin.—W. G. M.

Metals; Colouring of ——, *by Rieder's Electro-Chemical Process* Zeits. Elektrochem., 1902, **8**, [7], 101—102.

The object to be coloured is made the anode in an electro-yte gelatinised by means of glue or gelatin, whilst the cathode remains in a fluid electrolyte (Ger. Pat. 113,453 of 1899). Diffusion must be very slow, and the gases deposited on the anode must neither escape nor be absorbed by the electrolyte, so that they have every opportunity of combining with the anode-metal. Thus copper, as anode in gelatinised sodium carbonate and bicarbonate, becomes dark brown; in sodium acetate, clear brown; in sodium phosphate and sodium chloride, olive green; and in potassium ferrocyanide and ammonium chloride, lilac. When the metal has previously been electrolytically covered with a film of another metal, a mixed colour is obtained by Rieder's process. The current density must be moderate, and not so great that there is any perceptible evolution of gas at the anode. Various explanations of the process have been given; the most likely is that, when acetates or chlorides are not present in the electrolyte from the first, a certain amount of acetate is formed by the anode oxidation of the organic substances present, and that this acetate then reacts with the other substances present; the acetate, being prevented from diffusing out by the gelatinous character of the electrolyte, remains concentrated in the pores of the anode surface, and thus leads to the production of a thick, adhesive, and durable coloured film.—W. G. M.

English Patents.

Precious Metals; Recovery of ——, *by Electrolysis.* [*Cyanide of Potassium.*] J. F. Webb, London, J. E. Lilley, Wealdstone, and J. Chapman, Ealing. Eng. Pat. 5265, Mar. 12, 1901.

The apparatus consists of a revolving barrel or drum within which is the cathode, consisting of a metallic internal periphery connected to an external contact ring, and with or without a mercury bath. The anode, which is also mounted within, is adapted to turn with the barrel, and is connected to an external contact ring. Brushes or equivalent contact devices transmit the electric current through the cyanide solution contained in the drum, on which scoop pipes are arranged so as to automatically charge and discharge the material from it during rotation.

—G. H. R.

Metals for the Manufacture of Compound Wire Bars and the like; Electro-Deposition of ——, *and Apparatus therefor.* R. D. Sanders, Blackheath. Eng. Pat. 9011. May 1, 1901.

The depositing tank or vessel containing the electrolyte is divided by partitions into compartments in which the anodes are placed on either side of a foundation wire in the form of a coil on which the metal is to be electro-deposited, and which is suspended and rotated on an electrified shaft which is insulated from it except at the ends, or at other convenient parts. A similar compartment or support, containing or supporting anodes, is placed inside the coil, which obviates the employment of supporting frames for the wire coil as described in U.S. Patents 189,533 and 638,917. Struts or distance pieces are secured at the end of each coil, with pins at intervals, to prevent the spirals running together, or the same may be effected by forming rings at the ends of the coils. The shaft may be carried below a driving shaft by means of rings, chains, bands, or the like.

—G. H. R.

United States Patents.

Gold from Refractory Ores; Process of Recovering ——. H. R. Cassel, New York. U.S. Pat. 694,349, March 4, 1902.

The process for recovering gold from refractory ores, *e.g.*, tellurides and sulphides, consists in converting the ore to a pulp, adding a salt capable of yielding, by electrolysis, oxidising and dissolving agents, agitating the mixture, and simultaneously electrolysing it under such conditions as to oxidise the refractory elements, dissolving the gold, and reprecipitating the dissolved gold in the form of a black powder, reversing the current to detach the black powder from the electrodes, and finally adding a solvent to redissolve such black powder.—J. F. B.

Precious Metals from Refractory Ores; Apparatus for Recovering ——. H. R. Cassel, New York. U.S. Pat. 694,350, March 4, 1902.

The apparatus for the electrolytic treatment of refractory ores consists of a vessel lined with grooved carbon plates and a backing of cement between the vessel and plates. Metal conducting strips are provided in the grooves between the carbon plates, and are protected from the action of the liquid by means of cement. Inside the vessel is situated an insulated shaft, with metal stirring arms projecting radially from it. The metal stirrers are protected by a carbon covering, and this carbon forms the other electrode.

—J. F. B.

Metallurgical Process. [*Reduction in the Electrical Furnace.*] E. G. Acheson, Buffalo, New York, U.S.A. U.S. Pat. 693,482, Feb. 18, 1902.

Pulverised ore is mixed with graphite in sufficient quantity to bring about complete reduction, and treated in the electric furnace. The success of the operation depends upon the ore and graphite being well rubbed together, since the graphite acts both as conductor and reducing agent; condensing chambers are used in the reduction of a volatile metal. Graphite produced in the electric furnace is especially suitable for the process on account of its purity, electrical- and heat-conductivity, and capacity for coating the ore particles.—J. W. H.

Metals; Art of Refining Composite ——. T. Ulke, Ontario, Canada. U.S. Pat. 694,699, March 4, 1902.

The main object of this invention is to extract copper and nickel of commercial purity from nickeliferous copper material; the principle is also applicable to the treatment of copper-cobalt, copper-zinc, and cadmium-zinc. The process consists in depositing the copper from an acid solution of the material with an anode of the same material, periodically withdrawing a portion of the electrolyte as it becomes poorer in copper and richer in nickel, separating chemically the copper and nickel salts in the withdrawn electrolyte, electrolytically depositing the nickel from a non-acid bath of the nickel salt by the use of an insoluble anode, such as lead, periodically withdrawing and concentrating portions of the impoverished nickel bath, and periodically restoring to the copper and nickel baths respectively the copper and nickel salts obtained from the withdrawn solutions, so as to keep up their normal strengths.

—J. F. B.

Electric Welding; Method of ——. R. M. Hunter, Philadelphia. U.S. Pat. 690,958, Jan. 14, 1902.

Two wide, thin, flat sheets of metal can be welded together so as to form one continuous sheet by first forming at the end of one or both sheets, a large number of small independent projections or points in the line of weld transversely across the sheets; or the projections may be made on the edge of one or both plates, which are then overlapped so as to bring them into electrical contact at the points only. "A current of electricity of uniform voltage and fixed maximum current" is generated and passed simultaneously through all the projections, pressing the sheets together as the metal about the points of contact melts, whereby a large series of small fluid portions of metal are formed, and gradually increased in area, and separated by gradually decreasing areas of solid parts, until the several fluid portions just meet to form a long weld. The resistance becomes so low as the weld proceeds, that the current ceases to be sufficient in volume to continue the weld after a given extent has been made, and the current is automatically interrupted when the required maximum is reached which secures the union of the sheets and guards against the destruction of the lapped portions.—G. H. R.

Electrolytic Process [*Bath*]. J. Meurant, Liège, Belgium. U.S. Pat. 694,658, March 4, 1902.

Metals which are easily oxidised can be coated with those less oxidisable, and whose chlorides are soluble in water, such as zinc and tin, by forming an aqueous solution of the chlorides of the metals, and adding to it a compound of a metal of the alkalis containing oxygen, and adding thereto ammonium chloride and a solution containing a carbohydrate. In coating with zinc, a solution is formed of chloride of zinc, which is precipitated by the addition of a carbonate of an alkali metal, which is dissolved by means of ammonium chloride, and gelatin is added to the solution. The body to be coated is placed in the bath as cathode with a suitable anode, and an electric current is passed through it of not more than 1 volt, with a density not exceeding 1 ampère per square decimetre.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Cacao-Butter; Composition of ——. J. Klimont. Monatsh. für Chem., 1902, **23**, [1], 51—59.

Hitherto cacao-butter has been regarded as a mixture of the triglycerides of stearic, palmitic and oleic acids, with smaller proportions of those of lauric and arachidic acids. Its low melting point, however, has always been inconsistent with this view, and, in explanation of this, the lowering of the melting points in the case of metallic alloys has been suggested as a parallel. But direct experiments with mixed fats show that such lowering of the melting points does not occur. In the case of a mixture of triglycerides like tallow, the employment of acetone as a solvent affords a ready means of separating the glycerides of the solid fat acids from those of the liquid acids. On cooling the solution, there is an immediate crystallisation of tristearin and tripalmitin. Cacao-butter, when similarly dissolved in acetone, behaves quite differently, the solution remains quite clear for a long time after cooling, before a few crystals are produced.

The author has conducted a systematic examination of cacao butter by fractional crystallisation from acetone. The first fraction of crystals obtained by the spontaneous evaporation of the solvent was identified as a mixture of tristearin and tripalmitin, with melting point 64° C. and saponification number 198; no arachidic acid or its glyceride could be detected.

The second fraction obtained from the solution crystallised in beautful white plates, which had a constant melting point of 31°·4 C., iodine number 29 and saponification number 197·3—198·9. This substance, on examination, was identified as a mixed glyceride of stearic, palmitic, and oleic acids.

By evaporation of the mother liquors a third fraction was obtained, melting at 25°—27° C., saponification number 210·5—212·5, iodine number 31·7—32·6. It was not possible to identify this with certainty, but it was probably a mixed glyceride of myristic, palmitic, and oleic acids.

The author concludes that cacao butter is not, as hitherto supposed, a mixture of tristearin, tripalmitin, and triolein, but rather that tristearin and tripalmitin are only accessory, and that the fat consists substantially of a mixed glyceride of stearic, palmitic, and oleic acids, together with other mixed glycerides of fatty acids of lower molecular weight, in combination with oleic acid.—J. F. B.

Fatty Acids; Distillation of ——. F. Kassler. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [3], 48—50.

The author gives the following details of the method of distillation in use in his works. He states that in a well-managed stearin factory, widely divergent results seldom occur.

Pressed tallow and Chinese vegetable tallow were first saponified with magnesia in an autoclave without subsequent acidification of the fatty acids, whilst the fatty acids of palm oil, tallow, and bone fat were treated with 2 per cent. of sulphuric acid (66° B.) at 110° C. before distillation. In no case was more than 0·8 per cent. of neutral fat present in the fatty acids submitted to distillation

The retorts are constructed of cast-iron and have a capacity of about 1,800 kilos. They receive a charge of about 1,400 kilos., whilst subsequently in proportion as distillate passes over, fatty acid previously heated to 110° C. is allowed to flow in. The steam effecting the distillation is heated to 300° C., and reduced to a pressure of 0·3 atmosphere.

n the distillation of pressed tallow, tallow, bone fat, and etable tallow fatty acids, two fractions are obtained, of ch the first, known as the "distillate," is subjected etly to hot or cold expression; whilst the second, the tourgang," is mixed with the corresponding fraction u palm oil and again distilled.

n the case of palm oil fatty acids, the first fraction stillate) yields three smaller fractions, of which the first be mixed directly with finished stearin, whilst the ond is only subjected to hot expression, and yields a te practically non-crystalline stearin. The third part, ch possesses a marked crystalline structure, is mixed h the distillates from other crude material and subjected old and hot expression.

he "retourgang" consists of the last portions of the illate. It has a greenish colour and an unpleasant ll, and contains a considerable proportion of hydro-bons.

he average yields thus obtained by the author are wn in the subjoined table, in which the duration esents the time from the commencement of the heating the end of the distillation. The time required for ting up is about 4½ hours.

Material.	"Distillate."	"Retourgang."	Pitch.	Duration.	Quantity Distilled.
	Per Cent.	Per Cent.	Per Cent.	Hours.	Kilos.
y acids of—					
essed tallow	95·6	2·1	2·3	36	8,012
mese vegetable tallow	92·4	4·0	3·6	35	5,055
llow.....	94·6	2·8	2·8	33	7,037
ne fat	90·3	5·4	4·3	34	5,627
lm oil	91·0	5·3	3·7	32	4,898
Average.....	92·8	3·9	3·3	34	6,126

—C. A. M.

onification; Method of ——. P. Pollatschek. Chem.-Zeit., 1902, **26**, [21], 228—229.

he ordinary process of manufacturing curd soap, the er is separated by the addition of salt, the ley withdrawn, mass again boiled with water, and again treated with naller quantity of salt, and then fitted. After removal he neat soap, the residual soap is salted out and used he next saponification.

he author proposes to use caustic soda for the separa- of this residual soap, thus obtaining a ley ready for next saponification, effecting a concentration of the erin, introducing less impurities, and saving time and our.—C. A. M.

English Patents.

from Substances containing the same; Extraction f ——. E. G. Scott, London. Eng. Pat. 7802, April 16, 901.

the process claimed, the crude fat is placed in a casing n a perforated bottom, which fits into the digester where ests upon a ledge upon the bottom. Steam heat is lied and the outlet valves immediately opened, so that fat (tallow) is removed as soon as it is separated. It hen conducted over a perforated plate, through which lls in a fine state of sub-division into a clarifying vessel, re it is readily washed. The advantage claimed for process is that it effects a separation of the better first rendered, from the inferior quality subsequently rated, whilst at the same time it removes the water, ch has a deleterious effect upon the crude fat and tinous substances.

laim is also made for a special apparatus for carrying this process.—C. A. M.

p and other Substances; Machinery for Enclosing Tablets of ——, in Wrappers of Paper, Tinfoil, or other Material. Lever Bros., Ltd., and J. F. Phillips, both of heshire. Eng. Pat. 7819, April 16, 1901.

RANGEMENTS are provided for the automatic feeding of n the tablets and the wrappers in which they are to be enclosed. The two operations are effected in an intermittent manner, in such a way that, simultaneously with the feeding and gripping of a wrapper, a tablet in another position is directed to its position for being partially enclosed, whilst another tablet that has been partially wrapped is at the same time ejected and placed in a corresponding receiver, by which its position at delivery is reversed, and by the delivery of succeeding tablets, the ends of the enclosing wrapper are turned down in position for delivery.—A. S.

Soap or other Plastic Composition; Apparatus for Use in the Manufacture or Treatment of ——. A. J. Boult, London. From L. B. Lehmann, Dresden. Eng. Pat. 1430, Jan. 18, 1902.

THE apparatus claimed consists of a vertical (conical) receiver for the liquid soap, surrounded by a cooling jacket, and having a central shaft carrying a screw conveyor or worm, so arranged that there is a space between it and the shaft. Through the centre of the shaft passes a tube conveying superheated steam, which, reaching the bottom, passes upwards through a space between the tube and the boring of the shaft, and escapes through a valve at the top.

On charging this apparatus with soap solidification takes place on the exterior, whilst the part around the shaft remains fluid. The solid portion can then be expelled by means of the screw conveyor in the form of strips or bars through perforations in the base of the receiver, whilst the fluid central portion travels upwards.—C. A. M.

United States Patent.

Oleaginous Substances; Press for ——. G. W. Zoder and W. P. Hayne, Louisiana, U.S.A. U.S. Pat. 691,430, Jan. 21, 1902.

THIS is an improvement on U.S. Pat. 649,503, May 5, 1900, and has for its object the providing of means for preparing a charge for the pressing box, whilst the preceding charge is being expressed. The heated oleaginous material is fed into a measuring box, which conveys it into position beneath the open end of the charging box and over the follower of the ram. By means of the follower, the sections of the measuring box with their contents are forced up into the charging box, each section being kept in position by means of pawls. Finally, when the charging box is full, it is run under the pressing box, and the charge driven through it into the latter by means of the ram, whilst the charging box is withdrawn through a special door.

—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*B.*)—RESINS, VARNISHES.

English Patents.

Lacquers and Varnishes; Processes for the Manufacture of ——. E. Hecht, Vienna, and G. Poulenc, Paris. Eng. Pat. 4702, March 5, 1901.

THE objection to the use of Japanese wood oil (tung oil) in the manufacture of varnishes is that the heat required to dissolve copals renders the tung oil sticky. In the present patent this is obviated by using the fatty acids instead of the oil itself. A suitable proportion of the fatty acids is mixed with a drying oil, and the mixture heated to 250° C., a clear liquid being thus obtained, which mixes well with linseed and poppy-seed oils, &c., and can be diluted with turpentine.

Copals can also be readily brought into solution by mixing them in a powdered condition with the anhydrous fatty acids (say in the proportion of 25 to 50 per cent.), and heating the mixture to 280° C. The resulting varnish is diluted with turpentine to the required consistency.

—C. A. M.

Nitrocellulose Compounds for Various Useful Purposes. A. Browne, London. From J. B G. Bonnaud, Ostend, Belgium. Eng. Pat. 8063, April 19, 1901.

ACCORDING to this invention, nitrocellulose is prepared for coating or varnishing purposes by dissolving it in a suitable

solvent, *e.g.*, methylated spirit and camphor, and the film obtained on drying is rendered flexible by adding to the solution gum copal dissolved in boiling castor oil. Sugar of lead, litharge, white copperas, and a small proportion of vanillin may also be added.—J. F. B.

United States Patent.

Coating Preparation. H. A. Bentley, Glen Falls, New York, U.S.A. U.S. Pat. 690,915, Jan. 14, 1902.

This is a composition to be applied to any surface other than canvas in order to render the material suitable for being painted upon either in oil or water colours. The paper, pasteboard, or textile fabric first receives a coating composed of pyroxylin, 1 dram; amyl acetate, ½ pint; and a large teaspoonful of oil of cedar. When dry, a layer of gelatin or isinglass, dissolved in sufficient water to make it a strong jelly when cold, is painted on. The finished material is free from gloss, and can be used as above mentioned; or the composition can be applied to an engraving or picture in monochrome, the whole being treated with colours afterwards.—F. H. L.

(C.)—INDIA-RUBBER, &c.

India rubber Goods; Analysis of ——. A. Heintz.

See under XXIII., *page* 503.

English Patents.

India-rubber; Process for the Devulcanisation of ——. O. F. J. Duwez, Enghien, Belgium. Eng. Pat. 4803, March 6, 1901.

The india-rubber is heated with water containing lime (or a substance of which lime is an ingredient, *e.g.*, cement), which has previously been heated to redness and sifted, the proportion of lime depending upon the quantity of sulphur to be removed, but usually amounting to 30 to 50 per cent. The rubber is kneaded, and then boiled with the lime and sufficient water to cover both for 15 to 20 minutes. The liquid is then decanted, and the caoutchouc washed and rolled.

It is stated that, whereas ordinary lime would yield an almost insoluble sulphide in this process, lime heated to redness gives an almost completely soluble "hydrosulphate."
—C. A. M.

[*India-rubber*] *Crude Rubber; Treatment of*——. J. Thame and the South Western Rubber Co., Ltd., London. Eng. Pat. 9920, May 13, 1901.

The rubber is first soaked in a 2 to 10 per cent. solution of potassium or sodium hydroxide at a temperature of from 80° to 100° C., then sliced up and laid on grids in a closed tank. Here it is covered for 18 or 24 hours with one of the chlorides or the bisulphide of carbon, or some similar compound, next treated with water, and finally washed in a current of boiling water for several hours, till all the impurities are rinsed away, live steam being also employed if desirable. The rubber is taken out of the tank, and passed through hot rolls or pressed into blocks, and dried in a dark room at a temperature of 15° to 20° C.—F. H. L.

Gutta-percha; Substitute for ——. A. Gentzsch, Vienna. Eng. Pat. 24,590, Dec. 3, 1901.

This is a mixture of wax, resin, asphalt, tar, or pitch, with water, calcium carbonate, magnesium carbonate, calcium sulphate, magnesium hydroxide, ferric oxide, caoutchouc, and cotton-seed or mineral oil, some or all of these ingredients being mixed together in the manner specified. Eng. Pat. 15,255, 1899, this Journal, 1899, 927, is referred to.
—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patents.

Raw-Hide; Process of Manufacturing Resistible (Waterproof) Objects of ——. C. Neuhaus, Vienna. Eng. Pat. 7484, April 11, 1901.

An addition of a chromate, especially potassium biehromate, is made to the cement (mostly fish glue) used to unite the layers of hide, and the object is exposed to the action of light, with the result that the cement is rendered insoluble in water and the material waterproof.

Claim is also made for the use of the Röntgen rays to render the cement completely insoluble, especially in the case of thicker objects of raw hide in which the cement would not be readily acted upon by rays of light.
—C. A. M.

Tanning Extracts; Manufacture of ——. Max Hönig, Brünn, Austria. Eng. Pat. 21,863, Oct. 30, 1901.

Waste liquors obtained in the manufacture of sulphite pulp are treated with zinc dust and a sufficient quantity of an acid such as sulphuric acid to set free the combined sulphurous and acetic acids, the solution is stirred for one hour, lime is then precipitated by the addition of a soluble sulphate, phosphate or oxalate, and the precipitate removed by means of a filter press. The clear liquid is then concentrated in a vacuum apparatus to a density of 28° to 30° B.—J. T. W.

United States Patents.

Leaching Tan Bark; Apparatus for ——. E. F. Smith, Bradford, Penn., U.S.A. U.S. Pat. 693,748 and 693,749, Feb. 18, 1902.

The apparatus claimed comprises a series of leaching-tanks with perforated false bottoms and removable covers, with branch-pipes issuing from under the false bottoms, said branch-pipes, which are provided with shut-off plugs, leading to a main pipe connected with a heating-tank placed above the leaching-tanks. The liquor is conveyed from the leaching-tanks to the heating-tank by means of a pump provided with a return-pipe extending under the bottoms of the leaching-tanks and connecting with the suction of the pump, a branch-pipe, with shut-off plug, connecting each of the tanks with the return-pipe, a pipe leading from an overflow in each tank to the return-pipe, and a pipe leading from the discharge of the pump to the heating tank. Pumps are also provided for passing the liquor from one leaching-tank to another, the pumps discharging into vertical boxes, with shut-off plugs, connected with pipes leading to the bottoms of adjacent tanks.—A. S.

Hides; Apparatus for Colouring —— A. Rigaud. U.S. Pat. 691,075, 1900.

See under VI., *page* 475.

XV.—MANURES, Etc.

Nitrification; Studies in ——. J. G. Lipman. J. Amer. Chem. Soc., 1902, **24**, [2], 171–186.

The first series of experiments were made with the use of flower pots, watered and stirred occasionally, ammonium sulphate being added in each case. These experiments were designed to study the influence of sodium chloride, sulphur, frequent stirring and monopotassium phosphate respectively on the course of nitrification. No nitrification was set up but, on the other hand, the nitrates were reduced by denitrifying processes. The second series of experiments was conducted with 100 grms. of calcareous sand in closed flasks of 750 c.c. capacity, and infected with 1 c.c. of rich soil extract.

In Expt. I. the effect of varying the water added from 8 to 12 c.c. was studied; within these limits, the quantity of water affected the nitrification but little, practically the whole of the ammonium sulphate being oxidised. In Expt. II. increasing quantities of sodium chloride were added; there was a distinct decrease of nitrates formed as the quantities of salt were increased; the differences, however, were not great. Whilst quantities of salt up to 3,500 lb. per acre retard nitrification, they do not stop it entirely. In Expt. III. the influence of ferrous sulphate was investigated, and the results showed that this substance had but little influence on nitrification, although larger proportions seemed to retard it slightly. In the next experiment, equivalent quantities of calcium carbonate and calcium sulphate were studied side by side separately. The nitrification in presence of calcium sulphate

s fairly uniform and less than in presence of cal-
m carbonate. Lastly, nitrification was carried out in
sence of large quantities of organic matter, linseed meal
taining 4·51 per cent. of nitrogen being employed.
m these experiments it appeared that more nitrate was
duced where 1 per cent. of organic matter was present
n where only 0·5 per cent. was present. On the other
d when 3 per cent. of organic matter was used, only
ces of nitrates were found at the end of the experi-
nt.—J. F. B.

nure; Utilisation of Waste Liquors from Sulphite Cellulose Manufacture as ——. T. Knösel. Chem. Zeit., 1902, **26**, [21], 229.

E spent liquors from the manufacture of sulphite cellu-
have frequently been used, after treatment, for
nurial purposes, but they are difficult to transport, and
soil is only capable of assimilating a limited quantity.
n order to convert them into dry and not too readily
uble manure, the author concentrates them to about 25° B.,
l then mixes them with an approximately equal weight
Thomas slag-meal. There is a spontaneous evolution of
t, and in a short time a solid mass, easily distributed, is
ained. The products thus obtained are brownish-yellow
colour, have a pleasant odour, recalling vanillin, and
y dissolve slowly in water, yielding a brownish-yellow
ution.

The chemical composition differs greatly from that of
omas meal, which only contains about 75 per cent. of its
osphoric acid in a citrate-soluble form, whereas in the
v manures practically the whole of the phosphoric acid
soluble.

The following analyses show the amounts of potas-
m oxide and phosphoric acid in four of these prepara-
us. In the case of the fourth sample, a considerable
ess of slag-meal had been added, so that less phosphoric
d was in the citrate-soluble form.

——	I.	II.	III.	IV.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
al phosphoric acid (P_2O_5).	8·61	8·68	8·85	10·60
rate - soluble acid (P_2O_5).	8·45	8·45	8·40	9·10
assium oxide (K_2O) .	0·30	0·30	0·22	0·29

The alkali in the Thomas meal is neutralised by the
phurous and lignin-sulphonic acids in the sulphite
uors, so that the new manures can be used, even in
ixture, with ammoniacal manures without fear of
uring the plants.

Owing to the presence of the organic matter, the addition
turf usually made to Thomas meal is unnecessary in the
e of the new products.

The process here described is protected by the German
t. 128,213.—C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

w Syrups; Destruction of Sugar in working up ——. H. Claassen. Zeits. Vereins Deutsch. Zuckerind., 1902, **52**, [553], 104—113.

EGARDED generally, sucrose which is contained in pure or
pure solutions may be destroyed or changed into other
dies in the following manner: (1) by inversion or separa-
n into dextrose and levulose in consequence of the action
heat, of acids, or of micro-organisms; (2) by breaking
g up into other products of decomposition; or (3) by
nversion into condensation products similar to dextrin.
all probability sucrose first changes into dextrose and
vulose, and these sugars then either remain as such, form
ndensation products, or are further decomposed.

The hydrolysis of sucrose may be disregarded, the
cessary acidity being absent in normal work, a distinct
salinity to phenolphthalein being maintained in all syrups and molasses, and the high temperature and concentration of the syrups is not favourable to the activity of micro-organisms. The so-called foaming fermentation occasionally occurring in the working up of alkaline syrups which become acid through the decomposition at high temperatures of non-sugars of high molecular weight, with formation of carbon dioxide and non-volatile acids, may also be left out of account, as this decomposition with its injurious effects may arise, both in the old method of boiling to string or jelly proof and the newer process of boiling to grain.

Degener and von Lippmann have shown that dextrin-like condensation products are formed only in neutral or faintly acid solutions. Should an increase in polarisation at times occur in alkaline solutions, it is only small and quickly disappears, an indication that alkalis have here a destructive action as in the presence of invert sugar.

The only point requiring attention is, therefore, the decomposition of sucrose into products of an acid character. A decomposition of sugar without formation of acid is, as far as the author's experience goes, unknown If, therefore, on heating alkaline sugar solutions, there is no reversion of the alkalinity, no sugar has been decomposed

Although Herzfield found varying and smaller amounts, it may be taken roundly that 1 grm. of CaO destroys 4 grms. of sucrose or its equivalent of invert sugar. A loss of 0·01 of alkalinity therefore represents the destruction of 0·04 grm. of sugar as a maximum.

From an examination of the results obtained during five seasons, when the losses were calculated both from measurements of the massecuites and from alkalinity, the former showed results owing to the uncertainty of the tank measurements which gave losses evidently too high. Using the factor 4 with the alkalinity, the losses expressed in percentages of the second massecuite were 0·25, 0·23, 0·38, 0·18, and 0·17 respectively, from 1896–7 to 1901–2. In the first three seasons, the syrup was boiled to jelly or string proof in $\frac{1}{2}$ to 1 hour, and then left 5 to 8 days to crystallise. The syrup from this was reboiled and then stood 2 to 3 months. The boiling to grain occupied 20 to 30 hours and the mass was then stirred in crystallisers for 4 to 5 days.

It is evident that the loss of sugar by the latter method is distinctly less than by the former. As regards the stage at which the greatest loss of alkalinity occurs, the maximum was in the tanks. This is not surprising, as the author has previously shown that time plays an equally important part with temperature in the destruction of sugar.

In conclusion it seems clear that in working sound and alkaline syrups, the loss of sugar is very small by either method.—L. J. de W.

Carbohydrates in the Presence of Ferrous Salts; Action of Hydrogen Peroxide on ——. R. S. Morrell and J. M. Crofts.

See under XXIV., *page* 506.

Raffinose; Determination of ——. G. Reinhardt.

See under XXIII., *page* 504.

Arabinose; Derivatives of ——. G. Chavanne.

See under XXIV., *page* 506.

Heptacetylchlorlactose. A Bodart.

See under XXIV., *page* 506.

Heptacetylchlormaltose. R. Foerg.

See under XXIV., *page* 506.

English Patent.

Centrifugal Separators [Syrup from Masseeuite]; Improvements in ——. W. T. Matheeuwissen, Kraksaan, Java. Eng. Pat. 24,993, Dec. 7, 1901.

This apparatus has for its object the separation of the syrup spun from the massecuite—the first runnings—from

the washings or second runnings which are of a higher degree of purity. The outer casing of the machine is provided with a large number of stationary paddles, attached at an angle almost tangentially to the periphery of the centrifugal drum. When the crude massecuite is being spun, the centrifugal drum is revolved in one direction, so that the syrup does not penetrate between the paddles, but when the sugar is being washed, the direction of rotation is reversed, and the second runnings are projected between the paddles and are collected in a separate channel.—J. F. B.

United States Patent.

Sugar; Method of Manufacturing ——. J. H. Lavolay and G. E. Bourgoin, Paris. U.S. Pat. 693,408, Feb. 18, 1902.

See Eng. Pat. 22,767, 1900; this Journal, 1901, 489.
—J. F. B.

Clarifier, [*Sugar Juices*]. L. Litty, Donaldsonville. U.S. Pat. 694,871, March 4, 1902.

This apparatus consists of a tank divided at the middle into two compartments, with steam heating coils at the bottom. The liquid enters at one end of the tank and is deflected towards the bottom by a baffle plate; it flows over the partition at the other end of the compartment and is immediately deflected to the bottom of the second compartment, leaving this compartment at the bottom of the other end. At the entry end of the first compartment is arranged a conveyor on an endless chain, which skims the impurities from the top of the liquid and conveys them to a mud trough; at the corresponding part of the second compartment is placed a paddle wheel, which agitates the liquid and directs the flow of the scum towards the conveyor. A telescopic syphon is used for regulating the height of the liquid in the tank.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast and the Changes in the Enzyme Content during Fermentation and Storage; Connection between the Physiological Condition of ——. Delbrück. Ann. de la Brass., 5, [3], 49—55.

In view of the novel aspect imparted to fermentation by the discovery of Buchner's zymase, the author, in conjunction with Lange, Koenig, and Haymann, has repeated the researches of Hayduck, and finds that yeast juice exhibits increased activity in proportion as the yeast is richer in nitrogen. They then endeavoured to ascertain whether the life history of yeast is divisible into a period during which the organism absorbs nitrogen, and a second stage wherein it transforms this nitrogen into diastase. With this object they stored fully-developed, washed and pressed yeast for some time, examining its fermentative power from time to time by the Hayduck method, and at the same time determining the proportion of zymase present. The results showed that a diminution in fermenting power is accompanied by a decrease in the amount of zymase.

To determine whether the zymase content increases or decreases during storage, samples of bottom-fermentation yeast were kept at the following temperatures: 1·25°—2·5° C., 6·25°—7·5° C., 17·5°—18·75° C., and 27·5°—28·75° C. The results showed that, at low temperatures, the yeast remained unaltered for about 12 days, after which time the fermentative power began to diminish, though, even at the end of 36 days it was still expressed by 120° Hayduck, the original power having been 367°. At 6·25°—7·5° C. the fermenting power sank to 314 by the end of 12 days, and to 120 after 24 days. On the other hand at 17·5°—18·75° C. it declined to 220 in five days, and, by the eighth day, the yeast had become completely liquefied, the fermenting power being reduced to zero, though the cells still retained vitality. In the case of the samples stored at 27·5°—28·75° C., the fermenting power entirely disappeared in three days and the yeast had liquefied, but only one-half the cells had perished—a proof that the presence of zymase is not a certain indication of vitality in the yeast cell.

Top-fermentation yeast was found to withstand storage for a longer period at higher temperatures, though the maximum fermentative power was exhibited after keeping a week at 17·5°—23° C., the activity diminishing more rapidly at 27°·5—28°·75 C. At a storage temperature of 1°·25—2°·5 C., however, the fermenting power gradually increased from the outset (225° Hayduck) to 233° in three days, 264° after a fortnight, 320° after 38 days, and attaining a maximum (324°) after 48 days. The same applies to storage at 17°·5—18°·75 C., the maximum (320°) being reached in 25 days.

On the suggestion of Haymann that the zymase content of the yeast could probably be modified at will, during storage, by changing the conditions of temperature, experiments were made with this object, samples of yeast being kept for three days at 23·75° C.—during which time the fermenting power declined from 199° to 162°—and then cooled down to a low temperature, whereupon the fermenting power revived, and in fact rose to 256°, which value it retained for a considerable time.

The liquefaction of the yeast on the proportion of zymase being reduced, is attributed to the action of the proteolytic diastase, discovered in yeast juice by Buchner and Hahn, on the zymase, so that autodigestion proceeds within the cells. There are thus two conflicting influences at work, the one building up zymase, under the favouring action of low temperatures; the other, stimulated by warmth, facilitating the production of a proteolytic enzyme that destroys zymase.

Applying these considerations to the study of baker's yeast, it would appear that these yeasts require to be rich in peptic enzyme during the period of reproduction; but that this enzyme must afterwards be reduced in quantity in order that they may keep, without liquefaction, during transport and storage.

An important question for the brewing industry is how to develop the fermenting power of yeast to a maximum, and why does this power suddenly disappear before all the sugar present has been fermented, thus necessitating additions of fresh yeast or fermenting wort ("kräusen"). The experiments conducted by Lange demonstrate that, contrary to general opinion, the fermentative power of yeast is at its highest two hours after pitching, at a time when the process of cell reproduction is most active. Though new cells are formed later, there is no increase in the total fermentative power, all that occurs being the distribution of the ready-formed zymase throughout the mass of the yeast. The formation of zymase is favourably influenced by aëration and by the presence of sugar; in fact, by all circumstances tending to improve the vitality of the yeast. It may, therefore, be assumed that—as is the case with animal cells—when the life of the organism is prejudiced, the peptic diastases begin to attack the substance of the cells, or at least the most susceptible nitrogenous constituent, namely zymase. On this basis a new conception may be formed of the phenomena attending the stoppage of secondary fermentation, namely, that when this stage is reached, the yeast, having no longer occasion to do work, suffers a diminution in its zymase content and loses its fermentative power. This explains the beneficial action of added fermenting wort ("kräusen"), or fresh yeast, whereby the old exhausted cells are replaced by cells rich in zymase.

The proteolytic diastase may, under certain circumstances, become an exceedingly useful ally, *e.g.*, where the yeast is to be converted into substitutes for meat extract, since this enzyme dissolves the nitrogenous matters and facilitates their extraction.—C. S.

Extract; Some Causes Diminishing the Yield of ——. A. Ferubach. Ann. de la Brass., 5, [2], 25—27.

Even with a good malt, the yield of extract depends on the treatment in brewing; a malt low in diastase, for instance,

give poor results when mashed by the infusion method igh initial temperatures—though this process answers vell with English malts—whereas by infusing at a low ial temperature, saccharification will proceed normally a high yield of extract will result. The alleged eriority of the decoction method in point of extraction rue only in so far as less friable malts are in question, re being, ordinarily, but little difference between the two hods. The same also applies to the setting of the malt s so as to produce a finer grist.

'he yield is also affected by defects in the mashing cess, inasmuch as the ill-considered addition of hot liquor oo high a temperature will perhaps kill the diastase and riously affect the conversion of the starch. Even when defect has been safely avoided, there remains the blem how to separate from the grains all the extractive ter they have retained, and convey the same to the per. This greatly depends on the sparging, and, in er that the operation may be thoroughly well performed, s necessary to keep the first runnings as concentrated as sible, so that there will be sufficient room in the bopping per to hold all the spargings. With this object the ume of the principal wort should not exceed one-fourth one-third that of the total; if this limit be passed, the rt will have to be concentrated in the copper, at some siderable cost for fuel. The ideal method of working is so manage that by the time the copper is full, the wort l be of exactly the gravity desired, leaving the grains npletely exhausted. The employment of indirect steam it facilitates the attainment of this ideal, since it obviates necessity of adding hot liquor, and thus increasing the k of the wort, in order to raise the temperature. Conerable influence on the filtration of the grains is also erted by the number and arrangement of the perforations the false bottom; since, if the total working orifice of se perforations be insufficient in places, the drainage re will be imperfect, and a quantity of extract will be t behind.

In the author's opinion, the best means of ascertaining ether sparging has been properly conducted, is that opted in the brewing school at the Pasteur Institute, mely, to determine the gravity of the final spargings, en take a sample of about 20 lb. of the grains (from top bottom of the layer), place the latter in a bag, squeeze em in a hand-press, and test the gravity of the runnings. e greater the difference the more defective the sparging.

—C. S.

alactose; Separation of —— from Glucose by means of Saccharomyces Ludwigii. P. Thomas. Comptes Rend., 134, [10], 610—612.

preparing galactose by the inversion of lactose, the linary method of separating the galactose from the companying glucose gives a very poor yield. The thor prepares cultures of *Saccharomyces Ludwigii* by owing it in 400—500 c.c. of nutritive fluid in 1,500 c.c. sks, decanting off the fluid after development of the ast, and then pouring into each flask about 1,000 c.c. of e solution of inverted lactose (1,000 grms. of lactose, litres of water, 60 grms. of strong sulphuric acid; heat in toclave at 106°—107° C. for an hour; remove sulphuric id; ultimate volume of liquid about 8 litres). After ont 10 days at 25° C., fermentation is complete, and the uid is filtered, concentrated *in vacuo*, clarified by alcohol, e alcohol distilled off, and the syrup, after adding a ystal of galactose, gives a crop of nearly pure galactose, quantity about 85 per cent. of the theoretical. Repetition the process on this galactose will completely remove the tle remaining glucose; it cannot be removed by longer ntinuance of the first fermentation, for the yeast has come impoverished.—J. T. D.

English Patents.

east Cells; Process for obtaining the Contents of ——. R. B. Ransford, Upper Norwood. From L. W. Gans, Frankfort-on-the-Maine, Germany. Eng. Pat. 8722, April 27, 1901.

HE claims provide for obtaining the contents of yeast cells causing organic solvents or liquid organic compounds, which are indifferent towards the protoplasm of yeast cells, to react upon moist yeast in small quantities (5 per cent. or less of the weight of the yeast) by mixing the yeast and organic compound, stirring or kneading, and afterwards separating the liquid from the empty cells and treating it to obtain albumin and other extracts.

Further, the use of the vapours of such organic compounds as are somewhat volatile at ordinary temperatures (except ethyl ether) is claimed for a similar purpose.

—J. F. B.

Brewing, and Appliances therefor; Improvements in ——. P. Meura, Tournai, Belgium. Eng Pat. 16,032, Jan. 10, 1901.

According to this process the raw materials are pulverised in a mill, then transferred by means of a hopper into a closed converter where they are boiled and saccharified under pressure. When saccharification is complete, the whole mass is transported by means of an air pressure into a filter-press.

The special form of filter-press claimed is distinguished by the flutings of the filter-plates being wider, further apart, and deeper than those at present used, whereby the cloths are prevented from touching the bottom of the channels. The feed passage to the filter-press is of large section, and a pipe is arranged upon the end-plate of the press, provided with three branches for the admission of steam, hot water, and compressed air respectively.

—J. F. B.

Beer and the like; Method of and Apparatus for Brewing ——. A. M. Clarke. From L. Nathan, Zürich, and H. Bolze, Mannheim, Germany. Eng. Pat. 8526, April 25, 1901.

According to this process the hot wort is treated in a closed fermenting vessel, provided with a cooling jacket and a special form of stirrer, which circulates the liquid from below outwards against the walls and towards the centre downwards again at the top. During cooling the wort is saturated with filtered air admitted from the bottom. When the temperature of 7° C. has been reached, pure culture yeast is sucked in and the stirrer rotated rapidly for about two hours. The rotation of the stirrer not only circulates the liquid, but also effects a whirling motion, which causes a minute subdivision of all solid and gaseous particles, a vortex being produced at the centre. Such minute subdivision and aeration of the yeast has an essential influence on the rapid generation of a great quantity of cells. The liquid is then allowed to remain at rest for three or four hours to permit of an accumulation of fermentative power. The periods of rotation and rest are continued alternately for two or three days, beginning to stir when the cells of the former period are fully matured, and stopping the stirring when the budding aggregates are broken up. Towards the end of the fermentation, a period of twelve hours rest is allowed, in order to obtain a matured flavour, after which the stirrer is run slowly for a short time to obtain a "break." During the early stages of fermentation a slight aeration is given, after which the air supply is stopped, carbon dioxide being then injected. The beer is then drawn off, pasteurised if necessary, re-gassed, filtered, cooled to 2° C. and impregnated with carbon dioxide under pressure (see also this Journal, 1901, 919).

—J. F. B.

Beer; Manufacture of ——. L. Briant and H. C. Rigand, London. Eng. Pat. 7131, April 4, 1901.

The inventors claim the use of compressed air for simultaneously agitating, mixing and aërating the mash or wort, particularly in the conversion of raw grain.

—J. F. B.

United States Patents.

Malt Drum. F. Knüttel, Charlottenburg, Germany. U.S. Pat. 689,728. Dec. 24, 1901.

The inventor claims, in connection with pneumatic malting drums of the type invented by him (compare this Journal, 1902, 268), a provision for increasing the supply of air by

perforating the outer shell of the drum in the spaces between the ventilating pipes, whereby the cross-sections for the inlets of air are considerably enlarged.—J. F. B.

Rice; Method of Malting ——. E. C. Schrottky, Dresden. U.S. Pat. 693,569, Feb. 18, 1902.

See Eng. Pat. 9823, 1901; this Journal, 1902, 132.
—J. F. B.

Beer; Process of Converting Yeast into ——. O. Selg and C. Guntrum, Brooklyn, N.Y. U.S. Pat. 694,584, March 4, 1902.

The process here described provides for the fermentation of the wort, the removal of the yeast, and the clarification and impregnation with carbon dioxide of the beer all in the same apparatus. It consists in first adding yeast to the wort in a tub provided with an upper opening, to effect a main fermentation and a simultaneous ejection of the scum through this opening; then separating the main body of the yeast at the bottom of the liquid, leaving a residue of yeast in the tub; then closing the tub, and subjecting the liquid to after-fermentation by the residue of yeast, and simultaneously cooling the upper strata of the liquid. Whilst after-fermention is proceeding, the beer is clarified by the settling of the sediment in the yeast separator.
—J. F. B.

Beer; Apparatus for Converting Wort into ——. O. Selg and C. Guntrum, Brooklyn, N.Y. U.S. Pat. 694,585, March 4, 1902.

The apparatus claimed consists of "a fermenting tub having a sloping bottom, a communicating yeast-chamber arranged below the level of the bottom, an intervening cock, a sloping top having an opening at its apex for discharging the impurities, a cover for said opening, a gallery around said opening, and an attemperator in the upper portion of the tub." This apparatus is intended for working the process described by the inventors in U.S. Pat. 694,584 (see preceding abstract).—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Cassava. E. Leuscher. Zeits. öffentl. Chem., **8**, 10—11. Chem. Centr., 1902, **1**, [8], 493. (See also this Journal, 1901, 502.)

In the preparation of meal from cassava, a plant belonging to the Euphobiaceæ, a juice is obtained which contains hydrocyanic acid. Raw cassava paste is used in Jamaica as a healing ointment. The sweet cassava "manihotaipi" is stated to yield a milky, non-poisonous juice; from the starch which separates from the milk on standing, tapioca is prepared by heating on metal plates. A sauce named *cassareep* is prepared from the juice of poisonous cassava. The composition of cassava root, as shown by the average of six analyses, is:—Water, 70·25; starch, 21·44; nitrogenous matter, 1·12; crude fibre, 1·11; sugar, 5·13; ethereal extract, 0·41; and ash, 0·54 per cent.—A. S.

Coal Tar Dyestuffs; Poisonous and Injurious Effect of certain ——. G. W. Chlopin. Zeits. Untersuchung der Nahrungs u. Genussmittel, **5**, [6], 241—245.

Metanil Yellow has no poisonous action on dogs when taken daily in doses of 2—3 grms., nor on human beings in daily doses of 0·2 grm. It may therefore, perhaps, be regarded as practically harmless. Mandarin must be condemned as injurious. 0·2 grm. of this dyestuff are poisonous.—H. L.

English Patents.

Food Preparations (Molasses Food-stuffs); Manufacture of ——. H. Popper, Vienna. Eng. Pat. 5525, March 15, 1901.

To prepare a dry molasses food-stuff, the patentee adds to the molasses to be used, from 3 to 15 per cent. of size, before mixing with the oilcake flour, malt dust, brewers' grains, &c. The size may also be added after the molasses has been mixed with the other ingredients.—W. P. S.

Chocolate; Manufacture of ——. M. Rieck, Hamburg, Germany. Eng. Pat. 7800, April 16, 1901.

In the process claimed, the raw cocoa beans, after being shelled, are heated with "invert" sugar, and then ground up with or without the addition of cocoa-butter.
—W. P. S.

Milk, Butter, and other Substances; Process and Apparatus for Sterilising and Pasteurising ——. C. J. A. de Bock, St. Josse-ten-Noode, Belgium. Eng. Pat. 16,207, Aug. 12, 1901.

This invention consists essentially in causing the substance to be sterilised to flow by its own weight through small vessels or chambers surrounded by heating and refrigerating liquids, so that a thin layer of the substance is under treatment. The process is continuous, and the sterilising heat is gradually increased as the substance passes through the chambers. In the case of butter, the sterilised fat is afterwards conducted into a special form of churn (also claimed), where it is re-mixed with water and packed for use. Arrangements are provided for regulating the flow of material.—W. P. S.

Separators; Centrifugal [Cream] ——. C. A. Hult and O. W. Hult, Stockholm, Sweden. Eng. Pat. 312, Jan. 4, 1902.

The inset of the centrifugal apparatus consists of plates arranged in series around the axis of the drum, each series comprising a number of plates superposed in the direction of the axis, and set at an inclination to the radius of the drum, so that they have substantially the shape of a sector or a semicircle. The plates are held in their proper inclined position by their radial edges resting against partition walls, which extend from the centre of a frame placed in the drum, the outer edges of the plates resting against the wall of the drum, &c. The plates are hinged to the frame, or are pivoted to each other, so that when the inset is removed from the drum, the plates can be swung about an edge to facilitate cleansing.—R. A.

Eggs; Process for Preserving ——. C. Aufsberg, Wiesbaden, Germany. Eng. Pat. 1661, Jan. 21, 1902.

The eggs are immersed for five seconds in a solution containing 15—25 per cent. of magnesium sulphate and 0·5 per cent. of calcium sulphate, and are then placed in a cold solution of sodium silicate. The eggs may be kept in the latter solution or may be taken out and dried.
—W. P. S.

United States Patent.

Alimentary Product [Flaked Cereal]; Method of making an ——. E. W. Ayres, Washington, Columbia. U.S. Pat. 693,485, Feb. 18, 1902.

The product claimed is prepared by first cleaning and grading any cereal, such as wheat, barley, or oats. The cleaned cereal is then soaked in water for 24 hours, steamed under pressure at a temperature of 305° F., rapidly cooled, and air-dried. It is then mixed with malt extract (8—17 per cent. of its weight), pepsin (0·5 per cent.), and salt. This mixture is "flaked" by passing through hot rollers, and the moist flakes are heated to a temperature of 135°—145° F. for one hour, being at the same time subjected to a current of hot air. The flakes are then baked.
—W. P. S.

Coffee Substitutes; Process of obtaining ——. H. S. Maxim, London. U.S. Pat. 693,662, Feb. 18, 1902.

See Eng. Pat. 3129, Feb. 13, 1901; this Journal, 1902, 269.—W. P. S.

lk; Production of Dry Condensed ——. W. A. Hall, Bellows Fall, Vermont, U.S.A. U.S. Pat. 694,100, Feb. 25, 1902.

E process claimed consists in removing the cream from milk, evaporating the skimmed milk to dryness, and roughly mixing with the dry solids a quantity of cream al to the cream first removed. This mixture is then ther dried at a temperature not exceeding 100° F.
—W. P. S.

parators [Cream]; Liner for Centrifugal Liquid ——. N. W. Gales, Waterloo, Iowa, U.S.A. U.S. Pat. 694,736, March 4, 1902.

centrifugal cream separators the bowl is constructed h a removable central tube having discharge openings ding into a conical distributor. Above the distributor arranged a number of corrugated separating cones vided with suitable exit tubes.—J. W. H.

g Preserving Compound. J. M. Stukes, Texas, U.S.A. U.S. Pat. 694,899, March 4, 1902.

E compound claimed is prepared by melting 2 lb. each beeswax and paraffin wax in 1 gall. of warm cotton-d oil. This mixture is then partially cooled and receives further addition of one half-ounce of salicylic acid. The ished product is rubbed over the shells of the eggs.
—W. P. S.

uits [and Foods]; Process of Preserving ——. A. L. le Stürler, Holland. U.S. Pat. 694,301, Feb. 25, 1902.

E fruit, or other food such as meat, eggs, and the like, first treated with sulphurous acid, formic aldehyde, or ric acid, and is then closely enveloped in a wrapper, sisting of paper, cotton, or similar material, which has eviously also been impregnated with one of the above rilizing media. The wrapper is now coated with melted raffin wax or spermaceti.—W. P. S.

a Leaves; Method of Withering ——. C. U. Shepard, S. Carolina, U.S.A. U.S. Pat. 694,795, March 4, 1902.

ESH tea leaves are passed through a rotating cylinder, ing subjected at their point of entrance to a current of ghly-heated air. The leaves are moved through the linder by means of spirally-arranged flanges, which, sides imparting an onward movement to the leaves, also ck up and drop them during the rotation.—W. P. S.

imentary [Yeast] Extracts; Process of Preparing ——. E. C. L. Kressel, London. U.S. Pat. 694,102, Feb. 25, 1902.

IE process (see Eng. Pat. 15,885, 1895 (this Journal, 96, 608), and Ger. Pat. 89,819, 1896) consists in heating shed yeast in a closed vessel by steam to a temperature 180° to 200° C. After about 30 minutes' heating, the oteid matter of the yeast is converted into soluble peptones hich are filtered off and evaporated.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

English Patents.

eed-Water for Steam Boilers; Process and Apparatus for Purifying the ——. J. B. Lemaire-Destombes, Tourcoing (Nord), France. Eng. Pat. 5653, March 18, 1901.

HE feed-water is admitted into the purifying vessel above e water level, and a mixture, taken from the boiler, of eam and water containing sodium carbonate is simul-neously admitted below the water level. The feed-water, lling in a shower, is thus heated by the rising steam fore meeting water charged with the reagent, and is then oroughly agitated therewith by the steam, and having posited its impurities at the bottom of the vessel, the rified water is taken from the top and passes to the iler.—L. A.

Water Softening and Liquid Purifying Apparatus ——. R. Scott and W. Paterson, New Wandsworth, Surrey. Eng. Pat. 7170, April 4, 1901.

THIS apparatus works on the continuous-flow principle. The water, mixed with reagent solutions in suitable proportions, enters the cylindrical softening and settling tank through a central, vertical pipe, fitted internally with baffles and terminating in a cone, which, at its outlet, occupies just half the area of the tank. Thus, the water in flowing downwards through the cone, and then upwards outside the cone, is continually spread over a larger area, which decreases the rate of flow, and enables the precipitate to settle in the grooves of corrugated sloping plates which are fixed in the upper part of the tank, and fall to the bottom, whilst the nearly clear water is withdrawn from the top through an annular pipe, perforated with holes. A suitable arrangement of floats and valves automatically regulates the flow of water and reagent solutions in proper proportions.—L. A.

Refuse Matter or other Material; Furnaces and Apparatus for Burning ——. H. Heenan. Eng. Pat. 7011, 1901.

See under II., *page* 460.

United States Patents.

Liquids; Apparatus for Vaporising ——. W. G. Lyle and J. E. Stewart, New York. U.S. Pat. 694,396, March 4, 1902.

THE invention relates especially to a means of automatically maintaining the humidity of the air in a room constant, and consists of a closed vessel containing the liquid (water) to be vaporised and a movable wick, which carries the water to a sponge to feed the main wick for vaporisation. The movable wick is controlled by a hydrometer and is lifted from the sponge by electrical means when the humidity of the air reaches the maximum allowed, and is lowered again when the hydrometer indicates a minimum.—J. W. H.

Purifying Liquids (Water) by Electrolysis; Electrode for ——. W. R. Chipman. U.S. Pat. 694,933, 1902.

See under XI. A., *page* 185.

XIX.—PAPER, PASTEBOARD, Etc.

Wood-Pulp; Determination of Moisture in ——. C. Hofman.

See under XXIII., *page* 502.

Manure; Utilisation of Waste Liquors from Sulphite Cellulose Manufacture as ——. T. Knösel.

See under XV., *page* 489.

English Patents.

Paper Pulp and like Material; Apparatus for Straining ——. J. White, Edinburgh. Eng. Pat. 24,381, Nov. 30, 1901.

THE form of pulp strainer claimed is characterised by a plurality of strainer drums or elongated tubular vessels secured, within a vat or trough, to and alongside a central rocking shaft, with their axes parallel to the axis of the shaft. When two drums or flattened tubular vessels are used, they are secured one to either side of the shaft, the shells of the drums being composed of strainer plates and their ends being connected by flexible tubes to a delivery box beyond the vat.—J. F. B.

Paper, Card-Board and the Like; Method and Composition for Impregnating ——. J. Back, Vienna. Eng. Pat. 7344, April 9, 1901.

THE inventor claims a method for impregnating paper, cardboard, &c., for the purpose of increasing its stiffness, by soaking the materials with a composition consisting of a mixture of calcium hydrate, dextrin, meal, or starch and water.—J. F. B.

Celluloid-like Products; Manufacture of New ——. J. Y. Johnson, London. From Deutsch. Celluloidfabr., Plagwitz-Leipzig, Germany. Eng. Pat. 12,863, June 24, 1901.

In the manufacture of products resembling celluloid, the inventors claim to substitute for the whole or part of the camphor usually employed, "an acidyl product of secondary amines containing only aromatic radicles, such as acetyl-diphenylamine, formyl-diphenylamine, acetyl-phenyltolyl-amine, and acetyl-phenylnaphthylamine"—J. F. B.

UNITED STATES PATENTS.

Wood-Pulp; Apparatus for Separating Clean from Refuse Chips in the Manufacture of ——. T. P. Burgess, Berlin, New Hampshire. U.S. Pat. 693,684, Feb. 18, 1902.

The apparatus claimed, effects the separation of refuse chips of bark and knots from the clear chips suitable for boiling to pulp. Its operation depends on propellers which gently push a floating layer of mixed chips in a horizontal plane over the surface of a liquid and at the same time move the chips about relatively to each other and break up the layer in all directions. In this way, the heavier refuse chips are enabled to sink to the bottom, since their tendency to float, supported by the superior buoyancy of the clear chips, is destroyed by the motion.—J. F. B.

Pulp and Paper-making Machine. H. Parker, Bellows Falls, Verm. U.S. Pat. 693,896, Feb. 25, 1902.

This invention refers principally to a special form of doctor, adapted for removing the pulp picked up on the making-cylinder of a cylindrical paper making machine. The apparatus consists of a stack, connected at the top with a suction apparatus and at the bottom with a stand-pipe, which may lead to another part of the machine. A hollow snout of substantially the same width as the roll has an orifice along the edge adjacent to the roll; at the rear the snout is preferably reduced to an ordinary cylindrical pipe extending into the stack. The stand-pipe being filled with sufficient water to form a trap, the suction draws the wet web of pulp off the making-cylinder and carries it into the snout, whence it is discharged into the stack in a concentrated form (see also this Journal, 1902, 271).—J. F. B.

Paper-making Machine. T. H. Savery, Wilmington, Del. U.S. Pat. 694,427, March 4, 1902.

This invention relates to improvements in the construction of paper-making machines of the Fourdrinier type. In such machines the making wire runs round the couch roll to the breast roll at the further end and then back again underneath to the couch roll. It is customary to drive the couch roll and use the making wire as a belt to drive the breast roll, thus involving considerable wear and tear on the wire when the breast roll is very large and heavy. The 18 claims of this specification deal with means for driving both the couch roll and breast roll independently of the making wire, and for compensating the gearing of the breast roll, so that any inequalities in the speed of the two rolls do not cause any friction on the wire.—J. F. B.

Paper-Pulp; Screen Apparatus for ——. D. Sharpe, South Hadley Falls, Mass. U.S. Pat. 694,678, March 4, 1902.

The claims relate to improvements in screens for paper-pulp, providing for improved means for operating the diaphragm, which makes the suction beneath the strainer bed or screen, changing the length of the working play or stroke of the diaphragm, and varying the speed of its reciprocation.

Improvements are also claimed in the construction and arrangement of the strainer bed, and means are provided for flushing the dirt off the surface of the screen periodically; an arrangement of the conduit for taking away the strained pulp is also described.—J. F. B.

Paper-making Machine. J. W. Moore and J. A. White, Philadelphia. U.S. Pat. 694,772, March 4, 1902.

The improvements claimed in this specification relate to means for the vertical adjustment of the free end of the shake-frame in machines of the Fourdrinier type, so as to work it at different angles. The improvements are especially applicable to shake-frames provided with flexible suspension plates.—J. F. B.

Paper; Machine for Making ——. H. Parker, Bellows Falls, Verm. U.S. Pat. 693,895, Feb. 25, 1902.

In this specification the eight claims relate to an improved cylindrical type of machine for making paper or pulp for future use, in continuous webs. The interior of the making cylinder is divided into a number of radial compartments, the dividing walls being curved instead of flat; means are also provided for exhausting and introducing air from or into the compartments at different points of the revolution. The removal of water and air, and the introduction of air are effected by means of three independent sections of the central pipe.—J. F. B.

Paper-making Machine. H. Parker, Bellows Falls, Verm. U.S. Pat. 693,897, Feb. 25, 1902.

In a paper-making machine of the cylindrical type, the interior of the making cylinder is divided radially into a number of longitudinal compartments. Against the end of the cylinder a stationary plate is adjusted and pressed in position by springs, so as to cover the ends of any number of compartments, preferably four. As the cylinder emerges with the pulp picked up from the liquid, the compartments covered by the plate are subjected to the action of a suction maintained through the plate, so that the removal of the excess of moisture is materially facilitated.
—J. F. B.

Wool-Paper; Manufacture of ——. H. Zilles, Mannheim, Germany. U.S. Pat. 693,941, Feb. 25, 1902.

The claim deals with the manufacture of paper, having rough surfaces, and a mottled, woolly, appearance, by forming a pulp of fine fibrous material, dyeing relatively coarser wood fibres with a free-running colour, contrasting with the colour of the pulp, then mixing these dyed coarse wood fibres with the pulp, and transferring some of their colouring matter to the pulp, and finally converting the mixture into a paper with the coarser fibres projecting from the surfaces.—J. F. B.

Rosin Soap for Paper Size. H. F. Chappell, Chicago. U.S. Pat. 694,728, March 4, 1902.

The inventor claims a process for making a rosin soap, containing minimum proportions of uncombined rosin and soda ash, by effecting the reaction in the ordinary way and then subjecting the product to a heat above 212° F., such as is obtained by superheating it in a pan on an open fire short of scorching, stirring all the time, the resinate being obtained in a desiccated state.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Neodymium and Praseodymium; Acid and Basic Sulphates of ——. C. Matignon. Comptes Rend., **134**, [11], 657—660.

By dissolving the normal sulphates in boiling sulphuric acid, crystals are obtained on cooling of $M(SO_4H)_3$, and by heating the normal sulphates for some time at close upon 1000° C., residues are left having the formula $(MO)_2SO_4$. (M = either Nd. or Pr.) The acid sulphates form silky needles acting strongly on polarised light, very deliquescent and unstable. The basic sulphates are insoluble amorphous powders, rose-coloured (neodymium) and pale green (praseodymium) respectively.—J. T. D.

Sodium Phosphate; A New ——. H. Joulie. Comptes Rend., **134**, [10], 604—606.

By adding syrupy phosphoric acid to crystallised sodium phosphate (when the temperature falls to − 13° C.) till

ıe mixture is neutral to litmus and then concentrating ontinuously at 45°—50° C., oblique prisms are deposited of sesqui-sodium phosphate $Na_3H_3P_2O_8$. The salt has no ater of crystallisation, is not deliquescent, and is soluble in ater in almost any proportion. From the therapeutic oint of view it presents several advantages :—It is very oluble in water, and its solutions, even when concentrated, o not crystallise. It is a more active drug than the isodium salt. Its taste is not disagreeable. It could e employed hypodermically in much more concentrated olution than the disodium salt.—J. T. D.

Benzoyl - Acetyl and Diacetyl Peroxides; Formation, Decomposition, and Germicidal Action of ——. P. C. Freer and F. G. Novy. Amer. Chem. J., 1902, **27**, [3], 161—192.

A MIXTURE of benzaldehyde and refractionated acetic anhydride placed in a freezing mixture and subjected to ıe action of a current of cooled dry air, solidified in seven ours. The yield of benzylidene diacetate was almost heoretical; only traces of benzoyl acetyl peroxide and enzoic acid were formed. At 13°—14° C., under the ame conditions, the mixture remains almost unchanged. he reaction is greatly accelerated by the presence of ertain metals; with iron at the ordinary temperature, is complete in a few minutes. If the acetic anhyride is previously freed from acetic acid by standing over odium, benzylidene diacetate is not formed in appreciable uantity until after the lapse of 36 hours, even in the resence of iron. The authors conclude that the reaction one of simple addition, the catalysers effecting the rate f change of the aldehyde from the keto to the enol form.

In examining the influence of surface on the oxidation f mixtures of benzaldehyde and acetic anhydride, it is ecessary to use anhydride free from acid, in order to avoid xcessive formation of benzylidene diacetate. The amount f benzoyl acetyl peroxide produced, is determined by easuring the gas evolved on heating. The following uation empirically represents the decomposition :— $C_9H_8O_4 = 3CO_2 + CH_4 + C_{14}H_{12}O_2$. The residue is of omplex composition; it contains high-boiling hydrocarons and (probably) phenyl benzoate. A current of oroughly dried air was slowly passed through a mixture f equal parts of benzaldehyde and acetic anhydride, both ry, containing strips of pure metal. The amount of eroxide obtained was much increased by magnesium and on; with tin, platinum, and filter paper there was a naller increase. An experiment, conducted with special recautions to exclude moisture, showed that the presence f water is not essential to the formation of the peroxide. The oxidation is most simply assumed to result from the ldition of oxygen to the enol form of benzaldehyde, roducing benzoperacid, which then reacts with acetic nhydride to give benzoyl acetyl peroxide.

The best method for producing the peroxide in quantity as follows :—Strips of filter paper or muslin, hung in a rge covered glass jar, are saturated with a mixture of qual parts of benzaldehyde and acetic anhydride. The rips must not be crowded, or they may char, or even take re. A current of dry air is passed through until the lour of aldehyde has disappeared, the paper or muslin extracted by low boiling petroleum spirit, the solution ashed with a little soda solution until the washings just ecome alkaline (very little benzoic acid is produced, hence ttle benzoyl acetyl oxide was formed), the ether solution oncentrated on a bath of luke-warm water and placed in freezing mixture. An explosion may result, if the mperature of the bath exceeds 80° C. The crystals of eroxide are separated and recrystallised from the same olvent; the mother liquor yields a further quantity. The ield often reached 68 per cent. of the theoretical. When ure, the peroxide is perfectly stable; in the presence of oisture, traces of alcohol, ether, and acids, it gradually ecomposes, becomes liquid, and deposits crystals of ibenzoyl peroxide. The pure peroxide melts at 40°—41°. It is odourless and is not an oxidising agent: in thereal solution, it does not oxidise aniline until acetanilide nd benzoperacid are formed, the latter then gives zoxybenzene and benzoic acid. When benzoyl acetyl peroxide is hydrolysed by water, benzoyl peroxide is deposited and a solution is left containing acetic and benzoic acids, some benzoperacid, but chiefly acetoperacid. The solubility of benzoyl acetyl peroxide in water at 25° C. is 0·639 grm. per litre, which is equivalent to 0·0568 grm. of active oxygen per litre.

Acetyl peroxide is best prepared by covering commercial barium dioxide with water, cooling in a freezing mixture, and then adding acetic anhydride and dilute hydrochloric acid in small quantities alternately. The liquid must not be allowed to become alkaline; it is finally acidified with hydrochloric acid and the separated crystals of acetyl peroxide dried and recrystallised from petroleum spirit. On standing with water, acetyl peroxide, unlike benzoyl acetyl peroxide, gradually gives off oxygen.

Benzoyl peroxide is soluble with difficulty, is not hydrolysed, has no oxidising action, and is without effect on bacteria. Hydrogen peroxide is known to have some germicidal action. Acetyl peroxide and benzoyl-acetyl peroxide produce on hydrolysis, acetoperacid and benzoperacid respectively; these peracids are extremely active, both chemically and germicidally, their solutions containing only 0·01, or even 0·005 per cent. of active oxygen, destroy all known disease-producing bacteria within a minute, including the spores of such resistant forms as the potato bacillus. A hydrogen peroxide solution containing 0·05 per cent. of active oxygen was without action on many bacteria, even in 60 minutes, whilst a 5 per cent. solution of phenol failed to destroy the spores.

—A. C. W.

Nitro- and Amino-Acetophenone (*Hypnone*). R. Camps. Archiv, 1902, **240**, [1], 1—18.

THE author confirms the statement of A. Emmerling and C. Engler that on nitrating acetophenone, the amount of *m*-nitro compound produced decreases as the temperature of nitration increases. In a series of experiments carried out between − 15° and + 35° C., with 200 grms. of acetophenone in four 50 grm. portions, it was found that the yield of *o*-nitroacetophenone only varied within narrow limits (116 grms. at − 15° C., 114 grms. at 35° C.), but the yield of the *m*- compound is highest at − 15° C. (152 grms.) and attains a minimum at 35° C. (76 grms.). At temperatures between + 15° and + 35° C., nitrous gases are produced, and these act on the *m*-nitroacetophenone with formation of *m*-nitrobenzoylformoxime (*m*-nitroisonitrosoacetophenone).

Nitration of Acetophenone.—50 grms. of acetophenone were slowly added, with constant stirring, to 500 grms. of fuming nitric acid (sp. gr. 1·51) cooled to − 10° C., the temperature at no time being allowed to rise above − 8° C. After standing for 15 minutes, the liquid was poured in a thin stream, into four litres of ice-cold water, when the *m*-nitro-acetophenone separated as a flocculent, plastic mass. The acid mother liquor was immediately rendered alkaline by the addition of sodium carbonate, first in the solid form and then in solution, and was then exhausted with ether. From the ethereal extract, a reddish-yellow oil was obtained, consisting mainly of *o*-nitroacetophenone. The plastic mass was freed from the oily *o*-compound, and both the latter and the crude *m*-derivative purified by treatment with sodium carbonate and extraction with ether. 200 grms. of acetophenone yielded 118 grms. of *o*-nitroacetophenone (85 grms. of which were isolated from the acid mother liquor) and 147 grms. of *m*-nitroacetophenone.

m-Nitrobenzoylformoxime.—This is formed in greatest quantity at temperatures between 30° and 35° C. It can be easily separated from *o*- and *m*- nitroacetophenone by treatment with ether, in which it is only slightly soluble. From benzene it separates in aggregates of needles melting at 152° C., and exploding when heated above this point. It is only slightly soluble in alcohol, more readily in hot glacial acetic acid.

m-Aminoacetophenone. — The *m*-nitroacetophenone was reduced with tin and hydrochloric acid, 60 grms. thereof yielding 45 grms. of *m*-aminoacetophenone. The base melts at 96·5° C., distils without decomposition at 289°—290° C., and is only very slightly volatile with steam, a property which is of importance for its separation from the *o*-aminoacetophenone.

E

o-Aminoacetophenone.—o-nitroacetophenone was reduced as above, and the alkaline solution (treatment with caustic soda) distilled. The distillate (oil and water) was treated with ether, and the ethereal extract dried and evaporated. The base so obtained forms an oil boiling at 250°—252° C. under atmospheric pressure, and at 135° C. at 17 mm. o-aminoacetophenone possesses a peculiar odour, which in a diluted condition is very persistent and resembles that of jasmine flowers.

From 200 grms. of acetophenone, by the methods described, there were obtained, on the average, 145 grms. of *m*-nitroacetophenone and 120 grms. of o-nitroacetopheoone (90 per cent. purity), and from the latter 75—80 grms. of *o*-aminoacetophenone.—A. S.

Mentha Pulegium; *Proximate Analysis of Essence of* ——. L. Tétry. Bull. Soc. Chim. **27**, [6], 186—193.

The essence, fractionated under a pressure of 20 mm., yielded a considerable fraction passing below 105° C., a small portion between 105° and 110°, the main portion (or crude pulegone) at 110°—112°, and practically none boiling above this temperature.

In the crude pulegone, the presence of menthol was demonstrated, both by converting it into menthyl benzoate, which was separated and identified, and by converting the ketones into oximes and distilling, when the portion coming over between 110° and 120° was shown to be menthol, both by conversion into menthylphenylurethane, and by re-fractionating and crystallising the pure menthol. In the fractionation of the oximes, a portion coming over at about 50° was found to be acetoxime; and as a later portion of the distillate gave figures indicating a mixture of the oxime of pulegone with that of a ketone of lower molecular weight, probably β-methylcyclohexanone, the author assumes that in presence of excess of hydroxylamine, Beckner and Pleissman's "abnormal" oxime—

$$CH_3.C_5H_9O.C(NHOH).(CH_3)_2$$

is first formed, then forms an oxime—

$$CH_3.C_6H_8(NOH).C(NHOH).(CH_3)_2,$$

which breaks up into β-methylcyclohexanoxime —

$$CH_3.C_6H_2.(NOH), \text{ and acetoxime } C(NOH).(CH_3)_2.$$

Probably the "crude pulegone," in addition to pulegone and menthol (the latter estimated at 10 per cent.) contains small amounts of α or β-isopulegone.

From the portion of the essence boiling below 105° C. the author isolated menthone, identified by the properties of its semicarbazone. This portion was also found to contain a mixture of terpenes, which, however, the author was not able to isolate and identify.—J. T. D.

Lactic Fermentation; *Study of the —— by Observation of Electrical Resistance.* Lesage and Dongier. Comptes Rend., **134**, [10], 612—614.

Determinations of the specific resistance of a large number of samples of milk taken at random in the "Crémeries" of Paris (using Ostwald's apparatus and Kohlrausch's method) gave values lying between 230 and 275 ohms. (temp. 16°·7 C.) A number of milks of known origin gave values between 235 and 265 ohms., while daily observation, for four months, of the milk of a single cow, gave values between 245 and 265 ohms. The resistance of all these samples of milk gradually lessened on keeping, and coagulation set in in all of them when the specific resistance had fallen to 185—175 ohms. After coagulation the resistance is sensibly constant for a month, if the milk is kept in closed bottles, but falls, though slowly and at a decreasing rate (to 156 ohms in a fortnight) if the milk be in open vessels. If the casein be filtered off, however, the resistance of the buttermilk falls further (in closed bottles to 141, in open vessels to 93 ohms, after six days). The measurement of the specific resistance thus affords valuable information as to the progress of the fermentation. Addition of water to the fresh milk raises the resistance; with 10 per cent. addition, the increase is 15—20, with 30 per cent. 65 to 70, with 50 per cent. 73 to 100 ohms.

—J. T. D.

Alkaloids; *The Lactates of certain* ——. Ssergejew. Chem.-Zeit. Rep., 1902, 70.

The lactates of quinine, berberine, narceïne, and codeine are crystalline; chelidonine and cinchonine lactates could not be obtained in the crystalline form. Berberine lactate is soluble in 330 parts of water at 17° C., and in 143 parts of 96 per cent. alcohol at 17° C.; it melts at 187°—188° C. with decomposition. Quinine lactate melts at 100° C.; it appears to contain water of crystallisation.—A. C. W.

Corydalis Alkaloids. J. Gadamer. Archiv d. Pharm, **240**, [2], 81—113.

In continuation of a previously published communication, the author describes as comprising the corycavine group, the two alkaloids, corycavine and corycavamine. This grouping has been determined more from negative than from positive reactions. Neither alkaloid contains methoxyl or hydroxyl groups, and both react when treated with alcoholic iodine solution. The author considers that there are points of relationship between corycavine $C_{23}H_{23}NO_6$, corycavamine $C_{21}H_{21}NO_5$, protopine $C_{20}H_{19}NO_5$, and, perhaps, chelidonine $C_{20}H_{19}NO_5.H_2O$.

Corycavine.—By repeated re-crystallisation from alcohol, corycavine is obtained in colourless rhombic tables of the m.p. 215°—216° C., which do not contain any water of crystallisation. Wagner and Ziegenbein have previously found the formula to be $C_{23}H_{23}NO_6$ and not $C_{23}H_{23}NO_5$, as stated by Freund and Josephi.

Corycavamine was isolated from the amorphous basic residues from which all the crystalline bodies had been removed either as free bases or hydrochlorides, by means of its sulphocyanide compound, which is very insoluble, especially in the presence of excess of ammonium sulphocyanide. To obtain the pure base it is converted into the nitrate, which is then re-crystallised. The base is liberated from the crystals by ammonia, and twice crystallised from ether, when it is obtained in rhombic columns of m. pt. 148°—149° C. Analysis of the crystals gave figures agreeing well with the formula $C_{21}H_{21}NO_5$. The alkaloid is dextrorotatory, $[\alpha]_D^{20} = +166{\cdot}6°$. The salts of corycavamine, with the exception of the sulphate, are easily crystallisable. The hydrochloride, $C_{21}H_{21}NO_5HCl$, and hydrobromide, $C_{21}H_{21}NO_5HBr$ form fine needles; the hydriodide, $C_{21}H_{21}NO_5HI$, bulky, light yellow needles. The sulphate, $(C_{21}H_{21}NO_5)_2H_2SO_4 + 6H_2O$, forms rosettes of needles, the nitrate, $C_{21}H_{21}NO_5HNO_3$, long glittering needles. The gold and platinum double salts were prepared by direct precipitation and cannot be crystallised. The gold salt, $C_{21}H_{21}NO_5H.AuCl_4$, is a whitish yellow powder. The platinum salt, $C_{21}H_{21}NO_5H_2PtCl_6$, is an amorphous powder.

Corycavamine, heated with alcoholic iodine, adds 4 atoms of iodine.

On reduction of this body by zinc and sulphuric acid, instead of the expected hydro-corydaline iodide, there was obtained a body melting at 200° C., which probably is identical with *i*-corycavamine.

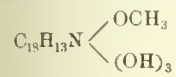
Iso-corycavamine. — By heating corycavamine with acetic anhydride and sodium acetate on the water bath, diluting with water and saturating with $NaHCO_3$, a body was obtained, which, crystallised from ether, had the m. pt. 216°—217° C., and was identified as iso-corycavamine. This substance, however, may be easily prepared by simply heating corycavamine to 180° C. for a few minutes, and recrystallising the product from alcohol. Analysis of the crystals gave figures showing $C_{21}H_{21}NO_5$ to be the formula, and it is probably a racemic combination. *i*-Corycavamine resembles cryptopine, $C_{21}H_{23}NO_5$, and as the formulæ differ by only two H atoms, it was thought that they might be identical, but further investigation, however, showed that this was not so.

Bulbocapnine Group.—In this group are the three alkaloids, bulbocapnine, corytuberine, and the hitherto unknown corydine.

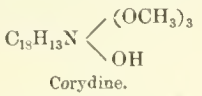
Bulbocapnine, $C_{19}H_{19}NO_4$. — Ziegenbein has previously showed that this alkaloid contains three hydroxyl groups and one methoxy group. He has tried to obtain a

thylated bulbocapnine by the action of CH_3I in alkaline ution, but only succeeded in obtaining bulbocapoine-thyl-iodide. Gadamer and Ziegenbein have also failed to ain, for the purpose of oxidation, tri-methylated bulbo-nine by the action of sodium methylate on tri-tyl bulbocapnine. By oxidation of tri-acetyl bulbocap-e, a small quantity of an acid was obtained, insufficient examination.

Corydine.—This alkaloid constitutes the principal part of amorphous alkaloid of Merck. Solutions of corydine very easily oxidised, and to prepare the pure base, the e hydrochloride must first be obtained. From this ydine may be obtained by liberation wth ammonia, and eated recrystallisation of the base from anhydrous ether, n which it separates in crystals melting at 129°—130° C. s purification is attended with great loss. Corydine stallises from alcohol in shining silky needles melting 103°—105° C., which contain water or alcohol of stallisation. The composition has not yet been exactly ermined; analysis of the base and several salts give the nula $C_{21}H_{25}NO_4$, while the analysis of the nitrate gives $H_{22}NO_4$, the latter being considered more correct on ount of its analogy to that of bulbocapnine. The base tains one hydroxyl and three methoxyl groups, and, since bocapnine contains one methoxyl and three hydroxyl ups the formulæ may be expressed thus :—



Bulbocapnine.



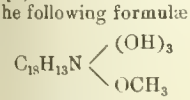
Corydine.

Both alkaloids are dextro - rotatory. Bulbocapnine $_D$ = + 237·1°; corydine $[\alpha]_D^{70}$ = + 204·35°.

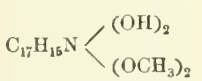
The salts of corydine are, as far as examined, free from er of crystallisation, and are easily crystallisable. The rochloride occurs in brilliant detached crystals, the ate in fine needles.

Corytuberine.—This alkaloid was discovered by Dobbie Lauder by extracting Schuchardt's crude corydaline with er. Corytuberine is insoluble in chloroform, benzene, ether, but is soluble in water.

They assigned the formula $C_{19}H_{25}NO_4$ to it. Wagner siders the formula $C_{19}H_{23}NO_4 + 5H_2O$ more accurate. ytuberine crystallises in white glittering laminæ, melting 40° C., with slight decomposition; it is dextro-rotatory $_D$ = 282·65°. It is a feeble base. The hydrochloride, $H_{23}NO_4HCl$, occurs in colourless crystals; the hydro-nide, $C_{19}H_{23}NO_4HBr$, in colourless crystals; the sul-te, $(C_{19}H_{23}NO_4)_2H_2SO_4 + 4H_2O$, in small colourless stals; the platino-chloride, $(C_{19}H_{23}NO_4HCl)_2PtCl_4 + O$, is easily reducible and cannot be crystallised; it a light yellow micro-crystalline powder. Dobbie and der have stated that the alkaloid contains two methoxyl ups, which the author confirms. On acetylation and sequent crystallisation from alcohol, greyish crystals were ined, m. pt. 72° C. Analysis of these indicated the nula $C_{19}H_{21}NO_4(C_2H_3O_2)_2 + C_2H_6O$. The base therefore tains two hydroxyl groups as well as two methoxyl ups, and its relationship to bulbocapnine may be shown he following formulæ :—



Bulbocapnine.

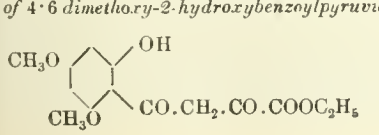


Corytuberine.

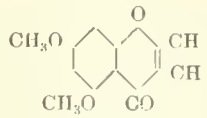
Attempts were made to methylate the base and to oxidise product by means of silver oxide and silver carbonate, without definite result.—J. O. B.

2.3-Dihydroxychromone. V. Kostanecki and J. C. de Ruijter de Wildt Ber., **35**, [4], 861—866.

Allic ether condenses with phloracetophenone dimethyl-er in the presence of metallic sodium to form the *ylester of* 4·6 *dimethoxy-2-hydroxybenzoylpyruvic acid*—



m. pt. 149° C., which may be converted into *1.3-dimethoxychromone-β-carboxylic acid*, m. pt. 244·5° C., by means of alcohol and hydrochloric acid. *1.3-dimethoxychromone*—



m. pt. 131°—132° C. is formed by heating the latter substance above its melting point. The methyl groups are removed by boiling with hydriodic acid (sp. gr. 1·9) and *1.3-dihydroxychromone*, m. pt. 273° C., is thus obtained. 1.3-Dimethoxychromone is not identical with limettin, a substance obtained by Tilden and Beck from the essential oil of *Citrus-limetta*. The view of Tilden that limettin is probably 1.3-dimethoxycumarin thereby receives confirmation.—H. L.

Lactic Acid; Two New Micrococci capable of forming ——. Hashimoto.

See under XXIV., *page* 506.

United States Patent.

Iodine Preparations; Manufacturing ——. M. Cohn, Berlin. U.S. Pat. 694,945, March 11, 1902.

An antiseptic compound of iodine, intended as a substitute for iodoform, is prepared by dissolving 100 parts of gelatin and 3 parts of potassium iodide in 1,000 parts of water, then adding $1\frac{1}{2}$ parts of iodine, as vapour or otherwise, and lastly about 1 per cent. of a hardening or solidifying agent, such as chrome alum. The mixture is dried on threads and powdered. The compound is described as odourless, but when applied in surgery, under the action of moisture, iodine is set free, and acts as iodoform under like conditions. Instead of pure water, a decoction of chamomile or lavender may be used in the preparation, and the proportions of the constituents may be varied.—E. S.

XXI.—PHOTOGRAPHY.

English Patent.

Photographic Plates and Films; Devices for Testing ——. E. S. Shepherd and C. Jones, London. Eng. Pat. 5356, March 13, 1901.

The device employed is essentially a combination of four different testers, and comprises, (1) a set of 25 sections of increasing opacity, as in the usual Chapman Jones apparatus; (2) a series of (say) four coloured patches and a strip of grey, all five having approximately the same luminosity, as in the Abney colour sensitometer; (3) a series of four pure coloured patches of such absorptions that they divide the spectrum into an equal number of separate portions; and (4) a combination of a line design with a superposed half-tone negative. Of the four pure-coloured patches, one transmits all light that ordinary plates are usually sensitive to, *viz.*, ultra-violet, violet, and blue as far as the Fraunhofer lines E or *b*; the second transmits the same *plus* the green that isochromatic plates respond to; the third passes only the red that some orthochromatic plates reproduce; and the last transmits only the red beyond line C.—F. H. L.

United States Patent.

Photographic Flash-Light Lamp. J. L. Zweck, Chicago, U.S.A. U.S. Pat. 690,508, Jan. 7, 1902.

A metal tube open at one end and closed at the other, with a hemispherical cap in which a slit is cut, telescopes into another tube bearing a lateral tube near its base, the whole fastening into a conical stand. Round the outer tube, near the point where the slit of the inner tube is, there is arranged a circular open chamber filled with absorbent material moistened with alcohol. The inner tube is loaded with the necessary quantity of the flash-light powder, and a current of air is driven through the side tube by means of a

rubber ball. The magnesium escapes into the alcohol flame, catches fire, and, owing to the slit-shaped orifice, forms a wide thin sheet of flame, which prevents the pictures being so "hard" as when taken by the aid of a smaller source of light.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENT.

Matches, of every Description, ignitable on any Surface. A New Process for Manufacturing Non-Poisonous Mixtures for ——. A. Purgotti and L. Purgotti, Perugia. Eng. Pat. 1074, Jan. 15, 1902.

THE composition of the dipping paste is given as:—Special amorphous phosphorus (50 parts), zinc oxide (120 parts), sulphur (30 parts), pulverised glass (120 parts), potassium chlorate (40 parts), gelatin (40 parts), glue (10 parts), water (250 parts). The special amorphous phosphorus is prepared by dissolving sulphate of copper (1 kilo.) in water (2·5 litres), and boiling phosphorus (1 kilo.) in this solution for two hours. A "phosphuret powder" is thus obtained non-hygroscopic and non-poisonous.—G. W. McD.

UNITED STATES PATENTS.

Gunpowder. F. W. Jones, Barwick, England. U.S. Pats. 693,547 and 693,548, Feb. 18, 1902.

SEE Eng. Pat. 15,553, 1898; this Journal, 1899, 858. —G. W. McD.

Powder-granulating Machine. M. P. Wilkins and H. C. Aspinwall, New Jersey, U.S.A. U.S. Pat. 695,129, March 11, 1902.

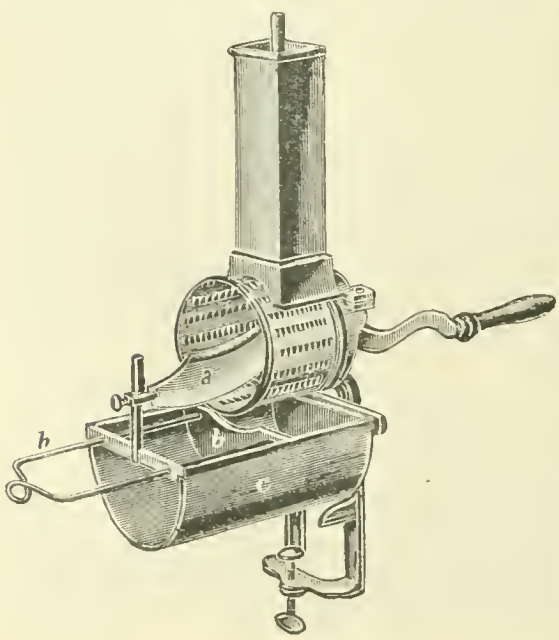
THE claim is for a powder-granulating machine with a cutting-wheel having its knives set transversely, a pair of discs, spaced apart, with transverse knives, guides for directing rods or cords to the knives and feeding rollers. Drawings are given.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, &c.

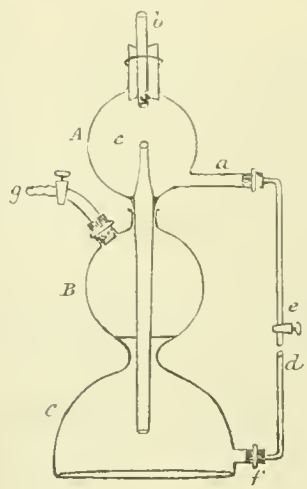
Ice Mill; An ——. C. Schwalbe. Chem. Centr., 1902, **1**, [9], 509.

IN preparing freezing mixtures and in cooling liquids, such as diazo solution, it is advantageous to use ice in a fine state of division. By means of the mill shown in the accompanying diagram, it is possible to rapidly convert ice into the form of powder. The pieces of ice are fed into the top chamber and are pressed against the perforated drum by means of a wooden stamp. The edges of the perforations are bent upwards, so that on rotating the drum, thin layers of ice are shaved off, and fall into the interior of the drum in the form of powder. The scraper, *a*, causes the ice powder to fall into the receiver, *c*, from which any desired quantity can be removed by the movable plate, *b*. The drum is made of thin iron plate, and becomes cooled through almost instantaneously, so that the ice powder is obtained in a dry condition. It is stated that 1 kilo. of ice can be easily reduced to powder in 5—7 minutes. The mill can easily be taken to pieces for cleaning and drying.—A. S.



Kipp's Apparatus; Modification of ——. C. Arnold. Chem.-Zeit., 1902, **26**, [21], 229—230.

THE apparatus shown in the figure is a slightly-altered form of a modification devised by Thiele (Chem.-Zeit., 1901, **25**, 468). The upper receptacle, A, has the glass tube, *c*, fused into its lowest part, and this passes into the receptacle, C, though not to the bottom. The acid saturated with salts can be drawn off by disconnecting the tube *d* from *e*, and turning it with its opening downwards. The tube, *c*, is considerably narrower than in the old Kipp's apparatus, whilst the neck between the bottom and centre vessel is so narrow that not more than a space of 0·5 cm. is left.



The side tubulure of B is 5·5 to 6 cm. in diameter, to allow large fragments of iron sulphide, &c., to be introduced. A piece of india-rubber or lead, with a hole in the centre to receive the tube, C, can also be introduced into B, and on this is placed a layer of coarse pumice stone. The capacity of the bulbs is 3·5 to 4 litres.

The author states he has used this apparatus for months without recharging, for the evolution of hydrogen sulphide the tube, *b*, being connected with a long tube passing through the roof.—C. A. M.

Litmus-Silk; Notes on ——. F. Emich. Monatsh. für Chem., 1902, **23**, [1], 76—80.

THE author contributes further information with regard to the litmus-silk which he has devised for microchemical reactions (see this Journal, 1901, 1142). The blue litmus silk, prepared by means of alkalis, has the drawback that the alkali is easily washed out during the test. The author finds that a more satisfactory blue silk, in this respect, is obtained by immersing the dyed silk in a solution of lead acetate. Silk thus blued by lead oxide is rather less sensitive than that blued by alkalis; it is not suitable for the microchemical detection of weak acids which give insoluble lead salts. Silk thus prepared contains 3·8 per cent. of litmus colouring matter and 18·6 per cent. of lead oxide.

The lead oxide litmus-silk, or lead oxide silk without the litmus, is eminently suitable for the microchemical detection of soluble sulphides, $\frac{1}{10000}$ mgrm. of sodium sulphide being readily detected.

The author has employed litmus-silk for the detection of the acid produced by the oxidation of sulphur by the a

hen exposed at the ordinary temperature. The principle f observing colour reactions under the microscope by xing them on fibres is capable of extended application; or instance, sulphide of iron can be distinguished by its reenish tint from the sulphides of nickel and cobalt.

—J. F. B.

INORGANIC—QUALITATIVE.

Platinum Metals; Detection of the ——, by the Action of Sodium Peroxide. Leidié and Quinnessen Bull. Soc. Chim., **27**, [6], 179—183.

A SCHEME of distinction (and partial separation) of the latinum metals from one another. The metal, either recipitated, or as extremely fine filings, is mixed with ve or six times its weight of sodium peroxide, and heated ently in a nickel basin or crucible over a small flame. When pasty, the mass is well stirred; the heat is continued ll the whole is semi-fluid, and then the whole allowed to ool. The vessel is placed in a larger basin, covered with funnel, and water (10 to 12 times the weight of the eroxide used) added. After reaction, the whole is trans-erred to a tall narrow vessel, allowed to settle, the clear quid decanted, and the residue washed with water and ltered.

Osmium is converted into sodium osmate, which forms a ellow solution; on warming and passing a current of alorine through, osmic peroxide volatilises, and can be ollected in iced water in an appropriate recipient, and ecognised by the formation of potassium osmate when otassium nitrite or alcohol and potassium chloride are dded.

Ruthenium forms sodium perruthenate, which reacts with ne water to form an orange solution of rutheoate. If the olution be treated with chlorine as above, ruthenium per-xide comes over, and can be recognised by the reduction ruthenium by alcohol and potassium chloride.

Palladium yields a yellow solution of sodium palladate. o palladium compound distils with chlorine, but if the emaining solution be neutralised with hydrochloric acid, nd carefully evaporated with potassium chloride and a little itric acid, ruby-red crystals of potassium chloropalladate eposit, insoluble in saturated solution of potassium chloride.

Iridium dissolves as "basic sodium iridate," $IrO_3.4Na_2O$, rming a blue solution. This solution, treated like the alladium solution, gives black crystals of potassium hloroiridate.

Platinum forms sodium platinate, which remains on the lter with the oxide of nickel. The whole is dissolved in ot concentrated hydrochloric acid, filtered, most of the xcess of acid boiled off, sodium nitrite added to neutrality, ien sodium carbonate; the solution is boiled and filtered. he filtrate is treated with excess of hydrochloric acid, and vaporated to dryness; the residue, taken up with water, ields the characteristic chloroplatinate precipitate with mmonium chloride.

Rhodium also remains on the filter as dioxide and esquioxide. The former dissolves in hydrochloric acid; nd on submitting the solution to the treatment just escribed, shows itself by the rose-colour of the solution f $6NaCl.Rh_2Cl_6$, when the excess of sodium carbonate is eutralised by hydrochloric acid.—J. T. D.

Nitric and Nitrous Acids; The Brucine Reaction for ——. G. Lunge. Zeits. angew. Chem., **15**, [11], 241—242.

EXPERIMENTS were made on the effect of adding brucine o a number of solutions containing equal quantities of itrous acid (as pure silver nitrite), but varying quantities f sulphuric acid, and an exactly parallel series with quivalent amounts of nitric acid (as pure potassium itrate) in place of the nitrous acid. Solutions of nitrous cid, containing not too much sulphuric acid, gave the rucine reaction; those containing much sulphuric acid nd in which, therefore, the nitrous acid is converted into itrosylsulphuric acid) did not. With nitric acid solutions, n the contrary, the reaction is only given in presence of a onsiderable excess of sulphuric acid. The author conse-uently withdraws his statement (this Journal, 1902, 190) hat brucine does not react with nitrous acid.—J. T. D.

INORGANIC—QUANTITATIVE.

Hydrochloric and Hydrocyanic Acids; The Quantitative Separation of ——. T. W. Richards and S. K. Singer. Amer. Chem. J., 1902, **27**, [3], 205—209.

THE dissociation constant of hydrochloric acid is about 9,000 times greater than that of hydrocyanic acid in deci-normal solutions (Walker and Cormack, J. Chem. Soc., 1900, 5). It was, therefore, probable that all the hydro-cyanic acid could be expelled by evaporating a dilute solution of both acids. Richards and Mallinckrodt have found that a decinormal solution of hydrochloric acid loses only an inappreciable quantity of acid in its vapour. In the experiments described below, the solutions were kept at this concentration by the frequent addition of water. An ordinary retort of 500 c.c. capacity, with the neck directed upwards at an angle of 45°, was finally adopted for the evaporations, though other vessels gave fairly satisfactory results. From solutions of pure hydrocyanic acid, every trace of acid was expelled by boiling for two hours. Commer-cial potassium cyanide was boiled with sulphuric acid, and the chlorine precipitated by silver nitrate; after boiling for two hours, the amount of precipitate was constant. When potassium chloride was added to the cyanide, it was neces-sary to boil for 8—9 hours before all the hydrocyanic acid was expelled.—A. C. W.

Iodine in presence of Bromine or Chlorine; Quantitative Estimation of ——, by Electrolysis. E. Müller. Ber., **35**, [4], 950—954.

IODIDES may be quantitatively converted into iodates by electrolysis in alkaline solution (concentration of alkali, $\frac{1}{10}$—$\frac{1}{100}$ normal), in the presence of bromides of normal concentration, or of chlorides in saturated solution, without the production of hypobromite or bromate in the one case, or of hypochlorite or chlorate in the other. The following conditions should be observed:—

(1) A small amount of soluble chromate (1—2 centigrms. of potassium chromate) should be present to prevent reduc-tion of iodate to iodide. The necessary correction for this is made in the final titration with thiosulphate.

(2) The pressure of the current used should be about 1·6 volts; this suffices to convert the iodide to iodate, but no periodate is formed, despite the alkalinity of the solution.

(3) The anode should consist of a smooth plate of platinum of about 14 sq. cm. area, platinised according to the method of Lummer and Kurlbaum, for half a minute, with a current of 1 ampère. This anode loses its sensi-tiveness by use, and after each experiment should be replaced by a new one, or rendered active again by employing it as a cathode in dilute sulphuric acid for two minutes, with a current of 1 ampère.

(1) The cathode, to ensure the greatest possible pressure, should be made of a smooth platinum wire, 10 cm. long and $\frac{1}{2}$ mm. thick, wound into a coil.

Experiments were made with the following solutions:—No. 1, potassium chromate (1 c.c. = 10·6 c.c. of N/100 thiosulphate. No. 2, N KOH No. 3, KI (1 c.c. = 9·13 c.c. of N/10 silver nitrate), and gave results as under:—

Estimation of Iodine alone.—A liquid made by mixing 2 c.c. of No. 1, 1 c.c. of No. 2, 10 c.c. of No. 3, and 90 c.c. of water, was electrolysed for 20 hours with 1·6—1·61 volts, and then made acid with dilute sulphuric acid, and potassium iodide added. This required 54·85 c.c. of N/10 thiosulphate (corrected for chromate present), which corresponds to 0·11594 grm. iodine, instead of 0·1158 grm. taken.

A second similar experiment showed 0·11632 grm. iodine.

Estimation of Iodine in presence of Chlorine.—A mixture of 2 c.c. of No. 1, 1 c.c. of No. 2, 1 c.c. of No. 3, and 100 c.c. of solution of NaCl (saturated) was electrolysed for 20 hours with 1·59—1·60 volts. The titration was carried out as in previous experiments. Amount of iodine taken = 0·01158 grm.; found (*a*) 0·01163 grm.; (*b*) 0·01167 grm.

Estimation of Iodine in presence of Bromine.—A mix-ture of 2 c.c. of No. 1, 1 c.c. of No. 2, 1 c.c. of No 3 + 100 c.c. of N potassium bromide solution was electrolysed for 22 hours with 1·60—1·61 volts.

Result: Amount of iodine taken = 0·01158 grm.; found (*a*) 0·001158 grm.; (*b*) 0·01170 grm.

All reagents should be tested whether they liberate iodine from a mixture of potassium iodide and sulphuric acid, as the caustic alkalis do this sometimes. The anode must be completely immersed in the liquid to avoid loss of iodine, and the electrolysis continued for two hours after a test with starch and potassium iodide fails to give a blue coloration. Alkaline earths interfere with the reaction, and should be removed previously.—R. L. J.

Chromates and Manganates; Analysis of ——. W. Herz. Ber., **35**, [4], 949.

The author recommends the use of hydrazine sulphate (commercial) as more expeditious and satisfactory for the estimation of chromates and manganates than the reagents usually employed.

0·1533 grm. of potassium bichromate was dissolved in about 10 c.c. of water, solid hydrazine sulphate was added in excess, and the mixture gently warmed. Reduction was complete in a few minutes, and, on addition of ammonia, 0·0796 grm. of Cr_2O_3 was precipitated. This represents 35·55 per cent. of Cr, as against the theoretical number 35·4. In a similar manner 0·3009 grm. of potassium permanganate gave, when finally precipitated with carbonate, 0·1460 grm. of Mn_3O_4, which represents 34·95 per cent. of Mn instead of the theoretical percentage 34·8.—R. L. J.

Sodium Thiosulphate, Sulphite, and Sulphide; Determination of ——. Dupré, jun., and W. Korn. Zeits. angew. Chem., 1902, **15**, [10], 225—226.

The determination of the amounts of these three salts in a solution containing them all, is carried out as follows:—(1) By running the liquid into N/10 iodine solution acidified with hydrochloric acid, the number of c.c. (*a*) required for the three salts is found. (2) In a further portion of the liquid, the sodium sulphide is precipitated by means of cadmium carbonate, and the filtered liquid divided into two parts. In one of these, the number of c.c. (*b*) of N/10 iodine solution corresponding with the amount of sodium sulphite and thiosulphate is determined by the Finkener-Volhard method, whilst in the other the thiosulphate is determined as follows: the sulphite is completely decomposed by boiling the liquid for about half an hour with acetic acid and a quantity of sodium acetate equal to 3 mols. of the salt for each mol. of the acid; the last traces of the sulphite are destroyed by the addition of a small quantity of potassium chlorate, and the liquid then titrated with N/10 iodine solution, (*c*, c.c.). Then the numbers of c.c. of the decinormal iodine corresponding with each of the salts present are: sulphide, *a*—*b*; sulphite, *b*—c; and thiosulphate, c.—T. H. P.

Potassium Ferrocyanide in Spent Gas-Purification Material; Determination of ——. O. Bernheimer and F. Schiff. Chem.-Zeit., 1902, **26**, [21], 227—228.

Knublauch's method (this Journal, 1889, 732) is the one most commonly employed, but, according to the author, it does not always yield uniform results, since, in the titration with copper sulphate, potassium copper ferrocyanide is formed in addition to copper ferrocyanide. The author has made attempts to calculate the amount of potassium ferrocyanide ($K_4Fe(CN)_6 + 3H_2O$) from the total quantity of iron contained in the precipitated and purified Prussian blue. The latter was dissolved in Knublauch's alkaline solution, which was made up to definite volume, and aliquot parts taken for the titration by Knublauch's method and for the determination of the iron left on ignition. The results obtained with five samples of spent gas-purification material were as follows:—

	By Knublauch's Method.	Calculated from the Yield of Iron.
	Per Cent.	Per Cent.
I.	11·74	12·45
II.	11·49	13·72
III.	5·03	6·99
IV.	12·39	14·06
V.	12·94	13·87

These determinations show that the results calculated from the percentage of iron are invariably higher than those given by Knublauch's method.

Similar determinations were made of the amount of nitrogen in the reprecipitated Prussian blue. The amounts of nitrogen found by Kjeldahl's method in pure potassium ferrocyanide, and in the Prussian blue obtained from it, were 20·01 and 20·1 per cent., as against the theoretical quantity 19·90 per cent.

The amounts of potassium ferrocyanide, calculated from the proportion of nitrogen in the Prussian blue precipitated from the spent gas material and purified by re-precipitation, were:—Sample II., 13·76; III., 6·73; and IV., 13·96 per cent.

This agreement with the results obtained by the determination of the iron appeared inconclusive to the author, since slight differences in the determination of the nitrogen would not be a criterion of the purity of Prussian blue, which has so high a molecular weight: and also because similar compounds containing about the same proportion of nitrogen might be present.

Further experiments were therefore made to determine whether the spent gas-purification material contained any other compounds, in addition to potassium ferrocyanide, that could be precipitated with iron salts.

In one of the samples of spent material it was found that other iron-containing compounds were absent. This liquid, on titration by Knublauch's method, gave 12·39 per cent. of potassium ferrocyanide, as against 12·20 per cent. calculated from the amount of iron present. On the other hand, a determination of the iron in the corresponding precipitate of Prussian blue gave 14·06 per cent. of potassium ferrocyanide—a result which seemed to point to Knublauch's titration method being correct.

In order to determine whether iron-free compounds precipitable by iron salts were present, the twice precipitated Prussian blue, prepared from the same sample of spent material, was treated with potassium hydroxide solution, the iron determined both in the precipitate and in the solution, and each result calculated into potassium ferrocyanide in accordance with the equation—

$$Fe_7(CN)_{18} + 12KOH = 3K_4Fe(CN)_6 + 2Fe_2(OH)_6$$

The amount of potassium ferrocyanide calculated from the iron in the filtrate was 12·14 per cent., whilst the result calculated from the iron in the precipitate was 15·64 per cent.

This showed that the precipitation of other compounds than potassium ferrocyanide was the cause of the higher results obtained by the determination of the amount of iron, but the nature of these was not determined.

There appeared to be no doubt, however, that in the determination by Knublauch's method, certain compounds which are precipitated by the iron chloride are not precipitated by the copper in the titration. Thus another sample of spent material was found to contain 11·27 per cent. of potassium ferrocyanide by Knublauch's method and 11·85 per cent. by the iron method. After the titration in the former method, the liquid was filtered, and the filtrate treated with iron chloride and hydrochloric acid, and concentrated on the water-bath. This caused the precipitation of a blue compound, which, on treatment with alkali, yielded potassium ferrocyanide. The amount of iron in this precipitate corresponded with 0·7 per cent. of potassium ferrocyanide, and this amount, added to the result obtained by the titration, gave 11·57 per cent., which was in close agreement with the 11·85 per cent. obtained by the other method (this Journal, 1901, 225).

—C. A. M.

Sodium Methylarsenite; Alkalimetric Titration of ——. A. Astruc. Comptes Rend., **134**, [11], 660—661.

This substance (arrhénal), $CH_3 . AsO(ONa)_2$, can be titrated by means of N/10 or N/20 sodium hydroxide, if litmus, or still better, rosolic acid, be used as indicator. Under these circumstances, 1 molecule of the substance corresponds to 1 molecule of the alkali. Phenolphthalein or methyl-orange cannot be used.—J. T. D.

Gold and Silver; Detection and Determination of Small Quantities of ——. L. Wagoner. Chem.-Zeit. Rep., 1902, 68.

The process, which is adapted to the determination of very small quantities of gold and silver in minerals, sea water, &c., consists in using very pure lead without fluxes, the blowpipe method, and extraction by cyanide. The pure lead is obtained by electrolysis of lead acetate solution, rejecting the first portions, which are richer in silver. The author has found that all the usual fluxes, except boric acid, increase the proportion of silver; even chemically pure soda was found to contain 3 grms. of silver per ton. The bead of metal is measured under a microscope, magnifying to 40—60 diameters, with an etched scale in the eye-piece. The bead is held in a bent watch spring. Readings may be made to 0·01 m.m.; the bead is not spherical; one scale division (0·02 m.m.) = 0·00007598 grm. Au or 0·00004213 grm. Ag. The bone-ash cupel must be examined with a lens for stray particles. The addition of lead should not be more than 8—10 mgrms. The bead of gold and silver is first measured as silver, the operation of parting then takes place on a fragment of white porcelain. The bead is brought by a needle into a drop of water, touched by a needle point wetted with sodium amalgam if it is too small for observation, nitric acid then added and warmed until the silver is dissolved. The gold is fused to a bead with 2—3 mgrms. of lead and measured.—A. C. W.

Mercury Ores (Dalmatian), and their Chemical Examination. C. Ehrmann and J. Slaus-Kantschieder. Chem.-Zeit., **26**, [19], 201—202.

Four samples of ore examined by the authors, yielded the following results :—

	Metallic Mercury. Per Cent.
Sample 1, Spizza	1·448
„ 2 „	4·560
„ 3 „	1·490
„ 4 Nehaj	2·599

A complete chemical examination of samples 1 and 4, gave the following results :—

——	Sample 1 (Spizza).	Sample 4 (Nehaj).
	Per Cent.	Per Cent.
Moisture	0·410	0·635
CO_2	..	
SiO_2	1·016	0·532
S	5·726	0·415
SO_3	28·923	32·451
BaO	55·314	62·011
CaO	Traces	1·121
MgO	„	Traces
Al_2O_3	1·157 ($Al_2O_3 + Fe_2O_3$)	0·259
Fe	4·622	..
Mn	Traces	..
Zn	0·639	..
Cu	0·046	..
Pb	0·950	Traces
Hg	1·448	2·599
Ag	Traces	Traces
As	„	..
Sn	0·047	..

Sample 4 (from Nehaj) is a slightly impure heavy spar (94·4 per cent. $BaSO_4$) interspersed with cinnabar (3 per cent. HgS). The complete analysis of the ores was carried out by the usual analytical methods.

Eschka's test for mercury did not give good results and neither the usual fluxes of PbO, iron powder, or ZnO nor Janda's mixture of MnO_2 and soda gave satisfactorily agreeing numbers. The mercury was determined by the authors by an abbreviated wet method which can be carried out in a comparatively short time. According to this method the ore is heated with dilute nitric acid till the sulphides are as completely decomposed as possible, three times the volume of concentrated hydrochloric acid is then added, and the whole gently warmed till the residue is no longer dark in colour and the smell of chlorine has completely disappeared. After cooling and filtering, the solution is precipitated by H_2S and again filtered through asbestos in a Gooch porcelain crucible. The contents of the crucible are then treated with a small quantity of bromo-hydrochloric acid and well washed with water. After expelling the excess of bromine by a gentle stream of CO_2, the heavy metals are again precipitated with H_2S. The H_2S precipitate is then filtered through asbestos in a weighed ignited Gooch porcelain crucible and washed with hot water till free from chlorine. Any sulphides of the arsenic group are removed by repeated digestion with hot yellow ammonium sulphide, filtered off, washed with water, and the contents of the filter treated with 1:3 nitric acid to remove PbS and CuS. After removing the nitric acid with water, the contents of the crucible are finally treated several times with a concentrated solution of sodium sulphite to remove any sulphur present, well washed with hot water, the HgS dried at 100° C., and weighed till the weight is constant. Where large quantities of lead are present, it is preferable to treat the precipitate with a concentrated solution of ammonium acetate prior to the final washing, to remove any lead sulphate which may perhaps have been formed. Though apparently complicated, it is stated that an estimation may be carried out by this method in a few hours.—H. F. C. G.

Thallium; Volumetric Determination of ——. V. Thomas. Comptes Rend., **134**, [11], 655—657.

The thallium solution is completely converted into thallic salt by heating with hydrochloric acid and potassium chlorate. After complete conversion, ebullition is continued till the excess of chlorine is completely removed. To the diluted thallic solution, excess of decinormal sodium thiosulphate solution is added, then excess of potassium iodide (free from iodate) and a little starch, and decinormal iodine solution is run in till the blue colour is struck. When the thallium solution is dilute, any vessel may be used for the titration; but with strong solutions, it is best to use a stoppered flask, so that the liquid can be well shaken after adding the potassium iodide. When this is done the thallous iodide readily collects at the bottom of the vessel, and the blue coloration is more readily and certainly seen. The author gives figures showing the applicability of the method to large and small quantities of thallium in concentrated and weak solutions.

—J. T. D.

Copper; Analysis of Industrial ——. P. Truchot. Ann. Chim. anal appl., **7**, 1—5 and 58—61. Chem. Centr., 1902, **1**, [9], 543; [12], 735—736.

Ten grms. of the sample are dissolved in a mixture of 50 c.c. of nitric acid (36° Bé.) and 10 c.c. of sulphuric acid (53° Bé.), with the addition of water, any sulphur present is oxidised by bromine, a further 5 c.c. of sulphuric acid added, and the solution evaporated till most of the sulphuric acid is expelled. The residue is treated with dilute sulphuric acid, filtered from insoluble matter (SnO_2, Sb_2O_3, $PbSO_4$, &c.), and the filter washed with water acidulated with sulphuric acid. The residue is digested for two hours with 25 c.c. of a saturated solution of ammonium acetate, filtered, and the filter washed with water containing ammonium acetate. The filtrate is mixed with 40—50 c.c. of nitric acid (36° Bé.), diluted to 300 c.c., and the lead separated electrolytically as PbO_2 by a current of 0·2 ampère and 2·50 volts, with an anode surface of 80 sq. cm.

To the main filtrate obtained in the first part of the process, 10—15 c.c. of nitric acid are added, and the copper separated electrolytically with a current of 0·4—0·5 ampère and 2·50 volts; a correction must be made for the amount of silver present. The solution, after separation of the copper, is evaporated on the sand-bath to expel the sulphuric acid, the residue dissolved in hydrochloric acid, sulphuretted hydrogen passed in, and the solution filtered. The filtrate is boiled to expel sulphuretted hydrogen, oxidised with bromine, and the iron precipitated twice as basic acetate, and finally as oxide by ammonia. The filtrate from the iron is evaporated with hydrochloric acid to expel acetic acid, neutralised with sodium carbonate, then faintly acidified with acetic acid and zinc, nickel and cobalt precipitated as sulphides. In the filtrate, the manganese is precipitated as phosphate, and then titrated in

neutral solution with permanganate. The precipitated sulphides are dissolved in hydrochloric acid, and to the hot solution caustic soda is added, whereby cobalt and nickel are precipitated as oxides. In the alkaline filtrate, the zinc is determined electrolytically.

Arsenic and antimony are determined by Hollard's method (this Journal, 1900, 563), using 5 grms. of material. For the determination of selenium and tellurium, which are frequently present in copper from the Western United States, the author recommends Keller's method (this Journal, 1895, 303). In this method any phosphorus present is oxidised to phosphoric acid, and passes into the filtrate from the sulphide precipitate. The solution is boiled to expel hydrogen sulphide, and the phosphoric acid precipitated first as ferric phosphate and finally by molybdic acid. For the determination of gold, 50—100 grms. of the copper are dissolved in nitric acid quite free from chlorine, the solution filtered, and the filter carefully incinerated, and the gold determined in the usual manner by the dry method. In the filtrate the silver is precipitated as silver chloride, and the latter treated by the usual dry process. The following table gives results of the analysis of four samples of commercial copper products: I. "Black copper" from Boléo; II., "bluestone" from Boléo; III. and IV., electrolytic sludge from Butte city (Keller):—

—	I.	II.	III.	IV.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Copper	92·960	61·4200	11·010	13·820
Sulphur	1·003	22·9000	SO_4 5·268	10·680
Iron	4·687	13·5900	..	0·800
Manganese	0·084	0·9940	..	..
Cobalt	0·738	0·3640	..	..
Nickel	0·197	0·1060	..	..
Zinc	0·223	0·2140	..	..
Lead	0·116	0·0225	0·916	2·070
Antimony	0·012	0·0021	0·250	2·440
Arsenic	0·009	..	2·107	1·090
Tellurium	0·000	0·0000	1·174	0·892
Selenium	0·000	0·0000	0·394	0·718
Phosphorus	0·186	0·0199	..	..
Silver	0·0146	0·4063	53·894	55·150
Gold	0·0000	0·0000	0·2959	0·198

—A. S.

Copper; Electrolytic Determination of ——. — Willame. Bull. Assoc. Belge des Chim., **15**, [11—12], 414—415.

In cases where it is necessary to guarantee the percentage of copper to the second place of decimals, the amount of substance taken for the test must be sufficient to preclude tenths of a milligram exercising any influence on this second decimal place in the weighing. The author therefore recommends increasing the amount of substance from 0·5—1 grm. to about 10 grms., in which event about 99·67 per cent. of the copper will be deposited at the cathode. He employs a weak current, and effects the electrolysis of copper sulphate in presence of 20 c.c. of HNO_3 (1 20) in a total volume of 200 c.c. The operation is complete in 48 hours. The spiral anode and conical cathode are placed about 15 mm. apart.—C. S.

Molybdenum Steel; Volumetric Determination of ——. F. T. Kopp. J. Amer. Chem. Soc., 1902, **24**, [2], 186—188.

Half a grm. of the sample is dissolved in a large platinum crucible with 2 c.c. of sulphuric acid (sp. gr. 1·58) and 12 c.c. of water. When the sample is completely dissolved, the water is evaporated and 30 grms. of fused potassium bisulphate are added. The mixture is carefully fused, cooled and dissolved in 500 c.c. of hot water; after digesting at the boiling point until the solution is clear, 100 c.c. of ammonia are added and the liquid is made up to a litre. After mixing, the precipitate is removed by passing through a dry filter, 500 c.c. of the filtrate are taken, 40 c.c. of sulphuric acid are added and the solution reduced by passing through a column of zinc (Jones' reductor). The reduced molybdenum in the solution, after the addition of 10 c.c. of sulphuric acid, is then titrated with permanganate. A "blank" experiment is made with a solution containing 450 c.c. of water, 50 c.c. of ammonia, and 40 c.c. of sulphuric acid, in order to correct the errors caused by the impurities in the zinc.

Tungsten Steel.—When tungsten is present, 1 grm. of the sample is weighed into a small beaker and dissolved in 25 c.c. of dilute nitric acid (sp. gr. 1·20), 10 c.c. of hydrochloric acid being subsequently added; the solution is evaporated to dryness, baked to separate the silica and redissolved in 15 c.c. of strong hydrochloric acid which will separate the tungsten as trioxide. The solution is diluted to 100 c.c. filtered through a dry filter, 50 c.c. of the filtrate are taken and evaporated with 10 c.c. of sulphuric acid and fused with potassium bisulphate as described above.

Ferromolybdenum.—The process is similar to that described for molybdenum steel with the exception that 0·5 grm. of the sample is first dissolved in 15 c.c. of strong nitric acid before evaporating with sulphuric acid, no water being added with this latter.—J. F. B.

Wood-Pulp; Determination of Moisture in ——. C. Hofmann. Papier-Zeit., 1902, **27**, [23], 817—816.

The author points out that in Germany there is as yet no standard procedure for the determination of the moisture in consignments of wood-pulp. So far as the actual determination of the moisture in the sample is concerned, no difficulty exists, since apparatus such as those of Schopper and Knöffler enable this to be done with ease and accuracy.

Some misapprehension seems to exist as to the calculation of the air-dry weight from the dry weight, some German text-books stating the air-dry moisture allowed as 12 *on* the hundred instead of 12 *in* the hundred. By applying the formula: Air-dry weight $= \frac{\text{Dry-weight}}{0{\cdot}88}$, no ambiguity can occur.

The only difficulty attending the determination of the moisture in wood-pulp lies in the correct sampling of the bulk. The British Associations have already recognised the necessity of establishing a standard method of sampling. The author considers that the proportion of 2 per cent. of the bales generally taken for sampling is not sufficient if the pulp has been stored for a long time, and yet the labour involved in opening a larger number would be too great. He would prefer to cut samples with a knife, if possible from all the bales. It is true that only the upper and lower parts of the bales would thus be accessible, but he thinks that a correct average would be obtained, since the lower side of the bale naturally contains more moisture than the upper side. A form of analytical report similar to that in use in this country would meet with the author's approval.—J. F. B.

Hydrogen Peroxide; Behaviour of Chromic Acid towards ——. A. Bach. Ber., **35**, [4], 872—877.

By an investigation of the action of chromic acid, the author throws some light on the action of oxidising agents generally on hydrogen peroxide. On the one hand, pure chromic acid, acting on hydrogen peroxide, free from acid, produces a dark brown colour, which disappears gradually with evolution of oxygen. Quantitative examination shows that the oxygen given off is exactly that due to the hydrogen peroxide used, and that the chromic acid is reproduced. It is, therefore, capable of decomposing an indefinite quantity of hydrogen peroxide. On the other hand, in presence of sulphuric acid, the author has shown that the following equation exactly represents the reaction in respect of the ratio of chromic acid to hydrogen peroxide, and also of oxygen set free—

$$4CrO_3 + 8H_2O_2 + 6H_2SO_4 = 2Cr_2(SO_4)_3 + 14H_2O + 7O_2.$$

Traube's hypothesis as to the action of hydrogen peroxide with oxidising agents, *viz.*, that the hydrogen is oxidised by the oxidising agent, and the total oxygen of the hydrogen peroxide is then given off, does not hold here, since the chromic acid is not reduced, and only half of the

ydrogen peroxide oxygen is disengaged in absence of cids, and, in presence of acids, the reaction should go, ccording to Traube's view, thus—

$$2CrO_3 + 3H_2O_2 + 3H_2SO_4 = Cr_2(SO_4)_3 + 3O_2 + 6H_2O;$$

ut it does not, there being less chromic acid consumed nd less oxygen liberated than this equation requires.

Berthelot's hypothesis that hydrogen trioxide is formed s an unstable intermediate compound also does not agree ell with this reaction, since only six of the eight hydrogen eroxide molecules could act in this way, while the other wo would be decomposed in some other way.

The author puts forward the theory that a higher stage f oxidation occurs in the added element and not in the ydrogen peroxide. In some cases (U, V, Ti, Mo, W, Nb, a) this intermediate product is stable; in others (Cr) it is nstable, but its presence is shown by its colour, and in thers (Ag, Hg, Pt, Pb, &c.) the intermediate product does ot show itself at all.—A. M.

Hypoiodous Acid. R. L. Taylor. Proc. Chem. Soc., 18, [249], 72.

r has been concluded by Orton and Blackman (this ournal 1900, 564), that "the solutions obtained from odine and mercuric oxide contain only a small quantity f hypoiodite, and that the iodine is chiefly present as odate." This is contrary to the results described by the uthor in a former paper (*Mem. Manchester Phil. Soc.*, 897, **41**, 8), where he used aqueous iodine (1 part in 000) and obtained 80 to 90 per cent. of the possible mount of hypoiodite. He has made further experiments nd finds that the proportion of iodine existing in the ltrate as hypoiodous acid increases with the fineness of ivision of the iodine, and diminishes as the proportion f iodine to the water employed increases and with the ime occupied in shaking and filtering. Using powdered odine, about 2 parts to 1000 of water, and occupying (as Orton and Blackman did) 15 minutes in shaking and 10 inutes in filtering, the author obtains results not very ifferent from theirs; but using *precipitated* iodine with he same proportion of water and taking only a little over minute in shaking and filtering, the filtered liquid con- ains 44 to 52 per cent. of the possible amount of iodine as ypoiodous acid, and of the total iodine in the filtered quid, 90 to 95 per cent. exists as hypoiodous acid and nly 5 to 10 per cent. as iodic acid. The solution of ypoiodous acid decomposes very rapidly, beginning to urn brown, owing to the liberation of iodine, almost nmediately after filtering, unless a very dilute solution of odine has been employed. Consequently it is impossible o obtain good results unless all the operations are per- ormed very quickly. The filtered liquid always contains a ttle mercury. The author has estimated this, and finds hat although the hypoiodite in the filtrate may exist partly s mercuric hypoiodite, there is so little mercury present hat a considerable proportion of the iodine must exist as ypoiodous acid.

ORGANIC—QUALITATIVE.

Berberine, Occurrence and Detection of, in Plants. H. M. Gordin. Archiv der Pharm., **240**, [2], 146—149.

Five to 20 grms. of the powdered substance are extracted ith hot alcohol, and the solvent evaporated off on the ater-bath. 20 to 40 c.c. of water are added to the residue nd a little talc, and the mixture filtered. 2 or 3 c.c. of the ltrate are mixed with a little 10 per cent. potassium odide solution; if no precipitate fall, berberine is not resent in appreciable quantity, but if a precipitate be btained, the following method is followed. 10 c.c. of the ltrate are mixed with 1 or 2 c.c. of 10 per cent. NaOH olution, and, if turbid, filtered. The filtrate is warmed o about 50° C., mixed with 5 c.c. of acetone, and set side. If a considerable quantity of berberine is present, ood crystals of berberine-acetone form in 15—20 inutes.

Should no crystals form in two hours, 30 c.c. of water re added, and the mixture left over night; if no crystals have formed by the morning, the 10 c.c. of filtrate taken contain less than 0·01 grm. of berberine.

When the potassium iodide solution gives a precipitate and no crystals are obtained with acetone and NaOH, the plant contains only a trifling quantity of berberine. In this case 10 or 20 c.c. of the filtrate are mixed with excess of 20 per cent. potassium iodide solution, the precipitate is collected on a filter, and washed by means of a suction-pump with water containing potassium iodide and finally with water. The filtrate is collected in a test tube or very small flask, concentrated to about 2 c.c. and a few drops of NaOH solution and 1 c.c. of acetone added. After some hours the liquid is diluted with twice its bulk of water, and left over night. If 0·001 grm. of berberine be present, good crystals of berberine acetone will be deposited by the morning.

Berberine has been detected in *Berberis vulgaris, B. aquifolia, Hydrastis canadenis, Xanthorhiza aquifolia,* and *Coptis trifolia.* It has not been found in *Cocculus palmatus, Pariera brava* (*Chondrodendron tomentosum?*) *Menispermum canadense* or *Jeffersonia diphylla.*

—J. O. B.

ORGANIC—QUANTITATIVE.

Phosphoric Acid in Organic Substances; Determination of ——. F. Rieger. Zeits. physiolog. Chem., **34**, 109; Zeits. angew. Chem., 1902, **15**, [10], 227—228.

In order to obviate the difficulties of obtaining a white, absolutely carbon-free ash from organic substances, more especially milk, the author recommends the following three methods:—(1.) 50 c.c. of the milk are evaporated to dryness in a platinum basin with calcined sodium carbonate. The residue is then heated until carbonised, covered with a layer of one part of anhydrous sodium carbonate and two parts of potassium nitrate, and heated for a quarter of an hour over a triple burner, being stirred meanwhile with a glass rod or platinum wire. After cooling, the white pasty mass is dissolved in dilute nitric acid, and when the silica has been separated, the phosphoric acid can be precipitated in the usual way with molybdate solution. (2.) The milk may be treated with copper sulphate and caustic soda to precipitate the albuminoids, the whole of the phosphoric acid passing into the precipitate. The latter is then heated as in (1), and the ash used for the determination of the phosphoric acid. (3.) 50 c.c. of the milk or urine, mixed with 5 c.c. of concentrated nitric acid, are evaporated to about 20 c.c. in a Kjeldahl's flask by means of a small flame. 20 c.c. of concentrated nitric acid are then added, and the liquid heated until brown fumes cease to be evolved. After cooling, the solution is mixed with 20 c.c. of concentrated sulphuric acid, and the black liquid thus obtained heated, with gradual addition of 25 grms. of ammonium nitrate, until it becomes colourless. After being allowed to cool, the liquid is first made alkaline, and then strongly acidified with nitric acid. The insoluble portion is then removed by filtration, and the phosphoric acid precipitated with molybdate solution.—T. H. P.

India-Rubber Goods; Analysis of ——. A. Heintz. Chem.-Zeit., 1902, **26**, [23], 247—248.

The amount of rubber present in rubber goods is usually determined by difference after the other constituents have been separately estimated. The author considers that the desired result may be obtained more rapidly, and on the whole with greater accuracy, by direct combustion (after removal of organic admixtures), and calculation from the amount of water obtained on the basis of the formula $(C_{10}H_{16})_x$ for rubber. A weighed quantity of the material should be extracted with solvents, such as ether, nitrobenzene, and alcoholic soda to remove unsaponifiable oil, asphaltum, or fatty compounds, should qualitative examination have indicated their presence. The residue is washed, dried, and burnt in the combustion tube. If weighed when dry, an aliquot part only need be burnt, the sulphur of vulcanisation, in either case, being held back by suitable means.

Despite the varied origin of rubber, all washed and purified samples have an average composition of $(C_{10}H_{16})_x$. Washed rubber, as prepared for commercial manufacture

(especially shoe-making), constantly shows 97 per cent. of this chemical substance, and this correction is recommended for technical use.

Two samples were examined by estimating the inorganic constituents, the sulphur and the organic components (other than rubber), and were found to contain, by difference, 21·63 per cent. and 19·38 per cent. of rubber. When analysed by combustion, after treatment with solvents as described, the amount of rubber indicated was 20·84 and 19·21 per cent. respectively, these values being corrected on the basis of 97 per cent. purity of the commercial rubber employed. Two other samples gave in a similar manner 75·11 per cent., as against 76·75 per cent. obtained by indirect estimation, and 49·65 instead of 49·30 per cent. The latter contained only inorganic admixtures.—R. L. J.

Raffinose; Determination of ——. G. Reinhardt. Zeits. Vereins Deutsch. Zuckerind., 1902, **52**, [553], 114—116.

Animal charcoal washed with hydrochloric acid to prepare it for clarifying purposes lowers the reading of an inverted solution of sugar by its absorbent action. If, however, a mixture of sucrose and raffinose be inverted, the clarified solution reads further to the left than the unclarified solution, when the proportion of raffinose is higher than 2·5 per cent. The calculation of the percentage from the raffinose formula of Herzfeld gives too much or too little raffinose according as the amount present is below or above 2·5 per cent. The amount of char used to obtain these results is 3 grms. of prepared char per 100 c.c. of half-normal inverted solution.

The increase of the levo-rotation is attributed to a strong absorption of the dextro-rotatory melibiose, which along with levulose is formed on inverting raffinose.—L. J. de W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Distribution of a Base between Two Acids; Method of Determining the Ratio of ——. H. M. Dawson and F. E. Grant. Proc. Chem. Soc., **18**, [249], 68.

The method consists in shaking up an aqueous solution containing two acids and a base (the latter being insufficient for saturation of the acids) with a second liquid which is but slightly miscible with water, and which is capable of extracting one, and one only, of the four substances present in the solution. Tartaric, malic, succinic, and citric acids are not extracted from their aqueous solutions by chloroform, but considerable quantities of acetic acid are.

Determinations of the ratio of distribution of acetic acid between water and chloroform at 20° have been carried out, and show that this ratio increases very considerably with the dilution. By means of a diagram on which the acetic acid concentrations are plotted as abscissæ, and the distribution coefficients as ordinates, the concentration of the acid in water corresponding to any given concentration in chloroform can be readily ascertained. The influence of the presence of the salts and the second acid on the distribution ratio of the acetic acid has been investigated and found to be small.

On shaking up an aqueous solution containing soda and acetic and tartaric acids with chloroform and determining the concentration of the acetic acid in the latter, then, from the diagram, the concentration of the free acetic acid in the aqueous solution can be ascertained. If the original concentrations of the base and the two acids are known, the concentrations of the free tartaric acid and of the two salts can be calculated.

The aqueous solutions were prepared in such a manner that, after shaking up with an equal volume of chloroform, the base and the two acids were present in as nearly as possible equivalent quantities, the excess of acetic acid required in the original solution being determined from the preliminary distribution experiments.

Several series of experiments have been carried out in which acetic acid is compared with the several acids above mentioned, three or four concentrations being investigated in each case, and the ratios determined for the distribution of the base between acetic and each of these acids.

This method of determining the ratio of distribution of a base between two acids can also be employed where the second liquid takes up two of the components, for example, the two acids from the aqueous solution, but the ratios of distribution of the two acids between water and the second liquid must differ considerably from one another at any given concentration.

Methane; New Syntheses of ——. P. Sabatier and J. B. Senderens. Comptes Rend., **134**, [9], 514—516.

The authors have applied the reducing action of recently-reduced nickel to the synthesis of methane from a mixture of hydrogen with either carbon monoxide or carbon dioxide.

In the case of carbon monoxide, the reaction sets in at 190° C., and reaches its maximum speed at 250° C. At this temperature a mixture of 3 volumes of hydrogen and 1 volume of carbon monoxide is completely converted into methane (1 volume) and water. Excess of carbon monoxide retards the reaction. The nickel is not affected, and can be used over again several times.

In the case of carbon dioxide, the initial temperature of reaction is about 230° C., and the most favourable temperature is above 300° C. With 2 vols. of hydrogen to 1 vol. of carbon dioxide, practically the whole of the hydrogen, and with more than 4 vols. of hydrogen to 1 vol. of carbon dioxide, the whole of the carbon dioxide, is converted into methane.—J. T. D.

Silicon Hydride; Preparation and Properties of a New ——. H. Moissan and S. Smiles. Comptes Rend., **134**, [10], 569—575.

Magnesium and silicon, heated together in a stream of hydrogen, yield a magnesium silicide of somewhat variable composition, which, when treated with hydrochloric acid, gives a mixture of hydrogen with other gases. When this gaseous mixture is cooled by liquid air, it deposits a white solid; and this substance, when its temperature is allowed to rise slowly to the ordinary temperature, gives off a gas, which the authors have not yet examined, and leaves behind a liquid, boiling at 52° C., and melting (after refreezing) at −138° C. This liquid inflames spontaneously in air, and has the formula Si_2H_6; is, in fact, the silicon ethane.—J. T. D.

Calcium Silicide. H. Moissan and W. Dilthey. Comptes Rend., **134**, [9], 503—507.

When excess of lime is heated with silicon in the electric furnace, the silicon is completely oxidised and converted into calcium silicate; but if the silicon be in excess, calcium silicide, $CaSi_2$, is formed, according to the equation $2CaO + 5Si = 2CaSi_2 + SiO_2$. It appears as a mass of small greyish crystals, of density about 2·5, insoluble in alcohol, ether, benzene, turpentine, or liquid ammonia. It is rapidly and violently attacked by fluorine, and by chlorine at a red heat; but air or oxygen, even at a red heat, has but little action on it. Water decomposes it very slowly, with evolution of hydrogen (difference from calcium carbide); and hydrochloric acid, which attacks it rapidly, yields also hydrogen, and produces no hydride of silicon.—J. T. D.

Mercuric Iodide in Solution; The Nature of ——. J. H. Kastle and J. V. Reed. Amer. Chem. J., 1902, **27**, [3], 209—218.

Solutions of mercuric iodide in organic solvents are yellow, and the yellow modification separates on crystallisation. If the solution be kept in contact with the separated yellow crystals, the latter turn to red; there is no equilibrium possible. From supersaturated solutions of mercuric iodide in melted naphthalene, the yellow form is separated on the introduction of a few yellow crystals, powdered glass, or other substances in coarse powder; the red crystals do not produce crystallisation. The yellow iodide, which crystallises from various solvents, differs greatly in stability; the more viscous the solvent, the slower is the change to the red variety. Light accelerates the transformation. Yellow crystals obtained from vaselin have remained under the vaselin almost unchanged for 18 months.—A. C. W.

Tellurium Tetrachloride. V. Lehner. J. Amer. Chem Soc., 1902, **24**, [2], 188—190.

When an excess of sulphur chloride is brought in contact with metallic tellurium at the ordinary temperature, the tellurium is rapidly attacked, with evolution of heat, and white needle-like crystals of tellurium tetrachloride separate out. The reaction may be represented as follows :—

$$Te + 2S_2Cl_2 = TeCl_4 + 4S.$$

The sulphur remains in solution in the excess of sulphur chloride, which is decanted off, and the crystals are washed with carbon bisulphide. Tellurium tetrachloride is permanent in dry air, but is decomposed in moist air with formation of the oxychloride. Excess of water gives tellurous acid. When tellurium is heated in a current of sulphur chloride vapour, the black dichloride is first produced, the tetrachloride being subsequently formed.—J. F. B.

Zinc Oxide; Action of Hydrogen Peroxide on ——. De Forcrand. Comptes Rend., **134**, [10], 601—604.

By the action of hydrogen peroxide on moist zinc oxide (or hydroxide), the two being kept in contact for 12 hours with constant agitation, a compound was obtained of the formula $Zn_4O_7.6\frac{1}{2}H_2O$, which gradually loses water to the limit $Zn_4O_7.4H_2O$. Increase in the proportion of hydrogen peroxide or in the time of contact makes no change in the state of oxidation of the product; but if the dried substance be freshly treated with hydrogen peroxide, an unstable compound containing oxygen very little short of the formula ZnO_2 is formed. If the last compound be kept for some months in a desiccator at the ordinary temperature, or if the compound Zn_4O_7 be heated to 100° C., an oxide, Zn_3O_5, with $2H_2O$ or $3H_2O$, is obtained. As these three compounds always contain at least as many molecules of water as of atoms of oxygen in excess of ZnO, the author thinks it possible that they are really compounds of ZnO or $Zn(OH)_2$ with H_2O_2.—J. T. D.

Ferric Oxide; Crystallisation of ——. A. Ditte. Comptes Rend., **134**, [9], 509—512.

When a mixture of crystallised ferrous sulphate and common salt is heated to redness, the ferric oxide formed is found partly in the condition of minute crystals. These crystals do not arise from the solution of the oxide in fused common salt, for (1) not nearly the whole of the ferric oxide produced is so crystallised, and increasing the proportion of common salt present has no perceptible effect on the amount of crystallised oxide formed; and (2) previously formed ferric oxide heated with common salt is not dissolved. Nor does the addition of ferric or ferrous chloride or of sodium sulphate to the common salt in the last experiment increase the solubility of the oxide. As, moreover, the crystals are not produced when the ferrous sulphate is completely dehydrated and the common salt very thoroughly dried before the mixture is made and heated, the presence of water seems necessary to their formation, and the author assumes that they are produced by the reaction, at the high temperature, of water vapour on the vapour of ferric chloride, the latter produced by the reaction of hydrochloric acid (formed from sulphuric acid and salt) on some of the ferric oxide. Obviously, the production of the sulphuric acid just mentioned implies the presence of water in the mixture. The addition, to the mixture of salt and ferrous sulphate, of a little potassium fluoride increases the amount and the brilliance of the crystals formed. The sulphates of nickel, cobalt, manganese, or aluminium, substituted for that of iron, give no crystals of their respective oxides; in all of them, the temperature of decomposition of the salt is far above that of its complete dehydration.

The oxidation of pyrites, and the heating of the ferrous sulphate thus formed with common salt, may explain, in some instances at least, the occurrence of crystallised ferric oxide in the crust of the earth.—J. T. D.

Manganese and Cobalt Chlorides; Compounds of Alcohol with ——. F. Bourion. Comptes Rend., **134**, [9], 555—557.

By evaporating solutions of these salts in alcohol, the compounds $MnCl_2.3C_2H_6O$ (rose-coloured crystals, rapidly losing alcohol *in vacuo* or in air) and $2CoCl_2.5C_2H_6O$ (blue needles, extremely deliquescent) are obtained. Nickel chloride is practically insoluble in alcohol.—J. T. D.

Glucophosphoric Acid; Preliminary Communication on ——. P. A. Levene. J. Amer. Chem. Soc., 1902, **24**, [2], 190—191.

The author has examined a substance first obtained by Palladin from various seeds. He has prepared a copper salt having the following composition:—Carbon, 16.95 per cent.; hydrogen, 2·85; nitrogen, 2·41; phosphorus pentoxide, 24·10; cupric oxide, 35·66; and ash, 57·67 per cent.

The acid occurs in nature in the form of its calcium magnesium salt, which is precipitated by alkalis and by sodium acetate, and is soluble in dilute acid. A comparatively dilute solution of it in acetic acid gives a precipitate with Witte's peptone. On hydrolysis with mineral acids, orthophosphoric acid is produced; no glycerin or fatty acids are formed. With phenylhydrazine the products of hydrolysis yieided a crystalline deposit resembling a glucosazone.—J. F. B.

Trinitroxylenol; The Symmetrical ——. J. J. Blanksma. Rec. trav. chim. Pays-Bas, **20**, 422—424. Chem. Centr., 1902, **1**, [7], 419.

By the action of nitric acid on Knövenagel's symmetrical xylenol, symmetrical trinitroxylenol, $C_6(OH)(CH_3)_2(NO_3)_3$ [$OH_1 : (CH_3)_2 : (NO_3)_3$, 1.3.5.2.4.6], is produced. It crystallises from dilute nitric acid in colourless needles, which melt at 104° C. Symmetrical trinitroxylenol resembles picric acid in many of its properties, but, unlike the latter, is not attacked by potassium cyanide, apparently because it contains no hydrogen atoms in the ring between the nitro groups.—A. S.

Protein Bodies; Sulphur in ——. T. B. Osborne. J. Amer. Chem. Soc., 1902, **24**, [2], 140—167.

The author communicates the results of estimations of sulphur in several of the better-known proteins. In most cases a large number of different preparations were analysed, and the mean of the most reliable numbers was taken; in a few cases, however, the results were very variable, owing to the ill-defined character of the proteins.

The *total sulphur* was determined by alkaline oxidation with sodium peroxide; the *loosely-combined sulphur, i.e.*, that which yields sulphide when treated with alkaline lead acetate, was determined (1) by Schulz's method, boiling with 30 per cent. caustic lye in presence of lead acetate and metallic zinc; (2) by heating under pressure with 50 per cent. alkali and a little lead acetate. The latter method generally afforded the best results, especially when the decomposition was effected at a temperature of 165° C.

After describing in detail the experiments in each case, the author gives a table in which he has compiled, from what he considers to be the most reliable analytical numbers, the elementary composition and formulæ of 24 animal and vegetable proteins. The molecular formulæ are calculated by multiplying those indicated by analysis by the whole number required to bring their molecular weight as near as possible to 15,000, this value being taken as representing the minimum size of the protein molecule.

In the table on next page the sulphur contents of various proteins are set forth, most of the determinations being the results of the present work.

From considerations discussed in the paper, it seems probable that the whole of the loosely-bound sulphur, especially in those proteins which are rich in sulphur, cannot be obtained in the form of lead sulphide, under the conditions of the experiments. It appears that when only one atom of loosely-bound sulphur is present, this can always be converted quantitatively into sulphide, but that, when more than one atom of such sulphur is present, the results

Protein.	Total Sulphur.	Atoms of Sulphur in the Protein Molecule on the 15,000 basis.	Loosely-bound Sulphur.	Proportion of total Sulphur in the form of loosely-bound Sulphur.	
	Per Cent		Per Cent.	Per Cent.	Ratio.
Seralbumin	1·930	9	1·280	66	2/3
Oxyhæmoglobin, dog	0·568	3	0·335	59	
Seroglobulin, horse	1·110	5	0·630	57	
Gliadin	1·027	5	0·619	60	
Oxyhæmoglobin, horse	0·380	2	0·190	50	1/2
Vignin	0·426	2	0·214	50	
Amandin	0·429	2	0·217	50	
Globin	0·420	2	0·200	48	
Glycinin	0·710	4	0·320	46	
Vicilin	0·200	..	0·092	46	
Legumin	0·385	2	0·165	41	
Edestin	0·880	4	0·346	40	
Zein	0·600	3	0·212	35	1/3
Ovovitellin	1·028	5	0·348	34	
Fibrin	1·100	5	0·380	34	
Excelsin	1·086	5	0·350	32	
Ovalbumin	1·616	8	0·491	30	
Phaseolin	0·312	..	0·072	23	1/4
Casein	0·800	4	0·101	13	1/8

of analysis by the alkaline lead methods are too low. There are probably two kinds of protein complexes containing loosely-bound sulphur reacting with alkaline lead solutions, one yielding the whole of its sulphur under these conditions, and the other, comparable with cystin, present in those proteins which are rich in sulphur, yielding only a part.—J. F. B.

Arabinose; Derivatives of ——. G. Chavanne. Comptes Rend., **134**, [11], 661—663.

By the method of Koenigs and Knorr (this Journal, 1901, 626), the author has obtained from arabinose both *acetobromarabinose* (hard, colourless, transparent needles, melting at 137° C., soluble in acetic acid, chloroform, benzene, but little in other solvents, slowly decomposed by moisture, strongly lævo-rotatory, reducing Fehling's solution when heated), and *acetochlorarabinose* (m.p. 148° C., closely resembling the bromo-compound in all the properties enumerated). The author has attempted with these substances to prepare tetracetylarabinose, and has obtained crystals melting at 80° C., but not yet in sufficient quantity for analysis.

The author has also prepared the phenylhydrazone of arabinose, in white crystals, m.p. 150°—151° C., apparently identical with that prepared by Tanret by a different method. —J. T. D.

Lactic Acid; Two New Micrococci capable of Forming ——. Hashimoto. Hygien. Rundsch., **11**, 821—834. Chem. Centr. 1902, **1**, [7], 438.

The author has detected in imperfectly-sterilised milk, two micrococci which have the power of curdling milk with the formation of acid. The author divides the micrococci capable of forming lactic acid into two main classes, *viz.*, simple micrococci and streptococci, with subdivisions depending upon their capability or otherwise of liquefying gelatin. The two micro-organisms isolated by the author produce *d*-lactic acid from milk sugar; one belongs to the group of simple micrococci, and the other to that of streptococci. The former is very nearly allied to, if not identical with, *Micrococcus acidi paralactici liquefac.* Halensis Kozai; for the streptococcus, the author proposes the name, *Streptococcus acid. paralact. non-liquefac.* (Halensis). —A. S.

Heptacetylchlorlactose. A. Bodart. Monatsh. für Chem., 1902, **23**, [1], 1—8.

Attempts at the acetylation of milk sugar by a mixture of acetic anhydride and sulphuric acid did not lead to satisfactory results. When the product of reaction was poured on to ice, nothing but an uncrystallisable resin was obtained. When the product was purified under anhydrous conditions, neutralised with fused sodium acetate and treated with organic solvents, the only product isolated was *pentacetyl glucose*, m.p. 111·5° C. No galactose derivative could be isolated from the amorphous residue.

Acetylation in presence of hydrochloric acid gave better results, and was carried out as follows:—10 grms. of dry milk sugar were mixed with 83 c.c. of acetic anhydride and saturated with dry hydrogen chloride gas, whilst immersed in a freezing mixture. The vessel was then sealed up and allowed to remain for several days, until the sugar was all dissolved. The excess of acetic anhydride and chloride was distilled off *in vacuo*, and the residue purified by benzene and petroleum spirit. The product consisted of *heptacetylchlorlactose*, melting unsharply at about 120° C. $[\alpha]_D$ in chloroform solution = + 71·75°. It was converted by silver acetate into octacetyllactose; alkyl lactosides could not be prepared.—J. F. B.

Heptacetylchlormaltose. R. Foerg. Monatsh. für Chem., 1902, **23**, [1], 44—50.

Heptacetylchlormaltose was prepared in a manner similar to that employed in the case of heptacetylchlorlactose (see preceding abstract).

Its conversion into the heptacetates of methylmaltoside and ethylmaltoside was readily effected by the process of Koenigs and Knorr (see this Journal, 1901, 626), but no acetonitrose could be obtained.

This heptacetylchlormaltose, $[\alpha]_D$ in chloroform solution = − 159°, prepared directly from maltose, appears to be different from that described by Fischer and Armstrong (see this Journal 1901, 1151), obtained by the action of liquid hydrogen chloride on octacetylmaltose. The former melts at 118°—120° C., whilst that of Fischer and Armstrong melts at 64°—66° C. On the other hand, the melting points of the acetylmethylmaltosides are not very different. —J. F. B.

Ketoses; Isolation of ——. C. Neuberg, Ber., 1902, **35**, [4], 959—966.

It is well known that phenylhydrazine yields the same osazones with all the sugars of allied groups, making no distinction between aldose sugars and ketose sugars. The author has discovered that unsymmetrical, secondary, substituted hydrazines of the type $\begin{matrix} C_6H_5 \\ R \end{matrix}\!>\!N.NH_2$, especially methyl phenylhydrazine, react with ketose sugars to form osazones, whilst with aldose sugars they form only colourless hydrazones. The osazones are strongly coloured and are readily separated from the aldose hydrazones. Hydrazines substituted in the benzene nucleus behave like phenylhydrazine.

d-Fructose-methyl-phenylosazone is the most important compound described by the author and is prepared as follows:—To a solution of 1·8 grm. of lævulose in 10 c.c. of water, 4 grms. of methylphenylhydrazine are added, together with sufficient alcohol to make a clear solution. After the addition of 4 c.c. of 50 per cent. acetic acid, the liquid, which rapidly becomes yellow, is heated for 5 or 10 minutes on a water bath. On standing, crystallisation soon begins and is complete after 2 hours. Crystallised from 10 per cent. alcohol, this osazone occurs as reddish yellow needles melting at 153° C.; it is readily soluble in most solvents, sparingly soluble in benzene and insoluble in light petroleum.

The *methyl-phenylosazone* of a *ketopentose*, obtained by the oxidation of *d*-arabite by Fenton's process, is described, m. pt. 172° C., also *dioxyacetone methyl-phenylosazone* m. pt. 127°—130° C. The sorbose derivative was prepared and analysed, but could only be obtained in the form of an oil.

This method for the isolation of ketose sugars is especially serviceable for the characterisation of lævulose in mixtures, particularly in physiological experiments.—J. F. B.

Carbohydrates in the presence of Ferrous Salts; Action of Hydrogen Peroxide on ——. *III.* R. S. Morrell and J. M. Crofts. Proc. Chem. Soc., **18**, [248], 55.

The specific action of hydrogen peroxide in the presence of ferrous sulphate was first demonstrated by Fenton in the oxidation of tartaric acid to dihydroxymaleic acid (this

ournal, 1893, 467). Glucose, lævulose, arabinose, and mannose have been shown by the authors to be transformed by this peculiar reaction into osones, which were recognised by their power to react with substituted hydrazines at the ordinary temperature (Trans. Chem. Soc., 1899, **75**, 786, and 1900, **77**, 1219). It has been found that mannose on oxidation gave an osone which yielded with phenylhydrazine at the ordinary temperature phenylglucosazone. The preparation of pure glucosone from both glucose and lævulose has been attempted, and a white, amorphous solid has been obtained which gave analytical results agreeing with the formulæ, $C_6H_{12}O_6$ and $C_6H_{10}O_6$. This substance reacted readily with phenylhydrazine at the ordinary temperature and furnished a good yield of phenylglucosazone. The glucosone from glucose was feebly dextrorotatory, whilst that from lævulose was slightly lævorotatory. Glucosone obtained by E. Fischer (this Journal, 1889, 296), is lævorotatory.

An aqueous solution of glucosone prepared from either glucose or lævulose on oxidation with bromine at 40° furnished a good yield of the calcium salts of a trihydroxybutyric acid. The barium salt of the same acid has been obtained, and both the calcium and barium salts seem to be identical with *d*-erythronic acid (Ruff, this Journal, 1900, 282). The calcium and barium salts of this acid obtained from glucosone prepared from either dextrose or lævulose have yielded butyric acid on reduction with hydriodic acid and phosphorus.

New Book.

MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR 1900 (Department of the Interior. United States Geological Survey. Charles D. Walcott, Director). DAVID T. DAY, Chief of Division of Mining and Mineral Resources. Washington, U.S.A.: Government Printing Office. 1901.

8VO VOLUME containing table of contents, introduction, summary of the mineral production of the United States in 1900, pages 13—38, and other subject-matter filling 865 pages. The volume ends with an alphabetical index of subject-matter. The following are the items upon which geographical and industrial details are given:—I. Iron Ores. II. Iron and Steel, at the close of the 19th Century. III. Gold and Silver. IV. Manganese Ores. V. Copper. VI. Clay Products. VII. Cement. VIII. Precious Stones. IX. Talc and Soapstone. X. Abrasive Materials. XI. Phosphate Rock. XII. Sulphur and Pyrites. XIII. Gypsum. XIV. Salt. XV. Mica. XVI. Fluorspar. XVII. Asbestos. XVIII. Lithographic Stone. XIX. Graphite. XX. Mineral Paints. XXI. Barytes. XXII. Fuller's Earth. XXIII. Flint and Felspar. XXIV. Chromite or Chromic Acid Ore. XXV. Mineral Waters.

Trade Report.

I.—GENERAL.

INDIGO, SYNTHETIC; REVOCATION OF PATENTS RELATING TO THE PRODUCTION OF ——.

Chem.-Zeit., 1901, 245, 1110.

By decision of the Austrian Ministry of Commerce (Handelsministerium), dated June 30, 1900, and Oct. 10, 1900, fifteen patents of the Badische Anilin und Sodafabrik, Ludwigshafen, have been revoked on the ground of their not having been worked in Austria. These patents were granted for the production of synthetic indigo and of intermediate products used in the manufacture of synthetic indigo, such as phthalic acid (from naphthalene). The following is an abstract of the reasons on which the decision is based.

The holder of a patent must commence to work his patent in the course of the first year after the patent is granted. Within this time at the least, all the preliminary arrangements must be made for working his invention permanently and on a manufacturing scale. Within the second year his invention must be actually worked on the large scale. Should difficulties in the sale or manufacture of the patented article occur, a stoppage of working may be permitted for a period, not exceeding two years, subject to the condition that the invention has actually been previously carried out on the large scale. The public demand for the patented article cannot be taken into consideration, and hence the plea of the defendants that there was no demand in Austria for the intermediate products patented, could not be entertained. The mere carrying out of the patented process or the production of the patented article on a single occasion or experimental working cannot be deemed to fulfil the requirements of the law.—F. N.

FUTURE OF CHINA:—THE INDUSTRIAL OUTLOOK.

Standard, April 1, 1902.

Dr. A. von Rosthorn, Councillor of Legation, and Austrian *Chargé d'Affaires* at Pekin during the siege of the Legations, recently read a paper on China at an Industrial and Commercial Club in Vienna. He gave some hints as to the articles which Austria might successfully export to China, and he specially mentioned beer, wine, mineral waters, sugar, conserves, enamelled ironware, cottons, ribbons, artificial flowers, cheap leather goods, paper, &c. He thought that the demand for a better class of goods was increasing. For some years past the import of inferior cotton goods has fallen off, and that of woollen cloth has increased. Several European articles, such as lamps, mirrors, and glassware, will, in future, sell much more extensively than they have hitherto done. The introduction of railways will increase the demand, not so much by cheapening freight, as by bringing larger sections of the native population in contact with European settlements, and by thus making them acquainted with Western comforts and luxuries.

CUSTOMS DECISIONS IN THE NETHERLANDS.

Bd. of Trade J., March 20, 1902.

The following decisions affecting the Dutch Tariff have recently been published in the official *Verzameling*.

Under certain conditions, collodion for use in the manufacture of gas mantles, may be admitted free of duty.

Sheets of paper pulp or wood pulp manufactured in such a way that they can be immediately used as cardboard or packing paper are dutiable as "paper of all kinds," at the rate of 5 per cent. *ad valorem*. If, however, such articles be not capable of being used immediately as paper, either because they are insufficiently prepared, or because they are perforated, they are exempt from duty.

EXPORTS FROM PORTUGUESE AFRICAN COLONIES.

Foreign Office Annual Series, No. 2746.

The principal articles exported from Angola in 1900 were 2,151,000 kilos. of india-rubber, valued at 3,685 contos of reis (571,200*l.*); 435,000 kilos. of wax, valued at 284 contos of reis (44,000*l.*); and 88,000 kilos. of oleaginous seeds.

The exports from the islands of St. Thomas and Principe included small quantities of wax and india-rubber

BRITISH CHEMICALS IN RUSSIA.

An Encyclopaedic Dictionary of raw materials and manufactured products is now being brought out in St. Petersburg, under the editorship of Mr. Boris M. Brandbendler, M.R.A.S., 6, Pracheshny, St. Petersburg.

The attention of British manufacturers of chemicals and chemical products is drawn to this work, and their assistance is requested in furnishing information with regard to these articles of commerce, under the following heads:—

(*a.*) *Kinds and Varieties* (commercial), with short description of each article.

(*b.*) *Packing* (material, quantity, &c.), with reference to each article.

(*c.*) *Statistics* (where exact details cannot be given, average figures may be furnished), relating to each article, explaining the amount of general production or trade with different countries, and with Russia, in particular.

Information is requested with regard to ammonium salts, aluminates, and other chemicals beginning with "A";

also with regard to barytes, benzaldehyde, borax, boric acid, carbonate of lime (of Scotch origin), coal-tar naphtha, and shale-naphtha.

All details should be sent to the above address.

Exports of the Straits Settlements in 1901.

Bd. of Trade J., March 20, 1902.

The following table shows the quantities of the principal articles of produce exported from the Straits Settlements to the continent of Europe and the United States of America in 1901 :—

Exports of Principal Articles of Produce in 1901.

Articles.	To Continent of Europe.	To United States of America.	To United Kingdom.
	Tons.	Tons.	Tons.
Gambier	8,150	12,500	14,500
Tin	6,600	18,650	21,350
Gutta percha	1,350	630	3,500
Jelutong rubber	770	6,250	360
Hides, raw	409	141	2,070
„ tanned	..	..	600
Gum copal	750	2,270	2,000
Borneo rubber	120	90	170
Gum benjamin	160	15	160
Cubebs	..	170	5
Illipi nuts	710	..	..
Sugar	90	..	3,760
Copra	33,200	10	..
Canes per mill	1,220	..	558
Isinglass	..	..	115
Gum dammar	50	120	50

Customs Decisions in New Zealand.

Bd. of Trade J., March 20, 1902.

The following Customs Decisions have reference to the Tariff of New Zealand :—

Articles, and how classed.	Rate of Import Duty.
Druggists' shop fittings, bottles for—	
As druggists' sundries	15 % *ad val.*
Tanning extract (mixture of "tannin" acid and sugar)—	
As chemicals, n.o.e.	15 „ „

Chemical Instruction and Chemical Industries in Germany; Supplementary Report on ——.

Foreign Office Miscellaneous Series, No. 573.

The information contained in the present report deals with the facilities for and expenditure on chemical instruction at the two Prussian technical high schools at Berlin and Hanover, respectively, and at the University of Berlin, and is intended to supplement the information given in the report on chemical instruction and chemical industries in Germany, published under No. 561 of the Miscellaneous Series (this Journal, 1901, 849). In the chemical department of the Berlin Technical High School, there are six professors for the following branches of chemistry :—Organic Chemistry, Inorganic Chemistry, Chemical Technology, Metallurgy, Electro-chemistry, Photo-chemistry; six lecturers for the following branches :—Chemistry of Foods, Agricultural Chemical Technology, Vegetable and Animal Fats, Oils, &c., Designing of Chemical Works and Plants, Architectural Chemical Technology, Physical Chemistry; finally, 12 private lecturers for the following branches :—Electrolytic Metallurgy, Chemistry of Foods, Ceramics and Mortar, Chemistry of the Growth of Plants, Investigation of Oils, Fats, and Naphtha, Technology of the Proteins and Albuminoids, Repetition of Organic Chemistry, Special Chemistry of Cement, Lime, &c., Qualitative and Quantitative Analysis, Aniline Dyestuffs, Terpenes and Camphor, Modern Synthetic Drugs.

Particulars are given regarding salaries of the staff, also number of professors, lecturers, and students. In 1899, there were no less than 41 professors, lecturers, private lecturers, and assistants to 278 students or about one instructor to seven instructed.

At the Hanover Technical High School, the proportion of instructors to instructed is 23 to 285, or about 1 to 12. The department of chemistry at the Berlin University forms one of the sub-divisions of the faculty of philosophy, and the professors of chemistry are members of the philosophical faculty. The lectures in the various branches of chemistry are open, not only to the students of chemistry, but also to the students of medicine and pharmacy, and to future schoolmasters and professors for mathematics and natural science. In 1899, the number of students in the Philosophical Faculty was 2,162; in the Mathematical and Natural Science divisions, 784. The total expenditure for new apparatus, instruments, chemicals, repairs, &c. in the First Chemical Institute, Second Chemical Institute, Technological Institute, and Pharmaceutical Institute, in 1901, was 4,079*l.* Particulars as to cost of buildings, &c. are given.

The various figures show clearly the large proportion of chemical instructors to students, the increase in the number of students, and the facilities provided for instruction in almost all conceivable branches of chemistry. They indicate that the Prussian State, in spite of the expenditure already incurred and the leading position attained by the chemical industries, is far from regarding the present means of instruction as adequate for future contingencies, but is at all times, upon representations from the requisite industrial and educational quarters, prepared for lavish public outlay should future developments reveal this necessity.—C. T. T.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Oil Prospecting Regulations in Western Australia

Bd. of Trade J., March 20, 1902.

The *Government Gazette* of Western Australia, of Nov. 29 last, publishes the text of new regulations under the Mineral Lands Acts, 1892—99, with regard to prospecting areas for oil. Oil is defined as including mineral oil, shale, bitumen, or any mineral fuel other than coal.

The above regulations may be seen by persons interested on application to the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

Petroleum in Germany.

Chem. Trade J., March 29, 1902.

The production of crude petroleum in Germany rose from 192,232 barrels, in 1899, to 358,297, in 1900. The increase of 1899 over 1898 was 8,808 barrels only. The mean price obtained, in 1900, was 10*s.* per barrel, as against 8*s.*, in 1899, and 8*s.* 3*d.* in 1898.

Oil at Pensacola (United States).

Foreign Office Annual Series, No. 2752.

Recent indications of oil have been discovered in and around Pensacola, and from samples obtained, oil of good quality is likely to be found.

Companies have been formed for the purpose of boring wells, and shares have been issued to the public.

IV.—COLOURING MATTERS, Etc.

Indigo Market in Germany in 1901.

U.S. Cons. Reps., March 6, 1902.

The year 1901 witnessed a slow but steady increase in the prices of natural indigo, with a relatively satisfactory business. Towards the end of summer the demand slackened, due to the fact that the large colour works at Höchst and Ludwigshafen offered artificial indigo at greatly reduced prices, in order to reduce their stocks.

The Consul calls attention to the wisdom of giving preference to the natural product when prices are satisfactory, and states that should producers be compelled to discontinue the cultivation of indigo on account of

s unprofitableness, consumers would become entirely ependent upon the colour manufacturers, who would robably combine and raise prices, as was done in the se of Alizarin Blue.

Owing to the improved method of production, natural digo will at least remain an equal rival of the synthetic roduct, and advices from Calcutta regarding the new crop note prices which will allow the natural product to uccessfully compete with the artificial.

The finer qualities of Bengal indigo were again least ffected by fluctuations of prices. The limited supply ound a ready market. The greatest demand was for edium qualities, and the stocks have been much reduced. ava indigo maintained its preferred position and brought latively high prices. Of the new crop, a considerable uantity is said to have been already sold at high prices r future delivery.

The stock on hand in Europe amounted to 9,000 cases at e end of the year 1901, against 8,500 cases in 1900, ,000 cases in 1899, 13,500 cases in 1898, 19,000 cases in 897, and 14,000 cases in 1896.

Indigo; Artificial *v.* Natural ——, in Germany.

Drogisten Zeit., Jan. 31, 1902.

The following announcement has been issued from the othing department of the Prussian Ministry of War, with ference to the reported decision of the Prussian Govern- ent to substitute artificial for natural indigo in the dyeing the blue cloth used in the army :—

Manufacturers are quite free to use either artificial or tural indigo, whichever they may prefer, in the dyeing cloth for military purposes. (See this Journal, 1902, 81.)

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Imitation Silk Yarn: Customs Decision (United States).

Bd. of Trade J., March 20, 1902.

Imitation silk yarn, made partly of pyroxylin, but which s been denitrated in the process of manufacture, and which, its imported condition, is not composed in chief value of roxylin or a compound of pyroxylin, is dutiable as "silk rn or thread," under par. 385 and the provisions of ction 7 of the Tariff.

Hemp-Bleaching Compound Duty-free in Canada.

U.S. Cons. Reps., March 18, 1902.

The Canadian Government has recently transferred a mber of articles, heretofore dutiable, to the free-import list, th a view to increase their manufacture in that country. mong these articles, which will be admitted free only when ported by manufacturers for use in their own factories, is mp-bleaching compound, for the manufacture of rope.

VII.—ACIDS, ALKALIS, SALTS, Etc.

Arsenic in Portugal.

Bd. of Trade Notice, March 17, 1902.

The only mine producing arsenic in Portugal is that of ntor, situated in the parish of Nogueira do Cravo, town- ip of Oliveira de Azemeis, district of Aveiro.

This mine has produced the following quantities of arsenic (As_2O_3) :—

Year.	Metric Tons.	Value per Ton in Reis.
1898	751	60,190
1899	1,082	52,460
1900	{ 500	66,000
	{ 500	56,000
1901	1,010·457	66,990

There is only a small importation of arsenic, which nearly comes from Germany, fetching a better price in lumps than in powder. The wholesale price is about £7 to £8 per ton. The druggists of Lisbon and Oporto together do not import more than 10 to 20 tons per annum, and the glass factories about 3 tons per annum.

Chemicals in Spain.

U.S. Cons. Reps., March 8, 1902.

The following are the principal chemicals imported by Spain :—Caustic soda (25,000—30,000 tons per annum) from Great Britain, Belgium, and France; chloride of lime from France, Belgium, and Great Britain; "ammonia alkali," or "ammonia ash" (about 8,000 tons a year), from Belgium and Germany; lump silicate of soda (about 1,000 tons per annum) from Great Britain, Germany, and Belgium; also bicarbonate of soda, chlorates of soda and potash, acetic acid, chloride of ammonium, and sulphate of copper. Between 1896 and 1899, a works was established at Flix, about 100 miles from Barcelona, for the electrolytic production of caustic soda and chloride of lime, the estimated output being 5,000 tons of chloride of lime and 2,000—2,500 tons of caustic soda. The products were first placed on the market at the end of 1899, but the competition does not appear to have injured foreign manufacturers to any considerable extent, the imports of bleaching powder and caustic soda during the past two years showing little, if any, falling off.

—A. S.

Nitrate in Chile.

Chem. and Druggist, March 22, 1902.

As a result of the Nitrate Combination, the Chilean Government propose to increase the export duty on nitrate by 6*d.* per quintal. This will produce 50,000,000 dols. per annum extra revenue.

Carbonic Acid Syndicate in Austria-Hungary.

Chem. and Druggist, March 22, 1902.

A syndicate of Austro-Hungarian carbonic acid manufacturers has been definitely arranged. It came into force on March 1, and will last for five years.

Salt in the Netherlands: Excise Dues on ——.

U.S. Cons. Reps., Feb. 19, 1902.

A Royal Order of December 27, 1901, provides for the exemption from excise dues of salt used in the preparation of bleaching powder by electrolysis, on the basis of the Royal Order of August 19, 1899.

Sulphur in Japan.

Bd. of Trade J., March 20, 1902.

Sulphur produced, in 1900, in Hokkaido, Rikuzen, Asumi, Shinano, and other provinces amounted to 14,435 tons, valued at 312,835 yen (about 31,000*l.*).

Electrolytic Production of Caustic Soda and Calcium Chloride in Italy.

Chem. and Druggist, March 29, 1902.

A company with a capital of about 44,000*l.* has just been formed at Milan for the electrolytic manufacture of caustic soda and of calcium chloride. These two products have up to the present been imported into Italy. The works of the new company will be situated at Varallo, where some 600 horse-power will be obtained from the River Sesia. The company expect, with some 350 working-days, of 24 hours, to produce about 2,359 tons of calcium chloride solution, and 2,880 tons of caustic-soda solution. The estimate of the income and cost show an annual profit of 14 per cent.

VIII.—GLASS, POTTERY, Etc.

Window-Glass Manufacture in Japan.

U.S. Cons. Reps., March 15, 1902.

After some discussion in the Japanese Diet in regard to the promotion of window-glass manufacture in Japan, the Government has decided to establish at the industrial

experiment station a model factory, or technical school, for training workers in window-glass manufacture. Japan affords the necessary materials for this industry and the cheap labour, but lacks the skilled artisans necessary to make it a success. All the window-glass now used in Japan is imported, and the market is an increasing one, since it is used for buildings of both foreign and Japanese style. The importation of window-glass, in 1899, was valued at 1,250,000 yen (625,500 dols.). Belgium furnishes the greater part of this import. It is estimated that a box of glass which now costs, imported, 7 to 10 yen (3.49 dols. to 4.98 dols.) would, if made in Japan, cost about $5\frac{1}{2}$ yen (2.75 dols.). It is expected that the factory, for which money will probably be appropriated at the next session of the Diet, will be working in a year, and in the course of two or three years will be able to supply enough skilled Japanese artisans to carry on the work in private factories. In the meantime, one or two Japanese have been sent to Germany to study the art; but it is probable that foreigners will be employed to teach methods, assist in the selection of machines, and in other arrangements for the plant.

X.—METALLURGY.

Mineral Exports of Portugal.

Foreign Office Annual Series, No. 2746.

The quantity and value of the minerals exported from Portugal, in 1900, is shown in the following table:—

Description.	Quantity.	Value.	
		Currency.	Sterling.
	Tons.	Milreis.	£
Copper	404,015	1,092,731	169,200
Lead	3,233	135,732	20,900
Manganese	5,008	16,926	2,500
Antimony	407	10,110	1,550

Platinum and Copper in the Urals (Russia).

U.S. Cons. Reps., Feb. 21, 1902.

According to a statement of the Mining Department, the production of platinum in the Ural district, for 1901, was 380 poods (1,368 lb.), showing a decrease, in comparison with 1900. The copper industry seems to be advancing, as several new works have been opened up for the production of this metal.

Platinum in the Cauca (Colombia).

Foreign Office Annual Series, No. 2747.

The Cauca possesses very rich alluvials and river washings, yielding platinum, this being the only part of the country in which this metal is found. The district known as the Choco is famous for its rich river washings, but the climate is very unhealthy.

Tin in Johore.

Bd. of Trade J., March 27, 1902.

The following particulars relating to tin in Johore are taken from a report prepared, after an extensive tour through Johore territory, by Mr. A. B. Snow, mining expert to the Sultan of Johore, and published in the *Straits Budget* of the 18th ult.:—

As regards the Johore River district, Mr. Snow says that there had been considerable work done in mining for tin in former years, and in washing from the surface at Ayer Puteh, he got a good sample of tin. The tin is of a very fine kind, and is associated with iron, which makes it difficult to clean in the ordinary Chinese way of tin washing. He estimates that there are thousands of tons of tin in the vicinity of Ayer Puteh, and that, when once bed rock is reached, there is no reason why the tin should not be of a coarser quality, and pay handsomely to work in a modern way.

In summing up his report, Mr. Snow says that he is prepared to state that there is a distinct tin belt of country running in a northerly direction from Sungei Raidau in the south to Bukit Tanah Abang in the extreme north of the State. It is more than 60 miles in length, and has an average breadth of three miles.

Mineral Wealth of Indo-China.

Eng. and Mining J., March 8, 1902.

M. Marc Bel, a mining engineer, who has recently travelled over a large part of Indo-China, on behalf of certain mining associations and of the Minister of Public Instruction, has communicated to the Society of Commercial Geography, of Paris, the result of his observations in regard to the mineral wealth of the country, as well as the prospects of mining enterprise there.

He states that the geological formations are such as should contain minerals in abundance, whilst the economic conditions are eminently favourable to the development of the mining industry. It is known that tin, copper, zinc, antimony, lead, iron, coal, marble, and china-clay exist. Tin is worked to a very small extent, and lead, copper, and antimony not at all.

Chemical Hard Lead in Missouri (United States).

Eng. and Mining J., March 8, 1902.

This term is used to designate certain brands of lead which are produced from the non-argentiferous ores of South-eastern Missouri. It is especially adapted to the manufacture of sheet and pipe which have to withstand the action of acids, and it finds a ready market for that purpose, usually at a premium of 5 cents per 100 lb. above the price of common Missouri lead. At one time, in 1901, there was an especially good demand for chemical lead, and temporarily it commanded a price somewhat higher than that for desilverised lead. The relative values of the different brands of lead in the St. Louis market are frequently subject to such variations. As to what constitutes chemical hard lead, there is no definite rule. Its peculiar property appears to be due to small percentages of copper or antimony, or both, in its composition, which are not removed by the methods of refining (liquating and poling) in use in the district, but no attempt is made to control the composition within precise limits. The artificial preparation of chemical hard lead is the subject of a patent recently granted to H. Leyendecker, of Cologne, Germany (Eng. Pat. 2756, 1901; this Journal, 1902, 124).

XII.—FATS, OILS, AND SOAP.

Linseed-growing in New Zealand.

Bd. of Trade J., March 20, 1902.

In the February issue of *Australasian Hardware and Machinery*, it is stated that, in the Poverty Bay district of Auckland, a thorough trial of the growth of linseed for industrial purposes is being made, fully 3,000 acres having been put under cultivation this year. Only a small quantity has been hitherto grown, and that for the seed only, the flax itself being rendered useless for want of special machinery. Now this is to be remedied, and the fibre saved, the local paper mills having offered to try the product for paper making. Last year, when the seed sold at 15*s.* per bushel, the crop realised 8*l.* per acre. By utilising the fibre as above, it is expected that this year's crop will realise 14*l.* per acre.

Olive Oil from Portugal.

Foreign Office Annual Series, No. 2746.

The exportation of olive oil amounted to 37,950 hectolitres, valued at 694 contos of reis (107,500*l.*), an increase of 15,000 hectolitres, as compared with the previous years. The olive oil industry in Portugal is capable of large development. Olive trees abound, and large quantities of oil are manufactured annually. It is only the want of care in its preparation that makes it unsuitable for the European markets, so that the greater part of the oil exported has to be sent to Brazil and the Portuguese colonies.

Quillaya Bark, &c.: Customs Decisions in Switzerland.

The following decisions have been arrived at by the Swiss Customs Department establishing the classification of the following articles under the Customs tariff :—

Description of Articles.	Tariff No. under which classed.	Tariff Rates of Duty.	English Equivalents.
		Per 100 kilos. Frs. cts.	Per Cwt. £ s. d.
Quillaya bark, soap wort, soap-wort root—			
In barrels, bags, &c. .	76	1 25	0 0 6
In boxes or packets of 4 kilos. or less.	77	2 50	0 1 0¼

Olive Oil in Andalusia (Spain) in 1902.

U.S. Cons. Reps., March 13, 1902.

The olive crop of Andalusia is unusually good, and the output of oil in consequence will reach large figures. But for heavy frosts last month, the oil produced in the provinces of Malaga, Cordoba, and Jaen would have reached 12,500,000 to 125,000,000 lb., and, even as it is, it is thought the crop will amount to about 87,500,000 lb., or some 37 per cent. more than in 1899, 1900, or 1901.

The crop now being pressed was grown in 1901, but it is known none the less as the crop of 1902, since it is marketed this year; the oil is of an excellent quality, both in colour and taste, and is much superior to the product of the three previous years.

Malaga is sending her olive oil this year principally to Italy, Russia, France, Germany, England, Holland, Norway and Sweden, and the United States.

The cheapest grade goes largely to Russia.

It is said here that the failure of the crop in Italy is due to the ravages of the "mosca" (*Dacus olea*). The same pest appeared in this province in 1894 and 1895.

Stearin Imports of Venice (Italy).

U.S. Cons. Reps., March 8, 1902.

The demand in this district for American stearin, paraffin, and tallow is increasing, imports for the last quarter having shown a decided advance. Mr. Guglielmo Olper, Calle dei Barcaroli, 1731, of Venice, asks to be put in communication with exporters of these materials.

Oil Seeds at Kieff (Russia).

Foreign Office Annual Series, No. 2750.

At the end of 1901, the ruling prices were :—

	Price. Per Pood.	Per Cwt.
	R. c.	s. d.
Linseed	1 85	12 1
Rape-seed	1 65	10 9
Poppy-seed	3 0	19 7

XIII. C.—INDIA-RUBBER, Etc.

Rubber in Ceylon.

Bd. of Trade J., March 27, 1902.

Rubber is receiving more attention; it is being steadily planted, both in the low country, and also on estates situated at moderate elevation. The yield and quality of rubber obtained from the Pará variety, growing in the Kalutara district, has been very satisfactory, some of the rubber realising 4*s.* 2½*d.* a pound. Steps are being taken to import more seeds and plants of the best varieties of *Castilloa* into the Island.

XIV.—TANNING; LEATHER; GLUE, Etc.

Leather Industry in Italy.

U.S. Cons. Reps., 68, [258], *March*, 1902.

In the *Revue de Commerce Extérieur* of Dec. 28th, 1901, it is stated that the leather industry in Italy is making notable progress. In 1899, there were in operation 1,226 tanyards, with a total of 19,921 vats, and employing 13,368 workmen, working, on an average, 263 days per annum. Of these tanyards, 255 use machines to a total number of of 3,026; 1,593 are worked by steam, 1,370 by hydraulic power, and 63 by gas.

Comparing these figures with those of 1896, the number of establishments is found to have decreased by 90, and the number of workmen, to have increased by 2,130. The motive power has trebled.

Tanneries in Maine (United States).

Foreign Office Annual Series, No. 2749.

There were 31 establishments engaged in the tanning, currying, and finishing of leather, in 1900, with 587 wage-earners, and products valued at 491,343*l.* In 1890, 51 establishments were reported, with 852 wage-earners, and products valued at 672,534*l.* The decrease in the value of products during the decade was 181,200*l.*, or about 27 per cent.

There were 200 tanneries in Maine in 1810, with an annual average of 275 hides and skins tanned, and an average product valued at 231*l.* In 1840, 395 tanneries were reported, whilst the total number of hands employed (454) averaged less than two to an establishment. York county alone contained 101 tanneries, with but 102 hands employed. Between 1840 and 1860, several tanneries of considerable size were built, and the industry received a further stimulus through the demands of 1861 and the time immediately following, so that during the next 15 years, many large sole-leather plants were established in the eastern part of the State. Hemlock bark has always been the principal material used for tanning purposes in the State, and it is to the increasing scarcity of this bark that the decline in the industry since 1870 must be attributed.

XV.—MANURES, Etc.

Artificial Manures in Russia.

Foreign Office Annual Series, No. 2750.

The employment of artificial manures in the "black-soil" district of Russia is in its infancy; in fact, the use of manure of any kind is of comparatively recent date. Nevertheless, the farmers are already appreciating the advantages of manuring their land, and as it is impossible for them to obtain a sufficient supply of farmyard manure, they are using artificial fertilisers instead. Hitherto the farmers depended entirely upon the richness of the black soil, but when harvests began to deteriorate, they bestowed their attention on means to enable it to recuperate its fertility, and profiting from the results shown them by the various agricultural institutes, they are adopting the suggested remedies to insure themselves against bad harvests.

In the cultivation of beetroot, in the south-western district (Kieff, Podolia, Wolhynia, and Chernigoff), superphosphate plays a very important part in strengthening the plants, during the spring, against the ravages of insects, and at the same time producing an increase in the size of the roots as well as a greater percentage of sugar.

As yet artificial manure is very little used in the cultivation of winter grain, as the selling price of grain does not leave a margin for the employment of fertilisers. Nevertheless, trials have been made with grain crops, and no doubt the increase in the yield will lead to a more extended use of fertilisers in the future.

In 1901, it is estimated that, in the "black-soil" district of Russia, the following quantity of fertilisers was used :—

	Quantity.	
	Poods.	Tons.
Superphosphate	400,000	6,452
Chili saltpetre	40,000	645
Kainit	30,000	484
Basic slag	50,000	806

XVI.—SUGAR, STARCH, Etc.

Sugar in Russia.

Foreign Office Annual Series, No. 2750.

The beetroot crop is above the average. The roots contain a high percentage of sugar, ranging from 55 to 62 lb. per "berkowetz" of 360 lb. The official returns show that the total area sown under this crop, in 1901, was 1,483,894 acres, as against 1,371,485 acres, in 1900; but of this quantity, 89,251 acres turned out a failure, so that the actual area yielding a crop was 1,394,643 acres, or 23,158 acres more than the actual area of 1900.

The yield expected from the above area is given as 8,170,600 tons of roots, or an increase, when compared with the yield of 1900, of 1,727,504 tons. The average yield per acre would, therefore, be about 117$\frac{1}{6}$ cwts., as against 99 cwts., in 1900, 108 cwts., in 1899, 104$\frac{1}{2}$ cwts., in 1898, 116 cwts., in 1897, and 121 cwts., in 1896.

The quantity of sugar expected to be produced from the above yield, with 278 factories in operation, is given as 955,930 tons, or 173,498 tons more than the estimated production of 1900. In order to obtain, as nearly as possible, the exact quantity of sugar available, it will be necessary to add to the above :—

	Quantity.	
	Poods.	Tons.
Estimated amount of sugar produced by 278 factories.	59,267,676	955,930
Balance of "inviolable reserve"	1,500,092	24,195
" "free reserve"	2,708,903	43,692
Total	63,476,671	1,023,817

In comparing the yield of sugar from the beetroot, it will be seen that, in order to produce 1 ton of sugar, 8·55 tons of beetroot were required, as against 8·23 tons, in 1900.

The quantity of sugar, as fixed by the Ministry of Finance, for home consumption, from the campaign of 1901–2, is 629,032 tons, and an "inviolable reserve" of 80,645 tons. There will, therefore, be about 314,140 tons of a "free reserve" for export.

Sugar Production, in 1901–2, in Russia.

Bd. of Trade J., March 27, 1902.

According to a circular notification of the Minister of Finance, published in the *Official Gazette*, of the 16th Feb.—1st March, 1902, the general output of all the Russian sugar works during the working season of 1901–2 is established at 63,610,092 pouds (1,025,969 tons).

Deducting from this quantity 39,000,000 pouds (629,032 tons), which should proportionately be supplied to the home market, the surplus quantity of manufactured sugar would amount to 24,610,092 pouds (396,937 tons). In view of this, and the remainders from last year, M. de Witte has sanctioned the disposal in the home market of 45·7 per cent. of the whole quantity of the output of sugar of this season, without additional payment of excise, over and above the 60,000 pouds (968 tons) manufactured by each sugar works; at the same time, 10·7 per cent. of the quantity manufactured is to constitute an inviolable reserve stock. All the remaining quantity of sugar will constitute a free remainder for exportation abroad.

Sugar in the New Orleans District (United States).

Foreign Office Annual Series, No. 2752.

The past commercial year has been productive of very satisfactory results to all interests kindred or allied to the sugar planting and manufacturing industries, in the State of Louisiana and City of New Orleans.

In round figures, the production, as shown by the receipts from plantations, at this market, gave an excess of 700,000 barrels and 24,000 hogsheads over the production of 1899–1900, or, approximately, 1,500,000 barrels and 56,000 hogsheads, as against 750,000 barrels and 32,000 hogsheads for the previous year. On the other hand, the production of molasses showed a slight decrease in volume. Prices were better, and values ruled throughout upon a uniformly higher plane than obtained during the preceding year.

There was a decided decrease in the amount of beet sugar shipped to New Orleans, attributed to the unsettled laws concerning the reciprocity question. The production of cane sugar, however, exceeds that of last year.

Beet Sugar Industry of the United States.

Bd. of Trade J., March 27, 1902.

The New York *Journal of Commerce*, for the 8th inst., with reference to a report by the special agent of the Department of Agriculture in charge of the beet-sugar investigations, quotes the following figures relating to the industry during the past year :—

The total production of beet-sugar in the United States, in the season 1901–1902, has aggregated 185,000 tons, an increase of 140 per cent. from the 77,000 tons produced during the season 1900–1901. There were 31 factories in operation, in 1900, according to the census figures, and 11 more were started, in 1901.

Sugar Production in Germany.

Bd. of Trade J., March 27, 1902.

According to statements published in the *Reichsanzeiger*, the quantity of raw sugar produced in Germany, in January last, amounted to 136,097 metric tons, and the quantity of refined, to 131,649 metric tons.

The output, in February, amounted to 41,449 metric tons of raw sugar, and 110,028 metric tons of refined. The output of raw and refined sugar in Germany in the period from Aug. 1st, 1901, to Feb. 28th, 1902, the first seven months of the 1901–2 sugar campaign, compares as follows with the corresponding period of the 1900–1 campaign :—

	August, 1900, to February, 1901.	August, 1901, to February, 1902.
	Metric Tons.	Metric Tons.
Raw	1,688,422	1,977,828
Refined	780,961	831,611

Note.—Metric tons = 1,000 kilos. = 2,204 lb. avoir.

New By-Product of Sugar in British Guiana.

Bd. of Trade J., March 27, 1902.

According to the *Argosy* (Demerara), of 22nd Feb., experiments have been carried out in the colony, in connection with the manufacture of a new cattle food, to which the name "molascuit" has been applied.

"Molascuit" is a composition of molasses and cush-cush of megass—the finest part of the fibre of sugar cane. Fifty per cent. of cush-cush is stated to be digestible and nutritive. The proportions of the composition are 80 or 85 per cent. of molasses, and 15 or 20 per cent. of cush-cush. This composition is dried in the air, or by means of the gases from the factory furnace. When ready for the market, it presents the appearance of very finely-ground oil cake, and to the taste, it is sweet and agreeable.

As a by-product of sugar, it is considered that the manufacture of "molascuit" should be of considerable advantage to planters, who will thus be able to dispose of molasses in

ie manufacture of rum and "molascut"; and when the ım market is over-stocked, the benefit of this will be pparent.

Sugar Industry in Bulgaria.

Bd. of Trade J., March 27, 1902.

The directors of the Sofia Sugar Factory and Refinery ompany have decided to suspend operations when they ave finished refining the product of last year's crop. hey have consequently given notice to the Government id the peasants that they will make no contracts for beet r the coming season.

Owing to the low price at which imported sugar can be ld, the company has been carrying on business at a loss er since it started. Even this season, when the amount beet supplied to it—43,000 tons—was within a few ousand tons of the limit of the capacity of the factory, estimates that the loss will amount to more than 100,000 ancs if the Government bounty be paid; if not, it will be me 200,000 francs more.

Beet-Sugar in Montana (United States).

Montana Experimental Station. Bull. No. 33, *Jan.*, 1902.

The opinion is officially expressed that conditions in ontana are favourable to the production of sugar-beets of gh sugar content and standard purity.

Montana seems to be the natural habitat of root crops, id the difficulty is to keep down the growth and prevent e formation of too large roots.

The yield, sugar content, and purity can be kept far ove the standards adopted as the minimum values by gar-experts; fuel is easily and cheaply obtained, water is re and abundant, and limestone of great purity is obtainble.

On one experimental farm, the yield was 25·6 tons to the re of beets, of 19·38 per cent. sugar content, and 86·4 per nt. purity.

Sugar Tariff Valuation in British India.

Bd. of Trade J., March 20, 1902.

In a Customs circular (No. 6 of 1902), issued by the nance and Commerce Department of the Government of dia on the 12th February last, a revision of the Tariff luation for "soft or raw sugar" imported into India from l places with the exception of Mauritius, Egypt, or China om Rs. 9 8a. to Rs. 8 8a. per cwt., is notified, the reduction take effect from the 20th Feb. 1902.

Cane Sugar Crop in Malaga (Spain).

U.S. Cons. Reps., March 20, 1902.

The unusual frosts of December and January have rought so much damage to the sugar cane of this province, at not more than a half crop of sugar can be expected is year.

Sugar cane is grown all along the coast of Malaga, and e annual yield of sugar is about 30,000 tons. There are sugar factories in the provinces of Malaga and Granada, nploying many thousand hands. Grinding generally gins about the middle of March. This year it may mmence earlier.

The loss of the sugar cane crop has resulted in the fusal of the manufacturers to take any part in the proosed organisation of Spanish sugar makers, with the ew of limiting production. There has been an overoduction of sugar—particularly of beet sugar—in Spain r several years, and strenuous efforts were recently made form a syndicate of all the sugar manufacturers in Spain, r mutual benefits along certain lines. This is understood have failed, because one of the most important beet sugar ctories refused to participate, and for the further reason at the cane sugar manufacturers, in view of the largely ecreased crop, saw no advantage in any further plan to mit production.

XVII.—BREWING, Etc.

Apparatus for the Use of Alcohol, Exhibition of ——, in Peru.

Bd. of Trade J., March 27, 1902.

The Board of Trade have received, from the Peruvian Consul at Southampton, particulars of an exhibition to be open in Lima for 30 days from Sept. 1 next, of articles and apparatus connected with the use of alcohol in the production of motive power, heat, and light.

The Consul states that he is prepared to receive catalogues and other information from the manufacturers of such apparatus, who may be desirous of exhibiting their goods at the Lima exhibition.

The Consul adds that he is expecting further particulars and the detailed programme of the exhibition, and will communicate the same to all intending exhibitors.

Competition of Alcohol Motors in France.

U.S. Cons. Reps., March 8, 1902.

The following is an official notice of an international competition of motors and apparatus using alcohol for generating motive power, light, and heat, to be held in Paris, in May, 1902. This competition will include practical tests, after which medals and certificates will be awarded, and it will be followed by a public exhibition from May 24 to June 1, 1902. The competition includes: (1) Automobile boats; (2) lighting and heating apparatus; (3) fixed motors, locomobiles, and motor groups. The exhibit will include, besides motors and apparatus using alcohol, apparatus producing industrial alcohol, receptacles for storing and transporting this product, apparatus worked by exposed motors, and compounds of alcohol. Sites for exhibition are free.

Distilling Millet in Scotland.

U.S. Cons. Reps., March 15, 1902.

Scotch distillers have lately experimented with Russian millet, and the results were unsatisfactory. Although the quality of the spirits was excellent, so great a proportion of rye or barley was necessary, that the process proved too expensive. Whilst millet has not been finally rejected by the two Edinburgh companies that have tried it, the common opinion is that any further effort to make an economical use of it for distilling purposes will fail.

Potato Spirit in Germany.

Chem. and Druggist, March 22, 1902.

Last year 390,000 proof gallons of German potato spirit were imported into this country for methylation purposes, the bulk being an increase of 329,000 gallons over the 1899—1900 imports. The increase is said to be due to the superior quality of the German product, and to the fact that it suits the purpose of the methylator better, whilst it is at the present time 2*d.* a gallon cheaper than British grain spirit. The production of German spirit is in the hands of a ring which is known as the "Verwerthungsverband Deutscher Spiritusfabrikanten," which was founded in 1899,* and appears to have met with a fair amount of success. The organisation consists of three bodies—distillers, rectifiers, and those who combine both industries. The department which transacts all the necessary business regarding the sales and the monetary accounts of all the participators is known as the "Centrale für Spiritusverwendung." The large capital necessary for such an enterprise has been provided by making use of all moneys and plant existing in the trade. For this reason the retailers are not shut out, but are allowed to participate on condition of paying a certain commission to the distillers. In the same way, the refiners buy the raw spirit from the distilleries on payment of the commission, and deliver according to the dictation of the "Centrale," chiefly to their former clients. The undertaking differs from a trust principally in the respect that the spirit ring does not limit the production in order to maintain a remunerative selling

* See also this Journal, 1899, 797.

price. The ring is, moreover, actively employed in extending the trade by making spirit available for various trade purposes, particularly heating and lighting. The "Centrale" has a separate department in which arrangements are made with railway and other authorities for the introduction of novelties in spirit-lamps and cooking and heating apparatus. One great means by which these aims are furthered is the cheapening of denatured spirit by the "Centrale." Another means of combating a possible over-production is the encouragement and extension of the export trade. The ring is to have an estimated duration of nine years, but a certain number of distillers who were unwilling to sacrifice their independence so long were allowed to join for a period of one, two, or three years. As showing the extent of its operations, it is found that, from Oct. 1, 1900, to Sept. 30, 1901, the total production of pure alcohol, in Germany, amounted to 406,000,000 litres, of which the ring produced 340,000,000 litres, or 77·3 per cent., the remainder being produced by "outsiders." Of the total quantity, the "Centrale" sold 279,000,000 litres, in 1900—1901, as against 265,000,000 litres, in 1899—1900. The quantity exported amounted to 16,000,000 litres, included in the foregoing. The chief aim of the ring being to increase the utilisation of methylated spirit at no matter what cost, it allows the retailer a profit of 25 per cent. to 30 per cent. The spirit is bottled, and the labels bear the retail selling price, with a guarantee that the contents represent 80 per cent. (by weight) of spirit. The retail selling price, in Germany, last year (in which there was practically no variation), was 25pf. to 28pf. per litre, equal to $3\frac{1}{2}d.$ per litre or $1\frac{3}{4}d.$ to $2d.$ per pint.

XVIII. A.—FOODS.

"Inspection of Meat" Law in Germany.

Bd. of Trade J., March 20, 1902.

Referring to the German "Inspection of Meat" law of June 3rd, 1900, an Imperial decree has been issued, putting into force, from Oct. 1st next, sec 21 of the law, together with the penal clauses relating thereto. This section prohibits the importation into Germany of meat prepared by processes or with ingredients which might impart injurious properties thereto, and empowers the Bundesrath to determine what ingredients and methods of preparation fall under this regulation.

In this connection, a notice has been issued, of which the following is a translation:—

"The provisions of sec. 21 (1) of the law are applicable to the following substances, as also to any preparations containing them:—

"Boric acid and salts thereof.
"Formaldehyde.
"Alkali and alkaline earth hydroxides and carbonates.
"Sulphurous acids and salts thereof; also sulphates.
"Hydrofluoric acid and salts thereof.
"Salicylic acid and compounds thereof.
"Chlorates.

"The same applies to colouring matters of all kinds; with the exception, however, of their application to make margarine yellow and for colouring the skins of sausages, so long as their use is not contrary to other existing regulations."

XIX.—PAPER, PASTEBOARD, Etc.

Paper Trade in Constantinople (Turkey).

U.S. Cons. Reps., 68, [258], *March*, 1902.

The *Moniteur Officiel du Commerce* states that the paper trade in Constantinople has scarcely changed in the last five years. The imports, in 1900, were as follows:—

	Metric Tons.
Brown wrapping paper	3,813
Ordinary paper	2,810
Letter and other fine papers	548
Paper hangings	50
Music paper	3
Blotting paper	1
Emery paper	12
Pasteboard	1,151

The consumption of printing paper is of considerable importance, on account of the great number of papers printed in Constantinople. Paper made from wood pulp is coming into use, and Norway and Sweden furnish the most favourable prices—6·17 dols. to 6·56 dols. per 220·4 lb., f.o.b. Constantinople. Austria manufactures a superior article, which sells for 6·90 dols. to 7·71 dols. per 220·4 lb.

Wrapping paper is a very important article of import, and many qualities are handled. One variety, called patent paper, of a yellowish-brown colour, manufactured in Italy and in the Austrian Tyrol, is greatly in demand. The price is established at 4·63 dols. for 220·4 lb. Italy furnishes a strong wrapping paper, used in the retail trade; also a heavier paper called "carto-mano," the price of which varies from 5·40 dols. to 5·79 dols. A lighter and much better quality of wrapping paper comes from Venice, which costs 11·19 dols. to 11·58 dols. for 220·4 lb. Paper made from straw formerly came exclusively from France. It is now imported from other countries, especially Italy. The price is 3·86 dols. per 220·4 lb. Another wrapping paper called "wapenveld," is imported from Amsterdam and sells for 4·44 dols. per 220·4 lb. Coloured poster paper is sold in great quantities.

Wood and Paper Pulp in Maine (United States).

Foreign Office Annual Series, No. 2749.

There were 36 establishments engaged in the manufacture of paper and wood pulp, in 1900, with 4,851 wage-earners and products valued at 2,644,655*l*. In 1890, there were 17 establishments, with 1,509 wage-earners, and products valued at 656,210*l*. The increase in the value of products was 1,988,445*l*., or 303 per cent. Paper manufacture has been carried on in Maine in a small way since 1735, but it is only within recent years that it has attained importance. With the discovery of wood pulp as a material for paper manufacture, great changes were brought about. One of the pioneer pulp mill sin the State was erected at Brunswick, in 1870. Since that date, numerous and costly plants have been built for the manufacture of ground wood-, soda-, and sulphite-pulp. These mills are situated chiefly along the three principal rivers of the State, the Androscoggin, Kennebec, and Penobscot. Recently, immense plants have been constructed at Milliuoket, on the Penobscot waters, at Madison on the Kennebec River, and at Rumford Falls on the Androscoggin River. Spruce is used generally in the manufacture of wood pulp. A few mills use also small quantities of poplar, fir, pine, and hemlock, whilst three plants use poplar only.

XX.—FINE CHEMICALS, Etc.

New Intoxicating Drug in India.

Chem. and Druggist, March 29, 1902.

In the last Excise report of the Central Provinces of India, the Commissioner mentions the alleged substitution of juar-root for ganja in the Hoshangabad district. It appears that juar-root is used to enhance the intoxicating powers of bhang by the lower classes. This enables them to get the desired amount of intoxication a little more cheaply. Juar-root appears, however, to be very rarely used by itself, as it is too potent a narcotic to be used alone by any except the most hardened drug-smokers; but, like datura and other substances, it is used to strengthen ganja for the *bluse* smoker.

Poisons Ordinance in Ceylon.

Chem. and Druggist, March 29, 1903.

The following articles are declared in the Ceylon *Government Gazette*, of March 5, to be poisons within the meaning of the Ordinance:—

All poisonous vegetable alkaloids and their salts.
Atropine and its preparations.
Preparations of cantharides.
Preparations of metallic cyanides.
Preparations of strychnine.

All vermin-killers containing any of the above preparations, and those preparations mentioned in part I, clause 2, of the amended draft regulations.
Chloral hydrate and its preparations.
Corrosive sublimate preparations and all other mercury salts.
Nux vomica and its preparations.

XXII.—EXPLOSIVES, Etc.

Prohibited Importation of Phosphorus Matches into the Netherlands.

Bd. of Trade J., March 20, 1902.

According to a Supplement to the Dutch Tariff, which has recently been issued by the International Tariffs Bureau, the importation into the Netherlands of phosphorus matches, in quantities exceeding 100 grms. at a time, is prohibited by Law of the 28th May last. Such matches may, however, be imported in transit.

Match Imports of Colombia.

Foreign Office Annual Series, No. 2747.

Swedish and American wooden, and French, Belgian, and Italian wax matches have the largest sale. British wax matches were very popular before the war, for, though dearer than the Belgian, French, or Italian article, they are infinitely superior in quality. With the ruling high exchange, however, they cannot be sold.

Patent List.

N.B.—In these lists, "A] means "Application for Patent," and [S.], "Complete Specification Accepted."
Where a Complete Specification accompanies an Application, an asterisk is suffixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 6468. J. P. Bayly.—From D. A. Keizer, Canada. *See under* IX.
„ 6486. O. Thiel. *See under* X.
„ 6507. E. Edwards.—From H. Geppert, Germany. Absorption refrigerating apparatus. March 17.
„ 6544. H. Cruse. Apparatus for generating and superheating steam. March 18.
„ 6545. H. Cruse. Apparatus for heating feed water and superheating steam. March 18.
„ 6552. S. F. McKee and A. C. Browne. *See under* II.
„ 6606. B. C. White. Machines for moulding plastic or granular materials, or the like.* March 18.
„ 6672. J. Hughes. Gaseous fluid compressors. March 19.
„ 6682. J. Riekie. Steam superheaters. March 19.
„ 6736. F. Paul, jun., and A. F. Gundlach. *See under* II.
„ 6786. J. Ingleby. Continuously acting presses. March 20.
„ 6859. J. H. Pearce. *See under* IX.
„ 6864. A. L. Christenson. Partitions for centrifugal drums. March 20.
„ 6892. T. Kerrod. An improved cooling apparatus for use in connection with cold storage rooms and other chambers March 21.
„ 7069. J. W. Rollings. Apparatus for spraying or diffusing medicated and other liquids. March 22.
„ 7167. J. A. Larsen. Apparatus for determining the relative components of a compound fluid.* March 24.
[A.] 7278. V. Taboulevitch. New or improved process of vaporisation at high temperatures, and apparatus therefor.* March 25.
„ 7288. A. J. Boult.—From J. F. Hardy, United States. Safety filling devices for fluid reservoirs. March 25.
„ 7318. M. Marquardt and E. Höffner. Steam superheaters. March 26.
„ 7354. C. F. Zeller. Process of and contrivances for evaporating and drying various materials and substances. March 26.
„ 7365. Galloways, Ltd., and W. Bayliss. Steam superheaters or dryers.* March 26.
„ 7451. L. Rousseau. Crucibles.* March 27.
„ 7488. P. Blaubach. Moulds. March 27.
„ 7569. W. Berrenberg. Air-pumps. March 29.
„ 7636. M. J. Adams. Distributor for percolating filters. April 1.
„ 7662. W. L. Jameson. Steam separators.* April 1.
„ 7690. E. S. Arrighi. Thermometers. April 1.
„ 7745. M. K. Bamber and J. Roger. Improved method of filtering and separation of suspended solids from a fluid. April 2.
„ 7774. H. H. Lake.—From C. T. Lee, United States. Processes for reducing materials to pulp. April 2.
„ 8015. G. G. M. Hardingham.—From H. Johnson, Belgium Filter presses. April 5.
[C.S.] 5556 (1901). Brookes and Barnes. *See under* VIII.
„ 7339 (1901). Desaulles. *See under* XVI.
„ 9021 (1901). Crossman. Apparatus for spraying measured quantities of liquids into casks or other receptacles. April 3.
„ 9144 (1901). Honiball. Evaporating, condensing, and feed-water heating apparatus. April 3.
„ 9271 (1901). Bennett. Apparatus for roasting, drying, and similar purposes. April 9.
„ 9604 (1901). Noakes. Manufacture of metal drums, casks, and the like. April 9.
„ 9813 (1901). Clubbe and Southey. Steam generators and superheaters. April 3.
„ 11,070 (1901). Whitwell. Steam heating apparatus. April 9.
„ 12,447 (1901). Holland. Centrifugal machines. April 9.
„ 12,507 (1901). Reeves. *See under* XVII.
„ 24,610 (1901). Kindermann. Level indicators for non-transparent liquid containers, and especially applicable for lamp reservoirs. April 3.
„ 26,169 (1901). Lundquist and Kern. Nebulizers or spray producers. March 26.
„ 2074 (1902). McPhail. Apparatus for superheating or drying steam. March 26.
„ 2863 (1902). Jewell. Distilling apparatus. April 9.
„ 3228 (1902). Friesdorf. *See under* XII.
„ 3860 (1902). Baker. *See under* XII.

II.—FUEL GAS, and LIGHT.

[A.] 6454. F. A. Powell and E. Tournet. Carburettors. March 17.
„ 6504. M. Graetz. Petroleum and like burners. March 17.
„ 6525. A. J. F. Miller and C. P. Marshall. Furnaces.* March 17.
„ 6552. S. F. McKee and A. C. Browne. Liquid fuel apparatus for heating purposes. March 18.
„ 6610. C. Jeffery. Anti-vibration burners for incandescent gas lighting. March 18.
„ 6684. G. Hookham. Incandescent electric lamps. March 19.
„ 6712. A. Sharp.—From A. Charon, Canada. Process of preparing peat for fuel. March 19

[A.] 6713. A. Sharp. — From A. Charon, Canada. Machines for preparing peat for fuel. March 19.

„ 6725. H. H. Lake.—From Battistini Orengo and Co., Italy. Treatment of fuel for furnaces and the like.* March 19.

„ 6736. F. Paul, jun., and A. F. Gundlach. Collapsible tanks for gas-generating plants.* March 19.

„ 6787. A. H. Hoad. Hoad's combination oil furnace and blow-lamp. March 20.

„ 6826. D. W. Bishop. Acetylene gas generators.* March 20.

„ 6843. H. L. Bermann. Carburetting devices. Mar. 20.

„ 6858. D. W. Bishop. Acetylene gas generators.* March 20.

„ 6916. J. G. Forbes. *See under* X.

„ 6927. W. Tawlks. *See under* XVII.

„ 6974. L. Denayrouze. Incandescence lamps burning vapour of liquid hydrocarbons.* Filed March 21. Date applied for, Aug. 7, 1901, being date of application in France.

„ 7003. N. Cleminson, J. W. Butterworth, and A. Morrison. Incandescent electric lamps. March 22.

„ 7004. C. Musker, A. Musker, and W. G. Hay. Oil-burning. March 22.

„ 7034. L. Liais. Incandescence vapour lamps.* March 22.

„ 7136. J. B. Bessey. Improved process for the manufacture of peat-coal. March 24.

„ 7151. The British Thomson-Houston Co., Ltd.—From W. C. Fish, United States. Electric arc lamps.* March 24.

„ 7163. E. H. Power.—From J. D. Swensson, Russia. Apparatus for spraying liquid fuel.* March 24.

„ 7171. H. E. Kent and D. Campbell. Furnaces. March 24.

„ 7248. H. H. Lake.—From Pressgas Gesellschaft Mercur zu Berlin, G. m. b. H., Germany. Apparatus for the manufacture of carburetted air. March 25.

„ 7257. S. Cowper-Coles and The Cowper-Coles Inventions Development Co., Ltd. Manufacture of electric conductors for use as leading-in wires or strips in the manufacture of incandescent electric lamps, vacuum tubes, and the like. March 25.

„ 7260. H. J. Leeves-Johnson. Electric incandescent lamps, and means for connecting the same in electric circuits. March 25.

„ 7271. O. Wiederhold and G. E. Morse. Machine for saturating mantle material for incandescent gas lighting.* March 25.

„ 7285. H. Schünemann. Process and apparatus for gasifying spirit and liquid hydrocarbons.* March 25.

„ 7321. G. Hookham. Electric incandescent lamps. March 26.

„ 7340. H. E. Bottlewálla. Oil lamps. March 26.

„ 7364. P. F. Holmes, E. D. Holmes, and E. G. Cameron. Apparatus for washing and scrubbing gases. March 26.

„ 7368. H. A. Hoy. Motive fluid distributing apparatus for engines. March 26.

„ 7380. F. Proctor. Electric arc lamps. March 26.

„ 7383. P. Högner. Electric arc lamps.* March 26.

„ 7446. L. Kamm. Carburator. March 27.

„ 7471. G. Watson and F. L. Watson. Furnaces for forced draught, and ventilating apparatus to be used in connection therewith.* March 27.

„ 7475. G. Hookham. Electric incandescent lamps. March 27.

„ 7496. T. Clarkson. Burners for liquid hydrocarbon. March 27.

„ 7527. A. E. Tucker and C. Cory. Artificial fuel. March 29.

„ 7585. J. F. Wakelin. Improved method of utilising filaments which are of higher resistance when cold, for electric lighting. March 29.

[A.] 7588. C. Wegener. Furnaces. March 29.

„ 7594. J. Ledru. Acetylene gas generating plant.* March 29.

„ 7608. M. T. Sale and A. W. Onslow. Means for obtaining high pressure gas.* March 29.

„ 7613. J. S. Daniels and F. L. Daniels. Gas producers. March 29.

„ 7618. J. Law and T. Law. Machines for the production of acetylene gas. April 1.

„ 7620. C. Scouller. Hydrocarbon burners. April 1.

„ 7626. G. Parker. Improved arrangement of Siemens' furnace. April 1.

„ 7683. L. C. Graessle. Improved hydrocarbon burner. April 1.

„ 7809. H. S. Scott, H. F. Tyzack, and T. J. Wright. Improved electric arc lamp.* April 3.

„ 7826. T. S. C. Lowe. Manufacture of coke and apparatus employed therein.* April 3.

„ 7845. Husson's Safety Acetylene Syndicate, Ltd., and W. H. Weston. Acetylene generators. April 3.

„ 7884. S. G. Coulson. Manufacture of artificial fuel. April 4.

„ 7888. H. N. Leask. Destructors or furnaces for burning refuse or other materials. April 4.

„ 7925. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and E. L. Orde. Furnaces for the combustion of liquid fuel. April 4.

„ 7956. H. G. Hills. Manufacture of gas for illuminating, heating, power, or similar purposes. April 5.

„ 7968. J. Farmer and C. Stewart. Appliances for burning oil in steam boiler and other furnaces April 5.

„ 7971. W. G. Gibbins. Method of lighting incandescent burners. April 5.

„ 7996. J. Busĕk. Steam boilers heated by spirit or alcoholic vapours. April 5.

„ 8004. A. J. Boult.—From La Companie pour la Fabrication des Compteurs et Matérial d'Usines à Gaz, France. Gas reservoirs. April 5.

„ 8008. E. A. Wood. Incandescent gas lighting. April 5.

[C.S.] 4229 (1901). Clamond. Incandescence mantles. April 9.

„ 4302 (1901). MacKean. Apparatus for burning and seasoning incandescence mantles. April 9.

„ 5940 (1901). Taylor. Furnaces. April 3.

„ 6336 (1901). Cranston. Incandescence oil lamps. March 26.

„ 6357 (1901). Boult.—From Chavanon. Gas generators. April 3.

„ 6468 (1901). Schwarz. Process for coking badly caking coal, and mechanical appliance for same. April 3.

„ 6507 (1901). Jones. *See under* XVIII. B.

„ 6861 (1901). Lambourne and Wood. Acetylene generators. April 3.

„ 6895 (1901). Newton.—From O'Brien. Pipe-joint pouring apparatus, and combined hydrocarbon vaporiser, and burner therefor. April 9.

„ 6952 (1901). Janz. Apparatus for burning down incandescent light mantles. April 9.

„ 7821 (1901). Thompson. Furnaces where gas is used. April 9. Post-dated, May 25, 1901.

„ 7995 (1901). Terraneau. Atmospheric gas burners. April 3.

„ 9414 (1901). Whitworth. Furnaces of steam boilers. April 3.

„ 9437 (1901). Crosland. Application of gaseous fuel in kilns or ovens used for calcining lime, cements, gypsum, and other materials. April 3.

„ 9643 (1901). Hancock. Atmospheric burner for gas combustion. April 9.

[S.] 10,758 (1901). Ram and Nernst Electric Light, Ltd. Electric incandescent lamps, in which the glower or light-giving body is a conductor of the second class. March 26.

„ 11,135 (1901). Johnson. Electric arc lamps. Mar. 26.

„ 11,356 (1901). Milbourne. Gas purifiers. April 3.

„ 11,785 (1901). Lux. Incandescent gas burners. Apr. 3.

„ 19,261 (1901). Brandon. Oil stoves, tanks, and other vessels, oil lamps, such as table suspension lamps, applicable also to oil containers generally, and like purposes. April 3.

„ 20,906 (1901). Bloxam. — From Ganz and Co. Smoke-consuming apparatus for boiler furnaces. April 9.

„ 23,119 (1901). Bowman. Gas or vapour heating devices. April 9.

„ 24,610 (1901). Kindermann. *See under* I.

„ 24,974 (1901). Frenay. Carburetters for use in connection with explosion motors. March 26.

„ 26,169 (1901). Lundquist and Kern. *See under* I.

„ 26,337 (1901). Walther. Vapour lamps. March 26.

„ 26,707 (1901). Bonelli. Hydrocarbon burners. March 26.

„ 1039 (1902). Thompson.—From Philbrook. Lighting devices. April 9.

„ 2117 (1902). Kemp. Carburetters. April 3.

„ 2541 (1902). Borner. Appliances for preventing damage or breakage of incandescent gas mantles. April 3.

„ 2751 (1902). Harris. Manufacture of gas. April 3.

„ 3481 (1902). Collin and Nicholls. Carbide feed mechanism for acetylene gas machines. March 26.

„ 4353 (1902). Forbes. Manufacture of acetylene gas. April 3.

„ 4755 (1902). McOnat. Incandescent electric lamps. April 3.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 6972. H. McPhail. Distillation of mineral oils, and their distillates.* March 21.

„ 7119. C. A. Halse. *See under* VII.

„ 7319. F. G. Holmes. Apparatus for distilling tar, oil, and the like. March 26.

[S.] 6739 (1901). Gaster. Distillation or utilisation of tar, pitch, petroleum, and other hydrocarbon mixtures, and the extraction of carbon suitable for the manufacture of electrodes, calcium carbide, and other industrial products. April 9.

„ 11,082 (1901). Scott. Distillation of ammoniacal and other liquors, and apparatus therefor. April 9.

„ 2863 (1902). Jewell. *See under* I.

V.—COLOURING MATTERS AND DYESTUFFS.

[A.] 6615. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture of azo colouring matters, and intermediate products relating thereto. March 18.

„ 6616. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matter containing sulphur. March 18.

„ 6987. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matters containing sulphur. March 21.

„ 7153. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture of azo colouring matter, and colouring lakes therefrom. March 24.

„ 7387. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matters of the anthraquinone series. March 26.

[A.] 7822. A. G. Bloxam.—From Chem. Werke vorm. Dr. Heinrich Byk, Germany. Manufacture of sulphurised colouring matters. April 3.

„ 7849. H. H. Lake. — From Chem. Fabr. vorm. Sandoz, Switzerland. Manufacture of sulphur dyes. April 3.

„ 7871. I. Levinstein, H. Levinstein, and Levinstein, Ltd. Production of blue colouring matters containing sulphur. April 4.

[C.S.] 8636 (1901). Imray. — From Farbwerke, Höchst. Manufacture of directly dyeing sulphurised dyestuffs from 1 : 8-dinitronaphthalene. April 3.

„ 9694 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of colouring matters and intermediate products derived from methyl-anthraquinone. April 9.

„ 9999 (1901). Newton. — From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of anthracene derivatives. April 3.

„ 10,728 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of a brown colouring matter. March 26.

„ 10,886 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of colouring matters of the anthracene series and of intermediate products for use therein. April 3.

„ 11,163 (1901). Meyenberg, Lévy, and Clayton Aniline Co., Ltd. Manufacture and production of colouring matters containing sulphur. April 9.

„ 11,358 (1901). Willcox. — From Bad. Anilin und Soda Fabr. Manufacture and production of new halogenised bodies, new indigo colouring matters, and of indigo. April 9.

„ 12,021 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture of an amidophenol derivative and new intermediate products relating thereto. April 3.

„ 19,587 (1901). Imray. — From American By-Products Co. Manufacture of dyestuff from cotton-seeds. March 26.

„ 26,061 (1901). Imray.—From Farbwerke, Höchst. Manufacture of indoxyl and its homologues. Apr. 3.

„ 2722 (1902). Imray.—From Basle Chemical Works. Manufacture of green sulphurised dyestuffs. March 26.

„ 4551 (1902). Imray.—From Dye Works, formerly L. Durand, Huguenin, and Co. Manufacture of new leuco-gallocyanides. April 9.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES

[A.] 6455. P. M. Matthew. Calendering or friction-coating fabrics with rubber, and apparatus therefor. March 17.

„ 6499. O. Imray. — From Fabriques de Produits Chimiques de Thann et de Mulhouse, Germany. Improved process for printing with sulphurised colouring matters. March 17.

„ 6650. S. H. Sharp. Machinery or apparatus for producing patterns or designs on textile or felted fabrics. March 18.

„ 6664. H. H. Lake. — From J. W. Fries, United States. Machines for steaming, oxidising, drying, or otherwise treating yarn or textile material.* March 18.

„ 6873. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. March 20.

„ 6894. J. Dutton. Machinery for lustreing cut pile fabrics. March 21.

„ 7073. C. D. Abel.—From Act.-ges. für Anilinfabrikation, Germany. Process for dyeing and printing. March 22.

[A.] 7074. O. Imray.—From Farbwerke, Höchst, Germany. Improvement in the mordant process for dyeing Turkey red. March 22.

„ 7124. R. Brandts. Textile materials. March 24.

„ 7148. T. Eck and W. Becker. Machines for washing yarns.* March 24.

„ 7262. R. S. Carmichael, J. H. Carmichael, and F. R. Carmichael. Apparatus for making products or emulsions specially suitable for oiling and weighting or loading textile materials and fabrics. March 25.

„ 7386. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. March 26.

„ 7695. J. D. Morel. Machines for the treatment of textile material.* April 1.

„ 7703. H. A. Bentley. *See under* VI.

„ 7716. B. Cohnen. Process and apparatus for treating textile and other materials with liquids, and subsequently drying the same. April 2.

„ 7870. F. C. Theis. Method of and apparatus for bleaching textile piece goods. April 4.

[C.S.] 1017 (1901). Vogelsang. Electrolytic bleaching of cotton and other textile materials, and apparatus for use in connection therewith. April 3.

„ 8577 (1901). Dobson and Barlow, Ltd., and Rushton. Frames for gassing yarns and threads. April 3.

„ 8828 (1901). Gebauer. Apparatus for washing or bleaching or other treatment of fabrics or fibrous materials with liquids or lyes. March 26.

„ 19,555 (1901). Römer. Treatment of yarns with liquids, and apparatus therefor. April 3.

„ 26,115 (1901). Hindley, Walker, and Rose. Apparatus for dyeing, scouring, bleaching, and otherwise treating yarn in cop or other similar compact form. March 26.

„ 1106 (1902). Tyms. Bleaching keir with circulation valves. April 3.

„ 2301 (1902). Walsh. Apparatus for steaming, ageing, and drying fabrics. March 26.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 6698. J. S. Schmitz. Printed and painted wall-paper and the like.* March 19.

„ 7529. A. B. Carlisle. *See under* XIX.

„ 7703. H. A. Bentley. Preparation of paper and fabric to receive artists' colours, prints, and the like, to render paper and fabric transparent, and to treat transparent paper and fabric to facilitate removal of colours or ink without injury to the surface. April 2.

„ 7743. J. Funcke. Rotary machine for colour printing on both sides of the sheet. April 2.

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 6642. A. Vosmaer and A. Lebret. *See under* XVIII. B.

„ 6719. W. Trantom. Treatment or purification of brine and other saline solutions. March 19.

„ 7048. L. Kamm. Oxygen generators. March 22.

„ 7119. C. A. Halse. Carbonisation of wood or matter of a similar nature, sawdust, wood shavings, and the various kinds of cellulose, also lignite, straw, &c., &c., with the object of producing a substitute for animal charcoal. March 24.

„ 7309. D. Donnachie. Appliances for the manufacture of nitric acid.* March 26.

„ 7364. P. F. Holmes, E. D. Holmes, and E. G. Cameron. *See under* II.

„ 7463. O. Meurer. Improved process for obtaining sulphates from mattes. March 27.

„ 7505. G. W. Johnson. From Chem. Fabr. Griesheim-Elektron, Germany. *See under* X.

[A.] 7767. O. Haltenhoff. Apparatus for carbonising wood waste or similar material.* April 2.

„ 7842. F. B. Crossley. Treatment of spent iron pickling or cleaning liquors, or other solutions containing sulphate or chloride of iron, for obtaining sulphate or chloride of iron, or other useful products therefrom. April 3.

[C.S.] 7256 (1901). Electric Ozone Syndicate, Ltd., and Smith. *See under* XVIII. B.

„ 10,729 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of contact bodies for use in catalysis, especially intended for use in the catalytic process for the manufacture of sulphuric acid. April 3.

„ 10,825 (1901). McKerrow. Preparation of fullers' earth, silicates, and siliceous matters for use in the treatment of oils, fats, and greases. April 3.

„ 12,186 (1901). Johnson.—From Chemische Fabrik Griesheim-Elektron. Electrolytic production of lead dioxide. April 3.

„ 12,250 (1901). Johnson.—From Chem. Fabr. Griesheim-Elektron. Manufacture or production of chromium compounds or alkalis. April 3.

„ 24,684 (1901). Berry and J. B. Lawes and Co., Ltd. Method or process for the recovery, collection, and utilisation of waste carbonic acid gas given off in the manufacture of certain acids and acid salts. March 26.

„ 698 (1902). Ostwald. Manufacture of nitric oxide and nitrogen oxides. March 26.

„ 848 (1902). Sachse and Kaufmann. Brine evaporators. March 26.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 6495. P. H. Mellor and S. W. Hassall. Process of moulding clay or other earthenware. March 17.

„ 6663. R. Stanley, D. B. Bates, and R. H. Bates. Process and apparatus for applying glazes, enamels, or bodying material to bricks, tiles, and other like goods. March 18.

„ 6774. H. W. Woodfield and W. Harmer. Apparatus for the manufacture of glass bottles, jars, phials and the like. March 20.

„ 6910. C. H. Ridsdale. *See under* X.

„ 7413. W. Illingworth. Machine or device to assist in pressing articles of pottery, either china, earthenware, or other bodies used in the making of pottery ware. March 27.

„ 7682. W. de P. Keyes. Manufacture of plate glass. April 1.

„ 7696. P. Aigner. Ceramic vessels. April 1.

„ 7930. W. W. Pilkington. Manufacture of sheet glass or glass cylinders. April 4.

[C.S.] 5556 (1901). Brookes and Barnes. Kilns for drying bricks, tiles, pipes, seggers, and other earthenware. March 26.

„ 7178 (1901). Hughes. *See under* IX.

„ 24,629 (1901). Stevens. Compound or composition to be used as a backing for opal facing tiles or other articles of glass. April 9.

„ 1429 (1902). Boult.—From Weber and Rauschenbach. Method of and apparatus for drying earthenware articles. March 26.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 6468. J. P. Bayly.—From D. A. Keizer, Canada. Brick making and moulding machines. March 17.

„ 6495. P. H. Mellor and S. W. Hassall. *See under* VIII.

„ 6601. D. F. Cooksey. Bricks, tiles, and terra-cotta and apparatus for making same. March 18.

„ 6606. B. C. White. *See under* I.

[A.] 6663. R. Stanley, D. B. Bates, and R. H. Bates. *See under* VIII.

„ 6844. A. J. Bonit.—From Hülsberg and Co., Germany. Impregnation of wood and other porous materials.* March 20.

„ 6859. J. H. Pearce. Machines for mixing plastic compositions.* Filed March 20. Date applied for Oct. 10, 1901, being date of application in United States.

„ 7110. C. R. Gostling. Improved method for the production of Portland cement from chalk and clay, and in conjunction with the rotary kiln process, or any other kind of kiln for burning cement. March 24.

„ 7165. W. R. Ormandy. Manufacture of bricks or artificial stone made from a mixture of a siliceous material and lime. March 24.

„ 7181. A. Picha. Paving tiles. March 24.

„ 7219. T. Kendrick. Manufacture of artificial stone. March 25.

„ 7232. J. P. B. Fiske. Kilns, or means or apparatus for facilitating the drying of bricks and the like.* March 25.

„ 7381. H. Warrington and H. J. Warrington. Treatment of fireclay for use in the manufacture of fireproof goods, such as potters' saggars, fire-bricks, crucibles, and the like. March 26.

„ 7436. C. E. Challis. Materials and apparatus for precipitating lime. March 27.

„ 7541. J. H. Pickles. Bricks and other building materials. March 29.

„ 7550. C. Marson. Improved material and method for and of building construction. March 29.

„ 7647. J. C. Sellars. Manufacture of building blocks, bricks, and other articles. April 1.

„ 7694. J. R. Horton. Kilns or apparatus for calcining purposes. April 1.

„ 7759. E. Kreft. Presses for the manufacture of artificial stones, tiles, and the like.* April 2.

„ 7796. E. P. Hooley. Means for and method of tarring broken slag, macadam, and other similar materials. April 3.

„ 7836. W. Schultness. Processes for colouring building materials, such as lime, mortar, bricks, and artificial stone. April 3.

„ 7891. C. Pryce. Brick presses. April 4.

„ 7906. W. Ratcliffe. Bricks, cornices, mouldings, and the like, employed in the construction of buildings and similar places. April 4.

S.] 6982 (1901). Morton and Bradshaw. Apparatus for removing or recovering fusible matter from stones, blocks, and other matter to which it is adhering. March 26.

, 7178 (1901). Hughes. Kilns for burning bricks, tiles, and pottery. April 9.

, 9437 (1901). Crosland. *See under* II.

, 9892 (1901). Carter. Manufacture of artificial stone. April 9.

, 24,683 (1901). Berry and J. B. Lawes and Co., Ltd. Cements or plasters, and manufacture of bricks, tiles, slabs, artificial stone, electric insulating compositions, and the like. March 26.

3426 (1902). Brookes.—From Fiske. Brick and such like kilns. April 9.

3657 (1902). Cummings. Insulated electrical conductors. April 3.

X.—METALLURGY.

] 6486. O. Thiel. Ore hearths and reverberatory furnaces.* March 17.

6622. B. Deby. Hardening, tempering, or toughening iron and steel. March 18.

[A.] 6727. W. Jonkoffsky and P. de Strowe. Treatment of iron or steel.* March 19.

„ 6728. L. V. Pratis. Manufacture of steel. March 19.

„ 6752. V. Bermont. An improved industrial process for the direct extraction of zinc. March 19.

„ 6888. F. H. Keane and T. Maxwell. Method of manufacturing chilled castings in iron or steel. March 21.

„ 6903. D. Matthews. Treatment of copper and other ores. March 21.

„ 6910. C. H. Ridsdale. Heating of metallic and other bodies for annealing and like purposes. March 21.

„ 6916. J. G. Forbes. Furnace for smelting scrap or other metals; for reducing metals from their ores into a condition of practical purity; and for casting metals into a malleable state. March 21.

„ 6951. C. Jousset and W. R. McKay. *See under* XIII. A.

„ 6955. J. Ornstein. Extraction of gold from seawater. March 21.

„ 6969. W. P. Thompson.—From O. Nicolai and F. Börner, Germany. Solders, especially applicable for soldering aluminium and aluminium alloys.* March 21.

„ 7037. J. M. K. Letson and F. W. Burpee. Soldering machine.* March 22.

„ 7091. A. D. Pennellier. Manufacture of wire from rolled gold plate, gold, or other metals. March 22.

„ 7213. J. F. Crowley and W. H. Hatfield. Production of mottled or white iron, in pigs or castings. March 25.

„ 7229. P. Müller. Process for the manufacture of crucible cast steel.* March 25.

„ 7255. H. H. Lake.—From Duisburger Maschinenbau Akt.-ges. vorm. Bechem and Keetman, Germany. Improved method of welding. March 25.

„ 7256. Sherard Cowper-Coles and The Cowper-Coles Inventions Development Co., Ltd. Improved process for nickel plating iron and steel. March 25.

„ 7352. R. W. Wallace. Manufacture of iron, steel, nickel, and the like. March 26.

„ 7395. W. Hutchinson, jun. Manufacture of ingot iron and steel. March 27.

„ 7463. O. Meurer. *See under* VII.

„ 7505. G. W. Johnson.—From Chem. Fabr. Griesheim-Elektron, Germany. Manufacture of the metals of the alkalis. March 27.

„ 7535. C. H. Berry and W. T. Hill. Improved self-lubricating alloy or anti-friction metal. March 29.

„ 7584. F. Irvine. Improved means of extracting metals from their ores. March 29.

„ 7626. G. Parker. *See under* II.

„ 7660. H. H. Lake.—From Electric Furnace Co., United States. Manufacture of steel.* April 1.

„ 7671. H. B. Atha. Process of preparing sand moulds for steel castings.* Filed April 1. Date applied for, July 10, 1901, being date of application in United States.

„ 7672. H. B. Atha. Process of preparing sand moulds for steel castings.* April 1.

„ 7701. A. Gutensohn. Improved process of recovering metals from their solutions or salts. April 2.

„ 7778. A. B. Hadfield. Treatment of steel. April 2.

„ 7799. W. Hutchinson., jun. Manufacture of ingot iron and steel. April 3.

„ 7841. J. Penhale. Separation of gold from slimes, and apparatus therefor. April 3.

[C.S.] 5846 (1901). Hatton. Manufacture of iron and steel. March 26.

„ 8208 (1901). Scott. Casting in chills of iron or steel articles. April 9.

[C.S.] 8511 (1901). Ulmann and Schlag. Method of soldering or joining together aluminium and other metals or substances, and material therefor. March 26.

„ 10,865 (1901). Lones, Holden, and Lones. *See under* XIII. A.

„ 12,308 (1901). Van der Ploeg. Method of extracting antimony from ores or residues. April 3.

„ 13,864 (1901). Bloxam. From La Compagnie des Forges de Chatillon, Commentry, and Neuves Maisons, and Charpy. Manufacture of armour plates. April 9.

„ 15,471 (1901). Breedon. Method, with apparatus therefor, for treating kaolin slimes, saponaceous earthy matter, and the like, preparatory to the extraction, by either amalgamation, chlorination, leaching, or such like processes, of the precious metals contained therein. March 26.

„ 21,176 (1901). Lake. — From Hawley Down-Draft Furnace Co. Method of and apparatus for melting and treating metals. March 26.

„ 21,481 (1901). Meininghaus. Process of making iron and steel, and apparatus used therein. April 9.

„ 2231 (1902). Clarke. Manufacture of crucible steel. March 26.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 6478. H. C. Porter. Storage batteries.* March 17.

„ 7039. S. Z. de Ferranti. Electric fuses. March 22.

„ 7125. P. K. Stern. Improved electrical ozonising and circuit-breaking apparatus. March 24.

„ 7169. C. A. Allison.—From W. C. Banks, United States. Battery.* March 24.

„ 7661. A. G. Betts. Electrolytic refining of lead and lead alloys.* April 1.

„ 7670. R. Wichand. Means for generating electricity.* April 1.

„ 7773. A. Nodon and J. Piettre. Improved process of oxidation by means of electric currents. April 2.

„ 7851. H. H. Lake.—From L. D. Giroux and L. E. Seddon. United States. *See under* XVIII. A.

„ 7858. M. Kronchkoll. Electric-vacuum discharge tubes.* April 3.

„ 7864. H. Korten. Secondary batteries. April 3.

„ 7921. A. Nodon. Electrolytic condensers. April 4.

„ 7923. E. Goldberg. Electrolytically coating iron with zinc. April 4.

„ 7995. P. Jensen. From Dr. G. Langhein and Co., Germany. Production of metallic deposits by electrolysis.* April 5.

„ 8011. G. Schauli and D. Loewenstein. Improved galvanic dry cell. April 5.

[C.S.] 4017 (1901). Vogelsang. *See under* V.

„ 4489 (1901). Vogelsang. Electrolytic cells, and electrodes therefor. April 9.

„ 6352 (1901). Drake and Gorham. Electric accumulators. April 3.

„ 6723 (1901). Pescatore and Tutor Accumulator Co., Ltd. Means for applying the active materials to the plates of secondary batteries. April 3.

„ 6780 (1901). Hirst and Bevis. Vessels for use with electric liquid resistances or other electrolytic solutions. April 9.

„ 10,879 (1901). Dickson. Voltaic cells. April 3.

„ 12,186 (1901). Johnson. — From Chem. Fabr. Griesheim-Elektron. *See under* VII.

„ 118 (1902). D'Andrimont. Anodes for electrolytic operations. March 26.

„ 1521 (1902). Apple. Storage batteries. April 3.

XII.—FATS, OILS, AND SOAP.

[A.] 6634. J. McFarlane and D. C. Reinohl. Process of extracting oil from cotton-seed.* March 18.

„ 7262. R. S. Carmichael, J. H. Carmichael, and F. R. Carmichael. *See under* V.

„ 7319. F. G. Holmes. *See under* III.

[C.S.] 9392 (1901). Clarkson. Separation of oil. April 3.

„ 9569 (1901). McDougall. Apparatus for extracting grease and oil from exhaust steam. April 3.

„ 10,825 (1901). McKerrow. *See under* VII.

„ 11,155 (1901). Scott. Melting tallow and like fat bodies. April 9.

„ 12,825 (1901). Roger. Tubes or casings for containing soap, paste, and similar plastic substances. April 9.

„ 13,135 (1901). Thompson. — From Maschinenbau Act.-ges. vorm. Beck and Henkel. *See under* XV.

„ 3228 (1902). Friesdorf. Oil and water separators for steam. April 3.

„ 3860 (1902). Baker. Apparatus for separating oil or water from steam. April 9.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 6951. C. Jousset and W. R. McKay. Application of any kind of metallic bronzes. March 21.

[C.S.] 10,659 (1901). Walker, Freestone, and Freestone. Metal keg or drum for holding paints and analogous substances. April 9.

„ 10,865 (1901). Lones, Holden, and Lones. Processes or combination of processes for the manufacture of a white pigment from zinc, and for utilizing residual products obtained during the conducting of the said processes or combination of processes. March 26.

B.—Resins, Varnishes.

[A.] 6714. G. F. Priestley. Means for coating or impregnating boxes, cisterns, and the like with resin, pitch, bitumen, and similar insulating compositions. March 19.

C.—India-rubber, &c.

[A.] 7917. J. T. Dickey. Method of and apparatus for covering flexible conduit with rubber in cement or liquid form or other similar elastic liquids.* April 4.

[C.S.] 8437 (1901). Claremont. Manufacture of vulcanised electric cables. April 3.

„ 11,149 (1901). Heyl-Dia. Desulphurising vulcanised rubber. April 3.

„ 347 (1902). Campbell. Dental vulcanisers. April 3.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 7088. L. Lederer. Manufacture of artificial horn and similar substances. March 22.

„ 7469. A. Billaud. Apparatus for depilating skins and furs. March 27.

[C.S.] 25,071 (1901). Jeffery. Apparatus for melting and applying marine glue and other convenient substances. April 9.

XV.—MANURES, Etc.

[C.S.] 6507 (1901). Jones. *See under* XVIII. B.

„ 8483 (1901). Delattre. Process for treating fish and fish refuse, and apparatus therefor. March 26.

[C.S.] 13,135 (1901). Thompson.—From Maschinenbau Act.-ges. vorm. Beck and Henkel. Process for obtaining fatty and fertilising substances from fecal substances. April 3.

„ 23,143 (1901). Cartter. Apparatus for sterilising soil fertilisers and the like. March 26.

XVI.—SUGAR, STARCH, AND GUM, ETC

[A.] 6738. G. Charles. A new or improved agglutinant composition. March 19.

„ 7436. C. E. Challis. *See under* IX.

„ 7564. H. Vaupel. *See under* XVIII. A.

„ 7693. J. Koštálek. Filters for sugar juices and other liquids.* April 1.

[C.S.] 23,415 (1900). Thompson.—From Geerligs and Hamakers. Process of extracting sugar from beetroot, sugar-cane, sorghum, and other plants. April 3.

„ 7339 (1901). Desaulles. Separation of liquids from solid matters, especially applicable in sugar manufacture. March 26.

„ 8086 (1901). Schwerin. Extraction of sugar. Mar. 26.

„ 25,695 (1901). Manoury and Naudet. Treatment of bagasse. Filed April 3. Date applied for under International Convention, June 1, 1901.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 6796. M. Weyermann. Process for producing tasteless, roasted malt decoctions.* March 20.

„ 6927. W. Tawlks. Kiln furnace for malt drying. March 21.

„ 7028. R. Anderson. Process for treating water, to render it suitable for brewing purposes. March 22.

„ 7168. H. C. Russell. Apparatus for washing and cleansing casks, barrels, and the like vessels. March 24.

„ 8000. E. De Meulemeester. Method of and means for rapidly and completely extracting saccharification worts in brewing. April 5.

[C.S.] 9752 (1901). Rouser apparatus for brewers' vats. April 3.

„ 11,035 (1901). Hancock. Method of obtaining diastase and preparing it for use. April 3.

„ 12,507 (1901). Reeves. Thermometers for the use of brewers and others. April 9.

„ 391 (1902). Duffy. Method for refining, ageing, mellowing, and purifying malt and spirituous wines and liquors. March 26.

„ 392 (1902). Duffy. Apparatus for refining, ageing, mellowing, and purifying malt and spirituous wines and liquors. March 26.

„ 2863 (1902). Jewell. *See under* I.

„ 5105 (1902). Knox, Ranger, and Thornley. Apparatus for use in brewing and distilling with unmalted or imperfectly malted grain. April 9.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 6549. A. H. Jones. "Visvitæ" food. March 18.

„ 7054. S. D. Rowland and W. Defries. Methods and apparatus for the concentration of animal and vegetable organs and tissues, and in the preparation of fine precipitates March 22.

„ 7066. A. Grünfeld. Improved substitute for coffee extract, and process for making same. March 22.

„ 7425. A. B. Graham, jun. Apparatus for pasteurising and sterilising milk and other liquids. March 27.

„ 7431. J. W. Bain and C. Hannay. Preservation of fruits, vegetables, and the like.* March 27.

[A.] 7473. C. Beale. Method of and appliances for the preservation of food and other perishable matters. March 27.

„ 7564. H. Vaupel. Improved process and apparatus for the manufacture of molasses food.* March 29.

„ 7744. J. Roger and M. K. Bamber. Producing a pure soluble extract of tea.* April 2.

„ 7851. H. H. Lake.—From L. D. Giroux and L. E. Seddon, United States. Electrical sterilising and preserving apparatus.* April 3.

„ 7919. M. Woolf. New concentrated article of food. April 4.

[C.S.] 6792 (1901). Rawson. Apparatus for sterilising liquids. April 3.

„ 6882 (1901). Stack. Treating milk at dairies, and apparatus therefor. April 9.

„ 9653 (1901). Manasse. Process for preserving foods. March 26.

„ 11,328 (1901). Mayer. Process for the production of tea-extract. April 3.

„ 1788 (1902). Von Rom. Preserving of meat. April 9.

„ 4512 (1902). Schmitz. Composition of matter to be used for coating yeast and other articles of food. April 3.

B.—Sanitation; Water Purification.

[A.] 6642. A. Vosmaer and A. Lebret Ozonisers. Mar. 18.

„ 6827. H. W. Hemingway. An improved insecticide, germicide, or fungicide. March 20.

„ 7048. L. Kamm. *See under* VII.

„ 7238. E. R. Candy. Tanks and apparatus for effecting the purification of sewage and other polluted liquids, and in the method of manufacture of substances for use in connection therewith. March 25.

„ 7436. C. F. Challis. *See under* IX.

„ 7470. J. C. Thresh. Disinfection of clothing or other articles. March 27.

„ 7495. G. S. Baker. Refuse destructors and the like. March 27.

„ 7635. M. J. Adams. Improved fittings for so-called septic tanks. April 1.

„ 7786. J. Anstee. Measuring wheel for sewage and other liquids. April 3.

[C.S.] 149 (1901). Scott. Treatment of condensed water for boiler supply. April 9.

„ 6507 (1901). Jones. Treating house-dust, garbage, and other refuse for the purpose of converting them into fuel, artificial manure, and other products. April 3.

„ 6754 (1901). Tippetts. Apparatus for obtaining a uniform flow of water from reservoirs, sewers, and the like. April 9.

„ 7256 (1901). Electric Ozone Syndicate, Ltd., and Smith. Ozonisers. March 26.

„ 9201 (1901). Harris. Apparatus for the treatment or purification of feed water. March 26.

„ 15,992. Bernardi. Apparatus for washing and sterilising linen and the like. April 9.

„ 23,143 (1901). Cartter. *See under* XV.

„ 1819 (1902). Goodridge. Non-septic purification and utilisation of sewage from country mansions and large houses. April 3.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 6746. A. Mabille and G. Leclerc. Process for rendering celluloid incombustible.* March 19.

„ 7089. H. H. Lake.—From C. S. Bird, United States. Manufacture of sheets of paper for making tubes.* March 22.

„ 7140. J. S. Hughes. Wood pulp presses.* Filed March 24. Date applied for July 3, 1901, being date of application in United States.

[A.] 7141. J. S. Hughes. Improved process of forming wood-pulp into sheets.* Filed March 24. Date applied for July 3, 1901, being date of application in United States.

„ 7388. A. Marx. New product formed from cellulose for the manufacture of combs or similar appliances. March 26.

„ 7529. A. B. Carlisle. Improved grounding-machine for enamelling papers. March 29.

„ 7700. L. Lebateux. Coated papers, and method of preparing the same. April 1.

[C.S.] 25,978 (1901). Tobelmann. Treatment of coated paper. April 3.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 7054. S. D. Rowland and W. Defries. *See under* XVIII. A.

„ 7744. J. Roger and M. K. Bamber. *See under* XVIII. A.

„ 7993. H. E. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of a new pharmaceutical compound. April 5.

[C.S.] 11,165 (1901). Weyl. Manufacture of compounds of fatty acids and their derivatives with ozone. April 3.

„ 11,191 (1901). Shakespear and Hincks. Medical solutions or dressings. April 3.

„ 11,328 (1901). Mayer. *See under* XVIII. A.

„ 12,021 (1901). Johnson.—From Bad. Anilin und Soda Fabr. *See under* IV.

„ 26,061 (1901). Imray.—From Farbwerke, Höchst. *See under* IV.

XXI.—PHOTOGRAPHY.

[A.] 7684. A. J. Bonella, D. H. Bonella and Son, Ltd., E. E. B. Bryant, C. H. Bryant, and E. W. Bryant. Improved electric arc light mechanism, applicable for rapid exposure photography. April 1.

[A.] 7835. H. Trant. Apparatus for producing light for photographic and like purposes. April 3.

[C.S.] 8457 (1901). Lehmann and Schönhals. Photolithographic and like transfer processes. April 9.

„ 26,386 (1901). Iltz. Baths for photographic purposes. March 26.

„ 3023 (1902). Ludwig. Process for developing photographic plates and the like in open daylight. April 3.

XXII.—EXPLOSIVES, MATCHES, ETC.

[A.] 6925. T. F. Durham. Safety blasting cartridges. March 21.

„ 7033. T. Nichol and W. H. Nichol. Cartridge loading machines.* March 22.

„ 7157. E. W. Bovce. Improved means for igniting matches.* Date applied for, March 23, 1901, being date of application in United States.

„ 7253. H. J. F. Crosby. Fog signals. March 25.

„ 7302. A. Brock. A new explosive. March 25.

„ 7986. A. Reichwald.—From F. Krupp, Germany. Percussion fuses for exploding shells. April 5.

[C.S.] 6159 (1901). Kisanow. Blasting cartridges. April 3.

„ 7148 (1901). Bielefeldt. Detonating or priming compositions for explosives. April 9.

„ 12,172 (1901). Reichwald.—From F. Krupp. Percussion fuses for exploding shells. April 3.

„ 25,233 (1901). Bate. Explosive mixtures or compounds for blasting purposes, for use in safety cartridges and other ways. April 3.

„ 26,456 (1901). Czerweny. Match-making machines. April 9.

„ 3238 (1902). Hess. Method for the treatment and use of detonating compositions. March 26.

„ 3951 (1902). Lake.—From Aktieselskabet "Progress." Manufacture of wooden matches. March 26.

Printed and Published by EYRE and SPOTTISWOODE, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 1464.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 8.—Vol. XXI. **APRIL 30, 1902.** No. 8.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902

President: Ivan Levinstein.

Vice-Presidents:

George Beilby.
C. Forbes Carpenter.
Dr. John Clark.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Dr. Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

C. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

CANADIAN.

Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.

C. Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.

Otto Hehner. | A. R. Ling.

MANCHESTER.

Dr. J. Grossmann. | J. Carter Bell.

NEWCASTLE.

W. L. Rennoldson. | F. C. Garrett.

NEW YORK.

Clifford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.

L. Archbutt. | J. T. Wood.

SCOTTISH.

Sir Robert Pullar. | Dr. Thos. Gray.

YORKSHIRE.

George Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.
L. Archbutt ..... I., XII., XVIII.B.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. .... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw .... VII., XI.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. .. IV., XX.
F. H. Leeds .. III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .. XXII.
W. G. McMillan X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. .... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ... IV., V.
F. Nourath, Ph.D. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak .... Patent List.
T. H. Pope ..... XX., XXI.
F. W. Renant ..... Index.
G. H. Robertson ..... XI.
Chas. Salter ..... I., II., III., XV., XVI.
M. J. Salter ..... XIII.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. XI
A. Shonk ..... Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
A. L. Stern, D.Sc. ..... XVII.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. ... XVI.
E. W. Wheelwright, Ph.D. ..... XXII.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.
A. C. Wright, B.Sc., M.A. ... IV., XVIII., XX.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.	Thos. Heys.
J. H. Bowman.	Edgar B. Kenrick.
Hugo Carlsson.	Thos. MacFarlane.
F. H. Clergue.	F. J. Smale.
W. Hodgson Ellis.	J. M. Sparrow.
M. C. Ellis.	Thos. L. Willson.
W. L. Goodwin.	

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.

Committee:

Percy Bateson.	*Herbert E. Davies.*
J. Campbell Brown.	*D. Herman*
A. Carey.	Julius Raschen.
Eustace Carey.	*F. H. Tate.*
G. C. Clayton.	*W. Collingwood Williams.*
Jas. T. Conroy.	

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

The following take office in July next:—*Chairman:* F. H. Tate. *Vice-Chairman:* C. Longuet Higgins. *Committee:* Max Muspratt, Alf. Smetham, H. B. Stocks, J. W. Towers

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.

Committee:

J. J. Bowley.	*B. E. R. Newlands.*
A. C. Chapman.	*Boverton Redwood.*
E. Divers.	Walter F. Reid.
H. Hemingway.	F. Napier Sutton.
E. Grant Hooper.	L. T. Thorne.
D. Lloyd Howard.	C. T. Tyrer.
W. Kellner.	Frank Wilson.
J. Lewkowitsch.	

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

The following take office in July next:—*Chairman:* Walter F. Reid. *Committee:* Julian L. Baker, M. O. Forster, Oscar Guttmann, A. Gordon Salamon, W. S. Squire.

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.

Committee:

J. Barnes.	*W. Irwin.*
W. Brown.	*M. J. Langdon.*
J. Craven.	*A. K. Miller.*
B. W. Gerland.	H. Porter.
W. Hevs.	T. Stenhouse.
J. M. Irving.	H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

The following take office in July next:—*Chairman:* Ivan Levinstein. *Vice-Chairman:* W. H. Bailey. *Committee:* J. Allan, R. Clayton, J. Hübner, H. Levinstein, W. J. Pope.

Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.	*H. S. Pattinson.*
P. P. Bedson.	John Pattinson.
J. T. Dunn.	W. W. Proctor.
T. W. Hogg.	*G. Sisson.*
H. Louis.	Harry Smith.
F. S. Newall.	J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

The following take office in July next:—*Committee:* H. S. Collins, J. Mather, C. E. Stuart.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.

Committee:

H. C. Aspinwall.	R. W. Moore.
M. T. Bogert.	T. J. Parker.
C. F. Chandler.	R. C. Schüpphaus.
A. P. Hallock.	M. Toch.
J. Hartford.	G. N. Williamson.
E. J. Loderle.	D. Woodmau.
E. G. Love.	

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.

Committee:

S. F. Burford.	A. L. Stern.
F. J. R. Carulla.	*J. J. Sudborough.*
R. M. Caven.	S. Trotman.
H. B. Mayfield.	G. J. Ward.
J. O'Sullivan.	J. White.
J. M. C. Paton.	

Hon. Treasurer: S. J. Pentecost
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

The following takes office in July next:—*Committee:* Loxley Meggitt.

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.

Committee:

W. Carrick Anderson	*W. Foulis.*
E. M. Bailey.	D. S. Jerdan.
G. T. Beilby.	A. D. Ker.
H. Bumby.	J. G. F. Lowson.
J. Christie.	W. Ivison Macadam.
W. J. Chrystal.	J. McCulloch.
D. B. Dott.	*T. L. Patterson.*
C. J. Ellis.	*D. J. Playfair.*

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hopo Street, Glasgow.

The following take office in July next:—*Chairman:* T. L. Patterson. *Vice-Chairman:* D. J. Playfair. *Committee:* Thos. Ewan W. Frew, Jas. Hendrick, Jas. Hope, H. Ingle, W. G. Johnston.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Fairley.

Committee:

E. A. Brotherton.	S. G. Rawson.
A. W. Cooke.	A. Smithells.
W. M. Gardner.	A. Turnbull.
H. Grandage.	H. A. Watson.
Edw. Halliwell.	Thorp Whitaker.
A. J. Murphy.	J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

N.B.—The names in *italics* are those of members of Committee who retire from their respective offices at the end of the current session.

Notices.

ANNUAL GENERAL MEETING, LIVERPOOL, 1902.

PROVISIONAL PROGRAMME.

Wednesday, July 9th.

10.30 a.m. Council Meeting, at University College.

11.0 a.m. General Meeting, at University College.

1.30 p.m. Luncheon, at the Adelphi Hotel, by invitation of the Liverpool Section. Ladies accompanying members are invited.

3.0 p.m. Garden Party, at Seaforth Hall, by invitation of E. K. Muspratt, Esq., J.P.

8.0 p.m. to 10.0 p.m. Reception at the Town Hall, by the Lord Mayor of Liverpool.

Thursday, July 10th.

Whole Day Excursions :—

(1) Works of the Telegraph Manufacturing Co., Ltd., at Helsby. Luncheon, by invitation of the Directors of the Company. Afternoon Tea, by invitation of G. Crosland Taylor, Esq.

(2) Excursion to Prescot :—

Morning—Works of the British Insulated Wire Company. Luncheon, by invitation of the Directors of the Company.

Afternoon—Works of the Lancashire Watch Company.

Half-Day Excursions :—

Morning—

(1) Visit to Port Sunlight Village and the Works of Messrs. Lever Brothers. Luncheon, by invitation of Messrs. Lever Brothers. Ladies are invited to join this excursion.

(2) Works of the United Alkali Co., Ltd., at Widnes. Luncheon by invitation of the Mayor of Widnes (W. W. Gossage, Esq., J.P.) and Directors of the United Alkali Company. It is hoped that it will be possible to convey members on this excursion by motor cars.

(3) Messrs. Ogden's Tobacco Factory and the Tobacco Warehouses of the Mersey Docks and Harbour Board.

Afternoon—

(1) Works of the Diamond Match Co. at Seaforth.

(2) Liverpool Corporation Electric Power Stations.

7.30 p.m. Annual Dinner at the Adelphi Hotel.

Friday, July 11th.

Whole Day Excursion to Llandudno and Beaumaris by Saloon Steamer "St. Elvies."

9 p.m. Smoking Concert at the Reform Club.

A detailed programme, with request forms for tickets, will be issued with the Journal of May 31.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are placed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Ivan Levinstein has been nominated to the office of President for a second year, under Rule 10; Mr. E. Grant Hooper, Dr. F. B. Power, Prof. Wm. Ramsay, F.R.S., and Mr. Thos. Tyrer have been nominated Vice-Presidents under Rule 8; and Dr. John Clark has been nominated a Vice-President under Rule 24.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Members are hereby invited to nominate fit and proper persons to fill four vacancies among the Ordinary Members of Council. Forms for this purpose can be obtained, on application, from the General Secretary, or from the Hon. Local Secretaries of the Canadian and New York Sections.

Extract from Rule 18 :—"No such nomination shall be valid unless it be signed by at least ten Members of the Society who are not in arrear with their subscriptions, nor unless it be received by the General Secretary, at the Society's Office, at least one month before the date of the Annual General Meeting, to the election to take place at which it refers. Nor shall any such nomination be valid if the person nominated be ineligible for election under Rules 12 or 15. No member shall sign more than one nomination form."

THE CORONATION.

The Society will be glad if any Members not resident in Great Britain will intimate to the General Secretary at the earliest possible date if they intend to be in London at the time of the Coronation.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
.....
And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
Signature of Candidate.....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....
Profession or Business Occupation .....
Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each

year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have now submitted their report, prescribing a method for dealing with the various substances which might contain Arsenic, and the report has been accepted by the Council.

Copies of this, together with the papers, discussions, and abstracts which appeared in the Journal in 1901, and other extracts, may be obtained from Messrs. Eyre and Spottiswoode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

List of Members Elected

23rd APRIL 1902.

Alden, Frederick, 311, 17th Street, Milwaukee, Wis., U.S.A., Chemist.

Bell, Edwin L., Vidal Dyes Syndicate, Ltd., West Ferry Road, Millwall, E., Manager.

Conner, Robert Shirley, Laboratory, B. & O. R. R., 21st and Water Streets, Wheeling, W. Va., U.S.A., Chemist.

Cook, Arthur James, 167, Richmond Road, Hackney, N.E., Chemist.

Croasdale, Dr. Stuart, 1574, York Street, Denver, Colo., U.S.A., Mining Engineer and Metallurgist.

Fraser, R. A., c/o Fraser and Co., Bootle, Liverpool, Fellmonger.

Hampson, B. A., "Hampson's Buildings," Smith Street, Durban, Natal, South Africa, Assayer and Geologist.

Harrison, C. Leland, c/o Harrison Brothers and Co., Inc., 35th and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

Hill, Wm. G. H., jun., American Rubber Co., Cambridgeport, Mass., U.S.A., Chemist.

Holton, Alfred L., 385, Bradford Road, Manchester, Chemist.

Hudson, C. Edward, c/o E. G. Jepson and Co., Albion Walk Chambers, Leeds, Drysalter.

Johnson, Emil F., 96-98, Maiden Lane, New York City, U.S.A., Consulting Chemist.

Jollyman, Walter H., Spartan House, Colney Hatch Lane, Muswell Hill, N., Analyst to Laboratory of Clinical Pathology.

Knudsen, Hans, 29A, Gillingham Street, London, S.W., Inventor.

Laugmuir, F. Leighton, 350, Bloor Street West, Toronto, Canada, Chemist.

McGovney, Chas. S., Newaygo, Mich., U.S.A., Chemist.

Matthews, Chas. R., 3313, Prytania Street, New Orleans, La., U.S.A., Chemist.

Meyer, August R., Room 402, New England Building, Kansas City, Mo., U.S.A., Metallurgist.

Neish, Arthur C., Columbia University, New York City, U.S.A., Chemist.

Oliver, Frank M., c/o H. K. Mulford Co., 412-428, South 13th Street, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

Porter, J. Edward, P.O. Box 785; and 205, West Genesee Street, Syracuse, N.Y., U.S.A., Chemist.

Prentice, David, 13, Lambert Street, Beverley Road, Hull, Chemist.

Pringsheim, Dr. H. H., 56, Morningside Avenue, New York City, U.S.A., Chemist.

Redfern, C. G., 4, South Street, Finsbury, E.C., Patent Agent.

Rhodin, B. E. F., Sault Ste. Marie, Ontario, Canada, Chemical Engineer.

Salter, M. J., 65, Park Road, Crouch End, N., Analytical Chemist.

Sanders, Warren W., 6428, Greenwood Avenue, Chicago, Ill., U.S.A., Chemist.

Schjölberg, T. E., 89, Bartholomew Close, London, E.C., Chemical Student.

Talley, Thomas Washington, c/o Tuskegee Institute, Tuskegee, Alabama, U.S.A., Chemist.

Taylor, Thomas, 12, Ancaster Drive, Great Western Road, Glasgow, Chemical Manufacturer.

Wells, J. W. S., Provincial Assay Office, Belleville, Ontario, Canada, Analytical Chemist.

Whipple, G. C., Mount Prospect Laboratory, Flatbush Avenue, and Eastern Parkway, Brooklyn, N.Y., U.S.A.

MEMBER OMITTED FROM LIST.

1888. Erskine, J. K.; (Journals) New Kleinfontein Co., Benoni, Transvaal, and (subscriptions) 102, Palmerston Crescent, Palmer's Green, N., Analytical Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Berry, Edw. E., l/o Casa Balestra; Bordighera, Italy.

Bischof, G., l/o Willesden; 19, Ladbroke Gardens, Notting Hill, W.

Burls, F. B., l/o Brixton Road; 4, Dyers Hall Road, Leytonstone, Essex.

Carter, W. Chas., l/o McGill College; 73, City Councillors Street, Montreal, Canada.

Charlton, Thos.; Journals to 244, Frederick Street, San Francisco, Cal., U.S.A.

Deerr, Noel F.; retain Journals.

Hoskins, A. Percy, l/o Cromwell Road; Gordonville House, Rosetta Park, Belfast.

Ingalls, Walter R., l/o Boston; 229, Ocean Street, Lynn, Mass., U.S.A.

Laycock, Dr. W. F., l/o Dewsbury; 46, Boar Lane, Leeds.

Le Bosquet, M., l/o Boston; Franklin H. Kalbfleisch Co., Brooklyn, N.Y., U.S.A.

Lloyd, Chas.; (subscriptions) c/o Lake View Consols, Ltd., Salisbury House, London Wall, E.C.; Journals as before.

Lymn, A. H., l/o East Molesey; 217, Woodborough Road, Nottingham.

Morson, T.; Journals to 31, Southampton Row, W.C.

Neil, J. Millar, l/o Beverley Street; 176, Roxborough Street East, Rosedale, Toronto, Canada.

North, E. Gordon N., l/o Rio Tinto; retain Journals.

Paul, Dr. L. Gordon, l/o Market Street; Market Hall Chambers, Huddersfield.

Redpath, L. W., l/o Newport; International Smokeless Powder and Dynamite Co., Parlin, N.J., U.S.A.

Rhodes, Jos., l/o Blackburn Road; Church Bridge House, Accrington.

Roberts, C. C., l/o Liverpool; Bradfield College, Reading.

Ross, Jas. G.; (Journals) 5–9, Sunbury Place, Belford Road, and (subscriptions) 47, Comely Bank Place, Edinburgh.

Spurge, E. C., l/o Witham; Bürgerstrasse 66, Göttingen, Germany.

Talati, K. E.; Journals to Munoeheher Leather Works, Dharavi, Bombay, India.

Tilley, Jas. W., l/o Stockwell; Melrose, Raleigh Gardens, Brixton Hill, S.W.

Walker, Jno. H.; Journals to Gourepore Works, Naihati, E.B.S.R., Bengal, India.

Witthaus, Prof. R. A.; Journals to Cornell Medical College, First Avenue and 28th Street, New York City, U.S.A.

Liverpool Section.

Meeting held at University College, on Wednesday, March 26th, 1902.

MR. C. LONGUET HIGGINS IN THE CHAIR.

ON THE FORMATION OF CARBONATE OF LIME UNDER VARIOUS CONDITIONS.

BY H. B. STOCKS, F.I.C.

Carbonate of lime crystallises in two distinct forms, *viz.*, as calcite, in the hexagonal system, and as aragonite, in the rhombic system. Of calcite there are many forms, and of aragonite there are also several varieties, and one cannot help noting the fact that carbonate of lime is a substance which is easily modified.

Gustav Rose first showed that aragonite is converted into calcite by heat, and that carbonate of lime precipitated from cold solutions assumes the form of calcite, whilst, from hot solutions, aragonite crystals are produced.

George Rainey, in an interesting treatise on the Mode of Formation of Shells of Animals, Bone, &c., published in 1858, gives an account of the effect of colloids upon carbonate of lime, these causing it to assume a spherical form.

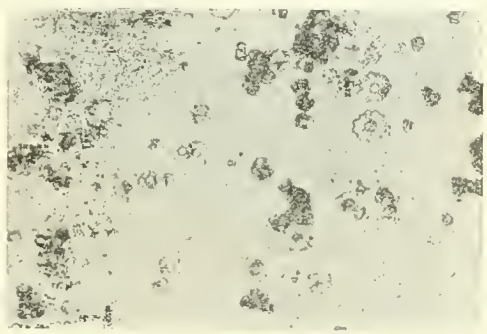
Reference may also be made to:—Gmelin: Handbook of Chemistry, Vol. I., p. 100; Mendeléeff: Chemistry, Vol. I., p. 611; Roscoe and Schorlemmer: Treatise on Chemistry, 1879, Vol. II., p. 207; H. Credner: Jahrbuch f. Mineralogie, 1871, p. 288: Zeits. Anal. Chem., 1871: J. prakt. Chem., 1870, [17]: and Chem. News, 1871, 23; also Watts' Diet., Vol. VII., p. 267; and Sorby: Presidential Address to the Geological Society, Quart. Jour. Geol. Soc., Vol. 35.

The present paper is devoted to an account of a series of experiments upon the precipitation of carbonate of lime under various conditions, with a special view to showing the effect of substances in solution upon its form.

The precipitates obtained were rarely amorphous; on examination with the microscope, some structure was usually apparent, and photo-micrographs of many of the deposits were taken, a few of the most interesting being here reproduced.

When a solution of ammonium carbonate is added to a solution of calcium chloride in the cold the precipitate is, at the moment of formation, amorphous, but after a limited interval it settles to the bottom, and becomes crystalline; the crystals are extremely minute and apparently rounded. If the solutions are mixed whilst boiling, the precipitate is much coarser, and is made up of arborescent tufts, rhombohedral crystals, and a few very fine crystals in the form of rosettes (Fig. 1). On reversing the operation, adding

Fig. 1.

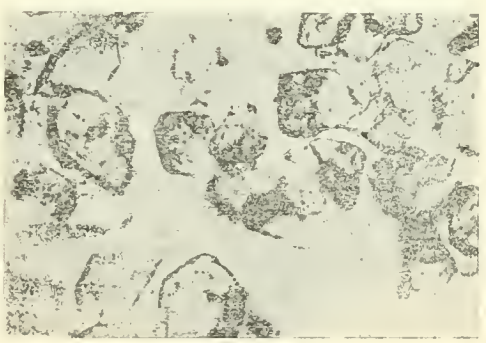


Calcium Chloride and Ammonium Carbonate precipitated boiling × 170 diam.

calcium chloride to the ammonium carbonate, the precipitate contains none of the rosettes. An interesting point with regard to these deposits is, that if allowed to stand in contact with the liquids for a few hours, they break down, and change entirely into rhombohedra of calcite.

The most remarkable form of carbonate of lime is the colloidal variety, which is formed by mixing together concentrated solutions of calcium chloride and sodium carbonate in the cold; it is exactly like colloidal silica, but after a few hours, or even, sometimes, only a few minutes, it changes into a clear solution, depositing calcite crystals.

Fig. 2.

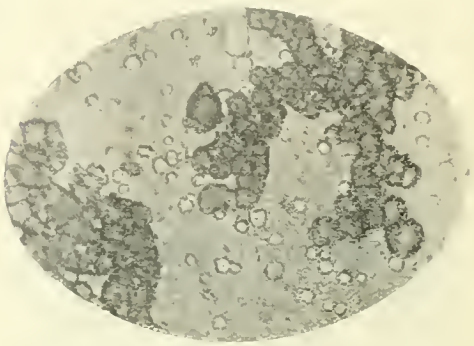


Hard Water after standing, × 170 diam.

When hard water is exposed to air, it loses carbonic acid, and the carbonate of lime it contains separates as a scum, which is made up of rough crystals of calcite of the acute form (Fig. 2). Lime water on exposure to air absorbs carbonic acid, and a pellicle is formed, but the crystals in this case are often perfect; these are also acute, but with the apices cut off. On passing a current of carbonic acid through lime water a precipitate is formed, which settles very rapidly and is composed of the ordinary rhombohedra.

When a little gum is added to lime water, the absorption of carbonic acid from the atmosphere appears to be much retarded, the scum and precipitate being composed of minute spheres only. Glue behaves similarly and yields many botryoidal aggregates (Fig. 3). Peaty water yields

Fig. 3.



Lime Water and Glue after standing, × 170 diam.

modified crystals approaching the spherical form. Glycerin and sugar behave differently, only crystals being produced when they are present. Albumin yields minute rhombohedra and double spheres.

Lime water and sewage exposed to air form a yellowish flocculent deposit, enclosing a number of small spheres or dumb-bells (Fig. 4), and in the case of lime-treated sewage

Fig. 4.

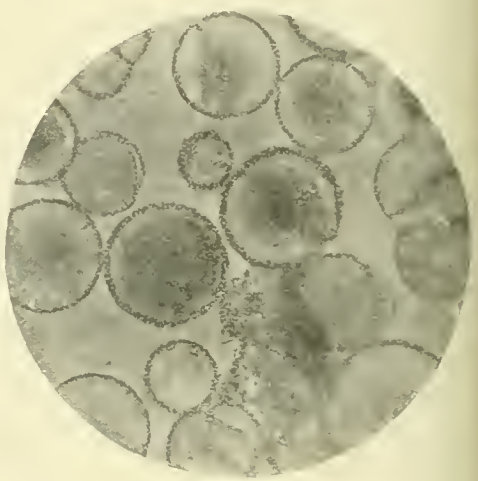
Calcium Hydrate and Decomposed Urine, × 450 diam.

the mud often contains spherical nodules, and more or less rounded crystals of carbonate of lime, including twins of this form:—

Lime water, through which carbon dioxide is passed, yields perfect rhombohedra of calcite, as before stated, but if albumin be present, the precipitate is flocculent, and settles very slowly; agar agar also produces a slow settling deposit, but it shows some structure, as black crosses can be seen on the particles under polarised light. Sugar and glycerin also yield minute rough crystalline particles, nearly flocculent, so that the precipitates in all these cases are much modified by the substances added.

The effect of colloidal substances upon carbonate of lime is much more clearly shown if the carbonate be produced slowly. This is best brought about, as described by Rainey, by preparing solutions of calcium chloride and of carbonate of soda in gum water, and placing them in contact in a bottle, without mixing, so that they form two layers. The solutions then gradually diffuse into each other, and the carbonate of lime separates either in dumb-bell forms or in perfect spheres with a radiating structure (Fig. 5).

Fig. 5.



Nodules of Carbonate of Lime produced by slow mixture of Calcium Chloride and Sodium Carbonate in presence of Gum × 170 diam.

In softening hard waters by chemical treatment, it is a well-known fact that there is great variation in the rate of subsidence in different cases. Working on a small scale with a water free from organic matter, and using lime water, I have found that the precipitate is flocculent. Mr. Leonard Archbutt, one of the patentees of the Archbutt-Deeley process for softening water, kindly sent me some of the deposits obtained in working this process, and these were also flocculent, with one exception, where the deposit showed broken crystals. These deposits settle rapidly, but the reason why they are flocculent is obscure. On the other hand, a deposit from Clark's process, also sent to me by Mr. Archbutt, was distinctly crystalline, consisting of rhombohedra and crystalline nodules. Mr. Archbutt suggested my trying the effect of magnesium compounds on the deposits, which I did, with the following results:—A solution of bicarbonate of lime containing bicarbonate of magnesia with lime water, yielded rounded crystals of calcite and twinned groups.

Magnesium sulphate, used in place of bicarbonate of magnesia, gave a similar result, but the crystals were very much smaller. This is quite unlike the deposit from a pure bicarbonate of lime solution, which consists of rhombohedra, and also unlike that from hard water, which is flocculent.

Two samples of the mud produced in causticising soda liquors proved to be amorphous, and waste mud from Chance's sulphur recovery process consisted of broken crystals. These samples were kindly supplied to me by Dr. J. T. Conroy.

The experiments on the precipitation of carbonate of ne in the cold from the solutions enumerated will give me idea of the variable nature of this substance and e effect of organic matter, and especially of colloidal bstances upon its form.

Now, with regard to the precipitation of carbonate of ne from hot solutions.

When a temporarily hard water is boiled, carbonic acid sses off and carbonate of lime deposits. When open am is used, long needle-shaped prisms of aragonite are oduced; these are very frequently twinned to form stars. ver open fire, the deposit consists of needles, but they e lens-shaped, and sometimes bunched together in the rm of sheaves; some rhombohedra are also present. hard water boiled with sodium carbonate yields a clean ite deposit, consisting of minute crystals and sheaf-like oups of aragonite. When, however, a small quantity of wage is present, the deposit is flocculent or else consists dumb-bell-shaped crystals in a flocculent matrix, or another peculiar form, consisting of twin lens-shaped ystals; similarly, peat solution yields only minute double heres, much of the colouriog matter in this case being rried down.

A hard water boiled with glue solution yields scarcely y deposit. On addition of sodium carbonate whilst iling, the deposit is extremely fine, and consists of a eculent mass of minute calcite crystals, an unusual cumstance. Gum water, similarly, almost prevents ecipitation on boiling, but when sodium carbonate is ded, the deposit is a fine one, made up of minute sheaves d spade-shaped crystals. Agar agar, by the same method, lds stunted lenticular crystals.

Calcium bicarbonate, boiled with gelatin solution, yields nost entirely minute nodules, and only a few crystalline fts. The deposit is very fine and settles slowly. Hard ter and albumin, boiled with sodium carbonate, yield oups of dumb-bell-shaped crystals.

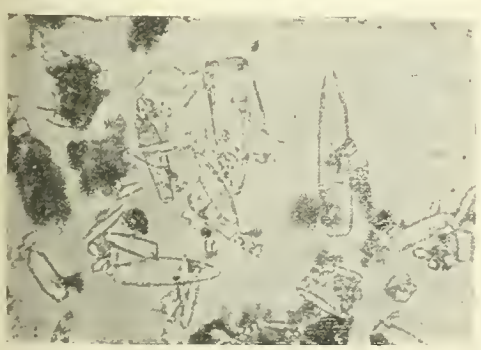
Lime water, boiled with peat solution and sodium rbonate, yields groups of minute needles; in this case so much of the colouring matter of the solution is ecipitated.

Gum arabic (which contains an organic salt of lime), iled with sodium carbonate, yields sausage-shaped ystals.

Hard waters, containing much common salt or calcium loride, on boiling yield very minute aragonite crystals, parently much broken down, the conditions being favourable for the production of the perfect prisms. When rd waters are evaporated in open vessels, the carbonate lime precipitated assumes many forms, the primary ombohedra and modified crystals of calcite being ually associated with aragonite prisms, but when waters ntaining much organic matter are similarly evaporated, e crystals of carbonate of lime are more or less modified, d sometimes associated with yellow spheres of the same bstance.

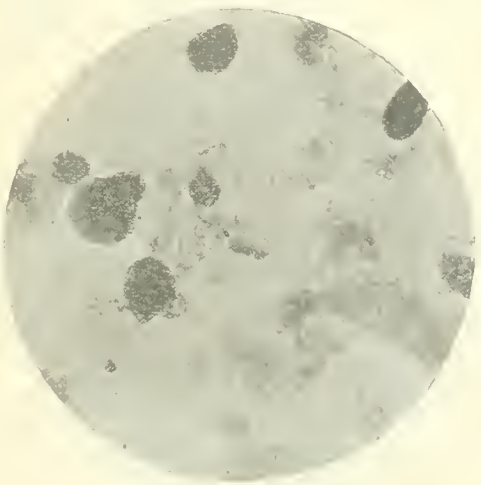
Several samples of boiler deposits were kindly sent to me Mr. C. T. Tyrer, of Messrs. Thomas Tyrer and Sons, Limited. These deposits were produced in boilers in which boiler compounds were employed; with one exception, the deposits were distinctly crystalline and contained many of the lens-shaped crystals with which you are already familiar. (Fig. 6.) Another deposit I obtained from a boiler in which pit water from a field (a water containing much organic matter in solution) was used along with hard water proved to be a very interesting one, consisting of lenticular crystals of aragonite often twinned in the form of stars, and many yellowish nodules of carbonate of lime showing a concentric structure. (Fig. 7.) In this deposit

Fig. 6.



Boiler Deposit × 170 diam.

Fig. 7.



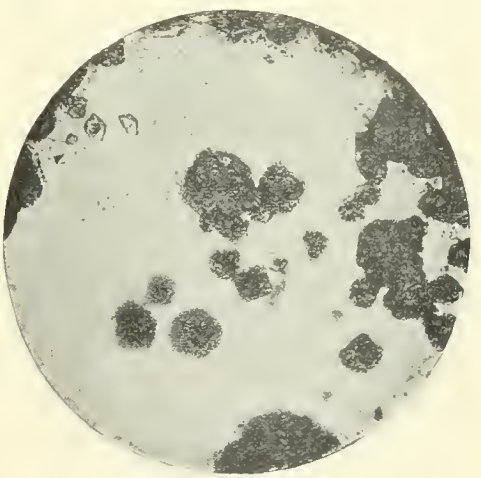
Boiler Deposit, × 170 diam.

there are also some very instructive examples of the growth of aragonite crystals, showing a skeleton or network of small aragonite prisms, upon which a subsequent growth of carbonate of lime has produced or is producing a single larger crystal.

These observations upon carbonate of lime produced at a boiling temperature or thereabouts show practically the same results as those produced at ordinary temperature, *viz.*, that organic matter very materially influences its form.

I should like now to say a few words upon the production of, or secretion of, carbonate of lime by organisms. This is too extensive a subject to treat fully now, and, moreover,

Fig. 8.

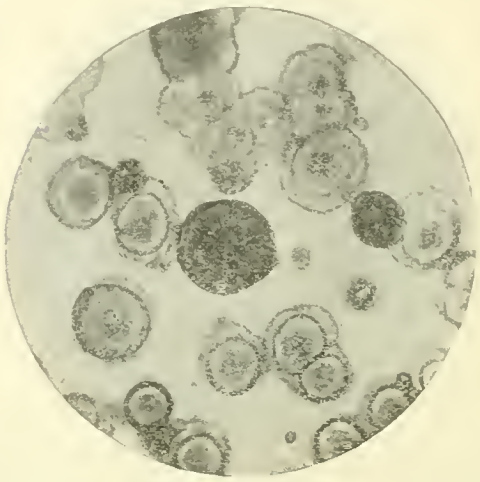


Shrimp Shell, × 50 diam.

it has little or no bearing upon chemical industry, but it will not be out of place to mention a few forms of carbonate of lime produced by living organisms, and to point out how very similar they are to those produced artificially under certain conditions. This has already been ably demonstrated by Rainey in the essay before mentioned.

Crustacea, as you know, such as the crab and lobster, have a hard covering consisting of chitin and carbonate of lime; they cast their shells every year, and remain for a short time in the soft condition; after three or four days, minute spots, widely disseminated, appear on the surface of the skin, these gradually grow in size, remaining spherical

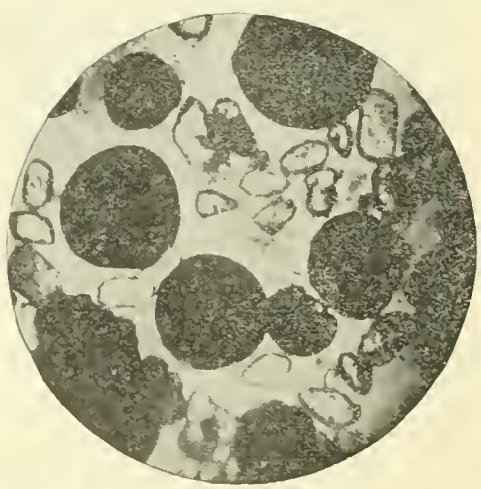
Fig. 9.



Prawn Shell, × 50 diam.

until they meet, when they form roughly hexagonal plates fused together, and the shell is complete. An ordinary egg-shell is produced in the same way. (Secretion of Carbonate of Lime by Animals, Pt. II., by Robert Irvine and G. Sims Woodhead, Proc. Roy. Soc., **16**, pp. 324—354.) Shrimps and prawns have a hard coat of chitin containing some carbonate of lime, which, instead of being continuous, is in the form of crystalline nodules in the shrimp (Fig. 8), and of perfect concentric spheres in the prawn (Fig. 9). These are instances of carbonate of lime precipitated in a colloidal substance,

Fig. 10.



Carbonate of Lime formed by Algæ and Diatoms. × 50 diam.

chitin, and show the shell formation in an unfinished condition. The lower forms of crustacea do not secrete carbonate of lime, the shell consisting of chitin only.

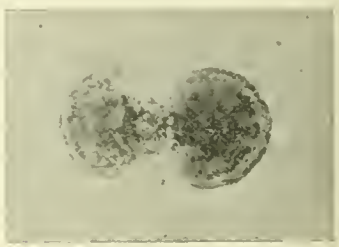
When a hard water, containing algæ and diatoms, was kept for some time, these chlorophyllaceous organisms absorbed carbonic acid, and the carbonate of lime was precipitated; many very fine spheres of carbonate of lime were in this way obtained, their form being apparently due to their having separated in the gelatinous matter produced by these organisms. (Fig. 10.)

Anaerobic bacteria from sewage are capable of decomposing calcium sulphate, and in presence of ferric hydrate, which is usually present in the mud, the products are ferrous sulphide (which blackens the mud) and carbonate of lime. According to the following equations:—

$$CaSO_4 + 2C = CaS + 2CO_2$$
$$CaS + CO_2 + H_2O = CaCO_3 + H_2S$$
$$Fe_2(HO)_6 + 3H_2S = 2FeS + S + 6H_2O$$

This carbonate of lime separates in the bacterial jelly, and, in consequence, is modified by it, and in the several experiments which I have tried, numerous interesting forms of it were obtained, including modified crystals, spheres, nodules, and dumb-bell-shaped groups. (Fig. 11.) (Concretions in the

Fig. 11.



Carbonate of Lime produced by Anaerobic Bacteria in Calcium Sulphate Solution, × 170 diam.

Coal Measures: H. B. Stocks, Quart. Journ. Geol. Soc., **58**, 1902, pp. 46—58.)

I have now given you a number of instances of carbonate of lime produced under various conditions, and the forms which it assumes, and pointed out that, whether produced in the laboratory or in nature, its form is largely affected by the external conditions, the effect of organic matters and especially colloidal substances being very marked.

Discussion.

The Chairman said that precipitated carbonate of lime was a substance with which the chemical manufacturer and the engineer frequently had to deal, and its settling properties in particular were interesting. That it settled better from a hot liquid might be partly due to the specific gravity of aragonite (2·9—3·2), which was higher than that of calcite (2·7—2·75). To the caustic maker, the subject was of great interest, for it was not easy to explain why causticised liquors (which usually settled very rapidly) sometimes settled very slowly.

Mr. Alfred Smetham asked Mr. Stocks whether he had taken any special means to ascertain whether the crystals he had described were in all cases really carbonate of lime, and not some combination of lime with other acids or substances. For instance, casein and lime were said to enter into combination in milk, and it occurred to him as just possible that, in cases like gum arabic, tannin, and albumic, and possibly in sewage and peaty matters, some of the crystals might be due principally to lime salts other than carbonate. Another point was that, although the forms of the crystals might be characteristic of carbonate of lime, it did not necessarily follow that the crystals were absolutely pure carbonate of lime. Some years ago, he had samples sent

him which had been formed on a coral island; on the p of the coral there had been a deposit of guano from hich the phosphates of potash and ammonia had been ashed out, so that these had come into contact with the oral. When he analysed the coral he found it was no nger carbonate of lime, but almost pure phosphate of me tinged slightly yellow with the organic matter from ie guano. It occurred to him, therefore, that possibly ome such change might have taken place in some of the ystals which Mr. Stocks had photographed.

Dr. J. T. Conroy observed that carbonate of lime was idently a substance of greater interest than was generally ecognised. Judging from Mr. Stocks' photographs, the fects produced, when organic matter was present, were very riking; in nearly all cases the presence of organic matter eemed to have indueed a change of form from crystalne to spherical, and he thought that that probably had a earing upon the use of organic matter to check incrustation boilers. He knew of a case in which a very bad water, r what appeared to be a very bad water, was used in a oiler, and yet the boiler worked quite clean. That was ue, no doubt, to organic matter which was present in conderable amount in the water. As regarded the crystalline rm of carbonate of lime, an interesting paper was pubshed some few years ago by Adler (Zeits. angew. Chem., 897, 431), who found that the form in which it was recipitated depended upon conditions of temperature, conentration, nature of atmosphere and pressure; and whilst, s a rule, at high temperatures, the carbonate showed a ndency to come down as aragonite, this was not always he case, calcite being the form assumed when carbon ioxide was present. A very striking point was that, whilst alcium carbonate, precipitated as aragonite from calcium hloride by ammonium carbonate, could be converted into alcite, at a temperature of 60° C., yet, if, instead of mmonium carbonate, one used sodium carbonate, the preipitated aragonite remained stable even at 100° C. In oth cases, the precipitates had been well washed to free hem from mother-liquors. It looked as if there must be ome matter precipitated along with the carbonate of lime, nd that this latter could not be absolutely pure to behave o differently in the two cases. Another point mentioned y Adler was that, whilst there was a great tendency for ragonite to change to calcite, the reverse change was nknown. Possibly Mr. Stocks had made some observations n that direction.

Mr. H. McDougall asked if Mr. Stocks knew what was he minimum amount of organic matter required to produce he effect he had described.

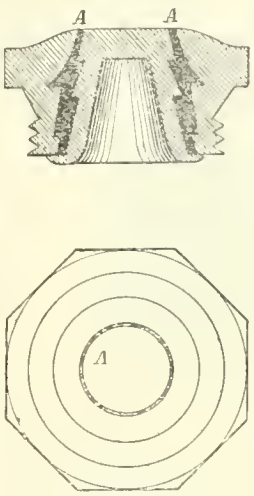
Mr. Stocks, replying to Mr. Smetham, said there was no eason to suppose that, except in one case, the deposits he ad referred to did not consist of carbonate of lime; in the ase of the boiler deposit containing yellow nodules there as a little doubt, but these spheres twinned with aragonite rystals; and, moreover, on being mounted in Canada alsam, much of the colouring matter was dissolved out, evealing a crystalline structure in these spheres very like he aragonite prisms. In many of the experiments sodium arbonate was used, and this would decompose any lime alts of weak organic acids. Most of the deposits had been ested with hydrochloric acid under the microscope, and hey showed effervescence. In reply to Dr. Conroy, he ust say that he had not tried any experiments on the conersion of calcite into aragonite, though in some of the xperiments given in his paper a reverse change was noted. Ie could not speak with certainty as to the amount of rganic matter required to modify the carbonate of lime; he experiments were not quantitative—in certain cases it as small, and in others large.

BRONZE CONTAINING LEAD: ITS CORROSION, EROSION, AND STRUCTURE.

BY T. LEWIS DAILEY, PH.D., F.I.C.

Corrosion.—A case of corrosion came under my notice a hort time ago, which is, I think, of sufficient interest to ring before you, more especially since it is a very common ractice (and one not to be recommended) to supply for all kinds of fittings, including boiler fittings, "brasses" or bronzes containing considerable quantities of lead. The material that I wish more especially to speak of consisted of two steam-boiler "fusible plugs," each formed of two pieces of bronze held together by means of a fusible metal composed largely of tin.* The form of the plugs is indicated in the accompanying sketches.

Fig. 1.



Section and Plan of Plug.
A = Fusible Metal.

The plugs had both been used for about the same length of time and with the same kind of water, although supplied from two distinct wells, only some 20 ft. apart. The total hardness of the water was 6·5 parts per 100,000, the chlorine 1·6 parts.

In the case of one plug, the fusible metal ring was sunk slightly below the surface of the bronze, but in the case of the other plug the fusible metal projected above the surface of the bronze; in both cases the fusible metal had been originally flush with the bronze.

A glance at the specimens, after cleaning, showed, from stamped marks, that in the former instance the bronze was practically uncorroded, whilst in the latter case there was evidence that the bronze had been reduced in thickness. Analysis showed the following compositions:—

	Uncorroded.	Corroded.
Copper	85	86
Tin	10	6
Zinc	5	5
Lead	Nil	3

The corroded metal thus differs from the other simply in that a portion of the tin is replaced by lead. When lead in any considerable quantity is melted with bronze, the lead, as is well known, separates out to a large extent, but the effect of small quantities is apparently variously stated; thus A. Krupp in his book on Alloys ("Legirungen," 2nd edition, p. 140) states that with only one-half per cent. of lead in bronze, liquation of the lead commences and the liability of the material to oxidation is increased. H. Behrens, in "Das mikroskopische Gefüge der Metalle und Legirungen," speaking of 10 per cent. bronze, states that 2 per cent. of lead may be "evenly distributed" in the alloy, but small separated specks are visible here and there on examining a polished section under the microscope, at the same time the hardness of the crystallised portions of the alloy is very slightly lowered. With 4 per cent. of lead, he says, the grey specks (which are considerably softer than the bronze itself) are more frequent. According to Behrens' measurements these separated grey specks are somewhat harder than lead but softer than tin. From all this it seems clear that they are due to the introduction of lead and are, at all events, rich in lead. This separation I have myself confirmed in various samples of bronzes containing 3 and 4 per cent. of lead, including the corroded specimen, the analysis of which I have given above.

The material of the uncorroded plug showed under the microscope no trace of separation of the grey particles. The essential difference in appearance of the two bronzes is that in the uncorroded one we have merely the structure of the pure alloy, whereas in the corroded one we have in addition the separated soft lead-containing spots, which occur in considerable number.

* For these plugs I am indebted to Mr. H. J. L. Rawlins.

The natural result of the contact of boiling water with this bronze containing lead will be then the setting up of electrical action favourable to corrosion—the corrosion with a good water is very slow, nevertheless it exists.

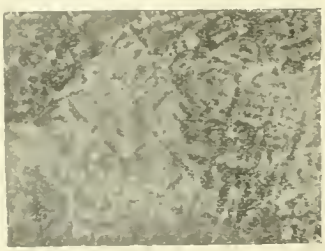
Erosion.—A specimen of so-called gun-metal came into my hands recently, which had been abnormally attacked by the action of steam particles forced over the surface of the metal. The composition of the material was much the same as that of the boiler plug containing lead already referred to. Microscopic examination of polished sections showed that many of the lead particles were spherical. The

Fig. 2.

Alloy not containing Lead, × 45 diam.

result of the action of steam particles under pressure, especially if containing any minute solid particles, on these soft globules would naturally be to erode them, and so produce cavities favourable to a cutting action on the bronze itself, as indicated by the deep straight grooves produced, the metal being cut out in some instances to the depth of $\frac{1}{8}$ in. in a few weeks. This cutting effect of the

Fig. 3.

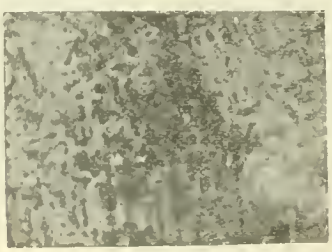


Alloy containing Lead, × 45 diam.

steam, and its rapidity of action, point to quite a different action from that produced by simple contact of the bronze with boiling water.

Structure.—From the investigation of a number of bronzes prepared in the laboratory, I am induced to bring before you the accompanying photographs of etched sections of the material of the plugs spoken of in the earlier portion of the paper. The sections were polished, then etched with nitric acid (1:3), and subsequently washed with strong ammonia and finally with water. Strong ammonia serves exceedingly well as an etching agent, but it is much slower in action than nitric acid.

Fig. 4.



Alloy containing Lead, × 45 diam.

Fig. 2 shows the very characteristic appearance of a bronze, and is from the uncorroded plug. Figs. 3 and 4 are from the corroded plug; the alloy structure is here by no means so regular as in the former case, and is somewhat smaller in its general character. Furthermore, throughout the lighter coloured portions there exists a large number of minute pittings, which appear to be always obtained on the addition of 2 per cent. of lead (for smaller quantities I cannot speak at present). Lead is undoubtedly a valuable constituent in bearing metals known as "machine brasses," and in cases where the metal is to be turned. From this point of view the photographs shown are suggestive. I might also recall the fact that the presence of lead, at any rate in quantities of 2 per cent., is easily recognisable when sawing; bronze not containing lead producing much greater resistance to sawing than that containing lead.

Discussion.

Mr. L. Archbutt (Derby), in a letter to the secretary, wrote as follows on the subject of corrosion:—"A hard water from one of the London water companies' mains was formerly softened by adding lime together with a small quantity of soda ash, but it was found that the "brass" fittings of the boilers, and especially the blow-off valves, were so seriously corroded, that the use of soda ash was discontinued and lime alone was used. Corrosion then ceased. Unfortunately, I was not told about this in time to obtain a sample of concentrated water from one of the boilers; but knowing how much soda ash was used and the analysis of the hard water, I find by calculation that the ash could not have been used in excess. A sample of the concentrated water, when lime alone is used, and which is said not to cause corrosion, contained in parts per 100,000:—

$CaCO_3$	4·07
$CaSO_4$	16·59
$CaCl_2$	15·96
$NaCl$	34·09
$NaNO_3$	33·23
SiO_2	0·6
Organic matter, &c.	8·9
Solids at 130° C.	113·44

The water was drawn from the lower gauge cock whilst the boiler was steaming.

Drillings from one of the brass valves were found to contain, in addition to copper, about 9 per cent. of tin, 3·75 per cent. of lead, a small quantity of zinc (2—3 per cent.), and a trace of antimony. The only difference which the soda ash would make in the concentrated softened water (if not used in excess) would be to replace $CaSO_4$ by Na_2SO_4, and $CaCl_2$ by more $NaCl$. Have you any information which would throw light on the probable cause of the corrosion?"

Mr. Eustace Carey said that he would like to know how the alloys spoken of by Dr. Bailey were made, especially with regard to the cooling of them. If one alloy had been cooled more quickly than the other he would expect the crystals or particles to be smaller. If the alloys were to be fairly compared should they not be cast into ingots of about the same size and cooled at about the same rate? The next point was the peculiar action of the water, mentioned by Mr. Archbutt, on the boiler fittings. He understood that there was no caustic soda present, which might have been the case if too much lime and soda ash had been added, and as, in his experience, a small excess of carbonate of soda in boiler feed water has no effect on boiler fittings, he failed to understand to what the action reported by Mr. Archbutt was due.

Dr. G. H. Bailey (Manchester) said he had had some experience of bronzes, more particularly from the point of view of corrosion. He did not know whether samples of gun-metals, containing copper and tin alone, had been

pared with samples containing also zinc. In the case valves that contained zinc, as they frequently did, rrosion usually took place much more rapidly. He stanced a case where the metal had been coated with tin, d stated that this was effectual for a considerable time. long as the tin-coated surface was quite intact no rrosion took place, but so soon as the smallest perforation ok place in the tin surface, and the alloy underneath as reached, then corrosion took place with surprising pidity.

With regard to the experience that Mr. Arehbutt referred , it seemed to him, looking at the analysis of that water, at it must have been a water containing a good deal of trogenous organic impurities. His own experience was at, in the case of second-rate alloys, or gun-metal taining zinc, ammonia was the most active agent of struction. It was well known in gas works, for instance, w difficult it was to keep the gun-metal steam-valves ght. This he thought was the source to which they ght to look for the corrosion in Mr. Arehbutt's case, and was one which was very often overlooked.

Even though an excess of soda ash were not used in the lers, it was very likely that the addition of the ash was de periodically in such quantities as to produce priming d the evolution of ammonia sufficient to induce corrosion a serious character.

Mr. Herbert E. Davies desired to ask concerning the o alloys, spoken of by the reader of the paper, whether had made any investigation as to the small quantity of senic that might be present. This point was brought to s notice by a paper he had seen recently on the corrosion Muntz metal, where some samples of metal had corroded sea-water with great rapidity whilst others had not, and here the only difference between the samples was that nall quantities of arsenic were present in the non-corroding etal and not in the other.

Mr. H. McDougall asked what effect rolling would ve on the shape of the lead particles separated in copper loys, as shown under the microscope.

Dr. Lewis Bailey, replying on the discussion, said that, far as corrosion was concerned, his desire had been to ll attention to the relative action of one and the same ater on bronze specimens containing lead and those not ntaining it. Mr. Arehbutt's question really raised nother point. Regarding this, he might say that, given the esence of ammonia from any source in a boiler, gun-etal fittings were bound to be corroded, the action of mmonia on copper alloys being comparatively rapid. The ldition of sodium carbonate together with the lime in the ftening process would transform all calcium salts into dium salts, which have a corrosive action on poor brasses d bronzes, but this did not seem at all a sufficient planation of the excessive corrosion that actually took ace. Apart from this he would like to be able to examine e fittings of the boiler after several months' use with erely lime-softened water; with fittings containing several r cent. of lead there was bound to be corrosion, though is would not necessarily be very great. In reply to r. Carey, he might say that the crystalline structure of loys was very largely affected by their rate of cooling and neral treatment; he had, however, carried out an investi-tion on copper-tin-lead alloys made in the laboratory, ways under the same conditions, and the results agreed ith what was indicated in the photographs brought before e meeting. Dr. G. H. Bailey's instance of the corrosion of copper alloy coated with tin quite corresponded with his n instance of the corrosion of bronzes containing lead, e action being an electrical one. Regarding the effect of nc he would point out that the two specimens he brought rward both contained the same amount of zinc; small antities of zinc introduced into bronze have no effect on e homogeneity of the alloy. As regarded the possibility the presence of arsenic affecting the results, he did not ink this entered into the present question at all. The fect of rolling on the leaden particles is to extend them the direction of rolling.

Mr. Archbutt further wrote, in reply to the remarks of r. Carey and Dr. G. H. Bailey, that the amount of soda h used was 0·24 lb. to 0·33 lb. per 1,000 galls. of water, and as the original hard water contained (according to a recent analysis) very nearly 5 parts of $CaSO_4$ per 100,000, or 0·5 lb. per 1,000 galls., it seemed clear that the ash was not used in excess. The water was tested for ammonia, but gave a mere trace of colour with Nessler's reagent. There was evidence of a considerable amount of organic matter in the concentrated boiler water, but the soda ash was not put direct into the boilers. It was added to the water, and thoroughly mixed with it, in a water-softening apparatus. He was indebted for his information entirely to the users of the apparatus; but he had every confidence in their statements, as the works in question were excellently managed, and everything was well looked after and kept in first rate order. The cause of the corrosion was by no means clear to him, and he should be grateful to any member of the Society who might read these remarks and would communicate information which would throw further light upon the subject.

Manchester Section.

Meeting held on Friday, April 4th, 1902.

DR. GROSSMANN IN THE CHAIR.

THE SOOT DEPOSITED ON MANCHESTER SNOW.

BY WILFRID IRWIN.

It will be within the recollection of everybody here that we had, early in February, a heavy fall of snow which remained unmelted for several days, no further fall occurring during that period.

At the end of that time, about 10 days, on three or four of which there was a dense fog, the appearance of the snow was as black as I had ever seen it, which is saying a good deal for one who has lived all his life in Manchester, and it occurred to me to determine the actual amount of soot which had fallen in a given area, also its approximate composition.

The sample was taken in my garden, in Wilton Polygon, Cheetham Hill, the spot being nearly three miles direct north of the Town Hall, and from a space sufficiently far from either trees or buildings to be affected thereby.

An area of 100 sq. in. was measured on the surface of the snow, and this to a depth of 1 in. was transferred to a dish, melted, filtered, and the solid matter dried and weighed. The dried residue was then extracted with benzene, dried and weighed again, and ignited. The weight of the extracted grease was also determined directly and found to agree with the aforementioned determination by difference.

The following were the results obtained:—

100 sq. in. contained	0·073	grm. of soot.
1 acre therefore	„	4·58	kilos.	„
1 acre therefore	„	10·7	lb.	„
1 sq. mile	„	3 tons 1 cwt.	„

It was my intention to have taken other samples from different parts of the town, but the thaw put a stop to any further work in that direction. Only to-day, however Dr. Knecht of the Manchester Technical School, who is present here this evening, has informed me that he took a sample in a similar manner a few hours before me in Whitworth Street, in the centre of the town, and found over three times the amount of soot which I did in Cheetham Hill. This is, of course, quite what one would expect, especially as the wind was in the north east most of the time.

As there will be at least an area of 100 square miles in a circle round the Manchester Town Hall under climatic conditions of such a character that the sample taken at Cheetham Hill would represent an average of the whole, we may calculate that over 300 tons of soot fell to the ground from the smoke of the Manchester chimneys, or 30 tons per day.

To ascertain whether the soot in the snow as it had originally fallen bore a great proportion to that which had subsequently fallen on to the snow, I took a sample from a similar area and depth underneath the previous sample. In this there was sufficient soot in the water from the melted snow to make it quite black, but it only weighed about three mgrms., showing that the great proportion of the soot had fallen subsequently to the snow and on the surface of the same.

Composition of the Soot.—Tested as before stated, I found it to contain :—

	Per Cent.
Solid carbon with a little fibrous matter.....	48·6
Grease	6·9
Ash	44·5
	100·0

The percentage of ash was higher than I expected, and much higher than in ordinary soot from chimneys.

The grease or heavy oil on heating smelt like burning wood, but the quantity was insufficient to allow of further examination. Its presence, however, caused the soot in the melted snow to adhere to the side of the vessel in which it was placed, and I am inclined to think that it plays a very important part in assisting the soot to adhere more firmly to anything it comes in contact with, whether buildings, vegetation, or the skin of our hands and faces.

Since writing the above, Dr. Knecht has kindly forwarded to me his sample of soot for analysis. The composition I found to be—

	Per Cent.
Solid carbon with fibrous matter.....	45·1
Grease or heavy oil	3·5
Ash.....	51·4
	100·0

The larger proportion of ash in this sample would seem to show that the coal is more completely consumed in the centre of the town, where the factories are more numerous, and the proportion of house smoke less, than in the suburbs.

Discussion.

Prof. E. Knecht said he had collected a square yard of untrodden snow about half an inch from the surface downwards from a clear space opposite the new School of Technology, in Whitworth Street, during February, after the snow had lain for nine days. When melted, it yielded a black looking liquid of a greasy nature, which, on being boiled, gave off a smell of soot. The insoluble residue which was left after boiling weighed 3·8 grms., and contained chiefly soot, besides fibrous material and other *débris*. The filtrate, which was of a brownish colour and which possessed an acid reaction, left, on evaporating to dryness, a residue weighing 0·406 grm. This residue was extracted with a small quantity of hot water, and in the aqueous solution thus obtained, 0·0106 grm. of ammonia, calculated as sulphate, was found. The insoluble portion consisted mainly of crystallised calcium sulphate, a product which he had always found to be present in ordinary household soot. Another sample of soot collected in a garden in Crumpsall was examined qualitatively. Besides free acid it contained ammonia, not only as sulphate, but also as chloride. It was well known that large quantities of ammonia were continuously finding their way into the atmosphere from burning coal. Ordinary chimney soot contained as much as 15 per cent. of ammonium sulphate, to the presence of which it largely owed its manurial properties. It was this knowledge which had prompted him to estimate the ammonia in the snow, in order to ascertain how much was actually deposited on the ground during a prolonged condition of calm in the atmosphere. The manurial value of this deposit must not be inconsiderable, not in the town itself, but in the surrounding country, provided always that a sufficiency of lime be present in the ground, either naturally or artificially added, to fully neutralise the free sulphuric acid.

New York Section.

Meeting held at the Chemists' Club on Thursday, March 13th, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE EFFECT OF PICKLING LIQUIDS UPON SEWAGE TREATMENT.

BY HARRISON P. EDDY.

The wastes from foundries and wire mills consist of spent acids or pickling liquids. The wire and castings are dipped into dilute sulphuric acid to remove scale and sand. When the acid becomes weakened by the formation of sulphate of iron to such an extent that it will not readily attack the metal, it is removed from the vats and replaced by fresh acid. The amount of free acid remaining in the spent liquors varies with the work being done as well as with the man in charge. In one case the contents of the vat about to be discharged contained 24·86 per cent. ferrous sulphate while that of another contained but 5·41 per cent. In the former there were 4·35 per cent. free acid, while there were but 1·71 per cent. in the latter case. In another instance where the ferrous sulphate amounted to 24·90 per cent. the free acid was reduced to 0·84 per cent. Thus it may be seen that there are wide variations in the quality of the pickling liquids discharged from the vats.

The city of Worcester, Mass., has for many years been the seat of large iron-working industries, and many of these discharge more or less pickling liquids into the sewers. The amount of these products received at the purification works has, in a single day, been sufficient for the manufacture of 70 tons of commercial copperas. In addition there was at this time enough free acid wasted to have made 30 tons more of copperas had it all been converted into that commodity. This was an extreme case, although during the week ending September 14, 1900, an average of 37 tons of copperas and the equivalent of 20 tons more in free acid were received daily. This would amount to 92·3 parts per 100,000 parts crystalline copperas or 32·5 parts per 100,000, calculated as sulphuric acid. This amount of acid would require 1,860 lb. of lime per million gallons of sewage, assuming that 80 per cent. of the lime would be available for neutralizing the acid. It may be readily seen therefore, that in this case, the trade waste gives to the sewage a very unusual quality and presents a complicated problem of disposal.

Chemical Precipitation.—The effect of salts of iron and free acid is naturally different in the various methods of sewage treatment.

With chemical precipitation, especially where dye and tannery wastes are present, salts of aluminium or iron are necessary to the production of a satisfactory result. In such cases the presence of pickling liquids in the sewage makes the addition of these salts unnecessary, and to that extent thus prove beneficial. As already pointed out, however such liquids vary in strength and always contain free acid. With copperas, it is always necessary to use sufficient alkali to neutralise the free and combined acid, and an excess either above that actually needed for proper treatment of the sewage entails unnecessary expense in treatment. The fact that these liquids are turned into the sewage only at stated intervals and then in concentrated form makes the utilisation in the treatment difficult and wasteful. Since with ordinary sewage, more than 1,000 lb. of copperas per 1,000,000 galls. is seldom needed for satisfactory treatment, it is obvious that its presence in such quantities as mentioned above proves exceedingly expensive.

The voluminous precipitate formed by neutralising copperas solution is familiar to every chemist, and the vast amount of precipitate formed by the addition of an excess of lime to a sewage containing several tons of sulphate of iron per million gallons can be readily appreciated. This greatly increases the difficulty of disposing of the sludge

adds much more to the expense of the process than the olus amount of lime required. In many places, if chemical ipitation is to be used at all, it must be merely as a iminary process, but if it is thoroughly executed it will ine the difficulties caused by the iron and the acid to part of the process, and the filtration will not be riously affected.

eptic Treatment.—The process of sewage disposal, known eptic tank treatment, is a preliminary step, and only er very exceptional conditions can it be adopted as the l and only procedure. It is largely dependent upon action of bacteria, although sedimentation appears to a very important part in the result obtained. The erial action is destructive and putrefactive. Complex nic substances are broken up into simpler forms, some he insoluble matter becoming soluble and some of that olution being precipitated. Much gas is formed by the mposition.

It is obvious that sulphuric acid is not favourable to a process of this kind. The addition of acid to the extent of 100 parts per 100,000 parts causes a strong sewage to remain practically sterile for many days, and one half that amount will suffice to preserve a sewage of moderate strength in good condition for analysis for a long time after it is collected. It is to be expected, therefore, that an acid sewage will not undergo the decomposition which is accomplished with an ordinary domestic sewage.

Associated with Dr. Leonard P. Kinnicutt, Director of the Department of Chemistry at the Worcester Polytechnic Institute, the writer has made a series of very careful experiments upon the action of the septic tank upon acid sewage containing ferrous sulphate, the results of which will be published presently, in the third annual Report of the Connecticut Sewerage Commission.

The following table taken from this paper will illustrate the effect of septic action upon ferrous sulphate.

Effect of Septic Action upon Iron in Sewage.

	1.			2.		
	Sewage.	Effluent.	Per Cent. removed.	Sewage.	Effluent.	Per Cent. removed.
n in solution	4·19	0·084	98·22	7·28	3·19	56·18
n in suspension	2·70	3·681	− 36·34	2·98	5·22	− 75·16
Total iron	6·89	3·765	45·36	10·26	8·41	18·03

The soluble iron in the sewage exists in the form of rous sulphate. This is changed to insoluble sulphide by tic action, in which condition it readily settles out of the ter, and forms a part of the sludge. In the case of the sed tank there is no opportunity for this precipitated phide to become oxidised again. From the above table will be noticed that in one case nearly the entire amount soluble iron was precipitated as sulphide, whilst, in the ier, 56 per cent. was so changed. In the open tank, which s been running for over a year under very similar conditns, this action is not so apparent. In February, 1901, iron removed from the sewage amounted to 38·77 per t. of that received in the sewage, which was the largest centage removed in any month during that year, the rage for the year being 11·52 per cent. removed.

Iron precipitated as sulphide is very easily oxidised the soluble sulphate, and it seems probable that the posure to the air in the open tank accounts for the small luction. The precipitated iron is being continually ought to the surface of the water by the action of the es, which accumulate in the sludge until of sufficient ength to cause its upheaval. These ebullitions are very quent, and, doubtless, assisted by the horizontal currents the sewage in the basin, carry the finely divided iron cipitate through the basin, giving it ample opportunity become oxidised. This theory is supported by the fact t at all times there are nitrites and nitrates in the effluent m the open tank. They exist, naturally, in small antities, and are usually less than in the original sewage. It is probable that, with a closed tank properly designed facilitate precipitation, iron in sewage may be practically mpletely precipitated, leaving in the effluent only the ess of free sulphuric acid to affect injuriously the filtran process. Could this be accomplished it would be a eat achievement for the septic process.

Intermittent Filtration.—Intermittent filtration is the y thoroughly tried, reliable method of effecting final l satisfactory purification of sewage where conditions uire a comparatively pure effluent. This process gives y good results under most conditions, and has been pted in many places in this country, especially in New gland, where there are large deposits of sand suitable filtering material.

This is essentially a bacterial method, and conditions favourable to their life and growth have an injurious ct upon the working of the filters. The germs, however, have a remarkable power of adaptation, and readily overcome moderate departures from their natural requirements. To a certain extent, they accustom themselves to acid sewage and perform their usual functions.

The filters at Worcester, 14 acres in extent, have received the effluent from the chemical treatment, that from the open septic tank, and settled sewage.

Where the sewage has been subjected to a thorough chemical treatment, receiving ample opportunity for subsidence, iron has not appeared in the filtrate from filters which had not previously received acid sewage containing iron.

During 15 months, in 1900 and 1901, sewage containing a comparatively large amount of copperas and free acid was passed through some of the filters. The albuminoid ammonia was reduced about 85 per cent., which was a very favourable result considering that about 150,000 galls. were filtered per acre per day. The nitrates were very low with correspondingly high free ammonia. These seem to be well established results of the filtration of acid sewage.

The following table gives the amount of copperas and acid in the sewage which was applied to the filter beds, after passing very rapidly through settling basins; and filtrate corresponding:—

Copperas and Free Acid in Sewage applied to Filters.

Date.	Copperas in Sewage.	Copperas in Filtrate.	Free Acid in Sewage.	Free Acid in Filtrate.	Total Flow per Day on all Filters.
	Lb. per Day.	Lb. per Day.	Lb. per Day.	Lb. per Day.	Million Galls.
1900.					
Feb.	26,839	14,691	6,175	2,143	3·8
Mar.	15,613	5,702	2,916	1,894	3·6
April	23,904	8,987	4,842	4,988	4·3
May	23,250	8,751	3,573	4,253	4·3
June	26,418	19,055	1,961	2,479	3·7
July	7,006	4,680	376	269	1·0
Aug.	22,325	5,950	1,180	808	2·5
Sept.	36,396	13,976	3,735	5,066	3·8
Oct.	12,291	5,330	1,863	2,470	1·7
Nov.	16,607	7,431	3,472	5,208	2·8
Dec.	10,009	2,989	3,160	1,744	1·9
1901.					
Jan.	8,799	6,073	65	1,119	2·1
Feb.	8,142	5,749	359	1,549	2·6
Oct.	6,456	3,526	1,044	2,434	2·0
Nov.	5,373	3,800	1,019	1,230	1·6

From these figures, it appears that 7 per cent. more sulphuric acid came away from the filters than was applied, whilst 53·35 per cent. of the copperas was retained in them. A small proportion of this may have settled out of the sewage in its passage through the settling basins.

During the portion of 1901, from April to September inclusive, the sewage was given the usual chemical treatment before it was turned on to the filter beds. Only a limited number of settling basins was devoted to this work, however, and as a natural consequence considerable precipitated iron passed out of them with the effluent, and was discharged on to the filters. During the first three months of this period, there was not enough lime added to the sewage to completely neutralise the acid and copperas, so that much dissolved iron was applied to the filters. The following table gives the daily amount of iron turned on to the filters and coming away from them in the filtrate:—

Copperas in Sewage and Filtrate.

Date.	Copperas in Sewage.	Copperas in Filtrate.	Total Flow per Day on all Filters.
1901.	Lb. per Day.	Lb. per Day.	Million Galls.
April	13,450	6,230	1·51
May	9,076	11,680	2·51
June	13,780	3,330	4·05
July	9,397	7,650	4·35
August	8,269	9,596	6·26
September	6,860	7,995	4·92

It will be noticed that the amount of iron retained in the sand was about 23·5 per cent. The natural inference would be that a larger proportion of the iron would be removed from the chemically-treated sewage than from that in which the free acid had not been neutralised. It is certain that a larger proportion of the iron existed as precipitate in the chemical effluent than in the settled sewage. It will also be noticed, from a comparison of the two tables, that much less iron was applied to the filters during the time when they were taking chemical effluent, although they were filtering several times as much water. These results indicate that the iron was being washed out of the filters faster, proportionately, than when the acid was applied. This may have been due to the larger volume of water or to the physical condition of the filter.

The iron in the filtrate is usually dissolved when it appears in the main under-drain, and when there is any in suspension, it is in such small amount, that the indications are that it is thrown out of solution in the lateral drains before it reaches the point of observation. Upon shaking the clear effluent, however, a copious precipitate is formed, and, in fact, with a few minutes' violent shaking, all the iron may be precipitated.

A very noticeable change in the quantity of iron washed out of the sand, occurs as the filter is becoming clogged on the surface, when the iron in the effluent increases rapidly in amount. If the surface of the filter in this condition is raked, ploughed, or even allowed to rest without receiving more sewage for a few days, large quantities of iron again appear in the effluent when it is put in operation. This large amount of iron is gradually reduced in the next few days, if the bed is kept in commission, until the sand has assumed its normal state. The foregoing table illustrates this peculiarity.

Copperas in Sewage and Filtrate.

Week ending	Copperas in Sewage.	Copperas in Filtrate.
1901.	Lb. per Million Gallons.	Lb. per Million. Gallons.
June 8	5480	2634
„ 15	8132	5657
„ 22	8132	8839
„ 29	7071	7125
July 6	Bed clogged. Rested 12 days.	
„ 13	7602	8132
„ 20	6421	5198
„ 27	5811	4128
Aug. 3	7151	3669

This bed was badly clogged when allowed to rest. The black colour of the filtering material due to deoxidation extending to a depth of two feet below the surface.

For the purpose of studying under laboratory conditions the action of water upon the iron in the sewage, a small galvanised tank was filled to a depth of 2½ ft. with sand taken from the upper 6 in. of one of the large filters after about ½ in. of the surface had been removed. This sand contained a comparatively large amount of iron which had been retained from sewage passed through it. City water was applied to this filter for nearly two months. From the results of this treatment recorded in the following table, it will be seen that, when water was first applied, much iron was washed through, which amount was gradually reduced until the filter was given a rest of at least one day. After each rest period, the amount of iron in the filtrate was considerably more than it was before the rest. After a prolonged rest the increase was very marked.

Iron Washed from Filter by City Water.

Date.	City Water applied to Filter.	Iron Washed from Filter calculated as Copperas.	Total Sulphuric Acid washed from Filter.
	Thousand Gallons per Acre.	Lb. per Million Gallons.	Lb. per Million Gallons.
Dec. 11	90·6	4,613	4,102
„ 12	90·6	1,329	1,170
„ 13	90·6	596	536
„ 14	90·6	459	772
„ 15	90·6	229	597
„ 16	Filter resting	..	..
„ 17	90·6	581	845
„ 18	90·6	2,124	1,000
„ 19	90·6	596	562
„ 20	90·6	229	457
„ 21	Filter resting	..	..
„ 22	90·6	1,284	425
„ 23—	Filter resting	..	..
Jan. 2			
„ 2	90·6	2,003	315*
„ 3	90·6	3,424	315
„ 4	90·6	1,304	315
„ 5	90·6	1,024	315
„ 6	Filter resting	..	..
„ 7	90·6	1,571	315
„ 8	90·6	1,177	315
„ 9	181·2	413	315
„ 10	181·2	291	210†
„ 11	181·2	260	210
„ 12	181·2	183	210
„ 13	Filter resting	..	..
„ 14	181·2	504	210
„ 15	181·2	489	210
„ 16–24	Filter resting	..	..
„ 25	90·6	5,172	583

* January 2—9 acid was determined in one sample.
† January 10—15 daily samples were made into one composite sample and one acid determination made.

It would naturally follow from the consideration of the action of the iron upon the filter, or the action of the filter upon the iron, that the iron would increase in the filtering material from time to time. It is interesting to note the distribution of the iron in the filter.

The table below gives the results of analyses of sand from a test pit dug in bed No. 13. The first sample was taken

Analysis of Sand, Bed No. 13, March 1902.

Depth of Sample.	Oxide of Iron (Fe_2O_3).	Ammonia.
Inches.	Per Cent.	Parts per 100,000.
0·25	1·25	912·9
0·25— 2	3·61	443·4
2— 6	2·85	70·8
6—12	0·83	44·8
12—18	0·79	32·1
18—24	0·77	12·4
24—30	0·55	12·1
30—36	0·11	12·0
36—42	0·39	9·2
42—48	0·07	9·7

rom the surface carefully scraped to a depth of one-quarter f an inch. Below this the samples were carefully taken to epresent the sand between the point of measurement. A lank analysis gave 1·53 per cent. ferric oxide and 4 parts er 100,000 ammonia, determined by the Kjeldahl method, n the sand used in the construction of the filter beds.

These results show that the iron is almost wholly retained n the upper six inches of the filter. This fact is also readily ecognised by observation, as the upper layers of the sand re much more discoloured than those below.

The rapidity of the oxidation of this iron is remarkable. When a filter is badly clogged, the sand becomes black for considerable depth. If the sand is excavated, thus giving he air an opportunity to reach the iron, it rapidly oxidises, urning red in colour within two or three minutes

From these observations, it may be seen that a sewage ontaining large quantities of pickling liquids offers several nteresting problems, and some which are of a serious ature. The acid greatly retards the action of bacteria; he iron passes through the filters, making the effluent look adly; and, with the chemical method, the acid requires uch lime, and the iron produces a large volume of sludge.

THE DETERMINATION OF SILICON IN FERRO-SILICON.

BY GEORGE L. NORRIS.

Owing to the difficulty of decomposing ferro-silicon by eaus of acids, the usual course of procedure has been to ffect the decomposition by means of fusion with sodium rbonate. This necessitates the evaporation to dryness of solution loaded with salts; and, for accurate work, a cond evaporation to dryness of the filtrate is necessary.

In the course of some work with ferric chloride, I was d to believe that I could, by the use of this reagent, dermine the silicon in ferro-silicon accurately and rapidly. he method as adopted is as follows:—

Half a gramme of powdered ferro-silicon is dissolved, in a aker, in a solution of 10 grms. of ferric chloride (U.S.P.), c.c. of strong hydrochloric acid, and about $\frac{1}{3}$ grm. of tarric acid. The solution is rapid, and requires little heat. hen the solution is complete, add 25 c.c. of strong hydrolorie acid, and boil for a few moments, remove from the lamp, dilute with cold water, and filter, washing with hot dilute hydrochloric acid and hot water.

The silicon is seldom stained with iron oxide, and filters very easily, not being at all slimy. The time required for the analysis is about one half-hour.

The following analyses are typical results on the same sample:—

			Per Cent.
By the fusion method.	1st evaporation.	Silicon ...	12·11
„	2nd „	„ ...	0·52
	Total silicon		12·63
By the ferric chloride method.	Silicon		12·68

Nottingham Section.

THE RÔLE OF ALUMINA IN BLAST FURNACE SLAGS.

BY G. J. WARD.

(This Journal, April 15, 1902.)

DISCUSSION.

Errata.

Page 453, col. 2, line 32 from bottom: delete "it was shown that."

Page 453, col. 2, line 31 from bottom: for "slag" read "silica."

Page 453, col. 2, line 22 from bottom: for "fused" read "fusible."

Yorkshire Section.

MODIFIED FORMS OF THERMO-REGULATOR AND ADAPTER FOR VACUUM DISTILLATION.

BY T. S. PATTERSON.

(This Journal, April 15, 1902, 156.)

Erratum.

For "Adaptor" read "Adapter" throughout.

Journal and Patent Literature.

lass.	Page.
I.—General Plant, Apparatus, and Machinery	538
II.—Fuel, Gas, and Light	538
III.—Destructive Distillation, Tar Products, Petroleum	540
IV.—Colouring Matters and Dyestuffs.....	541
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	544
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	547
VIII.—Glass, Pottery, and Enamels.....	549
IX.—Building Materials, Clays, Mortars, and Cements	549
X.—Metallurgy	550
XI.—Electro-Chemistry and Electro-Metallurgy	553
XII.—Fats, Fatty Oils, and Soap	553

Class.	Page.
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.....	555
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	555
XV.—Manures, &c.	555
XVI.—Sugar, Starch, Gum, &c.	556
XVII.—Brewing, Wines, Spirits, &c.....	556
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	558
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	559
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	559
XXI.—Photography	561
XXII.—Explosives, Matches, &c.	561
XXIII.—Analytical Chemistry.....	562
XXIV.—Scientific and Technical Notes	565

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage luded—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Water Level or that of other Liquids; Apparatus for Indicating or Recording the ——. H. A. Cutler, Cork. Eng. Pat. 5154, March 11, 1901.

The apparatus is of the type described in Eng. Pat. 10,521 of 1898, in which the indicator or recorder is actuated electrically, the rise and fall of the liquid level giving different indications by causing currents of reverse direction to pass through the indicator. In the present invention, the transmitter consists of a wheel rotated by a float supported by the liquid, and provided with eccentrically pivoted arms adapted to actuate tipping mercury-tube or other contact-makers.—R. A.

Spray-Producers or Nebulizers. I. Lundquist and A. Kern, both of New York, U.S.A. Eng. Pat. 26,169, Dec. 21, 1901.

The cap of the liquid-containing vessel is fitted with a discharge tube having a suitable nozzle, and with an air-supply tube connected to an elastic bulb for supplying the air. The inner end of the air tube is closed by a plug, which is formed with a shoulder to support a loose cylindrical sleeve having a bulb-shaped upper end, in which the liquid is vaporised. The air forced through the air tube passes through an upwardly-inclined duct in the side of the tube into the bulb, into which the liquid is drawn, partly by adhesion and partly by the suction produced, through the annular space between the sleeve and the tube. The liquid is atomised in the bulb by the action of the air, and the spray so formed is forced through the open upper end of the bulb into the body of the vessel, and from thence through the discharge tube.—R. A.

Superheating or Drying Steam; Apparatus for ——. H. McPhail, Wakefield, Yorkshire. Eng. Pat. 2074, Jan. 25, 1902.

The apparatus comprises an independently fired structure in which the series of superheating elements or members are superposed vertically, or arranged side by side, the elements or members being so constructed and arranged that they can be increased or diminished with facility. Two methods of arranging and connecting the elements are described, the connection between the tubes and headers being effected by an expanding operation, as described in Eng. Pat. 1449 of 1902.—R. A.

United States Patent.

Centrifugal Machine. W. P. Lafferty, Philadelphia, U.S.A. U.S. Pat. 695,158, March 11, 1902.

The machine, specially adapted for the separation of liquid from starch and similar substances, is a modified under-driven hydro-extractor, in which the whole contents are made to rotate at the speed of the drum, the liquid being discharged by overflowing its upper cover; the lower bearing of the drum spindle is supported in a spherical casing, and the upper bearing is normally maintained in a concentric position by springs; the drum is not perforated, but is provided with removable radial vanes, and with a cover for the discharge of the separated solids.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Alcohol in Germany; Technical Uses [Fuel, Light, &c.] of ——. U.S. Consular Reports, No. 1288, March 13, 1902.

Although, theoretically, alcohol has only three-fifths of the thermal value of petroleum, yet, on the other hand, it has been found that, for motor purposes, 28 per cent. of the theoretical efficiency of alcohol can be attained as against a maximum of 15 per cent. in the case of petroleum products. A mixture of alcohol with 16 per cent. of benzol is still more efficient. It is stated that at its present price of about 13½ cents per gallon, alcohol can compete economically with steam and other agents in engines of less than 20 h.p.

For lighting purposes, with incandescent lamps, alcohol is stated to be much superior to petroleum. The lamps are all similar as regards the main principles of construction: the alcohol is contained in a reservoir from which a wick of multiple strands leads to the burner, which is surmounted by the incandescent mantle and shielded by an Argand chimney. With alcohol at 21·7 cents per gallon, it is stated that with one form of lamp, a light of 85 candle-power can be obtained at a cost of ¾ cent per hour, whilst another form—the so-called arc-lamp—gives a light of 550 candle-power at two-thirds the cost of an electric light of the same power at Berlin rates.—A. S.

Acetylene Generators; Report of the Committee on ——. March, 1902.

In December, 1900, a committee, consisting of Messrs. C. V. Boys, H. E. Jones, Vivian B. Lewes, Boverton Redwood, A. Spencer, and J. Swinburne, was appointed by the department of H.M. Inspectors of Explosives to advise that department "as to the conditions of safety to which acetylene generators should conform, and to carry out tests of generators now on the market, in order to ascertain how far these conform with such conditions." Before starting upon their investigation the Committee drew up the following list of conditions which generators should fulfil before they could be considered safe: (1) The temperature in any part of the apparatus, when running at its maximum speed for a prolonged period, should not exceed 130° C., this being tested by the insertion of lengths of fusible wire in the most critical positions. (2) The generator should have an efficiency of not less than 90 per cent., because any notable proportion of undecomposed carbide in the waste residue may prove a source of inconvenience or even danger when it is thrown away. (3) The gas-leading pipes should be large enough to avoid throttling and consequent back-pressure. (4) The carbide should be completely decomposed in the apparatus (*cf.* No. 2). (5) The pressure on the generator side of the holder should not exceed 20 ins., and on the service side, or where no holder is provided, 5 ins. of water. (6) No tarry or heavy condensation products should be formed from the carbide. (7) Regard should be had to the danger of stoppage by frost, and, where necessary, steps should be taken to prevent it. (8) Lime sludge should not be able to gain access to the gas or water pipes. (9) Glass gauges should be avoided as far as possible; if necessary they should be protected from breakage. (10) The air space in the generator should be as small as possible. (11) Copper should not be used in places where it would come in contact with the acetylene. No reference was made, in the specified conditions under which the tests were to be conducted, to the determination of the efficiency of the various arrangements for automatically arresting generation.

In consequence of a circular addressed to the trade, 46 generators were handed to the Committee for examination, together with two table lamps, neither of which proved satisfactory. These generators were then tested, in the presence of a representative of the makers, upon carbide of predetermined gas-yielding power; the maximum pressure, as mentioned above, and the amount of acetylene liberated from the carbide being ascertained. Together with diagrams of the different apparatus and descriptions of their arrangements, the results of the tests are given in tabular form in the report, and show gas pressures from 30 ins. downwards in the generating chambers, and from 10 ins. downwards in other parts of the apparatus, with gas-yields (expressed as percentages of the highest possible, *i.e.*, 100 per cent.) ranging from 99·8 to 64·83. As the result of their experiments the Committee think it right to point out that while the generators have in no instance shown evidence of being otherwise than safe under the conditions of the test to which they were subjected, many are of unnecessarily and undesirably complicated design, and some are not sufficiently strong in construction. Referring to the question of automatic *versus* non-automatic generators (*i.e.*, those without and those with a holder large enough to contain all the gas capable of evolution from the entire carbide charge), the

members of Committee are not satisfied that under the varied conditions of use, especially with unskilled labour, the advantages aimed at by the designers of automatic apparatus are sufficient to make it worth while to incur the possible trouble which may be met with in the practical use of automatic generators, especially those of complicated design. In certain circumstances, however, with due safeguards, the employment of automatic generators may be admitted convenient.

Summing up the results of their work, the Committee consider that in selecting an acetylene generator, regard should be had to the following desiderata:—(1) Simplicity of action and design; (2) strength of construction; (3) high efficiency, as indicated by the yield of gas per lb. of carbide; (4) low pressure in generator; and (5) facility of removal of the residue.

The report also includes a model code of regulations for the storage of carbide, and for the installation of an acetylene plant.—F. H. L.

English Patents.

Producer Gas; Process and Apparatus for Generating ——. B. J. B. Mills, London. J. R. Taylor, Brooklyn, U.S.A. Eng. Pat. 26,330, Dec. 24, 1901.

The producer is furnished at the top with hoppers, for the admission of the initial charge of coke, and at the bottom with water-sealed ash-pits. Through the lower, contracted portion of the producer there pass air-and-steam injectors and, a short distance above the latter, screw conveyors, which act as under-feed stokers for introducing coal under the bed of incandescent coke. The conveyors are surrounded by passages for a forced draft, which is directed through tuyère orifices into the body of fuel. The producer having been started with a charge of coke, brought to incandescence, "green" coal is fed continuously under the incandescent coke by means of the screw conveyors. The coal is at once coked (the volatile tarry matters being converted into permanent combustible gases while passing up through the incandescent fuel), and on descending the sides of a central conical abutment, it encounters the streams of air and steam from the injectors, the ashes finally descending into the ash-pits. It is claimed that on using green coal in this manner, the gas obtained is free from water, tar or other condensable constituents.—H. B.

Gas-Pumps; Automatic ——. A. Rulf, Brussels. Eng. Pat. 14,865, July 22, 1901.

The pump is of the class of those which serve to draw in one or more gases, and force it or them under a given pressure into a gasholder or directly to the place of consumption. It consists of a gasholder, to the bell of which a piston is secured. A pipe discharges water under this piston, causing the bell to rise, during which motion the latter draws in the gas from a conduit. During the subsequent downward movement of the bell, the gas is compressed and delivered as required. Within the holder is a distributing device, consisting of three parallel cylinders having slide valves, the inner one being operated directly from the bell as it rises and falls, and opening or closing communications with the two outer or main-valve cylinders, the valves of which alternately connect the cylinder of the piston to the water inlet and outlet conduits, and the holder to the gas sucking and forcing pipes. The gasholder may have a number of compartments for receiving and compressing different gases at one time.—R. S.

Carburetters for Explosion Motors. J. W. Hinchley, London. Eng. Pat. 5316, March 13, 1901.

Carburetters of the spray or jet type are caused to produce a uniform and constant explosive mixture at any speed of the engine, by causing the air, after passing through a gauze cylinder to free it from dust, to pass through constricted opening, through the wall of which a fine hole is pierced, the hole being placed in communication with the supply of petrol, oil, or spirit.—R. S.

Carburetters for Use in connection with Explosion Motors. H. N. Frenay, Liège. Eng. Pat. 24,974, Dec. 7, 1901.

A carburetter is described which requires no regulation for admission of either the air or the oil, and having its dimensions designed in such a manner that the mixture is made automatically. The apparatus is all in one piece, the inlet for air and the outlet for gas being in the same axis. The end of the injection tube has a ring round it to prevent accidental spilling of the oil.—F. H. L.

Burners; Hydrocarbon ——. G. A. Bonnell, Arizona. Eng. Pat. 26,707, Dec. 31, 1901.

The burner described is fan shaped, slightly conical in cross section. The oil enters at the centre of the base, travels round a peripheral path to the top, then descends through a central hole to near the bottom, and finally emerges through two lateral tubes, one on either side of the fan, to the burner orifices. These are arranged convergently, so that the two sheets of flame lick the sides of the fan, and ultimately unite into one flame. By the heating of the fan, the oil is gasified during its passage through the tubes mentioned. Underneath the whole is the usual needle-valve for regulating the supply of oil.—F. H. L.

Vapour-burning Apparatus. A. Kitson, London. Eng. Pat. 7181, April 4, 1901.

The fine opening in the oil-vaporising tube leading to the burner is cleaned, when necessary, by means of a rod, extending through a stuffing-box secured to the wall of the tube at a point diametrically opposite to the outlet of the tube, and provided at its inner end with a cleaning needle. The outer end of the rod is provided with means, such as a lever, for moving the rod into the outlet in opposition to the action of a spring which normally keeps the needle clear of the outlet. The device is shown applied to the lamps forming the inventions described in Eng. Pats. 22,204, 1898 (this Journal, 1899, 1110), and 20,210, 1900 (this Journal, 1901, 1198).—R. S.

Hydrocarburetted Air; Obtaining and Utilising ——, *and Apparatus therefor.* W. P. Thompson, Liverpool. Eng. Pat. 7715, April 15, 1901.

Improvements on Wilkinson's Eng. Pat. 13,113 of 1900 (this Journal, 1901, 883). Air under pressure is passed upwards through a vertical cylinder, within which is a double, vertical diaphragm of wire gauze, of sinuous cross-section, having asbestos or other absorbent material within the walls of the diaphragm. Light hydrocarbon oil flows from a chamber, at the top of the cylinder, down through the diaphragm. The carburetted air issuing from the top of the apparatus is mixed with air supplied through a by-pass pipe in such proportion as to give a "self-burning" mixture. There is a claim for "bringing the gas against the surface to be heated in such manner" (in respect to pressure and dilution with air) "that it shall only light on the surface of the articles to be heated," and not at the burner orifice.—H. B.

Incandescence Oil Lamps. T. J. Cranston, Westminster. Eng. Pat. 6336, March 26, 1901.

In an oil lamp of the circular-wick type, provided with two concentric air cones, there is arranged a conoidal flame-spreader, supplied with air ascending the inner wick tube, the spreader having numerous perforations through its upper part, and a downwardly-projecting lip at its base. The spreader is supported on a tubular stem, with oblique slots through it, which rests on a protuberance within the inner wick tube. The impregnation of the upper part of the wick with silicate of soda is stated to have the advantageous effect of maintaining the capillarity of the carbonised top part of the wick.—H. B.

[*Incandescence*] *Vapour Lamps.* R. E. Walther, Werdau, Germany. Eng. Pat. 26,337, Dec. 24, 1901.

To prevent too great a transmission of heat from the burner to the oil reservoir, a non-conducting ring is arranged in the socket of the latter, into which the wick tube of the burner is detachably secured.—H. B.

Carbide Feed Mechanism for Acetylene Gas Machines. G. W. Collin, Bridgeport, Conn., and W. S. Nicholls, New York City, U.S.A. Eng. Pat. 3481, Feb. 11, 1902.

The device described is claimed to enable carbide, in its commercial irregular-shaped lumps, to be fed smoothly into

the water of an automatic generator of the shoot type. The base of the usual carbide hopper is bent laterally at an angle of 45°, and at its mouth is a star-wheel, which has web-like ends, portions of which are provided with teeth at the periphery. Carried on movable centres is another star-wheel, which is caused to revolve in an opposite direction to the former by the ends of its radii engaging with the teeth mentioned. When, however, a large lump of carbide comes between the wheels, the second is free to move away to make a wider space. Operated from the bearings of the second wheel is a serrated flap hinged in the carbide aperture, to which an oscillatory motion is periodically given, thus agitating the carbide and preventing the lumps jambing. The first wheel is driven by a clutch from the bell of the gasholder.—F. H. L.

Incandescent Lamps, Electric, in which the Glower or Light-giving Body is a Conductor of the Second Class. G. S. Ram and Nernst Electric Light, Ltd., Westminster Eng. Pat. 10,753, May 25, 1901.

The upper parts of Nernst lamps usually get very hot, owing chiefly to the ascending currents of hot air from the glower. In order to dissipate this heat, metal fins of considerable superficial area are attached externally to the metallic part of the lamp above the glower.—H. B.

Incandescent Electric Lamps. A. L. Reimann, Huyton, Lancaster. Eng. Pat. 17,070, Aug. 26, 1901.

The lamp is provided with a support for the filament, consisting of a central, or main, supporting rod of wire or glass, one end of which is fused into the base of the lamp, the other end having a glass bead fused on to it. One, two, or more short pieces of wire, forming sub-supports, are fused into the bead, and are formed at their free ends into loops, by which the convolutions of the filament are suspended. The filament may be secured rigidly in the loops by graphite or other cement.—H. B.

Electric Arc Lamps. S. H. Johnson, Stratford. Eng. Pat. 11,135, May 30, 1901.

This relates to lamps in which the regulation of the arc is effected by means of the expansion and contraction of a thermo-expansive metallic strip, through which the current passes on its way to the movable carbon. The thermo-expansive strip operates a spring-controlled lever, the end of which is locked to a main slip clutch surrounding the carbon. Above the main clutch the carbon is surrounded by an auxiliary feed-regulating clutch, suspended from a counterpoised, pivoted lever, which allows it a range of motion between predetermined limits. The two clutches and levers are linked together, and so arranged in relation to a series of clutch-tripping devices that they co-operate to produce a definite step-by-step feed of the movable carbon. After each step of the feed the auxiliary clutch is raised a predetermined distance upon the movable carbon, defining the extent of the next step of the feed, which is kept in readiness for application when the main clutch is released. —H. B.

Buoys or Signals [Automatic]; Illuminating ——. C. C. A. E. Wiese and C. F. M. Gröschner, Hamburg. Eng. Pat. 26,256, Dec. 23, 1901.

Reference is made to Eng. Pat. 21,036 of 1899. The buoy, which becomes automatically illuminated on being thrown into the water, consists of a floating body provided with means for fastening life-belts to it. Extending through the floating body is a tube, carrying at its upper end a lamp, and at its lower end an acetylene generator and a dry battery. When the buoy is thrown into water, water enters through passages into the generator, dropping gradually into a calcium carbide cartridge. The pressure set up causes the inflation of an expansible body, which raises a lever, thereby releasing a spring-controlled cock, which at once opens the pipe leading from the acetylene generator to the burner in the lamp. Simultaneously, the revolution of the cock causes a disc attached thereto, and provided with cam projections, to make contact so as to close the electric circuit from the dry battery; this causing a platinum wire, which forms part of the circuit, and is situated in the region of the flame of the burner, to become incandescent and to ignite the gas. The flame produced soon fuses the platinum wire, putting the battery out of action.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Olives; Utilisation [Dry Distillation] of the Expressed Residue of ——. Jürgensen and Bauschlicher. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [4], 80—81.

The dry distillation of wood is practically an unknown industry in the southern countries of Europe, owing to the scarcity of suitable material.

The authors have made numerous experiments to discover a suitable substitute for wood as the crude material for wood charcoal, methyl alcohol, acetic acid, acetone, &c., and have come to the conclusion that no industrial by-product is so suitable for the purpose as the residue left on expression of the oil from olives.

They calculate that the total quantity of residue, obtained in Spain, Italy, Algiers, Tunis, and other Mediterranean countries is about 1,200,000 tons, of which half might still be utilised for fuel. At present the residue is washed with water or extracted with carbon bisulphide to remove the last portions (10 to 12 per cent.) of oil, and is then utilised as a cheap fuel or manure. On the average a ton of the dried residue fetches 5 francs.

As yet there are but few factories in Spain, Algiers, and Tunis, where the residue is extracted; but in South Italy, especially in the neighbourhood of Bari, the industry has attained considerable importance. There, too, the extraction-residue is partly used as fuel in the factory and partly sold at a low price.

For the dry distillation of the expressed residue, special apparatus is necessary, and this has been patented by the authors in all the countries about the Mediterranean. They have also obtained a monopoly for the distillation of olive residues in Spain.

The yield of chemical products from the residues is stated to be very similar to that obtained by the dry distillation of the best oak- and beech-wood. The charcoal left in the retort is in fragments of the size of peas. It contains very little ash, and has a heating effect of 6,800 cals. It can readily be pressed into briquettes, which burn very slowly, and fetch a good price. In Algiers and Tunis, in particular, where wood charcoal is very scarce and dear, these briquettes could be utilised in the smelting of the local iron ores. (See this Journal, 1900, 913.)—C. A. M.

Petroleum; Diatom Wax and its connection with ——. G. Kraemer and A. Spilker. Ber., **35**, [5], 1212—1223. (See also this Journal, 1900, 36.)

The authors having further examined the diatom wax contained in the dry matter from a number of peat mosses, pyropissite, lignite, and bituminous coal, believe that this wax has played a conspicuous part in the formation of petroleum, for the following reasons:—

The fact that there is no need for merely assuming that considerable accumulations of wax have existed, since its presence can even now be detected, though in a modified form; the illimitable keeping properties of this wax in contrast to the ready dissociability of most of the animal fats; the occurrence of ozokerite and the proof that this forms an intermediate stage between diatom wax and petroleum; the ease and completeness with which the wax can be decomposed at comparatively low temperatures into the same gaseous, liquid, and solid hydrocarbons as are found in petroleum; the almost invariable presence in petroleum of sulphur, the extent of which apparently fluctuated with the number and activity of the sulphur bacteria symbiotic with the wax-producing algæ, whereas the origin of such sulphur from animal fats, which are mostly destitute of this substance, would be difficult to explain.—C. S.

roleum from Cuba. H. N. Stokes. Eng. and Mining J., 1902, **73**, [10], 347.

e author has examined a specimen of the petroleum ich issues with the water from a spring known as the dalwood Spring, at Santa Clara, Cuba. The oil, which alled sandalina or sandalwood oil, is about as viscous as ng sulphuric acid, and when dried over calcium chloride, perfectly transparent and amber-coloured, with the rest trace of bluish-green fluorescence. The specific vity of the oil is 0·901 at 33° C. Sandalina is charac-sed by its peculiar odour, resembling that of cedar-wood l by the almost total absence of bodies other than hydro-bons. The main quantity of the oil distils between 230° 330° C., 3·3 per cent. distilling below 230° C., and 11·3 cent. above 330° C. Paraffin wax is absent, and not re than 1 per cent. of unsaturated fatty hydrocarbons is sent. Like the Russian petroleums, the oil appears to sist for the most part of naphthenes. Naphthene or roleum acids are formed in notable quantity even in a idly conducted oxidation with chromic acid. The final ducts of oxidation are carbon dioxide, acetic acid with es of higher homologues, and water, together with small antities of acetone.—A. S.

French Patents.

nzenes and their Homologues; Improved Method and Apparatus for Producing ——. A. Nikiforoff. Fr. Pat. 315,428, Oct. 29, 1901.

E features claimed are: Subjecting liquid hydrocarbons oiling below 200° C.) from crude petroleum, petroleum idue, coal-tar oils, &c., to double decomposition at two ferent temperatures (about 525° and 900° C.), and under ssure; washing the primary decomposition products in a parator, before passing them through the condenser, order to retain in the former vessel the hydrocarbons ling above 200° C.; employing a device for enabling the ecific gravity of the liquid products to be constantly under servation. In order to increase the working area of the ondary retorts, they are surmounted by a third; the ernal pressure is increased by means of a perforated plug the discharge pipe of the retorts, and rakes are provided cleaning them out. The gaseous products from the ondary retorts are carefully washed in a water-cooled ndenser, fitted with a partition and with stirrers; and the matic hydrocarbons in the gaseous products are extracted the aid of organic solvents, such as methyl alcohol, etone, &c.—C. S.

etone from Saccharine Substances; Manufacturing ——. G. Péreire and G. P. Guignard. Fr. Pat. 316,060, Nov. 19, 1901.

IE saccharine substance (sugar-beet, molasses, sugar-ne, &c.) is dried, mixed with an oxide difficult of reduc-n (such as oxides of the alkalis, alkaline earths, iron, d, &c.), and heated to dull redness in a retort. The gar and organic acids are converted into acetone and its mologues, whilst the nitrogenous matters are decomposed th formation of ammonia. The latter product is absorbed suitable means, and the acetone vapours are condensed. ie residual saline matters in the retort may, according to eir composition, be treated for the recovery of alkalis, or ployed as phospho-potassic manures.—C. S.

etone, with Utilisation of the Gaseous Reduction-Products, and without producing Acetic Acid; Distilling Wood for the Manufacture of ——. G. Péreire and G. P. Guignard. Fr. Pat. 316,061, Nov. 19, 1901.

IE volatile products of the distillation of wood are passed rough a retort charged with charcoal and heated to tween dull and bright redness, in order to form the lowing products:—methyl alcohol, acetone, benzene, bon monoxide, hydrogen, and ammonia. These products passed through a purifier for removing the ammonia, l afterwards through an efficient condenser for liquefying methyl alcohol, acetone, and benzene. Finally, the uent gases are collected in a suitable manner, for use as ucing agents in metallurgy.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Nitrobenzaldehydes; New Method for the Preparation of ——. F. Sachs and R. Kempf. Ber., 1902, **35**, [5], 1224—1240.

The reaction between nitrosodialphylanilines and methylene compounds in presence of alkalis, yields condensation products which, on decomposition with mineral acids, give a ketone and dialphyl-*p*-phenylene diamine. With the object of converting methyl compounds into aldehydes, the authors have investigated certain nitro compounds of toluene which they find react in this manner. Thus 2.4-dinitrotoluene condenses with nitroso-dimethylaniline, giving a product which decomposes on treatment with mineral acids, even in the cold, into dimethylphenylenediamine and 2.4 dinitrobenzaldehyde; whilst 2.4.6-trinitrotoluene, in a similar manner, yields 2.4.6-trinitrobenzaldehyde. The dinitrobenzaldehyde can also be obtained by treating 2.4-dinitrobenzyl chloride with aniline, when dinitrobenzylaniline is formed, which, on oxidation with permanganate, yields the corresponding benzylidene compound identical with that obtained by the action of aniline on dinitrobenzaldehyde, and convertible by mineral acids into these two components.

The condensation between dinitrotoluene and nitrosodimethylaniline takes place in alcoholic solution in presence of sodium carbonate, yielding the compound $C_6H_3(NO_2)_2CH:N.C_6H_4.N(CH_3)_2 + H_2O$ with an 83 per cent. yield. The product crystallises from acetone in dark green metallic needles melting at 193° C. The corresponding derivative from nitrosodiethylaniline melts at 173° C. Both these compounds when treated with dilute mineral acids, preferably with nitric acid (27 per cent. HNO_3) in presence of benzene, yield 2.4-dinitrobenzaldehyde and *p*-aminodimethyl- or diethyl-aniline. The aldehyde melts at 72° C., and distils at 190°—210° C. under 10—20 mm. pressure. It is readily soluble in benzene, ether, alcohol and acetone, but very sparingly soluble in petroleum spirit. Both the alcoholic and aqueous solutions reduce ammoniacal silver and Fehling's solution. The aldehyde gives a bisulphite double compound and a characteristically insoluble phenylhydrazone. This latter reaction serves for the detection of the aldehyde, or of phenylhydrazine, as even 0·00001 grm. of phenylhydrazine gives a distinct precipitate with an alcoholic dinitrobenzaldehyde solution. By treating the phenylhydrazone with fuming sulphuric acid, it gives a sulphonic acid which melts at about 217° C. The product is somewhat hygroscopic, and the alcoholic or aqueous solutions dye wool deep Bordeaux red, and silk a more yellowish-red. The corresponding benzylphenylhydrazone melts at 156° C., and the *p*-nitrophenylhydrazone at 285° C. The action of hydrazine sulphate on the aldehyde in presence of sodium acetate yields 2.4.2′.4′-tetranitrobenzalazine, $(NO_2)_2C_6H_3.CH:N.N:CH.C_6H_3(NO_2)_2$, which separates from nitrobenzene in thin golden-yellow needles or in rhombic crystals melting at 246° C. With aniline, the aldehyde forms dinitrobenzylidene aniline, melting at 133° C., and when boiled with hydroxylamine hydrochloride in dilute alcoholic solution, it gives the oxime, which separates from very dilute alcohol in white tabular crystals melting at 125° C. This, on reduction in alcoholic solution with ammonium sulphite, gives nitraminobenzaldoxime, and subsequently diaminobenzaldoxime. The former separates from dilute alcohol in orange-yellow matted needles melting at 178° C., and gives a phenylhydrazone melting at 163° C., which dyes wool and silk orange to strawberry red from an aqueous solution, whilst the latter separates from alcohol in shining plates, melting at 200° C. As already mentioned, dinitrobenzaldehyde can also be obtained from dinitrobenzyl chloride by condensing this product first with aniline, when dinitrobenzylaniline is formed, melting at 95° C., and crystallising in golden-yellow rectangular plates. On oxidation with permanganate in a solution of acetone, this substance is converted into dinitrobenzylidene aniline, which, on decomposition with dilute acids, yields dinitrobenzaldehyde.

It is also found that 2.4.6-trinitrotoluene condenses in acetone solution with nitrosodimethylaniline in presence of sodium carbonate, yielding a product which, on decom-

position with mineral acids, gives 2.4.6-trinitrobenzaldehyde. This product separates from benzene in plates melting at 119° C.

Further examination of similar condensations showed that *p*-nitrobenzyl chloride combines with nitrosodimethylaniline in presence of soda lye, the product decomposing, on treatment with mineral acids, into *p*-nitrobenzaldehyde and dimethylphenylene diamine, whilst a very similar substance is formed by the condensation of these two products of the decomposition.—T. A. L.

Nitronaphthalenes; Reduction Products of the ——. L. Wacker. Annalen, **321**, [1], 61—70.

The author has previously (Annalen, **317**, 375) examined the products of the reduction of α-nitronaphthalene in alkaline solution. By reduction with sodium amalgam or zinc dust, a compound was obtained which Jaworsky had regarded as azoxynaphthalene (J. prakt. Chem., 1864, 532), but which has doubtless a different constitution. In neutral solution, by means of zinc dust and ammonium chloride, naphthylhydroxylamine and small quantities of true azoxynaphthalene were obtained.

On treating α-nitronaphthalene with grape sugar and caustic soda at 60°—70° C., a yellow compound separated; it was purified by dissolving in alcohol, with the addition of a little hydrochloric acid, and precipitating by water. This substance has basic properties, but its hydrochloride is decomposed by water. On heating, the base turns gradually brown, and melts at about 120° C.; it appears to contain two hydrogen atoms less than azoxynaphthalene. The nitrogen atoms must therefore be combined in a cyclic arrangement. By heating with zinc and iron filings, a bluish-violet product was obtained; it was soluble in sulphuric acid, but could not be identified with a naphthazine. The products of the reduction, which are soluble in alkalis, contain the elements of water more than the above base. The same yellow base is obtained by reducing α-nitronaphthalene with phenylhydrazine and caustic soda.

On reduction with zinc dust and ammonium chloride, 1.5-dinitronaphthalene yields 5.5′-dinitroazoxynaphthalene, an orange-yellow to brownish-red substance, which turns brown above 200° C. and slowly decomposes. Under the same conditions, 1.8-dinitronaphthalene yields a variety of products difficult of isolation. Phenylhydrazine and caustic soda in dilute aqueous solution produce dyestuffs similar to those obtained by means of glucose and caustic soda (Ger. Pat. 79,208 of the B.A.S.F.).

1.5-nitronaphthalene sulphonic acid, when reduced by grape sugar and caustic soda in aqueous solution, or by phenylhydrazine and caustic soda in alcoholic solution, yields azoxynaphthalene-5.5′-disulphonic acid, which crystallises with $2H_2O$ in fine shining leaflets or in yellowish prisms. The sodium salt of this acid dyes wool a pale yellow from an acid bath; on the fibre, as also in aqueous solution, it is transformed into a red dyestuff, which is not identical with the oxyazo compound obtained by the action of strong sulphuric acid. The latter dyes animal fibres red, and forms both yellow and reddish-violet salts, whilst the dyestuff produced by the action of sunlight gives no change of colour on the addition of caustic soda which would indicate the presence of a hydroxyl group.

Fuming sulphuric acid (25 per cent. SO_3) and sulphuric acid of 75—80 per cent. strength give different dyestuffs by their action on azoxynaphthalene-5.5′-disulphonic acid. The ammonium salt of the oxyazo compound produced by the weaker acid is soluble with difficulty; it crystallises in fine leaflets with a golden glitter. It gives a yellowish-red solution in warm water, which is coloured an intense reddish-violet by caustic alkalis. Strong hydrochloric and sulphuric acids separate the bluish-green dyestuff from the aqueous solutions. The salt dyes unmordanted wool orange-red from a weak acid bath.

1.3.8-nitronaphthalene disulphonic acid is reduced by glucose and caustic potash to azoxynaphthalene-3.3′.8.8′-tetrasulphonic acid, the potassium salt of which is an orange-red powder. The transformation of this dyestuff into an oxyazo compound is more difficult, but sunlight is not without influence. The sodium salts of 1.6-, 1.7-, and 1.8-nitronaphthalene sulphonic acids can also be reduced (best by zinc dust and ammonium chloride) to azoxy compounds, which are then readily transformed into oxyazo bodies.—A. C. W.

Blue Dyestuff [Triphenylmethane Dyestuffs] derived from Triphenylmethane; New ——. D. Maron. Rev. Gén. des Mat. Col., 1902, **6**, [64], 76.

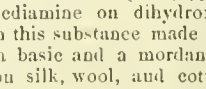
By condensing Michler's ketone with α-naphthylglycine ester in presence of phosphorus oxychloride, a well crystallised blue dyestuff is obtained. The product has the constitution—

$$(H_3C)_2N.C_6H_4.C\begin{cases} C_{10}H_6NHCH_2CO_2C_2H_5 \\ C_6H_4:N(CH_3)_2Cl \end{cases}$$

and hence is an analogue of New Victoria Blue, a derivative of ethyl-α-naphthylamine, in which the ethyl group is replaced by $CH_2CO_2C_2H_5$. The strength of the colour is thereby much increased. Naphthyl glycine itself gives a condensation product with the above-mentioned ketone, but has no particular value. The manufacture of the product described forms the subject-matter of Ger. Pat. 128,176 of April 2, 1901.—T. A. L.

2.3-*Dihydroxyphenazine [Azine Dyestuff]; Tinctorial Properties of* ——. E. Noelting. Rev. Gén. des Mat. Col., 1902, **6**, [64], 75—76.

This substance, having the formula—



has been prepared by Fischer and Hepp (Ber., **23**, 843) by heating diaminophenazine with hydrochloric acid to 200° C., and by Nietzki and Hasterlik (Ber., **24**, 1338) by reacting with *o*-phenylenediamine on dihydroxyquinone. Dyeing experiments with this substance made by the author show that it is both a basic and a mordant dyestuff. It gives yellow shades on silk, wool, and cotton mordanted with tannin, and dyes a level yellow on chromed wool. The shades given with other metallic salts are as follows:—Aluminium, orange; iron, dark brownish-red; copper, brownish-red; bismuth, like copper, but paler; cerium, thorium, zirconium, and yttrium, orange-brown. Other mordants, with the exception of antimony, give faint orange-yellow shades. All these dyeings are tolerably fast to soap, those on chrome being very fast.—T. A. L.

ω-Cyanomethylanthranilic Acid; Production of Esters of ——. [*Indigo.*] Badische Anilin und Soda Fabrik. Ger. Pat. 129,375, April 1, 1900. Zeits. angew. Chem., 1902, **15**, [13], 315.

Cyanomethylanthranilic acid—

$$C_6H_4\begin{cases} NH.CH_2.CN, \\ COOH \end{cases}$$

is subjected to the limited action of alcohols and mineral acids, so that esterification of the carboxyl group ensues, the saponification of the cyanogen group being avoided as much as possible. The products can be used in the manufacture of artificial indigo; *e.g.*, on boiling them with HCl they are converted into acid esters of phenylglycocoll *o*-carboxylic acid.—H. B.

ω-Cyanomethylanthranilic Acid; Production of Esters of ——. [*Indigo.*] Badische Anilin und Soda Fabrik. Ger. Pat. 129,562, Jan. 10, 1900. Zeits. angew. Chem., 1902, **15**, [13], 316.

The salts of cyanomethylanthranilic acid are treated with alkylating agents; *e.g.*, alkyl halogen compounds.—H. B.

English Patents.

Green Sulphurised Dyestuffs [Sulphide Dyestuffs] Manufacture of ——. O. Imray, London. From The Basle Chemical Works, Basle, Switzerland. Eng. Pat. 2722, Feb. 3, 1902.

The products obtained by heating *p*-nitrochlorobenzene or *p*-dichloronitrobenzene with *p*-nitrophenol in aqueous

lcoholic caustic soda solution, are fused with sulphur, austic alkali, and an alkaline sulphide at about 140°—50° C. The dyestuff dissolves sparingly in strong sulhuric acid to a dirty violet solution. Its solution in alkali r alkaline sulphide gives a fine brown precipitate with cids, whilst from aqueous solution the dyestuff may be alted out.—T. A. L.

Brown Colouring Matter [Sulphide Dyestuff]; Manufacture and Production of a ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 10,728, May 23, 1901.

ee Fr. Pat. 311,190; this Journal, 1902, 13.—T. A. L.

Dyestuff from Cotton Seeds; Manufacture of ——. O. Imray, London. From American By-Products Co., New York, U.S.A. Eng. Pat. 19,587, Oct. 1, 1901.

ee Fr. Pat. 314,629; this Journal, 1902, 402.—T. A. L.

French Patents.

ndigo, Mono- and Dibrom-, and Mono- and Dichlor-; Manufacture of ——. A. Rahtjen. Fr. Pat. 310,926, Oct. 21, 1901. Supplement.

he monobrom- or monochlorindigo obtained according to he chief patent of May 18, 1901 (Eng. Pat. 11,022 of 901; this Journal, 1901, 1205), can be converted by the ction of chlorine or bromine respectively into bromochlorndigo, which dissolves in concentrated sulphuric acid with n emerald-green colour. It sublimes with much decomosition, giving an orange-violet vapour, and yields a leuco erivative with suitable reducing agents. According to the aim, bromochlorindigo can be obtained by the simulaneous or successive action of chlorine and of bromine on ndigo.—T. A. L.

Phenylglycine [Phenyl-glycocoll], its Homologues, and their Salts; Process for the Manufacture of ——. [*Indigo.*] Compagnie Parisienne de Couleurs d'Aniline. Fr. Pat. 315,940, Nov. 14, 1901.

he process claimed consists in heating together, in solution n water or dilute alcohol, a mixture of aniline, or one of s homologues, with formaldehyde and the cyanide of an kali or alkaline earth. The reaction takes place according o the equation: $C_6H_5.NH_2 + CH_2O + MCN + H_2O = C_6H_5.NH.CH_2.COOM + NH_3$, in which M represents monovalent metal.—A. C. W.

Phenylamino-acetonitrile [Indigo Dyestuffs], its Homologues and Substitution Products; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 314,860, Oct. 9, 1901.

he products mentioned in the title are obtained by reacting ith the "nitrite" of glycollic acid, $OH.CH_2.C{:}N$, on niline, its homologues or substitution products. (*See next bstract.*)—T. A. L.

Phenylamino-acetonitrile, its Homologues and Substitution Products; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 314,860, Oct. 17, 1901. Supplement.

he patentees amend the chief patent (see preceding bstract), substituting the word nitrile for nitrite where it ppears in the title, claim and body of the specification.

—T. A. L.

Metallic Nitroso Derivatives of Phenols, Cresol, and Naphthol; Process for the Preparation of ——. R. Vidal. Fr. Pat. 315,695, Nov. 7, 1901.

he process is claimed for producing the metallic salts of e nitrosophenols, cresols, and naphthols, which consists grinding together, in the dry state, molecular proportions the phenol with a crystalline salt, such as zinc, copper, aluminium sulphate, and then adding sodium nitrite. he mixture then gradually liquefies, emits nitrous fumes, d finally solidifies. The process may be specially applied to the preparation of nitroso-*o*- or *m*-cresol from crude cresol, with subsequent separation from the *p*-cresol; in this case the zinc sulphate and sodium nitrite are employed in quantities equivalent to the *o*- and *m*- cresol in the crude cresol.—A. C. W.

Dyestuffs; Manufacture of Sulphide ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 315,669, Nov. 6, 1901.

According to Fr. Pat. 284,387 (*see* Eng. Pat. 7349 of 1899; this Journal, 1900, 239) sulphide dyestuffs are obtained from indophenols by heating these products with sulphur and sodium sulphide to high temperatures. The patentees find that a reaction takes place at the temperature of the boiling water-bath, yielding in some cases crystalline products. For example, a mixture of 25 kilos. of crystallised sodium sulphide, 13 kilos. of sulphur, 5 litres of water, and 5 kilos. of the indophenol, obtained by the joint oxidation of *p*-aminophenol and of 1.2-naphthylamine sulphonic acid, is heated for 24 hours on the water-bath. Large quantities of sulphuretted hydrogen are disengaged, and a dark crystalline precipitate separates from the clear liquor. After filtering, pressing, washing with water, and drying, the product forms a dark powder with a coppery reflex, readily soluble in water and in concentrated sulphuric acid to form blue solutions. It dyes unmordanted cotton dark greenish-blue shades from a bath containing sodium sulphide and salt, which, by a subsequent treatment with hydrogen peroxide, become bright blue. The method is also applicable to the leuco-indophenols.—T. A. L.

Dyestuffs [Sulphide Dyestuffs]; Manufacture of ——. Actiengesellschaft für Anilinfabrikation. Fr. Pat. 315,669, Nov. 11, 1901. Supplement.

The process described in the chief patent (see preceding abstract) can be effected in boiling alcoholic solution.

—T. A. L.

Black Dyestuffs [Sulphide Dyestuffs] containing Sulphur; Manufacture of ——. Kalle and Co. Fr. Pat. 315,458, Oct. 29, 1901.

Black substantive dyestuffs for cotton are obtained by the action of sulphur and sodium sulphide in presence of caustic alkalis on molecular mixtures of derivatives of diphenylamine obtained by reacting with dinitro-chlorobenzene [$Cl:(NO_2)_2 = 1:2:4$] on *p*-phenylene diamine or its sulphonate on the one side, and *p*-aminosalicylic acid or *p*-aminophenol on the other. This mixture is obtained by reacting with diazotised *p*-nitraniline on salicylic acid or on phenol, reducing the azo compound and heating the mixture in presence of an alkali salt (sodium acetate) with two molecular proportions of dinitrochlorobenzene.—T. A. L.

Dyestuffs [Sulphide Dyestuffs]; Manufacture of Brown Sulphur ——. Kalle and Co. Fr. Pat. 315,648, Nov. 5, 1901.

Brown dyestuffs for mordanted cotton are obtained by fusing, with sulphur and sodium sulphide, amino derivatives of *m*-tolylene diamine. The dyed fabric requires no subsequent treatment, and is very fast to light. Moreover, the new products can be diazotised on the fibre, and developed with β-naphthol, *m*-tolylene diamine or resorcinol. It is not necessary to start from triaminotoluene; the same result is obtained by employing an azo compound of *m*-tolylene diamine, such, for example, as benzene-azo-*m*-tolylene diamine. For instance, 30 kilos. of this substance are gradually added to 80 kilos. of sodium sulphide and 30 kilos. of sulphur fused with a little water at 110°—120° C. A reaction takes place, the temperature rising to 160° C. Aniline is given off, and the temperature is gradually raised to 200°—220° C., and maintained thereat until the melt becomes dry. The dyestuffs are soluble in water with a brown colour, and dissolve to turbid brown solutions in concentrated sulphuric acid. They are insoluble in alcohol. Soda lye does not change the aqueous solution, whilst the addition of acids produces a thick brown precipitate.—T. A. L.

Blue Dyestuff [*Azo Dyestuffs*] *for Cotton from Acetyl-1.4-Naphthylene Diamine 7-Sulphonic Acid; Manufacture of a* ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 312,388, Oct. 28, 1901. Supplement.

In place of the acetyl compound employed in the chief patent (this Journal, 1902, 12), the patentees now diazotise Cleve's acid itself, combine this with another molecular proportion of Cleve's acid, again diazotise, and combine with a third molecular proportion of Cleve's acid, and finally diazotise the resulting product and combine it with 2.1'.2'-amino-naphthol sulphonic acid. The dyestuff gives indigo-blue shades on unmordanted cotton, the shades possessing the same fastness to light and washing as those from the dyestuff in the chief patent.—T. A. L.

Orange Lakes [*Azo Dyestuffs*] *from a New Monazo Dyestuff; Manufacture of* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 315,573, Nov. 2, 1901.

When *p*-chloro-*m*-nitraniline is treated with fuming sulphuric acid at 170°—180° C., or with chlorosulphonic acid at 130°—150° C., it is converted into a new chloro-nitraniline sulphonic acid having the formula—

$$1.2.4.5.C_6H_2.Cl.NO_2.NH_2.SO_3H.$$

The diazo compound of this acid combines with β-naphthol in presence of sodium acetate or carbonate, giving a red dyestuff with a very sparingly soluble sodium salt. The calcium, barium, aluminium, and lead salts, or their mixtures, are insoluble, even in boiling water, and are therefore of great value for the manufacture of lakes. These lakes are almost absolutely insoluble, have a bright orange shade, and are unattacked by acids or alkalis; moreover, they are fast to light, do not sublime, and may be varnished after printing. They are suitable for lithographic work, painting, and for paper-staining.—T. A. L.

Anthraquinone [*Anthracene Dyestuffs*]; *Manufacture of New Derivatives of* ——. F. Bayer and Co. Fr. Pat. 315,575, Nov. 2, 1901.

Secondary and tertiary alkylaminoanthraquinones or their derivatives, such as sulphonic acids, are converted by the action of halogens or of nitric acid into new halogen or nitro derivatives. These products condense with aromatic amines, the halogen or nitro group being replaced by the alphylamino group yielding valuable dyestuffs.—T. A. L.

Dyestuffs [*Acridine Dyestuffs*] *of the Acridine Series; Manufacture of New* ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 312,771, Oct. 22, 1901. Supplement.

Acridine yellow or its leuco derivative is condensed with formaldehyde and aniline, *o*- or *p*-toluidine, xylidine, mono- and di-alkyl-anilines or alkyl-*o*-toluidines. The products dye mordanted cotton or leather reddish-yellow shades. (See this Journal, 1902, 112.)—T. A. L.

Phenol, Cresol, or Naphthol; Manufacture of Di- and Trinitro Derivatives of ——. R. Vidal. Fr. Pat. 315,696, Nov. 7, 1901.

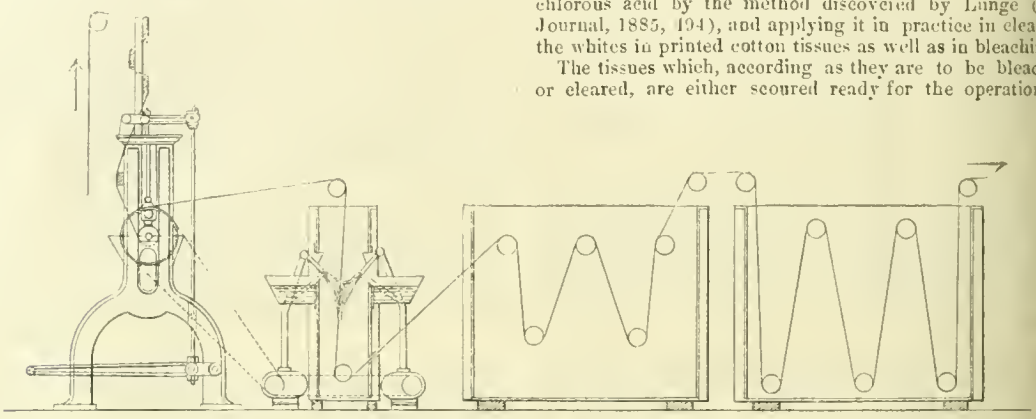
A mixture of a phenol, cresol or α-naphthol and sulphuric acid (66° B.) is poured into a solution of sodium nitrate, the whole being subsequently boiled. For example, a solution of 93 kilos. of phenol in 288 kilos. of sulphuric acid is poured into 1,700 litres of water containing 255 kilos. of sodium nitrate. The temperature is then gradually raised to boiling, and after cooling, the picric acid formed is filtered off.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

[*Bleaching*] *Steam Chlorinating Machine.* J. Dépierre. Bull. Soc. Ind. Mulhouse, Oct. 1901, 510—512.

An apparatus devised for the purpose of producing hypochlorous acid by the method discovered by Lunge (this Journal, 1885, 194), and applying it in practice in clearing the whites in printed cotton tissues as well as in bleaching.

The tissues which, according as they are to be bleached or cleared, are either scoured ready for the operation of bleaching, or they are printed and in a condition ready for clearing; they are then passed first through a mangle (see figure), containing a solution of bleaching powder (at from $\frac{1}{10}$° B. in the former to $\frac{1}{4}$° B. in the latter case), and then through a box into which a solution of acetic acid ($\frac{1}{2}$°—$\frac{3}{4}$° B.) is sprayed upon either one or both sides of the cloth, as required. They are next passed through one or two steaming chambers, after which they are washed and dried.



Steam-chlorinating Machine.

The quantity of acetic acid needed varies, according to the concentration of the bleaching powder solution which has been applied. In all cases an excess must be used.

The apparatus may also be employed in developing insoluble azo dyestuffs on the fibre. To this end a dilute solution of hydrogen peroxide is sprayed upon the tissues as they leave the mangle in which combination with the diazo salts is effected. The tissues are then washed or otherwise treated.—E. B.

Dyeing; Theory of ——. E. Knecht. Ber., 1902, **35**, [5], 1022—1024.

Witt's well-known solution theory of dyeing (this Journal, 1891, 42), standing midway between the mechanical and chemical theories, offers an attractive explanation of such facts as the partial exhaustion of the dye-bath, and the extraction of Magenta from dyed silk by means of hot alcohol, which on dilution with water again gives up the colour to the silk. But Witt has not considered the question of the form in which the dyestuff passes from the silk to the alcohol. The author long ago proved that in the ordinary dyeing process the whole of the hydrochloric acid originally combined with the Rosaniline remains in the dye-bath, and advanced the theory that the dyeing of wool and silk with basic dyestuffs depends on a chemical combination of the colour base with a constituent of the fibre (this Journal, 1888, 622, and 1889, 459). He also suggested that the

coloured compound so formed exists in the state of solid solution in the fibre (J. Soc. Dyers and Col., 1889, 77).

It is well known that aqueous solutions of lanugioic and sericinic acids prepared from wool and silk form highly coloured precipitates (lakes) with solutions of the basic dyestuffs. These lakes, the author now finds, are soluble in alcohol. That similar lakes are formed in the fibre in the dyeing process is borne out by the fact that when silk dyed with Magenta is exhausted with alcohol, the addition of water to the concentrated extract precipitates a lake. Further, if silk or wool dyed with Night Blue is extracted with alcohol in a Soxhlet and the concentrated solution poured slowly into baryta water, the colour base filtered off and the filtrate treated with carbon dioxide and again filtered, this solution gives intensely coloured precipitates with Night Blue and Magenta. These precipitates are soluble in alcohol. An aqueous extract of wool (obtained by prolonged digestion) also gives lakes with basic colours. On the other hand the author has extracted from silk a substance which precipitates acid and not basic colours. "Somatose" and pepsin-digested albumin also have the property of precipitating dyestuffs from aqueous solutions.

The above observations show that Witt's classical experiment may be explained on chemical grounds. The partial re-absorption of colour by the silk when the alcoholic extract is diluted with water may be explained by the fact that the Magenta lake is not quite insoluble in water. The author concludes that the simple solution theory of dyeing has now lost its chief experimental support.—T. A. L.

Indigo; Reduction of ——, with Dextrin and Caustic Soda. P. Wilhelm. Bull. Soc. Ind. Mulhouse, 1901, 515—516.

A PRINTING mixture is prepared from (A) 100 parts of ground Indigo (standard C.), 100 parts of water, and 100 parts of caustic soda-lye at 48° B., which are mixed and gradually added to 250 parts of a solution of "calcined" starch (33 per cent.) and 150 parts of a solution of dextrin (40 per cent.). Standard C. consists of 200 parts of artificial Indigo, 220 parts of water, 160 parts of white glycerin and 400 parts of caustic soda-lye at 48° B. The printing mixture is reduced, when required, with a mixture of 400 parts of caustic soda-lye at 48° B., 100 parts of water, 200 parts of a solution of dextrin (40 per cent.) and 300 parts of a solution of "calcined" starch (33 per cent.).

The tissues printed with the above mixture are steamed for 2½ minutes, washed, soaped, washed and dried. Steaming is the main difficulty in the process; every trace of air must be removed from the steaming chamber. To effect this, a large quantity of steam has to be used.

The printing mixture keeps well provided it is protected from the air.

Commercial dextrin can be used in place of calcined starch, but the printing mixtures made with it do not keep so well as those containing the latter.

Only pale and medium shades of blue can be obtained by this method. For dark blues it is necessary to print upon glucose-prepared tissues.—E. B.

Indigo; Reduction of ——, with Dextrin and Caustic Soda. Report upon the preceding paper. H. Grosheintz. Bull. Soc. Ind. Mulhouse, 1901, 516—518.

GROSHEINTZ has not been able to obtain satisfactory results by the above method (see preceding abstract). He attributes this to the different conditions of steaming, since the method is successfully practised at the printworks where Wilhelm is engaged.

As it seemed possible that the reduction of the Indigo might be due to the glucose present, along with dextrin, in the calcined starches used, some dextrin was purified from this compound, by repeated precipitation with alcohol. This was found to reduce Indigo in the presence of caustic soda. It would appear to be probable, therefore, that in Wilhelm's process, reduction is caused by glucose and dextrin jointly.

The idea of adding glucose to the colour mixtures containing caustic soda and Indigo, to effect the reduction of the latter on steaming, is not novel.—E. B.

Tannindigotine and its Application. C. Kurz. Rev. Gén. des Mat. Col., 1902, **6**, [61], 76—78.

THE use of tannin for white and coloured resists in Indigo dyeing suggested to the author the investigation of the action of tannin on reduced Indigo. He finds that Indigo white is completely precipitated by tannin, and gives the following recipe for the preparation of tannindigotine:—Suspend 25 grms. of powdered synthetic Indigo in 200 c.c. of hot water, and add milk of lime from 38 grms. of quicklime, and 150 c.c. of boiling water. Stir in gradually 19 grms. of zinc dust in 50 c.c. of water and make up the whole to 1 litre with water at 80° C. Heat for one hour on the water-bath at 80° C., and allow to stand for 24 hours. Draw off the liquor and wash the residue three or four times with warm water (30° C.), avoiding all exposure to the air. Finally, run in with vigorous agitation, 25 grms. of tannin dissolved in 200 c.c. of water at 50° C. The product can then be filtered off or washed by decantation, and gives about 200 grms. of a white paste which only oxidises very slowly when damp, but more quickly on drying the product. The new compound can be fixed on cotton without any other agent, and is oxidised to Indigo by a short steaming. For use in printing, it is preferably thickened with gum. The shade depends upon the quantity of paste employed, 25 per cent. giving a dark blue.—T. A. L.

Turkey-Red Dyeing; Old Process of ——. F. Driessen. Soc. Ind. Mulhouse, Procès-Verbaux, March 12, 1902.

THE paper deals with a research on Turkey-Red, carried out by the author in the East, and contains the following conclusions:—

1. The preparation of the goods with oil is accompanied by a double oxidation, *viz.*, both of the fatty substances and of the cotton.

2. The fatty substance, and in a less degree the oxycellulose which is formed during the oxidation of the oiled goods, coostitute most powerful mordants for aluminium salts, fixing even common alum. This explains the fact that the Hindoo process of Turkey-red dyeing is carried out without the assistance of basic salts of aluminium.

3. Turkey-red has been produced from time immemorial in Asia apparently without the use of salts of aluminium. This process has hitherto been inexplicable, but the author has succeeded in proving the presence of aluminium salts (tartrate and sulphate) in the leaves and other portions of certain plants employed.

4. The fatty substance, which is formed in and constitutes Turkey-red oil, has been isolated by the author by a new method. Its chemical nature has not been determined.

—F. N.

Indanthrene Blue; Notes on Printing with ——. P. Jeanmaire. Meeting Soc. Ind. Mulhouse, March 12, 1902.

INDANTHRENE Blue, although fast to light and washing, does not resist chlorine, and undergoes with it a change analogous to the greening of Aniline Black.

The author recommends the following treatment to obviate this defect:—Print the thickened blue with the addition of reducing agents, such as ferrous salts or tin-salt. Pass through soda-lye of 18—20° B. at 70° or 80° C., adding a little manganese oxide to maintain the purity of the white. Pass subsequently through an acid bath, rinse again in caustic soda or soda solution of 0·5 or 1 grm. per litre at 60° C. Dry and steam for 1½—2 hours.—F. N.

Paranitraniline Red; Sodium Sulphite as a Resist under ——. Report by H. Grosheintz upon a sealed note deposited by A. Tigerstedt. Bull. Soc. Ind. Mulhouse, 1901, 513—515.

A REPORT upon a sealed note, dated April 5, 1898, deposited with the Mulhouse Industrial Society, and opened, at the author's request, after the publication of Richard's paper on the same subject (this Journal, 1901, 711 and 712).

Tigerstedt obtains a *white resist* with a mixture of 50 grms. of sodium bisulphite solution at 36° B., 18 grms. of caustic soda-lye at 38° B., 50 c.c. of water, 10 grms. of starch, 12 grms. of gum tragacanth, 7 grms. of British gum,

and 3 grms. of glycerin; a *blue resist* with 0·5 grm. of reduced Alizarin Blue or Dauphin Blue, 40 grms. of the preceding mixture, 50 grms. of china clay, and 5 grms. of chromium "bisulphite"; and a *yellow resist* with 1 grm. of Chrome Fast Yellow R (Actiengesell., Berlin), 5 grms. of water, 40 grms. of the white resist mixture, 50 grms. of china clay, and 5 grms. of chromium "bisulphite." These mixtures are printed upon tissues prepared with sodium β-naphtholate, and steamed. After printing, the tissues are again steamed for a short time, and are then passed through the developing bath of diazotised *p*-nitraniline, and are washed and soaped. Beyond the fact that the thickening agent is British gum, the composition of the resist mixture which is employed when a white alone is to be produced upon the red ground, and which in this case does not require steaming, is not given.

The advantages of sodium sulphite, as compared with stannous salt, resist mixtures, are: (1) they give a purer white than the latter; (2) they cost considerably less than these; (3) they do not attack the fibre.

Tigerstedt mentions a modification of the method, which consists in adding to the white resist, albumin and basic dyestuffs, for the purpose of obtaining colour resists. Grosheintz does not consider these additions adequate for the production of fast work.

Another modification is to add sulphur dyestuffs to the white resist mixture, as has been recently recommended by the firm of Cassella for the production of resists under Aniline Black (see this Journal, 1902, 250).—E. B.

Paranitraniline Red; Discharging with Aluminium Powder. M. Alt. Meeting Soc. Ind., Mulhouse, March 14, 1902.

Referring to his process of discharging Paranitraniline Red with aluminium powder, patented by the firm, Kalle and Co. (this Journal, 1901, 985), the author claims that with aluminium powder and potassium bisulphite, much better discharge effects on Paranitraniline Red are obtainable than with zinc and sodium bisulphite. The process is also more advantageous than the tin-salt discharge, since the fibre is not attacked.—F. N.

English Patents.

Yarns; Treatment of Nitrocellulose, particularly for Manufacture of Lustrous ——. J. E. Bousfield, London. From Soc. Anon. Prod. Chim. de Droogenbosch, Ruys-broeck-lez Bruxelles, Belgium. Eng. Pat. 5076, March 9, 1901.

Certain difficulties occur in the preparation of nitrocellulose for spinning into lustrous yarns. The washing of the nitrocellulose for the elimination of all traces of acid is a long and tedious operation; further, even if the nitrocellulose be free from acid, traces of acid are always present in the ether employed for its solution; lastly, a proportion of moisture amounting to 25—30 per cent. is liable to remain in the nitrocellulose as water of hydration, and if not removed causes serious trouble. The inventor seeks to overcome these difficulties by treating the washed and hydro-extracted nitrocellulose on trays in a chamber with a current of hot dry air containing dry ammonia vapour, whereby the excess of moisture is removed and the nitrocellulose acquires a slightly alkaline reaction.—J. F. B.

Washing and Bleaching Processes; Impts. in ——. F. Moll and M. Dickhuth, Berlin. Eng. Pat. 5326, March 13, 1901.

To avoid injury to workmen, through their inhaling sodium peroxide in the state of dust, and the loss of oxygen which occurs in dissolving this and similar compounds in the powdered state, alkali peroxides, either alone or in admixture with sodium carbonate, "or the like," are formed into balls or cakes, which are dissolved, and then added to the bleaching bath.—E. B.

Textile Fabrics; Manufacture of ——. A. and H. Barraclough, Halifax. Eng. Pat. 20,401, Oct. 12, 1901.

Ordinary, undyed yarns, *e.g.*, of wool, are woven with yarns, either undyed or dyed, protected by a covering of cotton or other material, which can be destroyed by carbonising or a similar process. The tissue thus produced is then scoured and dyed, after which the protective covering is destroyed, leaving a pattern in one or more colours upon the tissue.—E. B.

French Patents.

Washing Hanks; Apparatus for Mechanically ——. T. Eck and W. Becker. Fr. Pat. 314,712, Oct. 4, 1901.

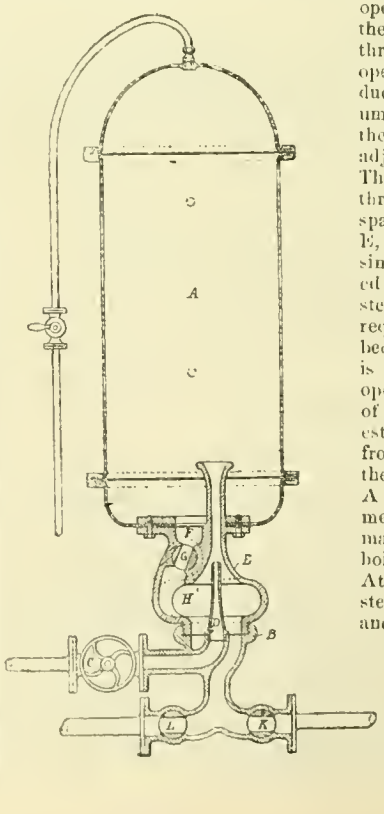
In most machines of this class, the hanks are stretched between rollers, and then caused to pass backwards and forwards through the wash vessel. But unless the hanks are very tightly stretched (and this retards the progress of the machine), they are liable to become entangled. The necessity for considerable tension is removed in the machine claimed, by providing each hank with separate guide-rollers, and separating it from its fellows by means of the teeth of a comb.—H. L.

Sizing Raw Silk; Machine for ——. M. C. H. Jacob. Fr. Pat. 314,810, Aug. 13, 1901.

A closed apparatus is claimed which may be used for sizing textiles in general, and particularly raw silk. The machine can take up any position and may be adapted to any machine for weaving, throwing, or winding silk.—H. L.

Sizings; Apparatus for Boiling Liquids such as ——, *used in Finishing.* C. Diederichs. Fr. Pat. 315,685, Nov. 6, 1901.

The apparatus generally employed for boiling sizing consists of a closed vessel, which is charged with the cold aqueous mixture, and then heated to boiling by means of a current of steam. The steam is blown in by a pipe leading to the bottom of the vessel. The drawbacks of this apparatus, *viz.*: (1) the difficulty of charging; (2) the vibration produced on passing steam into the cold liquor; (3) insufficient stirring, are obviated by the present machine (see figure). The mixture of water with the required ingredients is prepared in a separate vessel, which must communicate and be level with a pipe attached to the tap K. In working, taps L and G are closed, and C, the steam tap, is opened. The steam thereupon rushes through the narrow opening D, and, producing partial vacuum in E, aspirates the liquor from the adjoining vessel. The liquor passes through the annular space D and the cone E, and is stirred and simultaneously heated by the ingoing steam. When the requisite quantity has been aspirated, tap K is closed and tap G opened. A current of liquid is thereby established, flowing from the interior of the recipient vessel A and the compartment H, which is maintained until the boiling is completed. At this juncture, steam tap C is closed, and the finished product allowed to run out through tap L. A second form of construction is

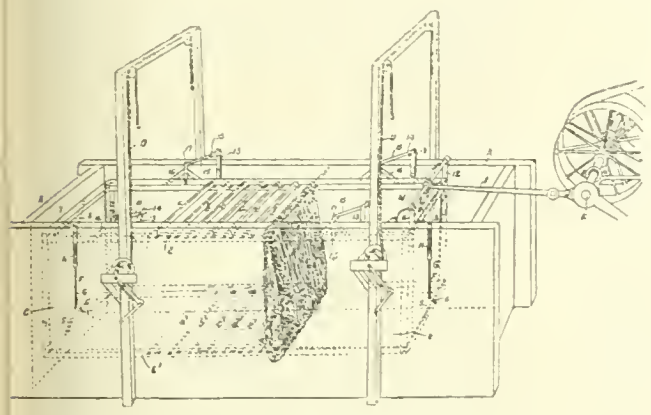


so described and claimed, wherein the closed boiling vessel replaced by an open vessel divided into two compartments, in one of which the mixture of water and other gredients is prepared.—H. L.

extiles in Hanks; Machine for Mechanically Dyeing ——. E. Dittmar. Fr. Pat. 315,658, Nov. 6, 1901.

HE machine has the following construction:—A metallic amework B (see figure) is placed in the dye vat A, and on its upper portion E and lower portion E¹ are fixed movable bars *a*, *b*, *c*, *d*, *e*, *f*, *g*, and a^1, b^1, c^1, d^1, e^1, f^1, g^1, at carry the hanks. The lower half of the frame E can be oved up or down by levers F and F¹, and is made to ide along the corner uprights 1, 2, 3, 4. Each lever onsists of a threaded rod G, which is joined on to the wer part of the framework by two short pieces, 5 and 6, id screws into a threaded sheath H. The sheath is fixed the upper framework E by two short rods 7 and 8. By rewing up or unscrewing G, the distance between E and can be increased or diminished, thereby enabling hanks any length to be dyed.

An oscillating movement can be imparted to the whole ame by the shafting *i*. This is fixed to the crank J,



Hank-dyeing Machine.

tached to the axle *k* of the driving belt 9 and 10, and at extremity has a hook L. The hook L clutches a rod M, hich is fixed to the centre of B by the supports 11 and 12. our rods, 13, with a spindle, 14, attached to their upper tremity, are fastened to the sides of the vat A. A lever, , fixed to frame B, by the support 16, pivots on the indles 14 of rod 13.

On setting the shafting in motion, a gentle oscillation of e frame is caused, which compels the hanks to be constantly ifting their position on the bars to which they are fixed. Perfectly level dyeing is said to be obtained. For avenience of charging and emptying, a pulley and rope *o* e provided with a small wheel N, whereby the framework n be raised from the vat A.—H. L.

eing Process for Sulphide Dyestuffs ——. Weiler-ter-Meer. Fr. Pat. 315,723, Nov. 8, 1901.

ING probably to air oxidation and to drying, the selvages a piece dyed with a sulphide dyestuff on a jigger are not perly dyed. In order to overcome this difficulty, the entees arrange to spray the selvages of the piece with a d liquid, such as water, and to use the dye-bath at as low emperature as possible. An increased amount of alkali l the addition of Turkey-red oil is also advantageous. —T. A. L.

United States Patent.

sein; Process for Producing Insoluble ——. H. V. Dunham, New York, U.S.A. U.S. Pat. 695,198, March 11, 1902.

CORDING to the process claimed, 85 parts of ordinary mmercial casein and 15 parts of borax or other metallic salt having an alkaline reaction, are dissolved in 400 parts of water. 15 parts of hexamethylene-tetramine are then added, together with any desired colouring matter, and the solution is dried in the form of thin films. When dry, the films are heated under steam pressure to 180° C. for half an hour. Instead of heating by steam, the films may be rapidly run through a hot 5 per cent. solution of an acid, preferably boric acid, heated to 180°. The product is intended for use as a substitute for egg- or blood-albumin in the arts.—W. P. S.

VII.—ACIDS, ALKALIS, AND SALTS.

Ammonia: Solubility of ——, *in Saline Solutions, as Measured by the Method of Partial Pressure.* R. Abegg and H. Riesenfeld. Zeits. physik. Chem., 1902, **40**, 84; through Chem.-Zeit., 1902, **26**, Rep. 89.

THE partial pressure of ammonia in pure water, as well as in salt solutions, between the concentrations of 0·5 and 1, follows Henry's law very closely. The alteration of the pressure of the ammonia depends, with most salts, almost entirely upon the concentration of the salt. No simple law can be recognised. Salts (in equivalent quantities) may be divided into two groups, according to the influence they exert on the pressure of the ammonia, *viz.*, those (consisting only of salts with monovalent ions) which exert a weaker and those which exert a stronger influence, the latter group containing salts with polyvalent ions, and also those with hydroxyl, fluorine, boron, acetic and formic acid, chlorate, bromate, and iodate ions.—W. G. M.

Sodium Nitrate; Decomposition of ——, *by Sulphuric Acid. III.* C. W. Volney. J. Amer. Chem. Soc., 1902, **24**, [3], 222—226.

IN a former communication (this Journal, 1901, 896) the author concluded that there were two distinct phases in the action of sulphuric acid upon sodium nitrate, occurring at different temperatures, *viz.*:—

(1) $2NaNO_3 + 2H_2SO_4 = NaNO_3 + NaH_3(SO_4)_2 + HNO_3$

(2) $NaH_3(SO_4)_2 + NaNO_3 = 2NaHSO_4 + HNO_3$.

In the present paper he gives an account of further experiments on this subject, from the results of which he has arrived at the following conclusions:—

(1) At temperatures below 20° C. neither concentrated sulphuric acid nor the polysulphate have any notable action upon sodium nitrate, only traces of free nitric acid being perceptible after three or four days' contact.

(2) At higher temperatures (below 100° C.) complete decomposition occurs, with the formation of free nitric acid and $NaH_3(SO_4)_2$, as in the first equation above.

(3) The second phase of the reaction takes place at temperatures above 165° C.

(4) The nitric acid liberated by the action of the trisulphate upon the sodium nitrate is partially decomposed into the yellow- or red-coloured acid, its vapours distilling over showing a temperature of 120°—123° C. This acid was formerly regarded as the second hydrate of nitric acid, $(H_2O)_2.N_2O_5$.—C. A. M.

Sodium Orthophosphate: An Acid Mono ——. H. Giran. Comptes Rend., **134**, [12], 711—713.

THE crystals which form on sticks of metaphosphoric acid kept for some time in imperfectly closed bottles were supposed by Zettnow to be pyrophosphoric acid, though when dissolved in water they give the reactions of orthophosphates. The author finds that they contain sodium, and analytical results indicate the formula $NaH_3P_2O_8$. This formula suggests a mixture of H_3PO_4 and NaH_2PO_4; but determinations of the heats of solutions of the three substances show that this is not the case, and that the substance is a monosodium diorthophosphate, $NaH_3P_2O_8$, belonging

to the same series as Joulie's salt, $Na_3H_3P_2O_8$ (this Journal, 1902, 494). Zettnow's error arises from his not having determined (though he noticed the presence of) the sodium in the crystals, so that he weighed and calculated Na_2O and P_2O_5 as P_2O_5.

The substance is formed by direct hydration from the mixture of $NaPO_3$ and HPO_3 contained in the metaphosphoric acid. The author finds that samples of this substance contain only from 75 to 80 per cent. of P_2O_5, and from 14 to 19 per cent. of Na_2O.—J. T. D.

Sesquisodium Phosphate. J. B. Senderens. Comptes Rend., **134**, [12], 713—714.

The salt described by Joulie (this Journal, 1902, 494) was first prepared and described in 1882 by Filhol and Senderens, and has since been described in many text books. Joulie prepared the anhydrous salt, but it can also be obtained with 3 and with 15 mols. of water of crystallisation. It forms one of a series of sesquibasic phosphates, corresponding to which there is a series of arsenates.—J. T. D.

English Patents.

Nitric Acid and Nitrogen Oxides; Manufacture of ——. W. Ostwald, Leipzig, Germany. Eng. Pat. 698, Jan. 9, 1902.

The conditions under which, according to the patentee, the known process for obtaining nitric acid by passing a mixture of ammonia and air over red-hot platinum black can be practically worked, are prescribed. When platinum black or sponge alone is used, there is considerable loss due to the formation of free nitrogen, which is to a great extent obviated when compact platinum, or platinum partly covered with the spongy metal, is employed. The catalyser may be variously constructed; as, for instance, of strips of platinum foil laid side by side, and undulated, or alternately flat and crumpled, to form pipe-shaped passages for the gases; or wire-netting or perforated plates may be used. The mixture of ammonia and air may be prepared by treating gas-liquor, or other ammonia-containing fluid, with, if necessary, addition of chalk or the like, on the counter-current principle; bringing the fresh air into contact with a practically exhausted solution, and the ammoniacal air in contact with a fresh solution, the heat of reaction in the catalyser being in some cases utilised in heating the ammonia water. Other metals, such as iridium, rhodium, or palladium, suitably heated in contact with the ammonia mixture, may replace the platinum.—E. S.

Carbonic Acid Gas given off in the Manufacture of certain Acids and Acid Salts; Recovery, Collection, and Utilisation of Waste ——. G. F. Berry and J. B. Lawes and Company, Ltd., both of London. Eng. Pat. 24,684, Dec. 4, 1901.

The manufacture of tartaric, citric, and like acids, and cream of tartar, is under this invention conducted in air-tight vessels, having water-luted wooden covers, with the needful hydraulically-luted pipes for exit of gases, admission of steam, &c. The CO_2 liberated in the processes is withdrawn by an exhauster and passed through a coke-packed water-tower into a gasholder, whence the gas is taken by a compressor through a series of purifiers for treatment with a weak solution of sodium bicarbonate and potassium permanganate, and then through driers, containing calcium chloride, into the second and third stage compressors, and through cooled condensing coils, in which it is liquefied, and is afterwards stored.—E. S.

Contact Bodies; Manufacture and Production of ——, *for use in Catalysis; especially intended for use in the Catalytic Process for the Manufacture of Sulphuric Acid.* J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, of Ludwigshafen-on-Rhine, Germany. Eng. Pat. 10,729, May 23, 1901.

Chrome oxide, copper oxide, iron oxide, or a mixture of any two or all of these, "superficially covered with a layer of platinum," is used as the contact body in the catalytic process for the manufacture of sulphuric acid. For example, 145 parts of arsenic-free burnt pyrites, reduced to the size of peas, are impregnated with about 30 parts, by weight, of a solution of platinum chloride containing about 17 grms. of platinum to the litre, and the mass is dried at about 70° C., when the product is fit for use. Reference is made to Eng. Pats. 15,948, 15,949, and 15,950, 1898 (this Journal, 1899, 831).—E. S.

Chromium Compounds and Alkalis; Manufacture or Production of ——. [*Simultaneous and Combined Electrolysis.*] G. W. Johnson, London. From The Chemische Fabrik Griesheim-Elektron, Frankfort on-the-Main, Germany. Eng. Pat. 12,250, June 15, 1901.

Solutions of the salts of the alkalis are electrolysed by employing an anode of chromium or of its alloys, and preventing the intermingling of the anode and cathode electrolytes by a diaphragm or other means. A sufficient quantity of a hydroxide or carbonate is added to the anode to neutralise the acid or to precipitate the metal alloyed to the chromium. The chromic acid is separated from the ferric sulphate by fractional crystallisation. A modification of the process consists in dissolving the chromium or ferro-chromium instead of using it directly as anode, and then electrolysing it, using an insoluble anode, such as lead. The cathode and anode compartments are separated by two diaphragms, and a hydroxide or a carbonate is added to the electrolyte contained in the compartment between the latter.—G. H. R.

Brine Evaporators. O. Sachse and L. Kaufmann, both of Aachen, Germany. Eng. Pat. 848, Jan. 11, 1902.

The object of the invention is to prevent clogging by salt deposits, of the tubes in continuously operating, upright-tube brine evaporators. The upper tube-ends, instead of projecting above the tube-plate, are made flush therewith, and an agitating device is arranged to keep the tube orifices clear. The vertical tubes being set in concentric circles, an arm extending over the diameter of the plate, carrying chains, to each of which a ball is attached, is caused to rotate, whereby the orifice of each tube is struck in turn, and so freed from salt. It is stated that the salt only tends to accumulate at the orifices of the tubes, so that when this device is used, other cleansing is unnecessary for months together.—E. S.

Broad Salt; Mechanical Appliance for Use in the Manufacture of ——, *by the Application of Steam.* R. Hodgson, Stafford, and W. T. Holt, Erdington. Eng. Pat. 6580, March 29, 1901.

Brine constantly flowing into a tank, is continuously forced thence into a copper coil contained within a steam cylinder attached externally to a long, wooden evaporating pan, provided with a mid-feather. The brine flows through a connecting pipe, at a temperature of about 180° F., from the coil into one end of the tank, and, flowing to the further end, returns on the other side; when the brine rises to a certain height, it is automatically discharged through an inclined pipe into the supply tank, the circulation being thus continuous. The steam cylinder with enclosed coil described, is duplicated, one being in use while the coil in the other is being flushed with water to remove incrusted salt, the needful connections being alternately made. The "broad" salt deposits in the wooden pan, in which the current of heated brine is constantly flowing.—E. S.

Iron Chloride; Treating ——; *and Obtaining Iron Oxide and Calcium and Magnesium Chlorides.* J. Hargreaves, Farnworth-in-Widnes. Eng. Pat. 7932, April 18, 1901.

Lime is added to solution of iron chloride in such proportion as not to effect complete precipitation. The precipitated oxide is separated, and is dried and oxidised in a current of heated air, to produce ferric hydroxide suitable for use as a pigment. The solution of calcium chloride, resulting from the precipitation, may be at once evaporated; or, if a white $CaCl_2$ be required, the iron manganese, &c. present, are completely precipitated by

rther portion of lime, before concentration. Magnesia ay replace lime in the process when it is desired to obtain agnesium chloride as the by-product.—E. S.

lumina ; Manufacture of [Electrical] ——. C. M. Hall, Niagara Falls, U.S.A. Eng. Pat. 2260, Jan. 28, 1902.

AUXITE, or other impure alumina, inclusive of silicate, is ixed with sufficient carbon to reduce the iron oxide, silica, l titanic acid present: and, if iron be deficient in the ineral, with sufficient iron to alloy with the silicon and tanium, and the mixture is heated in an electrical furnace low the point of fusion. This treatment causes reduction the iron oxide, and, to a greater or less extent, of the lica and titanic acid. The mass, when cold, is broken , and again heated, but now until it fuses, when the duction of the impurities is completed, and the fused loys are readily separated from the purified alumina.

These two processes are best conducted simultaneously. he furnace consists of a thick, round carbon block or base orming one of the electrodes), on which rest two con-entric perforated sheet iron-shells, the space between which filled with the raw material mixed with carbon, &c., the ner core or space, in which a series of carbon rods orming the other electrode) hang, being reserved for the eviously fritted mass, which after the arc is established, added by degrees, until the core is charged. When the aterial in the inner zone is fused, the furnace is allowed cool for several days, or even for weeks, the heat being ntinuously transmitted to the raw material in the outer ne, which becomes fitted to occupy the core in the next eration; the heat given out by the fused mass on cooling us doing useful work. As an example, it is stated that e process has been successfully carried out with "a rrent of about 500 horse-power at approximately 50 volts d 7,200 ampères, the charge being placed upon a carbon ab 7 ft. in diameter and 14 ins. thick, and a group of five spended carbons being employed." See Eng. Pat. 14,572, 00 (this Journal, 1901, 808).—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass for Water-Gauge Tubes (for Boilers). F. Krull. Zeits. angew. Chem., 1902, [13], 309—313.

HE glass tubes of water gauges must be capable of with-anding not only high pressures, aggravated as these are the strains set up by the high temperature, and by the cal, accidental cooling of the glass by snow, cold air, &c., t must also resist the corrosive action of the hot water d steam, and of traces of alkali which may get into the ed-water from the water-softening process. The author s compared, in these various respects, gauges made of six fferent kinds of glass, viz.:—(1) Jena composite glass, ade of a tube of soft glass ("Einschmelzröhrenglas") ving a thin, inner layer of a glass of low expansibility;) Jena soft glass, without the inner layer just referred to;) Jena combustion tubing; (4) Jena "Durax" glass, a w borosilicate glass, made specially for water gauges;) French glass; and (6) Scottish glass. The French bes were found to be inferior to the Scottish tubes in ery physical respect and in their resistance to corrosion, t both were very much inferior in every respect to the Jena asses. Of the latter, the "Durax" proved to be the best; it thstood higher pressures than the others and had much less ndency to fracture when subnitted to such sudden cooling fluences as occur accidentally in practice. It was also acked less by hot water and steam; but when the boiler ater contained a small percentage (0·1) of sodium drate, such as might be due to very carelessly conducted ater-softening operations, it was more markedly attacked an any of the other glasses. When the water contained 5 per cent. of sodium carbonate, the "Durax" glass was acked less than the French or Scottish glasses, but more an the other Jena glasses. Such severe conditions, wever, are not likely to occur in practice, and a series of olonged tests, on a practical scale, with six different ilers, five of them using softened water, proved con-sively the superiority of the resistant power of the Durax" glass as determined by observing the loss in ight of the tubes.—H. B.

English Patents.

Earthenware; Kilns for Drying ——. J. W. Brookes, Oldbury, and A. Barnes, Walsall. Eng. Pat. 5556, March 16, 1901.

BENEATH the floor of the kiln are flues for steam and hot air, connected with the chimney. A series of shelves are arranged between vertical columns in the kiln, and are maintained in any desired position by bolts which fit recesses in the columns; the bolts are operated by a lever arrangement described. The shelves can be raised by an overhead traveller.—W. C. H.

Earthenware Articles; Method and Apparatus for Drying ——. A. J. Boult, London. From F. C. R. Weber and A. B. Rauschenbach, both of Meissen-on-the-Elbe, Germany. Eng. Pat. 1429, Jan. 18, 1902.

THE method consists in heating the articles in a closed chamber with porous walls, so that air cannot enter from the outside, whilst the articles are gradually deprived of moisture in an atmosphere of the vapours given off by the articles, the excess vapours escaping through the porous walls of the chamber. In the plant described, the drying chamber is heated by steam pipes, and is surrounded by other chambers with porous walls, the whole series being surrounded by a chamber with solid walls, and provided with some means of exhausting the air, whereby a difference of pressure is brought about between the inside and outside of the closed drying chamber.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Gypsum; Solubility of ——, *in Aqueous Solutions of Certain Electrolytes.* F. K. Cameron and A. Seidell. J. Physical Chem., 5, 643—655. Chem. Centr., 1902, 1, [10], 558.

IN addition to the experiments on the solubility of gypsum in solutions of sodium chloride (this Journal, 1902, 257), the authors have examined the solubility in solutions of magnesium and calcium chlorides and sodium sulphate, and also in sodium chloride solution in presence of solid calcium carbonate. The results given relate to temperatures between 23° and 26° C.

In solutions of magnesium chloride, the solubility of gypsum is considerably greater than in water, a maximum effect being attained with an addition of 105 grms. of magnesium chloride per litre. The maximum effects observed with sodium chloride and magnesium chlorides are produced with quantities of the salts containing about the same amount of chlorine, but the amount of gypsum dissolved is not the same in the two cases; with magnesium chloride, 8·8 grms. of gypsum per litre are dissolved.

In solutions of calcium chloride, gypsum is much less soluble than in water; up to a content of 2 per cent. of calcium chloride the decrease in solubility is much greater than at higher concentrations.

In very dilute solutions of sodium sulphate, the solubility of gypsum is less than in water, but it increases as the concentration of the sodium sulphate becomes greater, and finally exceeds the solubility in pure water.

The solubility curve of gypsum in sodium chloride solutions in presence of solid calcium carbonate is lower than but somewhat resembles that for pure sodium chloride solutions. The highest solubility observed was 6·35 grms. per litre in a solution containing 80—90 grms. of sodium chloride. The differences between the two curves are considerably greater with concentrated solutions.—A. S.

English Patents.

Stone; Production of Imitations of ——. G. Weber, Nürnberg, Germany. Eng. Pat. 8,556, April 25, 1901.

THE plastic material (magnesia-cement, &c.), while still fluid, is poured into metal moulds, the working surfaces of which are coated with a smooth hard lac or enamel, capable of resisting high temperatures and chemical action. To

prevent distortion of the finished article, hard material, such as wood or cement, may be forced into the hot mass, while still soft.—W. C. H.

Kiln [Bricks, &c.]; Improved Bottom for Hoffmann ——. W. Ingham, Harrogate, and B. Langton, Leeds. Eng. Pat. 728, Jan. 10, 1902.

The claims are for the improved double bottom, and its use in any Hoffmann kiln. The double bottom consists of a firebrick floor, perforated with chequer or race holes, which communicate with concentration passages beneath the floor, these passages communicating by cross flues with the main flue.—W. C. H.

Kilns; Lime, Cement, and Like ——. I. Isserlis, Kieff, Russia. Eng. Pat. 6623, March 29, 1901.

See U.S. Pat. 691,145, 1902; this Journal, 1902, 480.
—W. C. H.

Cements, Bricks, Artificial Stone, &c. G. F. Berry and J. B. Lawes and Co., London. Eng. Pat. 24,683, Dec. 4, 1901.

The calcium sulphate, obtained by precipitation as a waste product in the manufacture of citric acid, &c., is dried, and calcined to form anhydrous gypsum. The claims also include the combination of this with other substances for different purposes. For "Keen's" cement, it is sprinkled with a 6—10 per cent. solution of alum or borax, and for hydraulic cement it is mixed with cement-clinker or the like, recalcined in closed ovens, and ground. Bricks, tiles, &c. are made by moulding a mixture of the calcium sulphate with sand and water. It may also be mixed with pitch or resin, rendered plastic by heat, or by the addition of a volatile vehicle.—W. C. H.

Cement; Apparatus for Manufacture of ——. G. W. Butchard, A. A. Butchard, J. A. Butchard, and H. Gibson, Executors of the late G. Butchard, Gravesend. Eng. Pat. 6800, April 1, 1901.

This apparatus is for keeping slurry thoroughly mixed, for use in rotary kilns. The slurry is mixed in an annular tank by an apparatus consisting of a number of horizontal arms, mounted on a central pivot, and carrying vertical stirrers, connected by bevel gearing with a central bevel wheel, loose on the central pivot. Fixed to this central wheel is a second wheel gearing with a pinion, which is driven by suitable means. Thus the arms are made to revolve, and the stirrers revolve relatively to the arms. To diminish the flow of the slurry and also to dry it, the upper part of the rotary kiln has a tubular lining, in the annular space between which and the kiln, the products of combustion circulate. The mouth of the slurry feed-pipe is made conical to prevent choking.—W. C. H.

Cement and the like; Apparatus for Manufacture of ——. A. M. Clark, London. From Fellner and Ziegler, Frankfort-on-Maine, Germany. Eng. Pat. 10,857, May 25, 1901.

This apparatus is especially intended for the disintegration of fusible materials, such as blast-furnace slag. The molten material is discharged on to the surface of a rapidly-revolving cone, which is hollow and perforated, and connected with a gas supply; the gas issuing from the perforations assists not only the disintegration of the material, but also the combustion of deleterious admixtures, such as sulphides, &c. To collect the disintegrated particles, the cone is surrounded by a suitably-cooled casing, which is provided with air-passages, and is sufficiently high to cause a continuous draught of air, and sufficiently wide to allow deleterious admixtures to be completely burnt while the particles are in the air. A combined hopper and discharging spout is arranged beneath the casing.—W. C. H.

Cement and Hydraulic Lime; Manufacture of Portland Slag ——. C. Heap and T. Oddy, both of Rochdale. Eng. Pat. 25,239, Dec. 11, 1901.

The claims cover the following points:—A continuous process for the manufacture of blast-furnace hydraulic slag cement or hydraulic lime. The molten stream from a blast-furnace is surrounded by a coil or series of hoops of perforated pipes by which liquid is driven into the stream to granulate the material. The materials for hydraulic cement are made into flat slabs or tiles before calcining. The special kiln described consists of an inner steel tube, surrounded with fire-brick, and constricted in places into clinkering spaces or cones, which are cooled with water. In the process, a portion of the calcined material is mixed with the next batch of slag and lime to be calcined, in order to absorb moisture and assist the material to set into the flat slabs. The clinker is sprayed with water to promote desulphurisation, &c. The cement is matured by forcing air through it as it falls into a silo. A special ball mill is described with grooved radial and circumferential grinding plates, and pounding weights with projections, which fit the grooves of the plates.—W. C. H.

Alumina; Manufacture of ——. C. M. Hall. Eng. Pat. 2260, 1902.

See under VII., *page* 549.

UNITED STATES PATENTS.

Wood; Process of Impregnating ——. J. L. Ferrell, Philadelphia, U.S.A. U.S. Pat. 694,956, March 11, 1902.

The process consists in injecting the impregnating fluid at one end of the piece of timber, so that it travels along the grain, and is discharged at the opposite end; as soon as the specific gravity of the discharged liquor is sensibly equal to that of the fluid injected, the discharge is prevented, and, finally, the impregnating fluid becomes evenly distributed throughout the mass. Two or more impregnating fluids may be used if desired. A suitable machine for conducting the process is described.—J. W. H.

Wood; Apparatus for Impregnating and Seasoning ——. H. Higgins, Cambridge, England. U.S. Pat. 695,152, March 11, 1902.

See also Eng. Pat. 10,124, May 15, 1901, and this Journal, 1901, 365.—J. W. H.

Stone; Machine for Moulding Artificial ——. N. F. Palmer, Brooklyn, New York. U.S. Pat. 694,985, March 11, 1902.

The machine carries a mould-box having sliding sides and ends, the sides being actuated by screws, and the ends, which move between the sides, by racks and pinions; cores may be inserted through openings in the false bottom on which the slab is formed, if the blocks are to be made hollow.—J. W. H.

Plaster; Elastic ——. H. L. Carter, New York, U.S.A. U.S. Pat. 695,031, March 11, 1902.

Finely powdered calcined gypsum (2,000 lb.) is mixed with marsh-mallow root or similar substance (6 lb.) and dextrin (6 lb.); gelatin may also be added.—J. W. H.

X.—METALLURGY.

Ores [Iron]; Utilisation of Small ——. H. Bamby. J. West of Scotland Iron and Steel Inst., 1902, 9, [5], 147—156.

If any considerable proportion of fine ore be used in the blast furnace under the same blast pressure as is used for coarser ores, the yield is reduced, and liability to hanging and slipping is greatly increased. In view of the growing scarcity of hematite ores, which are reasonably pure and, at the same time, of good mechanical condition, more attention has recently been given to the employment of fine ore. The author has investigated the matter carefully, and concludes that even under the most favourable circumstances, the extra cost of working very fine ores directly in the blast furnace would be greater than the cost of briquetting them in a well-designed plant. The different processes for

quetting, which either are now in use or have been tried, ıy be classified as follows :—

(1.) Binding with lime (either ordinary or hydraulic), : briquettes being either allowed to dry in the air or, tter, subjected to the action of superheated steam :—Blast-rnace slag and flue dust have been used to some extent substitutes for lime.

(2.) Binding with organic materials :—Pitch (from coal d wood), resin soap, starch, &c., have all been tried. The iquettes are either dried in the air or coked at a mparatively low temperature.

(3.) Binding with alumina, either in the form of clay or sh aluminous ore, and afterwards burning at a comparacly high temperature :—This was the earliest successful ocess.

(4.) Those processes in which the briquette is made thout the addition of a binding material, the briquettes ng afterwards burnt at a high temperature :—In these ses, binding depends on the formation of a fusible silicate her of lime or ferrous oxide from the materials contained the ore, the formation being greatly assisted if the ore ntains any salt of the alkalis.

In comparing the different systems, the improvement or herwise in the composition of the resulting briquette must borne in mind. Where lime is used as the binding aterial, the ore retains all the combined water, carbonic d, and sulphur it may have originally contained, losing ly a portion of its moisture, whilst hydraulic lime adds me silica and, usually, phosphorus also. In Britain, air-ying may be dismissed as usually impracticable, and all methods so far adopted for drying briquettes have the advantage of utilising only a very small portion of the at employed. In kiln-burning processes, on the other nd, all the water and carbonic acid and from 80—95 per nt. of the sulphur may be expelled, and thus a small ore h 46 per cent of iron in the raw state may give briquettes ntaining 58 per cent. The burning of briquettes is mplest where the binding is effected by comparatively ge proportions of alumina; where the binding depends on the formation of a silicate of lime or of ferrous oxide, re care is required, as in these cases the temperature cessary to form a hard briquette is only about 200—300° F. ow that at which the briquette fuses. Most of the processes designed for binding with organic materials have led mainly because the inventors did not sufficiently nsider the effect of the combined pressure and gradually reasing heat of the blast furnace. The method devised Edison for working up magnetic concentrates (this rnal, 1898, 851), however, which belongs to this class, ms well adapted to the dry and remarkably pure ncentrates for which it was designed.—A. S.

st-Iron ; Testing, Examination, and Classification of ——. B. Osann. Stahl u. Eisen, 1902, **22**, 316, 322; hrough Chem.-Zeit., 1902, **26**, Rep. 92.

est has, in America, arranged for the sale of standard t-iron borings, accurately analysed, to enable foundry oratories to check their laboratory methods. It is ommended that separate test-bars should be cast for chanical tests. West proposes to classify foundry-pig ten classes, and he protests vigorously against the ssification of pig-iron by fracture.—W. G. M.

el ; Determination of Molybdenum in ——. G. Auchy.

See under XXIII., *page* 562.

tinum ; Micro crystalline Structure of ——. T. Andrews. Proc. Roy. Soc., 1902, **69**, [157], 433—435.

A POLISHED micro-section of pure platinum was exposed a period of 1 min. 45 secs. to the action of boiling *aqua ia*, then washed with water and pure alcohol, and the hed surface examined. Four figures are given, showing, 1) the micro-crystalline structure as seen in transverse tion by oblique illumination at a magnification of 50 meters; (2) the structure as seen in transverse section direct or vertical illumination at a magnification of) diameters; (3) and (4) primary and secondary crystals n in section magnified 360 diameters, vertical illumina-n. The general micro-structure of platinum was observed to be allotriomorphic in character and derived from a system of interfering cubes and octahedra, the cubic and hexagonal form being frequently noticeable. The larger or primary crystal grains consist of irregular polygons of varying size (from 0·002—0·04-inch). The minute or secondary crystals (0·0002—0·007-inch) were, in the mass, observed to be in varied positions of orientation, but the orientation was generally on the same plane within the area of each larger crystal grain; the general orientation of the smaller crystals varied, however, in each separate larger crystal. The words "primary" and "secondary" are only used in relation to size, and are not intended to convey the idea of distinctive times of formation during solidification. The crystalline structure of platinum appears to generally resemble that of gold and silver. (See Osmond and Roberts-Austen, this Journal, 1896, 810; and Liversidge, this Journal, 1897, 212; 1898, 249).—A. S.

Muntz's Metal Sheathing ; Effect of Sea-Water on ——. E. A. Lewis. Chem. News, 1902, **85**, [2208], 134—135.

THE author recently had to examine a large number of samples of Muntz's metal (an alloy of 60—62 per cent. Cu and 38—40 per cent. Zn) sheathing which had worn away much too rapidly under the action of sea-water. From the results of his investigations, he finds that chemically pure Muntz's metal is easily attacked by sea-water; that Muntz's metal containing 0·2 per cent. of iron or nickel is more resistant, whilst an alloy containing 0·2 per cent. of tin, arsenic, or manganese is still better in this respect. Lead does not appear to have any influence in making Muntz's metal resist corrosion; every sample examined by the author contained from 0·1—1 per cent. of lead. The conclusion drawn, is that Muntz's metal, if it does not contain a small proportion of tin, arsenic, iron, manganese, or nickel, is of no value for ships' sheathing or for similar purposes.—A. S.

Aluminium ; Alloys of ——. W. Campbell and J. A. Matthews. J. Amer. Chem. Soc., 1902, **24**, [3], 253—266.

IT is pointed out by the authors that whilst aluminium forms intermetallic compounds more readily than almost any other metal, with the exception of the alkali metals, yet there are certain metals, such as lead, bismuth, and cadmium with which it will only combine or yield a homogeneous alloy when present in very small proportion.

In the authors' opinion many of the formulæ given as representing the composition of various aluminium alloys are open to question in the light of recent work, and in particular they consider that many of the so-called copper-aluminium compounds, that have been described, do not exist, since the crystals regarded as definite compounds may also contain one of the metallic constituents in a state of solid solution.

Alloys of Aluminium with Lead, Bismuth, and Cadmium.—The authors' experiments confirm, in the main, the results obtained by Alder Wright (this Journal, 1892, 492). In the case of aluminium with cadmium, the top layer was found to be aluminium and the base cadmium, whilst the latter contained, chiefly at the junction of the layers, minute bright crystals of lesser specific gravity than cadmium.

Aluminium and Platinum.—According to Tissier Brothers an alloy containing 5 per cent. of platinum has a yellow colour resembling that of gold containing 5 per cent. of silver.

Aluminium and Tungsten.—The crystals obtained were almost invariably thin monoclinic ones, though in one experiment hexagonal crystals terminating in hexagonal pyramids were left on treating the mass with dilute hydrochloric acid. In one alloy both forms of crystals occurred but further attempts to obtain the hexagonal form were unsuccessful. The monoclinic crystals had the following composition :—Tungsten, 57·1 to 60·13 per cent., and aluminium, 39·62 to 41·97 per cent., the possible formula being WAl_2. The hexagonal crystals contained 49·19 to 50·91 per cent. of tungsten, and 50·52 per cent. of aluminium, corresponding with a possible formula WAl_2.

Aluminium and Nickel.—Nickel in the proportion of 2 to 5 per cent, is commonly used as a hardening agent

for aluminium, often in conjunction with copper, tungsten, or other metals. An alloy containing 7 to 10 per cent. of these hardening substances is very tough and forms good casts.

Aluminium and Tin.—According to Heycock and Neville the lowest solidification point (3° C. below that of tin) is shown by an alloy containing 0·48 per cent. of aluminium. The authors have plotted a curve of the solidification points of a series of alloys, starting from pure aluminium (m. pt. 655° C.) From this it appears that the solidification point is gradually lowered by the addition of tin up to 74 per cent. (570° C.), at which point a sudden drop to 80 per cent. (490° C.) occurs, followed by a rise to 85 per cent. (550° C.), and finally a regular fall to the eutectic point, 99·52 per cent. of tin (229° C.).

Aluminium and Antimony.—The authors' solidification curve gave the maximum at about 82 per cent. of antimony. The compound SbAl should contain 81·6 per cent. of antimony (Alder Wright, *loc. cit.*; Roche). It has an abnormally high melting point, exceeding 1,000° C.

When examined under the microscope the series of antimony alloys can be separated into two groups, viz.:—

(1.) Those containing up to 81·6 per cent., in which increasing amounts of the compound SbAl crystallise out from a decreasing ground-mass of aluminium or of aluminium containing antimony in solid solution.

(2.) From 81·6 to 100 per cent. of antimony consisting of a series of alloys composed of the compound SbAl in a gradually increasing ground-mass.

Aluminium and Copper.—In Gautier's curve of the melting points of aluminium and copper alloys there are maxima at 50 and 88 per cent. of copper, and minima at 33, 54, and about 92 per cent. The authors consider that definite compounds are present at the maxima, viz., Al_3Cu_2, containing 48·4 per cent. of copper and $AlCu_3$ with 87·6 per cent.; whilst the fall in the melting point at 7·5 per cent. of aluminium apparently indicates a compound—

$$AlCu_5 = AlCu_3 + Cu_2.$$

Le Chatelier (Mettalographist, Jan. 1901) also claims to have detected the compounds, Al_2Cu_3, $AlCu$, and Al_2Cu, but the authors have not obtained evidence of the existence of these by the pyrometer. In their opinion, based upon the curve of the solidification points, all the alloys belong to three groups, viz.:—

(1.) Those containing up to 48·4 per cent. of copper, consisting of aluminium and Al_3Cu_2.

(2.) Alloys containing from 48·4 to 87·6 per cent. of copper, consisting of Al_3Cu_2 and $AlCu_3$, without either free aluminium or free copper.

(3.) From 87·6 to 100 per cent. of copper consisting of $AlCu_3$ and pure copper.

They consider that all the possible alloys probably consist of these three pairs of constituents mixed or dissolved in different proportions.—C. A. M.

Manganese [*Metallic*]; *Determination of Fusing-Point of* ——. W. C. Heræus. Zeits. Elektrochem., 1902, **8**, [14], 185—187.

A sample of manganese of 99 per cent. purity was tested by placing a pea-sized piece of the metal in a tube made from Marquardt's mass heated by means of an electrically heated spiral of very thin platinum foil, and, with the aid of a telescope, watching for the moment of fusion, the temperature being determined by a Le Chatelier thermo-electric pyrometer. The tube used was 16 mm. in diameter and 30 cm. long, but only 15 cm. of this were surrounded with the platinum spiral, so that the end of the tube was cool enough to permit of its being closed with a caoutchouc stopper. This furnace could be heated to 1400° C. in three minutes, the maximum temperature attainable being 1600° C., and it could be maintained at any desired temperature, to within 5° for a long period by suitable current regulation. Six experiments, the manganese being thus heated in carefully purified hydrogen, gave fusing points ranging from 1240° to 1265° (average = 1245° C.). Nitrogen, even when thoroughly freed from oxygen, could not be used, as at 1210° to 1220° C., the metal glowed and burned with a smoky flame, apparently forming a nitride. It was necessary to recalibrate the pyrometer after each experiment, as the zero was slightly altered owing to an alteration in the thermal couple, which becomes brittle when heated in hydrogen.—W. G. M.

English Patents.

Precious Metals; Method, with Apparatus therefor, for Treating Kaolin, Slimes, Saponaceous Earthy Matter, and the like, preparatory to the Extraction, by either Amalgamation, Chlorination, Leaching, or such like Processes, of the —— contained therein. J. Breedon, Sydney, N.S.W. Eng. Pat. 15,471, July 30, 1901.

The kaolin, slime, saponaceous earthy matter, &c. is coagulated by drying, and moulded so as to take the form of short tubes. These tubes are charged with inflammable material, and then subsequently calcined in a suitable furnace, with outwardly sloping floors in the calcining chambers, and an arrangement of flues adapted for either alternate firing in connection with another chamber, for concentrating the heat in one calcining chamber, or for distributing it among a number of chambers. The 16 claims include, not only the method, but also the special plant for carrying out the train of operations.—W. C. H.

Steel; Manufacture of ——. R. A. Hadfield, Sheffield. Eng. Pat. 6090, March 22, 1901.

To the chromium-nickel steel, the composition of which is described in Eng. Pat. 27,753, 1897 (this Journal, 1899, 49), manganese is added in proportion from 0·6 to 6·0 per cent. Steel suitable for armour-piercing projectiles, or for hardening by the process described in Eng. Pat. 6089, 1901, may contain approximately per cent. of carbon, 0·8; of silicon, 0·2; of sulphur, 0·04; of manganese, 1·2; of phosphorus, 0·04; and of nickel and of chromium, 2 per cent. each. A special method of hardening is stated to be necessary in the case of steel containing manganese.

—E. S.

Steel; Composition for Hardening ——. G. Kolb, Mannheim, Germany. Eng. Pat. 2115, Jan. 27, 1902.

The composition is made of, substantially, colophony, 7 parts, potassium ferrocyanide, 3 parts, and of cupric sulphate and linseed oil, 1 part each. No directions are given as to the manner of applying the composition.

—E. S.

Crucible Steel; Manufacture of ——. E. B. Clark, Pittsburgh, Penn., U.S.A. Eng. Pat. 2231, Jan. 28, 1902.

The raw materials are melted together in a suitable heating receptacle, preferably in quantities sufficient to charge a number of crucibles, and then poured into the heated crucibles, which are closed to prevent oxidation, and further heated for a limited time.—J. H. C.

Iron and Steel; Manufacture of ——. G. Hatton, Brierley Hill, Stafford. Eng. Pat. 5846, March 20, 1901.

In casting, the molten metal is made to flow, first downward then upward, and finally almost horizontally through an intereeptor, in order to regulate and retard its flow before reaching the moulds, which are mounted upon an endless chain and rotated in a horizontal plane around a common central axis.—J. H. C.

Antimony from Ores and Residues; Method of Extracting ——. J. P. van der Ploeg, The Hague, Holland. Eng. Pat. 12,508, June 17, 1901.

The complete separation of antimony from all kinds of substances containing it, and particularly from ores, is effected by mixing them in a finely-divided state with pulverised quicklime, or grinding them up together with it and then mixing them with water, either before or after the addition of mono- or polysulphides of calcium or magnesium, in order to bring the antimony alone into solution by converting it into the form of easily soluble low double sulphides best suited for electrolysis, without the employment of artificial heat or pressure. The antimony is then

parated from the solutions thus obtained, either in the etallic form by electrolysis, or as sulphide, or any other ntimony compound. After the separation of the antimony y electrolysis, the sulphide solutions can be repeatedly sed as a solvent for fresh ores, or of those which have been ready treated, either with or without the addition of fresh icklime and calcium or magnesium sulphides, according the nature of the antimony compounds.—G. H. R.

luminium : Soldering or Joining ——, and Material therefor. M. Ulmann and B. Schlag, London. Eng. Pat. 8511, Jan. 10, 1902.

HE portions to be joined are secured in place, and covered ith asbestos or other suitable material so as to maintain proper temperature. Molten aluminium is then poured rough a trough or groove, so as to complete the joint, hich may be reheated or wiped when necessary.—J. H. C.

letals ; Method of and Apparatus for Melting and Treating ——. H. H. Lane, London. From Hawley Down-Draft Furnace Co., Chicago, U.S.A. Eng. Pat. 21,176, Oct. 22, 1901.

spherical heating chamber, provided with a closing door id vent-opening, and mounted on trunnions, is employed ; e metal to be melted or treated is placed in this, and jets gas or flame are introduced by suitable pipes and having itably inclined orifices, so that the metal may be brought to their direct path. After melting, the metal is poured it through the vent opening. Arrangements are made by hich an oxidising, reducing, or carburising flame may be nployed or substituted at will.—J. H. C.

letal : Process of and Apparatus for Drawing-off Molten ——, from Cupolas, Blast Furnaces, and the like. L. Lincoln, Boston ; D. B. Lincoln, Wollaston ; and C. S. Gooding, Boston, U.S.A. Eng. Pat. 1093, Jan. 14, 1902.

HE object of the invention is to enable molten iron to be awn-off from cupola and blast furnaces in such manner as get rid of or reduce the pressure of the blast upon the id metal, and also to "even the blast." This is mainly fected by the use of an auxiliary reservoir set against the rnace, with which it communicates by a passage through side, near the bottom, through which the molten metal ws upwards from the hearth until it reaches a certain ight in the reservoir, when it discharges through a spout o a ladle, which is so arranged or suspended that it can tilted, so that its contents flow into a pigging bed neath, or other mould. The pressure of the blast from e tuyères in the furnace maintains the molten metal in e reservoir at the level of the spout, but in order to icken the discharge, the reservoir is connected by a pipe, tering near its top, to an exhaust pump provided with a lve, which is brought into action when necessary. The ère pipe is connected with the upper part of the ervoir by a valved pipe, to equalise pressure in the arth and the reservoir when desired, in which case the n will drop down below the discharge outlet. A ompressed air pipe" with valve is also provided at the of the reservoir, the function of which is to drive the tal out of the reservoir back into the hearth. An turned pipe, with the needful accessories, may be bstituted for the reservoir, the "compressed air pipe" ng connected with the pipe near its upper end.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

English Patents.

odes for Electrolytic Operations. [*Electro-Deposition.*] M. D'Andrimont, Liège, Belgium. Eng. Pat. 118, Jan. 2, 1902.

E anode is formed "from a number of elements separated interposed bushes or pieces of different conductivities, ereby the current is appropriately subdivided between component plates or elements."—G. H. R.

Ozonisers. [*Sterilisation.*] The Electric Ozone Syndicate, Ltd., and R. F. W. Smith, London. Eng. Pat. 7256, April 6, 1901.

AN ozoniser of the "Andreoli" type is enclosed in a glass jacket or envelope, one end of which has a nipple to receive an air supply tube, and the other may be formed with an outlet tube which is adapted to receive any one of a series of nozzles suited for the different purposes for which the instrument is to be used. The terminals are suitably attached on nipples formed on the glass jacket, and have pins passing through the jacket, and in contact respectively with the external metal conductor of the ozoniser and the wire running through the ozoniser tube. When used medically, the ozoniser is preferably provided with a handle secured to the outer jacket by a clip attached to the end of a cord passing over a pulley on a bar secured in any suitable position by means of a hook, the other end of the cord being provided with a counterweight. The bar is also provided with spring wires which pass down through suitable receptacles, and are connected to the terminals, thus enabling the apparatus to be used in any desired position.—G. H. R.

United States Patent.

Insulating Compound. H. W. Potter, Göttingen, Germany. U.S. Pat. 694,989, March 11, 1902.

SOAPSTONE or talc powder (100 parts) is mixed with water (35—45 parts) and some binder such as tragacanth (15 parts) dextrin, &c., formed into blocks, dried and baked ; chloride or nitrate of magnesium (2 to 4 parts) may be added if desired. If the compound is to be subjected to heat, 5 to 15 per cent. of water-glass is added also.

The inventor names the compound "Talcite" and states that it is a "highly refractory insulating material."

—J. W. H.

XII.—FATS, OILS, AND SOAP.

Fats ; Occurrence of Vegeto-fatty Acid Glycerides in Animal ——. W. Hansen. Arch. Hyg., 1902, **42**, 1 ; through Chem.-Zeit., 1902, **26**, Rep. 93.

THE author has obtained from beef and mutton tallow (after expressing the volatile glycerides) by repeated recrystallisation first from alcohol and then from ether, a glyceride of constant melting-point (62·5° C.), which, from its saponification-number (195·65), and from the melting point (64° C.) of the fatty acids extracted from it, is evidently not tri-stearin but distearo-palmitin. Dipalmito-stearin, dipalmito-olein, and stearopalmito-olein, having the following constants, were further obtained from the portion remaining dissolved in the ether :—

—	Melting Point.	Saponification Number.	Iodine Number.
	°C.		
Dipalmito-stearin.....	55	200·2	..
Dipalmito-olein	48	202·7	36·18
Stearopalmito-olein	42	195·0	29·31

—W. G. M.

Fatty Acids ; Distillation of ——. F. Kassler. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [4], 74—76.

THE author here continues the description of the method of distillation in use at his works (this Journal, 1902, 486). The "retourgang" from all the crude materials united and redistilled yields a further "distillate," which is mixed with the other products to be expressed, and a "green oil," part of which is worked up again with the "retourgang" of a first distillation, whilst a small part is burned. The following average results were obtained in the distillation of the "tailings" :—

"Distillate".....	77·2 per cent.
"Green oil".....	17·0 „
Pitch.....	5·8 „
Duration of operation.....	25 hours.
Quantity distilled	2,542 kilos.

Incorporating these results with the average yields obtained from the crude material (*loc. cit.*), the following final numbers are obtained:—"Distillate," 95·80; pitch, 3·32; and loss 0·88 per cent.

Samples of the distillates are tested from hour to hour, their solidification point and proportion of oleic acid (from the iodine value) being determined.

The fatty acids of the crude materials employed showed the following results before the distillation:—

Fatty Acids of	Solidification Point.	Oleic Acid.	Neutral Fat.
	C.	Per Cent.	Per Cent.
Pressed tallow	19·1	24·5	0·5
Chinese vegetable tallow.	52·5	35·6	0·8
Tallow	42·5	38·2	0·5
Bone fat	39·3	58·7	0·8
Palm oil	41·6	57·4	0·3

The values given below, taken from the author's long table, show the changes in the composition of the distillate during the course of distillation.

The author points out that in the case of the fatty acids of pressed tallow, bone fat, and tallow, in which the solid fatty acids consist of approximately equal parts of stearic and palmitic acids, the solidification points, which are low at first, gradually rise as the distillation proceeds; and he assumes that this is due to the earlier distillates consisting of a mixture of these acids with oleic acid, whilst subsequently an excess of stearic acid passes over. In the case of palm oil fatty acids (containing only 10 to 20 per cent of stearic acid in its solid fatty acids), he considers that at first only palmitic and oleic acids distil over, whilst the later fractions consist of a mixture of these acids with stearic acid, the mixture of the two solid fatty acids having a lower solidification point than that of either of the individual acids. With the vegetable tallow acids again, the characteristics of the distillates are in accordance with the fact that no stearic acid is present, but only palmitic and oleic acids.

Fatty Acids of	5 Hours.		10 Hours.		20 Hours.		25 Hours.	
	Solidification Point.	Oleic Acid.	Solidification Point.	Oleic Acid.	Solidification Point.	Oleic Acid.	Solidification Point.	Oleic Acid.
	C.	Per Cent.	C.	Per Cent.	C.	Per Cent.	C.	Per Cent.
Pressed tallow	17·0	20·46	48·1	19·50	50·4	24·02	52·4	26·48
Chinese vegetable tallow	49·5	28·64	51·0	32·40	53·7	35·95	53·0	40·84
Tallow	42·0	29·69	42·5	29·00	46·0	36·39	47·6	36·97
Bone fat	38·9	49·21	39·3	51·00	38·8	56·72	40·3	59·24
Palm oil	46·5	47·83	44·5	51·91	41·7	56·91	39·0	58·56

The final solidification points are invariably higher than the initial ones, which is to be attributed to the formation of iso-oleic acid and hydroxystearic acid. In every instance, too, the final distillates contain considerably more oleic acid than the earlier fractions.—C. A. M.

Soaps, Metallic, from Linseed Oil; Solubility in certain Hydrocarbons of ——. H. T. Vulté and H. W. Gibson. J. Amer. Chem. Soc., 1902, **24**, [3], 215—222.

The authors, having found it impossible to effect a complete separation of the "drier" from the base in paint-driers, have made experiments to determine the solubility of different metallic salts of linseed oil fatty acids after treatment with various solvents for uniform periods.

These different salts were precipitated from solutions of the sodium soap cooled to 20° C. or lower. The precipitates were washed with air-free water, dried, added in excess to each solvent, and the flasks allowed to stand in the dark. At the end of one hour, 24 hours, and 48 hours, portions of 10 c.c. of the clear solution were evaporated on the water-bath and the residue weighed.

The solvents used were:—

——	Boiling Point.	Sp. gr. at 15° C.
	C.	
Petroleum spirit	35—55	0·659
Benzine	55—75	0·702
,,	75—85	0·695
Naphtha	59	0·741
,,	62	0·732
Benzine	71	0·698
Gasoline	74	0·699

From the results of the experiments it was found that each metallic soap had a maximum solubility in some special solvent, and hence no particular hydrocarbon is suitable for all metals.

Metal.	Character of Soap.	Residue from Evaporation.	Boiling Point of most Active Solvent.	Permanence of Solution.
			C.	
I. Lead	White; granular; oxidises to yellow.	Colourless; hard lacquer.	35—55	Nearly complete separation in one hour.
II. Mercury	White; curdy	Soft; colourless	74	Gain in weight, all solvents.
Copper	Pale green; curdy; oxidises to deep green.	Bright green lacquer; rather soft.	55—75	Gain in weight, all solvents nearly constant after 24 hours
III. Tin	Yellowish-white; scanty; granular to slimy.	Oily smear	74	Nearly constant weight.
Antimony	Yellowish-white; plentiful; soft; granular.	,,	62	,, ,,
IV. Iron	Greyish-green; rapidly oxidises to red-brown.	Mahogany lacquer; rather soft.	35—55	Maximum at 24 hours; loss slight.
Chromium	Purplish-gray; oxidises to purplish green.	Bright green lacquer; quite hard.	59	Slight loss after 24 hours.
Aluminium	White; granular; oxidises to yellow.	Hard colourless lacquer	55—75	Gain in weight, all solvents.
V. Nickel	Apple-green; granular	Pale green lacquer	35—55	Permanent for several days, then nearly complete separation.
Cobalt	Purplish-red; granular	Soft, reddish	62	Solution and separation slight.
Manganese	Brownish; curdy; rapidly oxidises to dark brown.	Brown lacquer; hard	35—55	Maximum at 24 hours; partial separation at 48 hours.
Zinc	White; curdy	Oily smear	75—85	Uniform after 24 hours.
VI. Barium	,, ,,	,,	Very slight solubility.	——
Calcium	,, ,,	,,	,,	——

The time at which the maximum amount of separation of e soap from the solution occurred, also varied with each etal. Thus, the lead soap separated almost completely om all the solvents in less than an hour, whilst the nickel ap remained in solution for several days.

The iron soap yielded a permanent solution, which utinually increased in weight from oxidation. When ghtly heated it formed an excellent drier, though inferior the manganese soap in this respect.

The last table on preceding page summarises the characristics of the different metallic soaps.—C. A. M.

ils; Temperature Reaction of ——, with Sulphuric Acid [Moumené's Test]. H. S. Sherman, J. L. Danziger, and L. Kohlstamm.

See under XXIII., *page* 564.

English Patents.

ils, Fats, and Greases; Preparation of Fuller's Earth, Silicates, and Silicious Matters for Use in the Treatment of ——. C. A. McKerrow, Manchester. Eng. Pat. 10,825, May 25, 1901.

ULLER'S earth (or analogous hydrated silicate) is damped a current of steam in a closed vessel, which is subseently externally heated, the current of steam being aintained until sulphur compounds, &c. are decomposed, nen the source of external heat is withdrawn, and the rrent of steam continued until the temperature falls to out 100° C. The gases and vapours evolved may be llected, if desired. The same process is used in revivifying ent fuller's earth, &c.—E. S.

ish and Fish Refuse, Process of Treating ——, and Apparatus therefor. J. H. P. M. Delattre. Eng. Pat. 8,483, 1901.

See under XV., *next column.*

United States Patents.

oap; Apparatus for inserting Floats in Cakes of ——. W. Berry, Chicago. U.S. Pat. 695,026, March 11, 1902.

IS invention has for its object the introduction of floats o soap which would otherwise sink in water. A typical m of the apparatus described consists of a cylindrical ould, outside which is a pin support provided with enings to receive a series of superposed pins, the other ds of which are inserted into holes in the floats, thus fixed regular intervals in the centre of the cylinder. The top the mould is covered with a removable cap within which a conical deflector having at its base an annular opening, that the liquid soap introduced at the top falls to the ttom of the mould without touching the floats in the ntre. When the soap has solidified, the pins can be thdrawn through the side of the mould, leaving the floats ced at equal distances within the bar, which may then cut horizontally into cakes.—C. A. M.

Soap Mould. W. Berry, Chicago. U.S. Pat. 695,027, March 11, 1902.

IE object of this patent is the production of cakes of ap each containing an insert. The liquid soap is roduced into an upright mould, preferably cylindrical in m, in the centre of which is fixed a vertical rod passing rough perforations in a series of inserts arranged at iable intervals. After solidification of the soap, the ntral rod is withdrawn, and the soap forced from the ould and cut into cakes each of which will contain an sert.—C. A. M.

Soap Mould. W. Berry, Chicago. U.S. Pat. 695,028, March 11, 1902.

AIM is made for an apparatus which embodies an plification of the principle of the preceding patent. stead of one central rod a series of rods carrying rforated inserts is fixed across a rectangular mould from e to side. The liquid soap is poured into the mould, and en it has set, the rods are unscrewed and withdrawn, aving the inserts distributed at regular intervals within the soap, which can then be cut into bars and cakes. Claim is also made for a modification of this apparatus and for various mechanical details.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

English Patent.

White Pigment from Zinc [Zinc Sulphide], and for Utilising Residual Products obtained during the Conducting of the said Processes; Processes for the Manufacture of a ——. Jabez Lones, E. Holden, and Joseph Lones, Smethwick. Eng. Pat. 10,865, May 25, 1901.

A ZINC ore is powdered and roasted, if necessary in the presence of air. The residue is dissolved in hot acetic acid, the solution clarified by subsidence, precipitated with metallic zinc to throw down any lead, cooled, and allowed to crystallise. The crystals are dissolved in water, and the zinc is precipitated as sulphide by means of sulphuretted hydrogen. This gas is prepared by leading the sulphurous acid, evolved during the first roasting process, through a chamber filled with red-hot coke and water vapour. In an alternative process, the crude zinc oxide is dissolved by boiling in a solution of caustic soda, the solution cooled, treated with metallic zinc and some substance, such as copper, which sets up a galvanic couple, and then decanted. This solution is precipitated with sodium sulphide, which is made by igniting a mixture of carbon and sodium sulphate. The by-product of the reaction is caustic soda, which only requires partial re-causticisation to be ready for use over again.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patent.

Hides and the like; Method of and Means for Preparing and Tanning ——, Applicable also to Dyeing and Analogous Purposes. T. C. Fawley, London. Eng. Pat. 26,261, Dec. 23, 1901.

THE hides or skins are suspended on frames parallel to one another and the tan or dye liquor "rained" on them from above by means of a tank with perforated bottom or perforated pipes or jets. After passing over the skins, the liquor is raised by a pump and again passed over them until it is exhausted. Means are provided for giving a reciprocating motion to the frames supporting the skins.

—J. T. W.

XV.—MANURES, Etc.

English Patents.

Fish and Fish Refuse: Process for Treating ——, and Apparatus therefor. J. H. P. M. Delattre, Dorignies-Flers, Nord, France. Eng. Pat. 8483, April 25, 1901.

THE crude fish refuse is disintegrated and extracted with benzine or carbon bisulphide, and on separation of the oily solution, the residue is dried at a steam heat for application as a fertiliser. The apparatus used, is of the type of that described in Eng. Pat. 2665, 1900 (this Journal, 1900, 681), but has special features to adapt it to the present purpose. The fish or refuse is received by a hopper at one end of a horizontal pipe the other end of which opens into a vertical pipe (both pipes provided with screw carriers) delivering the point at the lower end of the cylinder where the arms terminate, a pipe is placed for admission, under pressure, of into a very long slightly-inclined cylinder, which has a revolving shaft carrying arms, each of which has a beater at one extremity and a fork at the other, to disintegrate the charge as it passes downwards. The solvent used, flows in the opposite direction to the refuse, to the higher end, where it passes up a vertical covered cylinder, or funnel-shaped vessel, with the larger diameter at the upper end, and provided with an annular gutter in the top part for more effectual separation of any pulp carried upwards

from the grease-charged solvent, which then has exit by a suitable channel to a distilling apparatus for recovery of the oil and solvent. From the lower end of the cylinder, the de-greased refuse falls into the bottom of an upwardly inclined steam-jacketed cylinder, the screw elevator in which discharges it into a drying drum, also steam-jacketed, and furnished with a hollow shaft carrying hollow blades through which steam passes, whence the refuse falls into a heated trough, the revolving screw in which finally delivers it into receptacles for packing.—E. S.

Soil, Fertilisers, and the like; Apparatus for Sterilising ——. R. W. Carter, West Springfield, U.S.A. Eng. Pat. 23,143, Nov. 15, 1901.

The apparatus consists of perforated pipes, which may be arranged in horizontal series with similarly perforated multiform end-pieces, coated throughout with fibrous fabric through which the steam injected into the apparatus may pass freely, without intrusion of the soil. Or, perforated steam boxes, similarly coated, may be used. It is stated that soil thus treated with steam at a sufficiently high temperature for about an hour, becomes sterilised through the thickness of a foot.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Apiose; a β-hydroxymethylerythrose. E. Vongerichten.

See under XXIV., *page* 566.

English Patents.

Liquids from Solid Matters; Separation of —— *; specially applicable in Sugar Manufacture.* G. Desaulles, Bourdon, France. Eng. Pat. 7339, April 1, 1901.

The apparatus for carrying out this process consists of a circular trough with a perforated metal bottom fixed to the cover of a tightly-closed vessel in which a partial vacuum can be maintained. The whole apparatus is arranged so that it can rotate with a slow but variable velocity around a hollow axis fitted with orifices. The magma of crystallised sugar is run through a special regulator into the circular trough, which it finally fills. The mother-liquor is removed by the partial vacuum, the apparatus rotating meanwhile, and the dried sugar or other material strikes against a blade, which raises it, and conveys it away by means of a screw. The hollow axis, around which the circular trough rotates, constitutes a conduit through which a vacuum may be formed in the vessel, steam or air injected, and the mother-liquors thereby allowed to escape. Claims are also made for an adjustable regulator, and also the means for raising the crystals and conveying them outside the apparatus. The working parts are illustrated by diagrams.—J. L. B.

Sugar; Extraction of ——. B. Schwerin, Munich, Bavaria. Eng. Pat. 8086, April 19, 1901.

The saccharine matter in a disintegrated state, and mixed, if necessary, with water, is subjected to the action of an electric current by means of a positive electrode separated from the matter to be extracted by a layer of water, and a negative electrode pervious to the liquid. As soon as the circuit is closed, liquor begins to percolate through and run down outside the negative electrode. The solution, which smells strongly of ammonia, is of a greenish-brown colour, owing to the presence of ammonium and sodium albuminates. These substances may be precipitated by agitation with metallic aluminium, and the sugar obtained from the filtered solution is but slightly coloured. Inversion of the cane sugar does not take place during this process.—J. L. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barley; Tendency of ——, *to get Hot during Malting.* By M. Delbrück. Woch. für Brau., 1902, **19**, [10] & [11], 122—123 and 142—143.

A tendency of barley to get hot is indicated by the temperature of the couches rising very rapidly, necessitating frequent turning over. The increase of the temperature of the couches in a given time depends on the nature of the barley, the course of the steeping and germination processes, the arrangement of the malt-house, and the condition of the air. Heat is generated by the respiration of the corn, and the intensity of the respiration depends on the physiological condition, the activity of the chemical processes performed by the enzymes, also the comparative size and weight of the corns. The chemical composition of the endosperm as regards sugar ready-formed, and the sugar and other soluble products produced by the various enzymes, influence the velocity of respiration. A further factor is the movement of these soluble respirable substances, depending on the proportion of water as the means of conveyance, the diffusion capacity of the cells, and the vigour of the embryos. The absolute height of the temperature at which germination takes place also influences the intensity of the reactions. Strong aëration causes strong respiration. The observable rise of temperature is the resultant of the heat developed and of that taken away (*a*) by radiation depending on the nature and extent of the exposed surface, (*b*) by the evaporation of water from the couch, and (*c*) by the introduction of cold air. A barley rich in proteids tends to get hot owing to excessive development of enzymes; a small-corned barley tends to get hot owing to the larger number of active respiring embryos; a barley with a thick husk tends to keep cool owing to the greater evaporation of moisture. Thus the typical "hot" barley is one rich in proteids, small-corned and with thin husks. An excessive steep, rank growth, high temperature, withered rootlets, and thick couches all tend to develop heat; mouldy corns are also harmful, because the moulds respire as well as the barley. The heat-energy, developed by the chemical change from starch to sugar and that absorbed by the building up of the plant substance from the sugar, may be neglected.

—J. F. B.

Malt; Conversion of the Percentages of Extract in —— *from K. Windisch's Tables into those from Balling's Tables.* O. Saare. Woch. für Brau., 1902, **19**, [11] 145—146.

There are two sets of tables now in use for deducing the percentage of extract in a malt wort from its specific gravity. Both are based on the specific gravity of a solution of cane sugar; but whilst K. Windisch's tables are calculated from specific gravities at 15° C, those of Balling refer to specific gravities at 17·5° C. The determined differences between the two scales, in worts ranging from 7·6 to 8·5°, were 0·10 to 0·12; average 0·11°.

Consequently, in the estimation of the extract in malt from the specific gravity of a 10 per cent. wort, the percentage of extract found by Balling's method must be increased by 1·1 for conversion to Windisch's scale, and conversely 1·1 must be subtracted from the percentage found by Windisch's method for conversion to Balling's scale, this correction referring to the percentage of extract in the malt dry-substance.—J. F. B.

Malt; Purchase of ——, *on Analysis.* O. Saare. Woch. für Brau., 1902, **19**, [10], 126—127.

In discussing the form in which the specification of a delivery of malt should be stated, the author quotes examples which show that, rather than guarantee the percentage yield of extract on the malt dry-substance, it is more convenient and simpler to specify the quantity of extract to be delivered in a given weight (100 kilos.) of malt at a certain price, at the same time undertaking that the proportion of moisture shall not exceed a certain percentage. In this way the value of a unit quantity of extract can be determined at a glance, and proportional adjustments can be made in the invoice for any divergences. Such purchases are assumed to be made on the German official process of analysis, and it should be agreed that divergences of 0·5 per cent. of extract, and 0·25 per cent of moisture are allowable for errors in analysis.—J. F. B.

Saccharomycetes; Spore-formation among the ——. B. T. P. Barker. J. Fed. Inst. Brewing, 1902, **8**, [1], 26—76.

The author deals exhaustively with the question of spore formation among the Saccharomycetes, dividing his subject

into two sections, the external conditions and the internal conditions. He comes to the conclusion that the statement of the conditions necessary for spore-formation, as formulated by Hansen, must now be extended as follows:—The cells must not be allowed to suffer desiccation; a plentiful supply of air must be obtained for the cultures; only young and vigorous cells can exercise the function; a suitable temperature is necessary; a food supply, *per se*, is not prejudicial and in one case at least (*S. anomalus*) is necessary; a sexual act must take place in some species and possibly in all.

Referring to the external conditions, it is interesting to note how closely they coincide with those to which the wild yeasts are subjected when vegetating on the surface of ripe fruits, the spores produced enabling the yeast to survive the unfavourable conditions of winter.

As regards the internal conditions, the author discusses very fully the question of a process of sexual conjugation as a preliminary to sporulation. Such a process has been observed in the group of fission yeasts, Schizosaccharomycetes, being well characterised in *S. octosporus* and *S. Pombe*. Recently the author has described a budding yeast, Zygosaccharomyces, on the surface of Jamaica ginger (see this Journal, 1901, 918), in which conjugation is certainly necessary before sporulation. In this respect, Zygosaccharomyces, which is otherwise closely related to the Saccharomycetes proper, forms a connecting link between the latter and the group of fission yeasts, just as *S. Ludwigii*, does from a morphological point of view. Moreover, preliminary experiments are described with *S. cerevisiæ, I.*, which might be explained as favouring a former view as to the occurrence of a very simple process of conjugation in this species.

As regards the details of the three definitely observed cases of conjugation, certain transitional differences are noticed. In Zygosaccharomyces, conjugation takes place between two entirely separate and distinct cells, having no close relationship to each other. In *S. Pombe*, no mention has been made as to the common relation between any pair of conjugating cells. But in *S. octosporus*, conjugation must take place between two daughter cells produced directly from the same mother cell.

Finally, the author considers that all the three groups of yeasts ought to be included in one main group—Saccharomyces—in view of the connecting links between them and the possibility of conjugation being common to all.

—J. F. B.

Mashing Process; Course of the Transformation of Starch and Albumin during the——. W. Windisch and R. Hasse. Woch. für Brau., 1902, **19**, [13], 192—194.

The authors have studied the course of the reactions taking place in Windisch's "short" mashing process. According to this, the mash is started at a temperature of 62·5 C., the first decoction is then withdrawn at once, brought to the boil, and returned to the mash, raising its temperature to 70° C. Saccharification is then allowed to proceed at this temperature for 30 minutes, and the second decoction is then withdrawn, boiled, and returned to the mash, raising its temperature to 75° C., and the mash is then let down. The authors took samples of the wort (1) just after starting, temperature 62·5° C., when the first decoction was withdrawn; (2) after returning the first decoction, temperature 70° C.; (3) after 30 minutes' saccharification at this temperature; (4) on letting down, temperature 75° C.

The results of the analyses of the filtered worts led to the following conclusions:—

Albumin Transformation.—The worts were boiled and the nitrogen determined in the coagulated albumin and in the filtrates. The uncoagulable nitrogen in the worts increased steadily throughout the process. The total nitrogen in the unboiled worts, on the other hand, decreased from sample 1 to sample 2, owing to the removal of coagulable albumin in the first decoction; after this stage, however, the total nitrogen in the worts showed an increase. Sample 3 showed a further decrease of coagulable albumin owing to the transformation of this substance by the proteolytic enzyme, during the saccharification process. Sample 4, on the other hand, in spite of the second decoction, showed an increase, not only of total nitrogen, but also of coagulable albumin, indicating a further extraction at this stage of previously insoluble proteids from the grain. The filtrates from the boiled worts were then submitted to a series of successive group precipitations, and the nitrogen was estimated in the various precipitates.

A further constant quantity of coagulable albumin was obtained by boiling the worts with dilute acetic acid. The filtrates were then treated with lead acetate, and here also the quantity of nitrogen precipitated remained practically constant. The filtrates from the lead precipitates were precipitated with phosphotungstic acid, and the final filtrates were boiled with 4 per cent. sulphuric acid for the determination of the acid-amide nitrogen. The acid-amides (asparagine, glutamine, &c.) remained practically constant throughout the process, but the group of nitrogenous compounds precipitated by phosphotungstic acid showed a steady and considerable increase. This group, therefore, was the only one found to increase owing to the activity of the proteolytic enzyme, but it is remarked that the whole of the groups determined only accounted for less than half of the total nitrogen in the worts.

Starch Transformation.—The authors made the unexpected discovery that as much as 92 per cent. of the total extract had not only been dissolved, but also fully saccharified in the first stage, before the intended saccharifying temperature of 70° C. had been reached. It follows, therefore, that in properly modified, pale malts, saccharification proceeds at 62·5° C. so rapidly that only the harder, less modified point-ends of the endosperm (equivalent to 8 per cent. of the total extract) remain to be dealt with in the subsequent operations at 70° C. The saccharification which then took place was characterised by a smaller production of maltose and a larger production of dextrin owing to the higher temperature. Thus the dextrin increased not only in quantity but in proportion to the maltose as the mashing proceeded. The cane sugar remained practically constant. These results explain why it is not possible to vary the composition of the worts obtained from the same malt by varying the conditions of mashing, most of the work being completed before the higher temperatures are reached.—J. F. B.

"Casse" of Wines; Action of Sulphurous Acid in Preventing ——. J. Laborde. Comptes Rend., **134**, [12], 723—725.

Free sulphurous acid prevents "casse," but in combination (whether as sulphite or with an aldehyde) it is not effectual. If to a "cassable" wine the minimum quantity of sulphurous acid necessary to prevent "casse" be added, and if the wine be then kept in a well-closed vessel for some time, some of the sulphurous acid goes into combination, and on again exposing the wine to the air "casse" shortly sets in. This proves that sulphurous acid does not act (as heat does) by destroying the oxydase to which "casse" is due. It also shows the necessity for adding to the wine, for permanent protection, more than the minimum quantity of sulphurous acid. Destruction of the oxydase, when this occurs, is most probably due to aeration and the action of the oxygen so absorbed.—J. T. D.

English Patents.

Kiln or Drying Apparatus for Drying Brewers' Grain, Wet Damaged, or Ill-conditioned Grain, and other Moist Substances. L. W. Harvey, London. Eng. Pat. 7110, April 4, 1901.

The kiln—plans of which accompany the specification—is so arranged that the products of combustion do not come into contact with the substance to be dried. The troughs conveying the material are connected together in such a manner that they are only open to a chamber external to the furnace uptake.

Every top edge of a trough in a tier is connected with the opposite edge of the trough above, the opposite edge of the bottom trough being connected to the wall of the chamber so as to form a separate chamber from the fire

chamber, and to allow of free heating all round the trough. Air-holes are provided at the lower part to induce and regulate an upward draught.—J. L. B.

Mash Tuns for Brewing Purposes. F. G. Riley, Surrey. Eng. Pat. 9357, May 6, 1901.

To the centre of the bottom of a mash tun a toothed wheel is suitably fixed, on either side of which revolve two pinions; these are secured on a horizontal shaft which extends the whole diameter of the tun but does not revolve. The shaft is attached by means of a bracket to a vertical shaft which passes through the bottom of the tun; arrangements are also made so that in case of excessive strain the shaft can slip. The two pinions are provided with bosses and sleeves to which rakes are attached. These internal rakes are independent of the shape of the tun, and require very little power to drive them.

The second claim is for a new method of removing the grains. A valve is made inside the tun with a screwed hole in which a footstep slides. This is kept at the top of the hole by means of a spring. Suspended above the tun is a screw-pointed spear and when the grains are ready to be removed, this spear is lowered, screwed into the valve and lifts the same out, thus allowing the grains to be discharged without entering the tun.—J. L. B.

Brewing. H. A. Hobson, and the Concentrated Beer Company, Ltd. London. Eng. Pat. 4943, March 8, 1901.

The patentees claim the following processes:—

1. A decoction of hops is prepared by digesting and boiling hops in a liquor made by extracting respectively residual soluble constituents which were retained by the spent hops and the malt of a previous brew. The liquor is then drawn off and the spent malt charged with hot water and the spargings added to the spent hop extract.

2. A portion of the hop infusion is withdrawn and the tannic acid fixed; this portion is then heated and returned to the bulk so as to raise the temperature of the mash liquor without diluting it by the introduction of naked steam.—J. L. B.

Brewers' Vats; Rouser Apparatus for ——. S. Briggs, Burton-on-Trent. Eng. Pat. 9752, May 10, 1901.

The rousing apparatus for fermentation vats consists of a wide central pipe with holes at the bottom, arranged as a vomit. A smaller pipe also enters the larger one at the bottom, and injects filtered air under pressure into the central shaft. This current of air sucks up the liquid and sediment of yeast at the bottom, and discharges it from the top, whence it falls back into the vat, guided, if necessary, by a cowl placed on the top.—J. F. B.

Malt and Spirituous Wines and Liquors; Method for Refining, Ageing, Mellowing, and Purifying ——. J. F. Duffy, Chicago, U.S.A. Eng. Pat. 391, Jan. 6, 1902.

The liquor is first treated with air under pressure, then heated and atomised. Air is impregnated with a suitable reagent and mixed with the atomised liquor, after which distillation takes place.—J. L. B.

Malt and Spirituous Wines and Liquors; Apparatus for Refining, Ageing, Mellowing, and Purifying ——. J. F. Duffy, Chicago, U.S.A. Eng. Pat. 392, Jan. 6, 1902.

The patentee claims the use of the following apparatus:—A supply tank, a heating tank arranged at a lower level, an air compressor, a supply pipe connecting the supply with the heating tank, and a pipe leading from the air compressor to the supply pipe, entering the latter at an acute angle. Within the heating tank is a coil connected with the supply tank. There is also an atomising tank, an atomiser connected with the heating tank, and means for ejecting a current of impregnated air upon the liquor as it emerges from the atomiser.—J. L. B.

Gaseous Liquids; Apparatus for Supplying ——. A. C. J. Charlier, Glasgow. Eng. Pat. 9041, May 2, 1901.

The apparatus is intended for delivering mineral waters, beer, &c., into glasses ready for consumption without loss of the contained gas. The liquid is delivered from the containing cylinder through a tap into a glass receptacle or vessel, from which it is discharged as required through another tap, the taps being worked in conjunction, so that one is opened when the other is closed, and *vice versa*. The glass receptacle is provided at the top with a poppet valve, which is loaded to any required pressure to vary or regulate the top pressure on the liquid.—R. A.

French Patent.

Denatured Alcohol; Process for Manufacturing ——, *by replacing Petroleum by Excessive and Different Fermentations.* G. Péreire and G. P. Guignard. Fr. Pat. 316,062, Nov. 19, 1901.

The ordinary distillery wort is first subjected to an amylic fermentation by the use of the vibrion amylozyme, and then to the usual alcoholic fermentation, wherein ordinary yeast is employed. By this process denatured spirit is obtained without addition of petroleum.—J. L. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

English Patents.

Alimentary Substances and Beverages, Oils and other Oxidizable Materials; Treatment of ——. J. Hogarth, Kirkcaldy, Fifeshire. Eng. Pat. 9039, May 2, 1901.

The process claimed is a development of Eng. Pats. 9003, 1896, and 4695, 1897 (this Journal, 1898, 366), and consists in subjecting the material to the action of the air surrounding arc lights or the external surfaces of incandescent lamps. The gases may also be collected at the terminals of electric mains, and caused to pass over or through the material by means of pumps or fans, with or without previous admixture with air. Screens of various coloured glass may be used to modify the rays. It is stated that the said gases and rays have an action on the diastase ferments of cereals and may be employed for oxidising oils and the like.—W. P. S.

Foods, Process for Preserving ——. W. Manasse, Berlin. Eng. Pat. 9653, May 9, 1901.

Cooked or partly cooked foods, such as meat, fat, fish, crustacea, eggs, fungi, vegetables, &c., are immersed for some time in a dilute acid, such as hydrochloric acid of 0·2 per cent, and are then placed in a gelatinous liquid, such as may be obtained by boiling meat, bones, or the like, in which is dissolved, in suitable proportion, a substance, such as sodium bicarbonate, to neutralise the acid. The product may then be sterilised and preserved in closed vessels.—E. S.

Diastase; Method of Obtaining ——, *and Preparing it for Use.* T. Hancock, Worcester. Eng. Pat. 11,035, May 29, 1901.

According to this specification, diastase is prepared by first malting the grain in the usual way and then grinding the sprouts into flour, which contains a considerable quantity of diastase, and which may be used either by itself or mixed with other flour.—J. F. B.

Oatmeal in Oat-cocoa [" *Hafercacao* "]; *Determination of* ——. A. Goske.

See under XXIII., *page* 565.

Citric Acid in Milk; Detection of ——, *and Reaction of Citric Acid with Bromine and Potassium Permanganate (Stahre's Reaction).* A. Wöhlk.

See under XXIII., *page* 564.

(B.)—SANITATION; WATER PURIFICATION.

English Patents.

Water; Apparatus for Softening ——, *and Removing Suspended Matter from Liquids by continuous Decantation.* T. R. Wollaston, Manchester. Eng. Pat. 6129. March 23, 1901.

The apparatus comprises a heating and mixing vessel, a precipitation tank, and a settling and decantation tank. The first has the form of a cylindrical funnel, open at the top, where the water is admitted and cascades downwards over a series of baffling plates, being heated by steam which rises from below. The heated water is then mixed with the chemical reagent, and falls down the spout of the funnel to the bottom of the precipitation vessel, overflowing from the top of this and entering the larger decantation tank at the bottom. This tank is fitted with a series of sloping plates, by which the precipitate is removed from the water as it slowly rises, and the clarified water overflows at the top.—L. A.

Sewage or other Liquid to, and Withdrawal from, Filter Beds; Apparatus for the Automatic Discharge of ——. H. B. Killon, Manchester. Eng. Pat. 5834, March 20, 1901.

This specification describes modified arrangements for effecting the same purpose as No. 2647 of 1900 (this Journal, 1901, 61). A combination of valves, floats, and levers is described by which four or more bacteria beds are operated automatically in rotation, means being provided for opening the inlet valve to each bed when the next anterior bed in the cycle is nearly full, and for keeping the latter bed full until the alternate posterior bed is nearly full, and for then draining it until the next posterior bed is nearly empty.—L. A.

(C.)—DISINFECTANTS.

Insecticides; Experiments with ——. V. H. Lowe and H. P. J. Parrott. Bull. New York Agric. Exp. Station, No. 202, December, 1901.

The authors have made experiments as to the best means of destroying the San José scale on fruit trees.

Spraying with Emulsions of Crude Petroleum and Water.—Winter applications of emulsions containing 25 per cent. or more of petroleum seriously injured or killed peach trees. European plum trees and apple trees were not injured, except by 40 per cent. and stronger emulsions. Cherry and pear trees were not injured by either the emulsified or undiluted petroleum. Spring applications resulted in serious injury to European plum trees by the undiluted petroleum; and slight injury by the 60 per cent. emulsion, whilst the 40 per cent. emulsion was as a rule harmless. Peach trees were seriously injured by the 40 per cent. and stronger emulsions. Young cherry and pear trees were not injured by either the emulsified or undiluted petroleum. The hibernating scales were not destroyed by the 25 per cent. emulsion; to effect this, emulsions of 40 per cent. or higher strength must be employed, but, as indicated above, these should be used only in spring, a short time before the buds begin to swell, and not at any time upon peach trees.

Fumigation with Hydrocyanic Acid Gas.—In the experiments, amounts of hydrocyanic acid gas varying from 0·18 to 0·3 grm. per cubic foot of air space were used. Apple, cherry, pear, and plum buds were not injured; peach buds were not injured by 0·22 grm. per cubic foot, but showed signs of slight injury with 0·3 grm. per cubic foot. Experiments in the winter (December) resulted in failure to destroy the scales with less than 0·3 grm. of HCN per cubic foot, but in the spring (early June), the scales were destroyed by 0·18 grm. of HCN per cubic foot.

As regards effectiveness, fumigation is better than spraying, the principal advantage being that, with suitable precautions, probably every scale will be killed by fumigation, whilst it is very difficult, if not impossible to reach all of them with a spray. In actual practice, however, the fumigation method can only be employed in the case of small trees.

Other insecticides which have been tried with some degree of success are an emulsion of whale-oil soap and crude petroleum; a lime, sulphur and salt wash (lime, 30 lb.; sulphur, 20 lb.; salt, 15 lb.; and water, 60 gallons), and a kerosene lime emulsion (fresh lime, 4 lb.; water, 5 gallons; and kerosene, 1 gallon).—A. S.

XIX.—PAPER, PASTEBOARD, Etc.

Spent Alkaline Liquor from the Reduction of Poplar Wood for Paper Stock; Composition of ——. M. L. Griffin. J. Amer. Chem. Soc., 1902, **24**, [3], 235—238.

Process of Reducing Spruce and Poplar Wood.—The method of preparing paper stock from these woods by treatment with alkali under steam pressure, was devised by Meliner in 1865. In the process now used, the wood is cut into chips and introduced into digesters holding from three to five cords, where it is treated with strong alkali solution (90 to 100 grms. of soda ash per litre), added in the proportion of about four gallons to each cubic foot of space in the apparatus. After being subjected to steam pressure of 100 to 120 lb. for 7 or 8 hours, the mass is forced out under pressure and washed.

Spent Alkaline Liquor.—When removed from the digester this is of a light rose colour, but on exposure to the air, immediately becomes black. It has a specific gravity of about 1·08 at 15° C., and contains about 14 or 15 per cent. of solid matter (*i.e.*, residue dried at 100° C.), which is very deliquescent.

A sample examined by the author gave the following results calculated upon the total solids dried at 100° C.:—

	Per Cent.
Silica	0·11
Iron and aluminium oxides	0·02
Calcium oxide	6·05
Potassium oxide	0·69
Sodium oxide	25·69
Carbon dioxide	3·43
Acetic acid	9·89
Organic matter extracted by naphtha boiling below 60° C.	1·56
„ „ extracted by ether	7·14
„ „ „ „ absolute alcohol	28·26
„ „ „ „ water	17·02
Total alkalis, by titration of incinerated residue	41·25

—C. A. M.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Bismuth Oxide; Reactions of ——, *with Metallic Salts.* J. Aloy. Bull. Soc. Chim., 1902, **27**, [5], 136—137.

A series of experiments carried out by the author do not support the statements of Lebaigue that bismuth oxide, anhydrous or precipitated, when boiled with metallic salt solutions, displaces ferric iron, chromium, and aluminium, but has no action on ferrous iron, cobalt, nickel, copper, zinc, and lead. With ferric salts the reaction is only complete in very dilute solution—not more than 1 molecular weight per litre in the case of the chloride, and half that amount per litre of the nitrate; with the sulphate the precipitation is still more difficult; in each case the precipitate consists of ferric oxide. A greenish-white precipitate, which appeared to consist of basic salts, was formed by the action of the oxide on ferrous salts. The reaction with aluminium salts only takes place completely as in the case of iron, in very dilute solution. Manganese, cobalt, nickel, lead, zinc, and cadmium, are partially displaced from their solutions by oxide of bismuth.—J. W. H.

Mercuric Chloride Solution; Preservation of ——. H. G. Greenish and F. A. Upsher Smith. Pharm. J., 1902, **68**, [1655], 215—217.

The authors have examined the influence on the change which mercuric chloride solution undergoes on keeping, of the nature of the bottle in which it is kept. They arrive at

the following conclusions: (1) A solution of mercuric chloride in distilled water will keep satisfactorily in white, green, or blue bottles for a reasonable length of time, if not exposed to direct sunlight. (2) Even in direct sunlight, the solution will keep, if protected by the use of amber-coloured bottles. (3) The ordinary white glass bottles, whether of English, German, or French manufacture, do not appreciably differ in their action. (4) The minute deposit gradually formed in the solution consists partly or wholly of mercurous chloride. (5) Mercuric chloride with tap water gives a copious precipitate in blue, green, or white glass bottles on exposure to light; the precipitate will not form, however, to any appreciable extent, in amber-coloured bottles or in darkness. (6) In diffused light, amber-coloured bottles preserve the solution better than blue, green, or white bottles. (7) In strong light, amber-coloured glass alone is satisfactory.—A. S.

Thorium in Monazite Sand; Determination of ——. E. Benz.

See under XXIII., *page* 563.

Thorium; New Method of Determining ——. F. J. Metzger.

See under XXIII., *page* 563.

Argemone Mexicana; Alkaloidal Constituents of ——. J. O. Schlotterbeck. J. Amer. Chem. Soc., 1902, **24**, [3], 238—242.

The Mexican or prickly poppy is indigenous to Mexico, the Southern States of North America, and the West Indies. According to some it has narcotic properties, whilst others claim that it is valuable as a purgative and emetic.

Charbonnier (J. de Pharm., 1868, [5], **7**, 348) claimed to have isolated morphine, and his statement was confirmed by Ortega. Peckolt (Ber., **8**, 286), however, concluded that the plant contained a new alkaloid, *argemonine*, and not morphine.

To determine this question the author exhausted a large quantity of the dried plant with chloroform, and obtained a large yield of berberine, whilst a second alkaloid, identified as protopine, was extracted with ether from the filtrate.

In the author's opinion protopine was the substance regarded as morphine by Charbonnier, and as a new alkaloid by Peckolt.

Potassium nitrate was identified among the salts naturally existing in the plant.—C. A. M.

Yohimbine. J. Pharm. Chim., 1902, **15**, [6], 281—282.

The bark of the yohimbé, a tree from the Cameroons, yields the alkaloid yohimbine, the hydrochloride of which, $C_{22}H_{28}N_2O_3.HCl$, has recently been found to be aphrodisiac. In physiological action the alkaloid is somewhat similar to cocaine. The reactions of the bases have been compared by Arnold and Behrens, with the following results: Yohimbine crystallises in prismatic needles, which melt at 232° C.; they turn yellow, then orange-red, on exposure to light. The hydrochloride melts at 290° C. Gold chloride (1 : 100) gives a deep greyish-violet precipitate. When heated with sulphuric acid, yohimbine gives a slight odour of menthol, whilst cocaine, under the same treatment, evolves an odour of methyl benzoate. Fuming nitric acid gives a deep green coloration, turned cherry-red with alcoholic potash; cocaine gives no such coloration. If dry bleaching powder is added to a solution of yohimbine in sulphuric acid, the particles are coloured a deep orange-red; cocaine gives no coloration. Yohimbine is not blackened when mixed with calomel and moistened, whereas cocaine causes blackening; yohimbine reduces alkaline silver solutions. Ammonium molybdate, iodine in potassium iodide, tannin, platinum chloride, Nessler's reagent, and chromic acid give similar reactions with the two bases. —A. C. W.

Tropine from Tropidine and the Synthesis of Atropine. A. Ladenburg. Ber., 1902, **35**, [5], 1159—1162.

The author's conversion of tropidine into tropine by means of hydrobromic acid in the cold (Ber., **23**, 1780 and 2225) has been questioned by Willstätter, who has devised a process of his own (this Journal, 1901, 1135). The previous method has now been modified as follows:—Pure tropidine was converted into the dry crystallised hydrobromide, which was then shaken with rather more than 1 mol. of fuming hydrobromic acid in the thermostat at 35° C. An equal weight of water was then added, and the mixture heated at 160° C. for 24 hours, the product being then distilled with a slight excess of soda to remove unaltered tropidine. Caustic potash in excess was added to the residue, which was extracted with chloroform. The extract is a mixture of tropine and ψ-tropine, which were separated by means of the gold salts. The tropine gold salt was then converted into the platinum salt, the most characteristic compound. The complete synthesis of atropine can thus be effected in the following stages: synthesis of glycerin, thence to glutaric acid, to suberone (Crum Brown and Walker), to tropidine (Willstätter), to tropine (Ladenburg), to tropaïc acid, then atropine from tropine and tropaïc acid (Ladenburg).—A. C. W.

Betaïne; Improved Method for the Preparation of ——. V. Staněk. Zeits. Zuckerind. in Böhmen, 1902, **26**, [6], 287—289.

As betaine withstands the action of hydriodic acid even at 210° C., as well as that of chromic acid, which destroys most of the associated organic substances, it was to be expected that it would not be affected by heating with sulphuric acid. Such was found to be the case, although asparagin, under these circumstances, is destroyed. On this result is based the method of preparing betaine.

Equal quantities of molasses or osmose-water (concentrated to 85° Balling) and concentrated sulphuric acid are mixed in a capacious vessel. When violent frothing has ceased, the spongy mass is heated to 120°—130° C. for three hours, then stirred up with water, calcium hydrate added to alkaline reaction and the mixture dried. The powdered mass is extracted by boiling with 96 per cent. alcohol. The pale yellow solution contains, in addition to betaïne, small quantities of lime salts of organic acids. By repeated extraction almost the whole of the betaïne may be brought into solution. The extract is boiled with animal charcoal, filtered, and the alcohol distilled off. The residue may be either strongly cooled and hydrochloric acid gas passed in, or it may be concentrated to a syrup and the mother liquor, poured off from the crystallised betaïne, diluted with alcohol before the gas is passed in. The hydrochloride obtained is recrystallised from water or dilute alcohol.

Molasses containing 0·67 per cent. of betaïne nitrogen representing 7·34 per cent. of the hydrochloride, gave a yield of 6·8 per cent.—L. J. de W.

Benzoyl-lupinin; Production of ——. E. Merck, Darmstadt. Ger. Pat. 129,561, June 25, 1901. Zeits. angew. Chem., 1902, **15**, [13], 316.

Monobenzoyl-lupinin, $C_{10}H_{18}(COC_6H_5)NO$, said to be an active therapeutic agent, is obtained by heating inactive lupinin with benzoyl chloride or benzoic anhydride, either alone or with the addition of diluents or of alkalis or other bases, such as pyridine. It forms colourless needles, m. pt. 48°—49°, is very readily soluble in the usual organic solvents, and is practically insoluble in water.—H. B.

Di-iododithymol [Aristol]; Presence of Chlorine Compounds in Commercial ——. H. Cousin. J. Pharm. Chim., 1902, **15**, [6], 274—279.

The aristol was treated with ether, the solution filtered, the residue washed with ether and ignited. The ash varied from 1·4 to 13·55 per cent. in the six samples examined; it contained chlorine and iodine combined with potassium, sodium and calcium. The ethereal solution, after evaporating and drying, gave the organic matter, in which the

ılorine and iodine were then determined. The composition ıaged from 42·58 per cent. of iodine and 0·29 per cent. of ılorine to 19·6 per cent. of iodine and 10·38 per cent. f chlorine. The theoretical amount of iodine is 46·18 per ent.

Three methods have been described for the preparation f aristol:—(1) The action of a solution of thymol in ıustic soda on a solution of iodine in potassium iodide, 2) The addition of potassium iodide to a solution of ymol in caustic soda and pouring the mixture into a large xcess of a strong solution of potassium hypochlorite; 3) the treatment of a solution of thymol in caustic soda ith a solution of iodine in potassium iodide, followed by ıe addition of a large excess of sodium hypochlorite to berate the iodine from the iodide. Method (2) gave the ıthor a product containing 27·82 per cent. of iodine and ·46 per cent. of chlorine. The substance obtained by ethod (3) contained 40·6 per cent. of iodine and 2·32 per ent. of chlorine.—A. C. W.

Otto of Rose. E. J. Parry. Chem. and Druggist, 1902, **60**, [1154], 390.

ccording to a recent statement, E. M. Holmes appears o consider that otto of rose cannot, for practical purposes, e obtained pure. The author, however, who has had pportunities of examining a very large number of samples o'n different sources, has come to the conclusion that lulteration is practised to a much less extent than is sually supposed. The author differs from Holmes' view ıat otto from white rose cannot be odorous, and that the hite rose is used because it yields more stearoptene for dulteration purposes. He states that the white rose ourishes far better than the red in some districts, and systematically distilled with the red rose in variable uantity. The author then refers to the great differences f opinion as to the influence of climate on otto of rose, nd against the statement, in Gildemeister and Hoffmann's ork, that the enormous differences between Bulgarian nd German ottos cannot be explained by mere reference climatic differences, he quotes the results obtained by Messrs. Schimmel and Co. (this Journal, 1901, 744).

The only practical adulterant of otto of rose in common se is "Turkish geranium oil," and the effect of adding his is to raise the specific gravity and the ester value. No ndication of a change in this direction could be detected, owever, in any of the 20 samples from good and reputable ources examined by the author. In no case could any permaceti or so-called guaiacum wood oil be detected in ıe stearoptene, although the characteristic crystalline form f the natural stearoptene of otto of rose is such that any ıaterial addition of these bodies can be easily detected. he ottos of the present season have, generally speaking, rather lower specific gravity and slightly higher con-ealing point than those of the past two years. Among ıe author's results, it is noteworthy that the four seasons' ıpplies of one firm were practically identical, both in odour nd chemical characters, and it is stated that this quite egatives E. M. Holmes' belief that large supplies of a nustant nature cannot be obtained.

In conclusion, the author reiterates his previously xpressed opinion that the limits for pure otto of rose, iven by the British Pharmacopœia, are quite inadequate. —A. S.

Peppermint Plants; Influence of Salt on ——. E. Charabot and A. Hébert. Comptes Rend., **134**, [3], 181.

HE authors examined the influence, on the growth of eppermint plants, of watering with a solution of 500 grms. f sodium chloride in 20 litres of water. From the results ound, they conclude that the presence of salt is beneficial, ıe percentage of organic matter in the plant and of esters the oil being increased, the relative loss of moisture minished, and the transformation of menthol into menthone ndered.—A. S.

Coumarin; A New Plant (Peristrophe angustifolia, from Java) producing ——. H. Molisch. J. Pharm. Chim., 1902, **15**, [6], 279—280.

HE plants indigenous in Java, in which plants, coumarin is ound, are without odour when fresh, the perfume being only developed during drying. *Peristrophe angustifolia*, a native of Java, which is grown in hot-houses in Europe, behaves in the same manner. The odour is especially developed when the leaves are gradually dried at 60° C. If the fresh leaves are treated with boiling water, they do not then yield any odour on drying. Behrens has also found that the *Ageratc*, a coumarin plant, yields no odour after treatment with absolute alcohol or boiling water. Apparently all the coumarin plants contain a ferment capable of decomposing a glucoside, which gives the coumarin, and this ferment is destroyed by boiling water or absolute alcohol.—A. C. W.

French Patent.

Acetyl Chloride and the Anhydrides of the Fatty Acids, Acetic Anhydride in Particular; Process for the Manufacture of ——. H. Kessler. Fr. Pat. 315,938, Nov. 14, 1901.

The patentee claims the process for the manufacture of acetyl chloride and the anhydrides of the fatty acids by means of sulphur chloride, under the special condition that the decomposition of the acid chloride with the anhydrous salt of the fatty acid, and the distillation of the anhydride thus obtained, take place *in vacuo*. It is stated that, at the corresponding low temperature, sulphurous acid and sulphuretted hydrogen are not formed and sulphur is not carried over with the anhydride.—A. C. W.

XXI.—PHOTOGRAPHY.

Toning and Fixing Bath; Theory of the Combined ——. L. Lumière and Seyewetz. Bull. Soc. Chim., 1902, **27**, [5], 137—153.

From a large number of experiments the authors conclude that sodium thiosulphate not only dissolves silver chloride, and acts as fixing agent, but by forming double thiosulphates with the salts of gold and lead present, plays an active part in the toning as well; lead only of all metals appears to give satisfactory results in thus co-operating with gold as double thiosulphate; any salt of lead gives the same results. The results of analysis show that lead, contrary to the hypotheses of various writers, does not enter into the composition of the toned image. Alum, apart from its hardening action on the film, forms, with the thiosulphate present, pentathionic acid; the addition of pentathionic acid, or its neutral lead salt, produces the same effect as alum. If excess of acid be added to the combined bath, free from lead, as rapid an action takes place as if lead were present; this is most probably due to the formation of pentathionic acid.—J. W. H.

English Patent.

Photographic Baths; Improved ——. J. Hitz, Dresden, Germany. Eng. Pat. 26,386, Dec. 24, 1901.

The sides of the bath project in several places, and recesses are provided at corresponding points of the bottom, for the purpose of lifting the plate from below without having the bottom of the bath larger than the plate; on the lower surface of the bottom are grooves for rocking the bath on bars placed underneath it.—W. C. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Blasting Cartridges. W. Kirsanow, Moscow. Eng. Pat. 6159, March 23, 1901.

The composition of the explosive is given as: potassium chlorate (40 to 60 per cent.), potassium picrate (40 to 30 per cent.), elimi or sandarach resin (0 to 5 per cent.), a solution of celluloid in ether and alcohol (20 to 5 per cent.). The explosive is used in a cartridge, closed by means of a small cylinder, provided with a hemispherical bottom, formed of tongues folding one over the other in a manner similar to the iris diaphragm; a fuse passes through the

diaphragm, which, however, at the moment of explosion is said to close completely, and thus bring about complete combustion of the explosive.—G. W. McD.

Explosive Mixtures or Compounds for Blasting Purposes, for Use in Safety Cartridges and other Ways; Improvements in ——. W. Bate, Hayle. Eng. Pat. 25,233, Dec. 11, 1901.

Two to eight per cent. of petroleum jelly or castor oil is mixed with blasting gelatin, or other explosives containing nitroglycerin. The addition of this ingredient renders these bodies less liable to premature explosion from undue friction or percussion.—G. W. McD.

Priming Caps; Improved Manufacture of ——. Hans Tirmann and Hugo Tirmann, Pietach, Austria. Eng. Pat. 2976, Feb. 5, 1902.

The claim is for (1) stamps or dies with projecting pins for the purpose of producing (2) a priming cap with one or more longitudinal holes in the fulminate, thus increasing the drying surface, and facilitating ignition.—G. W. McD.

Detonating Compositions; Method for the Treatment and Use of ——. F. Hess, Vienna. Eng Pat. 3238, Feb. 8, 1902.

An improved method for increasing the effect of detonators and reducing danger in their manufacture and use, by making them in two parts; the one being rendered less sensitive to chemical and mechanical effects by the admixture of such bodies as glycerin, paraffin, and vaseline, &c., with the detonating compositien (or simply by subjecting it to pressure), while the other part, which brings about explosion, consists of a small quantity of fulmiuate, or other detonating composition, in its ordinary active condition.—G. W. McD.

Matches; Improved Ignition Composition for.——. A. J. Boult, London. From F. Säfström, Kalmar, Sweden. Eng. Pat. 10,994, May 28, 1901.

The paste consists of glue (7 to 14 parts), red phosphoras (5 to 10 parts), chlorate of potash (40 to 60 parts), filling materials (8 to 30 parts), borates and phosphates (1 to 6 parts). The novelty claimed is the use of borates and phosphates, so constituted as to melt on the combustion of the composition, thus binding together the non combustible components, so that explosion is avoided, and further effecting a saving of 40 to 50 per cent. in the quantity of glue and phosphorus ordinarily employed.—G. W. McD.

Matches; Improvements relating to the Manufacture of Wood ——. H. H. Lake, London. From Aktieselskabet "Progress," Christiania. Eng. Pat. 3951, Feb. 15, 1902.

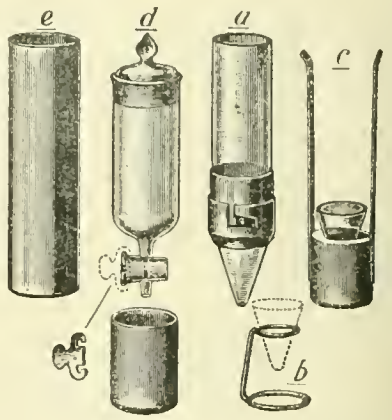
Before cutting into match-sticks the wood is soaked successively in the following baths: (A) alum (5 parts), sulphate of soda (5 parts), water (100 parts); (B) potassium chlorate (5 parts), saltpetre (5 parts), ammonium carbonate (5 parts), water (100 parts); (C) solution of glue (2 to 3 per cent.); in bath B for a second time, and then dried.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Centrifugal Apparatus for Quantitative Analysis. F. Steinitzer. Zeits. anal. Chem., 1902, **41**, [2], 100—105.

The principle of centrifugal separation may be advantageously employed in a variety of analytical operations. For collecting a precipitate the vessel *a* is used. This consists of a glass tube with a cone which is attached to the tube by a bayonet joint and rubber washer. Cones of glass, porcelain, or platinum are used according to the subsequent treatment of the precipitate. The precipitation is best performed in the tube itself, which can, if desired, be heated by a small flame. After centrifugating for 2—3 minutes, the cone containing the precipitate may be detached and placed in the holder, *c*, and the precipitate can be washed by stirring it up with water and centrifugating. The cone is then transferred to the stand, *b*, and dried.



Very small volumes of wash water, and in most cases only two or three washings, are required. As there is no filter paper to be burnt, it is often sufficient to dry the precipitate instead of igniting it. The separating funnel, *d*, is employed when it is desired to separate two liquids, and is placed in the wooden cylinder, *e*, for centrifugating.—M. J. S.

INORGANIC—QUANTITATIVE.

Pig-Iron; Colorimetric Method for Determining Sulphur in ——. T. Naske. Stahl u. Eisen, 1902, **22**, 333; through Chem.-Zeit., 1902, **26**, Rep. 333.

Lindsay's process for determining sulphur in pig-iron (see this Journal, 1902, 279) is stated to be as unreliable for quantitative work as is that based upon the nitroprusside reaction. The product of the action of hydrochloric acid upon pig-iron containing sulphur (H_2S and $(CH_3)_2S$) when absorbed by caustic soda solution yields sodium sulphide, sulphydrate, and polysulphides; and there is a tendency for them to pass over into thiosulphates and, in time, into sulphates. Hence caustic soda solution is not a good absorbent. Again, solutions of Methylene Blue and Lauth's Violet are decomposed and decolorised by hydrogen sulphide, or by thiosulphate solutions.—W. G. M.

Molybdenum in Steel; Determination of ——. G. Auchy. J. Amer. Chem. Soc., 1902, **24**, [3], 272—275.

The simplest method of determining molybdenum in steel is to titrate the yellow molybdic precipitate with zinc and permanganate after separation of the molybdenum from the iron, and to calculate the results from the amount of phosphorus. Experiments showed that, although ammonia (in moderate excess) could not be used for the separation, sodium hydroxide gave sufficiently good results for practical purposes. The following method of determination was devised by the author:—A quantity of steel, not exceeding 1·308 grm. is treated with strong nitric acid, in excess, and a little potassium chlorate (when chromium is also present), the solution is evaporated, and the residue boiled with strong hydrochloric acid, and evaperated to dryness to separate the silica. The residue is again treated with hydrochloric acid, and the liquid is evaporated until the first signs of a pellicle appear, when 5 c.c. of concentrated hydrochloric acid are added, and the liquid diluted to 20 c.c., and heated until solution is complete. The liquid is next made up to 50 c.c., and introduced little by little with constant shaking into a flask (with a mark at 300 c.c.) containing 20 grms. of sodium hydroxide in 100 c.c. of water. After being made up to the mark, the liquid is filtered, 250 c.c. of the

ltrate acidified with sulphuric acid, and evaporated down o less than 100 c.c., and the phosphoric acid determined by he usual volumetric method.

It is essential to make a blank determination with a nolybdenum-free steel containing the same amount of hromium. The amount of hydrochloric acid used has a reat effect upon the results, whilst although most of the hromium is precipitated with the iron, sufficient is left in olution to slightly affect the end-point of the titration.

In the gravimetric method a little chromate is invariably resent in the first lead molybdate precipitate.—C. A. M.

Copper in Iron; Electrolytic Determination of ——. H. Koch. Zeits. anal. Chem., 1902, **41**, [2], 105—107.

The iron is dissolved by sulphuric acid, when the copper vill remain wholly in the undissolved residue. At least 00 grms. of iron should be taken. In the case of steel, his quantity is treated with 100 c.c. of sulphuric acid of 0° Bé, added in two equal portions, the first in the cold, the econd whilst heating. Addition of 500 c.c. of water revents crystallisation of ferrous sulphate. The residue is ollected on a filter. If the substance is grey cast iron the esidue is liable to contain particles of metallic iron protected y graphite. It should be washed back into the beaker and oiled for half an hour with fresh sulphuric acid, then eturned to the same filter and washed. It is then dried, gnited, dissolved in a few c.c. of fuming hydrochloric acid nd the solution evaporated to dryness with sulphuric acid. t is taken up by 20 c.c. of water, and 20 c.c. of nitric acid 1·2 sp. gr.), and filtered. After diluting to 120 c.c. and dding a few drops of oxalic acid, the solution is electrolysed or 9—10 hours. The anode is a helix of platinum wire ·3 mm. thick, lying on the bottom of the beaker; the athode a cylinder of platinum foil 9 × 3·5 cm. A current f 0·094 ampère per square centimetre is used.—M. J. S.

Thorium; New Method of Determining ——. F. J. Metzger. J. Amer. Chem. Soc., 1902, **24**, [3], 275—276.

Fumaric acid precipitates thorium quantitatively from a 0 per cent. alcoholic solution, whilst it has no effect upon old solutions of cerium, lanthanum, or didymium. Traces f the latter substances are carried down when thorium is hus precipitated from a mixture containing them, but they an be removed by a single re-precipitation.—C. A. M.

Thorium in Monazite Sand; Determination of ——. E. Benz. Zeits. angew. Chem., 1902, **15**, [13], 297—309.

The author has examined critically the various methods vhich have been proposed for the separation of thorium rom the cerite metals.

(*a.*) *Ammonium Oxalate Process.*—This is based on the olubility of thorium oxalate, and the insolubility of cerium xalate, in neutral ammonium oxalate solution, and as sually applied consists in extracting the freshly precipitated, nixed oxalates with ammonium oxalate solution and filtering ff the undissolved cerium salt. In Glaser's modification this Journal, 1896, 675) the solution of the earths is treated irectly with an excess of ammonium oxalate, whereby only he cerite metals are precipitated. The author's numerous xperiments show that pure thorium oxalate is readily and ompletely soluble in ammonium oxalate, and pure neutral horium solutions yield no precipitate when a moderate xcess of ammonium oxalate is added; further, that pure erium oxalate is almost entirely insoluble under these onditions. When, however, both thorium and cerium are resent, the separation effected is never reliable, whichever odification of the process is adopted, the cerium oxalate xhibiting a strong tendency to associate itself with thorium xalate, apparently as an insoluble double oxalate.

(*b.*) *Sodium Thiosulphate Process.*—The results quoted how that when this method is employed in the manner escribed by the author, the precipitation of thorium, even rom pure solutions, is somewhat incomplete. When cerium s present, particularly in such proportions as occur in onazite sand, the separation is never complete with a single precipitation. It is necessary to dissolve the precipitate first obtained and to throw it down again with thiosulphate, the two filtrates being united and treated with thiosulphate, the small precipitate obtained being then added to the main thorium precipitate. By this tedious modification good results are obtainable.

(*c.*) *Hydrogen Peroxide Process.*—If hydrogen peroxide be added to a neutral thorium solution at 60°—80° C., thorium peroxide is precipitated. With proper precautions, this method yields excellent results, even in the presence of a large excess of cerium and lanthanum; the thorium is precipitated completely in one operation, and the minute amount of co-precipitated cerium is readily separated on reprecipitation or may be determined colorimetrically, as below. Only nitrates must be present, as sulphates affect the results injuriously; the solution must be neutral, or only faintly acid (up to 0·2 per cent. of nitric acid); and the cerium must be in the cerous form. If ammonium nitrate be present in the solution, the peroxide precipitate is loose and flocculer, instead of gelatinous. The precipitate may be dissolved in nitric acid, without risk of loss through evolution of oxygen; and it may with care be ignited directly to ThO_2 if, while partially dried and still enclosed in its filter paper, it is ignited first in a platinum spiral and then in a capsule. The process is well adapted for the analysis of monazite sand.

Colorimetric Determination of minute quantities of Cerium.—By matching, by means of solutions of known composition, the orange-tinted precipitate obtained on adding hydrogen peroxide and ammonia to the thorium solution to be examined, an approximate estimation of the amount of cerium present may be made. For exact determinations, however, the formation of precipitates must be avoided. To the solution of the nitrates, containing 0·1 mgrm. or more of cerium oxide, is added a sufficient excess of citric acid and some hydrogen peroxide. On neutralising gradually with ammonia, no precipitation occurs, and a yellowish colour is developed which remains constant for some hours. The clear solution is placed in a glass cylinder and the colour is matched in the usual way by a solution of known composition, approximately the same as that under examination.

Estimation of Thorium in Monazite Sand.—Half a gram of the very finely ground sand is mixed with 0·5 grm. of sodium fluoride, and cautiously fused with 10 grms. of potassium pyrosulphate in a covered platinum crucible until the evolution of gas has ceased. The crucible is then heated to redness for 15 minutes over a bare flame; the melt is next extracted with hot water acidified with HCl, the insoluble portion is filtered off, boiled with somewhat concentrated HCl, the liquid diluted and filtered. The thorium is thus extracted completely from the sample. The free acid in the solution is mostly neutralised with ammonia (care being taken not to produce a permanent precipitate of phosphate, which could only with difficulty be redissolved), and 3—5 grms. of solid ammonium oxalate are added to the boiling solution, which is then vigorously stirred. This precipitates the thorium entirely, the presence of free acid preventing the ammonium oxalate from retaining any in solution, a moderate amount of free acid having itself no solvent effect. After standing over night, the precipitate is collected, washed, and transferred to a porcelain basin, the filter paper being washed repeatedly with hot, concentrated nitric acid, and the liquid is evaporated nearly to dryness, on a water-bath. A few c.c of concentrated nitric acid (sp. gr. 1·4) are added, then 20 c.c. of *fuming* acid; the basin is covered with a glass and heated on the water-bath. The conversion of the oxalates into nitrates takes place readily, but not too violently. The liquid is evaporated to dryness, the residue again evaporated with water, to remove all free acid, taken up with water, filtered, the solution brought to about 100 c.c. in volume, ammonium nitrate added, and the thorium precipitated by hydrogen peroxide at 60°—80°. The precipitate may be either dissolved in nitric acid, for a second precipitation, or ignited directly to ThO_2, as described at (*c*) above, the minute amount of co-precipitated cerium being determined colorimetrically and deducted. The process is an accurate one.

—H. B.

ORGANIC—QUALITATIVE.

Oils; Temperature Reaction of——, with Sulphuric Acid [Maumené's Test]. H. S. Sherman, J. L. Danziger, and L. Kohnstamm. J. Amer. Chem. Soc., 1902, **24**, [3], 266–273.

The authors attribute the errors in the ordinary method of applying the Maumené test to: (1) Secondary reactions when there is considerable evolution of heat: (2) Variations due to diluting the oil with some other oil to moderate the violence of the reaction; and (3) Variations produced by the strength of the acid, or conditions of the test affecting the radiation of heat.

Throughout their experiments they have used the proportions originally used by Maumené (50 grms. of oil and 10 c.c. of acid), and have expressed all their results as "specific temperature reactions" as suggested by Thomson and Ballantyne (this Journal, 1891, 233).

Influence of Diluting Agents.—Mineral oil has been used to regulate the reaction by Maumené (this Journal, 1886, 361), by Ellis (*ibid.*), and by Jenkins (this Journal, 1897, 191); whilst Thomson and Ballantyne (*loc. cit.*) made use of olive oil.

The authors point out that the use of mineral oil (which giving less evolution of heat with sulphuric acid is preferable to olive or lard oil) assumes that the specific heat of the diluent is the same as that of the oil, whereas the different hydrocarbons occurring in petroleum differ considerably in this respect.

In their experiments they found that the results calculated from the mixture were considerably higher than those obtained with the same oil alone. Thus the following comparative figures were obtained, those in the first column by treating 50 grms. of the oil directly with the acid, and those in the second column calculated from the rise in temperature shown by a mixture of 25 grms. of the oil with 25 grms. of a mineral oil (sp. gr. 0·817), which itself gave a rise of 4° C. with the acid.

Oil.	Specific Temperature Reaction.	
	Direct Treatment of Oil with Acid.	Oil Diluted with Mineral Oil.
Lard oil	101	126
Olive oil	103	138
Almond oil	114	154
Sesamé oil	158	200
Cotton-seed oil	167	200
Earth-nut oil	176	194

Approximate determinations of the specific heat of some of these samples and of other oils gave the following results:—Olive oil, 0·493; lard oil, 0·50; raw linseed oil, 0·474; menhaden oil, 0·471; and the mineral oil used as diluent, 0·50. Hence the discrepancies in the two series of results due to the difference in the specific heat of the oils and the diluent were apparently insignificant.

Some experiments were made with chloroform and carbon tetrachloride as diluting agents, and it was found that the discrepancies were smaller than when mineral oil was used (see Mitchell, this Journal, 1901, 939).

Influence of Strength of Acid.—Thomson and Ballantyne found that in their method of expressing the results (*loc. cit.*), the specific temperature reactions obtained with sulphuric acid of from 95 to 99 per cent. in strength, were practically the same. The authors, however, find that with weaker acid (89 to 95 per cent.) there is a distinct difference, higher results being invariably obtained with the more concentrated acid.

This is illustrated by the specific temperature reactions given in the table at top of next column.

Specific Temperature Reactions with Diluted Acid.—The authors consider that the use of acid of 89 to 90 per cent. in strength, giving a rise of 33° to 34° C. with water, will give more uniform results than those obtained with acid of 95 to 99 per cent. strength, whilst secondary reactions will be reduced, and there will be no necessity to dilute drying oils with a mineral oil. The results obtained with

Oil.	Specific Temperature Reaction with Acid which gave with water a Rise of—			
	33·3° C.	37° C.	40° C.	43° C.
Olive oil	90	96	100	103
Almond oil	95	100	108	114
Castor oil	84	88	89	94
Lard oil I.	81	89	92	95
„ II.	88	95	99	101
Earth-nut	161	..	..	176
Rape oil	144	..	160	..
Cotton-seed oil	152	..	..	167
Sesamé oil	143	..	..	158
Sperm oil	102	106	..	111
Rosin oil	72	..	..	72

acid of 89 per cent. strength are given in the subjoined table, together with the figures published by Thomson and Ballantyne:—

Oil.	Thomson and Ballantyne.		With 89 per Cent. Acid.	
	No. of Samples.	Average Figure.	No. of Samples.	Average Figure.
Linseed, raw	4	315	2	299
Poppy-seed	..	..	1	212
Maize	..	..	2	163
Cotton-seed	3	167	3	152
Rape	5	133	2	150
Earth-nut	2	121	1	161
Sesamé	..	..	1	143
Almond	..	..	1	95
Olive	11	92	1	90
Castor	2	91	1	84
Menhaden	1	306	2	333
Cod-livor	3	254	2	270
Seal	4	222	1	253
Whale	1	157	..	..
Lard oil	..	..	2	85
Sperm	1	100	1	102
Arctic Sperm	1	93	..	..
Rosin oil	..	..	1	72

—C. A. M.

Citric Acid in Milk, Detection of——; and Reaction of Citric Acid with Bromine and Potassium Permanganate (Stahre's Reaction). A. Wöhlk. Zeits. anal. Chem., 1902, **41**, [2], 77—100.

In 1895, Stahre published a very sensitive test for citric acid (this Journal, 1896, 53), depending on the production of a white precipitate with potassium permanganate and bromine. Other oxidising agents than permanganate can be employed; the reaction has been obtained with bromine after the addition of manganic acetate, ferric hydroxide, cobaltic hydroxide, nickelic hydroxide, manganese dioxide, manganic hydroxide, or lead dioxide, but not with chromium or aluminium hydroxides, or manganous carbonate. The oxidation of the citric acid is therefore an indispensable condition. Now Denigès has shown by his mercuric sulphate test (Comptes Rend., 1900, **130**, 32—35) that acetone dicarboxylic acid is present in the product of the oxidation of citric acid by potassium permanganate, and the author has by the following method, succeeded in obtaining the "Enol" reaction in a solution of oxidised citric acid:—Ferric citrate, or a mixture of citric acid with ferric acetate, becomes colourless on exposure to sunlight, the ferric salt being reduced. On adding a trace of bromine, a rich violet colour is developed; a larger quantity of bromine precipitates pentabromacetone. Acetone dicarboxylic acid yields pentabromacetone with bromine water, but from the amount of bromine consumed, it is inferred that about half the acid taken decomposed into acetone and carbon dioxide.

The Denigès test is performed by mixing a solution of citric acid with $\frac{1}{20}$th of its volume of the mercuric reagent (5 grms. of mercuric oxide dissolved in 20 c.c. of concentrated sulphuric acid and 100 c.c. of water), heating the mixture to boiling, and then adding a few drops of permanganate. A white crystalline precipitate is immediately

luced. This reaction is more sensitive than Stahre's, less characteristic, since it is given by various ketones, nic acids, and aldehydes. In carrying out Stahre's test, mixture of citric acid and permanganate is warmed to -40°, any brown coloration or precipitate is removed mmonium oxalate, and then bromine water added. The e crystalline precipitate is produced immediately.

he existence of citric acid has been affirmed by ous authorities. From 10 litres of cows milk the ior has obtained several grms. of rhombic crystals, ch not only gave Stahre's, Denigès', and the calcium ate reactions, but when converted into silver and calcium s, gave correct numbers on elementary analysis.

—M. J. S.

ORGANIC—QUANTITATIVE.

meal in Oat-cocoa ["*Hafercacao*"] ; *Determination of* —. A. Goske. Zeits. öffentl. Chem., 8, 22. Chem. entr., 1902, 1, [10], 603.

e author uses a method based on the difference between densities of the prepared oatmeal and of the cocoa stoppered tube, 13 cm. long, of 15 c.c. capacity, is duated in $\frac{1}{10}$ c.c. divisions, beginning at the top with 1. rms. of the cocoa are introduced, and a mixture of 8 ts of chloroform and 1 part of ethylene bromide is ed up to the mark. The mixture, after shaking, must ch exactly the 1 mark. In another tube 3 grms. of a oa containing exactly 50 per cent. of oatmeal, are ated in the same way. The contents of the tubes are r powerfully agitated for ½ minute in a centrifugal chine. The upper solid layer consists of oatmeal, and reading off the volume in each of the tubes, the per- tage of oatmeal in the cocoa under examination may dily be calculated.—A. S.

XIV.—SCIENTIFIC & TECHNICAL NOTES.

Electro-Chemical and Electro-Metallurgical Industries. J. B. C. Kershaw. Electrician, 48, 421—462.

Aluminium.—The number of works producing this metal been increased from eight to nine, by the completion of works at Shawinigan Falls, Canada. The latter, which been erected by the Pittsburg Reduction Company of igara, possesses generating plant equal to 6,000 h.p., and employing the Hall process, utilising the Canadian osits of corundum for raw material. The use of minium in foundry work still remains one of the most portant of its applications, whilst plates of the metal are ng largely employed in place of stone for lithographic poses in Germany and America, and there is an increasing nand for the alloys for motor-car construction. It may noted that the Goldschmidt method of producing high peratures for welding, by means of a mixture of minium and ferric oxide, has undergone further improve- nt, and is now available for repairing broken propeller afts in mid-ocean, an application which will probably ove of considerable importance.

Copper.—The heavy fall in the price of copper which curred during the year, owing to the collapse of the erican syndicate, had the effect of diminishing the put, and, in consequence, the amount of the metal electro- ically refined will show a slight decrease from that of previous year, when 210,000 tons, or 44 per cent. of total, were thus treated.

Nickel.— Considerable development has taken place ring the year in connection with the nickel industry in Sudbury district of Canada, where three mining panies are now at work. Of these the Canadian Copper mpany and the Mond Nickel Company ship the con- trated matte to New Jersey and Swansea respectively, in the latter case, works have been erected at Clydach the extraction of the metal by the Mond process. In 0, the Sudbury district produced ores containing 12 tons of nickel, but during last year, the output of er cent. ore was 700 tons per day, equal to a total of 0 tons of nickel. The only new development in nection with the working of the nickel ore of New Caledonia has been the erection of smelting and refining works at Newcastle, New South Wales, and, in the latter colony itself, extensive beds of ore are said to have been discovered.

Zinc.—There is very little to be recorded concerning the electrolytic zinc industry, during 1901, as the fall in price of all the metals usually associated with zinc in its ores has checked development. The Hoepfner process is still in successful operation at Winnington, in Cheshire, and the method of Swinburne and Asheroft is now to be tried upon a manufacturing scale at Weston Point. A new method of treating zinc ores is reported from Italy, by which the metal is volatilised by smelting in an electric furnace, the yield being given as 1 kilo. of zinc per 2 E.H.P. hours.

Calcium Carbide.—During 1900, there were over 100 carbide works in existence, but, as already stated, the large over-production has resulted in many of these being closed or devoted to other purposes. On the Continent, however, the price of carbide has continued low—at a little above 10*l.* per ton, so that the accumulated stocks have not yet been disposed of—but the Acetylene Illuminating Company, which controls the English market, still quotes 19*l.* per ton for delivery in the United Kingdom. The low price of carbide has given a considerable impetus to the acetylene gas industry, and the number of lighting stations for small towns and villages is steadily increasing, both here and on the Continent. Another application to which calcium carbide has been put is as a germicide in the vineyards of Italy and France, where tests extending over three years are said to have proved its value for combating phylloxera. Carbide dust, which is sold at 10 frs. per 100 kilos., is used for the purpose, and that prepared from lime containing a high percentage of phosphates is found to be most effective, since it gives off a greater quantity of phosphoretted hydrogen on exposure, and the latter appears to be the real germicide.

Chemical Products.—The works engaged in the production of alkalis and bleach were increased by one during the year, now numbering 31, and in several cases, extensions were made. The Castner-Kellner mercury process, and the secret process of the "Electron" Company appear to be the most successful methods in operation on a large scale, and, together, produce two-thirds of the total output of electrolytic soda. A new method known as the "gravity" or "bell" process is, however, being tried in Germany and Austria, and up to the present, has given very promising results. It is said to be a simple process in which diaphragms are entirely done away with, and a current efficiency of 86 per cent. is obtained in the cells. The production of chlorates by electrical processes has not showed much development, as the low prices which now obtain ($3\frac{1}{4}d.$ per lb. for potassium chlorate, and $3\frac{3}{4}d.$ per lb. for sodium chlorate) have made the manufacture much less remunerative than formerly. The number of works remained stationary at eleven, and the output is estimated at 9,000 tons.

Miscellaneous Products.—Carborundum and artificial graphite are being produced in increasing quantities; the manufacture of compressed oxygen and hydrogen for industrial purposes by the electrolysis of water is also being taken up, and at present ten such installations are successfully at work. The Groth system of electrolytic tanning is in operation at Wem, in Shropshire, and at Wenersborg, in Sweden, whilst other large tanneries are about to give it a trial. The electrolytic methods of refining silver and parting gold are now being used in many bullion refineries. The new methods of manufacturing sodium and sodium peroxide have almost completely superseded the older processes, and magnesium is now being produced in a similar way; and, finally, the electric furnace is constantly receiving further practical applications.

Phosphorescence of Sulphides of the Alkaline Earths. L. E. O. de Visser. Rec. trav. chim. Pays-Bas, 20, 435—456. Chem. Centr. 1902, 1, [10], 553.

Pure barium sulphide prepared from carefully purified barium carbonate by heating with sulphur, was found to show no phosphorescence. If, however, a trace of bismuth was incorporated with the sulphide, phosphorescence was

shown, the maximum effect being attained when two atomic equivalents of bismuth were present to 100,000 of barium. Calcium sulphide behaves in an exactly similar manner, except that it is not possible to obtain it in such a pure condition that it is absolutely non-phosphorescent. It was observed that at the ordinary temperature, in the dark, phosphorescence could still be perceived a month after the illumination. At low temperatures, the phosphorescence is fainter, but persists for a longer time, whilst in the warm, exactly the opposite is the case.

The author puts forward the following theory of phosphorescence. The sulphides of the heavy metals present, in the state of solid solutions, in the alkaline earth sulphides, are decomposed into ions, and these are further split up by the light into smaller particles or electrons. If the electrons again unite to form ions, light is emitted.—A. S.

Oxides of Carbon; Hydrogenation of ——, in presence of finely-divided Metals. P. Sabatier and J. B. Senderens. Comptes Rend., **134**, [12], 689—691.

Carbon dioxide at 350° C., or carbon monoxide at 250° C., is readily and completely reduced to methane by being passed, in admixture with hydrogen, over freshly-reduced nickel (this Journal, 1902, 504). But in the case of the monoxide, if the temperature be raised above 280° C., some of the gas is broken up into carbon dioxide and free carbon. This action occurs to a greater extent as the temperature rises; but at a given temperature the proportion of the total carbon monoxide so broken up is lessened by increasing the proportion of hydrogen in the mixture.

Cobalt behaves similarly to nickel in these respects; but while its power of effecting hydrogenation is less than that of nickel, it has at least an equal power of causing the decomposition of carbon monoxide into dioxide and carbon.

Platinum, palladium, and iron are without reducing action on the mixture of hydrogen and carbon monoxide or dioxide. Copper has no action on the mixture of hydrogen and monoxide, but at 430° C. and above, it acts on the mixture of hydrogen and dioxide, producing water and carbon monoxide according to the equation—

$$CO_2 + H_2 = CO + H_2O.$$

—J. T. D.

Calcium Silicide. H. Moissan and W. Dilthey. Ber., 1902, **35**, [5], 1106—1110.

The experiments of earlier investigators have not yielded pure calcium silicide, and their statements as to its properties vary widely. Calcium oxide fused with an excess of silicon in the electric furnace yields the compound $CaSi_2$ with a small excess of free silicon. If the lime is used in excess, the silicon is oxidised. A mixture of equal parts of pure lime and silicon is placed in a graphite tube and heated with a current of 600 ampères and 60 volts. The tube must be removed from the furnace as soon as fusion takes place, otherwise carborundum will be produced.

The silicide is found in the interior of the regulus, which consists externally of calcium carbide and silicate. It is crystalline, has a density of about 2·5, and approximately the hardness of quartz. It is insoluble in all organic solvents, and in liquefied ammonia. It is, however, readily decomposed by a solution of ammonia and by the other alkalis. It is unaffected by heating to redness in hydrogen. In oxygen, at a red heat, it is only superficially oxidised. The halogens do not attack it in the cold, but at a red heat they decompose it. Fluorine decomposes it in the cold. It is not attacked by sulphur vapour, and only superficially by hydrogen sulphide at a red heat.

By fusion with excess of carbon in the electric furnace, it is converted into calcium carbide and carborundum. It dissolves with decomposition in fused aluminium and iron, but not in copper. It is very slowly attacked by water, with evolution of pure hydrogen. Nitric acid, strong or dilute, acts on it very slowly, and it dissolves with difficulty in concentrated sulphuric acid. It is decomposed with incandescence by 50 per cent. hydrofluoric acid. Cold hydrogen chloride gas has no action on it, but at a red heat decomposition takes place. It is rapidly attacked by concentrated hydrochloric acid, with production of hydrogen, silicon hydride, and Wöhler's silicone. The dilute acid yields only hydrogen and silicone. The latter yellow substance is not Si_2H_2, but no formula can be given to it, as it could not be obtained of constant composition.—M. J. S.

Ammonio-Calcium Phosphate. H. Lasne. Bull. Soc. Chim., 1902, **27**, [5], 131—135.

The author points out that by adding to a solution of calcium chloride and ammonium phosphate, sufficient ammonium citrate to keep calcium phosphate in solution, and cooling to 4° or 6° C., hard and transparent crystals are obtained; the results of analysis of these crystals agree with the formula, $NH_4CaPO_4.7H_2O$. The compound is easily dissociated, cold water even producing this effect. The corresponding barium salt has not been obtained.

—J. W. H.

Arsenic in Crops. A. and A. F. Angell. Chem. and Druggist, 1902, **60**, [1155], 430.

The authors have made a series of experiments to determine whether or not plants are capable of taking up arsenic from soil manured with arsenical phosphates. Ordinary superphosphate manures were found to contain, on the average, about 0·03 per cent. of As_2O_3. For the experiments, ordinary superphosphate was mixed with 0·5 per cent. of arsenic, and half the manure was applied at the time of sowing and half when the young plants were well above ground. For the determination of the arsenic Hebner's modification of Marsh's test was used. The results show that the roots of plants are capable of taking up arsenic from soils manured with arsenical phosphates. From the roots the arsenic can rise in the fibro-vascular bundles, and may be present in measurable quantities in the early stages of succulent growths. Arsenic was found in rhubarb-petioles and leaf blades, and in the young leaves or grass of rye and buckwheat, and in the stems and leaves and green pods of broad beans; but in no instance was the faintest trace of arsenic present in the fruit or seed of any plant. The authors consider that in those parts of the plant which are remote from the influences of mere mechanical forces, and where vital or physiological energies predominate, a selective power is brought to bear, and arsenic, even if present, is rejected.—A. S.

Silver Benzoate; Solubility of ——. C. Liebermann. Ber., 1902, **35**, [5], 1094.

In consequence, apparently, of an error in Gmelin's Handbuch, the solubility of silver benzoate in alcohol has, for nearly half a century, been stated incorrectly in numerous manuals. The actual solubility, according to the author's experiments, is 1 part in 5910 parts of cold, or 2150 parts of boiling, absolute alcohol.—M. J. S.

Apiose, a β-hydroxymethylerythrose. E. Vongerichten. Annalen, **321**, [1], 71—83.

Apiose is a sugar obtained from apiin (this Journal, 1901, 1034). It is not fermented by yeast; the osazone melts at 156°—157° C. after crystallisation from alcohol; the melting point is lowered by frequent solution in water; the bromosazone melts at 209° C. On reduction with sodium amalgam, apiose gives an uncrystallisable compound, which is again oxidised to apiose by bromine and soda. It is therefore improbable that apiose is a ketopentose. By the action of dilute nitric acid, apiose yields no trihydroxyglutaric acid, but a syrupy acid, which forms an amorphous calcium salt. Bromine oxidises apiose to apionic acid, of which the strontium salt, $Sr(C_5H_9O_6)_2$, is crystalline. The phenylhydrazide of apionic acid crystallises in small white prisms, it begins to soften at 120° C. and melts at 126°—127° C. Apionic acid is reduced, by boiling with hydriodic acid and red phosphorus, to a valeric acid, which was identified with isovaleric acid by means of the crystalline form and water of crystallisation of the calcium and barium salts. Apiose is thus to be regarded as β-hydroxymethylerythrose—$(CH_2OH)_2.C(OH).CH(OH).CHO$.

—A. C. W.

rogenetic Contact Reactions of Organic Compounds. II. W. Ipatiew. Ber., 1902, **35**, [5], 1047—1057.

CONTINUATION of the researches described in this urnal, 1901, 1200. Ethyl alcohol is not decomposed heating with brass filings in a sealed tube at 500° C. ie decompositions in porcelain and copper tubes under e conditions of the experiments in the previous paper, e similar to the decomposition in a glass tube. In aluminium tube at 700° C.; there is no decomposition. an iron tube decomposition begins at about 630° C., d is very energetic at 700° C.; at all temperatures carbon ntaining iron is separated; less aldehyde is formed than the presence of brass, and the aldehyde suffers more bsequent decomposition. The main decomposition of lehyde in an iron tube at 600° C. is according to the uation $CH_3.CHO = CH_4 + CO$, but a considerable quantity carbon is separated. In the decomposition of alcohol, is carbon lowers the temperature necessary for the re- tion, but the iron is the chief cause of the contact action. ie decompositions, which take place in the presence of ic oxide and ferric oxide, are similar to those produced zinc and iron respectively; the ferric oxide is reduced to ignetic oxide and carbon is separated. In the case of tin, actically no decomposition occurred, but stannic oxide used the formation of much aldehyde, being itself at once duced to metallic tin, which did not melt during the periment. This tin powder, which contains about 1 per nt. of carbon, loses its contact action in subsequent periments.

Isobutyl alcohol is practically not decomposed by passing rough glass tubes at 700° C., but at 650° C., in the presence brass and iron, it is decomposed mainly into isobutyl lehyde and hydrogen. The bromides obtained from the ses contained ethylene and propylene bromides and a ystalline bromide, which melted at 67°—78° C., the nstitution of which was not determined. This decom- sition affords a good method for the preparation of iso- tyl aldehyde. Iso-amyl alcohol, boiling at 130°—131° C., decomposed in a similar manner. The bromides obtained re those of ethylene, propylene, pseudobutylene, butylene, amylenes (several), also tribromides and vinyl rabromide.

Allyl alcohol is decomposed by brass at 600° C. into rolein and hydrogen, the former then gives carbon noxide, propylene and (apparently) di-vinyl. Benzyl cohol yields benzaldehyde and hydrogen, the aldehyde en giving carbon monoxide and benzene. Methyl alcohol quires a much higher temperature than the other alcohols glass and porcelain tubes; a little oxymethylene is pro- ced. In contact with iron the decomposition is very ergetic at 600° C., the chief products are oxymethylene d hydrogen, the former being further decomposed to drogen and carbon monoxide. Carbon is deposited.

The author had previously found that methylisobutyl rbinol, in the presence of iron, produced methylisobutyl tone. By contact with brass at 620° C., isopropyl alcohol s now found to decompose almost quantitatively into drogen and acetone; at the higher temperature required a glass tube, the acetone yields methane and carbon noxide.—A. C. W.

rogenetic Contact Reactions of Organic Compounds. III. W. Ipatiew. Ber., 1902, **35**, [5], 1057—1064.

HE decomposition, which produces aldehydes, always pre- minates over that which produces unsaturated hydrocar- ns when the catalysers previously mentioned (preceding stract) are used. The latter reaction, however, takes ace to the practical exclusion of the former when the talyser is the mixture of graphite and clay of which raphite" crucibles are made. It is not yet proved to ich constituent of this mixture the action is due; pure aphite, absolutely free from iron, does not give the re- ion. The graphite mixture retains its activity unaltered frequent use. Carbon is not deposited. Of 150 grms. ethyl alcohol passed through a glass tube containing ces of the graphite, in 30 mins. about half was decom- sed; not more than 1 grm. of aldehyde was formed, and gas contained 94·6 per cent. of ethylene. Propyl and iso-amyl alcohols behaved in a similar manner. Dimethyl- ethylcarbinol gave a mixture of $(CH_3)_2:C:CH.CH_3$ and $CH_2:C(CH_3).CH_2.CH_3$. Hydrogen and methane were the principal constituents of the mixture of gases obtained from methyl alcohol. In order to obtain butylene in good yield from isobutyl alcohol, about 400 grms. per hour must be sent through a graphite tube at 550° C.; the gas then contains 94—95 per cent. of butylenes, which consist of two-thirds isobutylene and one-third α- and β-butylene. Trimethylcarbinol produces a butylene which forms tertiary butyl bromide with hydrobromic acid.—A. C. W.

New Books.

ASSAYING AND METALLURGICAL ANALYSIS, FOR THE USE OF STUDENTS, CHEMISTS, AND ASSAYERS. By E. L. RHEAD, Lecturer in Metallurgy, Municipal School of Technology, Manchester, and A. HUMBOLDT SEXTON, Professor of Metallurgy, Glasgow and West of Scotland Technical College. Longmans, Green, and Co., 39, Paternoster Row, London. 1902. Also New York and Bombay. Price 10*s.* 6*d.*

THE authors state in their preface that Part I. of this book is devoted to laboratory appliances and general processes, useful hints rather than full descriptions being given; Part II., to the consideration, under the name of each metal, of (1) the materials and products in which its estimation is commonly required, giving a brief description of their character so as to make identification easy; (2) the dry tests for and important chemical reactions of the metal, with, in some cases, special instructions for the detection of small quantities; (3) the methods of conducting the dry assay by fusion or otherwise, followed by applications to special materials where modifications are necessary; (4) methods of dissolving substances and preparing solutions for the determination of the metal; (5) methods for the gravimetric, volumetric, and colorimetric determination, with the precautions necessary. Part III., METALLURGICAL ANALYSIS, is devoted to an attempt to group the very various substances to be dealt with, in a compact manner, by giving "examples" in detail. The book is one of 431 pages, 396 pages of which are filled with subject-matter. Then follow Appendices A to E (pages 397—423), and the alphabetical index (pages 425—431). There are 105 illustrations.

CRYOSCOPIE. Par F. M. RAOULT. Membre Corresp. de l'Institut, Doyen de la Faculté des Sciences de Grenoble. C. Naud, 3, Rue Racine, Paris. 1901. Price 2 fr.

SMALL 8VO volume, of the "Scientia" series, containing table of contents, a biography and frontispiece, preface, and 99 pages of subject-matter. The subject (Freezing or Solidifying of Liquids and Solutions) is treated under the following heads:—I. General Principles. II. Methods of Observation. III. Cryoscopic Properties, &c., of Non-Electrolytes (Organic Substances). IV. Cryoscopic Properties of Electrolytes (Saline Compounds).

THE GAS ENGINEERS' LABORATORY HANDBOOK. By JOHN HORNBY. Second Edition. E. and F. N. Spon, Ltd., 125, Strand, London. 1902. Price 6*s.* nett. Spon and Chamberlain, 12, Cortlandt Street, New York.

8VO volume, containing dedication, prefaces, table of contents, and 257 pages of subject-matter, illustrated with 67 engravings; an appendix of 46 pages follows, with one illustration, and numerous tables of boiling and fusing points, and specific gravities, &c., and lastly the alphabetical index. The work is divided into five parts, and these are classified as follows:—I. (i.) Introduction. The Balances, &c. (ii.) Sampling and General Analysis. II. Simple Gravimetric Determinations. III. Volumetric Analysis. IV. (i.) Analysis of Coal and Coke. (ii.) Determination of Impurities in Crude Gas. (iii.) Testing Purified Gas for Sulphur Compounds, &c. (iv.) Analysis of Ammoniacal Liquor. (v. and vi.) Analysis of Lime and Limestone. (vii. and viii.) Analysis of Oxide of Iron and Spent Oxide. (ix.) Of Fireclay and Firebricks. (x.) Of Coal-tar. (x

and xii.) Fractional Distillation and Determination of the Specific Gravity of Gas. V. Technical Gas Analysis, Calorimetry, Cyanogen in Gas, &c. Appendix. Gas Referees' Instructions.

Lighting by Acetylene. A treatise for the Practical Lighting Engineer, containing elementary information and details for those about to take up the work. By Frederick Dye, M.R.I. E. and F. N. Spon, Ltd., 125, Strand, London. 1902. Price 6s. nett. Spon and Chamberlain, 12, Cortlandt Street, New York.

Small 8vo volume, with preface, table of contents, and subject-matter filling 182 pages. There are 75 illustrations. The treatment of the subject is indicated in the following chapter headings:—Introduction. Acetylene Production. I. Calcium Carbide. II. Acetylene. III. Acetylene Generation. IV. Generators, Types, &c. V. Purification of Acetylene. VI. Burners and Appliances. VII. Legal and other Regulations governing the Storage of Carbide and the Fixing of Acetylene Generating Apparatus.

Review and Text of the American Standard Specifications for Steel, adopted in August 1901 by the American Section of the Internat. Assoc. for Testing Materials. By Albert L. Colby. Second Edition, re-written, and containing the revised text of the Standard Specifications. The Chemical Publishing Co., Easton, Pa., U.S.A. 1902. Price 1.10 dols., or 4s. 6d., post free.

Small 8vo volume, with table of contents, introduction, and subject-matter filling 101 pages. There are two illustrations. The leading subjects are: — I. General Review of the requirements specified in the American Standard Specifications; and also II. Review of each of the nine American Standard Specifications for Steel, with the reasons, both under I. and II., which governed the Committee in its Decisions.

The Appendix, pages 58—96, gives the revised text of the American Standard Specifications for Steel, adopted by the American Section of the International Association for Testing Materials, August 10, 1901.

Other Worlds: Their Nature, Possibilities, and Habitability in the Light of the Latest Discoveries. By Garrett P. Serviss. Hirschfeld Bros., Ltd., 13, Furnival Street, Holborn, London, E.C. 1902. Price 6s.

Small 8vo volume of 276 pages, with frontispiece, six charts, and numerous illustrations. It consists of a concise treatise on astronomy, with more than the ordinary amount of attention given to physical conditions.

Trade Report.

I.—GENERAL.

Imports and Exports of Germany to the United States.

U.S. Cons. Reps., April 2, 1902.

German imports of cotton-seed oil, oleomargarine, and oil cake, which have been growing considerably during the past few years, still further increased in 1901. Compared with former years, there was less refined petroleum sold to Germany, whilst crude mineral oils met with larger sales. Tallow and other refuse fats dropped considerably in the list of importations

Exports of raw beet sugar to America were less than those of any year since 1895, being a decrease of more than two-thirds of those of 1900 Cement decreased to one-half of the quantity shipped last year, and fell to a lower level than at any time since 1890. Exports to the United States of potash salts, in 1901, gained 25 per cent. over the figures for 1900. The shipments of drugs and chemicals increased, particularly those of cyanide, alizarin, and indigo. Aniline dyestuffs did not do so well. Whilst exports of blown glassware decreased, the sales of porcelain were greater, especially of dinner sets, &c. In the manufacture of paper, there was less cellulose, as well as finished goods, sold to the United States. An increa is noted in the exportation of pelts and hides, especially calf and gent skins.

Imports of Drugs and Chemicals into South Afric

Chem. and Druggist, April 12, 1902.

The value of the drugs and chemicals imported into t Transvaal Colony, during 1901, is officially given as 81,00 Drugs and chemicals of the value of 293,000*l.* were import into the Cape Colony during 1901. For the same period 1900 the value was 231,000*l.*

Tariff Decisions in Australia.

Bd. of Trade J., April 10, 1902.

A list of decisions under the Federal Tariff, up to the 9 Dec., 1901, is published in the *Board of Trade Journ* of the 10th inst.

German Colonial Economic Institute.

Imp. Inst. J., April, 1902.

A few years ago the *Kolonial-Wirtschaftliches Komitt* of Berlin was formed, on the initiative of a number gentlemen connected with academic institutions in German This body, which receives no financial help from t Government, carries out in Germany work similar to th of the Scientific and Technical Department of the Imperi Institute and of Kew Gardens, but on a very much small scale.

The society employs a chemist and a botanist, wh examine and report upon products submitted by coloni correspondents. Among the materials so examined durin the last year were rubber, gums, and various gutta-percha In addition, a number of substances were submitted commercial experts, such as divi-divi pods from S.W. Afric which were valued at 10s. per cwt., and "kapok," a fib derived from *Calotropis procera* (this material has alread been investigated in the Scientific Department of th Imperial Institute). The results of the chemical investig tions are printed in the official journal, *Der Tropenpflanze*

An "address book," giving the addresses of Germa dealers in natural products in all parts of the world is als published, and contains, in addition, particulars of th best routes to the colonies, and freight rates, as far as the are known, of most shipping companies.

II.—FUEL, Etc.

Coal Resources of India and their Development

W. R. Dunstan. J. Soc. Arts, 1902, **50**, [2574], 371—40

A long and comprehensive paper, in which the autho after some preliminary remarks, treats of the subject und the following headings:—Distribution of coal in India provincial coalfields and collieries, character of coal quality of Indian coal: methods of mining, labour, price transport—railway and dock communication; utilisation waste coal—manufacture of power-gas; concluding remark The paper is accompanied by an appendix consisting a sketch-map of India, showing railways and coalfield and nine tables:—(1) Quantity in tons of coal produced each province; (2) output for 1900 of coal in British an Colonial coalfields; (3) foreign coal trade of India; (4 Indian railways; (5) results of a preliminary examinatio of Indian coals; (6) results of ultimate analyses of selecte Indian coals; (7) other recorded analyses of Indian coals (8) typical British coals; (9) analyses of Indian coal an coke.—A S.

Coke-Plant in Maryland (United States).

Foreign Office Annual Series, No. 2755.

There is in course of construction at the Maryland Ste Works, near Baltimore, a coke plant, consisting of fou batteries of 50 ovens each, with which it is intended to mal all the coke required in the works for the smelting of iro

ıd steel. The ovens are being built upon steel columns ıd girders, and are adapted for the recovery of the mmonia, gas, and tar. Coke made in these ovens is aimed to be harder and denser than that produced in the d-fashioned "bee-hive" ovens, and of a grade very suitable r the large modern blast furnaces. The fuel to be used is as, and the arrangement of flues will be such that there ill be an even distribution of flames and consequent iiformity of heat.

Every half-hour there will be a reversal of the currents gas and air, and this will be a part of the methods uployed to secure evenness in heating. The ovens will the largest of the kind in the country, and will have, it expected, a daily capacity of 6 net tons of coke, obtained om 8 tons of coal, besides the by-products. They will be ovided with the latest labour-saving appliances, one of hich is a machine which pushes the finished coke out upon platform. It is expected that, when the ovens are in full rking order, the surplus of gas will be added to the supply rnished to Baltimore by the existing gas company.

Oil Fuel in the United States.

Bd. of Trade J., April 3, 1902.

The *Iron Age* (New York) states that the Southern icific Railway Company are making elaborate preparations r the use of oil for generating power on the locomotives om one end of the line to the other, and eventually to bstitute oil for coal fuel on their engines, ferryboats, and eamboats. Already the company have converted 210 of eir locomotives into oil burners, and have on hand material the Houston shop for converting 120 more. The Comny intend to establish 72 steel tanks of 50,000 barrels erage capacity along their lines, and have let the contract this work. These tanks will have a capacity of 3,600,000 rrels, and these, together with the 13 already constructed, ll give a total capacity of 4,425,000 barrels.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Oil-Lands Concession in Persia.

Mr. H. J. Whigham reports to the *Morning Post* that e oil-belt running along the Kerkah Valley, past Shushter d Ahwaz, to Bushire and beyond, has been leased to a itish subject. The lessee has sent out men to survey for e laying of a pipe, 360 miles long, from the head of the erkah Valley to Mohammerah. The starting point is ısr-i-Shirin, on the road between Bagdad and Kermanshah, the Province of Zohab.

The oil-beds are believed to be very fine, and the oil elf to be purer than the Russian product. Therefore, if e concession works well it may be expected to create ırked rivalry with the Russian industry, which supplies ost of the oil sold in Southern Persia and the Persian lf region.

Petroleum in Cuba.

Eng. and Mining J., 1902, **73**, [10], 347.

A deposit of petroleum, in the province of Matanzas, ıth-west of Cárdenas, has been described by Salterain and ckham. From a well, 500 ft. deep, 100,000 galls. were ained, but arrangements for additional drillings were errupted by the war between Spain and the Cubans. terain has also described a deposit of petroleum, in the n Juan mine, in the province of Santa Clara. The oil, gr. 0·754, b. pt. 85° C., is stated to be colourless, transent as the clearest water, easily inflammable, and is d to leave no sensible residue on complete combustion. e deposit was worked to some extent, in 1881, by nuel del Cueto, but operations were discontinued at lepth of 300 metres, and at the present time, the only being made of the oil is for the household purposes a family living near by.—A. S.

Asphalt in Arkansas (United States).

Bd. of Trade J., April 10, 1902.

According to the *Tradesman* of 15th ult., a deposit of ıminous sand rock is reported to have been found in Pike County, Arkansas, which runs from 20 to 30 ft. in thickness, and underneath it is a vein of liquid asphalt, fully 2 ft. in thickness, mixed with a very coarse gravel. A company has been organised to work this deposit.

Petroleum in Japan.

U.S. Cons. Reps., March 24, 1902.

Boring for petroleum is an industry of very recent date in Japan, and lack of experience and imperfect machinery have hitherto interfered seriously with its success. Echigo, a province on the western coast, about midway between the northern and southern extremities of the main island, has produced all, except a very insignificant part, of the oil thus far procured from native sources; but recent discoveries have given an impetus to this branch of mining in other parts of the empire, and active preparations for boring are under way in a district in the north-east. Indications promising excellent returns have been observed in the northern island also, and it is reported that American and European companies have been formed to exploit that region. Improvements are being made in the methods of procuring the oil, and transporting it to the refineries in the province of Echigo, and it has been proposed to construct a pipe line from the mines to Tokyo, 200 miles distant. The Empire furnishes a market for much more than the present flow, thousands of cases of kerosene being annually imported from Russia and the United States.

Naphtha Production of Baku (Russia).

Bd. of Trade J., April 3, 1902.

In the *Journal de St. Petersbourg* it is stated that, according to statistics recently published, the production of naphtha in the Baku district, in 1901, amounted to about 10,848,000 tons, showing an increase of nearly 1,205,000 tons, as compared with 1900. To the above figures must be added 482,000 tons produced at Grozny, making a total production in Russia of 11,330,000 tons.

Bitumen in Madagascar.

Bd. of Trade J., April 3, 1902.

It is reported in *La Revue de Madagascar*, for March, that General Gallieni has sent to the French Colonial Office two samples of bitumen forwarded to him by the officer commanding the post of Ambodiriana, near the village of Ankily Marobaola. It is stated that about 10 litres of liquid per day could be obtained from this source. The samples will be analysed, in order to determine if the source of supply be worth working.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo and Dye-wood Imports of Havre (France).

Foreign Office Annual Series, No. 2754, 1902.

The imports of indigo into Havre, in 1901, were 2,314 cases, from Bengal (as against 3,296, in 1900), 80 cases, from Madras, Bombay, and Kurpah, and 1,685 serons from Guatemala. Since January 1, 1902, a further and heavy decline has taken place, and the price has dropped to 3 fr. 75 c. (3*s.*) per French lb., the lowest point ever touched.

The imports of log-wood and other dye-woods declined greatly, in 1901, and the quantity received was less than in any previous year for nearly 30 years. The total amount of log-wood imported was 43,935 tons, against 60,465 tons, in 1900, and 64,500 tons, in 1899. The imports of fustic were 5,420 tons, against 7,060 tons, in 1900, and 13,815 tons, in 1899. The reduction in importations is attributed, firstly, to a general depression in trade, especially in Germany; secondly, the wars in South Africa and China; and, thirdly, to the competition of aniline dyestuffs, which is severely felt in regard to all kinds of dye-wood extracts. These causes have not only diminished the quantity of dye-wood

received, but have at the same time brought about a fall in prices. The first two are of a temporary character, but the use of aniline dyestuffs is increasing, and will continue to extend.

VII.—ACIDS, ALKALIS, Etc.

Borate of Lime in Bolivia.

Chem. and Druggist, April 12, 1902.

Valuable deposits of borate of lime are said to have been found in Bolivia, along the Mauri River.

Carbonate of Potash Duty-Free in New Zealand.

Bd. of Trade J., April 3, 1902.

Under order of the Commissioner of Trade and Customs (Order No. 684 of Feb. 5, 1902), having reference to the Customs Tariff of New Zealand, *Commercial carbonate of potash*, in bulk, is rated as *pearl ash*, and may be imported duty-free.

Salts Duty Free for Agricultural Purposes, in France.

Bd. of Trade J., April 10, 1902.

According to a recent circular of the French Director-General of Customs, it has been decided that the exemption from duty, accorded by the law of Nov. 8, 1869, to denatured salts intended for use as cattle food or as manure, or in the preparation of manure, applies only to exemption from the consumption tax. Consequently, imported salts intended for the uses specified can only be exempted from the consumption tax on proof that the import duty leviable thereon has been paid. (See this Journal, 1901, 1039; 1902, 370.)

X.—METALLURGY.

Mineral Production of Japan.

U.S. Cons. Reps., March 24, 1902.

The following table shows the output of the mines of the country, for 1900 (the latest data obtainable), as reported by the mining inspection boards to the Department of Agriculture and Commerce. The values given are computed by the average quotations in the Osaka market.

Description.	Quantity.	Value.
		Dols.
Silver..... Tons	6·4086	1,163,606
Antimony ..... „	477·6513	60,680
Manganese .... „	17,589·684	81,189
Kerosene..... 1thd.	571,906	966,872
Lead ... . Tons	208·72	162,113
Tin..... „	13·67	5,882

Platinum [Palladium] in Wyoming (United States).

Eng. and Mining J., March 22, 1902.

Mr. W. Coolidge writes that, on analysis of the ore mentioned by Mr. Wilbur C. Knight, discovered at the Rambler Mine, he has come to the conclusion that the metal is palladium, and not platinum. (See this Journal, 1902, 200.)

Solder: Customs Decision (United States).

Bd. of Trade J., April 3, 1902.

The following Decision, affecting the application of the Customs Tariff and Customs Regulations of the United States, has recently been issued by the Treasury Department. *Solder* is dutiable as a manufacture of metal, under par. 193 of the Tariff, at the rate of 45 per cent. *ad val.*

Mercury Production of the World.

Eng. and Mining J., March 22, 1902.

Sr. Vincente Spirek gives the following figures, showing the mercury production of the European mines for the year 1901. To these are added an estimate for the United States production; and the figures in the table below are compared with the statement of *The Mineral Industry*, for 1900. This table covers practically the mercury output of the world, with the exception of Mexico. The figures are in metric tons:—

Country of Origin.	1900.	1901.	Changes.	Per Cent
Austria.....	550	512	D. 38	6·9
Italy	220	278	I. 58	26·4
Russia.....	340	368	I. 28	8·2
Spain.....	1,111	846	D. 265	23·9
United States.....	967	992	I. 25	2·6
Total metric tons.	3,188	2,996	D. 192	6·0
Total flasks.....	91,873	86,340	D. 5,533	6·0

The production of Italy includes all the working mine That of Austria is from the Idria mines. The Spanis output includes 786 tons from Almaden, and 80 tons fro the smaller mines.

The Mexican production, in 1900, was 335 tons. If th same quantity be allowed for 1901, it would bring the world total production for the year up to 3,331 metric tons, again 3,523 tons, in 1900.

Mineral Production of Canada in 1901.

Bd. of Trade J., April 3, 1902.

The High Commissioner of Canada has issued a pr liminary report on the mineral production of Canada, 1901. Statistics and detailed tabular statements, givi figures for 1900 and 1901, are given in the *Board of Trad Journal* of the 3rd inst.

Mineral Output of Western Australia.

Bd. of Trade J., April 3, 1902.

A supplement to the *Government Gazette* of Weste Australia, dated the 19th Feb. last, contains statistics of t output of minerals, other than gold, in the State, in 19 and 1901, from which the following table is compiled:—

Minerals.	1900.		1901.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Black tin.....	823	56,702	734	40,000
Copper ore	6,183	43,673	10,157	75,246
Ironstone	12,251	9,258	20,569	13,246
Lead ore	268	533	..	..
Coal.....	118,410	54,835	117,835	67,561
Limestone.....	15,927	3,594	18,209	4,348

Asbestos and Nickel Deposits in Russia.

Bd. of Trade J., April 3, 1902.

It is reported in the *Journal de St. Petersbourg* of 2 Feb.—12th March, that rich deposits of asbestos and wh nickel have recently been discovered in the neighbourhd of Zanghésour, province of Elizabethpol.

Zinc Production of the World.

Eng. and Mining J., March 22, 1902.

In the following table is given the estimate of Mes Henry R. Merton & Co., of London, of the zinc production f the world, in 1901. The figures are in tons of 2,240 lb.

It will be seen in this table that the total production f metallic zinc showed, last year, an increase of 6 per c t. The gain made by the European producers was 4·3 per ce

Country of Origin.	1900.	1901.	Changes.
Rhine, Belgium, and Holland	186,320	199,285	I. 12,965
Silesia	100,705	106,385	I. 5,680
Great Britain	29,830	29,190	D. 640
France and Spain	30,620	27,265	D. 3,355
Austria and Italy	6,975	7,700	I. 725
Poland	5,875	5,935	I. 60
Total Europe	360,325	395,760	I. 15,435
United States	110,028	122,830	I. 12,802
Total	470,353	498,590	I. 28,237

whilst, in the United States, it was 11·6 per cent. In Europe, the increase in output was made in the face of some depression in trade and of lower prices; the average for good ordinary brands in London, in 1901, having been 17*l.* 0*s.* 7*d.* per ton, as against 20*l.* 5*s.* 5*d.* in 1900, a reduction of 15·9 per cent. In the United States, there was also a drop in prices, the average New York quotation for 1901 being 4·08 cents per pound, as against 4·39 cents, in 1900, a decrease of 7·1 per cent. The difference, to some extent, reflects the better condition of trade and the stronger demand for the metal in the United States.

Mineral Production of the British Empire.

Imp. Inst. J., April 1902.

The concluding section of the Report on Mines and Quarries (Part IV.—Colonial and Foreign Statistics), for 1900, which has recently been issued from the Home Office, gives a general survey of the mining industries of the world, and permits us to compare the mineral production of the British Empire with that of foreign countries.

In the United Kingdom itself, there were 4,148 mines in operation, during 1900, finding employment for 814,517 persons, an increase of 138 mines and 50,351 persons employed over the figures of the previous year. The number of quarries under official inspection—*i.e.*, those more than 20 ft. deep—was 6,959, employing a total of 93,895 persons, a decrease of 35 quarries and 4,100 persons employed from the figures of 1899. The death-rate through accidents at all the mines was 1·29 per 1,000, compared with 1·27 per 1,000, for each of the two previous years; whilst that in the quarries was 1·39 per 1,000, as against 1·19 and 1·00 for the two preceding years. The total value of all the minerals obtained from the workings is estimated at 135,957,676*l.*, whilst the value of the metals, obtainable by smelting, from the ores raised is given as 21,030,719*l.*, as compared with 17,470,296*l.* and 18,314,750*l.*, in 1899, or 77,415,063*l.* and 13,717,512*l.*, in 1898. The large increase in the value of the minerals raised, during 1900, over that of the previous year was principally due to the higher price of coal, for, whilst the output of this was increased by a little over five million tons, the value rose no less than 38,171,469*l.* The exports were, however, in no way checked by the rise in price, and amounted to 44,089,197*l.* tons, exclusive of two million tons of coke and patent fuel, being an increase of nearly three million tons over the previous year. Compared with coal, which now represents 89 per cent. of the total value of all the minerals raised, the other mining industries are of little importance. It may be noted, however, that the production of iron ore, in 1900, shows a slight increase in quantity but an increase in value, whilst the output of gold from Wales has risen from 3,327 oz., valued at 12,086*l.*, in 1899, to 14,004 oz., valued at 52,147*l.*, in 1900.

The contributions of the various parts of the British Empire to the world's production of certain metals, during 1900, are shown in the following table, the quantities being given in kilos. and metric tons for comparison with the world's output, but it must be borne in mind that the figures do not represent the amount of the different metals actually produced in each country, but the amount represented by the ore mined in that country.

	Fine Silver.	Lead.	Tin.	Zinc.
	Kilos.	Metric Tons.	Metric Tons.	Metric Tons.
Great Britain and Ireland.	5,936	24,755	4,336	9,211
Canada	138,302	28,654	..	97
Federated Malay States	..	..	43,123	..
India	..	..	45	..
New South Wales	315,261	4,888	925	4,100
New Zealand	10,154	..	..	..
Queensland	3,514	208	742	..
South Australia	311	1,390	8	9
Tasmania	108,560	13,347	1,832	..
Victoria	..	..	45	..
Western Australia	834	51	568	..
Total for British Empire	582,932	73,203	51,624	13,417
Total for the World	5,874,284	787,811	80,643	446,373
Total for British Empire, 1899.	620,975	50,964	47,148	25,120
Total for the World, 1899	5,445,594	676,116	71,281	510,701

Silver.—The production of silver in British possessions is diminished by 38,000 kilos. during the year, and now only forms one-tenth of the world's total. Canada and Tasmania have increased their output, the former to a large extent, but there has been a large decrease in the production of New South Wales, which has more than counterbalanced the other gains. Mexico and the United States are the largest producers of silver, their outputs being 1,923,331 and 1,862,929 kilos., respectively, or, together, nearly two-thirds of the world's total.

Lead.—The amount of this metal supplied by British Possessions was increased, in 1900, by over 20,000 metric tons, owing to a large increase in the Canadian production, and formed a little less than one-tenth of the world's supply. Great Britain also supplied 24,755 metric tons, and the other chief contributor is Tasmania with an output of 13,347 tons. The world's chief producers are the United States, Spain, and Germany, with outputs of 245,757, 203,744, and 121,513 metric tons, respectively.

Tin.—Of this metal, the British Empire contributed more than five-eighths of the world's supply, the chief source of ore being the Federated Malay States, which supplied 43,123 metric tons of tin out of a world's total of 80,643 metric tons. The greater part of the ore raised there is treated at Singapore, which has now the largest tin-smelting works in the world. Great Britain produces more than any of the other colonies, and the Tasmanian output has slightly declined. Of foreign countries the chief producers of tin are the Dutch East Indies, Bolivia, and Siam.

Zinc.—The production of this metal in the British Empire underwent a decrease of nearly 50 per cent. during the year under review, owing to a drop in the output of New South Wales from 16,272 metric tons, in 1899, to 4,100 tons, in 1900. Great Britain itself produced 9,211 tons, but the supplies obtained from the other colonies are insignificant. The world's chief producers are Germany and the United States, with outputs of 153,350 and 112,419 metric tons, respectively.

XII.—FATS, FATTY OILS, AND SOAP.

New Oil-Shrub in Spain.

U.S. Cons. Reps., 68, (259), *April*, 1902.

The Spanish journal, *Industria e Invenciones*, of Madrid, reports the discovery of a very useful shrub, which, if properly cultivated, might acquire great importance. The natives of the province of Vallegrande extract from the fruit of this shrub an oily substance, which, when cool, possesses the consistency of stearin, and is used in the manufacture of candles. This oil is of a greenish colour, and can be easily extracted. The shrub grows wild everywhere in this province, but especially in the valleys. Candles manufactured out of this oil would be of the same quality as those of stearin, and should possess even greater illuminating power.

Menhaden Fish-Oil in the United States.

Foreign Office Annual Series, No. 2755, 1902.

The menhaden is a fish of the herring tribe, and is peculiar to North American waters. Great shoals of this fish usually appear near Cape Fear at the end of April or beginning of May, and make their way northward, frequenting all the salt-water bays on the coast until November, when they have reached the vicinity of Eastport, Maine, and there they disappear until next year. They are caught in large seines, and when a boat has secured as much as she can carry, she makes her way as rapidly as possible to the factory, where the oil is extracted from the fish. It is said that the oil, which is used principally in leather dressing, rope making, and paint mixing, is clear profit, the refuse, which is sold as a fertiliser, paying all expenses. There are hundreds of factories engaged in the industry along the North Atlantic coast of the United States.

Oil Trade of France in 1901.

Foreign Office Annual Series, No. 2754, 1902.

The oil trade in France has been prosperous during the past year. Prices have advanced, and the importations of raw materials, especially of Indian oil-seeds, were on an increased scale. The imports of English cotton-seed oil show a falling off; but this decline is not confined to English oil, the American supplies having also decreased steadily during the last few years, owing to the recovery in the cultivation of earth-nuts in India, the oil from which competes with cotton-seed oil.

The deliberations of the Tariff Committee in connection with the proposal to place an import duty on oleaginous seeds, and to increase the existing duty on vegetable oils, which have lasted for several years, have resulted in the report to the Chamber of Deputies of a Bill which will shortly be discussed. It is, however, by no means certain that it can be passed by both Houses before the end of the Parliamentary session.

The chief aim of the Bill is to raise the price of colza seed by the exclusion of foreign seeds or the increase in price of the latter, but to do this it seems hardly necessary to tax other sorts of seeds, such as earth-nuts, sesame, linseed, &c., which are used for purposes for which it is impossible to utilize colza seed. The proposed tax varies according to the estimated yield in oil of each kind, so that, whilst cotton-seed is to be taxed 3 fr. per 100 kilos. (220 lb.), decorticated earth-nuts will have to pay 6 fr.; undecorticated, 5 fr.; linseed, 5 fr.; and sesame seed, 6 fr. 50 c. At the same time, the existing duty of 6 fr. per 100 kilos. gross weight on vegetable oils is to be raised to 18 fr. per 100 kilos. on the net weight. The increase of duties on oil is comparatively very much less than the tax which it is proposed to place on the seed, and the prospect has naturally raised great opposition on the part of the oil manufacturing industry throughout the country. A clause in the Bill provides that oils used for soap-making, candle-making, wool-washing, and tanning shall be admitted at the existing rate of duty, after being rendered unfit for edible purposes, whilst seed to be converted into oil for export will be free from taxation.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

"Tuberine": Customs Decision (United States).

Bd. of Trade J., April 10, 1902.

"*Tuberine*" is held to be a description of glue, and not starch, and is, therefore, dutiable under par. 23 of the Tariff according to value.

XVI.—SUGAR, STARCH, Etc.

Sugar Consumption Duty in Japan.

Bd. of Trade J., April 3, 1902.

In a report by His Majesty's Minister at Tokio on the Japanese Budget for 1901–2, it is stated that the following consumption duties are now leviable on all sugar and molasses imported into or produced in Japan. These duties came into force on the 1st October last:—

Sugar and molasses below No. 8, Dutch standard, in colour, 1 yen per 100 kins (1*s.* 8¾*d.* per cwt.).

Sugar between Nos. 8 and 15, Dutch standard, in colour 1 yen 60 sen per 100 kins (2*s.* 9½*d.* per cwt.).

Sugar and molasses between Nos. 15 and 20, Dutch standard, in colour, 2 yen 20 sen per 100 kins (3*s.* 9½*d.* per cwt.).

Sugar (including candy) and molasses above No. 20 Dutch standard, in colour, 2 yen 80 sen per 100 kins (4*s.* 10*d.* per cwt.).

XVII.—BREWING, WINES, SPIRITS, Etc.

Alcohol; Technical Uses of ——, in Germany.

U.S. Cons. Reps., March 13, 1902.

Attention is drawn to the great advantage German manufacturers possess for the manufacture of coal-tar dyestuffs, lacs, varnishes, perfumes, and a large number of pharmaceutical products, in a plentiful supply of cheap untaxed alcohol for industrial purposes. Last year, Germany produced and used 30,642,720 galls. of denatured spirits as compared with 10,302,630 galls. in 1886, the last year before the law exemptiog from taxation denatured alcohol to be used for industrial purposes was passed. Of the total amount, about two-thirds was of the ordinary grade for power and heating purposes, whilst the remaining third was denatured for lighting and chemical purposes, or used pure, under certain restrictions, for the manufacture of perfumes, extracts, and medicinal preparations.—A. S.

Alcohol Industry in Austria-Hungary.

Bd. of Trade J., April 3, 1902.

The following table, showing the number of distilleries at work in Austria, in 1901, as compared with preceding years, is taken from *Le Monde Economique*, of the 1st inst.: —

Year.	Agricultural.	Industrial.
	No.	No.
1898	1,075	39
1899	1,130	39
1900	1,166	36
1901	1,180	36

The bounties granted by the State to agricultural distilleries, in 1901, amounted to about 6,600,000 crowns, as compared with 6,314,712 crowns, in 1900. The production of alcohol in Austria and Austria-Hungary, in 1899—1900 and 1900—1901, was as follows:—

Period.	Austria.	Austria-Hungary.
	Hectolitres.	Hectolitres.
1899—1900	1,415,331	2,429,321
1900—1901	1,513,417	2,519,704

The consumption of alcohol in the form of various kinds of beverages, the exports of alcohol, and the denaturation of the same in Austria and Austria-Hungary, in 1899—1900 and 1900—1901, was as in the following table:—

		Austria.	Austria-Hungary.
		Hectolitres.	Hectolitres.
Consumption	1899—1900	976,646	1,795,447
	1900—1901	1,040,591	1,837,945
Export.....	1899—1900	238,051	324,732
	1900—1901	204,354	257,464
Denaturation	1899—1900	200,086	295,649
	1900—1901	234,308	337,875

It is said that the year 1901 was characterised by a large over-production and a fall in the selling-price, which did not allow of any profit to be made.

XVIII. A.—FOODS.

Beverages and Foodstuffs in Brazil.

Bd. of Trade J., April 10, 1902.

With reference to a report that appeared in the *Board of Trade Journal* of the 6th ult. (this Journal, 1902, 441), an article appears in the *Jornal do Commercio* of the 1st ult., from which it appears that the new regulation, requiring all imported foodstuffs and beverages to be submitted to the analytical department before clearance through the Customs, applies to Rio de Janeiro only, and that there are no official analysing laboratories at other Brazilian ports. According to the *Jornal do Commercio*, little difficulty is experienced in getting foodstuffs and beverages admitted at these ports, although suspected articles are occasionally sent to Rio for analysis.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives in Mines in England.

Chem. Trade J., April 5, 1902.

The Home Secretary gives notice that he has made an order, under section 6 of the Coal Mines Regulation Act, 1896, the effect of which is to add two new explosives, viz., Dibiouite and arkite, to the list of "permitted explosives."

Surtax on Explosives in Italy.

Bd. of Trade J., April 10, 1902.

The Italian *Bollettino Ufficiale* for February last contains the text of revised regulations, in virtue of which the external manufacturing tax on gunpowder and other explosives, and the surtax on gunpowder and explosives imported from abroad, are fixed at the following rates:—

Blasting powder, and powder in the form of dust, 50 lire per 100 kilos. (1*l.* 0*s.* 4*d.* per cwt.).

Sporting powder, and blasting compounds, other than blasting powder, 125 lire per 100 kilos. (2*l.* 10*s.* 10*d.* per cwt.).

All other explosives for sporting purposes or for firearms in general, 250 lire per 100 kilos. (5*l.* 1*s.* 7*d.* per cwt.).

Powder in granular form, employed in the manufacture of miners' fuses, shall be entitled to claim the return of the difference between the duty on sporting and on blasting powder.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 8090. J. R. Hilton. Improved means for use in cleaning the ascension pipes of retorts, in part applicable for other purposes. Apr. 7.

„ 8118. A. P. Mynders. Apparatus for automatically drawing off viscid substances.* Apr. 7.

„ 8223. T. Stone. *See under* XVII.

„ 8392. J. G. Grossman. Filter and extractor presses.* Apr. 10.

„ 8401. L. Schumacher. Purifiers or filters. Apr. 10.

„ 8435. M. J. Adams. Syphons and syphonic apparatus, and fittings connected therewith. Apr. 11.

„ 8436. W. D. Ferguson. Steam superheaters. Apr. 11.

„ 8446. J. Hargreaves. Separating gases from solutions, and apparatus for effecting the same. Apr. 11.

[A.] 8549. T. R. Sizer. Improved construction of apparatus for mixing and blending, as applied to seeds, powders, and the like ingredients requiring to be mixed or blended together. Apr. 12.

„ 8634. R. Parsons. Steam traps in which the operation is effected or controlled by the volatilisation of a volatile liquid or substance contained in a condenser chamber. Apr. 14.

„ 8645. W. P. Miles. Improved method of automatically regulating the flow of liquids, gases, electricity, chemicals, and powders. Apr. 14.

„ 8659. P. H. Reardon. Controlling devices for compressing air or other similar fluids.* Apr. 14.

„ 8674. H. Nordtmeyer. Portable pump filters. Apr. 14.

„ 8720. L. C. Reese. Refrigerating. Apr. 15.

„ 8973. J. Radcliffe. Drying apparatus. Apr. 17.

„ 8992. E. K. Dutton and E. L. Dutton, of Sutcliffe and Son. Coolers and condensers for fluids, and manufacture of the same. Apr. 18.

„ 9060. H. F. Ainley. Refrigerators or the like. Apr. 18.

„ 14,577A. P. Nacf. Process and apparatus for cooling and refrigerating. Filed Apr. 15. Date applied for, Dec. 18, 1900, being date of application in United States. An invention comprised in Application No. 14,577, 1901.

[C.S.] 7722 (1901). Abraham. Means for preventing the formation of scale and explosions in boilers and the like. Apr. 23.

„ 7736 (1901). Spooner and Spooner. Means for preventing the escape of liquid or vapour from vessels, or receptacles in which volatile or other liquids are contained. Apr. 16.

„ 8942 (1901). Saatmann. Drying and absorbing apparatus. Apr. 23.

„ 9315 (1901). Koch. Superheaters. Apr. 23.

„ 9936 (1901). Condron. Preservative compound. Apr. 16.

„ 11,580 (1901). Chambers. Taps or faucets for bottles, jars, or other vessels or reservoirs of earthenware or other material. Apr. 16.

„ 14,391 (1901). Posno. Vessels for holding volatile inflammable liquids. Apr. 23.

„ 17,364 (1901). Hillig and Müller. Vacuum drying apparatus for continuous working. Apr. 16.

„ 25,676 (1901). Still. Continuously acting distilling apparatus. Apr. 16.

„ 3492 (1902). Siemens Bros. and Co., Ltd.—From Siemens and Halske Act.- Ges. Apparatus for filtering liquids and treating them with gases. Apr. 16.

„ 5807 (1902). Wakeford and Smith. Safety nozzle tap or filling cock for tanks and other closed receptacles. Apr. 16.

II.—FUEL, GAS, and LIGHT.

[A.] 8032. A. L. Reinmann. Incandescent electric lamps. Apr. 7.

„ 8057. T. S. Hughes, J. Wilkins, and E. Wilkins. Oil or vapour spirit burners. Apr. 7.

„ 8073. W. B. Adams. Means for controlling the supply of oil or gas to the burners of steam boilers, ovens, drying chambers, and other heating apparatus. Apr. 7.

„ 8082. G. P. Herrick. Blast furnaces. Apr. 7.

„ 8091. S. C. Davidson. Employment of jets of motive fluid. Apr. 7.

„ 8105. H. L. Bermann. Air or gas carburetters. Apr. 7.

„ 8163. A. Hopkin and E. G. Leonard. Incandescent gas burners. Apr. 8.

„ 8199. C. Grobet and C. Bernasconi. Furnaces. Apr. 8.

[A.] 8206. J. J. Lane. Anti-vibration devices for incandescent gas lights.* Apr. 8.

„ 8287. G. Bamme. Turf coking ovens.* Apr. 9.

„ 8291. J. H. Sheldrake. Improved construction of incandescent gas burner. Apr. 9.

„ 8299. H. H. Lake.—From Hanseatische Acetylen-Gas Industrie Akt.-Ges., Germany. Gas-burners. Apr. 9.

„ 8339. J. E. Smith. Incandescent electric lighting. Apr. 10.

„ 8340. J. E. Smith. Incandescent electric lighting and electric call bells. Apr. 10.

„ 8341. J. E. Smith. Means for connectiug incandescent electric lamps with dry batteries. Apr. 10.

„ 8368. F. Fritz. Burning-off apparatus for incandescent mantles. Apr. 10.

„ 8369. D. S. Keith. Gas machines.* Apr. 10.

„ 8430. J. Duff. Constructions and application of flues, whereby two or more stills, coppers, or boilers may be heated from one furnace. Apr. 11.

„ 8456. F. Bryan and A. H. Bayley. Electric ignition devices for gas or oil motors. Apr. 11.

„ 8460. A. John.—From K. von Victinghoff-Scheel and S. Kapralik, Germany. Improved automatic gas lighter. Apr. 11.

„ 8505. A. Ducasble. Incandescent gas burners.* Apr. 11.

„ 8516. W. H. Dargue. Gas apparatus. Apr. 11.

„ 8568. A. J. Boult.—From M. Goffin, née Fichefet, Belgium, and J. Cael, France. Improved manufacture of artificial carbonaceous material. Apr. 12.

„ 8618. W. S. Clapham. Improved apparatus for use in the purification of coal, oil, and like gases. Apr. 14.

„ 8654. W. Railton, R. Campbell, and J. F. Crawford. Furnaces. Apr. 14.

„ 8661. A. J. Boult.—From H. Reeser and P. Zeitz, France. Apparatus for the production of gas for lighting and other purposes. Apr. 14.

„ 8670. T. L. Carbone. Electric arc lamps.* Apr. 14.

„ 8678. G. H. Burrows. Air and gas mixing and supplying apparatus.* Filed Apr. 14. Date applied for, Nov. 29, 1901, being date of application in United States.

„ 8688. H. Garde. Apparatus for carburetting air Apr. 14.

„ 8692. A. W. Ekström. Heaters for water and other fluids.* Apr. 14.

„ 8713. G. R. Hislop. Gas producers. Apr. 15.

„ 8717. W. Fairburn-Hart.—From General Electric Co., United States. Electric lamps.* Apr. 15.

„ 8779. B. Guigne.—From A. Borelly, France. Improved acetylene gas-producing apparatus. Apr. 15.

„ 8825. E. Eaton. Improved patent fuel. Apr. 16.

„ 8869. H. G. Cox. Smoke consuming furnaces.* Filed Apr. 16. Date applied for, Oct. 23, 1901, being date of application in United States.

„ 8927. E. T. Whitelow. Gas compressors. Apr. 17.

„ 8930. W. R. Pidgeon and E. F. Bradley. Device for automatically regulating the mixture for internal combustion engines. Apr. 17.

„ 8931. T. W. Smith. Incandescent gas burners. Apr. 17.

„ 8947. L. Wirtz. Electric arc lamps. Apr. 17.

„ 8957. F. Atherley. Carburetters. Apr. 17.

„ 8977. J. Armstrong. Obtaining blast for furnaces, and air or gas under pressure for other purposes. Apr. 17.

„ 9039. W. H. A. Sieverts. Incandescent gas burners. Apr. 18.

„ 9041. C. E. J. Berthold. Automatic igniter for gas burners. Apr. 18.

[A.] 9042. C. E. J. Berthold. Automatic gas lighters. Apr. 18.

„ 9054. C. L. Charlopin. Incandescent burners for gas or liquid fuel. Apr. 18.

„ 9062. F. Gubing and J. Auerbach. Electric arc lamps. Apr. 18.

„ 9065. G. Dorian. Burners for gas and the like. Apr. 18.

„ 9069. L. S. Liebermann. Gas burners. Apr. 18.

„ 9078. H. W. Smith and G. S. Albright. Purification of coal gas and recovery of by-products therefrom. Apr. 18.

„ 9974. Nernst Electric Light, Ltd., and S. Gowan. Series resistances for Nernst Lamps. Apr. 19.

„ 9105. J. Platt. Improved anti vibrator for mounting gas burners and mantles such as the Welsbach and the like; hereafter known as the floating light or burner. Apr. 19.

„ 9129. W. P. Warren. Gas holders for use with generators for acetylene or other gas. Apr. 19.

[U.S.] 7415 (1901). Ducellier. Acetylene lanterns or lamps. Apr. 16.

„ 7723 (1901). Abraham. Gas and like burners. Apr. 23.

„ 9377 (1901). Johnson.—From Genty and Soc. Gén. des Industries Economiques Moteurs Charon. Gas producers. Apr. 23.

„ 9513 (1901). Legge. Apparatus for carburetting air. Apr. 23.

„ 9660 (1901). Stevens. Atmospheric gas burners and apparatus for supplying gas and air thereto. Apr. 23.

„ 10,133 (1901). Shepherd. Furnaces for steam boilers applicable for burning wood chips or other refuse as fuel. Apr. 16.

„ 11,237 (1901). Società Generale Italiana Edison di Elettricità. Electric arc lamps. Apr. 16. Date applied for under International Convention, Nov. 26, 1900.

„ 11,519 (1901). Jousset and McKay. Manufacture of artificial fuel. Apr. 23.

„ 12,137 (1901). Wilson. Manufacture of mantles for incandescent gas lighting. Apr. 23.

„ 12,259 (1901). Brett and Henneberger. Incandescent gas lamps. Apr. 23.

„ 12,934 (1901). Bernson. Gas burners. Apr. 23.

„ 13,061 (1901). Kleinert. Annealing furnaces. Apr. 16.

„ 13,875 (1901). Dobson and Irwin. Peat presses Apr. 16.

„ 17,197 (1901). Eldred. *See under* IX.

„ 18,569 (1901). Quain. Incandescence electric lamps. Apr. 16.

„ 21,935 (1901.) McCullough. Incandescent electric lamps. Apr. 23. Date applied for under International Convention, Apr. 2, 1901.

„ 25,180 (1901). Phelps and Nadeau. Incandescent gas burners. Apr. 23.

„ 26,578 (1901). Brookes. — From Bradley. Fuel feeders for furnaces. Apr. 23.

„ 1121 (1902). Imray.—From International Smoke Prevention Co. Apparatus for preventing smoke from boiler fires. Apr. 23.

„ 2752 (1902). Badger. Vaporizing of liquid hydrocarbons for heating purposes. Apr. 23.

„ 3206 (1902). Heys.—From Thompson. Gas lighters. Apr. 16.

„ 3810 (1902). Lea. Method of and means for lighting and extinguishing spirit lamps and the like. Apr. 16.

„ 3948 (1902). Carlson. Petroleum lamps. Apr. 23.

„ 4151 (1902). Duffek, Wien, and Beschorner. Incandescence gas lamps. Apr. 23.

S.] 4374 (1902). Rignon and Eisenmann. Electric arc lamps. Apr. 16.

4534 (1902). Biheller. Means or apparatus for lighting by incandescent mantles. Apr. 23.

6176 (1902). Evans and Nelson. Carburetter and vaporizer for internal combustion engines. Apr. 23.

6394 (1902). Brush. Mixing device for internal combustion motors. Apr. 23.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

.] 8515. M. C. M. Tixier. New or improved process for obtaining in one operation all the extracts soluble in water, contained in tar. Apr. 11.

S.] 10,629 (1901). Lake. — From Stewart-Wallace. Treatment of mineral oils or the distillates or residuals thereof. Apr. 23.

25,676 (1901). Still. *See under* I.

V.—COLOURING MATTERS AND DYESTUFFS.

.] 8114. J. Y. Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of indoxyl, and derivatives thereof. Apr. 7.

8195. F. Gaess. Production of mono-formyl α_1-α_2 naphthalene diamine β_3 or β_4 mono-sulphonic acid. Apr. 8.

8360. A. G. Green. Manufacture of paranitraniline. Apr. 10.

8510. J. Y. Johnson.—From Bad. Anilin und Soda Fabr. Preparation of indigo vats and dyeing therewith. Apr. 11.

8663. R. B. Ransford.—From L. Cassella and Co., Germany. Manufacture of dyestuffs. Apr. 14.

9038. H. E. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany.—Manufacture and production of derivatives of naphthacene and of intermediate products for use therein. Apr. 18.

9126. O. Imray.—From Farbwerke, Höchst, Germany. Manufacture of yellow and orange-yellow and red dyestuffs of the acridinium series. Apr. 19.

S.] 7726 (1901). Ransford.—From L. Cassella and Co. Manufacture of dialkylamidooxydiphenylamines and dyestuffs therefrom. Apr. 16.

9774 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of acylated derivatives belonging to the indigo group. Apr. 23.

11,624 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of colouring matter for the direct dyeing of black or blackish shades. Apr. 23.

11,753 (1901). Abel.—From Act.-Ges. für Anilin-Fabr. Manufacture of new azo dyestuffs and of an intermediate product for use therein. Apr. 23.

11,839 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture and production of new azo dyestuffs. Apr. 23.

12,202 (1901). Imray.—From Farbwerke, Höchst. Manufacture of rhodamine derivatives. Apr. 23.

12,237 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Dyeing blue shades. Apr. 23.

12,591 (1901). Abel.—From Act.-Ges. für Anilin-Fabr. Manufacture of a mordant dyeing colouring matter. Apr. 23.

19,586 (1901). Imray. — From American By-Products Co. *See under* XII.

25,009 (1901). Imray.—From Farbwerke, Höchst. Manufacture of yellow to orange-yellow dyestuffs of the acridine series. Apr. 23.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

(A) 8212. W. Friese-Greene. *See under* VI.

„ 8238. W. Rodger and R. O. Tweedie. Printing or colouring of yarns or fabrics and other substances. Apr. 9.

„ 8279. R. Shuttlewood and F. W. Fanshawe. Dyeing of yarns in the hank. Apr. 9.

„ 8443. K. T. Sutherland. Improved method of degumming or cleansing stalk and leaf fibres. Apr. 9.

„ 8509. W. H. Perkin, jun., and Whipp Bros. and Todd, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. Apr. 11.

„ 9083. J. K. Lomax and W. L. Gibson. Rendering textile fabrics non-inflammable. Apr. 19.

„ 9140. C. O'Brien and J. Cargill. Process for the treatment of jute. Apr. 19.

[C.S.] 7491 (1901). Sella. Fulling and oiling of fibres and woven fabrics. Apr. 23. Date applied for under International Convention, Oct. 2, 1900.

„ 9704 (1901). Miln. Construction of reeds used in connection with textile processes. Apr. 23.

„ 12,476 (1901). Pickles. Method of finishing fabrics woven with coloured cotton or linen yarns. Apr. 16.

„ 13,755 (1901). Calico Printers' Association, Ltd., and Wilson. Calico printing machines. Apr. 16.

„ 19,586 (1901). Imray.—From American By-Products Co. *See under* XII.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 8212. W. Friese-Greene. Production of latent impressions on paper, textile fabrics, or other materials. Apr. 8.

„ 8371. F. R. Schmiedel. Methods for producing darker shades or tints in the ground colour of coloured paper showing a pattern or design, and a means used therein.* Apr. 10.

„ 8390. H. Anders and H. Anders. Improved process and apparatus for marbling paper.* Apr. 10.

„ 8786. R. Kraus. and C. Kraus. Machines for moulding plastic patterns on wall-paper.* Apr. 15.

[C.S.] 938 (1902). Dunn. Applying bronze and other powders to paper and like materials. Apr. 23.

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 8184. J. Waldbauer. Improved process for the production of barium chloride.* Apr. 8.

„ 8294. E. C. Rossiter and G. S. Albright. Manufacture of cyanides of the alkalis. Apr. 9.

„ 8300. W. Ostwald. Manufacture of nitric acid and oxides of nitrogen. Apr. 9.

„ 8302. U. Alvisi and F. Millosevich. Treatment of alum, alumites, and similar materials for the purpose of obtaining aluminic and potassic compounds.* Apr. 9. Date applied for, June 3, 1901, being date of application in Italy.

„ 8481. P. A. Guye. Improved process for decomposing the chlorides of carbon. Apr. 11.

„ 8757. A. A. Consoli. Retorts for subliming and refining sulphur.* Apr. 15.

„ 8759. H. W. Hemingway. *See under* X.

„ 8760. H. W. Hemingway. Manufacture of nitric acid, and incidentally the production of certain ferric salts. Apr. 15.

„ 9123. J. Camus. Apparatus for discharging bottles or tubes of liquefied carbonic acid and the like. Apr. 19.

[C.S.] 7710 (1901). Potut. Manufacture of sulphuric acid. Apr. 16.

„ 11,792 (1901). Briegleb. Manufacture of sulphuric anhydride. Apr. 16.

„ 12,510 (1901). Imray.—From Farbwerke, Höchst. Manufacture of a hydro-sulphite. Apr. 16.

„ 13,206 (1901). Abel.—From Siemens and Halske Act.-Ges. Method of impregnating with silica objects made of asbestos fibre or the like. Apr. 16.

„ 2743 (1902). Krause. Preparation of substances containing peroxide of magnesium. Apr. 16.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 8233. F. Mountford. Stencils used in decorating and glazing bricks, tiles, pottery, metal, glass, and other surfaces. Apr. 9.

„ 8335. V. Poulet and The Tile and Ceramic Products Manufacturing Co., Ltd. Manufacture of tiles, and apparatus therefor. Apr. 10.

„ 8393. S. Deards. Glazing. Apr. 10.

„ 8573. J. Tott. Glass melting pots or crucibles. Apr. 12.

„ 8696. W. Cartlidge. Improved construction of kilns or ovens for use in firing earthenware goods. Apr. 15.

„ 8827. Ainsley and W. Illingworth. Improved forms in pottery and glass ware, such as cups, bowls, jugs, beakers, tumblers, mugs, and other articles of hollow ware. Apr. 16.

„ 8861. W. C. Smyth. Glazing. Apr. 16.

„ 8952. J. Wedgwood and Sons, Ltd., and C. J. Robinson. Manufacture of tiles, slabs, or bricks for covering wall and other surfaces, and apparatus therefor. Apr. 17.

„ 9029. W. James. Manufacture of leaded glass. Apr. 18.

[C.S.] 13,061 (1901). Kleinert. *See under* II.

„ 14,356 (1901). Zsigmondy. Producing a coating of metallic lustre on ceramic objects, enamels, glasses, base metals, and the like. Apr. 16.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 8043. J. T. Curry. Manufacture of fire-resisting bricks. Apr. 7.

„ 8071. F. Basenau. Insulating materials or compositions. Apr. 7.

„ 8463. G. F. Berry and J. B. Lawes and Co., Ltd. New or improved material or substance, and method or process to be employed in the manufacture of non-conducting compositions. Apr. 11.

[C.S.] 7872 (1901). Fielding. Artificial stone slab-making machines. Apr. 16.

„ 9691 (1901). Stalker. Compounds or compositions for preserving wood. Apr. 16.

„ 9936 (1901). Condron. *See under* I.

„ 17,197 (1901). Eldred. Control of the temperature, volume, and duration of flame or combustion, chiefly applicable to the calcining of lime and the like. Apr. 23.

„ 2742 (1902). Taylor and Macleod. Fibrous plaster and manufacture of slabs, mouldings, and other articles therefrom. Apr. 16.

„ 2843 (1902). Clauson-Kaas. Plastic compositions for covering woodwork, brick walls, and the like. Apr. 16.

„ 4358 (1902). Anderson and Borchers. Combined brick and tile for walls, ceilings, and analogous structures. Apr. 23.

X.—METALLURGY.

[A.] 8233 F. Mountford. *See under* VIII.

„ 8293. E. Bouchaud-Praceiq. Process and apparatus for recovering gold from sea-water. Apr 9.

„ 8304. G. Hughes.—From L. Descamps. Improved zinc compound for reducing, decolorising, and analogous purposes.* Apr. 9.

„ 8474. J. Ornstein. Extraction of gold from water. Apr. 11.

„ 8494. J. T. Martin. Casting pig-iron and other metals. Apr. 11.

„ 8590. G. G. M. Hardingham.—From H. Pease and E. F. Jevers, Argentine Republic. Anti-friction metals. Apr. 12.

„ 8693. C. D. Brindley. Treatment of tin and other scrap. Apr. 15.

„ 8733. W. B. Kemshead and A. E. Collischoun. Manufacture of aluminium alloys. Apr. 15.

„ 8759. H. W. Hemingway. Improved process for stripping tin from tinned iron, recovering the respective metals, and obtaining nitric acid as a by-product. Apr. 15.

„ 8764. C. P. E. Schneider. Armour for ships, turrets, and other structures.* Apr. 15.

„ 8774. E. Edwards.—From Rose Gold Reclamation Co., United States. Apparatus for the separation of precious particles of gold or other relatively precious metals, and their recovery from the body of pulp or other material with which they are allied.* Apr. 15.

[C.S.] 7725 (1901). Vildorola. Production of copper. Apr. 16.

„ 11,596 (1901). Gardner and Jones. Apparatus for tinning or otherwise coating metal plates or sheets. Apr. 23.

„ 13,061 (1901). Kleinert. *See under* II.

„ 14,356 (1901). Zsigmondy. *See under* VIII.

„ 15,984 (1901). Eyermann. Process and apparatus for the production of malleable iron or steel by means of blast furnace gas. Apr. 16.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 8103. M. Schneider. Electrodes for storage batteries. Apr. 7.

„ 8288. E. Stassano. Electrical smelting of ores and the refining of metals and furnaces therefor. Apr. 9.

„ 8592. F. H. Hadfield. Construction of secondary batteries. Apr. 12.

[C.S.] 13,139 (1901). Duff and United Alkali Co., Ltd. Electric furnaces. Apr. 23.

„ 15,818 (1901). Lloyd. Storage batteries and insulation thereof. Apr. 23.

„ 5366 (1902). Méran. Electric accumulators. Apr. 1.

„ 6478 (1902). Porter. Storage batteries. Apr. 23.

XII.—FATS, OILS, AND SOAP.

[A.] 8372. C. H. Scott. Means or apparatus for use in the manufacture of inlaid linoleum. Apr. 10.

„ 8373. C. H. Scott. Means or apparatus for use in the manufacture of inlaid linoleum. Apr. 10.

„ 8374. C. H. Scott. Means or apparatus for use in the manufacture of inlaid linoleum. Apr. 10.

„ 8375. C. H. Scott. Means or apparatus for use in the manufacture of inlaid linoleum. Apr. 10.

„ 8800. W. Harris. Forming cakes or tablets of soap. Apr. 15.

[A.] 8828. G. F. Pierce and F. W. Warwick. Improved method of perfuming toilet soap tablets by absorption. Apr. 16.

„ 8997. J. Butterworth. Grease separators. Apr. 18.

[C.S.] 14,329 (1901). Douillet. Process and apparatus for refining oils, fatty matters, glycerin, wax, and for the extraction of perfume from flowers. Apr. 23.

„ 19,586 (1901). Imray.—From American By-Products Co. Manufacture of oil adapted for sulphonating from cotton seeds. Apr. 16.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 8412. G. Harding, jun. Compositions for covering metal or other surfaces.* Apr. 11.

[C.S.] 9796(1901). Berry. Lubricating compound. Apr. 23.

C.—India-rubber, &c.

[A.] 8084. P. H. J. Chautard and H. Kessler. Process for regenerating old caoutchouc and treating damaged gums vulcanized and raw gutta percha. Apr. 7.

„ 8739. A. J. Boult.—From A. H. Marks, United States. Tyre-curing or vulcanizing presses.* Apr. 15.

[C.S.] 4736 (1902). Glohensky. Vulcanizers. Apr. 23.

„ 6408 (1902). Schwarz and Meister. Manufacture of sponge surfaces. Apr. 23.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

[A.] 8507. R. Thomlinson. Improved process for treating hides, skins, and the like. Apr. 11.

„ 8594. W. D. Quigley and J. H. Gay. Machines for splitting skins or hides.* Apr. 12.

[C.S.] 5521 (1902). Lewin. Process for the treatment of smooth or wavy-haired skins so as to give the same the appearance of Persian or Astrakan skins. Apr. 23.

XV.—MANURES, Etc.

[C.S.] 1304 (1902). Milne, and W. and H. M. Goulding, Ltd. Disintegrating machines, especially intended for manures and the like. Apr. 23.

„ 3128 (1902). Brookes.—From H. J. Merck. Apparatus for comminuting or disintegrating superphosphates. Apr. 16.

XVI.—SUGAR, STARCH, and GUM, Etc.

[A.] 8685. J. Robin-Langlois. Improved method of and apparatus for rapidly refining white sugars. Apr. 14.

„ 9048. A. Kollrepp and A. Wohl. Improved process of purifying sugar juices. Apr. 18.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 8223. T. Stone. Improved machine for cleansing the interior of beer or other casks. Apr. 9.

„ 8332. F. R. Japp. Purification of alcoholic liquids. Apr. 10.

„ 8346. H. Ammon and K. Drechsler. *See under* XVIII A.

„ 8420. B. H. Remmers. Treating distillers' and brewers' slop, burot or pot ale, or the like. Apr. 11.

„ 8944. J. M. Waters. Destruction of fusel oil from raw spirits by a combined mechanical and chemical process. Apr. 17.

„ 9092. A. A. James and G. E. Whitehead. Kilning malt. Apr. 19.

[C.S.] 1008 (1901). Pitoy. Fermentation of liquids, and manufacture of an alimentary substance. Apr. 23. Date applied for under International Convention, June 15, 1900.

„ 25,676 (1901). Still. *See under* I.

„ 4152 (1902). Schneible. Manufacture of malt liquors. Apr. 23.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 8230. G. S. Bratby. Manufacture of coffee extract or soluble coffee. Apr. 9.

„ 8301. H. H. Lake.—From L. E. Seddon and L. D. Gironx, United States. Sterilising and preserving processes.* Apr. 9.

„ 8346. H. Ammon and K. Dreschler. Refrigerating apparatus for beverages in casks.* Apr. 10.

„ 8502. G. Pontio. Means of protecting and preserving perishable products. Apr. 11.

„ 8876. E. Donard and H. Labbé. Manufacture of a nutritious product from maize or other vegetable substances. Apr. 16.

„ 8987. H. Bender. Improved cider and fruit press. *Filed Apr. 17. Date applied for, Apr. 17, 1901, being date of application in United States.

„ 9031. H. Vaupel. Improved method for the production of artificial food for animals. Apr. 18.

[C.S.] 1008 (1901). Pitoy. *See under* XVII.

„ 7253 (1901). Verheggen, Arntzenius, Vierdag and Bijvoet. Process of preserving eggs and other aliments. Apr. 16.

„ 9936 (1901). Condron. *See under* I.

„ 1022 (1902). Bücka, Hansen, Nissen and Winmer. Process and apparatus for the production of a powdered milk preparation. Apr. 16.

B.—Sanitation; Water Purification.

[A.] 8225. S. H. Adams. Distributing apparatus for sewage or liquid. Apr. 9.

„ 8603. G. C. Kenyon. Apparatus for sanitary purposes and the like. Apr. 14.

„ 8687. S. C. Davidson. Apparatus for filtering, humidifying, and cooling air. Apr. 14.

„ 8816. H. Parker. Improved automatic portable or fixed combined precipitating deodorising tank and filter bed, and receptacle for filtered affluent for purifying water and sewage. Apr. 16.

[C.S.] 5388 (1901). McCallum. Apparatus for the application of sewage and other liquids to land filters or other purifying beds. Apr. 23.

„ 9342 (1901). Diehl and Netter. Water filters. Apr. 16.

„ 10,782 (1901). Barr and Wilkinson. Apparatus for periodically and automatically supplying and discharging chambers or receptacles, particularly applicable to bacteria beds, filters, or tanks for sewage. Apr. 23.

„ 11,202 (1901). Drummond and Drummond. Apparatus for use in softening water. Apr. 23.

„ 19,673 (1901). Colles. Apparatus for heating and purifying feed water. Apr. 16.

„ 3752 (1902). Furstenheim. Sterilising apparatus. Apr. 16.

C.—Disinfectants.

[A.] 8718. W. H. Tapp.—Improved perfumer, disinfector and deodorizer. Apr. 15.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 8083. E. Thiele.—Process for the manufacture of filaments from cellulose solutions. Apr. 7

„ 8633. E. de Pass.—From S. R. Wagg, United States. Refining engines for use in the manufacture of paper.* Apr. 14.

[C.S.] 8301 (1901). Williams and Parkin.—Process for rendering celluloid non-inflammable. Apr. 16.

„ 12,859 (1901). Eckstein.—Parchment paper provided with pattern in relief and a process for manufacturing same. Apr. 16.

„ 4383 (1902). Zühl.—Process for the manufacture of a celluloid-like substance. Apr. 16.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 8076. M. Ritter. Preparation or manufacture of plant juices for medical purposes. Apr. 7.

„ 8114. J. Y. Johnson.—From Bad. Anilin und Soda Fabr. *See under* IV.

„ 8195. F. Gaess. *See under* IV.

„ 8640, Lorimer and Co., Ltd., and T. G. Joyce. New salt of quinine. Apr. 14.

„ 8787. C. Moureu. Manufacture of useful products from hydrocarbons of the acetylene series and derivatives thereof. Apr. 15.

„ 8955. H. E. Newton.—From Farbenfabr. vorm. F. Bayer, and Co., Germany. Manufacture and production of new pharmaceutical compounds. Apr. 17.

„ 9125. O. Imray.—From E. Ritsert. Manufacture of solutions of aromatic amido-carbonic acid esters, suitable for therapeutic purposes. Apr. 19.

[C.S.] 26,353 (1901). Stephan. Preparation of medicinal compounds. Apr. 23.

[C.S.] 2129 (1902). Mills.—From Ampère Electro-Chemical Co. Production of derivatives of pinene. Apr. 23.

„ 5293 (1902). Linguer. Manufacture of and relating to a menthol derivative. Apr. 23. Date applied for under International Conventioo, Mar. 8, 1901.

„ 5387 (1902). Reimann. Process for improving tobacco and the products therefrom. Apr. 16.

XXI.—PHOTOGRAPHY.

[C.S.] 10,721 (1901). Newton.—From Farbenfabr. vorm F. Bayer and Co. Preparation of new chemical compounds, and their uses as developing means in photography. Apr. 16.

„ 579 (1902). Vathis. Processes for the production of multicolour photographic prints. Apr. 16.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 8072. R. Kenneth. Manufacture of matches and other illuminants and articles used for ignition Apr. 7.

„ 8278. G. Bower.—From A. Feraudez, Germany Construction and manufacture of "fuses" or "slow matches" for firing explosive charges or mines. Apr. 9.

„ 8647. J. H. Pleasance. Railway fog-signalling apparatus. Apr. 14.

„ 8776. C. Duttenhofer. Process for producing easily ignitible explosive materials.* Apr. 15.

„ 8820. N. C. Brodie. Manufacture of explosives Apr. 16.

„ 9043. R. Escales. Process for the manufacture of explosives of high disruptive force. Apr. 18.

[C.S.] 23,284 (1901). Fiedler. Explosives. Apr. 23.

„ 25,759 (1901). Abbot, Loomis, and Ives. Machine for making matches. Apr. 16.

„ 4781 (1902). Quinby, Sharps, and Greger. Manufacture of explosives. Apr. 16.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 4516

JOURNAL OF THE
Society of Chemical Industry.
A RECORD
FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 9.—Vol. XXI. **MAY 15, 1902.** No. 9.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Jean Levinstein.

Vice-Presidents:

...rge Beilby.
... Forbes Carpenter.
... John Clark.
...d. C. F. Chandler, D.Sc., ...LD., Ph.D., LL.D.
...of. G. G. Henderson, D.Sc.
... R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Dr. Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

...A. Brotherton, M.P.
...stace Carey.
... Edw. Divers, F.R.S.
...os. Fairley.
...of. W. R. E. Hodgkinson, ...h.D.
... Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

CANADIAN.
...of. W. R. Lang. | Alfred Burton.

LIVERPOOL.
... Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.
...'o Hehner. | A. R. Ling.

MANCHESTER.
... J. Grossmann. | J. Carter Bell.

NEWCASTLE.
... L. Reynoldson. | P. C. Garrett.

NEW YORK.
...fford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
...Archbutt. | J. T. Wood.

SCOTTISH
... Robert Pullar. | Dr. Thos. Gray.

YORKSHIRE.
...rge Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams .....I., XV.
L. Archbutt. I., XII., XVIII.B.
J. L. Baker .....XVI., XVII.
H. Ballantyne .....II., XII.
D. Bendix .....III.
E. Bentz .....IV., V., VI.
J. O. Braithwaite .....XX.
J. F. Briggs .....XVI., XVII.
J. H. Collins .....X.
C. F. Cross .....V., XII., XIX.
J. T. Dunn, D.Sc. .. {VII., X., XI.
Walter C. Hancock, B.A. .... } VIII., IX.
J. W. Hinchley. {I., X., XIII., XXI.
H. Ingle, Ph.D... {V., VI., XII., XIII.
R. L. Jenks .....XIV., XIX.
J. B. C. Kershaw .....VII., XI.
M C. Lamb .....VI., XIV.
T. A. Lawson, Ph.D. ..IV., XX.
F. H. Leeds..III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... } IV., V.
J. McCrae, Ph.D. .....IV.
G. W. MacDonald, M.Sc..XXII.
W. G. McMillan {X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. .....XV.
C. A. Mitchell, B.A. ..... } XII., XXII.
A. More .....VII., XVIII
G. T. Morgan, D.Sc. ....IV., V.
F. Neurath, Ph.D. .....IV., V.
J. G. Parker, Ph.D. .....XIV.
H. T. Pentermann..... } XVI., XVII.
H. S. L. Polak....Patent List.
T. H. Pope ..XVI., XX., XXI.
F. W. Renaut .....Index.
G. H. Robertson .....XI.
Chas. Salter..... {I., II., III., XV., XVI.
M. J. Salter.....XIII.
R. Sandon.....II.
J. Shields, D.Sc., Ph.D. } .....XI.
A. Shonk .....Gen. Chem.
W. P. Skertchley {XII., XVIII., XX.
E. Sonstadt .....III., VII., X.
A. L. Stern, D.Sc. .....XVII.
E. Howard Tripp, Ph.D. } III., VII., XVI.
Charles T. Tyrer..... XX.
L. J. de Whalley, B.Sc. ..XVI.
E. W. Wheelwright, Ph.D. } XXII.
A. Wingham .....X.
Joseph T. Wood.....XIV.
A. C. Wright, B.Sc., M.A... } IV., XVIII., XX.

Notices.

ANNUAL GENERAL MEETING, LIVERPOOL, 1902.

PROVISIONAL PROGRAMME.

Wednesday, July 9th.

10.30 a.m. Council Meeting, at University College.

11.0 a.m. General Meeting, at University College.

1.30 p.m. Luncheon, at the Adelphi Hotel, by invitation of the Liverpool Section. Ladies accompanying members are invited.

3.0 p.m. Garden Party, at Seaforth Hall, by invitation of E. K. Muspratt, Esq., J.P.

8.0 p.m. to 10.0 p.m. Reception at the Town Hall, by the Lord Mayor of Liverpool.

Thursday, July 10th.

Whole Day Excursions :—

(1) Works of the Telegraph Manufacturing Co., Ltd., at Helsby. Luncheon, by invitation of the Directors of the Company. Afternoon Tea, by invitation of G. Croshaud Taylor, Esq.

(2) Excursion to Prescot :—

Morning—Works of the British Insulated Wire Company. Luncheon, by invitation of the Directors of the Company.

Afternoon—Works of the Lancashire Watch Company.

Half-Day Excursions :—

Morning—

(1) Visit to Port Sunlight Village and the Works of Messrs. Lever Brothers. Luncheon, by invitation of Messrs. Lever Brothers. Ladies are invited to join this excursion.

(2) Works of the United Alkali Co., Ltd., at Widnes. Luncheon by invitation of the Mayor of Widnes (W. W. Gossage, Esq., J.P.) and Directors of the United Alkali Company. It is hoped that it will be possible to convey members on this excursion by motor cars.

(3) Messrs. Ogden's Tobacco Factory and the Tobacco Warehouses of the Mersey Docks and Harbour Board.

Afternoon—

(1) Works of the Diamond Match Co. at Seaforth.

(2) Liverpool Corporation Electric Power Stations.

7.30 p.m. Annual Dinner at the Adelphi Hotel.

Friday, July 11th.

Whole Day Excursion to Llandudno and Beaumaris by Saloon Steamer "St. Elvies."

9 p.m. Smoking Concert at the Reform Club.

A detailed programme, with request forms for tickets, will be issued with the Journal of May 31.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are placed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Ivan Levinstein has been nominated to the office of President for a second year, under Rule 10; Mr. E. Grant Hooper, Dr. F. B. Power, Prof. Wm. Ramsay, F.R.S., and Mr. Thos. Tyrer have been nominated Vice-Presidents under Rule 8; and Dr. John Clark has been nominated a Vice-President under Rule 24.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Members are hereby invited to nominate fit and proper persons to fill four vacancies among the Ordinary Members of Council. Forms for this purpose can be obtained, on application, from the General Secretary, or from the Hon. Local Secretaries of the Canadian and New York Sections.

Extract from Rule 18 :—"No such nomination shall b valid unless it be signed by at least ten Members of th Society who are not in arrear with their subscriptions, no unless it be received by the General Secretary, at th Society's Office, at least one month before the date of th Annual General Meeting, to the election to take place a which it refers. Nor shall any such nomination be valid i the person nominated be ineligible for election under Rule 12 or 15. No member shall sign more than one nominatio form."

THE CORONATION.

The Society will be glad if any Members not resident i Great Britain will intimate to the General Secretary at th earliest possible date if they intend to be in London at th time of the Coronation.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use o spirit (alcohol) having become pressing, the Counci would be obliged if those members who are intereste in industries, in which partially or wholly duty-free spiri would be of advantage, would inform the Secretary i what way the power to use spirit duty-free for manu facturing purposes would affect their industries, giving, a far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Grea Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures i regard to foreign competition.

4. As to the branches of industry which the duty o alcohol has crippled or destroyed.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with informatio at as early a date as possible, the Journal is now issue twice a month, and contains abstracts of French an American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of th Society must be proposed according to the form set out i Rule 26. He must be proposed by one or more Membe to whom he is known personally. The proposal form mus be sent duly signed to the General Secretary, who shall la the same before the Council at its next Meeting. If th majority of the Members of Council present are in favou of his election, the Candidate shall be declared duly elected and his name shall be entered in the Register of the Society At whatever period of the year a new Member may b elected, he shall be required (unless the Council shall dete mine otherwise) to pay his subscription for that year having done which he shall be entitled to receive all th numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, an may be obtained from the General Secretary, or from an of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industr hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
.....
And I, the said Candidate for Membership, hereby declare that elected I will do my best to support the Society, and will obser its Bye-laws.
Signature of Candidate.....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....
Profession or Business Occupation .....
Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription Twenty-five Shillings, due on the First of January in ea

ar; except that any Member may pay a life composition of Twenty Pounds in lieu of an annual subscription. He ill also pay, on receipt of notice of election, an entrance of One Guinea in addition to his first year's subscription; cept that should a Member who has paid an entrance fee ign and subsequently seek re-election the Council may pense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or of its Local Sections, are requested to take notice that ler Rule 43 of the Bye-laws the Society has the right of ority of publication for three months of all such papers. ringement of this Bye-law renders papers liable to be ected by the Publication Committee, or ordered to be tracted for the Journal, in which case no reprints can furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical ustry and Public Analysts have now submitted their ort, prescribing a method for dealing with the various stances which might contain Arsenic, and the report has n accepted by the Council.

Copies of this, together with the papers, discussions, and tracts which appeared in the Journal in 1901, and other racts, may be obtained from Messrs. Eyre and Spottisode, price 1s. per copy, or 1s. 1½d. post free.

A meeting of the Society of Public Analysts will be held Wed., May 21st, at 8 p.m., at the Chemical Society's oms, Burlington House, W., to discuss the report of the nt Committee of the Society of Chemical Industry and iety of Public Analysts on the Detection and Determiion of Arsenic, at which members of this Society are ited to attend.

LIST OF SECTIONAL COMMITTEES.

n future, the list of Sectional Committees will appear e a month only, in the second number.

Changes of Address.

When notifying new addresses, members are requested to e them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be ided as tending to create confusion. When sending scriptions, the use of the form attached to the application os in the verification of addresses, on which the safe very of the Journal depends.

hhold, Dr. G., l/o Imperial Starch Co.; P.O. Box 283, Prescott, Ont., Canada.

ley, Dr. T. Lewis, l/o Brownlow Street; University College, Liverpool.

ry, A. E.; Journals to 95, Osborne Road, Forest Gate, Essex.

es, W. A., l/o Cornwall; c/o W. O. Hemingway, Poplar Grove, Wapella, N.W.T., Canada.

k, Arthur J., l/o Hackney; 14, Peacock Street, Liverpool.

is, W. Walley, l/o Bristol; c/o Virginia Iron, Coal, and Coke Co., Roanoke, Va., U.S.A.

ar, Alex. H.; Journals to c/o The Linoleum Manufacturing Co., Staines.

s, Wm. G. (*not* M. C., as given wrongly in list), of Bedford Park P.O.; Journals to 31, Wellington Street, Toronto, Canada.

on-Smith, J., l/o Penketh; 20, Bold Street, Warrington.

nshaw, H., l/o Sunnyside; Parkside, North Road, Clayton, Manchester.

derson, J., l/o Stockton; Wolverton, Dunottar Avenue, Eaglescliffe Junction, near Stockton-on-Tees.

pelmann, A. J., l/o Germantown; P.O. Box 1549, Philadelphia, Pa., U.S.A.

Levinstein, Ivan; Journals to Crumpsall Vale Chemical Works, Crumpsall, near Manchester.

Littlejohn, Jas.; Journals to African (*not* South African) Banking Corporation, Johannesburg, Transvaal.

Mathew, W. de Vere, l/o Orlando Road; 23, South Side, Clapham Common, S.W.

Ogden, R. L., l/o Otto; 314, North Main Street, Bethlehem, Pa., U.S.A., Chemist (U.S. Navy).

Richardson, D. B.; Journals to Glen-Aros, Isle of Mull, N.B.

Schulze, E. A. F., l/o Balham Hill; 80, Sistova Road, Balham, S.W.

Shields, Dr. Jno., l/o Bryanston Square; 4, Stanley Gardens, Willesden Green, N.W.

Spence, Jno. D., l/o Dundee; 415, Ashton New Road, Clayton, Manchester.

Steinmetz, C. P.; l/o Research Laboratory; Publication Bureau, General Electric Co., Schenectady, N.Y., U.S.A.

Van der Linde, Harold, l/o 61; 47, Front Street West; and (Journals) 101, Tyndall Avenue, Toronto, Canada.

Wright, Sydney B., l/o Canada; c/o Ponsonby and Bolton, 48, Queen Street, Melbourne, Vic., Australia.

Wright, Walter J., l/o South Road; 11, Albion Terrace, Faversham, Kent.

MEMBER OMITTED FROM LIST.

O.M. Watson, John, c/o Zululand Mica Co., Entumeni, *via* Eshowe, Zululand, South Africa, Technical Chemist.

Death.

Glover, John, 20, Holly Avenue, Newcastle-on-Tyne. April 30.

Manchester Section.

Meeting held on Friday, April 4th, 1902.

DR. J. GROSSMANN IN THE CHAIR.

DISCUSSION ON THE PROPOSED MANCHESTER CORPORATION GENERAL POWERS BILL, RELATING TO THE DISCHARGE OF WORKS' EFFLUENTS.

After the election of officers,

The Chairman said he hoped it would be understood that the Section approached the subject in a friendly spirit. They all had full confidence in the Corporation that they had no intention to interfere with the interests of those ratepayers who had invested large sums of money in commercial undertakings, on the understanding that their business would not be injuriously interfered with. The danger which was always connected with bills of this kind was, that the wording might be so ambiguously put that it might allow at any time of a much wider construction than was originally intended.

Mr. J. Craven, in opening the discussion, expressed the fear that by the clauses formulated in the Bill, the chemical manufacturers were going to be subordinated to the successful working of the bacterial system of sewage treatment as carried out at Davyhulme. If the Manchester sewage did not suit the bacterial sewage system, the Corporation would be justified in spending any amount of money within reason to introduce such a sewage scheme as would make it unnecessary to harass any manufacture. The Corporation, he claimed, ought to protect local industries, but he feared that, under this Bill, chemical manufacturers were going to be enormously harassed. He agreed that chemical manufactures should be controlled, but it could not be expected that the effluent which left chemical works should be pure water. He objected to the clauses on the ground that they were ambiguous, and he thought the powers of entry and inspection which were sought were too large.

Dr. DREYFUS said that Mr. Craven was under a misapprehension in thinking that the Corporation were seeking these powers with a view to correct the bacterial system of sewage treatment. As a matter of fact, the Bill had nothing whatever to do with that system, and it was not the rivers committee that had proposed the clauses objected to, but a special committee. In May last, there had been an explosion in a main sewer of the Corporation, causing great destruction of property and alarm to the inhabitants of the neighbourhood. A special committee (of which he had been chairman) had investigated the cause of that explosion, and it had been found that, by accident, some carbon bisulphide had found its way into the sewer from a chemical works, and that an explosion took place upon a worker in the sewer striking a match. This explosion took place on the top of many complaints from the inhabitants of that particular neighbourhood, and the Home Office called the attention of the special committee to a London County Council Act, from which the clauses now complained of had been copied almost exactly. The Corporation sought these powers, not because it was afraid of the effect of the present effluents upon the bacterial system of sewage treatment, but because it was thought that additional powers were necessary for the protection of the lives of the men working in the sewers, and the health of the people of Manchester. He spoke as a chemical manufacturer himself, and he had not the remotest fear that any chemical manufacturer would be unduly pressed by the provisions of the Bill. There had been no complaints from the London manufacturers in regard to the working of the London County Council Act.

Mr. Councillor GRIMSHAW said the only object which the Corporation had in view in seeking the power by these special clauses was an easier method of procedure against offenders than was afforded under the Public Health Act, just in the same way that the Mersey and Irwell Joint Committee can proceed under their powers, instead of by the old Rivers Pollution Act, and thereby save legal expenses.

Mr. A. J. KING thought Dr. Dreyfus had misunderstood Mr. Craven's remarks. Mr. Craven did not refer to the condition of the sewers so much as to the words at the end of section B, "or works of the Corporation," which he thought might very well be omitted.

Dr. ANGEL said he could offer a solution of the difficulty, and one which would confirm Dr. Dreyfus' statement. He believed the origin of the Bill had no connection whatever with bacterial treatment, but was brought about by the action of the Manchester and Salford Sanitary Association, of which he had been an active member for many years. For some time there had been serious complaints by the people in Ancoats of their houses at certain times being utterly uninhabitable, in consequence of the noxious fumes rising from the sewers.

Mr. HERBERT PORTER, Government Inspector of Alkali Works, suggested a conference between the Corporation and chemical manufacturers, whereby they might come to some practical conclusion, in a friendly spirit, as to what is a satisfactory effluent or what is not, as was done between the Local Government Board and the alkali manufacturers.

Dr. BAILEY said, with reference to Dr. Dreyfus' assurance that the Bill was not intended to press harshly upon manufacturers, that it was a question what interpretation would be put upon the words objected to if a case came into Court. He thought no ambiguity should be allowed to remain.

Mr. FRANK SCUDDER said he was somewhat surprised to hear that certain members of the section doubted the wisdom of bringing this matter before the Society for debate. In 1882, a paper was read before the Society on "Some points of Legislation affecting Manufacturers," and in the discussion which followed, Mr. Howard stated: "I have never heard of anyone who has found it pay to fight public bodies." An exception to this observation is, however, to be found in the London County Council (General Powers) Act, 1894, which was said to be similar to the Act now sought by the Manchester Corporation, and in which it would be observed that the brewers had obtained, in clause 14, permission to introduce into a sewer an effluent that "does not contain any greater proportion than 3 cent. of solid refuse," that is to say, that a brewery effluent that contained 2,100 grains of solid matter per gallon would be admitted into a sewer. That clause had, however, been left out in the Manchester Bill. Having considered the regulations for admittance of trade refuse into the sewers of Manchester, which have been in force for some time, one cannot help asking the question: "Why are such more stringent regulations required?" The Manchester Corporation (General Powers) Bill differs in several important points from the London County Council (General Powers) Act of 1891. In the first place, clause 19 of the Manchester Bill regulates the discharge of solid matter or refuse into sewers, yet, by some means, the term "suspended matter" has been inserted, and it does not occur in the London Bill. This requires some explanation, inasmuch as an effluent from a manufacturing process that contained no suspended matter would commit an offence against this part of the Act. On the other hand, the Manchester Corporation have, in their regulations, defined an effluent to be admitted to the sewers as one "free from solids in suspension beyond 15 grains to the gallon." In the second place, clause 20 in the Manchester Bill regulates the discharge of injurious liquid refuse, but contained the additional words "but inclusive of gases, vapours, or gaseous matter," which are not contained in the London Bill. Moreover, liquid refuse is referred to as "offensive" liquid, and in the Manchester Bill as "injurious" liquid. Lastly, clause 8 of the Manchester Bill gives the Corporation power to take proceedings under any other Act, but debars the manufacturer from the protection that Acts of Parliament and rules of law provide. It would be well for the manufacturers to consider whether the existing law clearly defines the rights of the manufacturer to connect the drains to his factory to the sewer of the local authority, and to what extent his position and rights are affected by compliance with the regulations of the local authority. If he think that the law does not properly protect manufacturing interests, in what way would he suggest its alteration. The local authority must make such provisions as will secure that the manufacturing effluent shall be delivered into the sewers in such a condition and in such regular quantities as not to cause a nuisance or be injurious to the sewers or injurious to health. Another question that the manufacturer may have to face is whether a special rate ought not to be levied on the manufacturer who is allowed to discharge manufacturing effluent into a sewer. Why should the community be taxed with the treatment of manufacturing effluent in order to make a gift to the manufacturer? Fortunately, the Royal Commission on Sewage Disposal have come to the assistance of both manufacturers and local authorities in this direction, and have afforded facilities to the manufacturers to give evidence on this important subject. He hoped that the manufacturers would take up the question with zeal, and that the members of the Society would assist in solving the difficult problem.

New York Section.

Meeting held at the Chemists' Club on Friday, March 21st, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

BLUE-PRINT AND BLACK-PRINT PHOTOGRAPHIC PAPERS, AND THEIR PREPARATION.

BY ALFRED I. COHN.

The introduction of blue-print paper as an article of trade is due to the observation made by Sir John Herschel, in 1840, that ferric ammonium citrate (and, in fact, many other ferric salts) is reducible to a ferrous salt by the

ction of sunlight. This observation led him to utilise the arious colour reactions given by the iron salts, and to pply them practically in the reproduction of plans, designs, c. Thus he was the first to sensitise paper with a solu- on of ferric-ammonium citrate, and develop it with otassium ferricyanide (the ordinary blue-print paper), or ith gold chloride (the chrysotype process, yielding white nes on a purple ground). He was also the first to make ositive blue prints, by developing the paper, sensitised as bove, with a solution of potassium ferrocyanide and gum acia; by exposing paper sensitised with a solution of otassium ferricyanide; and by developing ferric-chloride aper with calcium-iodide and starch solution, whereby e iodine is liberated, and reacts with the starch.

The methods employed by Herschel were not, however, ommercially utilisable, because the prints obtained were ot uniformly good, whilst the process was too inconvenient nd not sufficiently rapid. Another serious defect was the stability of the prepared paper. The paper, when just ade, gave good results, but on keeping a few days, some- mes even a few hours, the whites of the prints were no nger white, but varying shades of greenish-blue. It on became necessary to have greater certainty and sim- icity, and a number of experimenters attacked the problem, th varying success.

Almost every ferric salt was tried in the endeavour to ake a more stable paper. Among the salts tested were rric chloride, usually in conjunction with oxalic, tartaric, tric, lactic, or other organic acid, ferric-ammonium trate, tartrate, and oxalate, and ferric-sodium oxalate. errie chloride, together with oxalic acid, is by far the ost rapidly affected by light, but the paper prepared with e mixture deteriorates very rapidly, even in the dark. he one found most suitable was the ordinary ferric- mmonium citrate, occurring in the well-known form of rown scales. This salt was the one chiefly used for many ears, and until a modification of the salt in the form of ndsome green scales was prepared. This form was und to be not only far more sensitive to light, but to be ore stable as well, and hence it is the one most largely in e to day in the manufacture of blue prints. This green lt differs from that occurring in the form of brown scales having a smaller iron content. It is made by a modifi- tion of the method used in manufacturing the ordinary lt.

In the manufacture of blue-print paper a number of ecautions must be observed. The mechanical difficulties ill be treated of when discussing the machinery employed sensitising the paper. In preparing the solution, the otassium ferricyanide should first be washed, *i.e.*, it should shaken with a little cold water to dissolve the exterior ating of the salt, because, as Herschel has shown, the lt is reducible by light, and if it has been kept for a while d particularly exposed to strong light, the surface of the ystals will have undergone a slight decomposition, and nce, when making the prints, perfectly white lines will t be obtained. It is well not to keep the solution of rric-ammonium citrate on hand long, as it soon becomes ouldy and spoils; it is, therefore, better to prepare blue- int solution just before using. Solutions for sensitising ve been made of varying strengths by different experi- enters, the proportions varying between 8 to 12½ per cent. r the ferric-ammonium citrate, and 4½ to 8 per cent. for potassium ferricyanide. An excellent solution may be ade from 12·5 grms. of the green ferric-ammonium citrate, 5 grms. of potassium ferricyanide, and 100 c.c. of water. ie solution should be filtered, and the application to the per made by gaslight—never by daylight.

Due regard must be had to the quality of the paper elf also. A good quality of well-sized paper gives the st results. If the paper is unsized, or not sufficiently ed, the solution soaks in too far, sometimes almost to back of the paper, and it is then difficult, if not possible, to get pure whites; furthermore, the prints ume a dull colour.

Ordinarily, care should be taken to work with a neutral ution, for if a few drops of ammonia or other alkali added to the solution, the finished print, whilst it will have a remarkably handsome dark-blue colour with a coppery lustre, will fade on exposure for some time to light; whilst, if the solution be acid, the keeping qualities of the prepared paper are impaired.

Blue prints may also be toned or changed in colour by various substances; for instance, on immersing the finished print in a very weak solution of ammonia the blue of the print is decomposed, and in its place appears the reddish-brown of ferric oxide. On now immersing the print in a solution of tannic or gallic acid, a black colour is developed in place of the original blue. Potassium sulphocyanato would give a red. Of course, it is understood that, under a positive drawing or design, a negative print, *i.e.*, a print showing the design in white lines on a blue ground, results; naturally, when toning blue prints, the corre- sponding prints are also negatives.

Mention has already been made of the positive blue prints obtained by Herschel. These, as made by the latter, were poor in colour, nor could the paper be made to yield prints of uniform appearance, because of the sinking-in of the solution too deeply into the paper. The beauty exhibited by well-finished prints, however, led a number of investigators to experiment with this process with a view to its improvement.

The first notable improvements were made by Henri Pellet, in 1881. This experimenter used a mixture of ferric chloride with either oxalic acid, sodium citrate, tartaric acid, or citric acid; or a mixture of ferric chloride with ferric-ammonium citrate, and developed the prints with potassium ferrocyanide. In this process, too, good results could not be obtained, chiefly because of the fact that the acid used rendered the ferric chloride too readily prone to change. It remained for Messrs. Pizzighelli and V. Hterheim to modify Herschel's process, and devise a method that would give uniformly good prints. The mixture they proposed is as follows:—(1) Gum acacia, 20; water, 100. (2) Ferric-ammonium citrate, 50; water, 100. (3) Solution of ferric chloride, 50; water, 100. Of these solutions, first mix 20 vols. of No. 1 with 8 vols. of No. 2, and then add 5 vols. of No. 3. This order of mixing must not be departed from, otherwise the mixture will be useless. The mixture when made thickens in a few minutes to the consistency of soft butter. It is set aside over night to "ripen," and used the next day.

In this process, it is absolutely essential to use a well-sized paper, otherwise a clear print cannot be obtained. The proportions of the two iron salts may be varied somewhat without danger, but that of the gum should be as stated, for if more be used, the solution cannot be applied uniformly to the paper, and the finished prints will hence show blue spots which are sometimes very troublesome to remove. On the other hand, if less gum be used, the solution will sink too far into the paper, and the finished prints will be either blnish throughout or will be very dull and "flat."

The development is effected by applying a 20 per cent. solution of potassium ferrocyanide with a brush, passed over the print in parallel strokes. The image starts out in pale-blue lines on a greenish-blue ground. The print is then immersed in very dilute sulphuric or hydrochloric acid, in which the image becomes at once deep blue, whilst the greenish blue ground disappears and gives place to a pure white. The print is then finished by washing thoroughly with clean water, to remove the acid, which, if left in the paper, would soon render it brittle. Any spots on the print, should such occur, may be removed by the cautious application of a caustic-soda or potash solution, followed immediately by a liberal supply of clean water. The finished prints are very handsome in appearance. One experimenter, Dr. Zoellner, in 1863, devised a method whereby paper sensitised with a solution of ferric chloride and ferric oxalate was developed with a solution of potas- sium iodide in albumin—in fact a variation of Herschel's process.

Whilst these negative and positive blue prints are very handsome and serviceable, the ideal print was nevertheless considered to be one that would present a fac-simile of the tracing or design in black characters upon a white ground.

This result was first accomplished by Poitevin, in 1860, who sensitised paper with a mixture of ferric chloride, tartaric acid, and water. A paper so sensitised presents a yellow appearance, but on exposure to light, it becomes colourless, because the green ferrous chloride, to which the ferric is reduced by light, is colourless in very thin layers. The paper prepared by Poitevin gave prints, but bad ones, because the solution invariably sank deeply into the paper, sometimes to the very back, with the result that the developed image frequently appeared stronger from the back than from the face of the print. The development was effected by plunging the print into solutions of gallic or tannic acid, hence the iron deep in the paper, not being completely washed out, invariably imparted a decidedly purple colour to the background.

Later experimenters modified Poitevin's process with a view to prevent the deep penetration of the sensitising solution into the paper. These modifications consisted in adding gum acacia, starch, gelatin, arrowroot, or other similar substance to the solution, thus keeping it more on the surface of the paper; or, the paper itself was first sized with these gummy substances before the solution was applied; in some cases both methods were combined. The general composition of the solution was retained, however, with but slight modifications. For instance, some experimenters added a little ferrous sulphate and sodium chloride, some replaced the tartaric acid by oxalic acid, some added a little ferric sulphate solution; others added some ferric subsulphate, &c. It remains to be said, however, that all of these processes required the development, after exposure of the paper in a solution of gallic or tannic acid. Nor could any of the papers be made to remain in a serviceable condition for a sufficient length of time to make them commercially practical.

The necessity of developing by using a solution of gallic or tannic acid was also an inconvenience, and a demand arose for a paper that would afford black lines on a white ground, but which would require no other treatment for developing it than simple immersion in water. The problem here presented was a very neat one. Practically it was thus:—Prepare an aqueous solution which, when applied to paper, would be sensitive to light; the parts of the paper untouched by light should, however, be blackened on contact with water, while the light-affected parts should not.

Some 10 years ago, the author undertook to study this problem, and succeeded to a certain extent in solving it. The well-known fact that ferric chloride gave no reaction with tannic or gallic acid in the presence of strong mineral acids was used as the starting point in the investigations. All the inorganic acids, as well as all the organic ones that could be considered as eligible from a commercial view, were tried. It was soon found that the inorganic acids could not be used, as either the paper did not print at all, or did so too slowly.

Oxalic acid was found to be the best, so far as rapidity of printing was concerned, provided the paper could be used at once. Other organic acids, such as tartaric, lactic, &c., were also useful, but larger quantities were required. The proportion of acid to the ferric chloride and tannic or gallic acid could not be fixed to a constant, as various papers required varying quantities of acids.

Of all the papers tried, only one has been found that could in any way be relied upon, and this is the Steinbach paper, made especially for the black-print process; but even with this, the sensitised paper is with difficulty made to keep sufficiently long for commercial purposes.

After a long series of experiments it was finally found that a mixture of oxalic and tartaric acids gave the best results, using, however, a mixture of tannic and gallic acids also.

Some of the difficulties encountered are as follows:—When too much acid is used, the print washes entirely (or nearly so) off in the development; further, the paper in a short time becomes so brittle that it may be readily and easily crumbled almost to dust in the hand. (The author has observed this phenomenon also on keeping some tartaric acid in paper for a while, the paper becoming very brittle, and crumbling on the slightest touch). This is most likely due to the formation of hydrocellulose from the action of the acid on the paper. Again, if too little acid be used in the solution, the sensitised paper rapidly becomes darker and darker and finally almost black, and either does not print at all, or requires so long a time to make the paper useless commercially. Paper sensitised with solutions containing ferric chloride and some organic acid print more quickly than when other ferric salts are used, but such papers are far more unstable than the others, due to the fact that the organic acids themselves act as reducers of the ferric salt, even in the dark, and the ferrous salt so formed promptly proceeds to become oxidised, not to a ferric state, but to an *oxysalt*, which affords the reactions given by ferric salts, yet is insensitive to light, even in the presence of organic acids, &c.

So far as the author is aware, no positive means have as yet been found to prevent this change from occurring, nor from the nature of the chemical, and the conditions under which it is here used, are any likely to be found.

Besides the processes in which iron salts are used for preparing sensitised papers yielding positives (from positives), there are also others, based on the employment of salts of chromium, manganese, cobalt, and cerium, and also of certain diazo compounds.

When a bichromate is exposed to the action of light in contact with organic matter, such as gum acacia, gelatin, glue, starch, &c., it undergoes reduction to brown chromic chromic oxide, whilst the gelatin, gum, &c. become "tanned." This action, whereby the gum, &c. is hardened and rendered insoluble even in hot water, was discovered by Fox Talbot, in 1852, and on it are based a number of methods of reproducing designs which are of great commercial value.

It will, of course, be readily understood that, in using a paper sensitised with a mixture of gum, &c. and bichromate, the development either of the light-affected parts, or of those covered by the lines of the drawing, &c. may be effected. In the former case, the print is first well washed after exposure, in order to remove all the bichromate and gum not affected by the light, and which is still soluble in water. In the latter case, the parts unacted upon by light are directly developed by various chemicals, *e.g.*, with salts of lead (yellow), silver (red) and mercury (brown); by using a hot solution of logwood a black print results.

It was further found that, if the sensitised paper, after exposure, were moistened, all the parts, not affected by the light, absorbed more or less moisture and swelled up, whereas all the light-affected parts remained perfectly dry and hard. A roller charged with ink could now be passed over the print, when the ink would adhere to all the dry parts of the print, whilst the moist parts would take up none at all. The print so made could now be either allowed to dry, or a copy of it could be made by simply pressing a clean sheet of paper over it. Of course, the copy would be reversed in position, but if the original print be made in reverse, a direct copy would result.

Another utilisation of the hardening of the bichromated gum (or gelatin) mixture consisted in adding carbon black (or even some coloured pigment) to the sensitising liquid before applying it to the paper; or, in sensitising paper coated with carbon black (or some pigment) and gelatin with a bichromate solution. In this case the prints are developed after exposure by washing in water, the parts not affected by light readily washing off, whilst the light-affected parts, having been rendered insoluble in water, remain.

Whilst the theory of making these prints is correct, the actual realisation of good prints is very difficult, because the pigment added prevents the light from striking through the film of sensitised substance to the paper. The consequence is that only the surface becomes insoluble, and when developing, the sensitive film washes free from the surface in spots, according to the intensity of the lights and shadows. To obviate this drawback, the prints have been exposed with their backs to the sun, and in contact with the face of the original. This method too, is troublesome as the appreciable thickness of the sensitised paper permit

e light to be partially diffused under the lines to be pied, hence the lines on the print will not be so sharp or an as they should be; furthermore, although the sensitive n is affected by the light next to the paper, the upper er is not at all affected, hence it washes away during velopment, and the resulting print is apt to be weak in lour.

In an attempt made to increase the sensitiveness of the n, it was found that sodium bichromate was more sensi- e than the potassium salt, whilst the ammonium salt was e most sensitive of the three. It was further found that e sensitiveness could be still further increased by neutra- ng half the solution of the bichromate used with ammonia, l then adding this to the reserved half. By means of a ution so made, fairly good results may be obtained. Of three salts, however, the sodium salt is best adapted for e purpose; it is, moreover, much more freely soluble than potassium salt.

The fact that bichromates are powerful oxidisers, and are pable of affording light-resistant colours with aniline, was lised by Willis in the process devised by him, and known the "aniline process."

In this process, paper sensitised with potassium bichromate after exposure, subjected to the vapours of aniline, the ult being that all the parts not affected by light are kened in colour on contact with the aniline vapours, from oxidising action of the bichromate on the aniline, aniline ck resulting. It was found, however, that the bichro- te alone did not give good results, and that good prints ld be obtained only when an acid was present. Further, addition of an acid appeared to greatly increase the sitiveness of the paper, but only up to a certain point, ond which it again declined. The solution which was nd to afford the best results was one containing 5 per t. of bichromate and 50 per cent. of phosphoric acid.

Paper, sensitised with a solution so made, prints very idly, $\frac{1}{2}$ to 1 minute in direct sunlight being sufficient ler a good tracing. The prints are developed by sus- ding them from small wooden spring pinch-cocks, in a tical drawer or cabinet, below which is a box containing ton waste, or other suitable material, upon which is ired some raw aniline, and into which steam is conducted. e prints thus hang in an atmosphere highly charged with line and steam. After the development, the prints are l washed with water.

The finished print, if properly made, is quite handsome, very permanent. In this process, the exposure must very accurately timed, and good judgment displayed in development. An under-exposed print will acquire a k-greenish background which cannot be remedied in mmercial practice; if over-exposed, the lines of the print be very weak or altogether absent. At times, the lines he print will have a greenish hue; when this occurs, it y be remedied by immersing the print, after washing, in er to which a few drops of ammonia have been added. this bath the lines acquire a bluish-black colour. It is ther essential, in this process, that *crude* aniline be used— very refined or pure aniline either does not develop at or does so very unsatisfactorily.

ome 10 years ago, Messrs. A. and L. Lumière carried out eries of investigations with a view to utilising the salts manganese, cerium, and cobalt, in photo-reproductive cesses. The authors soon found that these salts were ellently adapted for the purpose. Of all the manganese s, manganic oxalate was found to be the most sensitive, ineligible because of its instability. After experiments ering all the organic acids, lactic acid was found to be best for preparing a sensitive solution; and, further, addition of some potassium formate considerably reased the sensitiveness of the solution so made, without pairing the keeping qualities of the prepared paper. The cess followed by the authors for preparing the solution manganic lactate was as follows:—Potassium perman- ate, 6 grms.; distilled water, 50 grms. Dissolve, and slowly under stirring: lactic acid (sp. gr. 1·225), c.c.; after which, add potassium formate, 3 grms. The solution is filtered, and applied to paper previously ted with a thin layer of gelatin. The paper so sensi- tised is exposed under a positive, an exposure of a few minutes sufficing to completely reduce the manganic salt to a manganous. The parts unexposed to the light are then developed by various amines, phenols, &c.; different colours being obtained according to the developer used. For instance, aniline yields a green colour; paratoluidin, a red; xylidin, a yellowish-brown; benzidine hydrochloride, a deep blue; guaiacol, orange; resorcin, pale yellow; paramidophenol hydrochloride or sulphate, brown; and pyrogallol, violet-black.

Positive prints may also be obtained from positives by using salts of cerium. Among these, ceric sulphate and ceric nitrate are best adapted for use. Paper is sensitised with a solution of one of these salts just as is done with the manganic lactate solution, and is exposed under a positive. When all the parts exposed to the light have become colourless, the print is developed and fixed by simply treating with a solution of an amine, phenol, &c., just as is done with manganese prints. For instance, aniline and its salts give green prints; alpha-naphthylamine, blue; amidobenzoic acid, brown; parasulphanilic acid, red; orthotoluidine, green; an ammoniacal solution of aniline, violet, &c.

The cobalt salts, too, are adapted for photographic reproductions. The solution best adapted for the purpose is made by dissolving cobaltic hydroxide in a concentrated solution of oxalic acid. Paper sensitised with this solution is green. On exposure all parts affected by light acquire a rose-red colour.

The print may be developed either as a positive or as a negative, according to the developer used. For instance, after exposure under a positive, if the print is developed with a solution of hematoxylin, a red positive is obtained; benzidine, tolidin, and their hydrochlorates yield deep blue prints, changed by ammonia into brown, and by hydrochloric acid into pale yellow.

If it be desired to develop the reduced or light-affected parts, the print is first immersed in a 5 per cent. solution of potassium ferricyanide, and then thoroughly washed in water to remove all the unchanged cobalt salt from the paper. The print thus made has a pale red colour, which is converted into more intense and different colours by various substances. For instance, on treatment with an alkali-sulphide compound, the cobalt ferricyanide on the paper is converted into cobalt sulphide. If an iron salt be used, a blue colour results; with nickel salts, a red print is produced, &c.

In addition to the processes previously described, may be mentioned also the process invented by Messrs. Green, Cross, and Bevan, in 1890, and known generally as the "Primuline" or "Diazotype" process. It, too, affords positives from positives, the prints being producible in various colours, according to the developer employed.

This process depends upon the fact that when primuline (the sodium sulphonate of a complex amido base, obtained by heating paratoluidine with sulphur) is diazotised, it affords a diazo compound which is not only very sensitive to light, but is capable of affording a number of colour reactions with various amines, phenols, &c.

The process is carried out as follows:—The fabric (paper, cloth, silk, &c.) is dyed in a hot solution of primuline (15 to 30 grains to the gallon), then washed in cold water, and then immersed for about half a minute in a 0·25 per cent. solution of sodium nitrite strongly acidulated with hydrochloric or other acid. The fabric so treated is again washed in cold water and dried, when it is ready for printing. The exposure takes place under a positive, and when complete the print is developed in the colour desired by using the proper developer, usually in weak (about 0·25 per cent.) solution. The following colours are obtained by using the developers, all in alkaline solution:—Betanaphthol, red; betanaphthol disulphonic acid, maroon; phenol, yellow; alpha-naphthylamine hydrochlorate, purple; with eikonogen in neutral or slightly acid solution, blue to black.

In another process patented more recently by A. Feer, diazo compounds are treated with an alkali bisulphite, and are thus converted into diazo sulphonates. These com-

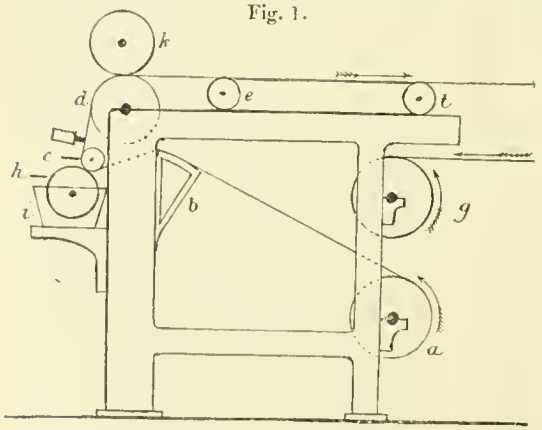
pounds are sensitive to light, the action of which is to set free the diazo group from its combination, but they give no reaction with amines or phenols as do the diazo compounds. Hence the mixture of a diazo-sulphonate with the latter remains uncoloured so long as it is kept in the dark, but on exposure to light, the diazo group is liberated, and immediately reacts with the amine or phenol present, and an azo colour develops on the paper to which such a mixture is applied. Of course, this process gives a positive only when a negative is printed from.

The sensitising of paper must be accomplished by means of a suitable machine in order to enable a perfectly uniform coating to be applied—and *uniformity* of application is *absolutely essential*, particularly in the case of the black print paper, in order to obtain a paper that will print evenly throughout. In an experimental way small pieces may be sensitised by hand, with certain precautions, but fine prints must not be expected, because contact of the sensitising solution with one part of the paper for a second or two longer than with another part will give the former part more time for a greater quantity of solution to be taken up by the paper; and this will cause one part to be over-printed on exposure, whereas that more heavily charged may not be sufficiently printed.

To sensitise small pieces by hand, the best way to proceed is as follows:—Cut the paper into strips from 3 to 8 inches wide (a greater width will be difficult to handle), and about 30 to 36 inches long. Pour the filtered sensitising solution into a square, shallow dish, one side of which must have a perfectly smooth, level edge. Now take hold of the strip of paper at the two ends and allow it to hang in the form of a festoon, then let the lower surface of the paper just touch the surface of the liquid and pass it along, managing so that the entire surface of the paper comes into contact with the liquid and without any air bubbles being between them; care must be taken that no liquid comes over the edges on to the back of the paper. This feat can be readily accomplished after a little practice. As soon as the entire length of paper has been charged with liquid, bring one end of the charged surface of the paper squarely down on the smooth, level edge of the dish, taking care that the paper is in perfect contact throughout, and then slowly draw it along the edge, exerting a sufficient pressure by stretching the paper, to uniformly scrape off the excess of liquid. The strip may then be hung up to dry.

Commercially, there are two types of machines in use for sensitising paper, both operating practically upon the same principle. In Fig. 1 is shown the machine used chiefly on

Fig. 1.

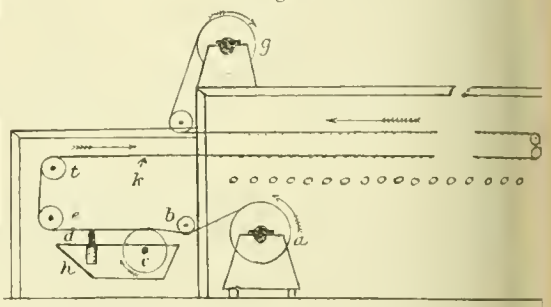


the continent. In this the framework is of iron. The roll of paper, *a*, to be sensitised, is placed on its bearings, and the paper led over an arc-shaped sheet of zinc, *b*, to afford the necessary friction and keep the paper smooth; it then passes under the roller, *c*, and over *d*. From this the paper is taken up and carried over an endless felt belt, stretched over the rollers, *e* and *t*, whence it passes through a narrow slit into a long closed chamber 10 to 20 feet in length wherein it is dried, and on its issuing is led back to the machine, where it is wound up on the roller *g*. The bottom of the drying chamber is made of sheet iron, and is heated by Bunsen burners, or coils of steam pipe are laid inside the chamber. The vapour-charged air within the chamber is removed by means of an exhaust fan or blower.

The paper, whilst passing around the roller, *c*, becomes charged with the sensitising solution which is applied by the roller *h*. This roller is made to revolve *towards* the paper, and dips into the sensitising solution contained in the trough *i*. At a convenient place between the rollers *c* and *d*, is fastened the scraper, a sheet of glass, one edge of which is bevelled and which is held in a frame pivoted to the iron frame of the machine. The scraper may be applied against the paper with more or less pressure, and at the angle best suited for securing the best results. In some machines, wheels, *k*, with rubber tires, are placed at each end of the roller, *d*, and are operated so as to draw the paper along at its edges, until it has been taken up by the roller, *g*, when the wheels are lifted from the paper. Of course, the paper will show where these wheels passed over it.

The machine shown in Fig. 2 is constructed of wood. The writer has operated both kinds of machines, and

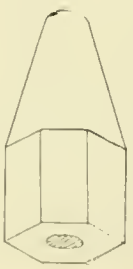
Fig. 2.



prefers the latter, which he considers much the better of the two. In this machine, the roll of paper is borne by a carrier sliding in grooves or on rails. The paper is first passed under a tension roller, is then sensitised by the roller, *c*, the excess of liquid being scraped off by the glass scraper placed at *d*; it next passes over the rollers, *e* and *t*, to the end of the machine (which may be 20 or 30 feet long, or any convenient length) where it passes over two rollers and returns to be wound up on the roller *g*. The paper in its passage through the length of the machine is supported by a criss-cross of string stretched from side to side, in order to prevent too much sagging, and yet allow the paper to be thoroughly dried by the coil of steam pipes placed beneath it.

The rolls of paper as ordinarily received are of varying widths, 30, 36, 42, 48, &c., inches, and contain usually several hundred yards. The paper is wound on a wooden cylinder, with a hole, either square or round, running lengthwise through it. The roll of paper is supported in its carrier by thrusting through the hole in the wooden cylinder a long iron rod each end of which is threaded, but in contrary directions. After the rod is in place a tapering nut with hexagonal or octagonal head, Fig. 3, is screwed down on each end. The conical parts of the nuts enter the holes in the ends of the wooden cylinder, and on being screwed up tight, the roll is centred and held firmly. The rod bearing the roll is now placed in the bearings of the carrier. The rod is threaded oppositely at the ends because otherwise one of the nuts would invariably become loose by revolving in the direction in which the paper is pulled. As it is, it is safest to always use an

Fig. 3.



dditional ordinary nut which is screwed down on each onical nut when the latter has been firmly fixed in place.

The sensitising liquid is contained in a trough, *h*, which preferably made of hard rubber. Galvanised zinc, owever, if coated with shellac first, and when dried with n asphalt solution, answers also. The sensitising roller ay be either of hard rubber or wood covered with felt r canton flannel. The scraper may be a sheet of glass bout 3 or 4 ins. wide, and as long as the width of the achine. It is well to have both of the long edges cut ccurately straight and rounded, and free from nicks. This , however, a point difficult to attain, hence the author as made use of glass tubing, which may be had perfectly raight and round; this gives the best results. The eets of glass may be supported in a frame of wood in hich it may be easily held perfectly tight, yet which llows the excess of liquid scraped off the paper to freely ickle down into the trough. If the glass tubing is used, should be cemented into a frame, one edge of which has en hollowed out to receive it.

When very, or even moderately thin, paper is sensitised, e moistening of the paper allows it to stretch considerably; nd the stretching occurs most at the middle of the paper. he result of the stretching is to cause a crinkling of the aper as it passes over the rollers, *e* and *t*, and longitudinal reases form which totally spoil the paper. This is obviated y replacing *e* and *t* by rollers which are not cylindrical, ut which are thicker in the middle than at the ends; and e thinner the paper the thicker must the rolls be in the iddle as compared with the ends.

The paper is started on the machine by first winding a uple of hundred yards of heavy manilla paper on the ll, *g*, and then carrying the end of this paper through the ngth of the machine and back again to about the place own at *k*. Here the paper drawn from the roller, *a*, meets , and the two are pasted together. The paper is then run ick until it is but a few inches in front of the sensitising ller.

Power is supplied at *g*, and a speed of about 100 yards r hour is given to the paper. The power must be steady d even, and must absolutely impart no vibration to the achine; otherwise, a series of transverse parallel lines will come visible on the paper when dry—due to the fact that e liquid remained in contact for a fraction of a second nger on one spot of the paper than it did on another, and e liquid will have soaked into the paper so much the ore the longer the contact. The utmost care must be served that no solid particles of matter settle in the angle rmed by the scraper and the paper, for, when this happens, e paper is partially lifted from the scraper, and a long ngitudinal streak caused by an excess of sensitising liquid ill result.

The form of machine last described has the advantage in at the top may be used as a table. The sides may be reened with oilcloth or other material, thus rendering ery part of the machine and paper easily accessible, which very important, as sometimes the paper does not run rfectly true, because of faulty winding-up on its spool, retching more on one side than on the other, faulty align-ent, &c. Furthermore, the operator has always before m the freshly sensitised paper as it leaves the scraper, d by reason of the arrangement, is enabled to watch over e details, by a close study of which alone is the sensitising paper, even with a well-constructed machine, rendered rfectly successful. It need scarcely be mentioned, of urse, that all movable parts of the machine must run sily and freely and without a jar, and all the bearings kept ell oiled and free from dirt.

Scottish Section.

Meeting held at Glasgow, April 8th, 1902.

DR. WM. FREW IN THE CHAIR.

THE ORIGIN AND NATURE OF THE FREE ACID FORMED DURING HÜBL'S REACTION WITH UNSATURATED COMPOUNDS.

BY HARRY INGLE, B.Sc., PH.D.

(*Forth Works, Kirkcaldy.*)

Since its proposal, in 1884, Hübl's solution of iodine and mercuric chloride has been extensively used as a means of identification in oil and fat analysis.

I wish to draw attention in this paper to some experiments that I have made on the origin of that free acid which has been observed by many chemists as being formed during Hübl's reaction with fats and oils, and has been the subject of much controversy.

Schweitzer and Lungwitz (this Journal, 1895, 130, 1030) thought that they had proof that this acid originated in the substitution of some of the hydrogen in the oil by iodine, and consequent liberation of free hydriodic acid, and they considered the "correct iodine number" (*i.e.*, addition) to be the difference between twice the amount of iodine thus converted into acid and the total absorbed.

In 1895, Waller (Zeits. angew. Chem., 1895, 1786, 1831) showed that Hübl's solution became more stable on the addition of some concentrated hydrochloric acid, and Ephraim (Zeits. analyt. Chem., 1895, 254) obtained iodine values, similar to those obtained with Hübl's solution, by the use of an alcoholic solution of ICl. Hübl himself had been of the opinion that iodine chloride was the active agent in his solution, and, indeed, isolated a compound, $C_{18}H_{34}ICIO_2$, from its interaction with oleic acid. The reactions taking place in Hübl's solution, and during its action upon oils and fats, have formed the subject of a series of classical papers published by Wijs (this Journal, 1898, 610, 698, 699; 1899, 405; Chem. Rev., 1898, 137); he was led to the conclusion that HOI, and not ICl, was the active agent in addition, in both Hübl's solution and his own, and that the free acid formed was due to the splitting off of hydrochloric acid from the iodochlorides (which, according to him, must be regarded as secondary products) with re-formation of double linkages. He, however, does not satisfactorily explain why these newly-formed double linkages do not absorb more halogen.

Henriques and Künne (this Journal, 1899, 377) dispute Wijs' statement that the free acid split off from the iodochlorides is hydrochloric acid, since they find that the mixed glyceride oleo-distearin, which, isolated from Mkani fat, gives an iodochloride, and this, by the action of caustic potash, first loses its iodine. They consider the acid formed in Hübl's solution to be more probably HI (Chem. Rev., 1899, 45).

Against Wijs' contention that HOI is the active agent, Marshall (this Journal, 1900, 213) shows that the same iodine values are obtained by the use of his solution, *i.e.*, a solution of iodine monochloride in dry carbon tetrachloride, as with Wijs' solution, and that it (Marshall's) is quicker in action, and forms no free acid; hence hypoiodous acid cannot be the active substance in this case, as none of it is present.

This brings us to the end of the published work upon the subject of the origin of the free acid. Before, however, entering upon the experiments described in this paper, I would point out that, admitting for the moment that Wijs' view that hypoiodous acid is the active substance, another explanation of the origin of the acid seems possible. This explanation, too, would get over the difficulty experienced in explaining why the assumed new-formed double linkages do not absorb halogen.

When the unsaturated groups absorb the HOI, to form oxyiodides, thus :—

$$(1)\quad -CH{:}CH- + I.OH = -CHI.CHOH-$$

there remains in the solution for every HOI absorbed one equivalent of HCl. The next stage, the conversion of the oxyiodide into the iodochloride, is most probably a reversible one, just as the formation of hypoiodous acid from iodine chloride and water is, and hence must depend upon the concentration of the water and hydrochloric acid and substance in the solution. The change—

$$(2)\quad -CHI.CHOH- + HCl = -CHI.CHCl- + H_2O$$

can never be complete, and some HCl must of necessity remain free in the solution.

All the points brought forward by Wijs (this Journal, 1898, 699) as favouring or preventing the formation of free acid in the solution would exert the same influence over this reaction, except that he finds dilution with chloroform to reduce it, whereas it should, according to the view just set forth, not alter or even rather increase its amount.

I shall have reason to refer to this matter later.

However, I think I shall be able to prove this evening that none of the above theories—substitution, splitting off of HCl from the iodine chloride addition product, or incomplete conversion of the oxyiodides into iodochlorides—are the real source of the free acid.

Erlenmeyer, in 1896 (Annalen, 269, 263), obtained from cinnamic acid and anhydrous iodine chloride an addition product — β-phenyl-α-iodo-β-chloropropionic acid, $C_6H_5.CHCl.CHI.COOH$—which, with water, even in the cold, became converted into β-phenyl - α - iodo-β-oxypropionic acid, $C_6H_5.CHOH.CHI.COOH$, and hydrochloric acid, whilst potassium iodide solution reduced it to cinnamic acid.

These observations suggested to me a satisfactory explanation of the formation of the free acid during Hübl's reaction with unsaturated compounds.

The double linkages absorb iodine chloride, and then the water, which is always present both in Wijs' and in Hübl's solution, acts upon the iodochloride and eliminates iodine or chlorine, or both, and forms hydroxy compounds of the nature of alcohols or glycols, thus :—

$$(3)\quad \begin{array}{c} -CHCl \\ | \\ -CHI \end{array} + H_2O + H_2O = \begin{array}{c} -CHOH \\ | \\ -CHOH \end{array} + \begin{array}{c} HCl \\ \\ HI \end{array}$$

No new double linkages are formed, and, consequently, the iodine absorption is independent of the amount of acid formed.

Just those conditions noticed by Wijs as tending to increase or decrease the amount of acid would, in every case, exert exactly the same influence over this. Thus, Waller's solution would tend to prevent the formation of HCl, because it would reverse the reaction (3) as far as the chlorine atom was concerned.

I hope to show that this explanation is the correct one.

The Reagents.

Wijs' Solution.—This was made, according to Wijs' formula, by passing dry chlorine gas into a solution of 12·7 grms. of iodine in 1 litre of glacial acetic acid until the characteristic colour-change took place. By gently warming the solution on the water-bath any excess of chlorine is converted into chloracetic acid, and when this is done, and pure glacial acetic acid is used, the solution is remarkably constant in titre.

Modified Hübl's Solution.—For performing experiments to determine the amount of free acid formed during the reaction of iodine chloride with oils, &c., Wijs' solution cannot conveniently be used, and therefore Hübl's solution must be employed. Ordinary Hübl's solution changes so rapidly in titre that it is inconvenient to employ, for one remains in doubt whether to titrate it before or after a reaction ; so, following upon a suggestion given by Wijs in a footnote to one of his papers (Chem. Rev., 1899, 10), I modified Hübl's method in such a way as to obtain results which, for constancy and agreement with those obtained with Wijs' solution and general ease in working, after three years of constant experience, I can confidently recommend to all those who do not feel inclined to adopt Wijs' solution for all purposes.

The modification is an extremely simple one ; it consists merely in keeping the two components, the solution of iodine in alcohol and the solution of mercuric chloride in alcohol separate.*

25 grms. of iodine are dissolved in 500 c.c. of alcohol (96 per cent.), and 30 grms. of mercuric chloride are dissolved in another 500 c.c.

The substance (0·1 to 0·2 grm.) is weighed out, dissolved in 10 to 20 c.c. of chloroform, and 15 c.c. of the mercuric chloride, followed by 15 c.c. of the iodine solution, added, in the latter case carefully counting the drops (three) run from the pipette. The mixture was allowed to stand overnight (16 hours) and titrated as usual.

15 c.c. of the iodine solution were then mixed with water and potassium iodide, and titrated against the thiosulphate. The difference between the two results gives the iodine absorbed, expressed in terms of the thiosulphate solution. The iodine solution in alcohol is very constant in titre, not altering more than 0·1 c.c. N/10 thiosulphate solution for 15 c.c. in a week.

Wijs advised, in the footnote referred to, the addition of 0·5 c.c. of strong HCl to every 500 c.c. of the iodine solution, so that it might have the same acidity as a one-day-old Hübl's solution. But it has not been found necessary in practice, as the solution made simply as described yields practically the same results with oils as are obtained from Wijs' solution. Blank tests made with the solution, in 16 hours were found to have lost not more than about 0·2 to 0·3 per cent. (equal to 0·1 to 0·2 c.c. of thiosulphate). As this loss depends upon the concentration of the ICl (or HOI), it is obvious that, in the case of substances which absorb a considerable quantity of iodine chloride, the concentration of this substance in the solution must be rapidly and greatly reduced ; so the loss in titre observed in actual practice, due to this cause, must be very small indeed, and hence no correction for the blank test need be made in the estimation.

Chloroform.—The chloroform used in this research was purified by washing with sulphuric acid and potassium bichromate solution until no further reduction took place. It was then washed with water, dilute sodium carbonate solution, and water again, and then dried over calcium chloride, and distilled. To the chloroform thus purified 2 c.c. of absolute alcohol were added per litre.

Unless this addition of alcohol is made, and the chloroform kept in the dark, it not only becomes acid, but also liberates iodine from potassium iodide, thus :—

$$CHCl_3 + O = COCl_2 + HCl.$$
$$COCl_2 + 2KI = CO + 2KCl + I_2.$$

Modified Waller's Solution.—In order to prevent the action of the hypothetically formed HOI upon the alcohol, Waller's modification of Hübl's solution, according to Wijs, may be used. The addition of the concentrated hydrochloric acid solution introduces a certain amount of water into the alcoholic solution, which further complicates matters. I therefore took Hübl's solution and passed hydrochloric acid gas through it. The HCl was obtained by boiling ordinary concentrated acid, and passing the evolved gas through strong sulphuric acid to dry it. I employed 100 c.c. of the acid for every 300 c.c. of the Hübl's solution, and in this way a solution was obtained containing about 42 grms. of HCl per litre, which is, of course, many times the amount present in ordinary Waller's solution. The large amount was employed in order to test the effect of the hydrochloric acid when in excess.

* Lewkowitsch, in his "Chemical Analysis of Oils, Fats, and Waxes," 2nd Edition, 1898, p. 171, recommends the preparation of stock solutions of iodine and of the bichloride, but says that the mixture should not be used before it is 12–24 hours old.

According to Schützenberger (Comptes Rend., 84, 389) drochloric acid and iodine chloride combine to form an stable double compound, IClHCl. This substance is ubtless present in the above solution, and also in ordinary ller's solution, though, of course, not to the same extent.

Determination of Free Acid formed by the Interaction of Substance and Hübl's Solution.—After the titration of excess of iodine in the ordinary way, following Schweitzer l Lungwitz's method, the free acid was determined by ding a concentrated solution of potassium iodate and ating the liberated iodine as usual. The equations presenting the action of hydrochloric and hydriodic acid , respectively,—

$$6HCl + KIO_3 + 5KI = 6KCl + 3H_2O + 3I_2.$$
$$6HI + KIO_3 = KI + 3H_2O + 3I_2.$$

ns for every equivalent of halogen present as HCl or , one equivalent of iodine is liberated.

Special Part.

In order to explain the mechanism of the reactions taking place during the determination of the iodine value, by whatever method be employed, it seemed more rational to examine the simplest unsaturated substances which could be easily obtained, and not the more complicated fats and oils, or their acids, which have in the past formed the materials investigated. If a satisfactory explanation of the behaviour of such substances could be obtained, then there would be more chance of explaining the behaviour of oils and fats. Two substances were chosen, namely, stilbene and styrolene, and the following is a record of the results of my experiments with those materials.

I. *Stilbene, or s. Diphenylethylene*, $C_6H_5.CH:CH.C_6H_5$.—Commercial stilbene was purified by recrystallisation from alcohol, when it was obtained in lustrous plates softening at 122° C. and melting at 124° C. It was thus evidently pure. The iodine value was determined by the various methods, with the results given below:—

Stilbene.—Theoretical Iodine Value, 141·1.

Method used.*	Quantity taken.	$CHCl_3$ used.	Iodine added as c.c. Thio.	Iodine absorbed in c.c. Thio.	0·2 grm. Iodine = c.c. Thio.	Iodine liberated by Free Acid.	Iodine Value.	Free Acid as I.	Remarks.
		c.c.							
Wijs' " *a*	0·1579	1	41·5	14·5	13·3	..	138·0	..	No precipitate.
" *b*	0·1078	10	42·75	9·65	13·35	..	134·1	..	"
" *c*	0·1363	25	49·8	11·9	13·3	..	131·2	..	"
Hübl m. *a*	0·1378	10	46·7	11·7	13·35	9·55	128·2	104·7	"
" *b*	0·1246	10	45·2	10·1	13·0	8·5	125·6	105·8	"
" *c*	0·1347	10	46·3	11·4	13·35	9·0	126·8	105·8	"
" *d*	0·1556	10	46·3	13·0	13·35	10·8	125·1	104·0	"

In the case of Wijs' solution 25 c.c. were used, while with modified Hübl's solution 15 c.c. each of the iodine and bichloride solutions re employed.

It was noticed that Wijs' solution became gradually rk-brown in colour during the interaction, indicating the paration of free iodine. This separation of iodine, which s afterwards noticed with other substances when treated th Wijs' solution, might be attributed to one or more the following causes:—

(*a*) The addition of chlorine by the substance, and eration of free iodine; but this does not explain the mation of any free acid.

(*b*) The substitution of chlorine for hydrogen in the mpound, and consequent formation of hydriodic acid—

$$>CH + ICl = >CCl + HI.$$

ic hydriodic acid thus liberated acts upon the excess of line chloride, and forms hydrochloric acid and free iodine, is:—

$$HI + ICl = HCl + I_2,$$

ich would explain both the liberation of iodine and the mation of some free acid. However, if this reaction ok place with both CH groups in stilbene, then the line absorption should be equal to 4 I per molecule = 2·2 per cent., and 141·1 per cent. should appear as free d.

Again, this reaction should take place as easily in rshall's solution (*i.e.*, iodine chloride dissolved in carbon rachloride) as in Wijs'. It was found that Marshall's ution, added to stilbene in absence of moisture, liberated iodine; but if the solutions were, after mixing, exposed air or breathed upon, iodine was slowly liberated. If the mixture aqueous alcohol were added, or a drop of ter, immediate separation of iodine took place. This s not due to the action of the water upon the iodine oride itself, merely, as Marshall has observed, because rallel experiments made with Marshall's solution and rshall's solution to which stilbene had been added, owed that whereas the addition of water to the latter used an immediate liberation of iodine, with the former liberation only took place on standing in contact with er some little time.

These facts point to the presence of water in Wijs' solution as being the cause of the liberation of iodine in its interaction with stilbene.

(*c*) This water may be supposed to bring about this reaction in two ways. First, as Wijs suggests, by acting merely as a substance which will absorb any acid which may be formed* by the splitting off of HCl from the addition product and re-formation of the double linkages. With stilbene, however, as both the iodine and chlorine are split off, this would result in the formation of a triple linkage, thus:—

$$C_6H_5.CHCl.CHI.C_6H_5 =$$
$$C_6H_5.C{:}C.C_6H_5 + HI + HCl.$$
Tolane.

The hydriodic acid thus produced would react with excess of iodine chloride as before. Apart from the difficulty experienced in explaining why this triple linkage does not absorb more iodine chloride, there are strong thermochemical objections to this assumption; although we cannot as yet consider it wholly disproved, yet the action of aniline on the iodochloride (*vide infra*) renders its extremely unlikely that tolane is formed.

The second way in which water may bring about this splitting of hydriodic acid and subsequent liberation of iodine has already been briefly noticed in the introduction. The double linkages first add on iodine chloride, and then the addition product is acted upon by the water with the liberation of both hydriodic and hydrochloric acid, and the formation of hydroxyl derivatives, thus:—

$$C_6H_5.CHI.CHCl.C_6H_5 + 2H_2O =$$
$$C_6H_5.CHOH.CHOH.C_6H_5 + HI + HCl.$$

As before, the hydriodic acid reacts with the iodine chloride, producing iodine and hydrochloric acid.

If this is the correct explanation of the behaviour of Wijs' solution, it is only reasonable to suppose that similar changes take place in Hübl's solution; and as there is more water present in the latter, more acid will be formed. The experi-

* Alcohol itself would do this, or acetic acid.

ments already recorded show that not only the iodine, but also the chlorine, is eliminated from the iodochloride in Hübl's reaction, but that the whole of the halogen is not split off, namely, only 82 and 84 per cent. of the amount absorbed, or 74 and 75 per cent. of the theoretical.

Now, if water be the cause of this splitting off by increasing the amount present we ought to get more acid formed.

A determination of the iodine value by the modified Hübl's method, with the addition of 10 c.c. of water to the 15 c.c of iodine solution and 15 c.c. of the bichloride solution used, gave the following result :—

	Hubl Direct.	Blank Test.
Substance taken	0·1252	0·1252
Iodine added in c.c. thiosulphate.	44·5	44·35
Iodine absorbed in c.c. thiosulphate.	11·50	11·35
0·2 grm. of iodine = c.c. thiosulphate.	12·9	12·9
Iodine liberated by acid, c.c. thiosulphate.	10·0	9·75
Iodine value.....	142·5	140·6
Free acid as iodine, per cent.....	125·0	120·8

The correction for the blank test is made because of the large amount of water present (*vide supra*).

The iodine absorption thus reaches nearly the theoretical, and the free acid formed is 86 per cent. of that absorbed, which, if merely substitution took place, is altogether inexplicable, because this would require not more than 50 per cent. of the absorbed halogen to appear as free acid.

Isolation of Stilbene Iodochloride.—In order to further examine the matter the addition product itself was isolated. 2 grms. of stilbene were dissolved in 60 c.c. of warm acetic acid, cooled, and then 150 c.c. of Wijs' solution added. The liquid gradually became dark red-brown in colour, and a copious precipitate of pinkish white lustrous spangles formed. After standing two hours these were filtered off, air-dried, and weighed; in two experiments 1·9 and 2·1 grms. were obtained. On recrystallisation from benzene the substance was obtained as shining colourless needles melting, with decomposition, at 131° C.

Halogen Determination.—0·2067 grm. of the substance gave weight of silver haloids formed, 0·2260; weight calculated for $C_{14}H_{12}ICl$, 0·2270.

The substance is therefore stilbene iodochloride or 3 diphenyl-chloriodo-ethane. It is difficultly soluble in hot alcohol, ether, and chloroform. Hot benzene dissolves it moderately easily, as does hot acetic acid, but the latter liberates iodine. Boiled with alcohol, iodine is slowly liberated; more quickly if water be added; indeed, water separates iodine from its alcoholic solution, even in the cold. Dissolved in chloroform, and treated with aqueous potassium iodide, iodine is very slowly separated. But if the chloroform solution is dissolved in alcohol, and a little potassium iodide be added, not sufficient to separate a chloroform layer, iodine is at once liberated. Also aqueous potassium iodide added to the cold solution of the iodochloride in alcohol at once separates iodine. Alcoholic silver nitrate gives first a yellow-coloured precipitate, and then gradually changes to white; *i.e.*, silver iodide is first formed, showing that the iodine is first split off.

Action of Aqueous Alcohol upon the Iodochloride.—0·2198 grm. of the iodochloride (=0·1155 grm. of stilbene) was treated with 50 c.c. of alcohol and 10 c.c. of chloroform, and heated to solution; 10 c.c. of water were added, and the precipitate which formed was dissolved by gently heating; the solution became gradually darker in colour by the separation of iodine. After boiling for about three minutes, the solution was allowed to cool for two hours and then water and KI solution added. The liberated iodine was titrated by standard $Na_2S_2O_3$, and, when neutralised, 10 c.c. of potassium iodate was added (0·2 grm. of iodine = 13·0 c.c. of the thiosulphate solution used).

Iodine liberated—	Thiosulphate.
By action of *aqueous alcohol*.....	1·7 c.c.
By subsequent addition of KI + KIO_3.....	3·3 c.c.

Calculating these amounts out to iodine liberated in per cent. of the stilbene present as iodochloride, we have :—

Free iodine.....	62·4
Iodine from free acid.....	43·9
Total.....	106·3

In order to explain these results, the reaction product was shaken out with chloroform, and the chloroform solution evaporated. The residue consisted of stilbene (identified by melting point and formation of dibromide of correct melting point) and an oily substance. This latter was formed in smaller amount. It did not absorb bromine, reduced ammoniacal silver nitrate, was coloured dark green by sulphuric acid. It was identical with the substance obtained by the action of iodine chloride, water, and alcohol upon stilbene (Hübl's reaction), and is probably a mixture of hydrobenzoin and isohydrobenzoin or their diethyl ethers (*vide infra*).

The changes taking place during the action of aqueous alcohol upon the iodochloride are thus formulated.

The water acts upon one portion of the substance thus:—

$$(1)\ C_6H_5.CHCl.CHI.C_6H_5 + 2H_2O = C_6H_5.CHOH.CHOH.C_6H_5 + HI + HCl.$$

The hydriodic acid thus formed attacks more of the substance, and, like potassium iodide, reduces it to the original stilbene, thus :—

$$(2)\ C_6H_5.CHCl.CHI.C_6H_5 + HI = C_6H_5.CH{:}CH.C_6H_5 + HCl + I_2.$$

liberating iodine and forming free acid.

If both these reactions took place with all the substance for every I_2 liberated, 2HCl should be formed for every two molecules of the iodochloride, or, the iodine liberated by water alone, *plus* that liberated when KIO_3 was added, should be equal to the total halogen present expressed as iodine.

As equation No. 1 is probably a revisable one, and as the HI liberated is at once converted into HCl by equation No. 2, the tendency is to split off the whole of the iodine as HI; but as this increases the concentration of the HI present, the reaction No. 1, as far as the chlorine atom is concerned, is not complete, or the whole of the chlorine is not split off as acid.

It is interesting to note that both Hübl's solution and actual experiment gave results well in agreement with the above theoretical considerations.

Action of Water on the Iodochloride.—Acid expressed as iodine in per cent. of stilbene present: 106·3.

Hübl's Solution.—Acid expressed as iodine in per cent of stilbene used: (*a*) 104·7; (*b*) 105·8; (*c*) 106·8 (*d*) 104·0.

This agreement, to my mind, is conclusive proof that the free acid formed during Hübl's reaction is due to the action of water upon the iodochlorides.

The whole of the chlorine is not split off, for the reasons already given, namely, because in both cases any HI is at once converted into HCl, which, by setting up a "back pressure," prevents the formation of more HCl. This is in agreement with Wijs' observations that Waller's solution with oil gives less free acid than Hübl's. The HCl present tends to prevent more being formed.

Action of Potassium Iodide upon the Aqueous Alcoholic Solution of Stilbene Iodochloride.—It has already been mentioned that potassium iodide solution at once liberates iodine from the alcholic solution of the iodochloride. It was determined to examine this quantatively. 0·1884 grm. of the iodochloride was dissolved in 10 c.c. of warm chloroform and 15 c.c. of potassium iodide solution (10 per cent.), and 50 c.c. of alcohol added. The solution was heated to 50° C., and allowed to stand one hour. $Na_2S_2O_3$ (12·8 c.c. = 0·2 grm. of iodine) required = 8·55 c.c. Calculating this upon stilbene present (0·0990 grm.) the iodine liberated is 134·7 per cent. Theory = 141·1.

Potassium iodate liberated no iodine when added to the solution after titration of the iodine; *i.e.*, no free mineral acid was formed.

Action of Aniline on Stilbene Iodochloride.—A small uantity of the iodochloride was heated with about 2 c.c. iiline in a test tube to boiling. The aniline was coloured iolet. On cooling, the solution was poured into dilute ılphuric acid, and the precipitate formed filtered off, ashed, and examined. It was found to be stilbene, entified by formation of debromide, melting point, crystal rm, and production of benzaldehyde on oxidation with romic acid. The filtrate contained hydrochloric and ydriodic acid, and chlor- or iodo-aniline.

It was expected, before trying the experiment, that tolane, phenyl-acetylene, would result, and the formation of ilbene was very remarkable. However, it is in accordance ith Henriques and Künne's (*loc. cit.*) observation that leodistearine iodochloride, when heated with aniline, yields leodistearine and chloro-aniline hydriodide. We may rmulate the reaction with stilbene iodochloride thus :—

$$C_6H_5.CHCl.CHI.C_6H_5 + C_6H_5NH_2 = C_6H_5.CH:CHC_6H_5 + ClC_6H_4NH_2HI.$$

The fact that even this energetic treatment does not split ff the two hydrogen atoms of the ethylene group along ith the iodine and chlorine renders the view that the rigin of the acid in Hübl's reaction is the splitting off of aloid acid with re-formation of double, or in the case of ilbene triple, linkages, extremely improbable. Aniline has much greater attraction for haloid acids than the water hich is present in Hübl's solutions, and to which Wijs scribes the determining cause in producing this reaction, it cannot bring about this reaction much less water.

Isolation of the Reaction Product of Hübl's Solution on tilbene.—The chloroformic layer from the action of Hübl's olution and 10 c.c. of water on stilbene, gave on evaporaon, an oil which refused to crystallise. It was easily oluble in all ordinary solvents, was coloured first brown nd then dark green by concentrated sulphuric acid, bsorbed no bromine from chloroform solution, and reduced mmoniacal silver nitrate. Tested for halogens, a trace of hlorine but no iodine was found. It is probably a mixture f the diethyl ethers of hydro-benzoin and iso-hydro-benzoin ; ut it is still under examination.

II. Styrolene, Monophenylethylene, $C_6H_5.CH:CH_2$.

Commercial styrolene was used for these experiments, as had no means at my command of purifying it. It probably ontained some polymerised or oxidised products, as in no ase did the observed values attain the theoretical amount, amely 244·2. However, the small amount of impurity oes not interfere with the general conclusions based upon ie observed values.

The following table gives the results obtained :—

Styrolene.—Theoretical Iodine Value, 244·2.

——	Wijs *a.*	Hübl *a.*	Hübl *b.*
ıbstance taken	0·1078	0·1088	0·1185
ɔdine added as c.c. thiosulphate	41·55	49·7	46·2
ɔdine absorbed as c.c. thiosulphate.	16·25	16·8	18·5
2 of grm. iodine = c.c. thiosulphate.	13·3	13·6	13·45
ɔdine liberated by free acid	..	..	7·75
ɔdine value	226·6	227·1	226·9
ɔdine, per cent., liberated as acid	..	..	95

Wijs' solution gave no separation of iodine, nor was any recipitate formed, only a slight cloudiness. These facts, gether with the observation that less than half the ɔsorbed halogen is split off as free acid in Hübl's reaction roves that it is hydrochloric acid which is formed in this se, and not hydriodic. Marshall's solution followed by ueous alcohol only very slowly developed iodine.

It was interesting to examine the influence of water upon ie iodine value and the free acid formed by Hübl's action.

Iodine Value of Styrolene by Hübl's Solution, with 10 c.c. of added Water, 16 hours.

——	Direct.	Corrected for Blank Test.
Substance taken	0·0926	0·0926
Iodine added as c.c. thiosulphate	44·7	44·7
Iodine absorbed as c.c. thiosulphate.	13·8	13·65
0·2 grm. of iodine = c.c. thiosulphate.	13·0	13·0
Iodine liberated by free acid	6·8	6·55
Iodine value	229·3	226·8
Iodine liberated by free acid, per cent.	113·0	108·8

The blank test is taken as the correct result, for the reason previously given. Here again we notice that the addition of water increases the amount of free acid formed. It has no influence upon the iodine value.

Again the addition product was isolated and examined for the better understanding of the reactions.

Isolation of Styrolene Iodochloride.—Two grams. of styrolene were dissolved in 10 c.c. of acetic acid, and 300 c.c. of Wijs' solution added. No separation of iodine took place, nor did any precipitate form. The solution, after standing for an hour, was diluted with about a litre of water, and at once shaken out with ether. The ethereal solution was washed with dilute sodium carbonate, and dried over calcium chloride.

On evaporation of the ether an oil remained, which solidified, on standing, to a mass of acicular crystals, which melted at 38°—40° C. These were dissolved in alcohol, in which they are very soluble, and the solution allowed to spontaneously evaporate. The crystals were removed from the mother-liquor (which contained an uncrystallisable oil which is still under examination) by filtration.

Thus purified they melted at 46° C., and formed white feathery needles.

From its reactions the substance is styrolene iodochloride ; it is very soluble in all ordinary solvents except water, and when treated in alcoholic solution with silver nitrate solution it at first forms a white precipitate, which then gradually becomes yellower in colour ; that is, the chlorine is split off first. The solution, after treatment with silver nitrate, has a very strong odour of hyacinths.

Water added to the alcoholic solution develops slowly free acid. Aqueous potassium iodide added to the alcoholic solution of the substance at once liberates free iodine. This reaction was quantitatively examined, and may serve as an analysis of the substance. The separation takes place even in the cold. If, however, the substance is dissolved in chloroform instead of alcohol when potassium iodide solution is added, the liberation of iodine only takes place very slowly. The bearing of these facts on the iodine value of this and other substances will be discussed later.

Action of Potassium Iodide upon the Aqueous Alcoholic Solution of Styrolene Iodochloride.—0·1794 grm. of the iodine chloride addition product (= 0·0700 grm. of styrolene) was dissolved in 25 c.c. of alcohol, and 10 c.c. of an aqueous solution of potassium iodide (10 per cent.) added. At once a yellow coloration was developed, which rapidly changed to dark red-brown on heating to 50° C. on the water-bath. The mixture was allowed to stand one hour, and then titrated as usual with standard sodium thiosulphate solution (13·45 c.c. = 0·2 grm. of iodine).

The liberated iodine was found to be equal to 11·3 c.c. of the above thiosulphate solution.

Calculating this on the styrolene present we find that the iodine split off is equal to 240·1 per cent., whereas theory requires 244·2, which is well within the experimental error.

Hence both the iodine and the chlorine were removed by the action of the potassium iodide. The resultant solution smelt strongly of styrolene, but contained no free acid.

The reaction may be thus formulated :—

$$C_6H_5.CHCl.CH_2I + KI = C_6H_5.CH:CH_2 + KCl + I_2.$$

Iodine Absorption of Stilbene and Styrolene from the Modified Waller's Solution.—In this solution, prepared as previously described, there is so much hydrochloric acid present as to exclude the existence of any hypoiodous acid in the solution. Prepared originally to study the behaviour of oils, I considered it of great interest to likew examine the behaviour of these two substances towards t solution. On carrying out the determinations the followi very remarkable results were obtained:—

Stilbene and Modified Waller's Solution.

The solution contained 42·8 grms. of free HCl per litre. Time of action, 16 hours.

Amount taken.	$CHCl_3$ used.	Iodine added in. c.c. Thiosulphate.	Iodine absorbed in. c.c. Thiosulphate.	0·2 grm. Iodine = c.c. Thiosulphate.	Iodine Value.	Remarks, &c.
0·1163	1 c.c.	23·6	0·2	13·3	2·6	Some little precipitate of stilb in first case. No precipitate
0·1159	10 „	40·1	0·1	13·3	1·3	others.
0·1129	30 „	40·1	0·0	13·3	0·0	The chloroform layer contained o stilbene.

These results seemed to point to the truth of Wijs' contention that HOI is the active agent, and as there is none of it present no addition took place. Styrolene was then examined.

Styrolene and Modified Waller's Solution.

Substance taken	0·1128 grm.
$CHCl_3$ used	10 c.c.
Iodine used, as c.c. thiosulphate	40·1
Iodine absorbed, in c.c. thiosulphate	21·3
0·2 grm. of iodine = c.c. thiosulphate	13·3
Iodine value	224·3

REMARK.—Small amount of precipitate.

On standing, the above solution, after the excess of iodine had been titrated slowly, "came back" to blue, *i.e.*, iodine was slowly liberated by action of the potassium iodide upon the addition product. In doing all the above tests, water was always added to the solution before the potassium iodide solution.

Here, then, we have proof that hypoiodous acid is not necessary for an iodine absorption to take place. The remarkable difference in the behaviour of these two similarly constituted substances will be considered later.

When iodine chloride is absorbed by the two substances from any of the solutions, there are formed the two iodochlorides isolated, namely,—$C_6H_5.CHCl.CHI.C_6H_5$ and $C_6H_5.CHCl.CH_2I$ respectively.

These two substances, when acted upon by water, lose more or less of their halogen in the form of haloid acid, in amount depending upon the concentration of the water present in the solution.

Now, it has been observed by several chemists that the presence of an aromatic radical exerts a loosening influence upon the other elements attached to a carbon atom to which it is itself united. In stilbene both the carbon atoms of the ethylene are united to a phenyl group; hence both chlorine and iodine are, in the iodochloride, subjected to this loosening influence, and both are easily split off by the action of water.

In styrolene only one of carbon atoms is attached to a phenyl group; hence only one of the halogen atoms is loosened in the iodochloride, and split off by the action of water upon it.

Auwers and Müller (Ber., 1902, 114) have recently shown that isoeugenol dibromide, $CH_3OC_6H_4OH.CHBr.CHBr.CH_3$, when treated with water, splits off the br mine atom next to the phenyl group as hydrobromic acid, and forms $CH_3O\ C_6H_3OH\ CHOH\ CHBr.CH_3$, and with alcohol an ethyl ether, $CH_3OC_6H_3(OH)\ CH(OC_2H_5)\ CHBr.CH_3$, is formed.

As styrolene liberates no iodine from Wijs' solution, and as its iodochloride with water does not split off iodine, but chlorine, we must conclude that in this case chlorine is the atom which is subjected to the loosening influence of the phenyl group, and consequently the formula for styrolene odochloride is $C_6H_5\ CHCl\ CH_2I$.

The action of water upon the iodochlorides, either alc or in presence of Hübl's or Wijs' solution, judging fr analogy, must form $C_6H_5\ CHOH\ CHOH\ C_6H_5$ and C_6 $CHOH\ CH_2I$ respectively. Very probably, in presence alcohol, as in Hübl's solution, the corresponding eth ethers are also formed, $C_6H_5\ CH(OC_2H_5).CH(OC_2H$ C_6H_5, and from styrolene, $C_6H_5\ CH(OC_2H_5)_2\ CH_2I$, and t oily substances isolated from the reaction products of Hüb solution upon stilbene and styrolene are most probabl mixture of these hydroxyl derivatives and ethyl ethe but until I have carefully examined these substances I pre not to express a definite opinion.

Now, just as the phenyl groups may be considered exert a loosening influence upon the added halogen aton so also we may consider them as in a measure protecti the carbon atoms to which they are attached from t action of the iodine chloride. In other words, they ca the ethylene union to which they are united to have l attraction for the halogen. If we present to stilbene styrolene a solution containing iodine chloride in a state combination with some other substance, these substanc before they can combine with the iodine chloride, m break up this combination, and they can only do that exerting a greater attraction for the iodine chloride tha has for the substance with which it is united. Stilbe having two phenyl groups must exert a less attraction t iodine chloride than styrolene, with only one such gro The modified form of Waller's solution contains suc combination, namely ICl HCl. Stilbene is unable decompose this compound, because of the protecti influence of two phenyl groups on both its attracti carbon atoms. Styrolene with only one carbon atom pr tected can exert by the other atom sufficient attraction break up the hydrochloride of iodine chloride, and hen addition takes place.

The conversion of the iodochlorides in Hübl's and Wi solution into hydroxyl derivatives must depend upon t concentration of these substances and the water present.

With stilbene we find that the addition of chlorofo reduces the observed iodine value, because it reduces t concentration of the water present, and leaves mo unacted-upon iodochloride, or, as iodine is first eliminate perhaps oxychloride, for reduction when the potassiu iodide is added. It also reduces the concentration of t iodine chloride, and hence likewise tends to make t addition less complete.

With styrolene it was found, for example, that the chlor formic layer from Waller's solution contained iodochlorid By the action of aqueous potassium iodide on this, a ve slow liberation of iodine was noticed. If, however, t chloroform layer was removed and dissolved in alcohol, the addition of a quantity of aqueous potassium iodide n sufficient to cause a separation of the chloroform imm diate and copious liberation of iodine took place. Th pointed to the necessity of adding, to the test solutio water, before running in the potassium iodide solution.

I may here give the results of two determinations m with a sample of commercial styrolene.

Iodine Value of Styrolene, adding Water *before the Potassium Iodide Wijs' Solution.*

Substance	0·1078
Iodine added as thiosulphate	41·55 c.c.
Iodine absorbed as thiosulphate	16·25 c.c.
0·2 grm. of iodine = thiosulphate	13·3 c.c.
Iodine value	226·6

Iodine Value of Styrolene, adding 10 c.c. of a 10 per ent. solution of KI before the Water. Standing five minutes. No separation of Chloroformic Layer.

Substance	0·1171
Iodine added as thiosulphate	41·75 c.c.
Iodine absorbed as thiosulphate	13·45 c.c.
0·2 grm. of iodine = c.c. Thiosulphate	13·3 c.c.
Iodine value	172·7

ese two results prove very conclusively that to obtain ect results the chloroform solution of the iodochlorides t be precipitated before the addition of the potassium le solution, or, in other words, that water should be d first.

was of interest to see how great the error arising from source could be. The chloroform layer from (*a*) was rated from the aqueous liquor, dissolved in alcohol, c.c. of potassium iodide added, and alcohol until no ration of a chloroform layer was noticed. Iodine was kly liberated, and, after standing 15 minutes, its amount estimated by titration with thiosulphate; 13·3 c.c. were ired, which is equivalent to an iodine absorption of 170. f the potassium iodide were added in sufficient amount, the contact was long enough, an error of 170 might been made in the iodine value.

ne theoretical amount of halogen, *i.e.*, the whole of that rbed was not liberated, because the iodochloride had ady lost some of its halogen by interaction with the r present in Wijs' solution. The amount of halogen split off, namely 227 − 170 = 57, gives us the quantity free acid formed in Wijs' reaction with styrolene. wing, as we do, that Wijs' solution contains less water Hübl's, this is about what we might expect.

'e have thus a means whereby we may determine the unt of free acid formed even in Wijs' and Waller's tions with stilbene and styrolene. Experiments in this tion with stilbene and other substances are in hand.

o return to the question of the amount of acid formed ng Hübl's reaction with styrolene and stilbene. In both s, as the action of water upon the iodochloride is ably a reversible one, hydrochloric acid might be cted to be formed less easily than hydriodic acid, use as soon as any of the latter was produced it would t once converted into hydrochloric acid and free iodine, thus prevented from exerting its "back pressure," e increasing the tension of the hydrochloric acid in the ion. With styrolene no iodine as hydriodic acid is off, because this atom is not loosened, only hydro- ic acid being formed. As this is not removed from phere of action it can exert its proper tension, and so ent more acid being split off. If we increase the quan- of water present, according to the law of mass action et more acid formed, until finally we get 48 per cent. ne added halogen split off (that is 96 per cent. of the ine) when we have 10 c.c. of water present.

ith stilbene, hydriodic acid is doubtless the first to be off by the action of water upon the iodochloride, and his is at once converted into hydrochloric acid and e, the former prevents by its "back pressure" the ting off of more HCl, hence even with the addition of c. of water to the Hübl's solution, only 86 per cent. of otal added halogen is split off as acid. All the iodine is ved by this action of water, for none was found in the ion products, but some of the chlorine remains as oxy- ide, (a trace of chlorine was detected in the oil ned from the chloroformic layer).

is interesting to note that the free acid formed with ne is always nearly the same percentage of that rbed, namely, 82—86 per cent. What the exact ing of this is, I am unable to say; probably stereo- ical influences are at work.

Oils.

Iodine Values by Waller's Solution.—As already mentioned, Waller's solution is slower in addition than Hübl's. Wijs is of the opinion that this is because it contains less hypoiodous acid. According to the view already set forth, Waller's solution must be looked upon as containing iodine chloride hydrochloride, and I am inclined to attribute its slow action to the fact that this compound must be first decomposed before addition can take place.

Waller's solution, too, is generally said to give lower results than Hübl's, but Henriques (Chem. Rev., 1898, 43—45) states that he has obtained the same iodine values from Waller's solution in 24 hours as from Hübl's if sufficient chloroform were added to prevent precipitation of any iodochlorides. He also observes that Hübl's solution, when it yields a precipitate with oils, gives lower results than normal, and also that Waller's solution more readily yields a precipitate than Hübl's.

This latter fact he explains by assuming that the water present renders the iodochlorides more insoluble, and they are therefore precipitated and carry down with them some oil which has not absorbed iodine chloride. It was therefore of interest to examine an oil with the modified form of Waller's solution previously described.

A Bombay linseed oil, of iodine value 184 by Hübl's method and 185 by Wijs', was chosen. Three experiments were performed, with the following results:—

Iodine value of Bombay linseed oil by Waller's solution (modified). The solution contained 55·2 grms. of HCl per litre:—

Oil taken.	Iodine added as c.c. Thio.	Iodine absorbed.	0·2 gr. Iodine = c.c. Thio.	Chloroform used and Precipitate.	Iodine Value.
0·1576	38·1	13·6	12·8	10 c.c. much ppt.	134·8
0·1327	38·1	13·45	12·8	20 c.c. less „	158·3
0·1479	38·1	16·7	12·8	30 c.c. no „	176·4

Here we have the same thing as Henriques' notes, namely, that if a precipitate is formed the iodine value is less, but in this case it cannot be due to the cause to which Henriques ascribes it, because there is no more water present in this solution than in Hübl's, which does not yield a precipitate even when only 10 c.c. of chloroform are used. It seems probable therefore that it is the more complete conversion of the oil into iodochlorides which are difficultly soluble in alcohol chloroform that brings about the precipitation which takes place with this solution. With Hübl's solution there is not that excess of hydrochloric acid present to prevent the formation of the more easily soluble hydroxyl derivatives. It was therefore of interest to examine this oil and others with the object of finding out how much of the added halogen was so loosened as to be split off by the action of water in Hübl's solution as free acid.

The following table gives the iodine values of some oils by Wijs' and Hubl's method, and the amount of halogen expressed as iodine eliminated as acid. 10 c.c. of chloroform were used in each case, 25 c.c. of Wijs' solution and 15 c.c. each of the iodine and bichloride solutions:—

Oil used.	Method.	Iodine Value.	Acid as Iodine in Per Cent. of Oil taken.	Acid as Iodine in Per Cent. of Iodine Value.
Baltic Linseed	Wijs'	198	..	..
„	M. Hubl's	197·5	31·8	16·5
Bombay Linseed	Wijs'	185	..	..
„	M. Hübl's	184	30·9	16·8
La Plata Linseed	Wijs'	180	..	..
„	M. Hubl's*	180	30·5	17·0
Wood Oil	Wijs'	169·5	..	..
„	M. Hubl's	167	90·8	54·3

* The Hübl solution used in this case had 15 c.c. of water added to every 250 c.c. of the iodine solution employed.

There is therefore in the Bombay oil 30·9 per cent. of iodine converted into free acid, or 16·8 per cent. of the absorbed halogen loosened. Now, if this halogen, probably chlorine, were prevented from being split off as it is partially by the "back action" of the hydrochloric acid present in the modified Waller's solution used, then when potassium iodide was added it would be removed along with a neighbouring halogen atom, and two equivalents of iodine would be liberated,* that is, $2 \times 30{\cdot}9 = 61{\cdot}8$, with a resultant apparent total iodine absorption of $185 - 61{\cdot}9 = 123{\cdot}2$. Although the lowest value found by the modified Waller's solution with 10 c.c. of chloroform is considerably above this, as doubtless even with this solution in spite of the excess of hydrochloric acid some acid is formed, yet it is interesting to note that each addition of 10 c.c. of chloroform occasions, by dissolving the iodochlorides during the reaction, and thus subjecting them to the action of the water present, or afterwards by removing them from the action of the potassium iodide more completely, an equal increment in the iodine value.

Even when no precipitate is formed, the iodine value is lower than that obtained from Wijs' or Hübl's solution. This may be due to the fact that the dilution with chloroform so lowers the concentration that complete absorption, especially by the protected portion of the oil (*vide infra*), cannot take place, or perhaps the large excess of hydrochloric acid prevents some of the chlorine which has been loosened from being split off, and so, when the potassium iodide is added, reduction of this and liberation of iodine lowers the observed iodine value. The former explanation appears the more likely.

The nature of the acid formed by the action of water and iodine chloride upon unsaturated substances is answered by their behaviour towards Wijs' solution. If they colour it red-brown, then hydriodic acid is the one formed, but if, on the other hand, they do not alter its colour, but merely render it lighter in shade, then any acid formed is hydrochloric acid.

All ordinary oils, when raw, merely reduce the intensity of the shade of Wijs' solution by absorption of iodine chloride, so any acid formed is hydrochloric and not hydriodic acid. Boiled oils and blown oils colour Wijs' solution red-brown, hence they must liberate hydriodic acid.

It was interesting to notice that Chinese wood oil immediately developed a very dark red-brown coloration with Wijs' solution, and as the free acid formed in Hübl's reaction is more than half the total absorbed halogen, both chlorine and iodine must have been split off. Whether the whole of the iodine and a small portion only of the chlorine, or approximately equal amounts of both, cannot yet be answered, but probably the former is correct. Under any circumstances one thing is evident, and that is, that Chinese wood oil is altogether different in structure to the other fatty oils.

A further point of interest is, namely, the amount of free acid formed with linseed oil. This is approximately one-sixth of the amount absorbed. Bauer and Hazura's analyses give the following as the approximate quantities of the glycerides of the various fatty acids, and Weger (Chem. Rev., 1898, 250) has thus given their iodine values :—

	Per Cent.	Iodine Value of Glyceride per Cent. of Total Oil.
Glycerides of saturated acids.....	15	0·0
„ Linolenic acid	68	178·2
„ Linolic „	13	22·6
„ Oleic „	4	3·4
Total.....	100	204·2

Now, in linseed oil only, some of the atoms of absorbed halogen—and those chlorine atoms—are so loosened by some cause as to be eliminated as hydrochloric acid by the action of water. The loosening influence at work must be some negative group, and as only one such is present in each equivalent of acid, namely, a carboxyl group, it appears likely that it must be proximity of the carboxyl group that loosens the atoms attached to one double linkage.

In oleic acid, the double linkage is generally admitted to be in the middle of the chain, but the position of the two double linkages in linolic acid is not known, nor of the three ethylene bonds in linolenic acid. We may therefore assume that in each acid one ethylene bond is either attached directly to the carboxyl group or in close proximity to it. One of the absorbed halogen atoms is subjected to its loosening influence, and that atom is chlorine.

Taking the above analysis, one of the six atoms absorbed by each linolenic acid residue of the trilinolenein is loosened, and one of the four atoms of the linolic acid residue of the glyceride trilinolein, that is—

One-sixth of 178·2.....	29·6
One-fourth of 22·6.....	5·2
Total loosened halogen atoms.....	35·2 as iodine per cent. of oil taken.

But the analysis of Bauer and Hazura refers to an oil of iodine value 204. The three linseed oils examined, of iodine values 198, 184, and 180, should split off as acid a proportionally less amount, namely, 34·4, 31·6, 30·8. The numbers obtained, 31·8, 30·9, and 30·5, are not far from these amounts; especially is this the case with the linseed oil of iodine value 180, where water had been added to the modified Hübl solution employed (60 c.c. per litre of iodine solution).

This agreement seems to point to the fact that in linolic and linolenic acid one of the ethylene bonds, if not directly attached to the carboxyl group, is, at any rate, so near to it as to be subjected to its influence, while the other double linkage or linkages are probably considerably removed from it.

The splitting off of more than 50 per cent. of the absorbed halogen by wood oil is at present inexplicable.

Further experiments on the relationship of the iodine absorption to the structure of the unsaturated compound are in hand, and will shortly be published.

Before concluding, however, let me briefly recapitulate the chief results, and conclusions which may be drawn from them given in this paper :—

(1) That the origin of the free acid formed during the action of the iodine chloride solutions upon unsaturated compounds is the action of water upon the iodochlorides, and its quantity is dependent upon the structure of the compound and the amount of water present in the solutions used.

(2) The nature of this acid varies with the structure of the compound examined, but the coloration produced by Wijs' solution affords information as to its character.

(3) Some iodochlorides are reduced by the action of potassium iodide, with liberation of iodine, and consequent reduction in the apparent iodine absorption.

(4) That the errors arising from this source may be avoided by either addition of more chloroform, so as to dissolve all the iodochlorides formed, or by the addition of water to the iodine chloride Hübl's solution; but that in any case the correct result can only be obtained when the properties of the iodochlorides are taken into consideration.

(5) That in all cases it is advisable to add water to the test solution before potassium iodide, so that any iodochloride which remains unchanged may, as far as possible, be removed from the sphere of action by solution in the separated chloroform layer.

(6) That iodine chloride is the active substance in addition, and not hypoiodous acid.

(7) That Waller's solution contains iodine chloride hydrochloride, and, as this has to be decomposed before addition takes place, it is not only slower in action than Hübl's solution, but also may, with certain substances, on this account, yield either no iodine value at all, or much below the correct amount.

(8) Some doubly linked carbon atoms, by the loosening or protecting influence of neighbouring groups, may be prevented from absorbing any halogen from a strongly acid Hübl's solution (Waller's).

* Compare the behaviour of stilbene and styrolene iodochloride with potassium iodide.

(9) That by determining the iodine value of a substance by Waller's (modified), Wijs', and Hübl's method, and the free acid formed during the latter reaction, it is possible to determine not only the number of doubly linked atoms, but also their position in the molecule relatively to certain other groups.

(10) That substitution does not take place during the determination of the iodine value by the methods ordinarily employed.

I have to thank my assistant, Mr. Ernest Wake, for the valuable help he has rendered me in the experimental work recorded in this paper, and also the directors of Messrs. Barry, Ostlere, and Shepherd, Ltd., for the use of their laboratory where the practical work was carried out.

Obituary.

JOHN GLOVER.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY, AND GOLD MEDALLIST OF THE SOCIETY (1896).

John Glover, the inventor of the well-known "Glover tower," was born in February, 1817, in Newcastle on-Tyne. He was the son of a working man, and at an early age was apprenticed to a plumber. Joining the old Mechanics' Institute, he studied chemistry, and subsequently took a post at the Felling Chemical Works, then Messrs. Lee and Co. (afterwards Messrs. H. L. Pattinson and Co.), and, about 1852, he went to Washington as manager of the large works there. At the Washington Chemical Works, founded by Mr. Pattinson and his partners, Mr. Glover was chiefly occupied in assisting in the development, on a manufacturing scale, of the oxychloride of lead process, patented by Mr. Pattinson. John Glover remained here until 1861, when he left to start the Carville Chemical Works at Wallsend, where he and his partners carried on the manufacture of alkali by the Leblanc process and bleaching powder until about the year 1882, when the works were closed. It was at the Carville Chemical Works that John Glover perfected his tower, for denitrating and concentrating sulphuric acid in one and the same process, thus saving nitre, fuel, and even lead, besides removing the nuisance of acid fumes. He ultimately retired into private life. The story of the Glover tower is well told in the Presidential Address of 1896, where, quoting the words of the late Dr. F. Hurter (this Journal, 1896, 510 and 511), it is stated that "Mr. "Glover built his first tower in 1859. I am proud to "say that the first Glover tower introduced into "Lancashire started on December 29, 1868, under my "superintendence, in the works of Messrs. Gaskell, "Deacon, and Co. The invention of Mr. Glover has "marked an epoch in the development of the manu-"facture of sulphuric acid. The saving that tower has "accomplished, if we compared present-day consump-"tion of nitre with the former practice, must be valued "to this country alone as at least 300,000*l.* per annum."

Yet John Glover took out no patent for his tower, and whilst contributing "beyond the ordinary to the well-being and prosperity of his fellows," he himself received no great reward, except the inward light and satisfaction of well-doing, and of benefiting others. Some years ago, at the instigation of various friends, a testimonial, to which many chemical manufacturers and others subscribed, was presented to Mr. Glover in appreciation of the great service he had rendered to applied chemistry. After receiving the medal of this Society, presented to him by Mr. Tyrer, the President in 1896, for conspicuous services to applied science, Mr. Glover made reply in words pathetic in their modesty. The wish expressed by the President that "length of days in happy retirement" should be granted to him, has been accomplished, for his life has considerably exceeded the "threescore years and ten." John Glover died on Thursday, May 1, at his residence, Holly Avenue, Newcastle-on-Tyne, and was buried on Saturday, May 3.

In 1871—2 he was President of the Newcastle Chemical Society, afterwards merged in the Society of Chemical Industry, and for a long time he was a member of the Committee of the Newcastle Section of our Society. John Glover took a great interest to the last in the Wellesley Training Ship for boys on the Tyne. One of the touching tributes at his funeral was a wreath of flowers from the Superintendent and Matron and the boys of this Institution, sent "in affectionate "remembrance of one who devoted so much time and "labour to their interest."

The following appreciation is contributed by an intimate friend:—

"In the genial personality of John Glover there has "passed away from amongst us one of the founders of "the Society of Chemical Industry, and one of its most "distinguished members.

"Without any of those adventitious aids to advance-"ment which fall to the lot of the tenderly nurtured "and the expensively educated, John Glover had that "force of character, that noble ambition, that genius "which amply compensated for what are usually "regarded as deficiencies and drawbacks in youthful "experience and education—a spartan brioging up and "a brief and inexpensive schooling. He left school at "an age when the sons of the wealthy are just beginning "what is termed their 'education.' But the short period "of his school life by no means ended the education of "John Glover; he was his own schoolmaster, and never "left school.

"I knew him when he was a young man, half a "century ago. I had the great advantage and happi-"ness of his close friendship, and many as are the men "I have known during the eventful time that has passed "since then, I have never known a man more devoted "to the acquisition of knowledge, or more successful "in attaining it, than our late dear colleague, John "Glover. His was that liberal education that grows "out of a healthy appetite for knowledge, a fine sense "of fitness in the choice of means to ends, and a "resolute determination to overcome all hindrances.

"At the time of my first acquaintance with him, in "the early fifties, he was at the Felling Chemical "Works—works that are associated with the name "of Hugh Lee Pattinson, one of the pioneers of the "great alkali manufacture of the Tyneside. John "Glover was a *protégé* of Hugh Lee Pattinson; he "was then in the chemical works laboratory, and very "eager to master and improve the analytical and "manufacturing processes.

"He was full of youthful enthusiasms, and these "ranged over the widest regions of science, of religion, "and of social economy. He read extensively, was a "keen controversialist, and loved debate.

"When Hugh Lee Pattinson and his partners built "works at Washington for the manufacture of magnesia "and oxychloride of lead, by the beautiful Pattinson "process, John Glover went from Felling to Wash-"ington to manage the works there. I recall with "ever fresh enjoyment the good old times when a "coterie of ardent young men, of which I was one, "were wont to meet at Washington on holidays, and "spend a vivid moment in the discussion of the oldest "and newest things.

"These patches of sunshine in a far distant view are "grateful in my memory.

"When the time was ripe for John Glover to enter the "wider field of initiative and invention as an independent "chemical manufacturer, he came back to the Tyne-"side, and designed and built the Carville Chemical "Works. Under his management these were carried "on very successfully for many years in conjunction "with his partners, the Carville Chemical Company.

"It was during this period that the world-wide known "and used Glover tower was invented.

"With that singular liberality which was one of "John Glover's characteristics, no attempt was made, "by patenting or by secrecy, to monopolise its use, "but to all the world was freely given the full benefit "of this most valuable improvement in the sulphuric "acid manufacture.

"It was chiefly in recognition of this contribution to "chemical technology that the Society of Chemical "Industry awarded to him its first medal.

"The later days of John Glover have, I fear, been "a little clouded, through the decadence of the alkali "manufacture on the Tyne. It must have been a great "trouble to him—it is impossible not to think so; but "he was of so serene a nature, all the qualities of "human goodness were so mixed in him, and his "resources of mind were such, that no one could have "been less hurt by the blows of unkind fortune than he.

"So, though in his later years there was perhaps less "outward brightness, the inward light never failed, nor "the delightful buoyancy of his spirit.—J. W. S."

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	596
II.—Fuel, Gas, and Light	597
III.—Destructive Distillation, Tar Products, Petroleum	607
IV.—Colouring Matters and Dyestuffs	607
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	610
VI.—Colouring Wood, Paper, Leather, &c.	614
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	614
VIII.—Glass, Pottery, and Enamels	615
IX.—Building Materials, Clays, Mortars, and Cements	615
X.—Metallurgy	616
XI.—Electro-Chemistry and Electro-Metallurgy	620
XII.—Fats, Fatty Oils, and Soap	624
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	625
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	627
XV.—Manures, &c.	627
XVI.—Sugar, Starch, Gum, &c.	628
XVII.—Brewing, Wines, Spirits, &c.	631
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	633
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	635
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	636
XXI.—Photography	638
XXII.—Explosives, Matches, &c.	639
XXIII.—Analytical Chemistry	639
XXIV.—Scientific and Technical Notes	645

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Spraying Measured Quantities of Liquids [Molten Wax, &c.] into Casks or other Receptacles; Apparatus for ——. J. G. Crossman, Watford, Herts. Eng. Pat. 9021, May 1, 1901.

The apparatus comprises a vessel containing the wax or liquid, a spraying nozzle, which may be heated by a steam jacket, &c., and a force-pump or other means for forcing the wax or liquid in determined quantity through the nozzle. In one form, in which a pump is employed, the cap of the nozzle is fitted with an internal cone, having an external spiral groove for the passage of the liquid, the space between the cone and cap being adjustable to regulate the fineness of the spray. In a modification, in which compressed air is employed to force the liquid through the nozzle, the liquid, as it enters the nozzle, is met by a jet of air, which converts it into a spray or mist.—R. A.

Evaporating, Condensing, and Feed-Water Heating Apparatus. C. R. Henihall, Liverpool. Eng. Pat. 9144, May 3, 1901.

The distributing and collecting pipes and coils of the apparatus are arranged and connected so that the joints of the pipes and coils are all at the front of the machine, where they are readily accessible when the door is removed. The coils are preferably of rectangular volute form, with the lower stretches of the volute slightly inclined, and with the drain end of the coil of much smaller diameter than the main portion. The evaporator is divided by a diaphragm into two chambers, in one of which the vapour is generated, while the other is connected to the vapour outlet. The diaphragm is provided with a valve for controlling the communication between the two chambers.—R. A.

Feed-Water Heater; Berryman ——, *and any other Heating or Cooling Apparatus for Steam, Gas, or Air and any other Fluids.* W. Wright, New Wandsworth, Surrey. Eng. Pat., 13,192, June 28, 1901.

The tubes of the condensing, heating, cooling, or evaporating apparatus are fitted with corrugated "interspersing or deflecting strips," for the purposes of breaking up currents and effecting a more rapid transfer of heat. Coned plates are also fitted at the bottom of the heater, to separate grease, valves being provided for drawing off the matter so separated.—R. A.

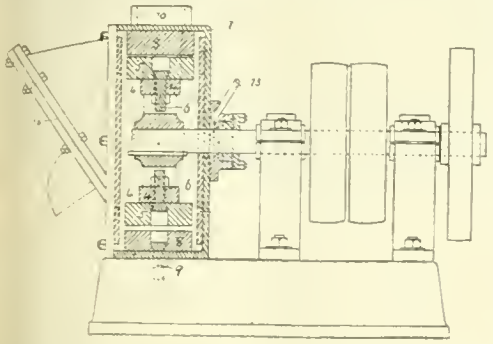
Level-Indicators for Non-transparent Liquid Containers, and especially applicable for Lamp Reservoirs. P. Kindermann, Berlin. Eng. Pat. 24,610, Dec. 3, 1901.

The indicator consists of a polished or glittering floating body, which is guided vertically in the interior of the reservoir beneath the filling opening. The indicator can always be seen through an inspection glass in the screw plug, which closes the filling opening, and the level of the liquid can be ascertained from its position.—R. A.

Grinding and Pulverising Mill [for Minerals, Chemicals, &c.]. T. Breakell, Wirksworth, near Derby. Eng. Pat. 18,637, Sept. 18, 1901.

The mill consists of a rotating disc 4, provided with shoes, 5, of hard material, and an enclosing casing 1, provided

ith dies, S, of hard material, the shoes being adapted to tate in close proximity to, but not touching, the dies. he shoes and dies are secured by taper-headed bolts 6, 9, nd they can be adjusted for wear by the insertion of icking pieces. The material is fed through the hopper 10,



d, when ground or pulverised, is ejected from the mill rough the screen 16 by a current of water or air. The reen 16 may be omitted. For wet grinding, water is pplied through the pipe 13.—R. A.

'urnaces; Impts. in ——. J. Taylor, Bacup. Eng. Pat. 5940, March 21, 1901.

IE furnace is shown in the drawings combined with a rizontal boiler. Air is forced by a fan to a feed pipe nning horizontally in front of the furnace, from which pe proceed perforated branch pipes running backwards der the fire-bars, one on each side thereof, and delivering to the fuel above. These tubes extend just behind the e-bridge, where they rise upwards and deliver the mainder of the air to the furnace gases passing over e bridge.—R. S.

United States Patents.

'aporating-Pan. J. H. Hill and J. Rivett, Horseshoe, St. Lawrence, New York. U.S. Pat. 697,484, April 15, 1902.

E evaporating-pan is removably supported on a hollow tangular base, adapted to serve as a steam jacket, and nged on its upper side to hold the pan in position. Steam supplied to the interior of the base, and also to coils in pan. The coils are arranged between and around ernately disposed partitions in the pan, and have a nection with the interior of the base, a return-pipe meeting the base with a steam-trap, or with a feed-water ter, or other means for utilising the heat in the water of ndensation. A number of pans may be arranged on ferent horizontal planes, with an outlet from each pan to next of the series.—R. A.

ntrifugal Machine. J. J. Berrigan, New Jersey, U.S.A. U.S. Pat. 696,130, March 25, 1902.

IS machine, for separating solids from liquids, is a dified form of that described in U.S. Pat. 677,926, y 9, 1901. The main pan of the separator contains an itional pan placed out of centre, and inside which a forated vessel revolves and carries scrapers to remove deposited solids to an opening, from which they are charged; the liquid is discharged from a pipe at the base he main pan.—J. W. H.

Filter. A. Johnson, Minnesota. U.S. Pat. 696,241, March 25, 1902.

E filter consists of a hollow drum, built up of four con- tric filtering cylinders of finely-woven wire ganze. ween the two inner and the two outer cylinders a able filtering material is placed, and the intervening ce forms an annular air-chamber, which is divided up a number of segmental compartments running from to end of the drum. When in use, the drum is immersed in the water to be filtered, with its axis horizontal, at such depth that one of the compartments is always out of the water at the top, and by rotating the drum on its axis, each compartment in turn can be thus exposed for cleaning, which is done in the following manner:—A closely-fitting head connected with a powerful exhausting fan is brought over the exposed compartment, and a rapid current of air is drawn through a pipe into the air chamber and through the filtering material between the two outer gauze cylinders. This soon dries the deposit on the exterior of the filter, and the air current then carries it away.—L. A.

Mixing or Spraying Device. C. C. Riotte and E. A. Riotte, New York. U.S. Pat. 696,116, March 25, 1902.

A TANK is provided with an inlet and outlet, and with a float having a vertical guide, consisting of a tube fixed to the float, open at the bottom, and extending upwards through the float. The top and bottom ends of the tube rest in sockets in the tank. The internal area of the tubular part affords sufficient capacity to prevent compression of its contents from materially interfering with the relative movements between the float and the tank.

—R. S.

II.—FUEL, GAS, AND LIGHT.

Calcium Carbide and Manganese Carbide; Simultaneous Manufacture of ——. Ind. Electrochem., 5, 6; through Electrochemist and Metall., 1902, 2, [12], 43—44.

MACÉ adds from 5 to 10 per cent. of MnO_2 to the charge in the calcium carbide furnace, and thus produces the two carbides simultaneously, the cost being practically the same as in the case of the single carbide. The effect is said to be the obviation of a deposit of carbon, and consequent clogging of the burners, owing to the polymerisation of acetylene during combustion. The following equation represents the reaction occurring on treatment with water:—

$$CaC_2 + Mn_3C + 8H_2O = C_2H_2 + CH_4 + H_2 + Ca(OH)_2 + 3Mn(O(OH)_2.$$

—W. G. M.

English Patents.

Furnaces where Gas is used. W. P. Thompson, Liverpool. Eng. Pat. 7821, May 25, 1901.

COMBUSTIBLE gas is injected through a series of nozzles into the furnace by means of concentric nozzles through which air at high pressure is passed. These nozzles are inclined so as to project the jets on to the materials to be heated, at an angle of about 60°. At the commencement of the process, the pressure employed is such that the gases shall ignite at the nozzles. Afterwards, the speed of the gases is increased to such an extent that the flame only exists on the material to be heated. When used for a glass furnace, a shallow portion of the bed is formed between the melting end and the settling end of the furnace, and the glass, as it passes over the sill forming this shallow portion, receives other jets of oxidising flame from a further series of inclined nozzles.—R. S.

Coking Badly-caking Coal; A Process for ——, *and Mechanical Appliance for same.* H. Schwarz, Austrian Silesia. Eng. Pat. 6468, March 27, 1901.

THE badly-caking coal is compressed before admission to the furnace, and again after admission thereto. The latter operation is performed by means of covering plates, so that the coal passes through the whole coking process under a constant pressure. These covering plates consist of cast-iron plates encased in fire-brick tiles. A travelling crane is employed for raising the plates and for opening and closing the furnace doors.—R. S.

Fuel, Artificial Manure, or other Products; Treating House Dust, Garbage, and other Refuse for the Purpose of Converting them into ——. W. G. Jones. Eng. Pat. 6507, 1901.

See under XVIII. B., *page* 634.

Gas Generators. A. J. Boult, London. From F. Chavanon, St. Gobain, France. Eng. Pat. 6357, March 26, 1901.

The generator, in which a mixture of steam and air is led down through the incandescent fuel, is connected with a boiler through which the pipes conveying away the hot producer gases pass, the waste heat of the gases being thus utilised in producing the steam required by the generator. The steam is injected into passages in the walls of the generator, drawing in the required proportion of air, the mixture being heated in the passages before entering the top of the generator. The ash-pit of the generator is water-sealed, but the ashes do not drop directly into the water; they collect in a trough beneath the grate, from which they are raked periodically into the water-seal by means of a rake, the handle of which passes through the casing. There is also described a generator in which air, mingled with steam, is aspirated through the fuel simultaneously from above and below, the hot gases passing through an economiser, for heating the air-supply.—H. B.

Gas; Manufacture of ——. L. G. Harris, Canning, Nova Scotia. Eng. Pat. 2751, Feb. 3, 1902.

A mixture consisting of mineral oil, water in excess of the oil, and an alkaline ingredient, is distilled from retorts, the resulting gas and vapour being superheated and purified. A suitable mixture consists of 50 galls. of water, 15 galls. of mineral oil, 5 lb. of caustic potash, 4 lb. of nitrate of soda, 2 lb. of common salt, and 3 lb. of slaked lime.

—H. B.

Gas Burners; Atmospheric ——. E. Terraneau, London. Eng. Pat. 7995, April 18, 1901.

At the foot of a roomy mixing chamber is arranged a horizontal fan, which is rotated by the gas impinging upon it, and which draws in air through openings in the casing beneath it. The vertical plug of the gas cock, which is situated at the base of the burner, is attached to perforated shutters, so that as the cock is turned to reduce the gas supply, the air inlets below the fan are correspondingly reduced. The inlet orifice of the plug of the gas cock is inclined, so as to deliver the gas upon the blades of the fan at a suitable angle.—H. B.

Burner for Gas Combustion; Atmospheric ——. W. Hancock, London. Eng. Pat. 9643, May 9, 1901.

Gas and air, either previously mixed or admitted separately, enter the bottom of a wide tube, closed at the top, except at the centre, where there is a narrow tube open at both ends. Arriving at the top of the latter, the gaseous mixture is caused, by the closed top of an outer concentric tube, to pass downwards through this outer tube, from which it escapes through perforations in the lower part to an upward extension of the first-mentioned wide tube. The walls of this extension are formed of wire gauze, and the mixture is ignited on the outer surface.—R. S.

Incandescent Gas Burners. H. Lux, Berlin. Eng. Pat. 11,785, June 8, 1901.

This describes a burner in which sufficient air is admitted to the gas, in the mixing chamber, to form a "self burning mixture." As the velocity of outflow of such a mixture must be greater than that of the propagation of its combustion, the gas-inlet nozzle at the foot of the mixing chamber is provided with a regulator of such a kind as to allow the gas to reach the mixing chamber without loss of pressure. For this purpose the nozzle consists of a split tube, the resilient sectors of which tend to move apart. A nipple at the base of the tube is screwed upon the gas-pipe as usual, and is externally provided with a screw thread upon which a sleeve, of slightly conical form, can be screwed up and down. When the sleeve is screwed downwards, the sectors are pressed together so that the passage for the gas is reduced, and *vice versa*.—H. B.

Incandescence Mantles. C. Clamond, Paris. Eng. Pat. 4229, Feb. 27, 1901.

The claims are for the use of thorium oxide and zinc oxide, in conjunction with cerium oxide or other excitant, in the manufacture of mantles. The proportion of zinc oxide to thorium oxide may vary widely, the best results being obtained with 1 part of the former to 3·28 of the latter, in the finished mantle. The mantle is prepared and burned off in the usual way; to avoid reduction and volatilisation of the zinc, the mantle is then exposed to the action of the oxidising flame, and, finally, to the seasoning flame. By this process the zinc oxide is combined in a non-reducible form with the thorium oxide. It is stated that mantles of this construction have stood burning for 900 hours without loss in illuminating power.—H. B.

Incandescence Mantles; Apparatus for Burning and Seasoning ——. W. Mackean, Westminster. Eng. Pat. 4302, Feb. 28, 1901.

A number of pressure gas burners are arranged in a row at suitable intervals, each burner consisting of a central Bunsen burner surrounded by an outer tube leading to a ring of jets, radiating outwards, near the top of the burner. The gas supplies to the inner and outer tubes, and to a central bye-pass jet, are independently controllable. A row of ring burners, from which issue jets directed radially inwards and downwards, is arranged some distance above the pressure gas burners, one ring burner above each. Behind these rows there is a clockwork which operates a vertically-movable bracket, carrying a removable bar having wires projecting forwards, from the ends of which the mantles are suspended. The clockwork is connected with a treadle (situated beneath the table), by pressing which with the foot, the bar carrying the mantles is lowered, the clockwork, which raises the bar, being at the same time wound up. A bar, carrying a supply of unburnt mantles, having been fixed in the apparatus, the fabrics are first burned off from above by means of the ring burners; by means of the treadle the mantles are then lowered over the pressure gas burners, the clockwork raising them gradually when the treadle is released; and after they have been lowered and raised over these burners several times, they are again raised and subjected to the action of the ring burners to strengthen their tops. The bar carrying the mantles is then removed and replaced by another bar having a row of unburnt mantles.—H. B.

Incandescent Light Mantles; Apparatus for Burning Down ——. J. Janz, Berlin. Eng. Pat. 6952, April 2, 1901.

The patentee claims a process of and apparatus for burning off and seasoning a number of incandescent mantles simultaneously, in which the mantles are caused to rotate while the burners rise and fall within them. A number of horizontal toothed wheels, gearing with one another, are mounted to revolve on the top of a framework erected on a long bench. A hooked wire, depending rigidly from each wheel, carries the mantle. By means of suitable gearing connected with the train of toothed wheels, all the mantles can be caused to revolve. Behind the row of mantles extend two rotatable horizontal gas pipes, carrying two branch pipes for each mantle, the one forming a Bunsen burner and the other an igniting-flame tube; by drawing down a lever attached to the rotatable pipes, the Bunsen burners are brought forward and down close to the top of the newly-mounted mantles, the gas supply being turned on simultaneously so as to light the Bunsen burners. Pressure gas burners, one beneath each mantle, are mounted on a horizontal beam which is caused to rise and fall through the action of eccentric cam discs, the gas cock controlling these burners being so connected with the lifting gear as to be turned on more fully after each up and down stroke. The process and apparatus can be modified so that each mantle is stationary whilst the pressure gas burner is both rotated and moved up and down; or the mantle may be moved up and down and the burner rotated; or the burner may be kept stationary whilst the mantle is both rotated and moved up and down; or both the mantle and burner may be rotated and moved up and down simultaneously.—H. B.

Carburetters. C. M. Kemp, Baltimore, U.S.A. Eng. Pat. 2117, Jan. 27, 1902.

The carburetter, which is designed for the production of carburetted air from volatile hydrocarbons, such as gasoline, consists of a horizontally-arranged cylindrical tank, partly filled with volatile hydrocarbon, an air-pumping wheel (a meter-wheel) rotatably mounted within the tank and immersed in the hydrocarbon, an air-inlet pipe, through which air is drawn into the tank, a gas outlet pipe, and suitable mechanism for driving the air-pumping wheel. The tank is buried in the ground, and the driving mechanism (actuated, for instance, by a falling weight) is situated some distance from the tank, having suitable power-transmitting connections which traverse the air-inlet pipe. The tank is preferably divided into two compartments, the main quantity of hydrocarbon being stored at one end and the air-pumping wheel being situated at the other; an inclined tipping-wheel, which revolves with the meter-wheel, transfers the hydrocarbon from the one compartment to the other.—H. B.

Gas or Vapour Heating Devices. D. W. Bowman, Toledo, U.S.A. Eng. Pat. 23,449, Nov. 19, 1901.

A vapour generator and heating burner are combined, part of the vapour being led away to incandescent lighting burners if desired. The generator consists of a deep spiral chamber surrounding a central tube, and filled with sand or equivalent material. Oil is adjustably led to the bottom of this chamber, rises through the sand, and overflows through a tube which leads it to the bottom of the central tube, where it overflows to a surrounding cup. The supply is then cut off, and the oil in the cup is ignited to initially heat the vaporiser and thereby generate vapour. The supply of oil is then again turned on, and the generated vapour passes up the central tube to the burner, escaping through the interstices between two rings of teeth which form the actual burner. The top cover of the burner is provided with an internal depending mixing device, and with external radial supports for the cooking utensils, &c. Instead of oil, gas may be used.—R. S.

Gas-Purifiers. R. J. Milbourne, Wellington. Eng. Pat. 11,356, June 3, 1901.

The purifiers are designed so that external valves on the inlet and outlet mains of each compartment are dispensed with. Through the partition which separates two adjacent compartments there passes a double elbow pipe, through which the gas may be led from the one compartment to the other. In the one compartment, a casing, which forms a widened extension of the elbow pipe, leads to the lowest part of that compartment, beneath the lowest tray; while in the other compartment the pipe, which opens downwards, is surrounded by a casing which opens above the uppermost tray. Each end of the elbow pipe is situated a short distance above the mouth of a branch pipe projecting into the compartment from (in the former compartment) the inlet main or (in the latter) the outlet main. In each case a disc valve, controlled from outside the purifier, is arranged between the mouth of the branch pipe and that of the elbow pipe above it, so that by either raising or lowering the disc, either pipe may be opened or closed as required. An arrangement similar to the above is provided at the partition between every two adjacent compartments of the purifier. By adjusting the disc valves, the gas can be passed through any desired number of compartments, in any desired order. When the compartments are arranged in line, a return passage is provided from the outlet of the last compartment to the inlet of the first.—H. B.

Acetylene Gas; Manufacture of ——. C. S. Forbes, Strathdon, Aberdeenshire. Eng. Pat. 4353, Feb. 20, 1902.

An automatic apparatus of the water-to-carbide principle, in which the supply of water is controlled electrically. When the holder-bell falls to a certain point, it closes an electric circuit, which operates a magnet and releases a lever fastened to the cock on the first water tank. Water then flows out of the cistern through a doubly-bent pipe to the decomposing vessel; but as soon as the tank is empty a ball valve falls, cuts off the current, and leads it to a similar arrangement on a second generator. Any number of such generators may be employed in series, and when the last water tank becomes empty, its ball-valve falling, brings into the circuit a bell to indicate the complete exhaustion of the apparatus. From each generator the gas passes through a washer to the holder.—F. H. L.

Acetylene Generators. W. T. Lambourne and J. C. Wood, London. Eng. Pat. 6861, April 2, 1901.

A self-contained water-to-carbide generator, working on the flooded-compartment system, with two carbide containers placed inside the main water vessel. The holder is of the rising type, and its water is used for decomposition, passing through a seal on its way to the carbide, while the gas passes through a non-return valve on its way to the holder. The carbide is held in subdivided compartments in horizontal cylinders, one of which is attacked at a time, and either of which can be isolated by cocks for the purpose of recharging.
—F. H. L.

United States Patents.

Moulding Machine [Briquettes]. B. C. White, Pittsburg, U.S.A. U.S. Pat. 695,773, March 18, 1902.

A machine for moulding powdered materials into briquette form is claimed, in which a plunger passing through a mould box, which is also the receiver for the powder, presses the material against another plunger supported by springs, and forming the base of the mould; the mould box and plunger then move together at different rates, the plunger forming the base of the mould being withdrawn in consequence, and the briquette is discharged.—J. W. H.

Reservoirs; Safety Device for Use in Filling Fluid ——, J. F. Hardy, Indiana, U.S.A. U.S. Pat. 695,929, March 25, 1902.

To prevent the reservoirs of gasoline or oil-burners, from being filled too full, means are described for reducing the capacity whilst the vessel is being filled, and for increasing it again immediately afterwards. A small additional reservoir, which is prevented from being filled until desired, a hollow body which can be removed from the liquid, and other devices to the desired end are described.
—J. W. H.

Heating Material; Method of ——. H. Campbell, Baltimore, U.S.A. U.S. Pat. 693,835, Feb. 25, 1902.

The material, such as asphalt or sand, rock or gravel, is enclosed, and there is supplied to it a volatile oil. Flames are then gradually and repeatedly passed bodily into and through the mass of the material at the same time that the material is stirred, and the volatile oil is burned by admitting a regulated supply of air thereto. This treatment increases the softness and plasticity of asphalt.—R. S.

Furnace. J. Ward, Newcastle-on-Tyne, England. U.S. Pat. 695,975, March 25, 1902. (See also Eng. Pat. 5319, 1900; this Journal, 1901, 344.)

The furnace has a series of communicating chambers arranged in a horizontal plane. Vaporisers for liquid fuel are arranged in the first chamber. The second chamber forms a combined mixing and heating chamber between the vaporising chamber and the melting chambers. The air for the second chamber passes through inlets in the furnace walls and along passages extending longitudinally along all the melting chambers.—R. S.

Furnace. W. Wakely, Taunton, Mass. U.S. Pat. 696,701, April 1, 1902.

The furnace is a metallurgical one, and is designed so that metals or alloys having different melting points may be simultaneously treated. Between the combustion chamber and the outlet to the flues there is a downwardly-inclined intermediate passage, in the hearth of which there are

formed a number of narrow, deep basins, the basin farthest from the combustion chamber being at the lowest level. These basins are placed across the furnace, and between each two there is a portion of the hearth of substantial thickness. The basins are provided at one end with discharge spouts or troughs, and may be open at their top, or closed substantially air-tight by suitable covers.—R. S.

Fuel; Process of Making Artificial ——. R. Steiner, New Orleans, U.S.A. U.S. Pat. 695,318, March 11, 1902.

The fuel is formed by mixing crude petroleum oil with about 6 per cent. of sawdust and about 12 per cent. of ordinary earth, distilling the mixture, and then pressing the residue, whilst still hot, into compact masses.—R. S.

Briquette Manufacture. T. Ingham, Liverpool. U.S. Pat. 695,210, March 11, 1902.

Granular solid matter is mixed with a solution of an alkaline alginate and cellulose, and the mixture is pressed and afterwards dried by means of hot gases travelling in the reverse direction and intermixed with any known gas or vapour which is capable of so acting on the alkaline alginate in the briquette as to render it insoluble in water. —R. S.

Fuel Block and Briquet. F. Chailly, New York. U.S. Pat. 697,234, April 8, 1902.

See Eng. Pat. 17,863 of 1901; this Journal, 1901, 1197. —H. B.

Gas Generator. R. A. Kummer, St. Louis, U.S.A. U.S. Pat. 694,288, Feb. 25, 1902.

Gasoline is led from an upper supply tank, past a needle valve and through a layer of filtering material, to an annular groove at the base of a lamp. From this groove it passes through very fine tubes to a central nipple, open at both ends, where it is ignited to form small jets of blue flame, which strike against a central rod. The gasoline which escapes unburned through the jets is immediately gasified, and passes up a mixing tube, to which a sufficient supply of air is also admitted, and the mixture is ignited at a burner on the top of the tube, and renders incandescent a Welsbach mantle.—R. S.

Gas Producer. E. J. Duff, Liverpool. U.S. Pat. 697,399, April 8, 1902.

See Eng. Pat. 15,646 of 1901; this Journal, 1901, 975. —H. B.

Gas Generator for Gas Engines. G. W. Bonds, Fresno, Cal. U.S. Pat. 697,789, April 15, 1902.

Relates to the class of generators in which liquid hydrocarbon is volatilised by the heat of the exhaust of an engine which is operated by such vapour. The generator consists of a flat heating plate having a boundary flange and a series of parallel ribs extending alternately from opposite sides or ends of the flange, and terminating at points short of the opposite sides, so as to form a circuitous passage. A series of outlets are located adjacent to one edge of the heating plate. The thin layer of oil on the plate is initially heated by igniting some oil and inflammable waste. The vapour passes to the engine, and the exhaust is led to a chamber beneath the plate.—R. S.

Gas Producer. L. Mond, London. U.S. Pat. 697,867, April 15, 1902.

A cylindrical gas producer, having at the top a bell containing raw fuel and at the bottom a grate in the form of an inverted truncated cone, is provided with a central vertical hollow rotating shaft carrying agitating arms. Gas and vapours from the upper part of the producer are drawn through lateral inlets into the upper end of the shaft by means of a steam injector, and are delivered at the lower end of the shaft through outlets into the mass of incandescent fuel.—R. S.

Gas; Apparatus for the Manufacture of Illuminating [Oil] ——. R. Dempster, Marietta, Ohio. U.S. Pat. 692,771, Feb. 4, 1902.

Within a rectangular casing, having in its lower portion grate upon which fuel is burnt, is arranged a series of horizontal retorts, closed by removable end plates, each retort having a horizontal vaporising tube fixed centrally within it, the tube having perforations along the top and feed pipe and cleaning pipe at each end respectively. Above the retorts is a superheating chamber, forming the crown of the apparatus, with which all the retorts communicate by flues or passages for the products of combustion of the fuel being arranged at the opposite sides of the chamber which has an outlet pipe leading to a purifier or gasholder. The generation and fixation of the gas from the oil proceeds progressively, first in the inner tubes, then in the retorts, and, lastly, in the superheating chamber. The casing of the apparatus is built up in sections.—H. B.

Gas [from Crude Petroleum] for Use in Explosive Engines; Device for Generating ——. J. S. Killian, Elmonte, California. U.S. Pat. 696,560, April 1, 1902.

Crude petroleum is fed from above into a drum-shaped upright chamber, concentrically arranged within which is a smaller drum-shaped chamber communicating with the discharge port of the explosion engine. The inner chamber is heated by the hot water-gases which pass through it and vaporises the petroleum dropping on its outer surface. To facilitate the removal of the petroleum refuse, which would otherwise accumulate on the surface of the inner drum, a swinging scraper, adapted to sweep over its whole surface, is mounted concentrically between the two drums and is operated by a handle outside. A refuse chamber having a drip-pipe and a removable bottom, is attached to the foot of the outer drum, and can be cut out for cleaning purposes by a swinging valve stopper mounted between the top of the refuse chamber and the foot of the drum. A pipe at the top of the outer drum leads the vapour produced to the explosion cylinder, a baffle shield preventing any liquid petroleum from entering the pipe.—H. B.

"Carbureter." F. Martenette, Chico, California. U.S. Pat. 691,955, Jan. 28, 1902.

Two closed cylinders are arranged horizontally, one above the other, the lower containing an air pump of any desired construction, the shaft of which extends through the end of the cylinder, and the upper being partly filled with gasoline. On a horizontal shaft in the upper cylinder are fixed radial arms, at the ends of which are swung cups weighted at their bottoms to keep them in an upright position; the shaft projects through the end of the cylinder and is caused to rotate simultaneously with the shaft of the air-pump, by means of a driving chain passing over toothed wheels on both shafts. As the shafts rotate, the cups in the upper cylinder carry up portions of the gasoline to an outlet funnel, into which the liquid is tipped, passing thence to the top of a carburetting vessel. The latter consists of a chamber having horizontal partitions made of felt or the like, and having at the bottom an inlet pipe from the air-pumping cylinder, and at the top an exit pipe to the burners. Liquid-sealed traps and blow-offs are provided on the various pipes.—H. B.

"Carbureter." H. J. Doolan, Washington. U.S. Pat. 692,255, Feb. 4, 1902.

A number of closed tanks are connected together, the exit pipe from the top of each tank passing down to near the bottom of the next, air being blown through a pipe reaching to near the bottom of the first tank, and so through the series. Each inlet pipe is closed at the end, but provided with lateral perforations, the combined area of which is greater than that of the bore of the pipe. Each tank is kept partly filled with either heavy or light hydrocarbon oil, and at the foot of each is arranged a heating coil which extends a short distance above the level of the oil. The carburetted air, produced by bubbling air through the heated oil, passes from the last tank, through a pipe of contracted bore, to a separator, whence, after passing through a bed

charcoal or other purifying material, it flows into an accumulator. The outlet pipe of the latter has a check valve, an opening in the casing of which is closed with a sheet of rubber, which will burst and relieve the pressure, should lighting-back occur.—H. B.

"Carbureter" for Explosion Engines [*Bicycle Motors, &c.*] N. G. Harris, Chicago. U.S. Pat. 692,444. Feb. 4, 1902.

The carburetter consists of a cylindrical shell, having a base-piece, through which pass air inlets and a central duct for gasoline, which extends a short distance above the base-piece. The upper end of the duct is closed by a vertical valve-plug, attached to a bridge-piece which carries a vaporiser consisting of a light, circular framework, covered with fine gauze, and arranged concentrically a little below the upper end of the gasoline duct. The rush of air into the carburetter, during the charging stroke of the engine, raises the vaporiser and hence the valve-plug, admitting a supply of gasoline which overflows the end of the central duct, down over the vaporiser. A pivoted lever is provided outside the carburetter for raising the vaporiser in starting the apparatus. The carburetted air passes up through a mixing fan or perforated plate, and out through a pipe at the side of the carburetter.—H. B.

"Carbureter." F. S. and W. D. Jacks, San Francisco. U.S. Pat. 692,578, Feb. 4, 1902.

Plant for the production of carburetted air is claimed, in which the proportions of gasoline and air supplied to the carburetter are controlled automatically by a hydraulic air-pump consisting of a bell, floating in a tank, the rise and fall of the bell being caused by a hydraulic piston. The plant comprises the hydraulic air-pump and its automatic regulator, a reservoir of gasoline, a measuring tank into which the gasoline is forced, a carburetter, an air-inlet to the carburetter, a bell holder for the carburetted air, floating in a tank of water, and various devices for controlling the pressures and the movements of the water and gasoline.
—H. B.

"Carbureter." C. M. Kemp, Baltimore. U.S. Pat. 692,860, Feb. 11, 1902.

See Eng. Pat. 2117 of 1902, page 599.—H. B.

Carburetter and Gasoline Regulator; Combined ——. J. C. Titus, Marion, U.S.A. U.S. Pat. 693,462, Feb. 18, 1902.

The hollow carburetting chamber, having a horizontal outlet, is combined with a gasoline cup, disposed in the base of the chamber and having its rim disposed inwardly from the wall of the chamber, while a portion of the rim is at and as high as the outlet. The chamber has a top, having a portion projecting down and concentrically within the gasoline cup, and is provided with a funnel-shaped air opening passing vertically through it. The gasoline is delivered to the cup by a nozzle, while its flow therethrough is controlled by a valve. An overflow pipe is provided to the cup.—R. S.

Carburetter for Explosion Engines. A. F. Bardwell, New York, U.S.A. U.S. Pat. 693,773, Feb. 18, 1902.

A casing is divided into two chambers, one a gasoline-receiving chamber, the other the carburetting chamber, a passage forming communication between the two. In the carburetting chamber there is a detachable bushing, having a contracted neck, and flared at its upper end. At the lower portion of this neck there is a valve-seat. A cap-plate covers both chambers, and carries a screw-valve, which is guided by the bushing, and rests upon the seat, to control the flow of liquid from the gasoline chamber to the carburetting chamber. The gasoline is admitted to the receiving chamber by an automatic valve, operated by a float and levers pivoted to the cap-plate and engaging the valve-stem.—R. S.

Carburetter for Explosion Engines. L. H. M. Sanson, Dieppe, France. U.S. Pat. 694,110, Feb. 25, 1902.

The carburetting vessel consists of a chamber open at the bottom and having outlet ports for the carburetted air in its top. It is surrounded on the sides and below by a casing, having air-inlet openings in its sides, a sufficient space being left to form an intermediate chamber. The casing, within the carburetting chamber, has an upwardly-extending portion, the exterior diameter of which is less than the interior diameter of the carburetting chamber, so as to form a second intermediate space. Oil is admitted through a needle valve to the top of the carburetting chamber. Beneath the upwardly-extending portion of the casing is a tube conveying heating gases thereto to heat the chamber.
—R. S.

Carburetting Device for Explosion Engines. J. Fillet, Neuilly-sur-Seine. U.S. Pat. 696,231, March 25, 1902.

In this device the exhaust gases from the engine are utilised in vaporising the liquid hydrocarbon and in pre heating the air that is to be carburetted therewith. A vertical spiral tube communicates at its lower end with an oil reservoir, arranged to keep the oil at an approximately constant level in the lower convolutions of the coiled tube, and carries a vapour outlet at its upper end, the vapour outlet projecting up into an air-carburetting chamber. The coiled tube is surrounded by a vertical tube, which is itself surrounded by a double-walled tube or tubular jacket, the whole being enclosed in a cylindrical casing. The air supply enters the tubular jacket through an inlet pipe, connected with an opening in the cylindrical casing, and flows into the carburetting chamber through openings at the top of the tubular jacket. The hot waste gases from the engine are led up a central passage to the foot of the coiled tube; they then pass up round the coil, down the annular space between the vertical tube and the inner wall of the tubular jacket, and up the annular space between the outer wall of the jacket and the outer casing, passing away through openings near the top of the casing. The coil and tubular jacket are thus bathed in the hot gases, the vapour produced and the hot air becoming mixed in the carburetting chamber, which is provided with strainers and leads to the cylinder of the engine.—H. B.

Carburetting Device for Explosion Engines. T. McCormick and A. D. Miller, Mount Pleasant, Penn. U.S. Pat. 696,909, April 1, 1902.

The exhaust from the engine is carburetted, and then returned to the engine. It first enters an exhaust chamber, forming the bottom chamber of the carburetter. It then ascends through tubes passing completely through the carburetting chamber and the still higher vapour chamber, whereby these chambers are heated. The tubes are continued by curved sections leading to other tubes passing downwards to and opening into the carburetting chamber. Through the latter tubes also the carburetting chamber is supplied with oil. The exhaust escapes from the carburetting chamber to the upper vapour chamber, through openings in the top plate, the openings being provided with wicks dipping into the oil.—R. S.

Lighting; Air-Pressure System of ——. J. E. Raff, Iowa. U.S. Pat. 697,015, April 8, 1902.

This describes apparatus for supplying gasoline or the like to burners situated at a distance. An upright, cylindrical reservoir for compressed air is connected by a pipe to the top of a smaller, upright, cylindrical tank, placed alongside the air reservoir, and containing gasoline. A pipe rises from the bottom of the gasoline tank to the burners to be supplied. A vertical bye-pass pipe is arranged between the top of the air reservoir and the lower part of the pipe which rises from the bottom of the gasoline tank. Cocks are arranged on the air-inlet and gasoline-outlet pipes of the tank, by means of which the tank can be cut out for refilling, whilst the compressed air acts by way of the bye-pass pipe. The latter pipe is of such size as to contain sufficient gasoline to supply the burners while the tank is being refilled, and it is provided with cocks which enable it to be filled with gasoline from the tank before the latter is cut out.—H. B.

Burner for Oil Lamps having Incandescent Mantles. L. C. Nielsen, Frederiksberg, Denmark. U.S. Pat. 692,170, Feb. 4, 1902.

A BURNER of the circular wick type, having two internal and two external air currents. Centrally within the upper part of the wick tube is fixed a conoidal spreader, which deflects the main central air current outwards over the top of the wick. A perforated ring is fixed inside the wick tube near its upper edge, and the second portion of the central air current, passing upwards through the perforations, mingles with the main central current, any irregularities in either portion of the current being neutralised in the combined current. A perforated ring surrounds the outer wick tube near its upper edge, leaving an annular space between the ring and the wick tube. One part of the external air current passes up through the annular space, mingling with the other part of the external current, which passes up through the perforations and is deflected inwards towards the top of the wick by a bent lip on the casing of the burner top, the combined current being free from irregularities.—H. B.

Burner; Hydrocarbon [*Incandescence*] ——. S. E. Farraday, Gloucester City, N.J., and J. H. Goss, Waterbury. U.S. Pat. 692,839, Feb. 11, 1902.

LIQUID hydrocarbon is supplied to a circular vaporising channel or chamber formed in the upper portion of a casting, which constitutes the mixing tube of the burner. A passage in the wall of the tube leads the vapour, generated in the vaporising channel, down to an upwardly-directed gas nozzle at the base of the mixing tube. The vapour, mingled with air, rises through the mixing tube to the burner gauze beneath a mantle, as usual, part of the combustible mixture issuing through slots in the wall of the mixing tube, immediately below the vaporising channel, and burning there so as to heat the channel. The burner is started by first burning some alcohol in a cup at its base. —H. B.

Burner for Lamps. H. S. Tompkins, Newark, U.S.A. U.S. Pat. 693,464, Feb. 18, 1902.

THE burners of vehicle and other like oil-lamps have wick spindles which do not project laterally so as to be in the way when the burner is being inserted. The spindle is telescopically extensible, and means are provided for locking the spindle against inadvertent turning after the wick has been adjusted to the proper height.—R. S.

Burner; Gas ——. J. Crane, jun., Westwood, U.S.A. U.S. Pat. 693,590, Feb. 18, 1902.

WITH the burner tube there is combined a valve for controlling the flow of gas to the burner. This valve consists of a movable chamber, having an inturned flange, and one wall thereof formed by a concave spring-metal diaphragm. A pipe leads from the centre of this diaphragm to an annular heating chamber surrounding the burner tip, whereby the diaphragm is operated to open or close the inlet of gas. The shape of the diaphragm causes it to recover its shape upon decrease of pressure within the diaphragm-chamber.—R. S.

Burner; Gas ——. H. S. Campbell, Baltimore, U.S.A. U.S. Pat. 693,836, Feb. 25, 1902.

THE burner is for use with an incandescent mantle. On the top of the gas-supply pipe is mounted a cup, which is provided with a tubular shell extending upwardly therein. Mercury is placed in this cup, and a float or bell is also placed in the cup, so as to be supported and floated by the mercury. Floating guides are provided for the bell, consisting of a ring between the shell and the inner face of the bell, and a second ring between the cup and the outer face of the bell. A burner and mantle are supported by the float.—R. S.

Burner; Hydrocarbon ——. S. D. Mott, Passaic, U.S.A. U.S. Pat. 695,223, March 11, 1902.

THE burner is formed of a compact flat and horizontally-separable drum, the lower part having cast integral therewith a depressed chamber for a pilot or secondary fuel-supply, and having a series of jet-pipes for air extending vertically through the drum from top to bottom. Gas-openings pass through the drum-top, and are arranged around the air-jets. Connections allow of fuel being supplied both to the main gas chamber and to the secondary chamber.—R. S.

Burners; Fuel-Feed for ——. F. A. Reynolds, Lewiston, U.S.A. U.S. Pat. 695,232, March 11, 1902.

THE liquid fuel is supplied from the main without any pressure, the necessary burner-pressure being supplied from a small pressure chamber, so that there is little fuel to explode in case of an accident. The pressure in the chamber is obtained by a hand-pump and a power-pump, a by-pass having a check valve allowing the fuel to pass around the hand-pump. An overflow pipe connects the fuel pipe between the power-pump and the pressure chamber back to the source of fuel supply. In this back-flow pipe there is a pressure regulator for controlling the pressure in the system.—R. S.

Burner; Gas or Vapour ——. H. H. Lytle, London. U.S. Pat. 696,061, March 25, 1902.

OIL is supplied down a coiled pipe to a horizontal tubular vaporiser situated above the burner. Vertical pipes at each end of the vaporiser lead the vapour produced down to an upwardly-directed jet at the base of the burner. A hollow truncated cone is supported a short distance above the jet by means of an adjustable standard, and above the cone is fixed a horizontal annular baffle plate or flame deflector, of which the portions near the central opening slope slightly downwards and inwards. When the burner has been started by burning alcohol in a cup at its base, the flame which forms at the vapour jet plays upwards through the truncated cone against the tubular vaporiser, &c., and part of the flame strikes the under side of the annular baffle plate, being deflected against the vertical vapour pipes and promoting a complete combustion of the vapour.—H. B.

Burner; Gas ——. P. Kries, Baltimore, U.S.A. U.S. Pat. 694,287, Feb. 25, 1902.

AN incandescent mantle is supported so as to relieve it practically from all jar or vibration. It is supported in a balanced position over the gas-supply tube, so that the burner may move up or down or sideways without perceptibly moving the mantle. The device consists of a loose sleeve carrying the mantle, which sleeve is connected to a fixed portion of the burner by means of a series of weighted levers.—R. S.

Burner; Vapour ——. J. S. Sherman and G. H. Harms, Detroit, U.S.A. U.S. Pat. 695,889, March 18, 1902.

THE burner is formed of a number of distinct concentric cylinders of cast metal, each of which is provided with longitudinal ribs, and with circumferential slots which divide the cylinders into rings held together by the ribs. The ribs are slotted to correspond with the circumferential slots. The chambers thus formed constitute alternate combustion chambers and air chambers, the latter of which have cover plates above their tops.—R. S.

Burner; Hydrocarbon ——. C. W. Poole, San Jose, Cal. U.S. Pat. 696,591, April 1, 1902.

A SPHERICAL casing contains two coiled pipes, one containing oil and the other steam, the two coils lying contiguous to each other, so that the heat of the steam raises the temperature of the oil. The outlets of the two coils are within the casing and adjacent to one another. The heated vapour becomes superheated within the casing, and then escapes to the furnace to be heated.—R. S.

Burner; Hydrocarbon ——. Lizzie C. Graessle, San Jose, Cal. U.S. Pat. 696,961, April 8, 1902.

THREE sets of communicating passages are heated so as to vaporise liquid hydrocarbons therein. The first set to which the oil is admitted is an inclined rectangular chamber arranged over the burner, and divided by partitions extending alternately from opposite sides so as to form a tortuous

duit. A pipe leads from the lower end of this chamber he top end of a vertical chamber, also having partitions, supported on one side of the burner by means of ndards. From the lower end of this chamber a second e leads to the top of a second vertical chamber on the osite side of the burner. From the lower end of the er a tube leads to an inverted cup-shaped burner. The ner is initially heated by means of oil placed in a pan ween the standards. Above the burner is a spreader to ect the flames against the side vaporising chambers or rts.—R. S.

rners; Vaporizer, Mixer, and Regulator for Oil ——. J. H. Larkin, San Francisco. U.S. Pat., 697,093, April 8, 902.

THIN a chamber of cast iron are arranged diaphragms ending alternately from opposite sides partly across the mber, so as to form a tortuous passage therethrough. one end of the chamber is a discharge opening, leading burner; at the other end, parallel oil- and steam-inlet es open into the side of a valve chamber, at right angles he latter, and it contains a rotatable hollow valve, having teral port opening into the interior of the valve, in line h the oil-inlet pipe. The end of the valve beyond the eral port is attached to a stem extending to a hand-wheel side the apparatus, and through the other end of the ve the oil is discharged into the tortuous passage. In valve chamber, surrounding the valve, is an annular mber, into which the steam pipe opens, and the steam charges through the annular space between the walls of valve and the valve-chamber into the tortuous passage, ere it mingles with the oil. By rotating the valve, its ut end is closable against a conical seat, whereby the flow steam may be regulated.—H. B.

ner or Vaporizer for Hydrocarbon Engines. B. Settergren, Chicago. U.S. Pat. 697,555, April 15, 1902.

IS consists of a mixing chamber in the air passage leading the cylinder, a pump casing opening into the mixing mber, and a chambered plunger working within the ing and the mixing chamber. An oil-inlet valve is proed in the plunger, and an oil-outlet valve is also provided reto, the latter being adapted to alternately open and se by passing within and without the casing, a sliding ck being provided to regulate the amount of oil discharged ough such port.—R. S.

rner; Hydrocarbon Vaporizer or ——. L. G. Gebhard and J. M. Rowley, Buffalo. U.S. Pat. 697,618, April 15, 1902.

E vaporising chamber is provided with an inlet and two tlet passages. The latter conduct the vapour to the porising and main burners respectively. The first vapour nerated passes only to the vaporising burner. A double porising chamber is formed by means of a plate recessed grooved on its under side, and a pair of thin metal diaragms removably attached to the plate. The space tween one diaphragm and the plate forms a long circitous passage, and that between the two diaphragms a ge chamber.—R. S.

rner; Hydrocarbon [Luminous Flame] ——. G. A. Bonelli, Kingman, Arizona Territory. U.S Pat. 693,225, Feb. 11, 1902.

QUID hydrocarbon is supplied to a circumferential passage an upright approximately flat body of semicircular shape, ich serves as a combined vaporiser and flame-spreader. e opposite sides of the vaporiser taper towards the peri-ery. The vapour produced from the hydrocarbon passes through a central downward continuation of the peri-eral passage, to two burners placed one on each side of vaporiser, the burners being so inclined that the two nes play upon the flat sides of the vaporiser, and unite ond its edge so as to form a single flame. The oil supply ontrolled by a needle valve.—H. B.

Gas and Air Mixing and Supplying Apparatus. G. H. Burrows, Somerville, Mass. U.S. Pat. 694,611, March 4, 1902.

A TUBULAR mixing chamber is provided at opposite sides with vertical inlets for gas and air, the width of the inlets being so proportioned that about ten times as much air as gas is admitted to the chamber. Gas- and air-supply pipes are connected with the inlets, and an outlet pipe conducts the gaseous mixture to the burners. Above the mixing chamber, and in open connection therewith, is a chamber covered with an elastic diaphragm, or a telescopic bell inverted in a sealing liquid, the diaphragm or bell carrying a rod which passes centrally down through the mixing chamber and is attached to a closely-fitting tubular valve sliding therein. The pressure within the mixing chamber, which depends upon the number of burners in use, causes the sliding valve to be raised more or less, covering up the gas- and air-inlets correspondingly, and controlling automatically the supplies of gas and air. A telescopic air-holder is connected with the air-inlet pipe and with a source of air under pressure, the bell of the holder having a valve, arranged to blow off when the holder is full, the bell being linked to a cock on the gas-supply pipe, whereby, when the bell has fallen to a predetermined point, the gas-supply to the mixing chamber is cut off.—H. B.

Gas-detecting Attachment for Miners' Safety Lamps. M. D. Mackie, Scranton, Pennsylvania. U.S. Pat. 692,885, Feb. 11, 1902.

THE detection of gas by this attachment depends on the fact that platinum wire, suspended over a flame burning in the presence of marsh gas, will become red hot at a greater distance above the flame, the greater the proportion of marsh gas in the atmosphere. Through a sheath, passing through the base of the lamp, there slides a vertical graduated support, the top of which is bent over so as to support several coils of platinum wire directly over the flame. When the lamp is brought into the atmosphere to be tested, the support is pushed up or down until the point is determined at which the platinum begins to glow, the percentage of marsh gas present being ascertained from the graduated scale on the support.—H. B.

Gas- [or Smoke and Gas-] Detector. O. Freymann and C. Tolman, Brooklyn. U.S. Pat. 692,007, Jan. 28, 1902.

THE gas detector comprises an electric battery, any suitable electrical signalling device, and an apparatus, to be exposed in the atmosphere under examination, for completing the electric circuit in the signalling device when coal-gas escapes into the room. The apparatus consists of a casing, freely open to the atmosphere of the room and fixed to the wall or ceiling, containing a stationary and a movable contact-piece, which close the battery circuit when they come into contact. A spring, acting through levers, tends to bring the contact-pieces together, but they are held apart normally by a thin platinum wire or a combustible thread. Bars or plates of "rare clay, sepiolite, or the like," impregnated with platinum sponge, are fixed in proximity to the wire or thread; these plates become hot when coal-gas comes into contact with them, causing the elongation of the platinum wire or the destruction of the combustible thread, whereupon the electrical alarm is put in operation.

The apparatus may be arranged for the simultaneous detection of smoke and gas. A thread of silk or horse-hair is "boiled (in a closed vessel) in a six to ten per cent. solution of commercial soda for about 20 minutes, and then dried, very moderately stretched, in a tube from which the air is exhausted." Such a fibre, for unknown reasons, has the property of elongating when exposed to smoke, and by using it as the combustible thread referred to above, the apparatus becomes sensitive to either smoke or gas.—H. B.

Gas-purifying Agents; Method of Making ——. H. S. Blackmore, New York. U.S. Pat. 697,931, April 15, 1902.

THE gas-purifying agent is formed by exposing an insoluble refractory comminuted compound, containing iron as the principal ingredient, to the action of quicklime and water.

The iron compounds claimed are intended to include all ferruginous compounds capable of being transformed from a dense or vitreous nature to a porous or hydrated form.
—R. S.

Carbide Cartridge for Acetylene Gas Generators. E. F. Mackusick, New York. U.S. Pat. 692,322, Feb. 4, 1902.

Special claim is made for the carbide cartridges employed in the generator described in U.S. Pat. 693,293 (next abstract) and Eng. Pat. 2851, 1902; this Journal, 1902, 461.
—F. H. L.

Acetylene Gas Generator. E. F. Mackusick, New York, U.S.A. U.S. Pat. 693,293, Feb. 11, 1902.

See Eng. Pat. 2851, 1902; this Journal, 1902, 461. A carbide-to-water acetylene generator, comprising a water-tank having an inclined platform or support for the carbide charges arranged above its bottom, and provided at one side with a vertical passage leading, at its lower end, into the tank above the platform. A gas-bell is adapted to rise and fall in the tank. The carbide charges are placed in a spiral guideway leading to the upper end of the vertical passage, and the delivery of the charges is controlled by a platform on the tank and vertical plates on the bell, between which the platform extends, the plates being provided with apertures at different levels. There are also mentioned a pivoted retaining and releasing device above the inclined platform, for alternately engaging with its ends the charges, to retain and release them; a well on the side of the tank into which the spent charges fall; and an elevating device for the removal of the spent charges. The calcium carbide cartridges are protected separately by U.S. Pat. 692,322, abstract of which precedes this.—A. S.

Acetylene Gas Generator. K. G. Gustafsson, Stockholm, Sweden. U.S. Pat. 691,855, Jan. 28, 1902.

This is a small apparatus intended to be immersed bodily in water in order to serve as a lighting-buoy. It is a T-shaped, cylindrical casting, with a discharge orifice at the base, which can be operated from the water surface by depending chains. The weight of the whole is so calculated that the carbide, carried on a grid, is normally above the water level, whence it is only attacked by water vapour. If the pressure of gas increases, the water is driven downwards in an inverted cone, so that a smaller area is left to evaporate. On top is fixed a purifier and lantern.—F. H. L.

Acetylene Gas Generator. E. Björnrud, Christiania, Norway. U.S. Pat. 691,890, Jan. 28, 1902.

An automatic apparatus of the carbide-to-water type, in which the carbide is stored in a number of boxes with falling bottoms arranged circumferentially in a horizontal plane on the top of the decomposing vessel. The bottoms of said boxes are kept shut by means of weighted levers, until the latter, each in succession, come in contact with a horizontal striker revolving on a vertical axis, which striker opens them and allows the carbide to fall into the water. The journal carrying the striker extends upwards to a point where clutch mechanism, actuated by the bell of the rising holder, periodically sets it in motion. The tops of the carbide boxes are made with lids for charging purposes.
—F. H. L.

Acetylene Gas Generator. A. Myers, Dryden, New York. U.S. Pat. 691,959, Jan 28, 1902.

This is an automatic carbide-to-water generator in which the solid is stored in boxes travelling on a horizontal tramway arranged across the top of the decomposing vessel. By means of a falling weight and toothed wheel, the boxes are drawn forwards till each in succession comes above an opening communicating with the interior of the generator; but the mechanism is prevented from moving by an escapement wheel and pawl, which is periodically released by the movements of the holder-bell.—F. H. L.

Acetylene Gas Generator. H. L. Salisbury, Springfield, Mass. U.S. Pat. 692,213, Jan 28, 1902.

An automatic carbide-to-water apparatus in which the solid is stored in a hopper above the decomposing vessel. The feed is effected by the horizontal movements of a cam-like spoon, which is rotated by mechanism actuated from a flexible diaphragm exposed to the pressure of the gas, aid by coiled springs.—F. H. L.

Acetylene Gas Generator. G. W. Collin, Bridgeport, Con U.S. Pat. 692,239, Feb. 4, 1902.

See Eng. Pat. 3481, 1902; this Journal, 1902, 539.
—F. H. L.

Acetylene Gas Generator. C. W. Caldwell, Chicago. U.S. Pat. 692,614, Feb. 4, 1902.

An automatic carbide-to-water generator in which the so is stored in a hopper at the side of the holder, but on t top of the decomposing vessel. The feed is effected by t upsetting of either of a pair of V-shaped scoops, running horizontal axes at the base of the carbide hopper. The scoops are overturned by the downward movement of t upright levers, which are pressed upon when the holder fa to a certain position, one lever being longer than the oth in order to operate one scoop at a time. But the said leve only act in the manner indicated when they are held in vertical position; and so to retain them, a pair of hoo engaging with an eyed rod fastened to the cap of the carbi hopper must be connected up. As the hooks must be n fastened before carbide can be inserted, unless the cap screwed home and the connections made, the whole gener tor is prevented from working. The holder is of the risi type, with its own store of water, and concentrically with it is a cooling chamber for the gas.—F. H. L.

Acetylene Gas Generator. E. N. Dickerson, New York U.S. Pat. 692,638, Feb. 4, 1902.

An automatic water-to-carbide generator in which t supply of liquid is governed by the pressure, and in whic the exhaustion of the charge is shown visually. The carbi is carried in a counterpoised cage, capable of slight vertic movement. Normally it hangs at the bottom of its pat but when the carbide is nearly spent, its weight is so reduc that it rises, and a rod projects up into a glass dome at t top of the apparatus. The cage can also be agitated by hand lever to remove waste lime. The cock on the wat pipe is actuated by a flexible diaphragm, and is so arrang that the water is cut off both when the pressure is too hig and too low. The object of the latter idea is to prevent t whole generator, and the service pipe, becoming filled wi water when the carbide is entirely spent. The principle generation is that of contact.—F. H. L.

Acetylene Gas Generator. A. L. Towne and E. F. Clough California. U.S. Pat. 692,738, Feb. 4, 1902.

An automatic water-to-carbide apparatus working on t contact principle, in which the carbide is carried in cag in outside decomposing vessels. The water inlet to t latter is at the bottom of each, and is fitted with a stopco for hand use during cleaning. The gas escapes at the to through pipes bent downwards and upwards again insi the holder. At the head of these pipes are needle valv closed by counterpoised levers, which levers, being depres when the bell falls, open the valves, permit the entry of g into the holder, and thus permit the entry of water to t carbide. As a safety device for use should the hand wate cocks be closed prematurely, just below the needle valv are descending pipes passing well below the water leve these pipes are normally inoperative, but are free for t passage of gas if the pressure in the cage exceeds the he of liquid.—F. H. L.

Acetylene Gas Generator. E. L. Weil and T. W. Evans New Orleans. U.S. Pat. 692,745, Feb. 4, 1902.

This is an automatic carbide-to-water generator, the supp of carbide being regulated by the movements of the hold bell. Above the decomposing chamber is a drum-shap vessel containing a wheel revolving on a horizontal beam and carrying circumferentially a number of hanging carbi buckets. The wheel is rotated by an outside toothed whe and pawl actuated from the holder; and when any buck reaches the bottom of its path, it impinges against a strik which upsets it and allows its contents to fall into the wat
—F. H. L.

Acetylene Gas Generator. M. T. Stevens, North Dakota. U.S. Pat. 693,078, Feb. 11, 1902.

An automatic water to-carbide generator in which the supply of liquid is regulated by the movements of the holder bell. The water store is a D shaped tank fixed to the side of the holder; it is fitted with a water-sealed cover, and projecting upwards through its base is a pipe extending nearly to the top, which is at once water inlet and gas exit for the decomposing chamber. Above the bottom of said water tank the pipe has a T, to which is connected a swinging piece, whose orifice may be either above or below the water level. From the top of the holder bell is a depending rod carrying a loop and ring, which travel upwards and downwards in an inner compartment of the water tank, and operate the swinging water-supply pipe in sympathy with the movements of the bell. The decomposing vessel is an upright cylinder containing superposed, subdivided boxes of carbide. The rising holder is provided with a float riding on the water surface, drilled to permit the passage of the various tubes, which float is claimed to prevent dissolution of acetylene in the liquid. After the holder another similar arrangement is fitted, the bell of which is weighted rather less; this apparatus the inventor regards as a "cooler and drier."

—F. H. L.

Acetylene Gas Generator. A. C. Einstein, St. Louis. U.S. Pat. 693,248, Feb. 11, 1902.

An automatic carbide-to-water generator, with the carbide stored in the usual hopper. This is provided with stuffing-boxes top and bottom, through which passes a vertical plunger fitted with transverse holes drilled diagonally, said holes serving to collect a charge of carbide. When the bell is high, the holes are above the lower stuffing box, and become filled with solid; when it sinks they also drop clear of the gland, and the carbide falls into the water.—F. H. L.

Acetylene Gas Apparatus. J. St. L. McGinn, Winnipeg. U.S. Pat. 692,891, Feb. 11, 1902.

This is an apparatus in which both the water admitted to the decomposing vessel, and the carbide brought in contact with that water, are regulated automatically. The generator is a vertical cylinder divided axially into four compartments, in each of which are provided a number of superposed covered carbide receptacles. Each compartment also contains a float, which, rising, successively drops the carbide cups into the water, until the whole of the solid in that compartment is decomposed, when a similar action takes place in the others. The water supply is controlled by a lever, clutch, and distributing mechanism, operated by a pin projecting from the rising holder. The decomposing chamber and gas-leading pipe are water-sealed, the water which is afterwards used for decomposing purposes first having to flow through the various seals.—F. H. L.

Acetylene Gas Generator. J. E. Reynolds, Onsett, Mass. U.S. Pat. 695,233, March 11, 1902.

An automatic carbide-to-water generator with a carbide hopper carried by the rising holder bell. The base of the hopper is closed by a counterweighted flap, which is caused to drop by the upward pressure of a stop on the casing when the bell falls to a certain position. Immediately above this flap is a hand-actuated slide to shut the feeding aperture when the hopper is being replenished.—F. H. L.

Acetylene Gas Generator. M. J. Erk, New York. U.S. Pat. 696,229, March 25, 1902.

This is an automatic generator of the water-to-carbide type. The carbide is carried in a rectangular vessel with a grid-like bottom, against which it is pressed by the weight of a water-loaded and water-sealed cover. The water is sprayed on to the carbide vertically upwards from below, and horizontally just above the grids, so that while gas is generated, the spent lime is washed off the lumps by the excess of liquid, and falls into a large receptacle with sloping bottom underneath. At the base of this lower vessel is the usual sludge cock, while a small distance below the grids is an overflow pipe, which serves automatically to draw off the clear lime water. From this generator the gas passes to a holder.—F. H. L.

Acetylene Gas; Apparatus for Generating ——. E. N. Dickerson, New York. U.S. Pat. 696,418, April 1, 1902.

Calcium carbide, made up into a cylinder with some suitable agglomerating material, is slung on a horizontal axis within a closed compartment, being free to revolve as its centre of gravity alters. From an upper tank water is led through a flexible pipe to a horizontal tube having a number of lateral apertures, which are in such position that the jets impinge on the cylinder level with its bearings. Acetylene is thus generated, and the spent lime is washed off the cylinder simultaneously, the latter action making the side of the mass lighter in weight, and causing the cylinder to rotate and present a fresh surface to the liquid. The supply of water is regulated by the pressure in the vessel.—F. H. L.

Acetylene Gas Generator. C. E. Drake, New York. U.S. Pat. 697,612, April 15, 1902.

A self-contained automatic apparatus of the carbide-to-water type, with the usual hopper, and requiring granulated carbide. The main vessel is an upright cylinder with a concentric generating space within it. In the annular space so left, which has two false bottoms, works an annular rising holder. The carbide container is fitted with two cones, the upper of which can be hand-closed by a sliding plate, while under the lower hangs a rocking tray, which, given its motion by the moving holder, causes the carbide to fall continuously or intermittently into the water beneath. At the bottom of the generating vessel is an agitator: below the annular false bottom is a washing vessel; outside the main casing is a drier. The water of the holder-seal is distinct from that used for decomposition, but both are filled through the same outside lip.—F. H. L.

Acetylene Gas Generator. F. Simonson, Sterling, Ill. U.S. Pat. 696,765, April 1, 1902.

An automatic apparatus of the contact type, in which the carbide is held in a number of vertical cylinders of small bore, open at the top and closed at the bottom, sliding vertically within guiding cylinders which are arranged circumferentially around a tank inside a rising holder. Normally the carbide vessels hang with their tops above the water level; but as the holder falls, mechanism comes into play which also gives it a rotatory movement on a vertical axis, and a horizontal striker, travelling round with it, releases each of the cylinders in succession, causing them to drop in their guide wells until they are beneath the water, which then attacks the carbide from above. The bell is removed bodily when the cylinders are being reloaded. From this generator the gas passes to a rising holder of the usual description.—F. H. L.

Acetylene Gas Generator. J. B. Clopton, Texas. U.S. Pat. 696,859, April 1, 1902.

This is an automatic carbide-to-water generator, the solid being held in a hopper, which is carried by a rising holder bell. When the bell descends, the lower end of a vertical rod touches the bottom of the outer tank, and lifts two mushroom valves, one inside, the other outside the hopper orifice. The edges of the orifice are cut so as to form spring tongues, which allow the valve to close even if one piece of carbide is jambed by the moving valve. From just above the mouthpiece of the hopper a vertical pipe descends to below the water level in the tank, thus sealing the hopper against escape of gas at any position.—F. H. L.

Acetylene Gas Generator. E. J. Dolan, Philadelphia. U.S. Pat. 696,948, April 8, 1902.

This specification refers to carbide-agitating devices for use in generators of the drip pattern. The carbide is carried in an open cylindrical cage revolving on a horizontal axis, which cage is caused to rotate by the action of a clutch ultimately operated from a flexible diaphragm connected with the gas leading pipe. By this movement of the cage a fresh surface of carbide is exposed to the water, which drips upon it from a horizontal perforated pipe; and the spent lime is also shaken out of the carbide holder.

—F. H. L.

Lamp; Acetylene Gas Generating ——. E. M. Rosenbluth, Philadelphia. U.S. Pat. 693,069, Feb. 11, 1902.

This is a portable lamp, mainly for cyclists' use, in which the carbide is employed as a special cartridge, and the water is admitted through a wick. The water reservoir is at the base, and the wick is held in a concentric tube; at the lower end of the latter is a plug cock, operated by an outside lever, by means of which the supply of water to the wick can be regulated. The carbide cartridge is a cylinder with extending concentric open ends, which for storage purposes can be closed with corks. Inside, this cylinder is divided into three portions, the two outside ones containing carbide, the central one wool, which serves to make room for the expanding solid. When required for use one cork is removed, and the open end of the cartridge is dropped into the lamp from a charging aperture on top; and when the bottom portion of carbide is decomposed, the position of the cartridge is reversed. Put in place, the porous diaphragm that holds the carbide in position within the cartridge rests against the upper ends of the wick, and thus the solid is attacked by the water rising by capillarity. At the side of the whole is a burner and casing of ordinary design.—F. H. L.

Carbide-feeding Device for Acetylene Gas Generators. W. E. Scofield, New York. U.S. Pat. 697,024, April 8, 1902.

At the base of the usual conical hopper is a tube with parallel sides. From bearings near its lower end hang two quadrant-shaped cups, one of which has a much larger radius than the other, and which are made to swing in unison by means of a pin. Both these cups are weighted asymmetrically, so that the upper one normally closes the carbide aperture, and the lower one hangs to one side. By the rotation of a spider-wheel carried on a horizontal shaft, driven through a clutch from the holder bell, both cups are periodically swung to the other side, when carbide falls out of the upper cup and lodges in the lower. When the tooth of the wheel passes, the cups return to their first position, and the carbide then falls from the lower cup into the water. —F. H. L.

[*Acetylene*] *Gas Purifier.* A. D. Williamson, Coleraine, U.S. Pat. 692,399, Feb. 4, 1902.

See Eng. Pat. 22,272 of 1898 (this Journal, 1899, 1112). This describes a combined liquid and dry purifier consisting of a circular vessel having a water-sealed cover and a vertical plate dividing it into two compartments, which are in communication at the top of the plate. One compartment contains liquid hydrocarbon, and the other is divided horizontally by perforated plates, of which the upper series contain bleaching powder, and the lower, oxide of iron. The oil compartment is furnished with a feed-pipe for the oil and an overflow stand-pipe for maintaining the level of the liquid, and also with a siphon pipe attached to a spray pipe for admitting the gas at a point about one and a half inches below the surface of the oil. A discharge pipe leads the purified gas out at the foot of the dry compartment. —H. B.

Lamp; Incandescent [*Electric*] ——. H. Garwood, Ottawa, Ohio. U.S. Pat. 692,260, Feb. 4, 1902.

The lamp is provided with a series of filaments, say three, of different candle-power, all the filaments being connected at one end with a single contact-piece, connected with one of the line wires, in the base of the lamp. At the other end each filament has a separate contact-piece, these contacts being arranged one above the other in a recess in the lamp base. Within this recess is a contact, suitably insulated and controlled by springs, which may be made to touch the contact-piece of any of the filaments, by screwing the lamp-holder, which has an external screw-thread, more or less into its socket, so that the contact is pushed into the recess to the required distance.—H. B.

Lamp; Electric Arc ——. S. M. Meyer, Brooklyn. U.S. Pat. 693,041, Feb. 11, 1902.

This describes an arc lamp that may be used on an incandescent lamp circuit, and may be connected up, by means of a plug, to any socket of an incandescent lamp fixture. A solenoid is fixed in the lower part of the lamp and its movable core is suspended by a chain from the smaller sheave of a differential pulley; a chain from the larger sheave of this pulley passes up over a pulley at the top of the lamp and suspends the upper carbon-holder, the action of these parts being that when the core is drawn down into the solenoid by the current, the upper carbon is raised. The holder of the lower carbon is fixed to a plate above the pulley. The solenoid is in the circuit of the carbons, and its core is of low magnetic quality. The feed of the upper carbon is regulated by a tilting clutch, having spring-controlled, pivoted iron jaws for engaging the movable core, the clutch being tilted downwards magnetically, so as to grasp the core, by the attraction of the core when the latter is magnetised on the passage of the current. Means are provided for adjusting the extent of the movement of the magnetic clutch and the distance of the pivoted jaws from the core. A rheostat is provided in the base of the lamp.—H. B.

Lamp; Electric Arc ——. M. S. Okun, New York. U.S. Pat. 694,410, March 4, 1902.

In an "enclosed arc" lamp the lower carbon is fixed tightly in the lower part of the globe, which is closed. In the top of the globe is an aperture for the passage of the upper carbon, the aperture being of such size as to retard the entrance of air, while allowing the carbon to feed freely. In order to facilitate the latter operation, the globe is given a certain amount of side play, independently of the fixed parts of the lamp, so that it may adjust itself relatively to the carbon, this being effected by suspending the globe by flexible connections, such as cords or wires, from the carbon-feed mechanism. The lower part of the globe may also be pivoted upon its supporting plate.—H. B.

Lamps [*Glow*]; *Removable Heater for* [*Nernst*] *Electric* ——. M. W. Hanks, Pittsburg. U.S. Pat. 695,928, March 25, 1902.

This relates to means for so supporting an electric heater in proximity to glow-bodies of the Nernst type, that it may be readily removed and replaced without disturbing the glowers. In the upper part of the lamp, inside the globe, is fixed a disc of porcelain or other refractory material, to the under side of which are attached two parallel lugs, the leading wires, with the glowers attached, being stretched across from one lug to the other. On the two opposite inner faces of the lugs parallel grooves are provided horizontal to the surface of the porcelain disc. The heater, which consists of a comparatively thin plate of non-conducting, refractory material, on which is disposed the heater wire, is carried in these grooves, between the disc and the glowers; it may be pushed into position, or withdrawn, without disturbing the glowers, after the manner of a drawer. The terminals of the heater wires and the glower wires are provided with friction plugs suitable for engagement in contact-sockets in the stationary part of the lamp. —H. B.

Lamps; System of Distribution for [*Nernst*] *Electric* ——, *connected in Series.* M. C. Beebe, Pittsburg. U.S. Pat. 695,900, March 25, 1902.

The lamps are arranged in series, each having a heater arranged in shunt to the glower or set of glowers. To prevent disturbance of the circuit conditions should any glower become impaired, each lamp is provided with an inductive resistance coil, connected in series with the heater. Since, in working this system, the resistance coils and heaters take the entire current until the glowers become conductive, a higher voltage is required at the outset than when the glowers are in operation. With a constant-current circuit this necessitates no auxiliary apparatus; but in the case of constant-potential circuits, there is arranged in the lamp circuit a condenser, the capacity of which is adjusted to neutralise the impedance of the resistance coils during the heating stage. By means of a switch a path is opened round the condenser when the glowers become incandescent. In order that the normal circuit conditions may be main-

ıed if any of the heaters should be destroyed, a second istance coil may bo connected in shunt to tho heater in h lamp.—H. B.

mp; Electric Glower ——. H. N. Potter, Göttingen. U.S. Pat. 696,380, March 25, 1902.

ERE is claimed the combination of a glower of the Nernst e, a stationary heater situated below the glower, and two more translucent globes surrounding the glower and ter, whereby the casting of shadows by the heater is stantially avoided, and the advantages of a stationary, as npared with a movable, heater are realised.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Kerosenes from Kieff; Commercial ——. D. Kudisch. J. Russ. Phys. Chem. Soc., 1902, **34**, [2], 201—202.

E author has examined six samples of commercial osene having specific gravities varying from 0·82300 to 2368. The percentages, by volume, distilling over at erent temperatures are: From 137°—150°, 5·0 to 6·0; °—200°, 31·0 to 36·0; 200°—270°, 45·5 to 47·5; ve 270° C., 13·0 to 15·5. The viscosity at 20° varies from 636 to 1·0727, and at 1°, from 1·1909 to 1·205. The h point limits are 32·5° and 36·0° C. All the samples readily and completely soluble in absolute alcohol, and e no solid products when cooled to −20° C. The per-tages of sulphur in the oils lie between 0·0045 and 05. These data are all in accord with those yielded by d kerosenes.—T. H. P.

ızines; Commercial ——. A. M. Rabinowitsch. J. Russ. Phys. Chem. Soc., 1902, **34**, [2], 200—201.

E author has submitted to distillation four samples of ssian benzine obtained from different sources, and ing specific gravities (at 15°/15° C.) lying between 0·7084 0·72095. Of the four fractions distilling—(1) up to , (2) from 70°—90°, (3) from 90°—100°, and (4) above °C.—the second is in all cases the largest, but the different ıples vary considerably in the proportions distilling for interval of temperature. The flash points all lie within limits, −10° and −12° C.—T. H. P.

United States Patent.

Pump for Handling Heavy Oils. F. O. Sterrett. U.S. Pat. 693,920, 1902.

See under XII., *page* 625.

IV.—COLOURING MATTERS AND DYESTUFFS.

liyo from Indigofera Tinctoria; Preparation of ——. A. Schulte im Hofe. Ber. dtsch. pharm. Ges., **12**, 19—30. Chem. Centr., 1902, **1**, [11], 672.

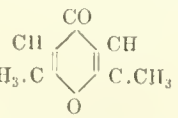
E author finds that bacteria have no appreciable influence the yield of indigo: in other words, that the formation the indigo precipitate is not caused by bacteria. It tated that two hours are sufficient, at 53° C., to bring solution the whole of the indican in the Bengal indigo nt; also that, at this temperature, the indican is not omposed. From the living plants, water will extract ican only when fermentation has set in; the plants are n killed by the fermentation and by the acid formed reby. When the whole of the oxygen present in the er is consumed, the acid fermentation stops, and a ucing one sets in. This "putrefactive" fermentation ses a decomposition of the indican, with loss of indigo; h loss, however, is not caused by the acid fermentation. dition of alkali causes an increased yield, whilst, in the ting vat, compounds are precipitated which dissolve to ed solution in sulphuric acid.—A. S.

Dibenzalacetone and Triphenylmethane: A Contribution to the Theory of Colour. A. Baeyer and V. Villiger. Ber., **35**, [5], 1189—1201.

The authors have devoted a chapter of their work on the the basic properties of oxygen (Ber., **34**, 2679, 3612; **35**, 1201) to a consideration of the connection between colour and chemical constitution, owing to the following facts. (1) *Dibenzalacetone* [Claisen, Ber., **34**, 3815]—

$$C_6H_5CH:CH.CO.CH.CHC_6H_5.$$

is colourless, but forms coloured oxonium salts. The hydrochloride is intensely yellow coloured, the hydriodide black. Dianisalacetone, $(OCH_3.C_6H_4.CH:CH.)_2CO$, is very much more strongly basic than dibenzalacetone, and therefore forms salts the colour of which is even more intense than those of the latter substance. The hydrochloride forms large, cubic red-blue crystals; the hydriodido crystallises in fine black needles, the picrate in yellow-red rhombic leaflets. Dianisalacetone is prepared by first mixing anisal-acetone (14 grms.), anisaldehyde (12 grms.), alcohol (112 grms.), and 10 per cent. caustic soda solution (20 grms.), and then allowing to stand for two days. It crystallises in long yellow leaflets, m. pt. 129°—130°. The colour of the above salts is not due to the introduction of a quinoid structure or other chromophoric group. Dibenzalacetone and dianisalacetone are colourless, but form coloured salts, differing in this respect from azobenzene (with which they may otherwise be compared), which is itself deeply coloured. This property may be conveniently termed "Halochromism." The authors show that in the case of dibenzal- and dianisalacetone, halochromism is due to the presence of a carbonyl group in connection with double bonds, and the benzene ring. The group that lies between the two benzene nuclei has no inherent property of forming coloured salts, for the salts of dimethylpyrone—



are colourless. It is essential that the group should be combined with two benzene residues. Similarly, the azo group gives colourless substances when combined with saturated hydrocarbons.

(2) *Triphenylmethane.*—Neither benzene nor diphenyl-methane, naphthalene, fluorene, nor diphenylbutadien are chromophors, nor do they possess halochromic properties, since they give no coloration with concentrated sulphuric acid.

On the other hand, triphenylmethane dissolves in sulphuric acid with a yellow colour, which colour disappears on the addition of water. This hydrocarbon therefore possesses weak basic properties. Halochromism, in this case, can be attributed only to the heaping up of three benzene rings on to one carbon atom. As the basicity of the complex increases, the coloration is greatly intensified, even though no groups are introduced which could act as chromophors, *e.g.*, trianisylmethane.

Trianisylmethane is prepared by treating a mixture of anisaldehyde (90 grms.), anisol (150 grms.), and glacial acetic acid (400 grms.), with concentrated sulphuric acid (320 grms.) in the cold. It separates as an oil, which on standing becomes crystalline, and boils at 275°—280° C., at 13 mm. pressure. From alcohol, long needles, m. pt. 45°—47° are obtained, which are quite colourless, but dissolve in concentrated sulphuric acid with a red colour. This case of halochromism is particularly striking, since the leuco bases of the triphenylmethane dyestuffs dissolve in sulphuric acid without coloration. Bearing in mind the basic properties of oxygen, trianisylmethane and hexamethyltriamino-triphenylmethane are in reality corresponding substances. Possibly the amino groups are too strongly basic to show halochromism. The authors are therefore endeavouring to obtain a derivative of leucaniline in which the basicity of the amino groups is so far weakened that the substance dissolves in sulphuric acid with coloration. On the other hand, a specific difference may exist in this respect between

oxonium and ammonium salts, and if that prove to be so, doubtful cases might be decided by a colour reaction.

Trianisylcarbinol was obtained by oxidising trianisylmethane with lead peroxide in glacial acetic acid solution. It crystallises in long needles, which, when pure, are quite colourless; m.pt. 83·5°—84° C. On passing hydrochloric acid gas into the colourless ethereal solution of the carbinol, red crystals separate, which become colourless on standing over soda lime *in vacuo* and subsequently washing with dry ether. The colourless substance is trianisylchloromethane. Hydrochloric acid colours it red, owing to the formation of oxonium salts with the anisyl groups. Like aluminium chloride, it is not a salt, but on adding silver sulphate to the solution in benzene, a red substance, probably the sulphate of trianisylcarbinol, is obtained, proving that the true carbonium salts are coloured. The nitrate, which crystallises in red needles, formed by adding nitric acid to the acetic acid solution of the carbinol, has the constitution $NO_3.C:(C_6H_4OCH_3)_3 + 1\frac{1}{2}.HNO_3$, and is, therefore, a nitric acid oxonium salt of the carbonium nitrate.

Trianisyl methane and trianisylcarbinol are truly halochromic substances. The halochromic character of the salts of the latter, which are not less intensely coloured than true dyestuffs, does not depend on a chromophoric group, but on the properties of the whole complex. The authors observe that their experiments do not lead them to doubt the correctness of the accepted theories as to the constitution of the triphenylmethane dyestuffs. They share the view that the latter contain a quinone-imide group as chromophor. But the intense character of the coloration is not only due to the presence of a chromophoric group, but also largely to the strongly halochromic structure of the molecule.

For the very interesting speculations on the nature of Gomberg's triphenylmethyl, the original must be consulted. —H. L.

Brasilin and Hæmatoxylin. VII. J. Herzig and J. Pollak. Monatsh. für Chem., 1902, **23**, [2], 165—179.

If brasileïn be reduced and then acetylated, the tetra-acetyl derivative of the compound $C_{16}H_{12}O_4$, is obtained (this Journal, 1901, 700). If the reduction and acetylation be simultaneously effected by boiling with acetic acid, acetic anhydride, sodium acetate, and zinc dust, the triacetyl derivative, $C_{16}H_9O(C_2H_3O_2)_3$, is obtained, which is not further changed by acetylation, or reduction and acetylation. This compound crystallises from alcohol, ethyl acetate, or acetic acid, in white shining leaflets, which turn brown at 170° C. and melt at 190°—195° C.; by hydrolysis with strong sulphuric acid in acetic acid solution, it is converted into the addition compound $C_{16}H_{12}O_5.H_2SO_4$. Brasileïn, by the action of gaseous hydrochloric acid in the presence of alcohol, gives the compound, $C_{16}H_{12}O_5.HCl$. This hydrochloride, or brasileïn itself, when rapidly treated with acetic anhydride and then with zinc dust, gives a triacetyl compound of the same composition as the above, but melting at 180° C., after turning black at 170° C.

Herzig (Monatsh. für Chem., **16**, 913) oxidised acetyltrimethylbrasilin, saponified the product, and obtained trimethyldehydrobrasilin. The product of the oxidation was now at once poured into water and the compounds separated, recrystallised. A substance was obtained, of the composition of trimethylbrasilone, crystallising in white needles and melting with decomposition at 160° C. Perkin and Gilbody obtained trimethylbrasilone in straw-yellow crystals, which melted at 191° C. The new compound, which the authors term β-trimethylbrasilone, was also obtained by oxidising trimethylbrasilin with chromic acid in acetic acid solution; it is insoluble in cold alkalis, but neutralises 1 mol. of hot caustic potash, the (alcoholic) solution, on acidifying, gives trimethyldehydrobrasilin. On heating, β-trimethylbrasilone begins to melt at 150° C., solidifies again at 160°—170° C., and finally melts at 196°—198° C. (trimethyldehydrobrasilin). When treated with acetic anhydride and sodium acetate, β-trimethylbrasilone gives acetyltrimethyldehydrobrasilin. On reduction with zinc dust and acetic acid, it gives an amorphous compound insoluble in alkalis.

If β-trimethylbrasilone be suspended in alcohol, and sulphuric acid added until solution is complete, a crystalline compound separates on cooling, which, on recrystallisation and acetylation, gives β-acetyltrimethyldehydrobrasilin, which melts at 183°—185° C. The compound of the same composition previously known, which must now be described as α-acetyltrimethyldehydrobrasilin, melts at 174°—176° C. The β-compound yields β-tetramethyldehydrobrasilin when treated with caustic potash and methyl iodide; this substance melts at 156°—159° C. α-Tetramethyldehydrobrasilin, obtained in a similar manner, melts at 163°—165° C.

Ordinary α-trimethyldehydrobrasilin is obtained from the alkaline solution of β-trimethylbrasilone. When the latter compound is treated with caustic potash and methyl iodide, ordinary tetramethyldehydrobrasilin is produced, but also at the same time a more soluble isomeride, which melts at 130°—135° C., and is designated γ-tetramethyldehydrobrasilin.—A. C. W.

English Patents.

Indigo, New Indigo Colouring Matters and New Halogenised Bodies; Manufacture and Production of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 11,358, June 3, 1901.

See Fr. Pat. 311,536; this Journal, 1902, 38.—T. A. L.

Indoxyl [for Indigo] or its Homologues; Manufacture of ——. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 26,061, Dec. 20, 1901.

The patentee claims the process for producing indoxyl and its homologues, which consists in heating aromatic compounds containing one or more of the groups—

$$\begin{matrix} R \\ \diagdown \\ \diagup \end{matrix}\!\!>\!N.CH_2.CO—$$

in which R represents phenyl, tolyl, &c., such as phenylglycine, "phenylglycinylphenylglycine," and α-phenylhydantoin, at a high temperature, with an inorganic substance capable of decomposing water (alkali metals and their alloys, alkaline earth metals, alkali amides, alkali and alkaline earth nitrides, and metallic carbides). Caustic alkalis and alkali cyanides may be used as fluxes to moderate the violence of the reaction.—A. C. W.

Anthracene [Anthracene Dyestuffs] Derivatives; Improvements in the Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 9999, May 14, 1901.

See Fr. Pat. 310,585; this Journal, 1902, 40.—T. A. L.

Colouring Matters [Anthracene Dyestuffs] and Intermediate Products derived from Methylanthraquinone; Improvements in the Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 9694, May 9, 1901.

See Fr. Pat. 311,103; this Journal, 1902, 42.—T. A. L.

Colouring Matters [Anthracene Dyestuffs] of the Anthracene Series, and of Intermediate Products for Use therein; Improvements in the Manufacture and Production of ——. J. Y. Johnson. London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 10,886, May 26, 1901.

See Fr. Pat. 311,357; this Journal, 1902, 42.—T. A. L.

Dyestuffs [Sulphide Dyestuffs] from 1.8-Dinitronaphthalene; Manufacture of Directly-dyeing Sulphurised ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 8636, April 26, 1901.

This specification is supplementary to Eng. Pat. 19,271 of 1900 (this Journal, 1901, 982). See Fr. Pat. 304,981; this Journal, 1902, 44.—T. A. L.

olouring Matters [Sulphide Dyestuffs] containing Sulphur; Improvements in the Manufacture and Production of ——. A. Meyenberg, R. J. Lévy, and The Clayton Aniline Co., Ltd., Manchester. Eng. Pat. 11,163, May 30, 1901.

HE conjoint oxidation of a monothiosulphonic acid of phenylene or of *p*-tolylene diamine, with a second mponent containing a disulphide or sulph-hydro group d a hydroxyl group, preferably ortho thereto, and in hich the position para to the hydroxyl group is free, gives e to compounds which readily yield leuco derivatives and e corresponding dyestuffs. For example, 12 kilos. of diethyl-*p*-phenylene diamine monothiosulphonic acid, 5 kilos. sodium carbonate, and 7 kilos. of the sodium salt of dihydroxydiphenyl disulphide in 1,000 litres of water are idised with 50 kilos. of bleach liquor containing 7·5 los. of active chlorine. After adding 50 kilos. of zinc loride, and heating on the water-bath for about an hour, e mixture is made acid with acetic acid, and is then boiled ith a slight excess of sulphuric acid, when the dyestuff parates as a blue precipitate. It dissolves to a blue lution in concentrated sulphuric acid, from which it is parated as a black flocculent precipitate. The new oduct dyes unmordanted cotton pure fast blue shades om a bath containing salt and sodium sulphide.—T. A. L.

midophenol Derivative, and New Intermediate Products relating thereto; Impts. in the Manufacture of an ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 12,021, June 12, 1901.

E Fr. Pat. 311,722; this Journal, 1902, 43.—T. A. L.

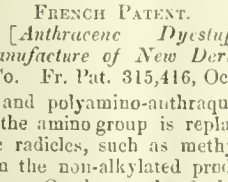
eucogallocyanines [Oxazine Dyestuffs]; Manufacture of New ——. O. Imray, London. From The Dye Works, formerly L. Durand, Huguenin, and Co., Basle, Switzerland. Eng. Pat. 4551, Feb. 22, 1902.

EUCOGALLOCYANINES analogous to those described in Eng. t. 21,415 of 1898 (this Journal, 1899, 827) are obtained reacting with the reducing agents therein mentioned the gallocyanines obtained from nitrosodiphenylamine drochloride and gallic acid or its derivatives, such as llamic acid, ethers of gallic acid, and gallanilide, or the lphonated gallocyanines obtained by the reaction of nitrosoxylbenzylaniline sulphonic acids on gallic acid or its rivatives as above, or those obtained by sulphonating the oducts of reaction of nitrosodiphenylamine hydrochloride gallic acid or its derivatives. For example, 40 kilos. of e gallocyanine obtained from nitrosodiphenylamine hydroloride and gallamic acid are suspended in 1,000 litres of ter. After adding 12 kilos. of hydrochloric acid (20° B.), kilos. of zinc dust are gradually stirred in together with kilos. of hydrochloric acid. When the reduction is mplete, the mass is filtered, and the dyestuff, which mains as a greenish precipitate, is stirred to a paste with ter, or dried. It is very sparingly soluble in water to a llowish-green solution, but dissolves to a reddish solution concentrated sulphuric acid, which becomes intense blue adding a small quantity of an oxidising agent. The estuff gives somewhat violet-blue shades on chrome-rdanted fibres.—T. A. L.

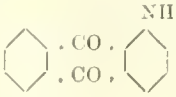
FRENCH PATENT.

thraquinone [Anthracene Dyestuffs] containing Nitrogen; Manufacture of New Derivatives of ——. F. Bayer and Co. Fr. Pat. 315,416, Oct. 28, 1901.

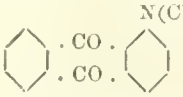
E mono-, di- and polyamino-anthraquinones, in which hydrogen of the amino group is replaced wholly or in t by alcoholic radicles, such as methyl, ethyl, &c., are inguished from the non-alkylated products by valuable nical properties. On the one hand, the introduction of yl groups modifies the shade towards blue or green. s, for example, *p*-amino-anilino-anthraquinone gives a dish-blue shade, whilst its methyl derivative, *p*-methylno-anilino-anthraquinone—



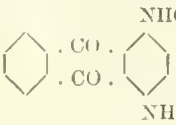
gives a remarkably fine greenish-blue. Moreover, the introduction of alkyl-groups confers a marked basic character on the new derivatives, which is greater the larger the number of alkyl groups present. For instance, α-amino-anthraquinone is scarcely basic, and only forms salts, readily dissociated by water, in presence of concentrated mineral acids. On the other hand, methylamino-anthraquinone—



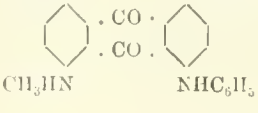
is more basic, and its salts are not decomposed by water so readily as those of the primary base. The tertiary bases, such as dimethylamino-anthraquinone—



are so strongly basic that they readily dissolve, even in very dilute mineral acids, forming colourless salts, which are not dissociated by water. This marked basicity of the secondary and tertiary derivatives corresponds with an increased tinctorial property compared with the non-alkylated products. The alkylation can be carried out according to two general methods. According to the first of these, primary or secondary amines of the fatty series are caused to react with anthraquinone derivatives containing negative radicles, such as chlorine, bromine, hydroxyl, or the nitro group in the α-position which become replaced by the radicle of the amine. An alternative method is to treat the primary amines of the anthraquinone series with ordinary alkylating agents (methyl alcohol and hydrobromic acid or dimethyl sulphate), or else for the preparation of the methyl derivatives to react with formaldehyde and a concentrated mineral acid on amino-anthraquinone. In the case of the mono derivatives of anthraquinone (Cl, Br, NO_2, OH), with the same amine the resulting product is always the same; but in the case of the di- and poly-derivatives, the substitution can take place in stages, and primary aromatic instead of fatty amines may be employed in the second and subsequent replacements. Moreover, the fatty amines may be replaced by other bases which act similarly, such as piperidine, piperazine, &c. The derivatives, containing both fatty and aromatic substituents, are of great technical importance, since their sulphonic acids are valuable dyestuffs. Thus, sulphonated 1.4′-methylamino-anilino-anthraquinone dyes unmordanted wool red, whereas sulphonated 1.4-methylamino-anilino-anthraquinone—



dyes a bright greenish-blue, whilst 1.4′-dimethyldiamino-1′.4-dianilino-anthraquinone—



after sulphonation dyes a green shade. The reactions take place in presence of a suitable solvent, alcohol, pyridine, water, &c., at the ordinary or at higher temperatures, and in closed or open vessels. In the case of the aromatic amines, the condensations take place on simply heating with the particular amine with or without a solvent. With the halogen anthraquinones it is advisable to work with the addition of a faintly alkaline substance, such as an acetate or a benzoate.—T. A. L.

UNITED STATES PATENTS.

Indigo [*Indigo Dyestuffs*]; *Process of making* ——. T. Sandmeyer, Basel. Assignor to Aniline Colour and Extract Works, formerly J. R. Geigy, Basle, Switzerland. U.S. Pat. 697,545, April 15, 1902.

SEE Eng. Pat. 6878 of 1901; this Journal, 1902, 337.
—T. A. L.

Chloranisidine. P. Julius, Ludwigshafen, and F. M. Jahrmarkt, Mannheim, Germany. U.S. Pat. 695,812, March 18, 1902.

THE patentees claim as a new article of manufacture, chloranisidine, which is characterised by the following properties: it is a white substance melting at 83° C.; its sulphate melts at 170° C., its acetyl derivative at 103° C.; its nitrate and hydrochloride decompose on heating; when diazotised and combined with β-naphthol, it yields a red compound, practically insoluble in water, which gives a violet-red coloration with sulphuric acid. The chloranisidine may be made by boiling nitro-*p*-dichlorobenzene with caustic potash and methyl alcohol, and reducing the chloronitro-anisol obtained with iron and acetic acid.
—A. C. W.

Blue Sulphur Dye [*Sulphide Dyestuff*], *and Process of making same.* J. Abel, Mannheim. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. (reissued) 11,973, March 4, 1902.

SEE Fr. Pat. 308,557; this Journal, 1902, 43.—T. A. L.

Sulphur Dye [*Sulphide Dyestuff*], *and Process of making same.* A. Bonati, Biebrich. Assignor to Kalle and Co., Biebrich, Germany. U.S. Pat. 695,533, March 18, 1902.

WHEN *p*-nitro-*o*-amino-*p*-hydroxydiphenylamine is boiled with carbon bisulphide, it gives a product having the characteristics of a thiocarbamide. This substance, when heated with sulphur and an alkali sulphide, is converted into a greyish-green dyestuff for unmordanted cotton, which, by subsequent treatment with hydrogen peroxide and stannic chloride, becomes greenish-blue.—T. A. L.

Sulphur Dye [*Sulphide Dyestuff*], *and Process of making same.* A. Bonati, Biebrich. Assignor to Kalle and Co., Biebrich, Germany. U.S. Pat. 695,534, March 18, 1902.

THE dyestuff described in the preceding specification (695,533), may be separated from the solution of the melt by passing a current of air through until no more dyestuff is precipitated.—T. A. L.

Black Sulphur Dye [*Sulphide Dyestuff*], *and Process of making same.* F. Reubold, Ludwigshafen. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 695,835, March 18, 1902.

A GREENISH-BLACK dyestuff for unmordanted cotton is obtained by fusing di-*p*-hydroxydiphenyl-trinitro-*m*-phenylene diamine with sulphur and sodium sulphide. The product is soluble in water, and the shade becomes bluer by a subsequent treatment with hydrogen peroxide together with ammonia.—T. A. L.

Blue Sulphur Dye [*Sulphide Dyestuff*], *and Process of making same.* C. Ris, Basle. Assignor to Aniline Colour and Extract Works, formerly J. R. Geigy, Basle, Switzerland. U.S. Pat. 696,751, April 1, 1902.

SEE Eng. Pat. 12,578 of 1901; this Journal, 1902, 471 and 44.—T. A. L.

Orange-Red Dye [*Azo Dyestuff*], *and Process of making same.* F. Scholl, Hoechst. Assignor to the Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst-on-the-Main, Germany. U.S. Pat. 695,238, March 11, 1902.

THE subject-matter of this specification, so far as it relates to the production of dyestuffs from diazotised *o*-aminophenol derivatives, has already been abstracted. See Eng. Pat. 20,276 of 1900; this Journal, 1901, 982.—T. A. L.

Red Cotton Dye [*Azo Dyestuff*], *and Process of makin same.* E. Winter, Hoechst a/M. Assignor to Farbwerl Hoechst, Hoechst, Germany. U.S. Pat. 697,765, Apr 15, 1902.

SEE Eng. Pat. 7250 of 1901; this Journal, 1902, 337 and 4
—T. A. L.

Red Azo Dye [*Azo Dyestuff*]. P. Julius and F. Günthe Ludwigshafen. Assignors to Badische Anilin und Soc Fabrik, Ludwigshafen, Germany. U.S. Pat. 695,81 March 18, 1902.

DIAZOTISED 2-amino-1-naphthylmethane sulphonic acid i combined with β-naphthol. The product dyes wool re from an acid bath, and gives a bluish-violet colour wit concentrated sulphuric acid.—T. A. L.

Phthalein Dyes [*Pyrone Dyestuffs*]; *Process of makin* ——. J. J. Brack, Basle. Assignor to Basle Chemic Works, Basle, Switzerland. U.S. Pat. 695,141, March 1 1902.

SEE Eng. Pat. 26,602 of 1901; this Journal, 1902, 338.
—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Sericin [*Silk Glue*]. S. Bondi. Zeits. physiol. Chem., 34 481—499. Chem. Centr., 1902, **1**, [13], 763—764.

A SIMPLE method of preparing pure sericin consists i adding cautiously to the crude sericin solution, a litt 1 per cent. acetic acid; the separated sericin is washed b repeated decantation with water, then treated first wit cold and afterwards with boiling alcohol, and finally ex tracted with ether. The pure sericin contains 45·00 pe cent. of carbon, 6·32 per cent. of hydrogen, and 17·11 pe cent. of nitrogen (calculated to the ash-free substance); i is easily soluble in water, but by heating for three hours a 110° C., it is completely converted into an almost insolubl modification. This conversion into the less soluble modifi cation is also effected, although not completely, by heatin for a shorter time or at a lower temperature, by evaporatio of the solution, and by the action of an acid in the cold The modification of glutin, which is only soluble wit difficulty, goes partly into solution in the form capable o gelatinising when heated with water in a closed tube fo two hours at 120° C., but this is not the case with th corresponding modification of sericin. Sericin dissolve instantaneously in concentrated hydrochloric acid, but oul slowly in concentrated nitric and sulphuric acids and glacia acetic acid; dilute acids cause it to swell to a greater o less extent. Solutions prepared with cold acids, contai much acid albumin and little (primary) albumose; solution prepared with hot acids contain much (primary and second ary) albumose and little acid albumin. Potassium carbonat solution readily dissolves the sericin with formation o (primary) albumoses; sodium carbonate solution merel causes swelling.

Aqueous solutions of sericin give precipitates with aceti acid only on the addition of definite proportions: fo instance, for the precipitation of a 0·5 per cent. solutio of sericin, an acetic acid content of 0·025 per cent. is th minimum, and one of 1—1·5 per cent. the maximum whilst the greatest effect is produced with 0·25 per cen of acetic acid. Precipitation with mineral acids and wit acetic acid and potassium ferrocyanide is also determine to a great extent by the concentration. Sericin is lævo rotatory, and on boiling with hydrochloric acid yield solutions which do not possess a reducing action, bu give Molisch's reaction. The necessary conditions for th gelatinisation of sericin solutions are stillness (agitatio hinders gelatinisation), time (a longer period than fo glutin), and a definite concentration (at least 1·5 pe cent. of sericin). By heating to 200° C. in a closed tub sericin loses its power of gelatinising.—A. S.

Bleaching Apparatus; Electrolytic ——. L. Tailfer. Ind. Electrochim., 1901, **5**, 45—48.

Two different forms of apparatus are described, intended for use with hank-yarn and piece goods respectively. The electrolytic cell or tank has fixed on its bottom a number of ebonite bars or rods, each carrying a positive and a negative electrode. The latter are formed of platinum wire wound upon the rod as two parallel spirals, the distance separating the anode and cathode wires being therefore small. The electrolyte, which consists of a solution containing 15—20 grms. of salt per litre, can only be used for a certain number of times, after which it is discharged, and a fresh solution introduced into the tank. The goods to be bleached are passed through the liquid in the upper portion of the tank, while the current is being passed through the spiral electrodes.—A. S.

Dyeing; Contribution to the Theory of ——. R. Gnehm and F. Kaufler. Zeits. angew. Chem., 1902, **15**, [15], 345.

CONTINUING the investigations of Gnehm and Roetheli (this Journal, 1898, 660 and 756), the authors performed experiments with the substantive dyestuffs, Chrysophenin, Benzopurpurin 4B, and Benzoazurin. Dyeing with the barium salt of Benzopurpurin, they find that the barium estimated in the fibre corresponds in amount to that originally used, and also the sodium salt of Benzopurpurin attaching itself as salt to the fibre. Weber's supposition (this Journal, 1894, 120) is therefore correct, that substantive dyestuffs, if in solution as metallic lakes, dye intact. But they point out that the free acids of substantive tetrazo-dyestuffs possess the same dyeing properties either alone or in presence of free mineral acids.

The dyestuff acids are obtained free from ash by dissolving them in concentrated sulphuric acid, pouring into a large amount of water, and washing the precipitate with water and alcohol. The dyeing was performed in porcelain beakers, since glass vessels would form alkali salts. Five grms. of cotton fibre, which only contained 0·04 per cent. of ash, were boiled with 0·5 litre of water, with the addition of 0·02 grm. of Benzopurpurin sodium salt in one case, and with 0·025 grm. of Benzopurpurin acid in the other case. After three weeks all the colour acid (Benzopurpurin acid) had not even yet disappeared from the bottom of the dye-vessel, but the two dyed specimens showed the same intensity, the length of time required being explained by the small solubility of the dyestuff acid, which is below 0·001 per cent.

The dyeing character of the acid was also proved by heating the portion which was dyed with Benzopurpurin salt with concentrated hydrochloric acid, when the shade turns blue. By rinsing with a large quantity of distilled water, the red colour returns. Repeating this treatment till all the sodium is extracted, the dyeing of the fibre so treated is exactly the same as the original dyeing obtained with the sodium dyestuff.

This fact explains at the same time why aniline or benzidine salts of dyestuff acids often go quickly on the fibre without it being possible to detect a base in the fibre. The reason is that such salts of weak bases with weak acids are in part hydrolytically decomposed. The acid goes on the fibre; in case the base also remains on it, it is easily washed off, since the excess of water completes the hydrolytic decomposition.

The same results as with Benzopurpurin were obtained in this respect with Chrysophenin and Benzoazurin. As the latter contains no amino-group, and therefore cannot form a salt with cellulose, the chemical theory (salt formation) cannot be maintained in this case.

When boiling the specimens dyed with dyestuff-salt and dyestuff-acid, with solutions of salts (*e.g.*, NaCl, $CaCl_2$, H_3Cl), or alkalis (KOH, NH_3), the strength was reduced to the same degree.

The conclusions arrived at are, that the dyeing is completed when the inner and outer part of the cell have arrived at equilibrium.

This was proved by boiling a hank, which was dyed with benzopurpurin sodium salt, together with an undyed hank for two days. After drying, the two hanks were found to have attained the same strength of dye-tint. This experiment stands in contradiction to Krafft's theory of colloidal salts as membrane-formers in the dyeing process (this Journal, 1899, 757).

The second part of the paper deals with the lanuginic acid, obtained by Champion, Knecht and Appleyard (this Journal, 1889, 457) from wool, and used as a support of the chemical theory of dyeing. The lanuginic acid was found to contain a considerable amount of colloidal substance, and the circumstance sufficiently explains the property of the precipitation of dyestuffs as a reaction peculiar to all albuminoid compounds. Owing to this discovery, the experiments were not carried further.—F. N.

Compound Dye Shades; The Influence of the Absorption Spectrum on the Gaslight Appearance of ——. David Paterson. J. Soc. Dyers and Colourists, 1902, **18**, [4], 90—96.

ANILINE dyestuffs possess sharp characteristic absorption bands in their spectra, and therefore, as is well known, change considerably in artificial light. Shades carefully matched in daylight may be widely dissimilar in gaslight. To make an accurate match of a given shade, dyestuffs should therefore be employed which possess as nearly as possible the same optical properties as those in the original fabric. It would be advantageous were dyeing recipes and pattern cards of dyestuffs to include a diagram of the absorption spectrum of each substance. The following is one of several examples given and explained by the author to illustrate this point:—A fine shade of olive may be dyed by using a mixture of Naphthol Yellow S, Acid Violet 6 BN, and a little Acid Red. A shade of olive exactly matching this in daylight may be dyed with Orange II. and Indigo Substitute (Violet 2 B, Acid Green, and Magenta S). But in gaslight there is a great contrast; the first shade reddens greatly, appearing almost russet, whilst the other becomes quite a green olive. This is explained by an examination of the absorption spectra, which shows that practically only the red and green (and some blue-green) rays are freely transmitted by the first shade. There is a strong absorption in the orange and yellow caused by the violet, and about the centre of the blue-green, continuing to the violet end of the spectrum, caused by the yellow. Ordinary gaslight is very deficient in blue-green and green rays, and is rich in red rays, hence the red is left to predominate. The absorption spectrum of the second shade is quite different. The Indigo Substitute, being a greenish-blue, absorbs most of the red rays, but the yellow-green is freely transmitted, whilst the blue-green, blue, and violet are almost totally absorbed. Some other facts stated by the author are given below. (1) It is difficult to conceal any characteristic optical property that a dyestuff may possess by admixture with other colours. For example, if Acid or Methyl Violets be used for shading purposes in russets, buffs, drabs, or olives, the dyes will all change greatly in gaslight, becoming very red. If a clear greenish-blue of the Patent Blue type be used, they will appear much greener. (2) Natural dyestuffs all, without exception, tend more or less to become redder in gaslight. (3) In general, while approaches to a yellow in gaslight; bright green blues (such as Patent Blue, Methylene Blue, Victoria or Night Blue) tend to become greener; violets turn to purple, and purples to red. Neither red, yellow, nor green are much affected. A bright pure green looks as well in gaslight as in daylight. Compound shades with complex spectra (drabs, olives, russets, greys, slates) offer the greatest difficulty. (3) All dyes, with the single exception of Naphthol Green, transmit some of the extreme red rays of the spectrum. Even bright clear green blues, such as Patent Blue, Nile Blue, Wool Blue, Methylene Blue, Victoria and Night Blues (of which the spectra are given), which become greener in gaslight, transmit in dilute solution some red rays. On the other hand, a blue ammoniacal copper sulphate solution is quite opaque to red rays.—H. L.

Basic Dyes; Behaviour of ——, *towards Wool and Silk; A Contribution to the Theory of Dyeing.* E. Knecht. J. Soc. Dyers and Colourists, 1902, [4], 101—103.

THE author brings forward fresh experimental evidence to combat O. N. Witt's solution theory of dyeing (1890).

By means of his theory, Witt satisfactorily explains the remarkable phenomenon that when a skein of silk which has been dyed with Magenta is heated with absolute alcohol, the colour is readily stripped from the fibre and passes into the alcohol. By adding water to the alcoholic solution the dye can be transferred back to the silk. This experiment is seemingly incompatible with the chemical theory of dyeing first advanced by the author in 1888. According to the latter theory, when either wool or silk is dyed with basic dyestuffs, the colourless colour-base unites with some constituent of the fibre (which is probably identical with or analogous to lanuginic or sericinic acid) to form an insoluble coloured lake. It is now suggested that the rosaniline is extracted from the silk in the form of such a compound. The alcoholic solution could not contain rosaniline as base, for that is colourless, nor as hydrochloride, for this salt has been shown by Knecht (1888) to be quantitatively decomposed in the process of dyeing. This view is supported (1) by the fact that lakes formed from lanuginic acid and Magenta are found by experiment to be soluble in alcohol. (2) On repeating Witt's experiment, and pouring the alcoholic solution into water, an intensely coloured and very finely divided precipitate separates out. (3) By extracting with alcohol, silk or wool dyed with 1 per cent. of Night Blue, a lake-giving substance was actually isolated along with the dyestuff. The alcoholic solution was evaporated down to a small bulk, and poured into a dilute warm solution of barium hydrate, the separated Night Blue base filtered off, and excess of barium removed by passing in carbon dioxide and boiling. The filtered solution was evaporated down to dryness, and left a yellow amorphous substance, which, dissolved again in water, was found not only to precipitate Night Blue again, but other basic dyestuffs. The substances isolated from the alcoholic extracts of both wool and silk dyed with Night Blue, are not identical with either lanuginic or sericinic acid. Whether they are present as such in wool and silk, or whether they are only produced during the process of dyeing, is uncertain, but the extract obtained from silk alone with alcohol, does not contain a lake-producing substance (see also Ber., **35**, [5], 1022).—H. L.

Wool; Influence of certain Mordanting Assistants upon the Spinning Property of ——. S. Kapff. Färber-Zeit., 1902, **13**, [7], 107—109.

Sample lots of worsted yarn, each weighing 4 kilos., were mordanted in a Schirp's dyeing apparatus with (1) 1·5 per cent. (of the weight of the wool) of potassium bichromate and 3 per cent. of lactolin (this Journal, 1898, 923); (2) 2 per cent. of potassium bichromate, 3·5 per cent. of lignorosin (this Journal, 1898, 45), and 1·2 per cent. of sulphuric acid; and (3) 3 per cent. of potassium bichromate and 2·5 per cent. of tartar. The tenacities of the several lots were then determined, and were found to have decreased to the extents of (1) 1·6, (2) 3·01, and (3) 10·3 per cent. as compared with what they were originally. Samples of worsted yarn mordanted in glass beakers, under identical conditions, with the above proportions of the same mordanting compounds, showed, on testing, an increase in tenacity of 4·6 per cent. in the case of (1), and of 4·3 per cent. in that of (2), and a decrease of 4·06 per cent. in that of (3). These higher results are due to the felting which takes place in working on the small scale. The wool mordanted by the aid of lignorosin contains more chromic acid than that mordanted by means of lactolin. This was proved by dyeing with dyestuffs sensitive to that acid, *e.g.*, Hæmateïn, Indigo and Acid Alizarin Blue B B, on the one hand, and, on the other hand, with dyestuffs which are developed by the same acid, as the Chrometropes. The lactolin mordant gave in the first instance darker, in the second paler, shades. Hence it would seem that lactolin reduces better, and injures the fibre less than lignorosin.

Flögl and Koller (this Journal, 1902, 339) have recently experimented with proportions of the above mordanting compounds different from those employed in this research, but as they used, in dyeing the mordanted wool, quantities of dyestuffs which were inadequate to saturate the mordants, the results they obtained cannot be considered as conclusive.—E. B.

Turkey Red; Action of Oil in the Ancient Process for Dyeing ——. Driessen. Soc. Ind. de Mulhouse, 1902, 4, 5.

Owing to the formation of oxycellulose in oiled tissue exposed to sunlight, these fabrics acquire the property of fixing the mordants so energetically that ordinary alum may be employed in the mordanting bath, as in the Asiatic process. In certain of these Asiatic methods for Turkey Red, the dyeing is performed without any aluminium mordant, but in these cases the plant *djirak* employed in the process is found to contain salts of alumina, and in all probability the leaves of *cusha*, also used in this connection, contain either alum or aluminium sulphate.—G. T. M.

English Patents.

Mercerising Yarns; and Apparatus for ——. A. Römer, Oberdollendorf, Germany. Eng. Pat. 19,555, Oct. 1, 1901.

See Fr. Pat. 306,826 of 1901; this Journal, 1902, 48.
—E. B.

Bleaching Kier with Circulation Valves. J. C. Tyms, Garfield, N.J., U.S.A. Eng. Pat. 1406, Jan. 18, 1902.

Check-valves opening downwards are arranged in a partition below the false bottom, and one opening upwards is placed in the central vertical pipe of a bleaching kier. Steam is supplied to the bottom of the kier, and the liquor circulates as usual through the vertical pipe and body of the kier.—E. B.

Bleaching Cotton and other Textile Materials; Method and Apparatus for Electrolytic ——. A. A. Vogelsang, Dresden, Germany. Eng. Pat. 4017, Feb. 25, 1901.

A patent supplementary to Eng. Pat. 20,214 of 1899 (this Journal, 1900, 741).

Cotton yarn in the bundles in which it comes from the mill is scoured and bleached in the same apparatus. With this object the bundles are placed end on end upon a platform and thus lowered into a kier. Here they are treated in succession with caustic soda, sodium hypochlorite (preferably prepared according to Eng. Pat. 14,104 of 1900; this Journal, 1901, 19), and sulphuric acid, being rinsed after each operation. The platform is then raised and the bundles are removed from the kier. Finally, the yarn is washed in an ordinary hank-washing machine and is hydro-extracted and dried.

The apparatus claimed comprises tanks for the preparation and reception of the solutions employed, an electrolyser and a bleaching kier, a special feature being the construction and arrangement of the latter and its associated parts.
—E. B.

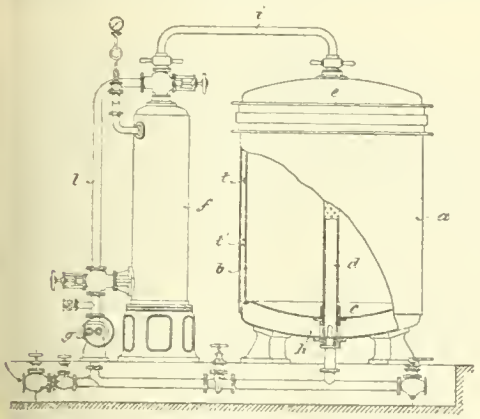
Bleaching, Washing, &c., Textile Fabrics; Apparatus for ——. J. Gebauer, Charlottenburg, Germany. Eng. Pat. 8828, April 29, 1901.

To ensure uniformity in the treatment of textile fabrics in the operations of bleaching, washing, &c., the necessary liquors are passed through the fabrics in a horizontal instead of in a vertical direction.

A perforated vessel *b* (see figure), which may be either fixed or movable, is placed inside a second vessel *a* of similar shape, in such a manner that spaces are left between the sides and bottoms of the two vessels.

In the scouring operation, the vessel *b* is first filled with hot lye, which is then drawn, by means of the pump *g*, from the space *h*, and forced into the boiler *f*, and thence through the pipe *i* into the space intervening between the sides of the two vessels, whence it flows radially and horizontally through the materials contained in the inner vessel to the central perforated pipe *d*, which is closed at the top, back into the collecting space *h*. Steam may be introduced into the pipe *l*, to directly heat the lye. To cause the latter to enter the inner vessel in currents of equal force, either parallel rings, *t*, *t'* &c., projecting outwards to greater distances as they descend, are fixed upon the outside of the vessel, or a spiral band is placed outside this in such a manner that the chambers between the adjacent coils decrease in size towards the bottom of the apparatus.

The vessels *a* and *b* are made of materials which are apable of resisting the action of alkalis and of acids, so hat the "operation of bleaching" and washing can be fected in the same apparatus, without the necessity of ansferring the textile fabrics from one vessel to another.



The fabrics may be washed in the vessel in which they e scoured, or the inner vessel may be removed from the ssel *a*, and the fabrics then transferred to a second ssel of similar shape, but made of a material which is not pable of resisting acids. This is employed in conjunction th an outer tank and suitable washing apparatus.—E. B.

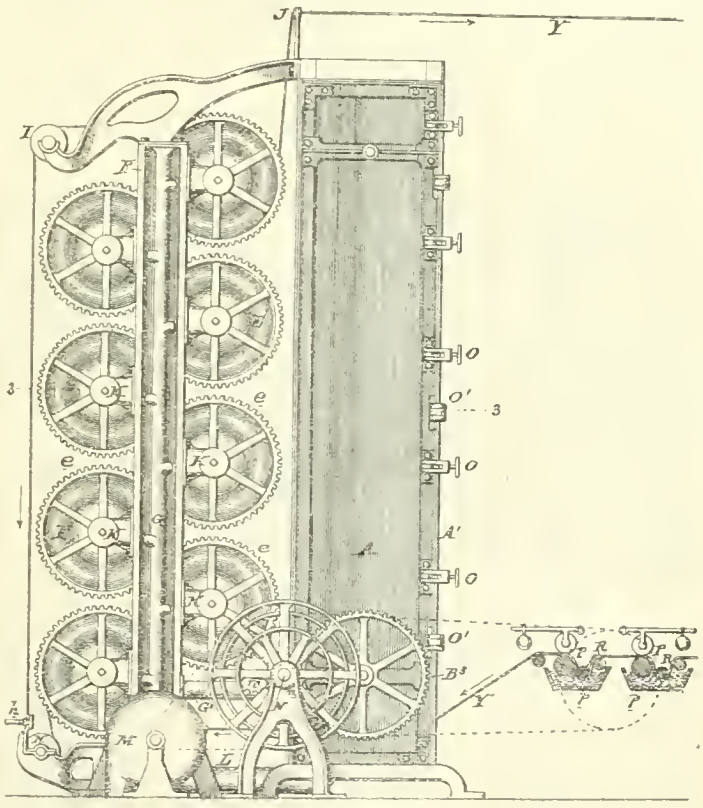
eaming, Ageing, and Drying Fabrics; Apparatus for ——. T. Walsh, Lowell, Mass., U.S.A. Eng. Pat. 2264, Jan. 28, 1902.

HE endless chains hitherto used in conuous steaming apparatus are disused with and replaced by metallic ds or tubes, provided with collars, ich run or slide in parallel tracks, hilst maintained at right angles to the gth of the latter. The textile fabrics be steamed are fed into the appaus at one end and withdrawn at the er end, continuously, while the rods moved forward intermittently by ans of cams. Spring latches are emyed to prevent the rods from returng, and a trough-shaped bar is pressed inst the rod last filled with the fabric, prevent the weight of the fold lying on this from drawing away the fold ich is being formed upon the rod der the feed rollers. The steam amber is supplied with steam in the ial manner.

A combination of two such arrangents of apparatus, placed side by side, claimed. One of these works in one l the other in the opposite direction, rods as they arrive at the exit end one arrangement being mechanically nsferred to the entrance end of the er arrangement.

The apparatus may be employed in processes of ageing or of drying, which cases a mixture of air and am, or hot air, is supplied to it.

—E. B.



eing, Scouring, Bleaching, &c., Yarns in Cop or similar Compact Form; Apparatus for ——. E. Hindley, . Walker, and M. Rose, Stockport. Eng. Pat. 26,115, Dec. 21, 1901.

E object of this invention is to afford means of reversing direction of the flow of dye, &c. liquors through yarns ch are dyed in the form of cops, in apparatus in which liquors are alternately drawn and forced through the cops by means of a pump, without reversing the action of the latter. This is attained by means of three-way taps upon, and of a branch pipe connected with, two pipes communicating with the pump and the dye-vessel, in which the cops are placed upon tubes in perforated plates.—E. B.

United States Patents.

Oxidising Yarn; Machine for ——. J. W. Fries, Winston-Salem, North Carolina. U.S. Pat. 696,032, March 25, 1902.

Long lengths of yarn are steamed, oxidised, and dried by passing round two cylinders (not shown), placed at the upper and lower ends of a tall vertical rectangular closed chamber A, subsequently issuing from the bottom of the closed chamber and winding in a zigzag course round a series of hollow drying cylinders, *e*, *e*, *e*, *e*, journalled on hollow horizontal bearings, *K*, *K*, *K*. The closed chamber is fitted with a steam coil (not shown), placed between the two cylinders, and the hollow bearings of the drying cylinders communicate with a vertical steam pipe G, the lower end of which is joined to the steam coil by means of a horizontal connecting tube G′. The steam is blown into the pipe G, passes into the hollow bearings *K*, *K*, *K*, and thence into the hollow drying cylinders and the connecting pipe G′, being finally admitted into the closed chamber through the steam coil. A suction pipe L at the bottom of the closed chamber leads to the exhaust fan employed in removing the waste steam and water. The yarn being dyed in the pans, *p*, *p*, provided with pressure and guiding rollers R, R and P, P, passes into the closed chamber at Y, and after passing twice over the drying cylinders is led off by the guide J. The drying cylinders and those contained in the closed chamber are driven by suitable gearing at the same surface speed.—G. T. M.

Fibres; Process for Retting Vegetable ——. By B. S. Summers, Chicago, U.S.A. U.S. Pat. 696,515, April 1, 1902.

The agents employed in retting vegetable fibres (flax, hemp, ramie, &c.) separate the filaments by dissolving out

the gummy and pectose substances which bind these together. It is, however, important that the fibres should not, during this process, be deprived of their oily and waxy constituents, for if this occurs they lose their soft silky texture and become harsh. Artificial retting may be satisfactorily effected by the use of an aqueous solution, more or less saturated with these oily and waxy substances but not with the gummy matters. This solution is prepared by steeping in rain or distilled water a batch of untreated fibres, agitating the solution with litharge to extract the gum, and filtering to remove the gummy precipitate and excess of precipitant. Barium sulphate, stannous chloride or lime may be employed as precipitant, but litharge is most efficacious.

The best qualities of fibres are produced when the retting solution is quite saturated with the oily and waxy substances, and since fresh water must be added from time to time to compensate for that removed in the moist product, the state of saturation is maintained either by steeping in the liquid the skins which surround the stalks of the fibre, these materials containing a large amount of the necessary ingredients, or by working up inferior qualities of fibres in the partially exhausted solution.

—G. T. M.

Filaments; Apparatus for the Production of Fibreless ——. W. A. P. Werner, London. U.S. Pat. 697,580, April 15, 1902.

The apparatus for spinning filaments from solutions of cellulose and other substances consists of a closed receptacle for the solution, fitted with a provision for admitting compressed air and valve cocks arranged radially, terminating in nozzles for forming the threads. The threads are collected on removable spools situated in casings mounted on revolving discs, a suitable coagulating liquid being contained in the casings.—J. F. B.

Dyeing Apparatus. J. Hussong, Camden, New Jersey. U.S. Pat. 695,727, March 18, 1902.

The dye-vat is fitted with a central frame carrying on either side the sticks for supporting the hanks of yarn; the width of these sticks is much greater than their thickness, and by a suitable arrangement of worm-wheels, one of which is placed on each stick, they may be turned alternately through 90° without the hanks on adjacent sticks coming into contact. Two slat sections are hinged to the frame, one on either side immediately above the sticks and the slats are placed directly over the spaces between the sticks, their object being to promote the circulation of the dye liquor through that portion of the yarn which rests on the sticks, thus ensuring the uniform dyeing of the material. Each slat is terminated by a flange which rests directly on the subjacent stick, and prevents any slipping off of the yarn. When it is desired to remove the hanks, the hinged slat frames can be rotated upwards, and held in such a position that they are clear of the sticks. The circulation of the dye liquor is effected by two wheels placed in a chamber fitted to one side of the dye-vat and partially separated from it by a partition which permits the liquid to pass out either below or above it.—G. T. M.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Coloured Paper; Casein in the Manufacture of ——. Papier-Zeit., 1902, **27**, [31], 1107.

Casein is frequently employed for fixing the colour on coated coloured papers, but it is not suitable for all colours. Casein size is good for all white and very pale shades, for yellow, red, and orange colours, but for green, blue and all mixtures or tones of these colours it does not answer. When the pastes containing these colours come from the mixing machine they are perfectly fluid and work beautifully, but this does not last long. After a short time the composition begins to thicken slowly until it can no longer be spread. The paper coated with it first acquires a marbled appearance, and shortly afterwards the rollers of the machine fail to take up the colour. No remedy for this trouble has yet been found, and such colours can only be worked in the old way, prepared with good Cologne size. The cause probably lies in the combination of the colour with the alkali employed to bring the casein into solution.

—J. F. B.

United States Patent.

Leather Colouring Machine. W. H. Moore, Salem, U.S.A. U.S. Pat. 693,561, Feb. 18, 1902.

This invention consists of a machine designed for the purpose of applying a seasoning mixture to leather previous to glazing. It is also claimed that the machine may be used for oiling, colouring, enamelling, or japanning. The machine is provided with two stationary pads which are saturated with the seasoning and pressed close together; the skins are drawn between these pads, afterwards being grasped by two blades and drawn, first against two fixed flat-faced brushes, then between two finishing pads, which remove the surplus seasoning, and also equalise its distribution. The skins are finally pressed against two thin rubber blades which draw them quite flat and stretch them.

—M. C. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Salts; Behaviour of Hydrogen Peroxide with certain ——. P. G. Melikoff.

See under XXIV., *page* 645.

Carbonates; Action of Hydrogen Peroxide on ——. P. Kazanezky.

See under XXIV., *page* 645.

Phosphates; Action of Hydrogen Peroxide on ——. G. J. Petrenko.

See under XXIV., *page* 645.

Oxygen; New Method of Preparing ——. G. F. Jaubert. Comptes Rend., **134**, [14], 778—779.

Peroxide of sodium, peroxide of potassium, or the mixture of the two obtained from the liquid alloy of the two metals, is mixed with potassium or other permanganate, with a hypochlorite, or with a trace of a salt of nickel or copper and the whole agglomerated by compression. On treating with water, oxygen is given off freely in the cold. In the case of the mixture of peroxide with permanganate or hypochlorite, part of the oxygen is of course derived from the reduction of these substances. The operation is extremely convenient—any form of Kipp or other automatic generator can be used—and the gas obtained is exceedingly pure.—J. T. D.

United States Patents.

Vacuum-Pan [for Brine, &c.]. G. L. Ribaud, Grand Saline, Texas. U.S. Pat. 697,366, April 8, 1902.

Each heating section of the vacuum-pan is supported on a transverse tube, mounted in dovetail grooves in brackets at the lower part of the pan. Into one end of this tube is threaded a short tube, which passes through the wall of the pan, the exhaust-pipe being similarly connected to the other end. The steam-pipe is packed into the short tube above mentioned, and extends into the transverse tube. The steam-pipe is made in separable sections united by couplings, which also connect with branch pipes extending into heating tubes screwed into the transverse tube, this arrangement enabling the steam-pipe to be withdrawn for repairs. A vertically-movable discharge-chamber at the bottom of the pan has an upwardly-extending neck, closed at its upper end, but having lateral apertures, adapted to slide in the outlet of the pan, cylinders and pistons being provided for moving the chamber. When the chamber is raised, the neck projects into the pan and permits the discharge to take place through its lateral apertures. When the chamber is lowered, the neck is withdrawn into

a sleeve connected to the outlet, so closing the apertures. The movement of the neck serves to break any crust of the salt, &c., which may form an arch over the outlet.
—R. A.

Caustic Alkali; Process of Making ——. H. A. Frasch, New York. U.S. Pat. 697,465, April 15, 1902.

Compare with Eng. Pat. 22,698, 1900, this Journal, 1901, 370. Ammonia is absorbed in solution of an alkali salt (such as sodium chloride), and an oxide of a metal capable of reacting with the ammonia and producing the caustic alkali (such as nickel hydroxide) is added. For example, sodium chloride solution is caused to absorb a stated proportion of ammonia, and nickel hydroxide is added. The insoluble nickel-ammonium chloride that forms is removed, washed with saturated sodium chloride solution, dissolved in water, and nickel hydroxide recovered by adding calcium hydroxide; the ammonia is recovered by distillation. The caustic soda solution first obtained, is concentrated in vessels suitable for the recovery of the ammonia present. Alternatively, nickel hydroxide may be mixed with a salt of an alkali, as NaCl, and the mixture exposed to ammonia gas until sufficient for the reaction is absorbed. The mixture is then lixiviated to obtain the caustic alkali in solution, and the nickel-ammonium salt.
—E. S.

Limekiln. W. Gleason, New York, U.S.A. U.S. Pat. 693,599, Feb. 18, 1902.

This is an upright kiln, in which oil is employed as fuel; it is provided with a conical combustion chamber and smoke stack, and a trough-shaped bottom and draw-hole for the removal of the lime. At the four corners of the kiln, water-jacketed burner tubes are arranged, pointing towards the centre of the kiln. The claims include an arrangement for permitting a continuous flow of water through the jackets, and a means of supplying oil to the burners. In one wall of the kiln a boiler is set, the steam from which passes to the oil injectors.—W. C. H.

Lime, &c.; Method of Calcining ——. B. E. Eldred, Brookline, Mass., U.S.A. U.S. Pat. 692,257, Feb. 4, 1902.

In the apparatus described for carrying out this method, a vertical flue is arranged in the centre of the upper part of the kiln, by means of which the products of combustion are led round, mixed with more air, and, by an artificially-accelerated draught, re-introduced beneath the grate of the furnace, in order to retard the combustion of the fuel there; the resulting heating agent being re-ignited by the calcining mass of lime, in which the combustion is completed.—W. C. H.

Alkaline Salts; Apparatus for the Electrolytic Decomposition of ——. J. D. Gilmour, Glasgow, N.B. U.S. Pat. 695,302, March 11, 1902.

See Eng. Pat. 18,397, 1900; this Journal, 1901, 1220.
—E. S.

Aluminous Ores; Purifying ——. D. A. Péniakoff, Brussels. U.S. Pat. 695,762, March 18, 1902.

Bauxite, or other ferro-aluminous ore, is heated in a current of hydrogen sulphide, in a vessel forming one of a series, the members of which can be successively charged and brought into action, so as to render the process continuous. The ore in which the iron oxide has been thus converted into sulphide (as indicated by the blackening), is acted upon by an acid, as sulphuric or hydrochloric acid, which dissolves the iron, setting free H_2S, which may be recovered. It is stated that the alumina is not attacked by the acid as long as iron sulphide is present. The product is methodically washed, and contains alumina free from iron, soluble in concentrated acids. Or the sulphurised ore may be acted upon by sulphurous acid, which dissolves the iron as hyposulphite; the separated solution and washings are treated with an alkali to precipitate the iron, and the filtered solution is concentrated to obtain crystallised kali hyposulphite, alumina free from iron being obtained before.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

United States Patents.

Glass-working Machine. J. W. Colburn, Ohio, U.S.A. U.S. Pat. 696,007, March 25, 1902.

There are 41 claims for the combination of a receptacle for holding molten glass, with a machine for drawing the plastic glass from the receptacle, and for successively compressing, flattening, and cooling the sheet. A continuous sheet can be drawn, and the thickness regulated as desired.—W. C. H.

Glass-working Machine. J. W. Colburn, Ohio, U.S.A. U.S. Pat. 696,008, March 25, 1902.

The 23 claims include, among other details, the combination of a receptacle for holding molten glass in a plastic condition, and a means of separating the same free from scum, &c., with a gathering plate for withdrawing a portion of the plastic material, and means for drawing the material, without torsion, and compressing it into a sheet of requisite thickness; also means of cooling and setting the sheet.
—W. C. H.

Ceramic Wares; Kiln for ——. W. E. Rivers, Oldbridge, New Jersey, U.S.A. U.S. Pat. 693,155, Feb. 11, 1902.

The kiln is circular, and has a series of furnaces arranged radially. The crown of each furnace is inclined downwards towards its inner end, and the grate is similarly inclined, but at a less angle than the crown, whereby the gas outlet is contracted; the main gas outlet is inclined upward, and divided into a vertical and a horizontal flue, both of which open into the floor of the kiln. The kiln is of the "downward-draught" class. Under the floor is a large annular flue connected by radial flues with chimney-flues on the one hand, and on the other with a smaller annular flue. The annular flues communicate with the oven by means of passages through the floor of the kiln.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

United States Patents.

Wood; Compound, Method and Process for Fireproofing ——. J. L. Ferrell, Philadelphia, Penn. U.S. Pats. 695,679, 695,678, and 695,450, March 18, 1902.

The compound described in Pat. 695,679, is prepared by mixing a solution of aluminium sulphate with a solution of a carbonate (*e.g.* magnesium carbonate); it is claimed that with this preparation the wood is not discoloured as it is with aluminium sulphate alone.

Under the second patent is claimed the production of a fire-proof material, consisting of wood impregnated with the above compound, the excess moisture being subsequently evaporated off.

The process described in the third patent consists in injecting a fluid reagent into one end of a body of wood, in the direction of the grain, until the specific gravity of the liquid discharged from the other end is the same as the specific gravity of the liquid injected. The escape of the liquid at the discharge end is then prevented, and liquid injected until it escapes from the circumference of the body. The wood so treated may then be treated in a similar manner with a second liquid, which can react with the former, and thus produce a mixed salt in the substance of the wood. (See this Journal, 1902, 550.)—W. C. H.

Hydrocarbon Composition. (*Cements, Pavement, Knobs, &c.*) B. B. Clawson, Cal. U.S.A. U.S. Pat. 692,627, Feb. 4, 1902.

The composition consists of 100 pounds of asphaltum, 300 pounds of bituminous rock, 100 pounds of "uintahite" or "gilsonite," 50 pounds of sand or like material, and 5 pounds of litharge. The asphaltum and bituminous rock are melted together, and in a separate vessel the "uintahite" is mixed with about 20 per cent. of its weight

of hot asphaltum, and after cooling slightly, the litharge is stirred in. All the materials are then mixed and the sand added, and the whole mass heated and thoroughly stirred. The product is said to be more rigid, and less brittle and less inflammable than products of a similar character, in the manufacture of which oil is often used.—W. C. H.

Limekiln. W. Gleason. U.S. Pat. 693,599, 1902.

See under VII., *page* 615.

Lime, &c.; Method of Calcining ——. B. E. Eldred. U.S. Pat. 692,257, 1902.

See under VII., *page* 615.

X.—METALLURGY.

Silver; Loss of ——, in the Roasting of Zinc Blendes containing Silver. C. Sander. Zeits. angew. Chem., 1902, **15**, [15], 335.

The results of the experiments, which were carried out in Malètra- and Liebig-Eichhorn furnaces, together with the analyses of the ores used, are shown in the following tables:—

Table I.

——	Loss in Roasting.	Amount of Silver in the Ores.		From 100 Grms. of Ag there were lost
		Raw.	Roasted.	
	Per Cent.	Grms. per Ton.	Grms. per Ton.	Per Cent.
Zinc blende, M.V.....	10·50	340	335	11·77
„ M.P.	10·05	413	410	10·68
„ F.	11·25	230	227·5	12·15
„ C.	12·70	324·5	330	11·22
„ A.	12·00	375	375	12·00

The loss of precious metal was nearly the same in the five ores, amounting to 10—12 per cent. of the total silver. The losses are caused by the volatilisation of the metallic silver, formed in the process of roasting, and are larger the higher the temperature of the roasting furnace is. A large amount of silver and lead could be found in the dust chambers of the furnaces.—F. N.

Table II.

——	Zinc.	Sulphur.	Lead.	Iron.	Lime.	Magnesia.	Baryta.	Quartz.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Zinc blende, M.V.....	31·00	22·26	7·50	4·25	1·60	0·65	24·50	2·75
„ M.P.....	41·80	27·40	4·00	3·00	1·40	0·80	10·55	10·20
„ F.	43·93	24·95	7·35	5·20	0·10	0·15	..	15·46
„ C.	47·50	33·26	2·15	13·60	..	1·20	..	1·14
„ A.	42·60	29·07	8·75	7·50	0·12	1·10	..	10·00

Gold; Action of Selenic Acid on ——. V. Lenher.

See under XXIV., *page* 646.

Platinum Metals, Identification of ——; by the Action of Sodium Peroxide. Leidié and Quennessen.

See under XXIII., *page* 640.

Iron-Carbon Systems; Equilibrium of ——. G. Charpy and L. Grenet. Bull. de la Soc. d'Encouragement pour l'Industrie Nationale, 1902, **102**, [3], 399—407.

Roozenboom's suggested explanation of the known facts relative to alloys of iron and carbon (this Journal, 1900, 1016), are opposed to experimental results obtained by Royston, Mannesman, and others, as has been pointed out by Le Chatelier and Stansfield. In these experiments, however, the well-known influence of other elements, such as silicon, manganese, &c., has not been taken into account, and therefore the abundant separations of graphite observed by Royston might have been due to the presence of silicon in the iron employed. To investigate this point, the authors have made a large number of experiments with five samples of iron of about equal carbon content, and containing trifling percentages of other elements except silicon, which existed in variable proportion, as shown in the table of analyses following:—

——	1.	2.	3.	4.	5.
Carbon	3·60	3·40	3·25	3·20	3·30
Silicon.....	0·07	0·27	0·80	1·25	2·10
Manganese	0·03	Traces	Traces	0·12	0·12
Sulphur	0·01	0·02	0·02	0·01	0·02
Phosphorus.....	Traces	0·02	0·03	0·01	0·01

These irons had been cast in cold water, and contained no appreciable amounts of graphite, except No. 5, which contained 0·2 per cent.

Fragments of the irons were annealed at various temperatures for more or less prolonged periods. These temperatures were attained either by a gradual rise or by falling from a higher temperature; in each case the operation was terminated by plunging in cold water. The total carbon and the graphitic carbon were then determined in the specimen. The following conclusions were arrived at:—

1. *The separation of graphite occurs at temperatures which are lower the higher the percentage of silicon.* Thus, prolonged annealing at 1100° caused no graphite to separate from No. 1, but at 1150° separation occurred. No trace of graphite separated from No. 2 at 1000°, but separation occurred at 1100°. Traces of graphite separated from No. 3 at 800°, and after six hours' annealing at 650° the graphite in No. 5 amounted to 2·83 per cent.

2. *The separation of graphite, having once commenced, continues at lower temperatures.*

3. *At constant temperature the separation of graphite continues progressively at a rate which is the more slow the lower the temperature and the smaller the percentage of silicon.*

4. *The percentage of combined carbon, corresponding to a state of equilibrium at any determined temperature, diminishes as the silicon increases, and also as the temperature is lower.*

Microscopic examination of several specimens confirmed the results of analyses without adding much information. In certain specimens in which the attempt had been made to establish equilibrium at low temperatures, it was observed that the transformation was more advanced in regions where graphite was in direct contact with ferrite. It seemed probable that in these regions the change had become complete, and consequently that the stable condition of iron-carbon systems in the cold corresponds to the coexistence of pure iron and graphite; all other conditions obtaining in iron and steel, notably cementite, being unstable at low temperatures.

A study of the heating and cooling curves obtained by the pyrometric method showed two very distinct critical points. One at about 700° corresponded to the resolution of pearlite. The other occurred at about 1150°, and was more marked in heating than in cooling. It was not possible to determine if this point corresponded with the resolution of the martensite-graphite or the martensite-cementite eutectics. It may include both.

The observations above recorded show that some points n the diagram of Roozeboom need modification; but it eems necessary to make further experiments before pro-osing a new theory (see also this Journal, 1902, 180).

—L. A.

Lead and Tellurium; Alloys of ——. H. Fay and C. B. Gillson. Amer. Chem. J., 1902, **27**, [2], 81—95.

The authors have made a series of 17 alloys of lead and ellurium, beginning at either end with the pure elements, and ave examined them microscopically and determined their reezing points. The results yield a curve which shows hat the addition of small quantities of tellurium to lead, apidly raises the freezing point of the latter 6 per cent., aising it over 300° to above 650° C. The maximum reezing point is 917° C., with about 33 per cent. of ellurium, this alloy consisting of the compound lead elluride PbTe. Up to this point the lead telluride com-ound separates first at the higher freezing points, the emaining lead freezing at its normal temperature, thus howing that there is no eutectic formed between the lead elluride and the lead. The lead telluride, however, forms n eutectic with tellurium, when the proportion of the latter xceeds 38 per cent., and crystallises from it until the ure eutectic is formed with the percentage composition f 78·5 of tellurium and 21·5 of lead, and with a freezing oint of 400° C. With further additions of tellurium the reezing point gradually rises to that of the pure element, hich is here stated to be 446° C.

The microstructure confirms the results obtained from he freezing points and shows that lead telluride is a con-tituent common to all the alloys. Its formation in the reparation of the alloys is accompanied by the evolution f light and heat. The lead and lead telluride are robably isomorphous. The tellurium used was obtained rom waste slime from the electrolytic treatment of copper natte, and was purified by converting it into basic tel-urium nitrate, the crystallisation of which from nitric acid olution completely separates it from selenium and other netals. The basic nitrate is decomposed by heat, the xide dissolved in hydrochloric acid and the metal pre-ipitated by sulphur dioxide. After fusing and cooling, it s crystalline and brittle, with a bright lustre and a specific ravity of 6·243.

The method finally employed for the analysis of all the lloys consisted in volatilising the tellurium as chloride n a current of chlorine gas, and weighing the residual lead hloride. The tellurium chloride could be completely dis-illed off without loss of lead. Reliable and concordant esults could not be obtained by other methods, whilst the bove was found to be convenient, accurate, and rapid.

—A. W.

Antimony and Tellurium; Alloys of ——. H. Fay and H. E. Ashley. Amer. Chem. J., 1902, **27**, [2], 95—105.

A series of alloys of antimony and tellurium have been nade and examined with respect to their freezing points, pecific gravities, and microscopic structure. The freezing oint curve shows a maximum with a composition of 1·37 per cent. of tellurium and 38·63 per cent. of ntimony; this alloy freezes at 629° C., or 5° above anti-ony, and corresponds to the compound Sb_2Te_3. This ntimony telluride forms with tellurium an eutectic alloy, ontaining 87 per cent. of tellurium, and 13 per cent. of ntimony, and freezing at 421° C. In this alloy any xcess of either the telluride or tellurium crystallises. The ntimony telluride is isomorphous with antimony, and does ot form an eutectic with it, the portion of the curve between hem being approximately a straight line. These latter lloys contain homogeneous mixed crystals of pure anti-ony and antimony telluride, the field being very similar hrough them all, except for a tendency of the latter to ggregate in excess of antimony. The curve dips slightly etween antimony and the telluride, and it is possible that compound SbTe might exist, but there is no evidence in vour of it at present; otherwise the curve resembles the ne obtained with the lead and tellurium alloys (*see* pre-eding abstract). The absence of any extra heat evolution t this stage precludes the formation of any SbTe. It is evident from the results that antimony and tellurium are not isomorphous, as they are generally supposed to be, and that consequently they do not mix as such at the tempera-ture of fusion, antimony telluride being formed and existing as a constituent throughout the series of alloys from one end to the other, similar to the lead telluride in the before-mentioned series.

The microscopic samples had to be specially prepared, owing to their highly crystalline and brittle nature, by first rubbing on an oil stone under water, polishing lightly on a wheel with a mixture of rouge and stearic acid, and then on chamois leather stretched on a wooden block. The etching was also difficult, and after trying acids and iodine, the best results were obtained by electrolysis, in either dilute hydrochloric acid or ammonia. Oxidation took place at the same time producing rich colours, which served to distinguish the crystalline constituents. By these and other experiments with tellurium, it is thought that some field of usefulness might be opened up for the large quantities of it now going to waste in the slime from the electrolytic extraction of copper from certain American mattes.—A. W.

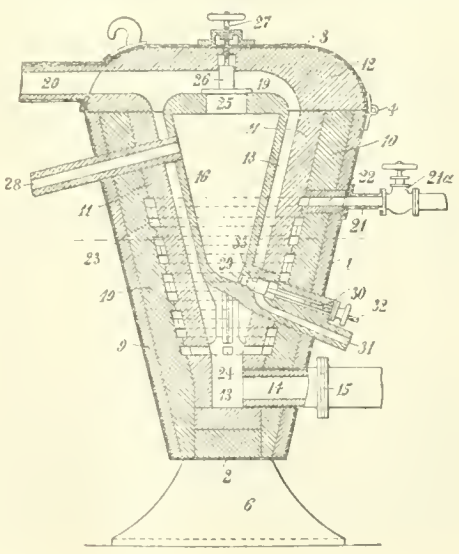
Ores containing Magnesium Nickel, Copper, and Iron as Oxidised Compounds, Silicates or Carbonates; Process for the Dry Sulphating of ——. Siemens and Halske Actien-Ges., Berlin. Ger. Pat. 130,298, March 2, 1901. Through Zeits. angew. Chem., 1902, **15**, [14], 340.

The ore is heated to from 500° to 1000° C., according to its composition, and is, at the required temperature, sub-jected to the action of a dried and heated mixture of sulphur dioxide and air, in predetermined proportions. The operation should be stopped from time to time and the ore leached with water to extract soluble sulphates. When several metals are present, the temperature of the ore may be raised by stages, the heat being so regulated that the temperature at one stage is below that at which the sulphate to be extracted is decomposed, but above the decomposition temperature of other sulphates.—W. G. M.

English Patents.

Iron and Steel; Process of Making ——, *and Apparatus used therein.* E. Meininghaus, Düsseldorf, Germany. Eng. Pat. 21,481, Oct. 26, 1901.

In the conical-shaped furnace shown in vertical section, next the casing 1, is a layer 9 of a material forming a bad heat conductor, followed by a layer of fire-bricks 10, be-tween which and the next layer 11 of best refractory bricks is the channel 23, leading from the pipe 21, through which air is forced into the hollow space 13, where the air thus heated is mixed with combustible gas admitted



through the pipe 14, and the flames ascend through the spaces 18 surrounding the crucible 16, and have exit through the passage 19, over the crucible cover, and the gases then pass through the pipe 20 to warm in advance another charge in a separate receptacle. The opening 29 at the bottom of the crucible communicates with the channels 30 and 31, the former serving for introducing the plug 33 by means of the rod 32, and the latter admits oxygen or air, on withdrawing the plug, when it is desired to heat the interior of the crucible, by burning combustible matters therein. The opening 25 in the top of the crucible is closed by the valve 26, which can be opened by internal pressure, when that is sufficient, or it can be operated by the screw 27. The side channel 28, ordinarily plugged, near the top of the crucible, serves for running off slag or molten metal, arrangements (not shown) being made for tilting the furnace when desired. The fluid metal may also be discharged through the passage 31. The raw materials, ores (which may be "dust ores") and fluxes are charged into the crucible, when it is closed and heated as described; and the crucible may also be internally heated by reactions taking place within under pressure. When the metal and slag have separated, the latter is run off, the valve 26 is opened, and air or "other suitable gases" are blown into the crucible and through the molten metal by the channel 31, whereby all combustible matters are consumed. When it is desired to obtain cast steel, the heating from outside may then be continued. If the crucible be used as a blast furnace, coke or other fuel is added to the charge.—E. S.

Armour Plates; Improved Manufacture of ——. A. G. Bloxam, London. From La Compagnie des Forges de Chatillon, Commentry, and G. Charpy, Paris. Eng. Pat. 13,864, July 8, 1901.

The plates are made of steel containing from 0·1 to 0·15 per cent. of carbon, 5 per cent. of nickel, and preferably 0·5 per cent. of chromium. One face is then carbonised by cementation, and finally the plate is uniformly heated at about 750° to 800° C., and is not subsequently annealed.—E. S.

United States Patents.

Separating Minerals; Apparatus for ——, *by Selective Action of Oils.* A. S. Elmore, London. U.S. Pat. 692,613, Feb. 4, 1902.

Compare with Eng. Pat. 21,948, 1898 (this Journal, 1900, 251); and with Eng. Pat. 6519, 1901 (this Journal, 1902, 349).

Powdered ore or mineral, mixed with from 5 to 10 times its volume of water, is run into one end of a trough having a rounded bottom, in which a shaft, carrying a number of blades, is rotated. A regulated quantity of oil is also admitted. The pulp issues at the further end of the trough into a subsidence tank, having a partition extending down a little below the level of an outlet pipe, through which passes the oil which has floated up with the metallic ingredients adhering to it. The earthy ingredients which subside in the tank are withdrawn through a valved aperture. The metallic ingredients and oil are received in the drum of a centrifugal machine, revolving within a casing. The drum has an inwardly-projecting flange at its upper edge, over which the oil flows into the casing, whence it is discharged, while the metallic matters accumulate in an annular layer at the circumference of the drum, and may be removed from time to time.—E. S.

Assayer's Furnace. J. J. Lonergan and A. C. Calkins, both of Los Angeles, California. U.S. Pat. (reissued), 11,979, April 1, 1902.

In the assaying furnace the muffle is arranged with its inner end provided with an opening, and separated from the rear wall except where the passage and opening coincide. A wide, thin exterior pipe, bent twice at right angles, connects the passage to the side of the ordinary vertical main flue, at a moderate height above the furnace. The ascending gases in the main flue draw with them the air in the accessory flue, the cooling and diminution of volume of the air on its passage tending also to increase the draught of air through the muffle. The accessory flue is provided with a damper, whereby the oxidising action in the muffle may be adjusted without materially changing the draught through the fire-box of the furnace. Gasoline or other hydrocarbon may be used as fuel in a furnace thus arranged.—E. S.

Assaying Furnace. A. C. Calkins, Los Angeles, California. U.S. Pat. 696,548, April 1, 1902.

See U.S. Pat. (reissued), 11,979, 1902 (see preceding abstract). The apparatus is a combined muffle and melting furnace, the muffle being centrally placed, with a wing or extension on either side. The sheet metal casing of the furnace extends below the firebrick and is provided with ventilating openings. The muffle traverses a combustion chamber, having a side opening for introduction of a gas burner, and a flue leads from the chamber to a sheet-metal bonnet, in connection with the main flue, set detachably upon the top of the furnace. The rear end of the muffle has an opening which communicates with a passage extending through the rear end wall, guarded by a pivoted valve, the passage serving for inspection of the interior, as well as for regulated admission of air. A passage leads from the front, open end of the muffle direct to the bonnet, and may be closed, partially or wholly, by a sliding block in the front; the air thus admitted being draughted upwards, induces a current of air along the muffle from the end passage, and thereby assists oxidation. The bottom of the combustion chamber is flush with the side chambers, so that crucibles for melting bullion or the like may be placed in the space beneath the arch as well as in the chambers. The crucibles are set on fireclay supported on withdrawable slides.—E. S.

Retort Furnace. D. Laird, Forfar, N.B. U.S. Pat. 696,456, April 1, 1902.

The furnaces are used for retorting amalgams in the process of separating precious metals from their ores. The retort is enclosed in a dome-shaped body of fireclay, an inclined flame passage being arranged below the retort, while around the sides and upper part of the retort there is a space tapering towards the end of the retort. Lateral passages form communication between the flame passage and the space. The retort is provided with a fireclay bed. A burner for liquid hydrocarbon or gas, and for air under pressure, is arranged in front of the flame passage. The volatilised mercury passes through the outlet of the retort to a condenser.—R. S.

Compound Ingot. S. A. Cosgrave, Pittsburg, U.S.A. U.S. Pat. 694,618, March 4, 1902.

"A homogeneous cast ingot, having at the end of the casting operation a substantial portion or layer of one kind or grade of metal, another substantial portion or layer of a different kind or grade of metal, and a substantial portion or layer intermediate of the other wherein the characteristics of the two metals merge gradually and equally into each other, said portions or layers being parallel or approximately parallel to each other." The invention particularly relates to the casting of such ingots from steel containing different proportions of carbon, in which a hard outer surface or wall of the desired thickness is obtained, with a gradual change inwards, to form a "decrementally-carbonised ingot," such as may, for instance, be available in the manufacture of armour plates, not liable to cleavage.—E. S.

Compound Ingots; Manufacture of ——, *and Mould therefor.* S. A. Cosgrave, Pittsburg, U.S.A. U.S. Pat. 694,731, March 4, 1902.

The mould is provided with channel ways and runners to its stool, and contains two or more partitions, having many perforations, dividing it into compartments for the different metals run in. The partitions are thin metal plates, supported by grooves in the walls of the mould and of the stool, which plates ultimately fuse to alloy with the metals. The perforations are so proportioned that when the outer compartments are being filled, the flow inwards shall not be such as, at least rapidly, to fill the inner compartments to the same level. It is preferred that

so much of the space between the partitions as is empty after filling the outer compartments, "should be filled by one or other of the bodies of metal cast."—E. S.

Ores; Cyanide Process of Extracting Precious Metals from ——. E. Schilz, Johannesburg, South Africa. U.S. Pat. 696,274, March 25, 1902.

Compare with *Cyanide Tailings* (this Journal, 1901, 127), *Cyaniding Slimes* (1901, 253), and with *Cyanide Process, Oxygen in the* —— (1900, 445). Slimes, concentrates, tailings, or the like, are intimately mixed with barium peroxide before subjecting them to the cyaniding process. Ordinary tailings require from $\frac{1}{2}$ lb. to 1 lb. of BaO_2 to the ton; concentrates, from 2 to 4 lb. It is stated that the reagent not only supplies the oxygen needful for the solvent action of the cyanide; but that it attacks the pyrites present, setting free the gold, and oxidises sulphurous impurities in the cyanide solution.—E. S.

Amalgamator. J. W. R. Laxton, Lynn, Massachusetts, U.S.A. U.S. Pat. 692,315, Feb. 4, 1902.

The mercury vessel of the apparatus is surmounted by and in communication with a tank, which is enlarged in diameter at the middle and has a contracted outlet at its upper end. The ore inlet pipe extends down through the tank into the mercury vessel, the ore rising through the mercury into the tank, past a deflector in the opening between the two. One or more receptacles are located centrally in the enlarged part of the tank to catch any entrained mercury. The outlet at the top of the tank is surrounded by a dome, having one or more bottom openings, through which the material from the tank is discharged on to a conical apron encircling the upper part of the tank. From the apron the material falls on to a pan, preferably having a slow rotary movement, and is discharged through a central opening in this pan into a receptacle below the tank. The internal bottom surface of the pan is silver-plated, and serves to separate and collect any remaining particles of mercury.—R. A.

Amalgamating-Machine. G. C. Scott, Columbus, Ohio, U.S.A. U.S. Pat. 694,112, Feb. 25, 1902.

A horizontal cylindrical casing, having an inlet at one end and an outlet at the other, has its lower portion formed with parallel wells or pockets containing mercury. A shaft, journalled centrally in the casing, carries a series of amalgamating-plate discs and reticulated casings filled with amalgamating material, the discs and casings alternating, and rotating through the mercury in the wells. Water-carrying pipes lead into the casing, and discharge between the discs. The outlet from the casing consists of an upwardly-inclined neck, in which is mounted an elevating mechanism carrying mercury cups and amalgamating plates. The elevator runs through a body of mercury at the lower end of the neck, and discharges at the upper end of the neck into a pocket or receptacle, which has a pipe connection with the inlet end of the casing.—R. A.

Fine Gold Amalgamator. M. Lasswell, Washington. U.S. Pat. 694,290, Feb. 25, 1902.

The amalgamator comprises a stationary chamber having a lateral extension chamber, and a sloping bottom which provides a mercury chamber at its base. The inlet pipe has a curved nozzle adapted to discharge water, sand, and gravel laterally in one direction against the wall of the extension chamber above the surface of the mercury, so as to cause them to rebound in the opposite direction over the mercury, avoiding the agitation of the latter. There is an outlet pipe, and spiral amalgam plates encircle both it and the inlet pipe. Removable adjustable standards are mounted in the container, each having a corrugated jacket coated with silver-plate and mercury.—G. H. R.

Ores; Treating ——. R. McKnight, Philadelphia, U.S.A. U.S. Pat. 696,469, April 1, 1902.

Compare with U.S. Pat. 693,982, 1902, this Journal, 1902, 411. Also with Eng. Pat. 21,623, 1900, this Journal, 1902, 481. Refractory ores, containing precious metal in the flour state and also in larger particles, are mixed with a haloid salt of an alkali or alkaline-earth metal, and the mixture is heated with free access of air and agitation, "until a haloid salt of the precious metal is produced and volatilised, and the coarser particles of the precious metal have their surface coatings removed, and the alkali or alkaline-earth metal unites with the oxygen of the air and with the refractory metalloid, to form a stable oxysalt." The volatilised haloids or oxyhaloids of the precious metals are collected, and the cleansed ore is treated by amalgamation. Should the ore be free-milling, it is mixed with iron or copper pyrites, or with another ore containing pyrites, and then with a haloid salt, and the mixture is treated as before described. This process applies to ores in which the particles of the precious metals are "coated with carbonates."—E. S.

Metals; Method of Producing ——. G. H. Clamer, Philadelphia, U.S.A. U.S. Pat. 696,092, March 25, 1902.

The process "consists in bringing the ore into contact with a flux and an alloy composed of the same kind of metal as the metal of the ore, and an element more electropositive than that metal, heating all said substances and effecting the combination of the electropositive element with the substance with which the metal was combined in the ore, fluxing the compound of the electropositive element, and recovering the metal set free from the alloy and from the ore." For example, in the production of low-carbon iron or of steel, iron ore, such as magnetite, is heated with "ferrosilicon" and a flux; when the silica formed is taken up by the flux, setting the iron of both the oxide and of the silicide, free. Wrought-iron or steel scrap may be added, when necessary, to reduce the proportion of carbon in the product. Nickel, for instance, may be obtained in like manner, by fluxing together nickel oxide and nickel silicide.—E. S.

Metals; Apparatus for Treating ——. G. C. Carson, Redding, California. U.S. Pat. 694,348, March 4, 1902.

A blowpipe is used for introducing jets of steam, air, gases, or vapours of any kind, for melting, or for producing chemical changes in molten metal. The blowpipe is a hollow tube of hard carbon, reinforced by an internal iron sleeve, split and lapped, and projects from the holder into the contents of the metal receptacle. Preferably, the carbon tube is left solid at its extremity, close to which are lateral openings for passage of the gases. The holder (described in detail) is hollow, and connected to valved tubing through which the gas or vapour is passed.—E. S.

Steel; Manufacture of ——. W. White, junr., Pittsburg. U.S. Pat. 695,256, March 11, 1902.

Molten metal is charged into a converter, and air and steam are forced through it to remove the silicon and neutralise the heat developed by the burning of the latter. The "de-siliconised" metal is then transferred to an open hearth furnace, and treated in the usual or any desired manner.—G. H. R.

Steel; Process of Manufacturing ——. [*Hydrogen.*] T. Andrew, Richmond, and T. K. Bellis, London. U.S. Pat. 695,264, March 11, 1902.

The pores or grain of the steel are first opened by the application of heat, so as to appreciably expose its carbon, and in this condition it is subjected to a bath of hydrogen. Finally, the temperature of the steel is raised by a second application of heat, and it is then immediately and suddenly chilled to fix the carbon.—G. H. R.

Iron and Iron Alloys; Manufacturing ——. F. C. Crean, Montreal, Canada. U.S. Pat. 695,670, March 18, 1902.

Loose, granular magnetite, such as "black sand," is stirred into molten pig iron to form a homogeneous metal. When 34 parts of magnetite are used to 66 parts of iron, the product is stated to have a breaking strength of 78,400 lb. in a bar 12 inches long, and of 2·99 by 2·93 inches cross-section. Instead of stirring the magnetite into the molten metal,

when working with considerable quantities, it is preferred to supply the needful proportion of it through a wide open tube, flared at the top, into the molten metal contained in a crucible or suitable receptacle, the tube being caused to traverse the mass of metal, while the magnetite is being fed, thus ensuring its distribution; or the molten metal may be poured through the tube into loose granular magnetite in the crucible. According to another method, the tube is made to stand on the bottom of the crucible, and is then filled with magnetite. The molten metal, which may be alloyed with nickel, manganese, or other metal "having an affinity for iron," is poured into the crucible, and the tube is gradually raised, until the magnetite has passed into the metal, which fuses it at once. The mixture is then rabbled for a short time. The process is described with reference to drawings of the apparatus, which apparatus is however not claimed, as having been the subject of a prior U.S. patent.—E. S.

Armour Plate; Manufacture of ——. G. Charpy, Montluçon, France. U.S. Pat. 696,941, April 8, 1902.

See Eng. Pat. 13,864, 1901, page 618.—E. S.

Zinc Furnace. G. G. Convers and A. B. de Saulles, Pennsylvania. U.S. Pat. 691,137, Feb. 25, 1902.

The zinc furnace has a retort chamber for the circulation of the products of combustion, arranged within which is a plurality of retorts or muffles in vertical series. A cooling-flue chamber, common to all the retorts, is adjacent to their vapour-discharge openings, and has zinc-condensers extending through it, between which are valved transverse partitions. Means are provided for creating and regulating a cooling draught through the flue chamber which is surmounted by a valved stack.—G. H. R.

Zinc Dust; Production of. G. G. Convers and A. B. de Saulles, Penn., U.S.A. U.S. Pat. 695,376, March 11, 1902.

The substantially maximum yield of zinc-dust, or "blue powder" can be obtained from a given retort charge while excluding an injurious admixture of zinc oxide therewith, by first heating the charge to effect the distillation of the zinc, conveying off separately the preliminary oxide of zinc vapours generated, and then receiving the metallic zinc vapours given off from the charge in their substantial entirety from the muffle directly into a collecting chamber, whereby their temperature is maintained throughout above the point of liquefaction of any portion of the vapour until they have entered the collecting chamber, where they are immediately expanded and condensed into zinc dust. The flow into the collecting chamber is interrupted when, at the final stage of the operations, vapours of oxide of zinc reappear in it.—G. H. R.

Copper, Process of Hardening ——. C. Renstrom, Seattle, U.S.A. U.S. Pat. 695,271, March 25, 1902.

Castings of copper or of copper alloys are laid on a charcoal fire, and when sufficiently heated, as to the temperature of melting tin, are sprinkled with sulphur, and after a short time, are plunged into a bath of cupric sulphate solution. Preferably, the castings are then reheated, and allowed to cool without the application of any cooling agent. The castings are stated to be thus hardened without lessening their ductility and toughness.—E. S.

Copper-Nickel-Sulphid Ores; Process of Treating ——. D. P. Shuler, Sudbury, Canada. U.S. Pat. 697,370, April 8, 1902.

Nickel-iron and copper-iron sulphide ores are comminuted and separated magnetically into headings and tailings. The headings are richer in iron and sulphur than the tailings, and contain very little copper, but are generally poorer in nickel, and the object of the sorting is to bring about such a readjustment of the ores as to produce the proportions of constituents proper for the making of nickel-steel. The headings generally are roasted, and smelted to obtain pig-iron containing the required proportion of nickel. Or the roasted headings may be smelted with the addition of Bessemer iron ore, the proportion of nickel they contain being suitable for the purposes of the invention. "In some cases the roasting of the tailings may be dispensed with."—E. S.

Alloys; Method of Making ——. E. Keller, Baltimore, U.S.A. U.S. Pat. 696,244, March 25, 1902.

The process consists in a method of preventing or reducing the tendency to concentration of impurities in metals or alloys, as a consequent effect of "segregation." Such segregation may take place towards the portion of the metal that is the first to solidify after fusion; or towards the last portion to solidify. Analyses are made of an ingot of portions taken from different depths, and if the impurities are found to accumulate near the surface, a proportion, determined empirically, of the pure metal is added by fusion; but if the contrary be the case, a certain proportion of another or of the same impurity as that present is added. One object of the prescribed treatment of metals and alloys is to obtain them in reliable condition as to strength throughout.—E. S.

Quicksilver-separating [Mercury] and Continuous Ore Furnace. C. Fitzgerald, San Francisco, California. U.S. Pat. 696,323, March 25, 1902. Compare with Eng. Pat. 15,879, 1900 (this Journal, 1901, 905).

The ore is delivered into inclined muffles, provided at their upper ends with horizontal projections which determine the height of the ore; the latter descends by gravity until it passes into chambers outside the furnace, whence, when cool, it is removed periodically, thus giving space for the passage of more ore down the muffles. As several tons of roasted or spent ore may accumulate in the cooling chambers, giving rise to poisonous fumes, an arrangement is provided for drawing the vapours back into the muffles, whence they are driven continuously, by hot air through pipes to a condenser, at the bottom of which the liquid mercury collects. The interior of the furnace is arched, and through the arched space the flames circulate into another space, closed at the back, to the front of the muffle, and thence around the end of a partition or wall, extending beneath and centrally along nearly the entire length of each muffle and through a space beneath the other portion of the muffle to the rear, whence the gases pass through passages beneath the hopper, and then out through the chimney. Thus, the fire-gases pass from a single fire-place around three sides of both muffles, and converge from the smoke passages and longitudinal flues into the chimney, the interior of the muffles being entirely closed from direct access of the gases. The floor of each muffle being parallel with the roof, enables the heating of the charge to be equalised throughout.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

English Patents.

Lead Dioxide; Electrolytic Production of ——. G. W. Johnson, London. From the Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. Eng. Pat. 12,186, June 14, 1901.

It is claimed that lead oxides, such as litharge, red oxide, and the like, when held in suspension in solutions of the chloride of a light metal, or of other haloid salts of the same, or of a mixture of such salts, are converted into lead dioxide if subjected to electrolysis.—G. H. R.

Electrolytic Cells, and Electrodes therefor. A. A. Vogelsang, Dresden, Germany. Eng. Pat. 4489, March 2, 1901.

The invention relates principally to the construction of the electrodes in cells in which only the end electrodes are connected to the source of current. The electrode is built up of rods faced with, or sheathed in, platinum foil, alternated with insulating rods. The sides of each sheath form

etrolysing strips, anode on one side, and cathode on the ner, while the intermediate portions embedded in the ctrode act as a conductor between them.—G. H. R.

lectric Accumulators. [*Planté Plates.*] B. M. Drake and J. M. Gorham, London. Eng. Pat. 6352, March 26, 1901.

HE forming solution consists preferably of 1·5 per cent. weight of saltpetre in sulphuric acid of 12° B. with a rrent density of 4 ampères per square foot of surface of d on the positive pole plate, to which may be added a nall quantity of caustic potash.—G. H. R.

United States Patents.

Electrode for Secondary Batteries. A. H. Boinville, Nanterre, France. U.S. Pat. 696,157, March 25, 1902.

HE electrode consists of a massive central rod provided th integral, radiating, longitudinal blades, the surfaces of jacent blades approaching each other at intervals, and e whole enclosed in a tubular jacket of the same material the rod. A modification is effected by pressing the ades together at several points to form cells for the tive material.—G. H. R.

lectrodes; Envelope for Battery ——. [*Pyroxylin.*] E. A. Sperry, Ohio. U.S. Pat. 696,209, March 25, 1902.

HE envelope is formed of a band of pyroxylin threads or res under tension, wrapped round and round the electrode, e width of the band being materially less than the dimen- on of the electrode measured on a line normal to the rection of winding. Various methods of applying the nd according to the shape of the electrode, and of inforcing it at interseeting angles, &c., are deserihed. A silient separator plate is interposed between adjacent ectrodes, and supports the envelope of each at intervals tween the edges of the electrode.—G. H. R.

Battery. W. C. Banks, Brooklyn. U.S. Pat. 696,924, April 8, 1902.

HE battery is composed of a jar, which contains the citing liquid and the elements, and has a cover through hich pass two terminals. The negative element contains e depolariser (such as a body of copper oxide), one- urth to one-sixth of which is located above the solution he, while the zinc positive element is entirely below it. —G. H. R.

ccumulator. G. de R. de Sales and F. Gueugnon, Lyons, France. U.S. Pat. 696,496, April 1, 1902.

HE cathode consists of a supporting frame of aluminium veloped by a sheet of lead in such a way as to form a vering for the frame, as well as a plate surrounded by it, d is provided with metal wires forming a brush. The node is composed of an aluminium tank, flanged for its spension, and divided into compartments made of the me metal, the interior being coated with lead, so that ch compartment forms the anode. Two concentric boxes th perforated walls, separate the cathode from the anode, d an absorbent material arranged between the adjacent alls of the boxes serves to absorb the liquid electrolyte d render it immobile.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

urnace; Magnetic Concentration of Low Grade Ores in the Electric ——. M. Ruthenberg. Electro-Chemist and Metall., 1902, **2**, [12], 12—16.

AGNETIC iron ores are concentrated until they are as clean possible. Magnetic concentration with the ore immersed water instead of in air gives good results. The con- ntrates are then passed into an electric furnace, the elting zone of which is a magnetic field, with the ention that the ore particles should make a connection tween the electrodes, which are water-cooled. The rticles are to be maintained in this position by the luence of magnetism until, becoming heated by the ssage of the current through them (between the elec- des), they melt, and thus, losing their magnetic properties, pass by the action of gravity out of the magnetic field, and from between the electrodes, and thus give place to a fresh portion of ore. The agglomerated masses so produced range in size from that of a bean to that of a walnut; and as the composition is unaltered (except for the loss of moisture, and of the last traces of sulphur) they may be used in the blast furnace, or in smelting operations, for which iron sands are not suitable. If coke dust is mixed with the ore, partial reduction takes place, and if the ore be dropped from the furnace into a soaking-pit, and allowed to remain there for a time, cementation takes place, and the product may be used for immediate melting (as steel) in the open-hearth. Impurities, which need not be excessive in quantity, pass off as slag. The process is said to be specially applicable to ferruginous beach sands; but in this case the grains of ilmenite should be separated by magnetic means, using a magnet strong enough to retain the magnetite, whilst allowing the titaniferous ore to pass. It is stated that it is possible to melt a ton of iron ore by this process with an expenditure of energy equivalent to less than 500 kilowatt-hours.—W. G. M.

Tin from Tin-Plate Waste; Electrolytic Separation of ——. P. Keppich. Oesterr. Chem.-Zeit., **5**, 73—74. Chem. Centr., 1902, **1**, [13], 780.

THE electrolytic method is stated to possess great advantages over the acid process. The electrolysis is carried on in a series of iron or cement reservoirs, about 3 m. long, 1·20 m. wide, and 1·20 m. deep. The electrolyte used is a 12 per cent. solution of caustic soda, which is kept at a temperature of 60°—70° C. The baskets which serve as anodes are filled with the tin-plate waste, immersed in the caustic soda solution, and connected to the copper conducting wires. As a rule, the tin is separated in from 2 to 4 hours; it is precipitated in the spongy form at the cathodes. It contains up to 1·6 per cent. of lead. It is estimated that with a dynamo giving 10 volts and 800 ampères, the tin can easily be removed from 10,000—12,000 kilos. of tin-plate in six working days.—A. S.

Iron; Increase of Electrical Resistivity, caused by alloying ——, *with various Elements, and the Specific Heat of those Elements.* W. F. Barrett. Proc. Roy. Soc., 1902, **69**, [458], 480—485.

IN every case, excepting possibly that of copper, the alloying of iron with other metals (Mn, Ni, W, Cr, Cu, Al, were tried) or with carbon or silicon, caused an increase in the resistivity; of these the effect is most marked in the case of Si and Al, and least in that of W. The approximate increase in electric resistivity (in microhms per c.c. at 18° C.) of annealed iron alloys is as follows:—

Alloy of Iron with	Percentage of added Element.		
	2 per Cent.	3 per Cent.	5 per Cent.
Tungsten	4	5·0	6·0
Nickel	7	9·0	13·0
Chromium	10	11·5	11·0
Manganese	16	18·0	24·5
Silicon	26	34·0	49·0
Aluminium	28	36·0	54·0

Hence, it seems that the increase of resistivity for every 1 per cent. of added element decreases as the percentage of

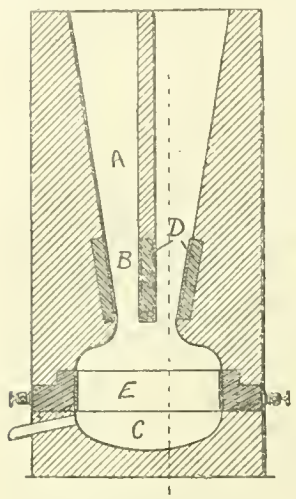
Alloy of Iron.	Increase of Resistivity for 1 per Cent.	Specific Heat.
Tungsten	2·0	0·035
Cobalt	3·0	0·107
Nickel	3·5	0·109
Chromium	5·0	0·1 (?)
Carbon	5·0	0·160*
Manganese	8·0	0·122
Silicon	13·0	0·183
Aluminium	14·0	0·212

* This is for graphite; diamond is 0·113.

that element increases. By dividing the figures in column 2 of the above table by the number at the head of the table the increase of resistivity per 1 per cent. of added element is found, when 2 per cent. of the alloying substance is present. These numbers show a remarkable correspondence with the specific heats of the added material, as seen by the foregoing table.

(See also this Journal, 1902, 411.)—W. G. M.

Steel direct from the Ore; The Conley Electric Steel-smelting Process for the Production of ——. Electro-Chemist and Metall., 1902, **2**, [12], 16—18. (See also U.S. Pat. 697,810, page 623.)



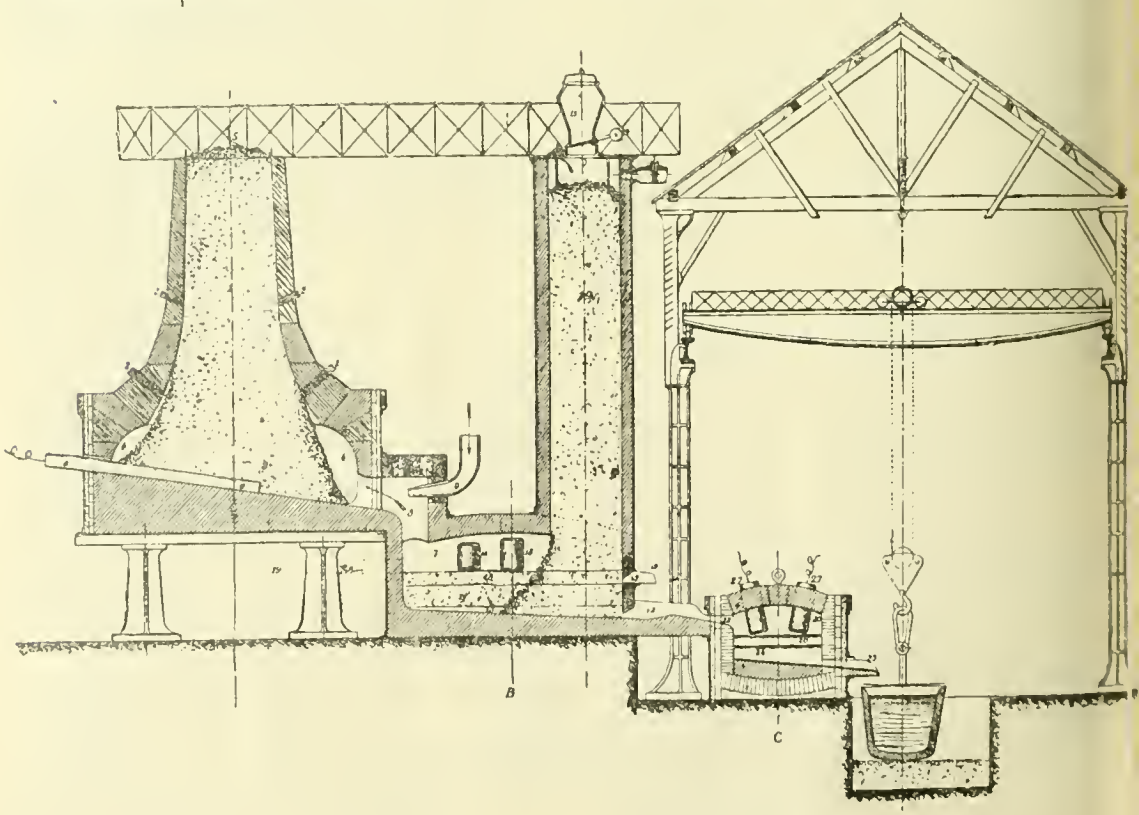
The accompanying figure illustrates the Conley furnace. The ore is placed in the chamber A, and, passing through the contracted throat B, comes in contact there with the plates D, which are intensely heated by the passage of an electric current through them. The ore thus melted falls into the hearth C, which is also heated by the electrically incandescent plates E. The inventor proposes to use the hearth C as he would an open-hearth furnace. Calculations are given purporting to show that by this process (taking costs of materials and of current at Buffalo, N.Y. prices), steel ingots can be made at $11·85, and crucible steel at $28·36 per ton.—W. G. M.

Steel direct from the Ore; The Harmet Process for the Production of ——. Electro-Chemist and Metall., 1902, **2**, [12], 18–20.

Ore charged into the stack A (see accompanying diagram) is to be fused at the level of the sloping bottom, and of the annular chamber immediately above it, by means of gases from the adjoining stack B, burnt with air injected at the point of their entry into A, assisted by heat generated electrically with the aid of electrodes placed on the bottom of A. The ore from A is, in a semi-fluid condition, caused to pass into B, where it is mixed with coke and reduced, the resulting metal and slag being passed out through a column of coke, the metal flowing into the hearth of the open-hearth furnace C. Whilst in B and C, the charge is heated in part electrically by electrodes shown in the open spaces above the hearths. The top of the stack B is closed, so that all the gases generated in it are forced to pass into A. The calculation of energy required to reduce one ton of metal at the rate of one ton per hour is as follows, the ore being such that 2,320 parts will produce 1,000 parts of metal and 535 parts of slag:—

	Calories.			Electrical Energy h.p.-hours.
	Needed per Ton of Metal.	Produced by Combustion.	To be supplied electrically.	
Ore-melting furnace A.	1,965,424	2,073,888	..	..
Reducing furnace B.	2,268,500	780,000	1,488,500	2,340
Refining furnace C.	536,000	..	536,000	850
Totals	4,267,924	2,853,888	2,024,500	3,190

Taking the cost of coal at *l.* per ton, and that of electric current at 1 centime per 1,000 calories (as in the French



Alps), the cost of steel is calculated as 29·24 francs per ton. (In the Martin process the cost is given as 42·5 francs per ton.)—W. G. M.

Titanium and Iron; Alloys of ——. E. Bahlsen. Stahl u. Eisen, 1902, **22**, 326. Chem.-Zeit, 1902, **26**, Rep. [12], 103.

It was shown by Ledebur that iron heated in a blast-furnace could only take up 0·2 per cent. of titanium, so that alloys of iron and titanium could not be prepared in that way. Such alloys were obtained, however, by Goldschmidt and Vautin by reduction with metallic aluminium (this Journal, 1898, 542), 83·3 parts of aluminium being required for the reduction of 100 parts of iron oxide and 100 parts of titanic acid.

Since aluminium powder is from 7 to 10 times as dear as block aluminium, and the ferro-titanium thus obtained very impure, Rossi has devised another method of reduction (Eng. Pat. 8066; this Journal, 1900, 829). Iron and aluminium are melted in a crucible in an ordinary Siemen's electric furnace, and the titaniferous material (powdered titaniferous iron ore, &c.) introduced between the electrodes and the sides of the crucible. On fusing the mass, the ferro-titanium separates sharply from the aluminium slag, and it is possible to prepare 100 kilos. of the alloy in 1½ to 2 hours, whilst the metal can also be refined.

Treated by this process, a Canadian ore containing 24 per cent. of titanium and 35 per cent. of iron, yielded an alloy containing 35 to 40 per cent. of titanium; whilst an ore with 8·5 to 9 per cent. of titanium and 58 to 60 per cent. of iron gave an alloy containing 13 per cent. of titanium. By the use of the so-called "concentrates," the same ore yielded directly ferro-titanium containing 75·8 per cent. of titanium. For this purpose the ore is mixed with sufficient carbon to effect the reduction of the iron oxide, and heated in the electric furnace, with the result that an impure iron containing silicon and a calcium titanate slag are obtained. The latter (the "concentrate") contains about 35 per cent. of titanium and only 2 or 3 per cent. of iron, and by using it for the reduction there is a considerable saving of aluminium. (Eng. Pat. 3582; this Journal, 1901, 588.)

The reduction of titanium iron ores with carbon in the electric furnace produced alloys showing a grey graphitic fracture and containing 10 to 12 per cent. of titanium. (See this Journal, 1898, 1154.)

The addition of 4 per cent. of the 10 per cent. ferro-titanium alloy to iron increased the bending strain of the product by 20 to 50 per cent., and the ductility by 30 to 50 per cent., whilst the ratio of graphitic to combined carbon was unaltered.

The addition of 2 to 5 per cent. of titanium to cast steel increased the elasticity, co-efficient of expansion, and diagonal contraction before fracture.

It is noteworthy that ferro-titanium has a lower specific gravity than cast iron or steel. Owing to the high melting point of the alloys it is difficult to utilise those containing more than 15 per cent. of titanium.

Titaniferous iron ores occur plentifully in the United States, Canada, Norway, Sweden and Russia. They contain up to 50 per cent. of titanium, are usually free from sulphur and phosphorus, and containing but little silica, are well suited for the manufacture of ferro-titanium.

Rossi has also prepared alloys of copper and titanium containing 8 to 15 per cent. of titanium, and has obtained good results with these as substitutes for manganese bronze.—C. A. M.

Copper Extraction; Theory of Electrolytic Methods of ——. J. Egli. Zeits. anorg. Chem., **30**, 18; through Zeits. angew. Chem., 1902, **15**, [14], 334—335.

In these experiments, pure fused cuprous sulphide was used, either as anode or as cathode, according to the nature of the electrolyte, the other electrode, separated from it by a clay diaphragm, being of platinum or copper. Using the sulphide as anode in sulphuric acid of sp. gr. 1·225, the solvent action proceeded in two stages as follows:—

$$Cu_2S + \overline{S}O_4 = CuS + CuSO_4$$

$$CuS + \overline{S}O_4 = CuSO_4 + S$$

The progress of the former reaction is shown by the alteration in colour from grey to black. The anode deposit, at first a smooth coating, but afterwards thick and broken, consists of cupric and cuprous sulphide and sulphur. At high current densities, the latter would be oxidised to sulphuric acid; but at those available for industrial purposes (up to 30 ampères per sq. dm.) the sulphur is not attacked, and adds, therefore, very greatly to the electrical resistance as it accumulates, until at last no current flows. The action may be continued by applying higher voltages or temperatures, but then the E.M.F. required is not constant enough to be satisfactory for technical purposes. The current-efficiency with cast electrodes may attain 90 per cent., and is better than that with granulated electrodes, in which it is only about 40 per cent.; but the efficiency decreases as the anode slime accumulates. By making the sulphide the cathode in a 4·5-times normal caustic soda solution, sulphur, up to 70 per cent. of that originally present, is ionised and passes into the solution, but the current-efficiency decreases with increasing current-density and with time. The residual slime, as the sulphur is removed, becomes increasingly red, owing to the presence of metallic copper, but even at the end it contains unaltered cuprous sulphide. The E.M.F. required remains very constant throughout. Pure copper can be prepared from the slime by washing it and making it the anode in sulphuric acid of sp. gr. 1·225. The E.M.F. is very constant, but extraction is incomplete; it would be more complete if the sulphur were removed as completely as possible in the first process, but the current-efficiency of that process diminishes as the amount of copper deposited increases. By making cuprous sulphide the anode in hydrochloric acid, the sulphide becomes black, as with sulphuric acid, and is covered with a dark brown solution, which adds greatly to the resistance, and unless it is constantly removed causes wide variations in the E.M.F. required. At the same time the sulphur passes into solution as sulphuric acid through the oxidising agency of the anode chlorine. The current efficiency of the process (as gauged by a copper voltameter) is 146·8 per cent., showing that much of the copper is electrolysed in the cuprous state. Some metallic copper appears at the anode when dilute hydrochloric acid is used, but not with the strong acid.

In the electrolysis of cupric chloride solutions, the following observations were made. A temperature of 25° C. is the most suitable; at lower temperatures the copper deposit is spongy, whilst at higher temperatures it is impure. The current-efficiency increases with the current-density up to the point at which hydrogen begins to be liberated at the cathode. Copper of the highest degree of purity is obtained from electrolytes having the composition:—0·1 mol. of $CuCl_2$, 0·1 mol. of HCl, and 0·4 mol. of NaCl per litre.

W. G. M.

United States Patents.

Electric Furnace. [*Iron Ores.*] M. R. Conley, New York. U.S. Pat. 697,810, April 15, 1902.

The body of the furnace, which is closed to prevent the ingress of air while it is in operation, is made of refractory non-conducting metals, and formed with a main inner chamber reduced to a comparatively small neck at its bottom, and with a hearth below it, the hearth, neck and chamber forming one connected enclosure. A heating zone forms the wall of the neck, and is made up of a series of parts of material of low electrical conductivity adapted to be heated to incandescence by the passage of an electric current through them, and a second zone, similarly constituted, surrounds the hearth.—G. H. R.

Metal-Working Apparatus; Electric ——. G. D. Burton, Boston. U.S. Pat. 696,004, March 25, 1902.

The receptacle for the substance to be treated has a perforated bottom to allow of the entrance of the electrolyte and the exit of the substance treated, and is provided with a cover, through a slot in which having a recessed, sliding cover, an adjustable electrode extends into it, and is adapted to automatically maintain contact with the substance treated, while it can also be clamped in any desired position and rendered unautomatic. The bye-products are carried off from the receptacle by a pipe connected with it.—G. H. R.

Wire Bars; Apparatus for the Manufacture of ——, *by Electro-Deposition.* R. D. Sanders, Blackheath, England. U.S. Pat. 696,109, March 25, 1902.

See Eng. Pat. 9011, 1901; this Journal 1902, 485.

—G. H. R.

Metal Tubes: Process of Making ——. [*Electro-Deposition.*] E. Emerson, Rhode Island. U.S. Pat. 695,635, March 18, 1902.

A thin sheet of metal is formed by electro-deposition on a metal cathode, and is then removed and formed into a tube or cylinder by uniting the edges, after which it is placed on a support in an electrolytic vat, and metal is deposited on it till the required thickness is obtained.—G. H. R.

Oxides of Tin and Lead; Method of Making ——. [*Oxidising Reagent.*] C. S. Lomax, Massachusetts. U.S. Pat. 695,939, March 25, 1902.

A horizontal layer of the metal of uniform cross-sectional area throughout its length, is maintained in a molten condition in an oxidising-chamber, and at a suitable temperature for rapid oxidation by the action of a current of electricity conducted to it by bodies of the metal of larger cross-sectional area. The molten metal is subjected at the same time to the action of a current of oxidising reagent which oxidises it and carries off the metallic oxide.

—G. H. R.

Metals by Electrolysis: Method of Recovering ——. [*Soluble Anode.*] H. A. Frasch, Hamilton, Canada. U.S. Pat. 697,631, April 15, 1902.

The process (which is preferably carried out with the apparatus described in U.S. Pat. 669,441, 1901), consists in electrolysing a double salt of ammonia and metals whose hydroxides are soluble in ammonia, in presence of a suitable cathode, and of an anode capable of binding the acid and halogen radicals of the ammonium salt, and having constituents different from the contents of the electrolyte. The cathode and anode are separated by a suitable diaphragm, and the metal contained in the solution is deposited on the cathode. The acid or halogen radicals are bound to the substance of the anode, and the ammonia is kept in solution in the cathode electrolyte. Nickel is recovered from nickel-ammonium-chloride (obtained according to U.S. Pat. 661,899, 1901) by supplying an electrolytic bath with a soluble anode consisting of different metals in comminuted form, and covering it with a chemically and electrolytically inert permeable substance, above which the cathodes are arranged, and which acts as a diaphragm, separating the solution of nickel-ammonium chloride containing an excess of ammonia supplied to the cathode, from that of sodium chloride which is supplied to the anode. By means of an electric current the nickel is precipitated in metallic form on the cathode, and at the anode a solution is formed of the various metals contained in it. The chloride solution is displaced from below the diaphragm by the addition of fresh sodium chloride solution, and the cathode solution is further electrolysed until the last trace of nickel has been removed from it, the remaining solution of free ammonia being utilised for the production of fresh nickel ammonium chloride.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Oils; Relation of Heat of Combustion to Specific Gravity of ——. H. C. Sherman and J. F. Snell. J. Amer. Chem. Soc., 1902, **24**, [4], 348—353.

The authors showed (this Journal, 1901, 590) that there probably exists a certain definite relationship between the heat of combustion and the specific gravity of different fatty oils. Since then they have examined many other specimens, and from their results have obtained data in support of this view and of their inference that atmospheric oxidation lowered the heat of combustion to the same extent that it increased the specific gravity.

The following table gives the average results obtained with different oils in a fresh condition:—

Fresh Oil.	Specific Gravity at 15° C. 15°	Calories per Grm.	Calories Multiplied by Specific Gravity.	Calories Divided by Specific Gravity.
Linseed (3)	0·935	9·375	8·77	10·03
Boiled linseed (2)	0·935	9·372	8·76	10·02
Poppy-seed (1)..	0·926	9·382	8·69	10·13
Maize (3)	0·925	9·423	8·72	10·19
Sesame (1).....	0·924	9·395	8·68	10·17
Cotton-seed (1) .	0·923	9·396	8·67	10·18
Rape (2).....	0·920	9·476	8·72	10·30
Earth-nut (1)...	0·917	9·412	8·63	10·26
Almond (1).....	0·919	9·454	8·69	10·29
Olive (2).....	0·917	9·454	8·67	10·31
Castor (2)	0·966	8·849	8·55	9·16
Menhaden (2)...	0·935	9·366	8·76	10·02
Cod-liver (2)	0·927	9·436	8·75	10·18
Seal (1).....	0·926	9·424	8·73	10·18
Whale (1)	0·924	9·475	8·75	10·25
Lard oil (2)	0·918	9·449	8·67	10·29
Sperm	0·883	9·946	8·84	11·23
Rosin oil.....	0·989	10·145	10·03	10·26
Petroleum oils (3)	0·894	10·714	9·61	12·01
Turpentine	0·872	10·830	9·31	12·52

The effect of oxidation upon these constants is seen in examples which are given, in which the values obtained by multiplying the heat of combustion by the specific gravity differ but little from the corresponding values in the case of the fresh oils, whereas the numbers obtained by dividing the heats of combustion by the sp. grs. vary greatly with the extent of the oxidation. That is to say, the specific gravity is increased almost in proportion to the decrease in the heat of combustion.

The effect of atmospheric oxidation upon one and the same oil is illustrated by the following results.

Oil.	Specific Gravity.	Calories per Grm.	Calories Multiplied by Specific Gravity.	Calories Divided by Specific Gravity.
Raw linseed	0·934	9·364	8·74	10·02
Raw linseed, after 4 months' exposure.	0·942	9·288	8·75	9·86
Boiled linseed	0·949	9·191	8·72	9·69
Boiled linseed, after 2 months' exposure.	0·9595	9·078	8·71	9·46
Boiled linseed, after 4 months' exposure.	0·968	8·965	8·68	9·26

An elementary analysis of the boiled linseed oil before and after exposure for two months gave the following results.

—	Carbon.	Hydrogen.	Oxygen.
	Per Cent.	Per Cent.	Per Cent.
Before exposure.....	77·02	10·73	14·25
After exposure	74·15	10·70	15·15

In the authors' opinion the oxygen is absorbed by direct addition and without causing material alteration in the volume of the oil.—C. A. M.

Cotton-seed Oil; Modification of Becchi's Silver Nitrate Test for ——. L. M. Tolman.

See under XXIII., *page* 643.

Cotton Seed Oil; Investigation of Becchi's Test for —— A. H. Gill and C. H. Dennison.

See under XXIII., *page* 643.

Cholesterol and Phytosterol in Fats; Determination of ——. E. Ritter.

See under XXIII., *page* 643.

ENGLISH PATENTS.

Oil; Separation of ——. T. Clarkson, London. Eng. Pat. 9392, May 6, 1901.

'his invention relates more particularly to the separation f oil from waste steam by centrifugal action.—C. A. M.

Grease and Oil from Exhaust Steam; Apparatus for Extracting ——. J. S. McDougall, Manchester. Eng. Pat. 9569, May 8, 1901.

'LAIM is made for an apparatus consisting of an upper nd lower vessel connected by a valve. The upper vessel ontains baffle-plates arranged in a specified manner, and ach provided with a series of ledges, so that water or oil eposited on the baffles runs along these ledges, and is arried off down vertical tubes having their opening at the dges of the ledges.

In another form of apparatus claimed, a series of wooden oards is arranged in a parallel plane or in the form of ibes, the oil being separated by the passage of the exhaust team between these boards. The oil and water collecting n the lower vessel may be expelled by steam- or air-ressure by means of special devices claimed.—C. A. M.

UNITED STATES PATENT.

Oil Filter. H. B. Wyman, Leominster, Massachussetts, U.S.A. U.S. Pat. 691,835, Jan. 28, 1902.

n the apparatus claimed, the waste oil is first passed upwards hrough a compartment of water or brine, from the surface f which it flows over a partition to the bottom of a hamber. It next passes upwards through a filter-bed of ulverised glass or fine grit, falls over another partition, and nally passes upwards through another filter-bed of felt r other porous material.—C. A. M.

Resins, Oils or Fats; Process of Refining ——. F. Arledter, New York. U.S. Pat. 696,222, March 25, 1902.

'URIFICATION and decolorisation is effected by treating he oil, &c. with a quantity of alkali insufficient for saponifi-ation, agitating the mixture in an atmosphere of carbon ioxide, with or without heat or pressure or the introduction f steam, and separating the resulting purified product rom the ley.—C. A. M.

Grease from Steam; Apparatus for Separating ——. W. J. Baker, Scarborough, Yorkshire. U.S. Pat. 692,415 Feb. 4, 1902.

'LAIM is made for means of cooling super-heated steam ntroduced into an oil separator, the object being to ncrease the deposition of oil upon the baffles. This is ffected by means of a water-injecting or other device, 'hich is claimed as an improvement upon the apparatus escribed in Eng. Pat. 15,384, 1897 (this Journal, 898, 687).—C. A. M.

Pump [Oil Pump] for Handling Heavy Oils. F. O. Sterrett, Henry, Illinois, U.S.A. U.S. Pat. 693,920, Feb. 25, 1902.

HE pump described is intended for use with thick viscous ls or other fluids without the application of heat. The ibe to be inserted into the oil has a ball valve at the ottom, whilst a valve stem carrying a valve of peculiar nstruction is moved vertically in the tube by means of a ndle. If the oil be sufficiently thin it will not be drawn ove a spout in the side, but if very thick it will rise to e top of the tube, which is enlarged to form a head, in e wall of which an exit aperture is provided.—C. A. M.

Oil Filter. H. Sims, Erie, Pennsylvania, U.S.A. U.S. Pat. 694,434, March 4, 1902.

is filter, all the parts of which can be readily separated r cleaning, is divided into two compartments by a vertical rtition. At the top of one of these is a chamber, from e bottom of which a pipe with a perforated cone-shaped se extends to the bottom of the compartment, which is nearly filled with water. On introducing oil into the top chamber, it passes through a filter bed, down the central pipe, and rising through the water, flows over into the other compartment, where it falls through another filtering bed.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

UNITED STATES PATENTS.

Lithopone; Process of Making ——. I. P. Lihme, Cleveland, Ohio. U.S. Pat. 697,731, April 15, 1902.

PROCESSES are claimed which yield a lithopone of any desired grade, or zinc sulphide-content, and simultaneously give a by-product of some value.—F. H. L.

White-Lead Drier. T. E. Kearns, New Kensington, Pennsylvania, U.S.A. U.S. Pat. 693,869, Feb. 25, 1902.

A PLANT for the drying of white lead, consisting of two parallel series of supporting columns connected by several tiers of cross-beams. Steam-pipes are carried lengthwise over each tier or stage of cross-beams and long pans or trays are placed thereon in direct contact with the steam-pipes, and secured in position by clamps attached to the main uprights or supporting columns.—R. L. J.

(*B.*)—RESINS, VARNISHES.

UNITED STATES PATENTS.

Linoleum; Manufacture of Inlaid ——. K. Klic, Vienna, and O. Poppe, Rixdorf, near Berlin. U.S. Pat. 692,677, Feb. 4, 1902.

THE novelty in this patent is the use of a linoleum cement prepared by oxidising a mixture of oil and resin to the consistency of india rubber, and mechanically incorporating the product with a suitable volatile solvent so as to form an emulsion. It is stated that pieces joined with this cement will not break at the line of junction on bending the linoleum.—C. A. M.

Pyroxylin Compound. J. B. G. Bonnaud, Ostend. U.S. Pat. 697,790, April 15, 1902.

(A) 1 lb. of nitrocellulose and 1 lb. of camphor are dissolved in 1 gallon of methylated spirit, and a "very small quantity" of vanillin is added. (B) Two to six parts of copal are dissolved in 180 parts of boiling castor oil, and one to four parts of a mixture of lead acetate, litharge, and zinc sulphate in equal proportions are introduced. From 10 to 30 parts of (B) are then incorporated with 180 parts of (A). The gum copal is claimed to prevent the solution from drying too rapidly; the vanillin masks any disagreeable odour. The whole is intended for varnishing purposes.—F. H. L.

Linoleum; Press for Pressing ——. C. H. Scott, Gloucester. U.S. Pat. 697,550, April 15, 1902.

THE apparatus consists of a horizontal roller carried on centres, to which an upward and downward motion can be given by vertical plungers rising from hydraulic cylinders in which horizontal pistons produce the necessary pressure. These pistons are driven by cranks carried on a central shaft, which are so arranged that the movement of the roller is comparatively rapid, with a relatively long dwell at its highest position. The sheets of linoleum, face upwards, are led into the machine in an intermittent manner, passing under and round the roller between it and two hot plates; when they arrive on top, they receive a compression between the roller and a curved pressure plate fixed above it. The pressure is removed and applied at the rate of 20 or 30 times a minute. The process is claimed to consolidate linoleum in a rapid, advantageous, and economical manner, without danger of injuring the surface.—F. H. L.

(C.)—INDIA-RUBBER, &c.

India-Rubber, Behaviour of ——, with concentrated Nitric Acid. R. Ditmar. Ber. 1902, **35**, [7], 1401—1402.

By the action of concentrated nitric acid on india-rubber, the author has obtained a compound differing from that obtained by Harries (this Journal, 1901, 1123). The action is very violent, the temperature rising to 96°, and the mixture inflaming. The caoutchouc becomes completely dissolved. On adding water a yellowish-red substance is precipitated, which, after solution in ethyl acetate and precipitation by ether, has the formula $C_{10}H_{12}N_2O_6$. The molecular weight (256) was confirmed by Beckmann's boiling point method, and a titration by alkali showed the substance to be a monobasic acid. It sinters at 142—143°, and decomposes explosively at a higher temperature. It is soluble in ethyl acetate, benzaldehyde, and nitrobenzene, and is reprecipitated from these solutions by ether. In alkalis it dissolves with blood-red colour, and is thrown down again, with a pure yellow colour, by acids.

—M. J. S.

English Patents.

Vulcanised Electric Cables; Manufacture of ——. E. A. Claremont, Knutsford, Cheshire. Eng. Pat. 8437, April 24, 1901.

The cables are vulcanised as usual, put into a vulcanising chamber and treated with steam under pressure, and then the steam (and air) are removed so as to produce a partial vacuum in the apparatus. The employment of this diminished pressure, it is claimed, will render insulation more complete.—F. H. L.

Desulphurising Vulcanised Rubber. G. E. Heyl-Dia, Warrington. Eng. Pat. 11,149, May 30, 1901.

See U.S. Pat. 689,616; this Journal, 1902, 264.

—F. H. L.

United States Patents.

Rubber; Machine for Working ——. J. H. Pearce, New Haven, Conn. U.S. Pat. 697,217, April 8, 1902.

This is a machine having two trains of four rollers each for making two films of rubber, the trains being connected through an adjustable, weighted, pressure roll, which can either be driven by friction or by independent mechanism. The last roller of the upper train is termed an "incised finishing-roll," having an ornamented or cut circumference, according to the work in hand. For instance, in making boot soles, the wheel referred to has sole-shaped pockets impressed on its surface. The pressure roll is given considerable capacity for adjustment, in order to permit "incised finishing-rolls" of various diameters to be inserted in the apparatus. Additional trains may be added to the machine if desired, with the object of making three or four ply rubber, the various films being united when passing between the incised roll and the pressure roll.—F. H. L.

Vulcaniser. C. P. Fritz, Philadelphia, U.S.A. U.S. Pat. 695,715, March 18, 1902.

This vulcaniser is of the small vertical type, with removable lid, suitable for dental work. A flange round the mouth of the retort rests upon and overhangs the outer casing. A short pillar, rising centrally from the lid, carries horizontal trunnions, upon which a pair of large hook-like jaws with long handles work eccentrically and form a yoke, securing the lid to the retort. When the handles are brought together in a vertical plane, the jaws open to their fullest extent. The lid is then applied to the retort and twisted round until the jaws lie vertically above two projections on the flange, with which they engage firmly, when the handles are pulled apart as far as possible. Various details of construction are claimed, notably a device for adjusting the axis of the yoke vertically to restore its grip upon the flange projections when this becomes necessary, owing to wear of the working parts.—R. L. J.

Vulcanising Rubber; Process of ——. A. O. Bouth, Bristol, Rhode Island. U.S. Pat. 697,792, April 15, 1902.

The apparatus consists of a jacketed cylinder, provided with thermometer, pressure gauge, drain cock, and blow-off cock. Into it are placed the articles to be vulcanised together with some volatile substance, such as ammonium bromide, iodide, or carbonate, which, vaporising with the heat, sets up the desired pressure, has an affinity for sulphur compounds, and neutralises those compounds which are injurious to rubber. The quantity of ammonium salt employed is calculated according to the dimensions of the vessel, so as ultimately to produce the pressure desired.

F. H. L.

Devulcanising India-Rubber. O. F. J. Duwez, Enghien, Belgium. U.S. Pat. 696,423, April 1, 1902.

See Eng. Pat. 4803, 1901; this Journal, 1902, 488.

—F. H. L.

Devulcanising Apparatus. L. A. Stelzer, Ohio. U.S. Pat. 697,688, April 15, 1902.

A narrow vertical jacketed cylinder, partly supported on rollers at its base, revolves in one direction on horizontal bearings, while concentrically within it is a stirrer revolving in the opposite direction. Steam is led into the jacket through one of the journals, and in the innermost vessel the waste rubber and the substance used to devulcanise it are placed. The double motion is claimed to stir up the contents more thoroughly than usual. A man-hole leading at once into the inner cylinder is provided for charging, during which operation the drum is kept stationary, and the stirrer rotating.—F. H. L.

Waste Rubber Scrap; Utilising ——. T. Harmer, Burlington, New Jersey. U.S. Pat. 697,338, April 8, 1902.

Crushed rubber scrap, 100—150 lb.; gutta-percha ("pontianak"), 50—75 lb.; soft African gum ("flake"), 8—12 lb.; and vegetable oil refuse ("substitute"), 10—40 lb. are subjected to the action of steam at a pressure of from 100 to 125 lb. for 36 or 48 hours. The whole is thus said to be converted into a homogeneous, viscid plastic mass, having all the essential qualities of raw rubber of good grade; and it may be worked up in the usual manner.—F. H. L.

Rubber-like Gum from Greasewood; Method of Extracting ——. A. Y. Werner and P. B. Ellis, Nevada. U.S. Pat. 697,957, April 15, 1902.

Stems of the greasewood plant (*chrysothamnus* or *begeloria*) are crushed, and digested in boiling water with constant agitation. The liquid is drawn off, strained, and the residue treated with steam for a few minutes; the solid matter is compressed, and the liquid, after straining, is added to the former. The solution is then evaporated nearly to dryness, the gum taken up with petroleum spirit or benzene, the detritus removed, and the solvent distilled away. So prepared, the product is a dark-coloured gum, with a pungent balsamic odour, which possesses many, if not all, of the properties of commercial caoutchouc.—F. H. L.

Electric Conductors; Covering ——, with Insulating Material [India-Rubber]. G. E. Heyl-Dia, Manchester. U.S. Pat. 692,012, Jan. 28, 1902.

See Eng. Pat. 11,217, 1900; this Journal, 1901, 593.

—W. C. H.

Gutta-Percha, or the like from Leaves or Twigs: Extraction ——. G. Mitchell, London. U.S. Pat. 695,751, March 18, 1902.

The leaves and twigs are dried, ground, and digested with cold carbon bisulphide; the insoluble matter is removed by subsidence or by centrifugal treatment, and the solution filtered through charcoal. The clarified liquor is then distilled from a steam- or water-bath.—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Quick Tanning from the Physico-Chemical Point of View. P. von Schroeder. Collegium, 1902, **1**, 15 and 24; through Chem.-Zeit., 1902, **26**, [30], Rep., 111.

Mechanical agitation is of assistance as it increases the slow rate of diffusion possessed by the tanning material, which can be regarded as a colloid. The action of the tanning solution on the skin is to produce a layer impervious to the further entry of the liquid; but this layer is extremely sensitive to mechanical injury, which destroys its impermeability; so that movement in the vat assists diffusion. Entry of tannin into the skin depends on osmotic pressure; so that the more concentrated the solution, the higher the pressure. During absorption heat is evolved; therefore, by Le Chatelier's principle, a reduction of temperature should assist, and an increase in temperature retard, tanning. But the absorption is accompanied by a shrinkage of the skin, i.e., by removal of water, and this process is accelerated by a rise of temperature. The pressure also affects swelling and absorption in opposite directions. The speed of absorption is raised by adding to the liquor, salts the solutions of which exhibit a high osmotic pressure, such as sodium chloride or carbonate, magnesium sulphate, and alum. Alcohol and glyceria hinder the formation of the impervious layer on the skin, since they are better solvents for tannins than water. Petroleum and turpentine act similarly, the latter acting as a de-oxidant. The commonest method of increasing the speed of the tanning process is to increase the strength of the liquor, for which purpose the exotic materials that are rich in tannins, quebracho above all, are particularly suitable.—F. H. L.

Tanning Materials; Commercial Valuation of ——. F. Belzer.

See under XXIII., *page* 643.

Lactic Acid and Other Acids; their Practical Effect in the Manufacture of Leather. W. Eitner. Der Gerber, **27**, [661, 662], 75 and 91.

To test the de-liming effect of lactic acid compared with that of other acids, three portions of hide, soaked and limed by the usual process, were treated, after "unhairing" and "fleshing," one portion with lactic acid, one portion with acetic acid, and one portion with hydrochloric acid, using for each experiment equivalent quantities. The following results were obtained from 100 parts of dry hide: by de-liming with lactic acid, 208 parts of pelt; acetic acid, 211 parts of pelt; and hydrochloric acid, 196·6 parts of pelt. The samples, on examination, showed that the lactic acid had removed 82·3 per cent. of the total amount of lime present, the acetic acid 83·6 per cent., and the hydrochloric acid 94·2 per cent. The three portions of hide so treated were now "tanned out." The hide de-limed with lactic acid gave 51·1 per cent. of leather, calculated on the pelt weight, that with acetic acid gave 52·6 per cent., and that with hydrochloric acid, 54·3 per cent. This calculated upon the dry weight of hide, gave for lactic acid 106·3 per cent. of leather, for acetic acid 106·7 per cent., and for hydrochloric acid, 106·6 per cent. These results are practically identical, but the cost of the lactic acid is considerably higher than either of the other two acids.

A second series of experiments was carried out to test the comparative value of lactic acid and hydrochloric acid as a substitute for "drenching." The calf leather so treated was afterwards tanned and curried, and it was found that both acids acted in an exactly similar manner; and although the hydrochloric acid had removed more lime than the lactic acid, the finished leather appeared to be exactly the same both in firmness and toughness; the grain was not in any way tendered, and both samples had a mild and pleasant feel.

A third series of experiments was carried out to test the comparative swelling effect in sole leather tanning. For this purpose the hides were soaked and limed in the usual manner, and divided into eight equal lots of equal weight of substance. The eight lots of pelt were put into eight separate liquors made from quebracho wood, and an equivalent amount of the following acids, was introduced into each pit—lactic, hydrochloric, sulphuric, acetic, oxalic, phosphoric, butyric, and tartaric. The pelt was left in the liquors for six days, and each day the same equivalent amount of each of the above acids was added. The pelt, after dripping, was then weighed, and the effect of the different acids was found to be as follows:—Lactic acid, 124·3; hydrochloric acid, 126·0; sulphuric acid, 117·2; acetic acid, 114·3; oxalic acid, 121·8; phosphoric acid, 105·5; butyric acid, 116·4; and tartaric acid, 119·3 per cent. These figures must be considered as comparative.

The eight sets of pelt were now "tanned out" in the ordinary manner, receiving first a treatment with an oak-bark liquor, and then two layers, each of four weeks, dusted with a mixture of ten parts of oak-bark and one part of valonia. The leather was then dried, and gave the following results, calculated on the original pelt weight:—Lactic acid, 62·00; hydrochloric acid, 63·01; sulphuric acid, 64·09; acetic acid, 62·13; oxalic acid, 62·67; phosphoric acid, 61·21; butyric acid, 62·04; and tartaric acid, 62·75 per cent. It will be noticed that the results in finished leather do not correspond with the swelling effect shown in the first table. The quality of the different samples of leather appeared to be the same, and it was not possible to detect any difference between them, either in appearance or in feel. On examining the sample of leather swelled with sulphuric acid, no trace of free sulphuric acid was found.

From the three sets of experiments carried out, the author is of the opinion that lactic acid possesses no special advantage over other acids, and that it is much more expensive.—J. G. P.

United States Patents.

Plumping and Tanning Process. S. Saxe, New York, U.S.A. U.S. Pat. 695,765, March 18, 1902.

The patentee claims the addition of lactic acid to tan-liquors for the specific purpose of plumping the hide, and so improving the tannage. The quantity recommended is ½ to ¾ lb. of commercial lactic acid to every 100 lb. of hide.

—R. L. J.

Leather; Imitation ——, *and Process of Production.* H. Rosenberg, New York, U.S.A. U.S. Pat. 695,627, March 18, 1902.

A textile fabric is coated with rubber, which is vulcanised and then dressed with a liquid consisting of vegetable oil (15 galls.), sulphur (13 lb.), turpentine (15 galls.), benzene (15 galls.), and colouring matter such as burnt umber (45 lb.). This outer coating is then vulcanised on to the rubber layer.—R. L. J.

Adhesive [*Liquid Glue, &c.*] W. A. Hall, Bellows Falls, Vermont, U.S.A. U.S. Pat. 695,926, March 25, 1902.

Dry powdered casein (85—95 parts) and powdered zinc oxide (5—15 parts) are intimately mixed, placed in water containing 1 ounce of liquid ammonia for every pound of the dry ingredients (4—6 parts), and heated to 140°—150° F. by a steam jet or in a jacketed pan, until solution is complete. The zinc oxide acts as a thickener and filler, so that the glue when applied to wood remains at the joint instead of sinking into the pores as casein-glue does. The liquid glue and the undissolved powdered mixture are claimed.

—R. L. J.

XV.—MANURES, Etc.

English Patents.

Fecal Substances; Improved Process for Obtaining Fatty and Fertilising Substances from ——. W. P. Thomson, Liverpool. From Maschinenbau-Aktien-Ges. vorm. Beck and Henkel, Cassel, Germany. Eng. Pat. 13,135, June 27, 1901.

The mixed solid and liquid excrement is distilled without, or with a small quantity of lime to obtain the ammonia. It is then treated with sulphuric, sulphurous, or hydrochloric acid, and filtered. The dried residue is extracted with light petroleum, which removes 14 to 17 per cent. of fat, and

may then be utilised as manure, or for paper manufacture. The acid filtrate is neutralised with lime or magnesia, the phosphate thus obtained being collected and dried.

—N. H. J. M.

Artificial Manure, Fuel, or other Products; Treating House Dust, Garbage, and other Refuse for the Purpose of Converting them into ——. W. G. Jones. Eng. Pat. 6507, 1901.

See under XVIII. B, *page* 634.

XVI.—SUGAR, STARCH, GUM, Etc.

Beetroot; Mineral Constituents of the ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [8], 960—962.

The author quotes an analysis by Sidersky of the ash of the beetroot:—Potash, 26·9 to 78·1; soda, 0 to 24·0; lime, 1·6 to 17·8; magnesia, 2·3 to 11·9; oxide of iron, 0·2 to 4·9; phosphoric acid, 3·4 to 27·2; sulphuric acid, 1·3 to 14·3; silicic acid, 0 to 12·1; and chlorine, 0·2 to 18·4 per cent. He is of opinion that the high proportions of potash, phosphoric acid, and silica are not representative of average beetroots. It is difficult to accept a figure like 78·1 per cent. for potash; and beetroots always contain more or less soda besides. The lower figure (1·6) for lime appears to indicate too small an amount. As magnesia is not replaced in the plant by the other alkalis, the variation seems considerable. It is found in the plant principally in the form of ammonium magnesium phosphate. The variation in the amount of phosphoric acid appears to be too great for normal roots, and the maximum of sulphuric acid too high. The author thinks that in all beetroots there is some silica, but that it cannot rise to 12·1 per cent. of the ash. This high figure must be explained by sand and earth adhering to the neck. Only that part of the silica should be considered as forming part of the plant which is soluble in caustic soda. The high percentage of iron is also to be put down to the mineral impurities. The lesser figure for chlorine appears low. The low result may be due to the manner of obtaining the ash. This should only be prepared by washing the carbonised mass, the insoluble mass being calcined at a low temperature and added to the evaporated liquors; otherwise there is likely to be a loss of chlorine.—L. J. de W.

Sugar Cane and Beetroot; Quantity of Phosphoric Acid per 100 *of Sugar in* ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [8], 970—973.

Complete analyses of beetroot and leaves from various countries, including Egypt, show that 100 parts of sugar require the presence of 1 part of phosphoric acid, part in the root and part in the leaves.

Analyses of sugar canes in Martinique showed that 0·7 to 0·8 of phosphoric acid were required for the formation of 100 of sugar. Sugar canes from Egypt gave 0·84.

—L. J. de W.

Beetroot; Relation between Phosphoric Acid and Ammonia in the ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [8], 962—964.

Confirming previous results that in vegetables, particularly in beetroot, there always exists an amount of ammoniacal nitrogen, corresponding to the phosphoric acid present, to form ammonium magnesium phosphate, the author finds that beetroots grown in Egypt show the same relation between these constituents, although grown on soil containing only an infinitesimal amount of ammonia or nitric nitrogen.

The leaves of beetroots grown in Europe contain sensible amounts of potassium nitrate; those from roots grown in Egypt contain only traces of this salt. As the soil is charged with sodium chloride, the neck of the beetroot, and particularly the leaves also, contain abundance of it.

The Egyptian beetroot also contains in the complete plant 1 kilo. of phosphoric acid per 100 kilos. of sugar produced.

The calculation with regard to the substitution of alkalis is also verified, the total bases in the root per 100 kilos. of sugar neutralising the same weight of sulphuric acid, notwithstanding the enormous variation in lime and potash principally.

The different vegetables examined have always sufficient magnesia to form ammonium magnesium phosphate with the ammonia and phosphoric acid present, and there is often more.

The ammoniacal nitrogen is determined as follows:—5 or 10 grms. of dry substance are introduced into a flask, 50 to 100 c.c. of water and 5 to 10 grms. of hydrochloric acid added and a little vaseline, the whole being then boiled. The liquid is cooled slightly, a few drops of phenolphthalein added, and dilute caustic soda to faint pink coloration, so as not to be in excess, and then 2 grms. of calcined magnesia are added. The remainder of the operation is conducted as usual in ammonia determinations.

Magnesia does not liberate the ammonia from ammonium magnesium phosphate; it is therefore necessary to previously dissolve it in hydrochloric acid. On operating otherwise only insignificant quantities of ammonia are found, as was the case with Jesser.—L. J. de W.

Cane Sugar in Preserved Fruits containing Glucose; Determination of ——. O. Schrefeld.

See under XXIII., *page* 644.

English Patents.

Centrifugal Machines [*Sugar Manufacture*]; *Improvements in* ——. A. Holland, Magdeburg-Sudenburg, Germany. Eng. Pat. 12,447, June 18, 1901.

In order to separate the remnants from a previous operation left on the collecting plate of a centrifugal, and prevent them from becoming mixed with, and either improving or deteriorating, the substances of the next action, the common collecting plate is replaced by two compartments by means of a concentric rib or division, so as to form divided runs or gutters, which discharge through separate openings.

The outer gutter is covered by an inwardly inclined flange provided with slots, and upon the fixed flange is placed a loose ring with similar apertures. This ring may be moved by a handle projecting through the casing, so as to open or close the slots leading to the outer gutter. Ribs are formed, separating adjacent slots of the flange-cover to prevent the materials flowing into the outer channel from running over into the inner channel or gutter.

An internally arranged steam pipe having fine perforations permits of blowing steam against the inner surface of the outer casing when it is required to render the flow of the substances more liquid and also to cleanse the surfaces.

—L. J. de W.

Beetroot, Sugar Cane, Sorghum, and other Plants; Improvements in the Process of Extracting Sugar from ——. H. C. Prinsen Geerligs, Pekalongan, Java, and K. R. Hamakers, Semarang, Java. Eng. Pat. 23,415, Dec. 21, 1900.

When the bagasse or refuse has had the greater part of the containing juice extracted by means of a mill or press, and has been systematically exhausted with water in a diffusion battery, the surplus water is removed from the exhausted pulp or bagasse by means of mills or presses.

Water is caused to percolate the bagasse in such a manner that fresh water is brought into contact with nearly exhausted bagasse, and water already partially saturated with sugar is brought into contact with freshly pressed bagasse that has not been previously exhausted in a diffusion battery. One method of doing this is to convey the bagasse on a travelling band methodically through a series of troughs through which water circulates continuously or intermittently in the reverse direction, the bagasse being pressed as it leaves each trough, if fuel is expensive.

—L. J. de W.

Bagasse [*Sugar Cane*]; *Impts. in and relating to* ——. H. Manoury and L. Naudet, Paris. Eng. Pat. 25,695, June 1, 1901.

The object of the process is to give a larger yield of sugar with a residue of bagasse thoroughly dry and suitable for

rning, to produce very pure and dense juices, and effect great economy in fuel.

The process and apparatus consist in having between ro cane mills a small number of diffusers provided with n appliance for creating in them a forced circulation, these iffusers serving, at the discharge from the first mill, to roduce a lixiviation of the bagasse in a closed vessel and at very high temperature, by permitting the juices, after rapid reulation through one or more reheaters to re-enter the iffuser filled with fresh bagasse, in such a manner as almost stantaneously to raise its temperature to 100° C., this pid circulation serving to accelerate the lixiviation and to erilise the juice produced.—L. J. de W.

French Patents.

ugar Works: New Method of Compression and Utilisation of Steam in ——. P. Horsin-Déon, Paris. Fr. Pat. 314,193, Sept. 11, 1901.

ELLETAN proposed to take the steam escaping from liquids uring their evaporation in closed vessels, and to increase ie heat units of this steam by compressing it, so that it ould be used for evaporating a fresh quantity of liquid.

Piccard put this in practice in evaporating brine, using a aterfall to work the compressor, and succeeded perfectly effecting considerable evaporation without the expenditure fuel.

Weibel and Piccard attempted to introduce the system to sugar works in 1879, taking the vapour from the third se of the triple effect and, after compression, returning it the first or second. Their efforts failed, the waste steam om the steam engine used for compression constituting a ead loss.

The present invention proposes to overcome the difficulty y using a gas engine to drive the compressors. A 200 orse-power gas engine would be required for a sugar orks treating 4,000 hectolitres of juice per 24 hours, and ie saving is estimated at 42 per cent. on ordinary work, or per cent. where a sextuple effect and rebeaters are used.

A steam-collecting chamber receives not only the xhaust steam, but is large enough to take the steam from ne or more compressors. From this receiver, steam is rawn for evaporation, boiling and reheating. It also reeives any surplus of direct steam.

With this system multiple effects give no economy of fuel. Against the cost of installation of the compressor must be ut the gain from dispensing with the air-pump, the conenser, and water-pump.—L. J. de W.

Beetroots and similar Products; Apparatus for Disintegrating and Dehydrating Exhausted Raspings of ——. A. H. Messenger and V. Popper. Fr. Pat. 313,667, Aug. 21, 1901.

HE exhausted raspings are passed through a meat-mincer, hich may have two or more perforated discs and knife ises one behind the other. These discs may revolve in pposite directions to facilitate the removal of the water, hich is run off.—L. J. de W.

Sugar Juices; Process for Purifying ——, by Electrolytic Oxidation. A. Nodon and J. Pietre. Fr. Pat. 313,318, Aug. 7, 1901.

HE soluble organic matters which accompany sugar in ugar juices are converted into insoluble matters by an nergetic oxidation produced by electrolysis. This action favoured by the presence of metallic oxides, lime, and the se of unalterable electrodes. The peroxides susceptible of oducing these reactions are those of lead, antimony, anganese, chromium, mercury, &c., but that of manganese, obtained in the regeneration of Weldon mud, fulfils most mpletely economical industrial conditions. The electrodes e formed of an alloy of 80 of lead and 20 of antimony. A ries of five or six cells of cement, wood or insulated metal e arranged in cascade to facilitate the circulation of the ice; the electrodes are placed vertically and very close gether, and below them are wipers to keep the liquor nstantly stirred.

The juices are kept at 60° C., 1·4 kilos. of lime and 50 grms. of hydrated manganese dioxide in impalpable powder are added per 100 kilos. of beetroots. The solids are maintained in suspension by the stirring arrangement. The scum which rises is removed; the juices rapidly become turbid. The potential necessary is 5 volts per cell, at 1 ampère per square decimetre, and the work absorbed is 6 kilowatts per 10 hectolitres of juice. After an hour the supernatant liquid is limpid and almost colourless. Electrolysis is followed by double carbonating. There is an increase of purity of 10 to 12 per cent. The juices are very fluid and give less residue in the filter presses, resulting in economy of lime and less loss of sugar. They boil well and produce half less of molasses.

To render the mixture of lime and manganese dioxide more intimate, this may be heated to a temperature near the point of decomposition of the peroxide. Peroxide may also be formed on the anode by electrolysing sulphate of manganese.

The soluble gums are transformed into insoluble resins, and the neutral organic radicals into acid radicals precipitable by lime.—L. J. de W.

Defecation of Liquids; Apparatus for ——. J. Hatton. Fr. Pat. 313,929, Aug. 31, 1901.

CLAIMS are made for improvements in apparatus for defecation and purification of liquids so that the work may be carried out in an automatic, complete, and continuous manner, and with arrangement for regulating the heat and neutralisation of liquids. This object is attained by cocks regulated by floats and analogous arrangements.

—L. J. de W.

Sucrose; Process for Extracting ——, from Sugar Liquors and particularly from Natural or more or less purified Cane and Beetroot Juice. S. de Sigoyer, St. André, Réunion (Bourbon). Fr. Pat. 313,939, July 27, 1901.

THE process consists in saturating the liquor to be de-sugarised by dissolving crystallised sugar in it, adding a further quantity of crystallised sugar, and stirring, and afterwards straining.

Owing to the extremely subdivided form, during the stirring a very active evaporation takes place even in the open air, and this may be increased by using a partial vacuum or a current of air or inert gas. As the crystals increase in size, the ratio of surface to volume diminishes, and with it the rate of evaporation, consequently, when the crystals tend to become too large, they are used for saturating fresh juices.—L. J. de W.

Molasses and Sugar Juices; Process for Purifying ——. J. Blachier. Fr. Pat. 313,395, Aug. 1, 1901.

MOLASSES is diluted by the addition of 30 to 40 per cent. of water, and then a saturated solution of tartaric acid added until no further precipitate is formed. The liquid is stirred and afterwards decanted. The excess of tartaric acid is precipitated by adding calcium carbonate so long as carbon dioxide is evolved, and calcium chloride so long as a precipitate falls. The potassium bitartrate is also converted into calcium tartrate for the subsequent recovery of tartaric acid. The purified molasses is more suitable for cattle feeding than ordinary molasses.—L. J. de W.

Molasses: Process and Apparatus for Utilising Residues from the Defecation of ——, for the Preparation of Barium Oxide or Carbide, mixtures of these, or Barium Hydrate. G. Levi, F. Garelli, and the Société Italiania dei Forni Elettrici, Rome. Fr. Pat. 313,476, Aug. 13, 1901.

A MIXTURE of pulverised coal and residues from the defecation of molasses are subjected to the action of the voltaïc arc in an appropriate furnace. The barium oxide obtained may be converted into hydrate, and the carbide into hydrate and acetylene. The molasses residues before being mixed with the coal must be perfectly dried, torrefied, and crushed. For this purpose the inventors utilise the waste heat of the furnace, which is described in detail with drawings.—L. J. de W.

United States Patents.

Evaporator [Sugar Juice]. C. L. Wilcox, West Williamsfield, Ohio. U.S. Pat. 696,154, March 25, 1902.

This specification gives a description and sketches of an evaporator designed for the concentration of any liquid, but of especial value for the boiling of maple, sorghum, and other sugar juices; it allows of perfect control of the heat and of ready cleansing. The inventor claims, in an evaporator, for the combination with the arch, of a series of pans carried by the said arch and having their bottom portions projecting within the arch, one of said pans having flues for the escape of the products of combustion therethrough, and an adjacent pan beyond the escape end of said flues having its bottom portion directly in alignment with the flues, and inclined to deflect said products of combustion, and a damper or pair of adjustable dampers within the arch arranged adjacent to the inclined bottom of the pan, and adapted to govern the course of the products of combustion; also for coupled pipe-sections forming communicating passages between the lower portions of the pans at a point below the top of the arch, these coupling-sections being so disposed as to partly extend through the side openings of the arch, and doors for closing these openings; also for the combination of these various devices.

—T. H. P.

Centrifugal Machine [Sugar Loaves]. A Kaczorowski, Kalisch, Russia. U.S. Pat. 697,255, April 8, 1902.

A set of holder sleeves for sugar loaves are arranged in combination with a centrifugal drum, not radially, but tangentially to a circle concentric with the drum axis. The pointed end of the same is supported in ball bearings in the drum wall.

There is a centrally disposed worm in the drum, held stationary by attachment to the housing [casing], and worm wheels having bearings adapted to rotate with the drum, so as to rotate the holder-sleeves and loaves around their own axes when the drum is rotated.—L. J. de W.

Sugar; Process of Converting Cellulose into ——. A. Classen, Aachen, Germany. U.S. Pat. 696,800, April 1, 1902.

See Eng. Pat. 12,588, 1901; this Journal, 1901, 1008.

—L. J. de W.

Sugar; Process of Recovering ——. A. Wohl, Charlottenburg, and A. Kollrepp, Berlin, Germany. U.S. Pat. 695,702, March 18, 1902.

The object of this process is to obtain, from lead sucrate solution, normal lead carbonate and sugar in purer forms than is usual. Claim is made for a process of expressing the lye from a mixture of alkali-lye and lead sucrate, treating the latter with warm wash lye, washing the sucrate, and saturating it with carbon dioxide, interrupting the saturation when the sugar is entirely liberated, separating the sugar solution from the precipitate, and subjecting the latter, either by itself or in a dilute acid solution, to additional saturation with carbon dioxide.—T. H. P.

Liquor from Diffusion Vessels; Process of Drawing off and Measuring ——. K. Sedlaczek, Saclaw, Russia. U.S. Pat 696,200, March 25, 1902.

The object of this invention is to withdraw and measure beet-sugar liquor from the diffusion vessels, in which it is produced during the course of manufacture, without causing deterioration. A large receiver, which is maintained in a vacuous condition by means of an air-pump, can be put into communication with either of two measuring vessels, which in turn can be connected, by means of pipes from their bases, with a pipe from the diffusion vessels, or with a similar pipe to carry off the measured liquor. Gauge glasses are provided on the measuring vessels as means of measurement, and by manipulation of the cocks, these measuring vessels are alternately filled and emptied.

—J. W. H.

Masseeuite; Apparatus for Purifying ——. M. Weiurich, Yonkers, New York. U.S. Pat. 696,217, March 25, 1902.

This specification contains a description and sketches of an automatic continuously-working apparatus which is led mainly by gravity, and requires but little power, whilst by its help very low and fine-grained sugar can be readily cleaned. Claim is made for an apparatus for cleaning and washing massecuite or raw sugar mass, having in combination an inclined plate perforated in its greater part, provided with a feeding-trough and with a rim, one or more casings forming vacuum-chambers, a set of scrapers for assisting and regulating the gravity feeding action of the mass, means for distributing washing agents upon the mass to be cleaned, a chute for discharging the cleaned crystals, means for creating a partial vacuum, and means for introducing steam into the said chambers.—T. H. P.

Sugar (Dextrose); Process of Converting Cellulose into ——. A. Classen, Aachen, Germany. U.S. Pat. 695,795, March 18, 1902. (See this Journal, 1901, 734.)

Claim is made for a process for converting cellulose into sugar by heating it in a closed vessel with either chlorine or chlorine-producing substances to about 120°—145°, and then introducing compounds of sulphur that will produce sulphuric acid by reacting with the chlorine.—T. H. P.

Sugar; Apparatus for Drying ——. F. Mahoudeau, New York. U.S. Pat. 694,767, March 4, 1902.

The apparatus consists of a furnace chamber closed at the top, open at the front for the ingress and egress of the material to be dried, and at the rear for the egress of the heated and moist air, which is drawn off by an exhaust blower at the upper portion of the chamber. A source of heat is located at the bottom of the chamber, near its forward end and horizontal parallel trackways for carriages bearing the trays containing the sugar or other bodies. The carriages are moved forward by projecting fingers on endless chains, and there are means for shifting the carriages from the upper to the lower track. The bodies to be dried are thus passed along in the upper part of the furnace chamber through a series of vertical zones of gradually increasing temperature, and in the lower part through zones of gradually decreasing temperature.

The practice hitherto in use was to pass the bodies to be dried in along the lower and hottest portion of the furnace chamber, and out along the upper and cooler part. Now the slowly-moving, highly-heated currents of air at the bottom do not readily separate the moisture from the bodies to be dried, and such moisture as is separated, in rising, deposits on, or is reabsorbed by, the bodies traversing the top of the chamber towards the outlet.

The object of the present construction and method is to overcome these objections.—L. J. de W.

Starch and Zein; Process of obtaining ——. H. Wulkan, Slanje, Austria-Hungary. U.S. Pat. 696,156, March 25, 1902.

Claim is made for a process of obtaining starch and zein, consisting in mixing comminuted corn—including maize, wheat, rice, and other grains and fruits—with a solution containing alcohol and alkali, separating this alcoholic liquid from the starch, which is washed and dried, and distilling off the alcohol, leaving a liquid from which zein may be precipitated by neutralisation with dilute acid.

—T. H. P.

Starch; Method of Making Thin-boiling ——. C. H. Duryea, Manhattan, New York. U.S. Pat. 695,949, April 8, 1902.

See Eng. Pat. 11,442, 1901; this Journal, 1901, 1127.

—L. J. de W.

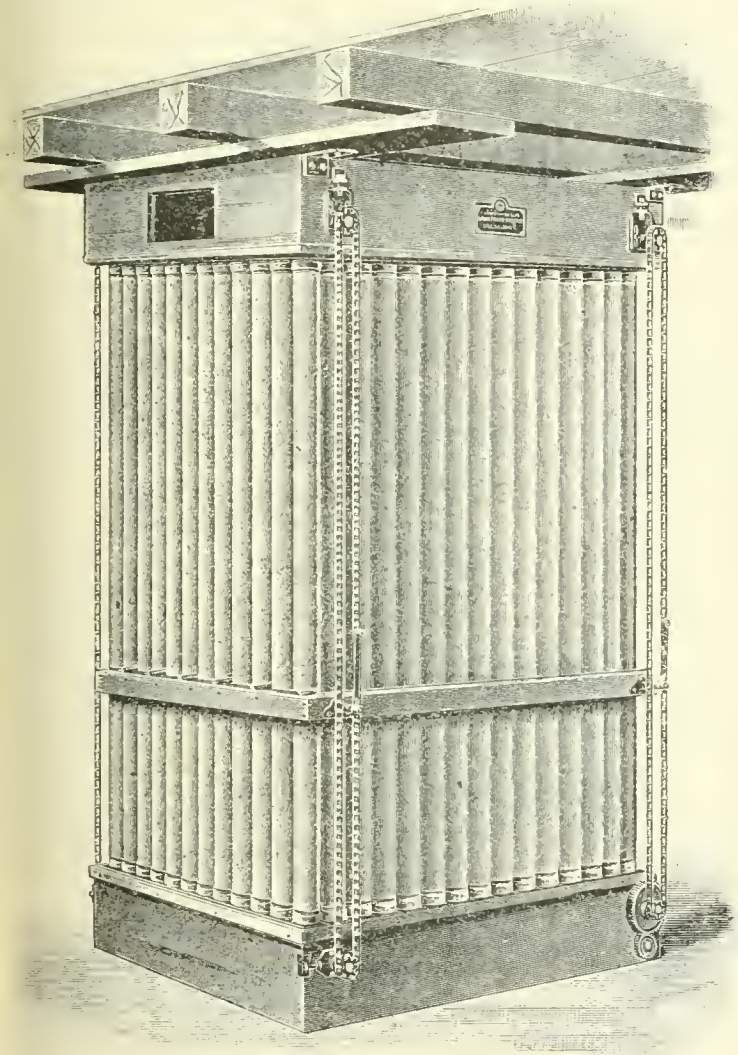
Gluten Tailings; Method of Utilising ——. E. Gudeman. U.S. Pat. 695,720, 1902.

See under XVIII. A., *page* 633.

XVII.—BREWING, WINES, SPIRITS, Etc.

Tubular Dust-filter for Brewery Use. V. Törnell. Woch. für Brau., 1902, **19**, [14], 208.

The removal of the dust from the machines used for cleaning and polishing grain is always effected by means of a current of air. Attention is not always paid to the disposal of this dust-laden air; it is frequently discharged into the open, sometimes after passing through a settling box or chamber. In consequence of this the germs from the surface of the grain infect the air of the brewery and find their way into the wort and yeast. This is especially the case in the autumn, when stocks of barley are laid in and turned over with simultaneous aëration. A Brunswick firm has recently brought out a device for purifying this air, which they term a hose-filter [Schlauchfilter], see figure. It consists of a large



number of pipes made of a special kind of cloth, and is arranged vertically between the air inlet and the dust-collecting chamber. The dust-laden air is conducted to the filter by a shaft. The air filters through the pores of the cloth, and the dust remains inside the pipes, whence it is displaced by moving rakes and falls into the collecting box. The large number of pipes affords a large filtering surface in a small space, and the filtration of the air is consequently very slow. It would be a great advantage if the barley when it enters the factory and the malt when it leaves the kilns were submitted to a suitable polishing operation, in order to obviate dust in subsequent operations requiring movement. The conveyors for barley and malt should always be well cased in; and pneumatic conveyors are hardly suitable for brewery work.—J. F. B.

Malt; Yield of Extract in ——, on the Practical Scale. W. Windisch. Woch. für Brau. 1902, **19**, [10—13], 123—126, 143—145, 166—167, and 189—193.

In the laboratory, the yield of extract in malt is generally determined by mashing coarse grist as used in practice on the one hand, and fine flour on the other. The latter shows the quantity of extract actually present, and the former shows that practically obtainable. If the two determinations differ by more than 0·5—1 per cent., the modification of the malt must be decidedly inferior. A special mill which can be adjusted with absolute precision is obtainable for preparing the coarse grist in the laboratory. The yield obtained in practice ought to fall short of that determined from the coarse grist in the laboratory, only by the quantity of extract unavoidably left in the spent grains. In German practice, this is far from being the case. The author has fully investigated the causes of the considerable deficiency of yield always noticed on a practical scale, and has found that the error lies in the custom of deducting the yield from the apparent volume of the wort in the copper. That the deficiency of yield is not a real one, is shown by the fact that, if the yield be calculated from the volume and density of the wort in the fermenting vats, the result is distinctly higher than that determined in the copper, in spite of the numerous possible sources of loss in the hops, in the cooler deposit, and in the cooler conduits and pipes. The author has carefully reinvestigated the corrections universally employed in Germany in gauging the volume of the wort in the copper. He finds that nearly all the bases of correction are wrong for modern conditions; they assume a constant proportion of hops, and that the hops are not sparged, the correction for the contraction of the wort from the boiling point to 17·5° C., is wrongly based, so that, in fact, a malt was found to yield 71·10 per cent. of extract when properly calculated, as against 69·58 per cent. when calculated in the usual way. It is not possible to lay down a constant correction for gauging the yield of extract in the copper, and the author strongly recommends that this be determined in the fermentation room. The author then describes very fully how the yield may be determined at this stage with the greatest possible accuracy. He deals successively with the accurate measuring or weighing of the malt, the gauging of the fermenting tuns, the taking and treatment of samples and the correction of the volume for temperature. The tuns should be gauged by weighing the water contained by them up to a certain mark, and the results checked by a titration method which he has devised (sodium carbonate or sodium thiosulphate). He has determined that the correction for the volume of the wort, measured at the fermentation temperature of 5°—6° C., to

the normal temperature of 17·5° C. should provide for its expansion by $\frac{1}{300}$ to $\frac{1}{500}$ of its volume, whereas certain German table-books put this expansion at the totally incorrect figure of $\frac{1}{10}$.—J. F. B.

Brewing; Higher Yields in ——. Comparative Results of Laboratory Extracts and Brewery Practice. M. J. Cannon and E. Foll. J. Fed. Inst. Brewing, 1902, **8**, [2], 186—212.

The authors conclude that the method of determining the extract of a malt in the laboratory is a safe guide to the brewer as to the amount of extract obtainable from it, and with other analytical data, it should decide the system of mashing. Tables are given comparing the laboratory results of various mixtures of materials with those actually obtained in practice with details as to the systems of mashing.

The yield is determined by the nature of the plant, the class of materials and the conditions of mashing. After the first mixing of the goods, the interior rakes should only be employed at the period of underletting, otherwise serious flooding may occur. The authors regard the underlet as almost a necessity for obtaining maximum yields, especially from inferior and badly modified malts. The use of the sparge for gelatinising the harder particles of starch is strongly condemned. The underlet should not be applied too soon, but after half to one hour's stand at the lower temperature. The use of the sparge should be confined purely to washing out the soluble constituents of the mash; the holes in the sparging arms should be arranged to deliver the water uniformly all over the goods.

The analytical data of the materials employed should guide their proper mixing and determine the policy to be followed in mashing. The best system of mashing consists of a low initial temperature to allow the proteolytic enzyme a chance of doing its work, the temperature being subsequently raised by steam or underlets until the chosen stand temperature is reached to allow the hard particles of starch to be saccharified. In drawing off, attention should be paid to obtaining a regular bed of mash so that the density of the runnings may decrease uniformly.—J. F. B.

Seed-Yeast [Distillery]; Bücheler's Process for the Acidification of ——, with Sulphuric Acid. A. Hesse. Zeits. Spiritusind., 1902, **25**, [15], 159—161.

Replying to criticisms by Bücheler, the author argues that the conclusions drawn from the series of experiments with sulphuric acid yeast (this Journal, 1902, 267) are quite valid and the results of fair trials of the process. He admits that the slight increase of acidity during primary fermentation of 0·1° — 0·2° is not harmful to the yield and was not due to bacterial action; such increase only occurred with the seed yeast prepared in 24 hours and was absent in the case of 48 hour preparations. A yeast prepared in 24 hours, whether with lactic or sulphuric acid, always shows sluggishness of fermentation and lack of mobility, since normal fermentation does not begin until after about 16 hours. This fact is attributed to deficiency of yeast foods until the proteids become peptonised, a fault which might be remedied if yeast extract were added. The author adheres to his view that a greater free space above the mash is necessary in this process, owing to the higher pitching temperature. In the same way the "boiling" fermentation is also due to the high temperature and not to the use of mineral acid. The efficiency of the author's process for preventing "boiling" fermentation, by adding a portion of the malt to the cold mash and performing a large proportion of the saccharification in the fermenting vat, is considerably reduced by the higher pitching temperature, since the formation of maltose and conversion of the dextrins is too rapid at this temperature. The restraining action of the process is also nullified by the excessive proportion of malt used by the Bavarian distillers, which is 75 per cent. more than is desirable. If such high proportions of malt are necessary for Bücheler's yeast, his process cannot be employed in Prussia. Rittsteig yeast, as stated by Bücheler, gives good results in lactic acid mashes also, but the author finds that after three weeks' use, boiling fermentations are liable to occur. The danger of exceeding the safe temperature for primary fermentation is increased in Bücheler's process, owing to the fact that this critical stage takes place at night and not in the daytime.—J. F. B.

Molasses Distillery; Abnormal Fermentations in the ——. A. Sorel. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [8], 937—940.

The causes of sluggish or arrested fermentation are attributed to bad denitration through insufficient acidity or low temperature; too great a density on charging, with low initial temperature or excessive acidity; too hurried charging or insufficient yeast, the latter being often contaminated before or during the preparation of the worts. There was no injurious influence detected from the salts present in the denitrated molasses.—L. J. de W.

English Patents.

Thermometers for Brewers' Use ——. W. Reeves, London. Eng. Pat. 12,507, June 19, 1901.

The copper case containing the thermometer is provided with a detachable conical top or cap, having a pin-hole at the apex, through which the air can escape.—J. F. B.

Brewing and Distilling; Apparatus for use in ——, with Grain Unmalted or Imperfectly Malted. J. Knox, R. R. Ranger, and G. Thornley, Burton-on-Trent. Eng. Pat. 5,105, Feb. 28, 1902.

The apparatus for bringing unmalted or imperfectly malted grain into a condition for mashing consists of a closed cylindrical vessel with a conical bottom terminating with a discharge outlet. A series of revolving arms is provided inside the vessel, the arms being reversely angled so as to force the material in opposite directions, preferably upwards at the centre and downwards at the sides. The lower part of the vessel is furnished with a steam jacket and revolving blades in its proximity, and means are provided for admitting steam to the charge, preferably by way of the central shaft through perforations in the revolving arms.—J. F. B.

United States Patents.

Wort and Yeast; Apparatus for Mixing and Aerating ——. M. Wallerstein and H. H. Freund, New York. U.S. Pat. 695,974, March 25, 1902.

The apparatus consists of a cylindrical vessel provided with a vertical air shaft down the centre. This air shaft is constructed to slide up and down inside the vessel and is furnished with a hollow handle at the top and a ball valve at the bottom. When the handle is pulled upwards, air is drawn in at that point, and being filtered in its passage, enters the liquid through the valve at the bottom. Near the bottom of the shaft a perforated disc is fixed, and above and below the disc are situated two movable propellers of opposite pitch, which agitate the liquid when the shaft is moved. The bottom of the vessel contains a recess to lengthen the available stroke, and at the lowest point is a cock by which the liquid may be discharged after the cover, which is provided with an air-inlet and filter, has been adjusted on the vessel.—J. F. B.

Brewers' Vat. W. Griesser, New York. U.S. Pat. 694,267, Feb. 25, 1902.

The object of this invention is to construct and secure the rings constituting the metallic frame surrounding the manhole so that the bolts, by which the rings are secured, are located outside the line of connection between the door and the vat, so that access to the bolts and the openings through which they pass is cut off from the liquid contained in the vat. The hinge on which the door is pivoted is also placed at a point removed from the interior of the vat.—J. F. B.

Converting Wood, Wood-Shavings, &c., into Dextrine, Glucose, and Alcohol. P. Magnier, Billancourt and P. A. Braugier, Estrées, France. U.S. Pat. 695,573, March 18, 1902.

Wood, woody fibre, shavings and the like are digested with water containing 2 per cent. of a mixture of sulphuric and phosphoric acids at 100° C., the mixture is then heated to

a high temperature in a closed digester, neutralised by calcium or barium carbonate, subjected to the action of an electric current whilst under pressure, a small quantity of a wort containing albuminoid substances (beetroot, grain, or the like) added, and the whole fermented and distilled. See Eng. Pat. 12,241, 1899; this Journal, 1900, 165.—A. S.

Condenser; Fractional ——. [*Alcohol Distillation.*] V. Slavicek, Vienna. U.S. Pat. 696,206, March 25, 1902.

The fractionating condensing column consists of communicating condensers comprising end chambers, a vapour inlet at the bottom of the apparatus, a cooling liquid inlet at the top, flat bottoms having passages through them located near the bottom of the lowermost condenser, sets of vapour pipes passing through each condenser, pipes for conducting the cooling liquid from one condenser to the other, perforated bottoms or partitions for receiving the liquid entering from these pipes, an outlet for the cooling liquid, chambers between each two consecutive condensers formed by concave and convex walls and intermediate plates having a central, capped aperture, conduits from these plates, parts having perforated sides located at the centre of the upper walls, and outlets for conducting the products of condensation from the upper walls. The different fractions are condensed in the different condensers and are thus collected separately.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Sulphurous Acid and its Salts; Poisonous Action of ——. H. Kionka. Dent. mediz. Woch., 1902, **28**, 89—92; Woch. für Brau., 1902, **19**, [16], 233.

Sulphites are largely employed as preservatives in beer, meat, and foodstuffs. The author has tested the effect of sodium sulphite, in the proportions usually employed in meat, upon dogs. He found that, after continued consumption of such food, serious symptoms of blood poisoning, which are described, supervened. Hitherto, observations on the human body have yielded few positive results; but it is only right to assume that the poisonous action now established in the case of animals must hold good for the animal organism generally, and the use of sulphites in human food should be resisted.—J. F. B.

Vegetable Protein; Some New Food Preparations from ——. M. Wintgen. Zeits. Unters Nahr. und Genussmittel, 1902, **5**, [7], 289—301.

The author has examined three new preparations—by-products from starch manufacture—introduced for human food under the names of roborate, aleuronate (improved), and energin. Roborate and aleuronate are both wheat proteins, the former extracted by means of alkali and the latter by mechanical separation with water; energin is the corresponding product from rice flour, separated by means of alkali and precipitated by acid. The two wheat products swell up in water to a glutinous mass, roborate at once, and aleuronate after some time; energin, on the other hand, retains its pulverulent condition.

	Roborate.		Aleuronate (improved).		Energin.	
	Per Cent.	On Dry Substance.	Per Cent.	On Dry Substance.	Per Cent.	On Dry Substance.
Moisture	10·55	..	7·24	..	9·03	..
Crude Protein	79·18	88·62	80·81	87·11	83·75	92·08
Ethereal Extract	4·15	4·65	5·63	6·07	4·74	5·09
Starch	4·43	4·96	6·05	6·52	0·67	0·74
Crude Fibre	0·19	0·22	0·26	0·28	0·27	0·30
Ash	1·34	1·50	1·18	1·27	1·03	1·13
	Per Cent. of Total.		Per Cent. of Total.		Per Cent. of Total.	
Protein digested by pepsin in 6 hours	92·5		96·3		94·0	
Protein digested in the human body	92·84		98·75		97·82	

The influence on the baking qualities of flour was tested with each of the three products in the proportion of 9 of flour to 1 of proteid. It was found that only roborate increased the lightness of the bread, the others made it heavier. The chemical composition of the three preparations was as shown in the preceding table.

The variations in the protein appear to be determined by the proportion of starch left in. These preparations offer protein in a readily digestible and concentrated form at a much lower cost than the equivalent of meat; they cannot, however, compete with the latter as regards flavour, and the retail prices must be reduced considerably before they can find extended application.—J. F. B.

Chocolate; Detection of Sesame Oil in ——. Utz.

See under XXIII., *page* 642.

Albuminoid Substances; Fractional Precipitation and its Value for Differentiating ——. J. Effront.

See under XXIII., *page* 642.

Preserved Fruits containing Glucose, Cane Sugar in; Determination of ——. O. Schrefeld.

See under XXIII., *page* 644.

English Patents.

Tea Extract; Production of an Alcoholic ——. J. Mayer Komotau, Bohemia, Austria. Eng. Pat. 11,328, June 3, 1901.

Tea leaves are first extracted for five minutes with boiling water in a funnel-shaped receiver, provided at its lower end with a strainer and draw-off cock, and closed by an air-tight cover. The decoction is then drawn off and the leaves are successively treated with dilute alcohol (50 per cent.) for two hours; strong alcohol (96 per cent.) for 48 hours, and finally with water. These extractions are mixed together and allowed to settle, or clarified if necessary, by the addition of a small quantity of alcohol. The clear liquid may then be kept in hermetically sealed vessels, and is diluted with hot or cold water for use.—W. P. S.

Milk; Treating [*Pasteurising and Separating*] ——. T. L. F. Stack, Drumquin, Ireland. Eng. Pat. 6882, April 2, 1901.

The claims are for improvements in connection with Eng. Pat. 13,273, 1900. In the process described in the present specification, the milk passes through pipes which are heated by water previously used to cool a former lot of milk. Before passing to the separators the heated milk is cooled to the proper temperature by less hot milk, the object being to make as much use as possible of the original source of heat. An apparatus is also claimed for regulating the flow of milk through the heater, consisting in a float which actuates a valve in one of the pipes.—W. P. S.

United States Patents.

Flour from Sweet Potatoes; Method of Making ——. E. Straus, Vineland, New Jersey, U.S.A. U.S. Pat. 696,088, March 25, 1902.

The sweet potatoes are skinned and grated. The pulp-like mass so obtained is then passed through rollers to remove aqueous matter, some starch at the same time being removed. The remainder of the starch is then separated by means of a washing-machine. The residual matter is now dried in a steam-heated chamber, and finally ground to a powder.—W. P. S.

Gluten Tailings; Method of Utilising ——. E. Gudeman, Chicago. U.S. Pat. 695,720, March 18, 1902.

Claim is made, in the manufacture of corn-starch by crushing the maize-kernels, floating off the husks and germs, regrinding the kernels and washing away the associated gluten as tailings from the detained starch granules, for the process of utilising such tailings, consisting

in heating them, either before or after the separation of the excess of water, to gelatinise the starch left in them; digesting the mass with malt at a suitable temperature for the conversion of the starch and isolating the resultant solution for the recovery of the maltose, thus leaving the separated gluten residue in a condensed form characterised by the presence of a higher content of proteids than usual.—T. H. P.

Eggs; Method of Preserving ——. J. A. Rylander, Norrkoping, Sweden. U.S. Pat. 696,495, April 1, 1902.

SEE Eng. Pat. 23,523, Nov. 20, 1901; this Journal, 1902, 183.—W. P. S.

Preserving Fruits, &c.; Composition for ——. J. H. Thorn, Puyallup, Washington, U.S.A. U.S. Pat. 697,566, April 15, 1902.

THE compound claimed consists of a dry mixture of lime (slaked) 20 lb.; ordinary "land plaster," 5 lb.; and wheat middlings, 5 lb. The fruit or vegetables to be preserved are buried in this compound in boxes or barrels. A wrapper of paper may be used in the case of fruit, before placing in the composition.—W. P. S.

Beverage [Pineapple]; Process of Making ——. M. Pereda, Brooklyn, New York, U.S.A. U.S. Pat. 697,656, April 15, 1902.

100 lb. of the filtered juice obtained on pressing pineapples are mixed with 8 ozs. of white sugar, and 8 ozs. of brewers' yeast, and allowed to ferment for 8 to 10 days. The fermented liquor is then strained and receives the addition of 6 lb. of "pineapple brandy." The latter is produced by allowing pineapple juice to ferment without any addition, and distilling the resulting liquor. The beverage is filled into bottles and corked under pressure.
—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Sterilization of Water; The Vaillard-Desmaroux Apparatus for the ——. Report by M. Hippolyte Fontaine, covering communication by M. René Huberson. Bull. de la Soc. d'Encouragement pour l'Ind. Nat., 1902, **102**, (3), 321—334.

THIS apparatus, which is shown in plan in the accompanying illustration, comprises a closed heater, K L, containing water and steam maintained at 110°—115° C. by means of a coal, gas, or petroleum stove.

which sterilises it, and it leaves the apparatus at U, cooled again to within 4° or 5° of the temperature of the inflowing water.—L. A.

Water; Characteristic Reaction for Pure ——. Causse.

See under XXIII., *page* 642.

ENGLISH PATENTS.

House Dust, Garbage, and other Refuse; Treating —— for the Purpose of Converting them into Fuel, Artificial Manure or other Products. W. G. Jones, Leicester. Eng. Pat. 6507, Mar. 28, 1901.

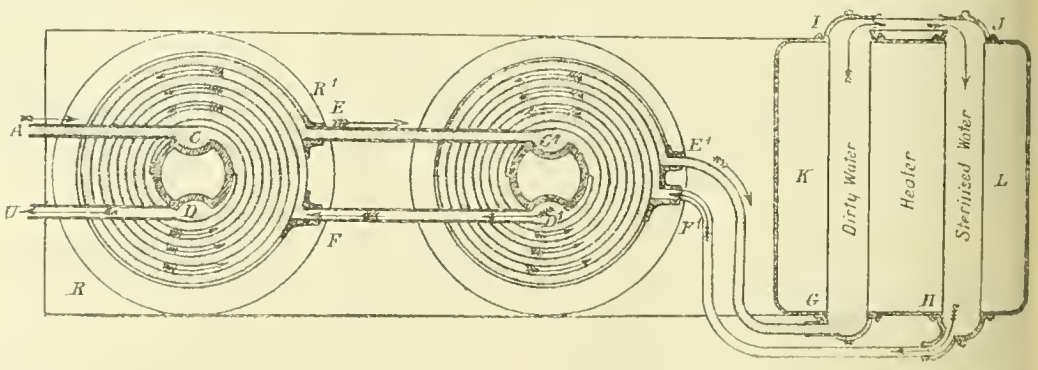
THE refuse is screened and hand-sorted simultaneously. The metal goods are melted down; the earthenware and glass broken up for road making, &c.; the vegetable products are burned or mixed with any animal refuse carried to refrigerators and taken away therein for conversion into manure; the small screened cinders are used for fuel; and the paper burned or despatched along with rags to paper mills, or with old boots and leather to be worked up again.—R. S.

Sewage from Country Mansions and Large Houses; Non-Septic Purification and Utilisation of ——. A. S. Goodridge, Bath, Somersetshire. Eng. Pat. 1819, Jan. 23, 1902.

THE sewage passes over open channels, where strainers of galvanised iron netting separate the solids from the liquid, the former being thrown on the manure heap. The liquid passes through a settling tank, where grease is intercepted; it is then discharged through an automatic rotary sprinkler on to a downward filter of coke, one inch clinkers, polarite sand, and stones, and then upwards through a second filter of gravel and sand, and is discharged "as a pure effluent, fit for fish pond or to supply water to cattle, if a good average sewage, and properly looked to."—L. A.

Sterilising Liquids; Apparatus for ——. W. S. Rawson, London. Eng. Pat. 6792, April 1, 1902.

THE apparatus claimed comprises "a sterilising vessel provided with hot water jacket or coil and means for agitating its contents, a water-heating vessel connected by flow and return pipes with the jacket or coil of the sterilising vessel, a steam connection for heating the water in the heating vessel, a valve for limiting the temperature of the water, and a pump for ensuring the circulation of the water through the jacket or coil."—L. A.



APPARATUS FOR STERILIZATION OF WATER.

Traversing this heater are two wide tubes, G I and J H, connected by narrower tubes with the heat exchangers, shown in the figure. The latter, which are cylindrical in form, are composed of spiral concentric tubes of thin sheet copper, rectangular in section, about 400 mm., the length of the cylinder, long, and 3—5 mm. wide. The water to be sterilized enters at A, and in passing through the exchangers takes up nearly all the excess of heat of the outflowing water, entering the tube G I hot. In flowing slowly through G I and J H, the water becomes further heated to 110°—115°,

UNITED STATES PATENTS.

Water; Apparatus for Purifying ——. J. P. Kinsey, Chicago, Illinois. U.S. Pat. 695,399, March 11, 1902.

ON the bottom of a circular tank, in the centre, a hollow cylinder is fixed, having numerous liquid-discharging pipes radiating therefrom, with their ends curved, so as to direct the liquid issuing from the pipes tangentially. A pipe connects this cylinder with the source of liquid supply. Fixed above this cylinder is another similar one into which

ir can be forced, and from which it escapes through imilar pipes. The tank is filled with water through the ›wer cylinder, chemicals being added at any time after the upply of water is started. After the discharge pipes are overed, the air valve is opened, and the air rushing into the ater causes a violent and thorough agitation, which ontinues until the tank is full. Both air and water are hen shut off, and the sediment is allowed to settle, after hich the water is purified and ready for use.—L. A.

Distilling Water; Apparatus for ——. A. J. Chase, Boston, Massachusetts. U.S. Pat. 697,912, April 15, 1902.

HE condenser of the still is superposed on the evaporating oiler, and a centrally located filter is arranged between iem, so that the vapour must pass through the filter before ondensation. Sterilised air is admitted through a number of oles beneath the filter, and after commingling with the apour, passes through the filter with the latter. The ondenser consists of a water tank, the bottom of which is onical and forms the condensing surface, the condensed ater falling into a reservoir surrounding the filter. The onical bottom of the condensing tank opens upwardly into a entral flue, which serves as the escape-vent of the still. he condensing tank is constantly fed with water, and the oiler may be fed with the heated jacketing water from the ank. Reference is made to prior U.S. Pats. 530,015 and 58,775.—R. A.

Air of Rooms; Device for Removing Noxious Impurities from the ——. C. Breuer, Friedenau, Germany. U.S. Pat. 693,638. Feb. 18, 1902.

HIS is an outlet ventilator for the purpose indicated, orking on the principle of atmolysis. Within a metal asing, which is let into the outer wall of a room, is fixed a orous diaphragm, made of caoutchouc or other pervious aterial, the diaphragm being either plain or curved into ay convenient shapes so as to present a larger surface. n the outside of the whole, louvre-boards are provided to rotect the caoutchouc from the weather, and inside is aced a perforated metal guard.—F. H. L.

(C.)—DISINFECTANTS.

United States Patent.

Disinfectant. A. W. Nelson, New London, Connecticut. U.S. Pat. 696,105, March 25, 1902.

AWDUST, shavings, or other wood-waste, is saturated with uminium sulphate and then coated with calcium sulphate. —L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Sulphite Pulp Factories; Troublesome Formation of Ice in ——. Papier-Zeit., 1902, **27**, [31], 1106—1107.

In blowing off the gas from the sulphite boilers during or after boiling, it frequently happens that the cooling worm through which the escaping gas is conducted suddenly becomes stopped up; the cause of this occurrence being ultimately traced to the formation of ice inside the pipe, although the water in the outer container is not frozen. The formation of ice is due to the liquefaction of the sulphur dioxide, which takes place at the ordinary temperature under a pressure of three atmospheres. If any of the outlet valves of the system be accidentally left closed, this pressure may easily occur in the pipes, and the gas when cooled in the worm will then become liquefied. Now the pressure in the pipe be discontinued, for instance, by shutting the escape valve of the boiler, the liquefied gas will evaporate and cause the freezing of any water which may have collected in the worm.—J. F. B.

Cellulose; New Method for the Determination of ——. S. Zeisel and M. J. Stritar.

See under XXIII., *page* 642.

Wood Pulp; Sampling, and Determination of Moisture in ——. W. Thörner.

See under XXIII., *page* 641.

United States Patents.

Pulp-Screen. O. H. Moore, New York. U.S. Pat. 695,754, March 18, 1902.

THE claims relate to a screen for paper pulp, comprising a rotatable screen proper, having its lower end provided with a downwardly-tapered chamber, a tubular support for the lower end portion, a corresponding bearing for this support, and a base chamber surrounding this bearing. The tapered chambered lower end precipitates the discharge of the coarse material from the screen, and the support, bearing and base chamber form a continuation of the discharge passage from the tapered lower end.—J. F. B.

Pulp-refining Engine. G. A. Clark, Mass. U.S. Pat. 696,314, March 25, 1902.

THIS invention relates to improvements in that class of engine in which the pulp passes from a central point radially between the refining devices instead of between a roll and a bed-plate. The improvement is designed to counterbalance all the pressure against the revolving head, which results in a great end thrust on the main shaft. It consists of a hollow cylindrical body with the pulp supply-pipe midway between its ends and suitable refining devices located at each end, operating in planes at right angles to the axis of the body, so that the end thrusts of the two devices counterbalance each other.—J. F. B.

Beating Engine. E. A. Jones, Mass. U.S. Pat. 696,822, April 1, 1902.

THE improvement consists of a means for facilitating the circulation and travel of the pulp to the discharge outlet when the engine is being emptied, by forcing a stream of water into or under the pulp in the direction in which the pulp is flowing. The device comprises a pressure chamber arranged under the rear wall of the backfall and extending from one side of the vat to the mid-feather, the chamber having a discharge slot right across and being connected to a fluid pressure supply.—J. F. B.

Paper-making Machine; Fourdrinier ——. J. W. Moore and J. A. White, Pa., U.S.A. U.S. Pat. 695,753, March 18, 1902.

THE claims provide for the mounting of the shake frame upon supports so as to materially reduce friction and to give to the shake frame a perfectly horizontal vibrating motion, and further for carrying the supporting-rolls, breast-roll, and return-rolls for the making wire on the shake frame so that the upper and lower portions of the making wire will move in unison.—J. F. B.

Paper; Machine for making Compound ——. C. P. Brown, Conn. U.S. Pat. 695,787, March 18, 1902.

THE device for pasting together webs of unfinished paper coming from the paper-making machine consists of a plurality of press rolls arranged in the form of a hollow square in the centre of which the pasting roller is situated. The two webs are conveyed to the square by means of felts, they are disengaged from the felts by bending the latter downwards and back over the two lower rolls, whilst the webs are bent upwards, one of them receives paste from the central roller and the two are pressed together by the upper pair of squeezing rolls. In this way the surfaces which are pasted together are those which were contiguous to the felts so that the finished paper bears no impression of the felts. —J. F. B.

Paper with Glazed Surface; Water- and Fat-Proof ——. H. Herfs, Bonn, Germany. U.S. Pat. 697,207, April 8, 1902.

THE inventor employs, supplementary to all other processes used for making paper waterproof, a coating of lac varnish and then a coating of talc, drying and otherwise treating the paper both after the lac and after the talc. The lac varnish and talc treatment is not applicable alone, but the paper must first be prepared, preferably by treatment with a mixture of boiled linseed oil and paraffin wax, which renders the paper waterproof and pliable.—J. F. B.

Fibre ware; Indurating [Toughening] ——. J. Peterson, Lockpost, New York. From the United States Indurated Fibre Company, New York. U.S. Pat. 696,379, March 25, 1902.

Moulded articles of wood pulp or paper are indurated or toughened by immersion in a "filler" composed of corn-oil mixed with a toughening material such as creosote, resin, or gum, and subsequently subjected to heat in order to harden the preparation; they are then sanded and rendered glossy and waterproof by the application of a suitable varnish, being finally baked to harden the finished surface.
—G. T. M.

Matrix [Paste-board]. J. L. Winter, Hamburg, Germany. U.S. Pat. 691,925, Jan. 28, 1902.

The inventor claims the manufacture of a matrix for stereotype printing, consisting of several sheets of absorbent blotting paper united by a paste composed of starch, potato-meal, dextrin, glycerin, gelatin, and water. The impression is stated to be deep and sharp, and the matrix remains unchanged after the casting has been made.—J. F. B.

Paper; Sizing of ——. C. Würster, London. U.S. Pat. 695,778, March 18, 1902.

The inventor claims the use of a bisulphate (preferably sodium bisulphate) either alone or in conjunction with an aluminium salt, for decomposing the rosin soap in the sizing of paper. The object is to obtain the sizing substance in the form of free rosin, and to decompose any resinate of alumina which may be produced.—J. F. B.

Casein Solution. W. A. Hall, Vermont, U.S.A. U.S. Pat. 695,927, March 25, 1902.

Casein precipitated by hydrochloric acid, which is the usual precipitant when milk-sugar is required, is unsuitable in the ordinary way for employment as an adhesive, because too much solvent has to be employed. The inventor claims the use of sodium phosphate, preferably the triphosphate, for dissolving casein which has been so precipitated. The casein is dissolved by the addition of 10—15 per cent. of its weight of phosphate mixed with one to three parts of water to one of casein; such a solution is said to be less viscous than a much more dilute solution of such casein prepared with alkalis in the usual way, and does not injure the enamel on lithographic stones.
—J. F. B.

Cellulose into Sugar; Process of Converting ——. A. Classen. U.S. Pat. 695,795, 1902.

See under XVI., *page* 630.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Quinine Camphorate. T. G. Joyce. Chem. and Druggist, 1902, **60**, [1160], 612.

This is a new compound of quinine and camphoric acid. It is soluble in about 460 parts of water at 15·5° C., and crystallises in beautiful needles which melt at 184° C., decomposing to a yellow liquid. The salt is said to have sedative tonic properties.—A. S.

Caffeine; The Iodides of ——. A. Fanconi. J. Pharm. Chim., 1902, **15**, [8], 370—373.

The ordinary caffeine iodide—tetriodocaffeine hydriodide—is a very unstable substance; it always contains a considerable proportion of free iodine, the irritant action of which is well known. Pending the production of a stable compound it would be better (in pharmacy) to hold to the use of a mixture of an alkali iodide and caffeine.
—A. C. W.

Conium Alkaloids. F. B. Ahrens. Ber., 1902, **35**, [7], 1330—1334.

The material for the present investigation was a mixture of bases obtained as a by-product of the manufacture of coniine. The optical rotation of the mixture was $[\alpha]_D = -28°$. The substance was a colourless liquid, with coniine odour, which boiled principally between 170° and 172° C., the residue distilling at 176° C.; the fractions differed in optical rotation, hence probably large quantities of *d*-coniine were still present. On treatment with the calculated quantity of hydrobromic acid, a salt separated from which a base with $[\alpha]_D = +8·3°$ was regenerated. For the separation of 1-methyl-*l*-coniine, the hydrochlorides of the bases in strong aqueous solution were treated with sodium nitrite, the nitroso compound removed, finally by extraction with ether, and the secondary and tertiary bases regenerated in the ordinary manner. The tertiary base, 1-methyl-*l*-coniine, was at once obtained pure.

The alkaloid separated from the nitroso compound was a mixture of *d*- and *l*-coniine, from which, by recrystallisation of the bitartrates, a *l*-coniine of $[\alpha]_D^{21} = -15°$ was obtained. It distils at 166·5° C.; the hydrochloride crystallises in needles which melt at 214°—215° C., the hydrobromide in shining needles which melt at 205° C.; the platinum salt crystallises from water in fine, red crystals, melting at 160° C.; the gold salt separates from water as an oil, but crystallises in long golden-yellow prisms, which melt at 95° C. Attempts were made to obtain pure *l*-coniine from the methyl-*l*-coniine by heating with hydriodic acid and phosphorus; transformation, however, into *d*-coniine takes place, the amount of the change increasing with the temperature of the reaction.

1-Methyl-*l*-coniine, $C_8H_{16}N.CH_3$, is a colourless liquid with an odour of coniine. It boils at 175·6°C., $[\alpha]_D^{20} = 81·9°$. Its salts crystallise well and are stable, they are readily soluble in water and alcohol, but not in ether. The hydrochloride forms needles, which melt at 191°—192° C. The hydrobromide crystallises from water in large needles, from alcohol in leaflets, which melt at 189°—190° C. The platinum salt forms fine, orange crystals, generally united to warts, which melt under water; the melting point is 153°—154° C. The gold salt forms shining leaflets, which melt at 77°—78° C. The picrate crystallises from water in long needles, which melt at 121°—122° C.—A. C. W.

Sweet Orange Flower Essence. E. Theulier. Bull. Soc. Chim., **27**, [7], 278—280.

This essence was obtained by simple distillation of sweet orange flowers without fractionation. It is of a dark yellow colour and has an odour unlike that of ordinary Seville neroli; sp. gr. at 23° C., 0·860. Optical rotation at 23° + 29° 30′. Esters (calculated as linalyl acetate), 6·4 per cent. With alcohol of 90° it gives a cloudy emulsion, but no solution. In the cold it deposits small crystalline scales, melting at 55°, and volatile without residue, probably identical with the paraffin obtained from Seville neroli which also melts at 55°.

Having dried the essence over sodium sulphate, 80 grms. were fractionated by distillation at ordinary pressure, with the following results:—

——	Temperature.	Grms.	Sp. Gr. at 25°	Optical Rotation at 26°
	° C.			° ′
1	160—170	9·630	0·8617	+ 50 40
2	170—175	10·870	0·8575	+ 48 8
3	175—180	6·984	0·8604	+ 42 32
4	180—185	5·330	0·8606	+ 36 18
5	185—190	3·170	0·8712	+ 25 0
6	190—200	3·380	0·888	+ 26 0
7	200—210	1·400	..	..
8	210—220	1·610	..	..
9	220—233	1·800	..	..
Residue	..	35·880	..	..

The above table shows the presence of a considerable quantity of terpenes and products of high boiling point whilst indicating no particular definite constituent.

By further treatment, described in detail in the original, the author succeeded in isolating from fractions 1, 2, 3, and 4, liquid *d* camphene and *d*-limonene, and from fractions 5, 6, and 7, *d*-linalool.—C. T. T.

nin. F. v. Hemmelmayr. Monatsh. für Chem., 1902, 23, [2], 133—164.

NIN is obtained from *ononis* root by extracting with hol, digesting the portion of the extract insoluble in er with litharge at 40° C. for a long time in alcoholic tion, and then subjecting the crude ononin, which rates on removal of the alcohol, to recrystallisation n alcohol. Three fractions are then obtained, the com- tion of which has now been investigated. The most luble fraction contains *onon* and *ononin*, the latter of ch is extracted by hot water, in which onon is very ttly soluble. The onon was purified by crystallisation n hot water, and finally by precipitating with water its solution in pyridine. *Onon*, $C_{39}H_{38}O_{19}$, consists of fine roscopic needles, which melt at 270° C. with decomposi- It is practically undecomposed by long boiling with ta water; boiling with normal sulphuric acid converts nto dextrose and an amorphous substance. *Ononin*, $H_{26}O_{11}$, is purified by repeated recrystallisation from hot er; it forms colourless needles which begin to sinter 04° C. and melt at 210° C.; when rubbed with manganese ide and strong sulphuric acid, it gives a cherry-red, ost violet liquid. Baryta converts ononin into *ononetin*, $H_{16}O_5$; if, however, it is boiled with baryta for 15 utes only, it is converted into *onospin*, $C_{21}H_{22}O_{10}$. By action of sulphuric acid, ononin is decomposed into rose and *formononetin*, $C_{16}H_9O(O.CHO)(OH)(OCH_3)$, ch is converted into formic acid and ononetin by ing with baryta. Ononetin appears to be a mixture of isomerides.

he second fraction obtained by crystallisation from hol contained *ψ-ononin*, a little ononin, and also a small ntity of one of the constituents of the third fraction. some alteration in the method of extraction, Merck olied pure *ψ-ononin*, which is a white indistinctly talline mass, melting at 206—210° C.; by the action of er, and more rapidly by baryta, ψ-ononin is converted *ψ-onospin*, $C_{24}H_{24}O_{11}$, of which there are two iso- ic forms, melting at 195°—197° C. and 220°—221° C. *nospin* forms a tetra-acetyl derivative; by the action of te sulphuric acid it is converted into a sugar and an rphous substance.

he third fraction obtained from alcohol is a mixture of ral substances, which have not yet been obtained e.—A. C. W.

onarin: A New Glucoside from Saponaria, coloured Blue by Iodine. G. Barger. Ber., 1902, 35, [7], 1296—298.

many years the existence in certain plants has been wn of a substance incorrectly described as "structureless ble starch." This substance now receives the name of onaria from the fact that the material used in the ent investigation was *Saponaria officinalis, L.*, but it similar substance is known to occur in at least 20 erent plants. For its preparation, the dried leaves of *onaria* were boiled with water, the extract was filtered, centrated, acidified with acetic acid, and allowed to ain for a few days. A dirty-white deposit had then ned, which was purified by repeated solution in ium carbonate and re-precipitation with acetic acid, the duct finally consisting of microscopic needles. Saponarin arly insoluble in cold but sparingly soluble in hot water alcohol, and insoluble in most organic solvents; centrated sulphuric acid dissolves it, forming a yellow tion with a blue fluorescence. It is soluble in alkalis an intense golden yellow coloration. The aqueous tion gives a strong blue coloration with iodine in ssium iodide; this coloration disappears on warming reappears on cooling. Dilute ferric chloride gives a rown precipitate, lead acetate a yellow, and silver te a white precipitate. Analysis showed carbon 0·66, and hydrogen = 6·30 per cent. When dried, the tance is intensely hygroscopic. Saponarin is slowly olysed by heating with mineral acids; a yellow substance posited, possessing the properties of the original with exception of the blue iodine reaction; glucose remains olution. From the products of the alkaline fusion of saponarin, the author has isolated *p*-hydroxybenzoic acid, and probably also hydroquinone. Appearances point to the possibility of saponarin being a glucoside of a flavone derivative; it also seems to have a certain similarity to scutellarin which occurs under analogous circumstances. —J. F. B.

Chloroform; Detection of Alcohol in ——.

See under XXIII., *page* 642.

Kola Nut and its Fluid Extract; Determination of the Alkaloids of ——. J. Warin.

See under XXIII., *page* 645.

Aloes in Pharmaceutical Preparations; Identification and Detection of ——. E. Léger.

See under XXIII., *page* 645.

Allyl Iso-Sulphocyanate [Essential Oil of Mustard]; Determination of ——, *in Commercial Products.* Roeser.

See under XXIII., *page* 645.

English Patent.

Ozone; Manufacture of Compounds of Fatty Acids and their Derivatives with ——. T. Weyl, Berlin. Eng. Pat. 11,165, May 30, 1901.

The patentee claims the process for the manufacture of compounds of unsaturated fatty acids and such derivatives of these acids containing a double bond, with ozone, which consists in treating acids of the oleïc series, or their (unsaturated) derivatives, with ozone in the absence or presence of water or other solvent. The "compounds" are also claimed, and are to be used in "perfumery, and as medicinal preparations and disinfectants."—A. C. W.

United States Patents.

Iodine and Sulphur; Process of Making Fatty Compound of ——. O. Degner, Elberfeld, Germany. U.S. Pat. 696,900, April 1, 1902.

The process claimed consists in dissolving iodine in a fatty oil (sesamé oil) dissolved in benzene, passing in sulphuretted hydrogen until the solution is colourless, washing with water and alcohol to remove excess of iodine and sulphuretted hydrogen, and removing the benzene *in vacuo*. The products are also claimed; they are more or less coloured oily liquids, which do not split off iodine when heated on the water-bath. They are stated to be valuable remedies.—A. C. W.

Pancreas Preparation, and Process of Producing ——. W. Weber, Stolberg H., Germany. U.S. Pat. 695,254, March 11, 1902.

An aseptic compound of 100 parts of pancreatin with 20 parts of tannin is claimed. It is stated to be insoluble in the gastric juice. It is obtained by adding a solution of pancreatin to a solution of tannin containing alkali, and then precipitating by acid. This process is claimed.—A. C. W.

Cinchona Alkaloids; Anisic Acid Ethers of ——. H. Thron, Frankfort-on-Maine, Germany. U.S. Pat. 695,591, March 18, 1902.

The process mentioned for the manufacture of anisylquinine is that claimed in Eng. Pat. 1901, 11,783 (this Journal, 1902, 275). The claims are for anisic acid ethers (esters) of the cinchona alkaloids, and for anisylquinine—

$$(OCH_3)C_6H_4.COOC_{20}H_{23}N_2O,$$

which forms fine tasteless needles, melting at 87°—88° C. Anisylquinine forms well-characterised salts with organic and inorganic acids; the salicylate and cinnamate are stated to be of great therapeutic value.—A. C. W.

Cinchona Alkaloids; Succinic Acid Ether of ——. H. Thron, Frankfort-on-Main, Germany. U.S. Pat. 696,609, April 1, 1902.

The process of manufacture is that of Eng. Pat. 1901, 11,783 (this Journal, 1902, 275); compare Eng. Pat. 1901, 8165 (this Journal, 1901, 1139). The quinine succinic ester, $C_2H_4(CO.OC_{20}H_{23}N_2O)_2$, which is claimed, forms nearly tasteless needles, which melt at 97° C.—A. C. W.

Cinchona Alkaloids: Cinnamic Ether of ——. H. Thron, Frankfort-on-Main, Germany. U.S. Pat. 697,042, April 8, 1902.

The process of manufacture is that of Eng. Pat. 1901, 11,783 (this Journal, 1902, 275). The cinnamic ether of quinine, which is claimed, is a tasteless white powder melting at 111° C.—A. C. W.

Alginates; Manufacture of Alkaline ——. T. Ingham, Liverpool, England. U.S. Pat. 695,209, March 11, 1902.

The process is claimed for obtaining a pure solution of an alkali alginate, which consists in neutralising a strongly alkaline solution of an alginate by alginic acid, and also the process for making pure alkali alginate, consisting in adding alginic acid to the mixture of alkali alginate and alkali, and evaporating to dryness.—A. C. W.

Isovaleramide Derivative, and Process of making same. A. Liebrecht, Frankfort-on-the-Main. Assignor to Farbwerke Hoechst, Hoechst a/M., Germany. U.S. Pat. 697,730, April 15, 1902.

The patentee claims the production of the diethylamide of isovaleric acid which distils at 205°—208° C. under 20 mm. pressure, and is sparingly soluble in ether and water. The product has an odour of peppermint, and is obtained by treating isovaleric acid (or officinal valerianic acid), its anhydride, ester, amide, or acid chloride with secondary amines. Analogous compounds are obtained from the corresponding derivatives of bromovalerie acid.—T. A. L.

XXI.—PHOTOGRAPHY.

Photographic Image; Reversal of the ——, *and its subsequent Development in Actinic Light.* M. I. Wilbert. Brit. J. Phot., 1902, **49**, [2185], 231—232.

The author describes experiments on reversed photographic images, and confirms Nipher's discovery that development of such images may be carried out in actinic light.

When sufficient exposure has taken place to give complete reversal, a greatly increased exposure appears to have little influence, the altered upper layers of silver salts appearing to protect the remainder. The range of the modern plate under ordinary conditions is shown to be very great by the fact that an exposure 80 times that required to give the best result produced a negative, although a somewhat thin one; with an exposure 120 times greater than this, a reversed image, a little dense perhaps in the shadows, was developed in the dark room in three minutes. When the development was carried out before a window of northern aspect, three times this length of time was required.

The best results were obtained by using a "hydroquinone" or "metol-hydroquinone" developer; "pyro," "amidol" "eikonogen," and "metol" alone did not give satisfactory results. Development was also tried with "hydroquinone" without alkali; the result was very good, but the image had a red brown colour. After exposure to diffused daylight for 10 or 14 days, photographic plates still gave images when exposed to the direct electric spark.

—J. W. H.

"Diphenyl" [Diaminohydroxydiphenyl] as a Photographic Developer. F. Graves. Brit. J. Phot., 1902, **49**, [2188], 288.

"Diphenyl" (this Journal, 1898, 181) is stated to be a splendid developer. It gives clear negatives, particularly free from fog; it yields plenty of density, and allows a good deal of latitude in exposure, being specially suitable for the treatment of over-exposed plates. The substance should be dissolved in about 20 parts of water, employing stronger or weaker solution according as the plate is under- or over-exposed. The negatives have a fine range of gradation, and are very soft.—F. H. L.

Sensitisers for Gelatino-Bromide, for the Visible Part of the Spectrum ——. E. Valenta. Phot. Corr., 1902, 39, 153.

The similar tar dyestuffs "Cotton Yellow II" and "Canary Yellow" (Holliday and Sons) are very powerful sensitisers for the visible part of the spectrum, exceeding the activity of Acridine Yellow, which was recommended by Eder and the present author in 1894. Five to 10 parts of a 1:500 solution of the new dyestuffs added to 100 parts of water, yield plates specially sensitive to the region between D ½ E and the ultra-violet, with a maximum between *b* and F, and a minimum in the blue-green. This latter peculiarity, which is not shown by most optical sensitisers, makes the dyestuff very convenient for spectrum analysis. The yellow colour is completely removed from the plates by washing with water, so that the finished negatives are not stained.

—F. H. L.

Image Intensified with Mercury and Sodium Sulphite, Nature of ——. G. Hauberrisser. Phot. Rundschau, 1902, **16**, 45.

When a negative is bleached with a solution of mercuric chloride, a double decomposition occurs between the mercury salt and the metallic silver of the image, yielding silver chloride and mercurous chloride. On treating such a plate with sodium sulphite, it is blackened again, the usual view of the process being that the mercurous chloride is reduced to the metallic state, while the silver chloride gradually dissolves, this notion explaining the gradual weakening of the picture on prolonged immersion in the sulphite. In order to ascertain whether silver chloride was present after a short treatment with sulphite, strips of the negative were (*a*) insolated, (*b*) placed in an alkaline developer. The first test gave a scarcely noticeable result, but the second showed a darkening, and certainly suggested silver chloride, as does the fact that a negative intensified in the manner indicated is photographically reduced by thiosulphate. Further experiments showed that the body formed by the interaction of mercurous chloride, silver chloride, and sodium sulphite is a sulphur compound; it cannot be metallic mercury or the negative would not be reduced by thiosulphate. On treating the intensified negative with thiosulphate, silver and mercury pass into solution, the former probably in the shape of chloride. The residue insoluble in thiosulphate yielded considerable quantities of sulphuretted hydrogen, so that the metals cannot be dissolved as sulphides; it also contained silver and mercury. In all probability, therefore, a plate intensified with mercury and sulphite consists of silver chloride and some compound of mercury and silver with sulphur, the exact nature of which has not been discovered.

—F. H. L.

Potassium Ammonium Chromate. A. D. Pretzl. Brit. J. Phot., 1902, **49**, [2185], 227—228.

By adding ammonia of sp. gr. 0·880 to potassium bichromate, warming until the salt is dissolved, and allowing to crystallise, pale yellow crystals of potassium-ammonium chromate are obtained. If heated or exposed to the air these crystals gradually lose their ammonia; the salt has no action on organic matter, except when exposed to light. Paper soaked in the solution keeps for a long time, and prints to a vigorous brown; on washing out the unaltered salt, the colour does not change unless the washing be prolonged, when it becomes pale green by the reduction to the chromic oxide formed by exposure to light, to chromium oxyhydrate. Silver nitrate solution turns the image red, mercuric nitrate alters the colour to reddish-brown, and lead nitrate makes it yellow. With a neutral solution of ferric chloride, a precipitation of oxide of iron takes place on the image, which becomes a rich blue-black by treatment with dilute gallic acid. Another process consists in conti-

paper with a mixture of potassium ferrocyanide, ammonium chloride, and potassium ammonium chromate; the ated paper after exposure is immersed in a neutral ution of ferric chloride.—J. W. H.

English Patent.

otographic Plates and the like in Open Daylight; Developing ——. J. N. Ludwig, Mainz, Germany. Eng. Pat. 3023, Feb. 6, 1902.

E plates are exposed in the camera inside a special mber which is so arranged that it can be filled with liquid. er the last exposure, the box is charged with a solution "Scarlet Saffron 3 B," or some other dyestuff capable exerting an identical effect. So treated the negatives stained red or orange, become insensitive to light, and y consequently be developed without any dark-room.
—F. H. L.

United States Patents.

ido-Oxybenzyl Compound [Photographic Developer], nd Process of making same. A. Eichengrün and K. Demeler, Elberfeld, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, U.S.A. U.S. Pat. 696,020, March 25, 1902.

E products have the general formula $C_6H_3.OH.NH_2.$ $_2OR$, where R represents hydrogen, an alkyl or acidyl ical. They are obtained by treating nitrophenols in sence of suitable condensing agents with halogen hylic alcohols (for instance, $ClH_2.Cl.OH$, from formalyde and hydrochloric acid), treating the resulting ivatives with water, alcohols, organic acids, or their ali salts, and finally reducing the nitrohydroxybenzyl ohols, ethers, or esters so obtained. The product cially claimed is amino-*p*-hydroxybenzyl alcohol, $C_6H_3.$ $.NH_2CH_2OH$, which forms colourless leaflets becoming in contact with air and melting at 135°—142° C. e substance is soluble in hot water, alcohol and ether, ms salts with caustic alkalis and acids, and gives a drochloride which separates in stable white needles and aluable as a photographic developer.—T. A. L.

sh-Light Machine; Photographic ——. L. G. Bigelow, . Joseph, Missouri. U.S. Pat. 696,402, April 1, 1902.

e powder is held under a flat longish cover provided n notched ends, which travels in slots at the upper edges horizontal U-shaped metal trough; and it is fired by ans of electricity and a fuse whilst lightly compressed er that cover. The device is claimed to give a flat le, and to permit the use of a larger proportion of bustible metal in the powder than usual.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

losives; Detonating or Priming Compositions for ——. M. Bielefeldt, Berlin. Eng. Pat. 7148, April 4, 1901.

e claim is for "detonating or priming compositions aining aluminium, in the shape of powder, in addition xygen-yielding substances." Examples given are:—

—	Per Cent.	Per Cent.
erised aluminium	20	15
c acid	50	60
ssium chlorate	30	20
um peroxide	..	5

—G. W. McD.

Match making Machines; Improvements in ——. Czerweny, Austria. Eng. Pat. 26,456, Dec. 27, 1901.

machine consists of a vessel for holding the com ion, a dipping rail so adjusted that the size of the h-head can be varied at will, and an exhaust hood, adjustable exhaust, so that the drying of the match-heads the dipping process may be controlled.—G. W. McD.

United States Patents.

Explosive Fire-Alarm. C. E. Buell, New Jersey, U.S.A. U.S. Pat. 693,229, Feb. 11, 1902.

The patentee claims an explosive fire-alarm comprising a chamber containing a charge of explosive material (cannon-cracker powder and fulminate), a phosphorus compound primer for igniting and firing the contents of the chamber, and means for excluding the atmosphere from the contents until the device is acted on by the heat of a fire.
—G. W. McD.

Explosives; Process for Producing ——. J. Bonnet, Paris. U.S. Pat. 693,667, March 18, 1902.

See Eng. Pat. 21,068, 1900; this Journal, 1901, 1024 and 1239.—G. W. McD.

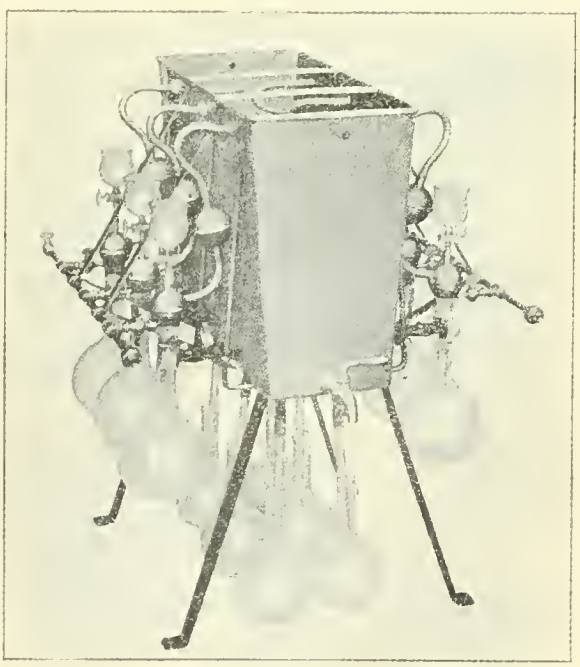
XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Nitrogen [Kjeldahl] Apparatus. J. A. Wesener. J. Amer. Chem. Soc., 1902, **24**, [4], 388—390.

The apparatus shown in the figure was devised for the rapid distillation of the ammonia in a current of steam, the whole of the ammonia being obtained in 250 c.c. of distillate within 10 minutes.

The distillation flask is round-bottomed and has a capacity of 24 oz. It is closed by a perforated rubber cork through which passes a copper tube flush with both ends, and this tube is connected with two hollow brass balls, the first having a capacity of about 40 c.c. and the second of 70 c.c. The alkali is introduced through a thistle-funnel, which passes through the top of the first ball, and reaches nearly to the bottom of the flask. The second ball is connected with the condensing coil by a pipe of block-tin tubing, whilst the steam is introduced through a small brass tube passing through the rubber stopper and joined on the inside to a glass tube, the opening of which is below the surface of the liquid.

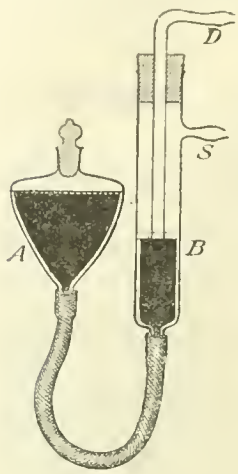


In using this apparatus the material is digested in the same flask with 15 c.c. of sulphuric acid and a globule of mercury. The colourless product is diluted with 60 c.c. of

water, and the flask connected with the distillation apparatus. After the introduction of 60 c.c. of a 50 per cent. solution of sodium hydroxide, steam is turned on, 20 c.c. of a 4 per cent. solution of potassium sulphide added, and the distillate collected in a 500 c.c. flask containing a little distilled water.—C. A. M.

Pressure Regulator for Vacuum Distillations. W. Burstyn. Oesterr. Chem.-Zeit., **5**, 55. Chem. Centr., 1902, **1**, [11], 614.

The author describes an apparatus, which he calls a *manostat*, by means of which the pressure in the distilling apparatus can be automatically maintained constant within certain limits. In the accompanying diagram, A and B are glass vessels joined together by a piece of pressure tubing and filled with mercury as shown. The tubes S and D are connected respectively to the pump and the distilling apparatus. Before starting the pump, the stopper is removed from A, the latter lowered till quite filled with mercury, and then with avoidance of air bubbles, the stopper replaced. The pump is then started, and when the required vacuum, say 20 mm., is attained, A is raised till the mercury in B just reaches the lower end of the tube D; in this way a Torricellian vacuum is formed in the upper portion of A. The action of the pump is now increased till a vacuum of, say, 15 mm. is attained, but as this causes the level of the mercury in B to rise 5 mm. (up to the dotted line), the pressure in the distilling apparatus remains unaltered, the mercury seal of 5 mm. equalising the difference of pressure. If the pressure in the distilling apparatus, by evolution of gas, rises above 20 mm., the excess can be sucked over by the pump.



When distilling with the aid of a mercury pump at a vacuum of 5 mm. or less, variations of pressure need to be still more carefully guarded against, and in such cases greater accuracy can be attained by filling the manostat with light paraffin oil instead of with mercury.—A. S.

INORGANIC—QUALITATIVE.

Ozone; Old and New Reactions of ——. C. Arnold and C. Mentzel. Ber., 1902, **35**, [7], 1324—1330.

A 15 per cent. aqueous solution of potassium iodide is mixed with sufficient of a 1 per cent. alcoholic solution of phenolphthalein to produce opalescence, and paper is wetted with the mixture. Ozone develops a red colour, which disappears gradually. Chlorine, bromine, and nitric oxide produce only blue or brown colours. Preference is given to rosolic acid. One c.c. of a 1 per cent. alcoholic solution of rosolic acid is mixed with a drop of a 15 per cent. solution of potassium iodide and paper is moistened with the liquid. Ozone produces a bright red colour. To use fluorescein, black paper is moistened with a solution of fluorescein and a 1 per cent. solution of potassium iodide or Zellner's fluorescein paper may be used. Ozone develops a green fluorescence.

The three phenylene-diamines, recommended by Erlwein and Weyl, are not sufficiently characteristic. Paraphenylene diamine mixed with potassium acetate may, however, be used. Paper moistened with this mixture is coloured green passing into brown by ozone; other oxidising gases give a blue or violet colour.

Of new reagents, benzidine and tetramethyl-*p*-*p*'-diamino diphenylmethane have proved serviceable. Paper soaked in a saturated alcoholic solution of benzidine is immediately coloured brown by ozone; chlorine, bromine, and nitric oxide produce a blue, whilst hydrogen peroxide, hydrocyanic acid, ammonia, hydrogen sulphide and ammonium sulphide have no action. Benzidine in presence of copper sulphate is, however, a sensitive reagent for hydrogen peroxide, a blue precipitate being produced. Tetramethyl-*p*-*p*'-diamino diphenylmethane is a more delicate reagent than benzidine. Paper soaked in an alcoholic solution is coloured violet by ozone; chlorine and bromine produce a deep blue, nitric oxide a straw-yellow; hydrogen peroxide gives no colour. The test is still more delicate if potassium acetate or acetic acid is added, but the colour is of a bluer shade and is distinguishable from that produced by chlorine.—M. J. S.

Phosphorus; Detection of ——, *in Cases of Poisoning.* P. E. Alessandri. L'Orosi, **24**, 397—407. Chem. Cent., 1902, **1**, [14], 831.

In place of the old methods, Binda has recommended taking small pieces of the mass under examination, rubbing with a glass rod, and placing the ground material on a heated glass plate in the dark. In presence of small quantities of phosphorus, the characteristic phosphorescence is shown. An alternative method consists in evaporating an alcoholic or carbon bisulphide solution of the substance under examination, leading the vapours into a crucible containing nitro-molybdic acid or silver nitrate and examining the precipitate produced under the microscope. The presence of phosphorus in the evaporation residue of the carbon bisulphide solution can also be recognised by the green flame reaction. According to the author the above methods admit of the rapid detection of the smallest quantities of phosphorus in cases of poisoning.—A.S.

Platinum Metals; Identification of ——, *by the Action of Sodium Peroxide.* Leidié and Quennessen. J. Pharm. Chim., 1902, **15**, [8], 364—369.

In order to characterise the six platinum metals, it is necessary to subject each to a series of independent reactions. The authors have endeavoured to find a rapid method, in which all the tests might be made on the same sample. The metal, in very fine filings, or in the form obtained by reduction in hydrogen, is mixed with 5—6 times its weight of sodium peroxide, and the mixture heated at a low red heat in a nickel dish. The mass blackens and

The solution is coloured *yellow*. It is heated and a current of chlorine passed through.

The distillate gives a black precipitate with ammonium sulphide.

The distillate gives an insoluble violet osmiate with caustic potash and alcohol, or with potassium nitrite on warming. No brown coloration on warming with hydrochloric acid.—*Osmium.*

The distillate gives a black precipitate with caustic potash and alcohol. Brown coloration on warming with hydrochloric acid. —*Ruthenium.*

Nothing distils over. The liquid is acidified with hydrochloric acid, and evaporated with nitric acid and potassium chloride; red crystals, insoluble in potassium chloride, are obtained. —*Palladium.*

The solution is *blue*. It is acidified with hydrochloric acid, and evaporated with nitric acid and potassium chloride; black crystals, insoluble in potassium chloride. —*Iridium.*

The solution is *colourless*. The precipitate is treated with hydrochloric acid, the filtrate is treated with sodium nitrite, and then with sodium carbonate, and filtered. The filtrate is evaporated to dryness with excess of hydrochloric acid, and the residue taken up in water.

The solution is pale yellow. Ammonium chloride gives a yellow precipitate insoluble in excess. —*Platinum.*

The solution is red. It is not precipitated by ammonium chloride. —*Rhodium.*

nes pasty; it is then stirred with a nickel spatula, and eating continued until it is semi-fluid. After treating a quantity of water equal to 10—12 times the weight e sodium peroxide, the liquid is allowed to settle, the part drawn off, water added, and the residue transferred ilter. The metals are then identified by means of the ons given in the foregoing scheme.—A. C. W.

INORGANIC—QUANTITATIVE.

osphorus in Iron; Rapid Determination of ——. K. Ramorino. Stahl und Eisen, 1902, **22**, 386.

or 0·50 grm. of iron is dissolved in 40 c.c. of nitric acid gr. 1·2 the liquid diluted to 50 c.c., silica and graphite ed, the filtrate oxidised with permanganate (10 grms. re), and the manganese peroxide reduced with white . The liquid is warmed till clear, neutralised with nia, treated with 50 c.c. of molybdate solution, and d to 80°. After shaking for five minutes, the precipi- s collected on a dry paper, and washed three times l per cent. nitric acid and 0·1 per cent. potassium e solution. The filter and precipitate are returned to iginal flask, the latter dissolved in 10 c.c. of 0·77 per soda solution, and the phosphorus titrated with d (2 per cent.) nitric acid. The soda is standardised issolving 0·062 grm. of phosphomolybdate dried at (= 0·001 grm. of P) in 100 c.c. of it, adding phenol- lein, and titrating with normal nitric acid. An sis of cast iron only occupies 20 or 30 minutes. —F. H. L.

: Common Errors in the Determination of ——. F. Hillebrand. J. Amer. Chem. Soc., 1902, **24**, [4], 2—374.

author's investigation owed its origin to the report of mmittee of the New York Section of this Society, nted with the object of obtaining uniformity in ical analysis (this Journal, 1902, 12).

iform samples of cement mixture and of finished nt were submitted to different chemists for analysis, the result that 15 reports, including that of the r, differed greatly from one another. Thus, in the of silica, the amount found in the mixture ranged 12·78 to 15·75 per cent., whilst in the finished cement mits were 19·18 and 21·56 per cent.

om the results of his experiments on this point the r concludes that it is not possible to render the whole e silica insoluble by repeated evaporation with hydro- ic acid, followed by a single filtration; but that it is sary to have two or more evaporations, with a filtration each.

e author also finds that silica, contrary to the accepted on, is not completely precipitated by ammonia or m acetate in the presence of a large proportion of inium or iron. Nor is the silica left completely ible when siliceous oxides of iron and aluminium are with potassium pyrosulphate, the latter substance g up appreciable quantities. By first separating the e of the silica, however, both these sources of error are ed.

e silica separated by water from silicon tetrafluoride rs to be of a different character from that separated sodium silicate by evaporation with hydrochloric acid. e case of the latter, ignition over the blow-pipe flame uired to obtain a constant weight, whereas the silica ed from silicon tetrafluoride ceases to lose in weight sufficient exposure to a Bunsen flame. In the author's on this accounts for the difference between the conclu- of Lunge and Millberg (this Journal, 1897, 762) f Fresenius and most other authorities.—C. A. M.

te; Determination by Oxidation of ——, *with manganate.* J. Waddell. Chem. News, 1902, **85**, 10], 158.

usual, in the titration of a nitrite by potassium nganate, to add a large excess of sulphuric acid, and idation may therefore be considered as that of nitrous to nitric acid. The author made experiments to nine whether excess of acid is necessary or whether a nitrite can be oxidised to a nitrate. The most satisfactory method of procedure was found to be to add the mixture of acid and permanganate to the nitrite; when the nitrite is added in the cold to the permanganate, a muddy precipitate of manganese hydroxide is produced which is difficult to get rid of. It was found that the amount of acid really necessary corresponds with that required by the equation—

$$5NaNO_2 + 3H_2SO_4 + 2KMnO_4 = 5NaNO_3 + K_2SO_4 + 2MnSO_4 + 3H_2O$$

or an amount just sufficient to form neutral sulphates and nitrates.

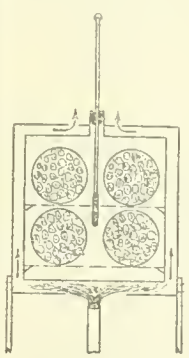
In making the titration, a mixture of sulphuric acid and nearly sufficient permanganate is added to the nitrite, the mixture slightly warmed, and then permanganate added till a persistent pink colour is produced.—A. S.

Copper; Volumetric Determination of ——. F. Repiton. Monit. Scient., 1902, **16**, [4], 287.

The author recommends the use of potassium ferrocyanide, instead of potassium cyanide, for the volumetric estimation of copper. A N/10 solution is added from a burette to a boiling neutral solution of the copper as sulphate, until test-drops placed upon a porcelain plate show a blue coloration with ferrous sulphate. The application of this method to other metals is being investigated.

Exact results are also obtained if a neutral solution of the copper salt as sulphate, chloride, or acetate is precipitated with excess of standard oxalic acid. The beaker containing the sample is covered with a clock-glass and set aside for three hours. A little sulphuric acid is then added and the excess of oxalic acid estimated with a cold permanganate solution of known relative value, the amount of oxalic acid combined with the copper being calculated by difference. The value of this, in terms of copper, is decided by repeating the process on a copper solution of known strength, and calculating the last term of the proportion sum.—R. L. J.

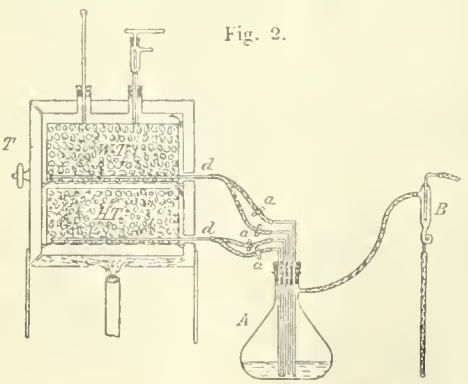
Fig. 1.



Wood Pulp; Sampling of and Estimation of Moisture of ——. W. Thörner. Zeits. Unters. Nahr.- und Genussmittel, 1902, **5**, [7], 304—305.

In sampling wood-pulp the author selects one bale in every ten, or, if the pulp be in stacks, he takes an equivalent number of stacks from various parts of the room. The bundles are unpacked and three sheets taken from each, namely, the sixth from the top, one from about the middle, and one from close to the bottom. The selected sheets are divided into four equal parts, and alternate quarters taken from these, torn up, and then packed into zinc cylinders

Fig. 2.



holding about 1,500 grms. of pulp. These cylinders are tightly closed with a broad rubber band round the lid and sent to the laboratory. After weighing, the lid is replaced by one covered with wire gauze, through which a glass tube is passed, reaching nearly to the bottom of the cylinder. After weighing again, four of these cylinders are placed in a special drying oven (see figures), with the glass tubes projecting through the walls. The temperature of the oven is then regulated at 105° C., and a current of hot air is sucked through the mass of pulp by connecting the ends of the glass tubes to an aspirating pump, as shown. Drying is continued until the weights are constant.—J. F. B.

ORGANIC—QUALITATIVE.

Water; Characteristic Reaction for Pure ——. Causse. Rev. intern. falsific., **15**, 16—17. Chem. Centr., 1902, **1**, [13], 778.

As a supplement to his previous work on the subject (this Journal, 1900, 472; 1901, 145), the author now proposes Crystal Violet or *p*-hexamethyltriaminotriphenylcarbinol as an additional reagent for the detection of contaminated water. If a solution of Crystal Violet made colourless with sulphurous acid be added to a pure water, the original colour reappears, the intensity of the reaction being greater if water which has been warmed to 35°—40° C. and afterwards cooled, be used. If the water be contaminated with animal refuse, the colour is not regenerated. For the preparation of the reagent, 0·25 grm. of Crystal Violet is dissolved in 250 c.c. of water saturated with sulphur dioxide. In carrying out the test, 100 c.c. of the water under examination are treated in a stoppered bottle with 1.5 c.c. of the reagent. Pure water is gradually coloured violet from above downwards. After warming to 35°—40° C. and again cooling, the reaction of the water to the reagent is about 10 times more intense.—A. S.

Iodoform; Detection of Small Quantities of ——. Pharm. Centr., 1900, 315.

If an ethereal solution containing traces of iodoform be evaporated to dryness and the residue moistened with three or four drops of dimethylaniline, a distinct yellow coloration is produced, which, if the liquid be heated nearly to boiling, becomes darker. Then, if, after cooling, the residue be diluted with a little alcohol, the resulting solution appears red by transmitted and violet by reflected light.—A. S.

Alcohol in Chloroform; Detection of ——. Pharm. Centr., 1899, 199.

The official method of the French Pharmacopœia depends upon the use of nitrososulphide of iron. A few c.c. of the sample are shaken for one or two minutes in a small stoppered bottle with a few crystals of nitrososulphide of iron. Pure chloroform is not coloured, and remains perfectly transparent; in presence of alcohol, the sample acquires a more or less decided brown coloration.—A. S.

Sesamé Oil in Chocolate; Detection of ——. Utz. Chem.-Zeit., 1902, **26**, [29], 309.

The author confirms the statement of Bömer (this Journal, 1899, **18**, 1054—1055) that sesamé oil, which has been heated for some time at 100° C., or has been treated with animal charcoal, is no longer sensitive to Baudouin's reaction. In testing chocolate, therefore, the fatty matter extracted by ether should not be heated for a long time in the water-oven before applying the test. It is also evident that the sesamé oil, if present in chocolate, cannot be considered as fresh, and the sensitiveness of the test is impaired. Soltsien's stannous chloride reaction is more reliable than Baudouin's for the detection of sesamé oil in chocolate.

—W. P. S.

Albuminoid Substances; Fractional Precipitation, and its Value for Differentiating ——. J. Effront. Monit. Scient., 1902, **16**, [4], 241—254.

The author discusses the question how far fractional precipitation may be relied on to separate proteid substances from one another, and whether the separation so obtained is real or artificial, especially in view of Duclaux's experiments with quinine sulphate.

He summarises his views as follows:—

(1) The method of fractional precipitation gives reliable results with solutions which contain a single albuminoid substance, and in some cases may be applied to analyse a mixture of proteids.

(2) The method is useful in the study of enzymic and acid transformation of proteids.

(3) The four albumoses obtained by this method should be regarded as a group of substances, each with specific characteristics.

(4) Albumose I. differs from the deutero-albumoses by its gradual degradation under the action of peptonising ferments.

(5) Deutero-albumose C, in its behaviour towards enzymes, differs from proto-albumose and the other deutero-albumoses.

(6) The four albumoses, whilst having definite properties, are groups of substances rather than distinct chemical compounds. Albumose I. consists of proto-albumose and hetero-albumose.

(7) Deutero-albumose C, under the action of pepsin behaves as a mixture of substances, one sensitive and the other insensitive, and can therefore no longer be regarded as a homogeneous compound.

Although it can scarcely be said that the lower limit of an albuminoid is as characteristic as the melting point of a crystalline substance (Hofmeister), the method of fractional precipitation, in view of the results it furnishes, cannot be discarded until a superior method is discovered.—R. L. J.

ORGANIC—QUANTITATIVE.

Sulphur in Plants; Determination of ——. G. S. Fraps. J. Amer. Chem. Soc., 1902, **24**, [4], 346—348.

In a former communication (J. Amer. Chem. Soc., 1901, **23**, 199) the author showed that on igniting the plant with calcium acetate, the ash contained from 4 to 100 per cent. more sulphur than the ash obtained in the ordinary way. He now describes experiments which show that the calcium acetate method does not give correct results, a considerable proportion of the organic sulphur compounds escaping oxidation. The following method is recommended as the most convenient:—Five grms. of the material are cautiously heated with 20 c.c. of concentrated nitric acid, in a porcelain basin, on the water-bath, and eventually concentrated by evaporation. The liquid is then mixed with 10 c.c. of 5 per cent. solution of potassium nitrate, and evaporated to dryness, and the residue ignited, at first gently, and finally over the blow-pipe flame until white. It is then dissolved in hydrochloric acid, the silica removed in the usual manner, and the sulphuric acid precipitated with barium chloride.

The following results show the differences in the amount of sulphur trioxide obtained by the three methods:—

Material.	In Ash. Usual Method.	In Calcium Acetate Ash.	Nitric Acid Method.
	Per Cent.	Per Cent.	Per Cent.
Wheat bran.....	..	0·221	0·368
Cotton-seed meal	..	0·343	0·926
Green rape.....	1·02	1·25	1·63
Wheat bran	0·00	0·14	0·30
Corn silage.....	0·20	0·24	0·43
Timothy hay....	0·15	0·17	0·28

—C. A. M.

Cellulose; A New Method for the Determination of —— S. Zeisel and M. J. Stritar. Ber., 1902, **35**, [7], 1252—1255.

In presence of nitric acid the non-cellulose of wood is oxidised rapidly by potassium permanganate in the cold and completely converted into products soluble in dilute ammonia. It is true that in this, as in all oxidation processes, a large portion of the cellulose—about 30 per cent.—is also converted into oxycellulose, which is insoluble in the above solvent, but which may be extracted by boiling with 10 per cent. soda lye. The error thus involved is quite small, but it can be estimated by extraction and

llowed for. At the same time, this and other oxidation rocesses are accompanied by the conversion of some of the ellulose—at most 4 per cent.—into soluble products. The stimation is carried out as follows:—About 1—1·5 grms. f the crude, finely divided substance (*e.g.*, oak-wood spings) is macerated with dilute nitric acid, and a 3 per nt. solution of permanganate is run in, 1 c.c. at a time, irring, and cooling, until the red colour persists for half hour. This operation occupies about two hours; the cess of permanganate and the precipitated oxide are moved by sulphurous acid, and the residue is filtered off, ashed, and then treated for 45 minutes at 60° C. with a ·5 per cent. solution of ammonia, being finally washed ith water, alcohol, and ether. The results agree very well ith those which it requires 15 days to obtain by the hulze-Hennebergprocess—extraction of the wood with ater and alcohol, and prolonged oxidation with potassium lorate dissolved in nitric acid. The yield of cellulose om oak-wood amounted to 37·2 per cent., the product ntaining 0·5 per cent. of methoxyl. Experiments made ith Schulze's original chlorate process invariably gave ry much higher yields, but the presence of 5 per cent. or ore of methoxyl in the cellulose obtained, indicated that e conversion was far from complete.

The authors' researches also show that the hemicelluloses, rticularly the mannoso-cellulose of the ivory nut, are mpletely converted into soluble products by permanganate, hich is not the case with chlorate mixtures. This process, erefore, is adapted for the direct estimation of cellulose its narrower sense, *i e.*, the dextroso-celluloses.—J. F. B.

otton-Seed Oil; Modification of Becchi's Silver Nitrate Test for ——. L. M. Tolman. J Amer. Chem. Soc., 1902, **24**, [4], 396—397.

order to remove fatty acids or other products of raucidity, hich frequently cause genuine olive oils to give a brown loration with silver nitrate, the author recommends the llowing method of purification:—About 25 c.c. of the are vigorously shaken with the same quantity of 95 per nt. alcohol, the mixture allowed to separate, the alcohol cauted, and the residual oil washed with 2 per cent. nitric id, and finally with water.

The author found that genuine olive oils, which gave ep brown colorations, caused no reduction at all after is treatment. On the other hand, the reducing substance cotton-seed oil was not affected. The method also gave tisfactory results in the case of lard and other fats.

— C. A. M.

cchi's Test for Cotton-Seed Oil; Investigation of ——. A. H. Gill and C. H. Dennison. J. Amer. Chem. Soc., 1902, **24**, [4], 397—398.

INIONS differ as to the nature of the active agent causing e reduction of the silver nitrate in this test. Some, *e.g.*, ipont (this Journal, 1896, 811), and Charabot and March is Journal, 1899, 771), consider that it is a sulphur mpound; whilst others, *e.g.*, Holde (this Journal, 1892, 7) regard it as an aldehydic body.

The authors confirm previous statements that cotton-seed , after being heated to 260° C., gives neither Halphen's r Becchi's reactions, but they point out that Raikow is Journal, 1900, 856; 1902, 279), by oxidation with assium permanganate and sulphuric acid, obtained a oduct which gave Becchi's reaction, but not Halphen's ction.

The authors have made various tests for aldehydic com- unds. 400 c.c. of cotton-seed oil were shaken with the ne quantity of strong sodium bisulphite solution for hours, after which the oil still gave Becchi's reaction, ough more slowly and with less intensity than before. a second experiment, crystals separated out, but these, distillation with sodium carbonate solution, gave no ehydic reaction.

On treating the oil with dry ammonia gas for seven hours, crystalline product was obtained, and the oil gave cchi's reaction even more strongly than at first.

In testing for sulphur compounds, the authors only erved in two instances a liberation of hydrogen sulphide m the black compound formed by the action of the silver nitrate upon the fatty acids. In experiments with salts of cadmium, lead, copper, and mercury, no reduction took place except in the case of mercury.

In repeating Dupont's work it was found that the aqueous distillate from the unheated oil gave the reaction, but that this was not the case with oil heated to 260° C.

On the whole, the authors consider that the evidence is in favour of the presence of sulphur compounds.—C. A. M.

Cholesterol and Phytosterol in Fats; Quantitative Determination of ——. E. Ritter. Zeits. physiol. Chem., 1902, **34**, 430. Chem. Zeit., 1902, **26**, Rep. 100.

FROM the results of comparative experiments on one and the same sample of fat, the author asserts that the product separated by the following method is purer than that obtained by any of the other methods, although it is not absolutely pure:—

About 50 grms. of the fat are heated in a large basin with 100 c.c. of alcohol upon the water-bath, and saponified by the introduction of a hot solution of 8 grms. of sodium in 160 c.c. of 99 per cent. alcohol. After evaporation of the alcohol, about 75 grms. of sodium chloride are added, together with sufficient water to dissolve the contents of the basin. The solution is then evaporated to dryness with continual stirring, and the residue dried at 80° C., pulverised, and left for some time in an exsiccator. It is next extracted with ether in a Soxhlet apparatus, the extraction requiring about nine hours. The glycerin settles to the bottom of the extraction flask. It can be separated, together with any traces of soap, by transferring the ethereal extract to a large flask, and shaking several times with fresh portions of ether, during which process the bulk of the glycerin adheres to the sides of the flask.

After evaporation of the ether, the residue is dissolved in a very small quantity of alcohol, and water introduced little by little, with continual shaking. The precipitate is washed with water on a filter, and dried at 60° C. It is then transferred to a weighed flask with the aid of ether, the latter evaporated, and the residue dried at 100°—120° C. and weighed. It is stated that the results thus obtained are more than 1 per cent. higher than those given by Bömer's method. (This Journal, 1898, 954; 1899, 301; 1901, 1147.)—C. A. M.

Tanning Materials; Commercial Valuation of ——, *for Leather Manufacture.* F. Belzer. Monit. Scient., 1902, **16**, [4], 282—287.

THIS technical method for the examination of tanning materials, as regards strength in tannin and leather-forming qualities, is based upon the observation of densities by means of a specially delicate hydrometer, graduated in hundredths of a degree Baumé, and containing within it a centigrade thermometer reading from 5°—40°. A suitable solution or liquor is made from a known weight of the material, and its density observed as nearly at 18° C. as possible, after any deposit formed has settled out. It is then boiled with sufficient zinc oxide, filtered, made up to its original volume at 18° C., and again tested with the hydrometer. The loss of density gives, by the help of Table I. (*vide infra*), the amount of tannin in the given weight of material. A second

TABLE I.

Baumé Degrees.	Tannin in 1,000 c.c. of Distilled Water.	Baumé Degrees.	Tannin in 1,000 c.c. of Distilled Water.
	Grms.		Grms.
0·055	1	0·620	11
0·125	2	0·670	12
0·170	3	0·715	13
0·225	4	0·760	14
0·270	5	0·820	15
0·310	6	0·880	16
0·395	7	0·940	17
0·450	8	1·000	18
0·505	9	1·065	19
0·555	10	1·130	20

lot of liquor is prepared in the same way, and strips of prepared hide or skin, freed from moisture as far as possible, are immersed in it, and left until three successive observations show no further loss of density. The difference from the original density shows the amount of tannin assimilated by the raw hide, and other observations as to the behaviour of the liquor and the character of the leather formed are made during the tanning process. The following table gives the density due to various quantities of pure oak-bark tannin (ether-extracted) when dissolved in distilled water at 18° C.

Table II. shows the variations of density from the normal, when the temperature of the liquors is other than 18° C.

Table II.

Baumé Degrees.	Centigrade Degrees.	Baumé Degrees.	Centigrade Degrees.
+ 0·040	20	− 0·030	17
+ 0·020	19	− 0·045	16
+ 0·010	18·5	− 0·08	15
0·000	18	− 0·095	14
− 0·010	17·5	− 0·100	13

In both tables, intermediate values can be calculated by interpolation.

Examples: Valonia.—20 grms. were extracted with boiling water and made up to 1 litre at 18° C. The density, after standing, was 0·520° B. = 9·4 grms. of tannin, or 47 per cent. of soluble matter (chiefly tannin).

Chestnut extract, of density 20° B. at 12·5° C.—100 c.c. were diluted to 2,000 c.c. without producing any deposit. Density of this at 19° C. = 1·08° B., which, corrected by Table II., becomes 1·10° B. One litre was boiled with 30 grms. of zinc oxide, filtered, cooled, and made up to 1,000 c.c. The density of this was 0·12° B. at 18° C. Loss of density = 0·98° B. = 17·6 grms. of tannin, or 35·2 grms. per 100 c.c. of original extract. Analytical tests showed that the whole of the tannin had been removed. The density of the original liquor, after treatment with hide in the way described, was 0·4° B. at 14° C., or 0·3° at 18° C., and the loss of density 0·8° B., which represents 14·66 grms. of assimilable tannin, or 29·32 grms. per 100 c.c. of extract. The appearance of the leather was very satisfactory.

Quebracho extract, of density 26° B. at 12° C., syrupy, and with an odour of creosote.—100 c.c. diluted to 3 litres, formed a copious deposit. The density of the liquor was 1·05° B., and became 1·52° B. after treatment with zinc oxide, so that the amount of tannin cannot be estimated by this method. The loss of density by hide treatment was 0·53° B., equivalent to 9·5 grms. of tannin, or 28·5 grms. per 100 c.c. of the original extract. The appearance of the leather was much against the use of this extract.

Chestnut extract, of density 26° B. at 10° C.—100 c.c. were made up to 3 litres, and gave a considerable deposit. The loss of density by zinc oxide indicated 46·5 grms. of tannin per 100 c.c., whilst the loss of density by hide showed 36·6 grms. of leather-forming constituents per 100 c.c. of extract.

Oak-bark extract, of density 25° B. at 9° C.—100 c.c. were made up to 3 litres, and formed a small deposit. Loss of density by zinc oxide = 46·65 grms. of tannin per 100 c.c. Loss of density by hide absorption = 35·4 grms. of tannin per 100 c.c. The quality of the leather was excellent.

Chestnut extract, of density 20° B. at 10° C.—Amount of tannin found per 100 c.c.: By zinc oxide treatment = 34·5 grms.; by hide absorption = 29·82 grms., the leather being of excellent quality.

The author concludes that tannins of the quercitannic series (oak, chestnut, and hemlock) are most suitable for leather manufacture, and considers that liquid extracts should not be concentrated beyond 20° B., otherwise insoluble products appear in making the tan liquors.

—R. L. J.

Cane Sugar in Preserved Fruits containing Glucose; Determination of ——. O. Schrefeld. Zeits. Vereins. Deutsch. Zuckerind., 1902, **52**, [554], 204—206.

Solutions containing 0·02 to 0·10 grm. of pure invert sugar, both with and without the addition of enough diluted glucose syrup to give an equal reduction of copper with the invert present, were examined. The results showed that the reducing power of the invert sugar was considerably affected by the presence of the glucose, so that the determination of cane sugar in the presence of glucose by this means is open to suspicion.

The copper method is only to be preferred to the optical if the assumption holds that the results are more exact.

As the quantity of dextrin in glucose varies, its influence cannot be eliminated by a definite formula. It would be better to have recourse to the optical inversion method, which offers results at least as exact, if not more exact, is convenient, and must be employed in making a qualitative test to find if glucose is present along with cane sugar.

—L. J. de W.

Morphine in Opium; Reichard's Method for the Determination of ——. P. Schidrowitz. Analyst, 1902, **27**, [313], 117.

Reichard has recommended (this Journal, 1901, 1149) the determination of morphine in opium by weighing the metallic silver obtained by the reducing action of the alkaloid on an ammoniacal silver chloride solution. If other reducing substances are present, the alkaloids are precipitated by ammonia, filtered off, and the amount of silver reduced by the filtrate determined, this amount being subtracted from the total amount of reduced silver. The author has examined the method, working with a good average Persian opium containing 10·98 per cent. of morphine. It was found that if Reichard's instructions were followed, it was, owing to the formation of colloidal silver, practically impossible to satisfactorily wash the precipitated silver; this difficulty was overcome by using a 20 per cent. solution of ammonium chloride (with the addition of a little ammonia) as wash liquor. The latter, contrary to Reichard's experience, the author found that, after precipitation with ammonia and filtration, the filtrate exercised a strong reducing action on the reagent, and here also it was necessary to make use of a liberal amount of ammonium chloride (added to the liquor before filtration), in order efficiently to filter and wash the precipitate. With 2 grms. of opium the following results were obtained:—

Table I.

Direct Method.

No. of Experiment.	No. of c.c. of Silver Solution.	Weight of Precipitated Silver.	= Morphine.
		Grm.	Per Cent.
1	5	0·15049	10·54
2	7	0·21189	14·85
3	8	0·25369	17·77
4	16	0·39609	27·75
5	30	0·29929	20·98

Table II.

Results after Precipitation with Ammonia.

No. of Experiment.	No. of c.c. of Silver Solution.	Weight of Precipitated Ag.
6	5	0·1459
7	10	0·2591
8	20	0·2189

The results show that, at any rate in its present form the method is valueless, the results, up to a certain point appearing to be dependent, not on the morphine content but rather on the quantity of silver solution employed.

—A. S.

es in Pharmaceutical Preparations; Identification and Detection of ——. E. Léger. J. Pharm. Chim., 1902, 5, [7], 335—341.

tection of Aloes.—Klunge's test, applied as follows, may employed: 0·5 grm. of the aloes is dissolved in 100 c.c. warm distilled water, the solution rapidly cooled in a eam of cold water, and the separated resin filtered off the aid of a little talc. 20 c.c. of the filtrate are heated the water-bath to 80° C. and a few decigrammes of ium peroxide added. A brown colour is produced, ich gradually changes to a bright cherry-red as more oxide is added. It is stated that by this reaction, 0 grm. of aloes in 100 c.c. of the solution can be detected. he reaction be faint, the coloured liquid should be acidu- d with HCl, agitated with ether, and the ethereal solu- n washed with 2 or 3 c.c. of dilute NaOH solution, when characteristic cherry-red reaction will be more pro- nced.

Distinction of Barbados and Curaçoa from Cape and ocotrine Aloes.—20 c.c. of the above aqueous filtrate are ated with one drop of a saturated solution of $CuSO_4$; rm. of pure crystalline NaCl is then added, the floccu- t precipitate which forms being disregarded, and, finally, c.c. of 90 per cent. alcohol. *Cape* and *Socotrine Aloes* e a wine-red colour, which gradually fades in an hour to ermanent yellow tint. *Barbados* and *Curaçoa Aloes* also e a bright currant-red colour, which is permanent for hours.

Detection of Aloes in Pharmaceutical Preparations.— nen no other drug giving similar reactions is present in enical preparations, the first of the above tests is avail- e. If, however, rhubarb or other purgative drugs, such cascara or buckthorn barks, be present, containing oxy- thyl-anthraquinones and their glucosides, these may precipitated by means of basic lead acetate, which does completely precipitate amorphous aloins from dilute utions, but removes the other bodies. An amount of the mple containing approximately 1 grm. of aloes is taken, d in the case of a liquid is evaporated to dryness on the ter-bath, and dissolved in 100 c.c. of hot water. After idly cooling, a slight excess, five or six drops, of solution basic lead acetate is added, and the precipitate filtered ; the excess of lead is then precipitated with a little ute sulphuric acid, and the solution again filtered. In c.c. of the filtrate, after neutralisation, the reaction of nge, as applied above, gives a marked reaction in the sence of aloes. In the case of tinctures, however, and er alcoholic preparations which have been kept for some e, the reaction is not obtained, since, as pointed out by rschsohn, they undergo decomposition and lose aloin. If only rhubarb accompanies the aloes in a galenical mpound, alum, instead of basic lead acetate, may be used remove the emodin. To 50 c.c. of the filtered aqueous ution 20 c.c. of 5 per cent. solution of alum is added, n excess of ammonia, and finally a very slight excess of tic acid. After filtration, 20 c.c. of this solution may be ated with sodium peroxide as above.—J. O. B.

la Nut and its Fluid Extract; Determination of the Alkaloids of ——. J. Warin. J. Pharm. Chim., 1902, 5, [8], 373—377.

e author gives the following method for the determination he bases in the liquid extract of kola :—Evaporate the hol from 15 c.c. on the water-bath, then triturate with grms. of calcined magnesia and 2 grms. of water, and w to stand. Transfer to a flask, add 150 grms. of roform, weigh, boil under an inverted condenser for minutes, let cool, add chloroform to make up the original ght, shake, and filter. Then evaporate 100 grms. of the ate in a deep dish to constant weight. The residue, tiplied by 10, gives the percentage of crude alkaloids. difference between the weight of the crude and purified aloids from the fluid extracts is negligible, but this is not case with the bases obtained directly from the powdered which must be purified. The crude alkaloids are dissolved ydrochloric acid, the solution filtered, the bases liberated ammonia and extracted by shaking three times with oform.

In the case of powdered kola, 15 grms. are triturated with 10 grms. of magnesia and 15 grms. of water, the mixture allowed to stand, and then treated with chloroform as above.

If lime is used in place of magnesia, the results are about 0·1 per cent. higher. The violent bumping in boiling with chloroform, which is produced by lime, is avoided with magnesia.—A. C. W.

Allyl Iso-sulphocyanate [*Essential Oil of Mustard*]; *Determination of* ——, *in Commercial Products.* Roeser. Répertoire de Pharm., 14, [3], 116.

To determine the amount of allyl iso-sulphocyanate in commercial essential oil of mustard, 5 c.c. of a 1 per cent. solution in alcohol (95 per cent.) are taken. To this are added 10 c.c. of ammonia; the mixture is then diluted with water, and 20 c.c. of N/10 $AgNO_3$ solution added, and the whole shaken, and allowed to stand for 24 hours. The volume is then adjusted to 100 c.c., and the precipitate filtered off. 50 c.c. of the filtrate are treated with 5 c.c. of N/10 KCN solution, and the excess of KCN titrated back with N/10 $AgNO_3$ solution, using a slightly ammoniacal 5 per cent. solution of KI as an indicator. The number of c.c. of solution of silver nitrate used up, in the first instance, in the 50 c.c. taken, multiplied by 2, gives the amount precipitated in the original 100 c.c. This number, multiplied by 0·3137, gives the equivalent of allyl iso-sulphocyanate, this figure being based on the mean percentage of 30 for sulphur in mustard oil.

To assay mustard flour and similar preparations, 5 grms. are treated with 60 c.c. of water and 15 c.c. of alcohol (60 per cent.). After leaving in contact for two hours, the mixture is distilled into a flask containing 10 c.c. of solution of ammonia, until two-thirds have come over. 10 c.c. of N/10 $AgNO_3$ solution are then added, the volume of the liquid adjusted to 100 c.c., and the process continued as above.—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Carbonates; Action of Hydrogen Peroxide on ——. P. Kazanezky. J. Russ. Phys. Chem. Soc., 1902, **34**, [2], 202—201.

Five grms. of freshly prepared ammonium carbonate were dissolved in 40 c.c. of 20 per cent. hydrogen peroxide, and the solution, after cooling in ice, mixed with 5 c.c. of aqueous ammonia saturated at 0°. The addition to the liquid of 2—3 volumes of alcohol then gave a white crystalline precipitate of a salt having the constitution $NH_4.O.O.CO.ONH_4 + 2H_2O$. The salt is readily soluble in water, by which it is almost completely decomposed into hydrogen peroxide and ammonium carbonate.—T. H. P.

Phosphates; Action of Hydrogen Peroxide on ——. G. I. Petrenko. J. Russ. Phys. Chem. Soc., 1902, **34**, [2], 204—207.

When acted on by hydrogen peroxide, phosphoric acid does not yield a corresponding hyper-acid, but its salts give compounds in which the metal is partially replaced by the residue of a metallic peroxide. Thus, sodium phosphate gives rise to the compound $PO(NaO)(NaO_2)_2 + 6\frac{1}{2}H_2O$, which is readily decomposed by water, with formation of hydrogen peroxide. It is probable that ammonium phosphate forms a similarly constituted compound, but this could not be isolated owing to the readiness with which it loses ammonia and oxygen; bodies were separated in which the ratio $P:O:NH_3$ had the values 5:8:14 and 2:3:5.

—T. H. P.

Hydrogen Peroxide; Behaviour of ——, *with Certain Salts.* P. G. Melikoff. J. Russ. Phys. Chem. Soc., 1902, **34**, [2], 207—210.

The compounds obtained by the action of hydrogen peroxide on various salts are of three kinds:—(1) Compounds of hyper-acids with hydrates of metallic oxides. (2) Compounds of normal acids with metallic peroxides. (3) Compounds of hyper-acids with metallic peroxides. From a consideration of the work described in the preceding papers, and of his own work with Pissarjewsky, the author draws the following conclusions:—The elements of the

fourth group, having high atomic weights, yield hyper-acids with hydrogen peroxide; this is also the case with the low atomic weight element, boron, the oxide of which has both basic and acid properties; elements with acid properties only yield hyper-acids by means of electrolysis of their salts.—T. H. P.

Borates of Hydrazine. A. Djavachoff. J. Russ. Phys. Chem. Soc., 1902, **34**, [2], 227—230.

When boric acid solution is neutralised with hydrazine hydrate, and the liquid evaporated partially on the water-bath and afterwards allowed to stand in a desiccator over sulphuric acid, rhombic crystals are deposited which have the composition $(N_2H_4)_2.(H_2B_4O_7)_3.10H_2O$, and rapidly effloresce in the air. When kept in a vacuum over sulphuric acid until they attain a constant weight, these crystals lose water, the final composition being $(N_2H_4)_2.(H_2B_4O_7)_3.5H_2O$. On heating at 100°, the remaining $5H_2O$ are given up, whilst at 250°—260° the compound assumes the composition $(N_2H_4)_2.(B_2O_3)_6$. When heated above 260°, this last substance melts, and is decomposed into hydrazine and boric anhydride. Attempts to prepare other crystalline borates of hydrazine than the above have failed.—T. H. P.

Gold; Action of Selenic Acid on ——. V. Lenher. J. Amer. Chem. Soc., 1902, **24**, [4], 354—355.

The selenic acid used in the author's experiments was prepared by fusing selenium dioxide with potassium nitrate, dissolving the selenate in water, precipitating it with lead nitrate, and decomposing the lead selenate by means of hydrogen sulphide. The dilute selenic acid thus obtained free from halogen compounds was concentrated on the water-bath.

It was found that, in a moderate degree of concentration, selenic acid had apparently no effect upon gold leaf in the cold, but when the acid was used in a hot (230°—300° C.) and more concentrated condition, the gold was dissolved, yielding a reddish-yellow solution of auric selenate, $Au_2(SeO_4)_3$, whilst selenium dioxide was evolved. In most respects the action of the selenic acid resembled that of sulphuric acid upon copper, though without the formation of complicated products like those described by Baskerville (this Journal, 1896, 201).

Gold selenate forms small yellow crystals, which dissolve in hot concentrated selenic acid, yielding a yellowish-red solution, from which the selenate separates again on cooling. It is soluble in sulphuric and nitric acids, and is decomposed by hydrochloric acid, with the formation of auric chloride and selenious acid, whilst chlorine is evolved. Being insoluble in water, it can be completely precipitated from its solution in selenic acid by dilution with water. It is decomposed by heat, yielding metallic gold, and also by exposure to light, changing in colour to dark green and then bronze.

The author points out that selenic acid dissolves all the metals of the sub-group B in the first group of the periodic system, selenium dioxide being evolved and the respective selenates formed. The reactions between silver or copper and selenic acid are analogous to those that occur in the case of gold.—C. A. M.

Gold Telluride; Investigation of Naturally Occurring ——. V. Lenher. J. Amer. Chem. Soc., 1902, **24**, [4], 355—360.

It is commonly accepted that gold occurs in nature either in the metallic form or in combination with tellurium. In order to determine the constitution of these so-called tellurides of gold, the author has made a series of experiments on their behaviour, compared with that of elementary tellurium, upon gold. He finds that tellurium precipitates gold quantitatively from its solutions, and that it has a similar though less complete reducing action upon silver salts. The natural tellurides, however, also cause the reduction of gold—a fact which speaks against their being definite chemical compounds of gold and tellurium. Moreover, they all lose their tellurium on treatment with reagents such as sulphur chloride, which would be unlikely if they were in chemical combination.

It is also pointed out that native gold is often found in the same mines as the tellurides, and that it is possible to extract the tellurium from the latter, leaving the gold as a residue.

Various attempts were made to prepare gold telluride, but without success.

Taking all facts into consideration, the author has come to the conclusion that there is great reason to doubt whether the telluride minerals are chemical compounds.—C. A. M.

Protein Substances; Action of Nascent Chlorine on —— R. Ehrenfeld. Zeits. physiol. Chem., **34**, 566—579; Chem. Centr., 1902, **1**, [13], 764.

The author, in conjunction with Habermann, has previously described (Zeits. physiol. Chem., **32**, 467) a chlorinated derivative of casein obtained by adding potassium chlorate to a solution of casein in 5 per cent. caustic potash, passing in hydrochloric acid gas till a yellow solution is produced, and finally precipitating the chlorinated casein by the addition of water. The method has now been applied to other protein substances. The products obtained resembled the casein derivative, and, like the latter, were soluble in warm alcohol (especially in presence of hydrochloric acid) and in glacial acetic acid. The following analytical results were obtained:—

Chlorinated Derivative of	C.	H.	N.	Cl.	O.
	%	%	%	%	%
Egg albumin	46·33	5·46	10·11	6·51	31·59
Serum albumin	52·23	6·54	6·43	8·95	25·89
Vitellin (from yolk of egg)	47·02	5·76	9·67	10·60	27·54
Legumin	51·77	6·16	7·96	9·63	24·37
Casein	43·36	5·50	12·38	13·58	25·19

All the products were quite free from sulphur. On distilling with magnesia, they gave ammonia, and on heating at 100° C. under pressure with bromine and water bromoform and bromanil.—A. S.

Hydro-aromatic Series; Synthesis in ——, *under the Action of Zinc Chloride.* J. Kondakow. J. prakt. Chem., 1902, **65**, [5 and 6], 201—238.

Those ethylene hydrocarbons, which contain a tertiary carbon atom at the double bond, unite with organic acids in the presence of zinc chloride to form esters. Among reduced aromatic compounds, tetrahydrotoluene, menthene, menthene, and carvomenthene do not give esters by this process, whilst camphene and fenchene do; the three former hydrocarbons doubtless have the double bond in the nucleus; thus camphene and fenchene must have a different constitution and contain the double bond in a side chain. This method of esterifying hydro-aromatic hydrocarbons with the ethylene linkage in the side chain is better than the process of Bertram and Walbaum. Camphene and fenchene consist of two isomerides, one of which is not esterified by this method, and therefore contains the double bond in the nucleus. Camphene contains only a very small quantity of this non esterifiable isomeride; fenchene contains a larger quantity, which could be isolated; its properties are described in Chem.-Zeit., 1901, No. 13. The alcohol obtained by saponification of the isofenchyl esters melted at 61·5° C., and had the specific rotation $[\alpha]_D = +45° 40'$.

The mixture of secondary and tertiary haloid anhydrides (the latter predominating) obtained from secondary hydro-aromatic alcohols, by loss of the haloid acid produces a mixture of hydrocarbons corresponding to each of the haloid derivatives. The tertiary halogen derivatives more readily lose the haloid acid than the secondary.

The author has now observed that hydro-aromatic compounds of various functions, which have a double bond in the ring and in the side chain, aromatic compounds with an unsaturated side chain, and also fatty compounds with multiple bonds, can react, in the presence of zinc chloride with acids, acid chlorides, acid anhydrides, and alkyl halides.—A. C. W.

Trade Report.

I.—GENERAL.

Modifications of the French Patent Law.

Bulletin Officiel de la Propriété Industrielle et Commerciale, April 7, 1902.

Law Modifying certain Articles of the Law of July 5, 1844, Concerning Patents of Invention.

The Senate and the Chamber of Deputies have adopted ud the President of the Republic promulgates the law, the enour of which is as follows:—

Art. 1.—Arts. 11, 24, and 32 of the Law of July 5, 1844, ne last already modified by the Law of May 31, 1856, are iodified as follows:

Art. 11.—Patents, for which application shall have been iade in due order, shall be granted without previous xamination, at the risk of the applicants, and without uarantee as to the reality, novelty, or merit of the invention, r as to the exactness of description. A ministerial order, stablishing the regularity of the application, shall be granted o the applicant, and shall constitute the patent of invention. o this order shall be added a printed copy of the descrip- on and designs mentioned in Art. 24, after its conformity ith the original document has been recognised and stablished, in case of need. The first issue of patents shall e made free of expense. Any further issue required by he patentee or his assignees, shall be made on payment of fee of 25 francs. The costs of designs, if there be the atter, shall be charged to the grantee. Delivery shall be iade not more than one year after the day of depositing ie application, if the said application contain a request xpressly to that effect. The benefit of the preceding pro- ision cannot be claimed by those who have already profited y the delays of priority accorded by reciprocity treaties, specially by Art. 4 of the International Convention for the rotection of industrial property, of March 20, 1883.

Art. 24.—Descriptions and designs of all patents of ivention and additional patents shall be published *in extenso*, i separate copies, in the order of registration. This publica- on, relating to the descriptions and designs of patents, for ie granting of which the delay of one year, referred to in rt 11, shall have been required, will only take place at the xpiry of this delay. A list of patents of invention granted hall also be published. An order of the Minister of Com- ierce and Industry shall determine (1) the conditions of orm, dimensions, and wording which the descriptions and esigns must fulfil, as well as the price of printed copies, and ie conditions of publication of the list; (2) the conditions o be fulfilled by those who, having deposited an application or a patent in France, and desiring to deposit similar pplications abroad before the delivery of the French patent, hall wish to obtain an official copy of the documents elating to their application in France. Each issue of this ature shall require the payment of a fee of 25 francs. The osts of designs, if there be such, shall be charged to the rantee.

Art. 32.—The patent shall be void—

(1) If the patentee shall not have paid his annual fee efore the beginning of each year of the duration of his atent.

The patentee shall, however, be granted a delay of three ionths at the utmost, in order that he may validly make ayment of his annual fee; but he must pay, in addition, a upplementary fee of 5 francs, if he make payment in the rst month; of 10 francs, if he make payment in the second ionth; and of 15 francs, if he make payment in the third ionth. This supplementary fee shall be paid at the same me as the overdue annual fee.

(2.) If the patentee shall not have worked his discovery r invention, in France, within a period of two years, dating om the day of signing the patent, or shall have ceased to ork it during two consecutive years, unless, in either case, e show cause for his inaction.

(3.) If the patentee shall have introduced into France rticles manufactured abroad, and similar to those covered y his patent.

Nevertheless, the Minister of Commerce and Industry may authorise the introduction of—

(1.) Models of machines.

(2.) Articles manufactured abroad, destined for public exhibitions, or for trials made with the assent of the Government.

Art. 2.—In conformity with the provisions of Art. 24 cited above, there shall be published the descriptions and designs of patents of invention and of additional patents, which shall have been applied for since Jan. 1, 1902. The present law, deliberated upon, and adopted by the Senate and the Chamber of Deputies, shall be put into force as a law of the State.

Paris, April 7, 1902. (Signed) Emile Loubet,
President of the Republic.

(Signed) A. Millerand,
Minister of Commerce, Industry,
Posts, and Telegraphs.
—H. S. L. P.

Mines and Quarries: General Report and Statistics for 1901.

Home Office Report, 1902.

The preliminary report of the Inspectors of Mines of Great Britain gives the production of the mines of the United Kingdom for 1901.

The figures for the mines working under the Coal Mines Act are as follows, in long tons:—

Mineral.	1900.	1901.
Coal	225,170,163	219,037,240
Clay and shale	181,686	140,067
Fireclay	2,814,676	2,834,997
Iron pyrites	9,078	7,661
Iron ore	7,667,578	6,849,926
Limestone	28,064	27,715
Oil shale	2,282,221	2,334,350
Petroleum	..	8
Sand	2,215	..
Sandstone and ganister	105,594	91,254
Total tons	238,291,275	231,343,224

The coal production shows a decrease for the first time in several years. This decrease was 2·7 per cent., and was due partly to lighter exports, but, in a greater degree, to a smaller demand from the blast furnaces and iron works.

The return for the mines operated under the Metalliferous Mines Act is as follows, also in long tons:—

	1900.	1901.
Arsenic	4,031	3,361
Arsenical pyrites	9,573	2,578
Barytes	27,456	26,413
Bauxite	5,779	10,191
Chalk	10,214	4,564
Chert and flint	3,721	2,976
Clay and shale	111,570	104,907
Copper ore and precipitate	9,488	6,792
Fluorspar	1,413	4,164
Gold ore	20,802	16,374
Gypsum	152,720	151,190
Igneous rocks	97,698	98,912
Iron ore	1,863,714	1,671,025
Iron pyrites	3,201	2,577
Lead ore	31,985	26,970
Limestone	589,042	512,158
Manganese ore	1,362	1,646
Ochre, umber, &c.	4,270	5,228
Rock salt	159,860	151,342
Sand	27,026	11,863
Sandstone	258,346	230,604
Slate	166,695	154,324
Tin ore (dressed)	6,000	6,542
Uranium ore	41	79
Wolfram	8	18
Zinc ore	24,675	23,582
Total, tons	3,590,650	3,230,565

The report says:—"In examining the statistics of output given in these tables, it must be borne in mind that the figures do not in all cases represent the total production of

the minerals for the year. Large quantities of several important minerals—such as iron ore, limestone, sandstone, slate, clay, &c.—are obtained from quarries, under the Quarries Act, and from other open workings, the returns from which are not yet available. The totals for coal and for the ores of copper, lead, and zinc may, however, be regarded as substantially complete.

United States Statistics for Manufacturing Establishments Allied to Mining.

Census Bulletin 150—*March* 14, 1902.

Capital Invested.

	1890.	1900.	Increase. Amount.	Per Cent.
	Dols.	Dols.	Dols.	
Chemicals (acids, bases and salts).	55,032,452	89,091,430	34,058,978	61·9
Explosives	13,539,478	19,465,846	5,926,368	43·8
Fertilisers	40,594,168	60,685,753	20,091,585	49·5
Clay products	108,705,670	147,913,323	39,207,653	36·1
Coke	17,462,720	36,502,670	19,039,950	109·0
Gas, illuminating and heating.	258,771,795	567,000,506	308,228,711	119·1
Glass	40,966,850	61,423,903	20,457,053	49·9
Iron and steel	405,771,786	580,041,710	174,269,924	43·0
Petroleum, refining	77,416,296	95,327,892	17,911,596	23·1
Salt	13,437,749	27,123,364	13,685,615	101·8
Shipbuilding, iron and steel.	7,769,066	59,839,555	52,069,589	670·1
Total	1,039,468,939	1,743,415,961	704,947,022	67·8

Wages Paid (not including salaries).

Chemicals (acids, bases and salts).	7,308,411	9,401,467	2,093,056	28·6
Explosives	1,240,502	2,383,756	1,143,254	92·2
Fertilisers	3,417,870	4,185,289	767,419	22·5
Clay products	38,578,889	39,534,070	955,681	2·5
Coke	4,072,632	7,085,736	3,013,104	74·0
Gas, illuminating and heating.	8,493,625	12,430,296	3,936,671	46·3
Glass	20,885,961	26,529,748	5,643,787	27·0
Iron and Steel	89,273,956	122,710,193	33,436,237	37·5
Petroleum, refining	5,872,467	6,717,087	844,620	14·4
Salt	1,593,412	1,911,140	317,628	19·9
Shipbuilding, iron and steel.	4,537,930	16,231,311	11,693,381	257·7
Total	185,281,185	249,126,093	63,844,908	34·4

Value of Products.

Chemicals (acids, bases, and salts).	59,352,548	62,676,730	3,324,182	5·6
Explosives	11,352,615	17,125,418	5,772,803	50·8
Fertilisers	39,180,844	44,657,385	5,476,541	14·0
Clay products	89,827,785	95,443,862	5,616,077	6·3
Coke	16,198,315	35,285,145	19,087,100	115·7
Gas, illuminating and heating.	56,987,290	75,716,693	18,729,403	32·9
Glass	41,051,004	56,539,712	15,488,708	37·7
Iron and steel	478,687,519	835,759,034	357,071,515	74·6
Petroleum, refining	85,001,198	123,929,384	38,928,186	45·8
Salt	5,484,618	7,966,897	2,482,279	45·3
Shipbuilding, iron and steel.	12,929,953	50,367,739	37,437,786	289·5
Total	896,353,719	1,405,768,299	509,414,580	51·2

II.—FUEL, GAS, AND LIGHT.

Acetylene in Bueno Ayres (Argentina).

Foreign Office Annual Series, No. 276.

There is an opening in Buenos Ayres for acetylene gas, with installations of simple and effective character. In 1900, 590 tons of calcium carbide were imported, and 400 tons, in 1901. There is a factory in Cordoba producing, by means of electricity, some 400 tons, all of which is used in the country.

Natural Gas in the Central United States.

Foreign Office Annual Series, No. 2763.

Natural gas is piped to Chicago, and is used in hous for heating and cooking, in large buildings for heating, an to a certain extent, in a few factories. This gas all com from Indiana.

Illinois, Kansas, Missouri, and South Dakota are also g producers. In Kansas and Missouri, gas is much used smelting zinc. The supply in the older fields is gradual decreasing.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Mineral Oil Discoveries in Western Australia.

Bd. of Trade J., April 17, 1902.

It is reported in *Australasian Hardware and Machiner* for the 1st ult., that a mineral oil deposit has been di covered near the mouth of the Warren River, in Weste Australia. Two prospectors, sent from Perth for t purpose of investigating the coast line between Cap D'Entrecasteaux and Leeuwin, found quantities of asphaltu thrown up by the tide near the mouth of the river, whilst a another point, oil was discovered floating on the surface the sea. The oil proved to be a mineral oil, whilst the soli specimens have been declared to be a very rich asphaltu low in mineral matter and highly bituminous. A little wa inland, shales and rock are found, showing surface satura tions of an oily character. The Government has allotte an area of land to the prospectors, and a company has bee formed to test the ground. Bridgetown, about 60 mile distant, is the nearest railway station to the scene of th discovery.

Oil in the Central United States.

Foreign Office Annual Series, No. 2763.

Oil is found in Illinois, Missouri, Kansas, Indian Territory Colorado, and Wyoming. In the last State, there are t distinct pools, but, as yet, very little development has take place, owing to the distances from railroads.

IV.—COLOURING MATTERS, Etc.

Indigo in the Netherlands.

Foreign Office Annual Series, No. 2671.

The total importation of indigo into the Netherland from Java, in 1901, amounted to 3,350 chests, of whic about one-half came to Amsterdam. At the beginning o the year, trade was dull, but as it began to be seen that i spite of the threatening competition of the synthetic articl there was still an opening for the colonial product, th market gained firmness and prices, steadiness. The quota tions for superior sorts are 4*s.* 9*d.* to 5*s.* 1*d.*, per lb moderate qualities being also in fair demand. The price quoted by synthetic indigo manufacturers have bee gradually reduced, but colonial indigo can still hold it own.

VII.—ACIDS, ALKALIS, SALTS, Etc.

Borax in Turkey.

Chem. and Druggist, April 19, 1902.

The International Borax Trust has acquired the Panderm Mine, on the south coast of the Sea of Marmora. Th exportation of Turkish borax has not been profitable o late years, owing to competition with the South America product, and, in 1901, only 4,000 tons were exported.

Salt Industry of Buenos Ayres (Argentina).

Foreign Office Annual Series, No. 2767.

A large sum of money has been laid out to obtain th salt from the marshes near San Blas, in the southern portio of the province of Buenos Ayres. There is a large demand for salt for the dried meat establishments. This enterpris shou'd be profitable. There is a good demand, too, fo by-products, such as soda ash and caustic soda, &c.

The source from which the salt is obtained is a huge lake the water of which contains 25 to 30 per cent. of sal Borings have been made under and round this lake an

ve shown that there exists a large bed of rock salt. rough this several springs force their way, the water rrying up the salt with it. The water is run off into a ge tank, where it is allowed to settle before being lifted d forced through cast-iron pipes to the coast, 26 miles . During the latter part of the route, the brine runs by avity. It takes 10 days to flow from the lake to the ast, where it is deposited in another tank, whence it runs o the evaporating pans. The syndicate has a capital of 0,000*l.*, and, at present, can turn out 25,000 tons per num, but the output could be increased to 100,000 tons. ie Bay of San Blas is some 800 miles south of Buenos res. It has a deep channel leading to it and a sheltered chorage. A pier is being erected by the syndicate to ilitate the loading of their wares.

VIII.—GLASS, POTTERY, Etc.

Manufacture of Earthenware and China.

Parliamentary Paper, April 7, 1902.

raft Supplementary Special Rules for the Manufacture of Earthenware and China which may be proposed y Manufacturers giving certain undertakings as to the use of Lead, &c.

Draft Rule 23.—If the occupier of any factory to which ese rules apply gives an undertaking in writing either to effect that—

(*a*) No glaze shall be used which yields to a dilute solution of hydrochloric acid more than 5 per cent. of its dry weight of a soluble lead compound calculated as lead monoxide when determined in the manner described in Schedule B.,

to the effect that

(*b*) No ware shall be cleaned after the application of glaze by dipping or other process except in the moist condition;

Chief Inspector of Factories may, if satisfied that the ier conditions are sufficient for the safety of the persons ployed, approve in writing of the suspension in the tory, or part of the factory, of so much of Rule 10* as uires the provision of a fan, or other efficient means, to approved by the Secretary of State, for the removal of st in the process of ware-cleaning; and thereupon the d part of Rule 10* shall be suspended accordingly, and said undertaking shall be deemed to be a special rule ablished in the factory.

Draft Rule 24.—If the occupier of any factory to which se rules apply gives an undertaking in writing to the ct that no glaze shall be used which yields to a dilute ution of hydrochloric acid more than 2 per cent. of its weight of a soluble lead compound calculated as lead oxide when determined in the manner described in edule B, the Chief Inspector of Factories may, if sfied that the other conditions are sufficient for the ety of the persons employed, approve in writing of the ification of Rule 5* in so far as it applies to the processes lipping, drying after dipping, and ware-cleaning, in the tory, or part of the factory, by the substitution of 14 rs for 15 years of age; and thereupon Rule 5 shall be dified accordingly, and the said undertaking shall be med to be a special rule established in the factory.

Proviso.—Any approval granted under Rules 23 and 24 iable to revocation in case it shall appear to the Secre- y of State that, owing to the occurrence of lead poisoning any factory, such revocation is desirable.

ode of Testing the Quantity of Soluble Lead Compound in Glaze.

Draft Schedule B.—A weighed quantity of dried mate- s is to be continuously shaken for one hour, at the mon temperature, with 1,000 times its weight of an eous solution of hydrochloric acid containing 0·25 per t. of HCl. This solution is thereafter to be allowed to d for one hour and to be passed through a filter. The lead salt contained in an aliquot portion of the clear filtrate is then to be precipitated as lead sulphide and weighed as lead sulphate. (See also this Journal, 1901, 1258.)

The references are to Rules 5 and 10 of the rules established by award of Lord James of Hereford, dated December 30, 1901. se rules were laid before Parliament on February 6, 1902.

China, Earthenware, and Glass Trade of Chicago (United States).

Foreign Office Annual Series, No. 2763.

There was an increase in the direct imports of British china and earthenware of 1,000*l.*, in 1901, whilst the total imports to the United States of the same articles decreased by about 9,000*l.* At the increased value of the article, this would indicate a very small increase in quantity, if any. French, German, and American china and earthenware sold in much increased quantities in Chicago, and all fetched a higher price. The china and earthenware trade of Chicago amounted to about 2,000,000*l.* for the year.

The manufacture of cut glass is increasing very fast, and a new large factory is in construction.

IX.—BUILDING MATERIALS, Etc.

Cement in the Central United States.

Foreign Office Annual Series, No. 2763.

Much of the cement used, of which but little is imported, comes from Michigan and Indiana, but there are cement works in Illinois, Kansas, Colorado, and Missouri.

Besides these, the Illinois Steel Works manufacture cement from slag, which is roasted, air slaked, ground fine, and mixed with other substances. Great care has to be taken in the burning or roasting, and the cement produced is delivered in Chicago for about 5*s.* 6*d.*, in barrels or sacks per 380 lbs. net.

Pennsylvania and New York works supply the Eastern demand at 3*s.* 6*d.* to 4*s.* per barrel at the mills. Kansas, Michigan, Indiana, and Illinois mills supply the central part of the States, charging 4*s.* 4*d.* to 4*s.* 9*d.* at the mill, whilst the Colorado mills get higher prices, owing to the distance from other works and the cost of freight.

The annual consumption in the United States is over 17,000,000 barrels, of which 8,000,000 barrels are "Portland," and 2,000,000 barrels imported; but, in 1901, imports fell off one-half.

Two brands of imported cement, one Belgian and the other German, are used to some extent, and fetch from 11*s.* 4*d.* to 16*s.* 6*d.* per barrel. They are made from slag, and are known as non-staining cement, being free from oxide of iron.

The American cement is ground as fine as flour, and it is said that the coarse grinding of British cement is a great obstacle to its sale, even were prices the same.

Deposits of gypsum, which are shipped to Chicago from Michigan, for plastering houses, are now being worked.

Cement in Paraguay.

U.S. Cons. Reps., April 14, 1902.

There is a large consumption of Portland cement in Paraguay, as most of the houses are built of brick. One firm alone sells about 48,000 barrels per annum. People build very thick walls and cover the outside with cement.

The chief brands coming to this market are: Aguila, which comes in barrels of 120 kilos., and costs 1.50 dol. and 1.60 dol., laid down in Buenos Ayres; Cardinal, which comes in barrels of 100 kilos., and costs 1.70 dol. gold; Leon, which comes in barrels of 100 kilos., at 1.65 dol. gold; and Plato, in barrels of 100 kilos., at 1.50 dol. to 1.60 dol. This last class is quite inferior, and does not seem to be popular in this market.

Clays in the United States.

Foreign Office Annual Series, No. 2763.

Missouri produces china clay, fire clay, and terra-cotta to the value of 80,000*l.*; Illinois, fire-clay and terra-cotta, valued at 20,000*l.*; and Colorado and Winsconsin, small quantities of china and fire-clay. A quantity of terra-cotta is now being used for the new buildings in Chicago, as it does not absorb the soot.

X.—METALLURGY.

Copper Industry of Cape Colony.

Bd. of Trade J., April 24, 1902.

The *Cape Argus* of the 2nd inst. states that the Cape Government is to be asked to improve the transport facilities of Namaqualand, and a new line will probably be constructed to Pella, and joining at Piquetberg Road. Already Port Nolloth holds the fourth place in the value of exports from Colonial ports. The value of its exports, during 1900, amounted to 500,000*l.* sterling.

Copper ore first appeared among the exports from Cape Colony in 1852, with 31 tons, rising to 109 tons, in 1853, 1,085 tons, in 1854, and to 3,396 tons, in 1862. The exports of copper ore increased steadily from 3,540 tons, in 1863, to 30,223, in 1890, the aggregate quantity amounting to 671,931 tons, valued, for export registration at the port, at 10,977,120*l.*

Lead and Zinc in the United States.

Foreign Office Annual Series, No. 2763.

The United States production of lead was about 265,000 short tons. Colorado and Missouri increased their output. Missouri is the chief producer of soft lead. The mines lie in the south-east of the State, and are within an area of 30 miles by 3 miles. The ore is galena, and the output was about 50,000 tons, valued at 800,000*l.* In the south-west of Missouri, lead is found in the zinc ore.

The zinc production shows a small increase over the 123,381 tons produced in 1900. The Joplin district, of south-west Missouri and south-east Kansas, furnished about 63 per cent. of the total.

Zinc ore, assaying at 60 per cent., has been selling at 4*l.* 19*s.* to 5*l.* 3*s.* per ton, and the mine owners are endeavouring to produce a high grade ore, on account of its finding quicker sale. Some of the ores are high in pyrites, and magnetic separators are being tried with satisfactory results.

The Joplin district is very busy, and much exploring for ore is being carried on. Some ore has been exported to the United Kingdom, and it is expected that as much as 50,000 tons may be exported in 1902.

Mercury in Austria.

Foreign Office Annual Series, No. 2762.

Mercury has been recently discovered at Spizza, in Dalmatia, and it promises good results. A Commission has been appointed to study the question.

At Idria, about 1,200 workmen are in regular employment. The working day consists of eight hours, if in the mine, and ten hours, if outside. The mine produces annually about 800,000 quintals of raw material. Three blast furnaces exist. 5,000 quintals of pure commercial mercury is produced, and 460 quintals of cinnabar (vermilion) per annum. It would seem that the mines are not working quite satisfactorily, and the works may be closed.

Open-hearth Steel in the United States in 1901.

Bull. of Amer. Iron and Steel Assoc., April 10, 1902.

According to the report of the American Iron and Steel Association, the total production of open-hearth steel in the United States, during 1901, including direct steel castings, was 4,656,309 gross tons, an increase over the output for 1900 of 1,258,174 tons, or over 37 per cent. During the last four years, the American production of open-hearth steel has more than doubled, having increased from 2,230,292 tons, in 1898, to the figures given above for last year. The foregoing statement shows the production of open-hearth steel ingots and castings in the States named from 1898 to last year, both inclusive.

States.	1898.	1899.	1900.	1901.
	Gross Tons	Gross Tons.	Gross Tons.	Gross Tons.
New England	47,381	57,124	74,522	170,876
New York and New Jersey.	47,957	61,461	67,761	82,985
Pennsylvania	1,817,521	2,393,811	2,699,502	3,594,763
Ohio	79,886	117,458	130,191	184,943
Illinois	183,103	246,183	285,551	398,522
Other States	54,444	71,279	141,008	224,220
Total	2,230,292	2,947,316	3,398,135	4,656,309

In 1900, the American open-hearth steel production for the first time exceeded that of Great Britain, which then amounted to 3,156,050 tons, and was the largest output known. The American open-hearth steel made in 1901, was produced by 90 works in 14 States. In the previous year, 94 works in 17 States made open-hearth steel. The four States in which this steel was not produced, in 1901, were Maryland, Kentucky, Michigan and Minnesota, although all four were producers, in 1900. Rhode Island made open-hearth steel for the first time, in 1901. The output of open-hearth steel made by the basic process, in 1900, was 2,545,091 tons, and by the acid process 853,044 tons. In 1901, the output was: basic steel 3,618,993 tons; and acid steel, 1,037,316 tons. The following table gives the production in gross tons by States:—

States.	Basic Open-hearth Steel.	Acid Open-hearth Steel.	Total.
New England	87,529	83,347	170,876
New York and New Jersey.	46,805	36,180	82,985
Pennsylvania	2,840,230	754,533	3,594,763
Ohio	120,146	64,797	184,943
Illinois	353,395	45,127	398,522
Other States	170,888	53,332	224,220
Total	3,618,993	1,037,316	4,656,309

Of the above output for last year, 301,622 tons were open-hearth steel castings, of which 94,941 tons were made by the basic, and 206,681 tons by the acid process. In 1900, the output of open-hearth steel castings was 177,449 tons, of which quantity, 42,641 tons were made by the basic and 134,847 tons, by the acid, process. The production of open-hearth steel castings by the two processes, in 1901 by States, is given in the annexed tabular statement, in gross tons:—

States.	Acid Castings.	Basic Castings.	Total.
New England, New York, and New Jersey.	33,165	3,989	37,154
Pennsylvania	104,631	3,855	108,486
Ohio, Indiana, Illinois, and other States.	68,885	87,097	155,982
Total	206,681	94,941	301,622

Chrome Ore in Greece.

Foreign Office Annual Series, No. 2764.

Chrome ore is extracted in Thessaly, and worked and exported by the Greek owners of the property on which it is found; considerable consignments are annually shipped to the United Kingdom, the Continent, and America.

XII.—FATS, OILS, AND SOAP.

Linseed Crop of the World.

Chem. Trade J., April 19, 1902.

According to the *Crop Reporter*, published by the United States Department of Agriculture, the flaxseed crop of the world, for 1900, the latest year for which comprehensive figures are available, amounted to 64,466,500 bushels, against 61,726,600 bushels, in 1899, and 72,938,500 bushels in 1898. In 1900, Russia produced 32·06 per cent.

e world's crop; United States, 31·02 per cent.; India, ·61 per cent.; Argentina, 13·75 per cent., and all other ountries combined, 4·56 per cent.

The prices made upon flaxseed in the United States, in the op year 1900–1, were the highest in 20 years, the highest hicago quotation having been in July, 1901, when the price seed reached 1·90 dol. per bushel. The exports of axseed, in the fiscal year ended June 30, 1901, were 755,683 bushels, valued at 4,319,102 dols.; imports, during e same year, were 1,631,726 bushels, valued at 2,098,207 ols., leaving an excess of exports over imports of 1,128,957 ushels.

The quantity of oil that may be manufactured from a op of seed such as that of 1900 (20,000,000 bushels) is out 50,000,000 gals.; the quantity of oil-cake or oil-cake eal would be about 760,000,000 lb. The linseed oil anufactured in the United States practically all enters to home consumption, the average annual exports not xceeding 100,000 gals. The greater part of the oil ke and of the oil cake meal, on the other hand, is xported, the exports of this product, in the year ended ne 30, 1901, having been 455,154,866 lb., which may be cepted as approximately representing the exports of the l cake and meal made out of the 1900 crop. Of American inseed oil cake and meal, Germany, in the fiscal year ended ne 30, 1900, took about 33 per cent., and the United ingdom, 28 per cent., of the total exports.

The growing importance of Denmark as a purchaser of inseed cake is attracting attention. From taking less than ght per cent. of American exports, in 1895, in the year ded June 30, 1900, almost 23 per cent. were consigned to r. In the fiscal year 1899—1900, about 84 per cent. of e exports of oil cake and meal from the United States ere directed to Germany, the United Kingdom, and enmark, the remainder of the United States shipments ing purchased by Holland, Belgium, and France.

Linoleum in Kansas (United States).

Foreign Office Annual Series, No. 2763.

A fair trade in linoleum is carried on and might be veloped; floor matting is largely imported from Japan, d in many cases it would seem that the British linoleum ight replace these mattings.

Soap and Candle Material in Argentina.

Foreign Office Annual Series, No. 2767.

There appear to be openings for raw materials used in the anufacture of soap and candles. The greater part of the da ash and caustic soda comes from the United Kingdom, t none of the talc, little of the resin, and only a dimin-hing quantity of the palm oil and wick.

Earth Nuts in British East Africa.

Bd. of Trade J., April 17, 1902.

In the *East Africa and Uganda Mail* of the 15th ult., it stated that earth nuts can be grown with success in East frica.

Copra in Holland.

Foreign Office Annual Series, No. 2671.

Copra has greatly increased in importance in this market, t less than 40,740 tons being disposed of in Amsterdam, 1901. The importation, in Amsterdam alone, amounted 22,000 tons. A great diminution in the crops was re-rted, and as the consumption is steadily increasing, there as much activity in the market at rising prices. Copra l is a product which is in such demand, that if the dimi-shed supply of copra be not made up by larger crops and nportations, prices may probably still advance.

Quotations for copra, during 1901, ranged from 15*s.* per t., in January, to 18*s.* 10*d.* per cwt., in December, through steady advance, whilst copra oil rose from 2*l.* 6*s.* 7*d.* to 18*s.* 5*d.* per cwt.

Linseed Oil and Cake in the United States.

Foreign Office Annual Series, No. 2763.

There was an increase of over 20 per cent. in the linseed oil and cake manufactured, in 1901. The price of seed was higher than the average (4*s.* 9*d.*) of five years. The price of oil was steady during the year, selling at the mills for about 2*s.* 2*d.* a gallon. The export of cake increased by about 15 per cent.

XIII. B.—RESINS, VARNISHES, Etc.

Turpentine, Resin, and Wood Tar in the United States in 1901.

Foreign Office Annual Series, No. 2759.

Spirits of turpentine, resin, and wood tar are mainly produced by the States of Georgia, Florida, and Alabama, and also, to a smaller extent, by North and South Carolina, Mississippi, and Louisiana; North Carolina produces about 17,000 barrels of tar yearly.

According to official figures, the industry has largely increased in the past 10 years, the total capital now invested being 11,847,490 dols., and the number of establishments in operation, 1,503. The total value of the annual product is 20,344,888 dols., the last yearly product being 754,670 barrels of spirits of turpentine and 2,563,067 barrels of resin. Of this output, the United States consumed about 53 per cent. of the turpentine, and a little over 7 per cent. of the resin, the rest being shipped to foreign countries.

The total year's output of the different States in barrels of crude turpentine, with the value of the same, was as follows:—

States.	Quantity.	Value.
	Barrels.	Dollars.
North Carolina	331,720	1,055,695
South Carolina	190,095	787,656
Georgia	1,515,569	8,110,468
Florida	1,212,935	6,619,609
Alabama	373,005	2,033,735
Louisiana	22,229	115,324
Mississippi	354,529	1,772,135

The receipts and exports at Charleston from April 1, 1901, until December 31, 1901, and for the same period of 1900, were as follows:—Receipts last season were 2,185 casks of spirits of turpentine, and 7,836 barrels of resin, as compared with 2,017 casks of turpentine, and 14,246 barrels of resin, during the same period of 1900.

The total exports, from April 1 to December 1901, were 2,159 casks of turpentine, and 8,258 barrels of resin, as compared with 1,720 casks of turpentine, and 12,876 barrels of resin, during the same period of 1900, and the stock remaining on hand (and on shipboard), at the end of 1901, was 56 casks of turpentine, and 678 barrels of resin, as compared with 307 casks of turpentine, and 2,155 barrels of resin, in 1900. Of the exports last year, all of the turpentine went to New York and American ports, except 2,500 barrels of resin, to the United Kingdom, and 1,700 barrels of resin to Barcelona, Spain; there were no foreign shipments. During the same period of 1900, the only foreign shipments were 4,600 barrels of resin, to the United Kingdom, and 5,742 barrels, to Northern European ports.

Another step taken during the past year has been the experiments at Statesboro', Georgia, by Professor C. H. Herty, of the State University.

The object of these experiments is to develop better methods of manufacturing spirits of turpentine and resin, and to ascertain if there be a better way of extracting the gum from the pine tree, and also of its distillation. It is also expected to enlist the co-operation of the Government in the protection of the pine forests, which have heretofore been cut down without regard to their preservation.

It is hoped that the result will induce the Government to establish an experimental turpentine farm for the purpose of gathering information, and utilising to the best advantage the products of the pine.

Another object of the experiments is to devise some means of extracting the gum from the tree, by the use of a sort of metallic cup for the former to flow in. The present plan is to chop into the side of the tree what is called a "box," about 2 or 3 ft. from the ground, into which the gum flows and collects until it is dipped out by the gatherer. From time to time the tree is "chipped off" above this "box" in order to promote the flow. The same process is followed on the opposite side of the tree, so that, when finished with, the tree is ruined.

It is hoped that a way may be found of adjusting, perhaps, a galvanised-iron cup to the side of the tree in such a manner that the gum may be extracted without destroying its growth. By the use of the right appliances, it is believed the life of the tree will be prolonged. There were some experiments made a few years ago with some kind of "cups," as substitutes for turpentine "boxes," but their use was abandoned, as they were found too costly.

Savannah.—The comparative receipts at the port of Savannah, during the year ended Aug. 31, 1901, were 332,057 barrels of spirits of turpentine, and 1,175,866 barrels of resin, in comparison with 315,849 barrels of turpentine, and 1,010,628 barrels of resin, during 1900.

The exports, during the past year, were 346,140 barrels of turpentine, and 1,126,760 barrels of resin, in comparison with 300,739 barrels of turpentine, and 1,029,214 barrels of resin, for 1900. Of last year's exports, 237,404 barrels of turpentine were exported to foreign countries, and of the resin exports, 644,595 barrels went to foreign countries.

The receipts at Savannah, from April 1 to December 31, 1901, were (including stock on hand on April 1 last) 300,348 barrels of turpentine, and 958,327 barrels of resin, and the exports, during the same period, were 274,225 barrels of turpentine, and 778,105 barrels of resin. Of the exports, 198,992 barrels of turpentine, and 363,611 barrels of resin was shipped to foreign countries.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Exports of the Gold Coast.

Colonial Office Annual Series, 344.

The comparative table below shows the quantities and values of rubber exported from the Colony to the countries mentioned, during the last three years, and shows a large falling off, in 1900, partly due to the disturbances in Ashanti:—

Countries.	Quantity.		
	1898.	1899.	1900.
	Lb.	Lb.	Lb.
United Kingdom	5,380,755	5,219,541	3,063,657
Germany	600,000	322,414	322,309
Other countries.....	3,429	599	56,774
Totals	5,984,184	5,572,554	3,442,440

Countries.	Value.		
	1898.	1899.	1900.
	£	£	£
United Kingdom	495,502	522,854	292,257
Germany	55,910	32,836	32,445
Other countries.....	255	41	3,451
Totals	551,667	555,731	328,156

Balata: Customs Decision (United States).

Bd. of Trade J., April 17, 1902.

Sheets of balata (a substance resembling india-rubber and gutta-percha) are dutiable at the rates of 30 per cent. or 35 per cent. *ad val.*, under pars. 449 or 450 of the Tariff, according as they more nearly resemble india-rubber or gutta-percha.

Rubber Forest in the Soudan.

Bd. of Trade J., April 24, 1902.

Considerable quantities of rubber trees are reported in the Bahr-el-Ghazal. The Director of Woods and Forests has been despatched to report as to re-opening the rubber trade of the Bahr-el-Ghazal, which, in former days was one of the principal sources of revenue of that district. It is also hoped to develop the rubber forests in South Western Kordofan.

XIV.—TANNING; LEATHER; GLUE, Etc.

Artificial Leather for Germany.

U.S. Cons. Reps., April 8, 1902.

Artificial leather, for upholstery, bookbinding, &c., of the quality made in Boston and in Ohio, would find a market in Germany. It should be made in pieces 50 to 100 yards long, and $1\frac{1}{2}$ to $2\frac{1}{2}$ yards wide. Samples from Boston have been shown and approved, but are found rather small for general use.

Leather in the United States.

Foreign Office Annual Series, No. 2763.

The tanners had difficulty, in 1901, in supplying the demand, as hides were scarce, and about 10 per cent. more had to be paid for them.

Heavy No. 1 hides ranged from 5*d.* to $6\frac{1}{4}$*d.* per lb., and light, from $4\frac{3}{4}$*d.* to $5\frac{3}{4}$*d.* per lb., during the year.

The chief demand was for smooth chromes, colt skins, enamels, and kid upper leathers, whilst, in heavier and cheaper grades, there was less business.

Heavy sole leather was in great demand, and the price was advanced 10 per cent. at the end of the year.

XV.—MANURES, Etc.

Phosphates and Fertilisers at Charleston (United States) in 1901.

Foreign Office Annual Series, No. 2759.

Whilst the fertiliser business was satisfactory, the mining of phosphate rock in this State was not so encouraging, as the product has to contend now with the Florida and Tennessee output. Florida annually mines about 750,000 tons of phosphate. Tennessee is also an important contributor to the yearly supply, and both these States ship most of their phosphate rock to foreign countries, for, as yet, they manufacture comparatively little of their phosphate production. On the other hand, Charleston, whilst a large fertiliser manufacturer, has never been a foreign exporter of either crude rock or its manufactured products, most of the foreign rock shipments being exported from Beaufort, Port Royal, Savannah, and Brunswick.

Charleston continues the leading centre throughout the country for the manufacture of phosphate fertilisers, and the business seems to be steadily increasing. The past year was not so encouraging for miners of phosphate rock, the official figures showing a falling-off in the rock trade at Charleston of 60,105 tons as compared with 1900, and a decrease of 42,689 tons at Beaufort. There was a satisfactory increase in the output of commercial fertilisers, Charleston showing a gain of 53,064 tons, and Beaufort, 10,000 tons. The total Charleston production last season was 429,378 tons, as compared with 376,314 tons, for 1900, and the value of the increase was 636,768 dols., with prospects for a good business next season.

It was estimated that 3,000,000 tons of phosphate rock were required to supply the world's demands last season, of which Europe required 2,000,000, and the United States 1,000,000 tons. Of the European supply, Florida shipped 550,000 tons; Tennessee, 200,000 tons; and South Carolina 100,000 tons.

During the season 1900–1, there were not so many independent companies interested in this industry at Charleston as heretofore, the combined output being the largest of any city in the United States. All but four of the

mpanies are owned by the Virginia-Carolina Chemical o., and have been incorporated into a syndicate con-olled by the last-named company. This syndicate has ecured control of nearly all the southern mills, with the ception of about 25, and it now owns the most important hosphate tracts and the largest fertiliser factories.

The imports of kainit, potassium chloride, pyrites, sulphur, trate of soda, and other chemicals used in the manufacture commercial fertilisers having phosphate as a basis, ggregated, last year, 180,828 tons of chemicals, valued 1,540,402 dols., in comparison with similar imports, iring 1900, of 128,929 tons, worth 778,353 dols.

During the commercial year ended August 31, 1901, the tal shipments of Tennessee phosphate rock were 446,085 ns, in comparison with shipments, in 1900, of 464,608 tons, owing a decrease of a little over 18,000 tons last season. last year's shipments, 177,532 tons went to domestic aces, and 268,553 were shipped to foreign countries.

The State of North Carolina is reported to have mined ,000 tons of phosphate rock, during 1901, as compared th 15,000 tons, in 1900. There are no foreign shipments m this State, the output being consumed by domestic rchasers.

Florida maintains her position as the largest phosphate-oducing State in the Union. Last year, Brunswick ported 23,009 tons of Florida rock, as compared with 15 tons, in 1900, and from Savannah, the imports, in 01, were 144,861 tons, in comparison with 126,860 tons, 1900.

There is, at the present time, about 15,000,000 dols. vested in Florida phosphate mining, and this State could sily produce 1,000,000 tons annually, if it were necessary; is simply a question of price. Florida has lost no stomers recently, unless it be Japan and Australia, ich may, in future, be able to supply their wants from ristmas Island. As phosphorus is now being made m phosphate rock, it opens up a new use for the higher ades. Florida furnishes soft rock, hard rock, river pebble, l land pebble as may be required, all of good quality, h an analysis ranging from 60 to 85 per cent. of phos-ate of lime.

The closing prices for hot-air-dried phosphate rock at arleston, on December 31, 1901, was 3 dols. 50 cents per ton, h in Ashley River, with the tone of the market quiet. e also this Journal, 1901, 1045.)

Phosphate Fertilisers at Savannah (United States), in 1901.

Foreign Office Annual Series, No. 2759.

The phospate fertiliser trade, during 1900, was the largest the history of the State of Georgia. The sales of tilisers, during the season 1900-1, were 473,839 tons, as pared with 407,839 tons, for 1900.

A number of new enterprises have been started, chief ong them, probably, being the Blackshear Manufacturing , of Blackshear, Georgia, with a capacity of 15,000 tons ually. The Southern States Phosphate and Fertiliser Co., se manufacturing plant is at Savannah, will also be dy to commence operations very early in the new year, h a capacity of 30,000 tons. This will be the largest iliser plant in Savannah, though the combined works of Virginia-Carolina Chemical Co., would be larger. Some e ago the Virginia-Carolina Chemical Co. lost the acid mber of one of their Savannah factories, but they are now structing another of larger capacity. The plant, that was ght by them from the Commercial Guano Co., has fallen the hands of the Southern Cotton Oil Co., under a 99 rs' lease, and it is doubtful if any fertilisers will be nufactured there during the new season. But the increase ne acid chambers of the Comer Hull Works will make product of both plants about the same as it formerly

here is to be more competition in the fertiliser trade than tofore, owing to new factors now entering the business, h are likely also to stimulate present manufacturers to e aggressive action in future.

The Armour Fertiliser Co. is now building at Atlanta, Ga., a 60,000 ton factory, and it proposes to utilise there the blood and tankage from its various slaughter-houses. (See also this Journal, 1901, 957, 521.) This movement by the Armour Co. has caused the Virginia-Carolina Chemical Co. to buy cotton-seed oil mills throughout the South, with a view of controlling the output of ammoniates in the shape of cotton-seed meal. These two companies will be active competitors in the field during the next season.

Most of the phosphate rock shipped from this port is Florida-mined, brought here by railway for export abroad. The total shipments of rock from Savannah, during the year ended August 31, 1901, were 138,504 tons, and the market quotations on the above-named date were about 5 dol. 90 c. per ton, f.o.b. at Atlantic ports, for Florida hard rock, guaranteed 77 per cent. of bone phosphate of lime, 3 per cent. of oxide of iron and alumina, and 3 per cent. of moisture. (See also this Journal, 1901, 1045.)

Chemical Manures in Greece.

Foreign Office Annual Series, No. 2670.

Small sample shipments of various chemical powders and manures of British manufacture, intended to combat the *peronospora*, *oïdium* and other maladies of the currant and grape vineyards, were tried on a small scale last year, but as all vineyards were unusually healthy throughout the season, it was not possible to judge of their efficacy. Greek growers, as a rule, are averse to any experiment of this kind; still, should any of these preparations, especially if cheaper than sulphate of copper, prove beneficial, there is no doubt that a large trade would result in time.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Conference at Brussels.

Parliamentary Paper, April 22, 1902.

This paper (Miscellaneous, No. 5, 1902), issued by the Foreign Office, contains "Correspondence relating to the Brussels Sugar Bounty Conference."

It contains the instructions of the Government to the British Delegates; the views of the Delegates themselves, on December 21, 1901; the propositions submitted to them by the Belgian Premier, as President of the Conference; the official views of the India Office; the final instructions of the British Government; and many points of minor interest. (See also this Journal 1902, 439.)

Sugar Crop of British Guiana.

Colonial Office Annual Series, No. 349.

The sugar crop of the Colony, in 1900–1, amounted to 94,745 tons, as against 84,782, for 1899–1900. The market conditions during the year were not unfavourable, and prices, as may be gathered from the subjoined figures, were somewhat in advance of the previous year:—

	1899—1900.	1900—1901.
	£ s. d.	£ s. d.
Sugar, vacuum pan, sold in the United Kingdom, per ton.	13 10 10	13 15 0
Sugar, refining, sold in the United States, per ton.	11 13 4	11 17 6
Sugar, molasses	9 7 6	9 11 8
Molasses, vacuum pan, per puncheon of 100 gallons, yellow V.P.	4 15 10	5 9 4½
Molasses, Muscovada Grocery	4 6 7	5 6 3

New Sugar Factories in France.

Foreign Office Annual Series, No. 2754.

An important sugar manufactory with a large capital has recently been established at Fenquières-en-Vimeu, and a sugar refinery at Colleville, near Fécamp, will be opened this year.

Sugar Production in Denmark.

Bd. of Trade J., April 17, 1902.

According to a report by the French Legation at Copenhagen, there are about 13 sugar refineries in Denmark, nearly all of which belong to an association called "De Danske Sukkerfabrikker," at Copenhagen.

The total production of sugar in Denmark was 33,157 tons, in 1898, 41,140 tons, in 1899, and 50,750 tons, in 1900. It is estimated that the production for 1901 will reach 55,000 tons.

No bounties are granted to Danish sugar manufacturers, and Danish refineries are not connected with any foreign companies or associations. The import duty on foreign sugar is 3 öre ($\frac{3}{8}d.$) per lb. The home product is taxed at the rate of $2\frac{1}{4}$ öre ($\frac{3}{16}d.$) per lb. The importation of foreign sugar into Denmark is very great. Denmark does not export any sugar.

XVII.—BREWING, Etc.

Alcohol for the Manufacture of Vinegar in Belgium.

Bd. of Trade J., April 17, 1902.

A Ministerial Decree appeared in the *Moniteur Belge* of the 26th ult., raising the excise on vinegar from the residue of currants, from which wine has been manufactured in Belgium.

A further Decree increases the rebate on alcohol, intended to be converted into vinegar, from 36 francs to 70 francs per hectol., in virtue of the law authorising a total or partial rebate of the excise on alcohol used for industrial purposes.

Methylation in Natal.

Bd. of Trade J., April 3, 1902,
and *Chem. and Druggist, April* 19, 1902.

The regulations made in 1897 have been rescinded, and under last year's Excise Act, the Governor in Council has issued two notices, Nos. 128 and 130. The first deals with manufacture and storage. No distiller may methylate less than 270 galls. of spirit, of not less than 59° above proof, but spirit of 64° above proof or over may be methylated for use in the arts and manufactures in quantities of not less than 54 galls. The quantity to be methylated at any time must be a multiple of 9 galls., and the wood naphtha to be employed should be 60° above proof, and contain not less than 80 per cent. of methylic alcohol. In the United Kingdom, the wood naphtha must contain between 72 and 80 per cent. of methylic alcohol and certain minimum quantities of other ingredients which give the deleterious character to the methylated spirit; the Natal authorities make no provision of this kind, but stringent regulations are made as to the examination of all materials employed, and the supervision of the work of methylating. The Regulations provide that—

Imported methylated spirits mixed with any ingredient or substance of any description or kind whatsoever, on being landed, must be placed in an approved warehouse, and not be removed until a sample has been examined and certified by the Government chemist. The cost for conveying or examining samples and for marking packages is to be paid by the importer before the spirits are removed. Each package or vessel must be legibly marked in letters of not less than one inch in height, with the words "Methylated spirits" painted in oil colour. Crude methylic alcohol or imported methylated spirits must be contained in vessels not exceeding 100 galls. capacity.

The regulations as to sale of methylated spirit state that it is a mixture of 9 galls. of spirit of wine, of not less strength than 59° above proof, and 1 gall. of wood naphtha.

XVIII. A.—FOODS.

Casein in Hungary.

Chem. and Druggist, April 19, 1902.

A Budapest firm is erecting a casein factory at Maria-Theresiopel. The Government has promised a subsidy of 720*l.*, on the condition that the factory shall use all the cheese produced by the union of agriculturists of the country, *viz.*, about 600,000 kilos. yearly.

Oleomargarine and Preservatives in the United States.

Foreign Office Annual Series, No. 2763.

The manufacture of oleomargarine in the United States showed a slight falling off, in 1901, 104,943,856 lb. being manufactured, and of this, 62,730,000 were made in Illinois, Kansas, and Missouri.

Many preservatives are offered for sale, most of which are made of some of the following: borax, boric acid, salicylic acid, salicylate of soda, benzoic acid, benzoate of soda, ammonia, formaldehyde, or sulphates. Of 67 samples examined by the Department of Agriculture, 33 contained borax or boric acid, 10 salicylic acid, and 3 formaldehyde. Formaldehyde was once much used here in milk, but the practice is not prevalent now.

XX.—FINE CHEMICALS, Etc.

Cinchona Bark in the Netherlands.

Foreign Office Annual Series, No. 2671.

The importation of bark, in 1901, was again very large, Amsterdam receiving 6,642 tons, as against 5,000 tons, in 1900. Notwithstanding the large supply, prices remained tolerably firm throughout the year, and the stocks, at the close, were comparatively insignificant. Prices averaged $1\frac{7}{16}d.$ per unit, as compared with $2\frac{1}{16}d.$, in 1900, and closed firmly at about the first quotation.

XXII.—EXPLOSIVES, Etc.

Dynamite Factory at Monterey (Mexico).

U.S. Cons. Reps., April 15, 1902.

A concession has been granted for the establishment of a dynamite and explosives plant at Monterey, convenient to the many mining properties of that district. (See also this Journal, 1902, 203.)

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 9268. J. Hurkett. Metallic kegs, drums, and the like. Apr. 22.

„ 9437. A. Coequyt. Air or gas compressors. Apr. 23

„ 9600. Albany Mfg. Co., Ltd., and F. Lamplough. System for the economical conversion of liquid air into power. Apr. 25.

„ 9655. A. G. Enock. Refrigerating apparatus. Apr. 26

„ 9660. W. Doman and W. Jones. Apparatus for use in washing and purifying or absorbing gases Apr. 26.

„ 9705. A. S. Legg. Improved apparatus for mixing definite quantities of one liquid or solution with another. Apr. 26.

„ 9724. C. Harvey and W. Paddock. Indicators for use in connection with storage tanks and other closed vessels, and method of and appliances for producing a certain part of such indicators. Apr. 28

[A.] 9854. A. J. Boult.—From D. Rojat, France. Filters Apr. 29.
„ 10,134. S. Puplett. Condensers and coolers for condensible gases, fluids, and other substances. May 2.
„ 10,143. J. Grouvelle and H. Arquembourg. Coolers or condensers, also applicable for use as heaters or evaporators. May 2.
„ 10,165. J. H. Holman and J. M. Holman. Apparatus for compressing air and other gases. May 2.
„ 10,178. R. H. Wilkinson. Formation and closing of tins for condensed milk, cream, butter, and other foods, chemicals, paints, and other articles requiring to be kept air-tight and liquid-tight. May 2.
C.S.] 8074 (1901). Bloume. Refrigerating process and apparatus therefor. Apr. 30. Date applied for under International Convention, Sept. 21, 1900.
„ 8146 (1901). Stewart and Wishart. Centrifugal machines. Apr. 30.
„ 8571 (1901). Lockwood. Construction of valves for fluids or gases. Apr. 30.
„ 8666 (1901). Siebert. System of and apparatus for refrigerating and ice-making. Apr. 30.
„ 11,594 (1901). Hallett. Apparatus suitable for heating or evaporating water or other liquid, and for condensing steam or other fluid. May 7.
„ 12,116 (1901). Wheatley.—From Richards. Centrifugal pumps.
„ 13,162 (1901). Read. Pump valve applicable to air and circulating pumps and the like. May 7.
„ 20,324 (1901). Henderson. Devices for increasing and decreasing the sensitiveness of oscillating beams, primarily of balance and scale beams for weighing uses. May 7.
„ 23,226 (1901). Hyde. Abrasive wheels or the like. May 7.
„ 2973 (1902). Boult.—From Wayne Chemical Co. Means for packing chemicals. Apr. 30.
„ 4598 (1902). Kurka. Filter. May 7.
„ 5750 (1902). Laidlaw. Centrifugal machines. Apr. 30.

II.—FUEL, GAS, AND LIGHT.

[A.] 9198. C. E. J. Berthold. Manufacture of pellets in combination with metal wire or metal foil for inducting the self-ignition of combustible gas. Apr. 21.
„ 9237. T. D. Kyle. Combustion of fuel in boiler and other furnaces, and apparatus therefor.* Apr. 21.
„ 9278. M. Hayashi. Incandescent electric lamps. Apr. 22.
„ 9299. H. H. Lake.—From American Furnace Co., United States. Furnaces.* Apr. 22.
„ 9307. G. Möller. Improved method of heating substances in crucibles and the like, and apparatus therefor. Apr. 22.
„ 9339. R. Nordmann. New or improved method for producing the heads of incandescent mantles. Apr. 22.
„ 9356. F. W. Hayward, R. C. Fox, and E. Wilkinson. New inflammable and explosive gas suitable for internal combustion motors and other purposes. Apr. 23.
„ 9382. C. Ricci. Sprayers for oil engines. Apr. 23.
„ 9404. N. Beck and R. Dior. Burner for liquid fuel.* Apr. 23.
„ 9407. W. Smith and J. Smith. Gas heating apparatus. Apr. 23.
„ 9412. R. Langhans. Process for manufacturing metallically-skeletonized earthy incandescent structures for producing light. April 23.
„ 9425. H. Salsbury. Lamps. April 23.
„ 9434. A. Clément. Carburetters especially applicable for motor bicycles. Apr. 23.
[A.] 9534. J. E. Dowson. Manufacture of generator gas and apparatus used therewith. Apr. 24.
„ 9564. A. B. Trythall. Improved method of and means for automatically igniting fuel. Apr. 25.
„ 9598. P. Winand. Improved process and apparatus for rapidly producing a gas suitable for driving gas engines and other appliances.* Apr. 25.
„ 9612. C. E. J. Berthold. Improved apparatus for automatically igniting gas jets. Apr. 25.
„ 9613. C. E. J. Berthold. Improved appliance to gas burners for providing a warmed air supply thereto. Apr. 25.
„ 9622. G. C. Trewby. Gas retorts. Apr. 25.
„ 9641. F. Windham. Acetylene generators.* Filed Apr. 25. Date applied for, Apr. 26, 1901, being date of application in United States.
„ 9648. G. R. Smith. Apparatus for heating by liquid fuel. Apr. 25.
„ 9758. W. G. Potter. Argan burners and the like for gas lighting. Apr. 28.
„ 9785. R. B. Ransford.—From La Compagnie Universelle d'Acétylène, France. Apparatus for the manufacture of gas by the reaction of a liquid upon a solid.* Apr. 28.
„ 9799. C. E. J. Berthold. Automatic gas lighters. Apr. 28.
„ 9851. F. Rosé. Self-generating gas lamp. Apr. 29.
„ 9865. R. S. Lovelace. Electrical ignition devices for internal combustion engines. Apr. 29.
„ 9871. W. T. Sugg. Manufacture of mantles for incandescent gas lighting. Apr. 29.
„ 9874. E. de N. Anderson. Gas lighters.* Apr. 29.
„ 9901. A. Bollinckx. Apparatus for distributing motive fluid in engines. Apr. 29.
„ 9902. W. L. Wise.—From E. Von Szalay, Hungary. Manufacture of carbide cartridges for acetylene generators. Apr. 29.
„ 9937. K. Trobach and K. Schultze. Improved process and apparatus for generating gaseous products of combustion and steam under pressure. Apr. 30.
„ 9974. E. Willshear. Improved furnace for the combustion of organic material and the like. Apr. 30.
„ 9987. O. H. Erich. Incandescent gas burners, for illuminating purposes. Apr. 30.
„ 10,004. W. H. Jeffery and A. G. Jeffery. Anti-vibrators for incandescent gas burners. May 1.
„ 10,034. R. Honoré. Furnaces for the production of oil gas. May 1.
„ 10,055. A. H. Goodwin, F. A. Keil, and J. Dougall. Apparatus for use in connection with the manufacture of coal gas. May 1.
„ 10,064. G. M. Hilger. Apparatus for feeding a liquid compound to a steam boiler, feed-water heater, and the like. May 1.
„ 10,079. H. Scorey. Oil lamps. May 1.
„ 10,169. A. G. Bloxam.—From La Soc. Anon. des Crystalleries du Val-Saint, Lambert, Belgium. Improved regenerator for lamps having a chimney.* May 2.
„ 10,170. W. Holzer and W. F. L. Frith. New process for treating fuel. May 2.
„ 10,175. J. B. Harris. Smoke consuming furnaces and fireplaces. May 2.
„ 10,176. A. H. Cook. Acetylene gas generators. May 2.
„ 10,189. A. L. Lean. Electric incandescent lamps and means for connecting the same in the electric circuit. May 2.
„ 10,210. A. Berry. Improved smoke burner with automatic air inlet. May 3.

[A.] 10,212. G. F. Lawrence and A. J. Field. Ignition device for firing gases in petrol and the like engines. May 3.

[C.S.] 6615 (1901). Bremer. Arc lamps. May 7.

„ 8479 (1901). Roy. Apparatus for burning vapours for producing incandescent light. Apr. 30.

„ 8546 (1901). Meissner and Richter. Apparatus for heating by means of petroleum and other liquid fuel. May 7.

„ 8762 (1901). Strathy and Riley. Acetylene gas lighting. Apr. 30.

„ 9238 (1901). Smith and Smith. Down-draught kilns. May 7.

„ 9460 (1901). Missire and Missire. Mantles for incandescent gas lighting. May 7.

„ 9642 (1901). Dyson. Apparatus or injectors for burning oil or liquid fuel in furnaces. Apr. 30.

„ 10,315 (1901). Glover. Furnaces of steam boilers. Apr. 30.

„ 10,568 (1901). Marshall. Smoke-consuming and coal-saving apparatus for steam boiler furnaces. May 7.

„ 11,518 (1901). Désandré. Method of heat insulation. Apr. 30.

„ 12,134 (1901). Lee. Electric arc lamps and electrodes therefor. May 7.

„ 12,413 (1901). Buhlmann. Process of manufacturing incandescent mantles. Apr. 30.

„ 12,552 (1901). Smith-Rewse and Coates. Gas purifiers and the like. Apr. 30.

„ 12,895 (1901). Smith and Wincott. Gas producers. Apr. 30.

„ 13,047 (1901). Koppers. Arrangements for treating gas-water with continuous working. Apr. 30.

„ 13,125 (1901). Littler. Means of regulating the supply of air to the combustion chamber of furnaces. May 7.

„ 13,833 (1901). Brownlow. Kilns. May 7.

„ 20,112 (1901). Kjoersgaard. Oil lamps. May 7.

„ 21,296 (1901). Thornton and Smith. Smoke-consuming furnaces. May 7.

„ 23,278 (1901). Koppers. Regenerative coke oven with separate distribution of gas and air to the heating flues. May 7.

„ 454 (1902). Crease. Manufacture of incandescence mantles. Apr. 30.

„ 761 (1902). Hewett.—From De Jong. Self-feeding surface carburetters for motor cycles and the like. May 7.

„ 1491 (1902). Wiesner and Hartmann. Device for separating chimney-soot from smoke. Apr. 30.

„ 2800 (1902). Williams. Miners' safety lamps. May 7.

„ 3246 (1902). Kruseman. Acetylene lamps. Apr. 30.

„ 3522 (1902). Conway. Devices for preventing smoke and increasing combustion in furnaces. May 7.

„ 3828 (1902). Roberts.—Hot blast stoves. May 7.

„ 3831 (1902). Roberts.—Hot blast stoves. May 7.

„ 4522 (1902). Apple. Electric ignition apparatus for internal combustion engines. May 7.

„ 4549 (1902). Longuemare, née Lechesne. Carburettors for motors. May 7.

„ 6000 (1902). Eisemann. Apparatus for producing high electrical potentials and means for utilising the same for the ignition of explosive mixtures or compounds in explosion motors. May 7.

„ 6209 (1902). Johnson. Electric arc lamps. May 7.

„ 6725 (1902). Lake.—From Battistini, Orengo & Co. Treatment of fuel for furnaces and the like. Apr. 30.

[C.S.] 6826 (1902). Bishop. Acetylene gas generators. Apr. 30.

„ 6858 (1902). Bishop. Acetylene gas generators. Apr. 30.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 9196. W. Walther. Treatment of mineral oils to render them available as ingredients of soap and varnish. Apr. 21.

„ 9416. L. Edeleanu and G. A. Filiti. Improved manufacture of nitro-products from petroleum, or mineral oil distillates. Apr. 23.

„ 10228. G. Wegelin. Processes of manufacturing soot from tar and other carbonaceous substances and apparatus for carrying the same into effect.* May 3.

[C.S.] 10,663 (1901). Daeschner. Process for separating the resinous parts without their decomposition from mineral oils or the like. May 7.

„ 25,469 (1901). Müller. Process of and apparatus for fractional distillation. May 7.

„ 6972 (1902). McPhail. Distillation of mineral oils and their distillates. Apr. 30.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 9163. A. Ashworth and J. Bürger. Production of blue colouring matters. Apr. 21.

„ 9194. H. E. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of new anthraquinone derivatives. Apr. 21.

„ 9195. H. E. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of new derivatives of the anthraquinone series. Apr. 21.

„ 9619. G. W. Johnson.—From Kalle and Co., Germany. Manufacture of green or greenish colouring matters containing sulphur. Apr. 25.

„ 9968. O. Imray.—From Soc. of Chemical Industry in Basle. Manufacture of sulphurised indophenols.* Apr. 30.

„ 9969. O. Imray.—From Soc. of Chemical Industry in Basle. Manufacture of sulphurised indophenols.* Apr. 30.

„ 10,046. R. Holliday and Sons, Ltd., J. Turner, H. Dean, and J. Turner. Manufacture of dyestuffs containing sulphur. May 1.

„ 10,187. G. W. Johnson.—From Kalle and Co., Germany. Manufacture of brown colouring matters containing sulphur. May 2.

„ 10,196. I. Levinstein, C. Mensching, and Levinstein Ltd. Manufacture of black colouring matters containing sulphur. May 3.

„ 10,243. O. Imray.—From Farbwerke, Höchst, Germany. Manufacture of azo-dyestuffs. May 3.

[C.S.] 11,766 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of new azo-colouring matters, and of intermediate products for use therein. May 7.

„ 13,378 (1901). Imray.—From Farbwerke, Höchst. Manufacture of reduced indigo. Apr. 30.

„ 13,863 (1901). Abel.—From Act.-Ges. für Anilin Fabr. Manufacture of mordant dyeing monoazo dyestuffs. Apr. 30.

„ 14,669 (1901). Johnson.—From Bad. Anilin and Soda Fabr. Manufacture and production of colouring matter containing sulphur. Apr. 30.

„ 16,945 (1901). Rak. *See under* XVI.

„ 4550 (1902). Imray.—From Dyeworks, formerly Durand, Huguenin and Co. Manufacture of new derivatives of gallocyanines. Apr. 30.

V.—PREPARING, BLEACHING, DYEING, INTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

] 9336. G. B. Ellis.—From Société Chimique des Usines du Rhone Anciennement Gilliard, P. Monnet, et Cartier, France. Dyeing and printing from *o*-nitrophenyl-lacto-ketone and preparations therefor. Apr. 22.

9408. J. Doull. Method of treating peat, moss, and like growths for production of fibre for spinning and other purposes, of paper pulp, and other commercial products. Apr. 23.

9524. S. H. Sharp and S. H. Sharp and Sons (Leeds), Ltd. Machinery or apparatus for producing patterns or designs on textile or felted fabrics. Apr. 24.

9620. W. H. Perkins, jun., and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and flax and cotton and linen goods to reduce the inflammability thereof. Apr. 25.

9658. Calico Printers' Association, Ltd., and W. Warr. Means for treating textile or other materials, fabrics and substances to render them non-inflammable. Apr. 26.

9707. A. F. Lundeberg. Improved method of and apparatus for printing or colouring floor coverings, wall papers, and other fabrics. Apr. 26.

9746. F. E. Dawson. Machinery employed in the treatment of fibrous substances. Apr. 28.

9812. A. J. Boult.—From H. Seibert and G. Tempel, Germany. *See under* XI.

10,005. J. Chester. New or improved process for treating textile fabrics and yarn composed of wool or other animal fibre. May 1.

10,168. F. Schaab. Process for the production of white and coloured reserves for indigo-dyed goods. May 2.

10,179. L. E. Barbe. Methods of dry cleaning, and apparatus therefor. May 2.

10,188. Johnson. — From Bad. Anilin und Soda Fabr., Germany. Treatment of indigo dyeing on vegetable fibre for increasing the fastness thereof. May 2.

10,266. W. Youlton. Fibre-cleaning machines. May 8.

.] 1850 (1901). Werner. Apparatus for use in the production of fibreless filaments. May 7.

8586 (1901). Hyatt. Fabrics for driving belts, mats, carpets, ribbons, scarves, or other articles, and method and means for making such fabrics. May 7.

11,853 (1901). Wolf. Apparatus for the dyeing, bleaching, and other similar treatment of fibrous materials. Apr. 30.

12,540 (1901). Ransford—From Cassella and Co. Reserve printing on fabrics to be dyed with sulphur colours. Apr. 30.

23,892 (1901). Lilienfeld. Pigment-printed textile fabrics. May 7.

25,365 (1901). Choksey. Means for extracting aloe and other fibres. Apr. 30.

2891 (1902). Geissler. Apparatus for dyeing cloth or other porous materials. May 7.

3223 (1902). Cotton Seed Co., Ltd., and Stanley. Drying apparatus for cotton and other materials. May 7.

COLOURING WOOD, PAPER, LEATHER, Etc.

] 9373. R. Rieder. Dyeing leather.* Apr. 23.

9707. A. F. Lundeberg. *See under* V.

[C.S.] 9556 (1901). Dreher. Process for producing fast colours upon any kind of leather or other material by the employment of titanium salts combined with tanning material or with mordant colours. May 7.

VII.—ACIDS, ALKALIS, and SALTS.

[A.] 9289. B. Adriance. Carbonating apparatus.* Apr. 22.

„ 9327. H. E. Howard and G. Hadley. Treatment of spent acid from galvanising works and the like, and the manufacture of zinc white and ferric oxide. Apr. 22.

„ 9536. C. Daub and J. C. Deuther. Apparatus for making anhydrous sulphuric acid.* Apr. 24.

„ 9545. J. Bock. Manufacture or production of sulphate of alumina.* Apr. 24.

„ 9586. F. J. Fletcher. Apparatus for aërating or carbonating liquids. Apr. 25.

„ 9605. J. D. Darling and C. L. Harrison. Manufacture of alkaline cyanides.* Apr. 25.

„ 9616. P. A. Guye. Improved process for the preparation of alkaline chlorates. Apr. 25.

„ 9790. P. A. Guye. Manufacture of basic zinc carbonate and of zinc oxide and alkaline earth chlorides. Apr. 28.

„ 9803. M. Wildermann. *See under* XI.

„ 9812 A. J. Boult.—From H. Seibert and G. Tempel, Germany. *See under* XI.

„ 9875. A. M. Clark.—From Gen. Chemical Co., United States. Manufacture of hydrochloric acid.* Apr. 29.

„ 9996. F. Fouché. Apparatus for distilling, and especially for distilling salt water. Apr. 30.

„ 10,111. J. R. Hatmaker.—From J. A. Just, United States. *See under* XV.

[C.S.] 9084 (1901). Windhausen and Windhausen, jun. Carbonic anhydride refrigerating machines. Apr. 30.

„ 9133 (1901). Plath. Apparatus for distilling nitric acid. Apr. 30.

„ 10,657 (1901). Young. Chemical fire-extinguishing apparatus. Apr. 30.

„ 12,729 (1901). Knecht. Process for the production of hydrosulphites. May 7.

„ 12,781 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of sulphuric acid by the contact process. Apr. 30.

„ 13,001 (1901). Haines. Lime from by-products. Apr. 30.

VIII.—GLASS, POTTERY, and ENAMELS.

[A.] 9405. F. H. Becker. Improved process for the utilisation of glass-gall to obtain glass therefrom.* Apr. 23.

„ 9897. G. B. Ellis.—From Soc. Anon. Manufacture de Faiences et Porcelaines à Saint-Amand-Les-Eaux (Nord), avec Succursale à Wandignies Hamage, J. Folscheid Fils, A. Labacqz, and M. Bourchart, France. Kilns for the baking or burning of ceramic products. Apr. 29.

„ 9917. W. Brooke and B. Stoner. Machinery for the manufacture of glass bottles. Apr. 30.

„ 10,006. G. L. Allen. Kilns for burning firebricks, sanitary pipes, pottery ware, terra cotta, and such like articles. May 1.

„ 10,095. F. H. Pierpont. Machines for the manufacture of glass bottles and other vessels. May 1.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 9431. S. Weill. Manufacture of imitation marble.* Apr. 23.

„ 9487. H. W. J. Cheffins. Washing for cement manufacture. Apr. 24.

„ 9511. L. Randolph. Insulating compounds and method of manufacturing same.* Apr. 24.

„ 9764. F. Arenberg. Manufacture of artificial stones for road pavements, footpaths, platforms, stairs, and the like, also for constructing purposes (houses). Apr. 28.

„ 10,083. H. J. Haddan.—From the "Pyrisolith" Isolating Material Mfg. Co., Ltd., Hungary. New or improved method for producing electric insulating bodies.* May 1.

„ 10,091. W. P. Thompson.—From P. Dziadek and Co., Austria. Process and preparation for making artificial stone blotters for ink and the like. May 1.

„ 10,218. A. Luft. Process for producing plastic compounds.* May 3.

[C.S.] 11,024 (1901). Cripps. Steel or wrought-iron chimneys for gas works. May 7.

„ 11,150 (1901). Wetter. — From Mack. Flexible sheets suitable as a cover or envelope for columns, for the construction of walls, and for other building purposes. May 7.

„ 14,655 (1901). Beckenham and Penge Brickworks. Ltd., and Pocknall. Manufacture of stock bricks, May 7.

„ 2048 (1902). Dawnay. Burnt brick or fireclay tile for supporting concrete between steel or iron joints or girders, and so forming part of the construction of a fireproof floor or roof. May 7.

X.—METALLURGY.

[A.] 9225. W. Holloway. Improved apparatus for forming wire from solder.* Apr. 21.

„ 9248. B. D. Healey and J. L. Stevenson. Ladles for blast furnace and other slag. Apr. 22.

„ 9300. J. Dewar. Manufacture of nickel carbonyl and its treatment for production of metallic nickel therefrom. Apr. 22.

„ 9310. W. Shone. New or improved solder and fluxes for aluminium. Apr. 22.

„ 9355. F. H. Briggs and A. L. Crosfield. Recovery of gold and other precious metals from their solutions. Apr. 23.

„ 9375. T. Shephard. Metallic alloys. Apr. 23.

„ 9438. J. Schiele. Silver-plating and gilding processes.* Apr. 23.

„ 9485. J. B. De Alzugaray. Protection of iron and other metals and materials from corrosion. Apr. 24.

„ 9501. F. W. Martino. Treatment of ores containing noble metals.* Filed Apr. 24. Date applied for, Sept. 30, 1901, being date of application in United States.

„ 9670. T. Sharp. Apparatus for compressing scrap metal into blocks or slabs. Apr. 26.

„ 9696. T. W. Just and W. F. L. Frith. Manufacture of a new metallic alloy or metal. Apr. 26.

„ 9890. E. C. Wills and H. Evans. Apparatus for the manufacture of steel and the like.* Apr. 29.

„ 10,035. J. E. Green, A. Quick, and W. A. Thoms. Metallic alloys. May 1.

„ 10,110. E. A. Claremont and J. Stratton. Apparatus for the manufacture of lead pipes and tubes and for covering cables with lead. May 2.

[C.S.] 1699 (1901). Hammond and Dennis. Method for apparatus for use in connection with the coating of metal plates or sheets with tin, lead, or other metals or alloys. Apr. 30.

[C.S.] 16,359 (1901). Lake. — From Scheidel. Proce for the extraction of metals from their ore May 7.

„ 1682 (1902). Mitchell. Smelting furnaces. Apr. 3

„ 2234 (1902). Strecker. Process of preparing plat of heavy metals or alloys for lithographic printin purposes. Apr. 30.

„ 2865 (1902). Auman. Smelting furnaces. Apr. 3

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 9803. M. Wildermann. Electrolytic decompositio of alkaline salts.* Apr. 28.

„ 9812 A. J. Boult.—From H. Seibert and G. Tempe Germany. Electrolytic production of a bleachin liquor and caustic alkali lye, and in apparatu employed therein.* Apr. 28.

„ 10,083. H. J. Haddan. — From the "Pyrisolith Isolating Material Manufacturing Co., Ltd., Hu gary. *See under* IX.

„ 10,102. F. T. Jackson. Apparatus for use in electr plating. May 2.

„ 10,204. J. Hargreaves, J. W. Stubbs, and Kearsley. Electrodes. May 3.

[C.S.] 8280 (1901.) Fortun and Semprun. Accumulat or secondary batteries. Apr. 30.

„ 10,655 (1901). Bell and Bell. Electrolytic cell, c apparatus. May 7.

„ 12,134 (1901). Lee. *See under* II.

„ 13,568 (1901). Tommasi. Plates for electric accumu lators. Apr. 30. Date applied for under Inter national Convention, Jan. 17, 1901.

„ 14,751 (1901). Tossizza. Process of electro-metal lurgic treatment of ores of copper and othe metals with depolarised insoluble anodes. May

„ 2820 (1902). Garuti and Pompili. Apparatus fo the electrolysis of water. May 7.

„ 6310 (1902). Thompson.—From Ulko. Electro lytic separation of metals. May 7.

„ 7169 (1902). Allison. — From Banks. Electri battery. May 7.

XII.—FATS, OILS, AND SOAP.

[A.] 9196. W. Walther. *See under* III.

„ 9211. J. Mensik. Manufacture of linoleum or lik material. Apr. 21.

„ 9283. J. R. Tate. Apparatus for heating, clarifying filtering, and liquefying waste oils or lubricants. Apr. 22.

„ 9313. W. F. Downs. New or improved lubrican and process for manufacturing the same.* Apr. 2

„ 9646. D. M. Nesbit. Grease separators, water, an like purifiers. Apr. 25.

„ 9985. P. Lewy. Method of preparing oils and othe liquids for medicinal use.* Apr. 30.

[C.S.] 10,177 (1901). Bach. Composition for cleanin metals. May 7. Date applied for under Inte national Convention, Oct. 19, 1900.

„ 11,031 (1901). Baker. Apparatus for separatin grease from steam. Apr. 30.

„ 11,941 (1901). Boult. — From Grassie. Treatmer of cotton-seed. Apr. 30.

„ 15,451 (1901). Schulz. Apparatus for separatio oil from steam. May 7.

„ 19,827 (1901). Lynch. Soap tablets. Apr. 3 Date applied for under International Conventio Apr. 2, 1901.

„ 23,893 (1901). Ostling. Lubricants and lubricatin apparatus for the cylinders of air-compressor May 7.

III.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 9322. H. H. Lake.—From F. J. Warren, United States. Manufacture of coal-tar compositions and pitches.* Apr. 22.

„ 9332. H. H. Lake.—From F. J. Warren, United States. Manufacture of, and method of using, asphalt cements and compositions.* Apr. 22.

„ 9485. J. B. De Alzugaray. *See under* X.

„ 9674. G. H. Lloyd. Coating of steel and iron pipes and the like for water mains and other services. Apr. 26.

[C.S.] 8923 (1901). De Brandel and D'Asson. New product especially applicable for use in the manufacture of colours and inks, and process of manufacture of the said product. Apr. 30.

„ 12,826 (1901). Lake.—From Weehsler. Preparation of colours for lithographic and other printing. Apr. 30.

„ 16,945 (1901). Rak. *See under* XVI.

B.—Resins, Gums, &c.

[A.] 9196. W. Walther. *See under* III.

[C.S.] 10,663 (1901). Daeschner. *See under* III.

C.—India-rubber, &c.

[A.] 9625. G. B. Wittenberg, E. Brock, and E. Koch. Vulcanizing processes, and apparatus for use therein.* Apr. 25.

„ 10,113. C. Manning. New or improved construction of machine for the production of india-rubber mats and like goods. May 2.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

[A.] 9286. C. F. A. Bitterling. Apparatus for dressing intestinal skins. Apr. 22.

„ 9304. M. Pianko. Grain and pebbled leathers, and the manufacture thereof.* Apr. 22.

„ 9709. R. C. Sennett and J. E. Sennett. Treatment of skins and hides. Apr. 26.

[C.S.] 9556 (1901). Dreher. *See under* VI.

„ 16,945 (1901). Rak. *See under* XVI.

„ 1010 (1902). Lake.—From Turner Tanning Machinery Co. Machines for use in treating hides, skins, and the like. May 7.

XV.—MANURES, Etc.

[A.] 9473. T. L. G. Bell. Manufacture of manures. Apr. 24.

„ 10,111. J. R. Hatmaker.—From J. A. Just, United States. Sodium acid phosphate and casein compound, and process for making same. May 2.

„ 10,241. J. Heron and R. Rapp. Treatment of brewer's waste yeast for the production of a fertilising product. May 3.

XVI.—SUGAR, STARCH, and GUM, Etc.

[A.] 9331. J. Kostalék. Filters for sugar juices and other liquids, and means for cleansing the filtering medium thereof.* Apr. 22.

„ 9506. J. A. Besson. Process for the purification and concentration of saccharine juices and products from sugar manufactories.* Apr. 24.

„ 9525. E. Gudeman. Method of utilising gluten tailings.* Filed Apr. 24. Date applied for, Oct. 17, 1901, being date of application in United States.

„ 9868. C. F. Cross and J. Traquair. Manufacture of soluble starch. Apr. 29.

[C.S.] 9496 (1901). Kaczorowski. Process and apparatus for covering or liquoring sugar loaves. Apr. 30.

„ 16,945 (1901). Rak. Batteries for the diffusion process by which certain juices, saps, essences, pigments, and the like are obtained from certain consistent matters as beetroot, sugar-cane, odorous plants, colour-woods, tannic acid materials, and the like. May 7.

„ 3914 (1902). Steffen. *See under* XVIII. A.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 9399. N. Körber. Apparatus for smoking wine barrels with sulphur. Apr. 23.

„ 9990. G. Lefebvre. Apparatus for continuous brewing whereby beer of bottom, top, or mixed fermentation can be produced.* Apr. 30.

„ 10,241. J. Heron and R. Rapp. *See under* XV.

[C.S.] 8309 (1901). Farmar. Slide rule for all calculating purposes in connection with wines and spirits. Apr. 30.

„ 9221 (1901). Jacquemin. Process of preparing and method of using low fermentation brewery yeasts fermenting at a high temperature. May 7.

„ 25,469 (1901). Müller. *See under* III.

„ 2954 (1902). Partridge. *See under* XVIII. A.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 9329. J. Sleeman. Improved food and method of preparing same. Apr. 22.

„ 9528. K. Wolff. Improved process for drying and preserving blood. Apr. 24.

„ 9655. A. G. Enock. *See under* I.

„ 9718. L. J. P. M. J. Dupere. Manufacture of feeding cake for cattle. Apr. 26.

„ 10,111. J. R. Hatmaker.—From J. A. Just, United States. *See under* XV.

[C.S.] 8074 (1901). Blonme. *See under* I.

„ 8666 (1901). Siebert. *See under* I.

„ 8777 (1901). Davies and Wilding. Yeast. Apr. 30.

„ 9084 (1901). Windhausen and Windhausen, jun. *See under* VII.

„ 12,648 (1901). McCaney. Cooling or refrigerating apparatus for cold storage chambers. Apr. 30.

„ 2954 (1902). Partridge. Mode and means for treating and drying hops, malt, fruit, vegetables, and other similar substances. Apr. 30.

„ 3914 (1902). Steffen. Process for the production of saccharine foodstuffs. Apr. 30.

„ 7431 (1902). Bain and Hannay. Preservation of fruits, vegetables, and the like. May 7.

B.—Sanitation; Water Purification.

[A.] 9179. F. P. Candy. Apparatus for the distribution of liquids on filter-beds. Apr. 21.

„ 9247. T. H. Ramsden. Apparatus for sewage tanks and for automatically working of such or the like. Apr. 22.

„ 9623. H. W. Dige. Tanks for biological cleaning of water in sewers.* Apr. 25.

„ 9646. D. M. Nesbit. *See under* XII.

„ 9823. R. R. McKee and C. A. Jackson. Automatic device for the collection and distribution of sewerage. Apr. 29.

„ 9920. S. H. Adams. Filters for sewage and liquid, and apparatus connected therewith. Apr. 30.

„ 9996. F. Fouché. *See under* VII.

„ 10,081. G. Richter. Apparatus for moistening air. May 1.

[C.S.] 9001 (1901). Lübbecke. Apparatus for spraying and pulverizing disinfectant liquids. Apr. 30.

[C.S.] 9337 (1901). Barnard. Profitable disposition of sewage, sludge, and other similar costly nuisances. May 7.

„ 10,346 (1901). Welch, Heywood, and Wollaston. Apparatus for the treatment of sewage. May 7.

„ 11,368 (1901). Haller and Machell. Filters and apparatus for automatically alternating the delivery of liquid or sewage thereto, more particularly applicable to bacteriological filters. Apr. 30.

„ 13,473 (1901). Schwarz. Means for cooling condensing water and the like. May 7.

„ 2133 (1902). McPhail. Apparatus for heating, softening, and purifying water. May 7.

„ 3523 (1902). Gunning. Means for heating feed water for boilers and precipitating therefrom scale-forming particles, and preventing the deposit thereof on the walls of the passages of the heater. May 7.

C.—Disinfectants.

[A.] 9591. W. H. Hughes, T. Hughes, and R. G. Whitford. New alkaloid to produce a sheep dip, disinfectant, and anti-malarial cleansing compound. Apr. 25.

[C.S.] 8882 (1901). Roubleff. Production of slow combustion lamps for disinfecting, therapeutic, and other purposes. Apr. 30.

„ 13,003 (1901). Drayton. Composition for use as insecticide and disinfectant. May 7.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 9408. J. Doull. *See under* V.

„ 9496. A. G. Brookes.—From M. D. Knowlton and F. H. Beach, United States. Apparatus for applying gum, glue, or other coating to sheets of paper or other material. Apr. 24.

„ 9683. H. J. Rogers and T. Allen. Means and apparatus for actuating revolving strainers for straining paper pulp and other materials.* Apr. 26.

„ 9759. J. Sims. Process or method of manufacturing artificial wood, boards, and blocks. Apr. 28.

[C.S.] 9905 (1901). Ribal. Paper-making machines. May 7.

„ 19,585 (1901). Imray.—From American By-Products Co. Manufacture of pure cellulose from cotton seeds. Apr. 30.

„ 68 (1902). Harrison.—From Parker. Sheet material applicable for covering the couch rolls and other parts of paper-making machines, the manufacture of belts for supporting Fourdrinier wires, and for other purposes. May 7.

„ 7140 (1902). Hughes. Wood pulp presses. May 7. Date applied for under International Convention, July 3, 1901.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 9416. L. Edeleanu and G. A. Filiti. *See under* III.

„ 9452. A. Macfarlane. New or improved solvent or compound. Apr. 24.

„ 9591. W. H. Hughes, T. Hughes, and R. G. Whitford. *See under* XVIII. C.

„ 9863. F. Blum. Process for the preparation of a serum for the treatment of diabetes and the like. Apr. 29.

„ 9936. L. Wenghoffer. Manufacture of ketones. Apr. 30.

[A.] 9953. A. Boake, Roberts, and Co., and R. Stewart. Manufacture of hydrogen peroxide. Apr. 30.

„ 9985. B. Lewy. *See under* XII.

„ 10,045. L. E. Evans. Improved apparatus to be used in obtaining infusions or extracts of various substances.* May 1.

„ 10,094. G. W. Johnson.—From C. F. Boehringer und Söhne, Germany. Manufacture of hydroxylamine. May 1.

„ 10,234. A. Nissel. Process for the manufacture of a compound of guaiacol, cinnamic acid, and tannin.* May 3.

[C.S.] 12,861 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of sulphuryl chloride. Apr. 30.

„ 13,205 (1901). Imray.—From Liebrecht. Manufacture of new derivatives of isovaleramide. May 7.

„ 15,127 (1901). Bloxam.—From Soc. de Laire et Cie. Manufacture of homologues of α- and β-ionone. May 7.

„ 16,945 (1901). Rak. *See under* XVI.

XXI.—PHOTOGRAPHY.

[A.] 9184. E. R. Clarke. Photography in natural colours. Apr. 21.

„ 9276. A. H. Frere. Sensitized roll films for photographic purposes. Apr. 22.

„ 9608. E. C. Varry. Apparatus for producing photographic and like prints by artificial light.* Apr. 25.

„ 9782. H. E. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Photography. Apr. 28.

„ 9842. G. Gerlach. Process and apparatus for treating in liquor baths photographs copied on endless sheets.* Apr. 29.

„ 9992. Y. Schwartz. Process of preparing paper for photographic purposes. Apr. 30.

„ 9993. Y. Schwartz. New and improved photographic emulsion. Apr. 30.

[C.S.] 11,719 (1901). Abel.—From Act.-Ges. f. Anilin Fabr. Process of rendering silver-haloid layers sensitive to different degrees of refrangibility. May 7.

„ 23,292 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of flash lights for photography. May 7.

„ 25,234 (1901). Livett. Means of developing, washing, and fixing photographic roll films. Apr. 30.

„ 4946 (1902). Cox. Photo-engraving of metallic plates for printing purposes. Apr. 30.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 9187. E. H. Harris, F. E. W. Bowen, and R. H. Milward. Manufacture of smokeless powder. Apr. 21.

„ 9480. H. Maxim. Smokeless powder grains and cartridges and charges especially adapted for use in large guns. Apr. 24.

„ 9481. H. Maxim. Smokeless powder grains and cartridges and charges especially adapted for use in large guns, and methods of making the same. Apr. 24.

„ 10,150. F. Czerweny, propr. of the K. K. Priv. Zündwärenfabr. Fl. Pojatzi and Co. Match making machines.* May 2.

„ 10,151. F. Czerweny, propr. of the K. K. Priv. Zündwärenfabr. Fl. Pojatzi and Co. Match making machines.* May 2.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 462

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 10.—Vol. XXI. **MAY 31, 1902.** No. 10.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

ge Beilby.
orbes Carpenter.
John Clark.
. C. F. Chandler, D.Sc., D., Ph.D., LL.D.
. G. G. Henderson, D.Sc.
R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Dr. Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

. Brotherton, M.P.
ace Carey.
dw. Divers, F.R.S.
. Fairley.
W. R. E. Hodgkinson, D.
rant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

CANADIAN.
W. R. Lang. | Alfred Burton.

LIVERPOOL.
nguet Higgins. | Dr. T. Lewis Bailey.

LONDON.
Hehner. | A. R. Ling.

MANCHESTER.
. Grossmann. | J. Carter Bell.

NEWCASTLE.
. Rennoldson. | P. C. Garrett.

NEW YORK.
rd Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
hbutt. | J. T. Wood.

SCOTTISH.
obert Pullar. | Dr. Thos. Gray.

YORKSHIRE.
e Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

ces: Palace Chambers, 9, Bridge Street, Westminster, S.W.
Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams .....I., XV.
L. Archbutt.I., XII.,XVIII.B.
J. L. Baker .....XVI., XVII.
H. Ballantyne .....II., XII.
D. Bendix .....III.
E. Bentz .....IV., V., VI.
J. G. Braithwaite .....XX.
J. F. Briggs.....XVI., XVII.
J. H. Collins .....X.
C. F. Cross.....V., XII., XIX.
J. T. Dunn, D.Sc. ..VII., X., XI.
Walter C. Hancock, B.A. ....VIII., IX.
J. W. Hinchley.I., X., XIII., XXI.
H. Ingle, Ph.D...V., VI., XII., XIII.
R. L. Jenks.....XIV., XIX.
J. B. C. Kershaw....VII., XI.
M C. Lamb.....VI., XIV.
T. A. Lawson, Ph.D. ..IV., XX.
F. H. Leeds..III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. .....IV., V.
J. McCrae, Ph.D. .....IV.
G.W.MacDonald,M.Sc..XXII.
W. G. McMillan.X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ....XV.
C. A. Mitchell, B.A. .....XII., XXII.
A. More .....VII., XVIII.
G. T. Morgan, D.Sc. ...IV., V.
F. Neurath, Ph.D. .....IV., V.
J. G. Parker, Ph.D. .....XIV.
H. T. Pentermann.....XVI., XVII.
H. S. L. Polak....Patent List.
T. H. Pope..XVI., XX., XXI.
F. W. Renaut .....Index.
G. H. Robertson .....XI.
Chas. Salter.....I., II., III., XV., XVI.
M. J. Salter..... ...XIII.
R. Sundon.....II.
J. Shields, D.Sc., Ph.D. .....XI.
A. Shonk .....Gen. Chem.
W. P. Skertchley.XII., XVIII., XX.
E. Sonstadt.....III., VII., X.
A. L. Stern, D.Sc. .....XVII.
E. Howard Tripp, Ph.D. .....III., VII., XVI.
Charles T. Tyrer..... XX.
L. J. de Whalley, B.Sc...XVI.
E. W. Wheelwright, Ph.D. .....XXII.
A. Wingham .....X.
Joseph T. Wood.....XIV.
A. C. Wright, B.Sc., M.A... IV., XVIII., XX.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: { G. P. Girdwood. / Harold Van der Linde.

Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. Hodgson Ellis.
M. C. Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.

Committee:

Percy Bateson.
J. Campbell Brown.
A. Carey.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Herbert E. Davies.
D. Herman.
Julius Rascben.
F. H. Tate.
W. Collingwood Williams.

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

The following take office in July next:—*Chairman:* F. H. Tate. *Vice-Chairman:* C. Longuet Higgins. *Committee:* Max Muspratt, Alf. Smetham, H. B. Stocks, J. W. Towers.

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.

Committee:

J. J. Bowley.
A. C. Chapman.
E. Divers.
H. Hemingway.
E. Grant Hooper.
D. Lloyd Howard.
W. Kellner.
J. Lewkowitsch.
B. E. R. Newlands.
Boverton Redwood.
Walter F. Reid.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

The following take office in July next:—*Chairman:* Walter F. Reid. *Committee:* Julian L. Baker, M. O. Forster, Oscar Guttmann, Otto Hehner, A. Gordon Salamon, W. S. Squire.

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.

Committee:

J. Barnes.
W. Brown.
J. Craven.
B. W. Gerland.
W. Heys.
J. M. Irving.
W. Irwin.
M. J. Laugdon.
A. K. Miller.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

The following take office in July next:—*Chairman:* Ivan Levinstein. *Vice-Chairman:* W. H. Bailey. *Committee:* J. Allan, R. Clayton, J. Hübner, H. Levinstein, W. J. Pope.

Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.
P. P. Bedson.
J. T. Dunn.
T. W. Hogg.
H. Louis.
F. S. Newall.
H. S. Pattinson.
John Pattinson.
W. W. Proctor.
G. Sisson.
Harry Smith.
J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

The following take office in July next:—*Committee:* H. S. Collins, J. Mather, C. E. Stuart.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.

Committee:

H. C. Aspinwall.
M. T. Bogert.
C. F. Chandler.
A. P. Hallock.
J. Hartford.
E. J. Lederle.
E. G. Love.
R. W. Moore.
T. J. Parker.
R. C. Schüpphaus.
M. Toch.
G. A. Williamson.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

The following take office in July next:—*Chairman:* V. Coblen *Vice-Chairman:* Russell W. Moore. *Committee:* L. Backelar G. Drobegg, W. F. Fuerst, Clifford Richardson, G. C. Stone, W. Schieffelin.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
J. J. Sudborough.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

The following takes office in July next:—*Committee:* Lox Meggitt.

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.

Committee:

W. Carrick Anderson.
E. M. Bailey.
G. T. Beilby.
H. Bumby.
J. Christie.
W. J. Chrystal.
D. B. Dott.
C. J. Ellis.
W. Foulis.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
W. Ivison Macadam.
J. McCulloch.
T. L. Patterson.
D. J. Playfair.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgo

The following take office in July next:—*Chairman:* T. L. Pat son. *Vice-Chairman:* D. J. Playfair. *Committee:* Thos. Ev W. Frew, Jas. Hendrick, Jas. Hope, H. Ingle, W. G. Johnsten.

Yorkshire Section.

Chairman: George Ward.
Vice Chairman: T. Fairley.

Committee:

E. A. Brotherton.
A. W. Cooke.
W. M. Gardner.
H. Grandage.
Edw. Hallwell.
A. J. Murphy.
S. G. Rawson.
A. Smithells.
A. Turnbull.
H. A. Watson.
Thorp Whitaker.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

The following take office in July next:—*Chairman:* Ja Bedford. *Committee:* C. S. Bedford, John W. Cobb, H. G. W. Slatter.

N.B.—The names in *italics* are those of members of Committee who retire from their respective offices at the end of the current se

Notices.

NUAL GENERAL MEETING, LIVERPOOL, 1902.

PROVISIONAL PROGRAMME.

Wednesday, July 9th.

0 a.m. Council Meeting, at University College.
a.m. General Meeting, at University College.
p.m. Luncheon, at the Adelphi Hotel, by invitation of the Liverpool Section. Ladies accompanying members are invited.
p.m. Garden Party, at Seaforth Hall, by invitation of E. K. Muspratt, Esq., J.P.
).m. to p.m. Reception at the Town Hall, by the Lord Mayor of Liverpool.

Thursday, July 10th.

ole Day Excursions :—

1) Works of the Telegraph Manufacturing Co., Ltd., at Helsby. Luncheon, by invitation of the Directors of the Company. Afternoon Tea, by invitation of G. Crosland Taylor, Esq.

2) Excursion to Prescot :—

Morning—Works of the British Insulated Wire Company. Luncheon, by invitation of the Directors of the Company.

Afternoon—Works of the Lancashire Watch Company.

f-Day Excursions :—

'orning—

(1) Visit to Port Sunlight Village and the Works of Messrs. Lever Brothers. Luncheon, by invitation of Messrs. Lever Brothers. Ladies are invited to join this excursion.

(2) Works of the United Alkali Co., Ltd., at Widnes. Luncheon by invitation of the Mayor of Widnes (W. W. Gossage, Esq., J.P.) and Directors of the United Alkali Company. It is hoped that it will be possible to convey members on this excursion by motor cars.

(3) Messrs. Ogden's Tobacco Factory and the Tobacco Warehouses of the Mersey Docks and Harbour Board.

'ternoon—

(1) Works of the Diamond Match Co. at Seaforth.

(2) Liverpool Corporation Electric Power Stations.

p.m. Annual Dinner at the Adelphi Hotel.

Friday, July 11th.

le Day Excursion to Llandudno and Beaumaris by loon Steamer "St. Elvies."

). Smoking Concert at the Reform Club.

detailed programme, with request forms for tickets, ied with this Journal.

accordance with the provisions of Rule 18 of the y aws, notice is hereby given that those Members whose s are placed in *italics* in the list of Council will retire o their respective offices at the forthcoming Annual e ng.

I. Ivan Levinstein has been nominated to the office of r lent for a second year, under Rule 10; Mr. E. Grant o er, Dr. F. B. Power, Prof. Wm. Ramsay, F.R.S., and r Thos. Tyrer have been nominated Vice-Presidents i Rule 8; and Dr. John Clark has been nominated a ic President under Rule 24.

T Hon. Treasurer and Hon. Foreign Secretary have e ominated for re-election to their respective offices.

M nbers are hereby invited to nominate fit and proper r s to fill four vacancies among the Ordinary Members C ncil. Forms for this purpose can be obtained, on p ation, from the General Secretary, or from the Hon. Sc Secretaries of the Canadian and New York Sections.

Extract from Rule 18 :—"No such nomination shall be valid unless it be signed by at least ten Members of the Society who are not in arrear with their subscriptions, nor unless it be received by the General Secretary, at the Society's Office, at least one month before the date of the Annual General Meeting, to the election to take place at which it refers. Nor shall any such nomination be valid if the person nominated be ineligible for election under Rules 12 or 15. No member shall sign more than one nomination form."

THE CORONATION.

The Society will be glad if any Members not resident in Great Britain will intimate to the General Secretary at the earliest possible date if they intend to be in London at the time of the Coronation.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on lcohol has crippled or destroyed.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.
For Names only of Members recommending the Candidate. .....
.....
And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
Signature of Candidate.....
Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....
Profession or Business Occupation .....
Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each

year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have now submitted their report, prescribing a method for dealing with the various substances which might contain Arsenic, and the report has been accepted by the Council.

Copies of this, together with the papers, discussions, and abstracts which appeared in the Journal in 1901, and other extracts, may be obtained from Messrs. Eyre and Spottiswoode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

List of Members Elected

23rd MAY 1902.

Avery, D., 23, Belmont Avenue, Kew, Melbourne, Vic., Australia, Teacher of Chemistry.

Benjamin, Albert, c/o Thos. Hardcastle and Son, Ltd., Firwood Works, Bolton, Colorist and Dyer.

Branegan, James Augustus, 511, Lexington Avenue, Brooklyn, N.Y., U.S.A., Chemical Salesman.

Brown, A. H., Deloro, Ont., Canada, Metallurgist.

Champion, Edmund C., c/o Iola Portland Cement Co., Iola, Kans., U.S.A., Chemist.

Chilwell, John, Oakeswell, Wednesbury, Analyst.

Clark, William Linus, c/o Champion Coated Paper Co., Hamilton, Ohio, U.S.A., Superintendent of Works.

Currier, Edward Eugene, 15, Ferry Street, Everett, Mass., U.S.A., Chemist.

Davies, William Rhys, Buckingham Mill, Perambore, Madras, India, Analytical Chemist.

Dick, John, c/o Coulthurst and Harding, Alpha Wharf and Works, Millwall, E., Manager and Chemist.

Edison, Thomas Alva, The Edison Laboratory, Orange, N.J., U.S.A., Inventor and Manufacturer.

Hays, B. F., c/o Fraser Tablet Co., 454–474, 18th Street, Brooklyn, N.Y., U.S.A., Chemist.

Hazard, Dr. Elmer C., Shrewsbury, N.J., U.S.A., Chemist.

Henderson, J. C. A., Sun Court, Cornhill, London, E.C., Gentleman.

Maedonald, Peter, Thornton Park, Thorntonhall Station, Lanarkshire, Analytical Chemist.

Meade, Richard K., c/o Edison Portland Cement Co., Stewartville, N.J., U.S.A., Chemist.

Pay, Walter Herbert, Government Laboratory, Durban, Natal, South Africa, Chemist and Assayer.

Quinan, Kenneth B., c/o De Beers Explosives Works, Somerset West, Cape Colony, South Africa, Chemist

Riley, Fred., 27, Dover Street, Crumpsall, Manchester, Traveller.

Sellar, W. C., c/o The New Gold Coast Ageney, Cinnamo Bippo, Tarkwa, Gold Coast Colony, *viâ* Sekon Analytical Chemist.

Shimotome, Henyi, 419, N. State Street, Ann Arbor, Mic U.S.A., Assistant Professor of Chemistry.

Thomson, Allen B., 4, Lyncroft Gardens, West Ealing, W Chemical Engineer.

MEMBER OMITTED FROM LIST.

1901. Schieren, G. Arthur, 47, Ferry Street, New Yo City, U.S.A., Mechanical Engineer and Tanner.

Changes of Address.

When notifying new addresses, members are requested write them distinctly, and state whether they are tempora or permanent. Multiplication of addresses is also to avoided as tending to create confusion. When sendi subscriptions, the use of the form attached to the applicati helps in the verification of addresses, on which the sa delivery of the Journal depends.

American Institute of Electrical Engineers, l/o 120; 9 Liberty Street, New York City, U.S.A.

Boyes, Herbert J.; all communications to c/o Rio Janeiro Flour Mills, Ltd., Caixa do Correio 574, S Paulo, Brazil.

Briggs, J. F., l/o Week Street; 12, Salisbury Road, Mai stone.

Bucknill, Jno. A., l/o London; Private Box, Patent Offi Pretoria, South Africa, Comptroller General of Paten Transvaal.

Burkhardt, Dr. G. A., l/o Bucarest; Valea, Calugareasi Roumania.

Clayton, J. W.; Journals to c/o Clayton and Jowett, Lt Concert Street, Liverpool, Essence Distiller.

Cook, A. J.; 14, Penecek Street, Gravesend (*not* Live pool).

Dains, H. H., l/o Madras; c/o Alf. Thorpe, Solicito Bramley, near Leeds.

Fergusson, D. M. (of Halifax, N.S.); Journals to 7, Caddl hill Terrace, Greenock, N.B.

Foster, Jas., l/o St. Andrew's Drive; 42, Herriet Stre Pollokshields, Glasgow.

Grandage, H., l/o Brighouse; 2, Darley Street, Bradford.

Haines, Reuben, l/o Germantown; 909, Walnut Stre Philadelphia, Pa., U.S.A.

Hall, Wm. F., l/o Kaapsche Hoop; retain Journals on further notice.

Hosie, G. H., l/o Glasgow; Yonderton, West Kilbrid Ayrshire.

Joplin, G. C., l/o O'Connell Street; 12, Harrington Stre Sydney, N.S.W.

Lindsay, Robt.; Journals to Rosshead, Alexandria, N.B.

Lindsay, Robt. B., l/o Busby; Hayfield, Alexandria, N.B

Lowe, Clement W., l/o Reddish; Cornbrook, Legh Ros Knutsford, Cheshire.

McDougall, Hugh, l/o Runcorn; Mount Pleasant, Hdding ton, N.B.

Mordle, F. Dare, l/o Nottingham; Gilderoy, Matlock Ba Derbyshire.

Neilson, Thos., l/o Mexico; retain Journals until furth notice.

Parrish, S., l/o Sholebrook Mount; 80, Grange Avent Chapeltown Road, Leeds.

Pauli, Dr. H., l/o London; 145, Lloyd Street, Greenhey Manchester.

Seldner, R., l/o Jefferson Avenue; 1395, Dean Stre Brooklyn, N.Y., U.S.A.

Stead, J. C. (Bow); Journals to 42, Grove Green Ro Leytonstone, N.E.

Stewart, Saml. (Westminster); Journals to Parkhurst, Pa Road, Wallington, Surrey.

Stone, G. C., l/o 115; c/o New Jersey Zinc Co., 11, Bro way, New York City, U.S.A.

ller, Dr. Elwyn, l/o New York City; 7, Franklin Place, Morristown, N.J., U.S.A.
itaker, M. C., l/o New York City; c/o Welsbach Light Co., Gloucester City, N.J., U.S.A.
ite, Paul T., l/o Saffron Hill; Horton Field House, West Drayton.
iteside, Jno. L., l/o Cannon Street; 376, St. Helen's Road, Bolton-le-Moors.

CHANGE OF ADDRESS REQUIRED.

wart, Jeffrey, l/o Albert Mills, Hammersmith, W.

Death.

ver, Thos., Messrs. Mort, Liddell, and Co., Widnes. May 20.

London Section.

Meeting held on Monday, March 10th, 1902.

MR. OTTO HEHNER IN THE CHAIR.

RMINGHAM SEWAGE AND ITS TREATMENT.

BY F. R. O'SHAUGHNESSY, A.R.C.Sc., A.I.C., ETC.

he systematic sewerage of the borough of Birmingham commenced in 1852, chiefly for the purpose of carrying y liquid refuse.

rigiually the liquid and solids discharged at the outfall he sewers were passed into the River Tame. Tanks e laid down about 1858, and various methods of purifi- on by precipitation, sedimentation, and filtration tried. ethod of treatment by addition of lime at the rate of it 12 grains per gallon, with subsequent sedimentation, adopted in 1872, and continued till two years ago. The ge was collected in three large tanks of a total capacity 440,400 cb. ft., with 16 smaller tanks of 728,960 ft. capacity. The sludge and liquid effluent were treated separately on land. The area of land has increased from a few acres round the tanks in 1870 ,800 acres at the present time.

eneral Description of Farm, &c.—Birmingham is situ- at from 400 to 600 ft. above sea level, and the area of square miles draining to the farm is occupied by a ulation of 815,400. The farm lies in a narrow strip in valley of Tame to north-east of Birmingham, along north bank of the river for a distance of six miles. eological formation on which the farm lies belongs to Upper Trias, the subsoil consisting largely of red and w marls, clays, sands, and mixtures of sand and gravel, acteristic of the Keuper beds. A strip of alluvium of ing width runs by the river basin.

resent Method, viz., Septic Treatment, &c.—The sewage ought to the works at Saltley in four great sewers, *viz.*, Saltley main, Rea main, Hockley Brook main, and n and Handsworth main intercepting sewers. Two of three large tanks are continually in use, the third one g out of use temporarily for cleaning purposes. Each is, hence, allowed to run a fortnight before emptying.

ese large tanks are each divided into three parts by erged partitions, rising to within 2 ft. of the surface. first chamber retains the detritus of a heavier nature, h carries down much organic matter with which it mes inevitably entangled, whilst the other two chambers t the bulk of the residual suspended matter. The ge passes on to the 16 smaller tanks, where it undergoes e treatment for a period of 5½ hours (it has recently increased to 8 hours), and finally passes on to an conduit which runs along the farm with an uniform ient of 2 ft. per mile, and from which the sewage is ibuted on to the land.

he large tanks are known as "roughing tanks," the ler ones as "finishing tanks."

Sludge Disposal.—The sludge which accumulates in the "roughing tank" is of two kinds. The detritus chamber, when full, contains heavy solid matter containing 50 per cent. water, which is dug out by a grab and crane, and is then carried by wagons to a convenient tipping ground. The rest of the tank contains semi-fluid matter containing 90 per cent. water, which is lifted into wooden shoots, often over a mile in length, along which it passes to the land. It is helped in its passage by men, who push it along with a flat wooden block.

Formerly the field was divided up into a number of plots or lagoons for the reception of the sludge, which was dug in when sufficiently dry. Now, however, trenches are dug the length of the field, about 18 ins. deep and 3 ft. wide. The trenches are dug out some time before required to let the earth dry, and the bulk of the water in the sludge is thereby absorbed by the soil. Any excess water is run off after standing, and caused to filter through other ground. The sludge is then covered in by the earth which has been dug out, the great nuisance due to free exposure of sludge under the old system being largely eliminated. The analysis of the effluent from a field whilst under sludge is given in Table F.

The following are the quantities of sludge lifted from the settling tanks in different years:—

Year.	Liquid Sludge, 90 per Cent. of water.	Road detritus, &c. 50 per Cent. of water.	Daily dry weather flow.
			Galls.
1880	178,100 cb. yds. (includes detritus)		13,000,000
	Cb. yds.	Cb. yds.	
1886	128,524	3,500	18,000,000
1896	281,443	9,249	20,000,000
1901	128,449	8,483	21,500,000

During 1901, no lime was added to the sewage. Road detritus and sludge are variable quantities depending upon changeable factors, but we may reasonably infer that the enormous fall in liquid sludge in 1901 is largely due to the cessation of the use of lime and adoption of septic treatment.

Analyses of Sludge, &c.

Road Detritus, &c.—The heavy sludge from the detritus chamber of the "roughing tank" is of a black colour, with a strong characteristic smell of stale sewage, and of a viscous nature. It contains a large proportion of gritty matter with occasional pebbles and small stones. Usually it is interspersed thickly with coarse hairs and vegetable refuse in all stages of decomposition. Fragments of bone, leather, worsted, &c., appear in it. It contains about 50 per cent. water.

Analysis of Dry Detritus.

	Per Cent.
Volatile and organic matter	44·95
Sand and insoluble matter	44·54
Other inorganic matter	10·51
Nitrogen	1·43

When dried in air this detritus passes into a stiff hard cake, losing about 90 per cent. of its moisture, but still retaining its objectionable smell.

Liquid Sludge.—The liquid sludge is quite black in colour, with a strong smell of sewage. The solid matter is much finer than in the foregoing sludge and consists largely of decomposing fæces and other organic matter, with much finer sand, a little hair, coal, &c. It contains about 90 per cent. water.

Analysis of Dry Sludge.

	Per Cent.
Volatile and organic matter	56·53
Sand and insoluble matter	29·12
Other inorganic matter	14·35
Nitrogen	2·59

On air-drying, it passes into a light porous friable cake having an earthy smell. The estimated rise in ground level due to sludging is one inch per year. The resulting soil is of a light free nature, and yields some of the best land effluents on the farm. Sludged land is very favourable to the growth of cabbage, kohl rabi, and mangold.

Distribution of Sewage on Land.—The great sewer through which the tank effluent flows along the farm is tapped by pipe or brick carrier, and this latter is again tapped, the water for each field being run along an earthen carrier which lies, as a rule, at right angles to the principal fall in the field. At convenient intervals the bootman (so-called from his long boots) inserts a stop in the carrier causing the water to "back up," and by means of a little rift in the side of the carrier to flow on to the land. The field when used simply as a sewage filter is divided into plots by means of "stanks" or small ramparts, and each of these plots is alternately drenched with sewage and then allowed a period of rest.

When worked as above no crop is grown on the field. As far as possible the fields are cropped in rotation, but insufficient land is available to allow of theoretical conditions being followed. Fields which are under crops may still be used for sewage treatment, the method of putting on water depending on the crop. Where root crops, cabbage, &c. are grown on ridges, the sewage is passed down the furrows, but some care has to be exercised, as by a too copious application of water a crop may be ruined. With grass crops small trenches or "grips" are cut at intervals to permit the water to run over the ground. Mangolds and kohl rabi take more water than any other crop.

The filter-beds are ploughed twice a year, and occasionally three times, in order to open up the surface, which becomes clogged. The land drains are laid at depths varying from 4 feet to 6 feet, averaging about 4 feet 6 ins., and are about 1½ chains apart.

This concludes the description of the chief arrangements at present for treating the sewage. Increased tank room, and provision for storm water, new sludge-lifting plant, &c., are in progress. Portions of the new plant are already in use, but it is premature here to say anything as to their effect.

The Sewage and its Properties.—Trade effluents constitute a very large proportion of Birmingham sewage, the manufacturers of the district being of course chiefly metal workers of various kinds. As far as can be ascertained the total number of such firms, whose discharge consists principally of spent and diluted acid with salts of iron, copper, &c., is 354. These consume a total quantity of 2,746 carboys of acid, viz., 1,100 of hydrochloric, about 1,000 of sulphuric, and 646 carboys of nitric acid per week. About a dozen firms contribute varying quantities of lime, the total being about 100 tons per week. These latter include chemical manufacturers, fellmongers, paper mills, &c. Several other institutions in the shape of markets with slaughter-houses, private slaughter-houses, gas works, pen manufactories, breweries, &c., contribute their own peculiar refuse.

The total flow of sewage from all sources is estimated at 24,500,000 gallons per day. In table A are given the average analyses of the sewage from the principal sewers.

The Saltley sewage is chiefly domestic, its flow being about 1,500,000 gallons per day. It receives about 50 carboys of sulphuric acid and 2 tons of lime per week.

This sewage is yellow (when filtered), with characteristic odour, sometimes like decaying straw, and very thick slowly subsiding sediment. Nitrates are usually present, but disappear in hot weather.

The Rea sewage is of a very mixed nature. Its flow is about 9,500,000 gallons per day. About 236 carboys of sulphuric, 800 carboys of hydrochloric, and 124 carboys of nitric acid, with 65 tons of lime, are received by this sewer per week. The whole of the markets of the city drain to this sewer.

The sewage is usually brownish in colour when filtered, with the usual smell, which is sometimes tarry, sediment dark and slowly subsiding. Nitrates are almost always present, disappearing in hot weather.

The Hockley sewage is of a very peculiar nature. Its flow is about 6,000,000 gallons per day. About 300 carboys of hydrochloric, 660 carboys of sulphuric, and 412 carboys of nitric acid are discharged, after use, to this sewer, as well as 10 tons of lime per week. The alkalinity of this sewage is usually very low indeed, but free acid has never been observed in it. The large quantity of nitrates comes chiefly from the dipping operations of brass-founders and jewellers.

The sewage is usually light yellow in colour when filtered, with characteristic, sometimes tarry, smell, and heavy brownish quickly subsiding sediment. Owing to large quantities of ferrous salts present, this sewage decomposes extremely slowly if left to itself. Nitrates are invariably present, but in varying quantities, the nitric nitrogen sometimes rising to 1·50 parts per 100,000. It is fortunate that it is possible to mix the whole of the sewage in the tanks, else this sewage would prove difficult to deal with successfully if isolated.

The sewage from the Aston and Handsworth districts is again different from all the others. Its computed flow is 4,750,000 gallons per day, the bulk of this being domestic. It receives 61 carboys of sulphuric and 75 carboys of nitric acid per week, with a small quantity of lime.

This sewage is usually light yellow in colour when filtered, with a strong smell of brewers' waste. The suspended matter is light and slowly subsiding. When passed through filter paper an opalescent filtrate is obtained. The fall in the sewer is small, and the rate of flow low, and hence, although much nitric acid is added, the nitrates are low and disappear in hot weather.

About 3,000,000 gallons of domestic sewage are received by the large conduit at different points on the farm from smaller sewers.

These statistics regarding acid have been compiled during the past year, which has been an exceptionally busy one for most of the trades concerned. Small firms and those not contributing objectionable trade waste have been omitted.

Discussion and Comparison of Analyses.—As a rule, samples were taken each quarter-hour, the quantity taken being in proportion to the flow.

A computed average analysis of the mixed sewage is given in Table A, which is calculated from the several estimated flows of the different sewages and my analyses of same. In Table B is given the analyses of the "roughing tank effluent" and the "finishing tank effluent" when under lime treatment two years ago. On comparing the former with the untreated "roughing tank effluent" it will be seen that the lime has arrested about one-third more of suspended matter in the tanks, whilst the dissolved matter is higher. The smaller sedimentation tanks formerly arrested 75 per cent. of the residual suspended solids.

In Table C is given the analysis of the "roughing tank effluent" and the "septic tank effluent" since the lime was stopped, *i.e.*, for 1901. An enormous quantity of gas escapes from the septic tank, and this results in a loss of about 8 per cent. in the solid matter which enters these tanks. The suspended solids are the same in both these effluents, but are very much altered in quality after passing the septic tanks. Much of the suspended matter in the "roughing tank effluent" must disappear in the septic tank, whilst the sulphides there developed precipitate most of the heavy metals in solution. The black colour of the septic effluent is due partly to ferrous sulphide. Thirty years ago it was apprehended that the large quantity of ferrous salts in Birmingham sewage would destroy the vegetation on the farm, and, in fact, several fields of crops were destroyed by the sewage in a crude state. Chiefly in order to precipitate this iron, &c., the treatment with lime was recommended and finally adopted. Here, however, in these septic tanks we have a natural and inexpensive means of attaining the same end. The present tank liquor is not merely harmless, but has considerable manurial properties; for in grass land irrigated by it the path of the water may be traced by the increased vigour of the herbage.

The following is an analysis of the dried sludge from the bottom of a septic tank after being several months in work.

Analysis of Septic Sludge.

	Per Cent.
Volatile and organic matter	42·30
Sand and insoluble matter	18·60
Other inorganic matter	39·10
Total nitrogen	2·80

The functions fulfilled by the tanks may be summed up as follows. The following heads include the principal considerations which led us to reject the treatment by lime and to adopt our present method :—

1. The sewage is mixed and becomes of a more uniform composition, the constituents of one kind of sewage either partially neutralising, precipitating, or diluting the constituents of another.

2. The flow is rendered more uniform.

3. The road detritus and larger particles of matter are arrested.

4. The septic action is set well on foot, by means of which the sludge is much reduced, and the residual suspended matter converted into a very finely divided state.

5. The residual sludge passing out in the septic tank effluent is distributed all over the farm, where it has a chance of acting efficiently as a manure. Land which has received no other manure has been found to give very good crops. Under the old lime treatment system, such sludge would have been dumped down in a concentrated form on a small area, which would thereby be rendered very rank and foul.

The Farm Effluents.—Table D contains the average analyses of the principal effluents from the farm for the year 1901.

1. The Castle Bromwich effluent, which receives the filtrate from one of the oldest and best parts of the farm, gives, as will be seen, the best results on analysis. A slight dilution takes place from small streams. The per cent. purification on the roughing tank effluent is 89 per cent. and 91·4 per cent. on original sewage, using the figures for "oxygen absorption." The area contributing to this effluent is 358 acres in extent, and the bulk of this was underdrained 20 to 25 years ago. The subsoil is chiefly a light yellow clay about 3 ft. thick, overlying gravel or red clay. There is a good proportion of sandy gravel subsoil, and a smaller proportion of stiff red and yellow clay in this area. This land was dressed several years ago with quicklime, and probably the extra alkalinity is due to this.

2. The Plants Brook effluent gets a comparatively small quantity of sewage effluent, as it consists partly of the overflow from a waterworks and partly of drainage from cultivated land above the sewage farm. About 70 acres contribute to this effluent. The subsoil is largely red sandy gravel.

3. The Water Orton effluent receives water from 500 acres of land which has been drained in more recent years. The purification is 84 per cent. on roughing tank effluent and 87·5 per cent. on original sewage. The high "free ammonia" is noticeable, and I shall remark on this later. Part of this land was treated several years ago with quicklime, and hence, no doubt, the high alkalinity. About one-third of this area has a light yellow clay subsoil from 2 to 3 ft. thick overlying gravel, and the rest consists chiefly of light and heavy clays overlying heavy yellow clay. There is a small quantity of sand and gravel subsoil.

The Minworth effluent receives water from 160 acres of land which is chiefly of a red, sandy, and gravelly nature. This land was drained and first treated with sewage about two years ago. The high "free ammonia" is partly due to the land being new and partly to the free and open nature of the soil. The per cent. purification is 84 on roughing tank effluent, 87·5 on original sewage.

The Curdworth effluent receives water from 350 acres of land which has been in use in part a little under a year, but a good portion has only been brought into use in sections during 1901. The subsoil is of a mixed nature including sand, sand and gravel, peat and clay. The per cent. purification is 83 on roughing tank effluent, 86·5 on sewage.

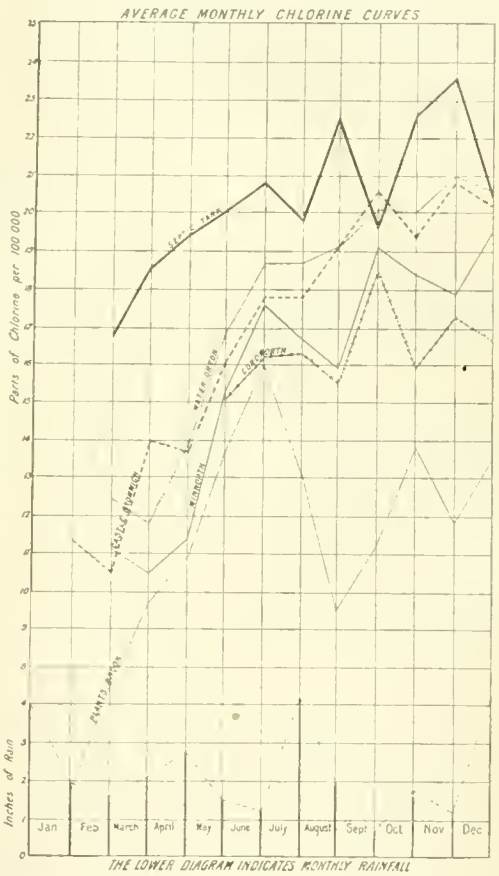
Some 270 acres of land adjoining the tanks drains to several smaller outlets.

To obtain a notion of the effluents yielded by different kinds of land, I have gone over the whole ground in detail and compared the nature of the subsoil of each field with its effluent. The following are my observations:—A subsoil of a mixture of sand and gravel with a small proportion of clay, underlain by a porous substratum of gravel, gives the best effluent.

Sand mixed with gravel subsoil allows the sewage to run through too quickly, resulting in a good nitrification but high "free ammonia." A light clay subsoil underlain by heavy clay gives good purification, but as a rule small nitrification. A heavy clay subsoil seems to act similarly to the last. Peaty land gives a very inferior effluent. One field with a subsoil of yellow ochre persistently gives the worst effluent on the farm. This field recently had a prolonged rest (for several months), and for a week or so after restarting yielded a high nitrification, but soon fell back into its original condition. Also a bulky ferruginous deposits separates from the effluent from this field. This would seem to indicate that an excess of iron in a subsoil inhibits the oxidation of sewage, &c., passing through it.

One field on the Saltley Farm, which had been heavily treated with sewage sludge for years, was regularly treated with crude sewage from the Rea main sewer. The average analysis of the effluent from this field is given in Table F; the nitrification is very high (the maximum observed was six parts of nitric nitrogen per 100,000), and the effect of the heavily limed sludge in the subsoil is seen in the alkalinity, which is quite abnormal.

A diagram is given showing the curves of the average monthly chlorine for the septic tank effluent and the land effluents for the year 1901. Generally speaking, the curves are similar. The tank effluent has, of course, been diluted



by subsoil water, and the effect of heavy rains may be seen on comparing it with the curve of rainfall. An average analysis is given of well water of the district as typifying to some extent the subsoil water in Table F. A remarkable rise in the chlorines is seen throughout the year. Some of the small irregularities in the curves are due to tracts of land which have been thrown out of use for ploughing.

Action of Soil, &c.—The action of soil on sewage may be considered under four heads: (1) Mechanical. (2) Physical. (3) Chemical. (4) Biological. The first two will depend on the porosity and degree of hydration

of the soil, the third will depend on the nature and constituents of the soil, and the last on the previous history of the particular soil.

The suspended impurities are abstracted, as a rule, by mechanical action. It has been shown that sand and organic constituents of soil have no chemical absorptive powers, but that this property, which is possessed by most soils, depends on the amount of clay contained in the soil. The constituent of the clay concerned in this action seems to be a hydrated silicate of alumina and soda, *i.e.*, decomposed zeolites, and the degree of chemical action seems to be determined by the ordinary laws of chemical mass action, *i.e.*, it depends on the concentration of solution and the quantity of soil used. Also the rate at which absorption proceeds varies greatly with different substances.

The practical conclusion to be drawn from these considerations is that care must be taken in working the land. After the point of saturation of the ground is reached, theoretically, the sewage should be shut off, or the effluent will suffer. During the period of rest the objectionable matters undergo a physical and chemical absorption by the particles of soil, and the organisms present are enabled to act on them, converting them chiefly into gaseous or soluble innocuous forms. Where a particular piece of ground is used contiouously as a sewage filter, what does not escape as gas must be principally washed out in the effluent. It is interesting to note in this respect the very large loss in nitrogen in the farm effluents.

Our farm is at present being strained to its utmost limit in order to deal with the whole of our dry weather flow, the sewage of about 470 people being treated per acre. On the high ground about one-fourth of the sewage is pumped, and it takes about 20,000 gallons per acre per day. For the whole of the farm the average is about 15,000 gallons per acre per day.

The effluent is a perfectly natural one, which never putrifies and gives rise to no nuisance, and will continue to improve after it has left our hands.

The change in the quality of the effluent from the older to the newer part of the farm is very marked and would seem to show that the longer land is treated by sewage the better it becomes for this purpose.

State of Farm, &c.—Some rather exaggerated notions of the nuisance arising from such a sewage farm as that at Birmingham are afloat. My laboratory is on the very centre of the farm, and its windows command a great stretch of farm land, which is continually irrigated by sewage. I have not the slightest cause of complaint, and the general verdict of visitors is the small amount of unpleasantness. It appears to be entirely a question of proper management, and with this very essential proviso, there appears to be little reason why a sewage farm should in all cases be a source of unpleasantness.

It remains for me to express my sincere thanks to all those gentlemen who have kindly supplied me with information.

In conclusion, I may point out, as others have pointed out before, that only by patient and uninterrupted experiment and observation, only by careful recording of phenomena on the large scale in the field, and comparison with the principles established in the laboratory, can we hope to extricate the solution of this problem from the realm of mere individual opinion or guess-work, and raise it to that of an exact science.

Birmingham Sewage Disposal, 1901.

Tables of Analyses.

Table A.

Results expressed in parts per 100,000.

Dissolved Solids.	Suspended Solids.	Free and Saline Ammonia.	Albuminoid Ammonia.	Chlorine.	Nitrogen as Nitrates and Nitrites.	Oxygen absorbed. Unfiltered.	Oxygen absorbed. Filtered.	Alkalinity.	Total Nitrogen. Unfiltered.	Total Nitrogen. Filtered.	Nature of Sample.
145·5	73·5	4·16	1·53	12·5	0·30	13·43	5·67	18·6	8·07	6·43	Saltley sewage.
134·0	54·6	3·59	1·52	24·5	0·33	17·38	10·26	18·2	8·33	6·55	Rea ,,
145·1	70·4	3·37	1·67	21·6	0·89	14·04	5·49	0·5	9·34	7·21	Hockley ,,
94·8	88·4	5·17	1·95	12·1	0·12	13·33	5·50	22·4	9·45	6·79	Aston ,,
129·1	67·6	3·87	1·63	20·3	0·44	15·32	7·61	..	8·84	6·78	Computed average sewage.

Table B.

138·0	16·3	3·46	1·00	22·9	0·48	10·91	8·17	..	6·71	6·56	Roughing tanks after liming, 1900.
133·2	4·2	3·79	0·97	19·8	0·58	9·52	..	26·4	5·70	..	Finishing tanks after liming, 1900.

Table C.

125·7	24·6	4·29	1·19	20·0	0·44	11·96	8·17	..	7·13	6·32	Roughing tank, unlimed, 1901.
115·4	24·5	5·26	1·06	20·3	none	10·77	6·85	23·7	7·42	6·58	Septic tank, unlimed. 1901.

Table D.

121·2	2·3	1·37	0·17	17·4	0·56	1·33	..	29·4	3·09	..	Castle Bromwich effluent.
84·6	2·9	1·53	0·20	12·3	0·45	1·18	..	15·8	2·68	..	Plants Brook effluent.
112·9	2·7	2·29	0·20	17·6	0·42	1·91	..	21·9	3·33	..	Water Orton ,,
100·0	2·7	2·01	0·21	15·9	0·43	1·91	..	16·3	3·31	..	Minworth ,,
107·8	5·1	2·03	0·21	16·2	0·42	1·99	..	17·0	2·83	..	Curdworth ,,

Table E.

99·0	5·8	0·64	0·22	9·2	0·45	1·72	..	20·9	..	..	River Rea.
79·6	11·3	0·90	0·17	16·8	0·22	1·27	..	17·7	..	..	River Tame.

Birmingham Sewage Disposal, 1901—*continued.*

Table F.

Results expressed in parts per 100,000.

Dissolved Solids.	Suspended Solids.	Free and Saline Ammonia.	Albuminoid Ammonia.	Chlorine.	Nitrogen as Nitrates and Nitrites.	Oxygen absorbed.		Alkalinity.	Total Nitrogen.		Nature of Sample.
						Unfiltered	Filtered.		Unfiltered.	Filtered.	
247·5	nil	2·31	0·19	17·0	trace	6·35	..	129·7	..	..	Effluent from sludged field.
229·8	trace	0·62	0·20	20·1	2·46	2·10	..	39·0	..	..	Effluent from land under crude sewage.
82·2	trace	0·016	0·020	7·5	0·71	0·27	..	..	..	..	Well water of district adjoining farm.

Discussion.

Dr. Rideal said that a careful record of the analytical data, when an important town like Birmingham was trying different methods, was essential for success. Failures in the past with sewage farms, and in the present from bacterial treatment, were due to the fact that the authorities were rather prone to begrudge the necessary fees for chemical and bacterial examination. It was surprising to find in Appendix to the recent report of the Royal Commission on Sewage Disposal how few towns were in a position to give the analytical data as to the quality of the sewage and effluent asked for by the commissioners. Birmingham had always been cited as an example of a successful sewage farm, but the figures now given and the recent injunction showed that this was far from being the case. In consequence, the Corporation had wisely thought it desirable to drop the land treatment and go in for the modern methods of bacterial treatment. It was very surprising that Birmingham had not taken the advice of their own expert, Prof. Frankland, who, like himself, was a strong advocate for bacterial treatment, but had left the matter entirely in the hands of the engineers. It was only within the last two years that Mr. O'Shaughnessy had helped them in their problem, and it now looked as if the conclusion they had come to, that they must have large storm filters, which cost an enormous amount of money, to take the extra liquid above three times the dry weather flow and up to six times that quantity before it was discharged into the river, was to a considerable extent money wasted. Some 50,000*l.* was spent in providing these storm filters, the work being carried out under the supervision of Mr. Hawksley, but in his opinion these filters were doing no good. The author had, however, given no analyses of the results. He believed they were going to be discontinued and to be turned into continuous filters for the liquid from the tank—a totally different purpose. This showed how money could be wasted on an arbitration award carried out by competent engineers when the problem was not looked at from the chemical and bacterial point of view. With regard to the present works it struck him as very extraordinary that the septic action referred to had taken place with the present small works. The septic tankage, which at first was 5½ hours out of the 24 hours of the dry weather flow, was now increased to 8 hours. He advocated 24 hours, but the Local Government Board now required 36 hours. At Birmingham they had only 5½ hours or 8 hours dry weather flow, and he was quite satisfied that small tankage was not sufficient to secure the proper amount of the putrefactive or septic change necessary for success. On the other hand, they had large roughing tanks, or, as they were better called, detritus tanks, for the sewage to pass through prior to septic action. These tanks had simply to take out the stones, gravel, and road grit, but the analyses given showed that the sludge contained not only 5·49 per cent. of sand but 1·08 of nitrogen, whereas there should be practically no nitrogen collected in a roughing tank so designed as to collect the heavy mineral solids. He believed that nearly the whole of the inoffensive solids were deposited in the first bay of the roughing tanks, so that they were obviously too large for this purpose. Such tanks should be small, not large, so that the rush of sewage passing along should deposit the mineral matter and then go on to the septic tank, where the organic matter should deposit and slowly putrefy and dissolve. At Birmingham they appeared to have just the converse arrangement, a large roughing tank where the organic matter was collected along with the sand, and small septic tanks from which 76,170 cb. yds. of sludge were collected in six months, which was half the quantity they used to have under the lime treatment. The object of the septic tank was to minimise the question of sludge and sludge pressing. Here, with these small septic tanks they had still to take on to the ground 50 per cent. of the sludge they formerly had under chemical treatment. If they had larger septic tanks and a small roughing deposit tank, or what came to the same thing, worked a portion of the present roughing tanks as septic tanks, the longer septic sojourn would dissolve more organic matter and there would be, therefore, less difficulty in dealing with the organic sludge. It had been argued that foundries contributed appreciably to the mineral constituents of sewage, and interfered with its treatment. He thought that the mineral effluents which contributed to the sewage, even in manufacturing towns like Birmingham, had been very much exaggerated in the past, and that they did not really interfere with the subsequent bacterial treatment providing the sedimentation tank was sufficiently large to hold something like 24 hours' dry-weather supply. This prevented the strong acids and poisonous metals having any appreciable action.

Dr. Divers remarked that sewage, running, as it did, into channels where it rapidly mixed with chemical matters coming from various works, must pass into the sewage works in a state in which much of the urea was still present, and the danger was that it would filter through the soil and not be retained. That difficulty was not felt in Japan. There the sewage as collected was placed in large tanks in the fields, covered over with a loose roof of straw, where it was allowed to ferment for some time, so that all the urea was converted into ammonia, and in the main passed into the soil and enriched it. The principal part of Japanese agriculture consisted in the growth of rice or paddy. This was cultivated on terraces or flat fields where the water flowed over it. The soil being clay, the water was always falling over the surfaces from field to field until at last it got into the valley and was carried away. One might imagine that under this system the nutrient matter of the soil and the sewage put on the field, particularly the soluble ammonia salts, would be dissolved out and carried away, but that did not happen. Dr. Kellner, an agricultural chemist, who was for years in Japan, ascertained that even with the system of artificial fertilisers this system of cultivation of paddy was perfectly satisfactory; that the water did not filter through the soil but flowed over it, leaving the mineral constituents, the nitrites and so on, behind, the effluent being very satisfactory. Liebig's notion of the value of human ordure was a mistake. In the first place the important point, as had been found in Birmingham, was not to grow crops with the sewage, but to get rid of it by these antiseptic tanks or any other means. Kellner had shown by some beautiful experiments that if you used artificial fertilisers for the growth of rice, much better crops were produced than by the use of sewage; therefore, although the Japanese and Chinese used excreta in the most perfect way possible, fermenting it so as to get nearly all the

ammonia, and making the best of the system in a way which could not be endured in this country, yet artificial fertilisers were far superior.

Prof. MILLS asked if any figure could be given as to the cost of the treatment.

Mr. W. T. BURGESS asked if the author could give a figure showing the maximum nitrification obtained in the Birmingham sewage works.

Mr. O'SHAUGHNESSY said that he had said nothing about the storm-water filters, because they were as yet in the experimental stage, and he thought it premature as yet to express an opinion. With regard to the roughing tank filter, Dr. Rideal was under a misconception. The detritus tank proper was really very small in comparison with the bulk of sewage, and answered the conditions fairly well. Would Dr. Rideal show them how to prevent sand becoming entangled with hair and other organic matter and carrying it down? With the means at their disposal they were carrying on a system which was about as perfect as it could be made under the circumstances. If they had unlimited capital to draw upon, they might possibly make it absolutely perfect. The septic action went on subsequently to the sedimentation, and the sludge he referred to was taken out before it was possible to induce a septic action simply as a matter of practical necessity. The cost of the treatment was a point that had troubled them for many years. In regard to nitrification the maximum observed was six parts of nitric nitrogen per 100,000, but that was an exceptional case. The minimum average was 0·6 part per 100,000 in the large effluent from the farm.

THE TECHNICAL EXAMINATION OF GLUE.

BY E. G. CLAYTON, F.I.C., F.C.S.

The investigations were directed mainly to certain specific points: hence the restricted scope of the paper and absence of reference to some well-known tests.

I. Colour and other Features.—Colour is of limited value as an indication of quality, and often too much importance is attached to it. Other things being equal, light-coloured samples are usually preferable to dark, although some dark tinted glues may be better in quality than comparatively pale samples. In Table I., A is a fairly good dark glue and H is a paler but very inferior sample: B and I are an excellent light-coloured and poor dark sample respectively. For some purposes, of course, pale glue is *sine quâ non*. Lustre, translucency, and opacity are no more useful than colour as a guide to quality. Air-bubbles should be few or, better, absent. Samples should be inodorous, or the odour should be inoffensive. This last characteristic is important, and a "sweet"-smelling glue is to be preferred. Good glue should not quickly deteriorate in air.

II. Chemical Composition.—The conclusions from analyses are usually less definite than those based on physical tests, but in Table I. are chemical data yielded by samples of various qualities and origins. The proportion of water in glue should be between 10·5 and 18·5 per cent. The percentage of mineral matter is variable, and, alone, no criterion of quality, though it should not exceed, as a rule, 3·5 per cent.: but a suggestion as to the source of a sample, or the method of manufacture, may sometimes be gained from the proportion of soluble to insoluble (alkaline to lime) salts; the fusibility or otherwise, and reaction of the ash; and the presence or absence of chlorides and phosphates. These, if in more than minute amounts, are held to indicate bone-glue rather than the more costly hide-glue, and it is generally stated that the ash of the former fuses and is neutral, and that that of the latter is infusible and alkaline. But it is wise not to base too positive opinions on results of the kind, which are apt to be contradictory. This is apparent in some of the analyses cited. Glue should be tested for sulphites, derived from the use of sulphur dioxide as a bleaching agent, and for

TABLE I.

Analyses.

SAMPLE.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Source	Foreign	British	Foreign	British	Unknown	British	Unknown	Foreign	Unknown	British
Colour	Dark	Pale	Pale	Pale	Dark	Dark	Medium	Rather pale.	Medium	Pale
Lustre	Dull	High	High	Very high	Moderate	Moderate	High	Dull	Moderate	Very high
Smell	..	..	..	..	Objectionable.	..	..	..	..	..
Character of jelly	Coherent, firm; no objectionable odour.	Strong, clean, and "sweet."	Firm and "sweet."	Coherent, clean, "sweet."	Slimy, offensive smell, rapid decomposition.	Firm, clean, and "sweet."	Coherent, no bad odour.	Very slimy, odour most offensive.	Strong and coherent, smell satisfactory.	Firm and coherent, but odour not good.
Odour of solution	Inoffensive.	Good	Good	Good	Objectionable.	Very fair	Good	Very fetid	Good	Not quite "sweet."
Quality	Medium	Very good	Very good	Good	Very poor	Somewhat inferior.	Good	Bad	Medium	Low medium.
Water	15·12	15·38	15·78	15·35	15·67	16·00	13·91	14·68	13·03	18·03
Non-gelatinising components (by Stelling's process).	4·24	1·91	2·04	1·63	9·94	7·82	1·38	8·40	2·54	2·61
Acidity (expressed as HCl):—										
Total	0·55	..	0·47	..*	..	0·69	..	0·55	..	0·22
Fixed	0·51	..	0·44	..*	..	0·67	..	0·53	..	0·20
Volatile	0·04	..	0·03	..*	..	0·02	..	0·02	..	0·02
Alkalinity (volatile, expressed as NH_3)	..	0·02	..	..*	0·02	..	0·01	..	0·02	..
Matter soluble in ether	Trace	0·07	Trace	0·10	..	0·32	..	Trace	..	0·10
Matter insoluble in boiling water	Trace	..	..	0·10	0·50	1·00	..	Trace	..	0·50
Total mineral matter	3·01	1·32	1·40	1·59	7·37	3·22	2·02	1·43	8·24	2·18
Soluble salts	1·42	0·93	0·86	0·32	3·93	2·22	1·09	0·93	2·93	1·10
Insoluble salts	1·59	0·39	0·58	1·27	3·46	1·01	0·93	0·50	0·31	1·08
Behaviour of ash	Infusible, alkaline.	Infusible, alkaline.	Infusible, feebly alkaline.	Infusible, strongly alkaline.	Fused, strongly alkaline.	Infusible, faintly alkaline.	Infusible, faintly alkaline.	Infusible, strongly alkaline.	Infusible, strongly alkaline.	Infusible faintly alkaline.
Chlorides	Slight	Slight	None	Very slight	Large	Moderate	Very slight	Trace	Slight	Trace only.
Phosphates	Trace	Very slight	Trace	Very slight	Large	Moderate	Very slight	Considerable.	Moderate	Trace only.
Sulphites	..	Trace	..	..	..	..	..	Present	Present	..

* Neutral.

preservatives sometimes employed, such as zinc and other metallic salts. Fat must be absent, and the proportion of matter insoluble in boiling water should be at most 0·25 per cent. A useful comparative test (perhaps the best *single* chemical test) is Stelling's (estimation of non-gelatinising matters by precipitating the glue solution with alcohol, filtering, evaporating a fractional part of the filtrate, and weighing the dried residue). Fels and others have criticised this test, but its results exhibit a striking relation to the quality of glue samples, as shown by other tests. From the table it will be seen that the poor glues E and H yielded markedly higher figures with Stelling's test than did samples of better or medium quality. A high result appears to be a *primâ facie* indication that the glue, at all events, is below the best standard of quality.

III. Physical Tests: 1. *Schattenmann's Immersion Test (Weight of Water absorbed, on Immersion of Glue).*—This test also has been criticised, and is doubtless useless if certain precautions are not taken: (*a*) the samples must be immersed in equal volumes of water at the same temperatures, and for the same periods; and (*b*) the fragments of glue must be as nearly alike in size as possible. The influence of temperature in this test is surprising, and is most important to bear in mind. Too often it is neglected, and comparisons are made between samples which have been immersed, at different seasons of the year, in water necessarily at various temperatures. Such comparisons are valueless. Either all the samples to be compared must be tested at the same time, in which case the same fluctuations of temperature will be experienced, or arrangements must be made always to use water at one standard temperature (16° or 20° C., for instance), and to maintain it at that temperature for the duration of the experiments. The results in Table II. show the enormous influence of temperature on this test, which, if properly carried out, under unvarying conditions, is of service. The samples B, C, and D, immersed at various temperatures and for periods ranging from 2 to 23 hours, will be seen to have absorbed very different quantities of water, according to the conditions of experiment. C, for example, which, at 16°, in 23 hours, absorbed 2·8 times its weight of water, took up, at 20°—25°, about twice that amount. D at 16° absorbed, in 23 hours, not quite four times its weight of water, and at 25° eight times its weight. Evidently only those series of figures, beneath identical temperatures, can fairly be compared with one another. Thus, the numbers obtained at 16° C., of course for respective periods, are comparable, and clearly show that C, E, and G absorbed decidedly less water than B and D. The results at 12° for B and I may also be compared, and are obviously favourable to B. Similarly, comparisons may be made between B, C, D, E, and G at 17°, or between C and D at 25° and 26° respectively. But it would be inaccurate to compare the results of B at 21° with those of G at 17°, or I at 12°.

Glue possessing high water-absorbing capacity is generally, and, in the main, rightly, regarded with favour. If a judgment as to quality could be formed from this test alone, D would seem, from the results in Table II., to be the best sample. But too much emphasis cannot be laid on the inadvisability of judging *alone* by this, or indeed any other single test. Trustworthy conclusions can only be formed from a series of tests, of which Schattenmann's may be one. And the tests chosen must have particular reference to the special uses to which the glue is to be put.

TABLE II.

Schattenmann's Immersion Test.

(The numbers represent the weights of water absorbed by unit-weights of glue.)

SAMPLE.	A.	B.				C.				
Temperature of Water.	20°	16°	12°	16°	17°	21°	16°	17°	20°	25°	26°
During 2 hours' immersion	..	..	0·8	1·0	1·4	1·2	0·5	0·9	..	..	..
„ 4 „ „	..	..	1·4	1·6	1·9	2·0	0·9	1·3	..	..	..
„ 5 „ „	..	..	..	..	..	..	..	..	..	..	1·7
„ 6 „ „	..	..	1·6	2·0	2·4	2·6	1·2	1·7	..	..	..
„ 8 „ „	..	..	1·9	2·4	2·7	3·1	1·4	2·2	..	..	..
„ 16 „ „	3·8	2·1	2·6	2·9	..	..	2·4	..	4·8	5·0	..
„ 23 „ „	5·1	2·7	3·1	3·5	..	..	2·8	..	6·4	5·9	..

SAMPLE.	D.				E.			F.	G.		H.	I.	J.
Temperature of Water.	16°	17°	25°	26°	15°	16°	17°	20°	16°	17°	20°	12°	20°
During 2 hours' immersion	0·8	1·5	..	..	..	..	0·9	..	..	1·1	..	0·6	..
„ 4 „ „	1·3	2·0	..	..	..	..	1·5	..	..	1·5	..	0·9	..
„ 5 „ „	..	..	..	2·6	..	..	..	..	..	..	..	..	..
„ 6 „ „	1·8	2·5	..	..	..	..	1·6	..	..	1·9	..	1·1	..
„ 8 „ „	2·0	3·3	..	..	..	..	1·7	..	..	2·1	..	1·4	..
„ 16 „ „	3·1	..	7·0	..	2·1	2·3	..	4·0	2·1	..	2·1	2·1	2·7
„ 23 „ „	3·8	..	8·0	..	2·5	2·6	..	4·3	2·7	..	2·4	2·7	3·3

In conjunction with the immersion test, the resulting jellies, and water used, should be examined. The former should be firm, elastic, clean, and free from foulness or sliminess; the latter clear and inodorous. Rapid fluidity of an exposed jelly (by liquefying bacteria), and early mouldiness, are objectionable signs. After warming, to dissolve the jelly, the smell of the hot solution, which should be slight and non-putrescent, may be noted. The cold solution also should be inoffensive.

2. *Hygrometric Test (Absorption of Moisture by Glue).*—For certain purposes, the writer has found it serviceable to ascertain the quantities of water-vapour absorbed by equal weights of glue samples, during some days' exposure, under precisely similar conditions, in a vessel containing air saturated with moisture. The samples are weighed at intervals of eight to sixteen hours. This test furnishes useful indications as to keeping properties of glues in damp climates, and is, like the last, greatly affected by temperature; so that samples must be side by side in the same vessel, and subject to the same temperature or fluctuations of temperature. The size of the containing vessel also has a remarkable influence on the rate of moisture-absorption. The less hygroscopic, the better is the glue; the greater the tendency to take up moisture, the more likely is a sample to become flabby and mouldy—very unsatisfactory features. The indications of this test are the converse of those afforded by Schattenmann's test; thus, high immersion results point to good quality, but high moisture-absorption is an unfavourable sign, and *vice versâ*. In Table III. are embodied results of the hygrometric test applied to six samples of glue. With B, C, and D the experiments were made at more than one temperature, the influence of this

on the test being well shown. B, for instance, exposed for 103 hours at an average temperature of 13° C., increased in weight about 10 per cent., but at 20°, it gained $18\frac{1}{2}$ per cent. C, exposed for 60 hours at 8°, gained 5·9 per cent., but at 15°, its increase was 11·4 per cent. D, exposed 60 hours at 8°, gained 5·5 per cent., but at 15°, the increase in its weight was 10·4 per cent. The temperatures are the averages of the fluctuations observed, and periods are stated approximately. In observing the results for different samples, only those obtained at the same temperatures (as C and D at 8°; also B, E, G, and I at 13°) are comparable. E, a sample shown by other tests to be decidedly inferior to B, G, and I, is much more hygroscopic. C and D, on the other hand, are scarcely distinguishable from one another in this respect.

TABLE III.

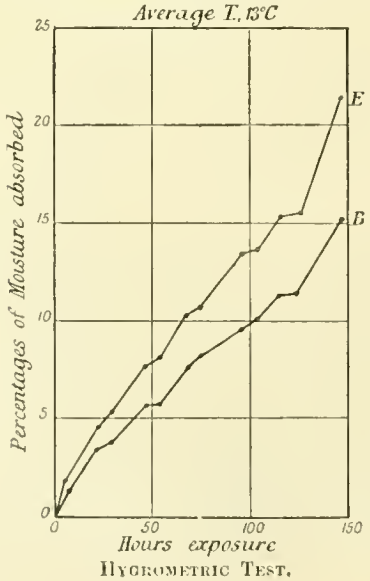
Hygrometric Test.

(The numbers express percentages of increase in weight, due to absorption of moisture.)

SAMPLE.	B.			C.		D.		E.	G.	I.
Average temperature.	13°	13° (Repetition).	20°	8°	15°	8°	15°	13°	13°	13°
After 5 hours' exposure	..	..	..	0·4	..	0·2	..	..	..	..
„ 7 „ „	1·1	0·7	1·4	..	..	..	..	1·6	1·0	0·7
„ 16 „ „	..	..	..	..	4·4	..	4·2	..	..	..
„ 19 „ „	..	..	..	..	4·5	..	4·3	..	..	..
„ 23 „ „	3·3	2·7	5·1	..	..	..	..	4·7	3·9	2·4
„ 29 „ „	..	..	..	2·2	..	2·5	..	..	..	..
„ 31 „ „	3·8	3·2	5·4	..	..	..	..	5·5	4·0	2·9
„ 47 „ „	5·7	5·2	12·4	..	..	..	..	7·5	5·0	5·0
„ 53 „ „	..	..	..	5·4	..	5·0	..	..	..	..
„ 55 „ „	5·8	5·7	12·9	..	..	..	..	8·0	5·5	5·5
„ 60 „ „	..	..	..	5·9	..	5·5	..	..	..	..
„ 64 „ „	..	..	..	..	11·4	..	10·4	..	..	..
„ 70 „ „	7·7	7·7	15·5	..	11·6	..	10·7	10·3	7·5	6·8
„ 78 „ „	8·0	8·1	15·9	7·5	..	7·6	..	10·9	7·7	7·3
„ 82 „ „	..	..	..	7·6	..	7·7	..	..	..	..
„ 95 „ „	9·5	9·4	18·3	..	..	..	..	13·1	9·1	9·1
„ 103 „ „	10·0	9·8	18·4	9·3	..	9·6	..	13·8	9·5	9·4
„ 117 „ „	11·6	10·9	20·4	..	..	..	..	15·4	10·8	10·7
„ 125 „ „	10·7	11·3	20·3	..	..	..	..	15·8	10·9	11·1
„ 148 „ „	15·2	15·4	22·1	..	..	..	..	21·7	14·4	15·1
After 151 hours' exposure	..	..	..	13·1*	..	12·6*	..	..	..	..
„ 156 „ „	..	..	..	13·2	..	12·7	..	..	..	..
„ 174 „ „	..	..	..	14·4	..	13·6	..	..	..	..
„ 222 „ „	..	..	..	14·3	..	14·3	..	..	..	..
„ 229 „ „	..	..	..	14·4	..	14·4	..	..	..	..
„ 246 „ „	..	..	..	15·9	..	16·1	..	..	..	..
„ 253 „ „	..	..	..	16·1	..	16·3	..	..	..	..
„ 270 „ „	..	..	..	17·5	..	17·5	..	..	..	..
„ 342 „ „	..	..	..	22·0	..	22·1	..	..	..	..
„ 414 „ „	..	..	..	25·7	..	24·9	..	..	..	..
„ 582 „ „	..	..	..	33·0	..	32·6	..	..	..	..
„ 918 „ „	..	..	..	41·7	..	40·9	..	..	..	..
„ 1,254 „ „	..	..	..	49·4	..	47·2	..	..	..	..

In two cases * * the experiments, begun in cold weather, were continued for greatly lengthened periods, during which the average temperature rose considerably (to about 14° C.); and it will be seen that in about seven weeks the samples had gained nearly 50 per cent. in weight. Both were soft, flabby, and mouldy; C more than D.

Fig. 1.



HYGROMETRIC TEST.

The differences, hygroscopically, between the poor sample E and the good sample B are exhibited graphically in the annexed diagram, Fig. 1, the curves showing the increasing amounts of moisture absorbed during successive periods.

The following experiments demonstrate the influence of the size of the vessel. Two samples, which had shown a steady advance in weight during several days' exposure to moist air at 8° C., in a vessel of about 20 litres' capacity, were temporarily removed to a 2-litre vessel.

	Glue C.	Glue D.
	Percentage of increase in weight.	Percentage of increase in weight.
Exposed in large vessel (8°):—		
After 103 hours' exposure	9·3	9·6
„ 151 „ „	13·1	12·6
„ 156 „ „	13·2	12·7
„ 174 „ „	14·3	13·6
Transferred to small vessel (19°):—		
After 198 hours' exposure	13·3	13·4
„ 205 „ „	13·2	13·4
Replaced in large vessel (8°):—		
After 222 hours' exposure	14·3	14·3
„ 229 „ „	14·4	14·4
„ 246 „ „	15·9	16·1
„ 253 „ „	16·1	16·3
„ 270 „ „	17·5	17·5

similarly charged with moist air (at a temperature about two degrees higher). The effect of such removal is shown in the table.

Thus, in spite of the higher temperature, which should have accelerated absorption, this was arrested altogether during exposure in the smaller vessel.

3. *Rate of Drying of Glue-Jellies, and Influence of Temperature thereon.*—In Table IV. appear the results of experiments selected from a considerable number, showing the rate at which equal weights of 15 per cent. and 33 per cent. glue-jellies throw off moisture, or "dry," when exposed in the laboratory, under precisely similar conditions, at the approximate average temperatures stated. [Here, and elsewhere in this paper, an (x) per cent. glue-jelly or solution means one made with (x) grms. of dry glue + 100 c.c. of water.] Results tabulated beneath identical temperatures are comparable. In these cases the samples experienced the same fluctuations of temperature—insignificant, however, in the room where the experiments were conducted. The influence of temperature is manifest; but its extent is variable. This test (Jelly-Exposure test it may be called) is important in connection with certain technical uses of glue, when, for instance, a rapidly-drying jelly is required; but like some other tests, well adapted for special purposes, it does not differentiate sufficiently to be serviceable as a single, or the only, test of quality. Of course it is entirely distinct from the setting and hardening test, presently to be mentioned, which is carried out in another way.

In Table IV., C, D, and B are examples of satisfactory glues, the third being the best; and the results given by two of these samples are shown by curves in the accompanying four figures.

TABLE IV.

Jelly-Exposure Test.

(The numbers represent percentages of water lost.)

SAMPLE.	C.						D.					
Average Temperature.	8°		17°		21°		8°		16°		17°	
	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.
During 16 hours' exposure	39·8	13·9	17·3	19·1	24·9	24·0	13·3	12·6	19·5	17·2	18·6	17·2
„ 24 „ „	46·6	19·3	23·9	26·2	37·2	35·7	19·7	17·7	27·2	23·1	25·4	23·3
„ 40 „ „	57·1	27·8	38·5	41·3	54·9	50·7	29·6	26·3	39·3	32·2	40·4	36·8
„ 48 „ „	62·0	30·9	46·1	48·8	..	..	34·4	30·4	44·1	36·5	48·3	43·8
„ 51 „ „	..	..	..	..	64·9	58·5	..	..	..	..	..	..
„ 64 „ „	70·5	37·3	60·5	60·8	..	..	..	..	52·9	43·2	..	..
„ 65 „ „	..	..	..	..	75·1	65·5	..	..	..	..	..	..
„ 66 „ „	..	..	..	..	..	..	41·8	36·8	..	..	62·7	55·4
„ 72 „ „	72·6	38·9	66·2	63·9	79·2	68·2	43·6	38·5	58·1	46·4	67·4	59·0
„ 88 „ „	78·8	44·1	76·4	68·2	..	..	49·6	43·5	67·7	53·6	76·0	65·4
„ 96 „ „	81·6	46·2	79·7	69·4	..	..	52·4	46·6	72·9	57·5	78·6	67·4
„ 112 „ „	..	..	83·8	70·7	..	..	..	..	..	..	81·9	70·7
„ 115 „ „	..	..	84·1	70·8	..	..	..	..	..	..	82·1	71·0
„ 136 „ „	..	..	..	..	..	..	..	..	84·1	67·8	..	..
„ 160 „ „	..	..	85·1	71·4	.	..	..	..	..	..	82·9	73·4

SAMPLE.	B.						E.		G.		I.	
Average Temperature.	13°		14°		17°		13°		13°		14°	
	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.	15 per Cent. Jelly.	33 per Cent. Jelly.
During 16 hours' exposure	11·5	10·2	16·8	15·8	21·0	18·0	16·4	16·0	12·7	15·5	11·4	10·2
„ 24 „ „	17·4	15·5	26·3	24·0	27·9	24·3	25·2	24·6	19·0	23·2	16·9	14·8
„ 40 „ „	32·9	28·6	39·2	34·6	43·2	37·0	37·8	35·8	27·8	33·2	31·4	27·2
„ 48 „ „	39·0	33·4	47·7	40·7	50·9	43·6	45·3	42·0	33·3	39·3	37·4	32·0
„ 64 „ „	53·7	45·7	59·4	49·0	64·6	54·1	55·9	50·1	41·5	47·7	51·7	43·5
„ 72 „ „	58·1	49·3	64·4	52·2	69·6	57·2	60·2	52·9	44·7	50·9	56·3	47·1
„ 88 „ „	67·8	56·2	71·7	54·4	77·8	62·7	66·9	54·7	50·3	55·8	65·0	53·8
„ 96 „ „	71·2	58·4	75·3	59·2	80·4	64·3	70·1	59·2	53·1	58·2	68·1	56·1
„ 112 „ „	77·6	62·7	81·1	62·7	83·0	66·6	75·1	62·2	58·5	61·9	74·2	60·6
„ 115 „ „	79·2	63·5	84·0	64·4	83·1	66·9	77·5	63·7	61·5	63·5	75·7	61·5
„ 160 „ „	83·9	66·2	85·5	68·5	83·5	67·9	84·1	67·7	74·2	68·5	82·2	65·7

4. *Fels' Test* (*Viscosity of Glue-solutions*). — The determination of viscosity is useful, particularly in connection with other methods of examination. Even alone, it often gives a rough idea, relatively, as to the quality of a sample (having this much in common with Stelling's test): hence it is especially valuable as a preliminary physical test. But the results depend much on the operator, the apparatus used, and the conditions of experiment. Whatever plan be adopted for one sample must be followed for all, if comparisons are to be of the smallest use. The writer's observations, comparable among themselves, were made for special purposes on 15 per cent. solutions at two different temperatures, not with Engler's viscosimeter, recommended by Fels, but with a simple instrument devised in the laboratory. The temperatures of the glue-solutions and the apparatus were uniform at the beginning of all tests, as to eliminate as far as possible any difference in the amount of experimental error due to cooling and thickening. Results, obtained as described, are here tabulated for the samples of glue, other particulars of which have already been stated.

TABLE V.

Viscosity-Numbers.

(Water = 100.)

Sample.	At 30° C.	At 35° C.
A.	Solid	185
B.	283	216
C.	Solid	223
D.	210	167
E.	150	143
F.	166	Not determined
G.	166	156
H.	159	133
I.	146	133
J.	143	133

Fig. 2. Fifteen per cent Jellies. (D)

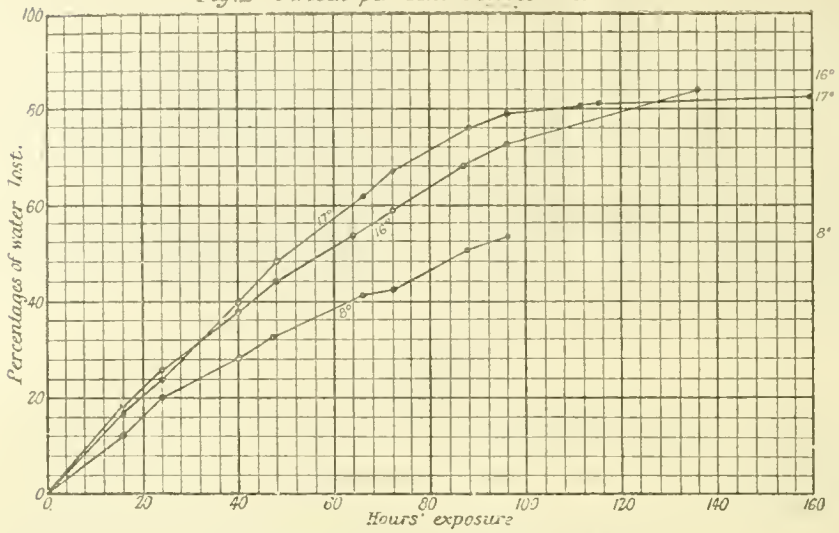


Fig. 3. Fifteen per cent Jellies. (B).

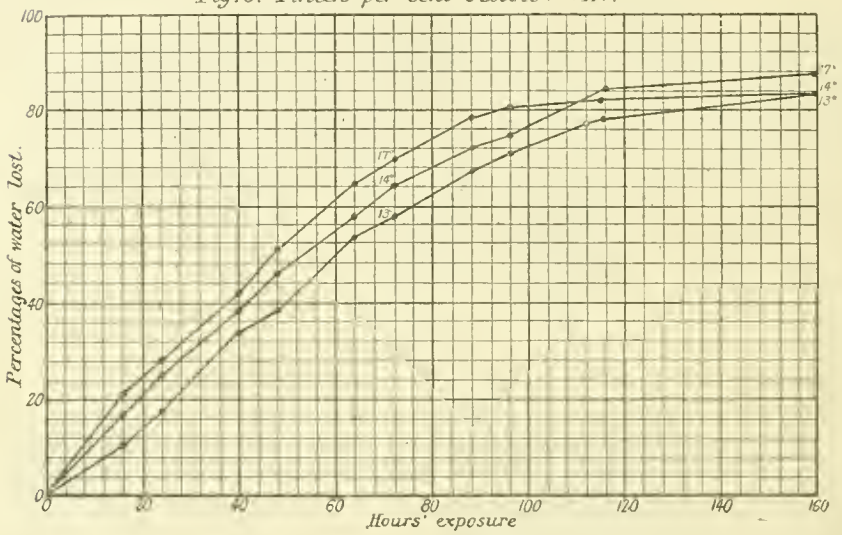


Fig. 4. Thirty-three per cent Jellies (D).

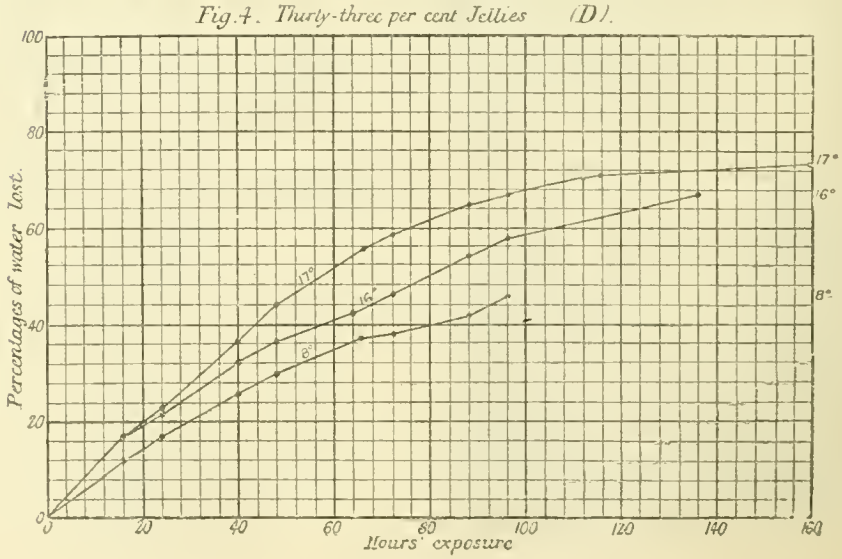
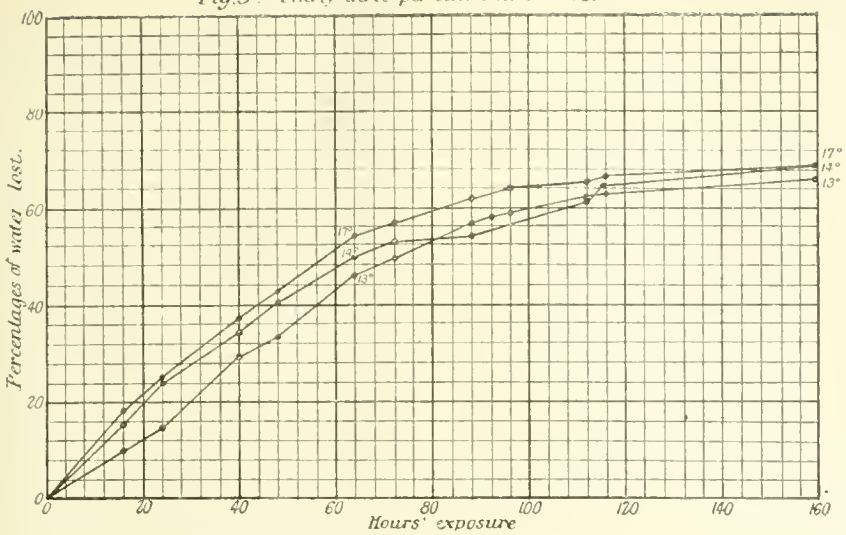


Fig. 5. Thirty three per cent Jellies (B)



5. *Setting and Hardening of Glue Solutions.*—A test, which (though difficult to apply in any but a rather rough manner) has yielded the author useful information, is to ascertain the time taken to *set* and *harden*, respectively, by layers of glue solutions spread on glass plates and exposed to the air at one temperature. The solution is "set" when it just fails to wet the end of a glass rod with which the surface is touched, and "hard" when the finger-nail no longer makes an indentation. Some results are here given:—

TABLE VI.

Setting and Hardening Tests.

(Temperature, 22°—23° C. m. = minute; h. = hour.)

SAMPLE.		A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
per cent. solution :—											
½ inch layer	Set in.....	2 m.	1½ m.	4 m.	4 m.	18½ m.	20 m.	3¼ m.	75 m.	15 m.	25 m.
	Hard in	2¾ h.	1½ h.	4 h.	1¾ h.	1¾ h.	2 h. 5 m.	1 h. 50 m.	4 h.	21 m.	3 h. 35 m.
⅛ inch layer	Set in.....	..	4½ m.	..	8 m.	21 m.	50 m.	4 m.	..	35 m.	55 m.
	Hard in	..	18 h.	..	22 h.	17 h.	23 h.	18 h.	..	4½ h	23 h. 30 m.
per cent. solution :—											
½ inch layer	Set in.....	..	10 m.	..	4 m.	65 m.	30 m.	12 m.	..	1 h. 28 m.	30 m.
	Hard in	..	¾ h.	..	1 h. 40 m.	2¾ h.	35 m.	2¼ h.	..	3 h.	35 m.
⅛ inch layer	Set in.....	..	13 m.	..	9½ m.	1¾ h.	3 h. 35 m.	13 m.	..	2 h.	2 h. 50 m.
	Hard in.....	..	18 h.	..	23 h.	20 h.	30 h.	18½ h.	..	48 h.	23½ h.

6. *Consistency and Weight-bearing Power of Jellies.*—The results of some determinations recently made by the writer, using a process similar to, and based chiefly on, Kidal's modification of Kissling's test, are here stated:—

TABLE VII.

Jelly-Consistency Test.

(Five per cent. jellies were used.)

	B.	C.	D.	E.	G.	I.
	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.
Breaking weight.....	32·5	19·5	35·0	17·0	42·7	7·0
Sinking weight	97·0	53·0	98·0	34·9	143·3	58·7
	Mins.	Mins.	Mins.	Mins.	Mins.	Mins.
Time to sink 100 mm.	9·4	7·0	8·5	3·5	9·5	2·5

The general correspondence of these results with those for the viscosity, setting and hardening, and other tests, will be noticed.

An acknowledgment is due to Mr. Henry H. Williams, for much careful assistance rendered by him in the earlier experiments and tests.

In conclusion, the observations seem to show that, whilst it would be rash to form a judgment on glue from a single test, the evidence afforded by a number may be irresistible. Most of the tests agree in classing E and H as inferior to the rest of the samples cited in the foregoing tables. In certain other cases — glues of medium quality — results here and there may be doubtful, the bulk being favourable. Examples are F, I, and J. But with samples of a higher all-round standard of quality, such as B, C, and D, practically all the indications are satisfactory. Glue may be shown by certain tests to be suitable for one purpose, though less perfectly adapted for another. The expert's wisest system appears to be, not to rely on single short-cut tests of general quality, but to employ a number of methods, including any having especial bearing on the prospective or present uses of the glue, and then to base his conclusions on a consideration of all the results together.

Meeting held on Monday, May 5th, 1902.

MR. OTTO HEHNER IN THE CHAIR.

THE PREPARATION OF ARSENIC-FREE ZINC.

BY OTTO HEHNER.

In testing for arsenic by the Berzelius-Marsh method, the chemist has to rely upon the dealer in fine chemicals to furnish him with zinc that is perfectly free from arsenic, as there has hitherto not been any method available by

which arsenical zinc could be perfectly freed from the impurity on a laboratory scale. Thus Fresenius (Qualitative Analysis, 16th edition) states, upon the authority of Eliot and Storer, that by no known sufficiently simple process, can arsenic be completely removed from impure zinc. Fresenius refers to processes proposed by Gunning, who repeatedly melts the zinc with a mixture of sodium carbonate and sulphur; to Selmi, who treats the molten metal with ammonium chloride; and to Lescoer, who first melts with potassium nitrate, and afterwards with zinc chloride. Otto, in his 'Ausmittelung der Gifte,' asserts that zinc perfectly free from arsenic can only be prepared on a large scale by reduction of pure zinc oxide.

Having frequently had great difficulty in obtaining zinc that complied with the stringent requirements of the method laid down by the Joint Committee of the Society of Chemical Industry and the Society of Public Analysts, and knowing that the same difficulty has been experienced by many other analysts, I have made many experiments to work out a method for the freeing of zinc from every trace of arsenic. I have repeated all the methods above referred to, and employed many other substances, such as zinc bromide, sodium and ammonium fluoride, and sodium hydroxide, but found them all to fail, mainly on account of the impossibilty of bringing into sufficiently intimate contact the heavy molten metal and the specifically light reagents referred to.

I find, however, that the object can be easily accomplished by operating in the following manner:—

Melt about a pound or two of ordinary block-zinc, no matter how impure, in a clay crucible over a good gas-fire. When quite fluid throw into the metal a piece of sodium, taking for each pound of zinc about one gramme of sodium at a time. Stir the molten metal with a piece of hard-glass tubing bent at right angles. A black scum forms immediately, which is removed by a china spoon or a crucible lid, held in the tongs. Stir vigorously and remove the scum from time to time, till the sodium appears to have oxidised out. Then add another piece of sodium and stir and skim as before; this takes, altogether, about ten minutes. Finally, pour out the metal into a second clean clay crucible, and repeat the sodium treatment once more. It is best to keep two crucibles marked with file cuts for the two stages. Allow the molten metal to cool considerably before granulating, as when the zinc is very hot and fluid, heavy solid drops like shot are obtained by granulation, whereas when the zinc is near its solidifying point, thin flakes, presenting a large surface to the acid, are obtained.

When properly treated, the metal is absolutely free from arsenic. I have thus purified crude zinc which was highly arsenical, the hydrogen prepared from it causing thick black stains upon a china basin; but it is preferable to start with material that is already reasonably pure.

It is of course necessary that the zinc thus purified be not only tested for purity, but also for sensitiveness.

It will be observed that the process is essentially a slight modification of the Thomas-Gilchrist process for the removal of phosphorus from iron.

It is well either to wash the granulated zinc with a little dilute hydrochloric acid, or to pour the molten metal into very dilute acid. The molten metal must on no account be stirred with an iron rod, as all commercial iron is arsenical.

Manchester Section.

Meeting held on Friday, May 2nd, 1902.

DR. J. GERLAND IN THE CHAIR.

THE CONSTITUTION OF GAS OILS.

BY RAYMOND ROSS, F.I.C., AND J. P. LEATHER.

In the month of November 1900, the Burnley Corporation commenced to use the Carburetted Water-Gas Plant, constructed for them by the Economic Gas Apparatus Construction Company.

The plant on a 24 hours' test with Russian oil gave the following results:—Quantity of gas made = 1,218,300 cb. ft. Amount of oil used = 3,304 galls. = 2·71 galls. per 1,000 cb. ft. Average candle power = 22·12 c.p. = 8·16 candles per gallon. Amount of coke used = 39.741 lb. = 32·34 lb. per 1,000 cb. ft.

As these results rather more than complied with the representations of the builders, they were considered eminently satisfactory, and indeed they continued to be so as long as this class of oil was in use. The following year a quantity of Borneo solar oil was purchased. On commencing to use this, an immediate and very considerable diminution in both the quality and quantity of the gas produced was observed. Besides this, after a short period of working, it was noticed that the quantity of tar made had risen to an enormous extent.

The change of oil had brought about a fall in the gas production of about 600 cb. ft. per ton, or a loss of about 38 per cent. calculated on the amount of gas actually produced by the oil, and likewise a reduction of the candle power of about 30 per cent. in proportion to the quantity of oil used.

Of course, the temperature at which an oil is cracked has a very considerable influence on the quantity and quality of the resultant gas. During the previous season we had carefully determined the best temperature at which to work the Russian oil by means of an electrical pyrometer, and at first the Borneo oil was worked at the same temperature, viz., 1,200° F. at the centre sight cock.

The result with Borneo oil, as already mentioned, being unsatisfactory, other temperatures were tried both lower and higher, proceeding in the latter direction till somewhat violent explosions were obtained on every opening of the stack valve. These temperatures were of course carefully controlled with a pyrometer. No improvement, and in fact rather an opposite result, was obtained by these variations of temperature.

We therefore directed our attention to the chemical composition of the oil, and found that on fractional distillation it yielded results differing very materially from those given by Russian oil, and that although the Borneo oil has the higher specific gravity, it had a lower boiling point, and also its refractive index was very much higher than that of Russian oil.

In order to better understand these results, we determined to investigate the matter more completely and to include in our investigations the four principal oils on the market, viz. Russian, American, Borneo, and Texas, the latter being quite a recent importation.

We laid out our preliminary plan on the following lines:—

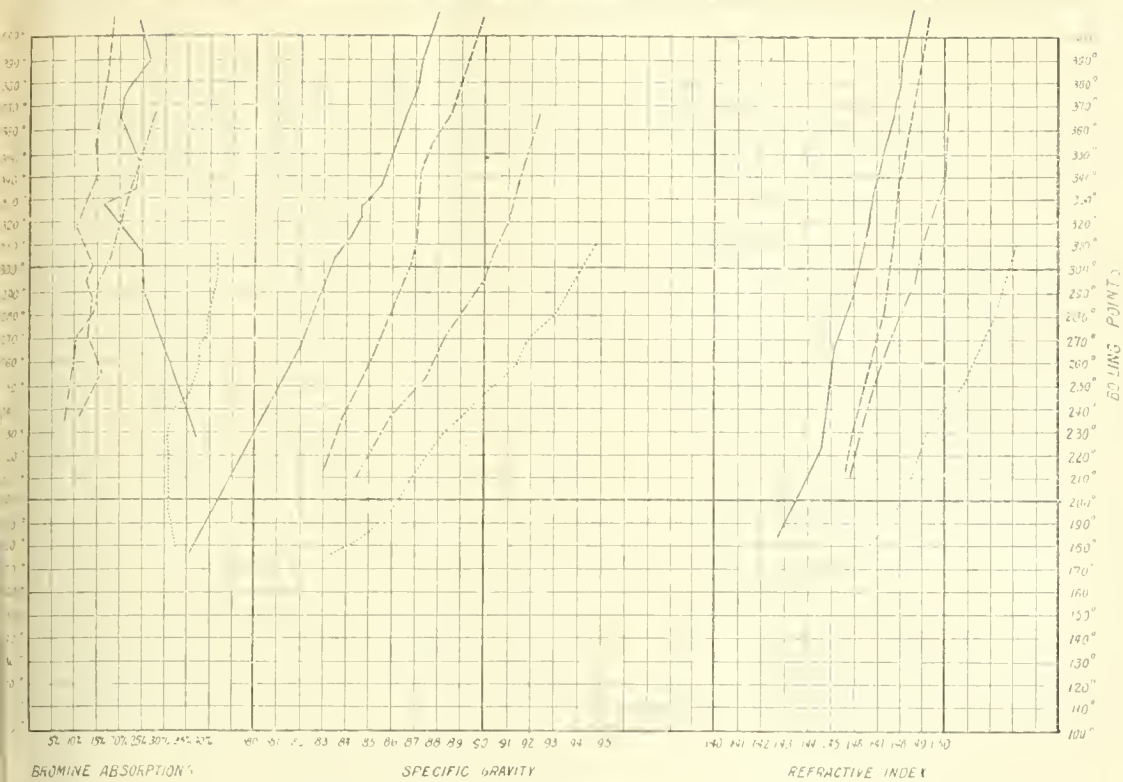
1. Fractional distillation.
2. Quantity obtained in each fraction.
3. Specific gravity of the fractions.
4. Refractive index of each fraction.
5. Bromine absorption of each fraction.
6. Gasification of the oil on a laboratory scale.
7. Analysis and density of the gas obtained from the oil.

The first results obtained were those under headings 1, 2, 3, 4, and 5, and they are set forth in the following tables.

Numbers 3, 4, and 5 are also graphically arranged in the diagram.

An examination of these results showed us that, although all the oils (with the exception of Russian refined) began to boil at about the same temperature, Borneo oil practically all distilled over at a temperature within the range of a mercurial thermometer, whereas the other oils distilled at considerably higher temperatures in the following order:—Texas, American, Russian, the last containing the highest boiling fractions.

Next taking the gravities into consideration, and comparing fractions of the same boiling point, we found that the gravity of the Borneo is the highest, and that the oils gradually decrease in gravity in the following order:—Texas, Russian, American; but perhaps the most striking difference is to be noticed in the refractive indices which were determined in these instances for the sodium line.



Russian Solar Oil.

Sp. gr. 0·872; Refractive Index, 1·4794.

No. of fraction.	Boiling Point.	Per Cent. distilled over.	Per Cent. per Degree.	Specific Gravity. (Water at 15° C. = 1.)	Refractive Index μ_D.	Bromine Absorption. 17 hours.	Bromine Absorption. 15 minutes.	$\mu_D - 1$ / d
	C.							
1	200—225	2·0	0·08	0·830	1·4565	..	..	0·5500
2	225—245	4·0	0·20	0·838	1·4613	33·8	11·2	0·5505
3	245—265	7·2	0·36	0·849	1·4672	31·2	15·8	0·5503
4	265—275	9·0	0·90	0·855	1·4704	26·8	12·7	0·5514
5	275—295	7·2	0·94	0·862	1·4741	21·7	13·7	0·5500
6	295—295	11·5		0·862	1·4741	24·2	12·5	0·5500
7	295—305	6·7	0·67	0·867	1·4759	20·4	13·6	0·5489
8	305—330	9·2	0·37	0·871	1·4783	24·4	10·7	0·5491
9	330—350	10·5	0·52	0·874	1·4806	23·8	15·1	0·5499
10	350—360	10·0	1·00	0·880	1·4840	24·9	14·6	0·5500
11	360—370	6·2	0·62	0·884	1·4856	23·9	15·5	0·5493
12	370—400	7·5	0·25	0·891	1·4896	27·2	17·3	0·5495
13	400—430	6·0	0·20	0·903	1·4962	33·1	18·0	0·5495
14	Residue	3·0	..	0·896	Too dark	53·9	..	..

omparing again fractions of the same boiling point, the neo has by far the highest refractive index, and erican the lowest; Russian is distinctly higher than erican, the differenee decreasing with the elevation e boiling point; Texas, although nearly approximating ussian at the lowest boiling points, rises much more lly than Russian in the higher boiling fractions, thus ving that it occupies a place intermediate between erican and Borneo with respect to its refractive index.

fore proceeding to the consideration of the bromine rptions, we think it will be best to indicate the methods employed. First, the bromine absorption was deter- d by the process of Mellhiney, 1 grm. of the oil lved in carbon tetrachloride being treated with 2 c.c. solution of bromine in carbon tetrachloride. This was kept for 17 hours in the dark. The bottles were then d by means of a freezing mixture, a wide rubber tube over the stopper, and water introduced by suction by gently raising the stopper, thus absorbing all the hydrobromic acid. Sufficient potassium iodide was then added, and more water, and the iodine liberated was titrated in the usual way with sodium thiosulphate. After separating off the carbon tetrachloride in a separating funnel, the HBr was titrated with N/2 NaOH.

This method was not altogether satisfactory, as a considerable amount of secondary action took place, rendering the substitution and addition figures unreliable. We therefore carried out a 15 minutes' bromine absorption with each fraction, again using a solution of bromine in carbon tetrachloride, and carbon tetrachloride as the solvent, the determination being entirely carried out by gaslight.

The results given by each of these methods are shown under different headings, and although there is a considerably greater absorption during the longer period, the figures obtained in both cases point to somewhat similar conclusions.

American Solar Oils.

Sp. gr. 0·851; Refractive Index, 1·4723.

No. of Fraction.	Boiling Point.	Per Cent. distilled over.	Per Cent. per Degree.	Specific Gravity. (Water at 15° C. = 1.)	Refractive Index μ_D.	Bromine Absorption. 17 hours.	Bromine Absorption. 15 minutes.	$\frac{\mu_D - 1}{d}$
	C.							
1	150—200	2·0	0·04	0·7708	1·4276	82·7	..	0·5547
2	200—250	3·0	0·06	0·7997	1·4459	76·6	36·8	0·5578
3	250—280	5·2	0·17	0·8205	1·4552	68·1	30·3	0·5548
4	280—300	5·2	0·26	0·8295	1·4606	63·7	25·7	0·5553
5	300—310	6·0	0·60	0·8356	1·4639	57·5	25·3	0·5552
6	310—315	2·8	0·56	0·8418	1·4659	55·6	22·4	0·5535
7	315—320	6·6	1·32	0·8430	1·4665	55·5	20·6	0·5534
8	320—325	6·8	1·36	0·8459	1·4678	47·8	19·1	0·5539
9	325—330	5·4	1·08	0·8466	1·4685	51·4	18·2	0·5534
10	330—340	8·1	0·81	0·8538	1·4710	49·2	23·4	0·5517
11	340—350	6·2	0·62	0·8573	1·4729	49·3	24·5	0·5516
12	350—360	7·6	0·76	0·8613	1·4749	50·1	22·1	0·5525
13	360—370	8·0	0·80	0·8653	1·4783	48·4	20·2	0·5528
14	370—375	6·6	1·32	0·8687	1·4794	51·3	20·6	0·5519
15	375—380	6·0	1·20	0·8707	1·4811	52·2	21·5	0·5525
16	380—400	6·8	0·34	0·8729	1·4823	52·9	26·3	0·5525
17	400—420	4·6	0·23	0·8791	1·4867	57·2	24·2	0·5536
18	Residue	3·1	..	..	Too dark	..	..	..

Texas Solar Oil.

Sp. gr. 0·883; Refractive Index 1·4806.

No. of Fraction.	Boiling Point.	Per Cent. distilled over.	Per Cent. per Degree.	Specific Gravity (Water at 15° C.=1).	Refractive Index. μ_D.	Bromine Absorption. 17 Hours.	Bromine Absorption. 15 Minutes.	$\frac{\mu_D - 1}{d}$
	° C.							
1	200—222	8·3	0·37	0·8447	1·4586	16·1	..	0·5429
2	222—243	13·9	0·51	0·8600	1·4659	27·7	7·8	0·5430
3	243—266	17·8	1·05	0·8743	1·4735	30·4	9·5	0·5416
4	266—276	9·5	0·95	0·8847	1·4789	36·7	10·9	0·5413
5	276—288	11·2	0·93	0·8915	1·4834	43·0	14·3	0·5422
6	288—299	11·9	1·08	0·8970	1·4878	50·7	15·5	0·5438
7	299—310	7·3	0·66	0·9029	1·4900	46·4	18·2	0·5427
8	310—326	9·2	0·51	0·9093	1·4938	45·7	19·9	0·5431
9	326—350	6·1	0·25	0·9170	1·5002	51·3	22·8	0·5475
10	350—382	2·6	0·08	0·9237	1·5023	51·7	28·2	0·5438
11	Residue.	2·2	..	..	Too dark.	..	..	..

Borneo Solar Oil.

Sp. gr. 0·9015; Refractive Index, 1·5067.

No. of Fraction.	Boiling Point.	Per Cent. distilled over.	Per Cent. per Degree.	Specific Gravity (Water at 15° C. = 1).	Refractive Index, μ_D.	Bromine Absorption. 17 hours.	Bromine Absorption. 15 minutes.	$\frac{\mu_D - 1}{d}$
	° C.							
1	170—175	2·4	0·48	..	1·4613	..	..	..
2	175—180	5·0	1·00	0·832	1·4639	43·9	32·7	0·5576
3	180—187	5·3	0·75	0·846	1·4723	49·1	31·7	0·5585
4	187—200	3·2	0·25	0·856	1·4783	48·6	31·2	0·5575
5	200—225	9·4	0·38	0·871	1·4863	47·2	31·5	0·5588
6	225—235	5·5	0·55	0·881	1·4925	48·8	30·9	0·5590
7	235—245	11·9	1·19	0·893	1·5008	50·4	32·3	0·5608
8	245—250	6·7	1·35	0·901	1·5058	54·2	35·7	0·5611
9	250—265	8·5	1·00	0·913	1·5127	57·3	37·3	0·5616
10	265—265	6·4		0·916	1·5148	56·0	37·6	0·5620
11	265—270	7·1	1·42	0·919	1·5165	66·4	37·9	0·5620
12	270—275	6·9	1·38	0·921	1·5187	57·8	39·1	0·5632
13	275—280	6·0	1·20	0·927	1·5210	54·2	39·4	0·5620
14	280—285	2·9	0·58	0·932	1·5227	56·6	40·4	0·5608
15	285—290	3·2	0·64	0·935	1·5249	57·5	41·0	0·5604
16	290—300	2·9	0·29	0·939	1·5270	58·5	41·9	0·5612
17	300—320	2·9	0·15	0·948	1·5315	58·8	42·0	0·5606
18	Residue	3·7	..	0·971	Too dark	55·1	..	..

We took at the same time the bromine absorption during 15 minutes of pure hexane and hexylene. Hexane gave no absorption, whilst hexylene absorbed 188 per cent., theory requiring 190 per cent., which, considering the small quantities used, is quite within the limit of experimental error.

We think it probable that with the short period of exposure to the action of bromine, the olefines are the only substances acted on to any extent, very little substitution taking place. The bromine absorptions, therefore, give an indication of the amount of olefines present in the oils, naphthenes and paraffins being neither of them much acted upon by bromine in the cold and in the absence of light.

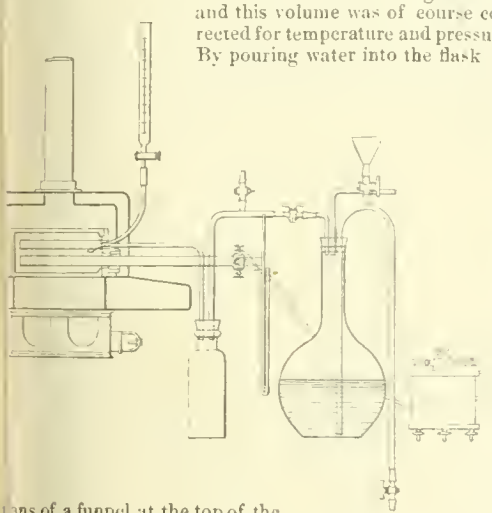
We next pass on to the gasification of the oil on a laboratory scale. For this purpose we used the following apparatus:—An iron retort was arranged so that it could

Russian Refined Oil.

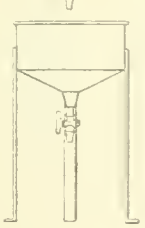
Sp. gr. 0·825; Refractive Index, 1·4521.

No. of Fraction.	Boiling Point.	Per Cent. distilled over.	Per Cent. per Degree.	Specific Gravity (Water at 15° C. = 1).	Refractive Index.	Bromine Absorption. 17 hours.	$\frac{\mu_D - 1}{d}$
	°C.						
1	115–149	3·4	0·10	0·7801	1·4279	16·9	0·5481
2	149–155	4·3	0·27	0·7829	1·4284	19·2	0·5478
3	155–171	8·0	0·50	0·7882	1·4315	22·7	0·5461
4	171–177	4·5	1·08	0·7905	1·4351	25·1	0·5468
5	177–182	4·5	0·90	0·7930	1·4377	25·5	0·5467
6	182–193	8·0	0·72	0·8072	1·4422	31·5	0·5478
7	193–198	6·4	1·20	0·8132	1·4473	52·4	0·5480
8	198–210	8·0	0·66	0·8190	1·4498	33·9	0·5480
9	210–221	8·5	0·78	0·8254	1·4521	36·5	0·5481
10	221–237	13·5	0·85	0·8328	1·4565	51·9	0·5482
11	237–254	10·5	0·62	0·8415	1·4610	49·0	0·5489
12	254–276	9·5	0·43	0·8493	1·4655	35·6	0·5491
13	276–293	5·6	0·33	0·8597	1·4713	11·6	0·5482
14	Residue	3·3	..	..	1·4817	..	..

heated in a gas muffle furnace. This retort carried an ectrical pyrometer and two tubes, one for the introduc-on of the oil entering only a short distance into the retort, nd the other for the exit of the gas, being carried the hole length of the retort. The oil was run in from a aduated burette, and the gas as it issued from the retort ssed through a bottle for the deposit of tar and thence to a large flask. At the commencement of each experi-ent the flask was full of water, which was drawn off by eans of a syphon at the same rate as that at which the s entered. This was easily regulated in practice by eans of a pressure gauge. The quantity of water drawn off was a measure of the gas made, and this volume was of course corrected for temperature and pressure. By pouring water into the flask by



eans of a funnel at the top of the hou, gas could be abstracted ough the glass stopcock for alysis. After several experi-nts we found that if the furnace s heated until the pyrometer i cated the desired temperature a the gas then turned off, 15 c.c. oil could be passed slowly into t retort without causing any a reciable alteration in tempe-r re.



he method, therefore, upon which we finally worked w to crack 15 c.c. of oil at a temperature of 1,350° F. c ecting the gas in the manner already explained. The r on why we chose this temperature was that experience w the carburetted water-gas plant showed that this was t best temperature to be maintained at the point where t oil entered the carburetter. In addition to analysing the g we determined its density and from this we calculated t weight of the gas produced and by difference the p entage of loss which we classify as tar.

The following table sets forth the results of this series of experiments. Each is the average of at least three experiments, and after some few determinations we had no difficulty in obtaining concordant results:—

The Gasification of Oils.

	Russian Solar Oil.	Borneo Solar Oil.	American Solar Oil.	Texas Solar Oil.	Russian Refined Oil.
Quantity of gas per c.c. of oil, corrected to N.T.P.	165·7	301	142·6	387·4	429
Density.....	0·833 Grm.	0·765 Grm.	0·885 Grm.	0·737 Grm.	0·775 Grm.
Weight of gas made per c.c. of oil.	0·502	0·298	0·506	0·398	0·430
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Tar by difference . ..	42·5	67·0	40·5	57	47·9
ANALYSIS OF GAS.					
Hydrocarbon vapours	1·0	4·0	3·2	3·4	3·8
Heavy hydrocarbons.	30·2	22·8	33·0	26·8	28·0
Methane.....	54·2	60·0	52·5	56·2	57·0
Hydrogen	12·0	13·6	11·6	13·4	11·5

The results shown above for Russian and Borneo oils are in accordance with those obtained from the use of these oils with the carburetted water-gas plant on a large scale, both as regards the make and quality of the gas and also the amount of tar produced.

From the above table it is evident that practically similar results are obtained by the use of Russian and American oils, and also that in the case of Borneo nearly 70 per cent. is incapable of gasification at this temperature. We will deal with this more fully when we give our views on the probable constitution of the oils.

Meanwhile, it is to be noted that Texas again occupies a middle place. It will be seen that the chief variation in the composition of the gas obtained is in the heavy hydrocarbons; and, since the illuminating power of the gas is dependent on the quantity of hydrocarbon vapours and heavy hydrocarbons, we would suggest that an approximate valuation of an oil for gas-making purposes can be made by multiplying the number of cubic centimetres of gas produced from 1 c.c. of oil by the sum of the hydrocarbon vapours and heavy hydrocarbons.

The following table gives the results obtained in this way for the five oils examined.

Basing the values of the oils on these figures, we find that American and Russian are practically of identical merit, and that Russian refined, Texas, and Borneo follow in the order named, the latter being less than half the value of the two first-named oils. It is of course quite possible that by working at different temperatures somewhat better results might be given by some of the oils. This we believe might especially apply to Russian refined, and we hope at some future time to give further results definitely answering this question.

Nature of Oil.	Number of c.c. of Gas obtained from 1 c.c. of Oil.	Percentage of Hydrocarbon Vapours + Heavy Hydrocarbons.	Product.
Russian solar	465·7	34·2	15,927
Borneo solar	301·0	26·8	7,067
American solar	442·6	36·2	16,022
Texas solar	397·4	30·2	12,001
Russian refined	429·0	31·8	13,642

At this point we thought it desirable to ascertain the properties of a paraffin, an olefine, and a naphthene of a like number of carbon atoms. For this purpose we selected hexane, hexylene, and hexamethylene. We prepared specimens of hexane and hexylene with a view to checking our results, but unfortunately we did not succeed in obtaining a specimen of hexamethylene, and we are indebted to the paper by Miss Fortey for our information on the characteristics of this naphthene.

The following table shows the constants pertaining to these hydrocarbons.

	Boiling Point.	Specific Gravity.	Percentage of Bromine absorbed in 15 minutes.	Refractive Index taken at 20° C. Na.	Hα. μ.	Hα. $\frac{\mu-1}{D}$	Hβ. μ.	Hβ. $\frac{\mu-1}{D}$	Dispersion Hβ−Hα.
	°C.	At 18° C.							
Hexane	69	0·6630	Nil	1·3744	1·3733	0·5631	1·3800	0·5731	0·0100
Hexylene	67	0·6879	188	1·3959	1·3945	0·5735	1·4028	0·5855	0·0120
		At 15·5° C.							
Hexamethylene	79	0·7822	..	1·4244	1·4267	0·5455	1·4341	0·5550	0·0095

From this table, and also from other sources, we know that the boiling points of correspooding paraffins and olefines do not differ greatly, but that the boiling points of the naphthenes are higher for compounds containing a like number of carbon atoms.

As regards gravity the olefine is slightly higher than the paraffin and the naphthene considerably higher than either of them.

The bromine absorption was nil in the case of the paraffin, and according to all the information we have been able to obtain on the subject, the behaviour of naphthenes is very similar to that of the paraffins with this reagent.

It is therefore probable that the quantity of bromine absorbed is at least an indication of the amount of olefines present in the oil.

The refractive indices of these compounds differ considerably, showing a marked increase in the following order, hexane, hexylene, and hexamethylene, but on the other hand, taking the dispersion for the hydrogen α and β lines, we find that the olefines have distinctly the greatest specific dispersive power, while the other two are almost identical.

Our next step was to determine the specific dispersive power, and the vapour density of those fractions of the oils, whose boiling points were sufficiently low to enable us to vaporise them with moderate facility; the following table sets forth the results we obtained.

The foregoing comprises the experimental work that we intend to make use of for the purposes of the present paper.

	Refractive Index at 20° C. Hα.	Hβ.	$\frac{\mu\alpha-1}{d}$	$\frac{\mu\beta-1}{d}$	Specific Dispersion.	Vapour Density.	VD 7	Boiling Point
								°C.
Russian—								
Fraction No. 2	1·4599	1·4692	0·5488	0·5599	0·0111	84·5	12·0	225—245
„ 3	1·4679	1·4777	0·5511	0·5627	0·0116	98·8	14·1	245—265
„ 4	1·4692	1·4789	0·5476	0·5588	0·0112	99·2	14·2	265—275
American—								
Fraction No. 2	1·4419	1·4511	0·5526	0·5641	0·0115	76·4	10·9	200—230
„ 3	1·4519	1·4613	0·5508	0·5622	0·0114	93·9	13·4	230—280
„ 4	1·4581	1·4675	0·5523	0·5635	0·0112	95·5	13·6	280—300
Texas—								
Fraction No. 2	1·4637	1·4730	0·5392	0·5500	0·0108	84·5	12·0	222—249
„ 3	1·4716	1·4816	0·5394	0·5508	0·0114	86·3	12·3	249—266
„ 4	1·4775	1·4871	0·5397	0·5505	0·0108	86·7	12·4	266—276
Borneo—								
Fraction No. 2	1·4623	1·4736	0·5557	0·5692	0·0135	67·5	9·6	175—189
„ 3	1·4724	1·4836	0·5584	0·5716	0·0132	72·9	10·4	180—187
„ 4	1·4777	1·4896	0·5567	0·5706	0·0139	75·6	10·8	187—200
„ 5	1·4849	1·4975	0·5567	0·5712	0·0145	80·6	11·5	200—225
„ 6	1·4933	1·5077	0·5599	0·5763	0·0164	80·6	11·5	225—235
„ 7	1·4989	1·5128	0·5587	0·5743	0·0156	85·0	12·1	235—245
„ 8	..	..	..	..	..	91·5	13·0	245—250
„ 9	..	..	..	..	..	95·3	13·7	250—265
„ 10	..	..	..	..	..	96·2	13·8	265—265
Russian Refined—								
Fraction No. 2	..	..	..	..	..	69·1	9·9	149—155

With a view to ascertaining the approximate composition of the different oils, we have applied the information available from the constants obtained from hexane, hexylene, and hexamethylene. We believe that in consideration of the results obtained we are justified in assuming that the principal constituents of the oils are paraffins, olefines, and naphthenes. The quantity of benzene homologues and such like substances must be inappreciable, as the action of strong sulphuric acid in the cold on these oils is very slig indeed.

Now, as already remarked, the 15 minutes bromin absorptions may be taken as an indication of the quanti of olefines present. It must be borne in mind that t percentage of bromine absorbed by an olefine is inverse proportional to the molecular weight and therefore to t vapour density. Assuming that the unsaturated hydr

arbons in the oil are all simple olefines, we can determine he percentage of these compounds present in any fraction f which we have the vapour density. Where this figure as not been obtained it can be approximately estimated rom the boiling point.

There is no doubt that carbo-cyclic compounds require very much higher temperature to crack them than that at hich we worked for the gasification of the oils, and therefore hese substances would certainly under the conditions of xperiment yield no appreciable quantity of gas. As will e observed by a reference to the table of the gasification f oils, there is a very marked difference in the quantity of il not converted into gas given under the heading of tar y difference. Now this must be taken as an indication of he relative quantities of non-gasifiable substances, in other ords, of naphthenes contained in the oil. This conlusion is confirmed by a consideration of the specific ravity and the refractive index, which are both very uch higher for naphthenes than for either paraffins or lefines.

If, knowing the percentage of olefines, we knew also the efractive indices of the higher boiling paraffins, olefines, nd naphthenes, we could calculate the percentage of these ompounds present in the oils; but not having as yet efinitely determined any of these, we can only approximate hem by analogy from those lower compounds which have een examined, bearing in mind that the specific gravity nd the refractive index gradually increase with the boiling oint, and that whereas the constants for the olefines are ly slightly higher than those of the corresponding araffins, those for the naphthenes of the same number of rbon atoms are very much higher.

We have endeavoured, and we believe with some degree success, to calculate the approximate composition of ch of the oils we have examined. This we have done means of a careful consideration of all the constants tained. At the same time we do not feel justified, in present state of our investigation, in doing more than dicating the nature of these deductions, reserving any finite statements till such time as the work we now ve in hand either confirms or corrects our present pressions.

The following statements embody in a general form the ductions which we have drawn in regard to the approxiate composition of the oils we have examined.

American solar oil probably contains paraffins and fines in about equal quantities, and only a very small rcentage of any closed ring compounds.

Russian solar oil we regard as consisting largely of raffins, with a comparatively small proportion of olefines d naphthenes, the former being in excess of the latter.

Borneo solar oil, according to our methods of deduction, sists almost entirely of naphthenes and olefines, the rcentage of paraffins being very small, especially in the her boiling fractions. The proportion of olefines, how-r, gradually increases with the boiling point.

t is thus quite possible that by a series of experiments, ne means might be devised whereby an oil might be tained from the Borneo fields of much greater value an the present one for gas-making purposes.

Texas solar oil occupies, as regards naphthenes, a place tween Borneo and Russian, differing, however, from neo in that it contains a considerably larger proportion paraffins, and thus it is a much better oil for gas making rposes.

We have thought it worth while, even in this early ge of our investigations, to bring the foregoing results the notice of this Society, in the hope that they may others to avoid some of those difficulties which we selves experienced through the purchase of an unsatisfory oil. We hope in the future to be able to give re precise and definite information on the constitution these oils, as the ever increasing use of oil for gasing purposes renders such information a necessity if the stry is to be developed on scientific lines.

conclusion, we beg to acknowledge the zealous help ur assistant, Mr. Joseph Race.

New York Section.

Meeting held on Friday, November 22nd, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE PRECIPITATION OF IRON, MANGANESE, AND ALUMINIUM BY BACTERIAL ACTION.

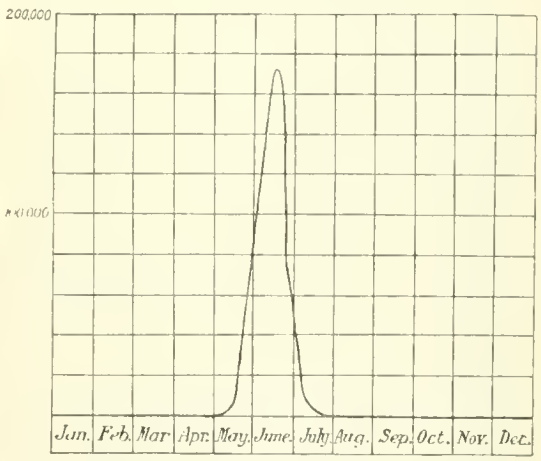
BY DANIEL D. JACKSON.

The precipitation of iron from water has been for some time the cause of serious trouble in numerous cities which have taken their water supplies from filtered or ground sources. This precipitation has usually been accompanied by a heavy growth in the water of the "giant bacterium" known as *Crenothrix*. Such was the case in 1878, when the Tegel water supply of Berlin* became seriously contaminated by the precipitation of flocculent iron and the wells sunk near Tegel Lake had to be abandoned as a source of supply.

A similar precipitation of iron brought about the abandonment, in 1887, of a set of sand filters, which derived their water from the River Maas, at Rotterdam.† During the last ten years the iron bacterium has caused serious trouble in numerous cities both in America and in Europe, and much expense has been involved in the replacing or treatment of the supplies affected.

Crenothrix occurs chiefly in ground waters, and only grows with rapidity when the dissolved oxygen is lacking or nearly so, and when the special salts are present which it precipitates. The presence of much organic matter, the absence of light, and the presence of carbonic acid in the water are also usual conditions, and seem to favour the growth of the organism.

In many places this growth has occurred in driven well-tubes, and stopped up the tubes or has been carried on to clog the screens. If allowed to go through the well screens it has made the waters disagreeable in appearance, and unfit for domestic use or for industrial purposes.



It grows rapidly also in the bottoms and sides of filter galleries and dug wells, and in the dead ends of pipes where the oxygen dissolved in the water has been exhausted.

* O. Brefeld und W. Zopf, "Bericht an den Magistrat der Stadt Berlin, uber die von ihnen angeführten Untersuchungen des Tegeler Wassers," Berlin, 1879.
W. Zopf, "Entwickelungsgeschechtliche Untersuchung der Crenothrix polyspora Die Ursache der Berliner Wassercalamitat," Berlin, 1879.

† Hugo De Vries, "Die Pflanzen und Thiere in den dunkel Raumen der Rotterdamer Wasserleitung, Bericht uber die Biol gischen Untersuchungen der Crenothrix Commission zu Rotterd vom Jahre 1887," p.p 1-55, Jana, 1890.

Growth may also take place in the bottoms of ponds which have become stagnant. The foregoing diagram shows the seasonal distribution of *Crenothrix* due to stagnation at the bottom of Jamaica Pond, Mass. The figures are in organisms per c.c., and are taken from observations made by the Massachusetts State Board of Health.

In a general way this diagram corresponds also with the seasonal distribution of *Crenothrix* in wells and filter-galleries, except that in the latter case the organism when present at all usually occurs throughout the year, and reaches its highest point in the month of August.

It will be seen from the following table that partially-filtered surface waters are more subject to growths of *Crenothrix* than other waters, and that the various ground waters follow next in this respect. The *Crenothrix* found in brooks and rivers usually comes originally from other sources, and is not natural to the streams themselves. It will be seen also that the various surface waters are comparatively free from the organism. This is because the conditions for growth are not found often in such waters.

Occurrence of Crenothrix in various kinds of Waters.

	Number of Observations.	Per Cent. containing Crenothrix.
		Per Cent.
Partially-filtered surface waters.	51	11·2
Closed reservoirs containing ground waters.	34	26·4
Springs	24	12·5
Driven wells and deep filter galleries.	59	12·1
Rivers	554	12·1
Brooks	91	11·0
Artificial ponds	386	6·9
Open reservoirs from rivers and brooks.	150	6·5
Natural ponds	386	3·6

The presence of *Crenothrix* in filtered water means improper conditions for filtration, or too heavy a draft upon the water, thus using up the dissolved oxygen and causing conditions which would favour the reduction and solution of the metallic elements in the soil.

General Appearance of Growth.—The growth of *Crenothrix*, wherever it occurs in water, causes a disagreeable turbidity which may be yellowish white, yellow, red, brown, or black. It may be stringy in appearance, but usually occurs in flocculent masses, which in time settle to the bottom of the bottle in which the water may be collected. Under the microscope these masses are shown to consist largely of an organic growth composed of long strings of bacteria, inclosed in a gelatinous sheath in which is imbedded the precipitated metallic hydrate.

Description of the Genus Crenothrix.—Filaments cylindrical, transversely divided into cells of very unequal length. Surrounded by well-marked sheath having a gelatinous envelope which is usually covered with a flocculent precipitate, yellow, red, brown, or black. Filaments unbranched, but the bacteria within have a faculty of leaving their outgrown sheath often at the side by means of a splitting in the cell wall.

Bacteria in sheath 1·5 μ wide and of very unequal length. Forms spores, 1 to 6 μ in diameter. Habitat, stagnant or improperly-filtered water.

The manner of multiplication of the genus is described by Sedgwick* in his "Data of Filtration" as follows:—

The first method of multiplication depends upon the capacity of all the cells composing a filament, if they become isolated in any way, to develop each a new filament. When, for instance, the cells free themselves from their old rust sheath, and, before they form a new envelope, are broken apart by the current or by a blow, obviously we have supplied the germ for one or several flocks. But besides this, the plant possesses other methods of multiplication. In the thicker filaments the cells divide not merely transversely, as in the thinner threads, but also lengthwise. Thereupon each cell divides into two or four adjoining cells. These latter separate and form the so-called microspores. In a filament in which this process has occurred, as soon as the cells have left their sheath in the usual manner, these microspores escape as innumerable entirely distinct masses, which speedily become scattered in the water. Each microspore, immediately after its escape begins to divide. Division takes place in all directions, and a little cluster soon arises composed of hundreds of cells. The sheath with which each cell envelopes itself changes in this case into a "slime" or jelly, which, however, becomes coloured in the usual manner with the oxide of iron. By means of this "slime" the whole mass is stuck or pasted to any part of the walls of the reservoir or to any objects within it. After some time the course of development changes, and each cell of the cluster grows out into a filament. In some of these the cells divide transversely only and form the so-called macrospores; in others the above-described microspores arise.

Description of Separate Species.—There are three species of the genus *Crenothrix*. The common and well-known species, *Crenothrix kühniana*, precipitates iron hydrate, and is consequently red or reddish-brown in appearance. The second is less common and less widely known among botanists and bacteriologists. It was formerly known as *Leptothrix ochracea*, but is now more properly called *Crenothrix ochracea*. This species precipitates aluminium hydrate, and is white to yellowish-white in appearance. Its usual colour is that of ochre, as it nearly always precipitates some iron with the aluminium. The third species is rare in occurrence, and has been found as yet in but two places (the Neponset River, and the filter galleries which supply the City of Newton, Mass.). It precipitates manganese hydrate, and is dark brown or black in appearance. This new species, *Crenothrix manganifera*, was first described by the author in a paper read at the Denver meeting of the American Microscopical Society, and printed in the Transactions of that Society, Vol. XXIII., 1901.

The following is a condensed description of the three species of *Crenothrix*:—

	Crenothrix kühniana.	Crenothrix manganifera.	Crenothrix ochracea.
Colour of precipitate in sheath.	Reddish-brown	Dark brown or black.	Very light buff (colour of ochre).
Filaments	Nearly straight	Nearly straight	Curved and often spiral.
	1·5–5 μ thick, widening at end to 6–9 μ; 6–15 μ long.	8–15 μ thick; 35 – 125 μ long.	1·5–3 μ thick; 60–150 μ long.
	Articulated and in places interrupted.	Articulated and in places interrupted.	Not articulated, but interrupted.
	Transverse division distinct.	Transverse division distinct.	Transverse division indistinct.
Bacteria in filament.	1·5×2 μ.....	1·5×3–6 μ...	1·5–2 μ × 4–9 μ.
	Distinct when treated with HCl.	Distinct when treated with HCl.	Not distinct when treated with HCl.
	Easily stained with Loeffler solution.	Easily stained with Loeffler solution.	Not easily stained with Loeffler solution.
	Slightly-rounded ends.	Decidedly-rounded ends.	Slightly-rounded ends.
Macrospores ..	1 6 μ, spherical diameter.	3×4 μ, oval...	1·5×2 μ, oval.
Microspores...	1 μ.....	1–1·5 μ.....	1 μ.

Chemical Analyses of the Precipitates produced by Three Species.—There are several points of interest chemically in the analyses of the materials precipitated by these three species. The analyses show that about one-third of the entire dried precipitate consists of the special oxide which the species throws down in the form of hydrate; another third or more consists of organic matter, and is chiefly that which is the living portion of the organism; while the remainder, which may be merely accidental and not a true constituent, is largely silica and aluminum silicate.

* Tech. Quart., Vol. III., No. 4, Nov. 1890.

The following table shows these facts:—

Analysis of Precipitates in Water caused by the Three Species of Crenothrix.

	Crenothrix Kühniana. Filter-gallery on shore of Ipswich River, Reading, Mass.	Crenothrix Manganifera. Filter-gallery on shore of Charles River, Newton, Mass.	Crenothrix Ochracea. Driven wells at Oconee, Brooklyn, N.Y.
	Per Cent.	Per Cent.	Per Cent.
Oxide of iron, Fe_2O_3.....	31·6	14·4	14·7
Oxide of manganese, Mn_2O_3.	0·0	33·9	0·0
Oxide of aluminium, Al_2O_3.	5·7	1·5	33·3
Silica, SiO_2	11·1	12·5	5·9
Aluminium silicate	10·4	8·0	7·6
Undetermined mineral matter.	4·2	1·8	2·3
Total mineral matter	63·0	72·1	63·8
Organic matter	37·0	27·9	36·2
Total mineral and organic matter.	100·0	100·0	100·0

Analyses of Waters which produce Crenothrix.—It is of interest to show that waters which produce *Crenothrix* contain salts which especially favour the growth of the particular species which they propagate. The following table gives the analyses of representative waters which have produced large quantities of the species named:—

Analysis of Waters in which the Three Species of Crenothrix grow.

Parts per Million.	Crenothrix Kühniana. Reading, Mass.	Crenothrix Manganifera. Newton, Mass.	Crenothrix Ochracea. Brooklyn, N.Y.
Fe_2O_3	3·1	0·2	0·3
Mn_2O_3	0·0	2·0	0·0
Al_2O_3	0·6	0·5	2·0
SiO_2	22·6	10·4	22·9
$CaCO_3$ } $MgCO_3$ }	24·0	12·0	98·0
$CaSO_4$ } $MgSO_4$ }	8·0	16·0	1·0
NaCl	5·3	7·8	7·5
Undetermined	3·5	3·3	2·2
Total, mineral	67·1	52·2	133·9
Total, organic.....	22·4	5·8	21·1
Total, mineral and organic.	89·5	58·0	155·0

It will be seen that waters which produce *Crenothrix kühniana* contain a predominating amount of iron, while the waters which produce *Crenothrix magnanifera* contain a predominating amount of manganese, and those which produce *Crenothrix ochracea* contain a predominating amount of aluminium. It is probable also that this aluminium must be present in the form of sulphate or in combination with carbonic acid and organic matter.

Artificial Cultures of Crenothrix.—*Crenothrix kühniana* was grown artificially on gelatin-agar, in an atmosphere of hydrogen. The growth was slight in amount, but normal in measurement and well-developed as to its sheath; but, although the medium contained ferrous sulphate, the iron was thrown down only in small amount. This was because there was little opportunity for oxidation.

Crenothrix kühniana was also grown in an atmosphere of air and carbon dioxide. The cultures were in a mixture of agar and gelatin, containing ferrous and manganous sulphates, and were kept in the dark at room temperature. The growth was not very luxuriant, but took place in sufficient amount to show that the organism in growing threw down but little manganese, but selected the iron to precipitate. This was also proved in stagnant solutions containing salts of manganese and iron.

In the same way cultures of *Crenothrix manganifera* were grown in solutions containing iron and manganese, and, although the growths were but slight, they showed the dark colour of the manganese predominating in the precipitate.

It is highly probable that *Crenothrix ochracea* would in the same way always select aluminium in predominating amount to precipitate as out of many hundreds of waters containing *Crenothrix* which have been examined, there has been no case where this species has thrown down a predominating amount of iron or manganese and in no case has *Crenothrix kühniana* been known to throw down a predominating amount of aluminium or manganese. In other words the species always precipitates its predominating amount, the special hydroxide which it selects.

Theoretical Conclusions.

I. Each of the three species seems to use a selective power in precipitating the special oxide ascribed to it, and about one-third of its dry body weight is composed of the oxide selected, whether it be of iron, manganese, or aluminium.

II. *Crenothrix kühniana* is very common because iron in quantity is a common constituent of water; *Crenothrix ochracea* is rather uncommon because aluminium sulphate or aluminium combined with carbonic acid and organic matter is uncommon in water; *Crenothrix manganifera* is very rare, because manganese seldom occurs in sufficient quantity in water to produce a noticeable growth of the organism.

III. The growth of all three species is due to the lack of oxygen, with a consequent reducing action in the soil or water. This reducing action may be produced by stagnation in the bottoms of ponds or by improper or too rapid filtration in wells or filter-galleries, thus causing the solution of iron, manganese or aluminium from the soil. These, combined with organic matter, seem to furnish the food material for the organisms, whilst the oxides of iron, manganese or aluminium which are precipitated in their gelatinous sheaths are the dross of the operation.

Practical Conclusions.

1. Keep the water of wells and filter-galleries as thoroughly aerated as possible, and blow off the dead ends of pipes frequently when there is danger of the loss of dissolved oxygen. The *Crenothrix* in the latter case takes its iron from the pipes themselves.

2. Avoid driving wells through large deposits of peaty matter.

3. Avoid driving wells or filter-galleries too close to the shores of ponds or streams having large deposits of organic matter on their banks.

4. Avoid pumping too heavily from any wells or filter-galleries, as the conditions are often thus produced which are favourable to disastrous growths of *Crenothrix*.

Explanation of Plate.

1. *Crenothrix kühniana.*—Magnification, 250 diameters. In this photograph the filaments and bacteria are entirely covered by the precipitated iron in the gelatinous sheaths. Nos. 1 and 5 are from photographs by G. C. Whipple.

2. *Crenothrix manganifera.*—Magnification, 800 diameters. The manganese has been removed from the gelatinous sheath in the lower part of the field by means of acid, and Loeffler solution used to stain the filaments and the inclosed bacteria, in order that they may be clearly shown. One of the bacteria near the bottom of the field is seen in a state of transverse division. A thread-like attachment connects each of the bacteria in a filament with its neighbour. This central thread has probably never before been photographed, and cannot be shown except by photography. This photograph and Nos. 3 and 4 are from preparations by the author, and were taken by Dr. R. B. Fitz-Randolph of the Hoagland Laboratory, Brooklyn, N.Y.

3. *Crenothrix ochracea.*—Magnification, 800 diameters. The filaments may be seen through the translucent precipitated alumina in the sheath.

4. *Crenothrix manganifera.*—Magnification, 800 diameters. The manganese has been dissolved by acid, and the articulated filaments are distinctly shown.

5. *Crenothrix kühniana.*—Magnification, 800 diameters. The iron has been nearly all dissolved by acid, and the filaments, with their articulations, may be seen. (Note the variation in size and general appearance in the three species represented by Nos. 3, 4, and 5.)

6. *Crenothrix kühniana.*—Magnification, 1,200 diameters. (Photograph by George W. Rafter.) At the left of the field is shown a young growing filament, while at the right is a filament filled with microspores.

Fig. 1.

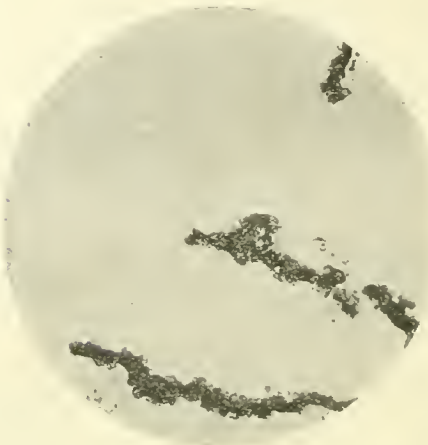


Fig. 2.

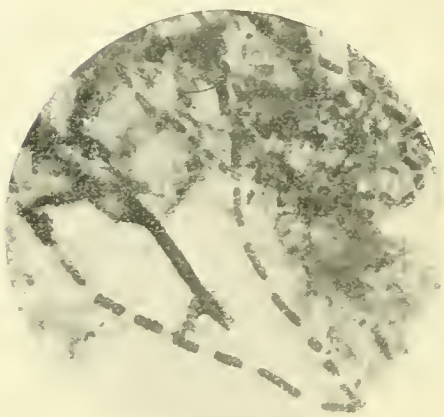


Fig. 3.

Fig. 4.

Fig. 5.

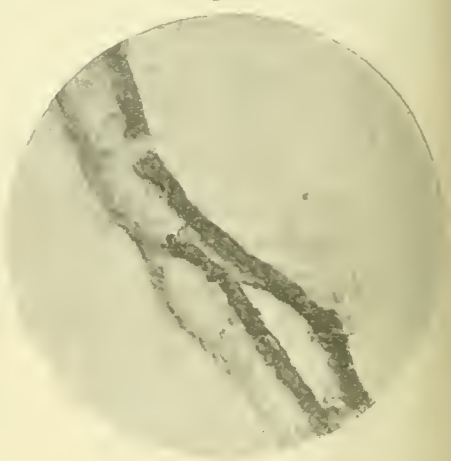
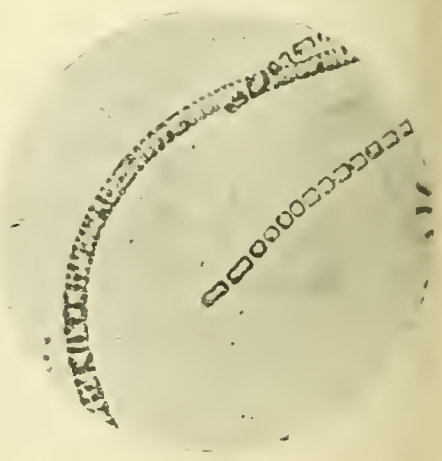


Fig. 6.



Meeting held at Chemists Club, on April 25th, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE ACTION OF CAUSTIC SODA ON WOOL.

BY J. MERRITT MATTHEWS, Ph.D.

The effect to be obtained by treating wool with caustic soda has been investigated, to a certain extent, by several chemists. Perhaps the earliest observations on this point were made by John Mercer, that chemist of broad genius who introduced so much of originality into many fields of technical chemistry, and more especially that of textile industry. The so-called "mercerising" of cotton is a process which is now familiar to most people, and it was in the prosecution of this research—which implies the action of caustic soda on cotton—that Mercer first observed the effect of cold concentrated caustic alkalis on wool. In the extension of his mercerising process for cotton to that fibre when in admixture with wool in fabrics known as "unions," it became necessary for him to allow animal fibre to become subject to the action of strong solutions of caustic soda. It was well known, even at that time—about the year 1845—that, under ordinary circumstances, the fixed caustic alkalis were very destructive in their action on wool; and even very dilute solutions of these chemicals readily dissolved that fibre, especially at elevated temperatures. But Mercer noticed that when he treated a piece of union goods with the solution of caustic alkali employed for the purpose of producing the mercerising effect on cotton, that the wool was injured thereby to only a very slight degree. This he attributed to the fact that the solution was allowed to act for only a short period of time and at a rather low temperature; in fact, he recommended that the temperature at which the operation was conducted should be kept as low as possible, in order to prevent deterioration of the wool fibre.

The action of alkaline agents on wool also appears to have been investigated to a slight extent by Chevreul, who was chemist at the Gobelin tapestry works in Paris. It was a well known fact that wool contained a considerable quantity of sulphur in its constitution, and it had been demonstrated that the presence of this sulphur at times caused serious faults in the dyeing operations, as, when brought into contact with salts of tin, copper, or lead, sulphides of these metals were formed, and dark coloured streaks were produced. This fault was of especial occurrence when the wool was mordanted with tin compounds, for the purpose, for instance, of dyeing cochineal scarlets. Chevreul investigated the subject, and overcame the defect by removing a portion of the sulphur from the wool by a treatment with lime water or caustic lime.

In 1898, Kertesz (*Färber-Zeit.* IX., 35—36) published the observation that woollen cloth could be printed with a paste composed of a mixture of caustic soda, gum-tragacanth, and glycerin; and the effect of the caustic soda, which was of 75° Tw., was to cause that portion of the fabric on which it was printed to acquire an increased affinity for dyestuffs, so that on subsequently removing the printing paste by washing in a solution of ammonia, and then dyeing the piece, two-colour effects could be produced.

Buntrock, in the same year (*Färber-Zeit.* IX., 69—71), also published the results of quite an extensive and systematic research on the action of caustic soda on wool. He used solutions of varying concentrations, and found that caustic soda solutions from 5°—70° Tw. rapidly disintegrated the fibre, whereas solutions from 70°—105° Tw. did not change the outward physical appearance of the wool, but increased its tensile strength considerably. The most powerful disintegrating effect of the caustic soda was exerted when the density of the solution was about 30° Tw., while at 80° Tw. the wool acquired its maximum tensile strength, and commenced to grow weaker again when this density was exceeded. Buntrock also made the observation that the addition of glycerin to the caustic soda solution was beneficial.

Last year, with the assistance of two of my students at the Philadelphia Textile School, I undertook an investigation of the effect of caustic soda on wool with a view to its working qualities in woollen manufacture. Our experiments corroborated, for the most part, the results obtained by Buntrock with regard to the density of caustic soda to be employed and the time of treatment. We used worsted yarn of 2·26 count in skeins containing 40 threads each. The effect of caustic soda solutions of different strengths is shown in the following table:

Density of NaOH.	Tensile Strength.	Remarks.
(1) Original strength.	41·3 lb.	..
(2) 5° Tw.....	39·4 „	..
(3) 25° Tw.....	27·8 „	The yarn had a yellow appearance; was harsh and brittle, and considerably felted.
(4) 35° Tw.....	Entirely dissolved	Solution had yellow colour.
(5) 40° Tw.....	..	Yarn was disintegrated to a transparent slimy mass.
(6) 60° Tw.....	25·3 lb.	Yarn much felted, yellow in appearance; very brittle and weak.
(7) 70° Tw.....	30·5 „	Yarn much felted, yellow in appearance and brittle.
(8) 75° Tw.....	39·5 „	Yarn much improved in appearance; had high lustre and silky feel.
(9) 80° Tw.....	56·5 „	Yarn white in appearance and not especially brittle; had a high lustre and a silky feel and scroop.
(10) 85° Tw.....	52·4 „	Appearance as above.
(11) 90° Tw.....	46·5 „	Ditto.
(12) 100° Tw.....	37 „	Yarn yellow in colour; brittle and harsh.

In the above set of experiments the time of immersion of the yarn in the caustic soda solution was uniformly five minutes; the temperature was 18° C. After removal from the caustic soda, the yarn was immediately washed in fresh water thoroughly, and then in a one per cent. solution of sulphuric acid. It appears from these experiments that the best effect is obtained by using a solution of about 80° Tw. The tensile strength of the yarn in this case increased 36 per cent. The elasticity of the "mercerised" wool (for I shall adopt this name for wool treated in this manner) proved to be 62·5 per cent., while the corresponding factor for the original yarn was but 35 per cent., thus showing an increase of nearly 80 per cent. The deterioration in the strength of the yarn by weaker solutions is evidently accompanied by a considerable change in its physical appearance. The yarn acquires a yellow colour and becomes harsh and brittle, and at the same time becomes felted together. When the concentration of the caustic soda solution reaches 80° Tw, however, the physical appearance of the yarn is much improved over that of the original. The fibre acquires a high lustre, very similar to that of chlored wool, and it has a silky feel; that is, it emits a rustling sound when rubbed or squeezed. It is also very white in colour, being almost similar in this respect to bleached yarn. At 100° Tw. it will be noticed that the appearance of the yarn is deteriorated together with the strength. It was found that after immersion in the caustic alkali, the yarn could not be totally freed from the sodium hydrate by simply washing in water, even by washing it in several fresh wash waters and finally boiling in water. To remove the last traces of alkali a bath of dilute sulphuric acid was employed as described. Experiments were made using nitric and hydrochloric acids in place of sulphuric, but the wool was left with a yellow colour, whereas with sulphuric acid the colour was quite white. Washing with ammonia was also tried, but though this gave good results with regard to the removal of the caustic alkali, it took a very much longer time than was the case with sulphuric acid, and consequently is not to be recommended. Washing in a solution of soap was also not satisfactory; both hot and cold solutions were tried, but the yarn was left in a

weaker condition than the original strength. Acetic acid was also used as a washing medium, but did not give results at all approaching those obtained with mineral acids. It was found that by employing the sulphuric acid wash water at a temperature of 60—70° C., better results were obtained than with cold solutions.

A series of experiments were also conducted with a view of seeing what influence the time of immersion would have on the results. The following table exhibits the observations made :—

Time of Immersion.	Tensile Strength.	Remarks.
(1) 5 mins.	56·5 lb.	..
(2) 10 „	55·5 „	..
(3) 15 „	50·5 „	..
(4) 30 „	47·0 „	Yellow in colour; slightly felted.
(5) 60 „	29·5 „	Yellow in colour; greatly felted; harsh and brittle.

The density of the caustic soda solution employed for the the above experiments was 80° Tw., and the temperature was 18° C. It is evident that the best duration of the treatment with the alkali is from 5 to 10 minutes, for if the action is allowed to continue beyond that time, the fibre is deteriorated both in strength and appearance.

Another set of experiments was undertaken to determine the influence of temperature on the process. The density of the caustic soda solution employed was 80° Tw., and the time of immersion was five minutes. The following results were obtained :—

Temperature.	Tensile Strength.	Remarks.
(1) 100° C.	Entirely dissolved	..
(2) 60° C.	Ditto.	..
(3) 30° C.	34·0 lb.	Yarn was harsh and brittle.
(4) 20° C.	55·5 „	..
(5) 15° C.	56·5 „	..
(6) 10° C.	51·5 „	..
(7) 0° C.	49·5 „	..

The decrease in the values for the last two experiments is caused by the fact that the caustic soda commences to separate out from solution at those temperatures, therefore the lessening of the effect of the alkali at these temperatures is only apparent and not real, it being due to a decrease in the concentration of the alkali.

Having determined the best conditions of treatment, various grades and kinds of yarn were operated on with the general result that a marked increase in tensile strength and physical properties was brought about by the action of the caustic alkali. Under the best conditions of treatment it appeared that harsh coarse wools, such as those employed in the manufacture of carpet yarns, were benefited more by the action of the caustic soda than the finer and softer wools, used mostly for the manufacture of worsteds. It was also observed that more tightly twisted yarns increased less in strength than those in the more loosely spun condition; a hard twisted two-ply worsted yarn showed only a small increase in strength, whereas a medium domestic yarn spun on the woollen principle showed a comparatively large increase.

It is well known that when cotton is treated with concentrated caustic soda, the material shrinks to a considerable extent unless such shrinkage is prevented by means of tension. Wool, on the other hand, shrinks but a small amount under this treatment, experiments on yarns showing a shrinkage in length of only 2—4 per cent., so it is hardly plausible to presume this small degree of shrinking to be due to any organic change in either the chemical or physical structure of the fibre.

In order to obtain the best results, it is necessary that the yarn should be very thoroughly scoured before treatment, and also the material should be well wetted out before entering the caustic liquor. If these two precautions are not observed carefully, the action of the alkali will be unevenly distributed throughout the yarn, with the result that on subsequent dyeing, uneven shades will be produced. With regard to the amount of caustic alkali absorbed by the wool, it was found that 35 grms. of wool treated with 650 c.c. of caustic soda solution at 80° Tw, caused a decrease in the density of the alkali to 75·6° Tw., which would mean that the wool had abstracted from solution about 18 grms. of caustic soda, or had absorbed 50 per cent. on the weight of the material treated. By adding glycerin to the bath, the action of the alkali appeared to be rendered more effective, and by steeping in a bath made up of equal parts of a caustic soda solution of 80° Tw. and glycerin for five minutes at 18° C., the tensile strength of the yarn was found to be increased from 41·4 to 63·5 lb.; treatment without the use of glycerin gave only 56 5 lb. It was thought that perhaps formaldehyde might have a toughening effect on the treated yarn, and an addition of this substance was made to the bath of caustic soda, but without any beneficial results b ing attained.

The caustic soda solution, after acting on the wool showed a light yellow colour ; on neutralisation with acids, hydrogen sulphide was liberated ; lead acetate solution also gave a black precipitate of lead sulphide. It is evident from this that the caustic soda extracts sulphur from the wool. To determine just how completely the sulphur was removed, analyses of the yarn were made before and after treatment, with the following results :—

Untreated yarn gave 3·42 per cent. sulphur. Treated yarn gave 0·53 per cent. sulphur, showing that the caustic soda had removed 84·5 per cent. of the sulphur originally contained in the wool. This appears to indicate that the sulphur is not a structural constituent of the wool fibre, as its removal in large part does not appear to disturb the cellular organised structure of the fibre. The fact that all of the sulphur is not removed by the treatment may serve to support the idea that this element exists in wool in two forms, one as an ultimate constituent of the fibre, and another as a more loosely combined compound. This view is also supported by the fact that the percentage of sulphur is by no means constant, varying with the breed and quality of the wool.

The dyeing qualities of the mercerised wool as compared with those of the untreated fibre, proved to be an interesting point in this research. In order to make these tests, a skein of yarn which had been subjected to the action of the caustic soda was dyed in the same bath together with a skein of the untreated yarn. We found as a result that with the majority of dyestuffs a very marked difference both in the time of dyeing and in the depth of shade was to be observed between the two skeins. The effect was much less marked with basic dyestuffs than with acid, substantive, and mordant dyestuffs, which would seem to uphold the chemical theory of dyeing in its application to basic dyestuffs, for we can readily understand that the acid constituent of the wool albuminoid would be more or less partially neutralised by the action of the caustic alkali, and hence any increased affinity of the fibre in dyeing due to structural differences caused by the caustic soda, would be more or less impaired by the negative influence caused by the neutralisation of the acid nature of the wool. Quantitative tests were made to determine, if possible, in an approximate manner, the amount of time which could be saved in obtaining the maximum shade on the mercerised wool, as compared with the time required for ordinary wool. Also determinations were made to discover the amount of dyestuff saved in obtaining the same depth of shade on both kinds of wool. Our results proved to be as follows :—

Class of Dyestuff.	Dyestuff Saved.	Time Saved.
1. Basic	12·5 per cent.	10·0 per cent.
2. Acid	20·0 „	30·0 „
3. Substantive	25·0 „	50·0 „
4. Mordant	33·3 „	40·0 „

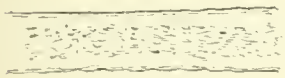
The fact that mordant dyestuffs show a considerable increase in affinity for the mercerised wool, is partly due to the fact that this fibre takes up the mordant to a much great

degree than the untreated fibre. Tests were made as to the comparative fastness of the different classes of dyestuffs on the two kinds of wool. The basic dyes showed practically no increase in fastness to washing, and, if anything, a slight decrease in fastness to light. With the acid, substantive, and mordant dyestuffs, a slight increase in fastness was noted to both washing and light, but not sufficient to warrant the statement that the action of caustic soda materially increased the fastness of dyestuffs on wool.

Untreated wool

with Na OH, 20° Tw.

with Na OH, 80° Tw.



same in Balsam

The microscopic examination of the mercerised wool fibre showed some interesting results. Whereas wool before treatment showed well defined scales and surface markings, with little or no internal medullary structure, when treated with caustic soda of low density (20° Tw.) the scales appear to fuse together, and instead of protruding sharply from the surface, they are rounded off, and smooth; the surface markings, however, still appear to be quite prominent. As the action of the caustic alkali proceeds, the fibre gradually disintegrates and finally dissolves. With concentrated solutions (80° Tw.), however, the effect is quite different. The scales appear to fuse together to such an extent that the surface markings on the fibre are almost entirely obliterated, and the fibre appears much smoother in outline and more transparent. In a balsam mount, the markings due to the presence of the scale, are entirely absent, and the inner medullary portion of the fibre is quite distinctly seen, and under a magnification of 350 diameters the individual cell elements can be readily observed. The fibre does not appear to be swollen to any extent, the diameters of the treated and untreated fibres being exactly the same. The increase in strength of the mercerised wool is no doubt due then to the segregation of the external scaly layer surrounding the fibre into a homogenous and continuous tissue, the effect being to give the fibre more the appearance and structure of hair. This also accounts for the increased lustre and elasticity of the mercerised wool. From this alteration in the surface structure of the fibre we would expect that the mercerised wool would be less liable to felt than ordinary wool, but on experimentation such was found not to be the case, the mercerised wool being felted up quite as rapidly as the untreated wool.

Since wool is regarded chemically as an amino-acid, I thought it would be of interest to observe if the amino group was split off or disturbed by the action of the caustic alkali. I did not, however, observe the liberation of ammonia during the treatment. On diazotising the mercerised wool by a treatment with a mixture of sodium nitrite and sulphuric acid, and subsequently developing with beta-naphthol, a distinct brown colour was obtained, which was considerably deeper in shade than that obtained on ordinary wool subjected to the same treatment. This would seem to indicate that the amino group had not been disturbed. Another point in evidence of this is that the treated wool dyes with the acid dyestuffs as readily as ordinary wool.

By adding sodium peroxide in small amount to the bath of caustic alkali, the appearance of the wool after treatment is considerably improved, the product obtained being bleached to a very good white.

In summing up the observations made in this research, I would say that, beyond the extraction of sulphur, the action of strong solutions of caustic soda on wool does not appear to effect any marked chemical changes in the fibre, though it does produce important physical changes. The outer sheath of the fibre seems to be hardened, is rendered more transparent, and acquires a high lustre, whilst the strength of the fibre is not only not impaired, but is considerably increased; and it is worthy of note that the beneficial effect is more pronounced on low grade coarse wools than when finer qualities are used.

STABILITY TESTS FOR SMOKELESS POWDER AND NITRO-EXPLOSIVES.

BY CAPT. H. C. ASPINWALL.

One of the most important problems to be solved by chemists engaged in the manufacture and examination of smokeless powder and nitro-explosives, is the establishment of a standard chemical test, by means of which, within a reasonably short space of time, the stability of such substances can be determined reliably and with accuracy. Both to the manufacturer and to the consumer the question is one of the greatest importance. The consumer must be assured that the substance having satisfactorily passed the prescribed test, possesses stability and keeping qualities; the manufacturer must also be protected from liability to loss caused by the rejection of an explosive, to which an unreliable or an erratic test has been applied.

The term "stability," as here employed, is to be considered more particularly with reference to the keeping qualities of an explosive under varying conditions of climate and storage; and as applied to smokeless powder, a test for stability must indicate that it will meet the following conditions, viz.:—

1. It must remain unchanged when subjected to prolonged storage under tropical heat or arctic cold; from + 45° C. to − 30° C. The temperature in a ship's magazine may at times reach 50° C., but only for a short time.

2. Exposure to moisture under normal conditions of different climates should produce no deleterious effects.

3. The ballistic properties of smokeless powder should remain unimpaired under the conditions described, that is to say, that the same weight of charge should at all times impart to the projectile the same velocity with the same pressure in the chamber of the gun. With all powders, higher velocities and pressures are to be expected when fired at high temperature, and the reverse when fired at low temperature; the variation, however, should be comparatively small.

4. The most important point is that under normal conditions, smokeless powder shall not be liable to spontaneous decomposition or disintegration.

None of the tests now employed afford reliable evidence as to the stability or instability of an explosive; they are all more or less crude and inaccurate; they are empirical, and the results obtained depend, to a great extent, upon the personal equation of the operators.

The Potassium-Iodide Test.—The best known test used for nitro-explosives is the potassium iodide starch test. It is carried out under widely varying conditions; formerly the temperature was fixed at 65·5° C.

The British government specifications now prescribe that nitro glycerin and dynamite shall stand for 15 minutes at 160° F. (71° C.); blasting gelatin, gelatin dynamites, and analagous preparations, 10 minutes at 160° F. (71° C.); cordite and ballistite, 15 minutes at 180° F. (82° C.); gun-cotton, tonite, &c., 10 minutes at 170° F. (76·6° C.); and gelatinised gun cotton preparations at 180° F. for 15 minutes, the same as for cordite.

In the United States, smokeless powder has been required to stand for 10 minutes at 100° C., and nitro-cellulose 30 minutes at 65·5 C., without showing any trace of the brown line on the test paper.

The formation of the characteristic brown line at the point of demarcation, between the wet and dry portions of the test paper, indicates the completion of the test; but on this point authorities disagree. The Navy specifications require that "the test shall end at the first appearance of the brown line" but as to how and when the brown line shall be determined, they are silent. In my opinion, this test is absolutely unreliable as a means to determine the stability of the nitro-cellulose smokeless powders, and cannot be considered as reliable for other explosives. As a means to indicate rapidly whether nitro-cellulose or nitro-glycerin has been sufficiently purified and contains no traces of free acid, the test is of value, and may be considered fairly reliable, if carefully made.

I know of one instance where a smokeless powder had passed a satisfactory test, but after being in store for some time, decomposed and fired, causing the destruction of the magazine and its contents. Its decomposition may be attributed to imperfect manufacture and exposure under abnormal conditions. On the other hand, I am credibly informed that a smokeless powder which originally gave a very low test (1 to 1½ minutes) has been stored for more than one and a half years without showing any decomposition.

Many instances have come under my observation, where smokeless powders, made from very impure ingredients, have been kept for more than 10 years without change. The retained samples were but small, so that any heat generated would be rapidly carried off, but on the other hand, small samples have decomposed completely in the vials in which they were kept. It is but fair to add that these samples were made during the earlier stages of the development of smokeless powder.

Oscar Guttmann contended that the potassium-iodide test was unreliable and proposed to substitute diphenylamine. In order to prove his point, he instituted a long series of tests, the results of which he gave in the paper quoted below.

Other operators were unable to obtain concordant results. (See also this Journal, 1897, 283; 1901, 11.)

My own experience with the diphenylamine test is that we were unable to obtain concordant results.

C. Hottsema ascertained the stability by heating nitro-cellulose in a constant bath for a quarter of an hour, and then blowing a dry current of carbonic acid through it for a short time, an interposed stopper of glass wool moistened with diphenylamine sulphuric acid solution indicated by blue colouration of the moistened part the first traces of nitrous fumes evolved. He repeated the operation, reducing the temperature 10° C. each time, until he reached a point where there was no reaction. Neither of these tests have been adopted as a practical method for determining stability.

German Test.—The stability test used largely in Europe, known here as the German test, consists in exposing the sample to be tested to a temperature of 135° C.; in a loosely closed glass tube. A piece of litmus paper is placed just above the sample, and the time when it is completely reddened is noted; this should not be less than 30 minutes for nitro-cellulose, and 45 minutes for powder. The appearance of red fumes at the upper portion of the test tube is also noted, the limit for nitro-cellulose powder being placed at 1½ hours. The substance should not explode at this temperature, 135° C., within 5 hours. Usually no explosion occurs after an exposure of many hours or not at all.

Thomas Test.—Another test suggested by Thomas is also used to some extent in Europe.

A very carefully cleaned re-agent cylinder 16 c.m. high, and 1·5 c.m. diameter, is fitted with a well ground glass stopper; the sample to be tested is placed in the bottom of the tube, and is thus heated in an oil bath to a given temperature (about 100° C.), which is carefully maintained for eight hours a day, until the production of red brown fumes is observed. The tube is always left in the oil bath during the whole time of heating and cooling; duplicate tests are made and the exact time after which the first distinct appearance of the brown fumes is observed, is taken as the end of the test. A powder containing nitro-glycerin should evolve no brown fumes at 94°—96° C. in four days, and gun-cotton and nitro-cellulose powders at 99°—101° C. in three days.

In Holland I was informed that gun-cotton heated for 10 hours each day at 95° C. required 21 days before red fumes developed. The objection to this test is the length of time required to obtain definite results.

The Vieille Test.—This test consists in exposing the substance to a temperature of 110° C., and is carried out as follows:—

Ten grms. of the substance are placed in a test tube, which is hermetically sealed by means of a brass cover and rubber gasket, held in place by a collar around the upper part of the tube, and a sprig to clamp the cover to the tube, so that it is practically air-tight.

The explosive is surrounded by a piece of blue litmus paper; the tubes are placed in a suitable bath and maintained at a constant temperature of 110° C. As soon as the litmus paper shall be completely reddened, the time is noted, the tube is removed from the bath and allowed to cool; a fresh piece of litmus paper is placed in the tube and the sample is again placed in the bath and remains until the paper is reddened, when the time is again noted the tube removed and allowed to cool. The operation continues until the reaction is completed in one hour, and the test is concluded.

The different lengths of time, that it has taken to effect the changes in the colour of the litmus papers, are added together and the aggregate indicates the stability of the explosive.

Dr. Vieille only adopted this test as the result of an exhaustive series of experiments covering a period of some years, and fixed upon the temperature of 110° C. as affording conclusive results within a reasonably short space of time. He found a distinct relation corresponding to time and temperature. Thus taking samples of the same lot of powder:—at 110° C. the test may end in 50 hours; at 80° C. in 50 days; at 60° C. in 50 weeks; at 40° C. in 50 months. As the temperature increases, time is reduced in arithmetical progression. Graphic curves developed from data obtained by experiment at different temperatures, indicate very clearly the correspondence between temperature and time.

This test appears to be one of the most reasonable that has been suggested, although it is empirical, and it requires some time to arrive at results. Unfortunately the personal equation again creeps in, as to the time when the change and depth of colour of the litmus paper is to be noted, and it has been found that a considerable difference of opinion exists between different operators. Unless the litmus paper be absolutely uniform and standard, widely varying results will be given; a difference exceeding an hour has been observed between two pieces of litmus paper supposedly prepared under precisely similar conditions, the one being of a light shade and the other darker. If, however, this test is standardised, as it can be without much difficulty, it is the most reliable and practical that has yet been suggested.

The Will Test.—An exhaustive research has been conducted by Professor Dr. W. Will, Director of the Laboratoire Centrale, Neu-Babelsberg, near Berlin, with the object of developing a quantitative test for the determination of the stability of nitro-cellulose and explosives. An abstract of the first report of this investigation was published in the Journal, June 30th, 1900. The amount of nitrogen evolved at a given temperature of 135° C., and its rate of evolution determine the results.

In a second report, Dr. Will describes more fully the apparatus employed and the method of making the test. He takes 3·5 grms. of damp nitro-cellulose (containing about 30 per cent. of moisture); this is placed in the decomposition apparatus, the nitro-cellulose being firmly pressed down in the tube. The tube containing the sample is now placed in the oil bath, maintained at a constant temperature of 135° C. by means of a suitable stirring device a current of pure carbonic acid gas is passed through at an uniform rate; the evolved gases then pass through a combustion tube in which the volatilised nitrogen oxides

are reduced to nitrogen; the carbonic acid gas is absorbed by sodium hydrate solution, and the volume of nitrogen is read off in the gas burette.

The first reading is made at the end of 30 minutes, and afterwards every 15 minutes. The gas evolved should be given off at an uniform rate, and if this be the case it may be considered that the sample has reached what Dr. Will terms, "the limit state of purification"; if, on the other hand, the gas is given off irregularly, if the observed differences are greater at first than later, it may be assumed that the sample has not been perfectly purified.

In Dr. Will's second report on the subject (January 1902) he enters into details, and explains the test. Some experiments have been carried on here, but so far I am unable to report any definite results.

A modification of the Will test has been suggested by Dr. Riess, who proposes to effect the decomposition at 135° C. *in vacuo*, instead of passing a current of carbonic acid gas. The apparatus necessary to carry on this investigation is now being installed.

As the time required to obtain results on nitro-cellulose by means of the Will test is approximately four hours, its application would be practical for determining the stability of nitro-cellulose or of smokeless powder. It is uncertain, however, whether it could be used for substances containing nitro-glycerin.

Another test has been suggested recently, which is to subject the sample to a constant temperature, weighing at stated intervals, and thus ascertain whether the loss is constant, and at an uniform rate.

With reference to the tests for stability employed by the U.S. Army, instead of depending upon any one test, both the German and the Vieille tests are used in addition to the potassium-iodide test, and other tests are being investigated.

SOME PARTS OF THE AMMONIA SODA PROCESS OPEN FOR IMPROVEMENT.

BY J. A. BRADBURN.

For one ton of soda ash by this process, the raw materials cost less than $5.00. Labour, supplies and other expenses bring up the total to about $10.00 and the net profit is about $8.00. This will pay 30 per cent. dividends on the necessary capital and provide for a reserve fund and other requirements. These dividends are now being paid by some Ammonia Soda Companies.

Although the ammonia process is such a financial success under certain conditions in experienced hands, it still wastes nearly one third of the salt and nearly one-third of the limestone used; and when we consider that the process consists essentially in causing the carbonic acid of the limestone to change places with the chlorine of the salt, a loss of one-third of each seems large.

For each ton of ash we use about 1·68 tons of salt in the form of brine; this costs about 12 cents to 20 cents where the brine is pumped near the works, and we waste one-third, or say 6 cents worth. We should not, however, look at the matter this way, but should say rather that we waste or lose half a ton of alkali which we could sell for about $9.00 with a profit of about $4.00. A works making now 100 tons per day would, if this waste was eliminated, make in the same time 150 tons. This problem is evaded by saying we are passing through our plant all the brine it will take and we make 100 tons of ash per day. We admit that if we utilised all the salt in the brine we should make an extra 50 tons, but we prefer to build an extra plant with a capacity half as large as our present one; we shall then get the extra 50 tons cheaper than we can from the unutilised salt of our 100-ton plant. The point, however, still remains that the 100-ton plant in the department concerned is losing one ton for each two tons made.

Some ammonia soda works only utilise about 52 per cent. of the salt and yet have practically the same expenses for management and the labour connected with that part of the plant dealing with or treating the several liquors in the process; the only reduction in expense occurs in the departments handling the solid materials.

Thus complete utilisation would give in 24 hours ..150 tons
" Two-thirds " " " " ..100 "
" One-half " " " " .. 75 "

From this the second works makes one third more product than the third, and makes it at a less cost per ton because the items of cost mentioned above are better utilised. The conversion of the salt into soda seems to depend largely upon the ratio which the quantities of $NaCl$, NH_3, CO_2, NH_4Cl, $NaHCO_3$ water and inert gas, chiefly the N, of the kiln gas, bear to each other. The laws of the influence of mass, of balanced actions, of solution and the modern theories regarding dissociation may be studied with profit in this part of the ammonia soda process. By referring to the Journal 1901, page 442, it will be found that a liquor coming from the tower contains in 1 litre, 39 grms. CO_2, 19½ grms. NH_3 existing as a carbonate, 180 grms. NH_4Cl and 85 grms. $NaCl$. The 19½ grms. NH_3 is enough with sufficient CO_2 to convert 67 grms. out of the 85 grms. $NaCl$ into $NaHCO_3$ provided the reversing influence of the NH_4Cl present could be neutralised and the concentration of the liquor kept constant. The reversing influence of the NH_4Cl (see Journal 1896, page 882), is to some extent neutralised by adding more salt ($NaCl$), and this was formerly done, but the financial benefit obtained was small (the salt had to be bought or obtained by evaporating brine) and it was found more profitable to be content with about a two-third utilisation of the salt in the brine and crowd through the plant all the brine it would take.

Influence of strong or weak Gas.—The limekilns in most ammonia soda works furnish a gas containing 30—32 per cent. of CO_2. A part of the kiln gas is used to carbonate the ammoniated brine, raising it from 39 grms. CO_2 per litre up to 66 grms. per litre; the remaining kiln gas is mixed with strong CO_2 gas coming from the calcination of the $NaHCO_3$, and the mixed gas of about 55 per cent. CO_2 is pumped into the precipitating towers.

What is wanted is a method of producing practically pure CO_2 from limestone direct, or a process of separating CO_2 from the limekiln gases. Several years ago the writer proposed calcining the limestone by steam superheated in a firebrick stove similar to those used in blast furnace work for iron. The advantages of this method are, 1st pure CO_2, and therefore a less volume of gas (about 50 per cent. less), to be pumped by the compressors, which means 50 per cent. less coal and steam consumption for this purpose; 2nd. Cleaner milk of lime for the distillers, and 3rd. Because a given quantity of pure CO_2 is absorbed in less time than the same quantity of impure CO_2; we, therefore, have an increased production of bicarbonate of soda in a given time, which means for this department a less labour cost per ton. The disadvantages are, 1st. The large quantity of heat latent in the steam; 2nd. A larger quantity of coal used; 3rd. Increased interest and depreciation charges for the necessary plant.

A second proposed plan is to take the limekiln gases and subject them to a low temperature to liquefy the CO_2, and so separate it from the gaseous nitrogen; the process being arranged so that, after separation, the cold nitrogen and liquid CO_2 travel in a direction opposite to that of the incoming kiln gas, the heat of which would thus be given to the outgoing products of the process. These would thus recover their original temperature and pressure. Theoretically the cost of power for this process should be very small. Liquid CO_2 and gaseous CO_2 at a low temperature could be used for cooling purposes in the tower. The cooling is now done by water passing through cooling tubes placed within the tower, and to a slight extent by the inert nitrogen expanding as it rises through the tower. Possessing liquid CO_2 we could dispense with compressors for pumping the gas into the towers; liquid CO_2 can be made to boil in several ways and the gaseous CO_2 forced by its own pressure into the tower in a series of impulses similar to the way it is now pumped in by a compressor. By so doing the liquor and precipitated

$NaHCO_3$ are better agitated than when an unchanging stream of gas is passed in. It is claimed by some that it is advantageous to have nitrogen mixed with the CO_2 going into the towers because it passing unabsorbed through the tower agitates the liquor better than would be the case if pure CO_2 were used. But the object of the agitation is primarily to increase the rate of contact of the liquid and the gas. Some agitation is needed to prevent the precipitated $NaHCO_3$ from settling on the partition plates. For the same quantity of CO_2 absorbed less agitation is necessary in the case of pure CO_2 than when diluted CO_2 is used. The most agitation is needed at the bottom of the tower, and is only needed at the top when there is CO_2 in the exit gases. At the bottom of the tower the liquor is at its most exhausted point in regard to NaCl and alkaline ammonia, the substances which are acted upon by the CO_2. At the top, no agitation should be necessary, because the process theoretically demands that no CO_2 shall pass away from the tower, and the manufacturer tries to come as near to this as possible. At present the waste gasses from the tower carry away about 60 grms. NH_3 per cubic meter of waste gas; this ammonia is regained by passing the waste gases through a washing vessel called the "Tower Washer." By using pure CO_2 this would be avoided. By reason of the great pressure of pure over diluted CO_2 it would seem to follow that for a given weight of CO_2 absorbed, that is for a given production of soda, the absorbing action o the liquor would be confined to the lower part of the present tower, and that a certain length of the column of liquor at the top would be idle when using pure CO_2, and, therefore, that a shorter tower would give the same quantity of soda as the present high tower. If this is so, therefore, in building a new plant there would be a saving in the cost of the tower, of the tower house, and in cooling water for this would not require pumping to its present height. It would follow also from the above that not only is 45 per cent. of the boiler capacity and coal consumption occupied in forcing useless nitrogen into the tower when gas containing only 55 per cent. CO_2 is used, but also that a large part of the tower capacity is rendered unproductive.

This problem of improving the quality of the gas can be attacked with greater chance of success than can the problem of increasing the conversion of the salt to bicarbonate.

Purification of the Brine.—In the manufacture of 100 tons of soda ash about 600 cubic metres or 158,400 U.S. gallons of brine are used, containing about 4,500 kilos. or 9,900 lbs. of lime and magnesia salts, chiefly, however, calcium sulphate. These are mostly precipitated when ammonia and ammonium carbonate are passed into the brine, and the precipitate is removed as a thick mud from the bottom of settling vats. (See Journal 1896, page 881.) But before arriving at the settling vats the brine and precipitate has travelled through about one half of the plant, and by reason of ammonium chloride and ammonium sulphate in the brine at this time much of the magnesium and some calcium is retained in solution while the brine is hot; these form a scale, chiefly of $MgCO_3$, on the pipes of the apparatus used for cooling the settled liquor and also on the sides of the conveying pipes. On the inside walls of the settling vats, and wherever the brine is held while it is hot a hard scale forms, composed chiefly of $CaCO_3$ and $MgCO_3$ and NaCl; but where the brine is cold, as in the tower washer, the scale is softer and consists chiefly of $CaCO_3$. The ammonia soda process would be rendered more automatic if purified brine were available, and while the expense of removing the scale and mud from the several vessels does not cost much when calculated on per ton of soda made, still the absence of blocked pipes and passages, and of the trouble caused when these occur suddenly, would be a great relief to every manufacturer and manager. To free the brine from calcium and magnesium is, however, not enough. It must also be freed from the sulphuric acid which, in the raw brine, is combined with the calcium, and after precipitation remains in the brine as ammonium sulphate. When the liquor is afterwards distilled with milk of lime, calcium sulphate is reproduced and forms a hard crystaline scale in the passages and on the sides and plates of the distiller which has to be chipped off with hammers.

A precipitation process of purification, to have a chance of financial success, must be a very cheap one. The writer, in conjunction with others, proposed the use of crude barium sulphide with CO_2 and also barium carbonate; these takes out both the sulphuric acid and the calcium and magnesium. We have seen that to manufacture 100 tons of soda ash per day we must take care of about $4\frac{1}{2}$ tons of impurities in the brine. About 98 per cent. of these (Ca and Mg) are removed at the present time by settling after precipitation with ammonium carbonate; the remainder goes to form scale in the tower washer, vat washer, absorber, settling vats, coolers, and pipes and passages connecting these. Of the sulphuric acid about the same percentage is run off with the waste liquor, the remainder forming scale in the distiller. This small quantity as scale is removed at a large expense figured on the quantity itself but at a small expense per ton of soda made. Now a purification process, which apparently must be a chemical precipitation process, must remove $4\frac{1}{2}$ tons per day, whereas the mechanical method only has to remove about 2 per cent. of this, but the advantage of a more automatic working, clean pipes, passages and vessels, and absence of many little troubles are all on the side of pure brine; therefore a cheap method of furnishing pure brine would be welcomed in the ammonia soda process.

THE DETERMINATION OF PARAFFIN IN PETROLEUM RESIDUES, ASPHALTIC OILS, AND ASPHALTS FLUXED WITH PARAFFIN OILS.

BY CLIFFORD RICHARDSON.

The method of Holde has been found to be quite accurate (Mitt. a. d. König. Versuchsanstalt zu Berlin, 1896, **14**, 211) in determining the amount of paraffin in distillates from paraffin oils, but, as has been shown by its originator, is not applicable to residues, to asphaltic oils, or to mixtures of asphaltum and paraffin residuum, owing to the fact that these substances contain compounds of a nature equally insoluble in the ether-alcohol precipitant as paraffin.

In my laboratory there is often occasion to determine the percentage of paraffin in the petroleum residum or tar, used as a fluxing agent in the asphalt-paving industry, in the mixtures of this with various asphalts, known as paving cements, and in the residues from asphaltic oils, known as oil asphalts, which at times contain small amounts of paraffin, as in the case of the residues from the petroleum from the Beaumont field.

Efforts have been made, therefore, to adapt the method of Holde to such cases, or rather to prepare materials of this description by a preliminary treatment so that the paraffin which they contain may be separated by that method.

For this purpose, 1, 2, or more grms. of the substance to be examined is taken and covered in an Erlenmeyer flask with 100 c.c. of 88° naphtha. The amount will depend on the paraffin present and on the percentage of oil which remains after the preliminary treatment with naphtha and acid. Of a residuum or tar from Eastern pipe line oils one grm. is sufficient, as the substance consists of a nearly pure bitumen containing from 6 to 12 per cent. of paraffin. Ten grms. of a residue from Beaumont oil should be used, as this, in some cases, contains only 78·0 per cent. of its bitumen soluble in naphtha, less than 50·0 per cent. unacted on by acid, and only about 1·0 per cent. of paraffin. Several grms. can be taken of a Trinidad asphalt cement, made of asphaltum and Pennsylvania residuum, which contains 26·0 per cent. of mineral matter and only 70·0 per cent. of its bitumen in a form soluble in 88° naphtha.

The object of the naphtha treatment is to separate the paraffin from substances of a non-bituminous nature and from some of those asphaltic hydrocarbons insoluble in naphtha which would be precipitated in the ether alcohol solvent and contaminate the paraffin.

The naphtha is allowed to act on the substance overnight, and the next morning the solution is decanted

ough a Gooch crucible. The residue is washed well h naphtha and the combined solution and washings united. desired, the residue, insoluble in naphtha, remaining on asbestos felt, can be weighed and the amount of soluble umen determined by difference. In the case of carefully pared residues from paraffin petroleum this naphtha ution may be evaporated in the flask in which the affin is to be separated and the subsequent determination the Holde method carried on with this residuum of bitumen uble in naphtha, but, as will be seen, the results obtained too high. Where asphaltic oils are present in the phtha soluble bitumen, and preferably in all cases except se of distillates, a further treatment is necessary to move oils, which would otherwise be thrown out, from ether solution with the paraffin by the alcohol. For s purpose the naphtha solution is placed in a separating nel and shaken with sulphuric acid, specific gravity 84, until a fresh portion of acid is but slightly coloured. ice is generally sufficient. The solution is washed with er several times, then, with a weak solution of carbonate soda, again with water, and the bitumen in solution overed, weighed, if desired, and treated by the Holde hod for the separation of the paraffin it contains. By means all the unsaturated hydrocarbons and those of asphaltic nature, readily precipitated by alcohol from r ether solutions, are removed and the possibility ught about of recovering the paraffin in a pure condition. method of Holde is given in this Journal, 1897, **16**,

ome determinations made in the manner described ulted as follows :—

Petroleum Residuum from Pipe Line Oil.

Specific gravity, 0·93.

Weight taken.	Soluble in Naphtha.	Not acted on by H_2SO_4.	Paraffin.
Grms.	Per Cent.	Per Cent.	Per Cent.
1·0	96·0	No treatment....	7·95
1·0	96·0	89·5	5·55
1·0	Distilled *in vacuo*..	No treatment....	5·95

Trinidad Asphalt Cement.

10·0	..	No treatment....	2·95
10·0	..	..	0·95

each case the paraffin recovered after treatment was e and pure, while that obtained in the other way, even by distillation *in vacuo*, was coloured. The results after treatment were of course lower and more correct.

The Trinidad asphalt cement was made from 100 parts of Trinidad asphalt and 20 parts of a residuum similar to the one analysed. The asphalt contained, of course, no paraffin, the residuum, 5·55 per cent. The calculated amount in the cement is therefore 0·925 per cent., and 0·95 per cent. was found.

ANALYSIS OF TANNING MATERIALS: FILTER PAPERS AND SOLUBLE SOLIDS.

BY HERBERT C. REED.

At the Eighteenth Convention of the Association of Official Agricultural Chemists the following method was adopted for the determination of soluble solids :—

V.—"Double pleated filter paper (S. & S., No. 590, 15 cm.) shall be used. To 2 grms. of kaolin add 75 c.c. of the tanning solution, stir, let stand 15 minutes, and decant as much as possible. Add 75 c.c. more of the solution, pour on filter, keep filter full, reject the first 150 c.c. of the filtrate, evaporate the next 100 c.c, and dry. Evaporation during filtration must be guarded against."

Under II.—Quantity of material, the following occurs :—"In case of extract weigh such quantity as will give 0·35—0·45 grm. of tannin per 100 c.c. of solution."

Certain tests have been undertaken in order to prove the necessity, or otherwise, of employing filter paper No. 590, an expensive quantitative paper, but one that has always yielded excellent results especially as regards uniformity. At the same time it was deemed advisable to compare results from double and single papers. The official method as quoted above was followed in all particulars, substituting the various papers—single and double pleated—for No. 590 double pleated. All papers shown in tables are brought in the 15 cm. size with the exception of S. & S. No. 588, of which a larger size cut down to 15 cm. was used. All dryings were done according to the official method.

The principal element causing variation in results, beyond the dissimilarity in the composition of the papers themselves, is the variation in time for filtration, and this in a measure is dependent upon the unlikeness of the papers. Trivial conditions may exert a hastening or retarding of the filtration. Thus it is only by taking the results of a considerable number of filtrations, using various tanning materials, that we may hope to arrive at a just conclusion as to the merits of different papers.

The results are embodied in the following tables which are self-explanatory. Two (2) grms. kaolin were used in every instance, and all filtrates perfectly clear unless otherwise specified.

TABLE I.

Extract.	S. & S. No. 590. Double.	S. & S. No. 590. Single.	S. & S. No. 588. Double.	S. & S. No. 588. Single.	S. & S. No. 597. Double.	S. & S. No. 597. Single.	S. & S. No. 595. Double.	S. & S. No. 595. Single.	E. & A. No. 6286. Double.	E. & A. No. 6286. Single.
	Per Cent	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
a) uebracho liquor	41·96	..	40·73	..	..	42·56	..	..	..	42·44
b) uebracho liquor	50·41	..	48·39	..	49·58	..	..	..	49·18	..
c) uebracho liquor	49·90	50·64	..	50·00	..	..	..	..	..	49·42
d) uebracho liquor	50·57	..	..	50·51	..	50·38	49·44	50·76	..	50·78
e) uebracho liquor	50·31	51·01	..	..	..	50·42	49·39	50·85	..	50·37
a) uebracho solid	67·50	68·87	..	67·53	..	..	N.C.	..	..	68·14
b) uebracho solid	68·59	69·40	..	..	..	..	66·20	..	..	..
a) nestnut	43·54	43·82	43·24	43·53	43·42	43·79	43·18	43·57	..	..
b) nestnut	43·32	43·63	..	..	..	..	43·33	43·63	43·15	43·28
a) nestnut oak bark	41·69	41·74	40·95	41·26	41·31	41·59	..	..	..	..
b) nestnut oak bark	42·43	42·76	..	..	..	..	41·96	42·16	42·04	42·44
a) emlock	47·30	47·33	..	47·27	..	..	46·84	46·95	..	46·01
b) emlock	46·55	46·61	45·08	..	45·18	46·28	..	..	44·82	..
a) itch	44·78	44·92	44·17	44·32	..	44·62	..	..	..	..
b) teh	44·30	44·52	..	..	44·12	..	44·05	44·30	44·15	44·20
a) mac	47·30	47·99	46·85	47·71	46·94	47·53	..	..	..	..
b) mac	48·63	49·12	..	..	..	..	48·51	48·56	48·59	48·77
ercitron	45·33	46·00	44·84	45·32	44·52	45·76	44·76	45·38	44·59	44·85
utiscus	46·44	46·49	46·00	46·30	45·62	46·37	46·32	46·42	..	..
a) ar sol. tan. ext.	41·82	41·90	41·70	41·74	..	41·92	..	..	..	11·60
b) ar sol. tan. ext.	41·91	42·07	..	..	..	..	..	41·88	..	..

N.C. Not clear.

In order that a better comparison may be made averages are given in Table II., which show the results from the various papers, single and double, in comparison with results from No. 590 double.

TABLE II.

	S. & S. No. 590. Single.	S. & S. No. 588. Double.	S. & S. No. 588. Single.	S. & S. No. 597. Double.	S. & S. No. 597. Single.	S. & S. No. 595. Double.	S. & S. No. 595. Single.	E. & A. No. 6286. Double.	E. & A. No. 6286. Single.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
S. & S. No. 590, double	48·27	44·20	47·77	45·09	45·57	47·63	45·86	45·22	47·69
Gain or loss compared with No. 590, double	47·87	44·98	47·83	45·70	45·18	48·25	45·83	45·85	47·78
	+ 0·40	− 0·78	− 0·06	− 0·61	+ 0·09	− 0·62	+ 0·03	− 0·63	− 0·09

Believing that other papers than shown in Table I. might give better results a second series of experiments was undertaken with two other papers, "Munktell's Swedish No. 1 F" and "Munkrell's Swedish No. 0," both 15 cm. size, the official method being pursued as in Table I. The results are shown in Table III.

TABLE III.

Extract.	S. & S. No. 590. Double.	S. & S. No. 590. Single.	Swedish, No. 0. Double.	Swedish, No. 0. Single.	Swedish, No. 1 F. Double.	Swedish, No. 1 F. Single.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
(*a*) Quebracho liquor	42·75	43·44	42·68	43·23	42·42	43·18
(*b*) Quebracho liquor	50·73	51·38	50·70	51·22	50·76	51·38
(*c*) Quebracho liquor	51·42	52·07	51·42	52·05	51·10	52·02
(*d*) Quebracho liquor	50·71	51·66	50·62	51·62	50·48	51·30
Quebracho solid	69·21	70·45	68·70	69·75	69·00	70·32
Hemlock	46·86	47·05	46·95	47·25	46·43	47·28
Quercitron	47·30	47·95	47·30	47·53	47·25	47·58
Chestnut	43·76	43·99	43·68	43·69	43·76	43·89
Chestnut oak bark	42·16	42·42	41·96	42·26	42·23	42·40
Cutch liquor	47·20	47·37	46·89	47·12	47·16	47·27
Sumac	49·33	49·36	48·97	49·06	48·90	49·26
Lentiscus	46·43	46·67	46·23	46·76	46·40	*46·25
Gall nuts	38·88	39·22	39·11	39·29	38·81	39·01
Clear solution of a tanning extract	41·66	41·97	41·80	41·80	41·82	41·92
Average	47·74	48·21	47·64	48·05	47·61	48·08
Gain or loss per cent. compared with No. 590, double	..	+ 0·47	− 0·10	+ 0·31	− 0·13	+ 0·34

* Filtration very slow.

S. & S., No. 590, the official paper, is well known, and needs no description.

S. & S., No. 588, approximately $1\frac{1}{4}$ times as heavy as No. 590, is cheaper and of coarser fibre than the latter, giving slower filtrations. No. 588 double is much inferior to No. 590 double, and single is slightly inferior, and in no respect equal to No. 590 single.

S. & S., No. 597, approximately $1\frac{3}{5}$ times as heavy as No. 590, is a soft and porous paper, giving fully as rapid filtrations as No. 590. When used double this paper shows considerably higher absorption than No. 590 double, and single slightly less, but is by no means the equal of No. 590 single.

S. & S., No. 595, approximately $1\frac{3}{10}$ times as heavy as No. 590, is a coarse and rather hard paper, but filters as rapidly as No. 590. A reference to the table shows it, double, inferior to No. 590 double, and single about equal. The paper cannot be depended upon to always give clear filtrates.

E. & A., No. 6,286, approximately $1\frac{2}{5}$ times as heavy as No. 590, is a coarse, hard, and slow filtering paper, poorer than No. 590, double and single. The paper should be discarded on account of slow filtration.

Swedish, No. 0, approximately $1\frac{1}{10}$ times as heavy as No. 590, is harder and much slower filtering than the latter, but far superior to any of the previous mentioned papers in results given. No. 0 double is but slightly poorer than No. 590 double, and single is greatly superior, but not equal to No. 590 single. By reason of the slowness of the filtrations through this paper, it cannot be recommended.

Swedish, No. 1 F, weighs approximately the same as No. 590, but is softer and somewhat more porous, giving more rapid filtrations. Double No. 1 F, is slightly inferior to No. 590 double, and single much better, but not quite equal to No. 590 single. The paper does not run so uniform as No. 590, and imperfect filters are not seldom found. Of the papers tested, however, No. 1 F single most nearly approaches No. 590 single.

S. & S., No. 590 single, gives uniform and more nearly theoretical results than any of the others examined, and in no instance failed to give a clear solution with two grms. of kaolin. It is apparent from an examination of the tables that tests made with clear tanning solutions do not give entirely just conclusions as to the value of various papers. This is due primarily to variations in time taken for filtrations, thus the difference in soluble solids between No. 590 double and No. 590 single is greater in the case of quebracho extract, a slow filtering solution, than in the case of extract gall nuts, which filters very rapidly. As a rule the double papers filter more rapidly than the single, but the loss from absorption, owing to increased time of contact of solution with paper, is not so large from this cause as from the greater weight of paper, where double papers are used.

It is advised that during filtrations the filters be kept full, as recommended by the A.O.A.C. method, solutions of certain extracts, with either double or single papers, giving cloudy filtrates when this clause is not obeyed.

Papers other than shown in the examination may be found to give results equal to No. 590 single, but as such papers will in all probability be expensive ones they will have no advantage over No. 590.

It is evident from the varying results obtained by the use of different papers that it is necessary to state specifically the paper to be used.

In conclusion it is urged that all chemists interested in the analysis of tanning materials give filter paper No. 590, single pleated, with 2 grms. of kaolin for all filtrations as specified by the A.O.A.C. method, careful consideration with a view to its adoption.

ARSENIC CONTENTS OF CERTAIN PENNSYLVANIA ANTHRACITES.

BY ROBERT JOB AND J. B. YOUNG.

An investigation was recently made to determine the proportion of arsenic present in certain Pennsylvania anthracite coals. The method used was that of Ling and Newlands, Jour. Fed. Inst. of Brewing, 1901, 7, 315; Jour. Soc. Chem. Ind., 1901, 10, 1008, which briefly is as follows:—Ten grms. of the finely powdered sample of coal were intimately mixed with five grms. of lime, and burnt off in platinum dish. The residue was boiled with hydrochloric acid (1·10 sp. gr.), then diluted to 200 c.c., and 100 c.c. submitted to the Marsh test. Blank determinations were made of all reagents used, in order to insure freedom from contamination.

The proximate analyses were as follows:—

	Sample No. 1.	Sample No. 2.	Sample No. 3.	Sample No. 4.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Fixed carbon	81·10	81·44	82·60	83·13
Volatile combustible matter	9·57	11·26	12·31	9·06
Ash	9·33	7·30	5·09	7·81
	100·00	100·00	100·00	100·00

The arsenic contents were:—

Sample No. 1, none.

Sample No. 2, none.

Sample No. 3, 0·021 grain arsenic per 1 lb. of coal, which is equivalent to 0·0003 per cent. arsenic.

Sample No. 4, none.

As a check upon the accuracy of the work, we added arsenic to coal in the proportion of 0·007 grain of arsenic per 1 lb. of coal, followed the above-mentioned method throughout, and obtained a distinct arsenic mirror.

Nottingham Section.

Meeting held at the Municipal Technical School, Leicester, on Wednesday, April 30th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

THE ANALYSIS OF COD-OILS FOR TANNING PURPOSES.

BY S. R. TROTMAN, M.A., F.I.C., AND H. PETERS, A.I.C.

Some time ago our attention was drawn to a resin-like substance which was thrown down when tallow was mixed with a cod-oil obtained during the process of chamoising. This body was formed in such quantity as to render the use of the oil impossible. It was found, upon analysis, to be almost completely saponifiable, and was characterised chiefly by the presence of large quantities of hydroxy acids.

It was undoubtedly an oxidation product, but was not identical, in our opinion, with dégras-former. At a later date, we hope to be in possession of the exact nature of its acids, but having satisfied ourselves that it was almost entirely an oxidation product, we proceeded to the study of the question which was originally put to us, viz.: Can we foretell by analysis of the original cod-oil whether this obnoxious substance is likely to be produced or not? Cod-oil has been shown to contain considerable but varying quantities of unsaturated acids, notably, jecoleic, which readily yield hydroxy acids upon oxidation. The determination of these acids would perhaps yield all the information required, but as yet we have not been able to do this satisfactorily, and the operation would in any case be long and troublesome. Experiments in this direction are being carried out, but in the meantime, we have collected some facts connected with the ordinary constants of the oil which are of interest. The chief analytical constants of the oil were—

	Per Cent.
Acid value	22·58
Iodine value	448·0
Saponification value	186·0

Of these constants, the acid number varies between somewhat too narrow limits to be of much use, and the iodine absorbed varies so much with the conditions of the experiment as to be of comparatively small value as the basis of an opinion.

Since the resinous matter consists chiefly of oxidised acids, it occurred to us that the measurement of the power of absorbing oxygen which an oil possesses would give a rough but useful indication of its value for tanning purposes. The advantage of such a determination is that it is an attempt to measure a reaction which we know does occur during the use of the oil, and of which the excessive occurrence is shown to be prejudicial.

In the first instance, the hydroxy acids were determined by Jean's process, after exposing the oil to the action of the air at about 100° C. for some hours. In this way 8·8 per cent. was obtained, whilst in other samples, which had given good results in chamoising, the percentage never rose above 2. The process, however, is rather difficult to manipulate, and was discarded in favour of the measurement of the oxygen absorbed when the oil was treated with excess of permanganate. Various methods were tried—*e.g.*, in presence of acid and alkali—and rejected, and finally the following was adopted:—

From 0·5 to 1 grm. of the oil was weighed out into a flask or bottle of about 400 c.c. capacity, 150 c.c. of water added, and the whole agitated to mix the oil well into the water. 25 c.c. of normal permanganate solution was now added, and the whole well shaken, to form as homogeneous a mixture as possible. This was allowed to stand for two hours, with frequent and vigorous shakings. At the end of the two hours a black precipitate settled out. The solution was now filtered into a 250 c.c. flask, and made up to the mark. 50 c.c. of this were titrated with a solution of ferrous sulphate of about normal strength. Alongside the experiment a blank was done in a similar way. The difference between the two titrations gave the amount of permanganate oxygen used to oxidise the oil.

A number of oils which we have examined gave the following data. Where we could ascertain it, we have inserted the nature of the oil from a manufacturer's point of view, and it will be noticed that as the oxidation rises the oil becomes less suitable for chamoising.

The wide difference between the oxidation numbers we obtained renders it possible to draw a line between suitable and unsuitable oils. As far as we can judge, any oil which has a higher oxidation number than 30 as shown, is unsuitable for the leather industry.

		Oxidation Value.	Iodine Value.	Saponification Value.	Acid Value.
1	Used with good results.	10·1	130	180·2	21
2	" "	12·5	129	179·2	18
3	" "	14·6	108	219	4·1
4	" "	26·5	88	153	19·3
5	" "	25·1	211·1	165	15·7
6	" "	19·2	166	143	6·04
7	Found unsuitable in use.	43·8	376	184	22·6
8	" "	63·7	350	170·5	20·42
9	" "	30·9	448	186	22·6
10	" "	77·7	364	179	27·4
11	Rejected by tanner on inspection.	85·2	111·9	204	16
12	" "	46·8	376	184	22·5
13*	No history	43·7	155	184	21·3
14*	"	33·1	161	180	18·1
15*	"	32·1	155	207	7·1
16*	"	30·1	100	201	5·47
17*	"	53·6	97·2	171	6·7
18*	"	10·4	130	210	4·0

* Samples of genuine cod oils obtained from manufacturers.

Discussion.

Mr. P. G. Jackson asked what method was used in estimating the iodine values.

Mr. L. Archbutt said he would like to know whether these analyses were made on the filtered oils, as otherwise there might be extraneous organic matters interfering with the results. It seemed to him that the oxygen number did not give much more information than the iodine value. The bad oils reached in most cases the figure 300, whilst the good ones were well below 200. There was therefore a sharp line dividing the good from the bad. He had never before heard of any fixed oil giving such extraordinary iodine values as some of those recorded by the author: turpentine came nearest to some of them. He was also surprised to hear that the iodine value was not easy to determine. He had found the Wijs method both expeditious and accurate, and the test solution kept its strength for many months. He certainly thought it easier to determine the iodine value by this method than the oxygen number.

Mr. S. F. Burford also thought that the iodine value had advantages over the oxidation value. He also suggested that the refractive indices of the oils might give useful indications.

Mr. T. F. Harvey said he had occasion to test medicinially cod liver oils, and always employed the method of Wijs. The acetic acid used should be strong —99 per cent. He liked it very much better than the old method of Hübl, as it was not only easier, but gave closer results. Figures given by the old method were 138·8 to 159·6. By the Wijs method, he had obtained 159·72 to 176·9 on 13 samples. This was practically 167, the figure given by Lewkowitsch in his recent work, which probably was an average. He had found his Wijs solution absolutely unchanged after a period of three months, so that, for all practical purposes, it is very stable. He had no experience of such high iodine numbers as some of those given by the authors, except with pinene, a terpene obtained from oil of lemon, which reached 400.

Mr. Harold Peters, replying to the discussion, said that they had used the old iodine method with mercuric chloride in alcoholic solution. The oils were filtered in each case. The iodine value was, of course, a measure of the unsaturated bodies, but their object had been to determine the oxidisable bodies, which could also be effected in less time than was taken up by an estimation of the iodine value by the old method. The reason for filtering the black matter obtained in their method was because it made the end reaction more sharply visible.

Mr. Trotman added that the method they had devised was like what actually took place when the oil was used. It was through the oxidisable bodies that the trouble occurred, and here was a quantitative measure of these undesirable constituents.

Mr. Archbutt said that, to get accurate results by the Hübl method, the oils ought to be allowed to stand overnight, certainly not less than 16 hours, and at the end of the test there ought to be as much iodine left as was absorbed.

A MODIFIED ARGAND BURNER FOR THE FIRST PROCESS IN THE "KJELDAHL" ESTIMATION OF NITROGEN.

BY JOHN GOLDING.

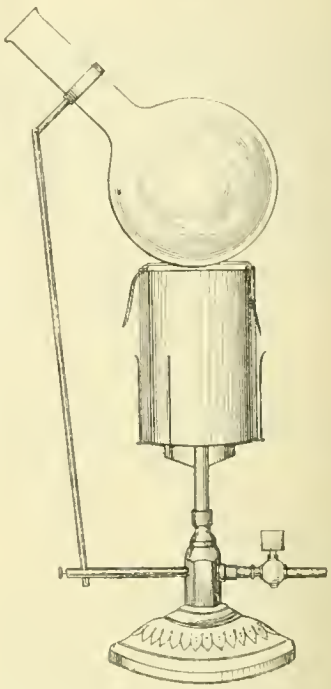
This is a simple device, consisting of a clip attached to a thin brass rod, the other end of which passes through a thicker rod, which screws into the foot of the Argand burner. The clip supports the neck of the flask, the weight of which rests on a pipeclay triangle; the rod is adjusted to the desired height by means of a screw in the end of the thicker rod.

The advantages of using these burners are:—

(1) That a very low even heat can be obtained, thus enabling the determination of the nitrogen in liquids and solids which have a tendency to froth with the strong sulphuric acid.

(2) That a strong heat can be produced without danger of the flasks breaking.

(3) That the burners can be used for other purposes.



This burner was adapted from my design by Messrs. Baird and Tatlock, of London, and is used in my laboratory with gasoline.

THE DETERMINATION OF NITRATES IN WATER BY THE INDIGO CARMINE METHOD.

BY S. R. TROTMAN AND HAROLD PETERS.

Owing to the great loss of time and waste of material in the estimation of nitrates in water by the indigo carmine method of comparisons, we suggest the following improved method, which we have proved to be much quicker and quite as accurate.

From 5 to 20 c.c. of the water under examination are mixed with 25 c.c. of indigo carmine solution. To this is added concentrated sulphuric acid equal in amount to the united volumes of the water and indigo carmine solution. The whole is then heated on the sand bath for 15 minutes. At the end of this time, the excess of carmine solution is titrated with a standard solution of potassium permanganate. In a similar manner, and alongside the above, a blank estimation is done, replacing the water under observation by distilled water. The difference between the two titrations is the amount used by the nitrates in the water.

The permanganate solution is standardised by means of standard solution of potassium nitrate containing 0·0001grm. of N per c.c.

The best method, and the most suitable strength for the solutions are those used in Löwenthal's method for estimating tannin.

Discussion.

Mr. S. F. Burford asked whether the method had been compared with the nitrometer method.

Mr. Trotman said the results were identical.

Mr. J. Golding stated that he had given up the volumetric method, and now exclusively used the copper-zinc couple which he found to work well in his hands.

Mr. L. Archbutt said he did not understand from the authors that they regarded their method as superior to the nitrometer method, but that it had advantages over the

employment of this instrument in certain cases. He had found the picrate of ammonia method described by Leffmann and Beam remarkably simple and usually accurate. It could be applied to the solids obtained from 70 c.c. or 100 c.c. of the water, the nitrate in which was converted, by treatment with phenol sulphonic acid, into picric acid, and then into ammonium picrate, and estimated colorimetrically. In the presence of high chlorides, the results were apt to be a little low, but as a rule high chlorides were accompanied by high nitrates, and in this case, by taking a smaller quantity of the water, the influence of the chlorides did not seem to interfere with the accuracy of the results.

Mr. Trotman, in the course of his reply, said that the time required to estimate nitrate by the copper zinc couple was often an objection. On the ground of accuracy, they placed every reliance on their method, by which they could estimate minute quantities of nitrate, as little as 0·1 part in 100,000. The nitrometer was no doubt a better method, but the loss of mercury and liability to accident with the taps made it expensive, and in some ways inconvenient.

Mr. Auchnutt admitted that to use the Crum nitrometer in the ordinary way, and to have to make the necessary corrections for temperature and pressure, did take up time. He got over this difficulty by having a second nitrometer containing a standard volume of nitric oxide, which, of course, was subject to all the physical changes that the volume of gas under examination underwent. One had, therefore, only to read off the volumes in the two nitrometers, and make a proportion sum to obtain an accurate result. He first used this method many years ago in Mr. Allen's laboratory, at Sheffield.

Scottish Section.

THE ORIGIN AND NATURE OF THE FREE ACID FORMED DURING HÜBL'S REACTION WITH UNSATURATED COMPOUNDS.

BY HARRY INGLE, B.Sc., PH.D.

(This Journal, May 15, 1902, 587—595.)

Errata.

Page 590, col. 1, line 15: for "3 diphenyl-chloriodo-ethane" read "*s*-diphenyl-chloriodo-ethane."

Page 591, col. 1, line 7: for "debromide" read "dibromide."

Page 592, col. 2, line 19: for—

"$C_6H_5CH(OC_2H_5)_2CH_2I$" read

"$C_6H_5CH(OC_2H_5)CH_2I$."

Page 593, col. 1, line 2: after "Potassium Iodide" insert full stop; and for "Wijs' Solutions" read "Wijs' Solution."

Page 594, col. 1, line 7 from bottom: after "linseed oil" insert comma, and delete comma after "only."

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	695
II.—Fuel, Gas, and Light	696
III.—Destructive Distillation, Tar Products, Petroleum	699
IV.—Colouring Matters and Dyestuffs	700
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	701
VI.—Colouring Wood, Paper, Leather, &c.	705
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	705
VIII.—Glass, Pottery, and Enamels	706
IX.—Building Materials, Clays, Mortars, and Cements	707
X.—Metallurgy	708
XI.—Electro-Chemistry and Electro-Metallurgy	710
XII.—Fats, Fatty Oils, and Soap	711
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	712
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	713
XV.—Manures, &c.	713
XVI.—Sugar, Starch, Gum, &c.	713
XVII.—Brewing, Wines, Spirits, &c.	715
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	716
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	718
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	719
XXI.—Photography	723
XXII.—Explosives, Matches, &c.	723
XXIII.—Analytical Chemistry	723
XXIV.—Scientific and Technical Notes	726

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Drying and Absorbing Apparatus. F. W. Saatmann, Charleroi, Belgium. Eng. Pat. 8942, May 1, 1901.

The apparatus is of the kind described in Eng. Pat. 15,565 of 1895 (this Journal, 1896, page 641). Tilting plates for carrying the material under treatment are arranged in superposed rows, between which a current of warm air, or the gas to be absorbed, passes. The plates are tilted only in one direction by the weight of the material with which they are loaded, and regain their normal horizontal positions automatically, when freed from their loads. Under these plates are arranged supplementary rows of tilting plates, between which a current of cold air is passed, for the purpose of cooling the dried material. Means are provided for making all the plates of one row discharge simultaneously on to the row next beneath, and gratings, or screens, are employed to separate automatically, according to their size, the pieces of material falling from one row of plates to the next.—R. A.

Scale and Explosions in Boilers and the like; Means for Preventing the Formation of ——. F. Abraham, Berlin. Eng. Pat. 7722, April 15, 1901.

Floating bodies are employed, preferably chips of pumice-stone, or cork, or both, which may be impregnated with chemicals, such as pertannate of iron. The bodies also serve to prevent the formation of an oil layer when greasy water is used.—R. A.

Escape of Liquid or Vapour; Means for Preventing the ——, from Vessels or Receptacles in which Volatile or other Liquids are contained. J. E. G. and J. C. Spooner, Upton Park, Essex. Eng. Pat. 7736, April 15, 1901.

The neck of the vessel is fitted with a male thread, and inside with a liner of soft metal, or other suitable material, which is internally flared at the top, and has an external bead. On to this screws a cap with female thread, similarly provided with a soft washer. By the action of the screw the two portions of soft substance are tightly compressed together. By screwing the whole of the neck, and giving it a conical or other base, with an external parallel washer, leading the liner to the bottom of the tube, and returning it upwards outside, the neck itself may be made to form a tight joint with the main vessel, when that washer is tightened downwards against the shoulder of the drum.—F. H. L.

Drying Apparatus for Continuous Working; Vacuum ——. O. M. Hillig, Berlin, and W. Müller, Breslau. Eng. Pat. 17,364, Aug. 29, 1901.

The apparatus consists of a number of drying chambers, and a vacuum chamber, preferably arranged centrally, common to all the drying chambers. A revolvable valve in the floor of the vacuum chamber has two sets of passages, through which communication can be established with the drying chambers, one set of passages being closed automatically by a valve, when the other passages have established communication between a freshly charged drying chamber and the vacuum chamber, until the pressure in the freshly charged chamber has been reduced.—R. A.

Filtering Liquids and Treating them with Gases; Improved Apparatus for ——. Siemens Bros. and Co., Ltd., London. From Siemens and Halske Actien Gesellschaft, Berlin. Eng. Pat. 3492, Feb. 11, 1902.

This apparatus comprises a chamber immediately under a filter, a layer of coarse material in the chamber, through which the filtered liquid passes, a gas inlet at the bottom of the chamber, and a gas outlet at the top of the chamber. The outlet for the liquid is arranged so that the gas passed into the chamber is under the pressure of a column of liquid, the height of which can be regulated.—R. A.

II.—FUEL, GAS, AND LIGHT.

Briquetting; Binder for ——. B. Dumont du Voitel. Eng. and Mining J., 1902, **73**, [15], 520.

For briquetting coal-dust, thin starch solution is used, and the resulting mass is "subjected to boiling" for a short time, filled into moulds, and the briquettes dried slowly at a moderate heat.—A. S.

Fuels; Micro-Organisms from the Fossil ——. B. Renault.

See under XXIV., *page* 727.

Naphthalene Extraction; Cost of ——. R. Lieberknecht. J. für Gasbeleucht., **45**, [18], 316.

The author discusses the cost of extracting naphthalene from coal-gas by the Young and Glover process, as compared with the older condensation process. The former consists in washing the slightly cooled gas with anthracene oil, to which 3—4 per cent. of benzol has been added, the mixture being capable of absorbing about 10 per cent. of naphthalene. In the condensation process, the tar and naphthalene are removed simultaneously by gradually cooling the gas, sudden differences in temperature being avoided. The outlay on plant for the Young and Glover process is considerably less than that required by the enlarged cooling plant of the condensation process; but in the latter the depreciation is less, and the cost of anthracene oil is saved. In a gasworks having an annual output of 2,000,000 cubic metres (70·6 million cubic feet) the cost per annum for anthracene oil only, in the Young and Glover process, amounts to 800—1,000 marks, and the capital outlay on the washing plant amounts to about 2,000 marks; interest on the latter at 4 per cent. and depreciation at 7½ per cent. bring the total cost for the removal of naphthalene to 1,030—1,230 marks per annum, exclusive of labour, &c. For the same output, using the condensation process, the capital outlay on the condensers would amount to about 6,000 marks; interest on this at 4 per cent. and depreciation at 5 per cent. (on account of the simplicity of the plant) bring the annual cost to 540 marks. There is thus a saving of 500—700 marks (25*l.* to 35*l.*) per annum in favour of the latter process, apart from the labour required in the washing process, the fluctuations in the price of the oil, and the dependence upon chemical works.—H. B.

Incandescent Lighting; Oil-Gas and Oil ——. V. B. Lewes. J. Gas Lighting, 1902, **79**, [2032], 1025—1029.

The author deals with the methods of production and cost of oil-gas; the Young process for gasifying the whole of the oil, without any production of tar; the candle-power obtainable per gallon of oil; the progress in oil incandescent lighting; the differences in coal-gas and oil-gas, and their effect on mantles; and different systems of incandescent lighting by means of oil. He sums up by giving the comparative cost of 1,000 candles per hour with various illuminants. Cost of 1,000 candles per hour:—

	s.	*d.*
Electricity, 3½*d.* per unit:—		
Incandescent	1	2
Arc	0	3½
Coal-gas:—		
Flat flame	1	6
Argand	1	0
Incandescent	0	2½
Incandescent, high pressure	0	1½
Oil:—		
Lamp (oil at 8*d.*)	0	7½
Oil-gas (oil at 4*d.*)	0	6
Incandescent lamp (oil at 8*d.*)	0	2½
Incandescent air-gas (spirit at 10*d.*)	0	2
Kitson lamp (oil at 8*d.*)	0	1

—A. S.

English Patents.

Fuel; Manufacture of Artificial ——. C. Jousset and W. R. McKay, London. Eng. Pat. 11,519, June 5, 1901.

Briquettes are made from coal-dust, coke-dust, peat, &c., by treating with a binding agent, *viz.*, a solution of amylaceous matter in ozonised water, to which is added sodium carbonate and sodium thiosulphate, which latter may be "diluted with hydrochloric acid."—C. S.

Liquid Hydrocarbons for Heating Purposes; Vaporising of ——. G. L. Badger, Mass., U.S.A. Eng. Pat. 2752, Feb. 3, 1902.

See U.S. Pat. 698,354; page 698.—R. S.

Flame or Combustion; Control of Temperature, Volume and Duration of ——; chiefly applicable to the Calcining of Lime and the like. B. E. Eldred, Boston, Mass. Eng. Pat. 17,197, Aug 27, 1901.

The fuel has an artificially accelerated draught of a mixture of air and a neutral gas. Thus, combustion becomes incomplete within the furnace, while the escaping gases carry off a large quantity of fuel gases, which burn in actual contact with the "lime or cement-forming material" to be calcined.

—R. S.

Carburetter and Vaporizer for Internal Combustion Engines. W. C. B. Evans and C. P. Nelson, London. Eng. Pat. 6176, March 13, 1902.

The oil is led through openings in the cover, to a reservoir provided with a float fitting the reservoir sides and the cover. The oil passes from above to below the float by vertical passages. When the float rises to its limit, it arrests the entry of further oil. The oil flows from the reservoir through a tube to a vaporising chamber, which is warmed by a hot-water jacket. The vapour escapes through a conical opening in the top of this chamber, the exit being regulated by a needle valve; it then mixes with cold air, admitted through the sides of the casing, and with any desired amount of air, warmed by passing upwards through the hot-water jacket. The supply of warm air is regulated by a hit-and-miss valve.—R. S.

Smoke from Boiler Fires; Apparatus for Preventing ——. O. Imray, London. From The International Smoke Prevention Co., New York. Eng. Pat. 1121, Jan. 15, 1902.

Relates to automatic apparatus for the above purpose, in which, upon opening the fire door, warm air and steam are projected into the fire to effect complete combustion, and thus prevent the production of smoke; upon closing the fire-door, the supply of warm air and steam is gradually cut off, the steam supply being opened by the admission of a liquid to a cylinder provided with a piston, and being closed by withdrawal of the liquid from the cylinder. The action of the piston is rendered prompt by increasing the pressure in the cylinder, by means of steam taken from the boiler. The valve in the liquid-supply pipe is arranged so that upon opening the fire-door, a supply of the liquid, under full pressure, is admitted to the cylinder, and at the same time escape of liquid from the cylinder is cut off, whilst upon closing the fire-door, the valve is closed, so as to cut off the liquid-supply and also permit the liquid to escape from the cylinder. Dampers are provided in air-channels leading from the ash-pit to the fire chamber. These dampers are connected with the piston which actuates the steam-supply valve, so that when the piston is moved, on opening the fire door to admit jets of steam over the fire, the dampers are simultaneously opened to permit warm air to pass from the ash-pit through the air-channels, and mingle with the steam, to be impelled with it over the fuel.
—R. S.

Gas Producers. J. Y. Johnson, London. From L. Genty and Société Générale des Industries Économiques Moteurs Charon, Marseilles and Paris. Eng. Pat. 9377, May 6, 1901.

An arrangement whereby the fuel is distilled by the heat of the producer before it sinks into the combustion zone, the distilled gas and tars being conducted to a region immediately above the combustion zone, whilst the producer gases are generated in a zone between the combustion zone and the zone of distillation. The proportion of gas and air is regulated by first charging the air with steam by passing it over the surface of water in an annular boiler surrounding the gas producer, and then supplying the said air with a further quantity of steam from another boiler, heated by the gases issuing from the producer. The steam-outlet valve of this second boiler is controlled by an expansion apparatus influenced by the variations of temperature of the gases issuing from the producer. The two boilers are connected by a tube in such manner that the water in the second boiler is forced into the annular boiler when a smaller amount of steam is required. A fan is provided for drawing a constant volume of air into the producer, and a double-beat valve enables part of the producer gas to be forced into the mains, and the production of gas to be reduced when necessary. There is also a valve by means of which the gas-utilising device can draw its charge of combustible gas direct from the producer in the event of the fan becoming inoperative.
—C. S.

Carburetting Air; Apparatus for ——. J. St. C. Legge, London. Eng. Pat. 9513, May 7, 1901.

See U.S. Pat. 690,303, 1901; this Journal, 1902, 461.
—R. S.

Burners; Gas and like ——. F. Abraham, Berlin. Eng. Pat. 7723, April 15, 1901.

A double supply of air is admitted to the mixing tube to the outer part of the flame of an atmospheric burner respectively. Two cylinders are provided, and in the gallery supporting the outer one is an annular chamber, where the incoming air of combustion is heated, the rate of flow being governed by adjustable slides, whilst the air admitted to the outer part of the flame passes from the space between the two cylinders through adjustable orifices in the funnel-shaped gallery supporting the inner cylinder.
—C. S.

Gas Lighters. W. E. Heys, Manchester. From L. McGregor Thompson, New York. Eng. Pat. 3206, Feb. 8, 1902.

The apparatus described, consists essentially of a combination of the usual electrical gas-lighter with the ordinary chemical "pill" of platinum black.—F. H. L.

Furnaces; Impts. in Electric ——. E. J. Duff and The United Alkali Company, Ltd., Liverpool. Eng. Pat. 13,139, June 27, 1901.

The furnace is constructed of angle-iron frames and cast-iron plates, the front plates being removable. The electrodes are connected to conducting rods passing through the insulating top of the furnace and capable of being raised or lowered as required. The space above the front plates is closed by an apron or front cover, which rises and falls, and is raised by suitable means.—C. S.

Burners; Incandescent Gas ——. E. W. Phelps, Montreal, and T. Nadeau, Toronto. Eng. Pat. 25,180, Dec. 10, 1901.

This describes a burner provided with a central pilot-flame and means for adjusting the gas supplies to the main burner and the pilot-flame. The mixing tube consists of two concentric tubes, in open communication at their lower ends, the outer tube having air-holes half way up its length; the air drawn in through these holes is heated as it passes down the annular space between the two tubes to the foot of the inner tube, where it meets the rising current of gas and passes upwards to the burner head, to burn beneath a mantle.
—H. B.

Lamps; Petroleum ——. S. Carlson, Stockholm. Eng. Pat. 3948, Feb. 15, 1902.

In petroleum lamps and similar illuminating apparatus where petroleum is forced to the burner by a compressed gas discharge through a pressure-reducing valve, the use is proposed, of a small reservoir, inserted into the usual petroleum reservoir, and communicating with the chamber containing the pressure-reducing valve and with the lamp burner, as well as being provided with a valve opening inwards, through which oil from the outer reservoir enters the inner one.—C. S.

Lamps; Incandescence Gas ——. A. Duffek, H. Wein, and A. Beschorner, Vienna. Eng. Pat. 4151, Feb. 18, 1902.

The gas supply to the burner enters the mixing tube through an annular nozzle, at the same time drawing in air through the conical central passage of the nozzle. The mixing tube consists of a lower conical or nozzle-shaped part, having air-inlet holes at its base, and an upper tubular portion which surrounds the lower part above the air holes, and is likewise provided with air-inlet holes. The mantle and burner are surrounded by two concentric lamp-glasses, for preheating the air supply to the outside of the mantle. A discharge chimney, serving to increase the draught, joins on to the inner glass, and above it is situated a series of conical-mouthed, adjustable tube lengths, fitting one over the other like the nozzles of an injector; and at the top of the chimney is arranged a deflector for the hot gases, having a downward projection in the form of an inverted cone with curved sides, whereby the gases are discharged laterally.—H. B.

Lamps; Incandescent Gas ——. C. G. Brett and F. Henneberger, London. Eng. Pat. 12,259, June 15, 1901.

There is claimed an incandescent gas lamp, comprising several Bunsen tubes of the double truncated cone form, circularly arranged on a hollow base, and opening at their tops into a single burner head. The latter consists of a perforated metal cone, surrounded by a taper casing, and provided with a central tube, up which air passes to the interior of the flame; over the annular space between the tops of the cone and the casing is fixed an annular burner outlet in the form of a toothed wheel. The burner carries a central support for the mantle, and has a vertically adjustable gallery, on which is supported a tall chimney, the lower part of which consists of glass and the upper part of metal.—H. B.

Mantles for Incandescent Gas Lighting; Manufacture of ——. J. Wilson, Birmingham. Eng. Pat. 12,137, June 14, 1901.

To a solution of nitrate, or other salt of thorium, is added a small quantity, not exceeding 2 per cent., of phosphate of cerium, which may, if preferred, be dissolved in hydrochloric or other suitable acid. Mantles are made from the solution as usual. The claim is for "the use of all chemical combinations containing both the elements cerium and phosphorus" in the manufacture of mantles.—H. B.

Incandescent Mantles: Means or Apparatus [Burner] for Use in Lighting by ——. S. Biheller, London. Eng. Pat. 4534, Feb. 22, 1902.

The glass chimney is provided with a cylindrical elongation for increasing the draught. At the base of the mixing tube, there are long air-inlet slots, surrounded by a sleeve which may be raised or lowered to regulate the air supply, and a hood, open below, surrounds the air slots, serving to give an upward direction to the current of air. The socket for the mantle-crutch is supported by a cross-bar in the burner head, presenting a single thin edge only to the current of gas and air. A hemispherical piece of wire gauze covers the mouth of the burner.—H. B.

Acetylene Lanterns or Lamps. G. Ducellier, Paris. Eng. Pat. 7415, April 10, 1901.

This is a vehicular acetylene lamp fitted with two water reservoirs, one on the top and the other at the back, which are contiguous at one spot, and are in constant communication. Water is charged into the upper tank through a depending tube, which has a hole above the water level, so that the liquid is free to rise or fall therein. From the second tank the water travels under a partition to the tube leading to the carbide holder, said tube being narrowed at its extremity and provided with a double-headed rod sliding loosely in it for cleaning purposes. The gas-leading tube starts from a point in the water pipe, and is bent into the shape of an inverted U, the top of which is inside the first water reservoir. This leads to a drying space, whence another similar U tube leads through a second drying space to the burner. In the chimney of the lantern are two horizontal air tubes so arranged that a current of warm air impinges on the outside of the first water tank, with the object of protecting the liquid from frost. The burner has a cock underneath for regulating the supply of gas.—F. H. L.

United States Patents.

Oil; Method of Burning ——. G. L. Badger, Mass. U.S. Pat. 698,354, April 22, 1902.

The hydrocarbon or oil is vaporised under pressure by heat: the supply of vapour is divided into fine jets, and each jet is mixed with air. To each jet of vapour and air there is added, by means of the expansive force of the oil vapour and in successive quantities, a further supply of air proportional to the amount of vapour supplied by each jet. The several jets of mixed vapour and air are combined, and the mixture is ignited.—R. S.

Burner; Liquid-Fuel ——. J. W. Neumann, Louisville, Ken. U.S. Pat. 698,408, April 22, 1902.

The liquid fuel is fed to a horizontal trough-shaped tray from the ends of a short horizontal tube placed centrally above it. The trough is continued upwards on one side to form an arched symmetrically-curved overhanging hood. In the front and in the rear of the tray there is a shield; and a damper, comprising a flat plate having an inner flange, rests on the front edge of the shield. The damper partially closes the opening between the shield and the hood. The oil in the tray is ignited. The flames and hot gases are deflected by the hood, and mix with a further supply of air, which is induced to enter between the baffle plate and the hood. The whole of the gases then ignite, and pass under the tray to the flue, heating the former on their way sufficiently to instantly vaporise the oil when the latter touches it.—R. S.

Burner for Furnaces; Oil ——. W. Booth, San Francisco, Cal. U.S. Pat. 698,361, April 22, 1902.

The burner consists of a rectangular casing having a crude-oil passage and an adjacent steam passage, separated from one another by a partition. At the outlet end of the casing is a flat, rectangular nosepiece, which projects into the furnace and forms a chamber, the floor of which is horizontal. In the forward end of this nosepiece is a slit in line with the floor, entirely across the front, and extending for a distance back along each side of the extremity of the nosepiece.—R. S.

Gas-Producer. Ludwig Mond, London. U.S. Pat. 697,867, April 15, 1902.

See Eng. Pat. 8449 of 1901; this Journal, 1902, 460. —H. B.

Burner; Incandescent Gas ——. F. E. Clawson, Newark, and O. C. Benjamin, Orange, N.J. U.S. Pat. 698,373, April 22, 1902.

There is claimed, in a Bunsen burner, a needle-valve arrangement for regulating the gas supply. Beneath a conical gas-inlet nozzle, which is situated at the foot of the mixing tube of the burner, is a vertical, pointed valve-needle, the valve seat being formed by the interior wall of the conical nozzle. The stem of the needle passes down through a central boring in a solid connecting piece situated between the burner and the gas pipe, and a recess is provided at the lower end of the boring for a horizontal adjusting nut. Depressions are formed on opposite sides of the connecting piece to give room for the finger and thumb in operating the milled adjusting nut, the nut having a central screw-threaded hole which fits the threaded lower end of the valve-needle. Passages are provided in the connecting piece to admit the gas from the gas pipe to the inlet nozzle. By the above arrangement the gas supply may be regulated without moving any of the upper parts of the burner.—H. B.

Gas; Method of Manufacturing ——. F. W. C. Schniewind, New York. U.S. Pat. 698,062, April 22, 1902.

See Eng. Pat. 17,494 of 1901; this Journal, 1902, 331. —H. B.

Gas; Plant for Manufacturing ——. F. W. C. Schniewind, New York. U.S. Pat. 698,063, April 22, 1902.

See Eng. Pat. 17,510 of 1901; this Journal, 1901, 1197. —H. B.

Lamps, Hydrocarbon; Apparatus for Distributing Hydrocarbon under Pressure to ——. J. G. Branch, St. Louis, Mo. U.S. Pat. 698,364, April 22, 1902.

Liquid hydrocarbon is distributed to street lamps by the following arrangement:—The base of one lamp forms a chamber having two compartments arranged one above the other. In one there is a tank for the oil; in the other a vessel for compressed air or carbon dioxide. Connection is made between the two, so that the oil may be forced in regulated quantities to any desired number of lamps.—R. S.

Acetylene Gas Generator. G. P. Washburn, Nebraska. U.S. Pat. 698,160, April 22, 1902.

In feeding mechanism for an automatic carbide-to-water generator of the hopper type, the conical base of the hopper is made in duplicate, the lower orifice being normally closed gas-tight by a counter-weighted plate which is periodically forced downwards from its seat by the charge of carbide falling upon it. Below the mouth of the upper orifice is supported a D-shaped scoop, having its convex edge upwards, and open at the top, which is divided transversely into two compartments. This has a horizontally; but when the falling gasholder arrives at a certain position, it is caused to tilt on a horizontal axis, first in one direction and then in the other; in doing so it collects a charge of carbide, and ejects it from either of its open ends alternately. Connected with the bearings of this scoop is a vertical lever, which occasionally thrusts the counterweighted plate away from its seat, thus preventing it from becoming jambed.—F. H. L.

Acetylene Gas; Apparatus for Generating ——. J. Nouzaret, Brussels. U.S. Pat. 698,044, April 22, 1902.

An automatic carbide-to-water generator of the side-shoot pattern, in which the carbide is carried in a number of buckets arranged radially round a horizontally-revolving wheel placed on the top of the decomposing vessel. When each bucket arrives over the mouth of the shoot, mechanism upsets it, and the carbide falls into the water.—F. H. L.

Acetylene Gas Generator. P. F. V. Möhrer and J. Hopp, Philadelphia. U.S. Pat. 698,306, April 22, 1902.

A non-automatic water-to-carbide generator of the contact pattern. The generator is divided almost to its base by a central vertical partition. Parallel with the partition, an upright hollow tube extends through the top of the decomposing chamber, and is capable of being rotated. At its base this pipe carries a rectangular box loaded with carbide. The box is made with a hinged water-tight lid, kept closed by a spring catch, said lid being connected with a chain which passes round the box and up through the hollow pipe to the outside, and by pulling which, the lid is opened and the carbide exposed to the action of the water. When in operation, the box hangs on the closed side of the partition. For recharging purposes the upright pipe is given a half turn, hauled upwards until the box is brought immediately below a manhole in the top of the generator, when by opening the latter and the lid of the box, fresh carbide can be inserted.—F. H. L.

Acetylene Gas Generator. O. J. Monssette, New York. U.S. Pat. 698,308, April 22, 1902.

A mechanically-fed carbide-to-water generator of the hopper type. The mouth of the hopper is closed by a convex-faced valve with a diamond-shaped opening. This is connected, through its horizontal bearings, with a lever working in a vertical plane, which is joined at its other extremity with a lever extending from the holder bell. As the bell falls, the system of levers moves in such a manner as gradually to open the valve, the carbide then falling into the water. (U.S. Pat. 659,086, Oct. 2, 1900, is mentioned.) —F. H. L.

Acetylene Gas Generator. A. Yancey, New Orleans. U.S. Pat. 698,425, April 22, 1902.

This is a mechanically-fed carbide-to-water apparatus on the hopper system, the latter terminating in two cones. The lower is closed by a mushroom-headed valve, which is given an upward thrust (which opens the orifice) by means of a lever originally controlled by the movements of the holder bell. When it rises, the apex of the moving valve enters the hollow underneath-side of a similar mushroom valve, which is supported in the hopper by a chain, the agitation given in this manner to the latter serving to loosen any carbide which may have stuck together in the hopper. The whole apparatus is contained in one tank, the generator and holder being separated by a vertical partition, extending nearly to the base of the vessel.—F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum in North-West Germany; Production of ——. H. Sachse. Glückauf, 1902, **38**, 302; through Chem.-Zeit., 1902, **26**, Rep. 119.

The daily production of petroleum in North-West Germany now amounts to 80,000 kilos. The oil zone extends without break for a distance of about 150 kilometres in the great Hanoverian valley, which is bounded by the Wesergebirge and the Teutoburger Forest, beginning in the east near Brunswick, and reaching to Verden a/Aller, parallel with the course of the enclosing hills. The places where oil has been found nearly all lie on a line drawn from north-west to south-east; Verden is the termination at the north-east. Parallel with the main line there are also oil regions to the south (Oberg, Oelsburg, Sehnde), and in the north, at Hölle in Holstein. The oil country lies in a great depression in the Devonian, Carboniferous, and Silurian strata, in which the more recent formations were deposited and protected. The oil is found here in secondary and tertiary deposits.

Greater development is to be expected when more numerous wells have been sunk to greater depths. At 150—170 metres a thick black oil is found; at 250 metres a much lighter oil. The production of Wietze alone amounts to 450—500 barrels per diem. The oil is generally obtained by pumping. There are two chief qualities of the crude oil: the heavier has a specific gravity of 0·95, and gives 0·5 per cent. of benzine, 12 per cent. of kerosene, 20 per cent. of spindle oil (sp. gr., 0·89), 14 per cent. of machinery oil (sp. gr., 0·917—0·936), and 10 per cent. of tar. The lighter gives 6 per cent. of benzine, 31 per cent. of kerosene, and 60 per cent. of residuum.—A. C. W.

Crude Petroleum from Fergana, Turkestan. K. W. Charitschkow. Chem.-Zeit., **26**, [33], 357.

This oil contains paraffin (2·6 per cent.), and furnishes on distillation 23·8 per cent. of burning oil and very little benzine. It contains 0·57 per cent. of sulphur.—C. S.

English Patents.

Mineral Oils, or the Distillates or Residues thereof; Treatment of ——. H. H. Lake, London. From J. S. Stewart-Wallace, Flushing, Holland. Eng. Pat. 10,629, May 22, 1901.

This patent has reference to the treatment of oils of the class mentioned in Eng. Pat. 9796 (this Journal, 1901, 464). The oil is first mixed with water, and agitated by means of steam, or steam and air, at about 180° F. It is then treated with a solution of caustic soda previously brought to the same temperature, after which hot solutions of potassium permanganate and aluminium sulphate (preferably mixed) are introduced, and the liquid agitated with steam, or steam and air. Finally, after subsidence of the solid material, the oil is transferred to the still.

If desired, the distillates obtained may be further purified by treatment with a solution of aluminium sulphate and sodium chloride, or by agitation with a small proportion of nitric or nitrous acid and iron sulphate or other iron compounds, and redistillation; or this process may be applied to the original oil prior to the treatment with permanganate and aluminium sulphate.—C. A. M.

Distilling Apparatus [Petroleum, Tar, Coal Products, &c.]; Continuously Acting ——. C. Still, Recklinghausen, Germany. Eng. Pat. 25,676, Dec. 16, 1901.

The apparatus is stated to be especially applicable for the recuperation of the heavy tar oil used as wash-oil in benzene works, and comprises a preheater, a distilling column, and a condensing column, with suitable connections between them. The liquid to be treated is fed continuously to the preheater, from which it passes to the distilling column, where it is subjected to the action of jets of steam, the vapours carried off by the steam passing, with any vapours generated in the preheater, through the condensing column. The condensing column consists of a series of chambers, in which any of the heavy wash-oil carried off by the steam, condenses, the liquid so condensed flowing back into the preheater, while the steam and the benzene or other vapours to be recovered are carried off through a discharge pipe. —R. A.

Tar, Pitch, Petroleum, and other Hydrocarbon Mixtures, and the Extraction of Carbon suitable for the Manufacture of Electrodes, Calcium Carbide, and other Industrial Products; Distillation or Utilisation of ——. L. Gaster, London. Eng. Pat. 6739, March 30, 1901.

Pitch, or the residue from the distillation of tar, petroleum, or other viscous hydrocarbon mixture containing free carbon in suspension, or the residue from the chemical purification of petroleum by acid, is extracted by the aid of naphtha or other volatile solvent, forced in under pressure (the material being heated to maintain it in a liquid condition if necessary); the free carbon is then separated out by means of a filter press, the tarry matter left in the press cakes is dissolved out by a suitable solvent, the solvent

itself eliminated by water or heat, and recovered, whilst the residue is fractionated by distillation or condensation, or is converted into asphalt, as the case may be. The carbon is left as a fine powder, which may be used for the manufacture of electrodes without previous calcination, or may be mixed with lime or other suitable material for the manufacture of carbides.

The apparatus for separating free carbon from a mixture of pitch, volatile solvents, and free carbon, includes the combination of a retort with an automatically-adjustable revolving scraper, a feed-pipe supplying the mixture to the retort through a distributing nozzle, a regulating tap in the feed-pipe, a flushing pipe supplying steam or oil under pressure to the feed-pipe or distributing nozzle, and a centrifugal governor geared to the scraper shaft to control the regulating tap. The nozzle is provided with a cooling jacket, and the upper part of the retort is fitted with a strainer for intercepting solid particles carried off by the vapours on their way to the outlet.—C. S.

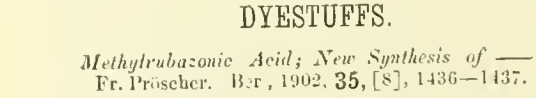
Volatile Inflammable Liquids; Vessels for Holding ——. V. Posno, Antwerp, Belgium. Eng. Pat. 14,391, July 15, 1901.

The lid of the vessel is provided with a sleeve or socket to receive a hollow perforated stopper, the interior of which is in communication with the outer air through a horizontal tube fitted into the sleeve. A passage in the inner end of the stopper is closed by a plug of metal, fusible at a low temperature. If the vessel become heated, the plug melts, and the vapours issuing from outlet perforations in the stopper draw with them a current of air through the horizontal tube, the volume of air so drawn into contact with the vapours not being sufficient to make the mixture explosive, even in case of ignition at the outlets. In a modification, the stopper of the vessel is fitted with a T-shaped tube, the branch which passes through the stopper being provided with a stop-cock having two small fusible plugs. The horizontal branches of the tube serve respectively for the issue of the vapours and for the circulation of air. In another arrangement, in which there is no stopper, a tube for the circulation of air connects the funnel of the filling aperture with the pouring spout. Reference is made to Eng. Pat. 19,113 of 1900.—R. A.

IV.—COLOURING MATTERS AND DYESTUFFS.

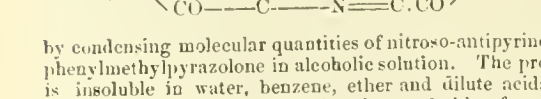
Methylrubazonic Acid; New Synthesis of ——. Fr. Prüscher. Ber., 1902, **35**, [8], 1436—1437.

When pyramidone is taken internally, a red dyestuff is found to be present in the urine (Jaffé, Ber., **34**, 2737). Further examination showed that this was identical with Knorr's rubazonic acid. The author describes a method of synthetically preparing methylrubazonic acid having the formula—



by condensing molecular quantities of nitroso-antipyrine and phenylmethylpyrazolone in alcoholic solution. The product is insoluble in water, benzene, ether and dilute acids, but readily soluble in alcohol, acetic ether and chloroform. It dissolves with a fine dark-reddish purple colour in dilute ammonia and alkalis, and has not been obtained in a crystalline form. When boiled with dilute sulphuric acid it yields aminophenyldimethylpyrazolone (amino-antipyrine) and phenylmethylketopyrazolone.

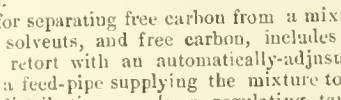
It is noteworthy that nitroso-antipyrine readily condenses to indamines and gives, for instance, with pyrrol, a dyestuff having the formula—



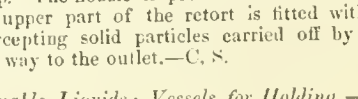
and with tolylene diamine a dyestuff having a dull-red shade. —T. A. L.

Ketopyrazolones. F. Sachs and H. Barschall. Ber., 1902, **35**, [8], 1437—1439.

The authors condense phenylmethylpyrazolone in alcoholic solution with nitrosodialphylanilines, and treat the condensation products with mineral acids, obtaining directly, and with good yield, the *o*-diketone, 1-phenyl-3-methyl-4-ketopyrazolone-5, having the formula—



When nitrosodiethylaniline and phenylmethylpyrazolone are condensed in alcoholic solution in presence of sodium carbonate, the new product forms large blackish-green crystals with an emerald-green reflex. It melts at 117° C., and has the formula—



The compound dissolves in alcohol to a deep cherry-red colour, and dyes wool and silk violet-pink. The corresponding dimethyl derivative crystallises from alcohol in small blackish-green crystals with a greenish reflex, melts at 187° C., and is less soluble than the diethyl compound. Both compounds, when dissolved in ether and shaken with dilute sulphuric acid, decompose, yielding phenylmethylketopyrazolone, which sublimes or separates from petroleum spirit in shining bronzy crystals melting at 119° C. The diketone forms with water a hydrate melting at 71° C., and also yields an oxime melting at 157° C., and a phenylhydrazone melting at 155° C. On shaking with sulphuric acid and benzene containing thiophene, a deep green coloration is produced, whilst with *o*-phenylene diamine in acetic acid solution an azine is formed, melting at 235° C., having a vermilion-red colour, and dissolving in sulphuric acid with a deep cornflower-blue colour.—T. A. L.

Methyl Determinations according to Herzig and Meyer. M. Busch.

See under XXIII., *page* 725.

English Patents.

Indigo Group [*Indigo Dyestuffs*]; *Manufacture and Production of Acylated Derivatives belonging to the* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 9774, May 10, 1901.

See Fr. Pat. 311,562; this Journal, 1902, 38.—T. A. L.

Dialkylamido-oxydiphenylamines [*Sulphide Dyestuffs*], *and Dyestuffs therefrom; Manufacture of* ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 7726, April 15, 1901.

See Fr. Pat. 303,524; this Journal, 1902, 41. The specification is supplementary to Eng. Pat. 16,247 of 1900; this Journal, 1901, 889.—T. A. L.

Colouring Matter [*Sulphide Dyestuffs*] *for the Direct Dyeing of Black or Blackish Shades; Improvements in the Manufacture and Production of* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 11,624, June 6, 1901.

See Fr. Pat. 311,438; this Journal, 1902, 43.—T. A. L.

Azo Dyestuffs, and of an Intermediate Product for Use therein; Manufacture of New ——. C. D. Abel, London. From The Actien Gesellschaft für Anilin Fabrikation, Berlin. Eng. Pat. 11,753, June 8, 1901.

See Fr. Pats. 311,700 and supplement, also 311,889; this Journal, 1902, 45 and 46.—T. A. L.

Colouring Matter [*Azo Dyestuffs*]; *Manufacture of a Mordant-dyeing* ——. C. D. Abel, London. From The Actien Gesellschaft für Anilin Fabrikation, Berlin Germany. Eng. Pat. 12,591, June 20, 1901.

See Fr. Pat. 311,963; this Journal, 1902, 45.—T. A. L.

Azo Dyestuffs; Manufacture and Production of New ——. H. E. Newton, London. From The Farbenfabriken vorm. Fr. Bayer and Co., Elberfeld, Germany. Eng. Pat. 11,839; June 10, 1901.

See Fr. Pat. 311,542; this Journal, 1902, 11.—T. A. L.

Rhodamine Derivatives [*Pyrone Dyestuffs*]; *Manufacture of* ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a Main, Germany. Eng. Pat. 12,202, June 11, 1901.

See Fr. Pat. 311,815; this Journal, 1902, 44. On hydrolysis with dilute mineral acid, the acidyl derivatives described, yield asymmetric dialkyl rhodamines.—T. A. L.

Dyestuffs [*Acridine Dyestuffs*] *of the Acridine Series; Manufacture of Yellow to Orange-Yellow* ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a Main, Germany. Eng. Pat. 25,009, Dec. 7, 1901.

When tetra-aminoditolylmethane (Eng. Pat. 17,971 of 1889; this Journal, 1890, 935) is heated in presence of a mineral acid with chloracetic acid or one of its alkyl salts, it is converted into a mixture of orange and orange-yellow basic dyestuffs. Similar dyestuffs are obtained from Acridine Yellow or its leuco compound. The new products are orange-yellow to brownish-red powders, readily soluble in hot water and dye mordanted cotton yellow or orange-yellow shades.—T. A. L.

French Patents.

Azo Dyestuffs; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 315,932, Nov. 14, 1901.

The patentees find that the nitro, halogen, or sulpho group, ortho or para to a diazonium group in an aromatic radicle, is readily replaced by hydroxyl by the action of alkaline reagents. They have thus obtained derivatives of *o*- and *p*-diazophenol hitherto unknown, or only prepared with difficulty. The following derivatives are suitable for this invention:— 2-nitraniline-4-sulphonic acid, 2.5-dichloraniline-4- and -3-sulphonic acid, 2.3.6-trichloraniline-5-sulphonic acid, 3-chloro-6-nitraniline-4-sulphonic acid, 2.4-dinitraniline, 4-chloro-3-nitraniline, and finally 4-chloro-3-nitraniline-6-sulphonic acid. In cases in which the diazo compound is readily converted by the action of alkalis into a nitrosamine, it is necessary to employ alkali acetates or oxalates, barium or magnesium carbonate, or alkali bicarbonates, the latter in not too large an excess. In other cases alkali carbonates or caustic alkalis may be used. The same reaction takes place by adding organic acids to the alkali salts of nitrosamines, or by diazotising the amino compounds with alkali nitrite and organic acids, avoiding the presence of mineral acids. All the diazophenol derivatives combine with the usual dyestuff components giving wool dyestuffs, the shades of which are modified by a subsequent treatment with chromium or copper salts, the fastness to light, washing and fulling being thereby also considerably increased.—T. A. L.

Sulphide Dyestuffs; Production of ——. Actien-Gesellschaft für Anilin Fabrikation. Fr. Pat. 315,669, Nov. 11, 1901. Supplement.

Alkyl-benzyl-*m*-toluidine sulphonic acid is condensed with tetra-alkyldiaminodiphenylmethane in presence of sulphuric acid, and the leuco product is oxidised with lead peroxide or with potassium bichromate. The product dyes wool from an acid bath bright level blue shades fast to washing.—T. A. L.

Anthraquinone [*Anthracene Dyestuffs*]; *Manufacture of New Derivatives of —— containing Nitrogen.* Fr. Bayer and Co. Fr. Pat. 316,416, Nov. 7, 1901. Supplement.

Alkylated α-monamino-, diamino-, or polyamino anthraquinones containing negative groups (nitro or halogen), are condensed with primary aromatic amines, yielding alphyl-amino-alkylamino-anthraquinones. The sulphonic acids of these products are valuable fast wool dyestuffs. The shades are red, blue, or green, according to the relative positions of the alphyl- and alkyl-amino groups. Moreover, when tertiary dialkyl derivatives containing negative groups are condensed with aromatic amines, one alkyl group in the amino group is removed, forming secondary derivatives. As an example of the method employed, 10 kilos. of 1.5 nitrodimethylamino-anthraquinone and 100 kilos. of *p*-toluidine are heated for two hours to 180° C. The melt is cooled to 80° C., and mixed with alcohol, when 1.5-methylamino-*p*-tolumo-anthraquinone separates on further cooling. The condensation product is extracted with concentrated hydrochloric acid, and, after filtering, is precipitated with water. On crystallisation from pyridine or methyl alcohol, it forms needles melting at 199° C. Its sulphonic acid dyes unmordanted wool red shades.

—T. A. L.

Acridinium [*Acridine Dyestuffs*]; *Manufacture of New Combinations of* ——. Cie. Par. de Couleurs d'Aniline. Fr. Pat. 316,467, Dec. 2, 1901.

By heating Acridine bases with benzyl chloride in nitrobenzene, the benzyl group becomes attached to the nitrogen atom of the central ring, yielding yellowish-orange to reddish-brown dyestuffs fast to sodium carbonate and ammonia.—T. A. L.

United States Patents.

Indigo from Indole; Process of Making ——. P. Seidel, Ludwigshafen. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 698,328, April 22, 1902.

Indole is treated with persulphuric acid in presence of sulphuric acid. See also Eng. Pat. 9613 of 1901; this Journal, 1902, 471.—T. A. L.

Greenish-Black Sulphur Dye [*Sulphide Dyestuffs*], *and Method of Making same.* A. Pfenniger, Brugg. Assignor to The Chemische Fabrik Brugg A. G. vorm. Dr. Zimmermann and Co., Brugg, Switzerland. U.S. Pat. 698,220, April 22, 1902.

Sodium *p*-toluene sulphonate is heated with sulphur and sodium sulphide. The product dyes unmordanted cotton greenish-black shades fast to light, from a bath containing sodium sulphide, carbonate and chloride. See Fr. Pat. 313,586; this Journal, 1902, 169.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Cotton Tissues; Influence of the Hygrometric State of ——, *upon their Tenacity.* A. Scheurer. Bull. Soc. Ind. Mulhouse, [Jan.—Feb.], 1902, **72**, 34—35.

In determining the breaking strains of cotton tissues, attention is drawn to the importance of leaving the samples for some time in an ordinary, dry atmosphere before making the tests. How these are affected by the presence of varying amounts of moisture in the tissues is shown by the following results:—

	Relative Tenacity.		
	Experiment 1.	Experiment 2.	Experiment 3.
Tissue containing normal amount of moisture (standard).	100	100	100
Same tissue rendered perceptibly damp with water.	105	106	104
Same tissue dried, and still in the warm state.	88	85	86
Same tissue completely moistened with water.	..	..	103

—E. B.

Cotton Tissues; Influence of various Operations upon the Tenacity of ——. A. Scheurer. Bull. Soc. Ind. Mulhouse, [Jan.—Feb.], 1902, **72**, 33—31.

Each of the numbers given below represents the average result obtained in 20 experiments, the breaking strain of the warp threads of the tissue employed (75 × 26, Alsatian counts), being determined :—

	Relative Tenacity.
1. Bleached tissue (standard)	100
2. Hung for a month in an ageing room	98
3. " " in a drying chamber	96
4. " " in a drying chamber for woollen tissues	93
5. Exposed for a month to air and rain	98
6. Passed 20 times through a bleach-house washing machine	96
7. Soaped for six hours at 212° C. (2 grms. of soap per litre)	101
8. Soaped for 12 hours at 212° C. (2 grms. of soap per litre)	99
9. Passed 10 times round a calendering roller (= 20 crushes)	80
10. Treated as 9, followed by a washing	78
11. Damped and dried on a drying cylinder 20 times in succession	97
12. Boiled for 30 minutes in a solution of sodium carbonate (10 grms. per litre)	100
13. Treated with a 5 per cent. solution of hypochlorite of lime at "7°B.," dried on a drying cylinder, and then treated as 12	100
14. Treated as 13 twice	98

Two experiments were made with a sateen tissue, which was passed 20 times through a continuous-washing machine without tension. On testing it, its tenacity was found to have diminished in one experiment to 88 (warp threads) and 82 (weft threads), and in the other experiment to 86 and 96 respectively, the original tenacity of the tissue being 100.—E. B.

Cotton; Action of certain Inorganic Sulphur Compounds on ——. T. R. Appleyard and T. B. Deakin. J. Soc. Dyers and Col., 1902, **18**, [5], 128.

Since the introduction of the so-called Sulphur Blacks, which generally contain an admixture of sodium thiosulphate, sodium sulphide, sodium sulphite, sodium sulphate, &c., much damage has been noticed to cotton goods dyed with these blacks, and the authors wanted to ascertain whether such inorganic sulphur compounds or the pure dyestuffs themselves are the cause of the detrimental result.

A special yarn was spun, which gave reliable tests throughout the whole of the hank.

Sodium sulphide was found to have no immediate tendering action on the cotton fibre, but sodium sulphide weakens the yarn—commercial sulphide to a greater extent than the pure salt; and by increasing the temperature on drying, the tendering is also increased.

Testing the result of different exposures, it was stated that the tendering of the yarn is increased with the amount of moisture in the atmosphere. In a perfectly dry atmosphere no tendering whatever takes place, and in one with a gas jet burning, which would obviously become gradually drier and drier, only a slight tendering is noticed. Copper sulphide tenders the yarn on exposure, to a less degree than sodium sulphides, and with ferrous sulphide in the fibre practically no tendering takes place under any condition, except in a damp atmosphere, whilst at the same time the iron is partially oxidised to the higher state.

When yarn containing sulphur is exposed in a damp atmosphere, its strength is reduced to about one-half of its original. It has been suggested that this is due to the oxidation of the sulphur into sulphurous and sulphuric acids (this Journal, 1902, 405). The authors conclusively proved that this oxidation does take place, from the fact that in all cases sulphuric acid was found in the aqueous solution obtained by extracting the exposed yarn with water. With the exception of the yarn exposed in a damp atmosphere, the amount of this acid is so extremely small that it is only detected by careful manipulation, and even with every precaution it was impossible to detect it by any method in the yarn exposed in a dry atmosphere. It has been generally accepted that this tendering is entirely due to the chemical energy of oxidation, but at the same time the amount of heat given out by the formation of H_2SO_4 may also be regarded as playing some part in the tendering action.—F. N.

Indigo; Some Modern Methods of Producing Discharge and Resist Effects on and under ——. W. G. White. J. Soc. Dyers and Col., 1902, **18**, [5], 131.

The application of the chromate white discharge, when printed on naphthol-prepared indigo, invariably gives an impure white, owing to the formation of brownish oxidation products of the naphthol. Kurz and Kunert's process, which, it is claimed, overcomes this drawback (this Journal, 1897, 438), is not economical, since the greater part of the chromate is lost, and there is danger of lead salts being left in the whites. In 1894, Bentz patented a modification of the process (this Journal, 1898, 760), which, according to the author, gives good results in practice. Even dark indigo shades can be discharged in this way.

An old modification of the alkali prussiate discharge consists in printing a paste containing red prussiate and carbonate of magnesia pulp. The goods are steamed half an hour. The method is confined in practice to the production of three or four shades only, and it is very difficult to get a white.

Of all processes for discharging indigo, that by which pigments and lake colours are printed with albumin and bichromates, steamed, and discharged in the cutting bath, is still the best.

One of the oldest processes, which existed long before the calico-printing machine was invented, is the so-called resist style on vat-dyed indigo, which is still in use in a few English works at the present time. The prints produced by this method are free from tendering, and give very good whites, but only large and coarse designs can be obtained satisfactorily. This old process has been revived by a patent by Messrs. H. A. Costobadie and The Calico Printers' Association (this Journal, 1902, 250).

The author worked out a modification of the vat process, whereby some of the diazo colours can be applied for the production of fast coloured designs on indigo-dyed cloth, which, whilst producing a fairly good imitation of block work by roller-printing alone, is much cheaper in production. The diazo colour, suitably thickened, is printed by means of an engraved copper roller on naphthol-prepared cloth, and this is followed by a second roller on which a facsimile of the first design is also engraved, and which prints paste on containing substances which act as resists to the indigo during the subsequent operation of vat-dyeing or "skying." The cloth, after drying with suitable precautions, is taken and treated in the vats in the usual way.—F. N.

Indigo Waste Waters. H. Maclean Wilson and E. D. Halliwell. J. Soc. Dyers and Col., 1902, **18**, [5], 119.

Binz and Rung (this Journal, 1898, 1143) determined the amount of indigo absorbed by the goods (in their case cotton), and collected the whole of the waste waters, from which they obtained the amount of indigo removed by the washing and scouring. The authors have determined the amount of indigo extracted from the vat in the dyeing of one or more pieces, and the amount present in the various waters used in the washing, scouring, and subsequent processes, together with the amount of water used.

These waste waters can be so treated as to recover the indigo in a useful form, and at a cost less than the value of the indigo recovered. Two methods are worked on a large scale.

In the one case, all the waste waters, washing-off waters waters after earthing, waters after soaping, &c., are discharged into a settling tank, the overflow running to a filter Average samples, during a day of 19½ hours, of crude and treated liquid were taken, and gave the following results :—

	Grains of Indigo per Gallon.
Untreated liquid	3·08
Treated liquid	0·32
Six hours' average treated liquid on different days	0·21

The amount of indigo discharged was found to be 91 lb. for 00 lb. of cloth dyed, and of this 90 per cent. was retained y the treatment in the tanks and filters. Fuller's earth nd other chemicals present acted as precipitants, and used the indigo to settle quickly, but reduced the per-ntage of indigo present to a very marked extent. A mple of the sludge of the tank was analysed, and found contain 1·37 per cent. of indigo, calculated on the dry dge. The sludge itself taken from the tank, contained per cent. of water.

A very large percentage of Indigo can be obtained in the dge by treating the wash-off waters separately, the best sults being obtained by using as a precipitating agent a turated solution of aluminium chloride, to which sodium rbonate had been added until a precipitate of aluminium ydrate was formed.

In the other method the whole of the washing waters from e indigo dyeing of cotton goods are discharged into settling nks. The top water is run off by a floating arm, and the dge pumped into tubs, and, after further treatment to move zinc and other impurities, the Indigo is used for aking up fresh vats. The moisture-free sludge contained om 8 to 10 per cent. of Indigo, which by treatment was creased to 25 per cent.

The following method of analysis was used throughout e experiments. Quantities varying from 100 c.c. to 000 c.c. were taken, air drawn through to make certain at all the Indigo was oxidised, hydrochloric acid added, d the liquid boiled. This quickly precipitated the Indigo, hich was very easy to filter off after washing. The ndigo in the residue was then extracted in a Soxhlet by acial acetic acid, and precipitated from it by cooling and luting, which left the dyestuff in a beautiful crystalline rm. This was further treated with alcohol and ether, and eighed on a tared filter paper.—F. N.

esists under Steam Colours upon Woollen Tissues. R. Koechlin. Bull. Soc. Ind. Mulhouse, [Nov.—Dec.], 1901, **71**, 566—568.

'OOLLEN tissues, prepared for printing by treatment with lorine, are printed with a resist mixture composed of litres of gum ghedda, 4 litres of water, 2 kilos. of china ay, and 2 kilos. of zinc dust, and are then padded, by eans of an engraved roller, with solutions of appropriate estuffs, slightly thickened with gum, and acidified with a nall quantity of tartaric or acetic acid. The following estuffs have given satisfactory results:—Ponceau N 2 R Poirrier), Grenat for printing (Poirrier), Acid Violets 7 B nd 4 B N (B.A.S.F.), Orange G (B.A.S.F.) and Light Green solution (B.A.S.F.). By adding to the resist printing-ixture dyestuffs which are not reduced by zinc dust, or hich, after being reduced to leuco compounds, are readily xidised by the air, two-colour effects are obtained. A *blue* *sist* is thus obtained with Indigo Carmine, *yellow* with ersian berries or Thioflavine T, *buff* and *orange* with hosphine, and *pink* with Azocarmine or Safranine.—E. B.

esists under Steam Colours upon Woollen Tissues: Observations upon the preceding article. J. Dépierre. Bull. Soc. Ind. Mulhouse, [Nov.—Dec.], 1901, **71**, 568–569.

has long been known that zinc dust could be employed resisting, as well as in discharging colours upon wool. he firm of Heilmann Bros., of Mulhouse, so used it in the ear 1866 in the production of a style of print destined for apan, in which the principal objects of the pattern appeared ith white borders round them. This effect was obtained y printing a mixture containing zinc dust and cover-rinting with various colours which were resisted by the ne. Resists were also printed by roller and padded with olet or scarlet. The author, also, in the same year, printed discharge mixture of 1,000 grms. of gum solution, 50 grms. glycerin, 750 grms. of zinc dust, and 200 grms. of ammo-um tartrate upon grounds dyed with Magenta, the tissue us printed being damped, steamed for ¾ hour, and ashed. Previous to this time, however, Durand, who troduced zinc dust as a reducing agent for Indigo, had ointed out the possibility of its finding application in the scharge styles of printing.—E. B.

English Patents.

Dyeing Blue Shades [Sulphur Dyestuffs]. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 12,327, June 17, 1901.

On moderately reducing with sodium sulphide, sodium sulph-hydrate, or a mixture of caustic soda and glucose, the blue dyestuffs prepared by fusing indophenol thiosulphonic acids with sulphur and alkali sulphides, deep blue solutions are obtained, which, after the addition of common salt or sodium carbonate, dye vegetable fibres. The dyeings produced are said to be very fast.

On more energetic reduction, the dyestuffs are converted into their leuco compounds, in the solutions of which both animal and vegetable fibres can be dyed. The dyestuffs can be thus used in conjunction with Indigo.

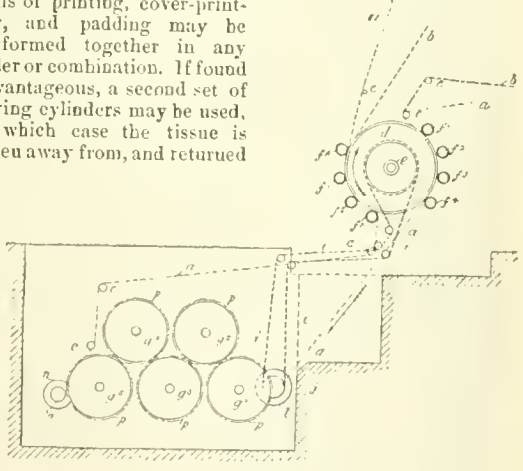
Example I.—100 parts of cotton materials, after being moistened, are dyed for 1 hour at a temperature of 20°—25° C. in a bath containing 5 parts of the dyestuff prepared from dimethylamino-indophenol thiosulphonic acid, 10 parts of crystallised sodium sulphide, and 50 parts of common salt. They are then rinsed and dried.

Example II.—2 parts of the above dyestuff (Example I.) are dissolved by the aid of 3·5 parts of caustic soda-lye (containing about 18·5 per cent. of NaOH), 1·5 parts of sodium carbonate, and 60 parts of "Turkey-red oil F." The solution obtained is poured into one of 16 parts of a 10 per cent. solution of sodium hydrosulphite in 1,000 parts of water. The textile materials are dyed in the usual manner, at a temperature of about 40° C., in the vat thus formed, and are afterwards rinsed and, if necessary, treated with acid. The dyeings thus obtained when an animal fibre like wool is employed, are distinguished by their great fastness to milling.—E. B.

Calico-printing Machines. The Calico Printers' Association, Ltd., Manchester, and W. W. Wilson, Backton Vale. Eng. Pat. 13,755, July 6, 1901.

An ordinary printing bowl *d* (see figure) is employed, with any required number of engraved printing rollers, f^1—f^4. The tissue, *a*, is printed with, *e.g.*, two, and cover-printed with a third of these, and is then led from the bowl, and dried by passing round the drying cylinders g^1—g^5. From these it is guided back to the printing bowl, and is passed under, *e.g.*, two padding rollers in the set f^5—f^8. It is then dried as usual.

Any desired number of printing rollers may be employed, and the tissue may be printed and cover-printed, printed and padded, cover-printed and padded, or all three operations of printing, cover-printing, and padding may be performed together in any order or combination. If found advantageous, a second set of drying cylinders may be used, in which case the tissue is taken away from, and returned to, the printing bowl twice, instead of once, as in the example given. Again, the drying cylinders may be placed in a closed chamber, and the tissue may be heated



Machine for Printing, Covering, and Padding.

with formaldehyde vapour, or otherwise treated, before being returned to the printing bowl. Further, an ageing or drying chamber may be used instead of the drying cylinders. —E. B.

Finishing Fabrics Woven with Coloured Cotton or Linen Yarns [*Mercerising*]. T. Pickles, Burnley. Eng. Pat. 12,476, June 19, 1901.

To avoid the difficulties met with in mercerising weft yarns and in weaving mercerised yarns, tissues are woven with unmercerised yarns, which may be wholly dyed, or partly dyed and partly undyed. After being moistened with water, they are mercerised under tension, neutralised, cleared, and subjected to any further finishing processes desired.—E. B.

Hydrosulphite; Manufacture of a ——. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoechst-am-Main, Germany. Eng. Pat. 12,510, June 19, 1901.

A SPARINGLY soluble zinc hydrosulphite is obtained by stirring 45 parts of zinc-dust in 385 parts of a bisulphite solution of 40° B., and introducing at the bottom of the vessel, 257 parts (all by weight) of sulphuric acid of sp. gr. 12·4° B., the temperature being so regulated as to prevent evolution of SO_2. The zinc hydrosulphite formed, is separated, and washed with alcohol, acetone, or the like. It may be used for dyeing purposes direct, or may be transformed into sodium hydrosulphite. If a calcium sulphite be employed in the described example of the process, hydrochloric acid of 10 per cent. should be used instead of sulphuric acid.—E. S.

Fibres and Tissues; Fulling and Oiling ——. C. Sella, Biella, Italy. Eng. Pat. 7491, April 11, 1901. (Date claimed under Internat. Conv., Oct. 2, 1900.)

A CASTOR-OIL soda soap, prepared, for instance, from 200 parts of castor oil and 100 parts of caustic soda-lye at 25° B., is dissolved in olein (400 parts), and the product is diluted with about 4,200 parts of water; but the water used may vary according as it is to be employed in fulling or oiling, from 100 to 3,000 parts for 100 parts of oil. Glycerin may also be added.—E. B.

FRENCH PATENTS.

Tissues; Novel Effects in Mixed ——, *by Local Carbonisation of Vegetable Fibres* [*Tissue Printing*]; *Production of* ——. E. Roussel. Fr. Pat. 316,110, Nov. 20, 1901.

TISSUES composed of animal and vegetable fibres, *e.g.*, of wool and cotton, are printed with a thickened solution of sulphuric acid at 8° B., and heated to destroy the cotton. They are then dyed, a uniform colour being obtained on the wool, which is left in the printed parts, and two colours or shades of colour being produced upon the wool and the cotton in the unprinted parts. The order of the operations may be reversed, the tissue being dyed before being printed. Other suitable compounds may be employed instead of sulphuric acid in the process.—E. B.

Fixing Pigments with Oily Compounds, India-rubber, &c. [*Calico Printing*]. Soc. dite Englische Wollenwaaren-Manufaktur. Fr. Pat. 316,229, Nov. 25, 1901.

PIGMENTS, metallic powders, &c., are printed by means of engraved rollers, after being mixed with a 5—20 per cent. solution of a metallic salt of sebacic acid or of a resin acid, in light petroleum, chloroform, carbon bisulphide, acetone, or other suitable solvent; or with a 5—25 per cent. solution of an organic acid derivative of albumin, such as acetyl-albumin; or a 2—20 per cent. solution of india-rubber or gutta-percha in linseed oil. These may be mixed together or with other vehicles in use in printing. Clear impressions, which are fast to rubbing, washing, soap, alkalis, and acids, are said to be obtained.—E. B.

Dyeing Tissues composed of Animal and Vegetable Fibres with Sulphur Dyestuffs. Manufacture Lyonnaise de Matières Colorantes. Fr. Pat. 316,243, Nov. 25, 1901.

THE addition of glucose (5—10 grms. per litre) to a dye-bath containing sodium sulphide renders this innocuous to animal fibres, and at the same time increases the affinity of the dyestuff for the latter, so that dyeings of equal intensity are obtainable on both the animal and vegetable fibres in mixed tissue. For example, a tissue composed of equal parts of wool and cotton is dyed for about an hour at 80° C. in a bath containing, per litre, 5 grms. of Immedial Black V extra, 5 grms. of sodium sulphide, 5 grms. of sodium carbonate, 7 grms. of glucose, and 30 grms. of common salt. The black-dyed tissue is then rinsed, soured, passed through a dilute solution of sodium acetate, and dried.

In place of glucose, tannic acid and dextrin may be employed, but the results are hardly so satisfactory.—E. B.

Printing Indigo [*Production on the Fibre*]. Soc. Chimique des Usines du Rhône. Fr. Pat. 316,12 Nov. 22, 1901.

THE sodium bisulphite compound of *o*-nitrophenylmethyl lactoketone (Kalle's Indigo salt) (this Journal, 1893, 90 and 988; 1894, 145; 1900, 243 and 440) is not very stable and in tissue printing gives a yield of indigo which is considerably below that theoretically obtainable. A greater yield is obtained when a solution of the ketone in dilute acetic acid is printed upon tissues, which are then dried and treated in the usual manner with caustic soda-lye (15 per cent.). A printing mixture suitable for this purpose is composed of 10 grms. of the ketone, 110 c.c. of acetic acid (40 per cent.), 40 c.c. of water, and 150 grms. of thickening. —E. B.

Tissues (*Velvets, &c.*); *Decoration of* [*Printing*] —— G. Jacquemin. Fr. Pat. 315,686, Nov. 6, 1901.

TISSUES, more especially velvets and plushes, are dyed, and then printed with solutions of various hypochlorites, *e.g.* those of potash, soda, lime, ammonia, iron, and nickel, with the object of producing decorative effects by modifying the shade of or destroying the colour in the printed parts. The solutions in question are applied through stencils or better, by means of wooden or enamelled iron rollers bearing in relief the designs to be reproduced. After being printed, the tissues are dried and brushed.—E. B.

Resists upon Silk, Half-Silk, and Cotton; Application of Hydrosulphites as ——. The Badische Anilin und Soda Fabrik. Fr. Pat. 315,997, Nov. 16, 1901.

THE resisting agent preferably employed, is the double zinc sodium hydrosulphite (Eng. Pats. 19,762 of 1899 and 90 of 1900; this Journal, 1900, 909, and 1901, 43).

Fabrics composed entirely of silk, of cotton and silk, or of cotton alone, are printed with it, and are padded respectively with solutions of basic, acidic, or cotton-substantive dyestuffs, basic or cotton-substantive dyestuffs, or sulphur dyestuffs.

A *white resist* under dark blue upon silk tissues is, for instance, produced by printing a mixture of 150 grms. of the zinc sodium hydrosulphite of commerce, 10 grms. of ammonia, and 840 grms. of gum thickening, drying, and padding with a mixture of 30 grms. of Acid Violet 7, 20 grms. of Neptune Green S, 750 c.c. of water, 50 grms. acetic acid at 6° B., and 150 grms. of gum thickening. The tissue is then steamed for ½—1 hour, without pressure, washed, and dried. *Coloured resists* are similarly obtained by the employment, along with the hydrosulphite, of dyestuffs which are capable of resisting the action of the compound, *e.g.*, Quinoline Yellow, Safranine T extra, Rheonine A, and Induline Scarlet.

A suitable *white resist* for half-silk tissues contains a larger proportion (namely, 200 grms. per kilo.) of the hydrosulphite. After being printed with this, they are padded with a mixture of, for example, Methyl Violet, Diamond Green B, acetic, and tannic acid, or with Oxamine Blue 3 R and a little "Turkey-red oil F."

Cotton tissues, printed with a mixture composed as in the last instance, are padded with a solution of, for example, 100 grms. of Kryogen Black B N C, 100 grms. of sodium sulphide, and 75 grms. of soda-ash, dissolved in 625 c.c. of water, and thickened with 100 grms. of dextrin solution (25 per cent.). The tissues are afterwards steamed for ¼—1 hour, and lightly soaped. A *yellow resist* may be

ained with Primulin. *Coloured resists* may also be pro-ed by adding acetate of alumina or of chrome to the ting mixture, and, after padding and steaming, dyeing appropriate dyestuffs. It is sometimes advantageous dd a little "bisulphite" to the printing mixtures.—E. B.

UNITED STATES PATENT.

ulose Solutions; Method for obtaining Threads from —. E. Bronnert, Niedermorschweiler, and M. Fremery d J. Urbann, Aachen, Germany. U.S. Pat. 698,254, pril 22, 1902.

Fr. Pat. 308,715; this Journal, 1902, 49.—J. F. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

ather Dyeing. P. Kauschke. Chem.-Zeit., 1902, **26**, Rep. 127.

dyestuffs behave towards hide in the same manner as annins; the substance of the hide alone comes into con-ation, and thus raw hide and all kinds of leather can ed. Basic dyestuffs require the assistance of certain ic acids, which are afforded by the tannins in the case ark- and sumac-tanned leathers, and by fatty acids or sed fatty acids in the case of chamois, glacé, &c. me-leather and raw hide cannot be dyed with basic uff's. Bark- and sumac-tanned leather may be dyed basic and acid dyestuffs, the latter requiring the addition little sulphuric acid, which, if in proper quantity, does njure the leather. Chrome-leather or raw hide cannot ed with basic dyestuffs; it is exclusively dyed with dyestuffs if it is not to be afterwards treated with ns; in this latter case it may also be dyed in the manner as bark-tanned leather. Black leathers are ied from bark-tanned leather by means of basic uffs and certain acid dyestuffs, such as Naphthyl-e Black; for chrome-leather, Chrome-leather Black C d.—A. C. W.

II.—ACIDS, ALKALIS, AND SALTS.

and Bleaching Powder by Electrolysis; Production —, *with Special Reference to the Use of Mercury ctrodes.* J. Rhodin. Chem.-Zeit., 1902, **26**, Rep. 120.

author refers to his apparatus (Chem.-Zeit., 1899, **23**, this Journal, 1900, 417), by means of which an ncy of 85 per cent. can be guaranteed with 4 volts n. A calculation of the cost is given (Elektrochem.-, 1902, **9**, 4) for a production of 151 tons of caustic nd 300 tons of bleaching powder per 24 hours, on sumption of a prime generator of more than 2,000 -power.—A. C. W.

onia; Heat of Solidification of ——. De Forcrand d Massol. Comptes Rend., **134**, [13], 743—745.

f the authors has previously determined the heat of on at 10° C. of liquefied ammonia at −77° C. to 1·77 Cal.; calculations based on the experimental of Berthelot, Favre and Silbermann, Regoault and mann, relating to specific heats, &c., gave two results: 2 and + 1·855 Cal., the mean result being + 1·882 adding to this the value obtained by one of the 's for the heat of solution of solid ammonia at −77° C. er at 10° C., the result + 1·95 Cal. represents the f solidification of 17 grms. of liquid NH_3 at −77° C. uthors remark on the similarity in physical and cal properties of ammonia and water.—J. W. B.

rites; Method of Preparing ——. J. Matuschek. Chem. Ind., **25**, [9], 207—212.

ICALLY no nitrite but the sodium salt is commercially able in anything like purity, although different e nitrites vary so greatly in the case with which they into reaction that it is very desirable to be able to command others than the sodium salt. The author has found it practicable to prepare certain metallic nitrites by double decomposition in concentrated solutions, from the sodium salt and a soluble salt of the metal in question and he is extending his experiments to other nitrites beside those which he has as yet prepared.

Barium Nitrite.—1 kilo. of pure (1020 grms. of 98 per cent.) sodium nitrite and 1780 grms. of barium chloride are powdered and mixed, then heated on the water-bath for half an hour in a porcelain basin with 1½ litres of water. The liquid is filtered hot from the deposited sodium chloride, and the filtrate allowed to cool, when it yields a crop of needles of barium nitrite. These are sucked dry by the filter-pump and washed in the funnel with small quantities of cold water. The mother liquors, concentrated till the separation of sodium chloride ceases, are filtered, cooled to crystallisation, and the same process repeated so long as the bulk of liquor is workable. The final mother-liquor, the united washings, and all the deposited sodium chloride are then mixed, and the same process repeated on them. In this way 78 per cent. of the theoretical yield of barium nitrite was obtained, the composition of an average sample of the whole being $Ba(NO_2)_2$, 90·36; NaCl, 2·20; H_2O (by diff.), 7·44 per cent. [$Ba(NO_2)_2.H_2O$ would give $Ba(NO_2)_2$, 92·72; H_2O, 7·28.]

Magnesium Nitrite.—Molecular proportions of sodium nitrite and magnesium sulphate were treated with water as above, but not heated. The mixture set to a hard mass, from which pure magnesium nitrite could not be separated by addition of water. Alcohol was therefore substituted for water in the original mixture, which was kept stirred until the reaction was completed, filtered, and the filtrate concentrated by vacuum distillation to one-third of its bulk, when, after standing, minute prisms of magnesium nitrite deposited. The yield was but small however (18 grms. from 51 grms. of sodium nitrite), for though the alcoholic solution is fairly stable, as it becomes diluted with water it more readily decomposes, deposits magnesium hydroxide, and evolves nitrous fumes, according, the author concludes, to the following equations—

$$(i)\ Mg(NO_2)_2 + HOH = Mg(OH)_2 + N_2O_3$$

$$(ii)\ Mg(NO_2)_2 + 2N_2O_3 = Mg(NO_3)_2 + 4NO.$$

The dried crystals themselves gradually decompose in a vacuum over sulphuric acid. The formula is—

$$Mg(NO_2)_2, 2H_2O.$$

Zinc Nitrite.—This salt, $Zn(NO_2)_2.H_2O$, was prepared in the same way as the magnesium salt, in felted masses of fine needles. It is still less stable than the magnesium salt: the dry salt, the aqueous solution, and more gradually the alcoholic solution, giving off nitrous fumes and leaving a mixture of zinc nitrate and hydroxide.—J. T. D.

Metallic Chlorates. A. Meusser. Ber., **35**, [8], 1414—1424.

THE author has studied the chlorates of zinc, magnesium, cobalt, nickel, copper, and cadmium with reference to the hydrates which they form, and to the solubility of the hydrates in water. The chlorates of manganese and iron are so unstable, even in solution, that they could not be studied with the others.

The chlorates of zinc, magnesium, cobalt, and nickel were obtained both as hexahydrates, $R''(ClO_3)_2 + 6H_2O$, and tetrahydrates, $R''(ClO_3)_2 + 4H_2O$, the former passing into the latter at somewhat low temperatures. At temperatures near to those of incipient decomposition of the salts, dihydrates were produced, but it was not possible by further heating to obtain the anhydrous chlorates.

Of copper chlorate only the tetrahydrate was obtainable and cadmium chlorate yielded only the dihydrate.

In all chlorates the change in water of crystallisation occurs by 2 mols. of water at a time, as compared with 3 mols. in the case of the nitrates. All the chlorates are more soluble in water than the corresponding nitrates. The loss of water of crystallisation is connected with a radical rearrangement of the salt molecules.

Details of a large number of determinations of the solubility of the various salts are given, and the results are exhibited graphically in curve-tables. From the latter it is seen that all the hexahydrates show similar curves, and there is a like resemblance in the curves for the tetrahydrates. The limits of solubility, imposed by the transition of the salt in solution into one of a lower degree of hydration, lie, in the case of the hexahydrates, between 15° and 40°, and in the case of the tetrahydrates, between 60° and 83° C. As the chlorates of copper and cadmium occur in only one degree of hydration, their solubility curves are of a continuous character, and show no transition-points or other resemblances to those of the other chlorates.—H. B.

Persulphates; Production of ——, by Electrolysis without a Diaphragm. E. Müller and O. Friedberger. Zeits. für Elektrochem., 1902, **8**, [17], 230—236.

If a current be passed through a neutral solution of potassium sulphate, it will be observed that the electrolytic gases evolved, will contain a deficiency of oxygen as compared with those produced in a sulphuric acid voltameter placed in series in the same circuit. In time, if the current be continued, the deficiency in the oxygen in a newly collected sample will decrease until it reaches *nil*. At the same time the solution will become gradually more alkaline until, at the moment when the deficiency in the evolved oxygen ceases, the alkalinity will have reached a permanent maximum limit. These phenomena are due to the utilisation of oxygen in forming persulphate and in the freeing of a K-ion during the process. The greater the current density at the anode, the more noticeable is the effect. Quantitative experiments were tried, using a 500 c.c. vessel closed with an india-rubber stopper, suitably perforated to allow of the passage of the electrodes, and to permit of samples of liquid and of gas being easily withdrawn for analysis. Ten experiments are described, which have led to the following conclusions. Potassium persulphate can be produced in acid solutions and without using a diaphragm, with a current efficiency of 35 per cent. Ammonium persulphate can be produced with an efficiency of 80 per cent., using a neutral solution with an addition of chromate, and neutralising as required with sulphuric acid. This yield is not inferior to that obtained when diaphragms are used, but the voltage required is lower (5·9 as compared with 8 volts). Hence the process is a practical one. Its progress can be observed and checked if so desired, by the aid of gas analysis.

—W. G. M.

English Patents.

Sulphuric Acid; Manufacture of ——. J. Potut, Paris. Eng. Pat. 7710, April 15, 1901. (Under Internat. Conv.)

In order to effect the oxidation of sulphurous acid, it is subjected to the action of sodium nitrate solution, "pulverised" by an apparatus preferably placed at the upper portion of the Glover tower, opposite to the pipe for the discharge of the gases. The "pulveriser" consists of a cone-shaped casing (of resisting material, such as platin-iridium) along the longitudinal axis of which a pipe passes, terminating at the contracted opening of the casing, and at the other end bent upwards, and funnel-shaped at the top, to receive the sodium nitrate solution. Another pipe enters the casing, carrying into it steam under pressure, the outrush of which at the opening, and so around the open termination of the pipe conveying the flow of the solution, pulverises the latter into the midst of the sulphurous gases. The sodium sulphate formed and carried into the leaden chambers is stated to be in small proportion, and not inconvenient in most cases.—E. S.

Sulphuric Anhydride; Manufacture of ——. H. Briegleb, Berlin. Eng. Pat. 11,792, June 8, 1901.

"A process for the production of sulphuric anhydride from sulphurous acid and air or oxygen in accordance with the contact process, with special method of heating the contact material, the said method being characterised by this heating being effected in the contact chamber itself by the combustion of anhydrous or dry solid or gaseous fuel."—E. S.

Ammoniacal and Other Liquors, and in Apparatus therefor; Impts. in the Distillation of ——. E. G. Scot London. Eng. Pat. 11,082, May 29, 1901.

The apparatus comprises a series of cylindrical pipes, fitte with internal perforated plates, and closed at the ends b covers, the pipes themselves being connected together b branches so as to form a complete still. The liquor intr duced into the top of the apparatus meets, in its descent, current of steam, which distils off the volatile portion whilst the final effluent liquor heats the cold incomin liquor.—C. S.

Peroxide of Magnesium; Preparation of Substanc Containing ——. A. Krause, Berlin, Germany. En Pat. 2743, Feb. 3, 1902. (See U.S. Pat. 698,399, below

To a saturated solution of 6 kilos. of hydrated magnesiu chloride are gradually added 2 kilos. of sodium peroxid the temperature not being allowed to rise above 20° C. litre of alcohol is next added, and after standing for a hour the precipitate is collected (without washing), is drie then powdered, well washed with water, and again dried 50° to 60° C. The white and tasteless product is stated be permanent, and to contain about 27 per cent. of Mg(According to an alternative process, in which the operatio are similar, the 2 kilos. of sodium peroxide are replaced l a mixture of 1·45 kilo. of ammonium chloride with 2 kilo of Na_2O_2, and 3 kilos. of crushed ice are gradually added keep down the temperature. The product from this proce is stated to contain from 35 to 40 per cent. MgO_2.—E. S.

United States Patents.

Brine; Treating ——. G. N. Vis, Schweizerhalle, Switzerland. U.S. Pat. 698,341, April 22, 1902.

See Eng. Pat. 276, 1901; this Journal, 1901, 1210.—E. S

Magnesium Peroxide Compound. F. Fuhrmann, Berl U.S. Pat. 698,399, April 22, 1902.

Compare Eng. Pat. 2743, 1902 (see above). An aquec mixture is made of a soluble magnesium salt, a cor sponding ammonium salt, and sodium peroxide; alcol is added after the reaction, and the magnesium peroxi compound is separated from the liquid, and dried at a l temperature.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass and Hydraulic Cements; Studies on Zulkowsk Theory of ——. A. Glaessner. Chem. Ind., 1902, 5, [8], 186—191.

This is a continuation of Zulkowski's work on t behaviour of glass-forming acids towards fused alk carbonates. He found that these acids showed a marl tendency to form meta-compounds, even in the presence o large excess of alkali. The work was afterwards exten l to the behaviour of these acids towards alkaline earth t higher temperatures, and from that to the elaboration o theory of hardening of hydraulic cements. The pres t work includes experiments (1) as to whether titanic d zirconic acids, both on being melted with alkali carbona , and also on continued heating with lime and similar bas, behave like silicic acid, *i.e.*, form meta-compounds, and o hydraulic products; and (2) as to what is the nature of e composition of the hydrates of those pyro-acids, wh result from the fusion of aluminium, iron, and chrom n oxides with alkali carbonates.

The results of the experiments serve to illustrate e following points:—

1. Titanic acid, like silicic acid, on fusion with potass m carbonate, forms a meta compound. Potassium m titanate, however, is decomposed by solution in water (ry like the alkali-ferrite), while the alkali meta-silicate s u.

2. Titanic acid yielded on heating, in a Seger oven, th two molecules of calcium carbonate, a slightly fi d, earthy-looking product, devoid of hydraulic charac r, which takes up much less water than theory requires, nd since these amounts of water do not agree with one ano er,

thing can be said with certainty about the constitution of s product. Though a strongly hydraulic product (Port-d cement) is formed by heating at a lower temperature, a xture of silicic acid and alumina, the author only obtained indifferent mass on heating the mixture of $2(TiO_2.2CaO)$ $Al_2O_3.2CaO$, which should have yielded a product analo-us to kaolin cement. The addition of boric acid brought ut no better result.

3. Zirconic acid combines with molten alkali carbonates, e silicic and titanic acids, but combination results very wly and with great difficulty; only a mono-alkali-meta-conate could be formed.

4. Zirconic acid yields, on heating with two molecules of cium carbonate, in a Heinecke furnace, a compound, which ws no hydraulic characteristic, and on hydrolysis half lime separates, whereby a basic dicalcium-meta-zirconate ormed.

5. In agreement with Zulkowski's results, it was found t on melting alumina with potassium carbonate only one lecule of potassium oxide is taken up. The mono-assium aluminate so obtained is soluble in water, and if solution be treated with carbon dioxide, no mono-hydrate arates but the tri-hydrate of alumina.

6. On melting with potash, ferric oxide combines, like all above substances, with only one molecule of potassium de; and this ferrite is immediately decomposed by water potassium hydroxide, and a colloidal hydrate of ferric de with an indeterminate water content.—W. C. H.

ystal Glazes [Pottery]; Nature of ——. E. K. Bris. Sprechsaal, **35**, 133. Chem.-Zeit., **26**, [16], Rep., 34—135.

the opinion of some ceramists the formation of crystalline zes is attributed to the deposition of Willemite crystals $ZnO.SiO_2$) from saturated alkaline zinc glazes during the ng process, and is, therefore, a species of devitrification, ilst others ascribe the same to the titanic acid usually sent in these glazes. From the author's results in a ies of experiments with zinciferous glazes, with and hout titanic acid, it appears that the last-named only nish crystals sparingly and in the thicker portions of layer; whereas if these glazes receive an addition of per cent. of rutile, or have a portion of their silica laced by titanic acid, the crystals at once increase in ensions, and sometimes attain the size of a half reign. Crystallisation is also facilitated by the pre-ce of well-fired (biscuit) sherds, by maintaining a longed uniform temperature towards the end of the ng process, and by very gradual cooling of the fired re.—C. S.

English Patents.

ramic Objects, Enamels, Glasses, Base Metals, and the like; Producing a Coating of Metallic-Lustre on ——. R. Zsigmondy, Jena, Germany. Eng. Pat. 14,356, July 15, 1901.

COAT of metallic lustre is produced on ceramic articles, mels, glasses, base metals, &c., by applying to the objects argentiferous organic fluid, containing less than 7 per t. of precious metals, and subsequently heating the ects to a temperature of 340° to 480° C. A greyish-ite lustre is produced by the use of a fluid comprising pounds of silver, bismuth, and boric acid dissolved in ential oils; and yellow, greenish-yellow, and red lustre the use of mixtures of solutions of organic silver, gold, bismuth salts, in certain proportions (see this Journal, 0, 664).—W. C. H.

ss; Composition for the Use as a Backing for Opal Facing Tiles and other Articles of ——. P. Stevens, Brussels. Eng. Pat. 24,629, Dec. 3, 1901.

composition consists of bleached india-rubber (15 lb.), (1 lb.), resin (1 lb.), sulphate of baryta (35 lb.), or, in stead, oxide of zinc, sulphate of alumina, or other able base. The ingredients are heated and thoroughly ed, and the composition applied to the back of the tiles, whilst still warm, fine white gravel is sprinkled on to form a rough gripping surface for the fixing cement.
—W. C. H.

Kilns for Burning Bricks, Tiles, and Pottery. W. B. Hughes, London. Eng. Pat. 7178, 1901.

See under IX., *page* 708.

United States Patents.

Glassware; Finishing Machine for ——. W. R. McCloy, Elwood, Indiana, U.S.A. U.S. Pat. 697,521, April 15, 1902.

THE machine is for expanding the tubular ends of glass articles (such as lamp chimneys) whilst in the plastic state. It consists of a revolving cylinder, to which fingers are secured, the free ends of the fingers converging to a common centre; beaders, capable of a horizontal movement, are also secured to the cylinder. The fingers and beaders are worked by a spring and a "spreader," which causes the fingers to expand, and so form the bulb portion of the chimney.
—W. C. H.

Glass-gathering Machine. D. C. Ripley, Pittsburg, Penn., U.S.A. U.S. Pat. 697,886, April 15, 1902.

THE machine consists of a supporting frame, capable of being moved towards or from a furnace, and carrying a shaft to which gathering-irons are connected. The gathering-irons are made to revolve by means of wheels gearing with worms fixed to the shaft. By a handle fastened to the shaft, the gathering-irons can be pulled out of the furnace in order to supply the glass to moulds.—W. C. H.

Clay Hydraulic Pipe, Vases, Crockery-ware, &c; Process of Strengthening ——. L. Millet, Hagerman, Idaho, U.S.A. U.S. Pat. 697,642, April 15, 1902.

THE inventor proposes to strengthen pipe and other pottery articles, by first burning them to a proper consistency, and then making a groove (helical) round the outside, in which wire or iron rods are wound tightly, the whole article being finally glazed.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Glass and Hydraulic Cements; Studes on Zulkowski's Theory of ——. A. Glaessner.

See under VIII., *page* 706.

English Patents.

Woodwork, Brick Walls, and the like; Plastic Composition for ——. A. V. H. F. C. Clausen-Kaas, Copenhagen. Eng. Pat. 2843, Feb. 4, 1902.

THE composition consists of an albuminate of an alkali or alkaline earth, with or without a granular substance (such as cork-dust, &c.), mixed with fibrous material, such as paper pulp, wool, wool-flock, asbestos, cowhair, or the like.
W. C. H.

Wood; Composition for Preserving ——. R. J. Stalker, Chester. Eng. Pat. 9691, March 10, 1901.

THE composition consists of crude resin spirit (92 parts), carbolic acid (4 parts), and caustic soda or potash (4 parts).
—W. C. H.

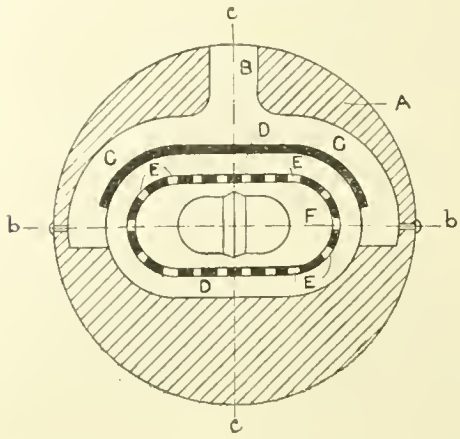
Asbestos Fibre and the like; Impregnating with Silica Objects made of ——. C. D. Abel, London. From Siemens and Halske Actiengesellschaft, Berlin. Eng. Pat. 13,206, June 28, 1901.

THE method consists in impregnating asbestos fibre and the like, either before or after it is manufactured into an object, with an organic silicon compound (such as silicic esters), which by the action of moist air deposits silica, which acts as an agglutinant.—W. C. H.

Kilns or Ovens used for Calcining Lime, Cements, Gypsum, and other Materials; Application of Gaseous Fuel in ——. F. Crosland, Egremont, Cheshire. Eng. Pat. 9137, May 7, 1901.

THE drawing is a horizontal section through the kiln at about the middle of its height. The gaseous fuel enters at

B, passes around branch tubes, C, into a gas space, D, from which it enters the kiln, F, through ports, E. The essential features of the invention are: 1st, making the interior of the kiln approximately of an oblong shape with rounded corners instead of circular as usual; and 2nd, twisting the upper portion of the kiln around an axis through an angle of not less than 90°, so that at the top the major axis is over



the short axis, *c*, *c*, whilst the minor axis is over the long one, *b*, *b*. In high kilns the twist may be still greater. This twist causes the lumps of limestone, &c., to roll over, and thus expose fresh surfaces to the action of the gas as it falls downwards.—R. S.

Kilns for Burning Bricks, Tiles, and Pottery. W. B. Hughes, London. Eng. Pat. 7178, April 4, 1901.

A CONTINUOUS kiln with a number of chambers, each of which is provided with a furnace, which has a side wall, with several openings in it, to prevent the fuel coming in contact with the articles to be burnt. The chambers are connected by openings from one to the next. Shutters are provided to cover the furnaces when not alight. Passages are arranged to lead from the ash-pits to the furnaces above the fires, by which heated air is supplied. The products of combustion from each chamber are conveyed by exits to a common flue, and thence to the chimney stack. Means are provided for regulating the supply of hot air to the ash-pits and furnaces. The heated air is supplied as a blast by a form of injector. The flues for the exit of the products of combustion are divided into sections, each of which is provided with a damper to regulate the direction of the products of combustion. A deflector is arranged above the furnace to prevent the flames licking round the arch of the chamber.—W. C. H.

Kilns; Brick and such like ——. A. G. Brookes, London. From J. P. B. Fiske, Newton, Mass., U.S.A. Eng. Pat. 3426, Feb. 11, 1902.

THE walls of the kilns are furnished with fireproof linings, and the roofs are composed of beams with fireproof lining between them. The beams are provided with bearing surfaces, which press on receiving plates on the top of the kiln walls. The fireproof lining of the roof is independent of that of the walls, and terminates short of it; the space between the fireproofing of the roof and the top of the walls is filled with a movable sealing medium (such as sand) to permit of the free expansion and contraction of the roof independently of the walls.—W. C. H.

Stone; Artificial ——. H. E. Carter, Cape Town, South Africa. Eng. Pat. 9892, May 13, 1901.

ONE part by weight of sand, "tailings," broken stone, broken brick, clay, loam, or other appropriate substance, mixed with one part of cement, is treated with two parts of silicate of soda, and one and a quarter part of silicate of potash, mixed with 1 to 500 per cent. of water. For the cement may be substituted an equal quantity of sand, &c.; the proportion of water depends upon the nature of the hard substance employed. The plastic mass is moulded as required, dried to a sufficient consistency, and then treated with a solution of about 2 oz. of calcium chloride dissolved in 100 lb. of water, until the calcium chloride has penetrated the moulded substance.—W. C. H.

UNITED STATES PATENTS.

Lumber [*Timber*]; *Process of Drying Red-Wood* ——. H. B. Phillips, Berkeley, Cal., U.S.A. U.S. Pat. 698,134, April 22, 1902.

THE lumber is placed in a closed vessel, into which air, and gases saturated with water-vapour, are forced under pressure; the vessel is then exhausted by pumping out the air, gases, water-vapour, and the sap of the wood, and the vacuous interstices of the wood are finally filled with carbon dioxide gas by pumping the latter into the vessel. —W. C. H.

Wood-Preserving Compound. C. Kleinschmidt, Assignor to E. M. Kleinschmidt, both of Seattle, Washington, U.S.A. U.S. Pat. 697,632, April 15, 1902.

THE compound consists of cryst. copper sulphate (2 lb.), "sulphate of iron" (2 lb.), potassium cyanide (2 lb.), sulphuric acid (4 lb.), "prussic acid" ($\frac{1}{3}$ lb.), and 40 gallons of refined petroleum.—W. C. H.

Sandstone; Process of Making Dolomitic ——. H. E. Brown, Coldwater, Michigan. U.S. Pat. 697,319, April 8, 1902.

THE process consists in calcining dolomite, and hydrating it under pressure, and mixing the hydrated substance with finely-divided silicious material, and finally subjecting the mixture to the action of steam and carbon dioxide, with the object of forming carbonates and silicates. The proportions suggested are 5 to 35 per cent. of the mixed calcium and magnesium hydroxides, and 65 to 95 per cent. of silicious material.—W. C. H.

Plaster of Paris; Process of Indurating ——. A. Broodsky, Montreal, Canada. U.S. Pat. 696,410, April 1, 1902.

THE process consists in immersing plaster of Paris articles in a bath of boiling alum until the articles are thoroughly impregnated; the loss of liquid by evaporation is compensated by the addition of dilute acid (vinegar). It is stated that the treatment does not affect water-colour decorations applied to the articles.—W. C. H.

Cement; Process of Making ——. O. Friz, Nüremberg Germany, Assignor to C. A. Kapferer, and W. Schleuning Munich. U.S. Pat. 698,268, April 22, 1902.

BY this process a white cement, said to be suitable for decorative purposes, is made by mixing lime and clay, as free as possible from iron, with felspar, and burning the mass to the verge of fusion, that is, beyond the sintering temperature. The proportions suggested are 4 parts of normal kaolin to 6 parts of plagioclase (albite), and about 75 parts of carbonate of lime to every 15 parts of silica in the mixture of kaolin and felspar.—W. C. H.

X.—METALLURGY.

Iron; Cementation of Wrought ——. C. W. Bildt. Chem.-Zeit., 1902, **26**, Rep., 127—128.

THE temperature required in cementation is somewhat below the melting point of the material. A mixture of 60 parts of wood charcoal with 40 parts of bone meal is used, the presence of the latter substance causing the powder to remain more compact during the heating and more certainly excludes the air. Carbon is consequently taken up more uniformly. Swedish Lancashire iron or cast-iron poor in carbon is employed; parts which are not to be carburised are coated with clay. The temperature required is 1100°—1200° C., and the heating lasts from 15 hours to several days. The carbon absorbed may reach 1—1·2 per cent.;

ıtity diminishes inwards from the surface. From cashire iron, steel can be made, free from red and shortness, and not containing more manganese than original iron. Cementation Lancashire steel is very able for turning hard cast rollers, it cuts better and ts less readily than English cast steel.—A. C. W.

Platinum and its Associated Metals; Notes on ——. F. Kemp. Eng. and Mining J., 1902, **73**, [15], 512.

ost all the platinum of commerce is obtained from acers" and by hydraulic processes. Native platinum ains, as a rule, 70—85 per cent. of Pt., whilst of the r metals present, iron generally forms the larger portion. The highest percentage of iron observed by author was 19·5, in a specimen from the Urals aining 68·8 per cent. of Pt. The amount of iron dly decreases with increase of platinum; with amounts he latter below 80 per cent., iridium tends to become abundant. Until the amount of platinum falls below er cent., that of iridium seldom reaches 5; rhodium, 4; palladium 2 per cent. Besides the metals mentioned, ium, ruthenium and copper are often present. As a hanical admixture, chromite is the commonest asso- d mineral, whilst less frequently, olivine and rarer ates such as biotite and pyroxene have been observed. ts usual associations, platinum is found only with the e, igneous rocks which are rich in the mineral olivine, or solite. Several cases have been recorded of the ciation of platinum with copper-bearing minerals, for nce, the discovery of sperrylite ($PtAs_2$) in the con- rates from nickel-copper ores at Sudbury, Ontario. also this Journal, 1889, 314,710.—A. S.

Platinum Ores of Wyoming. Eng. and Mining J., April 26, 1902.

he finding of platinum in the copper ores of the Rambler e, about 50 miles south-west of Laramie, Wyo., caused ulation as to how the metal occurred. In a recent ber of the *American Journal of Science*, H. L. Wells S. L. Penfield state that, by alternate treatment of llite ore from the mine with strong boiling nitric acid caustic soda solution, a concentrate was obtained, from ch a few glittering, highly modified crystals were ated, weighing approximately 0·00004 grm. These d on heating, gave a sublimate of crystalline arsenious de, and the residue, when dissolved in *aqua regia* gave, evaporation with ammonium chloride, yellow octahedral stals of ammonium platinic chloride. The crystals, refore, were doubtless sperrylite, $PtAs_2$, but the authors not assert that platinum may not occur in some other n in the ore. The Rambler ore is generally platiniferous, ning from 0·06 oz. to 1·4 oz. per ton (0·0002 to 0·0048 cent.), and it may prove of commercial importance. e authors express the hope that copper ores will here- r be carefully examined for platinum, since the occur- ces of sperrylite seem to show its association chiefly with s of copper. (See also this Journal, 1902, 200, 570.)

gs and Smelting Products; The Sulphur Content of —. H. von Jüptner. Stahl u. Eisen, **22**, 387; 432.

e sulphur in slags and metals is always present in the n of monosulphides. Molten slags dissolve sulphides, the solubility is small at the temperatures employed; solvent capacity increases with the temperature, the city of the slag, and the content of lime and manganese le. In considering the mutual relation of pig iron and furnace slag, the impossibility of absolutely freeing the ier from sulphur is demonstrated, though it may be ap- imately effected by suitably selecting the slags and espe- y having regard to the composition of the pig iron. The takes up more sulphur in proportion as its content of , CaO, and MnO, is increased, whilst the solvent capacity e iron is diminished as the percentage of carbon and man- se rises; and this view is confirmed, though not very rmly, by an observation of the Martin process. In Thomas process, the phosphorus content in the metal is principal factor, the carbon coming next, the former enting complete desulphurisation. The only way to obtain an iron poor in carbon and manganese, and with a low sulphur content, is either to start with materials poor in sulphur, or to repeatedly remove the old slag and form new. —C. S.

Aluminium; Determining the Silicon Content of ——. H. Goldschmidt.

See under XXIII., *page* 724.

Sampling [Ores]; Automatic System of ——. P. Johnson.

See under XXIII., *page* 724.

English Patents.

Iron or Steel, Malleable; Process and Apparatus for the Production of ——, *by means of Blast-Furnace Gas.* P. Eyermann, Beurath, Düsseldorf, Germany. Eng. Pat. 15,984, Aug. 8, 1901.

The blast-furnace gases are first cleared of dust, and are then passed through reversing valves to a regenerative chamber, and thence to a chamber filled with heated coke, and finally to a special type of open-hearth furnace, provided with two hearths, one similar to that of the ordinary type of furnace, and the other with tuyères, where they are burnt with air suitably introduced. The tuyères are at the side of the furnace, and are used to accelerate the process by directing the blast upon the liquid charge, which is kept in motion by rocking the furnace. The fuel chamber, in which the fully oxidised constituents of the blast-furnace gases, CO_2 and H_2O, are reduced to CO and H, may be used as an ordinary gas-producer in the absence of furnace gases. The process may be used in order to render blast-furnace gas suitable for use in the Talbot process.—W. G. M.

Copper; Production of ——. L. V. L. R. T. Vildorola, Santander, Spain. Eng. Pat. 7725, April 15, 1901.

The ore is first treated by a wet process, whereby the copper is obtained in solution as sulphate. In the case of sulphide ores the raw material is roasted; the sulphur dioxide is converted into sulphuric acid; the copper sulphide is for the most part obtained as sulphate, and the other sulphides as oxides. The charge is then thrown, whilst still hot, into water, whereby the soluble sulphates are rapidly dissolved. The residue is treated with dilute sulphuric acid, hot, to dissolve copper oxide and some iron which unavoidably accompanies it. The solution thus obtained is run into an enamelled iron cementing-vat, in which is supported a rotating iron drum more than half immersed in the liquid, which is then heated nearly to the boiling point. Under these conditions the copper deposits very rapidly by a "simple immersion" process on the iron drum, and is removed by a set of scrapers resting tangentially to the drum at the upper portion. The scrapers are supported on the sides of the vat, and are so arranged that the detached cement-copper passes by gravity down the scrapers, which are turned up at the sides to scoop-shape, and so to a receptacle at the side. A wooden cylinder, covered with black-leaded thin copper sheet, serves as cathode; it is rotated within the semi-cylindrical anode. The copper sulphate, obtained by leaching the roasted ore with hot water, is used as electrolyte, any iron being removed as oxide by the addition of copper carbonate to the solution, and agitating it when hot.—W. G. M.

United States Patents.

Sulphide Ores; Separation of the Constituents of Complex ——. M. M. Haff, New York. U.S. Pat. 695,306, March 11, 1902.

Mixed sulphides of zinc and lead are roasted with the acid sulphate of an alkali metal, thereby producing sulphates of lead and zinc and sulphur dioxide, sulphuric acid being produced from the latter by the usual means. The sulphates of lead, zinc, and alkali metal are treated with water to dissolve the two latter, and barium hydrate is added to the solution to precipitate zinc hydrate and barium sulphate. The sulphate of alkali metal is recovered from the solution, and treated with the sulphuric acid produced from the roasting process to obtain acid sulphate of the alkali metal to use in the repetition of the process.—G. H. R.

Assaying Ores; Apparatus for ——. W. T. Armstrong, San Jose, Cal. U.S. Pat. 697,774, April 15, 1902.

This consists of a tubular receptacle of heat-resisting material, closed at one end and having a movable cover at the other end. In this is inserted a lining or cupel of carbonaceous material.—J. H. C.

Zinc-Bearing Ores; Process of Purifying ——. C. R. P. Steinau, Cleveland, Ohio. U.S. Pat. 697,898, April 15, 1902.

Zinc-bearing solutions containing copper, lead, arsenic cadmium and other metals kindred with zinc are treated with zinc powder, consisting of a mixture of about 75 parts of zinc, and 25 parts of zinc oxide, by which the other metals above named are precipitated. Any iron or manganese present are then removed; lastly, if nickel or cobalt be present, the partly purified solution is treated with the hydrate and hypochlorite of an alkali to remove part of these metals, and finally again with zinc powder, so as to remove the remainder.—J. H. C.

Spelter; Refining ——. C. Wessell, New York, U.S.A. U.S. Pat. 698,163, April 22, 1902.

For every 100 lb. of spelter (which may be of low grade) melted in a crucible, one half-pound of phosphorus is added. The phosphorus, in half pound portions, is wrapped in damp paper, attached to the end of a rod, and plunged into the molten mass. A stated proportion of crushed horn is placed in the bottom of the crucible before melting the charge. It is stated that, by adding 2 oz. of magnesium per 100 lb. of spelter, its quality may be still further improved.
—E. S.

Coating Metal Plates; Apparatus for ——. J. H. Williams, Monmouth, England. U.S. Pat. 697,909, 15th April 1902.

Carriers, with clips, adapted to carry the plates edgewise, are arranged to move to and fro in the coating-bath.
—J. H. C.

Alloy. W. Rubel, Ludwigsburg, Germany. U.S. Pat. 697,544, April 15th, 1902.

This is composed of aluminium with from 4 to 7 per cent. of phosphorus. This alloy is said to be silvery in appearance; it does not easily oxidise and can be soldered.
—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electrolytes; Retrograde Diffusion of ——. J. Thovert. Comptes Rend., **134**, [15], 826—827.

Cylinders were filled, one-third with a solution of a diffusible substance and an electrolyte, two-thirds with a solution of the electrolyte alone, the electrolyte being of uniform concentration throughout. The concentrations of the electrolyte in the three portions were determined after definite intervals of time. The following results were obtained:—

Diffusible Substance.	Electrolyte.	Time in Hours.	Concentration of Electrolyte.		
			Upper Third.	Middle Third.	Lower Third.
0·4 HCl	0·39 NaCl	16	0·384	0·390	0·395
		47	0·373	0·380	0·405
1·0 " HCl	0·39 " KCl	47	0·363	0·392	0·413
		143	0·370	0·401	0·425
0·5 " HNO_3	0·5 " $NaNO_3$	10	0·48	0·49	0·52
		50	0·47	0·49	0·54
½(" H_2SO_4)	1·03 " HCl	52	1·07	1·01	0·98

Thus the electrolyte tends to concentrate in the lower portion, save in the last case, where the reverse occurs. The results are quite in accord with Nernst's theory of electrolytic diffusion.—J. T. D.

Persulphates; Production of ——, *by Electrolysis without a Diaphragm.* E. Müller and O. Friedberger.

See under VII., *page* 706.

English Patent.

Accumulators; Electric ——. J. E. G. Méran, Paris. Eng. Pat. 5366, March 4, 1902.

The oxides of lead of the accumulator are enclosed within a porous sheath of magnesium silicate, alone or with other materials, so that the accumulators are no longer simply frames from which the oxides can become detached, but consist of a series of closed receivers containing the active mass, the liquid gaining access to it through the pores of the sheath. The latter is made by crushing the magnesium compound, making it into a paste, and baking the moulded cases in kilns.—W. G. M.

United States Patents.

Electrolytic Apparatus [Metallic Salts]. F. McDonald, Maine. U.S. Pat. 697,157, April 8, 1902.

A metallic tank is subdivided into anode and cathode compartments by spaced, perforated, metallic plates, electrically connected with it, and lined with asbestos diaphragms between which the bottom and end walls of the tank are covered with a layer of acid-proof cement. The upper edges of the plates curve outwardly to form seats co operating with recesses formed in the upper edges of the end wall of the tank, and the anode cover is supported by, and fits down on the seat thus formed, to which it is hermetically sealed. The positive electrodes are carried by this cover and there are negative connections to the plate and tank. A second cover closes the cathode compartment which has overflow pipes, and to which, and to the anode compartment, outlet pipes for the products of electrolysis are connected. The anode compartment, which has a gauge for indicating the level of the fluid in it, is supplied through a valved feed-pipe from a vessel containing a float which controls the flow of the liquid.—G. H. R.

Storage Batteries; Process of Making Plates for —. A. Meygret, Paris. U.S. Pat. 698,039, Apr. 22, 1902.

The electrodes are made by forcing a disintegrated active mass through a suitable die-plate, from which it emerges in the form of hollow sticks or tubes of suitable contour, which are then placed in a suitable mould into which metal is run and conducted into the tubes, the fluid metal remaining outside their bores constituting a frame integral with the metal cores formed in them. The plates thus formed are coated with varnish, which is subsequently given the necessary porosity to allow the fluid to gain access to the active material.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Copper Cyanide [Electro-Plating] Baths; Substitution of Sodium Sulphite for Sodium Bisulphite in ——. Fischer, Elektrochem. Zeits., 1901, **8**, 192—193; through Zeits. für Elektrochem., 1902, **8**, [18], 270.

Pfanhauser's bath, which gives an excellent coating of copper on iron and zinc is made up with sodium bisulphite and carbonate, copper-potassium cyanide and potassium cyanide, the two first-named salts being mixed in advance with formation of CO_2 and Na_2SO_3. An attempt to obviate the necessity for the preliminary treatment was made by using an equivalent quantity of Na_2SO_3 direct. The result was a deposit in the plating-vat was, however, bad; and it therefore appeared that the equation—

$$2NaHSO_3 + Na_2CO_3 = 2Na_2SO_3 + CO_2 + H_2O$$

does not correctly represent the reaction, which is probably incomplete. The following bath is found to give excellent results:—Na_2SO_3 (calc.), 20 grms.; $NaHSO_3$, 6 grms.; Na_2SO_4 (calc.), 20 grms.; $Cu(CN)_2.KCN$, 30 grms.; free KCN, 2 grms. per litre. The current density should be 0·003 to 0·004 amp. per sq. cm. [2·8 to 3·7 per sq. ft.], and the pressure between the electrodes, which are 15 cm. apart, 2 to 2·5 volts.—W. G. M.

United States Patent.

tals; Process of Recovering ——. E. D. Kendall, New York. U.S. Pat. 698,292, April 22, 1902.

DILUTE solution of potassium cyanide, containing the tals in solution, is made to flow over and through a gmental mass of carbon presenting a large surface area, l which serves as cathode. The anode consists of a plate plates of carbon immersed in a solution of potassium or ium hydroxide which is separated from the cathode ation by a porous diaphragm, so that the cyanogen set by the electric current is reconverted to alkali cyanide. flowing dilute solution is subjected to the action of an tric current having sufficient ampèrage and an E.M F. of east 5 volts, the flow being then stopped, and a stronger ition of potassium cyanide made to flow over and through carbon mass, after which the deposited metal is subjected he action of a reversed electric current not exceeding an I.F. of 5 volts, using the carbon mass as anode, and a te of metal as cathode.—G. H. R.

XII.—FATS, OILS, AND SOAP.

ty Oil of Lindera Benzoin; Investigation of ——. E. Caspari. Amer. Chem. J., 1902, **27**, [4], 291—303.

e spice bush, or fever bush (*Lindera benzoin*, *Laurus zoin*), grows in damp places in all parts of the United es, and in the Southern States it is used as a febrifuge. In extracting the kernels of the berries with ether, author obtained 34·5 per cent. of fat, whilst extion with petroleum spirit yielded an additional 11·1 per t. The fat was a yellow crystalline solid, melting 26° C. It was very soluble in alcohol, light petron spirit, and acetone, but dissolved with more difficulty anhydrous methyl alcohol. Its alcoholic solution was tral towards litmus. The saponification value was nd to be 284·4, and the Reichert value, 1·29—1·34. Examined by the usual methods, the fat was found to sist of a mixture of the glycerides of capric, lauric, and c acids, of which the lauric acid was present in the atest proportion.—C. A. M.

ric Acid and Some of its Derivatives. C. E. Caspari. Amer. Chem. J., 1902, **26**, [4], 303—311.

E author states that the seeds of *Lindera benzoin* are best known source for obtaining a plentiful supply of ic acid. The acid prepared from this fat melted at C. and boiled at 166° C. under a pressure of 10 to mm.

The chloride, $C_{11}H_{23}.CO.Cl$, was obtained by heating the d with a slight excess of phosphorus trichloride for 15 to minutes on the water-bath, and purified by distillation der reduced pressure. It boiled at 145° C. under a ssure of 18 mm., and remained liquid when cooled to 7° C.

The amide, anilide, and various metallic salts of lauric d were also prepared, and are described in the paper.
—C. A. M.

ycerides of Fatty Acids; Double Melting Points of ——. H. Kreis. Chem.-Zeit., 1902, **26**, [35], 384—385.

NSEN (this Journal, 1902, 553) has recently claimed to e isolated four mixed glycerides from beef and mutton but not having observed the phenomenon of a double lting point, even in the case of tripalmitin or tristearin, has called in question the correctness of the statements Duffy and Heintz as to the melting point of tristearin. In reply to this, the author gives an account of his periments, in the course of which he has frequently iced this phenomenon. Thus, for example, by the eated crystallisation of the kidney fat of the ox and pig n ether, fractions with the melting points shown in the e were obtained.

t is also pointed out, as corroborative evidence, that the almitin and tristearin synthetically prepared by Scheij c. trav. chim. Pays-Bas, 1899, **18**, 169) both had ble melting points.

Fraction	Ox Fat.	Pigs' Fat.
	°C. °C.	°C. °C.
1st crystallisation.....	45 and 54	47 and 62
2nd „	46 „ 55	49 „ 64
3rd „	47 „ 67·5	50·1 „ 64·8
4th „	48 „ 58·7	50·4 „ 65

As regards the mixed glycerides which Hansen claims to have isolated, the author points out that no evidence of their identity is offered beyond the iodine and saponification values; and that since, in most instances, the latter value was determined on quantities of 0·15 to 0·43 grm., a very trifling error (0·1 c.c.) in the titration would make a difference of 6·5 to 17·9 units in the value, *i.e.*, in unfavourable cases, of nearly as much as the difference between the saponification values of tristearin and tripalmitin.
—C. A. M.

Fats; Decomposition of ——, *by Micro Organisms.* K. Schreiber.

See under XXIV., *page* 728.

Cholesterol and Phytosterol in Mixtures of Fatty and Mineral Oils; Separation of ——. J. Marcusson.

See under XXIII., *page* 725.

Soaps; Determination of Ethereal Oils in ——. C. Mann.

See under XXIII., *page* 726.

English Patents.

Oils, Fatty Matters, Glycerin, Wax; Process and Apparatus for Refining ——, *and for the Extraction of Perfumes from Flowers.* E. Douillet, La Garenne-Colombes, France. Eng. Pat. 14,329, July 13, 1901.

In this process, which is embodied in a series of claims, the oil is treated with benzine or carbon bisulphide, then subjected to the successive action of a current of alcoholic vapour and of steam accompanied by hydrogen, and finally filtered through a bed of animal charcoal, which may also contain magnesium carbonate. During the passage of the steam and hydrogen, the oil is maintained at a high temperature (about 150° C.), this being conveniently effected by means of a calcium chloride bath.

It is stated that when this process is used for the separation of perfumes extracted from flowers by means of fatty oils, rancidity of the latter does no harm, since the perfumes volatilising with the alcohol can be separated from the products of rancidity which are carried away by the current of hydrogen.—C. A. M.

Oil adapted for Sulphonating from Cotton Seeds; Manufacture of ——. O. Imray, London. From American By-Products Co., New York. Eng. Pat. 19,586, Oct. 1, 1901.

The mixture of oil and other substances obtained by extracting cotton-seed hulls with a volatile hydrocarbon, preferably naphtha vapour, is stated to yield a sulphonated product which forms a cheap and efficient substitute for sulphonated castor or olive oil.

In the type of apparatus preferred for this process, the hulls are placed in a digester, through which the naphtha vapour is made to circulate in a downward direction, the condensed liquid, with the oil, &c., in solution, returning to the vapour generator, where the solvent is again evaporated. When the extraction is complete, the naphtha remaining in the hulls is expelled by means of a current of hot air, and condensed. The extracted oil, &c., is sulphonated in a lead-lined kettle cooled by cold water circulating through a surrounding jacket.—C. A. M.

Tallow and like Fatty Bodies; Process of Melting ——. E. G. Scott, London. Eng. Pat. 11,155, May 30, 1901.

According to this patent the crude fat is subjected to the action of a vacuum pump in a digester, with the result that

the steam subsequently admitted penetrates the tissue more readily. After the mass has been heated, a vacuum is again created to burst the fat cells, and the fat melted by the fresh introduction of steam, and run off through a discharge pipe. The gases drawn off by the vacuum pump are discharged into water or into a furnace.

It is claimed that this process gives an increased yield of a purer product in a shorter time than is possible by the usual methods.—C. A. M.

Lubricating Compound. C. H. Berry, Manchester. Eng. Pat. 9796, May 11, 1901.

This preparation, which is specially intended for lubricating the pistons and valves of condensing engines, consists of a neutral or alkaline soap, with which is incorporated plumbago or other suitable insoluble mineral substance, such as steatite.—C. A. M.

UNITED STATES PATENTS.

Rendering Apparatus. J. C. W. Stanley, London. U.S. Pat. 696,506, April 1, 1902.

An apparatus consisting of a closed vessel with a perforated false bottom, above which is a vertical plate dividing the upper part into two compartments communicating at one end. The oleaginous matter is heated in these compartments by means of perforated steam pipes whilst kept in motion and broken up by a suitable mechanical device. —C. A. M.

Oil; Apparatus for Separating Solvents from ——. C. Erisman, Illinois, U.S.A. U.S. Pat. 698,398, April 22, 1902.

An apparatus consisting of a closed chamber, which contains a vertical pipe or coil of pipes, through which steam or other heating material circulates. The solution of oil is introduced into a tank at the top, whence it trickles in a thin film over the hot pipes, with the result that the solvent is evaporated and condensed in a chamber above, whilst the oil is collected in a receptacle below.—C. A. M.

Lubricant; and Process of Making same. W. F. Downs, Jersey City, U.S.A. U.S. Pat. 697,936, April 22, 1902.

The lubricant consists of particles of a solid lubricant coated with an oil in which it is insoluble, and suspended in an enveloping oil with which the coating oil is not miscible. Preferably, finely-divided graphite is used as the solid lubricant, castor oil as the coating oil, and a mineral oil of specific gravity from 22° to 40° B. as the suspending medium. The proportion of coating oil required is usually about 7 per cent. of the weight of the graphite taken, and the coating is effected at a temperature of about 100° C., and the product should not be pasty, but crumbly. The coated particles are then suspended in the enveloping oil by rapid stirring or boiling. "For the best results the final lubricant should not contain more than 3 per cent. of graphite, and in the less viscous mixtures this proportion may be reduced considerably."—E. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*B.*)—RESINS, VARNISHES.

Manila Copal: The Resin of Dammara Orientalis. A. Tschirch and M. Koch. Arch. Pharm., 1902, **240**, [3], 202—229.

The origin of Manila copal has been assigned by some writers to a dipterocarpous tree, *Vateria indica*, but Wiesner has demonstrated that it is derived from a conifer, *Dammara orientalis*, a native of the Malay archipelago. The authors have examined two authenticated specimens of this resin, I., a soft dull specimen; II., a hard, lustrous one from Celebes. Both samples were completely soluble in ether, alcohol, and 80 per cent. chloral hydrate solution. The method of examination consisted in dissolving the substance in ether, and shaking the solution successively with 1 per cent. solutions of ammonium carbonate, sodium carbonate, and potassium hydroxide. The ethereal oil, and the non-saponifiable substance remaining in the ether solution were then separated by steam distillation. The portion soluble in ammonium carbonate yielded a crystalline acid, *mancopalinic acid*, $C_8H_{12}O_2$ (m.pt.175°), and an amorphous acid, *mancopalenic acid*, $C_8H_{14}O_2$ (m.pt.100°—105°). The sodium carbonate solution furnished two isomeric acids, $C_{10}H_{18}O_2$, *α-mancopalolic acid*, which sinters at 85° and is fluid at 90°, and gives a lead salt insoluble in alcohol, and *β-mancopalolic acid*, which sinters at 83° and is liquid at 88°, and the lead salt of which is soluble in alcohol. All four acids are monobasic, and have iodine numbers which correspond with the replacement of 1 atom of hydrogen by iodine. The potassium hydroxide removed nothing from the ether solution. The neutral substance, *mancopaloresen*, had the formula $C_{20}H_{32}O$ (m.pt.80°—85°). The ethereal oil had a sp. gr. of 0·840, boiled between 165° and 170°, and oxidised on exposure to air, becoming resinous and acid.

The two samples had the following composition:—

	I.	II.
Mancopalinic acid } Mancopalenic acid }	4	6
α-Mancopalolic acid } β-Mancopalolic acid }	75	80
Mancopaloresen	12	12
Ethereal oil	6	5
Water	2	2
Succinic acid and impurities	1	1
	100	100

—M. J. S.

(*C.*)—INDIA-RUBBER.

India-Rubber; Theory of the Vulcanisation of ——. C. O. Weber. Gummi-Zeit., 1902, **16**, [31], 561—564.

The author has investigated the influence of time and temperature on the process of vulcanising rubber by means of sulphur at temperatures above 100° C., defining the term "degree of vulcanisation" as the percentage of fixed sulphur that can be estimated by analysis of the washed product.

A mixture of pure Para rubber (100 parts) and neutral precipitated sulphur (10 parts) was rolled into plates 3 mm. thick and cut into strips 3 cm. broad and 6 cm. long. An autoclave of phosphor bronze, fitted with safety-valve, thermometer, and manometer, was chosen as a vulcaniser. The water in this vessel was first heated to boiling, a porcelain beaker containing boiling water was placed therein, and 8—10 of the strips added to the beaker. The lid was then fixed, the temperature raised to the desired degree and kept constant. At the end of each hour or half hour, the autoclave was opened, and one strip was removed for analysis, the time and heat lost in these operations being negligible compared with the total quantities involved. Each strip was cut into shreds, extracted with acetone, and dried in a current of carbon dioxide, and the sulphur therein, determined by the method of Carius. The results are shown in the following table:—

Time in Mins.	Temperature of Vulcanisation. 120° C.	125° C.	130° C.	135° C.	140° C.
	Per Cent. S.	Per Cent. S.	Per Cent. S.	Per Cent. S.	Per Cent. S
30	0·71	0·74	0·99	1·76	..
60	1·18	1·32	1·44	2·17	..
90	1·31	1·67	2·04	2·36	..
120	1·62	1·91	2·32	3·92	5·07
180	1·78	2·11	2·94	4·18	6·05
240	1·93	2·22	5·00	5·50	..
300	2·25	2·35	5·27	6·74	..
360	2·60	3·80	5·82	6·88	..
420	3·71	4·04	6·04	6·97	..
480	3·94	4·31	6·33	7·13	..

The curves plotted from these numbers show distinct breaks quite independent of experimental error, and

vidently of special significance. The author's main conlusions are grouped under the following heads :—

I. In view of the fact that hydrogen sulphide is not bserved in the actual manufacture and that direct experiient shows its non-production, "the rubber hydrocarbon, olyprene, combines with sulphur, without the evolution of ydrogen sulphide : the process of vulcanising is therefore n addition process."

II. As the result of experiments to determine the upper nd lower limits of vulcanisation, it may be considered "that he process consists in the formation of a continuous series f addition products of sulphur and polyprene ; the upper mit is probably represented by the formula $C_{100}H_{160}S_{20}$ 32 per cent. S), the lower by $C_{100}H_{160}S$. This series is haracterised physically by the loss of expansibility and ncrease of solidity from the lower to the higher members. 'he temperature and time of vulcanisation, as well as the mount of sulphur added, determine which members of this eries are produced."

III. As regards the relation between physical qualities nd degree of vulcanisation, "the physical constants of the ubber colloids have no influence on vulcanisation, conidered as a chemical reaction, but they determine the hysical character of the final products."

For the arguments on which the latter conclusions are ased and a preliminary discussion of vulcanisation by liquid ulphur compounds at low temperatures and of the comlexity of the sulphur molecule when it reacts, the original aper must be consulted.—R. L. J.

India-Rubber Goods ; Analysis of ——. F. Frank and E. Marckwald.

See under XXIII., *page* 726.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Gelatin ; Hydrolysis of ——. E. Fischer, P. A. Levene, and R. H. Aders. Zeits. physiol. Chem., **35**, 70—79. Chem. Centr., 1902, **1**, [17], 1018.

The authors have examined the products of the hydrolysis of the best commercial gelatin by hydrochloric acid. They have detected and isolated glycocoll, active and racemic alanine, active and inactive α-pyrrolidine-carbonic acids, leucin, asparagin, glutaminic acid, and phenylalanine, together with some lower amino acids.—A. S.

United States Patent.

Hides and Skins ; Machine for Treating ——. F. J. Perkins, Mass, U.S.A. U.S. Pat. 696,588, April 1, 1902.

The machine can be used both for unhairing and fleshing hides and skins, the feed-roller being carried on a movable support, so that it can be moved bodily towards or away from the bed roller. The rotating knife cylinder is the same as in other Vaughan machines.—J. T. W.

XV.—MANURES, Etc.

English Patents.

Manures and the like ; Disintegrating Machines, especially intended for ——. J. Milne, and W. and H. M. Goulding, Ltd., Dublin. Eng. Pat. 1304, Jan. 17, 1902.

The material to be treated is first fed into a shoot or receptacle, from which it is raised by a bucket elevator and delivered through a shoot into a disintegrating screen, where it is subjected to the action of loose arms or beaters, carried within the screen, the beaters and screen being rotated in opposite directions. The screen is built up of a number of flat detachable screening surfaces. The screened material falls into a hopper, while the tailings fall through an overflow shoot to a crushing roll, from which they are returned to the primary receptacle.—R. A.

Superphosphates ; Apparatus for Comminuting or Disintegrating ——. A. G. Brookes, London. From H. J. Merck and Co., Hamburg, Germany. Eng. Pat. 3128, Feb. 7, 1902.

This is an improvement on the apparatus described in Eng. Pat. 9260, 1899. Instead of the cutting blades being attached to the periphery of a drum or roller, as in the former specification, they are now fixed upon the circumference of a disc, forming a series of projecting radii. The disc rotates either vertically or horizontally, and can be worked in conjunction with several charging orifices, so that the disintegrated material is distributed on to a number of collecting plates, thus accelerating the output.

—C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar of Mahwa Flowers. E. O. von Lippmann. Ber., 1902, **35**, [8], 1448—1450.

The East Indian Mahwa tree (*Bassia latifolia*) sheds in the months of March and April an enormous quantity of flowers, the fleshy corollas of which are very sweet with an odour of raisins. These are largely eaten by the natives, who also prepare an alcoholic liquor from them by fermentation and distillation. Previous investigators have stated that the dried flowers contain about 60 per cent. of a readily fermentable, partially crystallisable sugar, of which 1—17 per cent. is described as cane sugar. The author has examined samples of this sugar extracted from the freshly fallen flowers by means of alcohol. They consisted of an upper layer of pale yellow faintly acid syrup and about two-thirds of very hard crystals resembling sugar candy. The syrupy portion was found to consist of invert sugar, containing only traces of cane sugar, whilst the crystals were also identified as pure, crystallised invert sugar. This observation is of interest, as it appears to be the first record of the occurrence of invert sugar in such large and well-defined crystals. Whether the flowers originally contained cane sugar or invert sugar is a question which can only be decided by analyses on the spot.—J. F. B.

Sugar Juices ; Treatment of ——, *with Aluminium Powder and Ammonium Sulphite.* Besson. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [9], 1082—1083. See this Journal, 1902, 416.

It is claimed that with this process incrustations of lime salts in the triple effect are avoided. The fear of loss of alkalinity from decomposition of ammonium salts and consequent inversion is groundless, the author having never found a trace of invert sugar in the massecuites examined. The massecuites obtained were always neutral to litmus.

—L. J. de W.

First Jet Syrups ; Filtration of ——, *and Composition of the Resulting Deposits.* K. Andrlik. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [9], 1093—1101.

The concentrated syrups even when appearing absolutely clear, become more or less turbid on the addition of water. The precipitated matters may be removed by filtration. Different syrups require a different degree of dilution to produce the maximum of precipitate. With green syrups there was no increase of precipitate after diluting to from 51 to 55 Brix. The quantity of deposit retained by asbestos on a Gooch crucible was 0·038 to 0·182 per cent. on the dry solids. The quotient of purity is raised by the filtration to the extent of about 0·08 per cent., taking the initial quotient at 78 per cent. In practice, filtration does not remove the whole of the deposit. The influence of the filtration on the crystallisation of the syrups is decided, it being stated that syrups not filtered give small-grained sugars which do not lend themselves well to affination. It does not appear that this influence can be detected in the laboratory, working on the small scale. Filtration eliminates chiefly calcium and iron salts of organic acids and next silica. Among these organic acids, oxalic acid is the most prominent, forming one-fifth of the total weight of the deposit. The nature of other organic acids was not determined ; they were, however, insoluble, or but slightly soluble in ether. Non-saponifiable fatty matters are also removed by filtration, and they usually form about one-sixth of the total weight of the deposit. Only small quantities of nitrogenous matters were removable by filtering.

—L. J. de W.

Sugar Crystals Coloured throughout. A. Jossé. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [9], 1101—1105.

Sugars consist as a rule of crystals of pure sugar, coated with the syrup in which they were formed, and which gives them their colour. On removal of this syrup the crystals are obtained in a state of great purity. There is, however, a certain class of sugars which remain impure and coloured even after a thorough external cleansing. To the naked eye the colour in such sugars appears to be uniformly distributed throughout the mass, but on microscopic examination it is found that the colour occurs in isolated patches, of various forms and dimensions. These remarks refer to individual crystals, and do not apply to syrup retained in the crevices of twinned crystals and rolled grain. About 2 grms. of sugar are mixed with 10 c.c. of a cold saturated solution of pure sugar to separate the crystals and to dissolve the adherent molasses, and a portion is then observed under the microscope with a magnification of 50 diameters. Normal sugar crystals appear perfectly colourless; those coloured throughout show characteristic yellow patches.

The phenomenon of internal coloration is frequently observed in large crystals formed in impure media, as in sugar candies, but this is easily explained, since during the period of growth the crystals are subject to changes of temperature, and vibrations, which may influence the crystalline form and cause syrup to be imprisoned in cavities. This explanation does not apply to the mode of crystallisation of raw sugars from masseeuites in the factory, but the result is caused by a simultaneous crystallisation of sugar and a salt, generally potassium sulphate.

Andrlik, Urban, and Stanek, while studying the residual products of sugar factories, observed that molasses contained relatively less sulphates than the masseeuites, and they were led to admit that these sulphates crystallised with the sugar. Raw sugars often contain sulphates forming 20 to 80 per cent. of the total ash. The author has met with a sugar containing 1·71 per cent. of ash; after eliminating all external impurities it still contained 1 per cent. of ash, consisting almost exclusively of sulphate of potash which had evidently crystallised with the sugar. By dissolving the sugar in a cold saturated solution of potassium sulphate, crystals of this salt in rectangular tables could be seen under a magnification of 100 diameters. Pure sugar gives no such deposit. The converse does not always hold; sugars may contain crystallised potassium sulphate, and yet not be coloured throughout. The crystallisation of the sugar and salt in this case has not been simultaneous. By a preliminary washing of the sugar with pure syrup it is possible to determine whether the salt is in the interior of the crystal or only on the surface.

The crystals of sugar serve as points of attachment for crystals of potassium or calcium sulphate, and the difference of crystalline system causes irregularities of form where small quantities of the mother syrup lodge and become covered with sugar. For these conditions to be realised the potassium sulphate must be supersaturated. A masseeuite containing 12 per cent. of water, and 2 per cent. of potassium sulphate will produce a crystallisation of this salt.

The causes of abnormal quantities of sulphate of potash may be due to the use of special manures, sulphurous acid or limestone.—L. J. de W.

Sugar Extracted by Maceration; Determination of the Amount of Crushing required for Canes and of the ——. H. C. Prinsen-Geerligs. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [9], 1115—1118.

The author, replying to a criticism by Haddon and Bonnin on the method of chemical control of cane crushing in use in Java, remarks that the method is adapted to the conditions prevailing in Java and not to those in Mauritius. He only approves of the figure representing the pressing as a rough check on the daily work of the mill, as it is impossible to obtain an exact figure when maceration is employed. The richness of the cane worked is found by adding the sugar in the juice entered per 100 of cane to the sugar lost in the bagasse, also per 100 of cane. The total weight of cane worked in a week or a fortnight is taken, the weight and sugar content of the juice obtained, and then the sugar extracted per 100 of cane is calculated. Next the fibre is determined in the cane and in the bagasse and the sugar in the latter. The percentage loss on the cane is then found by multiplying the sugar per 100 of bagasse by the fibre in 100 of cane, and dividing the result by the fibre in 100 of bagasse. The sum of these two values gives the richness of the cane without recourse to the figure of crushing

The method of determining the crushing by finding the weight of maceration water from the diluted juice as recommended by Haddon and Bonnin, though apparently simple, could not be used in Java, where it was tried 10 years ago and abandoned. The various meters tried for measuring water soon gave erroneous results and the rapid evaporation of the water introduced errors.

In comparing the work of mills in different factories, the fibre must be taken into account. The co-efficient 0·85 may give results 5 per cent. from the truth. As Scheibler has shown for the beetroot, the fibre of the living cane contains a considerable proportion of water exempt from sugar, while the fibre is weighed after drying in a stove and in the anhydrous condition.—L. J. de W.

Glucose Syrups; Corn or ——. E. Gudeman. School Science, Chicago, 1902, **2**, [1], 22—26.

The different grades of corn- or glucose syrups are made by mixing varying proportions of sugar syrup and glucose. Raw beet sugar syrup is not used to any appreciable extent, as its peculiar bitter taste cannot be fully masked by flavours. When used, it is only to replace part of the cane sugar syrup in the lowest and cheapest grades of corn syrups. Refineries working up cane- and beet sugars turn out low-grade syrups, the quality of the syrup depending on its taste and the content of sugar which may vary from 5 to 50 per cent. Sorghum syrups are mixtures of raw sorghum syrup, cane syrup, and glucose; raw molasses is the cane sugar syrup, direct from the plantation, without having been purified or refined. As molasses is very often bleached, it must be examined for mineral salts, especially zinc and tin, and if found to contain any, should be rejected as unwholesome. Molasses can be easily bleached. The best way of ascertaining if a specimen has already undergone the bleaching process, is by means of a simple bleaching test. If the reaction is not strong and rapid, the sample may be suspected of having been previously bleached Pure maple syrups may contain up to 25 per cent. of reducing sugars. A good flavoured maple syrup containing 10 to 1[illegible] per cent. of glucose and 10 to 15 per cent. of dissolved cane sugar cannot be distinguished from the pure article. The limited number of syrups flavoured with bark extracts and maple flavours can never be mistaken for genuine maple syrups. The addition of glucose to raw sugar syrups materially improves them and makes them palatable whereas in the impure state they would not be fit to be used as an article of food.

Table syrups frequently contain various substances, some of which are unwholesome. The most commonly used ingredients are: saccharine; natural and artificial flavours caramels; phosphoric, hydrochloric, sulphuric, or citric acid; antiseptics, especially bisulphites of soda or lime vanillin and coumarin. The author condemns the use of artificial flavours or essences, as most of the commercial preparations are cheap imitations of the pure articles. The composition of two gives a good idea of the whole class.

Nectarine.—The pure flavour should be an alcohol mixture of raspberry extract and vanilla. Analysis of the commercial article showed spirits of nitre, amyl acetate glycerin, and saccharin, and about 70 per cent. of alcohol The price was 6 dols. per (U.S.) gall.

Chocolate Flavour.—The pure flavour should be a alcoholic extract of the cocoa bean. Samples examined contained no cocoa extract, but contained glycerin, ether and caramel, also alcohol, 60 per cent. Selling price 9 dols. per gall.

In two cases wood spirit was used in place of alcohol Most flavours are considered by the author as downright poisons.

Vanillin and coumarin are not placed in the same class h the artificial and imitation flavours, as these synthetic oduets seem to be identical with the aromatic principles racted from the vanilla and tonka beans.

Caramel or sugar colourings are perfectly harmless if de without sulphuric acid. Some very low grade syrups sist of 98 per cent. of glucose and 2 per cent. of caramel. ch syrups differ from pure glucose only in colour, and re no characteristic taste.

China clay is often mixed with syrups for the purpose of ating the false impression that the syrup contains a large ount of sugar, the cloudiness due to sugar being thus tated with clay. The quantity used is small, as 1 part clay to 600 of syrup gives a very distinct cloud.

Acids are added, especially to sorghum syrups and lasses mixtures, to give a peculiar tart taste. The use of drochloric and sulphuric acids should be prohibited. Pre-vatives are quite unnecessary for the protection of ups from fermentation. They are very commonly used wever, especially salicylic, benzoic, boric, hydrofluoric, phurous and sulphuric acids; sulphites of soda or lime; rax, phosphates, formaldehyde, &c.

The fact that corn syrups are consumed in the United tes in very large quantities by all classes, young and old, many cases forming a large part of the daily food supply, kes it absolutely necessary that these syrups should be re and free from all deleterious substances.

The necessary conditions for guarding against the iling of syrups are:—sufficient body, a specific gravity below 42° B.; sterilising when filling the containers; -tight packages; absolute cleanliness in the process of nufacture.

The largest manufacturers of corn syrups use these ans, and only these, to preserve their products.

—L. J. de W.

United States Patent.

gar, and Solutions thereof; Process of Purifying ——. C. A. Spreckels and C. A. Kern, New York. U.S. Pat. 698,150, April 22, 1902.

HE inventors have made the discovery that the fluid pro-cts obtained by the sulphonation of resins, rosin oils, ential oils, fats, fatty oils and fatty acids are specific vents for the mineral salts, invert sugar and caramel nerally associated with sugar in the impure state, and ve greater affinity for these impurities than has the sugar elf. The process claimed in the refining of sugar is the p consisting in mixing with the impure sugar or solution ch a sulphonated product, and then separating the sul-onated substance together with the impurities it has sorbed.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

ast; Production by the Aid of Lactic and Volatile Fatty Acids without Fermentative Acidification, of Artificial ——. Verein Spiritus-Fab. in Deutschland, Berlin. Ger. Pat. 127,355, Feb. 16, 1900; through Zeits. Spiritus-ind., 1902, **25**, [17], 187.

has been proposed by Lauge to effect the acidification of ed yeast mashes by the addition of commercial lactic acid stead of by fermentation *in situ* by the lactic organism. he question then arose as to whether the small proportion butyric acid usually present in commercial lactic acid d any unfavourable influence upon the yeast, since butyric id has always been regarded as a decided yeast poison. vestigations have shown, however, that as much as 30 per nt. of butyric acid may be mixed with the lactic acid ployed in the yeast mash without in any way harming e yeast. Moreover, an admixture of butyric acid was und to increase the power of resistance of the yeast wards infection very considerably, the effect of this acid the organisms inimical to fermentation far outweighing adverse influence on the yeast. The claims of this tent provide for the addition to the lactic acid employed acidifying the yeast mash of a proportion of a volatile id of the fatty series of not less than 5 per cent.—J. F. B.

Beer Yeast for Bakers' Purposes; Purification of ——. F. Raben and F. Wrede. Ger. Pat. 130,299, March 4, 1900; through Woch fur Brau., 1902, **19**, [17], 247—248.

The removal of the bitter flavour and the colour of beer yeast for utilisation for bakers' purposes has generally been effected by extraction with alkaline solutions, *e.g.*, ammonium carbonate. Such solutions have an injurious effect on the vitality of the yeast, by attacking the cell membranes. According to the inventor, a solution of magnesium hydrate has no such injurious action, and accomplishes the desired result most satisfactorily. In this process the beer yeast is diluted with half its volume of cold water, and passed through a fine sieve. It is then treated in a washing apparatus with a solution of magnesium hydrate, which dissolves the hop bitter principles. The yeast is then washed with water, and neutralised or soured by the addition of a little dilute acid.—J. F. B.

Hemicelluloses; Action of Enzymes upon ——. J. Grüss. Woch. für Brau., 1902, **19**, [17], 243—245.

The secondary cell walls of the barley endosperm, consisting of hemicelluloses, are attacked by the enzymes during germination in two ways: by penetration of the enzymes into the cell wall whereby a change is brought about resembling the conversion of starch-paste into dextrin by diastase and by the solvent action of the enzyme from the outside analogous to the action of diastase on starch granules. The hemicelluloses of the barley corn consist of galactans and pentosans; these cannot be isolated as such, but similar material for the purposes of this investigation was obtained in the form of the mannan of the date-stone and the galactan of gum tragacanth.

A solution of Lintner's diastase was allowed to act upon gum tragacanth in presence of thymol for a period of two months, at the end of which time the swollen gum had been converted into a structureless slimy liquid. The presence of galactose in this liquid was demonstrated by extraction with alcohol and conversion of the extract into mucic acid. In the same way mucic acid-yielding substances, analogous to dextrins, were obtained by the digestion of the endosperms of green malt, eight days old. Experiments with the mannan of the date endosperm were followed by observing the increase of cupric reduction on digestion. This hemicellulose proved to be remarkably resistant, even under the action of the enzyme of germinated date stones the conversion was not very great; the enzymes of the juice expressed from green malt had an approximately equal effect, whilst that of Lintner's diastase was only about half as great. In all cases the increase of cupric reduction was confirmed by the isolation of mannose in the form of mannosazone. A preparation of oat malt diastase was also found to saccharify the mannan, but a solution of Lintner's diastase in glycerin had only a feeble action. The author concludes that the enzymes saccharify the hemicelluloses with the production of the same sugars as in the case of dilute acids. Hence it may be assumed that malt worts contain small quantities of galactose and pentoses, the former being derived from the endosperm and the latter from the husks, seed-walls and embryos.—J. F. B.

Beer Wort; A Simple Method of Caramelising ——, *during the Mashing Process.* E. Prior. Bayer-Brauer-journ., **12**, 109. Chem.-Zeit., **26**, [16], Rep. 135.

To prepare dark coloured beer, the author proposes to run the filtered mash—either entirely or in part, according to the depth of colour desired—into a steam-tight, iron cylinder, which is fitted with simple stirrers, a pressure valve, and the necessary inlet and outlet, and is placed in connection with a steam boiler. The stirrers being set in motion, steam is turned on at the top of the vessel, and the wort is kept for two hours under a pressure of $2\frac{1}{2}$ atmospheres. This will effect the desired coloration without the assistance of air or ozone. When caramelisation is complete, the wort is run into the hop copper, and passed through the usual final stages of the brewing process.

—C. S.

Filter-Presses, instead of the Double-bottomed Tun, in the Brewery; Employment of ——. R. Rückforth and C. Dornieyer. Woch. für Bran., 1902, **19**, [18], 255—256.

The employment of filter presses for separating the wort from the mash has met with great success in Belgian breweries working the infusion process. On the other hand, Windisch, in Germany, has hitherto failed in his attempts to apply them for a similar purpose in the lager beer breweries. He found that the filters clogged, almost before any clear wort had been obtained, and attributes his failure to the faulty construction of his press. The corrugations on the plates of the Belgian presses are very deep and close together, whilst those in the German presses are shallow and wide apart, so that the cloths sag between them and cease to work. The authors have conducted experiments at a brewery at Stettin with a Dehne filter press, with plates of 500 mm. and an inlet of 40 mm. diameter. The main wort had a density corresponding to 18 per cent. of extract, and in every case this was separated absolutely clear with ease. The chambers filled up well with fairly compact cakes of grains, containing, especially on the surface, a fine mud composed mainly of albuminous matter. The corrugations on the plates were 5 mm. deep and the cloths showed no tendency to sag between them, even under pressure; single and double cloths gave equally satisfactory results. In washing the cakes, to avoid an excess of after-runnings, it is essential that the chambers be completely packed and all the air displaced; it is also advisable to press up the cakes after the main wort has come through before proceeding to wash. Under these conditions Dehne's system of so-called absolute extraction, whereby the cakes are washed breadthwise from one side, answers admirably, and no portion of the grains can escape extraction. All kinds of decoction mashes were tested by the authors with extremely favourable results.—J. F. B.

Brewery Mashes; Filter Presses for ——. H. van der Schrieck. Monit. de la Brass., 1902, [2216]. Remarks by W. Windsch. Woch. für Brau., 1902, **19**, [18], 256.

In this paper the author gives an account of mashes made with the aid of filter-presses in his brewery in Belgium. The grist consisted of barley malt with 24—37 per cent. of maize flour and a little caramel malt and colour malt. A table is given showing the yields actually obtained, and those indicated by laboratory determinations in 16 different brews, certain of these worts being taken without washing out the cake of grains. In another table the gravity of the liquid left in the cakes in the different brews when the presses were emptied, is shown; the highest gravity was equal to 0·39 per cent. of extract, but most of the liquids were considerably less. The results indicate a great improvement as regards yield over the old system of running off the wort. The author admits certain drawbacks of the system, the principal one being the depreciation of the filter cloths, which he estimates at 1 to 1·5 per cent. of their value per brew. Further, it is absolutely essential to adopt some mechanical arrangement for washing the filter cloths, such as is employed in sugar factories; the press itself also is far more difficult to clean than the ordinary double-bottomed tun. Windisch confines his remarks on the above paper to showing that, although the process of extracting the grains may be dispensed with in Belgian breweries, where the main worts contain only 8 or 9 per cent. of extract, this could not possibly be the case in the lager beer breweries with worts of 14 to 16 per cent. of extract. The loss in the first case is estimated at 2·3 per cent., and in the latter at 4 per cent. of the total extract.
—J. F. B.

Vinasses; Concentration of ——, *in the Triple Effect.* E. Barbet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1901, **19**, [9], 1064—1082.

From a comparision of the evaporation of vinasses in the old potash furnace, the triple effect with a vacuum and the triple effect under pressure, the author shows that the last is the most economical, both as installation and for cost of fuel. The high temperature of boiling is not to be feared for molasses vinasses; there is no reason to be apprehensive of caramelisation as in a sugar works, since the concentrated liquid is destined for incineration. A further advantage of this method of working is the possibility of extracting the glycerin.—L. J. de W.

Liqueurs; Determination of Ethereal Oils in ——. C. Mann.

See under XXIII., *page* 726.

English Patents.

Malt Liquors; Manufacture of ——. J. Schneible, New York, U.S.A. Eng. Pat. 4152, Feb. 18, 1902.

The treatment claimed consists in cooling the newly fermented liquor, charging the liquor with carbon dioxide gas to saturation under the conditions of temperature and pressure maintained on the cooled and charged liquor, resting the liquor so cooled and charged until coagulation of the albuminous matters is effected and separating the coagulated matter from the liquor. The gas, if desired may be obtained and compressed from the fermentation vessels themselves.—J. F. B.

Fermentation of Liquids and Manufacture of an Alimentary Substance. H. F. Pitoy. Eng. Pat. 1008, 1901.

See below, under XVIII. A.

United States Patents.

Alcoholic Liquors; Method of Refining, Ageing, Mellowing and Purifying ——. J. F. Duffy, Chicago. U.S. Pat. 698,184, April 22, 1902.

The process for treating alcoholic liquors consists of the following steps:—the mingling of the liquors with air under pressure; the heating of the mixture thus formed; the atomising of the heated mixture; the impregnating of air with a suitable reagent; the mingling of the impregnated air and the atomised mixture; the distilling of the product. Tannic or acetic acid are mentioned as suitable reagents for impregnating the air.—J. F. B.

Alcoholic Liquors; Apparatus for Refining, Ageing Mellowing, and Purifying ——. J. F. Duffy, Chicago. U.S. Pat. 698,183, April 22, 1902.

This specification refers to the combination of apparatus to be used in carrying out the process described in U.S. Pat. 698,184 (see preceding abstract).—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Tea-Leaf; Enzymes of the ——. H. H. Mann. J. Asiatic Soc. of Bengal, 1901, **70**, [2], 154—166.

The author's investigations lead him to the following conclusions:—The oxydase present in the tea-leaf is the principal agent in bringing about the fermentation and colouring of the leaf in the manufacture of tea. It is most active below 55° C., and is destroyed at a temperature of about 80° C.; it is very sensitive to acids and alkalis. It occurs in greatest quantity in the unopened tip-leaf of the shoot and in the stalk; the quantity decreases as the leaves get older. In specimens from gardens of the same type that leaf which contains the greatest quantity of enzyme makes the most highly-flavoured tea. The increase of enzyme in the leaf seems to bear a certain relation to the amount of of phosphates in the soil. The amount of enzyme in the leaf materially increases during withering. (See also this Journal, 1902, 182.)—A. S.

English Patents.

Alimentary Substance; Fermentation of Liquids and Manufacture of an ——. H. F. Pitoy, Reims, France. Eng. Pat. 1008, Jan. 15, 1901. Under Internat. Conv. June 15, 1900.

See Fr. Pat. 301,280; this Journal, 1901, 826.—J. F. B.

Eggs and other Aliments; Process of Preserving ——. W. J. H. Verheggen, R. H. Arntzenius, P. J. H. Vierdag, and A. F. J. Bijvoet, Breda, Holland. Eng. Pat. 7253, April 6, 1901.

The eggs or other foodstuffs are steeped in an aqueous solution containing 2 c.c.—10 c.c. of formaldehyde, 1 grm.—2 grms. of benzoic acid, and 1 c.c.—10 c.c. of alcohol per litre. The benzoic acid may be replaced by boric acid or salicylic acid.—W. P. S.

Milk Preparation; Production of a Powdered ——. H. J. Bücka, Frederiksberg; C. Hansen, Copenhagen; L. Nissen, Frederiksberg; and O. B. Wimmer, Hellerup, Denmark. Eng. Pat. 1022, Jan. 14, 1902.

The powdered milk is produced by evaporating milk under reduced pressure in a steam-heated vessel with constant stirring. When the water has been reduced to 25—30 per cent., the crumbly fragments are dried at a temperature below the melting point of butter fat until the water is reduced to 16—20 per cent. The mass is then pulverised and further dried at a low temperature, so that the final product contains from 6—7 per cent. of water.—W. P. S.

Sterilising Apparatus. F. Fürstenheim, Berlin. Eng. Pat. 3752, Feb. 13, 1902.

In the apparatus claimed, the patentee makes use of a charcoal fire for keeping the temperature of the steriliser constant. The charcoal is laid on a grating under the vessel, and is ignited by means of a spirit lamp, the heat of the latter being cut off from the charcoal as soon as it begins to glow.—W. P. S

French Patents.

Casein Phosphate [for Baking Powders]; Method of Making ——. R. H. James. Fr. Pat. 315,803, Nov. 11, 1901.

The product claimed is prepared by grinding together 100 parts of syrupy calcium acid phosphate, $Ca(H_2PO_4)_2$, and 0 parts of caseïn, drying the mixture and powdering it. (See U.S. Pat. 692,451, 1902; this Journal, 1902, 360.)—W. P. S.

Caseïn Phosphate [for Baking Powders]; Method of Making ——. R. H. James. Fr. Pat. 315,804, Nov. 11, 1901.

Twelve parts of caseïn are dissolved in an aqueous solution containing 24 parts of phosphoric acid, and the mixture so obtained is evaporated to a syrupy consistency. 64 parts of casein are then added, and the whole is dried and powdered. (See U.S. Pat. 692,454, 1902; this Journal, 1902, 361.)—W. P. S.

United States Patents.

Flour; Ageing and Bleaching ——. J. Andrews and S. Andrews, Belfast, Ireland. U.S. Pat. 698,240, April 22, 1902.

The process claimed consists in subjecting the flour in a state of fine division to the action of air containing a small quantity of gaseous nitric acid or chlorine. The flour is contained in a revolving polygonal reel. From this the fine flour dust falls through a chamber filled with the above charged air. (See also U.S. Pat. 693,207, 1902, this Journal, 1902, 421.)—W. P. S.

Separator; Centrifugal [Milk] ——. J. E. Siedel, Güstrow, Germany. U.S. Pat. 698,332, April 22, 1902.

A flange is made round the separating drum, forming an annular channel adjacent to and surrounding the discharge pipes. Between the upper end of the flange and the side of the drum is a perforated plate through which the outflowing milk or cream passes. The milk, or cream, then flows over the edge of the flange in a thin sheet into the carrying-off pipes. The object of the invention is to prevent frothing.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Mineral Waters containing Sulphates; Baryta in ——. P. Carles. Ann. Chim. anal. appl., **7**, 91—93. Chem. Centr., 1902, **1**, [17], 1024.

The author boiled for three hours a finely-ground sample of heavy spar with a dilute solution of sodium bicarbonate, then filled the liquid into "seltzer flasks," and saturated with carbon dioxide. After 12 hours, the liquid was filtered, and portions of the filtrate allowed to stand in a narrow upright glass cylinder, and in an open Erlenmeyer flask respectively. In both cases the liquids remained clear for several days; then the liquid in the flask became turbid, and later also the liquid in the cylinder. On heating a portion of the filtrate on the water bath, the carbonates of calcium, barium, and (in traces) strontium separated.

These results confirm those of some earlier experiments of the author, viz., that solutions of bicarbonates saturated with carbon dioxide can decompose barium sulphate with formation of soluble barium bicarbonate.—A. S.

English Patents.

Softening Water; Apparatus for Use in ——. W. Drummond and G. W. Drummond, both of Govan, N.B. Eng. Pat. 11,202, May 31, 1901.

The apparatus comprises a drum or hopper for holding lime or other softening material, stirring or ejecting blades adapted to be rotated within the said drum to eject the lime through an adjustable doorway, and a turbine or water-wheel actuated by the inflowing water for rotating the blades.—R. A.

Bacteria Beds, Filters, or Tanks for Sewage; Apparatus for Periodically and Automatically Supplying and Discharging Chambers or Receptacles particularly applicable to ——. J. Barr, Kilmarnock, Ayrshire, and J. P. Wilkinson, Manchester. Eng. Pat. 10,782, May 25, 1901.

In connection with each bacteria bed a small chamber is provided, through which the sewage has access to the bed from the main channel, and in the bottom of this chamber there is an outlet closed by a supply valve in the form of a counterbalanced tank. In the under side of this tank-valve there is a small auxiliary valve, a cord from which passes over a pulley to the armature of an electro-magnet. On the completion of the electric circuit, the cord raises the auxiliary valve, allowing the sewage contained in the tank valve to escape, thus causing the tank-valve to rise off its seat and allowing the sewage to flow to the bed. The movement of the armature which opens the supply valve moves, at the same time, a detent lever which was holding up a valve controlling the discharge outlet from the bed, and allows this valve to close. When the sewage has reached the predetermined height in the bed, it raises a small float, which frees the armature, allowing the auxiliary valve to close and the supply valve to sink and cut off the supply. A portion of the sewage now flows from the bed, through a regulating valve, into a time or gauge chamber, and when this is full, the sewage overflows into an automatic siphon, which discharges the liquid suddenly into a balance tank, which sinks, raising the outlet valve off its seat, and causing the bacteria bed to be discharged.—L. A.

Sewage and other Liquids to Land, Filters, or other Purifying Beds; Apparatus for the Application of ——. T. S. McCallum, Manchester. Eng. Pat. 5388, March 14, 1901.

The claim is for "an arrangement of cams mounted upon a shaft driven by clockwork or other suitable motive power in conjunction with a float and ratchet and other gearing for accelerating the rotation of the shaft in case of flood; the said cams actuating weighted levers, and thereby periodically opening and closing valves for supplying with liquid and emptying tanks, bacteria beds, filters, and the like, for the retention of the liquid therein for any given time, and for the discharge of a given quantity of liquid in a given time."—L. A.

Distilling Apparatus [Water]. J. H. Jewell, Chicago, U.S.A. Eng. Pat. 2863, Feb. 4, 1902.

The apparatus consists of a shallow boiler supported above a condenser. The steam which rises passes down a wide central tube to the condenser, which consists of a battery of tubes cooled by a stream of cold water.—L. A.

UNITED STATES PATENT.

Water; Device for Purifying ——. J. M. A. Lacomme, Brooklyn, New York. U.S. Pat. 696,647, April 1, 1902.

See Eng. Pat. 7806 of 1901 (this Journal, 1901, 739). The sparking rods need renewal from time to time. To accomplish this without allowing water to escape from the main, a tube is provided, having a valve near one end, and containing an adjustable rod or electrode, the discharging end of which is removable, whereby the rod may be first partially withdrawn from the tube, the valve then closed, and the rod then completely removed. After a new discharge point has been substituted for the old one, the rod may be partially inserted within the tube, the valve then opened, and the rod finally adjusted in its proper position. A further improvement consists in employing three electrodes, the two outer ones being connected with one pole of a sparking coil, and the third or intermediate electrode being connected with the opposite pole of the coil.

—L. A.

(C.)—DISINFECTANTS.

Disinfection; Experiments on ——. Report to the London County Council by the Medical Officer, presenting report by Drs. Klein, Houston, and Gordon. Feb. 1202. (King and Son, Great Smith Street, Westminster, London.)

These experiments were made with the object of ascertaining the value of various disinfectants under the ordinary conditions of their use in dwelling houses. The microbes experimented with were:—Spores of *bacillus anthracis*, representing one of the most resistant forms of pathogenic microbes; *staphylococcus pyogenes aureus*, representing one of the most resistant forms of non-sporing pathogenic microbes; the *typhoid bacillus*; the *diphtheria bacillus*; the *bacillus pyocyaneus*; the *vibrio* of *cholera*; the *bacillus* of human *tuberculosis*; and *tubercular sputum*.

Four different kinds of material, in ordinary practice requiring to be disinfected, were chosen, *viz.*:—plain, unpainted wood, cloth, linen, and paper. The microbes, diffused in broth, in milk, or in melted gelatin, were liberally applied to these materials, and allowed to dry. The infected materials were then exposed to the following disinfectants:—

1. *Formalin Vapour.*—30 formalin tablets (= 1·02 oz.) evaporated in a space of 1,344 cubic feet. Time of exposure, 5 hours. This killed all the microbes, also tubercular sputum, on linen, and all, except the spores of anthrax, on paper. On wood and cloth, the formalin also killed all, except the spores of anthrax and tubercular sputum. Although in one experiment (the first made) the typhoid bacillus was not killed on wood or cloth, in two later experiments this bacillus was completely devitalised.

2. *Sulphur Dioxide.*—3½ lb. of sulphur burned in a space of 1,075 cubic feet. 24 hours' exposure killed all the microbes, including anthrax spores, on both linen and paper; but, like formalin, the sulphur dioxide failed to kill the spores on wood or cloth; and dried tubercular sputum was not devitalised on either of the four materials. As regards the latter (*sputum*), therefore, sulphur dioxide is inferior as a disinfectant to formalin. The fact that both formalin and SO_2 failed to disinfect wood and cloth charged with spores, whilst both killed the spores on linen, and sulphur dioxide killed them on paper, may, it is suggested, be due to the fact that owing to the greater thickness of the wood and cloth, the deeper portions of these materials are not acted upon by the gas. Therefore, stronger reagents than formalin and SO_2 must be employed for the disinfection of unpainted wood, such as floor boards and cloth materials.

3. *Mercuric Chloride.*—Immersion for 24 hours in a 0·1 per cent. solution killed all the microbes, as well as the spores of anthrax and the tubercular sputum, on all the materials tested.

4. *Phenol.*—Immersion for 24 hours in a 5 per cent. aqueous solution failed to destroy the anthrax spores, but killed all the microbes and the sputum.

5. *Condy's Fluid.*—Diluted with water, 1 to 142 and 5 to 142. These solutions proved practically useless in all the experiments, but the reporters are unable to say whether this may have been owing to the disinfecting power of the fluid being consumed in oxidising the organic matter present. Time of exposure, 24 hours, and anthrax spores, 72 hours.

6. *Bleaching Powder.*—1 per cent. solution, acting for 24 hours. Generally speaking, this destroyed only the less resistant forms of microbes, though in the case of anthrax spores on linen and paper, the solution proved more efficient than phenol.—L. A.

UNITED STATES PATENT.

Disinfecting Apparatus. E. Fournier, Paris. U.S. Pat. 698,109, April 22, 1902.

The apparatus comprises an outer and an inner vessel, connected together by means of a tubular fitting which contains two passages, one connected with the outer and one with the inner vessel, a two-way tap, and an extension beyond the tap in which the two passages unite in one flexible tube and a spraying device. The inner vessel having been filled with disinfectant solution, and the outer vessel with water containing from 1 to 5 per cent. of alcohol and 0·5 per cent. of ammonia, the latter is heated until a steam pressure of about four atmospheres is obtained within the vessel. The tap is then opened, and the slightly alcoholised and alkaline steam is allowed to escape into the room to be disinfected, until the air is saturated. The tap is then closed, and when the steam pressure has again reached four atmospheres the tap is again opened, and the disinfectant solution contained in the inner vessel is sprayed into the room.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Pulp; Bleaching of ——. A. Ahlin. Papier-Zeit., 1902, **27**, [33], 1178.

The author disputes a statement to the effect that the electrolytic bleach is only advantageous where water power or a cheap supply of brine are locally obtainable.

An apparatus is employed which is guaranteed to consume only 5·5 kilos. of salt and 8·4 kilowatts of power per kilo. of active chlorine produced. The cost of installing a plant works out at about 135 marks per kilo. of active chlorine produced in 24 hours. Thus, for producing 335 kilos. of active chlorine in 24 hours, 1,850 kilos. of salt costing 37 marks, 175 H.P. costing 43·75 marks, and 22·5 marks for depreciation and repairs would be required, as against 140 marks for 1,000 kilos. of bleaching powder. It is not true that the active chlorine produced electrolytically will do more work than an equal quantity from bleaching powder. But a great advantage is obtained by the electrolytic process owing to the greater rapidity of the bleaching action. For obtaining an equal brightness, the pulp remains for a much shorter time in contact with electrolytic bleach liquor than in the case of chloride of lime liquors. Consequently the destructive action on the fibre is greatly reduced, the fibre is stronger, and there is far less loss of weight by conversion into soluble products. When the remarkable results obtainable by the use of oxygen in combination with electrolytic bleach liquors are taken into consideration (see this Journal, 1902, 131), there is no doubt in the author's mind that the electrolytic system is cheapest and best.—J. F. B.

Paper for Wrapping Metallic Objects; Freedom from Chlorine and Acid of ——. W. Herzberg. Mitt. aus dem königl. Versuchsanst., Berlin, 1901, **19**, [5—6], 297—299.

Paper containing sulphur or sulphur compounds may tarnish silver plate, whilst the same paper could be used without much risk for polished steel goods. On the other hand, if both alum and chlorides are present in a paper, hydrochloric acid may be formed under certain conditions,

and such paper might cause steel goods to rust, whilst it would have little or no effect upon silver plate. The paper manufacturer should be informed as to the use of the paper, so that care may be taken to prevent the presence of the substances specially injurious in that particular case. Thus, needles have so long been packed in black paper that its use has become practically obligatory, although in the author's opinion, based on the results of comparative tests with writing and blotting paper, it is far from being the most suitable for the purpose. In manufacturing such paper, alum should be cautiously used, and only unbleached material employed. If the use of a dyestuff is essential, it should not be logwood, as is ordinarily the case, since part of the mordant required is retained by the fibres, and may become injurious under suitable external conditions.

Paper intended for silver goods should be free from sulphur and sulphides, and dyestuffs containing sulphur (*e.g.*, ultramarine).

In all cases the aim should be to have paper consisting of pure fibre, and to eliminate, wherever possible, the presence of added substances.—C. A. M.

Wood Pulp; Colour Reaction for ——. A. Kaiser.

See under XXIII., *page* 725.

English Patents.

Celluloid Non-Inflammable; Process for Rendering ——. A. Williams and W. C. Parkin, Sheffield. Eng. Pat. 8301, April 23, 1901.

The inventors claim as a non-inflammable celluloid composition, a mixture composed approximately of 25 parts of dissolved celluloidine, 6 parts of dissolved magnesium chloride (in spirit), and 3 parts of finely-pulverised asbestos. —J. F. B.

Celluloid-like Substance; Manufacture of a ——. E. Zühl, Berlin. Eng. Pat. 4383, Feb. 20, 1902.

In the manufacture of compositions resembling celluloid, the inventor claims the employment, in place of the whole or a part of the camphor hitherto used, of such substituted "phosphoric acid esters of the phenols, cresols, or naphthols in which either the oxygen of the PO group has been replaced by sulphur, or the hydrogen of the benzol ring by chlorine, bromine, or other substitutive." Trieresyl thiophosphate, diehlordiphenyl thiophosphate, dinitrotrinaphthylthiophosphate, monochlortrieresyl phosphate, and tetranitrotrinaphthyl phosphate are cited as examples (see Eng. Pat. 8072, this Journal, 1901, 741; and Fr. Pats., this Journal, 1902, 65).—J. F. B.

French Patent.

Acetyl-cellulose; Process of Manufacturing ——. L. Landsberg. Fr. Pat. 316,500, Dec. 3, 1901.

The inventor claims the process of preparing acetyl derivatives of cellulose by treating hydrocellulose with acetic anhydride, with the addition of phosphoric acid, pyrophosphoric acid, metaphosphoric acid, or phosphoric anhydride, at a temperature of about 40°—60° C. —J. F. B.

United States Patents.

Peat-fibre Pulp. A. Kalmann. Rabenstein, Austria. U.S. Pat. 698,118, April 22, 1902.

See Eng. Pat., 3656, 1901; this Journal, 1902, 422. —J. F. B.

Fibre Crosser [*Paper-making Machine*]. P. Miekle. Troy, N.Y. U.S. Pat. 698,304, April 22, 1902.

In connection with a paper-making machine of the cylindrical type, the inventor claims a device for crossing the individual fibres, causing them to felt together and form a paper of uniform texture. The device consists of a wheel, extending transversly across the vat between the making cylinder and the pulp inlet, carrying radial wings or blades tapering longitudinally from the middle where they are broadest. The wings are rotated in an opposite direction to the rotation of the cylinder, and at a greater peripheral speed than the cylinder, whereby the pulp fibres are directed in crossing paths immediately before being picked up by the making cylinder.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Rare Earths from "Cerium Oxalicum Medicinale"; Production of ——. C. R. Böhm. Zeits. angew. Chem., 1902, [16], 372—380.

The "cerium oxalicum medicinale" of commerce, which is obtained by converting into oxalates the rare-earth residues from the extraction of thorium from monazite sand, is a convenient starting material for the production of the individual rare earths, of which it contains practically all those known. The author has worked up 80 kilos. of the material as follows:—

Separation of Cerium.—The oxalate mixture was ignited, to convert the cerium into the ceric form, and Auer's method of separating the cerium as ceric ammonium nitrate was followed. Pure CeO_2 is insoluble in nitric acid, but if lanthanum and didymium are present, it becomes soluble to an extent dependent upon the proportion of these in the mixture. If the mixture contains less than 45 per cent. of CeO_2, it is completely soluble in nitric acid, the cerium passing into the solution mainly, but not entirely, in the ceric form. The reddish-brown oxides obtained on ignition as above were treated with twice their weight of concentrated nitric acid, and when the violent evolution of oxygen has ceased, the mixture was heated till only a small insoluble sediment remained. Ammonium nitrate, equal to the weight of oxides taken, was added, in concentrated solution, to the decanted liquid, which was then evaporated to crystallisation. After 10 recrystallisatioos the ceric ammonium nitrate was obtained in a pure state. This is a rapid and reliable method.

Separation of Lanthanum.—The cerium remaining in the mother-liquors was removed by a modification of Auer's process of selective solution of the earths in dilute nitric acid. The earths were precipitated as oxalates, washed thoroughly free from ammonium salts, and ignited, the main portion of the oxides obtained being dissolved in a small excess of concentrated nitric acid, and the other part being rubbed into suspension in water. To the heated solution of the nitrates was added a quantity of the suspended oxides about equal to the amount of cerium supposed to be present, and the liquid was boiled with frequent stirring till the colour of the added oxides disappeared, and a slimy yellow precipitate of basic cerium nitrate was formed. The treatment of the solution with successive quantities of the oxides was continued till a filtered portion, tested with H_2O_2 and ammonia, showed that all the cerium had been displaced from the solution. The method is a convenient and satisfactory one. To the cerium-free solution was added ammonium nitrate equal to the weight of oxides present, and the liquid was evaporated to crystallisation. The crystals of lanthanum-ammonium nitrate obtained, after 15 crystallisations, contained only traces of praseodymium.

Separation of Didymium.—The double ammonium nitrates of didymium and of the yttrium elements have such a strong tendency to form syrupy, supersaturated solutions, that further crystallisation of the mother-liquors from the lanthanum salt is not available for separating the didymium. The earths were precipitated as oxalates, which were dried and added cautiously to boiling concentrated sulphuric acid. After letting the sulphates settle out, the supernatant acid (in which the sulphates are insoluble) was poured away, the adhering acid was volatilised from the anhydrous sulphates, and the latter were added in small portions to ice-water in the proportion of 1 to 3. The solution was then warmed to 20° C., when part of the sulphates separated out; these were dehydrated, redissolved in ice-water, and the fractionation continued. Lanthanum was thrown down in the first fractions. After a few fractionations the material contained only slight traces of lanthanum, but still contained yttrium earths. It was

treated further by fractional precipitation with weak ammonia, the didymium accumulating in the precipitates, and the lanthanum and yttrium earths in the solutions.

Having eliminated the lanthanum, the yttrium earths remaining were removed by precipitation of the didymium with potassium sulphate. The didymium potassium sulphate produced was then boiled for some time with an equal weight of Na_2CO_3 and a small quantity of water, when the basic carbonate formed dissolved mostly in the excess of soda. Hydrochloric acid was added in excess, the hydrate was precipitated by ammonia, converted into oxalate, and ignited, yielding pure Di_2O_3. For the perfect separation of Di_2O_3 into Nd_2O_3 and Pr_2O_3, the author found over four years' fractional crystallisation of the double ammonium nitrates to be necessary.

Composition of "Cerium Oxalicum Medicinale."—In analysing this material, Nd and Pr were determined spectroscopically; Ce, by titration of the chlorine liberated on boiling the ignited oxides with HCl (a correction being duly applied for the chlorine liberated by the PrO_2; the Yt earths, by separation with potassium sulphate; and La by difference. Traces of samarium were identified spectroscopically. The composition of the earths was as follows:—

Ce_2O_3	51·35
La_2O_3	24·16
Nd_2O_3	16·20
Pr_2O_3	8·00
Samarium	traces
Yt-earths	0·20
	99·91

In the Yt earths, Yt, Yb, Er, Terbium and Gadolinium were found to be present.—H. B.

Cerium Peroxide. E. Baur. Chem.-Zeit., 1902, **26**, Rep. 114.

Solutions of cerous compounds in potassium carbonate become peroxidised on exposure to air. Job has isolated the compound $(CO_3)_3Ce_2O_3.4K_2CO_3.12H_2O$, in which the cerium is in the form of CeO_3. The peroxidised cerium solutions also contain ceric salt. In the presence of arsenious acid, which acts as the "acceptor," the peroxidation takes place with production of ceric compounds. Cerous salts have no catalytic action on the reaction between potassium iodide and hydrogen peroxide in acid solution. In neutral solutions iodine is separated and ceric hydroxide formed.—A. C. W.

Polyhalogen Compounds of the Alkaline Earths. J. Meyer. Zeits. anorg. Chem., **30**, 113—121; Chem. Centr., 1902, **1**, [15], 847.

Wells and Wheeler have already shown (Zeits. anorg. Chem., **1**, 85, 442) that the alkalis form solid polyiodides of the form MeI_3 and MeI_5. The author now describes the preparation of polyhaloids of the alkaline earths. Calcium tetraiodide can easily be prepared by heating calcium iodide and the requisite quantity of iodine to 70°—80° C. A deep-black liquid is produced, which, on cooling, solidifies to a crystalline paste. That it is not merely a mechanical mixture of the components is shown by the fact that no iodine vapour is evolved, even on heating to 100° C. Strontium and barium tetraiodides resemble the calcium compound and are prepared in an analogous manner. The tetraiodides dissolve in water without separation of iodine, but from the solutions two atoms of iodine are extracted by carbon bisulphide, chloroform, &c. On fusing with the requisite quantities of iodine, compounds of the types $M''I_6$, $M''I_8$, and $M''I_{10}$ are formed. Solid polybromides, bromiodides and polyhalogen compounds of the chlorides of the alkaline earths could not be prepared. The author believes that, in solution, the polyhaloids exist as chemical compounds, but that the solid polyiodides are molecular compounds of $M''I_2$ and I_2. In the case of the alkalis, the stability of the polyhaloids increases with the atomic weight of the metal, but with the alkaline earths the reverse appears to be the case, CaI_4 being the most stable compound of the series.

The author also determined the solubility of iodine in solutions of the chlorides, bromides, and iodides of calcium barium and strontium. 100 c.c. of a 10 per cent. solution dissolve:—

——	Cl_2.	Br_2.	I_2.
	Grm. I.	Grm. I.	Grm. I.
Ba	0·037	0·231	6·541
Sr	0·066	0·270	6·616
Ca	0·078	0·274	8·062
Temperature	18·5° C.	13·5° C.	13·5° C.

The solubility of iodine in pure water at 15° C. is 0·0142. —A. S.

Bismuth; Sulphates of ——. F. B. Allan. Amer. Chem. J., 1902, **27**, [4], 284—288.

Various bismuth sulphates have been described:—Adie (this Journal, 1900, 69) obtained an acid sulphate, $Bi_2O_3.4SO_3$, crystallising with 1, 3, 7 or 10 mols. of water. The sulphate $Bi_2O_3.3SO_3$ has been prepared as a constituent of double salts, by heating the acid sulphate. The compound $5Bi_2O_3.11SO_3.17H_2O$ crystallises from sulphuric acid of concentration 47·5 to 31 per cent. (Adie), whilst the sulphates $Bi_2O_3.2SO_3.2H_2O$ and $Bi_2O_3.2SO_3.3H_2O$ are obtained by crystallisation from dilute sulphuric acid (Leist, Heintz). By the action of water on $Bi_2O_3.2SO_3$, $Bi_2O_3.SO_3$ is formed. Leist obtained the salt $4Bi_2O_3.3SO_3.15H_2O$ by continued washing of the acid sulphate, but Hensgen was unable to obtain this compound. By heating a solution of bismuth nitrate with sodium sulphate in a closed tube at 200°—250° C., the sulphate $3Bi_2O_3.2SO_3.3H_2O$ is produced (Athanasesco).

In his investigation on this subject, the author stirred the acid sulphate, or the basic salt, obtained by the action of 10 per cent. sulphuric acid upon the acid sulphate, with sulphuric acid solutions of different strengths until equilibrium was obtained, employing the apparatus used in his former research upon bismuth nitrates (this Journal, 1901, 603). When but little sulphuric acid was present, the composition of the solid matter was inferred from the change in the liquid, but with stronger acid solutions, the solids were rubbed between porous plates and analysed, and the composition of the sulphate calculated from the ratio of Bi_2O_3 to SO_3.

It was found that at 50° C. the salt in equilibrium with sulphuric acid solution of 51·4 per cent. strength and upwards was acid bismuth sulphate; with acid solutions ranging from 5·4 to 51·4 per cent., the salt in equilibrium was $Bi_2O_3.2SO_3.2\frac{1}{2}H_2O$; and with solutions of weaker strength than 5·4 per cent., the sulphate $Bi_2O_3.SO_3$ was formed.

Adie's sulphate, $5Bi_2O_3.11SO_3.17H_2O$ was not obtained by the author; and it was also found that water at 50° C. had no action upon $Bi_2O_3.SO_3$.—C. A. M.

Alcohols with Water; Properties of Mixtures of the Lower ——. S. Young and Miss E. C. Fortey. Proc. Chem. Soc., **18**, [251], 105.

Methyl alcohol does not form a mixture of minimum boiling point with water, and, contrary to general opinion, dry methyl alcohol can be easily obtained by distillation of the dilute alcohol with an efficient still-head. The alcohol so obtained is drier than when the strongest dehydrating agents are used.

As regards the purification of the other six alcohols investigated, distillation with benzene gave the best results with ethyl, *iso*propyl, *n*-propyl, and tertiary butyl alcohols: this treatment was also found useful in the case of *iso*butyl and *iso*amyl alcohols for the removal of lower homologues. All these alcohols were found to form mixtures of minimum boiling point with water. The boiling points and the composition of these mixtures of constant boiling point were determined, also the contraction which occurs on mixing the alcohols with water in various proportions, and the approximate temperature changes for certain mixtures. It was found that (*a*) the differences in boiling point between

c alcohol and the alcohol-water mixtures of constant iling point, (*b*) the molecular percentages of water in ese mixtures, follow the same order as the boiling points the alcohols themselves. So far as experiments have en made, the heat evolution diminishes or the heat sorption increases as the boiling points of the alcohols se.

As regards the primary alcohols, the percentage contrac ons on mixing with water diminish as the boiling points of e alcohols rise, but irregularities were observed with the condary and the tertiary alcohols investigated.

The experiments show that as the molecular weights of e alcohols increase, the attractions of their molecules for ose of water diminish, but the constitution as well as the mposition of the alcohols must be taken into account. ne mixtures with constant boiling points which the alcohols rm with water are in no case hydrates of the alcohols.

bsolute Alcohol from Strong Spirit; Preparation of ——. S. Young. Proc. Chem. Soc., **18**, [251], 104.

HE strongest spirit that can be obtained by distillation with e most perfect still-head contains less than 96 per cent. by eight of pure alcohol. In order to remove the remainder the water, dehydrating agents have always been employed, it they do not give very satisfactory results; according to endeléeff, freshly ignited lime is the only one by means of hich pure dry alcohol can be prepared, and, even with this bstance, special precautions have to be taken to ensure ccess. More recently, Squibb has obtained alcohol of ill lower specific gravity by the long continued action of ne in a percolator, but his results, unlike those of endeléeff, were somewhat variable.

The method of dehydration recommended by the author epends on the fact that when a mixture of alcohol, benzene, d water is distilled, separation tends to take place into) a ternary mixture of alcohol, benzene, and water boiling nstantly at 64·85°; (2) one of three possible mixtures constant boiling point, (*a*) alcohol-benzene, b. pt. 68·25°;) benzene-water, b. pt. 69·25°; (*c*) alcohol-water, pt. 78·15°; (3) one of the three pure substances, alcohol, pt. 78·3°; benzene, b. pt 80·2°; water, b. pt. 100°.

For example, when a mixture of equal weights of 5 per cent. alcohol and benzene is distilled, the fractions e (1) the ternary mixture containing, theoretically, the hole of the water; (2) the binary alcohol-benzene ixture; (3) pure alcohol.

Pure benzene and dilute alcohol are easily recovered from e ternary and binary mixtures, and there is practically no ss of material.

Theoretically, a single distillation should be sufficient to move the whole of the water, but the separation is a fficult one, and even with a very efficient still-head a cond, or even third, distillation with more benzene is ecessary; the water may then be completely eliminated. it there appears to be a trace of benzene left in the cohol. This may be completely removed by distillation of e dehydrated alcohol with normal hexane; the binary exane-alcohol mixture which comes over first carries ie benzene with it and no hexane is left in the residual cohol.

The observed specific gravities of dehydrated alcohol are follows:—

Mendeléeff, by means of lime	0·80625 at 0°
Young, by means of benzene.....	0·80634 „
„ „ benzene and hexane ..	0·80627 „

roperties of Mixtures of the Lower Alcohols with Benzene and with Benzene and Water. S. Young and Miss E. C. Fortey. Proc. Chem. Soc., **18**, [251], 105.

e the seven alcohols examined, all except *iso*amyl alcohol rm mixtures of constant boiling point with benzene. The iling points of these mixtures and the molecular per-ntages of benzene in them follow the same order as the iling points of the pure alcohols. The boiling point of e *iso*butyl alcohol-benzene mixture is very near that of nzene itself; neither *iso*amyl alcohol nor any other alcohol with a higher boiling point can form a mixture of constant boiling point with benzene.

Of these alcohols, only ethyl, *iso*propyl, *n*-propyl, and tertiary butyl alcohols form ternary mixtures of constant boiling point with benzene and water. When a mixture of methyl alcohol, benzene, and water is distilled, the first fraction consists of the binary alcohol-benzene mixture, and when a mixture of either *iso*butyl or *iso*amyl alcohol with benzene and water is distilled, the first fraction consists of the binary benzene-water mixture. No alcohol of this series with a boiling point higher than that of *iso*butyl alcohol can form a ternary alcohol-benzene-water mixture of minimum boiling point; with these higher alcohols, the first fraction will always consist of the binary benzene-water mixture.

The boiling points and the composition of the binary alcohol-benzene and the ternary alcohol-benzene-water mixtures have been determined.

Acetic Acid; Manufacture from Crude Pyroligneous Acid. Gustav Glock, Berlin. Ger. Pat. 130,439, July 20, 1901.

On adding sodium bisulphate to crude pyroligneous acid, the greater part of any tarry matter present is separated, and collects as an oily layer on the surface. The aqueous solution, distilled after the removal of this layer, yields a nearly pure acid, the first fraction being the strongest.

—M. J. S.

Cinchona Bark and its Preparations; Determination of the Alkaloids in ——. F. de Myttenaere. Chem.-Zeit., 1902, **26**, Rep. 117—118.

The author has examined the methods of determination given in the pharmacopœias of Holland (1890), Switzerland (1893), Germany (1900), Italy (1892), Austria (1893), and England (1898), and has found all more or less unsatisfactory. The following method is proposed:—7 grms. of finely powdered bark (put through a sieve with 30 meshes to 1 cm.) are brought into a 200 c.c. flask, and 140 grms. of chloroform and 10 c.c. of 10 per cent. ammonia are added. After standing three hours, with occasional shaking, 3 grms. of tragacanth gum are added, and 20 c.c. of distilled water; the flask is then well shaken, finally the agglomeration of the solid mass and the separation of the chloroform are hastened by rotating the flask. After standing for one hour to allow the precipitate to deposit, 100 grms. of the chloroform solution are quickly filtered, the solvent evaporated, and the residue dried on the water bath. It is then dissolved in the smallest possible quantity of chloroform, and the solution transferred to a separating funnel containing 15 c.c. of decinormal hydrochloric acid. The vessel is then twice washed with 5 c.c. of chloroform and subsequently a third time with such a quantity of ether that the mixture of chloroform and ether floats. The funnel is violently shaken for five minutes, the acid solution filtered through a wet filter, and the ethereal solution washed three times with quantities of 10 c.c. of distilled water. The filter is finally washed, and the excess of acid titrated with decinormal caustic soda, using hæmatoxylin as indicator. The number of c.c. of acid used, multiplied by 0·0309, gives the alkaloid in 5 grms. of bark.

In applying this process to the assay of cinchona tincture and the dry or liquid extract, the dry extract is first dissolved in dilute alcohol and the solution evaporated on powdered pumice; the tincture and the fluid extract are similarly evaporated.—A. C. W.

Cinchona Alkaloids; Bromine Derivatives of ——, *and the Compounds derived therefrom which contain less Hydrogen.* A. Christensen. Chem.-Zeit., 1902, **26**, Rep. 115.

Cinchonine, cinchonidine, and quinine form dibromo addition compounds, which can be obtained from the hydrobromide perbromides. Comstock and Koenig have obtained cinchonine and quinine dibromides, but cinchonidine dibromide and dehydrocinchonidine have not hitherto been made. On treating the dibromides with alcoholic potash, a monobromo substituted alkaloid is first obtained, which then, by continued treatment at 100° C., yields the dehydrobase, containing two atoms of hydrogen less than the

original alkaloid. The three dehydro-bases take up only two atoms of bromine to form the dibromo substitution products of the original alkaloids. The hydrobromodehydrocinchonine, obtained by Comstock and Keenig by the addition of hydrobromic acid to dehydrocinchonine, is identical with the author's monobromocinchonine. Skalweit's dibromocinchonidine and Galimard's bibromocinchonidine are also identical with the author's cinchonidine dibromide.

Cinchonine dibromide, $C_{19}H_{22}Br_2N_2O$. Bromine (1 mol.) is added gradually (finally rapidly) to a solution of the base in acetic and hydrobromic acids. If necessary, the solution is then decolorised by sulphurous acid. In a short time it solidifies to a crystalline mass of the hydrobromide, from which the free base is obtained by the addition of excess of caustic soda. *Monobromocinchonine oxalate*, $(C_{19}H_{21}BrN_2O)_2.H_2C_2O_4.7H_2O$, crystallises well. *Cinchonidine dibromide*, $C_{19}H_{22}Br_2N_2O$, is obtained in the same manner as the cinchonine compound. Skalweit's dioxycinchonidine is stated not to exist; the substance must be *dehydrocinchonidine*, $C_{19}H_{20}N_2O$, which is obtained by boiling the dibromide for 20 hours with alcohol and potash (0·75—1 part), precipitating with carbon dioxide filtering and evaporating. The base is obtained quite free from bromine by converting it into the normal oxalate. *Dibromocinchonidine hydrobromide perbromide*, $C_{19}H_{20}Br_2N_2O.2HBr.Br_2$, obtained from dehydrocinchonidine, is relatively stable and differs from the other perbromides. *Dibromocinchonidine*, $C_{19}H_{20}Br_2N_2O$, forms prismatic needles, which melt at 186° C. *Quinine dibromide*, $C_{20}H_{24}Br_2N_2O_2$, and *monobromoquinine*, $C_{20}H_{23}BrN_2O_2$, which melts at 210° C., have also been prepared. *Dehydroquinine*, $C_{20}H_{22}N_2O_2$, which melts at 184° C., is obtained by boiling quinine dibromide with alcohol and potash (0·5 part) for 20 hours.—A. C. W.

Cevadine, Decomposition of ——, by means of Hydrochloric Acid in Alcoholic Solution. P. Horst. Chem.-Zeit., 1902, **26**, [31], 334.

On hydrolysis, cevadine produces cevine and angelic and tiglic acids (this Journal, 1899, 514). The author has endeavoured to ascertain which of these acids is the primary product. A solution of cevadine in alcohol was treated with hydrochloric acid gas, the mixture digested for 24 hours, diluted and distilled. On dilution, the distillate separated an oil, which boiled at 151°—152° C., and gave, on saponification, tiglic acid melting at 62°—63° C. It was found that angelic acid, when esterified under the above conditions, is not converted into tiglic acid; hence the latter is the primary product of the hydrolysis of cevadine.
—A. C. W.

Orange Flowers; Essential Oils of Sweet ——, or Portuguese Néroli Oil. E. Theulier. Chem.-Zeit., 1902, **26**, Rep., 126.

This essential oil is obtained by simple distillation. It is dark yellow in colour, and in no way resembles in odour the ordinary Néroli or orange oils from *Citrus bigaradia*. The specific gravity of the oil at 23° C. is 0·860; its optical rotation at 23° C. is + 29° 30′; it contains 6·35 per cent. of esters calculated as linalyl acetate; it gives a silky turbidity with 90 per cent. alcohol. Methyl anthranilate could not be detected. By cooling, a somewhat considerable precipitate of small crystalline plates, which melted at 55° C., was obtained. This is a paraffin and apparently identical with that from the *Citrus bigaradia* oils. The oil contains a considerable quantity of terpenes and high-boiling compounds. The presence of *d*-camphene, *d* limonene, and *d*-linalool was proved.—A. C. W.

Methyl Determinations according to Herzig and Meyer. M. Busch.

See under XXIII., *page* 725.

Tartaric Acid in Pressed Grape Skins (Marc); Determination of ——. C. Ehrmann and H. Lovat.

See under XXIII., *page* 726.

English Patents.

Medicinal Compounds [Gelatinised Silver Salts]; Preparation of ——. A. Stephan, Berlin. Eng. Pat. 26,355, Dec. 24, 1901.

A solution is obtained by means of gelatin, water, glycerin and organic silver salts.—A. C. W.

Menthol Derivative [Chlorinated Methyl]; Manufacture of and relating to a ——. K. A. F. Lingner, Dresden Saxony. Eng. Pat. 5293, March 3, 1902. Date claimed under Internat. Conv., March 8, 1901.

Menthol is heated with formalin on the water-bath and dry hydrochloric acid gas passed in; the upper layer is removed, dried, and freed from hydrochloric acid by a current of air *in vacuo*. The product, $C_{11}H_{21}OCl$, is an oily substance boiling at 160°—163° C. under 13—16 mm pressure. It is suitable for therapeutic purposes, and is claimed, together with the process.—A. C. W.

Pinene; Production of Derivatives of [Dipentene and Camphor] ——. C. K. Mills, London. From the Ampère Electro-Chemical Co., Jersey City, U.S.A. Eng. Pat. 2129, Jan. 27, 1902.

The process claimed consists in heating anhydrous rectified turpentine with anhydrous oxalic acid, washing with water and distilling, with or without previous saponification. The dipentene forms the first portion of the distillate. See also Eng. Pat. 14,754, 1900; this Journal, 1901, 67 and 604.
—A. C. W.

Volatile Inflammable Liquids; Vessels for Holding ——. V. Pesno. Eng. Pat. 14,391, 1901.

See under III., *page* 700.

Perfumes from Flowers; Process and Apparatus for Refining Oils, Fatty Matters, Glycerin, Wax; and for the Extraction of ——. E. Douillet. Eng. Pat. 14,329, 1901.

See under XII., *page* 711.

French Patent.

Vanillin; Process for the Preparation of ——. W. Langot and Freyer-Delapierre. Fr. Pat. 316,526, March 26, 1902.

The process claimed consists in passing a rapid current of air through spirit of turpentine, and then over asbestos cloth soaked in eugenol, which becomes oxidised to vanillin.—A. C. W.

United States Patents.

Aromatic Aldehyde and Acid; Process of Making ——. M. Bazlen, Ludwigshafen, Germany. U.S. Pat. 698,353, April 22, 1902.

The processes claimed for the production of aromatic aldehydes and acids consist in heating toluene, xylene, nitrotoluene, &c., with nickel or cobalt peroxide, with or without the presence of a salt of nickel or cobalt, and with or without an oxidising agent (sodium hypochlorite).
—A. C. W.

Salicylquinine, &c.; Salicylate of ——. H. Thron, Frankfort-on-Maine, Germany. U.S. Pat. 698,079, April 22, 1902.

The patentee claims the compounds of one mol. of salicylic acid with one mol. of the salicylic esters of the cinchona alkaloids, and in particular the salicylate of salicylquinine. This compound is obtained on cooling a solution of the constituents in hot alcohol. It forms tasteless needles, which melt at 182°—183° C. It is stated to have a peculiar medicinal effect, differing from that of either constituent. (See also this Journal, 1902, 637, 638.)
—A. C. W.

Thymol; Process of Making ——. M. Dinesman, Paris. U.S. Pat. 697,994, April 22, 1902.

See Eng. Pat. 13,745, 1901; this Journal, 1901, 1019.
—A. C. W.

XXI.—PHOTOGRAPHY.

Intensification; Mercurial ——. R. E. Chesterman. Brit. Jour. Phot., **49**, 1902, [2190], 329.

G. Hauberisser has suggested a modification of that method of intensification [Chapman Jones' method], in which bleaching with mercuric chloride solution is followed by treatment with a ferrous oxalate developer. In this case the intensified image consists of metallic silver and metallic mercury. On account of the presence of sulphite in all others, pyrocatechol is the only organic developer which may satisfactorily replace ferrous oxalate in this treatment; the pyrocatechol developer is best kept in concentrated form and diluted just before use.

A. Pyrocatechol, 2 grms.; water, 100 c.c.
B. Caustic potash, 20 grms.; water, 100 c.c.

For use add 50 c.c. of water to a mixture of 5 c.c. of A and 5 c.c. of B.—J. W. H.

Persulphates and their Use as Photographic Reagents. H. Marshall. Brit. Jour. Phot., 1902, **49**, [2189], 309—311.

The passage of an electric current through a concentrated solution of an acid sulphate liberates at the anode HSO_4 groups which may unite and form persulphuric acid, and ultimately act on the salt present to form a persulphate. The anode must be very small and the temperature kept low. Potassium persulphate is soluble to the extent of 1·7 per cent. in water at 0° C, the similar ammonium salt being soluble to the extent of 55 per cent. under similar circumstances. The dried purified salts may be kept for a long time without undergoing appreciable decomposition. Metals are attacked readily by solutions of persulphates, a sulphate of the metal being produced; on this account persulphates may replace acids for etching plates, &c. When silver nitrate is added to a solution of potassium persulphate, a black precipitate of silver peroxide gradually forms and then dissolves again; with the ammonium salt little, if any, peroxide is formed, but the solution becomes more energetic, and decomposes faster than one to which no silver has been added. On making a cold saturated solution of ammonium persulphate in strong liquor ammoniæ, no action is observable, even after some time, but the addition of a small quantity of silver nitrate causes immediate effervescence, and the action develops heat and becomes quite violent. The fact that ammonium persulphate, when used as a reducing agent, diminishes contrast, i.e., attacks the high lights more than the shadows, is explained in the light of the above experiments by silver acting as a "catalytic agent" in acceleratiog the action of the persulphate. The action of the persulphate on the image is stopped by immersion in a solution of sodium sulphite. If this explanation of the action be correct, a strong solution of persulphate, freshly prepared, should work best where reduction of contrast be required. A more dilute solution, containing a small quantity of silver, may be used in other cases. The solutions, once used, will not keep, and their action will differ from freshly prepared ones owing to the presence of a small quantity of silver sulphate.

—J. W. H.

English Patents.

Developing Means in Photography; The Preparation of new Chemical Compounds and their Use as ——. H. E. Newton, London. From The Farbenfabriken vorm. Fr. Bayer and Co., Elberfeld, Germany. Eng. Pat. 10,721, May 23, 1901.

By the action of organic photographic developing substances, such as pyrogallol, pyrocatechol, resorcinol, &c., on aliphatic or cyclic amines, new additive compounds which also act as developers and do not necessitate the addition of caustic alkalis for that purpose, are formed. As an example, an aqueous solution of 126 parts of pyrogallol is added to 225 parts of a 20 per cent. solution of dimethylamine, and the mixture allowed to stand, contact with the air being avoided. After a time the mixture becomes hot and crystals of the additive compound separate out. A photographic developer may be made up by adding 0·1 kilo. of powdered pyrogallol-dimethylamine to a solution of 0·8 kilo. of sodium sulphite in 10 litres of water.—J. W. H.

Photographic Prints; Process for the Production of Multicolour ——. S. Vathis, Paris. Eng. Pat. 579, Jan. 8, 1902.

"Multicolour photographic prints" are produced by the application of heat to an ordinary gold-toned silver print, the print after heating being immersed in water for 10 minutes.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Explosives. M. Fiedler, Moscow. Eng. Pat. 23,284, Nov. 18, 1901.

The explosive consists of two parts, a cartridge containing a dry powdered mixture of 70 parts of $KClO_3$ and 20 parts of $KMnO_4$, and a vessel containing a mixture of 9 parts of oil of turpentine and 1 part of phenol. For use, the turpentine-phenol is poured into the cartridge, a longitudinal channel in which is formed by pressure when the cartridge is made. The cartridge thus impregnated can be exploded in a bore-hole by means of fulminate.—L. A.

Explosive Compounds; Manufacture of ——. W. C. Quinby, California, H. B. Sharps, Philadelphia, and D. J. Greger, San Francisco. Eng. Pat. 4781, Feb. 25, 1902.

A liquid substance, called "maltha," is incorporated with explosive mixtures to prevent premature explosion and protect the particles of the metallic salts from the effects of moisture. Maltha is obtained on distilling crude asphalt, forming the fraction which comes over between 150° and 260° C. The following are given as examples of this explosive:—

Ammonium picrate	50	..	..
Potassium chlorate	..	80	..
Potassium nitrate	40	..	75
Sulphur	..	10	10
Charcoal	..	3	5
Maltha	10	7	10

—G. W. McD.

Matches; Machines for Making ——. M. S. Abbot, F. A. H. Loomis, and F. D. Ives, Connecticut. Eng. Pat. 25,759, Dec. 17, 1901.

The machine described is so constructed that only every alternate splint is severed from the veneer at each stroke of the cutter mechanism, and hence the splints enter the carrier with an open space between them, the full width of a splint, and in a direct line with the veneer.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

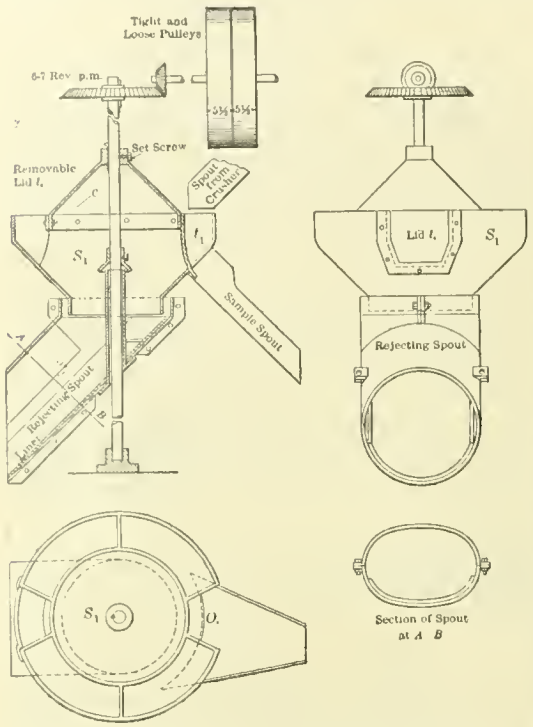
Rubrescin: A New Indicator for Alkalimetry and Acidimetry. A. Rosenfeld and J. Silber. Farmazeft, **10**, 263. Chem.-Zeit. Rep., **26**, [16], 130.

Rubrescin is prepared by fusing together 50 grms. of resorcinol and 25 grms. of chloral hydrate in an oil bath, the reaction proceeding, with liberation of hydrochloric acid and without further heating, when the temperature of 106° C. is reached. The melt is a brittle, non-hygroscopic mass insoluble in chloroform, sparingly soluble in ether, soluble in warm amyl alcohol, and in cold methyl- or ethyl alcohol, also in water. The product is purified by treating the powdered melt with chloroform. The one per cent. solution of rubrescin is dark red in colour, and is exceedingly sensitive towards alkalis, 3—6 drops producing with one drop of decinormal caustic soda in 100 c.c. of water, a red coloration that lasts for one hour, and leaves behind a red fluorescence for a day, whereas with phenolphthalein the coloration would vanish in a few seconds. The same

result is obtained with 1—2 drops of decinormal borax, as also with sodium carbonate and bicarbonate. The coloration is completely destroyed by one drop of decinormal sulphuric acid in presence of 3 drops of the indicator, but with 5—6 drops of the latter a decided yellow tinge is left. Ammonia also gives a red coloration. Rubresein as an indicator is to be regarded as of strongly acid character. —C. S.

Sampling; Automatic System of ——. P. Johnson. Eng. and Mining J., 1902, **73**, [15], 514.

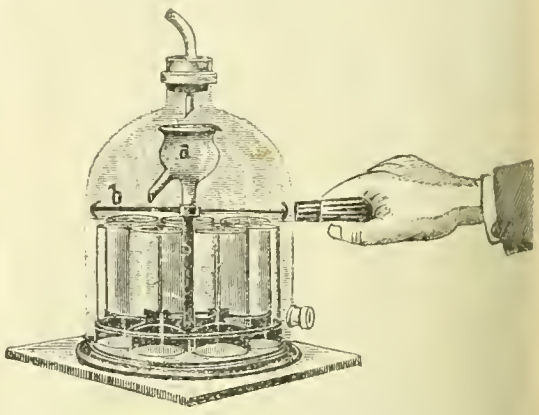
The ore, after passing through a No. 5 Gates crusher with corrugated crusher heads, where it is reduced to a size of 3—5 inches, is fed into a No. 1 Johnson sampler (see figures).



This sampler makes from six to seven revolutions per minute, and takes out either 10 per cent. or 20 per cent., as desired, for the first sample. In the arrangement shown in the figures, 10 per cent. are taken out, but by removing the lid, *l*, and putting the second tongue, t_1, into the opening, two samples are removed for each revolution, each one amounting to 20 per cent. The rejected 80 or 90 per cent. pass through the "rejecting spout" into an ore bin, whilst the sample passes to a No. 2 Gates crusher, where it is reduced to a size of $\frac{3}{4}$—$1\frac{1}{4}$ inches. The crushed sample is fed into a No. 2 Johnson sampler which makes nine revolutions per minute and cuts out three samples—each 20 per cent.—for each revolution. This second sample is passed through a No. 0 Gates crusher, where it is reduced to a size of $\frac{1}{4}$—$\frac{1}{8}$ inch, and is then fed into a No. 3 Johnson sampler, which makes 12 revolutions per minute and takes out three samples—each 20 per cent.—for each revolution. The sample is now fed to a pair of 10 by 16-inch rolls which reduce it to an average size of $\frac{1}{8}$ inch, then passed through another No. 3 Johnson sampler, and finally quartered, &c., in the usual way. The construction of the Johnson sampler is shown in the accompanying figures. The crushed ore falls down the spout from the crusher to the circular opening of the sampler outside the top cone, *c*. Every time the openings, O, come under the spout, the ore is diverted by means of the tongue, t_1, to the "sample spout," whilst when the opening, O, is not under the spout, the ore drops inside the inverted cone S_1, and passes through the "rejecting spout" into the ore bin below. In the No. 1 sampler there are two openings, O, but in the No. 2 and No. 3 samplers there are three such openiegs. The author gives figures showing the good results obtained with this system.—A. S.

Fractional Distillation [in Vacuo]; Receiver for ——. M. H. Palomaa. Chem.-Zeit., 1902, **26**, [31], 337.

The funnel, *a*, which receives the distillate, is fastened to a movable magnet, *b*, which can be rotated by means of a



magnet held outside the bell-jar. The delivery tube of the funnel can thus be brought over the receivers in turn. —A. C. W.

INORGANIC—QUANTITATIVE.

Aluminium; Determining the Silicon Content of ——. H. Goldschmidt. Zeits. für Elektrochem., 1902, **8**, [8], 123.

Haber and Geipert, in the course of a series of experiments on the preparation of aluminium (see this Journal, 1902, 260) claim that they have prepared aluminium containing only 0·034 per cent. of silicon. The author considers that this low percentage of silicon is not correct, and that the error is due to the method used for its determination. Haber and Geipert used Moissan's method, in which the aluminium is dissolved in hydrochloric acid, and this, according to the author, must lead to low results for the silicon, as appreciable quantities of SiH_4 are formed and escape with the hydrogen evolved. This source of error was pointed out in 1886 by Wöhler and Buff, and their statement is confirmed by the author, who made some experiments on the subject. In order to avoid the loss of silicon, the addition of a slight excess of bromine to the acid before dissolving the aluminium, is recommended.—A. S.

Zinc; Volumetric Determination of——: A New Reaction. E. Prothière. J. Pharm. Chim., **15**, [9], 419-422.

The author discusses the various modifications of the volumetric estimation of zinc by solution of monosulphide of sodium, and reaction with lead paper, and points out their various inaccuracies, chiefly owing to the coloration of the lead paper being acted upon before complete precipitation of the zinc. The author recommends paper impregnated with a 5 per cent. solution of tartar emetic, using the "drop" method; this remains colourless until the monosulphide has completely precipitated the zinc; on saturation a fine yellow stain is produced instantly. The saturated paper, after drying in the air, may be preserved indefinitely. The author claims great sensibility for the method and a great advantage of this antimony reaction over the lead reaction.—C. T. T.

Zinc; Determination of ——, by Sodium Sulphide: Influence of Iron on the Results. A. Coppalle. Ann. Chim. anal. appl., **7**, 94—96. Chem. Centr., 1902, **1**, [16], 954.

Prost and Hasscreidter proposed, when iron is present in considerable amount, to add a corresponding quantity of iron to the pure zinc solution used in the blank test. In order to determine the accuracy of the results obtained in

is way, the author made a series of experiments with a
ire zinc solution of known content of zinc, with the
dition of amounts of iron corresponding to those contained
different types of ore. The results obtained were:—

Type of Ore.	Percentage of Zinc in Solution.	Percentage of Iron added.	Error in Percentage of Zinc found.
ic blende.....	30	10	− 0·33
	30	20	− 0·77
	40	5	− 0·44
	40	13	− 1·08
iciferous pyrite.....	5	30	− 0·60
	5	40	− 0·80
	10	30	− 0·84
	10	40	− 1·16
iciferous galena	5	5	− 0·25
	5	15	− 0·40
	10	5	− 0·31
	10	15	− 0·63
xture of zinc blende, yrite, and galena.	15	10	− 0·37
	15	20	− 0·84
	25	10	− 0·53
	25	20	− 1·12

The results show that it is necessary to make the addition iron to the pure zinc solution used in the blank tests, as ierwise, quite erroneous results are obtained.—A. S.

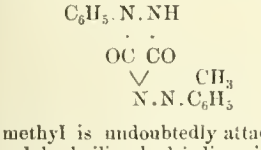
drogen Peroxide; Titration of ——. M. Tarbouriech. J. Pharm. Chim., **15**, [9], 422–427.

IE author criticises the volumetric methods in use, and poses the following method as less inconvenient, and obviating the use of mercury. The ureometric tube l accessories of Esbach are used. A known volume of sample to be examined is introduced by means of a ette, into a tube provided with a good cork. 1 c.cm., ual to ten divisions on the tube, of 30 per cent. caustic la solution is carefully added, then, slightly inclining the e, water is carefully added until the liquid marks about); the exact point being noted. Finely-powdered manese dioxide is rolled in a cigarette paper, the whole ming a mass not larger than a pea. This is placed in tube and the latter immediately closed with the cork. e tube is well shaken and allowed to remain in an erted position for 10 minutes. When the evolution has sed, the tube is uncorked under water, the oxygen disc ing a portion of the liquid. The tube is recorked under ter and reversed. The volume of oxygen evolved can be v read and compared with the tables compiled by the hor.—C. T. T.

ORGANIC—QUALITATIVE.

Methyl Determinations according to Herzig and Meyer. M. Busch. Ber., 1902, **35**, [8], 1565–1567.

suitably modifying Zeisel's method, Herzig and Meyer e devised a means of distinguishing between methyl ached to oxygen and that attached to nitrogen. They l that whilst boiling hydriodic acid hydrolyses the thoxyl group, temperatures of 200°—300° C. are resite in order to remove the methyl from nitrogen. The hor, however, has observed in the case of 1-phenyl-4-thylanilino-urazole—



which the methyl is undoubtedly attached to nitrogen, it is removed by boiling hydriodic acid. Since neither o- nor dimethylaniline nor *as*-methylphenylhydrazine ave in the same way towards boiling hydriodic acid, it ows that the loosening of the methyl group depends n the presence of the carbonyl groups connected with β-nitrogen. This appears to be the case since both zoyl- and dibenzoyl-methylphenylhydrazine give off hyl, although not quantitatively, when boiled with riodic acid. It would, therefore, appear that the use of Zeisel's apparatus for distinguishing between methoxyl and methylimine is only conclusive as to the absence of the former when no positive result is obtained. No trace of methyl iodide is obtained from acetyl- or benzoyl-methylaniline.—T. A. L.

Cholesterol and Phytosterol in Mixtures of Fatty and Mineral Oils; Separation of ——. *II.* J. Marcusson Mitt. aus dem königl. techn. Versuchsanst., Berlin, 1901, **19**, [5 and 6], 259—260.

In addition to the methods described in the author's former communication (this Journal, 1901, 484), a serviceable test can be based on Bömer's observation that the higher alcohols in fatty oils can be readily extracted by means of ether from an aqueous or dilute alcoholic solution of the soap, whilst the extraction from an alcoholic solution by means of petroleum spirit is incomplete. The oily mixture is first boiled with alcoholic potassium hydroxide to saponify the fatty oil, and the resulting soap solution completely freed from mineral oil by repeated extraction with petroleum spirit. The alcohol is then removed by evaporation, the residue repeatedly extracted with ether, and the extracted fatty alcohols purified by recrystallisation from alcohol.

This method is obviously not quantitative, but it is capable of showing whether an oil is of animal or vegetable origin, and the author has used it successfully in the examination of two mixtures recently submitted to him.

—C. A. M.

Formaldehyde; Delicate Method for the Detection of ——. C. Arnold and C. Mentzel. Zeits. Unters. Nahr. und Genussmittel, 1902, **5**, [8], 353—356.

In presence of small quantities of ferric salts, formaldehyde gives a red coloration with phenylhydrazine; excess of ferrous salts destroys the reaction. The coloration is best observed in alcoholic solution, since a precipitate is produced in aqueous solutions. Acetic aldehyde gives the same coloration, but in a far weaker degree. The coloration should appear at once, any coloration produced after standing being disregarded. The test is carried out as follows:—5 c.c. of the alcoholic solution are mixed with 0·03 grms. of phenylhydrazine hydrochloride and four drops of ferric chloride solution, and 10—12 drops of concentrated sulphuric acid are added, keeping the mixture cool. This procedure in aqueous solutions produces a precipitate, which should then be dissolved by the addition of sufficient concentrated sulphuric acid (cooling), or preferably of alcohol. One part of formaldehyde may thus be detected in 50,000 of alcohol, or 40,000 of water. The method may be applied directly, with a delicacy of about 1 in 10,000, for the detection of the addition of formaldehyde as a preservative in foodstuffs. For meat, fats, and milk, the procedure consists essentially in extracting the substance with absolute alcohol and testing the filtered extract.

In pale beers of the Pilsener type, the coloration may be observed without any previous treatment, provided a little alcohol be added at the last. In darker beers the coloration can generally be detected in the froth when the mixture is shaken. In doubtful cases with very dark beers, it is advisable to add the reagents as above and then extract the mixture with ether; 2·5 c.c. of the ethereal layer are then placed in a dry graduated test tube, made up to 4 c.c. with alcohol, and 1 drop of concentrated sulphuric acid is added. In presence of formaldehyde the liquid then becomes distinctly red, whereas pure beer only gives a trace of red coloration.—J. F. B.

Wood-Pulp; Colour Reaction for ——. A. Kaiser. Chem.-Zeit., 1902, **26**, [31], 335.

The reagent is obtained by warming sulphuric acid with an equal volume of amyl alcohol, free from furfurol, on the water-bath at about 90° C. until a slight evolution of gas begins. The pale reddish-yellow mixture is then cooled. This "amyl-sulphuric acid" gives red, violet, or deep indigo-blue colorations with wood-pulp, according to the quantity present. The reaction is accelerated by blowing a current of air over the paper moistened with the reagent, and by

gentle warming. The coloration is due to the action of furfurol, produced from xylose, on the amyl-sulphuric acid (Vitali's reaction).—A. C. W.

ORGANIC—QUANTITATIVE.

India-Rubber Goods; Analysis of ——. F. Frank and E. Marckwald. Chem.-Zeit., 1902, **26**, [31], 335.

According to the authors' experience, the method now used for the determination of caoutchouc, founded on the work of Henriques, is the only practicable process which gives good results. The following criticisms are passed on the method proposed by Heintz (this Journal, 1902, 503):—1. Large quantities of weighting materials, if present, must be previously removed to a great extent, otherwise the extraction of the organic constituents is not quantitatively possible. 2. It is extremely difficult to remove the alcoholic potash used to extract the fatty compounds. It is also very difficult to drive off all the water, so that weighing to constant weight cannot be avoided. 3. The absorption of water by sulphuric acid in a U-tube is known not to be a good method, a determination of carbon must be made at the same time, since the estimation of hydrogen alone is not sufficient for an exact analysis. 4. The qualitative examination of the weighting materials cannot be avoided, the presence of volatile metals and carbonates would prevent the determination of the weighting materials by means of the residue in the combustion boat. 5. The necessity of assuming that washed and purified caoutchouc contains constantly 97 per cent. of $C_{10}H_{16}$ introduces a new, though slight, error into the analysis.—A. C. W.

Tartaric Acid in Pressed Grape Skins (Marc); Determination of ——. C. Ehrmann and H. Lovat. Oesterr. Chem.-Zeit., **5**, 121—124. Chem. Centr., 1902, **1**, [17], 1028.

One hundred grms. of the finely-chopped skins are treated in a 1½-litre flask with 20 c.c. of hydrochloric acid (sp. gr. 1·1), and water added till the total weight is 950 grms. The mixture is heated for 1½ hours on a vigorously boiling water-bath, allowed to cool, made up to the original weight, filtered, and 500 c.c. of the filtrate evaporated in a porcelain dish to 100 c.c. The residual liquid is boiled with 35 c.c. of a 20 per cent. solution of potassium carbonate till effervescence has ceased, allowed to cool, rinsed into a 200 c.c. flask, made up to the mark, filtered, and 100 c.c. of the filtrate evaporated to about 15 c.c. This residue is treated whilst still hot with 3 c.c. of glacial acetic acid, and the tartaric acid now determined by the method of Goldenberg, Géromont, & Co. (this Journal, 1898, 609, 698). The calculation of the amount of tartaric acid from the number of c.c.s of N/4 alkali used in the titration is based upon the assumption that the marc contains 50 per cent. of water. For each 10 per cent. of water above or below this amount, a correction of $\frac{1}{100}$ per cent. in the amount of tartaric acid is necessary. For the determination of the water, 15—20 grms. of the finely-chopped grape skins are dried to constant weight at 105° C. —A. S.

Ethereal Oils in Soaps; Determination of ——. C. Mann. Arch. Pharm., 1902, **240**, [3], 161—165.

Twenty grms. of the soap shavings are dissolved in 150 c.c. of water and 20 grms. of 90 per cent. alcohol, in a flask fitted with an inverted condenser. The cooled solution is very feebly acidified with sulphuric acid, saturated with sodium chloride, treated with about 1·5 grm. of tannin and distilled in a current of steam with a lamp flame under the flask to keep the volume constant. The distillate, which contains the ethereal oil, is treated as described in the abstract which follows.—M. J. S.

Ethereal Oils in Liqueurs; Determination of ——. C. Mann. Arch. Pharm., 1902, **240**, [3], 163—164.

Of liqueurs which contain only alcohol, water, sugar, and ethereal oils, 100 c.c. are diluted with 5 volumes of distilled water, the mixture is saturated with sodium chloride and well shaken with 50 c.c. of rigolene (light petroleum spirit). One half of the rigolene solution is then withdrawn by a pipette and evaporated in the manner devised by the author for recovering the ethereal oil.

If the liqueur contains in addition resin, fat, chlorophyl or other vegetable extractive matter, this will also pass into the rhigolene. In this case the 25 c.c. of rigolene solution are transferred to a retort containing purified cellulose with half its weight of pumice fragments, and distilled by steam. The cellulose retains the extractive matters, whilst the ethereal oil distils over with the rigolene. The rigolene distillate is made up to 50 c.c. and one half of it treated as above.—M. J. S.

Fractional Distillation as a Method of Quantitative Analysis. S. Young and Miss E. C. Fortey. Proc. Chem. Soc., **18**, [251], 106. (See also pages 720 and 721.)

It has already been pointed out (Young, this Journal, 1900, 1072) that the composition of a mixture of two homologous substances can be ascertained with a fair degree of accuracy from the results of one or more fractional distillations with a very efficient stillhead without bringing about anything like a complete separation of the components.

The method has now been found applicable, not only to mixtures which separate normally into their original components, whether homologous or not, but also to cases in which binary or ternary mixtures of constant boiling point are formed, such mixtures behaving, as regards distillation, like pure substances. It depends on the following facts. In the case of a mixture which tends to separate into two components, the weight of distillate that comes over below the temperature midway between the boiling points of the two components—whether single substances or mixtures of constant boiling point—is almost exactly equal to that of the more volatile component. If the original mixture tends to separate into more than two components, the weight of these components will be very nearly equal to the weight of distillate below the first middle point, the weights of distillates between the successive middle points, and the weight above the last middle point respectively.

When a binary mixture of constant boiling point is formed, the method may be employed for the determination of its composition if that of the original mixture is known, or of the original mixture if that of the binary mixture is known; when the original mixture tends to separate into a ternary mixture, a binary mixture, and a single substance, the composition of the ternary mixture may be ascertained if that of the binary mixture and of the original mixture are known.

There are a few cases such as that of ethyl alcohol and water, or of benzene and *n*-hexane, to which the method is not applicable. In these, the curve representing the relation between boiling point and molecular composition is exceedingly flat where the more volatile component is in large excess. When this is so, the separation by fractional distillation of the more volatile component, whether a single substance or a mixture of constant boiling point, is practically impossible.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-Active Substances. I. Radio-Active Lead. K. A. Hofmann and others. Ber., **35**, [8], 1453—1457.

In recent publications (this Journal, 1901, 290, 611, 1150) it has been shown that lead compounds obtained from pitchblende, &c., contain a strongly radio-active substance resembling lead in its reactions with H_2SO_4, H_2S, &c. A more convenient method than that formerly described, for separating the substance, consists in dissolving the lead chloride in a 10 per cent. solution of sodium thiosulphate at 5°—10° C. and allowing the filtered liquid to stand at room temperature. A gradual spontaneous decomposition ensues, accompanied by the precipitation of a black sulphide, the first fractions of which, collected after about four days, are the most strongly active. From 50 grms. of the lead chloride there was obtained in this way 0·3 grm. of a sulphide which discharged a negatively-charged electroscope in 9 seconds (electroscope alone, 3 minutes 40 seconds), and was free from radium, polonium, &c. The influence

his preparation on the electroscope and the photographic plate was found to be not less than that of the most active radium preparations.

The authors consider the activity of radio-lead to be of a primary nature, and not only induced. If preparations, the activity of which has been weakened by physical or chemical influences, are kept for some time in the dry condition in closed vessels, their activity is restored. The sulphates and sulphides, when freshly prepared, are not so active as when they have been kept in stoppered tubes for several days. To obtain the maximum activity, therefore, radio-lead preparations should be kept under these conditions for a considerable time. Becquerel has shown that uranium preparations also may have their activity restored, and the authors found that such preparations, from which the activity had been removed by chemical means, became distinctly active after being kept for two days in stoppered tubes.

A slight activity may be induced in ordinary lead, if it is precipitated by means of sulphuric acid from a solution containing active uranium; but if the separation is effected by means of potassium hydroxide, the $PbSO_4$ precipitated is inactive.—H. B.

Zinc Hydroxide; Solubility of ——, in Ammonia and Ammonium Bases. W. Herz. Chem.-Zeit., 1902, **26**, Rep. 113.

The zinc hydroxide used in these experiments was precipitated by ammonia from zinc sulphate solution, washed and dried at 60°—70° C. An excess of the dry powder was shaken with the solvent at 17°—19° C. for 2—3 days and the dissolved zinc then determined. The more dilute the solution of the base, the more molecules of it are required to dissolve the zinc hydroxide. In mono-substituted ammonias, the decrease in solvent power is greater the higher the molecular weight of the replacing radical. Dimethylamine and diethylamine do not dissolve zinc hydroxide.—A. C. W.

Chromium Sesquioxide; Compounds of Alumina with ——. Duboin. Comptes Rend., **134**, [15], 840—842.

Lecoq de Boisbaudran has established the fact that alumina combines with chromium sesquioxide, and has suggested that chromium occurs in the ruby in the condition of sesquioxide; but the analysis of the aluminium-chromium compound has not hitherto been effected. The author finds that while free chromium sesquioxide from whatever source is oxidised and dissolved by fusion with potassium chlorate, and can thus be separated from admixture with alumina, the compound of alumina with chromium sesquioxide is unaffected by chlorate. He has prepared, and analysed by this method, the compounds in question, both by igniting a mixture of the previously ignited anhydrous salts, and by precipitating mixed solutions of ammonia alum and chrome alum by ammonia, and washing, drying, and igniting the precipitate. The first method yielded a compound containing very regularly between 15 and 16 per cent. of chromic oxide ($Cr_2O_3.8Al_2O_3$ = 15·78 per cent.), which, however, from its appearance still contained some free chromic oxide in admixture; the second method yielded compounds containing from 10 to 38 per cent. These compounds for the most part are rose-coloured with a violet shade, but as the proportion of chromic oxide increases they become more green. The colour is no safe guide to the composition, for those prepared by the first method containing 15 per cent. of chromic oxide are almost identical in tint with those prepared by the second method, which contain 28 per cent.—J. T. D.

Barium Sulphate, in the Presence of Ferric Chloride, Aluminium Chloride, and Magnesium Chloride; Solubility of ——. G. S. Fraps. Amer. Chem. J., 1902, **27**, [4], 288—291.

The author's experiments solutions of barium chloride and sulphuric acid in sufficient quantity to form exactly 1 grm. of barium sulphate, were added to solutions containing ferric, aluminium or magnesium chlorides. If no precipitate appeared after 24 hours, the same amounts of barium chloride and sulphuric acid were added, and so on until there was a turbidity. The tests were then repeated with smaller quantities of barium sulphate and longer periods of standing. In this way the solubility of the barium sulphate in the presence of these salts was found to be as follows:—

Amount of Salt per Litre.	Barium Sulphate dissolved per Litre in presence of		
	Ferric Chloride.	Aluminium Chloride.	Magnesium Chloride.
Grms.	Mgrms.	Mgrms.	Mgrms.
1	58	33	30
2½	72	43	30
5	115	60	33
10	123	91	33
25	150	116	50
50	160	170	50
100	170	175	50

Comparing these results with those of Fresenius and Hintz on the influence of ammonium chloride, sodium chloride, 10 per cent. nitric acid, and 10 per cent. hydrochloric acid upon the solubility (Zeits. anal. Chem., **35**, 170), the author states that barium sulphate is much less soluble in 10 per cent. ferric chloride or aluminium chloride than in 10 per cent. nitric or hydrochloric acids. It is also less soluble in 10 per cent. ferric chloride or aluminium chloride solutions than in 10 per cent. ammonium chloride solution, but more soluble in 2·5 per cent. solutions of these salts than in ammonium chloride solution of the same strength.

Similar experiments were made in the presence of barium chloride in excess. Comparing the results with those of Fresenius and Hintz it was found that the solubility of barium sulphate in the presence of barium chloride was smaller in solutions of ferric and aluminium chlorides, than in solutions of ammonium chloride (10 or 2·5 per cent.), sodium chloride (2·5 per cent.), or nitric or hydrochloric acids.—C. A. M.

Fuels; Micro-Organisms from the Fossil ——. B. Renault. Boll. de la Soc. de l'Ind. min. de St. Etienne, **13** and **14**, [3]. Chem. Centr., 1902, **1**, [15], 888.

As the result of 24 years work, the author has drawn the following conclusions:—In marshes and in deep water, micro-organisms have effected the partial decomposition of plants; in the first case with formation of peat, lignite, and lignitic coal, and in the latter with that of boghead coal, pit-coal, cannel coal, and anthracite. The nature of the plants has a certain influence on the fuels formed.

Peat is an aggregation of vegetable residues that have resisted, to varying extents, the prolonged maceration. The decomposition has been effected by saprophytes and bacteria.

Lignites are formed in shallow, boggy, stagnant water, where infusoria are able to develop. Lignites contain the same kind of wood residues as peat, but, owing to the more effective action of the microbes, are richer in carbon.

The recent bituminous shales can be regarded as having been produced by the change to a solid condition of ponds on the bottom of which animal and vegetable residues, together with clay, fine sand, and the slime produced by the action of microbes, had accumulated.

Boghead coal has been formed in deep, small lakes, from a wonderful abundance of microscopic gelatinous algæ, the composition of which is greatly altered by bacterial action.

Cannel coals consist in general of the fructification organs of cryptogamia, spores, macrospores, microspores, &c.; they contain few or no algæ.

Pit coals have been formed from accumulations of all possible vegetable organs, as wood, bark, leaves, fructification organs. The composition of the coal depends upon the extent of the change effected by microbial fermentation. In the evolution of pit coals two phases can be distinguished: (1) the chemical reactions effected by bacteria, which convert the vegetable matter into coal; and (2) the causes (pressure and desiccation) which determine the physical characteristics of the products.

Old bituminous shales contain algæ, vegetable residues, and carbonised vegetable slime in sufficient quantity to account for the formation, on distillation, of condensable or uncondensable products. They also contain numerous remains of fishes, reptiles, and frogs, and coprolites filled with bacteria.—A. S.

Metho-ethenylbenzene. M. Tiffeneau. Comptes Rend., **134**, [15], 845—847.

Phenyl magnesium bromide reacts on acetone, or methyl-magnesium bromide on acetophenone, to form dimethyl-phenylcarbinol. This alcohol, heated with acetic anhydride or dried oxalic acid, yields methoethenylbenzene $C_6H_5.C(CH_3):CH_2$, which, after fractional separation and rectification over sodium, is a liquid boiling at 160°—162° C., and having a density of 0·9231 at 0° C. On hydrogenation it yields isopropylbenzene. It cannot be oxidised to a glycol by aqueous potassium permanganate, which destroys it, forming acetophenone and formic and acetic acids. It forms a dibromide (b. pt. 115° C. at 8 mm.), which does not yield a diacetin with potassium acetate (yielding the unsaturated compound C_9H_9Br), but which can be converted into a glycol by long boiling with water in which barium carbonate is suspended. The glycol melts at 37°—38° C., and when heated with sulphuric acid yields phenyl-α-propanal, $C_6H_5.CH(CH_3).CHO$.

Methoethenylbenzene in alcoholic solution yields, with mercuric oxide and iodine an iodhydrin, which silver nitrate converts into phenylacetone (b. pt. 213°—214° C.). This molecular migration is exactly opposite to that of propenyl-benzene, which by similar treatment is converted into phenyl-α-propanal—

$$C_6H_5.C(CH_3):CH_2 \rightarrow C_6H_5.CH_2.CO.CH_3$$
$$C_6H_5.CH:CH.CH_3 \rightarrow C_6H_5.CH(CH_3).CHO.$$

—J. T. D.

Fats; Decomposition of ——, by Micro-organisms. K. Schreiber. Arch. Hyg., **41**, 328—347. Chem. Centr., 1902, **1**, [16], 945.

Sweet almond oil was used in all the experiments. The pure fat alone proved not to be a nutrient medium for micro-organisms. A number of bacteria were capable, in presence of nutrient material and oxygen, not only of simply decomposing the fat into its primary elements, glycerin and fatty acid, but of the more entire decomposition involving these latter constituents themselves, especially if calcium carbonate were present to combine with the acids formed. The decomposition proceeds most rapidly if the fat is in a finely-divided condition (emulsion). External circumstances that affect the growth of the bacteria (temperature, deficiency of oxygen, illumination), also influence in the same way, their activity. A series of mould fungi also possessed the powers referred to, and the acid reaction of the nutrient substratum had no disturbing influence on the energy of the decomposition. The fat-decomposing activity of these micro-organisms is connected with their life-process.

The decomposition of fat by bacteria and mould fungi is an aërobic process. Under anaërobic conditions, there is, at the most, a slight primary decomposition of the fat, but no more thorough going secondary decomposition.—A. S.

Methylglucosides; Acetyl Derivatives of the Two ——. J. Moll van Charante. Rec. trav. chim. Pays-Bas, **21**, 42—44. Chem. Centr., 1902, **1**, [17], 988.

Tetra-acetyl-α-methylglucoside, which has been previously described by Koenigs and Knorr (this Journal, 1901, 626), crystallises from benzene with 1 molecule of benzene of crystallisation, which it loses on exposure to the air; tetra-acetyl-β-methylglucoside under the same conditions does not retain any benzene. The α-compound, freed from benzene, gives, in absolute alcoholic solution, $[\alpha]_D^{20} = +137° 17'$, but in benzene solution, $[\alpha]_D^{20} = +137° 17'$; the β-compound gives $[\alpha]_D^{20} = -27° 20'$.

—A. S.

Toxic Intensity; Variations in ——, of Substances, according to the Groupings with which they are united in their Soluble Compounds. M. Laffont. Comptes Rend., **134**, [15], 861—863.

The modifications produced in the action of drugs by union of the fundamental nucleus with various atomic groupings have not hitherto been studied, and the author has begun the examination of the subject. His results up to the present are as follows:—

Arsenic.—Cacodylic acid, derived from arsenic acid by the substitution of methyl for two of the hydroxyl groups, is much less poisonous than arsenic acid. The monomethyl-arsenic acid of Gautier is more poisonous than cacodylic acid, according to the author's experiments, in the proportion of five to one.

Aromatic Compounds.—The phenols are much more poisonous than the corresponding hydrocarbons. The substitution of methyl for hydrogen in the nucleus does not modify the poisonous action of the phenol; but if the nuclear substituent be the methoxy-group, the toxic character of the phenol is lessened. The poisonous action, not only of the hydrocarbon, but also of the phenol, is greatly reduced, and in some cases altogether neutralised or destroyed, by the introduction of the sulphonic group SO_3H.

—J. T. D.

Maize Pith and Elder Pith; Constituents of ——, and the Simultaneous Occurrence of Araban and Xylan in Plants. C. A. Browne, jun., and B. Tollens. Ber., 1902, **35**, [8], 1457—1467.

Elder pith and maize pith consist of lignified tissues containing no starch or free cellulose, but small quantities of a substance which reduces Fehling's solution. Analysis gave the following results:—

——	Elder Pith.	Maize Pith.
	Per Cent.	Per Cent.
Moisture	11·28	9·81
Crude fibre	61·26	38·24
Ash	1·71	4·04
Fat	1·06	1·26
Protein	2·22	2·99
Non-nitrogenous extractive matter	22·47	43·66
Yield of furfural on dry substance	10·76—11·02	14·35—15·87
Yield of cellulose by the bisulphite process.	72·72	45·45
(giving furfural on distillation	7·20	6·18)
Yield of cellulose by the chlorination process.	41·96	39·93
(giving furfural on distillation	5·39	5·53)

Neither of the cellulose preparations showed any lignone reaction with phloroglucin. The maize pith contained about one quarter of its weight as vascular bundles, which contained rather more fat and protein than the ground tissue. Both piths were hydrolysed by long boiling with dilute sulphuric acid; from the products of hydrolysis were obtained gummy matters precipitated by alcohol, consisting of galactan and pentosan, and sugars from which both xylose and arabinose were isolated. On extraction with 5 per cent. caustic soda, and precipitation with alcohol, the wood gums were isolated. Maize pith yielded 17·4 per cent. of gum, containing 4·16 per cent. of ash and 60·72 per cent. of pentosans (xylose and arabinose); in alkaline solution it showed $[\alpha]_D = -68·8°$. Elder pith yielded 5·7 per cent. of gum, containing 15·5 per cent. of ash and 55·93 per cent. of pentosans, it showed $[\alpha]_D = -36·8$. Further experiments of the authors showed that beech wood gum contains besides xylan probably a little araban, and that cherry-wood gum contains besides araban a little xylan. So that these substances are to be included with brewers' grains, and perhaps wheat bran in the class of product which contain both kinds of pentosan simultaneously.

—J. F. B.

English Patent.

Tobacco and the Products thereof; Process for Improving ——. C. Reimann, Hamburg, Germany. Eng. Pat. 5387, March 4, 1902.

The process claimed consists in subjecting the tobacco, the raw or worked-up condition, to the action of the vapou

given off by wine or ordinary vinegar mixed with from "one to three thousandths" of camphor. The treatment is carried out at the ordinary temperature, and the time required varies with the quality and nature of the leaf.

—W. P. S.

New Books.

Technisch-Chemisches Jahrbuch, 1899. Ein Bericht über die Fortschritte auf dem Gebiete der chemischen Technologie. Herausgegeben von Dr. Rudolf Biedermann. Jahrgang 22. Mit 164 in den Text gedruckten Abbildungen. Friedrich Vieweg und Sohn, Braunschweig, Germany. 1902. Price M. 15.

This year book of Chemical Technology takes the form of an 870 volume, bound in cloth, and containing, besides the table of contents and list of journals utilised, subject-matter covering 463 pages, list of New Books on Physics, Chemistry, Chemical Technology, Mineralogy, and Geology, &c., covering 7 pages, and closing with indexes of subject-matter and authors, and a register of German patents duly classified. These are so arranged under their appropriate headings, and so paged, that the abstracts to which they relate may be easily found and turned up in the text. The subjects treated of are:—I. Iron. II. Aluminium. III. The Noble Metals. IV. Copper, Zinc, and Lead. V. Nickel and Cobalt. VI. Various Metals. VII. Sulphuric Acid. VIII. The Alkali Industry. IX. Electro-chemistry. X. Ammonia and Cyanogen Compounds. XI. Alkaline Earths, Alumina, &c., and Calcium Carbide. XII. Gases. XIII. Phosphorus. XIV. Glass. XV. Earthenware. XVI. Cement and Artificial Stone. XVII. Explosives, &c. XVIII. Illuminants. XIX. Fuels, &c. XX. Sugar. XXI. Starch, Dextrin, and Starch Sugar. XXII. Fermentation Industries. XXIII. Fats, Soaps, Ethereal Oils, and Resins. XXIV. Organic Acids, &c. XXV. Organic Bases. XXVI. Dyestuffs. XXVII. Textiles, Bleaching, and Dyeing. XXVIII. Paper, &c. XXIX. Photography. XXX. Tanning and Glue. XXXI. Water. XXXII. Foodstuffs. XXXIII. Manures, &c., and Disinfection.

Handbuch der anorganischen Chemie. Herausgegeben von Dr. O. Dammer. IV. Band. Die Fortschritte der anorganischen Chemie in den Jahren 1892—1902. Bearbeitet von den Herren Baur, Richard Meyer, Muthmann, Nass, Nernst, Rothmund, Stritar und Zeisel. Lieferung 1. Ferdinand Enke's Verlag, Stuttgart, Germany. 1902. Price M. 4.

This forms Part I. of Vol. IV. of Dammer's Handbook of Inorganic Chemistry, and runs from page 1 to page 160. It commences a continuation of Dammer's Handbuch, noticed in this Journal, 1894, 1231, and which extended to Vol. III. The section treated of in this and certain succeeding numbers, *viz.*, that of Physical and Theoretical Chemistry, is under the care of Dr. V. Rothmund, with the co-operation of Prof. W. Nernst.

Die Elektrolyse des Wassers, ihre Durchführung und Anwendung. Von Viktor Engelhardt. Wien. Wilhelm Knapp's Verlag, Halle a. S., Germany. 1902. Price M. 5.

8vo volume. One of a series of monographs on Applied Electro-chemistry, this forming volume I., and containing 5 tables, and being illustrated with 90 engravings. The volume contains 114 pages of subject-matter, besides preface, table of contents, and index of authors, &c. The subjects treated of in these pages are as follows:—I. Historic Review. II. Constants of Electrolytic Water decomposition. III. Review of the Processes of Water Electrolysis. IV. Applications and Uses.

The processes of Water Electrolysis are treated under two heads:—A. Processes and Apparatus for the Preparation of Oxygen and Hydrogen, obtained separately. B. Processes and Apparatus for the Electrolysis of Water without separation of the Gases.

Handbook of Technical Gas Analysis. By Clemens Winkler, Ph.D., Professor of Chemistry at the Freiberg Mining Academy. Second English Edition, translated from the Third, greatly enlarged German Edition, with some additions, by George Lunge, Ph.D., Professor of Technical Chemistry at the Federal Polytechnic School, Zürich. Gurney and Jackson, 1, Paternoster Row, London, E.C. 1902. Price 10*s.* 6*d.*

8vo volume, containing translator's prefaces to the first and second editions, table of contents, introduction, and subject-matter occupying 170 pages; an appendix of 15 pages follows, and then the alphabetical index. The work is illustrated with 81 engravings. The following subjects are dealt with in the text:—I. Taking Samples of Gases. II. Measurement of Gases: (i.) Direct Volumetric Estimation. (ii.) Estimation by Titration. (iii.) Gravimetric Estimation. (iv.) Arrangement and Fittings of the Laboratory. III. Apparatus and Methods for carrying out the Analysis of Gases: (i.) Estimation of Solid and Liquid Admixtures. (ii.) Estimation of Gases by Absorption. (iii.) Estimation of Gases by Combustion.

Manual of Agricultural Chemistry. By Herbert Ingle, Lecturer on Agricultural Chemistry, the Yorkshire College, Leeds, &c. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1902. Price 7*s.* 6*d.* nett.

This work contains preface, table of contents, and subject-matter covering 381 pages. An appendix of eight pages then follows, and the alphabetical index. There are eleven illustrations. The author states in his preface that the matter is mainly based upon lectures annually delivered to his classes in the Yorkshire College. The general scheme of the work will be gathered from an outline of the subjects treated of in the chapters:—I. Introduction. II. The Atmosphere. III. The Soil. IV. Reactions occurring in Soils. V. Analysis of Soils. VI. Natural Manures. VII. Manures. VIII. Analysis of Manures. IX. Constituents of Plants. X. The Plant. XI. Crops. XII. The Animal. XIII. Foods and Feeding. XIV. Milk and Milk Products. XV. Analysis of Milk and Milk Products. XVI. Miscellaneous Products used in Agriculture.

Trade Report.

I.—GENERAL.

Mineral Production of Germany.

Eng. and Mining J., April 19, 1902.

The advance statement of the Imperial Statistical Bureau for 1901 has been published. The most important production is that of coal, the others follow in separate tables.

The production of other minerals is given below, in metric tons:—

Mineral.	1900.	1901.
Iron ore	18,964,294	16,570,258
Zinc ore	639,215	647,496
Lead ore	148,257	153,340
Copper ore	747,749	777,339
Gold and silver ore	12,593	11,576
Cobalt, nickel, and bismuth ores	4,495	10,479
Manganese ore	59,204	56,691
Pyrites	169,447	157,420
Asphalt	89,685	90,193
Petroleum	50,375	44,095
Rock salt	926,563	985,919
Kainit	1,227,873	1,500,748
Other potash salts	1,822,758	2,036,326

The principal features were the decrease of 12·6 per cent. in the production of iron ore, and the increase of 16 per cent. in that of potash salts.

The products of reduction works for the year are stated as follows, in metric tons :—

	1900.	1901.
Copper, fine ds ...	30,929	31,376
Copper matte, &c.	4,267	305
Zinc	155,790	166,283
Lead, pigs, bars, &c.	121,513	123,098
Litharge	3,088	4,101
Pig iron	8,494,852	7,835,204

The production of refined common salt and of other salts, in refined or commercial form, is reported below, in metric tons :—

	1900.	1901.
Salt, common	587,464	578,761
Potassium chloride	271,511	282,750
Glauber salts	90,468	76,005
Potassium sulphate	20,853	37,394
Potassium-magnesium sulphate	15,338	14,285
Magnesium sulphate	48,791	46,714
Aluminium sulphate	14,372	16,807

The increases in these salts were very much less than that in the crude kainit and other salts mined, a result due to the control of the business by a syndicate, which limits the quantity sold.

Drugs and Chemicals: Changes in Australian Tariff.

U.S. Cons. Reps., April 18, 1902.

A list of recent amendments made by the House of Representatives to Australian Customs duties contains the following :—

Article.	Previous Proposal.	New Duty.
Division IX.		
Insecticides	15 per cent.	Free.
Medicines, viz., patent and proprietory medicines and other medicinal compounds.	25 per cent. *ad val.*	15 per cent. *ad val.*

II.—FUEL, Etc.

Peat Briquettes in Germany.

Imp. Inst. J., May, 1902.

A briquette process for peat has been developed in Germany, and is being exploited. In this process, a portable centrifugal pump dredger is used to excavate the peat from the bog, rotary cutters being used on the suction pipe, so that the peat is reduced to a pulp. This pulp, with about fifteen times its volume of water, is then carried by a pipe line to the briquetting factory. The pump's suction is so protected that stones and roots cannot enter, and sand and clay fall to the bottom of the bog. At the peat factory the peat pulp is delivered into a vat, from which it passes to a centrifugal separator, which extracts the bulk of water. The peat then passes to a cylinder press, which operates on a principle similar to that of a paper-making machine. Here the peat becomes a thin sheet which is carried by belt conveyors to drying cylinders. These reduce the moisture to 15 or 30 per cent., an amount sufficient for briquetting. The peat, now a hot powder, is automatically fed to the briquetting machine, and is submitted to a pressure of about 2,000 atmospheres. The bituminous parts of the peat act as a cement, and the product is hard coal-like clean briquette. Analyses of these briquettes show, in percentage—carbon, 52·5; hydrogen, 4·8; oxygen, 22·1; ash, 9·0; water, 11·6. This corresponds in heating value to 4,850 calories per kilo., as compared with 5,500 calories for ordinary coal, and 3,000 for wood. By carbonising the peat to a greater degree, the heating value may be increased. One metric ton of these briquettes, in Germany, is said to cost 5*s.* to 7*s.* to produce, according to the size of the plant. A plant for producing 50 tons per day is said to cost 16,000*l.*

Blast-Furnace Gases in Austria.

Eng. and Mining J., April 26, 1902.

The first plant for the utilisation of blast-furnace gases in Austria has been installed at the Königshof furnace of the Mining Company of Bohemia. The plant consists of a gas-engine of 300 h.p., of the Delamarre-Debouteville type, like those used at the Cockerill works at Seraing, Belgium.

The gas used has a heating power of 800 calories to the cubic metre. Its analysis shows 13 per cent. of carbon dioxide, 25·1 per cent. of carbon monoxide, 1·9 per cent. of hydrogen, and 60 per cent. of nitrogen. The gas shows, after passing the cleaners, only 0·6 grm. of dust to the cubic metre, an amount so small that it has caused no trouble in the engines.

In addition to this engine, which operates the electric plant, the Königshof furnace has a blowing engine run by blast-furnace gas. This engine is of the Cockerill type.

The blast furnaces at Kladno have under construction two gas-engines of 300 h.p. each. They will be used to run an electric plant.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Trade of Russia.

U.S. Cons. Reps., April 10, 1902.

Production of Crude Oil in the Baku Fields.—The total production of the Baku wells, in 1901, amounted to nearly 222,000 barrels per day, a net increase of about 21,500 barrels, as compared with 1900; but some 67,000 barrels were derived from the newly-drilled Government lands. As regards the number of wells, 603 were being drilled at the commencement of the year, 282 were started, and 358 completed, the average depth of the latter being 1,086 ft., and the initial production of each, 330 barrels per diem; whereas the average of the 448 wells completed, in 1900, was 999 ft., and the production 304 barrels. An increase of nearly 10,000 barrels per day was recorded from flowing wells, and this increase was greatest in the Balakhani-Sabunchi district. The amount raised from pumping wells declined from an average of over 197,000 barrels a day in July, to a minimum of 180,600 barrels in December, this being attributed to the increased production of flowing wells, and the consequent disinclination of owners to go on incurring the expense of pumping. It is to this circumstance also that the comparatively small increase in the recorded number of producing wells is due, the figures being given as 1,354, as against 1,306 in 1900. The deepest well in the Bibi-Eibat field is 1,813 ft. deep, and is finished with 14-in. pipe; whilst the Romani well is 1,811 ft. deep, and finished with 11¼-in. pipe.

The cost of sinking is high, averaging about 6,000*l.*, of which 2,000*l.* represents the cost of drilling (a 1,500-ft. well). On this basis, and allowing about 900*l.* per annum for the pumping and repairs, the owner of an average well producing 477,000 poods, must obtain 5 kopecks per pood (2½*d.* per 36 lb.) for the crude oil in order to pay expenses.

The method of raising oil by compressed air has given different results in different hands; but as the cost of installation is high and the price of crude oil is low there is little inducement to increase the output by this means.

The number of owners of producing wells was 154, the output of each ranging from a minimum of 360 barrels to a maximum of a little under ten million barrels. There was practically nothing accomplished in the search for new territory during the year.

Price of Crude Oil at Wells.—The price fell continuously from 11·42 kopecks in January, to 5·875 kopecks per pood in December, the average for the whole year being 8·25 kopecks. This fall has continued in the present year, sales having been made at 3¾ kopecks at

bi-Eibat wells, and at 4 kopecks in the other districts, the rmer oil being slightly inferior for residuum and more pensive to convey to the refineries, in the absence of a pe line from the wells.

The depression in the Baku oil trade appears to be due lack of capital, operators having gone out of their pth in putting down new wells after the recent profitable ars, and being now at the mercy of the foreign con-mers, the parties controlling the foreign trade in refined , and the consumers of liquid fuel in Russia. It is con-lered that the proposed appeal to the Government to ver the royalty to lessees would merely lead to a further crease in production and depression of values.

Refining.—Prices also fell continuously from 11·07 pecks per pood on vessels (20·58 on cars) in January, a minimum of 7 kopecks (and 8·75) in September, and osed for the year at 7·75 and 9·37 kopecks respectively, e average being 8·77 and 12·13 kopecks. Since the st of refined oil (on the above-mentioned price of ude) averaged 15·51 kopecks, whilst the average sale ice was only 11·7 kopecks, there was evidently a con-erable loss. In the present year prices have gone still ver, sales having recently been made at 6½ kopecks in nk cars; and it has been reported that an offer to supply nned for the whole season of Volga navigation at kopecks found no takers. It is proposed to appeal to the vernment to reduce the excise tax on refined oil for me consumption, and to allow a rebate in the Batoum ight on exported oil.

Residuum.—Some 262,000,000 galls. more residuum were oduced at Baku than in 1900; but since, on account of vigation difficulties, 215,000,000 galls. were detained at e mouth of the Volga, the actual stock at the end of the ar attained 582,000,000 galls., instead of 367,000,000 lls. the previous year. By the time the Volga navigation resumed, the stock will probably be 1,250,000,000 galls., practically the same amount as the total consumption ring last year. As, however, the price is declining—the erage rate for the year being 8·87 kopecks per pood, as mpared with 17·7 kopecks in 1900—a material increase the demand may be anticipated. Sales have even been orted as low as 5 and 4½ kopecks, though 7½ kopecks ve been paid for forward contracts without any advance cash by the buyer.

Transportation.—No additions were made to the railway pipe-line capacity during the year, but the Mikhailovo-toum pipe-line was at work all the time instead of seven nths, as in the preceding year. There seems no doubt t that the construction of a pipe line from Baku to toum will be decided upon, but how long it will take not be estimated. The existing line delivered 55,000,000 ods last year, and with the extension to Ag-Taglia the al capacity of the transport arrangements to Batoum will obably reach 75,000,000 poods, as compared with ,000,000 million poods last year. Shipments to Novo-sisk declined during the year, and a reduction of freight s granted by the railway company, so that the rates are w only 2—3 kopecks higher than to Batoum, instead of -6 kopecks.

Grosny Field.—The daily average piped from the wells s 11,482 barrels, the total production for the year being 90,918 barrels, as compared with 3,658,924 barrels, 1900. There were 99 producing wells, 27 standing idle, in course of drilling, 13 under repair and deepening, d 10 derricks ready to drill. Thirty-three wells were npleted during the year, but the number of produc-r wells only increased by six. The price of crude oil the wells was 8 kopecks at the end of the year, which es producers an advantage of 3—4 kopecks over ku oil for the nearer centres of consumption. In the sent year prices have declined to about the same level at Baku. Three refineries are at work, and one is lding, but owing to the high specific gravity of the crude, more than 8—10 per cent. of illuminating distillate can recovered without destroying the value of the residuum fuel. Consequently, the output of illuminating oil is small to have any influence in the world's markets.

—C. S.

Petroleum at Grosny (Russia).

Foreign Office Annual Series, No. 2782.

The method at Grosny for refining petroleum differs from that in practice at Baku, because the Grosny crude oil contains a large proportion of benzine, and the density of its residues renders it unsuitable for the manufacture of kerosene. It is better adapted for the production of benzine, but this is hampered by the difficulties of transporting quantities of benzine in tank cars.

The utilisation of another product of Grosny petroleum, *viz.*, "ligroin," also does not appear to be easy. As a distillate of petroleum of a specific gravity that exceeds 0·730, this product is taxed by the Excise Department with a duty equivalent to the rate levied on illuminating oils, and cannot be shipped away. Benzine residues were used as fuel, and it is only within the last two years that modifications have enabled the refineries to use ligroïn for the manufacture of a special type of light kerosene, which resembles American. But this process only utilises about 25 per cent. of the benzine residues. The question as to what is to become of this excess of ligroïn will probably come before the next Congress of petroleum producers. Grosny petroleum also has residues of high specific gravity, so that when it is being refined, some kerosene has to be retained in the petroleum in order that a large accumulation of residues, which have a deteriorating effect on the quality, may be avoided. Grosny petroleum yields 20 per cent. of kerosene, but producers only refine from 10 to 15 per cent. To increase the yield of kerosene, and to improve the quality of residues, it was proposed to refine the raw material until 20 per cent. of kerosene was obtained, then again to separate 25 per cent. of the heavy residues which remain, and to further refine until 15 per cent. of the distillate is obtained, and to add the last-mentioned 15 per cent. to the 75 per cent. of mazut, thus reducing its specific gravity. By this process of refining, the substance which remains is of a tarry nature, and is adaptable for the manufacture of asphalt or patent fuel. How Grosny naphtha should be distilled, and the best appliances therefor, still remains open.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Crop in Bengal.

Indian Planters' Gazette, Dec. 21, 1901 (through Leipz. Färb. und Zeugdrucker-Zeit.).

The final report of the Bengal Board of Agriculture describes the indigo crop of 1901 as unfavourable. The area under cultivation, which, in the preceding year, amounted to 360,000 acres, has diminished. This decrease must be attributed to the unsatisfactory prospects of indigo planting at the present time, owing to the competition in European markets with the synthetic product. In the five districts of North Behar the crop is calculated to amount to 78 per cent. of the normal quantity; in the remaining districts, 86 per cent. In Purnea, the yield is reckoned to be 110 per cent.; in Malda, 94 per cent.; in Nadia, 77 per cent.; in Murshidabad, 86 per cent.; and in Bhagalphur, 76 per cent. of the normal. The total yield of indigo in the districts of North Behar is estimated at 48,756 factory maunds, against a yield of 60,942 maunds, in the previous year. A factory maund is, roughly, equal to 75 lb. The total yield in all provinces is estimated at 70,600 factory maunds, or 5,295,000 lb.—H. L.

VII.—ACIDS, ALKALIS, Etc.

Chemical Industries at Gijón (Spain).

Foreign Office Annual Series, No. 2771.

Sulphate of ammonia appears in the export list for the first time, 222 tons being shipped to France.

A factory has been established for making celluloid and refining camphor.

A paint factory has been established also.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Clay-working Industries of France.

U.S. Cons. Reps., April 11, 1902.

Roofing Tiles.—Round tiles, of length 15—20 inches, and greatest width 7—8½ inches, are much used in southern Europe, and though heavy, preserve the building from too great heat. Tiles are coloured black, generally by immersion in tar at 50°—60° C., or by colouring the clay with oxide of manganese, or by baking the tiles in the presence of finely-divided carbon. Particular care is taken to prevent warping during baking, which is preferably effected by gas, on account of the easy regulation of temperature, and absence of ash. The value of Angers machine-cut roofing tiles is quoted at 52 francs per 1,000.

Porcelain.—Sèvres is a soft vitreous porcelain. Since 1884, the glass composition for this has contained:—silica 77 per cent.; lime 10·3 per cent.; potash 5 per cent., and soda 7·7 per cent. It is then combined with the following clay, sand of Fontainebleu, 49·02 per cent.; glass, 27·45 per cent.; lime 16·66 per cent.; and Dreux clay 6·86 per cent. After baking, the composition becomes, silica 80·31 per cent.; alumina 2·62 per cent.; potash 13·27 per cent.; lime, 1·5 per cent.; and soda, 2·3 per cent.; and takes decoration better than hard porcelain. The latter is manufactured chiefly in Haute-Vienne and Cher, and also in several European countries, China, Japan, and the United States, but not in England. The clay for "fire-porcelains" is less siliceous, and more aluminous than that generally used for hard porcelains

French Faïence.—The fine products are made of pure white clay, kaolin, sand, and flint, the commoner varieties of marly sands, loamy clays, &c. In the former, boric acid is used to a considerable extent, and in the latter, oxide of tin, which gives an enamel like opacity to the glazes, and hides the red colours of inferior clays.

Brick.—At the present time, at Marseilles, blocks perforated lengthways are made, which are said to be not only much lighter than solid bricks, but equally strong, durable and cheap, less expensive to ship, and to afford protection against wet, heat, and cold. It is claimed that the uniform hardness obtained renders them less liable to break, and capable of withstanding steady pressure. Not only do they require less clay and fuel in the manufacture, but less mortar and time to lay. As a rule the bricks are dried naturally, and artificially, only in bad weather. The average price is 25 francs per 1,000 kilos., or 1,000 pieces.—W. C. H.

Portland Cement Imports of the United States.

Bd. of Trade J., May 1, 1902.

A report on Portland cement manufacture in the United States states that the quantity of cement imported into that country was as follows:—

Imports of Cement.

Countries.	1899.	1900.	1901.
	Barrels.	Barrels.	Barrels.
United Kingdom	199,633	267,921	37,391
Belgium	624,449	826,289	303,181
France	15,649	32,710	11,771
Germany	1,193,822	1,155,559	555,039
Other European countries	68,348	75,827	19,078
British North America	4,398	4,517	6,066
Other countries	2,389	23,869	6,808
Total	2,108,388	2,386,683	939,354

X.—METALLURGY.

Mineral Production of Gijón (Spain).

Foreign Office Annual Series, No. 2771.

The output of manganese ore, in 1901, was considerably increased, and 1,600 tons were shipped to the United Kingdom and Belgium.

The quantity of manufactured zinc exported showed a still further decrease, 2,270 tons being shipped to France, as against 2,525 tons, in 1900.

There was a slight increase in the quantity of copper ore shipped to the United Kingdom, the figures being 291 tons, in 1901, and 275 tons, in 1900.

A great falling off is noticed in the output of blende; only 530 tons were shipped to France in 1901, as against 1,700 tons in 1900.

The quantity of quicksilver mined, in 1901, was 12 tons, as against 23 tons, in 1900.

There was a considerable decrease in the output of arsenic sulphide; the figures were 29 tons in 1901, as against 45 tons in 1900.

Copper in Asiatic Turkey.

U.S. Cons. Reps., April 18, 1902.

The copper deposits at Arghana Maden, in the Taurus Mountains, are being steadily mined, and bring a revenue of over 26,000*l.* to the town. The methods of mining and smelting are of the crudest.

Copper and Lead Exports of Huelva (Spain).

Foreign Office Annual Series, No. 2780.

Nearly 2,000 tons of sulphate of copper went to France and Algiers alone, and a further 4,000 tons were produced locally for consumption in the Peninsula.

The most important feature of the year was the completion of the Rio Tinto Company's smelting and Bessemerising works, which are now producing blister copper in large quantities and of a high standard of purity.

Exports to the United Kingdom from the Port of Huelva during the Years 1900–1.

Articles.	Quantity.		
	1900.	1901.	
	Kilos.	Kilos.	Tons.
Cupreous pyrites	533,525,425	519,618,493	511,136
Copper precipitate	27,587,125	26,308,223	26,189
„ matte	19,555,080	15,520,040	15,177
„ sulphate	129,147	206,886	204
Iron pyrites	39,780,369	6,560,920	6,458
Lead ore	525,380	10,450	10

Antimony Sulphide; Duty on ——, in the United States.

U.S. Treasury Circular, April 7, 1902.

"Crude sulphide of antimony" was assessed for duty at 20 per cent. *ad val.*, as a non-enumerated manufactured article under section 6 of the Act of 1897. The importers protested, claiming the merchandise to be entitled to free entry under par. 476 of the same Act, which provides for "antimony, crude sulphite of."

The word "sulphite" in the Tariff has been found to be a misprint for the word "sulphide." It was therefore held to be entitled to free entry, as claimed by the importers in their protest.

Manganese Ore in the Caucasus.

Foreign Office Annual Series, No. 2782.

The exports from Batoum and Poti, during 1901, were 16,000 and 263,963 tons, respectively, showing a large decrease on the figures for 1900. The manganese fields in the district of Tchiaturi, which were estimated to contain 10,500,000 tons of ore, and were said to cover an area of over 44 sq. miles, now appear not to be so extensive as was supposed.

Mineral Production of Colorado.

Eng. and Mining J., April 19, 1902.

The report of the Commissioner of Mines of Colorado has been issued for the year 1901. The statement gives the

production of copper and lead as below, as compared with that for 1900 :—

Mineral.		1900.	1901.
Copper	Lb.	7,826,949	7,872,5 9
Lead	„	164,274,762	148,111,020

Zinc.—The mines of the State produced, in 1901, ores containing 26,843,731 lb. of zinc, the value of which, as metal, would be 1,095,224 dols. About 30 per cent. of these ores was shipped to smelters in the United States, and about 70 per cent. exported. Of the total, Lake County produced 88 per cent., and Mineral County, 7·7 per cent.

Manganese.—The production of manganiferous iron ores was wholly from Lake County, and aggregated 68,500 long tons, carrying 28 to 30 per cent. of manganese, 22 to 24 per cent. of iron, 3 to 4 per cent. of silica, 0·035 to 0·050 per cent. of phosphorus, 4 to 10 per cent. of water. About 65 per cent. of the output was shipped to the Illinois Steel Co., and 35 per cent. was used in Colorado for the manufacture of ferro-manganese and spiegeleisen. A large portion of the manganiferous iron ores shipped during the year was consumed as a flux by the silver-lead smelters, of which no account has been made.

Bismuth.—The bismuth ore production, for 1901, amounted to 637,200 lb., or 318·6 tons. Of this amount, Lake County produced 253·6 tons, carrying from 4 to 10 per cent. of bismuth; and Ouray County, 65 tons, carrying from 6 to 12 per cent. of bismuth. All this ore has associated gold and silver values, for which the producers were paid. The prices paid for the bismuth contents varied from 8 dols. to 15 dols. per unit. The demand for this metal appears to be limited, and the producers are little inclined to report or make public the detail of actual production and market conditions. As near as may be determined, the 318·6 tons produced yielded an average of 80 dols. per ton, or 25,488 dols., less deductions for transportation and treatment charges.

Tungsten.—Boulder County was practically the only producer of tungsten ore, during 1901. The production for the year aggregated 65 tons, carrying an average of 60 per cent. of tungstic acid. The average price received for the ore was 2·25 dols. per unit, 135 dols. per ton, or 8,775 dols. for total production, less cost of transportation and deductions for treatment.

XII.—FATS, FATTY OILS, AND SOAP.

Linseed Crop of Argentina.

Bd. of Trade J., May 1, 1902.

Reports from the Argentine Republic show that the linseed crop of the River Plate region will be considerably in excess of early predictions. Moderate estimates pointed to a crop of 8,000,000 bushels, but, basing figures on the shipments of the first four weeks of 1902, the opinion is becoming general that the crop will be 10,000,000, and, possibly, 12,000,000 bushels.

British Candles for Stettin (Germany).

Foreign Office Annual Series, No. 2774.

In *Der Seifenfabrikant*, it is observed that the better kinds of British candles are short, thick, and bulging, with broad compact-woven wicks, which illuminate very well. It is characteristic of the wick that, whilst giving a bright light, it burns only at the tip, not as most wicks, which burn inward from the candle edge, and bring about an unnecessarily fast melting of the candle's constituents. No such candles are to be had in the German market.

Candles giving but little light, and costing nearly double the price of good British candles, are largely manufactured and sold here. The import duty amounts to 17*s.* 8*d.* per 220 lb.

Sunflower Seed Oil in the Caucasus (Russia).

Foreign Office Annual Series, No. 2782.

The cultivation of the sunflower for the manufacture of oilcake has now been extensively adopted. The industry, which is remunerative, is rapidly increasing, and promises to still further develop. It is claimed that the sale of the oil-cake covers the working expenditure. The stalks are used as fuel, and the ash that remains gives 25 to 30 per cent. of potash. The sunflower gives the following results :—

	Per Cent.
Oil	25
Oil-cake	40
Stalk	37

XIII. C.—INDIA-RUBBER, Etc.

Gutta-Percha and Rubber in German New Guinea.

U.S. Cons. Reps., April 17, 1902.

Two years ago, the German Colonial Society offered a prize of 3,000 marks for the finding of a plant in the German colonies furnishing gutta-percha suitable for cable purposes. A telegram from German New Guinea says that gutta-percha and rubber have been found in large quantities.

XV.—MANURES, Etc.

Sulphate of Ammonia in Spain.

Foreign Office Annual Series, No. 2780.

A new industry was started a few years ago to utilise the ammoniacal liquor from the gasworks of Cadiz, by making liquid ammonia and sulphate of ammonia from it. The increasing demand is shown by the following figures :—

Year.	Liquid Ammonia.	Sulphate of Ammonia.
	Tons.	Tons.
1897	54	Nil.
1898	45	58
1899	44	72
1900	44	76
1901	50	80

The liquid ammonia is principally consumed in the sherry district, where it is used for preparing casks by the "Ivison" process, whilst sulphate of ammonia is sold in the beet-growing districts.

Few gasworks in Spain dispose of ammoniacal liquor for use. The consequence of this waste, which is due more especially to the difficulty of transport and to the scarcity of sulphuric acid, is that, whereas some 30,000 tons of liquid ammonia and sulphate of ammonia are annually consumed in Spain, not more than about 3,000 tons, or one-tenth of the whole quantity, are produced in the country itself.

A few years ago all the chemical manures that were imported into Spain came from the United Kingdom, but now the greater part comes from Germany, and the quantity imported from the United Kingdom is smaller every year.

Fertilisers in the Leeward Islands (B.W.I.).

U.S. Cons. Reps., April 19, 1902.

These islands being of volcanic origin, the soil is largely composed of decomposed volcanic rock, which still contains a large store of phosphate of potash.

As a result of experiments conducted during the season 1899—1900, it was evident that during a dry season, the application of (1) sulphate of ammonia and (2) nitrate of soda to plant canes gave small gains, not enough to prove remunerative. These experiments were repeated with "rattoon" canes on the same plots, during the season 1900–1 with very satisfactory results.

With rattoon canes the preference was for sulphate of ammonia as the most useful form of nitrogen. No great gain resulted from the use of very large applications.

In the plant canes it was found that the application of phosphates generally reduced the yield.

Phosphates of the Somme (France).

Foreign Office Annual Series, No. 2768.

The principal deposits of phosphatic chalk and other phosphates are in the Department of the Somme, localities

named being Beauquesne, Marcheville, Damqueur, Airaines, Doullens, Eclusier-Vaux, Hardicourt-au-Bois, Templeux-la-Fosse, Terrasnesnil, Templeux-le-Guèrard, and Roisel, whilst in the Department of the Pas-de-Calais, only Orville, Ferques, and Fiennes are mentioned. Several cargoes of phosphates went to British ports, in 1901, including a shipment of 1,500 tons of "rock phosphate" to Middlesbrough."

Fertilisers in Lombardy (Italy).

Foreign Office Annual Series, No. 2773.

The use of chemical fertilisers continues to extend, but of superphosphates alone the annual production of this country has reached nearly 500,000 tons, which is excessive as compared with the consumption. A crisis has naturally occurred, and still continues, as a project for forming a syndicate for regulating the production and sale price fell through, owing to the refusal of a certain number of firms to join.

XVI.—SUGAR, STARCH, Etc.

Sugar Refined in Japan: Import Duty on ——.

Bd. of Trade J., May 8, 1902.

The following is the translation of a Japanese law relating to the return of the import duty paid on certain kinds of raw sugar, when afterwards refined in Japan.

Art. 1. Manufacturers of refined or rock-candy sugar from imported raw sugar of or below No. 14 (Dutch standard) in colour, may, with the consent of the Government, apply to the Government for the grant of a sum equivalent to the amount of duty paid on the imported raw sugar. Such application may not be made after the lapse of a year from the date of importation.

Art. 2. Applicants for the return of duty, in accordance with the preceding Article, must attach to their application documentary proofs of the payment of import duty.

Art. 3. This law shall come into force on October 1, 1902, and from that date shall apply to unrefined sugar upon which import duty has been charged.

Art. 4. This law shall remain in force till March 31, 1907.

Sugar for Home Consumption in Russia.

According to the official *Commercial and Industrial Gazette*, the Minister of Finance, after placing on the home market of Russia, on April 12, without payment of the additional excise, 2,000,000 pouds of sugar over and above the quantity fixed by the Ministerial Ordinance of March 1, finds that the price of sugar, instead of falling, rose above the fixed limit of price (4 roubles 50 copecks per poud), and has authorised the issue on the market of a further 2,000,000 pouds of sugar, to be taken from the disposable stocks. (See also this Journal, 1902, 512.)

Sugar-beet Refuse in the United States.

Chem. and Druggist, May 10, 1902.

It is intended to erect a factory at Saginaw, Mich., for the purpose of manufacturing syrup, acetic acid, and vinegar from the refuse molasses of sugar-beet, and a company has been organised with a capital of 150,000 dols. The promoter has been making an investigation with sugar-beets for years, and has found that an excellent grade of vinegar can be made from them.

Beet Sugar in Italy.

Foreign Office Annual Series, No. 2773.

In 1898, the factories engaged in this industry were only four, with a production of about 3,830 tons, whilst in 1901, their number had risen to 33, with an estimated production of about 73,660 tons.

The cultivators of beet are said, in certain cases, to have made more than 12*l.* per acre, but it appears that the beet grown in those districts where it does best as regards quantity is seriously deficient in saccharine matter as compared with that of France and Germany. If the agriculturists do not speedily succeed in remedying this defect by improved methods of cultivation, the factories in this country, placed at a disadvantage as they are by the larger quantities of raw material they are obliged to treat in order to obtain the same quantity of sugar, will not be able to hold their own against their foreign rivals at the present price of the roots. In fact, the necessity for reducing the output, in consequence of the recent fall in the price of foreign sugar, is already being discussed, and if this measure had to be adopted, it would be a serious blow to an industry which is still young and struggling.

XVII.—BREWING, WINES, SPIRITS, Etc.

Excise Duty on Spirits in Natal.

Bd. of Trade J., May 8, 1902.

The "Excise Act, 1901" (No. 33 of 1901), which came into force on the 1st Jan. 1902, consolidates and amends the laws relating to the manufacture, storage, conveyance, and sale of colonial spirits and wines, and the denaturing of spirits.

Inter alia, it provides that:—

There shall be levied and paid for every gallon of spirits made in Natal, not exceeding the strength of proof by Sykes' hydrometer, a duty of 7*s.* 6*d.*, and so in proportion for any greater or less strength.

[A rebate of duty may be granted on rectified spirits of wine, made from spirits distilled in the colony, and used by chemists or druggists in the preparation of medicines, perfumery, and non-potable articles.]

Methylated spirits, made under the provisions of this Act from colonial spirits, are exempt from duty.

Licenses are required to be obtained to keep or make stills, distil, rectify, or compound spirits, sell methylated spirits by retail, and make wine.

XVIII. A.—FOODS.

Preserved Articles of Food in the United States.

Bd. of Trade J., May 1, 1902.

A circular issued by the United States Treasury Department, lays down the following regulations with regard to preserved comestibles generally:—

(i.) In the examination of comestibles, the condition in which the goods are imported, not the condition into which they may be brought by subsequent treatment, is considered.

(ii.) Cherries and other fruits in brine are admissible to entry, if not containing sulphurous acid in quantities inimical to health, and provided that the sulphuration is carried out by processes recognised as legitimate by the United States Department of Agriculture.

(iii.) The importation of comestibles treated with salicylic or benzoic acid, or other preservatives, save common salt and sulphurous acid, is prohibited.

(iv.) Invoices of comestibles are to be accompanied by a certificate from the shipper, without which United States Consular officers will not authenticate invoices. (See also this Journal, 1902, 118.)

Milk Flour in Sweden.

U.S. Cons. Reps., April 23, 1902.

An application has been made to the office of the Governor-General in Stockholm for the incorporation of a company, to manufacture and sell Dr. Ekenberg's "exsiccators" and other apparatus for the manufacture of milk flour. The head office will be in Stockholm.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Mills in India.

Bd. of Trade J., May 8, 1902.

There are nine paper mills in operation in India—four in the Bombay Presidency, four in Bengal, and one at Lucknow. Most of the white and blue foolscap and much of the blotting paper, notepaper, and envelopes used in the Government offices is now obtained from the Indian mills.

The following table shows the progress of paper mills in India during the last five years :—

Year.	Number of Mills at Work.	Capital employed (as far as known).	Daily Average Number of Persons employed.	Production.	
				Quantity.	Value.
	No.	Rs.	No.	Lb.	Rs.
1897	8	62,72,000	3,532	38,581,703	56,82,161
1898	8	62,72,000	4,187	42,181,509	61,06,459
1899	8	67,72,000	4,436	44,428,440	62,40,908
1900	8	70,22,000	4,871	45,940,591	62,51,748
1901	9	73,20,000	4,978	46,713,125	65,83,724

XXII.—EXPLOSIVES, MATCHES, Etc.

Matches in Bavaria (Germany).

Foreign Office Annual Series, No. 2783.

After 1902, it will be illegal to employ white phosphorus in the manufacture of matches, and, after 1903, to offer matches manufactured for sale. The importation of white phosphorus is also prohibited after 1902.

Germany furnishes phosphorus, glue, paper, and zincnite for the manufacture of Bavarian matches; sulphur is chiefly imported from Italy.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 10,968. Norman. Separating substances of different specific gravities. May 9.

„ 10,724. Eltz. Apparatus for heating air or liquids to a constant temperature.* May 9.

„ 10,756. Gottwald. Steam superheaters in boilers. May 10.

„ 10,844. Herriot. Multiple effect apparatus for the concentration of liquids. May 12.

„ 10,937. Wilson. Piece of apparatus for showing the relation between volumes of certain reacting gases, and the volumes produced by these reactions. May 13.

„ 11,098. Evans. Improved strainer or filter. May 14.

„ 11,217. Von May. Cooling, heating, distilling, evaporating, and condensing apparatus. May 15.

„ 11,228. Gore and Courteen. Chambers for refrigerating purposes. May 16.

„ 11,350. Burdon. Apparatus for effecting the mixing of different substances, such as solids and fluids.* May 17.

[S.] 10,190 (1901). Strachan and Robertson. Storing and discharge of inflammable and volatile solutions. May 22.

„ 12,586 (1901). Soar. Filtering apparatus. May 22.

„ 12,694 (1901). Imray.—From Soc. Anon. Pour la Production et l'Emploi de la Vapeur Surchauffée. Method of and apparatus for generating and superheating steam. May 22.

[S.] 12,918 (1901). Joly. Compression, expansion, and liquefaction of air and other gases, and in cooling, ice-making, cold storage, and the like. May 22.

„ 14,327 (1901). Douglas and Conroy. Cooling or refrigerating apparatus. May 22.

„ 4786 (1902). Anderson. Centrifugal separators. May 14.

„ 7057 (1902). Hill. Air-compressing machines. May 14.

II.—FUEL, GAS, and LIGHT.

[A.] 10,268. Bartlett. Controlling and regulating devices for gas-lighting burners. May 5.

„ 10,269. Veritys, Ltd., and Ridings. Electric arc lamps. May 5.

„ 10,293. Darby. Method of making firelighters from bog turf or peat. May 5.

„ 10,358. Thomas and Podmore. Incandescent gas burners. May 5.

„ 10,417. Brookes.—From Stearns, United States. Apparatus for consuming smoke or gases, or collecting and destroying products of combustion, dust, and such like matters.* May 6.

„ 10,422. Josseaume. Apparatus for carbureting air. May 6.

„ 10,426. Robin. Manufacture of incandescent gas mantles, and apparatus therefor.* May 6.

„ 10,456. Scott-Snell. Bunsen burners. May 6.

„ 10,464. Johnson.—From Kobici. Atomisers for the injection of liquid fuel into furnaces. May 6.

„ 10,480. Fiddes. Apparatus used in gasworks for discharging coke from, and charging coal into, gas retorts. May 7.

„ 10,493. Price, sen., and Price, jun. Mixer and regulator of fuel to be used in explosive engines. May 7.

„ 10,539. Derval. Inclined gas retorts.* May 7.

„ 10,566. Russel and Willey. Acetylene gas lighting. May 8.

„ 10,581. Wynne. Electric lamps of the Nernst type. May 8.

„ 10,584. Nichols. Oil lamps. May 8.

„ 10,590. Sweetser. Incandescent electric lamps. May 8.

„ 10,601. Kierzkowski-Steuart. Improved apparatus for generating high velocity jets and for applying such jets to the production of motive power. May 8.

„ 10,608. Altman. Improved incandescent burner. May 8.

„ 10,632. Schauer. Improved igniting device for explosion engines.* May 8.

„ 10,712. Hooker. Methods and apparatus for incandescence gas or vapour lighting. May 9.

„ 10,730. McKinlay. Apparatus for drawing the charge from retorts used in the manufacture of gas. May 9.

„ 10,750. Postlethwaite. Lamps, burners, and stoves, for the better and safer consumption of paraffin or other hydro-carbon oils. May 10.

„ 10,757. Schönfelder and Stefan. Gas burners.* May 10.

„ 10,811. Carter. Rotary carbons for electric arc lamps. May 10.

„ 10,819. Courts. Smoke consuming apparatus for furnaces. May 12.

„ 10,840. Ryland. Gas burners especially adapted to incandescent gas lighting. May 12.

„ 10,865. Melhuish. Vaporizers of hydrocarbon engines. May 12.

„ 10,871. Higgins and Shaw. Production of combustible vapours for lighting, heating, and motive purposes. May 12

[A.] 10,876. Feld. Treatment of coal gas; or other gases, containing cyanogen, for the obtainment of soluble cyanides therefrom, and the preparation of materials for use in such treatment. May 12.

„ 10,881. Crook and Mines. Electric incandescent lamps with rare earth filaments. May 12.

„ 10,923. Hurst and Hurst. Method for use in connection with heat engines, of creating an inward flow of a fluid, or any admixture of fluids into a receptacle or receptacles. May 13.

„ 10,934. Andrews and Electrical Productions, Ltd. Arc lamps. May 13.

„ 10,946. Tatam. Method of separating the emulsion produced during the washing, scrubbing, and condensation of crude carburetted water gas into two fractions, viz. (*a*) tars and oils, and (*b*) water containing small quantities of tarry matter. May 13.

„ 10,951. Rew and Solari. Supply of gas to atmospheric burners of gas stoves and for other similar purposes. May 13.

„ 10,956. Lake.—From Lockwood, United States. Atomizers.* May 13.

„ 10,967. Lange. Improved fireplace for open chimneys, stoves, furnaces, and the like.* May 13.

„ 10,971. Le Tall.—From Brener, United States. Electric arc lamps. May 13.

„ 10,984. Watts. Portable incandescent lamps. May 13.

„ 11,042. Terrel. Manufacture of incandescent mantles. May 14.

„ 11,044. Girdlestone and Thorkelin. Electric arc lamps.* May 14.

„ 11,069. Sugg. Incandescent gas lighting. May 14.

„ 11,076. British Thomson-Houston Co., Ltd.—From Rice, jun., United States. Electric arc lamps.* May 14.

„ 11,078. British Thomson-Houston Co., Ltd.—From Fish, United States. Electric arc lamps.* May 14.

„ 11,093. Rainey. Carburetters. May 14.

„ 11,131. Bray. Acetylene burners. May 15.

„ 11,134. Eckstein and Angold. Electric arc lamps. May 15.

„ 11,139. Bellamy. Electrical igniters of gas and similar explosive vapour motors. May 15.

„ 11,152. Ehmann. Atmospheric gas burners. May 15.

„ 11,160. Kirby and Kirby. Electric arc lamps. May 15.

„ 11,191. Hooker. Incandescent gas or vapour burners. May 15.

„ 11,206. Engelhardt. Arc lamps. May 15.

„ 11,215. Weiss. Burners for incandescent gas light. May 15.

„ 11,220. Lecomte. New or improved oil lamp.* May 15.

„ 11,280. Schottmann. Incandescent mantles. May 16.

„ 11,284. Lenglez. Carburating apparatus for engines worked by hydrocarbons. May 16.

„ 11,293. Joy and Simms' Manufacturing Co., Ltd. Carburetters for hydrocarbon engines or motors. May 16.

„ 11,328. Webber. Gas manufacture. May 16.

[C.S.] 4951 (1901). Keller and Krappich. Acetylene gas generators. May 14.

„ 9770 (1901). Brown. Electrical sparking devices for firing the charges in internal combustion engines and for similar purposes. May 14.

„ 10,013 (1901). Westinghouse. Production and utilisation of gas. May 14.

„ 10,032 (1901). Malkin. Fuel economiser and smoke consumer for stoves, fireplaces, and the like. May 14.

[C.S.] 10,220 (1901). Gwynne and Crewe. Carburetting apparatus for explosion engines. May 22.

„ 10,867 (1901). Abel.—From Siemens and Halske Akt.-Ges. Manufacture of thorium, zirconium, and elements of the ytterite group. May 14.

„ 10,869 (1901). Abel.—From Siemens and Halske Akt.-Ges. Manufacture of incandescence bodies for electric lighting. May 14.

„ 11,014 (1901). Serpollet. Apparatus for supplying water and liquid fuel to steam generators. May 22.

„ 11,988 (1901). Frohnhäuser. — From Hagen. Vaporiser for explosion engines. May 14.

„ 12,184 (1901). Cooper. Carburettors or vapourizers for oil or spirit engines. May 14.

„ 12,307 (1901). Imray.—From Soc. Anon. Pour la Production et l'Emploi de la Vapeur Surchauffée. Construction of gas producer. May 14.

„ 12,547 (1901). Macgregor and Reid. Spraying machines. May 14.

„ 12,552 (1901). Crompton and Co., Ltd., and Hodgson and Ewart. Electric arc lamps May 14.

„ 12,593 (1901). Reichenbach. Method of ignition in internal combustion motors. May 22.

„ 12,938 (1901). Clark.—From Gould, United States. Smoke preventer and fuel economiser for furnaces. May 22.

„ 13,138 (1901) Duff and United Alkali Company, Ltd. Gas furnaces for steam boilers or for other heating purposes. May 22.

„ 13,197 (1901). Compin. Apparatus for automatically incinerating incandescent light mantles. May 22.

„ 13,439 (1901). Bayles. Apparatus to control the flow of illuminating gas through the burner tips. May 22.

„ 13,460 (1901). Mackean and Walker. Apparatus for burning and seasoning incandescence mantles. May 14.

„ 13,611 (1901). Wright and Darwin. Radiators for utilising the waste heat generated by ordinary gas fires. May 22.

„ 14,237 (1901). Girdlestone and Thorkelin. Electric arc lamps. May 22.

„ 14,410. (1901.) Dürr. Carburetted hydrogen motor in the form of a locomotive. May 22.

„ 15,476 (1901). Stoltenhoff. Burners for lamps employing incandescent mantles. May 14.

„ 16,211 (1901). Johnson.—From Deutsche Continental Gas-Ges. and Bueb. Manufacture of gas and coke. May 14.

„ 18,575. (1901). Clemang. Process of and apparatus for cleaning blast furnace gases. May 22.

„ 19,804. (1901). White. Apparatus for use in burning hydrocarbon oils. May 22.

„ 23,056. (1901). Fabry and Linard. Coke ovens. May 22. Date applied for under International Convention, June 29, 1901.

„ 23,543. (1901). Losfeld. Apparatus for generating acetylene gas. May 22.

„ 24,239. (1901.) Drake, Sheppard, Ram, and Nernst Electric Light, Ltd. Cases or holders for Nernst lamps. May 22.

„ 26,375. (1901.) McClave. Furnaces. May 22.

„ 1242 (1902). Bousfield.—From Soc. des Brûleurs Roger. Burners for lighting and heating with hydrocarbon vapour. May 14.

„ 3448. (1902.) Lemp. Means for controlling the supply of liquid fuel to burners for heating steam generators. May 22.

„ 4863 (1902). Eisele and Letzgus. Appliances for the consumption of smoke in furnaces. May 14.

„ 5503. (1902.) Boyle. Furnaces for burning liquid fuel. May 22.

„ 6379. (1902.) Rignon and Eisenmann. Continuous burning arc lamp with inclined carbons. May 22

S.] 6525. (1902.) Miller and Marshall. Furnaces. May 22.
„ 7383. (1902.) Hogner. Electric arc lamps. May 22.
„ 7608 (1902.) Sale and Onslow. Means for obtaining high pressure gas. May 14.
„ 7826. (1902.) Lowe. Manufacture of coke and gas, and apparatus employed therein. May 22.
„ 8206. (1902.) Lane. Anti-vibration devices for incandescent gas lights. May 22.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

A.] 10,423. Hermes. Improved process for the production of artificial asphalte.* May 6.
„ 10,946. Tatam. *See under* II.
„ 11,035. Torkington.—From Knight, United States. Apparatus for and method of treating and working bituminous and other compounds and articles made therefrom.* May 14.

V.—COLOURING MATTERS AND DYESTUFFS.

A.] 10,516. Imray.—From Farbwerke, Höchst, Germany. Manufacture of bromo-indigo-white and bromo-indigo. May 7.
„ 11,179. Imray.—From Farbwerke, Höchst, Germany. Manufacture of esters of methyl-anthranilic acid. May 15.
„ 11,348. Thompson and Co., Ltd., Vlies, and Brownlie. Manufacture of azo-dyes. May 17.
„ 11,403. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of dyestuffs of the anthraquinone series. May 17.
C.S.] 12,326 (1901). Johnson.—From Kalle and Co. Manufacture of mono-alphyl-alpha (1)-naphthylamine alpha- (4) sulphonic acids. May 14.
„ 13,377 (1901). Abel.—From Akt.-Ges. f. Anilin Fabr. Manufacture of colouring matters directly dyeing cotton. May 14.
„ 14,081 (1901). Imray.—From Farbwerke, Höchst. Manufacture of a blue dyestuff from para-amido-para-oxydiphenylamine. May 22.
„ 15,062 (1901). Imray.—From Farbwerke, Höchst. *See under* V.
„ 24,354 (1901). Johnson.—From Bad. Anilin and Soda Fabr. Manufacture and production of colouring matters of the anthracene series and the employment of colouring matters of the anthracene series in dyeing. May 22.
„ 4552 (1902). Imray.—From Dye Works formerly L. Durand, Huguenin & Co. Manufacture of new leuco-derivatives of gallo-cyanines. May 14.
„ 5895 (1902). Imray.—From Soc. of Chemical Industry in Basle. Manufacture of substantive azo-dyestuffs. May 14.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

A.] 10,313, Telles. Manufacture of thread, cord, textile fabrics and the like from malvaceous plants. May 5.
„ 10,530. Leinweber. *See under* XIX.
„ 10,737. Burghardt and The Royton Dyeing and Waterproofing Co., Ltd. Improved process or processes for decreasing the inflammability of cotton fibres and fabrics. May 10.
„ 10,896. Junghans. New or improved method of drying and bleaching.* May 12.
„ 10,987. Anderson and Judson. Dyeing machinery. May 13.
„ 11,024. Graemiger. Apparatus for treating fibrous and other materials with fluids. May 14.
[A.] 11,184. Schmidt. Improved means for dyeing warp yarns.* May 15.
„ 11,201. Sieberth, Swanström, and Thorvaldsen. Process and machinery for colour and other printing.* May 15.
„ 11,335. Bedford and Bedford. *See under* XIV.
[C.S.] 9695 (1901). Perkin, jun., and Whipp Bros., and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. May 14.
„ 12,319 (1901). Bronn. Treatment with liquids and vapours for dyeing, bleaching, and other purposes of textile, fibrous, and other materials of animal origin such as wool, hair, silk, feathers, leather, and the like, and of animalized fibrous materials of vegetable origin. May 22.
„ 13,313 (1901). Calico Printers' Assocn. and Higginbotham. Machines for printing calico and other fabrics. May 14.
„ 13,395 (1901). De Keukelaere. Treatment of textile materials on cops, bobbins, spindles, and the like. May 14.
„ 15,062 (1901). Imray.—From Farbwerke, Höchst. Manufacture of a black produced by oxidation or steaming on textile materials. May 22.
„ 16,421 (1901). Johnson.—From Bad. Anilin and Soda Fabr. Indigo reserve printing and means to be employed therein May 22.
„ 1464 (1902). Bloch. Manufacture of printing surfaces for colour printing. May 14.
„ 5508 (1902). Faure. Method of and apparatus for decorticating ramie and other textile plants and leaves. May 22. Date applied for under International Convention, Oct. 17, 1901.
„ 8682 (1902). Maertens. Art of cleaning wool and other animal fibres. May 22.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[A.] 10,510. Sanderson and Humphrey. *See under* XIX.
[C.S.] 12,319 (1901). Bronn. *See under* V.

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 10,351. Carey, Heslop, and the United Alkali Co., Ltd. Recovery of sulphur compounds from waste gases. May 5.
„ 10,775. Caille. Cartridges of compressed gas for fire extinguishing and other purposes.* May 10.
„ 10,812. Stevens. Hand fire-extinguishers. May 10.
„ 10,876. Feld. *See under* II.
[C.S.] 11,497 (1901). Gutierrez. Manufacture of common salt (chloride of sodium). May 14.
„ 14,741 (1901). Chapman. Chemical fire extinguishers May 22. Date applied for under International Convention, Dec. 21, 1901.
„ 19,038 (1901). Fraser. Process for preparing cobalt hydroxide or a cobalt ammonium salt, the process being applicable for separating cobalt from nickel, copper, and other metals. May 14.
„ 25,776 (1901). Young and Griffiths. Magnesium carbonate and process of making same. May 14.
„ 8184 (1902). Waldbauer. Process for the production of barium chloride. May 22.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 10,355. Keyes. Lehrs for annealing plate glass.* May 5.
„ 10,356. Keyes. Apparatus for the manufacture of plate glass. May 5.
„ 10,611. Peters. Kilns and drying sheds for drying bricks, tiles, pottery, and other ware. May 8.
„ 10,614. Mosley and Robb. Porcelain facings for crown and bridge work. May 8.

[A.] 10,777. Claus. Enamelling machines.* May 10.
„ 11,119. Tindal. Improved construction of kilns and ovens for firing earthenware goods. May 15.
„ 11,207. Haley. Glass tiles and the like, and the manufacture thereof. May 15.
„ 11,372. Stanley. Manufacture of earthenware sanitary pipes, cable conduits, and other like objects. May 17.
[C.S.] 12,452. (1901). Tabouret. Ceramic, stucco, or other decorations. May 22.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 10,399. Loewenthal. Composition for making stones and mortar.* May 6.
„ 10,723. Best and The United Alkali Co., Ltd. Apparatus for slaking and dressing substances, more especially intended for slaking and dressing lime. May 9.
„ 10,853. Williams. Process of roasting or calcining raw materials from which Portland cement and cements of a similar character are manufactured, ores, and minerals, and in the kilns or furnaces used in the process. May 12.
„ 10,996. Haskin. Apparatus for vulcanizing or preserving wood. May 13.
„ 11,023. Crompton. Manufacture of Portland cement. May 14.
„ 11,166. Jordan. Process for making cement. May 15.
[C.S.] 9617. (1901). Davis. Machine for damping and mixing cement and the preparation of evenly gauged test briquettes therefrom, and for making bricks from powdered materials. May 14.
„ 10,124. (1901). Higgins. Apparatus for drying, seasoning, and impregnating wood and other substances. May 22.
„ 11,644. (1901). Harding. Composition or cement. May 22.
„ 13,452. (1901). Graham. Manufacture of artificial stone. May 22.
„ 13,793. (1901). Passow. Process for producing cement. May 14.
„ 3606. (1902). Berry. Apparatus for the manufacture of concrete slabs or blocks. May 14.
„ 5995. (1902.) Palmer. Machine for moulding artificial stone, building and paving blocks. May 22.
„ 7759. (1902.) Kreft. Presses for manufacture of artificial stones, tiles, and the like. May 22.

X.—METALLURGY.

[A.] 10,283. Sharp. Furnaces for heating iron and steel. May 5.
„ 10,300. Healey and Stevenson. Smelting furnace hoists and charging apparatus. May 5.
„ 10,315. Wakeley. Metallurgical furnaces.* Filed May 5. Date applied for, Dec. 7, 1901, being date of application in United States.
„ 10,353. Hunter. Metallurgical furnaces especially designed for conversion of iron castings into steel.* May 5.
„ 10,432. Burton and Hartley. Manufacture of steel. May 6.
„ 10,522. Mercer. Apparatus to be used in the extraction of precious metals from their ores. May 7.
„ 10,679. De Alzugaray. Agitators and vats used in the treatment of ores. May 9.
„ 10,853. Williams. *See under* IX.
„ 10,906. Miller. Soldering or fixing aluminium to aluminium or other metals such as tinplate, brass, copper, iron (tinned), bronze, &c. May 13.
[A.] 10,929. Allison.—From Hannes, United States. Processes of and apparatus for smelting.* May 13.
„ 10,953. Nagel. Process of making spelter.* May 13.
„ 10,968. Coleman. Improved process for reclaiming tin or zinc from tinned or zinc scrap. May 13.
„ 11,071. Johnson.—From Soc. Galy et Rain, France. Manufacture and production of improved alloys for soldering and coating aluminium. May 14.
„ 11,210. Steinhart, Vogel, and Claus. Smelting and refining of tin and recovery of tin from hardhead. May 15.
[C.S.] 2782 (1901). Butterfield. Treatment of ores containing zinc. May 14.
„ 10,101 (1901). Thofehrn and De Saint Seine. Extracting copper and nickel from their ores. May 14.
„ 10,105 (1901). Havemann. Process for the treatment of mixed ores and compounds, for the extraction or separation of lead and zinc therefrom. May 22.
„ 10,351 (1901). Hardingham.— From Heberlein. Means applicable for use in the separation of volatile from non-volatile metals, metalloids, and other metalliferous substances. May 22.
„ 15,526 (1901). Elmore. Apparatus for the separation of minerals by the selective action of oils and like substances. May 22.
„ 5085 (1902). Harrison.—From Cobianchi. Method of and apparatus for casting metal objects. May 22.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 10,329. Lespagnol. Secondary batteries. May 5.
„ 10,457. Redding, Lothrop, and Deering. Storage batteries.* May 6.
„ 10,532. Bristol. Portable, secondary, or other electric batteries, accumulator plates, and the like.* May 7.
„ 10,534. Dessauer. Röntgen tubes. May 7.
„ 10,945. Booser. *See under* XXII.
„ 11,286. Puchmuller and Pearson. New or improved galvanic cell.* May 16.
„ 11,340. Heys.—From Hutchinson Acoustic Co., United States. Dry or semi-dry cells of primary or secondary electric batteries.* May 17.
[C.S.] 7629 (1901). Celestre and Gondraud. Secondary batteries. May 22.
„ 9927 (1901). Sherard Cowper-Coles and Co., Ltd., and Cowper-Coles. Deposition of metals or compounds. May 22.
„ 12,975 (1901). Madden. Secondary batteries. May 22. Date applied for under International Convention, Mar. 19, 1901.
„ 21,942 (1901). Nauhardt. Process for the electrolytic treatment of tin, and apparatus therefor. May 14.
„ 4520 (1902). Apple. Electric batteries. May 14.
„ 7851 (1902). Lake.—From Giroux and Seddon. *See under* XVIII. A.
„ 7858 (1902). Krouchkoll. Electric vacuum discharge tubes. May 22.
„ 7995 (1902). Jensen.—From Dr. G. Langbein and Co. Production of metallic deposits by electrolysis. May 22.

XII.—FATS, OILS, AND SOAP.

[A.] 10,507. Salamon.—From Verley, France. Purification of vegetable oils. May 7.
„ 10,613. Hills. Lubricators. May 8.
„ 10,874. Davis and Perrett. *See under* XVIII. B.
„ 10,926. Bolton and McNeil. Soap frames or moulds.* May 13.

A.] 11,149. Ambler and Asquith. Filtering and storage of oil and like liquids.* May 15.

„ 11,271. Garrigan. Candles.* May 16.

„ 11,301. Hélie. Candles, night lights, and the like. May 16.

C.S.] 13,065 (1901). Mally. Soap tablets, bars, and the like. May 14.

„ 13,188 (1901). Ellis. Liquid cleansing compositions. May 14.

„ 14,970 (1901). Rank. Plates used in the manufacture of oilcakes. May 14.

„ 2032 (1902). Baum. Separators for drying steam and extracting oil and grease from exhaust steam. May 22. Date applied for under International Convention, July 16, 1901.

III.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

B.—Resins, Gums, &c.

A.] 10,794. Johnson.—From Foelsing, Germany. *See under* XVI.

C.—India-rubber, &c.

C.S.] 3468 (1902). Price. Recovery of rubber from vulcanized rubber waste. May 22.

„ 3855 (1902). Zühl. Process for the regeneration of caoutchouc. May 14.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

A.] 10,458. Wetmore. Glue tanks.* May 6.

„ 10,628. Jenks, Clowes, and Hatschek. New material to be used for decolorizing and clarifying tanning extracts and other liquids. May 8.

„ 10,760. Hatmaker.—From Just, United States. Casein adhesive solutions and compositions. May 10.

„ 10,868. Perkins. Machines for treating hides, skins, and leather.* Filed, May 12. Date applied for, Mar. 7, 1901, being date of application in United States.

„ 11,096. Bitterling. Apparatus for dressing intestinal skins. May 14.

„ 11,208. Livington. Machines for dressing leather and the like.* May 15.

„ 11,335. Bedford and Bedford. Production and application of a cementing material to the manufacture of coated fabrics and the covering of printers' rollers. May 17.

C.S.] 12,332 (1901). Maertens. Art of tanning and tawing hides, skins, and similar animal tissue. May 14.

XV.—MANURES, Etc.

A.] 10,461. Dolle. Manufacture of an artificial manure.* May 6.

XVI.—SUGAR, STARCH, and GUM, Etc.

A.] 10,794. Johnson.—From Foelsing, Germany. Apparatus for the treatment of products containing gums and resins, for the separation and obtainment of gums and resins therefrom. May 10.

„ 10,872. Blumer. Process for rendering starch soluble. May 12.

„ 11,116. Binnie and Lugo. Process of making gums from liquid hydrocarbons. May 15.

C.S.] 10,113 (1901). Thompson.—From Manonry. Processes of refining sugar of low quality. May 14.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 10,350. Hört and Marxsohn. Arrangement for the washing and airing of barley for malting purposes.* May 5.

„ 10,549. Bell. Treating casks or barrels, for the purpose of purification or sterilisation. May 8.

„ 10,699. Schneible. Manufacture of fermented liquors.* May 9.

„ 10,729. Wyers. *See under* XVIII. A.

„ 10,988. Joyce. Improved apparatus for heating air for distribution in hop, malt, and other drying kilns and stores. May 13.

„ 11,014. White. Steam exhausts, for disposing of surplus steam generated in washing and brewing boilers, and the like. May 14.

„ 11,100. Hardingham. — From Johnson, Belgium. Brewing. May 14.

„ 11,287. Stevens. Method of preserving beer, wines, and the like whilst in casks or other vessels that have been opened. May 16.

„ 11,412. Overbeck. Improved apparatus for cleaning malt, grain, seeds, and other material.* May 17.

[C.S.] 10,127 (1901). Bradley. Drying of malt so as to prevent its contamination with arsenic. May 14.

„ 10,813 (1901). Menzies. Pressing machinery for the treatment of brewers' and distillers' grains, hops, and the like. May 14.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 10,323. Mercier. Apparatus for bleaching and conditioning wheat, flour, or other cereals. May 5.

„ 10,348. Fournier. *See under* XVIII. B.

„ 10,503. Heather. Improved apparatus for preserving organic substances. May 7.

„ 10,637. Taylor. Taylor's housekeeper's adulteration detector. May 9.

„ 10,638. Taylor. Taylor's consumer's pure milk tester. May 9.

„ 10,729. Wyers. Preserving yeast, and apparatus therefor. May 9.

„ 10,760. Hatmaker.—From Just, United States. *See under* XIV.

„ 10,903. Budde. Method of sterilising articles of food and other perishable organic substances at a low temperature. May 12.

„ 10,962. Jolles. Manufacture of albumin. May 13.

„ 11,054. Barlow. Process for preservation of new-laid eggs. May 14.

„ 11,065. Bell. Alimentary preparations. May 14.

„ 11,229. Hart. Butter making. May 16.

„ 11,410. Barclay. New or improved treatment of cod-liver oil for making the same more easily assimilable as food. May 17.

[C.S.] 12,015 (1901). Week. Sterilising apparatus. May 14.

„ 12,099 (1901). Arzt and Wilding. Yeast powder. May 22.

„ 12,164 (1901). Topley. Preparation for use as a beverage. May 14.

„ 13,097 (1901). Elb. Process of preparing an alimentary yeast extract. May 22.

„ 2251 (1902). Lemire. Apparatus for agitating and aerating milk. May 14.

„ 7851 (1902). Lake. — From Giroux and Seddon. Electrical sterilising and preserving apparatus. May 22.

„ 8301 (1902). Lake. — From Giroux and Seddon. Sterilising and preserving process. May 22.

B.—Sanitation; Water Purification.

[A.] 10,348. Fournier. Improved disinfecting and preserving process.* May 5.

„ 10,479. Parsons. Ventilating buildings, clearing dye houses of steam, drying substances, and the like. May 7.

„ 10,485. Bryan and Barr. Distribution box for directing the flow of liquids, particularly applicable to bacteria beds, filters, or tanks for sewage. May 7.

„ 10,549. Bell. *See under* XVII.

„ 10,571. Roach. Automatic distributing and alternating apparatus for use with bacteria beds for the treatment of sewage and other liquids.* May 8.

„ 10,572. Ralston. Valve apparatus for automatically discharging sewerage filter tanks and the like. May 8.

„ 10,691. Smith. Air diffusers. May 9.

„ 10,714. Thursfield. Improved vapour disinfecting apparatus. May 9.

„ 10,719. Paterson. Water-softening and liquid-purifying apparatus. May 9.

„ 10,734. Grumbacher. Improved apparatus for cooling and filtering compressed air.* May 9.

„ 10,829. Adams. Liquid distributing apparatus for filters. May 12.

„ 10,874. Davis and Perrett. New or improved apparatus for separating oils and other impurities from water. May 12.

„ 10,940. Doulton and Pleace. Water valves. May 13.

„ 11,367. Morris. Means for the collection and disposal of sediment in Cornish and Lancashire boilers. May 17.

[C.S.] 5847 (1902). Melvin and Muir. Automatic alternating valves and valve gear for the baeteriological treatment of sewage or other liquid refuse. May 14.

C.—Disinfectants.

[A.] 11,351. Beater and Toppin. Anti-microbe disinfecting powder. May 17.

[C.S.] 7677 (1901). Bentley. Calf white scour cure. May 22.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 10,510. Sanderson and Humphrey. Process for the manufacture of washable water colour paper.* May 7.

„ 10,524. Lake.—From Bird, United States. Manufacture of paper.* May 7.

„ 10,530. Leinveber. Preparation from cellulose, paper-pulp, wood-pulp, or similar material of threads capable of being spun. May 7.

„ 11,164. Lederer. Process for acetylising cellulose and materials containing cellulose. May 15.

[C.S.] 10,029 (1901). Topham. Means for regulating the flow of solutions of cellulose through squirting nozzles. May 14.

„ 12,769 (1901). Wurster. Sizing paper. May 14.

„ 76 (1902). Harrison.—From Parker. Machinery or apparatus for forming paper-pulp into sheets. May 22.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 10,873. Murray. Improved liniment. May 12.

„ 10,876. Feld. *See under* II.

[C.S.] 10,867 (1901). Abel.—From Siemens and Halske. Akt.-Ges. *See under* II.

„ 12,325 (1901). Johnson.—From C. F. Boehringer und Sochne. Manufacture and production of new derivatives of camphoric acid. May 14.

„ 12,421 (1901). Newton. — From Farbenfabr. vorm F. Bayer and Co. Manufacture or production of new chemical compounds. May 14.

„ 13,059 (1901). Johnson.—From Deutsche Gold and Silber Scheide-Anstalt vorm. Rössler. Production of indoxyl derivatives from aromatic glycolls, their homologues, and their substitution products. May 14.

„ 21,295 (1901). Rother. Process for preparing a medical compound containing mercury compounds and other substances. May 14.

„ 6311 (1902). Thompson.—From Exporthier Brauerei, H. Siemens and Co. Preparations for counteracting the deleterious effects of nicotine and processes for producing the same. May 14.

XXI.—PHOTOGRAPHY.

[A.] 10,609. Brandt. Dishes for photographic purposes.* May 8.

„ 10,610. Brandt. Improved holder for use in treating photographic plates and films.* May 8.

„ 10,690. Clarke. Methods and apparatus for taking coloured photographs. May 8.

„ 10,813. Szczepanik. Production of photographs in natural colours. May 10.

„ 10,948. Leuchter. Production of negative plates for bichromated gelatin processes.* May 13.

„ 11,380. Bouvier.—From D'Osmond, France. Improved method of applying the system of flash light to or for the purpose of photography. May 17.

[C.S.] 9763 (1901). Ohse. Process for producing pictures in relievo on metal, celluloid, gypsum, or the like, by means of photography. May 22.

„ 11,866 (1901). Abel.—From Act.-Ges. f. Anilin Fabr. Manufacture of photographic developers, stable in the dry state. May 14.

„ 12,421A (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Preparation and employment of new photographic developers. May 14. Date claimed under Patent Rule 19, June 18, 1901.

„ 24,619 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Developing photographic pictures. May 14.

„ 526 (1902). Humphrey. Photographic developing apparatus. May 22.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 10,655. Bale. Production and manufacture of matches, and striking compositions, and the substances and processes employed therein. May 9.

„ 10,766. Allen and Dolby. Improved explosive composite shell for use in warfare.* May 10.

„ 10,945. Bonser. Electric detonating fuzes for blasting and mining purposes. May 13.

„ 11,001. Wright. Match making machines.* May 13.

„ 11,325. Schachtebeck. Manufacture of safety explosives. May 16.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 4094.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 11.—Vol. XXI. JUNE 16, 1902. No. 11.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum:
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stamford	1893—1894.
T. E. Thorne, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

...rge Beilby.
Forbes Carpenter.
John Clark.
...f. C. F. Chandler, D.Sc., LL.D., Ph.D., LL.D.
...f. G. G. Henderson, D.Sc.
...R. Messel.
J. M. C. Paton.
Dr. Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
Dr. Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

...A. Brotherton, M.P.
...stace Carey.
...Edw. Divers, F.R.S.
...s. Fairley.
...f. W. R. E. Hodgkinson, h.D.
...Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

CANADIAN.

...f. W. R. Lang. | Alfred Burton.

LIVERPOOL.

...Longuet Higgins. | Dr. T. Lewis Bailey.

LONDON.

...o Hehner. | A. R. Ling.

MANCHESTER.

...J. Grossmann. | J. Carter Bell.

NEWCASTLE.

...L. Reynoldson. | F. C. Garrett.

NEW YORK.

...ford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.

...Archbutt. | J. T. Wood.

SCOTTISH.

...Robert Pullar. | Dr. Thos. Gray.

YORKSHIRE.

...rge Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.	Wm. Kellner, Ph.D.
G. Beilby.	Charles A. Kohn, M.Sc., Ph.D.
J. Carter Bell.	J. Lewkowitsch, Ph.D.
Joseph Bernays, M.I.C.E.	A. R. Ling.
H. Brunner.	W. Macnab.
Edw. Divers, M.D., D.Sc., F.R.S.	N. H. Martin.
Sir John Evans, K.C.B., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
A. G. Green.	B. E. R. Newlands.
Samuel Hall.	John Pattinson.
Otto Hehner.	F. B. Power, Ph.D.
John Heron.	Prof. H. R. Procter.
D. B. Hewitt, M.D.	Boverton Redwood, D.Sc.
E. Grant Hooper.	Walter F. Reid.
David Howard.	John Spiller.
Prof. J. J. Hummel.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.

Editor:

Watson Smith, 31, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.	A. Morr ..... VII., XVIII.
L. Archbutt, I., XII., XVIII.B.	G. T. Morgan, D.Sc. ... IV., V.
J. L. Baker..... XVI., XVII.	J. G. Parker, Ph.D. ..... XIV.
H. Ballantyne ..... II., XII.	H. T. Pentz-mann ..... XVI., XVII.
D. Bendix ..... III.	H. S. L. Polak .... Patent List.
E. Bentz ..... IV., V., VI.	T. H. Pope... XVI., XX., XXI.
J. O. Braithwaite ..... XX.	F. W. Renaut..... Index.
J. F. Briggs ..... XVI., XVII.	G. H. Robertson ..... XI.
J. H. Collins ..... X.	Chas. Salter ..... I., II., III., XV., XVI.
C. F. Cross ..... V., XII., XIX.	M. J. Salter..... XIII.
J. T. Dunn, D.Sc. .. VII., X., XI.	R. Sandon ..... II.
Walter C. Hancock, B.A. ..... VIII., IX.	J. Shields, D.Sc., Ph.D. ..... XI.
J. W. Hinchley. I., X., XIII., XXI.	A. Shonk ..... Gen. Chem.
H. Ingle, Ph.D. .. V., VI., XII., XIII.	W. P. Skertchley XII., XVIII., XX.
R. L. Jenks ..... XIV., XIX.	E. Sonstadt..... III., VII., X.
J. B. C. Kershaw. ... VII., XI.	A. L. Stern, D.Sc. ..... XVII.
M. C. Lamb ..... VI., XIV.	E. Howard Tripp, Ph.D. ..... III., VII., XVI.
T. A. Lawson, Ph.D... IV., XX.	Charles T. Tyrer ... . XX.
F. H. Leeds.. III., XIII., XXI.	L. J. de Whalley, B.Sc. ..XVI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.	E. W. Wheelwright, Ph.D. ..... XXII.
J. McCrae, Ph.D. ..... IV.	A. Wingham ..... X.
G.W. MacDonald, M.Sc. .. XXII.	Joseph T. Wood ..... XIV.
W. G. McMillan X., XI., XIV., XXII.	A. C. Wright, B.Sc., M.A. .. IV., XVIII., XX.
N. H. J. Miller, Ph.D. .... XV.	
C. A. Mitchell, B.A. ..... XII., XXII.	

Notices.

ANNUAL GENERAL MEETING, LIVERPOOL, 1902.

PROVISIONAL PROGRAMME.

Wednesday, July 9th.

10.30 a.m. Council Meeting, at University College.
11.0 a.m. General Meeting, at University College.
1 30 p.m. Luncheon, at the Adelphi Hotel, by invitation of the Liverpool Section. Ladies accompanying members are invited.
3.0 p.m. Garden Party, at Seaforth Hall, by invitation of E. K. Muspratt, Esq., J.P.
8.0 p.m. to 10.0 p.m. Reception at the Town Hall, by the Lord Mayor of Liverpool.

Thursday, July 10th.

Whole Day Excursions :—

(1) Works of the Telegraph Manufacturing Co., Ltd., at Helsby. Luncheon, by invitation of the Directors of the Company. Afternoon Tea, by invitation of G. Crosland Taylor, Esq.

(2) Excursion to Prescot :—
Morning—Works of the British Insulated Wire Company. Luncheon, by invitation of the Directors of the Company.
Afternoon—Works of the Lancashire Watch Company.

Half-Day Excursions :—

Morning—
(1) Visit to Port Sunlight Village and the Works of Messrs. Lever Brothers. Luncheon, by invitation of Messrs. Lever Brothers. Ladies are invited to join this excursion.
(2) Works of the United Alkali Co., Ltd., at Widnes. Luncheon by invitation of the Mayor of Widnes (W. W. Gossage, Esq., J.P.) and Directors of the United Alkali Company. It is hoped that it will be possible to convey members on this excursion by motor cars.
(3) Messrs. Ogden's Tobacco Factory and the Tobacco Warehouses of the Mersey Docks and Harbour Board.

Afternoon—
(1) Works of the Diamond Match Co. at Seaforth.
(2) Liverpool Corporation Electric Power Stations.

7.30 p.m. Annual Dinner at the Adelphi Hotel.

Friday, July 11th.

Whole Day Excursion to Llandudno and Beaumaris by Saloon Steamer "St. Elvies."

9 p.m. Smoking Concert at the Reform Club.

A detailed programme, with request forms for tickets, will be found in the Journal for May 31, and the ticket of membership is issued with this Journal.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are placed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Ivan Levinstein has been nominated to the office of President for a second year, under Rule 10; Mr. E. Grant Hooper, Dr. F. B. Power, Prof. Wm. Ramsay, F.R.S., and Mr. Thos. Tyrer have been nominated Vice-Presidents under Rule 8; and Dr. John Clark has been nominated a Vice-President under Rule 24.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Dr. J. Grossmann, Dr. J. Lewkowitsch, and Messrs. N. H. Martin and Frank Scudder have been nominated under Rule 18 to fill four vacancies among the Ordinary Members of Council. There will therefore be no Ballot.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. .....
.....

And I, the said Candidate for Membership, hereby declare that elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate.....

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....

Profession or Business Occupation .....

Date.....

(*Extract from Bye-laws—Rules 27, 29, and 30.*)

Each Member shall pay an annual subscription of Twenty five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or y of its Local Sections, are requested to take notice that der Rule 43 of the Bye-laws the Society has the right of ority of publication for three months of all such papers. fringement of this Bye-law renders papers liable to be ected by the Publication Committee, or ordered to be stracted for the Journal, in which case no reprints can furnished to the author.

ARSENIC.

The Joint Committees of the Societies of Chemical lustry and Public Analysts have now submitted their ort, prescribing a method for dealing with the various stances which might contain Arsenic, and the report has en accepted by the Council.

Copies of this, together with the papers, discussions, and tracts which appeared in the Journal in 1901, and other racts, may be obtained from Messrs. Eyre and Spottis-ode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

n future, the list of Sectional Committees will appear e a month only, in the second number.

Changes of Address.

When notifying new addresses, members are requested to te them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be ided as tending to create confusion. When sending scriptions, the use of the form attached to the application os in the verification of addresses, on which the safe very of the Journal depends.

elder, O. J., l/o Perth Amboy; 1230, Sheffield Street, Allegheny, Pa., U.S.A.

an, John, l/o Fallowfield; 55, Northern Grove, West Didsbury, near Manchester.

lerson, G. L., l/o Northfleet; 4, Lansdowne Square, Gravesend, Kent.

lby, George, l/o 8; 11, University Gardens, Glasgow.

xam, Prof. W. Popplewell, l/o Madras; c/o W. Coventry, Dalsingh Serai, Tirhoot, Bengal, India.

vtell, Norman E., l/o Greenway Road; Hazeldean, Heath Road, Runcorn.

rough, Horace, jun.; Journals to 509, West Lombard Street, Baltimore, Md., U.S.A.

van, L. L., l/o Chicago; 817, Pennsylvania Avenue, Kansas City, Mo., U.S.A.

rlier, A. C. J., l/o Glasgow; 54, Hornsey Rise, Crouch End, N.

Castro, J. Paul, l/o Redruth; Laboratory, Effingham House, Arundel Street, Strand, W.C., Consulting Chemist and Assayer.

rr, Noel, l/o Coventry; Mauritius Estates and Assets Co., Ltd., Mauritius.

ld, W. Ralph, l/o Bush Hill Park; Trederwen, Village Road, Enfield, Middlesex.

dge, H., l/o Loop Street; 146, Church Street, Maritzburg, Natal, South Africa.

ald, Jas., l/o Glasgow; 96, Anerley Park, Anerley, S.E.

gau, T. R., l/o Vanbrugh Hill; 17, Foyle Road, Blackheath, S.E.

ier, W. J., l/o Commercial Road East; 121, Adelaide Road, London, N.W.

, J. K., l/o Chester, Pa.; 413, Vanhook Street, Camden, N.J., U.S.A.

, T. E.; Journals to c/o Calder and Mersey Extract Co., Ltd., Dewsbury, and (subsn.) Calder House, Dewsbury.

sser, F., l/o Wapping Station; Eaton Villa, Fairfield Crescent, Fairfield, Liverpool.

Gray, Elisha B., l/o New Brighton; c/o Tide Water Oil Co., Bayonne, N.J., U.S.A.

Greenwood, Holmes; Journals to Regent House, Hartmann Street, Accrington.

Hawkins, E. M., l/o Canterbury; Lime Tree Farm House, Stone Street, Petham, Canterbury.

Jones, G. Cecil, l/o Basingstoke; c/o F. W. Gayner, Filton, Bristol.

Kingsford, T. P.; Journals to Oswego, N.Y., U.S.A., only.

Langstaff, W., l/o Cleveland; c/o Grasselli Chem. Co., Tremley, N.J., U.S.A.

Leathart, T. H.; Journals to Lead Works, Newcastle-on-Tyne.

Leuthardt, P., l/o Droylsden; Newstead, Upper Chorlton Road, Manchester.

Miller, A. R., l/o Castlebank; Hill Park, Bothwell, N.B.

Myers, Dr. H. C., l/o Berkeley; Greeley Sugar Co., Greeley, Colo., U.S.A., Chief Chemist.

Neumann, Dr. Edgar, l/o Maida Hill; Bell and Neumann, 3, Mincing Lane, London, E.C.

Neurath, Dr. F., l/o Manchester; H. 3, Gr. Schiffgasse 12, Vienna, Austria.

Reekie, J. A., l/o Dinting; 51, Blackford Brow, Whitefield, near Manchester.

Royle, T. H., l/o Rosa; Bareilly, U. P. O. & A., India.

Shaw, Wm. R., l/o Newton; Oak Lea, Carlton Road, Godley, near Hyde, Cheshire.

Skinner, Hervey J., l/o Camden; c/o Little and Walker, 7, Exchange Place, Boston, Mass., U.S.A.

Taverner, W., l/o Hamilton Road; c/o Messrs. Worthington and Co., Burton-on-Trent.

White, W. G., l/o Broom Lane; 18, Fairburn Road, Levenshulme, Manchester.

Wilson, A. Poole, l/o Omagh; 16, Nora Terrace, Glasnevin, Dublin, Ireland.

Woodward, J., l/o Selborne Road; 31, Coventry Road, Ilford, Essex.

Death.

Metcalf, Wm., Tar Works, Church, Lancashire.

Canadian Section.

Meeting held on Friday, May 2nd, 1902.

PROF. W. R. LANG IN THE CHAIR.

THE MANUFACTURE OF CHARCOAL AND BY-PRODUCTS IN ONTARIO.

BY W. L. GOODWIN, PH.D.

The closing year of the eighteenth century saw the first attempt to manufacture charcoal iron in Ontario. In 1800, a small furnace was built at Furnace Falls (now Lyndhurst), on the Gananoque River. But the ore was poor and had to be drawn some distance, and attempts to cast the charcoal iron into the pots and kettles so much needed by the settlers proved a failure. In 1813, a furnace was built to make charcoal iron from the bog ore of Norfolk County, near Lake Erie. This venture proved a failure, but the abandoned property was bought, in 1820, by Mr. Joseph Van Norman, and the first successful charcoal iron furnace in Ontario was blown in, in 1822. It worked for eight or ten months of the year and produced 700 or 800 tons of iron. Four thousand cords of good hard wood (very plentiful in those days) were required for the charcoal used, a ton of iron being produced for 250 bushels of charcoal. This enormous consumption of charcoal is accounted for by the use of a cold blast and by the small size of the furnace. It

throws a little light upon the conditions of those early days when we read that there was no sale for the pig iron, but that Van Norman was obliged to become founder, and cast the product of his furnace into articles such as the great kettles for boiling down maple sap and potash lye—two great industries of Ontario at that time. Maple sugar is still produced in considerable quantities, but the days have passed when the farmer brought in his cakes of potash to the country store and exchanged them for goods. The great iron kettles can, however, still be seen in use as water-butts at some of the farmhouses in Eastern Ontario—monuments of the enterprising Van Norman. This furnace was shut down in 1847.

Blairton, near Marmora, and Madoc were the scene of several attempts to make charcoal pig—all failures, in spite of the high prices—viz., $30 to $35 a ton. The building of the St. Lawrence canals in the fifties let in pig-iron from Great Britain, and the price at once went down to $16. This closed the first period of the manufacture of charcoal iron in Ontario, with the solitary exception of Van Norman's furnace in Norfolk Co., a record of dismal failures.

The next recorded attempt to manufacture charcoal on the large scale was by a company organised in Kingston, in 1886, to use the Matthieu retort process, with acetate and methyl alcohol as by-products. The works were built at Sharbot Lake, an excellent hardwood district, and the intention was ultimately to use the charcoal to reduce the iron ores of that district. The best of charcoal was obtained, but the process was slow and expensive, and the price of acetate went down from 3 or 4 cents to ¾ cent a pound. The company did not even get so far as to put in the wood alcohol plant, but went into liquidation. The plant was bought, in 1887, by the Rathbun Co., of Deseronto, and removed to that place, but, after a short time, it was destroyed by fire. The retorts were replaced by bee-hive kilns, holding about 40 cords each, and the manufacture of charcoal and by-products was successfully carried on from the start. In 1889, they were running eight kilns, and 75,000 bushels of charcoal were produced in that year. Wood alcohol and calcium acetate were made as by-products and also "black liquor," the turnings from the machine shops being available for that purpose. Efforts were made to prepare marketable products from the tar by distillation. Wood creosote was put upon the market for creosoting timber, and the residual pitch was used as a roofing material. It was at this period that the writer's limited practical acquaintance with the subject was obtained. A short investigation of the tar was made with a view to ascertain its probable value for creosoting, and, if possible, to find means of avoiding the frequent accidents and difficulties due to the frothing of the tar and pitch when heated or when run hot from the still into barrels. The investigation showed a large percentage of the higher phenols and a considerable amount of paraffins, and I at that time formed the opinion that this wood tar, if properly used, would be superior to ordinary coal tar creosote as a timber preservative. But theoretical conclusions in these matters do not carry much weight with practical engineers, and the experimental proof would have required many years. The pitch manufactured from wood tar is brittle, and for many purposes, therefore, inferior to coal tar pitch. Several years ago the distillation of the tar was abandoned, and it has since been used as a fuel, mixed with the charcoal "braize." The number of kilns was increased until there are now seventeen in operation, one kiln being emptied every day. The charcoal was at first mostly shipped to Detroit for the manufacture of iron there, but, in 1897, the Rathbun Company made the natural completion of the series of works in this thriving little town by building a hot blast furnace of 50 tons capacity, the first furnace which has been run successfully in Ontario since the days of Van Norman, 75 years ago. This furnace uses the whole output of charcoal from the kilns, and from 50 retorts of a capacity of about five-eighths of a cord each, erected by the Standard Chemical Company, which began to operate the charcoal works at this time. The combined yield is about 2,800 bushels a day.

The retorts are iron half-cylinders set horizontally, about 9 ft. long and 4 ft. high. Each retort is charged once a day. The distillate is condensed by straight condensers one attached to each retort. As these works are at the water's edge, the cost of pumping cold water to the condensers is relatively low. The distillate is collected into a main and pumped by a small Northey pump into the chemical works, into which the distillate from the kilns is also conducted. The fuel used under the retorts is the tar mixed with the waste from the charcoal. The acid liquor is run into five tanks, allowed to settle, and the heavy tar is run off and distilled with steam at 80 lb. pressure to remove alcohol and acetic acid. The remaining tar is run off and used as fuel. The acid liquor is run into tanks and neutralised with lime, brought over the Company's railway from Napanee, where a lime sufficiently free from magnesia is obtained. The settled liquor is run into five stills to distil off the wood alcohol. A fine white wood alcohol (still containing the acetone) is obtained by four distillations combined with a process of chemical purification. The alcohol as supplied to the trade is 96 per cent. to 98 per cent., but a 99 per cent. alcohol can be made when required. The acetate liquor is run into tanks and then into evaporators (five of 850 galls. capacity each), evaporated to dryness, shovelled out, and thoroughly dehydrated on a sheet-iron floor heated by a fire in which refuse is used as fuel. The grey acetate produced is of good quality, assaying about 84 per cent. of calcium acetate. It is sold in Germany, England, and Belgium, for the manufacture of acetic acid, some of which Canada afterwards imports! Since pyrites is being mined in Ontario, and about 81,600 a day in sulphur dioxide is going into the atmosphere at Copper Cliff, it would seem that there is room here for a combination of our resources. Sulphuric acid is being made from Sicilian sulphur in Hamilton, and from pyrite at Capelton, Quebec. Small quantities are being made at Sydney, Cape Breton. We are importing large quantities for the manufacture of explosives and for other uses. I understand, however, that the Standard Chemical Company has begun the manufacture of acetic acid in Toronto.

The wood alcohol is put up in iron drums holding about 80 gallons each, and also in 40-gallon barrels. The market is principally in Canada, where it is used as a solvent, and for denaturing grain alcohol.

The wood supplied by the Rathbun Company for the manufacture of charcoal at Deseronto is brought by the company's railway from the Central Ontario District (Coe Hill, &c.), and from the neighbourhood of Marmora, Tweed, and the district along the Kingston and Pembroke Railway. About 70 per cent. is hard wood (maple, beech, birch, &c.), and the remainder elm and ash. But these districts have long supplied hard woods for fuel and for manufacturing purposes to Kingston, Belleville, and the smaller towns. They are thus becoming depleted, and the tendency of prices is, therefore, upward. The Rathbun Company have, therefore, decided to extend the Bay of Quinte railway north-eastward so as to reach what is practically an untouched supply of good charcoal wood. The forest areas thus made available will also supply the Deseronto saw-mills with logs for the manufacture of barrel staves for cement, apple, and sugar barrels. There are also several small manufacturing towns in the district which consume a good deal of hardwood for the manufacture of carriages, &c. It would seem advisable to place charcoal works in such a district rather than in a place so far removed from the wood supply as Deseronto is. The distribution of the by-products from such a place would be equally easy, and the freight on the charcoal to the furnace at Deseronto would be less than that on the wood.

There are also charcoal works (The Standard Chemical Co.) at Fenelon Falls and at Longford. At the former place, there are 32 retorts holding 1¾ cords each, giving a daily output of 850 to 900 bushels. At Longford, there are six oven retorts of a capacity of six cords each. The daily output is 1,300 to 1,350 bushels. No. 1 hardwood (beech and maple) must be used to attain this output. With soft wood the yield is much less. By products are made in both places.

This account would be incomplete without some further reference to the work of the Deseronto Charcoal Iron Company. It has been found that the charcoal made from

ıe local wood is of excellent quality for blast furnace use. When carefully made, it carries a good burden.

The chemist, Mr. Horace C. Mabee, has given me the ollowing analyses:—

Mixed Sample.

	Per Cent.
Phosphorus in charcoal	0·011

Retort Charcoal.

Moisture at 110° C.	2·62
Carbon and volatile matter	91·48
Ash	5·90

Kiln Charcoal.

Moisture at 110° C.	3·14
Carbon and volatile matter	92·62
Ash	4·24

Vnited States Lake Superior ores are mostly used, but ntario ores have also been successfully smelted, and reparations are now being made to use ore from the Helen ine, Michipicoten. The iron finds a ready sale in Canada such manufacturing points as Niagara Falls, Walkerville, shawa, Smith's Falls, &c., at prices ranging about $2.00 a n more than those for coke pig. Considerable quantities e now being shipped to England, where the product of adnor Forges in Quebec has always been well received. ıdd a few analyses:—

Deseronto No. 1 B.

	Per Cent.
Iron	91·59
Silicon	1·56
Sulphur	0·01
Phosphorus	0·12
Manganese	0·338
Graphitic carbon	1·88
Combined carbon	1·23

Deseronto No. 1 A.

Iron	91·07
Silicon	1·82
Sulphur	0·007
Phosphorus	0·17
Manganese	0·327
Graphitic carbon	2·053
Combined carbon	0·957

Deseronto No. 3 Low.

Iron	95·30
Silicon	0·734
Sulphur	0·01
Phosphorus	0·18
Manganese	0·318
Total carbon	3·425

From this account, the conclusion is inevitable that ıtario, with its immense areas of forest, has only made a ginning in the manufacture of charcoal and by-products, l in the production of charcoal iron. But, since success this, as in so many industries, depends to such a large tent upon by-products, the investigation of the destructive tillation of wood might well be undertaken by some of r chemists. There are three obvious fields of research :—) an extension of the work of Violette on the influence of mperature on the composition and amount of the volatile)duct; (2) a thorough examination of wood tar with a w to discover new materials for synthetic compounds, l (3) the perfection of a process for converting the waste saw-mills into fuel or by-products, or into gas available power. Violette's results show that, if the wood is ıted very slowly, it suffers a loss of oxygen and lrogen, passing through stages which remind us of the wer natural processes by which it becomes peat, lignite, l bituminous coal. As it passes through the stages in artificial process, the character of the distillate changes, tic acid, methyl alcohol, acetone, phenols, &c., coming r between 150° C. and 280° C., gaseous products from ° C. to 350° C., and hydrocarbons (paraffins, benzene,) from 350° C. to 430° C. This suggests the possibility of so regulating the temperature as to produce a maximum of acetic acid and methyl alcohol, and at the same time a tar more nearly approximating in composition to that of coal tar. The usual methods of firing do not permit of such an exact control of the temperature. For this reason some manufacturers have used superheated steam. The obvious disadvantages are the limit of temperature and the expense of the apparatus. Recently, Jebsen (Zeits. f. Elektrochem., Jan. 16, 1902) has introduced a process for distilling peat in retorts heated by electricity generated by water power. He obtains peat-coke, and as by-products, gas, ammonia, methyl alcohol, &c., and a considerable proportion of paraffin wax. The control of the temperature with such an apparatus should be very perfect, and the process might be applicable to wood. In our country, where wood and peat are both plentiful, and so commonly associated with water power, an inviting field for experiment is opened up by this work of Jebsen (Canadian Mining Rev., April, 1902, p. 83). Dr. James Douglas, of New York, has recently published an account of the modification of the Loomis Pettibone Generator, which converts wood into a mixture of water gas and producer gas available directly for use in gas engines. He writes, "I have no doubt whatever that this apparatus and process would be admirably applicable to the conversion of the coarser waste from saw mills; but in using sawdust, the grate bars would, as in the Swedish sawdust producer, have to be dispensed with, and in their place probably a thick layer of coke supplied." As the supply of saw mill waste is unlimited, the problem before us is to so perfect a generator of this type as to render it available for the conversion of the mixed waste (now destroyed at a considerable cost) and at the same time to provide a profitable use, in manufactures, &c., for the large amounts of power thus afforded.

In fact, the whole subject of wood products invites Canadian chemists to follow the lead given by Messrs. Cross and Bevan in their interesting researches on cellulose, and I cannot more fitly conclude this paper than by quoting from the preface to their recent volume on this subject (Researches on Cellulose, 1895—1900, preface, p. vi.)

"We invite the younger generation of students of chemistry to measure the probability of finding a working career in connection with the cellulose industries. The impression is, that the industries in coal tar products largely exceed in importance those of which the carbohydrates are the basis; whereas the former are quite insignificant by comparison. A little reflection will prove that cellulose, starch, and sugar, are of vast industrial moment in the order in which they are mentioned. If it is an open question to what extent science follows industry, and *vice versa*, it is not open to doubt that scientific men, and especially chemists, are called in these days to lead and follow where industrial evolution is most active. There is ample evidence of activity and great expansion in the cellulose industries."

I am indebted to Messrs. Jones and Lloyd, of Deseronto, to Mr. Gaylord, manager of the Deseronto Iron Works, to Mr. Joseph Bawden, of Kingston, and to Mr. G. J. Webster, of the Standard Chemical Company, for information used in the preparation of this paper.

Discussion.

Mr. M. T. Taylor spoke of the great field open for improving the methods of producing methylated spirits in Canada, and referred to the great perfection of the processes now employed in the United States.

Dr. Beattie Nesbitt said there were works in Toronto where acetic acid was regularly manufactured from the crude acetate. They employed large iron retorts, with mechanical mixers. The bottom of these retorts was cast much more heavily, because this was the portion that wears out most rapidly. It was so constructed as to admit of renewal. The acetate was decomposed, running in sulphuric acid. The retorts were subsequently heated to drive off the acetic acid. This, however, did not result in a very complete recovery of the acid, the balance being got off by injecting superheated steam. The crude acid thus obtained was then redistilled from copper stills steam-heated.

Mr. Van der Linde desired to draw attention to the fact that during the past 10 years or so the patents granted in Canada were nearly all for mechanical inventions, chemical patents being few in number. The reason for this was that it was often very difficult to protect a chemical patent, or even to discover if it is actually being pirated, without first instituting a law suit. Perhaps the Patent Act could be improved to the point of giving more protection; meanwhile, the fear of endless litigation drove those who were unfortunate enough to have worked out new chemical processes to resort to the bad expedient of secret processes. Dr. Goodwin's objection to secret processes was just, but the manufacturer was in this matter merely the victim of circumstances.

Mr. J. A. DeCew said that the plant at Fenelon Falls seemed to be in a very thriving condition, since the number of retorts had lately been increased from 12 to 24, thus doubling its capacity. The woods consumed there were chiefly maple and hard birch. It had been said that the charcoal product alone would pay for the cost of wood and running expenses, but owing to the increased value of these hard woods, this statement would hardly represent the case at present. The alcohol, as sold, contained about 15 per cent. of acetone, which gave it its characteristic odour. He also suggested that the Pacific coast would some day be the scene of large industries of this kind, owing to the demand for the products, facilities for export, and cheapness of raw material. The fir timber there made a firm but light charcoal, which would stand considerable pressure.

Dr. Goodwin said there were two points raised by the discussion. One speaker had suggested an explanation of the superiority of hard woods as material for the manufacture of charcoal and by-products. This superiority depended on two things. (1) the great density of wood, which conferred a superior density and hardness upon the charcoal, and (2) the higher proportion of lignin and lignocellulose in the hard woods. The distillation of these compounds yielded a larger proportion of methyl alcohol and acetic acid than was obtained by the distillation of cellulose, owing doubtless to the lower proportion of oxygen in the former compounds. A great deal had been written about the utilization of our soft wood waste, that is, pine, spruce, &c. Many of those who wrote upon the subject bewailed this case, and suggested distillation to produce by-products, forgetting that the charcoal must be disposed of. The general use of charcoal for domestic purposes was perhaps out of the question. If large quantities of charcoal were to be made, some use would have to be found for it. Those who worked at iron reduction told him that they could not use more than a small percentage of soft-wood charcoal. It was well known, too, that pine, spruce, and fir, did not yield much acetic acid and methyl alcohol. In these woods the proportion of lignin and ligno-cellulose was low. On the whole, with our present methods and knowledge, the outlook was not very promising for the utilization of the waste of their pine and spruce forests in that way. He had been told that the Ottawa people had expended large sums of money, but had not yet succeeded. A more inviting field of experiment was the conversion of waste wood into a gas suitable for gas engines.

THE ARTESIAN WATER SUPPLY OF THE CITY OF WINNIPEG.

BY EDGAR B. KENRICK.

A softening plant with a $2\frac{1}{2}$ million gallons daily capacity having been recently installed for the treatment of this water by the Clark process, I have thought it would be interesting to collect some particulars regarding the chemistry of this extensive underground body of water.

The city of Winnipeg, with its population of about 45,000 inhabitants, is situated on the left bank, or west side, of the Red River, at the point where the Assiniboine flows in from the west.

From the base of the Rocky Mountains, some 800 miles west of Winnipeg, there is a gradual fall in the land, averaging about 4·5 feet per mile, to the Red River, after which, the land rises again to the east. The Red River, therefore, may be supposed to occupy the axis of a wide shallow valley extending from the Rocky Mountains to the Rainy River district in the east. The greater portion of this district consists of prairie, and is divided by geologists into three "prairie levels" or "prairie steppes" which are distinguished from each other by more or less well-marked natural features. The lowest and most easterly of these, the "First Prairie Level" or "Red River Valley," embraces the country immediately surrounding the Red River, together with the large sheets of water to the north and north-west of Winnipeg. In the latitude of Winnipeg, the Red River Valley has a width of about 150 miles, but rapidly narrows down towards the south. The total area is about 55,000 square miles, 40 per cent. of which is made up of lakes. The valley has an average height of 800 feet above sea level, and is said to comprise the most level tract of prairie country on the whole American continent.

Geologically, the surface clay must be looked upon as the alluvial deposits of the great lake that once occupied the whole valley, the fine silty materials at the surface being separated from the underlying Cambro-Silurian limestone by a layer of till or boulder clay. Beneath the City of Winnipeg, the limestone is reached at a depth of about 50 to 100 ft., the greater depths being near the Red River. The artesian water is derived chiefly from the drift on the surface of the limestone.

Whilst the Red River is fed largely by streams flowing over glacial and post-glacial deposits from the wooded districts in the east, the drainage area of the Assiniboine River consists exclusively of some 58,000 square miles of level prairie country to the west of Winnipeg. Owing to the small rain fall of this district, the average flow per second is not more than 0·01 cb. ft. per square mile of drainage area, so that the Assiniboine is a comparatively small stream, and, at times of low water, the proportion of salts in solution is high.

The Assiniboine River for some years formed the source of Winnipeg's public water supply, but the river water was subsequently abandoned, on account of the large proportion of vegetable matter it contained, and the quantity of finely divided clayey material carried in supension at certain seasons of the year.

In the neighbourhood of Stony Mountain, to the north-west of Winnipeg, where the rocks appear at the surface, there are numerous springs in the limestone, and quite recently, the Poplar Springs, 17 miles to the north of the city, were seriously considered as a source of supply for Winnipeg. One of the latter springs has a daily discharge amounting to nearly three million gallons. Between this district and Winnipeg, wells bored through the clay yield an abundant supply of water, the water, except in the neighbourhood of the river, rising above the surface. Within the limits of the City of Winnipeg, there are probably more than a hundred bored wells, many of which have been in constant use for a number of years. It would seem probable that there is a continuous body of water flowing over the limestone in an easterly direction towards the Red River, and extending at least as far north as the Poplar Springs.

A comparison of a very large number of analyses of this artesian water has brought out some facts of great interest. In the first place, the water from any particular well has not been found to vary from time to time, the writer's own observations having extended over a period of about 15 years. The following figures for chlorine are given as illustrating this point:—

	July 1889.	February 1893.
	Parts per million.	Parts per million.
Well A	283	283
Well B	268	266
Well C	280	277
Well D	280	283

The assumption that the water flows in an easterly direction towards the Red River, taken in conjunction with this constancy in composition from year to year seems difficult to reconcile with the fact that follows, viz.

hat the composition of the water changes regularly from ast to west, or in the assumed direction of flow, as though he water were altered chemically by the rocks in the mmediate vicinity of the wells. The accompanying map of Winnipeg shows the positions of the Red and Assiniboine Rivers, together with the locations of about 70 wells. The umber opposite each well indicates the chlorine in parts per illion. Two fuller analyses are also given of water from ells respectively two miles, and half a mile, from the Red iver. The positions of these wells are marked on the ap by the letters H and G. A comparison of the analyses ill show that in the water nearer the river, chlorine, ulphuric acid, sodium and calcium (also total and per-anent hardness) are higher than in the water more mote. There is not much difference in the magnesium, rt carbonates (and, therefore, temporary hardness) are wer in the water nearer the river. This last peculiarity borne out by measurements of alkalinity to methyl ange, this having been determined in a large number the wells by Mr. S. J. Pierce, who has pointed out a ry remarkable falling off in the alkalinity as the river approached. This fact, the increase of the sulphates at e expense of the carbonates, seems difficult to explain, less on the assumption that sulphuric acid is formed the rocks by the oxidation of pyrites, and that this composes the carbonates in the water.

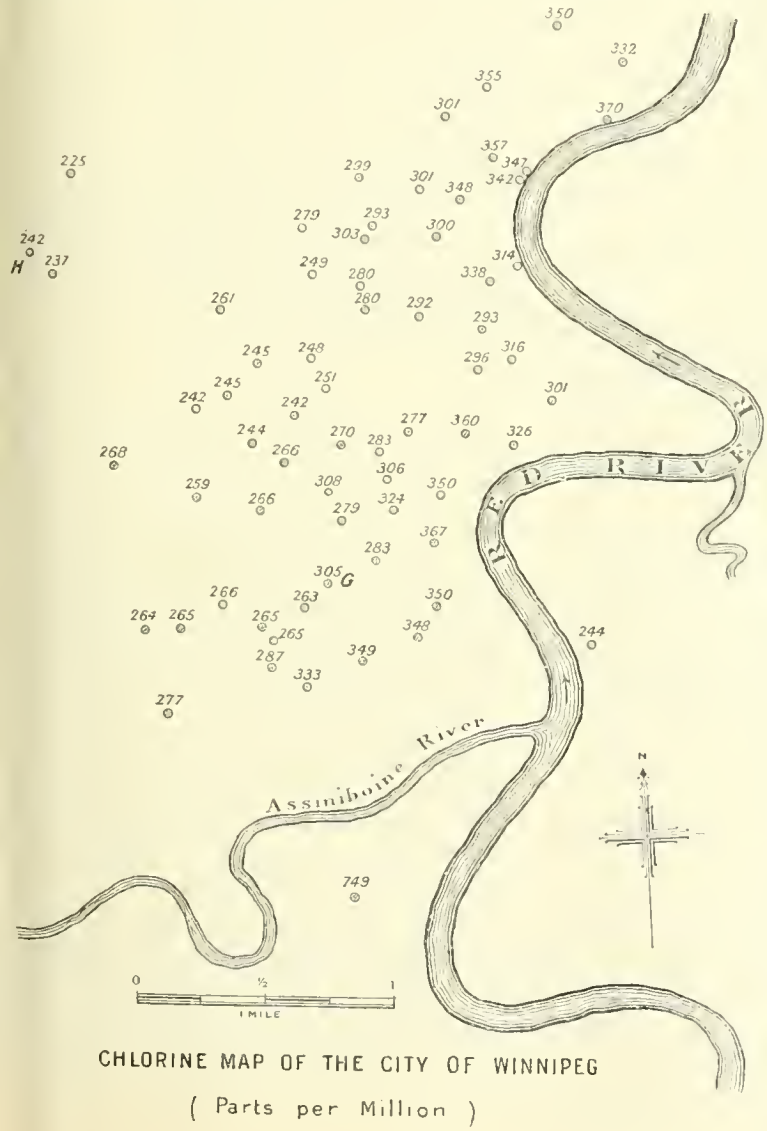
Analyses of the River and Artesian Waters.

(Parts per million.)

—	E.	F.	G.	H.	H¹.
Sodium chloride	35	41	503	399	399
Sodium sulphate.....	30	77	37	31	33
Magnesium sulphate ...	..	..	..	..	124
Magnesium carbonate..	113	186	241	237	63
Calcium carbonate	110	169	20	70	..
Calcium sulphate	92	201	339	216	72
Total solids	380	674	1,151	953	691
Temporary hardness ...	245	390	307	352	75
Permanent hardness ...	68	148	243	159	157
Total hardness.....	313	538	350	511	232

(Hardness = parts per million of $CaCO_3$.)

E. Red River. December, 1900.
F. Assiniboine River, February, 1902.
G. Well half a mile from Red River, May, 1901.
H. Waterworks well, two miles from river, June, 1901.
H¹. The same water after softening, June, 1901.



CHLORINE MAP OF THE CITY OF WINNIPEG

(Parts per Million)

As far as it has been possible to investigate this matter, these changes in composition extend to the west and north of Winnipeg. The water of the Poplar Spriggs, 10 miles from the Red River, is practically free from sulphates, and the chlorine is only 23 parts per million. The chlorine present in the water is less than sufficient to combine with the sodium, so that, if the results are calculated to salts in the conventional manner, part of the sodium must be returned as carbonate. The hardness is, therefore, of a temporary character only. Water of this nature is not uncommon to the west of the Red River valley. Flowing wells on the prairie a few miles west of Winnipeg show low chlorine and permanent hardness with high temporary hardness, whilst the water from the wells on the river bank some miles north of Winnipeg gives results not differing very much from the artesian water in the city.

At the present time, the city of Winnipeg is supplied with water from the underground source, the water being softened by the Clark process. The large well from which the water is taken is 17 ft. in diameter and 48 ft. deep, and is situated in the outskirts of the city, about two miles from the Red River. The well was sunk to the limestone, and then filled in with broken stone to a depth of 5 ft. On the top of this was placed 3 ft. of concrete perforated with four 6-in. pipes. This filling in of the bottom was found to be necessary in order to put a stop to the erosion that was taking place, and which had begun to affect the stability of the surrounding buildings.

The natural level of the water in the well is 3 ft. above the ground, and pump tests have shown that the well is capable of yielding continuously nearly 3,000,000 galls. a day.

The process of softening is a continuous one, and is carried out as follows:—The lime employed is a very pure material imported from the United States. Attempts to make use of the lime from the dolomitic limestone of the neighbourhood were not successful, on account of the difficulty of obtaining a clear lime-water, and the large amount of useless material that had to be handled. At intervals of every two hours a quantity of lime, amounting to about 400 lb., is slacked with hot water, using about two gallons of water to the pound. The cream of lime so formed is run into a well where it is kept continually mixed by a paddle. From here it is pumped to tanks, where it becomes converted into lime-water by mixture with a portion of the hard water. The hard water from the well is pumped first to a weir-box, 30 ft. above the ground, where it divides into two streams in the proportion of 18 to 82. The smaller stream passes to the two lime-water tanks already referred to. These are 14 ft. in diameter and 18 ft. deep. The water as it enters these tanks at the bottom becomes thoroughly mixed with the cream of lime, and at the same time displaces from the tops of the tanks an equivalent volume of clear, or nearly clear, lime-water, which rejoins the larger portion of the hard water in a baffle channel. The thoroughly mixed liquid then passes to the two reaction tanks, entering at the bottom. These tanks are 20 ft. deep by 30 ft. in diameter. As the mixture clarifies at the surface, it is continually drawn off by discharge pipes supported by floats. Before passing to the filters, a portion of the nearly clear water is pumped to the carbonating boxes, where it becomes charged with carbon dioxide formed by the combustion of coke. This carbonated water rejoins the main current in its passage to the filters.* The water, still retaining about half a per cent. of the original suspended carbonates, is finally filtered through cloth under a pressure of about 7 lb. to the square inch. The filters (which are arranged in seven groups) contain 567 separate cloths, with a total filtering surface of about 10,000 sq ft. Once every day the filtering cloths are removed from their frames and thoroughly washed, the last portions of the precipitate being dissolved out with weak hydrochloric acid. The water flows from the filters into a 300,000 gallon reservoir, whence it is pumped into the mains.

The water as it leaves the well has a temperature of about 40° F., and is not much increased in temperature in passing through the softening plant.

The Winnipeg softening plant is said to be the largest in the world, and the first installed on this continent for treatment of a civic supply. Many difficulties were experienced in getting the plant into operation, chiefly on account of the large amount of magnesia in the water.

The plant has a capacity of 2,500,000 galls. a day, but at present the average amount of water used is only about 1,300,000 galls. Apart from interest on capital and the cost of pumping to the plant, the following are the chief items in the expense of softening 1,000 galls. of water:—

	Cents.
Wages, $15·00 a day	1·15
Lime, 3·65 lb. at $12·00 per ton	2·19
Coke, 300 lb. a day at $16·00 per ton	0·12
Acid, 50 lb. a day at 1·5 cents per lb.	0·06
	3·52

It is the intention to eventually put in a recovery plant by means of which pure lime will be obtained from the sludge. It is estimated that in this way good lime will be obtained at one-third the price now paid. Possibly, the magnesia obtained at the same time may be sold to steel works as lining for basic furnaces.

*This was the arrangement originally adopted. Recently, however, it has been found more satisfactory to carbonate the water *after* filtration.

THE SEPARATION OF ARSENIC, TIN, AND ANTIMONY.

BY W. R. LANG, D.SC., C. M. CARSON, B.A., AND J. C. MACKINTOSH.

These experiments were undertaken to determine on a suitable method for accurately estimating the amounts of arsenic, antimony, and tin in a mixture. Various processes were tried as recommended in different text-books on qualitative analysis, all of which had proved, in the authors' opinion, more or less unsatisfactory.

I.—The principles involved in the first method devised were the oxidation of the arsenic sulphide to arsenic acid, and the subsequent separation of the antimony sulphide from that of tin by digestion with tartaric acid. The process was thus carried out:—Known quantities of pure arsenic acid, tin chloride, and tartar emetic, were dissolved in water, with addition of sufficient hydrochloric acid (arsenic free) for complete solution. The whole was made up to a known volume, and aliquot parts taken for subsequent experiments. After reduction with sulphur dioxide the elements were precipitated as sulphides with sulphuretted hydrogen. It was found that precipitation occurred best in hot solution, not too strongly acid. The washed precipitates were evaporated to dryness with 15 c.c. of concentrated nitric acid, and the arsenic acid extracted by digestion in the water-bath with 100 c.c. of water. In the resulting filtrate, the arsenic was determined as $Mg_2As_2O_7$.

For the antimony, the residue from the last filtration was digested with a concentrated solution of tartaric acid for one hour, then filtered, and the residue washed, ignited, and weighed as SnO_2.

To the solution of antimony oxide in tartaric acid were added hydrochloric acid and a considerable excess of water, and the antimony then precipitated as sulphide. Oxidation with nitric acid and subsequent ignition brought it into the state of oxide (Sb_2O_4), in which it was finally weighed.

Our results were as follow:—For each experiment, 20 c.c. of a solution were employed containing 0·0800 grm. of As_2O_5, 0·0800 grm. of $SnCl_4$, and 0·0731 grm. of Sb_2O_4, and the amounts of arsenic, tin, and antimony found were calculated to the above.

—	I.	II.	Average.
	Grm.	Grm.	Grm.
As_2O_5	0·0801	0·0799	0·0800
$SnCl_4$	0·0804	0·0797	0·0801
Sb_2O_4	0·0732	0·0722	0·0727

The digestion of the mixed oxides of antimony and tin is best carried on in a flask, with a glass tube and cork attached to prevent evaporation, sunk in a water bath.

II.—The method here employed was to separate the sulphides of antimony and tin by means of concentrated hydrochloric acid. The results of several experiments showed that an appreciable quantity of arsenious sulphide was dissolved by the hydrochloric acid when warmed, though the method of separation is advocated in most text-books.

In this Journal, 1898, 211—214, Messrs. J. & H. S. Pattinson showed that the addition of two-sevenths by volume of hydrogen sulphide water sufficed to prevent the solution of any of the arsenious sulphide, whilst the sulphides of antimony and tin dissolved readily. Nothing is said of the temperature at which this reaction took place. We have tried the effect of different concentrations of hydrochloric acid alone at different temperatures, and found the amounts of arsenious sulphide, which are dissolved, to vary very considerably. It is our intention to investigate the solubility of sulphide of arsenic under varying conditions of temperature, concentration, and relative masses of sulphide and acid; but as far as our present examination has gone these results point to the method of separating the sulphides by hydrochloric acid as being unreliable.

Liverpool Section.

Meeting held on Wednesday, April 30th, 1902

DR. D. B. HEWITT IN THE CHAIR.

WATER CARRIAGE WITHIN GREAT BRITAIN.

BY ARTHUR CAREY, M.SC.

In a country such as ours, incapable of producing sufficient foodstuffs to support our population, existence depends on our power to purchase foreign foodstuffs. The power to purchase foreign foodstuffs depends in its turn on our power to supply other countries with manufactured goods at lower prices than they can produce the same articles themselves. Without taking by any means the pessimistic view which has been so common of late as to the present condition and prospects of our manufacturing industries, there is no doubt that this country has before it a severe industrial struggle for existence. In this struggle many factors play an important part, such, for instance, as possession of capital, supplies of raw material, enterprise, education, technical skill, and a low cost of transport of (1) means of subsistence to the population; (2) raw materials to the place of manufactures; (3) manufactured articles to the consumer or the coast.

Mr. Max Muspratt opened his very interesting paper last year on "The Transport of Chemicals" with the following sentences:—

"While scientific manufacture has always engaged the attention of this Society and the improvement of the patent law is associated with the Manchester Section there is one subject which has not recently received the attention which its merits, viz., that of transport of chemicals."

"In the case of the staple heavy chemicals the battle with the railway companies has been fought and largely won, while with the larger shipping companies much has been done."

Now it is with the following statement of Mr. Muspratt's that my paper to-night has really to deal, viz., "that in the case of the staple heavy chemicals the battle with the railway companies has been fought and largely won," I think few will refuse to admit with Mr. Muspratt, that the battle has been largely won to the extent of reducing railway rates on the main heavy chemicals to somewhere near the lowest paying rate at which railways constituted as ours are, and constructed at an average capital expenditure of over 50,000*l.* per mile, can carry goods. The mean dividend on our railways is under 4 per cent. on the capital; a figure which clearly indicates the absence of extravagant profits.

I had hoped to be able to give a number of examples showing how large a proportion of the total cost of manufacture of many important articles is the item for railway freight. Owing, however, to the short time at my disposal for the preparation of this paper, I can only give two instances. Take a Leblanc soda works at Widnes, which is an exceptionally well-situated place. The railway rates on the raw materials and on the conveyance of the finished goods to the port of Liverpool amounts to about 10 per cent. of the total sale price.

I give in the accompanying table the cost of carriage on raw material, which was very kindly given me by a well-known steel works.

To take the case of the pig-iron in this table. The cost of railway freight per ton, pig iron for raw material alone, without any cost of carriage of the iron to consumer or the past is equal to about 15 per cent. of the sale price. Now, we admit, as I think we must do, that apart from some very revolutionary action on the part of the Government with regard to railways, there is little chance of material reduction in our rates, what is to be done or hoped for? I believe the only possibility of material reduction in the freight charges on our manufactures in the carriage of heavy goods, especially raw materials, is by development of our waterways.

	Freight per Ton of Pig Iron made.	Freight per Ton of Ingots made.	Freight per Ton of Finished Bars made.
	s. *d.*	*s.* *d.*	*s.* *d.*
Freight on fuel for making coke.	0 10·75	0 7·52	0 8·26
Freight on fuel used for gas producers.	..	0 2·22	0 2·44
Freight on fuel used for re-heating furnaces.	..	..	0 1·74
Freight on limestone for blast furnaces.	0 4·5	0 3·15	0 3·46
Freight on limestone for steel furnaces.	..	0 1·92	0 2·11
Freight on iron ores for blast furnaces.	7 7·96	5 4·37	5 10·74
Freight on iron ores for steel furnaces.	..	0 4·75	0 5·22
Freight on purchased pig iron, wrought iron, scrap, &c.	..	0 8·27	0 9·09
	8 11·21	7 8·2	8 7·06

In spite of periodical and spasmodic attempts to attract attention and obtain relief, the inland water system of this country has never recovered from the collapse which followed the introduction and rapid spread of railways. This state of collapse was not peculiar to the canal system of this country; there were the same phenomena, and to a certain point, the same results, in other countries. The peculiarity in the case of this country has been that our canal system has never recovered itself. The railways in this country have throughout been too much for the canals. How the railway companies managed to do this is described at some length in the Report of the Parliamentary Committee of 1872, an extract from which reads as follows:—

"The most important method by which the railway companies have defeated the competition of canals has been the purchase of important links in the system of navigation, and the discouragement of through traffic. South of Birmingham there are independent canals which work together; whilst in the same and adjacent districts there are other canals, viz., the Birmingham and Liverpool Junction, Trent and Mersey, Ashby-de-la-Zouche, and Stratford-upon-Avon Canals, which form, or ought to form, a continuous system with the independent canals, but which have fallen into the hands of the railway companies. It is stated that the independent canals work together; that the carriage is conducted by private barges; that if traffic offers, the independent canals make special and favourable through rates; but that the railway companies refuse to make similar rates on their parts of the system; and in some cases charge a bar toll, *i.e.* a large and almost prohibitory toll on barges entering their canals from the independent canals. Thus the through rate for iron to London is 4*s.* 6*d.*; of this the independent canals get 3*s.* for 146 miles, whilst the Birmingham Canal, which, by means of a guarantee, is under the virtual control of the London and North-Western Railway Company, takes 1*s.* 6*d.* for 10 miles. The Great Western Railway Company charge 10½*d.* for 12 miles on their Stratford-upon-Avon Canal, but if the traffic enters an independent canal, an extra or bar toll of 1*s.* 10*d.* is charged; 4*d.* a ton is charged for the use of the Birmingham Canal, but if the barge enters an independent canal, 1*s.* 6*d.* extra is charged. Traffic is forced 67 miles round by independent canals, instead of going by the shortest route, which is 37 miles. The independent canals have, since the time when the arrangement between the Birmingham Canal and the railway company took place, reduced their tolls by an amount varying from 70 to 25 per cent., and generally by about 50 per cent., whilst during that period no reduction whatever has been made upon the Birmingham Canal. They carry a larger local traffic than the canals owned by railway companies. The Worcester Canal, which is nearly bankrupt, and which the Midland Railway Company are

now proposing to buy, has, it is said, been ruined by being placed between canals which are in the hands of railway companies."

In 1883 a Select Committee was appointed to report on Canals. This committee took a great deal of evidence as to the conditions of the canal system at that time, and, though it made no report, requested that it might be re-appointed in the next session to continue the inquiry. The request was, unfortunately, not granted. Since 1883, there has been no exhaustive inquiry into the canal system.

Mr. H. R. de Salis, who knows the canal system better, perhaps, than any man, and who has visited the entire length of every inland waterway in England and Wales, has been good enough to tell me that "there has been very little alteration since 1883 in the general condition of English canals, and that, taking the country thro', canal traffic, during the last few years, has been slightly on the increase."

As there has been no general alteration in the state of the canals since 1883, a description of them, taken from the evidence given before the Select Committee of that year, will be, for purposes of a general view, accurate.

The length of the canals of England and Wales is 4,050 miles, of which 2,472 miles are in independent hands, 1,833 miles are in railway hands, 188 miles are derelict, and 119 miles have been converted into railway.

Though it is not possible to accurately divide the canals, they fall naturally into four main groups—The 1st group connects the Mersey with the Humber, the 2nd group connects the Humber with the Thames, the 3rd group connects the Thames with the Severn, the 4th group connects the Severn with the Mersey. Cross connections join the Severn and the Humber and the Mersey and the Thames, and all four rivers with the important manufacturing district round Birmingham. In addition, there are several smaller groups and isolated canals. This seems on paper an extensive and well thought-out scheme of water communication. Unfortunately there was no general scheme in the minds of the many constructors of our canals. The canals were made in short bits by independent companies, the majority of whom have either maintained their independence or, what is worse, sold it to the railway companies. Each canal company selected the size of canal and lock, which either the length of its pocket or merely local conditions dictated, and each canal charged and still charges its own toll.

A few examples from the evidence before the 1883 Committee of what a confusion this means are given in the accompanying three tables, which give the details of three through routes :—

1. *Through Route, London to Liverpool*: 245 *miles.*

Waterway.	Miles travelled.	Size of Locks in Feet.
Regent's Canal	8¼	90 × 18 × 5
Grand Junction	101	80 × 14 × 4½
Oxford	5	..
Warwick and Napton	15	72 × 7 × 4
Warwick and Birmingham	22	72 × 7 × 4
Birmingham	15	..
Stafford and Worcestershire	1¼	..
Shropshire Union	68	80 × 7½ × 4
Mersey	10	..

Through Route, London to Hull: 289 *miles.*

Waterway.	Miles travelled.	Size of Locks in Feet.
Regent's Canal	8¼	90 × 15 × 5
Grand Junction	138	72 × 7 × 4
Leicester	16	70 × 14 × 3½
Loughborough Navigation	8	70 × 14 × 3½
Trent	100	90 × 15 × 3½
Humber	18½	..

These tables illustrate clearly the difficulties and complications of the through water communication, which are: (1) The large number of different canal companies, each demanding a different toll, which difficulty is accentuated by the fact that there is no organisation such as the railway clearing house for simplifying through rates; (2) The possession by the railways of lines in almost every possible through line of communication; (3) The variation in size of boat which can navigate the canals varying from boats of 500—600 ton burden on the "Gloucester" and "Berkeley" ship canal to a 30-ton narrow boat on nine of the canals mentioned in these three tables.

Through Route, Liverpool to Severn Ports: 187 *miles.*

Waterway.	Miles travelled.	Size of Locks in Feet.
Mersey	15	..
Duke of Bridgwater	5¼	84 × 15 × 4½
North Staffordshire	55	72 × 7 × 3½
Stafford and Worcestershire	21½	72 × 7 × 4
Birmingham	15	72 × 7 × 5½
Worcester and Birmingham	30	150 × 30 × 6
River Severn	29	135 × 22 × 9
Gloucester and Berkeley	16	100 × 24 × 6

With very few exceptions no mechanical improvements have been introduced to cheapen haulage (which is still in the vast majority of cases done by horse, as it was 100 years ago) or to lower the terminal charges.

The original cost of construction of the canals was stated in evidence, in 1883, to be between 15,000,000*l.* and 20,000,000*l.*, or about 4,000*l.* per mile. The cost of the larger canals was stated to be about 10,000*l.* per mile.

In Mulhall's Dictionary of Statistics it is stated that the cost of canals in the United Kingdom averaged 9,500*l.*, and the capital involved 35,000,000*l.*

To put it shortly, whilst all that concentration of capital and management, unstinted expenditure of energy and mechanical skill could do, has been done for railways, our canals have with one or two exceptions remained in the same condition in which they were first made. This makes it the more difficult for Englishmen, unless they look abroad for information, to realise the possibilities of water carriage for the cheap conveyance of heavy goods. To compare our railways, as they stand, with our stagnant and antiquated canals is not fair. In the words of Lieut.-General Rundle, R.E. "It is like comparing a perfectly modelled mail-steamer of the great ocean companies with the coal barges of the Thames. All such comparisons can only serve to obscure the real point to be arrived at, viz., the practicability of reducing the cost of carriage to the lowest possible figure, and the necessity for doing so if the mercantile interests of the United Kingdom are to hold their own in competition with foreign nations."

If we, however, look abroad, to France, Belgium, Germany, and the U.S.A., we see that in all these countries where the railway rates are, on the average, distinctly lower than with us, it has been considered necessary to develop the means of water carriage. Take the case of France. In France, as in England, the great boom in railways in the middle of the last century drew all men's attention from the water communications which were for a time neglected and considered out of date. At the time, however, of the great national stock-taking after the disastrous war of 1870, a commission was appointed to enquire into railways and other means of communication. The figures published in the report of this commission on internal navigation are of great interest.

The total length of the French canals was 3,123 miles, of which 2,481 miles belonged to the State.

The canals had been made at a cost of about 33,000,000*l.*, or about 10,500*l.* per mile. The traffic amounted to 167,000 tons per mile per annum.

The cost of maintenance on the State canals, including all repairs, water, and lock attendance, amounted to 90*l.* per mile per annum. The average total cost of carriage was 0·24*d.* per ton per mile. Haulage was almost exclusively by man, donkey, or horse.

The total average cost of carriage of goods by water, is ted by the commission to be, on a traffic of 167,000 tons annum per mile of canal :—

	Per Ton per Mile. d.
Interest 5 per cent. on 33,000,000*l.*	0·5
Maintenance and repair	0·08
Carriage	0·24
Total	0·82

The commission go on to point out that the traffic, per le, is far below the capabilities of the canals, and state t would not be rash therefore to assert that the ton leage of our canal system can be doubled." On this umption they argue the total cost of water carriage, luding capital charges, would be about $\frac{1}{3}d.$ per ton per le.

The commission sum up the situation with regard to terways as follows :—

"It has been shewn that, on the average, the cost of nsporting bulky articles on canals, resolves itself nearly follows :—

	Per Ton per Mile. d.
Carriage only	0·24
„ „ + maintenance	0·32
„ „ + „ + interest	0·82

The last-named rate is the only one on which, to all pearances, calculations should be founded, for it seems sonable that the traffic should support the charges for ablishment and maintenance. But this rule, though solutely right when applied to private companies, is estionable when the State only is concerned. Thus when company constructs a canal, it has nothing to receive yond the fares. It is necessary, then, that the fares uld suffice to reduce the cost of construction, pay the intenance charges, and furnish the dividend, but when e State alone is concerned this is not the case.

If the canal promotes agricultural improvements, stimu- es the establishment of factories, facilitates the working mines, quarries, forests—increases, in a word, the public alth—the State, its inevitable partner, takes its share of such increased wealth, and that share is perhaps fficiently large to do away with the necessity for bringing y toll. It is thus, that the State and departments have en enabled to construct and maintain roads, without manding any toll from the public who use them. It is is fact also which, though in a less degree, admits of the existence of those canals, from which the State realises a moiety only of the expenses of maintenance.

But under such apparently erroneously liberal views, there lies both a true perception of the wants of the country, which induces the State before everything to augment its wealth and production, and also a profound equity of taxation, for the impost laid upon wealth created by help of the canals, diminishes the burdens of the whole community, even of that portion of it, which does not make use of them.

Formerly (*i.e.*, before the railways) a difference of 1·75*d.* per ton mile, existed in the charges for land and water carriages. Although perforce divided between the public and the canal grantees, yet this margin admitted of a large return upon the capital employed. This fact explains how, notwithstanding the feeble development of private enterprise, and the poverty of the period, yet for more than 200 years, grantees were forthcoming for the construction of the older canals.

At the present day, capital is abundant and the spirit of enterprise in full vigour, but, on the other hand, since the competition of railways, the rate of freight has become lowered in every direction. The difference of cost does not exceed 0·32*d.* per ton-mile, and is therefore insufficient to remunerate capitalists. Herein lies indeed, the great difficulty of the question, for, involved as it is, the State is powerless to carry out any considerable improvements on its navigation works; and private enterprise, for want of sufficient remuneration, is not willing to engage in such undertakings."

The commission recommended the expenditure of 17,000,000*l.* for works urgently required.

As a result of the work of this commission, the French Government fixed a minimum gauge to which all alterations must conform, and has spent 10,000,000*l.* in improving the internal waterways of France. The waterways are now free for the use of all, as the roads of the country; the last vestige of canal due having been abolished in 1880.

The chief traffic on the French canals is in such articles as coal, salt, alkali, and heavy chemicals, lime, minerals, cement, bricks, beetroot, manure, and many agricultural products. Steam haulage and horse haulage appear about equally to divide the traffic. Electric haulage is little used, and is increasing very slowly. The normal size for canal boats is a capacity of 200—300 tons.

I give below a list of rates charged for carriage of minerals and other goods whose value does not exceed 50—60 francs per ton. From the list it is seen that the average rate charged by the carrier is under 0·2*d.* per ton per mile.

Canal Rates, France.

To	From Havre.		Rouen.		Dunkerque.		Antwerp.	
	Distance.	Pence per Ton Mile.	Distance.	Pence per Ton Mile.	Distance.	Pence per Ton Mile.	Distance.	Pence per Ton Mile.
	Miles.		Miles.		Miles.		Miles.	
ambrai	310	0·225	234	0·213	108	0·185	165	0·122
. Quentin	298	0·242	201	0·211	140	0·178	197	0·140
ompiègne	226	0·265	155	0·232	191	0·171	208	0·192
ouen	..	..	..	..	341	0·176	..	..
aris	227	0·22	152	0·185	297	0·202	..	..
eims	267	0·245	193	0·207	187	0·227	237	0·174
ancy	491	0·163	417	0·132	302	0·191	..	..
ontercau	..	..	..	..	560	0·121	..	..
joi	476	0·231	400	0·225	560	0·170	..	..
evers	400	0·20	323	0·186	471	0·170	287	0·215
anne	505	0·168	428	0·152	573	0·152	590	0·190
on	..	..	557	0·182	695	0·172	716	0·196
Average	..	0·22	..	0·21	..	0·176	..	0·175

If we take Belgium we find the attitude of the Govern- nt to the question of cost of transport of goods, resented by the following extract from a Report on blic works to the Belgian Chamber of Representatives by . Le Hardy de Beaulieu, in 1870.

The Report dealt chiefly with railways, but the principle applied equally to canals.

Extract :—"In the countries which surround Belgium, and contend with her products in the markets of the world, the railway companies are paying off their bonds and

extinguishing their capital by sinking funds, and advancing to the time when the railways will be in the hands of the State, free from all charges for interest on capital."

The State in Belgium owns almost all the canals, and, I understand, makes no charge for interest on capital sunk, but only a small toll to cover cost of maintenance. The Belgian canals carry the same description of goods as the French canals. The haulage is almost exclusively by horse. Electric haulage is being very slowly adopted, though rather faster than in France. The size of the canals is not uniform, and the capacity of the boats used varies from 60—300 tons.

The following extract from a letter written by Messrs. J. P. Best and Co., the shipbrokers and forwarding agents of Antwerp, Ghent, Flushing, and Terneuzen, is in reply to a question from me as to the relative cost of carriages, in Belgium, by rail and water.

"In a word we consider the facilities offered in Belgium for carriage by water are of immense value to commerce and industry, and it is not an exaggeration to say there must be a saving from at least 50—100 per cent. in favour of water carriage."

To sum up the attitude of foreign states with regard to water communication, I will quote the words of one of the great canal advocates who gave evidence before the 1883 committee.

"In Belgium, in France, and in America it is not a question of canals as against railways or anything of that kind, but a question of how can the public have the cheapest transport. France puts down 40,000,000*l.* for the improvement of the canals, and France, America, and Belgium all say you can do for one-third by water what you can do by land, and you shall have every facility to do it."

I have found it an extremely difficult matter to give a detailed comparison of the rival merits of canals and railways for the carriage of heavy goods.

Information, and especially figures, for the purpose of an accurate comparison on modern lines I have not been able to get. However, I have tried to arrive at a comparison from the figures within my reach, and I give them to you for your consideration. I have divided the comparison under the following heads:—

(1) Initial cost for equal power of conveyance.
(2) Cost of maintenance and carriage.
(3) Speed of delivery.
(4) Chance of stoppage.

To take these points in detail.

1. *Initial Costs.*—Of course, in the case of both a canal and a railway, the cost of construction varies enormously with the local conditions. It is necessary, therefore, to take in each case a wide average:—

	Per Mile. £
Average cost of English canals	9,600
" " French "	10,800
" " U.S.A. "	9,800
" " Canada "	15,500
" " English railways	50,000

The average cost of English railways, which is taken from the division of the total capital by the mileage, is extravagantly high; but it is, unfortunately, the capital sum for which the struggling industries of this country have to find the interest.

I have no data for comparing the actual maximum carrying power of a canal as against a railway. I only know the capacity of a canal is very great indeed. Take, for instance, a canal with locks capable of accommodating a 100-ton barge. A modern lock will manœuvre in three minutes, but if we say six minutes is actually taken we can pass through the one lock 1,000 tons per hour, or 8,000,000 tons per annum. If this is not enough, the tonnage can be doubled by increasing the size of the locks or duplicating them. What is the maximum tonnage a line of double rails will carry I do not know; but if we were to consider the total number of trains run on the English lines, in the year 1900, passenger, goods, and mineral trains all as mineral trains, and calculate the weight per mineral train as 90 tons, we shall get a figure far above the actual tonnage hauled per mile over our railways, *i.e.*, 1,640,000 tons per mile per annum, or less than one-quarter of what we calculated the maximum capacity of our canal with single locks capable of accommodating a single boat.

The French Commission of 1872, in their Report, considered the capital involved for equal power of conveyance to be 50 per cent. greater in the case of a railway than a canal. There is no doubt, I think, that we are justified in considering the capital charge per ton goods hauled along a canal to be less per mile hauled than on a railway.

2. *Cost of Maintenance and Carriage.*—The figures given by the French Commission of 1872 for the total expenses of the French State canals apart from interest on capital and carriage of goods, is 90*l.* per annum per mile of canal. This figure is very low, but is a basis of fact from which it is fair to argue. For English and Welsh railways the charge for maintenance of way and works for 1899 was at the rate of about 450*l.* per annum per mile.

Cost of Carriage: By Canal.—The figures given by the French Commission as the actual cost of carriage, including repair and maintenance of boats and interest on capital, amounted, under the very unsatisfactory conditions previous to the French canal revival, to 0·21*d.* per ton per mile.

Mr. Bartholomew, of the Aire and Calder Canal, before the 1883 Committee, gave the following as the actual costs, including all charges and 10 per cent. depreciation on stock, as:—

	Per Ton per Mile. *d.*
With horse haulage	0·2
Steam haulage tugs not carrying cargo	0·14
" " carrying cargo	0·03

This last figure is extraordinarily low; but it is quite possible under the circumstances. I will read you an extract from a letter of a gentleman who has great knowledge and experience of our canals and their traffic, and who has very kindly assisted me most materially in my paper. With regard to the cost of haulage, he says:—

"The circumstances of our different navigations cannot admit of one cost being applied to all of them. If the Aire and Calder tow (as they have been known to do) as many as 32 compartment-boats behind one tug in one train, each boat being loaded with about 35 tons of coal, how will the expenses of conveyance per ton per mile compare with that of a 25—30-ton narrow boat?"

Again: "The Aire and Calder is no doubt the finest navigation . . . . we have;" "it is well situated for commanding a large quantity of suitable traffic, and has spent large sums of money constantly in improvements, with the result that their shares stand at a price which they do not like people to know; I do not know what they are worth, and nobody outside themselves probably does either; and there is small doubt that they can deal with stuff at a price per ton mile which no railway could look at."

There seems little doubt from the above figures, that on suitable waterways with either steam or electric haulage, $\frac{1}{10}$ penny per ton per mile should cover cost of carriage. This figure is confirmed, I am told, by American practice.

Cost of Carriage on Railways.—It is impossible to separate the haulage and traffic expenses on the railways between the different classes of traffic. In this connection I will quote a few sentences from the first of the extremely interesting series of articles on the "British Railway Position" which has recently appeared in the *Statist*:—

"And when the railway managers and directors have before them the ton and passenger mileage, the wagon and car mileage, the average receipts per ton and per passenger per mile, they will have little difficulty in ascertaining the costs of handling the different classes of traffic."

The same article says, *à propos* of the recent decision of the Railway Commissioners on an increase in rate on coal imposed by the Scotch railways:—

"The Scotch companies have lost their case simply because they had not the data for proving to the satisfaction of the Commissioners that the cost of moving the coal traffic had increased." "And doubtless until the railway companies compile data essential to the scientific conduct

every industry, the Railway Commissioners will be slow sanction any increase in rates based on the plea that sts of working have increased."

My only means of arriving at a figure to express the st of haulage of minerals and heavy goods on railways volves one or more assumptions which may be very far the mark.

I have made two attempts, and shall be very glad of ticism and aid to improve the accuracy of the final ures.

First attempt.—From figures extracted from Mr. J. D. vinberrow's paper on "Capacity of Railway Wagons as ecting Cost of Transport."

For 1899, the total goods train mileage was 177,000,000. om the recent articles in the *Statist*, the average load of goods train is about 40 tons, and a mineral train 90 tons. ie proportion of goods carried to minerals is as follows:— ods, 28 per cent.; minerals, 72 per cent. The average in load (goods and mineral) would be therefore about tons.

Now the expenses per train mile run on all railways for 99 were:—

	d.
Traffic charges	11
Loco. charges	9
Rolling stock	5
	25

We have no means of separating the passenger and goods in expenses from each other, and have therefore to make assumption—and rather a big assumption too—that the an cost of a passenger and a goods train mile is the ne. On this assumption the cost for carriage on railways uld be $\frac{25}{70} = 0{\cdot}35d.$ per ton per mile.

Second Attempt.—The average freight per ton per mile minerals is given in the *Statist* for the L. & N.W.R., R., G.W.R., and N.E.R., as $0{\cdot}77d.$ The proportion of penditure to gross earnings on all traffic for these lines rages about 64 per cent. If, now, it is safe to assume t the normal charge is made for carriage of minerals — to assume that freights have been so settled as to give equal proportion of profit on all traffic—we can take per cent. of $0{\cdot}77d. = 0{\cdot}49d.$ per ton per mile."

This figure includes not only carriage but maintenance es, and general charges, and if these are allowed for on basis of the figures given by Mr. Twinberrow, we have $9d.—0{\cdot}16d. = 0{\cdot}38d.$ per ton per mile, which is substantially the same as that obtained by the first method.

The net result of these two calculations, would be to mate the actual cost of carriage of heavy goods by ways under the British conditions at about one-third of a ny.

. *Speed of Delivery.*—There is no doubt, especially long distances, that the railway is much quicker than the al. The actual loss due to the time thus lost is, for cles of low value, quite negligible, as the following mple will show. Take an exaggerated case in which the way delivers in one day what the canal takes seven s to deliver. The distance travelled now could not be than 180 miles. What is lost? Interest on capital the canal, the boat, and other appliances is already wed for in the question of interest on canal capital and of carriage. The only thing lost by the delay is rest on the capital sunk in the material carried. The owing would be the amounts represented by this:—

		Per Ton per Mile.
	d.	*d.*
ton of coals at 10*s.* at 5 per nt. for seven days.	0·12	0·0007
ton of pig iron at 70*s.* at 5 per nt for seven days.	0·84	0·005
ton of copper at 60*l.* at 5 per nt. for seven days.	1*s.* 3*d.*	0·09

ntil, therefore, we come to valuable materials, such as per, the delay in carriage, due to the slowness of canals, on journeys of considerable length, is negligible.

4. *Chance of Stoppage.*—The canal may be stopped by frost in winter, and shortness of water in summer. The railways may be stopped or delayed by snow and flood in winter, and by fog all the year round. With modern ice breaking appliances and decent engineering care I see no reason to suppose that there need be appreciably more stoppage on the average canal in this country than on the average railway.

To sum up this comparison without binding ourselves to the actual figures I have given, we can reasonably admit—(1) That for an equal weight of material carried, the capital charge on a canal is less than on a railway; (2) that the cost of maintenance and carriage is materially less on a canal than on a railway; (3) for the class of traffic we are considering, the slow speed of the canal is no material disadvantage.

Water carriage for heavy materials conveyed in large quantities is therefore considerably more economical than railway carriage.

For those engaged in the various manufactures, which, together, make the great chemical industry, this is a matter of most serious, it may be vital, importance.

If we make up our minds that we want inland water carriage, the question naturally arises as to how we can hope to get it.

I put this question to a great canal authority, Mr. R. de Salis, who replied as follows:—

"An earnest and combined agitation on behalf of the Chambers of Commerce and similar influential bodies (really representing traders)" to get the Government "to agree to some scheme for improving the main routes of the waterways, and to free from the fetters of railway control some of the important links in railway hands."

The improvement mentioned by Mr. de Salis in the waterways refers to an increase in the cross section of a large part of our canals, which are now too small to admit of the economic application of improved means of traction.

Mr. de Salis says: "Steam haulage is possible in practically all the canals, but of very little economic value in any but those few of larger section. I maintain that had our canals been generally suited for economical mechanical haulage we should have seen more of it with steam long ago, without having to wait for electricity."

Now the private "Bill," which I have here in my hand, has been prepared and brought in by several gentlemen, among whom are Sir John Brunner and Sir Alfred Hickman, and is entitled "Canal Traffic.—A Bill to provide better regulation of Canal Traffic." Shortly, the intention of the Bill is to assist the formation of public canal trusts, and to enable local authorities to take over the management of existing canals, and to subscribe to the expenses of formation or promotion of public canal trusts. This Bill is undoubtedly a considerable step in the right direction, and I understand a deputation is being arranged to wait on Mr. Balfour to press on the Government the necessity of making this a Government Bill. The Iron Trade Association is taking a leading part in the agitation.

I feel most strongly that this is a point where the chemical industries, which have as important interests at stake as the iron trade, should assist in furthering a movement which can but do good, and may result in very material benefit to the trade and the State. I wish, therefore, to propose that this section should press on the Council of the Society the advisability of assisting to the utmost of their power the aims of the promoters of the Bill, and that the Council of the Society of Chemical Industry should take steps to be represented on the deputation.

I hope that I have said enough to bring home to all the importance of internal water communication to this country. Whether we ever emulate the countries on the continent in their care for and development of their waterways only the future can disclose. Practically, all we can do at present appears to be to support the Bill I have just described. I should like, however, in concluding my paper, to leave in your minds a broad question of economic politics and a theory regarding it. This is contained in the extract I have already read to you from words of the great French Commission's Report of 1872.

"Thus, when a Company constructs a canal, it has nothing to receive beyond the fares. It is necessary then

that the fare should suffice to redeem the cost of construction, pay the maintenance charges, and furnish the dividend."

"But where the State is alone concerned, this is not the case. If the canal promotes agricultural improvements, stimulates the establishment of factories, facilitates the working of mines, quarries, forests, increases in a word the public wealth, the State, its inevitable partner, takes its share of all such increased wealth, and that share is perhaps sufficiently large to do away with the necessity for levying any direct toll.

"It is thus that the State has been enabled to construct and maintain roads without demanding any toll from the public who use them."

I wish to acknowledge most cordially the assistance I have received in the compilation of this paper from many gentlemen, amongst whom I must mention Mr. H. R. de Salis, Mr. Barber, of the Liverpool Chamber of Commerce, and Messrs. Sheffield and Twinberrow, of Newcastle.

Discussion.

The Chairman said that, for his own part, he had wondered at the apathy of the traders in this country for a great many years; other countries had adopted quite a different policy with regard to inland navigation. Russia, which was looked upon as such a retrograde nation, had of late years adopted most enthusiastically the plan of developing her canal systems and navigable rivers; so much so, indeed, that now it was very difficult for an English trader, carrying a material like salt, to in any way compete in Russia with the native article. The facts, as put forward by Mr. Carey, had been known to the speaker for a great many years. The Governments of France and Belgium published a manual showing every mile of canal in their respective countries, the depth of the canals, the size of the locks, the height of the arches, directions to the boatmen, and all sorts of particulars—where there is a toll, where a man can get the necessary help, if he wanted to abandon his horse and adopt other means of drawing his boat. In England, everything was left to the individual trader, and it was, indeed, worse than that, because in the past, the legislature had permitted such a state of things as was pointed out by Mr. Carey—with such a large proportion of the canals in the hands of the railway companies, whose interest it was to stifle the canal and develop the railway traffic. The policy of allowing the canals to be handed over to the railway companies, especially that splendid canal between Birmingham and London, had created a state of things that would be very difficult to get rid of. It was only now that they understood in this country how very difficult it was for the private trader, who had to deal with such a condition of things as we had in England, to compete with the trader in America, Canada, Russia, Belgium, and France, where the conditions were such that the Governments took it into their own hands to provide every facility for canal traffic, without any toll whatever. It was also difficult to get at the cost of railway traffic, because the railway companies had all along concealed from the public and from Parliament what their costs were. He had attended many sittings of the commission, and whilst he heard the representatives of the railway companies ask all sorts of questions, when they, on behalf of the traders, were asked to supply figures as to cost of carriage, they said it would take many years to get out the particulars. But there were many railways in South America, the United States, and Canada, which furnished these particulars, and could show each item of the cost of railway carriage, what it cost for locomotive work, for maintenance of lines, for trucks, &c., per ton mile, and all this was given separate from the particulars of passenger carriage. If they took the cost of transport only on the English railways, he was convinced it would be found to be very small apart from terminal expenses, rent, or interest on capital, and all the expenses of warehousing. It was in these latter items that the enormous cost of railway carriage came in. As shown in Mr. Carey's paper, it was very difficult to get at figures of the cost of canal carriage, for the conditions varied so greatly. In this country the average boat load on many canals was about 18 to 20 tons, and frequently not more than two or three boats could be drawn in line, whereas in France, where the load of a train of barges was about 300 tons, the cost was of course very much less. The whole difficulty of canal traffic in this country arose, as Mr. Carey stated, from the fact of the slight depth, low bridges, the narrowness of some of the canals, the smallness of the boats, the impossibility of utilising anything but horse haulage generally, whilst in France, Belgium, or Germany, these conditions had been largely improved in the last 20 years. In America, where there were enormous ship canals, the cost was reduced to a minimum. In that country, however, certain railway companies had been able to take traffic from point to point cheaper than it could be carried the longer distance by water, and one railway manager said he looked upon this traffic as won back from water, and that they were prepared to carry it at an exceedingly low rate. Where the railway lines were not overcrowded, this policy was sound financially and commercially. He believed that the railway managers in this country were waking up to the fact that they could learn something from their foreign competitors. The question of the big train load had been alluded to, and perhaps, just as the big steamer could be worked more cheaply, comparatively, than the smaller one, so, probably, the big wagon and train load might enable companies to carry goods at a rate per ton per mile, with which a smaller train load could not possibly compare. This all showed the value of competition. In America, the experience was the reverse of what it was in England, and the railway managers were actually entering into competition with the great inland lakes and canals. That was a condition of things he would like to see in this country, but he had not much hope of seeing it. It was difficult to compare the railway conditions with those obtaining abroad—for instance, in the United States, land was obtained so cheaply that many companies constructed their lines out of the profit from the sale of surplus lands, and then they were told on this side that the American lines did not pay dividends or very little. In this country, the cost of the canals and railways had been very much heavier on account of the enormous prices paid for the land, and, in the case of the canals, the original capital had in many cases been so watered, that the original cost was hard to get at. This question of the canals should be regarded as a national one, and he hoped they would approve of the resolution to the council of the Society in London to ask them to make their voice heard in this matter.

Mr. Max Muspratt said he would like to know whether the trolley system had been used in any of the continental canals. If any scheme of canal connection, such as that referred to by Mr. Carey, could be brought about, then the greater number of the difficulties he (the speaker) raised last year (see Journal, 31st May, 1901) in connection with the transport of chemicals and other goods, sometimes erroneously classed as dangerous, would be solved. He, however, suggested that the cost in the matter of terminals would be very little different in the case of canal companies compared with the same expenses incurred by the railways. He was, however, open to conviction on this point. The terminal charges of the railway were absolutely scandalous and apparently had no real connection with the actual cost, but he thought the actual cost of terminals would be about the same on canals as on railways. This question of the terminal charges was the crux of the matter of expenses for short distance carriage, say, up to 40 or 50 miles, and this was likely to be the same on both systems. Though it was a fact that the railway companies had met them to some extent, it was, nevertheless, true that the English trader was at a great disadvantage as compared with his continental competitor. The cost, he understood, on canals in France was 0·1*d.* per ton mile; if this could be attained in England, the cost of sending goods to London would be about 1*s.* 8*d.* per ton. London was a great market wherever there was such a teeming population and wherever that population wanted goods from manufacturing centres, as was the case between Lancashire and London cheap communication between these places was of the mo

ital importance. With regard to questions of delay, ouched upon by Mr. Carey, he did not regard it as momen- ous, for, when the waterways became virtually highways of ie country, traders would become accustomed to the con- ition of affairs and would make allowance accordingly. Vith regard to the Canal Bill, now before the House of 'ommons, he thought that they should recognise the pioneer ork of the Bristol Chamber of Commerce in bringing it orward, and in this connection, it was worth noting that hambers of commerce were becoming a power in the land s a means of overcoming the inertia of the industrial men f this country. He did not think there was the same pathy as existed in 1883, referred to by the chairman. his question of canals was attracting more attention and had almost become one of practical politics. He believed iat the help of the chambers of commerce of the country hould be sought in favour of the Canal Bill, and he sug- ested that, after the stipulated time laid down by the ociety's rules, Mr. Carey should read his paper before ie Liverpool Chamber of Commerce. He seconded the esolution proposed by the reader of the paper.

Mr. Eustace Carey said that he had always found the anagers of railway companies very reasonable. They ad their own difficulties to deal with, and one of these was ie enormous price the railways had had to pay for land. heir dividends were not excessive. He understood the eader of the paper to say that the canals in France are ublic property, as the high roads are here.

The Chairman: To a large extent.

Mr. Eustace Carey, continuing, said he did not see why ey should not be. It had been a very much discussed atter whether the nation should not own the railways and llow the companies to have running powers over them. hat, however, was not now within the range of practical olitics, but they might face the problem as far as the wnership of canals is concerned. With regard to the rge American wagon, it was a question as to how far its se would be practicable with the quick curves of the nglish railway sidings, public and private. The majority f works would have to be remodelled if the 40-ton wagon ere to come into general use.

Dr. Campbell Brown said that the reader of the paper, in ie of his calculations, compared the capacity of the canals ith that of railways by taking the maximum tonnage that ould pass continuously through the canal locks, but he id not take the maximum number and weight of trains iat could get along the railways. He took the number of rains actually running. There were very few railways on hich the maximum number of trains possible was run. hen the trains, he thought, would be heavier in the future. le had calculated on the basis of an average of 90 tons, ut up to 200 was not uncommon, and there was no doubt iat this would increase. In short, an excessive relative rrying power for the canals had been assumed.

Mr. Eustace Carey said that for the last 30 years they ad had 200-ton trains, but a great many train loads were ery light.

Dr. Campbell Brown thought the average in future ould be 200 tons.

Mr. Arthur Carey, in his reply, said that he did not think ey could hope that the British railway lines, even in the ture, would equal the American lines in cost or charge for rriage of goods. With the present freight charges, it ok about 40 per cent. of the gross earnings of our railways pay 4 per cent. on the capital. They could not therefore pect any very revolutionary reduction in the charges ade. In reply to Mr. Muspratt, he might say that a olly system of electric haulage worked out by Messrs. iemens and Halske was, he believed, about to be adopted one of the Belgian canals. In reply to Dr. Campbell rown, the only object of his calculation as to the relative rrying power of canals and railways was to try to show iat the money spent per mile on a double line of railway uld be fairly compared with the 10,000*l.* per mile for canal. He thought that the figures quoted did show this. he object of his paper had been to emphasize the fact that anufacturers in this country had to pay about three times much for the carriage of goods per mile as their rivals in America, France, Belgium, and Germany. This was the vital fact, and the development of water carriage seemed the only way out of the difficulty.

In conclusion, the following resolution was put to the meeting and carried unanimously:—

"That, in view of the great importance to the industries of this country of the means of internal navigation, the Council be requested to do all in their power to support the private Bill on Canals (Canal Traffic Bill) now before the House of Commons, and to take steps to be represented on the deputation which the Iron Trades Association and the chambers of commerce are organising to wait on the First Lord of the Treasury to press on him the necessity of making the Bill a Government measure."

London Section.

Meeting held on Monday, May 5th, 1902.

MR. OTTO HEHNER IN THE CHAIR.

THE PRODUCTION OF MIXED CARBIDES OF MANGANESE AND CALCIUM.

BY J. S. S. BRAME AND VIVIAN B. LEWES.

The steady advance in the use of acetylene, especially on the Continent, has led to many efforts being made to cheapen the manufacture of calcium carbide from which it is produced, and as the chief factor in the cost of this material is the electrical energy necessary to bring the lime and carbon to the required temperature to cause interaction and produce the carbide in a fused form, most of the attempts have been made in the direction of raising the material to the highest possible temperature by various devices and then applying sufficient current to complete the action. Several so-called preheating processes have been proposed and patented, the best known of which are those devised by Pictet and Landin, but so far all attempts to show any great commercial superiority have proved futile, a result which is not to be wondered at when one considers that all such processes necessitate the employment of special plant, introducing one or more operations, and although the carbon monoxide obtained from the electric furnace may be used as a source of heat, yet it is doubtful whether anything is to be gained by such preheating, especially when it is remembered that the raising of the material the first few hundred degrees will require nothing like the electrical energy necessary to raise the temperature from an ordinary furnace heat to that of the electric arc.

When acetylene was first introduced as an illuminant, one of the chief troubles that militated against its success was the difficulty in finding a burner which would satisfactorily consume it in such a way as to develop its full illuminating power, and yet to prevent carbonisation of the burner tip and smoking of the flame after a few hours' burning. It was, however, found that if acetylene were diluted with anything over 25 per cent. of hydrogen, this trouble disappeared, but that the dilution lowered the illuminating value of the acetylene present in the mixture in a far greater ratio than the increase in volume would have led one to expect, and a series of experiments made by one of the authors showed that if the diluting gas used with the acetylene contained 30 per cent. of methane this trouble disappeared and the acetylene gave its full enrichment value.

Experiments were then made on a laboratory scale with a dynamo giving a current of 20 to 25 amperes at 65 to 70 volts to see if it were possible to make a mixed carbide of manganese and calcium, and if so, the action of hot water upon it would have been to yield a mixture of acetylene with hydrogen and methane, which would have burnt at small "Bray" nipples without the risk of carbonisation and consequent smoking of the flame.

In these experiments a small plumbago crucible and a carbon rod ½ in. in diameter formed the respective poles, and the experiments proved so successful that the idea suggested itself that not only might a mixed carbide of commercial value be prepared, but that by taking the manganese in the form of pyrolusite, and using a small excess of coke or other form of carbon, the heat of the arc would liberate oxygen from the pyrolusite and the heat produced by the rapid combustion of the excess of carbon with this oxygen would hasten the action and economise current.

It also seemed probable that as the manganese carbide is formed at a considerably lower temperature than that needed to produce calcium carbide, and is also more easily fusible, it might act as a flux to the mixture of lime and carbon and bring about their interaction with a smaller amount of current.

Protection was taken for this process, in 1896, and in 1897, Macé took out a patent for adding 5 to 15 per cent. of 'oxide of manganese' to the usual charge of lime and coke in the carbide furnace; and in August, 1899, Sunye states that he experimented with the process at the "Georges de Chatiles" carbide works at St. Beron, Savoy, where furnaces of the Heroult type are used for the manufacture of calcium carbide.

The conclusions arrived at by Sunye were that carbide could be made by this process in one half the time needed to make carbide under ordinary conditions with the same current, that it saved 35 per cent. in cost, and that the carbide formed yielded 10 per cent. more gas. As far as the authors have been able to ascertain, these results were only made public in documents used in the attempted exploitation of the process in England, but if correct were so remarkable that it appeared expedient to attempt their verification.

The first thing done was to repeat the laboratory experiments of 1897, using the same dynamo and apparatus as before. With lime and coke mixtures, porous masses of calcium carbide were obtained. With manganese dioxide and coke mixtures, fused "buttons" of manganese carbide were obtained with ease. Experiments were then made with various mixtures of lime, manganese dioxide, and coke. If the proportion of lime used was small, there was no difficulty in obtaining buttons of the carbide, but with higher proportions fusions did not take place, and only a porous mass was obtained.

A series of three experiments was made, after several preliminary trials, with varying proportions of manganese dioxide and lime, the result being shown in the following table:—

Mixtures.			Theoretical Gas.		Gas evolved.	
Manganese Dioxide.	Lime.	Coke.	Methane and Hydrogen.	Acetylene.	Methane and Hydrogen.	Acetylene.
2·5	1·0	1·5	51·63	48·37	44·08	55·92
5·0	1·0	2·5	68·16	31·84	84·2	15·8
7·5	1·0	3·2	76·25	23·75	89·75	10·25

The results show that, with a high proportion of manganese dioxide, the amount of manganese carbide formed becomes greater, whilst, with a low ratio of manganese to lime, considerably more than the theoretical amount of calcium carbide was obtained. In considering these results, it must, however, be remembered that all the material does not enter into combination, neither is it possible to obtain fusion except in small portions of the mass. In a further experiment, the ratios being manganese dioxide 6, lime 1, the product yielded a gas almost in agreement with theoretical values.

The current at the author's disposal was so low that it was impossible to form any idea as to whether the addition of the manganese dioxide gave any practical economy, but the experiments seemed to show fairly conclusively the possibility of making mixed carbides of manganese and lime which would yield mixtures of acetylene, methane, and hydrogen.

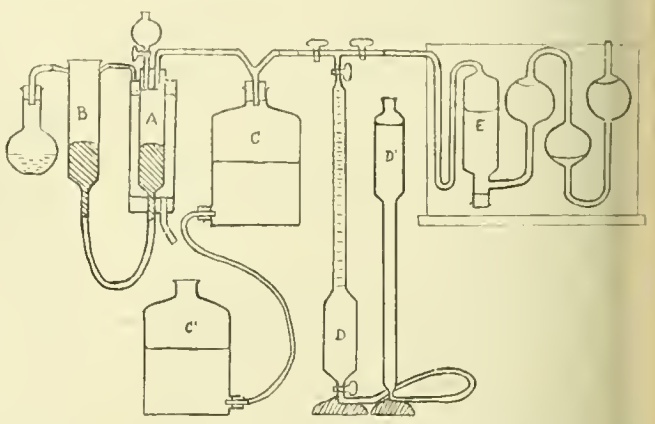
Under these conditions one of the authors applied to Mr. F. G. Worth, of the Acetylene Illuminating Company, to allow some experiments to be made on a large scale in the carbide crucibles at Foyers, a request which was acceded to in the most generous manner, and a long series of experiments was carried out under the able supervision of Mr. P. C. Day, who carefully noted all the necessary data, and forwarded the ingots formed for analysis.

The determinations made were gas yield per kilo. of carbide, percentage of true carbide in the ingot, and analyses of the gas.

For the first series of experiments, Nos. 1 to 5, Bamberger's method was employed for estimating the gas yield, namely, decomposing the carbide with brine, and estimating the loss of weight. Since, in every case, the gas was shown by analysis to consist of nearly pure acetylene, the loss of weight could be calculated as all due to acetylene, the error introduced by such an assumption being less than the experimental errors.

For the manganese carbides, Nos. 1*b* to 4*b*, the gas yields per kilo. were obtained by direct measurement.

To obtain samples of the gas for analysis a special apparatus was employed in order that the water in contact with the carbide might be heated to the boiling point. The arrangement is shown in the figure. A is a wide glass tube,



having a lamp chimney surrounding it so that steam might be blown through. B is another wide glass tube, connected with A by thick-walled rubber tubing, and containing sufficient mercury to fill A. The carbide was dropped into A, and mercury driven up until the capillary gas tube leading from it was full of mercury. The gas was collected in a large bottle, C, filled with brine, this being connected with a reservoir bottle, C'. Before generating the gas and making the connections, the brine was driven up into the Y-tube, so that entry of air was impossible. On letting water in by the tapped funnel, the gas, as generated, passed over and was collected in C.

A special gas burette, D D', also filled with brine, served to measure the gas, the burette having a capacity of 250 c.c. between the taps. The gas was passed into D at a pressure slightly above that of the atmosphere, and then by disconnecting the reservoir C, and opening the tap to the air, the gas was brought to atmospheric pressure before being driven into the Hempel pipette E, which contained ammoniacal cuprous chloride for the absorption of the acetylene.

In order to test the apparatus, 250 c.c. of a mixture containing 218 c.c. of acetylene with 15·3 c.c. of methane, and 16·7 c.c. of hydrogen was driven into the absorption pipette. The residual gas measured exactly 32 c.c., being in exact agreement with the total volume of methane and hydrogen.

To test the error which might be introduced by air remaining between the pieces of carbide and occluded air, both of which it was impossible to drive out completely with mercury, experiments were made with a porous

ium carbide. It was found that from the 250 c.c. of ylene there would always be left about 1 c.c. of air. ntroducing the carbide in fairly large pieces this volume lessened, but another and more significant error lted, because it was not easy to obtain representative os.

stimation of Manganese and Calcium.—The carbide decomposed by distilled water and dried thoroughly. ral methods were tried for the estimation, but the only factory one was so tedious, and the results of such fficient importance, that to carry out estimations in all s was out of the question.

may be well to place on record some of the results nree of the methods tried.

t Method.—By twice treating with ammonium acetate move the iron, and twice precipitating the manganese bromine water and ammonia, finally estimating the um by ammonium oxalate.

he objection to this method was the large volume of filtrates, and to obviate this the following was tried :—

d Method.—The iron and manganese were twice ipitated together by bromine water and ammonia. The hed precipitate was dissolved in hydrochloric acid, and precipitated with ammonium acetate. The filtrate from bromine water and ammonia was treated for calcium.

3rd Method.—After removal of iron by the acetate process, the manganese was precipitated as sulphide. This method is, according to Fresenius, the only satisfactory one, and the authors' experiments fully bear this out.

A comparison of the results by the three methods is given below :—

	First Method.	Second Method.	Third Method.
Manganese per cent. in top of ingot.	0·77	0·33	0·616
Manganese per cent. in bottom of ingot.	0·74	0·307	0·666

The experiments at Foyers were all carried out under the same conditions, the current being kept at 55 volts, 1,000 ampères, as nearly as possible, the crucible being of plumbago, with a carbon electrode 6 ins. square.

Two series were run, the members of which are numbered respectively 1, 2, &c., and 1*b*, 2*b*, &c. In the first series the manganese dioxide was in the proportion of 5, 10, 15, 20, and 25 per cent., calculated on the lime and coke present, or in the percentages given in the table, taking the whole amount of material.

Table I.

al ber.	Pounds of Material used.			Percentages of Materials.			Power.				Net Weight of Ingot per Kilowatt Hour.
	Coke.	Lime.	Manganese Oxide.	Coke.	Lime.	Manganese Oxide.	Volts.	Amperes.	Kilowatts.	Kilowatt Hours.	
											Lbs.
1*b*	75	100	..	42·86	57·14	..	57	870	49·6	188·5	0·34
1	80	100	8·5	42·44	53·05	4·51	54	1,100	59·4	133·7	0·20
2*b*	40	50	5·25	42·0	52·49	5·51	55·4	1,020	56·5	127·1	0·28
2	80	100	17·5	40·5	50·64	8·86	57	1,000	57	128·3	0·16
3	40	50	12·5	39·03	48·78	12·19	55	950	52·5	105·0	0·23
4	40	50	18	37·03	46·30	16·67	58	1,040	60·3	105·5	0·26
5	40	50	22·5	35·56	44·44	20·0	61	1,200	73·2	109·8	0·33
3*b*	21	9·75	45	27·72	12·87	59·41	58·5	900	52·7	30·7	0·80
4*b*	21	9·75	45	27·72	12·87	59·41	58·0	180	27·8	22·8	0·34

Table II.

ial Number.	Nature of Ingot.	Gas yield, Litres per Kilo.	Composition of Gas.	Per Cent. of Acetylene in Gas.	Composition of Ingot.	
					Calcium Carbide from Gas.	Manganese Carbide Gravimetric.
.....	Clean crystalline.....	318	Pure acetylene.....	100	91·5	..
p	Very spongy	281	Nearly pure acetylene	99·4	80·7	..
ttom		293		99·28	84·0	..
.....	Clean crystalline.....	289		99·42	83·0	..
p	Very spongy	275·5		99·36	79·0	..
ttom		265·0		99·36	76·0	..
p	Spongy	260·6		99·32	74·8	..
ttom		251·7		99·08	72·2	..
p	Less spongy	252·2		99·24	72·3	..
ttom		274·3		99·24	78·7	..
p	Fairly clean, with nodules.....	301·0		99·36	86·25	..
ttom		287·7		99·10	82·50	..
.....	Yellow ingot, green crust.	241·76	Methane and hydrogen.	Traces	Traces	97·43
.....	" "	241·2	" "	"	"	98·37

will be seen that very little appears to be gained by addition of manganese even in fair proportions, the eight of ingot per kilowatt hour in no case rising to obtained for a simple lime and coke mixture made in econd series. When, however, the manganese dioxide large excess of the lime (3*b*), a remarkable efficiency ived at when the conditions of current are practically al. With a low current density, however, and using ilar mixture to that used for 3*b*, the efficiency drops again to about the normal, 4*b*.

ormation as to the nature of the ingot is given in II. For ingots obtained in the first series (1—5), portions from both the top and bottom of the ingot were examined ; but in some cases, whilst the top portion gave the best gas yield, in others, this was obtained from the bottom portion.

In the table, in the column giving percentage of acetylene in the gas, the figures show the percentage absorbed by alkaline cuprous chloride ; but it will be remembered from the description of the apparatus that it was impossible to entirely get rid of occluded air, and this mainly represents the difference between the figures given and the theoretical. The volume of gas remaining unabsorbed was so small that it was impossible to determine whether it contained traces

of hydrogen and marsh gas; certainly it showed no signs of inflammability. We may therefore conclude that for all practical purposes the carbide in all these cases was commercial calcium carbide, with, at the most, only minute traces of manganese carbide.

By far the most interesting results were those obtained in the third and fourth experiments in the second series (*3b* and *4b*). Here we find that the ingot is practically pure manganese carbide. The substance varied in colour from a yellow to a silvery whiteness, and was extremely dense and hard. The ingots were surrounded by a bright green crust. The substance was practically unacted upon by cold water, but at a temperature of about 70° C. gas was rapidly evolved, sufficient heat being liberated to maintain the action. According to Moissan (Comptes Rend., **122**, 421), pure manganese carbide is decomposed by water in the cold.

At first the residue was nearly white, of a gelatinous consistency, undoubtedly manganous hydrate, but this rapidly turned brown on exposure to air.

The theoretical yield of the mixture of marsh gas and hydrogen from manganese carbide is 251·21 litres per kilo. The gas yields shown in Table II., *3b* and *4b* respectively, correspond to 96·2 and 96 per cent. of manganese carbide, these low results being due to portions of the green crust which it was impossible to completely remove in all cases. Since the green crust is not attacked by dilute acid, it was possible to treat the residue, after generation and measurement of the gas, with dilute hydrochloric acid, estimate the residue, and then by subtraction from the weight of original material obtain the necessary correction. For *3b* the corrected gas-yield was 246·36 litres per kilo., equivalent to 98 per cent. of real manganese carbide, a figure agreeing closely with that obtained by gravimetric analysis.

Gravimetric Analysis of Manganese Carbides.—Careful analyses were made of carbides *3b* and *4b*, with the following results:—

	3b.	*4b.*
	Per Cent.	Per Cent.
Manganese, Mn	92·77	92·67
Silicon, Si	0·50	0·25
Iron, Fe	Traces	0·46
Calcium, Ca	Traces	Traces

These results agree with the composition given below, assuming the silicon is combined with manganese to form Mn_2Si, the remaining manganese being calculated to manganese carbide.

	3b.	*4b.*
	Per Cent.	Per Cent.
Manganese silicide, Mn_2Si	2·44	1·22
Manganese carbide, Mn_3C	97·43	98·37
Iron and calcium compounds	Traces	races
	99·87	99·59

Analysis of Gas from Manganese Carbides.—The gas was first driven into alkaline cuprous chloride solution, when traces of acetylene were shown to be present, but no contraction sufficiently great to be measured occurred. The gas was then exploded with oxygen, and the carbon dioxide produced absorbed by potash.

	3b.		*4b.*	
	Methane.	Hydrogen.	Methane.	Hydrogen.
1st determination	48	52	49	51
2nd "	50	50	51·8	48·2
3rd "	50	50	50	50
Mean	49·3	50·7	50·3	49·7

The gas, therefore, consisted of equal volumes o methane and hydrogen, with only the smallest traces o acetylene.

Thermal calculations in relation to the production o carbides are not of much value, since the data to b obtained are not very reliable, and of the different value ascribed to the same reaction, quite an arbitrary choic must be made. Thus, for the heat of formation of calciu carbide, Forcrand (Comptes Rend., **120**, 686) gives −64 calories, whilst in the excellent little "Taschenbuch fü den Acetylen-Teckniker," a value +390 calories is give Again, it is difficult to say at what temperature the reaction take place, and not only does this affect the amount heat necessary to raise the materials themselves to th temperature of reaction, but, as is well known, the specifi heat of carbon rapidly increases with rise of temperatur until at the temperature of the electric furnace it ha reached a normal point, *i.e.*, when the atomic heat equal 6·6 nearly.

Assuming, however, a temperature of 3,000° C. for th production of calcium carbide, and 1,500° C. for manganes carbide, the following calculations approximate to th truth:—

Calcium Carbide.—$CaO + 3C = CaC_2 + CO$.

Specific heat of lime	0·2		
" " " carbon	0·45	T	3,000°
56 grms. CaO to 3,000° C.:—			
3,000 × 0·2 × 56			33,600 cal.
36 grms. C to 3,000° C.:—			
3,000 × 0·45 × 36			48,600
Heat for decomposition of CaO (Moissan's figures)			145,000
			227,200
Heat of combination, CaC_2			3,900
" " CO			26,100
			30,000
Then	227,200		
	30,000		
	197,200		

Manganese Carbide.—$3MnO_2 + 7C = Mn_3C + 6CO$

Specific heat of MnO_2	0·16		
" " C	0·45	T	1,500°
261 grms. MnO_2 to 1,500° C.:—			
261 × 0·16 × 1,500			62,640
84 grms. C to 1,500° C.:—			
84 × 0·45 × 1,500			56,700
*Heat for decomposition of $3MnO_2$			119,340
3 × 63,000			189,000
			308,340
Heat of combination, Mn_3C			5,200 (Troost and Hautfeuil)
" " 6CO			
26,100 × 6			156,600
			161,800
− heat	308,340		
+ heat	161,800		
	−146,540		

It appears, therefore, that from these theoretical co siderations there is not likely to be much economy in t matter of current, when manganese dioxide is added to t mixture, a point fully borne out by the experiments n large scale.

The authors have been unable to find data as to t fusing points of calcium and manganese carbides, but th the latter is much lower than for the calcium carbide certain, for Mr. Day noted that not only did the mangan

* Le Chatelier (Comptes Rend., 122, 80).

arbide become quite fluid in the furnace, but appeared even o boil. This may account for the high efficiency of pro- luction, since, owing to greater fluidity of the manganese arbide, more material would be rapidly brought under the nfluence of the arc.

The great difficulty is to satisfactorily explain the almost ntire absence of manganese in the carbides of the first eries, and the absence of calcium in the manganese carbide f the second series. At 18°, Moissan (Comptes Rend., 118, 02) found calcium carbide to have a density of 2·22, whilst e found the density of manganese carbide at 17° to be 6·89 Comptes Rend., 122, 422). If manganese carbide were ormed together with the calcium carbide, owing to its much reater density, it might be expected to appear in the ower portions of the ingots, but no evidence was found of his having taken place, and until further experiments have een made, the authors do not feel justified in at present ffering any explanation of these peculiar results.

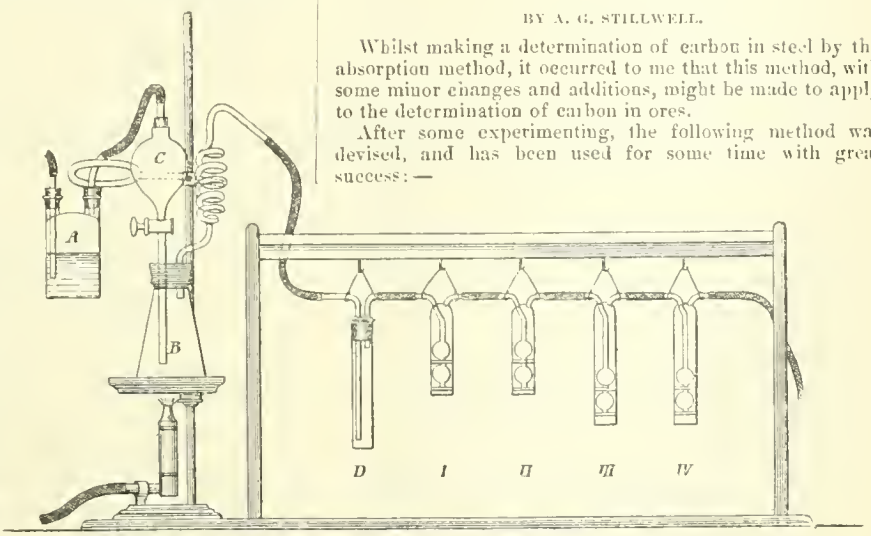
Summary.—From the experiments there seems to be no dvantage in mixing oxide of manganese with the lime nd coke ordinarily used.

Manganese carbide of great purity from a commercial tandpoint could be made with a low current expenditure if demand for it should arise.

A mixed illuminating gas consisting of methane, hydrogen, nd acetylene could be prepared from a mixture of man- anese and calcium carbides in a suitable generator, the eat produced by the action of calcium carbide and water eing sufficient to bring about reaction between manganese arbide and another portion of the water.

There is no evidence that a mixed carbide of manganese nd calcium has been obtained in these experiments on a arge scale. It appears that, with an excess of lime, alcium carbide alone was formed, but with a considerable xcess of manganese ioxide, the carbide of anganese in a nearly ure state resulted.

Since the conclusion f these experiments, a aper has been published y Tucker and Moody his Journal, 1901, 71) on "The Produc- on of Ethylene from norganic Sources," and e authors make refer- ence to attempts to pre- are mixed carbides, cluding those of man- anese and calcium. ey state that "it was und impossible to make is mixture, since man- nese carbide requires ite different conditions r its formation than e calcium compound. o evidence of the pres- ce of manganese car- de was ever obtained, t element always appearing as a metallic button."



The contention that quite different conditions are required the production of manganese carbide is not borne out our experiments. A reference to Table I. shows that nganese carbide was readily formed with great economy der the same current conditions as for calcium carbide. a small scale we also show that a mixed carbide can be pared.

From the paper by Moody and Tucker it does not appear t they made any examination of the "metallic button" ained in their experiments, and the authors of this paper k that had some of these metallic buttons been crushed tested with water at its boiling point, a mixture of hane and hydrogen would have resulted, showing the tons to be commercial manganese carbide.

Reference should be made to the nodules found by us in oide 5, 1st series. Analysis showed conclusively that nodules consisted almost entirely of silicides of man- ganese and iron, the remainder being small quantities of calcium carbide. It has been recorded by many observers that metallic silicides sometimes occur as nodules in ordinary calcium carbide.

In all these experiments, both in the laboratory and on a large scale, no mixture has been employed containing manganese dioxide between 20 and 50 per cent., the latter being only a laboratory experiment, on a works scale 60 per cent. (3*b*). It has been previously shown in this paper that on a small scale with a low ratio of manganese to lime, the calcium carbide yield is considerably higher than the theoretical, and this, together with the fact that, with preponderance of manganese oxide, only manganese carbide is formed leads the authors to hope that with intermediate percentages of manganese dioxide they may be able, with perhaps slight modification of method, to prepare mixed carbides on a commercial scale, and it is hoped that, with the assistance of Mr. Worth, further experiments will shortly be carried out by them on these lines.

New York Section.

Meeting held at the Chemists' Club on Friday, April 25th, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

GRAPHITE IN ORES.

BY A. G. STILLWELL.

Whilst making a determination of carbon in steel by the absorption method, it occurred to me that this method, with some minor changes and additions, might be made to apply to the determination of carbon in ores.

After some experimenting, the following method was devised, and has been used for some time with great success:—

The following description of apparatus employed will serve to simplify the description:—

A.—Guard bottle containing caustic potash in solution.

B.—Generator flask. (An Erlenmeyer with mouth 1¼ in. in diameter.)

C.—Tube for running in sulphuric acid.

D.—Empty test tube to catch water carried over.

I. and II.—Guard bulbs, sulphuric acid (concentrated).

III.—Caustic potash bulb for absorbing CO_2 (KOH 1·27 sp. gr.).

IV.—Bulb for sulphuric acid (concentrated).

The following amounts of the finely-ground sample (80 mesh) will be found most satisfactory for use:—

For ores running over 25 per cent. of carbon use 0·25 grm.; for ores running between 15 and 25 per cent. of carbon, use 0·5 grm.; for ores running below 15 per cent of carbon, use 1 grm.

The material is weighed on balanced glasses and brushed into a deep platinum or porcelain crucible. Heat is applied to dull redness for a few minutes to drive off any organic matter that may be present. The material is now transferred to a small beaker, and dilute HCl (1—1) added, and heated to boiling to decompose any carbonates and expel CO_2; solution is now filtered through a porcelain Gooch crucible, using *ignited* asbestos as filtering medium, and washed two or three times with hot water till the HCl is all gone. The crucible, with its contents, is now placed in the flask "B," and 15 c.c. of a saturated solution of chromic acid added. The apparatus is connected (after weighing III. and IV.), and all air is drawn out by means of suction. Seventy-five c.c. of H_2SO_4 (concentrated) are now put into bulb of tube "C," and run in very slowly, gently rotating flask "D" at same time, so as not to have a violent evolution of gas. When the H_2SO_4 is all in, close stop-cock and heat flask with *small* flame till heavy fumes fill the flask. Now turn flame very low, open stop-cock so that one bubble per second passes through solution in "A," and continue aspiration for half an hour. Disconnect and weigh III. and IV. The increase in weight represents CO_2, which, multiplied by 0·2727, gives the amount of carbon.

The whole operation may be run in two hours, with no attention from the operator during the last hour.

If no organic matter or carbonates be present, the two steps relating to them may be dispensed with, and the weighed material brushed directly into flask "B." In this case the operation is completed in one hour.

By running a number of blank tests, *i.e.*, using chromic and sulphuric acids, it was found that III. and IV. increased in weight by 0·0045 grm. This is to be deducted from weight of III. and IV., before calculating results.

The method gave, on various ores, the results shown in the table.

The first two ores (low grade) were run in thirty-five minutes from first weighing.

Description of Ore.	Amount used.	Weight of CO_2.	Carbon.
	Grm.	Grm.	Per Cent.
Low-grade ore	1	0·085	2·31
Quartz gangue....	..	0·084	2·29
Low-grade ore	1	0·1740	4·74
Quartz gangue....	..	0·1710	4·66
Containing limestone .	½	1·440	39·27
	..	1·445	39·40
Containing limestone .	¼	1·096	29·90
	..	1·096	29·90
Pure Ceylon graphite .	½	3·615	98·58
	..	..	(ash 1·42)

Nottingham Section.

THE ANALYSIS OF COD OILS FOR TANNING PURPOSES.

BY S. R. TROTMAN AND H. PETERS.

Discussion.

(This Journal, May 31, 1902, p. 694, col. 1.)

Mr. T. F. Harvey wishes the last sentence of h remarks to read as follows:—

"He had no experience of iodine values so high as son of these given by the authors, except in the case of limonen the value of which approached 400, being theoreticall twice that of pinene."

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	760
II.—Fuel, Gas, and Light	761
III.—Destructive Distillation, Tar Products, Petroleum	765
IV.—Colouring Matters and Dyestuffs	766
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	769
VI.—Colouring Wood, Paper, Leather, &c.	771
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	772
VIII.—Glass, Pottery, and Enamels	773
IX.—Building Materials, Clays, Mortars, and Cements	773
X.—Metallurgy	774
XI.—Electro-Chemistry and Electro-Metallurgy	776
XII.—Fats, Fatty Oils, and Soap	780
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	782
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	783
XV.—Manures, &c.	783
XVI.—Sugar, Starch, Gum, &c.	783
XVII.—Brewing, Wines, Spirits, &c.	784
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	786
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	788
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	789
XXI.—Photography	791
XXII.—Explosives, Matches, &c.	792
XXIII.—Analytical Chemistry	792
XXIV.—Scientific and Technical Notes	795

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Refrigerating Process, and Apparatus therefor; Improved ——. L. Bloume, Brussels. Eng. Pat. 8074 of 1901, dated (under Internat. Conv.) Sept. 21, 1900.

Producing ice by the use of ammonia or similar solutions, previously concentrated under pressure greater than that of the atmosphere. For the process, the ordinary compression apparatus, working by means of anhydrous ammonia, combined with a pump for liquid and a heat exchanger. —R. A.

Refrigerating Machines; Impts. in Carbonic Anhydr——. F. Windhausen, and F. Windhausen, jun., Berl. Eng. Pat. 9084, May 2, 1901.

A liquid-cooler, arranged on the counter-current syste is employed to cool, by means of cooling water or the li the liquid carbon dioxide flowing from the condenser to

vaporator. A part of the liquid carbon dioxide passing rom the condenser is evaporated in an intermediate eceiver, so cooling the remaining portion, a separator eing employed to dry the vapours leaving the receiver. he receiver may also be arranged so that the cold pro- uced in it serves for other useful purposes, such as the ooling of water, &c. To prevent the liquid from being vaporated before entering the expansion cylinder, the pparatus is arranged so that the liquid flows by its own eight from the condenser through a cooled pipe to the xpansion cylinder.—R. A.

ire-extinguishing Apparatus; Chemical ——. W. L. Young, Kinning Park, Renfrewshire. Eng. Pat. 10,657, May 23, 1901.

HE apparatus acts automatically to break the acid holder nd liberate carbon dioxide in the space wherein the fire kes place. The acid-holder is broken by a spindle actuated y a bullet from an explosive cartridge, which is fired, either y a spring-actuated striker or electrically, when a link of sible metal is melted. The extinguishing fluid is distri- ted by a series of nozzles on a revoluble head, which is tated automatically by the reaction of the issuing fluid. dicator boards, bells, and the like may be employed to dicate the locality of the fire.—R. A.

United States Patents.

Centrifugal Machine. O. Oblsson, Södertelje, Sweden. U.S. Pat. 699,003, April 29, 1902.

E drum of the machine has a tubular centre, in which is ted a bearing-piece provided with a recessed seat in its der side. An upright driving shaft extends up into the atre, and a separate bearing block is interposed between seat on the shaft and the seat in the bearing-piece. The aft is of smaller diameter than the centre, so that the um has a certain freedom of movement laterally with pect to the shaft. The separate bearing-block can also ve laterally in all directions with the drum.—R. A.

lter-Press. J. Wilson, Glasgow. N.B. U.S. Pat. 699,052, April 29, 1902.

E cake-forming frames interposed between the movable tens or followers of the press are formed with inclined ver ends, and are supported by slotted links, which, when platens are separated, tilt the frames into an inclined ition to discharge the cake.—R. A.

operating Apparatus [Brine, &c.]; Vacuum ——. . N. Vis, Schweizerhalle, Switzerland. U.S. Pat. 00,105, May 13, 1902.

Eng. Pats. 16,738 and 25,640 of 1900; this Journal, 0, 1111; and 1901, 123.—R. A.

dro-Extractor [for Breweries, Paper-mills, Laundries, Sugar Refineries, &c.]; Continuous ——. L. Atwood, Philadelphia. U.S. Pat. 700,112, May 13, 1902.

ONICAL perforated shell or screen is revolvably mounted in a fixed casing having an outlet at the bottom, the lower of the shell being in the form of a wheel with inclined les, to facilitate the discharge of the material after tment. A conical water-receptacle suspended within the ll is formed with discharge openings inclined downwards, ough which water is forced into the shell, the material to treated being fed into the space between the shell and water receptacle. A discharge pipe is provided at the om of the water receptacle, for loosening the material the shell, so that it will pass away from the machine.

—R. A.

es; Vessel for the Reception of High-Pressure ——. Ludwig, Bernburg, Germany. U.S. Pat. 699,333, ay 6, 1902.

Eng. Pat. 16,908 of 1900; this Journal, 1901, 878.

—R. A.

Erratum.

his Journal, 1902, page 458 col. I, line 9 from bottom: for 'Chamberlain" read "Chamberland."

II.—FUEL, GAS, AND LIGHT.

Coke from Compressed Fuel; Manufacture of ——. J. H. Darby. Iron and Steel Inst. Paper read at Meeting, May 1902.

The author has made a series of experiments on the manufacture of coke from compressed fuel. It was found that the nett gain in production of coke per oven was from 10 to 12 per cent. in favour of the compressed charge, and that coke produced from the latter was considerably denser. Other advantages were: (1) The breeze, or small coke, was very much reduced in quantity, the lumps of coke were larger and firmer, and in a marked degree bore handling without very much breakage; (2) the process of charging an oven by the mechanical means in use where compression of fuel is adopted, occupies much less time than the old method of charging by hand through holes in the top of the oven; in fact, the time is reduced from 10 or 12 minutes to 3 or 4 minutes, so that the objectionable smoke is largely prevented and the loss of by-products is less, the yield of ammonia having been increased, in some cases, by 25 per cent.; (3) less hand labour is employed, and the laborious work of forcing the wet fuel out of the tubs into the ovens and levelling the charge in the ovens is entirely abolished, whilst the clearance between the cake of fuel and the side of the oven allows the free escape of the gases, and tends to prevent undue deterioration of the oven walls.

The improvement in the coke obtained from compressed material is more marked with some fuels than with others, but the author considers that even with the best coking fuels the results seem to justify the outlay in equipping a plant for compressed fuel.—A. S.

Coke-making; Recovery of By-Products in ——. J. Thiry. Iron and Steel Inst. Paper read at Meeting, May 1902.

An account is here given of the Otto-Hilgenstock oven, which, it is claimed, gives a coke that loses only 0·5 to 0·6 per cent. on ignition, in the crucible test, and is thus quite equal to coke made in the beehive oven. It is found to give, on an average, about 5 per cent. more than the crucible yield. The oven is a modified Otto; the gases are drawn from the ovens, treated for the recovery of by-products, and returned to a main running below ground in a conduit passing the whole length of the battery of ovens. From this main a series of branch mains pass at right angles, one below the flues between each pair of ovens. From these horizontal branch mains a series of vertical pipes convey the gases into a horizontal flue, just below the level of the retort floor. The gas is burned at Bunsen burners with air preheated to 400° C. by passing through flues in the foundations. Thence the products of combustion pass up vertical flues between the ovens, and then along a horizontal flue and down vertical flues to a space beneath the oven, and so through a waste-gas collector to the boilers. It is claimed that the combustion of the gas is perfect, the temperature uniform and high, and the loss of gas by leakage minimised. The gases produced do not contain more than 5 per cent. N. In Germany an oven lasts from 10 to 12 years before any heavy repairs are needed. The production of coke is about 4½ tons per oven per 24 hours. Tests at the Newport Iron Works, at Middlesbrough, have shown temperatures in the combustion flue of 1378° to 1462 C.; in the lower horizontal flue, of 1215° to 1312° C.; in the upper horizontal flue, of 1142° to 1278° C.; in the gas-main, of 283° to 293° C.; and in the waste-gas flue, of 1245° C. The pressure of the draught below that of the atmosphere was equivalent to a water pressure, in the combustion flue, of 1·16 to 2·39 mm.; in the lower horizontal flue, of 1·53 to 2·10 mm.; in the upper horizontal flue, of 0·29 to 1·02 mm.; in the gas main (at the top of oven), of 0·44 mm.; and in the waste-gas flue ranging from 6·89 mm. in front of the oven to 10·3 mm. before entering the boilers.

—W. G. M.

Calcium Carbide; Formation of ——. V. Rothmund. Nachr. k. Ges. Wiss. Götting., 1901, 224—233. Chem. Centr., 1902, **1**, [18], 1045.

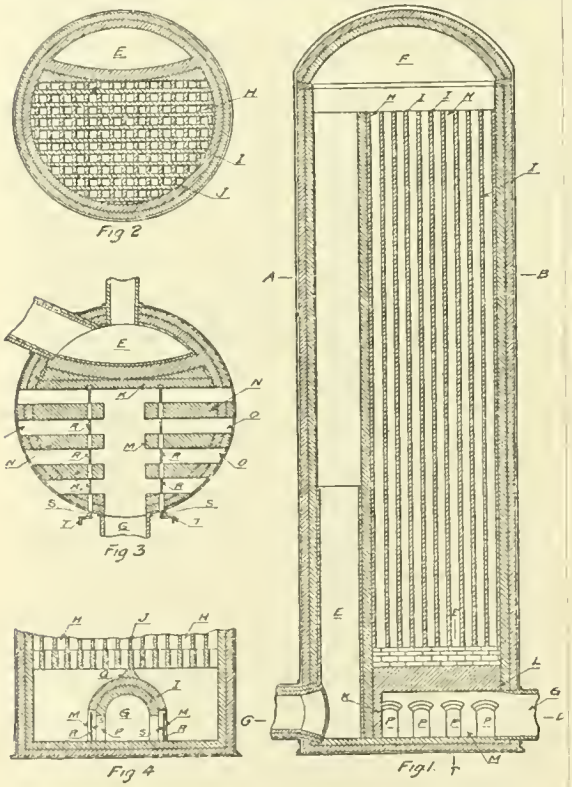
The experiments were made with an electric furnace consisting of a tube of charcoal, surrounded by a layer of

charcoal and then by magnesia. The reaction mixture (12 parts of charcoal and 7 parts of lime) was placed in small charcoal tubes, which were laid on their sides in the furnace. The author has previously shown that more than 700 watts are necessary for the formation of carbide, and he has now determined the influence of temperature on the reaction. It was found that there is a definite temperature, about 1620° C., at which the formation of carbide takes place. The transformation point, at 1620°, as represented by the formula $CaO + 3C = CaC_2 + CO$, corresponds to a partial pressure of CO of $\frac{1}{2}$ atmosphere. The author also obtained the reverse reaction by heating carbide with carbon monoxide. Below the temperature mentioned above, it was possible to completely decompose a certain quantity of carbide, and it was also possible to reduce the transformation temperature by diminishing the partial pressure of the carbon monoxide.—A. S.

English Patents.

Hot-Blast Stoves. F. C. Roberts, Philadelphia, Penn., U.S.A. Eng. Pat. 3831, Feb. 14, 1902.

This relates to two-pass or two-flue hot-blast stoves, having one up-pass E and one down-pass H, the down-pass containing checker-work I, J. To prevent the accumulation of dust and dirt in the checker-work, the velocity of the products of combustion, where they enter the checker-work, is increased by the following device. The flue G below the checker-work extends completely across to the vertical wall K separating the two passes. The top of this flue is arched (Fig. 4), and a wall Q is built thereon up to the checker-work, so that the gases from the latter are separated into two portions, each portion entering the flue G through



side openings P, having externally adjustable dampers R (Figs. 3 and 4). When it is desired to heat the stove, gas is admitted and burned in the up-pass E, and the dampers R on one side of the flue G are opened, so that the products of combustion are drawn downwards through only one-half of the checker-work, which results in the velocity being greater than usual. When one half of the checker-work is heated, the dampers on the heated side are closed and those on the other side are opened.—R. S.

Furnaces; Apparatus or Injectors for Burning Oil or Liquid Fuel in ——. E. Dyson, Manchester. Eng. Pat. 9642, May 9, 1901.

The steam is passed to a central nozzle having a regulating plug or needle-valve; the oil is dropped from a vertical pipe into an open cup, the bottom end of which is connected to a tube having an ordinary plug or tap, and leading to a small chamber surrounding the end of the nozzle.—R. S.

Fuel; Apparatus for Heating by Means of Petroleum and other Liquid ——. O. Meissner and M. Richter, Chemnitz, Saxony. Eng. Pat. 8546, April 25, 1901.

The liquid fuel is supplied under pressure from a high-level reservoir, and is forced through a fine nozzle into a horizontal tube provided with a series of narrow orifices. Underneath this horizontal burner tube is a trough charged with spirit or other liquid fuel for heating the contents of the burner tube. Owing to the high pressure generated in the burner tube by the conjoint influence of the oil supply and the heat from the underlying trough, the vaporised fuel, issuing from the narrow orifices, burns with a very long flame, which enters the flue and replaces the flame of a coal fire. A pressure regulator is provided between the fuel reservoir and the inner nozzle of the burner tube.—C. S.

Gas Producers. J. B. Smith, Glasgow, and G. P. Wincott Barrow-in-Furness. Eng. Pat. 12,895, June 25, 1901.

The producer is provided with a horizontal pipe below the base of the producer, having a steam-air injector connected to it, and one end, which may extend into an external pit closed with a detachable cover. This pipe is connected with a short pipe rising centrally within the producer, the short pipe being continued by an outwardly extending part at the top of which is a ring of apertures through which the blast enters the furnace. Above the apertures is placed a removable dome.—R. S.

Fuel for Furnaces and the like; Treatment of ——. H. H. Lake, London. From Battistini, Orengo, and Co. Genoa, Italy. Eng. Pat. 6725, March 19, 1902.

The fuel is mixed with an oxidising substance, preferably an alkali nitrate. The activity of combustion is controlled and reduced by mixing with the nitrate some indifferent or inert substance, such as carbonate of soda.—R. S.

Coke Ovens with Separate Distribution of Gas and Air to the Heating Flues; Regenerative ——. H. Koppers, Carnap, Germany. Eng. Pat. 23,278, Nov. 18, 1901.

The regenerative coke-oven is provided with a gas distributing channel below the heating flues, and with an air-distributing channel below the bottom of the oven. Both these channels are connected with the heating flues by means of nozzles for the separate supply of measured quantities of gas and air thereto. Above each heating flue there is an opening which is continued to the top plate of the oven, and is closed by a cover-plate. When the oven plate is removed, the nozzles are accessible for cleaning or repairs.—R. S.

Gas Purifiers and the like. H. S. Smith-Rewse and T. Coates, Darlington. Eng. Pat. 12,532, June 19, 1901.

To form a tight joint between the body of the purifier and the cover a metallic packing is employed. The top horizontal flanges of the producer are provided with grooves into which lead, white metal, or other suitable alloy is run, and the lower edges of the cover are provided with a V-shaped projection, which, when the cover is forced down, cuts into the metal, and thereby forms a tight joint. When leakage occurs, the cover is removed, and the packing simply hammered or pressed so as to fill up the groove formed by the bevelled edges.—R. S.

Acetylene Gas Generators. D. W. Bishop, Mass., U.S.A. Eng. Pat. 6826, March 20, 1902.

This is a self-contained, water-to-carbide generator, specially designed for use on a moving vehicle in such a

ashion that agitation shall not affect its regular working. t consists of a vertical cylindrical vessel divided into two arts by a horizontal partition, of which the upper portion the main water reservoir. A central tube passes through ne cover and bottom of the water reservoir, and extends own through the partition to nearly the base of the lower alf, and has a needle-valve, controlled by an outside andle, at its own base. Between the water inlet and the eedle-valve the valve stem passes through a kind of dash-pot," consisting of a long sleeve with a narrow nnular hole; this dash-pot prevents the shaking of the ehicle interfering with the steady drip of the water upon ne carbide. The bottom half of the whole apparatus is ne carbide container, the solid being piled round a central hamber of gauze, into the middle of which the water falls. as passes to the burner through a tube placed within the ain water vessel, and packed with cotton-wool and some rying material. In order to permit escape of any surplus as, another tube extends upwards from the partition hrough the water and out at the top, where it is twice oiled and returned downwards through the water to a avity sunk in the partition. Here the gas issues from the ipe and bubbles through the water; but as the descending g of this gas tube is longer than the ascending one, iphonage is avoided. There is an orifice in the top of the pper part, fitted with a funnel mouth; this serves for itroducing water and for the final exit of surplus gas. Compare following abstract.)—F. H. L.

cetylene Gas Generators. D. W. Bishop, Mass., U.S.A. Eng. Pat. 6858, March 20, 1902.

SE preceding abstract. With regard to this generator, the rplus-gas pipe only rises through the water in the upper mpartment above the upper lid, where it is bent down and st passes through that lid. The main water reservoir is ghtly closed by a spring-supported valve opening outwards, that the pressure in the upper vessel cannot rise above a rtain point, even if the jolting of the vehicle causes more ater to pass the needle-valve, and therefore more gas to evolved than is desirable.—F. H. L.

cetylene Gas Lighting. F. R. L. Strathy and A. J. Riley, Birmingham. Eng. Pat. 8762, April 29, 1901.

WATER-to-carbide, flooded-compartment generator in hich the supply of water is controlled by the movements the holder bell. The carbide is stored in superposed ceptacles in a water-sealed vertical vessel from the top of hich protrudes a doubly bent pipe with funnel end for the try of water. Above the mouth of this funnel is a curved t approximately horizontal pipe rigidly fixed to the top of e holder, from which fastening it proceeds as a flexible be to the outlet of the water reservoir, where the liquid is aintained at a constant level by an application of the bird-fountain" principle. When therefore the holder rises, e mouth of the water pipe is above the water level in the ore tank, and the supply of liquid to the carbide is cut off. cock on the horizontal pipe worked through a lever and is on the funnel tube assists in stopping the water more ickly. An alternative arrangement is described in which spoon-shaped lever carried near the top of a cylindrical bide receiver is, by the descent of the holder bell, made oscillate, so that it first collects water from the annulus d then tips it on to the solid.—F. H. L.

candescent Light; Apparatus for Burning Vapours for Producing —— F. M. St. O. Roy, New York. Eng. Pat. 8479, April 25, 1901.

E lamp described, which is intended for use with light lrocarbons, such as gasolene, comprises a main reservoir, ving a central air tube; a horizontal fan-shaped damper the base of the air tube for regulating the air supply; a ly of porous material within the reservoir, packed round central air tube, and formed with an annular chamber or ondary reservoir in its upper portion; an annular vapour- eiving chamber situated above the secondary reservoir d communicating with it through small tubes; a hori- tal, valve-controlled, tubular body, communicating at e end with the vapour-receiving chamber and at the other h an auxiliary vapour-burner, and provided on its upper side with a vapour-nipple directed upwards into the mixing tube of the main burner; an annular gutter surrounding the base of the mixing tube, to hold a small quantity of combustible liquid for the preliminary heating of the lamp; a valve-controlled, annular, auxiliary vapour-burner (above referred to), consisting of a perforated tube arranged within the gutter, for maintaining the vaporisation when the lamp is in use; a mixing tube, detachably secured to the upper end of the central air-tube, and provided with air inlets; and a second tube, adapted to slide over the mixing tube, and having corresponding air-inlet passages. The second tube carries the burner-top, gallery, mantle, &c., and has at its lower end a hood adapted to envelop the annular gutter, and provided at its upper end with radially-disposed tubes for leading out beyond the chimney the smoky products of the preliminary combustion in the gutter. The main reservoir is provided with a float valve to prevent over filling with gasolene, &c., and with an air-inlet valve and a safety valve for use when the liquid is to be fed to the burner by slightly compressed air.—H. B.

Mantles for Incandescent Gas-Lighting. F. and M. L. Missire, Paris. Eng. Pat. 9460, May, 1901.

A MANTLE, strengthened by ribs or the like formed by interweaving the raw fabric with extra strands or strips of textile material, and having its lower edge and top strengthened by suitable incombustible material, such as "mineral flax."—H. B.

Incandescent Mantles; A New and Useful Process of Manufacturing ——. G. Buhlmann, Berlin. Eng. Pat. 12,413, June 18, 1901.

THE impregnated fabric is exposed to a flame or hot-air mantle produced around the outer surface of a perforated or sieve-like body, corresponding in form and size to the desired form of the finished mantle.—H. B.

Incandescence Mantles; Manufacture of ——. J. F. Crease, Guildford. Eng. Pat. 151, Jan. 7, 1902.

VEGETABLE fibre, or collodion cellulose, spun into threads with asbestos or metallic wire.—H. B.

Electric Arc Lamps, and Electrodes therefor. C. A. Lee, Chelsea. Eng. Pat. 12,134, June 11, 1901.

THE main negative electrode consists of a hollow rod, composed preferably of a mixture of zirconia with about 5 per cent. of yttria, and having a core of silver, platinum, or other suitable metallic wire. The main positive electrode consists of a similar electrode impregnated to a limited extent with a volatilisable oxide, such as oxide of copper, iron, or nickel. The effect of these oxides is to render the electrode more conductive, in order to prevent excessive heating; but as they have a deleterious effect on the illuminating power, they must be capable of volatilising out of the extreme tip of the electrode when it is in use. In preparing the electrode, the hollow zirconia-yttria rod is heated to a high temperature in contact with the oxides or the metals (packed either inside or outside the rod), until they have diffused sufficiently into the rod.—H. B.

UNITED STATES PATENTS.

Fuel; Artificial ——. W. R. Peakes, Vineyard Haven, Mass. U.S. Pat. 698,850, April 29, 1902.

A MIXTURE of sawdust, salt, blue vitriol, charcoal, sulphur, and copperas in equal proportions. The compound is intended for sprinkling over or adding to firewood just before lighting.—R. S.

Carbon-Oil Heater. Lucy K. Hosea, Ohio, U.S.A. U.S. Pat. 698,502, April 29, 1902.

KEROSENE is burned in a special open fireplace, consisting of a metal box-shaped structure having a rear and a front wall, the space between the two forming an air chamber. The oil is led to an open trough extending from side to side of the fireplace and partly bisecting the lower portion of the enclosed chamber. The forward wall has a number of perforations allowing hot air to pass from the chamber to

the flames which are in front of the forward wall, and also other perforations allowing air to be discharged "rearwardly" across the front edge of the trough. Two or more such open troughs may be used, disposed one above the other.—R. S.

Carburetter. G. W. Honts, Nebraska. U.S. Pat. 698,953, April 29, 1902.

Liquid hydrocarbon is charged into a vertical cylinder, having an outlet for the carburetted air at the top, and inlets consisting of oppositely-disposed jet-tips of reduced capacity near the bottom, the jets being connected to an external vessel containing air under pressure.—R. S.

Carburetted-hydrogen Gas; Apparatus for the Manufacture of ——. B. van Steenbergh, New York. U.S. Pat. 699,353, May 6, 1902.

Steam is superheated in a furnace, and then led to an electric decomposing apparatus, the oxygen passing off in one direction to a holder, and the hydrogen passing to the base of a cylinder, which is heated by electric incandescent heaters, and down which oil passes. The hydrogen and oil vapour pass away from the top of this cylinder to the base of another one, where the vapour is fixed by means of other electric incandescent heaters. The fixed gas is then passed through a washer and a scrubber.—R. S.

Carburetter. J. Wilkinson, Burton-in-Lonsdale, E. F. Chapman, Leeds, and H. Thornton, Leeds. U. S. Pat. 699,357, May 6, 1902.

The carburetter consists of a horizontal cylinder with closed ends, apertures for admitting air and oil, and another aperture for the outlet of the mixtures. A deflecting plate is fixed to the interior of the air-admission end of the cylinder. Within the cylinder there is an arch, constructed of absorbent material, held in position between layers of wire gauze, and having similarly constructed ends. A fan drives the air first into an air-collecting chamber, which is heated by a burner, and thence into the carburetter. The oils used are mixed in raised tanks, which are connected to each other and to the carburetter by pipes. A distributing plate for the oils is placed in the carburetter. (See also Eng. Pats. 20,690, 1899, this Journal, 333, 1900; and 13,113, 1900, this Journal, 883, 1901).—R. S.

Carburetter for Explosive Engines. J. F. Duryea, Springfield, Mass. U.S. Pat. 699,504, May 6, 1902.

Air is mixed with oil as the latter leaves a nozzle. The mixing chamber is provided with a concentric partition ring, having a central aperture and side openings through its walls, which slope from above outwards. The hydrocarbon inlet pipe is passed vertically upwards, so as to discharge into the central aperture. Above the ring is a collar, shaped to fit the top of the ring, and moved upwards or downwards to admit more of less air by means of a screw connected thereto, and passing through a longitudinal slot in the mixing chamber.—R. S.

Carburetter. D. Best, San Leandro, Cal. U.S. Pat. 699,830, May 13, 1902.

A vertical closed chamber is heated at first by a fire, and afterwards by the exhaust of a gas-engine to be driven by the vapour produced. Oil to be vaporised is admitted to the chamber some little distance below the top, and flows slowly downwards from one horizontal disc to another, or down a spiral track. In either case the flow of the oil is impeded by obstructions. Air is admitted at the bottom of the casing, so as to meet the oil vapours given off near the oil outlet. These vapours are carried upwards by the air, which gradually becomes more heavily charged with them.—R. S.

Carburetter. A. L. Mangin, Aylmer East, Canada. U.S. Pat. 699,965, May 13, 1902.

Oil is fed to a horizontal helical passage, into which dips fibrous material extending to the top of the casing, and brought into positive contact with fibrous material lining the cover. A long passage is thus formed, exposing a large surface of oil-saturated material. The air to be carburetted is introduced to a lower casing, from which it escapes to an outer casing through small perforations. It escapes from the latter casing through other small perforations, and then enters the spiral passage, wherein it absorbs hydrocarbon vapour, and from which it escapes for use.—R. S.

Lamp; Hydrocarbon ——. C. H. de Voll, Oakland, Cal. U.S. Pat. 699,912, May 13, 1902.

A reservoir is charged with oil, and air is pumped in to put the oil under the desired amount of pressure. This reservoir supports the lamp. The oil passes up a tube, which reaches down nearly to the bottom of the reservoir, and which is provided with a tap. The tube extends upwards, and is passed over the top of the lamp chimney, the part of the tube immediately over the burner being packed with wire gauze, and leading to a nozzle. Surrounding the end of the nozzle are perforated caps, whereby any desired amount of air may be mixed with the vapour. The mixture is led to the bottom of a cup closed at the bottom and open at the top, from which the mixture passes to an outer cup closed at the top, and provided with a tube at the bottom leading to a burner surmounted by a mantle.—R. S.

Acetylene Gas Generator; [Locking Device for ——]. M. D. Compton, New Jersey, U.S.A. U.S. Pat. 698,633, April 29, 1902.

This is a locking device for an acetylene generator by means of which the supply of water to the carbide and the communication between the decomposing vessel and the holder are automatically closed when the carbide container is opened for recharging. Over the lid of the container lies a horizontal bar, which forms the lever of a two-way cock for the water, and also of a three-way cock for the gas; to open the carbide vessel this bar must be swung aside, and in its movement it shuts off the water, closes the communication with the holder, and opens one with a safety pipe.—F. H. L.

Acetylene Gas Generator. F. H. Merrill and F. Hickman, New Jersey, U.S.A. U.S. Pat. 698,722, April 29, 1902.

This is an apparatus of the mechanically-fed carbide-to-water type, arranged to be suspended bodily in an underground tank of water, the level in which is maintained at a constant point by a ball-valve and overflow pipe. The usual carbide hopper is made detachable from the main casting of the generator by means of a water-seal, and it is also of considerable height so as to reach the floor level. The base of the apparatus is open except for a movable grid on which the carbide falls; this grid can be agitated by a hand rod. The feed is effected by the falling of the bell, for when this reaches a certain point it presses a lever down which communicates its movement through a second lever and a bell crank to a cup hanging beneath the hopper mouth; but the entire carbide receptacle cannot be lifted out of its seal for recharging without releasing a screw which throws the feeding mechanism out of gear. The holder has its own water-seal, and is carried on the main casting at the side of the carbide vessel. The water level in the outermost tank is arranged to be below the frost line.—F. H. L.

Acetylene Gas Generator; ["Cartridge" for ——]. T. H. Lewis, London. U.S. Pat. 698,975, April 29, 1902.

A carbide "cartridge" so made as to ensure an even emission of gas at its top orifice when its foot is immersed in water, and fitted at its base with a valve which permits entry of moisture, but prevents egress of gas. The device appears to be similar to that claimed in Eng. Pat. 22,389, 1899.—F. H. L.

Acetylene Gas Generator. O. Falkenwalde, Baltimore. U.S. Pat. 699,106, April 29, 1902.

This is a mechanically-fed carbide-to-water generator in which the carbide hopper is carried by the rising holder bell. The mouth of the hopper is closed by a flat plate connected with a ball-valve; and when the bell falls low enough for the ball to touch the water it floats, and permits

escape of the carbide. The said plate can be closed by depressing a hand lever at the top of the apparatus. If the holder rises to a certain point it operates a lever which opens an escape pipe for the surplus gas.—F. H. L.

Acetylene Gas Generator. J. S. Wood, Brooklyn. U.S. Pat. 699,274, May 6, 1902.

In an upright cylinder in which a cage of carbide is suspended, water enters from below from a store tank, and gas escapes at the top. The acetylene passes through a needle-valve, the stem of which is operated through levers from a small rising holder inserted on the service side of the valve. If production exceeds consumption this holder rises, chokes the needle-valve, and the resulting surplus of gas in the generator prevents the entry of more water. The gas-leading pipes pass through the water tank, thus using it as a cooler; while underneath is a condensing chamber. In large machines the water tank may have a rising holder placed in it, so provided with levers as to close a cock on the gas-inlet pipe; which, as before, causes the water to be driven downwards away from the carbide in the decomposing chamber.—F. H. L.

Acetylene Gas Generator. A. D. Williamson, Coleraine, Ireland. U.S. Pat. 699,271, May 6, 1902.

The generator claimed appears to be similar to that described in Eng. Pat. 22,272, 1898 (this Journal, 1899, 1112); but no mention is made of the condenser, purifier, and second holder therein referred to.—F. H. L.

Acetylene Gas Generator. D. N. Long, Buffalo. U.S. Pat. 699,332, May 6, 1902.

This is a mechanically-fed carbide-to-water generator of the hopper type, provided with the usual mushroom valve. The generating vessel and the rising holder stand side by side at the same level, and their gas spaces are put into connection by means of a U-tube, which also serves to hold the levers connecting the holder bell with the hopper valve. The base of this U, which is straight, is made of somewhat wide diameter, thus leaving room for the up and down movements of the mechanism. Means are provided for flooding this horizontal channel with water, so as to isolate the generating chamber for recharging and cleaning purposes. The hopper is detachable from the decomposing vessel, being dropped into position and made gas-tight by a water-seal.—F. H. L.

Acetylene Gas Generator. L. Montel, New York. U.S. Pat. 699,337, May 6, 1902.

This is a portable acetylene lamp taking carbide in the form of "cartridges." The apparatus works on the contact principle, having a water reservoir at the base, which acts as a displacement holder, the liquid being driven by any excess of gas into an upper reservoir disposed round the top of the space containing the carbide cartridge. The acetylene travels to the top of this central space, then down through a side tube to a pressure equalising chamber, passing on its way a cock which is also connected to a cam-like lever that lifts the cartridge out of the water. The block of carbide is pressed downwards against the perforated bottom of its containing tube by means of a spring; and through that bottom extends a circular scraper, operating from a hand wheel at the base of the lamp, which removes the crust of lime. From the equalising chamber the gas enters a small vessel at the base of the burner, which can be charged with filtering material, and which has a plug underneath to remove condensation products.—F. H. L.

Acetylene Gas Generator. W. H. Bazley, Whitman, Mass. U.S. Pat. 699,645, May 13, 1902.

An automatic water-to-carbide generator working on the dipping principle, the carbide being carried in a number of boxes disposed radially round a central gas space in the holder bell, which boxes rise with the bell, and have their weight partly supported by a float in the main water tank. Special features of the apparatus are the employment of a small supplemental carbide vessel placed lower than the others, and so arranged that it comes into action first, its gas serving to sweep the air out of the interior of the generator; also that the carbide boxes are fitted with sloping lids, "which protect the carbide from intimate association with the moisture contained in the gas."

—F. H. L.

Acetylene Gas Generating Apparatus. A. E. Adolfsson, Sundbyberg, Sweden. U.S. Pat. 699,828, May 13, 1902.

An automatic carbide-to-water generator of the hopper variety, the feed from which is effected by a revolving scoop, actuated by the holder bell, similar in design to the slides of the rotatory water or gas pump.—F. H. L.

[*Acetylene*] *Gas Distributing System.* M. Toltz and A. Lipschutz, St. Paul, Minnesota. U.S. Pat. 699,725, May 13, 1902.

See Eng. Pat. 24,577, 1901; this Journal, 1902, 397.

—F. H. L.

III.—DESTRUCTIVE DISTILLATION. TAR PRODUCTS. PETROLEUM.

English Patents.

Gas-Water; An Arrangement for Treating ——, with Continuous Working. H. Koppers, Carnap, Essen-on-the-Ruhr, Germany. Eng. Pat. 13,047, June 26, 1901.

The gas-water passes into the upper part of a column apparatus connected to a separating apparatus or still. The gas-water, after passage through some of the upper columns, is led by a pipe into the lower part of a heater, into which also pass the hot gases from the still, which are thereby cooled, whilst the gas-water is warmed. The latter is then led back to the column apparatus, which it enters below the point at which it issued, and, flowing downwards, meets a current of injected steam, whereby CO_2 and H_2S are set free, and rise, together with ammonia, which latter is retained in the cooler, upper part of the column.—E. S.

Distillation; Process of and Apparatus for Fractional ——. J. H. Miller, Brühl, Germany. Eng. Pat. 25,469, Dec. 13, 1901.

An equalisation of temperature between the distilled vapours and the products of condensation which flow back, is effected, as also a reduction of the temperature of the ascending vapours to the desired point by systematically increased cooling, instead of by a number of partial equalisations between the vapours and the products of condensation. An apparatus, comprising a system of one or more consecutive rectifiers and superposed condensers is used, each condenser consisting of an upright tube cooled externally.

—R. A.

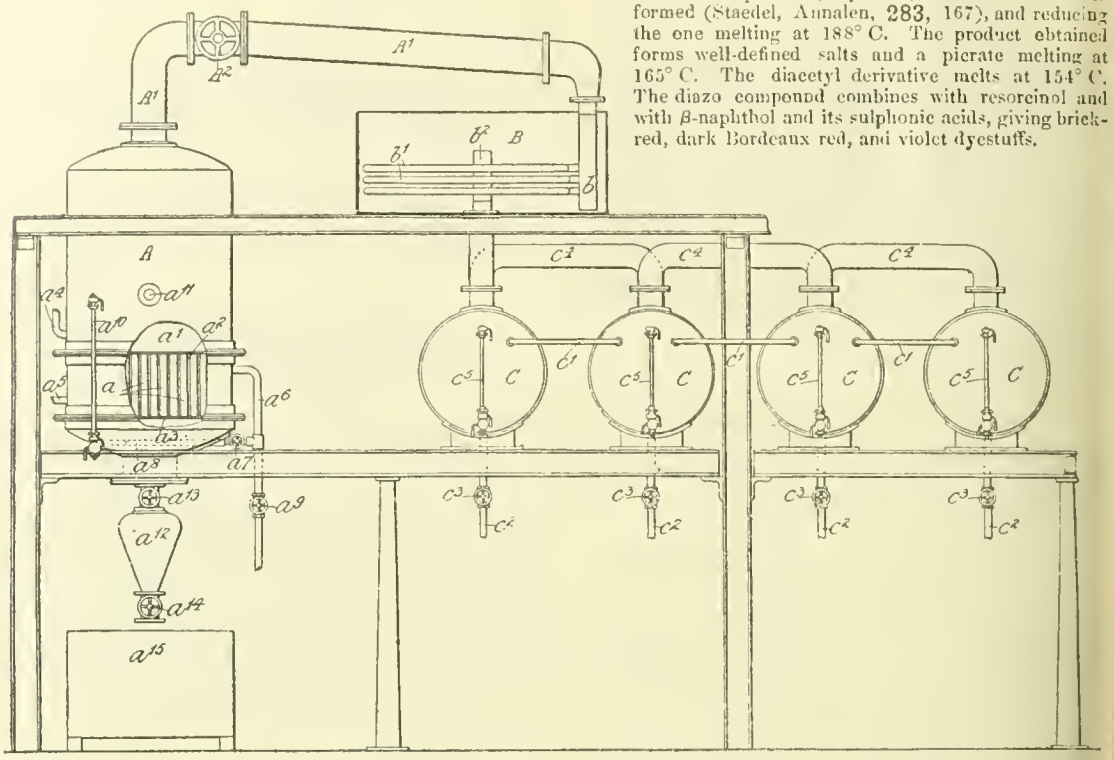
Mineral Oils or the like; Separating the Resinous Parts, without their Decomposition, from ——. C. Daeschner, Dresden. Eng. Pat. 10,663, May 23, 1901.

The mineral oils, the natural asphalts, "residues of sulphuric acids" [acid sludge], and the like, are mixed with fusel oil and extracted therewith.—C. S.

Mineral Oils and their Distillates; Distillation of ——. H. McPhail, Wakefield. Eng. Pat. 6972, March 21, 1902.

The still consists of a vertical cylinder, A, fitted with a series of steam pipes (for superheated steam, the sole heating agent employed), which terminate at both ends in tube plates dividing the still into three compartments. The oil is admitted into the upper compartment, a^1, through the pipe, a^1, or may be admitted into the lowermost compartment, a^3, as desired. The steam-pipe, a^6, is fitted with a branch for admitting steam into a perforated coil, a^8, for agitating the oil and assisting in carrying off the distilled vapours; also for cleaning out the still. The residue is run off into a chamber, a^{12}, whence it can be discharged into a reservoir, a^{15}, the said chamber being also provided with a plug hole for the admission of air in discharging the residue, and also for the insertion of a cleaning rod. The distillate is conducted through the pipe A^1, into the condenser B, fitted with a coil, b^1, for the circulation of the

cooling liquid. The condensed products are then led through a series of receivers, C, to effect the separation of the condensed oil and water by settling, and also for the condensation of the lighter vapours, the water being drawn off through



the pipes, c^3, and the uncondensed products conveyed from one receiver to the next by the larger pipes, c^4. Gauges, c^5, are provided for showing the level of the liquid contents in the receivers.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Toluidines with Diazo Compounds; Coupling of ——. Hans Mehner. J. prakt. Chem., 1902, **65**, [9 and 10], 401—472.

This article is a contribution to our knowledge of the Diazoamino compounds.

Di-o-dinitrodiphenylmethane and Di-o-dinitrobenzophenone. W. Bertram. J. prakt. Chem., 1902, **65**, [7 and 8], 327—345.

Diamino-diphenylmethane (from aniline and anhydroformaldehyde aniline) is converted into a dinitro derivative by means of concentrated nitric acid in presence of a large quantity of sulphuric acid. The amino groups are removed by means of the diazo reaction, and the crude product is recrystallised from benzene. The di-*o*-nitrodiphenylmethane thus obtained melts when pure at 159° C., is very sparingly soluble in water and petroleum spirit, easily soluble in ether, alcohol, glacial acetic acid, acetic ether, and benzene on heating. A characteristic property of the substance is its solubility in dilute solutions of caustic soda, from which it is precipitated unchanged by acids. When treated in alkaline solution with bromine it is converted into *o-o*-dinitrobenzophenone. Reduction with iron and acetic acid, or with stannous chloride and hydrochloric acid, yields di-*o*-diaminobenzophenone, melting at 133° C., and only when a very vigorous reaction took place was di-*o*-diaminodiphenylmethane obtained. The latter separates from alcohol in thin white needles, melting at 160° C. Oxidation of the dinitrodiphenylmethane with chromic acid in glacial acetic acid solution gave di-*o*-nitrobenzophenone, melting at 189° C. A more satisfactory yield of diaminobenzophenone is obtained by nitrating *o*-nitrobenzophenone, separating the two isomerides formed (Staedel, Annalen, **283**, 167), and reducing the one melting at 188° C. The product obtained forms well-defined salts and a picrate melting at 165° C. The diacetyl derivative melts at 154° C. The diazo compound combines with resorcinol and with β-naphthol and its sulphonic acids, giving brick-red, dark Bordeaux red, and violet dyestuffs.

From the foregoing results and previous data the author concludes as follows:—

I. $4.1(CH_3)_2N.C_6H_4.CO.C_6H_4.N(CH_3)_2 1.4$ readily yields an Auramine.

II. $2.1(CH_3)_2N.C_6H_4.CO.C_6H_4.N(CH_3)_2 1.2$ does not yield an Auramine, and remains unchanged on heating with zinc chloride and sal ammoniac to 160° C.

III. $2.1\ H_2N.C_6H_3.CO.C_6H_3.NH_2 1.2$ only gives a small quantity of acridone when heated for a long time with zinc chloride above 170° C.

IV. $[4.2.1(CH_3)_2N(NH_2)C_6H_3]_2CO$ gives spontaneously an acridone derivative.

V. *o*-Aminodiphenylmethane only yields acridine when its vapour is passed over red-hot lead oxide, and di-*o*-diaminodiphenylmethane is equally stable.

VI. Compounds of the type —

$$4.2.1\ X_2N.H_2N.C_6H_3.CH_2.C_6H_3.NH_2.NX_2 1.2.4$$

readily give off ammonia, yielding hydroacridines, which, on air oxidation, are converted into acridines.

The stability of the two *o*-substituted benzophenones towards hydroxylamine and phenylhydrazine appears to be due to spacial relations. Moreover, the great stability of the compounds only substituted in the o-position is contrasted with the easy decomposability of the diphenylmethane and benzophenone derivatives substituted in the *o*- and *p*-positions.—T. A. L.

Sodium Tetrazoditolylsulphite; Compounds of ——, *with Aromatic Amines and Phenols, and their Transformation into Azo-Dyestuffs.* A. Seyewitz and Biot. Compte Rend., **134**, [18], 1068—1070.

Cold saturated aqueous solutions of sodium tetrazoditolyl sulphite, and of the hydrochloride of the amine (aniline toluidines, *p*-phenylenediamine, α- and β-naphthylamine α-ethylnaphthylamine) are mixed, when yellow precipitate

fall, crystallising from alcohol in yellow or red needles. Dilute acids decompose them slowly, with evolution of sulphur dioxide. Cold alkalis dissolve them, and they are reprecipitated from the solutions by acids. Hot alkalis dissociate them, the original alkali salt and the amine being reproduced. Papers soaked in the alkaline solutions and exposed to light are dyed orange-yellow; the same yellow substances are obtained in the dark by boiling the alcoholic solutions, when sulphur dioxide is evolved. They are true azo compoonds. The circumstances of their formation, and their reactions, lead the authors to regard them as indicated by the following equations (exhibiting the α-naphthylamine derivative) :—

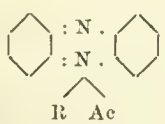
I. $$\begin{matrix}C_6H_3(CH_3).N:N.SO_3Na\\ \dot{C}_6H_3(CH_3).N:N.SO_3Na\end{matrix} + 2C_{10}H_7NH_2HCl =$$
$$2NaCl + \begin{matrix}C_6H_3(CH_3).NH.N(SO_3H).C_{10}H_6.NH_2\\ \dot{C}_6H_3(CH_3).NH.N(SO_3H).C_{10}H_6.NH_2\end{matrix}$$
Compound (not a dyestuff).

II. $$\begin{matrix}C_6H_3(CH_3).NH.N(SO_3H).C_{10}H_6.NH_2\\ \dot{C}_6H_3(CH_3).NH.N(SO_3H).C_{10}H_6.NH_2\end{matrix} =$$
$$2SO_2 + 2H_2O + \begin{matrix}C_6H_3(CH_3).N:N.C_{10}H_6.NH_2\\ \dot{C}_6H_3(CH_3).N:N.C_{10}H_6.NH_2\end{matrix}$$
Azo dyestuff.

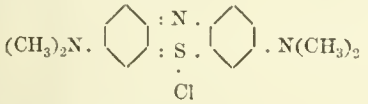
—J. T. D.

Oxazine and Thiazine Dyestuffs, and their Relation to the Azonium Compounds; Constitution of ——. F. Kehrmann. Annalen, 1902, **322**, [1], 1—77.

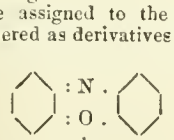
The constitution of the Indulines and Safranines may now be considered as well established, the Aposafranines, Safranines, Rosindulines, and most of the Indulines of the aminoazobenzene melt belonging to the group of azonium compounds. Although for some time the benzene Indulines and the Rosindulines, chiefly from the work of Fischer and Hepp, were considered as structurally different from the Safranines, and were classed as *p*-quinoneimide derivatives, it is now certain that this view is incorrect. All these dyestuffs are derived from the parent substance of the series, the salts of phenylphenazonium, or from its analogues and homologues, containing, in place of the phenyl attached to the pentavalent nitrogen, other alphyl or aryl groups (R)—



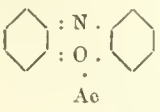
in such a manner that, generally, the hydrogen para to the trivalent azine nitrogen is substituted by ammonia, amine, or hydroxyl radicles. The similarity between the indulines, oxazines, and thiazines led the author to investigate further the correctness of the *p*-quinonoid formulæ for the two latter groups. He had already pointed out (Ber., **30**, 1571; this Journal, 1897, 793) that Methylene Blue was probably represented by the formula—

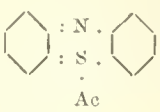


and subsequent investigations have shown that a similar constitution may be assigned to the oxazine dyestuffs, which may be considered as derivatives of the hypothetical phenazoxonium—



This view received further support from Collie and Tickle's work (J. Chem. Soc., 1899, 710), who showed that dimethylpyrone, like its nitrogen analogue, dimethylpyridone, gave crystalline salts with acids. The author finds that the oxazine and thiazine dyestuffs are, in fact, amino- or hydroxy-substitution products of two *o*-quinonoid substances analogous to phenylphenazonium, and represented by the formulæ—





In conjunction with several of his students he has succeeded in confirming this theory. The results may be summarised as follows :—

1. The salts of phenazoxonium and phenazthionium are formed by suitably treating phenoxazine and thiodiphenylamine with oxidising agents—

(*a*) $$C_6H_4\begin{matrix}NH\\ O\end{matrix}C_6H_4 + Br_2 = C_6H_4\begin{matrix}N\\ O\\ \dot{B}r\end{matrix}C_6H_4 + HBr$$

(*b*) $$C_6H_4\begin{matrix}NH\\ S\end{matrix}C_6H_4 + 2FeCl_3 =$$
$$2FeCl_2 + HCl + C_6H_4\begin{matrix}N\\ S\\ \dot{C}l\end{matrix}C_6H_4$$

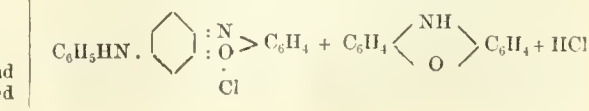
Hence phenoxazine, thiodiphenylamine, and their analogues are leuco derivatives of *o*-quinonoid compounds. They correspond, in the azonium series, to bodies like *N*-phenyldihydrophenazine, which is converted, on oxidation, into a salt of phenylphenazonium—

$$C_6H_4\begin{matrix}NH\\ N\\ \dot{C}_6H_5\end{matrix}C_6H_4 + 2FeCl_3 =$$
$$2FeCl_2 + HCl + C_6H_4\begin{matrix}N\\ N\\ C_6H_5\ Cl\end{matrix}C_6H_4$$

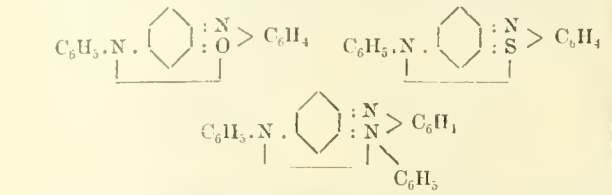
2. When both the hydrogen atoms para to the tertiary nitrogen in the azoxonium, azthionium, and azonium compounds are unsubstituted, the substances are unstable and very prone to react, the two former even more readily than the latter. The compounds become more stable when these hydrogens are replaced by alkyl groups, and still more so when substituted by amino or hydroxyl radicles. For instance, the bromide of dimethylphenazoxonium is tolerably stable in solution, and the stability of the amino and hydroxyl oxazine and thiazine dyestuffs is a fact long well known. The azonium compounds show a similar reaction.

3. The azoxonium and azthionium salts readily react with alkalis and amine bases, yielding dyestuffs like the azonium compounds, which give Rosindulines and Safranines—

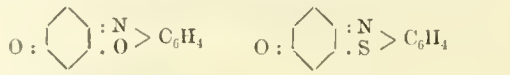
$$2C_6H_4\begin{matrix}N\\ O\\ \dot{C}l\end{matrix}C_6H_4 + C_6H_5NH_2 =$$



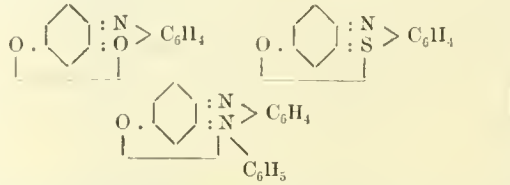
4. The azoxonium and azthionium dyestuffs aminated para to the tertiary nitrogen exist as bases in the form of anhydrides analogous to those of the azonium series—



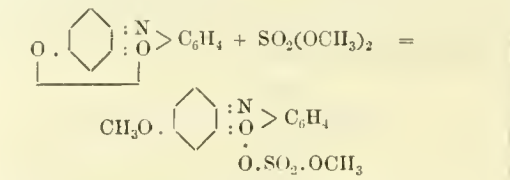
5. The anhydrides of the hydroxylated azoxonium and azthionium compounds, hitherto known as oxazones and thiazones, do not exist in the *p*-quinonoid form—



They are more correctly termed azoxones and azthiones, and are comparable with the Rosindones and Aposafranones—

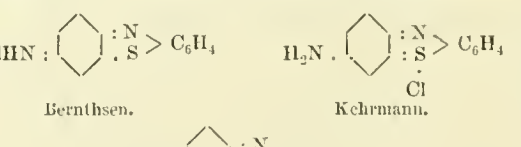


All three classes add methyl sulphate, with severance of the oxygen linkage—

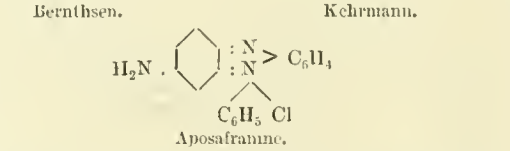


and the resulting products, which have the character of a salt, when treated with amines, exchange the methoxyl group attached to the ring for the amine radicle, yielding the same dyestuffs as those obtained by reacting with amines on the azoxonium, azthionium, and azonium salts.

6. Bernthsen's so-called Imidothiodiphenylimide is 3-aminophenazthionium, corresponding to Aposafranine.



Bernthsen. Kehrmann.



Aposafranine.

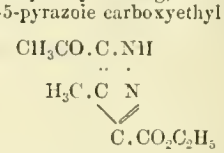
It contains an amino and not an imino group, and, like Aposafranine, can be diazotised and combined with phenols.

7. Several of the oxazine and thiazine bases appear to exist in a pseudo form, like many of the azonium bases, but this matter has not been thoroughly investigated.

It follows from the foregoing conclusions that, in future, dyestuffs having a *p*-quinonoid structure will be much curtailed in number. There only remain the Indamines, Indophenols, di- and triphenylmethane dyestuffs, and the Fluorindines. The azine dyestuffs (Eurhodines, Indulines, Safranines), the Oxazines and Thiazines (Gallocyanines, Meldola's Blue, Capri Blue, Methylene Blue), the Pyronines, Rosamines, Rhodamines, Acridines, and many others, will in future be treated as *o*-quinonoid dyestuffs, whilst the elements oxygen and sulphur, hitherto considered as divalent, must, in the case of the Oxazines, Thiazines, and similar dyestuffs, be accorded that valency which is their due.—T. A. L.

Pyrazoles from 1.3-Diketones and Diazoacetic Ester; Synthesis of ——. A. Klages. J. prakt. Chem., 1902, **65**, [7 and 8], 387—393.

The β-diketones, which in alkaline solution exist in the enolic form, condense in presence of dilute caustic soda lye with diazoacetic esters to form unstable oxypyrazolines, which give off water and are converted into pyrazoles. Thus, by warming equimolecular proportions of acetylacetone and diazoacetic ethyl ester to about 80° C. with sufficient caustic soda lye (1½ per cent.) to keep the oil in solution, and subsequently cooling, colourless needles of 4-methyl-3-aceto-5-pyrazole carboxyethyl ester—



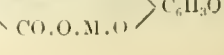
separate out. The product melts at 124° C., and boils under 26 mm. pressure at 202° C. It is readily soluble in alcohol, chloroform, and glacial acetic acid, less so in ether and petroleum spirit, and forms with concentrated soda lye a sodium salt crystallising in colourless needles. The oxime melts at about 165° C. On hydrolysing the ester by boiling for about six hours with alcoholic soda lye and acidifying, it yields the corresponding acid, which separates from water in colourless needles, melting at 233° C. This acid is readily attacked in alkaline solution by permanganate, giving a new acid, melting at 293° C., and having the composition of a methylpyrazol dicarboxylic acid. The silver salt of this acid, when distilled in a current of carbon dioxide, gave 4-methylpyrazole, identified by its silver salt and its picrate, both of which melt at 142° C.

A similar reaction takes place between propionylacetone and diazoacetic ester, the pyrazole melting at 59° C., and giving an oxime and a semicarbazone. On hydrolysis with alcoholic potash, the condensation product is converted into a ketopyrazole carboxylic acid, melting at 191° C. The constitution of the product has not yet been determined, since in the case of propionyl acetone there are three possible enolic formulæ, the constitution of which would modify considerably the formation of the pyrazole derivative. —T. A. L.

Mordant Dyeing. C. Liebermann. Ber., 1902, **35**, [8], 1490—1498.

Noelting, in a lecture before the Chemical Section of the Naturforscherversammlung last year, although in the main confirming the Liebermann-Kostanecki rule with regard to the mordant-dyeing of the hydroxyanthraquinones, which requires the presence of two hydroxyl groups or a hydroxyl and a carboxyl group ortho to one another (Ber., **34**, 1562; this Journal, 1901, 710), drew attention to the fact that several dyestuffs were now known which dyed mordanted fibres without conforming to the rule (see also Buntrock, this Journal, 1901, 983). The author now replies that in deciding whether a substance is a mordant-dyestuff or not the following points must be considered:—(1) The purity of the dyestuff employed; (2) the particular mordant; (3) the strength of shade obtainable; and (4) whether the colour is sufficiently deep to be of any technical value.

The theory also holds when the substitution of the hydrogen atoms in the hydroxyl and carboxyl groups by a polyvalent metal leads to the formation of a ring. When five- or six-membered rings are formed in this way, relatively stable compounds are obtained, which withstand sufficiently well the various dyeing and subsequent operations—washing, soaping, &c. Similar rings are also formed when dyeing mordanted fibres with anthranilic-acid-azo-β-naphthol and with anthranilic-acid-azo-resorcinol, which Noelting instances as exceptions to the Liebermann-Kostanecki rule, the metal of the carboxyl condensing with the hydroxyl group; for example—



That the theory of the mordant-dyeing properties of the *o*-hydroxylated dyestuffs is in the main correct, is borne out by the fact that the acid mordant dyestuffs for cotton, so far as their constitution is known, belong to the class of *o*-derivatives.

Liebermann's earlier experiments were carried out principally with iron and alumina salts or their mixtures, but latterly a much more delicate reagent has been put on the market in the form of calico heavily printed in parallel stripes, with the oxides of cerium, thorium, zirconium, yttrium, beryllium, aluminium, cobalt, nickel, uranium, chromium, copper, zinc, cadmium, manganese, antimony, bismuth, tin, and iron, which the author terms Scheurer's mordants.

In general the elements yttrium, beryllium, thorium, cerium, zirconium and copper appear to have the greatest combining power, although not with all mordant-dyestuffs; and zinc, cadmium, manganese, antimony, bismuth, lead, tin, and thallium the least; whilst iron, aluminium, chromium, and uranium are intermediate. It appeared possible that these differences might be due to some chemical action of the mordant on the dyestuff, such as the introduction of new hydroxyl groups. That this was not the case, was shown by boiling an alcoholic solution of Chrysazin with cupric oxide, when the Chrysazin liberated from the orange copper salt was the unaltered substance, and possessed its original dyeing power.

The experiments led to the following conclusions. All hydroxy dyestuffs dye mordants, and the series falls into two classes. 1. Dyestuffs which dye the ordinary mordants (iron, aluminium, and chromium) quickly and a deep shade, such as Alizarin, the Purpurins, Rhamnetin, Brasilein, Hæmatein, the dihydroxyfluoresceïns, &c. 2. Such dyestuffs as Chrysazin, Anthrarufin, Benzdihydroxyanthraquinone, Anthrachrysone, Chrysophanic acid, &c., which do not dye ordinary mordants, or only slightly, and were previously held to be non-mordant dyestuffs, but react with Scheurer's mordants more or less completely. Chemically pure Hystazarin (2.3-dihydroxyanthraquinone) dyes iron, aluminium, and chromium mordants about one-sixth or one-eighth as deep as Alizarin, but Scheurer's mordants a good deep shade. In spite of the *o*-position of the hydroxyls, the non-contiguity to a quinone group depresses to a marked degree the mordant-dyeing properties of the substance. On the other hand, Quinizarin (1.4-dihydroxyanthraquinone), in which the hydroxyls are ortho to the carbonyl groups, is, although its hydroxyls are para to one another, a mordant-dyestuff, giving, with ordinary mordants, shades about one-tenth the strength of those given by Alizarin, but deep shades with Scheurer's mordants. Similar effects are noticed with Anthrachrysone 1.3.5.7-tetrahydroxy-anthraquinone). Chrysamic acid tetranitrochrysazin) and tetranitrochrysophanic acid only dye Scheurer's mordants faintly, and tetrabromchrysazin has no mordant-dyeing properties.

The results show that the mordant-dyeing action of the hydroxy dyestuffs can be increased or diminished by the position of the hydroxyl groups. The introduction of nitro groups appears to act beneficially, and probably there are other groups (NH_2?) which act in the opposite direction.

—T. A. L.

English Patents.

Indigo; Improved Manufacture of Reduced ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 13,378, July 1, 1901.

See Fr. Pat. 312,469; this Journal, 1902, 38.—T. A. L.

Azo Colouring Matters [*Azo Dyestuffs*] *and of Intermediate Products for use therein; Manufacture or Production of New* ——. H. E. Newton, London. From The Farbenfabriken vorm. Fr. Bayer and Co., Elberfeld, Germany. Eng. Pat. 11,766, June 8, 1901.

See Fr. Pat. 311,339; this Journal, 1902, 41.—T. A. L.

Mono-Azo-Dyestuffs; Manufacture of Mordant-dyeing ——. C. D. Abel, London. From The Actien-Gesellschaft für Anilin-Fabrikation, Berlin. Eng. Pat. 13,863, July 8, 1901.

Supplementary to Eng. Pat. 10,294 of 1900 (this Journal, 1901, 467). See Fr. Pat. 312,496; this Journal, 1902, 46.

—T. A. L.

Gallocyanines [*Oxazine Dyestuffs*]; *Manufacture of New Derivatives of* ——. O. Imray, London. From the Dye Works, formerly L. Durand, Huguenin and Co., Basle, Switzerland. Eng. Pat. 4550, Feb. 22, 1902.

Derivatives analogous to those of Eng. Pat. 6055 of 1898 (this Journal, 1899, 573), but dyeing different shades, are obtained by treating gallocyanines with free sulphurous acid, a sulphite or a bisulphite. The gallocyanines employed are obtained by reacting with nitrosoalkylbenzylaniline sulphonic acids or nitrosodiphenylamine hydrochloride on gallic acid or its derivatives, such as gallamic acid, gallic acid esters, and gallanilide, or with the sulphonated gallocyanines obtained by sulphonating the gallocyanines derived from nitrosodiphenylamine.—T. A. L.

Colouring Matter [*Sulphide Dyestuffs*] *containing Sulphur; Impts. in the Manufacture and Production of* ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 14,669, July 18, 1901. (See Fr. Pat. 312,573; this Journal, 1902, 43.)

The dyestuffs obtained are quite different from those of Eng. Pat. 23,578 of 1893 (this Journal, 1894, 725).

T. A. L.

United States Patents.

Resist-White [*Indigo Dyestuffs*] *under Indigo; Process of Making* ——. A. J. Stiegelmann, Ludwigshafen, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 699,033, April 29, 1902.

The material employed is printed with a resist consisting of a thickening agent, glycerin, and lead peroxide, is then dried, dyed in an indigo vat to the required shade, rinsed in cold water, and finally worked in a bath containing hydrochloric acid until the desired white has been obtained.

—T. A. L.

Indigo-diacetic Acid [*Indigo Dyestuffs*], *and Process of Making Same.* P. Seidel, Ludwigshafen, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 699,581, May 6, 1902.

When authranilic acid is condensed with two molecular proportions of a haloid-acetic acid, and the resulting product, anthranilo-diacetic acid, treated successively with caustic alkali, water, and air, it is converted into indigo diacetic acid. The new substance crystallises from hot water, and, on heating, melts and decomposes. It is readily soluble in alcohol and ether. (See also Eng. Pat. 16,566 of 1900; this Journal, 1901, 889.)—T. A. L.

Green Sulphur Dye [*Sulphide Dyestuffs*], *and Process of Making Same.* C. Ris, Basle, Assignor to Aniline Color and Extract Works, formerly J. R. Geigy, Basle, Switzerland. U.S. Pat. 698,555, April 29, 1902.

The sulphonic acid of dimethyl-*p*-amino-*p*-hydroxydiphenylamine, obtained from dimethyl-*p*-aminophenylquinoneimine and normal sulphites (Eng. Pat. 12,578 of 1901; this Journal, 1902, 471), is heated with alkaline polysulphides in presence of finely-divided copper or of a copper salt. The product dyes unmordanted cotton yellowish-green shades, fast to light and soap, from a bath containing sodium sulphide and salt.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mordanting Wool with Chrome. G. Ulrich and B. Tugendhat. Färber-Zeit., 1902, **13**, [9], 134—135.

With a view of determining the amount of chromic acid present in wool mordanted with chromic acid salts, by the

method recently employed by Kapff (this Journal, 1902, 612), samples of wool were mordanted with chromic acid, by means of potassium bichromate and a large excess of sulphuric acid, and with chromic oxide from a chromic oxide salt. Portions of each were then dyed with Chromotrope 2 R. Those mordanted with chromic acid, which contained a small proportion of chromic oxide, became dyed reddish to dull violet, those mordanted with chromic oxide being dyed blue- to red-violet colours. As these differences are not sufficiently great to afford a basis for a quantitative method of determination, logwood was tried and found to answer better. With a small proportion of this, the wool mordanted with chromic oxide gives clear blue, while that mordanted with chromic acid gives reddish-grey dyeings.

Samples of wool were mordanted by boiling for 1½ hours with (1) 3 per cent. (of the weight of the wool) of lignorosin, 1 per cent. of sulphuric acid, and 1·25 per cent. of potassium bichromate; (2) 3 per cent. of lactolin and 1·5 per cent. of potassium bichromate; and (3) 2·5 per cent. of tartar and 3 per cent. of potassium bichromate. After washing, samples (2) and (3) were observed to lose chromic acid when they were steeped in water, whilst sample (1) remained unaffected, indicating, as Whiteley has pointed out (this Journal, 1887, 131) the presence of chromic acid in the wool mordanted according to methods (2) and (3). On dyeing the samples with a small quantity of logwood, (1) yielded a blue which was almost as clear as the colour produced upon a pure chromic oxide mordant, whilst (2) and (3) gave greenish-grey dyeings.—E. B.

Dyeing Animal Fibres with Acid Dyestuffs. M. P. Sisley. Rev. Gén. des Mat. Col., 1902, **6**, [65], 89—94.

The author finds that when an aqueous solution of picric acid is shaken with toluene, ether, or amyl alcohol, the law of distribution does not hold good. The same was found to be the case with the aqueous solution of Crystal Scarlet (free colour acid) and amyl alcohol.

As is known, the author compares the dyeing process (this Journal, 1900, 736) to the extraction of a dyestuff by means of a neutral solvent, and the following tables give the comparative behaviour of aqueous solutions of picric acid of various strengths towards silk, amyl alcohol, and toluene:—

Strength of Solution.	Percentage remaining in the Bath.		
	Silk.	Amyl Alcohol.	Toluene.
Per Cent.			
0·001	100	100	100
0·01	83·6	98·7	100
0·1	50	92·5	89·5
0·5	67·2	86·9	88·1
1·0	82	85·7	85·2

If the solutions of picric acid were acidulated in the proportion of 5 grms. of sulphuric acid per litre, the figures obtained are:—

Strength of Solution.	Percentage remaining in the Bath.		
	Silk.	Amyl Alcohol.	Toluene.
Per Cent.			
0·001	Nil	Nil	3
0·01	5·9	57·8	71·1
0·1	12·3	71·3	67·4
0·5	52·7	78·4	66·1

In each case the experiment was conducted by shaking 2 grms. of silk (or an equal amount of the solvent) with 40 c.c. of the aqueous solution of picric acid in a stoppered bottle until equilibrium was established, which was the case in about eight hours (in the cold).

The free colour acids of

Chrysoine—

$$(SO_3H)C_6H_4.N:H.C_6H_3(OH)_2,$$

Orange II.—

$$(SO_3H)C_6H_4.N:N.C_{10}H_6(OH)_\beta + 4H_2O,$$

Crystal Ponceau—

$$C_{10}H_7.N:N.C_{10}H_4(OH)(SO_3H)_2 + 9H_2O,$$

Carmine Blue—

$$(C_2H_5)_2NC_6H_4.C\begin{cases} C_6H_4:N:(C_2H_5)_2 \\ C_6H_2\begin{cases} SO_3 \\ SO_3H \\ OH \end{cases} \end{cases} + 5H_2O$$

behaved in a similar way, the author remarking that the similarity in the action of silk and the neutral solvents is noteworthy.

In conclusion, he believes that these phenomena may be explained by assuming that the addition of acids and salts to the dye-bath favour the formation of molecular compounds between the fibre or the solvent and the colouring matter, by preventing to a certain extent the dissociating action of the water on the combination.—F. N.

Primuline Red; Improvements in Dyeing Reserve Effects on ——. E. C. Kayser. Färber-Zeit., 1902. **13**, [10], 152—153.

Primuline Red is discharged with great difficulty, but a good reserve of yellow under red is obtained after dyeing the silk or cotton fabric with Primuline, by printing with the following mixture:—60 grms. of starch meal, 250 c.c. of water, 40 c.c. of acetic acid, 150 c.c. of stannous acetate solution (sp. gr. 1·215), 15 grms. of paraffin wax, and 15 grms. of resin.

When the material is to be over-printed with Aniline Black, a yellow reserve may be obtained with 45 grms. of starch, 30 grms. of British gum, 250 c.c. of water, 30 c.c. of acetic acid, 150 c.c. of stannous acetate solution, 60 grms. of stannous chloride, and 300 grms. of sodium acetate. A green reserve, suitable for over-printing with Aniline Black, is produced by introducing 8 grms. of Brilliant Green dissolved in 40 c.c. of acetic acid and 40 c.c. of tanuin glyceride (50 per cent.) into a mixture of 45 grms. of starch meal, 45 grms. of British gum, 250 c.c. of water, 40 c.c. of acetic acid, 15 grms. of stannous chloride, and 300 grms. of sodium acetate. The red is developed in the usual way with nitrous acid and sodium β-naphtholate, but the fabric should not remain too long in the acid bath, otherwise reduction of the diazo compound may occur.

When the pattern contains comparatively little red on a yellow ground, the fabric is dyed with Primuline, and then printed with a non-volatile acid, such as tartaric or phosphoric acid, the material being subsequently passed through a bath of sodium nitrite containing milk of lime and finally developed with β-naphtholate in the ordinary way.—G. T. M.

Aniline Black; Dyeing Cottons with ——. F. Beltzer. Rev. Gén. des Mat. Col., 1902, **6**, [65], 95—100.

The author gives, in the two following tables (I. and II.), the proportions to prepare the dye-bath for 100 kilos. of cotton

I. Warm Method (8 per cent. of Aniline).

——	Full Black.	Medium Black.	Cheap Black.
(1.) Aniline	8 kilos.	6 kilos.	4 kilos.
Hydrochloric acid	32 „	20 „	30 „
Sulphuric acid	2 „	10 „	..
Water	50 litres.	50 litres.	50 litres.
(2.) Sodium bichromate	12·5 kilos.	12 kilos.	8 kilos.
Water	50 litres	50 litres.	50 litres.

The author has carried out four experiments in order to investigate the proportions of the ingredients and the concentration of the bath, using 500 grms. of ordinary American cotton in each case, *viz.*:—

Bath No. I.—Water, 6 litres; sulphate of aniline solution, 500 c.c., containing 30 c.c. of aniline and 45 c.

II. Cold Method.

	Full Black.	Medium Black.	Ordinary Black.
(1.) Aniline	9·22 kilos.	7 kilos.	6 kilos.
Sulphuric acid, 66° B.	24·8 „	10·5 „	9 „
Water	50 litres.	50 litres.	50 litres.
(2.) Sodium bichromate	21·6 kilos.	16·8 kilos.	14·4 kilos.
Water	50 litres.	50 litres.	50 litres.

of sulphuric acid of 66° B.; sodium bichromate solution, 1,000 c.c., containing 72 grms. of commercial sodium bichromate of 64·1 per cent. CrO_3. Total, 7·5 litres.

Bath No. 2.—Water, 6 litres; sulphate of aniline solution, 500 c.c.; and sodium bichromate solution 1,000 c.c., as in the first bath; sulphuric acid, 25 grms. Total, 7·5 litres.

Bath No. 3.—Water, 6 litres; sulphate of aniline solution, 500 c.c., as in the first bath; sodium bichromate solution, 1,000 c.c., containing 72 grms. of $Na_2Cr_2O_7$, with 50·6 grms. of CrO_3, titrating 70·3 per cent. of CrO_3; sulphuric acid, 24 grms. Total, 7·5 litres.

Bath No. 4.—Water, 6 litres; sulphate of aniline solution 500 c.c., as in the first bath; sodium bichromate solution, 1,000 c.c., as in the first bath.

In the second case the dyeing took place the most rapidly, in the third case a little quicker than in the fourth, and in the first case the colour was produced the slowest. After 1½ hours the titration of the waste liquors showed:—

Bath No. 1.—12·00 grms. of unreduced chromic acid.
Bath No. 2.— 7·00 „ „ „
Bath No. 3.—11·24 „ „ „
Bath No. 4.—12·50 „ „ „

After three hours the bath was in every case exhausted, and it was found conclusively that with baths Nos. 1 and 4, the best results were obtained, bath No. 1 giving slightly better results than No. 4.—F. N.

English Patents.

Filaments; Apparatus for Production of Fibreless ——. W. A. P. Werner, London. Eng. Pat. 1850, Jan. 26, 1901.

See U.S. Pat. 697,580; this Journal, 1902, 614.—J. F. B.

Hydrosulphites; Process for the Production of ——. E. Knecht, Manchester. Eng. Pat. 12,729, June 22, 1901.

Aqueous solutions of sodium bisulphite and of titanium sesquichloride (Ti_2Cl_6) are mixed in a receptacle the size of which, and also the flow of the two solutions, are so adjusted that the liquid may overflow before the hyposulphurous acid formed begins to decompose. The resulting solution is quickly caused to flow into an aqueous solution of sodium hydroxide. The titanic hydrate precipitated is filtered from the solution of sodium hydrosulphite, and after solation in an acid, is reconverted into a titanous salt, preferably by electrolysis, for re-use. Ammonium or potassium bisulphite may be substituted for the sodium salt in the process; or sulphurous acid may be used.—E. S.

Dyeing Apparatus. M. Geissler, Goerlitz, Germany. Eng. Pat. 2891, Feb. 5, 1902.

The apparatus is designed for the purpose of securing a rapid and thorough penetration by dye liquors of "cloth or other porous materials," especially thick tissues. The tissues are sewn together and drawn in the form of an endless band over a winch fixed above a dye-bath, passing, as they ascend, between two squeezing rollers placed in the dye-bath, which are moved to and fro by means of mechanism attached to the ends of the winch. The tissues are thus moved about from side to side while passing through the dye-bath.—E. B.

Printing Tissues with Pigments [*Powdered Metals, &c.*] L. Lilienfeld, Vienna. Eng. Pat. 23,892, Nov. 25, 1901. (See Fr. Pat. 316,229; this Journal, 1902, 704.)

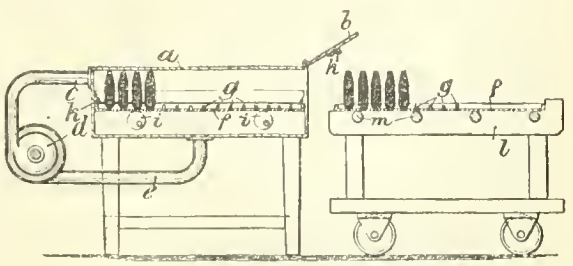
Impressions are obtained, with pigments and powdered metals, which are perfectly resistant and pliable, by the use of (1) metallic salts of fatty acids, especially the oleates, stearates, and palmitates of aluminium and zinc, and metallic resinates, dissolved in volatile and non-volatile oils, benzene, carbon bisulphide, acetone, &c.; (2) acid derivative, of albumin, *e.g.*, acetyl-albumin (obtained by treating albumin with acetic anhydride and a dehydrating agent, or with acetyl chloride) dissolved in acetone, acetic ether, &c.; and (3) india-rubber or gutta-percha, decomposed by heating for about five hours at 240°—300° C. with a drying oil.—E. B.

Resists for Sulphur Colours. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 12,540, June 19, 1901.

See Fr. Pat. 311,644; this Journal, 1902, 51.—E. B.

Dyeing and Bleaching Textile Fibres; Apparatus for ——. C. Wolf, Germany. Eng. Pat. 11,853, June 10, 1901.

Yarns in the form of cops, wrapped upon hollow, perforated tubes, are fitted upon hollow spindles, projecting from a plate *f* (see figure). This is placed, horizontally, inside a dye vessel *a*, and pressed upwards, by means of eccentrics *i*, against ledges *k* on the sides of the vessel, for the purpose of forming a tight joint. Dye liquor is forced by a pump *d* alternately through the pipes *e* and *c*, the end of the latter of which is widened and flattened to ensure uniform distribution of the liquor, when this is supplied through it. The spindles are each furnished with several rings or sleeves to enable cop-tubes of different sizes to be fixed upon them. A hinged door *b* and trolley *l*, upon which rollers are mounted, are provided to facilitate the removal of the plate after the cops have been dyed.



Cop-dyeing Apparatus.

Loose fibres are put into a perforated box, which takes the place of the cop-carrying plate in the apparatus described.—E. B.

United States Patents.

Artificial Silk; Preparation of Collodion for Manufacture of ——. J. Douge, Paris. U.S. Pat. 699,155, May 6, 1902.

Pyroxylin for the manufacture of artificial silk is air-dried at a low temperature until it contains from 6 to 10 per cent. of hygroscopic moisture, and then dissolved in a mixture of ether, alcohol, and an aqueous alkaline solution.—J. F. B.

Mercerising Process. W. Kleinewefers, Crefeld, Germany. U.S. Pat. 698,026, April 22, 1902.)

See Eng. Pat. 7093 of 1897; this Journal, 1898, 240.
—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Dyeing Leather and other Materials; Use of Titanium Salts in ——. C. Dreher, Freiburg-in-Baden, Germany. Eng. Pat. 9556, May 8, 1901.

The yellow dyeings hitherto obtained upon tanned leather by treating this with titanium salts (Ger. Pat. 106,490 of 1898) have been too pale in colour to be of practical value.

The following methods of applying such salts in dyeing are claimed:—

1. Raw hides are first steeped in a cold 1 per cent. solution of a titanium salt, and are next partially tanned. After rinsing and again immersing, for several hours, in a solution of a titanium salt, the tannage is completed, and the hides are then treated with a ½ per cent. solution of the titanium salt, which may now be applied at a higher temperature than before, *e.g.*, 40° C. They are then thoroughly washed, and finished as usual. The leather thus produced has a deep colour, and is uniformly dyed throughout its substance.

2. Leather, *e.g.*, goat and sheep skins, is dyed fast colours, in shades ranging from yellow to black, by tanning it with ordinary tanning agents in admixture with extracts of vegetable (wood) dyestuffs, and then acting upon it with a titanium salt.

3. Leather, tanned with vegetable agents of any kind, is treated with titanium salts and mordant dyestuffs, either separately or together.

4. Fast dyeings are produced upon leather by treating it with titanium salts and dyestuffs, the formation of lakes in or upon it being promoted by adding alkalis, alkali carbonates, silicates, phosphates, sulphites, "hyposulphites," chlorates, ferrocyanides, chromates, formates, acetates, sodium stannate, sodium aluminate, borax, &c.

5. The dyeing is effected in conjunction with soluble basic salts, such as the basic sulphates of aluminium and chromium, and soluble salts of the alkaline earths, such as the acetates.

6. As in 5, but with the addition of the sulphates, chlorides, or nitrates of aluminium or chromium, or of such salts as zinc sulphate, manganese sulphate, and copper sulphate.

7. "Leathers of any kind" are mordanted with insoluble oxides or hydroxides, and are then dyed with titanium salts and mordant dyestuffs.

8. Leathers, tanned with metallic oxides, *e.g.*, chrome- and alum-tanned leathers, are treated as in the last instance.

9. Leather "mordanted" with salts easily decomposed by the titanium salts employed (*e.g.*, double oxalates, tartrates, and fluorides), such as insoluble carbonates, ferrocyanides, chromates, and tannates of the "earth metals" and heavy metals, is dyed as in methods 7 and 8.

10. Leathers of all kinds, that is, ordinary tanned and chrome- and alum-tanned leather, chamois leather, "and the like," are treated with titanium salts and mordant-dyestuffs, and metallic salts are added to the baths at any stage of the dyeing process.

11. Textile fabrics, composed of either vegetable or animal fibres, are mordanted with metallic tannates, and are then dyed with titanium salts and mordant-dyestuffs.

(See also Eng. Pats. 5712 and 27,742 of 1896; this Journal, 1897, 238, and 1898, 44; and this Journal, 1895, 310; 1896, 420; 1899, 15; and 1901, 1111.)—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Alums; Volumetric Determination of Aluminium and Free and Combined Sulphuric Acid in ——. A. H. White.

See under XXIII., *page* 793

Ozone; Spontaneous Decomposition of ——. E. Warburg. Preuss. Akad. Wiss. Berlin Sitz. Ber., 1901, 48, 1126—1139.

At a low temperature the velocity of spontaneous decomposition of ozone is small compared with that of the decomposition caused by impurities in the ozone, but that as the temperature rises, the first-named quickly increases. The reaction is bimolecular, and proceeds according to the equation $dC = -\beta_1.C^2.dt$, where C = the mass of ozone in grms. per litre, t is the time in minutes, and β_1 a value depending on the temperature. β_1 has the value 0·00000204 at 17° C., 0·0157 at 100° C., and 0·177 at 126·9 C. The author does not agree with Shenstone's statement (this Journal, 1897, 474) that dry ozone is less stable than the damp gas. (See also this Journal, 1900, 1120.)—A. S.

English Patents.

Sulphuric Acid by the Contact Process; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik of Ludwigshafen, Germany. Eng. Pat. 12,781, June 22, 1901.

Under the conditions of working prescribed in Eng. Pat. 15,949, 1898 (this Journal, 1899, 831), although the yield is good, much platinum is needed as contact material to get a high yield of SO_3. "If, for example, with 100 parts of platinum, a total conversion of 97 per cent. is obtained, the production of the first 80 per cent. of sulphuric anhydride only requires about 15 parts of the total platinum employed, while for the remaining 17 per cent. a further 85 parts of platinum are necessary;" the retardation being caused by the presence of the SO_3 formed. The improved process consists in working with a reduced proportion of platinum "in two or more contact apparatus, so that about 80 to 90 per cent. of the SO_2 are converted into SO_3 in the first contact apparatus, and absorbed, and the remaining SO_2 is oxidised in the succeeding apparatus."—E. S.

Nitric Acid; Apparatus for the Distillation of ——. G. Plath, Cassel, Germany. Eng. Pat. 9133, May 2, 1901.

The apparatus for distilling nitric acid is adapted to ensure prolonged contact between the acid and air, either by drawing off or blowing in air, partly in the opposite direction to the flow of the condensed acid, and partly with the acid fumes, at a temperature admitting of regulation.

—E. S.

United States Patents.

Hydrochloric Acid; Making ——. E. Hart, Easton Pennsylvania, U.S.A. U.S. Pat. 698,704, April 29 1902.

From a mixture of sodium chloride with its equivalent o either sodium pyrosulphate or sulphuric acid, introduce with steam continuously into a rotatory cylinder heated below redness, the hydrochloric acid is got off without leaving pyrosulphate or chloride with the sodium sulphate.—E. S.

Sulphuric Acid; Apparatus for the Manufacture of Concentrated ——. W. R. Quinan, California. U.S. Pat 699,011, April 29, 1902.

In the apparatus shown in vertical section, the sulphu fumes from the pyrites burner 10, after traversing th mixing chamber 15, pass through the inclined flue 20, ove a descending thin stream of acid, into the collectin chamber 42, under the grating 41, of the Glover tower 4 and after passage through the usual stone packing 4 receiving a shower of acid from the spraying device 4 pass through the pipe 50 into the lead chamber 70, one the system. The walls of the burner kiln and chamber a constructed to conserve the heat, to regulate which t mixing chamber has an iron roof 16, with a removabl covering of infusorial earth or the like 17. The flue leadin to the Glover tower is in the form at its bottom of a seri of separable steps, each of which is composed of a slab volvic lava (or the like) from the south of France, provide with upwardly-extending flanges at the back and sides, an a downwardly-extending lip at the front edge, overlappin the flange at the back of the next step. The flue has a sl 25 near the kiln, through which the concentrated acid flow into the receptacle 100. A ledge 46 is disposed at t mouth of the opening into the concentrating flue, ov which the acid collected at the bottom of the tower passe The ledge is notched for better adjustment of the flo which is regulated by the pipe 60 connected to an elbo pipe 61, the adjustable upper bend of which determin the height of the layer of acid in the tower, since a

excess acid flows through the pipe, and may be received in one of the chambers. If the flue is used without a Glover tower it may be connected directly with the first lead chamber.
—E. S.

Cyanides; Making Alkaline ——. J. D. Darling, Philadelphia, U.S.A. U.S. Pat. 698,462, April 29, 1902. Compare with Eng. Pat. 9350, 1900 (this Journal, 1901, 717).

An alkali oxide, hydroxide, or carbonate is heated with carbon in presence of nitrogen. The resulting black mass, called "cyanised carbon," is then heated with enough sodium or potassium to consume all the carbon, in a series of iron vessels, through which and into the molten metal ammonia is passed.—E. S.

Cyanides; Making ——. J. D. Darling, Philadelphia, U.S.A. U.S. Pat. 698,463, April 29, 1902.

The two stages described in preceding abstract are conducted together, nitrogen and ammonia together being passed through the molten metal under a mixture of the alkali with carbon.—E. S.

Cyanides; Making Alkaline ——. J. D. Darling, Philadelphia, U.S.A. U.S. Pat. 698,464, April 29, 1902.

The "cyanised carbon" (see above) is heated with an alkalamide previously prepared by heating the metal in ammonia.—E. S.

Erratum.

This Journal, 1902, page 705, col. 1, first abstract under VII.: for "151 tons of caustic soda" read "15·1 tons," &c., and for "300 tons of bleaching powder" read "30 tons," &c. Also, for "2,000 horse-power," read "3,000 horse-power."

VIII.—GLASS, POTTERY, ENAMELS.

United States Patents.

Glass; Manufacture of ——. A Voelker, Ehrenfeld, Germany. U.S. Pat. 698,766, April 29, 1902.

See Eng. Pat. 12,672, 1900; this Journal, 1900, 1112.
—W. C. H.

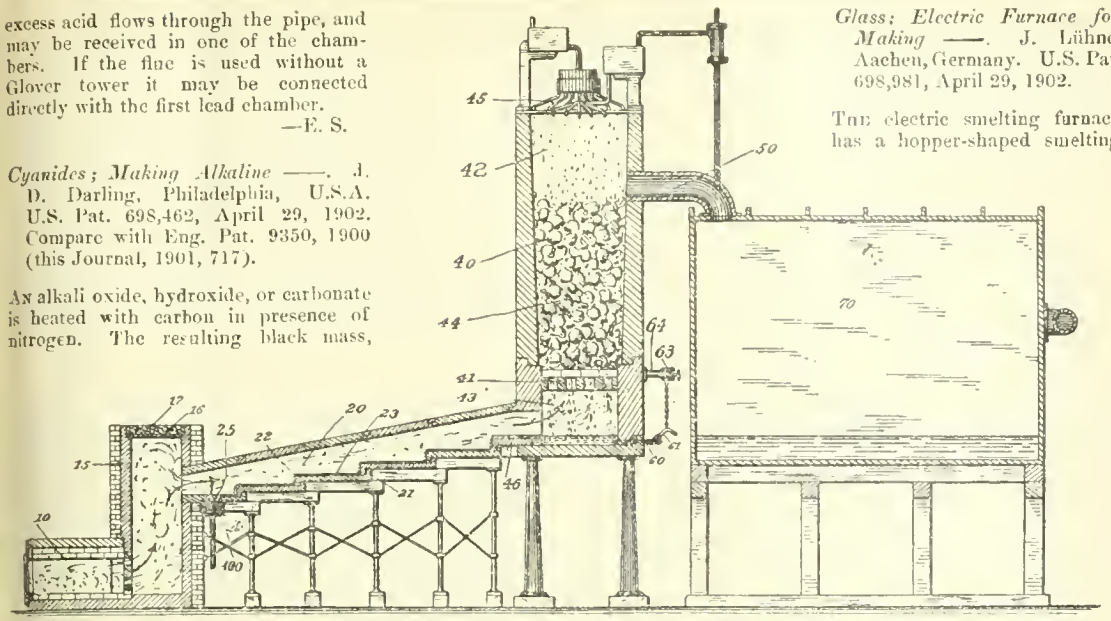
Glass-Making Furnace. E. Gobbe, Jumet, Belgium. U.S. Pat. 698,932, April 29, 1902.

The furnace is provided with a revolving sole on which are placed the pots containing the material to be smelted, refined and cooled. Means are arranged for securing a high temperature zone in one part of the furnace, where the melting and refining are effected, and a low-temperature zone where the cooling can take place. Openings are provided for introducing and removing the pots.—W. C. H.

Glass, &c.; Apparatus for the Manufacture of ——. J. Lühne, Aachen, Germany. U.S. Pat. 698,980, April 29, 1902.

See Eng. Pat. 23,990, 1899; this Journal, 1900, 747.
—W. C. H.

Glass; Electric Furnace for Making ——. J. Lühne, Aachen, Germany. U.S. Pat. 698,981, April 29, 1902.



The electric smelting furnace has a hopper-shaped smelting chamber with a longitudinal discharge opening at the bottom, provided with vertically-extending corrugations in the inner surfaces of its side walls. A single horizontal negative electrode is arranged longitudinally in the opening, with a plurality of transversely arranged positive electrodes in the same horizontal plane on each side of it, and located in the vertical planes of the grooves of the corrugated sides. The negative electrode, which is prism-shaped in cross section, and presents opposite sharp corners towards the positive electrode, is bored longitudinally, having one end of the bore closed, and there are side outlets from the bore for the passage of air and gas.—G. H. R.

Glassware; Art of Manufacturing Hollow ——. J. I. Arbogast, C. V. Arbogast, F. J. Arbogast, P. R. Arbogast, and F. L. Arbogast, all of Pittsburg, Penn., U.S.A. U.S. Pat. 699,058, April 29, 1902.

The process consists in simultaneously pressing in a mould a number of blanks, and thus partly finishing the articles to be made. The blanks are then annealed, and afterwards simultaneously re-heated by the application of gas-jets to the unfinished parts, a number of blanks being finally blown in a single mould by compressed air.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Calcium Carbonate; Solubility of ——, *in Aqueous Solutions of Certain Electrolytes in Equilibrium with the Atmospheric Air.* F. K. Cameron and A. Seidell. Jour. Physikal. Chem., **6**, 50—56. Chem. Centr., 1902, **1**, [18], 1041.

The determinations relate to the solubility in sodium chloride solution at 25° C., in sodium sulphate solution at 24° C., and in sodium chloride solution in presence of solid calcium sulphate. A current of air, which was first passed through sulphuric acid to free it from ammonia, was passed through the solutions.

The following results were obtained:—

The solubility of calcium carbonate in presence of sodium chloride attains a maximum. The solution under these conditions apparently contains no normal carbonate.

Sodium sulphate has considerable influence on the solubility of calcium carbonate; the solution contains both acid and normal carbonate. The solubility increases constantly with increasing amounts of sodium sulphate till the saturation point of the latter is attained.

In presence of calcium sulphate the solubility of the calcium carbonate in sodium chloride solution is considerably less. The solubility increases with increasing amounts of sodium chloride to a maximum and then shows a sudden decrease. The solution contains no normal carbonate.
—A. S.

United States Patents.

Bricks, Tiles, and the Like; Manufacture of ——. A. J. Keeble, Peterborough, England. U.S. Pat. 699,534, May 6, 1902.

See Eng. Pat. 10,160, 1901; this Journal, 1902, 257.
—W. C. H.

Stone; Process of Making Artificial ——. C. W. Stevens, North Harvey, Ill., U.S.A. U.S. Pat. 699,588, May 6, 1902.

The process consists in forming a layer of sand on the bottom of a mould, and pouring a liquid stone composition to form a layer on the top of the sand. A core-box without a bottom, and rather smaller than the mould is placed on the layer of stone composition, and the core-chambers are filled with relatively dry sand. More plastic stone composition is then poured into the space between the mould and the core-box, and as the latter is withdrawn, the plastic composition is said to fill up the spaces previously occupied by the walls of the core-chambers. As a modification the walls of the core-chambers, instead of being solid, may be formed by two thin parallel plates with a space between into which the stone composition may be poured, so that, on withdrawing the core-box, the plastic composition has to flow only through a distance equal to the thickness of the thin plates, in order to completely fill the spaces between the cores. The blocks are afterwards allowed to set.—W. C. H.

X.—METALLURGY.

Blast-Furnace; Chemical and Physical Properties of Carbon in the Hearth of the ——. W. J. Foster, Iron and Steel Inst. Paper read at Meeting, May, 1902.

This is a study of the thermal effects of the reactions taking place near the tuyères of the furnace. It is stated that by increasing the temperature and diameter of the hearth, an increased rate of driving and economy will result.—W. G. M.

Steel; Elimination of Silicon in the Acid Open-Hearth ——. A. M'William and W. H. Hatfield. Iron and Steel Institute, 1902.

High silicon in acid open-hearth steel is not the result of a special attack on the sides or bottom of the furnace (sand-boil) nor in all probability, of variations in the working temperature, but is owing to the condition and composition of the slags themselves. Heats which furnished thin slags containing about 51 per cent. of silica yielded a steel low in silicon, while those which furnished thick slags containing 57 per cent. of silica yielded steel high in silicon. Fluidity or otherwise of the slag is not the cause of the variations in silicon, fluidity being only taken as a measure of basicity, apart from differences in the characters of the bases. The proportion of ferrous to ferric oxide present seems to be of subsidiary importance, as also the total amount of iron oxides. The authors ran a special "prophesying heat" in which they endeavoured to eliminate the silicon as completely as possible while yet the carbon was high, then allowed the slag slowly to become siliceous, thus gradually raising the silicon in the bath while the carbon slowly boiled away; then changing the procedure they lowered the silicon and carbon together, finishing with a low silicon content; finally they produced a first class marketable steel. Full details of this series of experiments are given in a series of elaborate tables. The authors note the "curious point" (not before described to their knowledge) that the percentages of both silicon and manganese increase when the slag has gained more than a certain amount of silica, "which almost points to the reduction of a silicate of manganese."—J. H. C.

Drawn Steel; Researches on ——. *I. Magnetism and its Changes with Temperature; and II. Resistivity, Elasticity, and Density, and the Temperature Coefficients of Resistivity and Elasticity.* J. R. Ashworth. Proc. Roy. Soc., 1902, **70**, [459], 27—30.

I.—The author has previously shown that the variation of the intensity of magnetisation of a magnet under fluctuations of temperature is controlled to a large extent by the self-demagnetising factor of the magnet and this is governed by the dimension ratio. In general an increment of temperature in the cyclic state reduces, and a fall of temperature augments the magnetic intensity, so that in the equation—

$$I_{t'} = I_t (1 + \alpha t' - t)$$

α is negative, t' being a higher temperature than t' and I_t, and $I_{t'}$ the corresponding magnetic intensities. Experiments were made as to the change of α and also of I as the dimension ratio is increased from about 16 to 100 for pianoforte steel wire in three conditions, namely, in the annealed, glass hard, and commercial drawn state. In the first two the coefficient is decremental, and in magnitude, large for annealed, and very small for glass hard, but with the drawn wire, α changes from decremental to incremental as the dimension ratio advances. Experiments with lengths of 50 and 100 diameters of twelve samples of pianoforte steel, representing every stage in the process of drawing from the rolled rod through annealing and tempering to the fine-drawn wire, showed that α changes in sign at a not very advanced stage in the drawing, grows more positive, reaches a maximum, and then falls towards zero again at extreme drawing. The magnetic intensity rises steadily with drawing, and shows no tendency to diminish even at the final stage of drawing; it is then about 200 per cent. greater than at the first drawing. As regards the influence of magnetic intensity on the magnitude of α, it was found that the temperature coefficient in general follows the susceptibility and becomes least at the highest intensity, but always incremental; on demagnetising, it increases slightly, and then falls towards zero, which occurs at some very low residual intensity.

II.—The series of wires representing the 12 stages in the manufacture of drawn wire were subjected to examination for resistivity and its temperature coefficient, for Young's modulus and its temperature coefficient, and for density. Resistivity is augmented by tempering, but diminished by drawing up to a certain stage; extreme traction, however, causes a rapid increase again of resistivity. In general high resistivity and low temperature coefficient are associated; drawing, however, does not produce a very large change in the temperature coefficient of resistivity.

Young's modulus increases markedly with tempering and to a less extent with drawing, up to the point where the resistivity is a minimum; after that, extreme drawing produces a sharp diminution of the modulus. The temperature coefficient, like the resistivity coefficient, follows in an inverse sense the modulus curve, so that when the modulus is large the coefficient is small. After heating and cooling the wire, the value of Young's modulus did not return to its initial value, but was always a little greater, this effect persisting for some time. Apart from some initial irregularities, the density of the wire is very decidedly increased by drawing to the very last stage. There is a very close correspondence between density and magnetic intensity, the two being nearly proportional to one another over a considerable range. There is also some evidence of agreement between a smoothed curve of Young's modulus and the magnetic intensity; both appear to be functions of the density.—A. S.

Steel Ingots; Influence of Chemical Composition on the Soundness of ——. A. Wahlberg. Iron and Steel Inst. May, 1902.

Up to the present the percentage of carbon and the casting temperature have been considered as the principal, if not

the only, agents responsible for the presence and position of blow-holes. The author's experiments lead him to the conclusion that these factors exercise only a secondary, though by no means unimportant influence, the principal prevailing cause being the absolute no less than the relative percentage of silicon and manganese, and in some cases of aluminium, contained in the ingot metal at the moment of casting.—A. S.

Iron and Steel; A Remarkable [Carbamine] Reaction of ——. V. v. Cordier.

[*See under* XXIII., *page* 792.

Nickel in Nickeliferous Pyrrhotite from Sudbury; Note on the Condition of ——. C. W. Dixon. Eng. and Mining J., 1902, 73, [19], 660.

By repeated crushing of some Sudbury ores and separation of the non-magnetic material, the nickel was reduced from between 3 and 4 per cent. to between 0·68 and 1·20 per cent. This indicates that at least a very large proportion of the nickel is present, not as a component part of the pyrrhotite, as was supposed, but as a separate mineral. Analyses of the non-magnetic material were made, and from the results there appears to be no doubt that the mineral is essentially pentlandite [(Ni Fe) S], and that the nickel occurs in this form in all the deposits of the Sudbury districts.—A. S.

Zinc-bearing and Silicious Materials: Process for Treating ——. A. Dorsemagen. Ger. Pat. 132,531, Dec. 25, 1902. Through Zeits. für. Elektrochem, 1902, 8, [20], 301.

The material to be treated is mixed with carbon, and heated in an electric furnace, whereby zinc is reduced and distilled off, and the gangue stuff, reacting with carbon, forms silicon carbide.—W. G. M.

English Patents.

Furnaces; Smelting ——. G. Mitchell, Naco, Arizona, U.S.A. Eng. Pat. 1682, Jan. 21, 1902.

The furnace is constructed to utilise the heat of escaping gases and products of combustion, especially in the smelting of copper ores, and to supply heated air through a series of pipes in such manner as to maintain the furnace walls above the feed opening at such a temperature as may render fire-brick lining unnecessary. A rectangular metal chamber is mounted on the feed floor, provided with a number of horizontal metal plates to form a series of partitions enclosing air spaces, constituting a zig-zag or serpentine way for the air blast entering from a tuyère near the top of the section. A series of pipes around the interior walls of the crucible are connected at their upper ends to the lower air chamber, and at their lower ends to the tuyères entering near the base of the crucible and directing air therein. A series of vertical flues pass through the metal plates and air chambers, and a partition or crown sheet below, over the crucible, and open above into a large hopper-shaped chamber. In smelting sulphide ores, the gases and products of combustion, carried forwardly through these flues, heat them and the air chambers through which they pass, whereby the blast of air from the upper tuyère traversing these serpentine chambers is progressively heated until it enters the furnace through the lower tuyères already mentioned.—E. S.

Furnaces; Smelting ——. H. E. Auman, Reading, Pennsylvania, U.S.A. Eng. Pat. 2865, Feb. 4, 1902.

A crucible, bulging in its central portion, rests on a brick base in a metal casing with inwardly projecting openly spaced firebricks closely surrounding it at the base and top, and a combustion chamber is formed between the lined wall of the casing and one side of the support, in which chamber a hydrocarbon burner passes, through which the liquid fuel is sprayed against the vertical wall of the support. The hot blast arising from the combustion chamber passes completely around the crucible, the upper part of which is firmly held by perforated firebrick supports, admitting permeation of the hot gases. The casing has a firebrick hinged cover, with an aperture for admission of material. The furnace is pivotally mounted to admit of discharge, on tilting, of the contained molten metal, over a lip in front of which is a gutter in the upper face of an inwardly projecting firebrick, allowing flow of the metal. The furnace is particularly intended for melting brass and other metals.—E. S.

Ore and like Concentrators. E. A. Sperry, Denver, U.S.A. Eng. Pat. 11,435, June 4, 1901.

"The machine consists essentially of a concentrator table, and a frame carrying the table, to which a combined rotary and eccentric or vanning motion is imparted, the said frame comprising an upper member and a lower member, connected by links, and held apart by interposed springs mounted upon a vertical shaft, whose upper part, upon which the upper member of the frame revolves, is eccentric to the lower portion of the shaft on which the lower member of the frame revolves, the shaft and frame being independently driven."—E. S.

Metals; Improved Process for the Extraction of ——, *from their Ores.* H. H. Lake, London. From A. Scheidel, Sydney, New South Wales. Eng. Pat. 16,359, Aug. 14, 1901.

Process for lixiviating ores.—E. S.

Copper and other Metals with Depolarised Insoluble Anode; A Process of Electrometallurgic Treatment of Ores of ——. C. J. Tossizza, Paris. Eng. Pat. 14,751, July 19, 1901.

A depolariser is introduced into the neighbourhood of the (insoluble) anode. This depolariser may advantageously be sulphur dioxide, derived from the roasting of the sulphide ore under treatment. The added energy introduced by the oxidation of the SO_2 at the anode reduces the E.M.F. required for the electrolysis from (say) 1·2 to 0·3 or 0·4.—W. G. M.

Heavy Metals or Alloys for Lithographic Printing Purposes; Process of Preparing Plates of ——. O. C. Strecker, Darmstadt, Germany. Eng. Pat. 2231, Jan. 28, 1902.

The claim is for the process of preparing plates of heavy metals or alloys for lithographic printing purposes by submitting well-ground plates to the action of a solution which is composed of a salt or salts, the acids of which form insoluble compounds with the metal plate to which it is applied; also an oxidising agent, such as ammonium nitrate, and an acid substance ["gum arabic for instance"] which does not decompose the salts of the solution or set an acid free; by the combined action of which agents or chemicals an insoluble and hygroscopic layer is formed which adheres firmly to the plate.—E. S.

United States Patents.

Ores; Art of Treating ——. A. M. Dorr and J. Spang, Boston, Mass. Assignors to Chemical and Electrical Ore Reducing Co., West Virginia. U.S. Pat. 699,456, May 6, 1902.

The ore, mixed with a little charcoal, is charged through a valved hopper into a suitable reduction chamber, in which a layer of coke has been previously placed, resting on its grated bottom. In the walls of this chamber flues are constructed and partially filled with charcoal. Below the grate of the reducing chamber is a matte chamber in which also charcoal is placed, and this has flues connected with a draught fan and chimney.

By igniting the charcoal in the charcoal chambers or flues, and maintaining a down-draft through all the chambers, the ores in the reducing chamber are at first heated to

a moderate, and afterwards to a high or smelting temperature, when they are discharged into the matte chamber. Here the matte is still more intensely heated by the aid of jets of gas rich in oxygen, by which the molten metal is finally brought to and maintained in violent ebullition, and thus purified and concentrated.—J. H. C.

Metals, &c.: Furnace for Heating or Smelting ——. H. H. Hewitt, Buffalo, New York. U.S. Pat. 698,495, April 29, 1902.

The furnace is preferably circular, constructed of boiler plate, and furnished with a refractory lining. Side holes are provided for the insertion of burners for oil, gas, or like fuel, also openings for charging, and for the withdrawal of molten products. A roof or cover is provided which may be conveniently raised or lowered within the lining so as to vary the capacity of the combustion chamber, or, if desired, completely clear of the furnace, so that it may be charged from the top. An opening in this cover supplies an exit for the products of combustion.—J. H. C.

Metals from Ore or the like; Extraction of ——. B. Hunt, San Francisco, Cal. U.S. Pat. 699,108, April 29, 1902.

The ores or tailings are leached with a solution containing a cyanide and free ammonia, the metals being subsequently recovered by precipitation.—J. H. C.

Spelter; Process of Making ——. O. Nagel, New York, U.S. Pat. 699,969, May 13, 1902.

Zinc oxide, whether native or obtained by roasting sulphide ores or otherwise, is heated with one-seventh part of coal in a blast-furnace, and is there subjected to the action of water-gas injected at a temperature of about 1000° C. The zinc vapours are condensed in an atmosphere of water-gas. The object of the coal in the charge is to effect the decomposition of any compounds which would cause re-oxidation of the vapour of zinc. In water-gas the condensation in dust-form which occurs in the neutral atmosphere is avoided.
—W. G. M.

Metals; Process of Preventing Oxidation of Molten ——. J. H. Walker, Milwaukee, Assignor of one-half to E. H. Bottum, of Milwaukee, Wisconin. U.S. Pat. 698,769, April 29, 1902.

Non-oxidising gases, produced by the complete combustion of the fuel employed to melt the metal, are directed, by means of flues constructed within the furnace, horizontally over the surface of the metal while molten, so preventing access of air.—J. H. C.

Aluminium Alloy. E. Murmann, Vienna. U.S. Pat. 699,216, May 6, 1902.

The alloy consists of 100 parts of aluminium, 3 to 16 parts of copper, and 12 to 2 parts of zinc—the amount of zinc being twice that of the copper. It is prepared by adding brass of the required composition and in the required quantity to the aluminium. Greater density is obtained by cooling the alloy rapidly, and also by adding predetermined quantities of calcium, barium and strontium to the alloy.—J. H. C.

Alloys (Aluminium, &c.); Process of Reducing Metals and Producing ——. H. S. Blackmore, New York. U.S. Pat. 699,282, May 6, 1902.

Metallic oxyhaloids or oxyfluorides in suitable mixtures are exposed to the combined action of heat and a metallic carbide.—J. H. C.

Copper; Extraction by the Wet Method ——. T. A. Irvine, Hornsey, England, Assignor to D. McVean, Chiswick, England. U.S. Pat. 699,326, May 6, 1902.

The ore is crushed and when necessary, roasted; it is then agitated with a solution of chloride of sodium and sulphuric acid in the proportion of four ounces of the former to one fluid ounce of the latter per gallon. Peroxide of manganese is added in some instances.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electrolysis with Soluble Anodes; Formation of Precipitates Soluble with difficulty by ——. M. Le Blanc and E. Bindschedler. Zeits. für Elektrochem., 1902, 8, [18] 255—261.

In 1894, Luckow patented in Germany, and in 1895 in England (Eng. Pat. 14,801 of 1895; this Journal, 1895 975), an electrolytic process for the production of lead chromate or white lead. The authors have now experimentally examined this process for lead chromate production. They used an accumulator cell with two lead cathodes and one lead anode, and a current of 2 amp., giving a current density of 0·0059 amp. per sq. cm. Starting with a 1½ per cent. solution of a mixture of 80 per cent. $NaClO_3$ and 20 per cent. K_2CrO_4, the current passing with a pressure of 2·1 volts, a fine covering of $PbCrO_4$ was formed on the anode, but without adhering to it, and this covering constantly fell, in a continuous stream to the bottom of the vessel, whilst hydrogen was evolved at the cathode, and no reduction of chromate was there observable. The p.d. remained constant at 2·1—2·2 volts, and after two hours the yield of lead chromate was found to be from 98·5 to 99 per cent. of the theoretical. The anode on removal was readily cleansed by swilling, no chromate adhering to it. The colour of the precipitate was at first that of sulphur but in time, after long contact with the electrolyte, it tended to become a dirty orange yellow. In the electrolysis of 1½ per cent. solution of potassium chromate alone under similar conditions, the p.d. being 4 volts, no trace of lead chromate was formed, but the anode became covered with peroxide and oxygen was evolved.

Experiments were tried with 1½ per cent. solutions of the same ingredients in different proportions as follows: with 70 per cent. of $NaClO_3$ and 30 of K_2CrO_4, the p.d. at first was 2·1 volts, rapidly rising to 6·6 volts, as an adhesive film of chromate formed on the anode, and falling again whenever the film was detached; the current efficiency was 96 per cent. With 65 of $NaClO_3$ and 35 of K_2CrO_4, the p.d. rose from 2·1 to 4·8 volts in seven minutes, some PbO_2 was precipitated, and the current efficiency was only 46 per cent. With 60 of $NaClO_3$ and 40 of K_2CrO_4 the efficiency was only 20 per cent., and with the salts in equal proportions it was almost *nil*.

Next, using the proportion 80 of $NaClO_3$: 20 of K_2CrO_4 experiments were made with 3 per cent., 6 per cent., and 18 per cent. (saturated as to $KClO_3$) solutions, and also with 6 per cent. and 12 per cent. solutions, using the salts in the proportion of 90 : 10. The results showed that high efficiency and fineness of product are not inseparable from a low degree of concentration in the electrolyte; but with higher aggregate concentrations, the proportions of the added salts must be varied, so that the absolute concentration of the chromate increases but little. In the experiments the p.d. required and the appearance of the anode, afford reliable indications of the success of the operation.

Electrolysis of a 1·5 per cent. $NaClO_3$ solution alone led to the production of basic lead chlorate at the anode, precisely the same way as the chromate was deposited in the earlier experiments; but some spongy lead was also deposited at the cathode. 1·5 per cent. $NaNO_3$ and $NaC_2H_3O_2$ solutions gave similar results; whilst a 1·5 per cent. NaCl solution gave first a white deposit on the anode, and then peroxide.

Experiments were next tried with sodium nitrate, acetate, and butyrate successively, in place of chlorate, mixed with potassium chromate. The main results are given in the following table, the amount of added salt being given in terms of $NaClO_3$. In each case a 1·5 solution was used.

The nitrate mixture appears to give the best and the butyrate the worst result, whilst the acetate is probably preferable to the chlorate, both being intermediate between the former two extremes.

Nature of Addition.	Percentage of $NaClO_3$ equivalent to added Salt used.	Percentage of K_2CrO_4 in Mixture.	p.d. at First.	p.d. subsequently.	Current Efficiency.
					Per Cent.
$NaNO_3$ ...	80	20	2·2	2·2	99
„ ...	70	30	2·0	4·7	96
„ ...	65	35	?	1·9	94
„ ...	60	40	?	5·4	55
$NaC_2H_3O_2$	80	20	2·1	2·2	96
„	70	30	2·5	2·7	100
„	65	35	?	4·7	79
$NaC_4H_7O_2$	80	20	2·5	2·5	96
„	70	30	?	4·7	58

A 0·06 per cent. K_2CrO_4 solution, gave a 10 per cent. efficiency with the same current density; the p.d., however, rapidly rose to 15 volts, and after a quarter of an hour much oxygen was evolved. A 0·02 per cent. solution gave good results for 20 minutes, and then failed as before. By reducing the current density to 0·00059 amp. per sq. c.m., the 0·06 per cent. solution gave, however, an efficiency of 83 per cent., whilst with the 0·02 per cent. solution the efficiency was *nil*; so that the effect of altering the current density depends upon the degree of concentration. An alteration in the current density in the earlier experiments with added salts had a marked effect on the efficiency for better or for worse, as the case may be.—W. G. M.

Cathodes; Disintegration and Conversion into Dust of ——, owing to the Formation of Alloys of the Cathode Material with Alkali Metals. F. Haber and M. Sack. Zeits. für Elektrochem., 1902, 8, [18], 245—255.

This disintegration has already been described by Bredig and Haber (this Journal, 1899, 50—51). The explanation, then offered, that the phenomenon was due to the formation of alkali-metal alloys with the cathode-metal, which alloys were then attacked and disintegrated by the action of water, is now confirmed by an examination of the polarisation phenomena with lead and tin cathodes in alkaline electrolytes, and by measurements of the p.d. between sodium alloys and the solutions in which they are immersed. Since alloys rich in sodium are vigorously attacked by solutions at ordinary temperatures, the measurements were made under refrigeration, generally with the aid of a paste of ether and carbon dioxide. The electrolyte used was a solution of lithium chloride in methylic alcohol; concentrated potassium or sodium hydroxide solution being found to be unsuitable at these low temperatures.

Lead-Sodium.—Using a lead point as a cathode, it was found that the potential difference at which the appearance of the clouds of disintegrated cathode material appeared was only a few tenths of one volt below that at which sodium would be deposited. After exposure for some time however, to an E.M.F. sufficient to evolve hydrogen (1·7 volt on a Pb cathode opposed to a Hg anode below Hg_2O in KOH solution), a dulling of the cathode surface is observed, this being caused by superficial formation of lead-sodium alloys which are afterwards attacked by the aqueous solution. A series of lead-sodium alloys was made by melting the metals together in an iron crucible under the oil; fragments of these alloys were then broken off, and measurements were taken of the p.d. when they were opposed to Hg/HgO in LiCl at the temperature of a paste of solid carbon dioxide and ether. The alloy with 4·5 per cent. of Na was hard and with difficulty broken up; it slowly evolved hydrogen when placed in water, and showed 0·6 volt or nearly the same p.d. as lead, when opposed to Hg as above explained. The alloy with 8 per cent. of Na when immersed in water shows an immediate formation of a cloud of disintegrated matter, giving place to a gradual evolution of hydrogen. The p.d., when opposed to the Hg electrode, was about 1·7 volts. Alloys containing more Na are increasingly readily attacked by water until an alloy is reached forming blue or olive-green needles, which is at once entirely disintegrated on immersion. As the proportion of Na is increased to 30 per cent. the p.d. rises to 2 volts. The alloys containing between 4·5 and 8 per cent. of Na vary much as to their p.d. when opposed to the Hg electrode; they are however not homogeneous, but are made up of constituents differing as to their chemical properties.

Tin-Sodium.—The behaviour of tin is analogous to that of lead. The alloys with 8·6 per cent. of Na show the disintegration at the moment of plunging into water, and rapid evolution of hydrogen which are not shown by those alloys containing less than 6·2 per cent. of Na. It is noted that the point 6·1 per cent. of Na corresponds to the formula Sn_3Na. These experiments confirm the view that the evolution of hydrogen at the cathode during electrolysis is here due not to direct electrolysis of water, but to the formation of sodium alloys which are then attacked by water.

Platinum-Sodium.—A platinum plate was kept for some minutes in melted sodium at a red heat. On cooling, and immersing it in alcohol, after the sodium had been removed by the resulting reaction, several decigrms. of platinum powder were found to have separated and the plate was greyish black in appearance. This is a repetition, in an intensified degree of the phenomenon observed when Pt cathodes are exposed to a high current density.

Sodium-Amalgams.—Amalgams with less than 2 per cent. of Na show almost the same p.d. as pure Hg when opposed to a standard electrode, but with above 2·3 per cent. of Na the p.d. is much higher and nearly constant. The p.d., however, varies with the physical condition of the amalgams. Various well-defined amalgams (Hg_2Na, Hg_5Na, and Hg_6Na) have been described. The amalgam Hg_5Na contains 2·25 per cent. of Na, and many experiments are described to show that the more dilute amalgams contain the sodium always either as Hg_6Na or Hg_5Na or as a mixture of the two.

—W. G. M.

Salts; Electrolysis of Fused ——. R. Lorenz. Electro-Chemist, 1901, 1, 267.

Garrard (see this Journal, 1899, 1027) found two "kink" points in the decomposition voltage curves of fused $PbCl_2$; he considered that the first point which occurs at 0·8 volt (temperature 600° C.) corresponds with the equation (1) $PbCl_2 = \overset{++}{Pb} + \overset{-}{Cl} + \overset{-}{Cl}$, and the second (at 1·2 volts) with the equation (2) $PbCl_2 = \overset{+}{PbCl} + \overset{-}{Cl}$. The author, however, is of the opinion that the second point corresponds with equation (1), whilst the first point is caused by depolarisation phenomena, and he gives experimental results supporting this view. He deduces the empirical formula $\epsilon/\epsilon_0 = \alpha$, where α is the current yield and ϵ_0 and ϵ the counter electro-motive forces, and he shows that the principle that ϵ (the counter electro-motive force in the electrolytic bath) is proportional to α is applicable to the commercial electrolytic production of potassium, sodium, and magnesium, and to the Héroult cell for the production of aluminium. This principle also affords an explanation of the increased yield obtained by cooling the cathode, and by adding certain substances; in both cases the solubility of the metal and its tendency to diffuse in the form of "fog" (see this Journal, 1900, 670) are diminished, the polarisation is reduced and the current yield consequently increased. The author states that the various suboxides and subchlorides which are said to form at the cathode, are, in reality, simply solutions of the metals, in the form of "fog," in the electrolyte.—A. S.

English Patents.

Accumulators or Secondary Batteries. R. Fortun and E. Semprun, Madrid. Eng. Pat. 8280, April 22, 1901.

The electric accumulator comprises a series of positive elements, consisting of perforated aluminium plates provided with a filling of carbon with an unstable mixture of different lead oxides; and a series of negative elements, each consisting of an aluminium casing in two parts,

provided with aluminium net or open-work sides, coated with a silicate, and a perforated aluminium plate between the two halves forming the casing, and a charge of "active material" consisting of a mixture of spongy lead and a hydrated lead suboxide (obtained electrolytically) within the casing. The insulating diaphragms are of parchmented perforated cardboard. The electrolyte covering the plates of the accumulator is prepared of a stated strength from neutral lead nitrate and nitric acid.

To obtain the lead oxide required for the positive element of the accumulator, described as having the constitution $PbO_2PbO + 4(Pb_3PbO) + 3PbO$, a saturated solution of plumbic oxide in potash lye, with stated proportions of sugar and of neutral potassium tartrate is electrolysed in a porcelain trough having at the bottom a lead plate and suspended near it a large lead perforated pipe, as electrodes, a current not exceeding 0·6 ampère per square decimetre being used. The deposit formed is dried and mixed with about one-fourth of its weight of finely-divided carbon for application as described. The "silicate" used in coating the aluminium net-work of the negative element, is obtained by mixing a previously heated mixture of litharge and linseed oil, with kaolin, ground glass, and potassium silicate, all in stated proportions.—E. S.

Electrolytic Cells or Apparatus. G. W. Bell, Liverpool. Eng. Pat. 10,655, May 23, 1901.

The anode cells are partitioned off from the cathode cells in such a way that the mercury which covers the bottom of each may be transferred from one to the other alternately at predetermined intervals. For instance, in soda-production, the cell in which the mercury is made the cathode, and therefore receives a charge of sodium, has the floor somewhat higher than that of the other vessels, and in the form of a shallow tray with a passage (outside and below the tray) communicating with the other cells beneath the partition separating them. These oxidising cells are closed air-tight, with an escape-pipe for the hydrogen generated, controlled by a gas-cock. The pressure developed during the process by the hydrogen evolved, forces the mercury from the oxidising chambers into the cathode cell, where it absorbs sodium, and then, automatically, the hydrogen valve is released, and the bulk of the amalgam flows back into the outer cells, leaving only a thin layer on the tray in the cathode cell. An electro-magnetic valve-controlling device is described, in which the pressure of hydrogen in one limb of a U-shaped vessel forces mercury upwards in the other limb until it makes contact with a wire and completes an electric circuit, and so brings an electro-magnet into action, which opens the hydrogen valve. The valve and its connections are fully described. Other means are claimed for obtaining within the cells the pressure necessary for the transfer of the mercury and amalgam.
—W. G. M.

Water; Apparatus for Electrolysis of ——. P. Garuti and R. Pompili, Tivoli, Rome. Eng. Pat. 2820, Feb. 4, 1902.

In the Garuti apparatus for the electrolysis of water (see this Journal, 1893, 768; 1897, 337; and 1900, 1121), the diaphragm between the anode and cathode compartments is so modified that the row of perforations for the passage of the ions between the electrodes is extended upwards as far as is consistent with the complete separation of the electrolytic gases in the upper part of the cell. To guard against such a mixture the perforated area is covered on both faces with thick metallic webs or perforated sheets, or an opening or window, similarly covered, is substituted for the perforated part of the diaphragm.—W. G. M.

United States Patents.

Salts; Methods of Treating Solutions of ——. [*Caustic Soda and Chlorine from Sodium Chloride.*] C. J. Reed, Philadelphia. U.S.Pat. 699,414, May 6, 1902.

The process is carried out by subjecting the latter to the action of an electric current by means of mercury cathodes and anodes of electro-negative material in a number of reducing cells in series, subjecting the resulting amalgam to electrolytic action, in a lesser number of oxidising cells in series, and transferring the resulting amalgam to the next in series.—G. H. R.

Electrolytic Apparatus (Caustic Soda and Chlorine). C. J. Reed, Philadelphia. U.S. Pat. 699,415, May 6, 1902.

The apparatus comprises a receptacle or compartment having a number of open pockets containing mercury, above which is a liquid electrolyte into which project a plurality of stationary electrodes of electro-negative material, alternating with a number of metal discs provided with side grooves extending from their peripheries towards their centres, and mounted on a shaft which is rotated to move the edges of the discs into and through the mercury. There are 18 claims which cover a modification suitable for employment in producing sodium hydrate and chloriae from aqueous solutions of sodium chloride.—G. H. R.

Storage Battery Plates; Process of Forming ——. R. N. Chamberlain, Depew. U.S. Pat. 699,492, May 6, 1902.

The preliminary process of pickling the plates is described in U.S. Pat. 707,592, 1899, and they are afterwards formed by oxidising a plate as anode in an electrolytic bath, and then shifting it into the position of cathode, a new plate being introduced as anode and oxidised in conjunction with the previously oxidised one as cathode, whereby it is asserted, that the reduction of oxide on the first plate serves to diminish the amount of energy required to oxidise the second. The electrolyte is composed of nitric and sulphuric acids, and it is claimed that a continuous electrolytic action takes place without reversing the current.
—G. H. R.

Battery; Reversible Galvanic ——. T. A. Edison, Llewellyn Park, N.J., U.S.A. U.S. Pat. 700,135, May 13, 1902.

The use of iron scale in the production of a reduced iron to be employed in an alkaline electrolyte is claimed (see Eng. Pat. 10,505 of 1901; this Journal, 1901, 1002).
—W. G. M.

Battery; Reversible Galvanic ——. T. A. Edison, Llewellyn Park, N.J., U.S.A. U.S. Pat. 700,137, May 13, 1902.

This patent refers principally to the manufacture of grids to carry the active material in alkaline electrolytes. (Compare Eng. Pat. 2490, of 1901; this Journal, 1901, 589).
—W. G. M.

Electrolysis; Apparatus for Fused-Bath ——. C. W. Koepper and G. P. Scholl, both of Philadelphia. U.S. Pat. 699,851, May 13, 1902.

A flat-bottomed receptacle for the fused electrolyte is provided with a longitudinal partition projecting up to the top, but not reaching to the bottom of the vessel. This receptacle is so set that one of the longitudinal halves lies between a grate and chimney, and so forms the hearth of a reverberatory furnace, whilst the other half, which is not exposed to direct heating, is provided with an electrolytic box, with positive and negative electrodes to effect the required decomposition. The electrolytic boxes are made without bottoms, and may have hollow sides through which a fluid is circulated in order that a layer of solidified electrolyte may protect their surfaces from any corrosive action by the bath. Special means are described for the collection of the electrolytic gases, and for such metallic deposits as would be fluid at the temperature of the bath. A pre-heating chamber from which the melted electrolyte can flow downwards to the hearth, is also described. Other arrangements for carrying out the device of exposing a portion only of the bath to direct heating influences, are also set forth.—W. G. M.

Salts, suitable for the subsequent Production of Chlorine, Electrolytic Apparatus for Manufacturing certain ——. G. J. Atkins, London, England. U.S. Pat. 699,907, May 13, 1902.

A MIXTURE of sodium chlorate, "oxychloride" and chloride for the subsequent production of chlorine, is prepared by electrolysis in a long trough-like vessel, lined with a suitable anode, within which is rotated a cylinder covered with sheet-lead as cathode. A flexible scraper above the level of the liquid removes the electrolyte, and detaches any bubbles of gas adhering to the cathode. The E.M.F. of the current supplied should not exceed 4 volts. Inlet and exit pipes are provided for the electrolyte.—W. G. M.

(B.)—ELECTRO-METALLURGY.

Cyanide; Electromotive Force of Metals in Solutions of ——. S. B. Christy. Amer. Chem. J., 1902, **27**, [5], 354—420.

A CAREFUL series of experiments has now been made with different metals at different degrees of concentration of cyanide in the solution. The most probable values representing the E.M.F. of certain metals immersed in the solutions indicated are as follows :—

Concentration of KCN.	Zn.	Cu.	Au.	Ag.	Pb.	Hg.	Fe.
	Per Cent.						
M = 10^{0} = ...	6·5	+ 0·945	+ 0·930	+ 0·420	+ 0·340	+ 0·200	+ 0·150	− 0·030
M = 10^{-1} = ...	0·65	+ 0·870	+ 0·680	+ 0·265	+ 0·195	+ 0·160	+ 0·050	− 0·090
M = 10^{-2} = ...	0·065	+ 0·775	+ 0·430	+ 0·090	+ 0·055	+ 0·110	+ 0·040	− 0·120
M = 10^{-3} = ...	0·0065	+ 0·415	− 0·050	− 0·340	− 0·310	+ 0·070	− 0·190	− 0·130
M = 10^{-4} = ...	0·00065	+ 0·385	− 0·250	− 0·450	− 0·420	+ 0·050	− 0·590	− 0·140
M = 10^{-5} = ...	0·000065	+ 0·355	− 0·270	− 0·565	− 0·470	+ 0·040	− 0·600	− 0·150
M = 10^{-6} = ...	0·0000065	+ 0·330	− 0·280	− 0·620	− 0·495	+ 0·040	− 0·635	− 0·160
Distilled water	0·0	+ 0·280	− 0·320	− 0·720	− 0·570	+ 0·040	− 0·640	− 0·200

Curves plotted from these (taking the logarithm of the molecular concentration expressed in the powers of 10, and the E.M.F. in volts as co-ordinates) show in most cases critical points at concentrations of 0·065 or of 0·0065 per cent., which may be explained by assuming the dissociation of the complex ion containing the metal in question to be complete below this point. It will be noted that the sequence of the metals varies at different concentrations. The solubility of gold in cyanide is readily explained by the ionic theory. Gold cannot at any concentration displace, without external aid, positive ions such as K or H ; but by applying an external E.M.F., the gold may be converted into ions and so dissolved. Thus gold merely immersed in pure air-free cyanide does not dissolve. But when air is introduced, the oxygen contained in it tends to assume the ionic state, combining with water to form negatively electrified hydroxyl ions ; and the introduction of these ions affords the necessary added E.M.F. to cause the gold to dissolve electrolytically.

The author concludes from his experiments that the modern theory of electrolysis explains, and stands alone in explaining, the peculiarities of cyanide solutions as compared with other solutions, and that it satisfactorily accounts for the reactions occurring when gold, silver, and other metals are dissolved in and precipitated from cyanide solutions.

He also considers that the determination of the E.M.F. of the metals in cyanide solutions, under different conditions, offers a means of research that is likely to be of great practical utility in determining the direction and intensity of chemical reactions under fixed conditions, or in following them under changing conditions, just as they occur. The differences of E.M.F.'s of metals in dilute cyanide solutions do not give much support to the so-called "selective affinity of dilute cyanide solutions for Au," copper being the only common metal showing any indication of such favourable action. Further, it is probable that in the absence of external E.M.F.'s, an aërated cyanide solution less than M/10,000 (or 0·00065 per cent. of KCN), and for all practical purposes such a solution with less than 0·01 per cent. is without action on metallic gold.

—W. G. M.

ENGLISH PATENT.

Metals; Electrolytic Separation of ——. W. P. Thompson, Liverpool. From T. Ulke, Sault Ste. Marie. Eng. Pat. 6310, March 14, 1902.

USING anodes preferably containing not more than 20 per cent. of Ni and not less than 80 per cent. of Cu, and an acid solution of this material as electrolyte, a portion of the resulting solution is withdrawn from time to time as it becomes richer in Ni and poorer in Cu ; and the salts of these two metals contained in the fraction removed are separated ; the nickel is then deposited from a non-acid solution and an insoluble anode. A portion of this solution as it becomes impoverished is withdrawn and concentrated ; the copper and nickel salts from the withdrawn solutions are returned to the baths periodically. The process may thus be a continuous one. The nickel bath is preferably heated, and ammoniacal. Contrary to expectation it is found that lead is the best anode-material for the nickel process ; the cathode may be of any suitable metal, but is preferably nickel-surfaced.—W. G. M.

UNITED STATES PATENTS.

Tin by Electrolysis; Process of obtaining ——. E. Quintaine, Argenteuil, France. U.S. Pat. 699,012, April 29, 1902.

TIN is separated electrolytically from tin scrap by suspending the latter as the anode in a bath composed of an aqueous solution of nitrate of tin to which have been added chloride of ammonium and chloride of tin. A suitable cathode is suspended in the bath, and an electric current passed through.—G. H. R.

Liquids; Apparatus for Aerating or Agitating ——. H. E. Dolphin, Liverpool. U.S. Pat. 699,291, May 6, 1902.

IT is found of great importance during the electrolytic deposition of metals that the liquid in the vat or cell should be constantly agitated. The apparatus consists of a storage tank for the liquid with a main supply pipe leading from it connected to a series of vats by a depending feed pipe to each vat, which delivers the liquid under pressure through an injecting nozzle into the bottom of each cell. A branch pipe leads from the adjacent cell to the feed pipe at a point near the nozzle, in such a way that the liquid issuing from the nozzles at high velocity is asserted to set up an induced current of liquid through the branch pipe with which the jet issuing through the nozzle mingles and is delivered into the cell, causing a very efficient and constant agitation therein. A casing surrounds the nozzle of the feed pipe, with an orifice contiguous to it to cause an induced current of air, and a duct for each cell communicates with a main pipe for discharging the liquids in it.—G. H. R.

Spongy Lead Plates for Storage Batteries ; Method of Cleaning ——. R. N. Chamberlain, Depew, Erie, U.S.A. U.S. Pat. 699,493, May 6, 1902.

THE spongy lead plate formed according to U.S. Pat. 707,592, 1899, is cleansed from the active dissolving agent of an electro-chemical forming-bath, by exposing it as a cathode in an electrolytic bath containing a solution relatively free from such active agent, while another plate is simultaneously oxidised by exposing it as anode in the same bath.—G. H. R.

Converter; Electrolytic ——. F. H. Long, Chicago. U.S. Pat. 699,964, May 13, 1902.

A WOOD-LINED tank has a perforated dish-shaped division near the bottom, and, at some distance above this, a conical partition with apertures at the periphery for the passage of fluid. The anodes, consisting of large carbon blocks, are supported by copper rods passing through the conical partition, and through insulating sleeves in the top of the tank to the connectors outside. The anodes are in the space beneath the perforated partition, which, in use, is covered with layers of bibulous paper and canvas. A pipe is provided to withdraw accumulations of gas from beneath the diaphragm, as these accumulations are found to increase the electrical resistance of the apparatus. Means are provided for the constant circulation of the electrolyte with the aid of a pump placed outside the apparatus.

—W. G. M.

XII.—FATS, OILS, & SOAPS.

Neat's Foot, Tallow, and Horse Oils; Analytical Values of ——. A. H. Gill and A. W. Rowe. J. Amer. Chem. Soc., 1902, **24**, [5], 466—467.

THE following results were obtained by the authors in the examination of samples of these oils:—

Oil.	No. of Samples.	Specific Gravity at 15° C.	Specific Gravity at 100° C.	Valenta Test.	Maumené Test.	Specific Temperature Reaction.	Iodine Value.	Iodine Value of Clear Oil.	"Titre" Test.	Iodine Value of Fatty Acids.
				°C	°C.				°C.	
Neat's foot.	5	0·914—0·919	..	51·0—75·5	42·2—49·5	87·9—103·1	67·1—72·9	..	16—26·5	63·6—69·5
Tallow oil..	3	..	0·794	71·0—75·7	35·0	72·9	55·8—56·7	..	35—37·5	54·6—57
Horse oil ..	3	0·916—0·922	..	54·0—80·2	46·0—54·7	95·8—114	75·1—86·3	82·0—83·7	25·0—33·5	72·9—78·7
" ..	2	..	0·798—0·799	48·0—61·0	53·5—54·2	111·5—112·9	78·8—79·9	78·2—81·8	30—35	80·4—82·1

In the Valenta test an equal quantity of 100 per cent. glacial acetic acid was used, and in the Maumené test sulphuric acid of 100 per cent. strength. The iodine value was determined with Hübl's solution which had been mixed for 24 hours, and four hours' absorption was allowed. The "titre" test was carried out in the manner prescribed by Lewkowitsch.—C. A. M.

Oils, Lubricating; Test for the "Gumming" Quality of ——. A. H. Gill. J. Amer. Chem. Soc., 1902, **24**, [5], 467—468.

THE author, having found that the amount of "tar" deposited by mineral oils when subjected to the claidin test afforded an indication of their "gumming" qualities in practical use, has made experiments to determine the relationship between the amount of change in this test and the proportion of oxygen absorbed by the oils.

The method of applying this "gumming" test was to mix 5 grms. of the oil with 11 grms. of Roth's liquid (nitro-sulphuric acid), the glass vessel being cooled by immersion in water at 10°—15° C. In the case of bad oils it was found that masses becoming red within two hours were formed around the edges.

The reagent was prepared by adding a few drops of nitric acid to sulphuric acid of 46° B., cooling the liquid to 0° C., and saturating it with nitric oxide.—C. A. M.

Oils, Oxidised; Analytical Values of ——. J. Lewkowitsch. Analyst, 1902, **27**, [314], 139—146.

THE following results were obtained by the author in the analysis of various blown oils, and of solidified linseed oil:—

Blown Oils.

Oil.	I. Acid Value.	II. Sap. Value.	III. II.—I.	IV. Iodine Value.	V. Total Soluble Acids.	VI. Specific Gravity.	VII. Unsap. Matter.	VIII. Oxidised Acids.
	Mgrms. KOH.	Mgrms. KOH.			Mgrms. KOH.		Per cent.	Per cent.
Ravison rape	10·47	198·31	187·84	72·66	35·89	0·9685	1·23	21·22
East India rape.....	13·25	215·57	202·32	61·92	56·26	0·9623	0·93	20·74
Cotton seed.....	9·11	224·59	215·18	65·74	46·49	0·9785	1·37	29·39
Solid linseed oil.....	?	287·47	..	52·2	136·9	..	1·33	53·01
Maize.....	7·33	208·63	201·3	90·7	49·13	0·9806	2·28	31·93

Oil.	IX. Hehner Value.	X. Acetyl Value. Apparent.	XI. Acetyl Value. True.	XII. Sap. Value of Acetylated Oil.	XIII. True Acetyl Value × 0·55.	XIV. Hehner Value after Acetylation.	XV. XII.—II.
		Mgrms KOH.	Mgrms. KOH.	Mgrms. KOH.			
Ravison rape	83·52	88·37	52·93	243·2	29·11	..	44·9
East India rape.....	82·18	102·87	46·61	253·33	25·63	..	37·76
Cotton seed.....	82·59	110·73	64·29	273·30	35·35	83·85	48·71
Solid linseed oil.....	53·92	..	..	367·75	..	..	..
Maize	82·34	113·16	63·37	268·75	34·85	..	60·1

Total Fatty Acids of Blown Oils.

Oil.	I. Acid Value.	II. Sap. Value.	III. II.—I.	IV. Iodine Value.	V. Total Soluble Acids.	VI. Hehner Value.	VII. Acetyl Value. Apparent.	VIII. Acetyl Value. True.	IX. Sap. Value of Acetylated Acids.	X. IX.—II.	XI. Hehner Value of Acetylated Acids.
	Mgrms. KOH.	Mgrms. KOH.			Mgrms. KOH.		Mgrms. KOH.	Mgrms. KOH.	Mgrms. KOH.		
Ravison rape.....	175·14	191·7	16·56	73·31	7·26	..	50·0	42·75	227·4	35·7	..
East India rape...	171·93	190·0	18·07	60·80	10·71	..	66·2	55·5	237·8	47·8	..
Cotton seed	194·79	210·46	15·67	72·43	12·94	93·76	67·35	55·67	254·8	44·4	92·11
Solid linseed.....	209·63	248·74	39·11	60·27	59·57	81·32	115·01	55·04	304·24	55·5	84·4
Maize.....	192·8	209·93	17·13	88·08	29·45	86·4	85·97	59·52	267·3	57·37	..

It was found that on acetylating the blown oils, emulsions were produced, but that this was not the case with the total fatty acids. The acetylated product of the solid linseed oil was a heavy sticky mass.

Oxidised Acids.—These were prepared by treating the total fatty acids with petroleum spirit. With reference to the values given in the subjoined table, it is pointed out that in each case the saponification values are much higher than the acid values, which points to the presence of lactones. In determining the iodine values, the oxidised acids were dissolved in strong alcohol, since they were found to be practically insoluble in carbon tetrachloride. The proportion of iodine absorbed by these acids indicates that they are not saturated compounds.

Oxidised Acids.

Oils.	I. Acid Value.	II. Sap. Value.	III. II.—I.	IV. Iodine Value.	V. Total Acids Soluble in Water.	VI. Hehner Value.	VII. Acetyl Value. Apparent.	VIII. Acetyl Value. True.	IX. Sap. Value of Acetylated Acids.	X. IX.—II.	XI. True Acetyl Value × 0·55.	XII. Hehner Value of Acetylated Acids.
	Mgrms. KOH.	Mgrms. KOH.			Mgrms. KOH.		Mgrms. KOH.	Mgrms. KOH.	Mgrms. KOH.			
Blown Ravison rape ..	171·5	208·0	36·5	49·14	22·56	..	102·5	80·0	307·5	99·5	44·0	..
Blown East India rape	173·3	211·3	38·0	39·79	22·35	..	128·0	105·65	315·9	104·6	58·1	..
Blown cotton seed	174·7	220·71	46·01	48·6	36·12	..	154·1	118·28	322·69	101·98	65·02	83·85
Solid linseed.....	..	..	..	45·49	59·68	..	164·67	104·99	341·43	86·29	57·74	76·38
Blown maize.....	171·9	215·74	43·60	70·87	48·0	93·53	173·58	126·68	326·45	111·11	69·67	..

Experiments were made to ascertain whether the soluble acids were formed by the action of the alcoholic alkali, since they were estimated after the determination of the saponification value. It was found, however, that the oxidised acids, as first obtained, also yielded considerable amounts of soluble acids, in some cases approximating those obtained after the saponification. The difference between the amounts of soluble acids before and after boiling with alcoholic potassium hydroxide was not observed in the case of the total fatty acids, or of the acids separated from the oxidised acids. The author's preliminary experiments have led him to the conclusion that the oxidised acids are soluble to some extent in water, and that volatile fatty acids are split off when they are subjected to the action of a current of steam.

Acids freed from Oxidised Acids.—The following results were obtained with the acids left after removal of the oxidised acids by means of petroleum spirit :—

Fatty Acids freed from Oxidised Acids.

Oil.	I. Acid Value.	II. Sap. Value.	III. II.—I.	IV. Iodine Value.	V. Total Soluble Acids.	VI. Hehner Value.	VII. Soluble Acids.	VIII. Acetyl Value. Apparent.	IX. Acetyl Value. True.	X. Sap. Value of Acetylated Acids.	XI. X.—II.	XII. True Acetyl Value × 0·55.	XIII. Hehner Value of Acetylated Acids.
	Mgrms. KOH.	Mgrms. KOH.			Mgrms. KOH.		Mgrms. KOH.	Mgrms. KOH.	Mgrms. KOH.	Mgrms. KOH.			
own Ravison rape ..	176·8	188·6	11·8	61·88	6·97	..	6·75	42·5	35·53	220·3	31·7	19·54	..
own East India rape	166·6	176·8	10·2	55·93	10·09	..	8·85	47·13	37·54	219·2	42·95	20·64	..
own cotton seed	188·0	196·15	8·15	56·02	11·0	..	7·27	33·69	22·69	232·0	33·6	12·49	96·17
lid linseed.....	179·97	187·58	7·68	61·31	18·89	..	..	50·25	31·36	246·11	58·53	17·24	96·05
own maize.....	172·37	177·68	5·31	85·52	6·14	85·54	7·54	43·8	36·7	228·76	50·52	20·18	..

The considerable acetyl values here recorded may, it is ggested, be due to the oxidised acids not being completely oluble in petroleum spirit, or to oxidation of the fatty ds after separation. The difference between the acid l saponification values again points to the presence of a all amount (4—6 per cent.) of lactones.

Separation of Supposed Lactones.—The saponification values of the substances separated from the oxidised ds by neutralisation with potassium hydroxide and traction with ether, and the acid values of the fatty ds separated from them after saponification were as own in the table opposite.

Oxidised Acids freed from Lactones.—The fatty acids covered from the soap solutions after extraction of the lactones gave the following values, the differences in the duplicate results being due to the dark colours of the solutions interfering with accurate titration :—

Lactones from	Saponification Value.	Acid Value of Fatty Acids recovered from the Saponified Lactones.
Blown Ravison rape oil.....	117·8	125·3
Blown East India rape oil	42·72	80·25
Blown cotton seed oil	72·116	86·6
Solid linseed oil.....	35·51	57·44
Blown maize oil.....	101·1	106·9

Oxidised Acids freed from Lactones.

Oil.	Acid Value. I.	Saponification Value. II.	Fatty Matter, recovered from Soap Solution, obtained sub. II. Acid value. III.	Saponification Value. IV.	Difference. V.
own Ravison rape	172·2—173·6	220·6—221·5	184·8	223·7	38·9
own East India rape.....	194·0—195·4	237·7—247·6	198·5	234·1	35·6
own cotton seed	177·9—204·5	215·1—222·9	190·2	221·7	31·5
lid linseed.....	190·8—194·5	255·5 ..	212·9	249·8	37·9
own maize	182·2—284·3	216·0—217·7	185·8	218·8	33·0

The author points out that the differences between the acid and saponification values show that lactonic substances had been re-formed. He found that this fresh formation of lactones invariably took place, even after repeated extractions of the neutralised fatty acids with ether.
—C. A. M.

ENGLISH PATENT.

Soap Tablets; Impts. in ——. T. A. Lynch, Brooklyn, U.S.A. Eng. Pat. 19,827, Oct. 4, 1901.

A RIGID plate of some material not affected by water, such as wood, with two rounded projections forming legs, is inserted into the bottom of the tablet to prevent waste of the soap in coming in contact with water in the dish or holder.—M. J. S.

UNITED STATES PATENTS.

Oil; Process of Refining ——. E. Rocca, Marseilles, France. U.S. Pat., 699,571, May 6, 1902.

THE process is similar to that described in Eng. Pat. 10,899 (this Journal, 1901, 485), with the addition of a series of collecting points where the oil is arrested, whilst heat is applied to prevent condensation of the steam.
—C. A. M.

Oil; Apparatus for Refining ——. E. Rocca, Marseilles, France. U.S. Pat. 699,572, May 6, 1902.

SUPPLEMENTARY to U.S. Pat. 23,481, 1900 (Eng. Pat. 10,899, this Journal, 1901, 485). The steam entering the oil containers is broken up into jets by means of a perforated plate, whilst the temperature of the mass is maintained by means of a closed steam coil.—C. A. M.

Rendering and Drying Apparatus. J. Glatz, New York. U.S. Pat. 700,033, May 13, 1902.

THIS apparatus is especially adapted for extracting oil or fatty matters from fish or garbage, and drying the residue. A hollow rotary shaft mounted within the casing of the apparatus is provided with hollow arms, through which steam, &c. is delivered to the interior of the casing, the materials being stirred during the operation by wings on the arms. The bottom of the casing is fitted with a filtering screen and a removable head, the latter having an outlet, which is constantly open for the discharge of the fluid rendered out. When the extraction is completed, the steam supply is shut off, and hot air is admitted to dry the residue.
—R. A.

Soap Press. J. R. Masecar, Toronto Junction, Canada. U.S. Pat. 699,887, May 13, 1902.

IN this apparatus the soap is forced into the die-box by means of a plunger reciprocating with the upper vertically-acting die, whilst the stamped bar is discharged laterally by means of a second plunger acting at an angle to, but in the same plane as, the charging-plunger. The machine also embodies improvements already claimed in U.S. Pat. 35,473, Dec. 11, 1901.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

ENGLISH PATENTS.

Colours and Inks; New Product specially applicable for use in the Manufacture of ——, *and Process of Manufacture of the said Product.* Felix de Brandel and A. de Baudry D'Asson. Brussels. Eng. Pat. 8923, April 30, 1901.

MIXTURE of petroleum residues with solutions of coal-tar dyestuffs in amyl or methyl alcohol.—M. J. S.

Colours for Lithographic and other Printing; Impts. in the Preparation of ——. H. H. Lake, London. From S. Wechsler, Vienna. Eng. Pat. 12,826, June 24, 1901.

500 to 550 parts of glycerin, 5 to 20 parts of carbonate of soda, 12 to 20 parts of tartar, 150 to 180 parts of turpentine, and 270 to 350 parts of varnish. Colours thus mixed allow of continuous dry printing without the necessity of moistening or wiping the printing plate or other surface.—M. J. S.

UNITED STATES PATENTS.

Paris Green; Process of Making ——. R. Franchot, Niagara Falls, U.S.A. U.S. Pat. 698,696, April 29, 1902.

AN electric current is passed through a solution of an acetate and arsenious oxide with a copper anode, and with the cathode immersed in a solution of an acetate, and enclosed to prevent the cathode products mixing with the arsenious oxide of the electrolyte.— G. H. R.

Paint Drier. D. J. Ogilvy, Cincinnati, Ohio, U.S.A. U.S. Pat. 699,555, May 6, 1902.

ROSIN oil (2,500 galls.), manganese dioxide (380—400 lb.), lead monoxide (170—180 lb.), and calcium hydroxide (220 lb.) are heated together. The resulting heavy transparent liquid may be diluted, if desired, with a solvent such as turpentine or petroleum.—R. L. J.

(*B.*)—RESINS, VARNISHES.

Shellac; Adulteration of ——. E. J. Parry. Chem. and Druggist, 1902, 60, [1161], 670.

THE author has previously (this Journal, 1901, 1245) called attention to the frequent adulteration of shellac with rosin. Most of the statements recorded in text-books are stated to be quite valueless as a guide to the analyst in the examination of shellac. Dieterich appears to attach importance to solubility determinations, but, according to the author, quantitative results cannot be obtained in this way. The determination of the iodine absorption value is stated to be the most reliable of all methods for ascertaining the extent of adulteration. If the experimental conditions be kept constant, very concordant results can be obtained. Of adulterated samples recently examined by the author, many contained from 20 to 35 per cent. of rosin, and some over 40 per cent.—A. S.

UNITED STATES PATENTS.

Rosin; Process of Hardening ——. E. and M. Schaal, Feuerbach, Germany. U.S. Pat. 698,741, April 29, 1902.

THE rosin is powdered, spread out in a layer, and exposed to a current of air at a gradually increasing temperature which is always below the melting point of the rosin, until its melting point no longer rises. Unless it is subsequently melted, the product is imperfectly soluble in turpentine and fatty oils, resembling in this particular, and in its commercial applicability, so it is claimed, copal and amber. The method may be carried out also upon the compounds of rosin with metals such as magnesium, calcium, aluminium, zinc, manganese, and lead, or upon mixtures of rosin with powdered talc, salt, potassium chlorate, boric acid, &c. which diminish its tendency to stick together and facilitate its reduction to powder.—F. H. L.

Plastic Compound, and Method of Manufacturing Same L. M. Randolph, Newark, New Jersey. U.S. Pat. 698,856 April 29, 1902.

"VARNISH residue," or "mud," obtained when tanks holding varnish, japan, or shellac are cleaned out, is heated and strained through cloth, mixed with 25 per cent. of powdered peat, and with 20 per cent. of old rubber ground up and dissolved in naphtha. The mixture is allowed to dry out and is finely ground, when it may be cast in hot mould into any desired shape. It is stated to be useful for making washers, engine packings, golf balls, and the like.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

ENGLISH PATENT.

Sulphuryl Chloride; Manufacture of ——. J. Y. Johnson London. From the Badische Anilin und Soda Fabrik of Ludwigshafen, Germany. Eng. Pat. 12,861, June 29, 1901.

SULPHUR dioxide and chlorine in the liquid condition are caused to react on one another in the presence of bodies

which promote their union, such as camphor, glacial acetic acid, anhydrous formic acid, and the like, to obtain sulphuryl chloride. The product may be isolated and purified in any suitable manner.—E. S.

United States Patent.

Insulating Composition [*Gutta Percha Substitute*], *and Method of Production.* A. Gentzsch, Vienna. U.S. Pat. 699,383, May 6, 1902.

Gum-rubber or caoutchouc (40 parts) and a vegetable wax (60 parts) are kneaded together at a moderate temperature, which is increased towards the end of the operation to about 100° C., the resulting product being a plastic mass with properties resembling those of gutta-percha. The wax may be partly replaced by resins and oil as in the following formula :—Palm or carnauba wax, 20 parts; resin, asphaltum, or shellac, 10 parts; thickened olive oil, 50 parts; gum rubber, 50 parts.—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Leather; Examination of ——, *for Industrial Purposes.* H. Boulanger. Bull. Soc. d'Encourag. pour l'Ind. Nat., 1902, **101**, [4], 491—554.

A long paper dealing with the mechanical testing of leather for industrial purposes. The paper is illustrated, and the results of numerous mechanical tests are shown in a series of tables and curve diagrams.—A. S.

United States Patent.

Tan-Bark; Apparatus for Leaching ——. G. C. Vaughn, Salem, Massachusetts, U.S.A. U.S. Pat. 698,877, April 29, 1902.

The more important features of this apparatus are :—A rotating drum divided by a partition wall into a leach-chamber and a liquor-chamber, the former having an inlet for liquid and several separate outlets near the wall of the drum which move with the same and pass below, the bulk of the material being leached in such a way that the extract passes from the leaching-chamber into the liquor-chamber; each outlet, moreover, having a special straining device. Means are provided within the leaching-chamber to lift a portion of the material under treatment, and a specially designed heating apparatus is also contained in this chamber.

—R. L. J.

XV.—MANURES, Etc.

Fertiliser; An Artificial ——. Papier-Zeit., 1902, **27**, [42], 1508.

A process has recently been patented for preparing a useful fertiliser in a dry condition from waste sulphite cellulose liquors. These are evaporated to a syrupy consistency, and mixed with an equal quantity of Thomas meal. The mixture almost immediately becomes solid, and can be broken into small pieces. Nearly the whole of the phosphoric acid of this fertiliser is soluble in citrate solution, *i.e.*, is in a condition suitable for utilisation as a fertiliser; in fact, 98 per cent. of the phosphoric acid is citrate soluble as against 3 per cent. in the original Thomas meal.—J. F. B.

English Patent.

Sewage Sludge and other similar Costly Nuisances; Profitable Disposition of ——. T. J. Barnard. Eng. Pat. 9337, 1901.

See under XVIII. B., *page* 787.

XVI.—SUGAR, STARCH, GUM, Etc.

English Patents.

Diffusion Process; Batteries for the ——, *for obtaining Juices, Saps, Essences, Pigments, &c., from Matters containing them.* A. Rak, Cesky Bord, Austria. Eng. Pat. 16,945, Aug. 23, 1901.

In a continuous diffusion battery a series of conical diffusers are formed of conical casings with conical worms fitted inside them rotated on spindles; the broad ends of the worms are fed with slices or other materials for diffusion, which slices undergo compression in their conveyance to the pointed end of the diffusers owing to the conical shape, whereby part of their juice is extracted on the way through the perforated walls of the casing, whilst the slowly advancing slices close up more or less the remainder of the casing, and are transported by way of a connecting tube into the broad part of the next diffuser. In combination with the above arrangement the system of contrary flow of the lixiviating liquid is adopted from the perforated walls of the diffusers through connecting tubes to the next vessels.—J. F. B.

Sugar Loaves; Apparatus for Covering and Liquoring ——. A. Kaczorowski, Zbiersk, Russian Poland. Eng. Pat. 9496, May 7, 1901.

The sugar loaves are arranged in a centrifugal machine, tangentially to a circle concentric with the suitably heated centrifugal drum, and receive a movement of rotation round their longitudinal axes.

The independent rotation is obtained by a worm arranged concentrically in the drum, acting by means of worm wheels and tangentially-placed shafts on gear wheels which are provided with moulds for receiving the sugar loaves, the points of which revolve in ball bearings.

—J. F. B.

United States Patents.

Evaporating Apparatus; (*Sugar boiling*). O. M. Nilson, Mansfield, Louisiana. U.S. Pat. 698,733, April 29, 1902.

Claims for improvements in apparatus for boiling cane juice and reducing this to "sugar density" are made, and more especially for the combination with a furnace, of (1) A boiler with an inclined bottom forming a wall of the combustion chamber of the furnace, an evaporating pan with a flue extending underneath, flues extending through the boiler and adapted to convey the products of combustion from the furnace to the flue of the pan, tubes connecting the pan with the interior of the boiler and a valved outlet from the boiler. (2) Alternately arranged cross-strips in the pan, a dam, and tubes connecting the pan with the interior of the boiler, whereby juice is permitted to flow into the boiler and surround the flues therein, and a valved outlet from the boiler at its lowest point. (3) Combinations of these devices.—T. H. P.

Multiple Effect. (*Evaporation or Concentration of Sugar Solutions*). B. Thoens, New Orleans, Louisiana. U.S. Pat. 699,038, April 29, 1902.

The several chambers of the multiple-effect apparatus are superposed in a common shell, the apparatus being thus simplified. Claims are made in such an apparatus, and more especially for that used in sugar manufacture, for (1) The combination with an evaporator divided into a plurality of chambers with heating devices in the lower portion of each of said chambers, of two pipes, one connecting the lower portions and another the upper portions of each pair of said chambers, means for supplying the liquid to be concentrated to one of the chambers and means for drawing off the vapour from another. (2) A separator arranged in the upper portion of the evaporating chamber, comprising a base plate and a number of baffle-plates projecting upwards therefrom, and arranged to form tortuous passages to permit the passage of the vapour but to arrest any condensed liquid. (3) A reducing valve in the pipe connecting the upper parts of the chamber. (4) A heating drum hollow in the middle and provided with a series of water-legs, located in the lower portion of each of the chambers, and steam or vapour flues opening upward into the hollow central portions of the drums. (5) Combinations of these various devices.—T. H. P.

Centrifugal Machine (*Sugar*) L. Hirt, Grevenbroich, Germany. U.S. Pat. 699,321, May 6, 1902.

In centrifugal machines for converting masseeuites into blocks, plates, strips, or small cubes, improvements are

proposed as to the construction of the wedge-shaped partitions forming part of the basket of the rotating drum of the machine, which basket may be inserted, with the massecuite, into the drum.—R. A.

Syrup Cooler. J. Werner, Rochester, New York. U.S. Pat. 699,730, May 13, 1902.

The syrup cooler is of the type in which the syrup circulates outside and the cooling water inside a number of pipes, and consists of a tank in which are situated suitable cooling devices, a swinging valve for closing and opening the bottom of the tank, screw-operated means for closing the valve, and independent means for forcing and locking the valve on its seat.—J. F. B.

Sugar-bearing Material; Process of Purifying Fluid ——. C. A. Spreckels and C. A. Kern, New York. U.S. Pat. 699,933, May 13, 1902.

Sugar solutions are treated with sulphonated derivatives for the purpose of purification. (See U.S. Pat. 698,150, this Journal, 1902, 715.)—J. F. B.

Sugar Crystals; Process of Treating ——. C. A. Spreckels and C. A. Kern, New York. U.S. Pat. 700,099, May 13, 1902.

Sugar crystals are purified by washing them with sulphonated oleaginous or similar derivative and then separating the cleansing agent together with the impurities absorbed. (See U.S. Pat. 698,150, this Journal, 1902, 715.)—J. F. B.

Starch; Process of Making Modified ——. L. Cerf, Lyons. U.S. Pat. 698,632, April 29, 1902.

Amylaceous matters are treated with persulphates in presence of water, by which means these substances are converted into products, characterised by their complete neutrality and solubility in hot water and suitable to replace gelatin in its principal industrial applications.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Zymase Formation in ——. E. Buchner and A. Spitta. Ber., 1902, **35**, [9], 1703—1706.

The quantity of zymase in yeast is liable to vary largely according to its physiological condition, so that in many cases the expressed extracts are almost devoid of activity. It has been shown by Albert (this Journal, 1899, 1040) that the quantity of zymase in yeast and in the extract expressed from it may be increased by applying Hayduck's method of regeneration, *i.e.*, cultivation at 15° C. in a well aërated sugar solution containing very little nitrogenous compounds. He found that less zymase was present in the yeast at the highest stage of fermentation than was found some time after this point had been passed. Delbruck and others have determined recently that the zymase content of living yeast varies greatly on keeping the yeast in the pressed state, increasing on storage at low temperatures and decreasing at higher temperatures. The authors find that the only objection to this conclusion lies in the liability of the quantity of zymase in the yeast to change in the course of the determination of its fermentative power. They have overcome this by killing the yeast cells instantaneously at any desired stage by a modification of Albert's method (this Journal, 1901, 269) by means of alcohol and ether, thus bringing the yeast into a perfectly stable condition in which the quantity of zymase present may be determined subsequently. In this way they have studied the quantity of zymase secreted by the yeast at various stages in the course of Hayduck's process of regeneration. They found in confirmation of Albert's conclusions that yeast taken out and killed at the highest stage of fermentation contains little zymase, although at this stage the production of zymase must be at a maximum, it apparently gets used up or destroyed as it is formed. They also found that by keeping yeast withdrawn at this stage in the pressed condition at a low temperature for 2 to 3½ hours before killing it, the quantity of zymase secreted by it was very considerably increased. On the other hand, in the case of yeast taken before regeneration or after the highest stage of fermentation was passed, similar storage at low temperatures had no such effect. "Regenerated" yeast, therefore, is not necessarily that which contains much zymase ready formed, but rather that which is in such a condition as to be able to produce this enzyme rapidly.
J. F. B.

Kilned Malt; Analysis and Valuation of ——. E. Prior. Zeits. angew. Chem., 1902, **15**, [19], 455—462.

A measure of the degree of modification, and the treatment on the floor and the kiln is afforded by the estimation of the diastase and the starch, and the reducing carbohydrates produced by their interaction during mashing.

The author's work was carried out on 20 samples of malt of all types and of various qualities; the scheme is briefly as follows:—In the first place the official Vienna method of chemical and physical analysis is carried out. In addition to this are determined the percentage of diastase (calculated on the malt dry substance) by Lintner's method; the reducing carbohydrates produced from the pre-existing soluble carbohydrates of the malt by mashing; the total pre-existing soluble carbohydrates, and the quantity and nature of the carbohydrates of the ordinary wort-extract. The pre-existing soluble carbohydrates are determined after mashing a filtered cold water extract of the malt, by the cupric reduction before and after inversion: the diastase is determined in a separate portion of the meal, and the total carbohydrates in the ordinary wort are determined by inversion. Hence are calculated the total transformation products of the soluble portion, and of the portion unlocked by mashing; by deducting the pre-existing transformation products, the quantity of the starch transformed by the mashing is found. Thus the carbohydrates of the wort are separated under two heads—those pre-existing, and those produced by mashing—each of which is expressed in terms of starch on the one hand, and in terms of maltose and dextrin on the other. The quantity of diastase required to transform 100 parts of starch, the maltose and dextrin produced by 1 grm. of diastase, the quantity of starch transformed by 1 grm. of diastase in 10 minutes and the ratios of the pre-existing and the produced maltose to the corresponding dextrin values are then worked out.

The author has arranged the results obtained from the malts examined in the form of a table, the malts being classed in order of their types. The individual results under each heading are discussed, and the conclusions in each case set forth.

The pre-existing soluble carbohydrates represent those produced on the floor and in the earliest stages of kilning, and afford an idea of the treatment there received by the malt; defective modification on the one hand, and "forcing" on the other are thus detected. The results of the mashing process and the quantity and efficiency of the diastase show the type of malt, and give information as to the physical condition of the endosperm, *i.e.*, whether the starch is transformed readily or with difficulty. Lastly, the sugar to dextrin ratios are useful for deducing the character and type of the malt as determined by practical experience, and for indicating the degree of attenuation of the beer.
—J. F. B.

Barley, and the Malt prepared therefrom; Comparative Chemical Examination of ——. J. C. Lermer. Zeits. Ges. Brau., **25**, [10], 151—158.

The author found that the conversion of 100 parts of barley into 88·81 of dry malt was attended with a loss of 14·57 parts of starch, 0·26 of proteids, and 0·58 of fatty oil, but with an increase of 0·23 part of dextrin, 0·21 of cellulose, 1·75 parts of ash, &c., and the formation of 2·03 parts of sugar. Traces of copper were found in the cooler sludge and the beer, and were probably derived from the copper brewing utensils used.—C. S.

Steeping of Barley; Influence of Duration of the —— on Germination. O. Jacob. Zeits. Ges. Brau., **25**, [19], 289—291.

The researches of Bleisch and Will having demonstrated the impossibility of overcoming, by prolonged steeping, the

difficulties arising from irregularities of germinative energy in a batch of barley, the author experimented with an equal number of barley corns of three different kinds, steeped for 24, 48, and 72 hours in water at room temperature. The germinated corns were counted twice daily and classified into three groups; those chitting without protrusion of the rootlet, those in which the rootlet also appeared, and these exhibiting bifurcation. The tabulated results show that, in all cases, prolonged immersion in water both retards germination and diminishes the energy of the phenomenon, the effect being more marked the lower the germinative power of the barley. The critical point is situated at about a duration of steeping of 48 hours, and the results are regarded as confirming the advantages of an abbreviated steeping process. It is also considered that prolonged steeping cannot improve an irregular sample in respect of furnishing a better average germinating power, a higher percentage of germinating corns, and a more uniform growth.—C. S.

Cellars [Tun Rooms]; Infection and Ventilation of ——. P. Lindner. Woch. für Brau., 1902, **19**, [20], 277—279.

The author emphasises the fact that a low temperation in itself is no protection against mildew, unless the air be kept dry at the same time. In over-ground tun rooms, which are the most common, leakage through or underneath the doors or other openings near the bottom causes a down draught instead of an escape through the ventilating cowls in the roof. The air which is thus drawn in from above is warm and moist, and frequently strongly infected with dust from the maltings. The warmth of the air increases the cost of cooling, the moisture contained in it is condensed, and carries down with it the germs in a favourable condition for development. The filtration of the air is useless unless it be previously cooled and dried, since although the filtered air is germ-free, it provides warmth and moisture to the germs which are already inside. All the openings of an over-ground tun room should be capable of being closed hermetically to prevent infection and wastage of cooling power. It often happens that a badly-ventilated tun room will keep cool and dry, whilst one which is well-ventilated becomes warm, moist, and musty.

Ventilation is only beneficial when the air which enters is cold and dry. It is questionable whether fresh air is so absolutely essential in tun rooms as is generally supposed; it is also doubtful whether it is necessary to keep the temperature of the room as low as is generally done. The cooling of the fermenting wort can be done more economically by using more ice in the wort-coolers than by cooling down the air of a leaky tun room.—J. F. B.

Alcoholic Fermentation; Action of some Antiseptics (Lime, Sodium Arsenite, and Phenol) on ——. C. Knoesel. Centr.-Bl. f. Bakter u Parasitenk, **8**, [2], 241—245, 268—273, 299—304, and 327—335. Chem. Centr. 1902, **1**, [15], 884; [16], 943; [18], 1065.

The experiments were made with a definite number (counted) of cells of a pure culture bottom fermentation yeast of the Frohberg type, in the same stage of growth in all cases; with nutrient solutions of definite composition; and under identical conditions of temperature and time. The author sought to determine what quantities of the antiseptics were capable: (1) of reducing the yeast to a condition of inactivity; (2) of destroying its power of propagation; (3) of destroying its fermenting power; and (4) of killing the yeast. In the case of the action of poisons on yeast in cane sugar solution, the invertiug power and the influence of the poisons on this was also studied.

The nutrient solutions were sown with the yeast to the extent of 200 and 2,000 cells per c.c. respectively, and experiments were made both at room temperature and cellar temperature. The inverting power of the yeast was increased by additions of lime up to a certain point, but then again diminished. Low temperatures and relatively small amounts of lime are the conditions which favour the inverting power. The relations quoted for inversion also hold good, in general, for the amounts of cane sugar fermented. The multiplication of cells was greater in the case of the weaker sowing; it was smaller in the experiments with 2,000 cells per c.c., and was entirely prevented by small amounts of lime.

The experiments with sodium arsenite gave, in many respects, results analogous to those obtained with lime. In the cellar experiments a smaller amount of the salt sufficed to destroy the propagating and fermenting powers of the yeast. The inverting and fermenting powers here also were increased up to a certain point by the addition of small amounts of sodium arsenite. The greater the increase in the number of yeast cells, the smaller was the quantity of cane sugar fermented.

Phenol gave similar results to lime and sodium arsenite. The yeast killed by phenol showed strong inverting power. A blank experiment showed that phenol without yeast had no inverting action on cane sugar. It was found by direct experiment that yeast treated with phenol alone gave up no invertase to water. In presence of saccharose, however, invertase could be detected, probably in consequence of the alterations in osmotic pressure effected by diffusion of the saccharose into the interior of the cells, it being immaterial whether the yeast is living or dead.

The results of the investigation are given in a series of tables.—A. S.

Filter Presses instead of Mash Tun in the Brewery. W. Windisch. Woch. für Brau., 1902, **19**, [19], 265—266.

The author has carried out experiments in the brewery with different types of filter-presses. In the first case a press of German make was employed; the malt was ground very fine almost to a flour, and mashed by the two-mash decoction process. The press had 34 chambers, making cakes 40 mm. thick. The wort ran rather thick at first, but soon became bright and remained bright during the whole operation, which lasted for about an hour and a quarter. Only when excessive pressure was applied with the pump did the liquor run cloudy, a defect which was immediately remedied by adjusting the pressure. The density of the runnings was taken every few minutes, and indicated a very regular extraction. The final runnings showed a percentage of extract of 0·7. The cakes were removed, and the enclosed liquor was squeezed out and the density determined. The density of the liquor in some of the cakes was slightly higher than in the others, corresponding with the quantity of scum present in the cakes, this having a greater capacity for holding back the wort. The yield was higher than that calculated from the laboratory results for coarse grist and approached that for fine meal.

In the second series of experiments, a Belgian filter-press was employed; it had 28 chambers, making cakes 48 mm. thick. The wort was thick at first, but ran clear after a little time. The cause of the wort running thick at first is attributed to the fact that grist was mashed instead of flour, and the coarse particles failed at first to provide a suitable filtering layer. It is one of the chief advantages of filter-presses that the malt must be mashed in the form of meal, and a higher yield is thus obtained. The author considers that the problem is solved in principle, and only details require improvement.—J. F. B.

Fusel Oil; Separation of the Amyl Alcohols of ——. III. W. Marckwald. Ber., 1902, **35**, [9], 1595—1601.

The author has examined several of the fusel oils of commerce, and finds that the relative proportions of inactive isoamyl and active amyl alcohols in them vary greatly according to the raw material from which the oils were obtained. Four or five samples of each kind were examined, and it was found that the amyl alcoholic portions of grain and potato fusel oils contained from 13·5 to 22 per cent. of the active alcohol, whilst that from molasses fusel oil contained as much as 48—58 per cent.; the latter material is therefore the best starting point for the preparation of pure active amyl alcohol. It is not yet certain whether this difference in composition is due to the difference in the raw material or the methods of manufacture.

The author has further developed Pasteur's method for separating the two alcohols from fusel oil by fractional crystallisation of the barium amyl sulphates. His experiments have been completely successful, and he finds that

the two salts form an unbroken series of mixed crystals, so that by proper fractional crystallisation, the two constituents can be separated in a perfectly pure state. For esterification, 500 c.c. of amyl alcohol were mixed in the cold with 300 c.c. of concentrated sulphuric acid, and allowed to remain for a day at the ordinary temperature. Not more than 75 per cent. of the alcohol was thus esterified. It was found that the residual mixture of alcohols had exactly the same composition as the original, also that the esterified portion yielded on saponification both alcohols in the original proportions, no isomerisation or selective esterification having taken place. The barium salts were then fractionally crystallised systematically, the mother liquors from the more sparingly soluble fractions being employed for the solution of the more readily soluble fractions until pure and constant products were obtained. The solubility of the inactive isoamyl barium salt was 12·15 parts at 20·5° C., whilst that of the active amyl barium salt was 26·10 parts at the same temperature. The specific rotation of the latter salt showed $[\alpha]_D = +2·58°$, $c = 20$ or 16 and $[\alpha]_D = +2·71°$, $c = 4$.

The composition of mixtures of the two barium salts could be accurately deduced from the optical rotation of the mixture. (See also this Journal, 1901, 378 and 379).

—J. F. B.

English Patents.

Hops, Malt, Fruit, Vegetables, and other similar Substances; Mode and Means for Treating and Drying of ——. J. A. Partridge, Tenbury, Worcester. Eng. Pat. 2954, Feb. 5, 1902.

The substances to be treated are carried, during the drying, cooling, bleaching, or other operations, on skeleton trucks, which are adapted to travel on pathways through the various rooms. The trucks may be provided with removable suspended linings of hair-cloth, and are arranged to cover the drying room, &c., superficially, so that the hot air or other agent passes through the material. The hot air from the drying room is conveyed by a return flue back to the blower and heater, and the means employed for circulating the air may be arranged so that the direction of the current can be reversed.—R. A.

Brewery Yeasts fermenting at a High Temperature; Preparing and Using Low Fermentation ——. G. Jacquemin, Malzéville, France. Eng. Pat. 9221, May 3, 1901.

Low fermentation yeast possessing the property of a high fermentation yeast of fermenting at a higher temperature is prepared by cultivating the low yeast in any nutritive medium and substituting progressively in successive cultures for one part of the nourishing medium an equal quantity of a must to which has been added organic acid, this treatment taking place preferably at a temperature a little higher than that at which it is wished to cause the beer to ferment.—J. F. B.

Yeast; Impts. in ——. M. P. Davies and E. Wilding, London. Eng. Pat. 8777, April 29, 1901.

The inventors prepare an improved ferment or yeast by washing, drying, and powdering yeast, and mixing with it a suitable quantity of potato meal, and a small quantity of a diastatic compound such as malt meal.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Fruits; Dried ——. [*Presence of Sulphites.*] A. Beythien and P. Bohrisch. Zeits. Untersuch. Nahr.- und Genussmittel, 1902, **5**, 401—409.

The authors have examined a number of dried fruits, principally American, and give the results of their analyses as regards the amount of sulphite contained in the fruits. Californian apricots were found to contain from 0·2162 to 1·1585 per cent. of sulphite, calculated as crystallised sodium sulphite; peaches 0·9921 per cent., pears 0·2399 per cent., Italian prunes 0·2637 per cent., and "Görtzer" pears 0·2901 per cent. Only dried apples and plums were found to be free from this substance. Less than half the quantity of sulphite contained in the fruits was removed by cooking, and not more than half by soaking over-night and then cooking. The sulphurous acid was determined by acidifying with phosphoric acid, distilling in an atmosphere of carbon dioxide, oxidising the distillate, and precipitating with barium chloride as usual. It should be mentioned that marble sometimes contains traces of sulphide, and, in such case, the carbon dioxide should be passed through a solution of copper sulphate before entering the distillation flask.

Zinc was not detected in any of the fruits.—W. P. S.

Butter; Rancidity of ——. O. Jensen. Centr.-Bl. f. Bakter. u. Parasitenk., **8**, [2], 11—16, 42—46, 74—80, 107—114, 140—144, 171—174, 248—252, 278—281, 309—312, 342—346, 367—369, and 406—409. Chem. Centr., 1902, **1**, [6], 362; [9], 537—538; [10], 599; [11] 678; [13], 771; [15], 889; [18], 1071—1072.

The author summarises in the following statements the results of a comprehensive series of experiments. When butter is exposed to sunlight or to a high temperature in contact with air, it is oxidised and acquires a very unpleasant taste and odour, but it does not become rancid. The butter becomes rancid only by the action of certain micro-organisms. As these all need air for their development, the rancidity proceeds from the outside inwards. For the preservation of butter it should be packed in hermetically-closed receptacles and it should be formed into large pieces, so that the surface to be exposed shall be as small as possible. The micro-organisms which, under ordinary conditions, cause the rancidity of butter are, *Oidium lactis*, *Cladosporium butyri*, *Bacillus fluorescens liquefaciens*, and at times also *Bacillus prodigiosus*. All these decompose the butter fat. Volatile fatty acids are produced, first by the bacteria and later by the combined action of the two mould fungi; butyric acid esters are also formed. The formation of volatile fatty acids can be restricted by means of common salt and that of esters by means of milk sugar. *Bac. fluorescens liquefac.* and *Bac. prodig.* are communicated to the butter from the water, and *Oidium lactis* and *Cladosporium butyri* from the air. In order to prepare butter capable of being preserved without decomposition, the milk, cream, and butter must therefore be brought as little as possible in contact with water and not be exposed to the air. Acidification of the cream diminishes to a considerable extent the danger of infection from the water, but for this purpose perfectly pure cultures of lactic acid ferments must be used, since with impure cultures there is a strong risk of infection with mould fungi. By pasteurisation of the cream at 85° C., all micro-organisms capable of injuring the stability of the butter can be destroyed, but the pasteurised cream must be cooled in a closed apparatus by a current of sterilised (filtered) air; the cream receptacles must be kept well closed; and the butter allowed to come in contact only with boiled water. Finally care must be exercised in the selection of packing material

—A. S.

Milk, Fresh and Sour; Detection of Artificial Colouring Matter in ——. M. Wynter Blyth.

See under XXIII., *page* 791.

English Patents.

Fruits, Vegetables, and the like; Improvements in the Preservation of ——. J. W. Bain and C. Hannay, Glasgow. Eng. Pat. 7431, March 27, 1902.

The fruit is first chilled at a temperature of 35°—40° F. then packed in infusorial earth, "Barbadoes earth," or tripolite.—A. C. W.

Fruit, Vegetables, Hops and Malt, and Similar Substances; Mode and Means for Treating and Drying of —— J. A. Partridge. Eng. Pat. 2954. 1902.

See under XVII., *page* 786.

United States Patents.

Baking Powder. J. A. Just, Syracuse, U.S.A. U.S. Pat. (reissued) 11,981, April 29, 1902.

196 parts of phosphoric acid are combined with 620 parts of casein. The dried and ground product is mixed with 336 parts of sodium bicarbonate, and an inert filler, such as starch. A combination of 24 parts of phosphoric acid with 76 parts of casein is also claimed.—E. S.

Gluten; Process of Manufacturing ——. L. A. Morel, Paris. U.S. Pat. 698,534, April 29, 1902.

See Eng. Pat. 9283, 1900; this Journal, 1901, 738.

—T. H. P.

Eggs [and other Perishable Edible Substances]; Packing Compound for ——. T. M. Stukes, Texas, U.S.A. U.S. Pat. 699,258, May 6, 1902.

Shale dust (500 parts), gypsum (25 parts), fresh wood-ashes (25 parts), sulphur (1 part), borax (1 part), saltpetre (1 part), and salicylic acid (1 part), in a dry and powdered state are intimately mixed and sifted together. The articles are packed in this mixture.—R. L. J.

Corn or other Vegetables; Method of Canning ——. C. H. Plummer and F. T. Stare, Waukesha, Wisconsin, U.S.A. U.S. Pat. 699,765, May 13, 1902.

The corn and other vegetables are cooked at a temperature considerably above the normal boiling point. The hot cooked material is then filled into cans and sealed down, the operations of cooking, filling, and sealing being carried out in a chamber in which the pressure is greater than that of the external atmosphere. Arrangements are supplied for entering the chamber and for the admission of cans and material without loss of pressure.—W. P. S.

(*B*).—SANITATION; WATER PURIFICATION.

English Patents.

Lime from By-products [Water Softening]. C. J. Haines, Winchester. Eng. Pat. 13,001, June 26, 1901.

The calcium carbonate slush mixed with 8 per cent. of chalk or other binding material, and with 2 per cent. of coke or furnace breeze, is dried and burned as with cement; or is moulded into blocks for burning in a lime or rotary kiln.—E. S.

Water; Apparatus for Heating, Softening, and Purifying ——. H. McPhail, Wakefield, Yorkshire. Eng. Pat. 2133, Jan. 27, 1902.

Reference is made to Eng. Pats. 10,453 of 1895, 5391 of 1896, and 27,026 of 1897 (this Journal, 1898, 1170). In the present invention the chamber into which the water is sprayed is open at both ends, and is arranged within a vessel connected with the steam generator, or within the steam generator itself. The water is sprayed through a perforated plate or reticulated diaphragm, or a perforated nozzle, arranged at the upper part of the chamber.—R. A.

Filters, and Apparatus for Automatically Alternating the Delivery of Liquid or Sewage thereto, more particularly applicable to Bacteriological Filters. J. C. Haller and R. H. Machell, both of Dewsbury, Yorkshire. Eng. Pat. 11,368, June 4, 1901.

A series of filters, arranged to act in succession in repeated cycles, is combined with automatic apparatus, actuated by the overflow from the filters, for directing the sewage to, and discharging it from, each filter in succession. The means for controlling the admission of the liquid to the filters, &c. comprises a closing chamber, to which liquid overflowing from the tank is admitted through a pivoted float-ing arm, and raises floats for actuating a lever to close the inlet, the lever reopening the inlet on the falling of the float. Another arrangement for controlling the admission comprises an opening chamber, to which liquid overflowing from one tank is admitted, to raise floats for opening the inlet valve of another tank. From each tank or filter the liquid is slowly drawn off from the top, the apparatus for this purpose comprising a discharge chamber containing a balance float and a rising and falling arm or outlet pipe, the float and outlet pipe being situated at opposite ends of a lever, which allows the outlet pipe to fall as the float rises. As the liquid enters the discharge chamber, the float rises therein and allows the outlet pipe to come into action. On the liquid being drawn off, the float falls and raises the outlet pipe to its inoperative position. Claim is also made for an arrangement of semicircular or channelled pipes or conduits, whereby an even distribution of liquid over a filter bed is obtained, and for supporting the channels or conduits in a filter by vertical pipes.—R. A.

Sewage Sludge and other similar Costly Nuisances; Profitable Disposition of ——. T. J. Barnard, Truro, Cornwall. Eng. Pat. 9337, May 6, 1901.

Sewage sludge in a concentrated form is solidified and made into fuel by being mixed with powdered limestone or chalk, together with coal dust, petroleum, creosote, coal tar, &c. Or, the sludge, excrement, &c., is mixed with natural or calcined limestone or chalk, without the other ingredients, and made into a solid manure similar to Peruvian guano. (See also this Journal, 1900, 266.)—L. A.

Sewage; Apparatus for the Treatment of ——. J. W. Welch, H. W. Heywood, and J. R. Wollaston, Manchester. Eng. Pat. 10,346, May 18, 1901.

Automatic apparatus for operating the inlet and outlet valves of a series of bacteria beds, in order that the sequence of operations in each tank or bed may be carried out in the needed order and at the proper times. Each valve is operated by either an hydraulic or an electric motor, controlled by a float or gravity-operated mechanism connected with the same or another tank of the series, and so arranged as to receive the overflow from the tank when the sewage to be treated has reached a predetermined height. Thus, as each tank of the series becomes full and begins to overflow, mechanism is operated which causes the inlet valve of said tank to close, the inlet valve of another tank in rotation which has remained empty for the proper time to open, and the outlet valve of a third tank which has remained full for the proper time to open and allow the contents to escape.—L. A.

United States Patents.

Water; Apparatus for Distilling ——. E. E. Murphy, Boston, Mass. U.S. Pat. 698,724, April 29, 1902.

This apparatus is adapted to purify and condense steam generated in an ordinary boiler, &c. An elongated vertical casing is partitioned to form a plurality of superposed chambers, which are connected by pipes. Beneath and connected to the lower chamber of the casing is a wash chamber and filter, through which the steam is passed before entering the casing. In the lower chambers of the casing the steam also passes through wash water, and then passes through vertical perforated pipes into the upper or condensing chambers, which are kept cool by the evaporation of a film of water supplied to the outside of the casing. The water of condensation is drawn off from the lower condensing chamber through a cooling worm, and may then be passed through a charcoal filter. An adjustably loaded valve is provided for the escape of gases from the upper condensing chamber.—R. A.

Copper; Precipitating ——, *from Water.* A. J. Pelmeteer, Montana, U.S.A. U.S. Pat. 699,009, April 29, 1902.

Copper-water, such as is pumped from mines, or otherwise occurring, is treated with an alkaline liquor, obtained by boiling one part of sulphur and four parts of lime with water, of which 1 gall. is taken to 20 oz. of the mixture, the boiling being continued for about an hour. The proper proportion of the liquor is added to the copper-water immediately before the latter enters the pipes of the

pumping system, so that the precipitate is held in suspension. This treatment, besides precipitating the copper, neutralises the acidity of the cupreous water, whereby it ceases to be corrosive to the pumping apparatus.—E. S.

(C.)—DISINFECTANTS.

Aspergillus; Conditions necessary for the Destruction of the Spores of some Varieties of ——. A. Lode. Arch. Hyg., 42, 107—152. Chem. Centr., 1902, 1, [19], 1122.

The experiments were made with *Aspergillus fumigatus, niger, flavescens,* and *clavatus*. Corrosive sublimate proved an efficient antiseptic in about $\frac{1}{2}$ per cent. solution; the $\frac{1}{1000}$ solution required 1 hour to destroy the spores of *Asp. fumigatus* and *niger*, $\frac{1}{4}$ hour for *Asp. flavescens*, and $\frac{1}{6}$ hour for *Asp. clavatus*. Silver nitrate was as good as corrosive sublimate in 1 per cent. solution, and superior to the latter in $\frac{1}{1000}$ solution. Zinc sulphate, zinc chloride, and copper sulphate in 10 per cent. solution did not destroy the spores in 6 days, nor did 50 per cent. solution of common salt, 30 per cent. solution of calcium chloride and cold saturated solution of sodium sulphate. 20 per cent. sodium carbonate solution killed the spores of *Asp. niger* in 15 minutes and the others in 5 minutes; 10 and 15 per cent. solutions were without action even after 3 days. 1 per cent. milk of lime had no effect on the spores even after 6 and 12 days; 10 per cent. milk of lime even in 10 days had no action on *Asp. fumigatus* and *niger*. Chloride of lime solution with 0·67 per cent. of active chlorine (a 3·4 per cent. solution) was nearly as good as the 1 per cent. solution of corrosive sublimate; even the 0·34 per cent. solution of chloride of lime killed all the spores, with the exception of *Asp. niger*, in 10 minutes. $\frac{1}{1000}$ solution of iodine in potassium iodide killed the spores of *Asp. fumigatus, flavescens,* and *clavatus* in $\frac{1}{2}$ hour, but not the spores of *Asp. niger* in 1 hour. Iodine trichloride was effective in $\frac{1}{4}$ minute in 1 per cent. solution, and in 10 or 15 minutes in $\frac{1}{1000}$ solution. Bromine was effective in 1 per cent. and 2 per cent. solution; but potassium permanganate in double normal solution only gave good results with *Asp. flavescens* and *clavatus*. In 5 per cent. carbolic acid solution, none of the spores were capable of development after 1 minute. Two per cent. "lysol" solution destroyed the spores in 5 minutes. A mixture of the three cresols had no effect even after a day's action. 2·5 per cent. "creolin" solution, 1 per cent. "saprol," $\frac{1}{2000}$ thymol, and 10 per cent. acetone had no particular destructive action on the spores. 96 per cent. alcohol had an effect equal to that of the 0·5 per cent. solution of corrosive sublimate, whilst 80 per cent. and 60 per cent. alcohol were superior to the $\frac{1}{1000}$ solution of corrosive sublimate. Gaseous formaldehyde had only a slow action (after 1—2 hours) on the spores; Methyl Violet in 1 per cent. solution was without action.

Dry heat of 125° C. killed all the spores in 15 minutes; the spores were not affected at 80° C. even after 7 hours. A current of steam at 100° C. destroyed the spores instantaneously; even water heated to 80° C. was very effective.

In practice the most useful agents are a current of steam, $\frac{2}{1000}$ solution of corrosive sublimate, 5 per cent. carbolic acid solution, 2 per cent. solution of "lysol," and 3 per cent. solution of chloride of lime.—A. S.

Calcium Sulpho-Ichthyolate; Preparation of ——. A. Hegland. Pharm. Zeit., 47, [22], 211; after Pharm. Weekbl., [1902], (10).

Ammonium sulpho-ichthyolate is precipitated with a solution of calcium chloride in lime water. The odour and taste of ichthyol may be removed by washing the precipitate once with light petroleum spirit.—J. O. B.

English Patent.

Lamps for Disinfecting, Therapeutic, and other Purposes; Production of Slow Combustion [*Formaldehyde*] ——. A. Roubleff, Paris. Eng. Pat. 8882, April 30, 1901.

The oxidiser for the alcoholic vapours arising from the lamp consists of a ribbed or fluted conical cap, inside of which is fixed a smaller, inverted cap having the same number of ribs, the caps being held together by a refractory rod passing down through their centres. The caps are made of any suitable refractory, porous substance, such as kaolin or asbestos, impregnated with solutions of platinum chloride and of nitrates of the rare earths, and calcined after being dried. An extension of the refractory rod rests in a socket in the head of the lamp wick, the head of the wick consisting of porous refractory material, or of a strip of asbestos sheet wound round the socket, attached at its lower end to an ordinary cylindrical cotton wick. For the vaporisation of medicines which are insoluble in alcohol, these are placed in bowls or, in the form of briquettes, on a support over the glowing oxidising body. The lamp may be constructed as a combined disinfecting and incandescent lighting lamp by a modification consisting in replacing the refractory rod by a downwardly extending tube filled with a cotton wick, the lower end of which lies with the main lamp wick, the upper end of the tube carrying a small burner fitted with a mantle, &c. The heat imparted to the tube by the oxidiser vaporises the alcohol absorbed by the wick.—H. B.

United States Patent.

"Sulphur Candle." C. H. Shaw, Brooklyn, New York. U.S. Pat. 698,748, April 29, 1902.

Sulphur is moulded in a circular container, having circumferential grooves, and fitting into a removable cap-shaped piece forming the bottom. The sulphur is provided with a central cavity and with an annular wick lining the cavity.—R. S.

XIX.—PAPER, PASTEBOARD, Etc.

Fertiliser; An Artificial —— [*from Waste Sulphite Cellulose Liquors*].

See under XV., *page* 783.

English Patent.

Cellulose from Cotton Seeds; Manufacture of Pure ——. O. Imray, London. Communicated by the American By-Products Co., New York, U.S.A. Eng. Pat. 19,585, Oct. 1, 1901.

See U.S. Pat. 683,785; this Journal, 1902, 63.—J. F. B.

United States Patents.

Wood; Grinding Machine for ——. H. Wegerer, Gloggnitz, Austria. U.S. Pat. 699,600, May 6, 1902.

In a machine for grinding wood for the manufacture of paper pulp, means are provided whereby a number of blocks of wood may be piled in each of a number of receptacles or boxes grouped about a rotatory grinding stone, so that the grain of the wood will lie longitudinally, relatively to the periphery of the stone. Means are also provided for feeding the blocks of wood automatically to the stone, and for supplying jets of water to the periphery of the stone; also for obtaining access to the stone for dressing or cleaning, without removing it from the machine. —J. F. B.

Paper or Pulp-Board Making Machine. L. Atwood, Philadelphia. U.S. Pat. 698,428, April 29, 1902.

The pulp is laid in layers on a roll or drum, and the tube so formed is automatically cut and delivered from the machine as a sheet, without handling. The cutting blade is actuated by a spring to cut the tube, and is withdrawn by a cam. The cut tube or sheet is delivered from the roll on to a conveyor, mounted on a pivoted frame or feed-table, which is counterbalanced at the end farthest from the roll. At the counterbalanced end the frame is provided with a series of pivoted "layboys," which deliver the sheets from the machine and deposit them in a pile on the floor, or on a truck, &c.—R. A.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Mercury Tannate of Constant Composition; Preparation of ——. Zdarek. J. Pharm. d'Anvers, 58, 98.

Twenty grms. of freshly-prepared mercurous nitrate are moistened with a few drops of water, and triturated in a mortar to a very fine powder. A solution of tannin (12 grms.) in water (2 grms.) is then added, and the trituration continued for half an hour. The product is then treated with a large excess of water, and the precipitate formed washed by decantation until free from nitric acid. It is then collected and dried at 30° C. It contains, on an average, about 55·7 per cent. of mercury. It is essential that the trituration, should be thoroughly carried out for the prescribed period; otherwise, a basic combination, containing a much higher percentage of mercury, will be formed.—J. O. B.

Atoxyl [*Anilide of Metarsenic Acid*]. Pharm. Zeit., 47, [22], 211.

The anilide of metarsenic acid has been introduced into therapeutics under the name "Atoxyl," given on account of its alleged extremely low toxic action on the animal organism, which allows of the administration of 40 to 50 times more arsenic than is possible in the form of arsenious acid. It forms a white crystalline, odourless and tasteless powder, which is readily soluble in water.—J. O. B.

Tartar Emetic; Electrolysis of ——. F. v. Hemmelmayer.

See under XXIV., *page* 796.

Ether Explosions. E. von Neander. Chem.-Zeit., 1902, 26, [31], 336—337.

The author draws attention to certain instances in which the residues left after the evaporation of ethereal extracts exploded. The only cases of ether explosions of this kind previously recorded appear to be those given by J. König (Landwirthschaftl. Versuchsstat., 1890, 37, 1). In determining fat in raw cotton, the ethereal extract was evaporated at about 70° C., and two of the flasks containing the residue were placed in a drying oven. After about 20 minutes, the temperature being still below 100° C., a violent explosion took place, by which one of the flasks was broken, whilst after a further five minutes another less violent explosion occurred. The evaporation was completed on the water-bath with the aid of a strong current of air, but even then explosions occurred, although of a much less violent nature. The ether used for the extraction was a small quantity which had stood undisturbed at the bottom of a carboy for about 18 months. It contained hydrogen peroxide, traces of ethyl and vinyl alcohols, aldehyde, and a substance, probably ozone or ethyl peroxide, which at once separated iodine from potassium iodide. The ether contained in 1 c.c., 0·0032 and 0·191 grm. of active oxygen as measured by the iodine liberated from neutral and acid solutions of potassium iodide respectively; the difference between these figures may at once be calculated to hydrogen peroxide. A non-explosive ether, containing the same impurities, showed only 0·0019 grm. of total active oxygen (estimated from amount of iodine liberated from an acid solution of potassium iodide), but the amounts of iodine liberated from a neutral and acid solution of potassium iodide respectively were in approximately the same ratio as with the explosive ether. Ozone could not be detected by the blackening of silver foil; consequently the substance which causes the immediate separation of iodine from potassium iodide may be ethyl peroxide.

The explosions are apparently due to the active oxygen, and with a content of 0·26 per cent. of the latter, only when other organic substances, such as fat, are present, as the ether does not explode when evaporated alone.—A. S.

Ether Explosions; Cause of ——. W. Kleemann. Chem.-Zeit., 1902, 26, [35], 385.

Referring to the communication on this subject by von Neander (see preceding abstract), the author states that some years ago he was drying the ethereal extract of a sample of unwashed wool in a platinum basin in the drying oven at 100° C., when after 10 minutes there was a violent detonation. Extracts of the same wool cautiously evaporated on the water-bath left a white emulsion-like residue, which, on ignition, burnt explosively like guncotton.—C. A. M.

Ether Explosions; Investigation of ——. J. Hertkorn. Chem.-Zeit., 1902, 26, [37], 407.

According to the results of the author's experiments, drying oil distributed over the surface of animal or vegetable fibre undergoes spontaneous ignition much more rapidly than when spread over mineral fibre, such as asbestos, glass wool, &c., even when the exposed surface of the latter is as great or greater than that of the animal or vegetable fibre. The effect of this difference of structure of the fibre upon the decomposition of ether is illustrated by the following experiments:—Two balls of equal size, one of cotton wool and the other of glass wool, were saturated with ether under similar conditions. On pressing the cotton-wool ball upon a hot plate (200°—300° C.) for a few seconds there was an evolution of vapour, and when, on the occurrence of a small blue flame, the ball was withdrawn from the plate, the decomposition of the ether continued quietly until the whole of it was consumed. When once started the reaction could be communicated from one saturated cotton-wool ball to another, whilst by the use of a suitable funnel apparatus, the decomposition could be carried on continuously in the cold, fresh ether being introduced as the products of the oxidation were carried off. The addition of alcohol retarded, and if in sufficient quantity prevented, the reaction. Similar experiments with balls of glass wool gave negative results in most cases. The products of this "catalytic" oxidation of ether were found to consist, in the main, of aldehydes and volatile acids.—C. A. M.

Alkaloids; Determination of the Solubility of ——. R. A. Hatcher. Amer. J. Pharm., 1902, 74, 134—137; through Analyst, 1902, 27, [314], 159—160.

The method devised by the author is intended for the determination of the solubility of alkaloids that do not readily dissolve in water. The alkaloid (0·1 grm.) is triturated with about 9 c.c. of water, sufficient normal sulphuric acid added from a burette, to just convert it into the sulphate, and the solution made up to 10 c.c. Several portions (1 c.c.) of this solution are then diluted with water in different proportions, and each treated with normal sodium hydroxide in slight excess, the relative amounts of precipitates giving an indication of the solubility. Two fresh portions of 1 c.c. each are then diluted, one slightly above and the other slightly below the point found in the first determination, and the sodium hydroxide added as before. Finally, a third determination, based on the second results, gives the solubility. For example, a solution of cinchonine sulphate containing 1 part in 22,000 gave a slight precipitate on the addition of a slight excess of sodium hydroxide, whilst there was no precipitate with a solution containing 1 in 24,000, and the solubility was therefore taken as 1 in 23,000.

In the case of morphine, the solubility of which is known to be 1 in 4,350, portions of 1 c.c. of the sulphate solution diluted to 43 c.c., and treated with sodium hydroxide in slight excess, gave a slight precipitate, whilst portions diluted to 44 c.c. remained clear. Hence, the solubility was taken as the mean of these results, or 1 part in 4,350.

—C. A. M.

Aristoquinine. H. Dreser. Pharm. Zeit., 47, [22], 210.

Diquinine carbonic acid ester has been introduced into medicine under this name on account of its relatively slight taste, due to its sparingly solubility. It is stated to be readily absorbed, and to produce prompt and lasting therapeutic effects. Its toxicity on protozoa is stated to be double that of quinine.—J. O. B.

Lead and Mercury Cathodes in Sulphuric Acid Solutions; Reducing Action of ——. (Caffeine, Acetone, and Camphor.) J. Tafel and K. Schmitz. Zeits. für Elektrochem., 1902, **8**, [10], 281—288.

In an earlier paper an account is given of the reduction of caffeine with lead and mercury cathodes (this Journal, 1900, 969), it was then found that under like conditions of current concentration and current density, the reduction was easier with the latter than with the former. But in that case the mercury cathode was horizontal, the lead cathode vertical. A new form of apparatus with horizontal cathode is described in which the distribution of the current is made as uniform as possible. With 50 c.c. of a solution of 2·5 grm. of caffeine in 50 per cent. sulphuric acid; a 50 per cent. H_2SO_4 as anode solution, a cathode area of 25 sq. cm., a current of 3 ampères, and a temperature of 20°—21° C., the current efficiency with mercury cathode was 84 per cent. initially, rapidly falling to 10 per cent. in one hour, and then more slowly. With lead cathodes, the current efficiency was about 50 per cent. at first, rising in five minutes to 53·5 per cent., and then falling gradually to 20 per cent. in one hour, and then, still gradually, to zero in three hours. The earlier observation is thus confirmed, that *ceteris paribus* the reduction is more energetic with the mercury cathode. With lead cathodes and with concentrations between 5 and 45 grms. of caffeine per litre, the current efficiency is directly proportional to the concentration of the caffeine in the solution. With the mercury cathodes no such relation was observed. A comparison of horizontal with vertical lead cathodes gave results in favour of the latter. Experiments showed that strongly amalgamated plates are better than pure lead cathodes.

Reduction of Acetone and of Camphor with Mercury and Lead Cathodes.—The electrolytic reduction of ketones in sulphuric acid solution with lead or carbon electrodes has been described by Merck (Ger. Pat. 113,719) and Elbs (this Journal, 1901, 700), the products being alcohols and pinacones. Camphor was not readily reduced with lead cathodes, but, with mercury cathodes gave a product consisting chiefly of borneol (yield 45 per cent. of the theoretical).—W. G. M.

Eucalyptus Oils, New; Characters and Constituents of——. Schimmel's Report, April 1902, 39—41.

Eucalyptus angophoroides.—Apple-top box, has yielded (R. T. Baker, Proc. Linn. Soc., New South Wales, 1900, [14]) 0·185 per cent. of oil having the sp. gr. 0·9049 and the $[\alpha]_D = -12·7°$. It contains much phellandrene and a small quantity of pinene. On rectifying the fraction boiling at the temperature of cineol, it was found to contain only 26 per cent of that body.

Eucalyptus fletcheri.—Lignum vitæ, or black box, gave 0·294 per cent. of oil, sp. gr. 0·8805, $[\alpha]_D = -14·2$. It contains much phellandrene and but little cineol.

Eucalyptus intermedia.—Bloodwood, or bastard bloodwood yielded only 0·125 per cent. of oil, sp. gr. 0·8829, $[\alpha]_D = +11·2°$. It consists chiefly of pinene, and contains but little cineol. The oil of the same species grown in the neighbourhood of Sydney, was lævo-rotatory to approximately the same degree.

Eucalyptus lactea.—Spotted gum, gave 0·541 per cent. of oil containing no phellandrene, and but little cineol. Sp. gr. 0·8826; when rectified, 0·8788. The crude oil is optically inactive.

Eucalyptus nigra.—Black stringy bark, yielded only a small amount of oil.

Eucalyptus ovalifolia.—Red box, gave 0·27 per cent. of oil, sp. gr. 0·9058, $[\alpha]_D = -9·93°$. It contains much phellandrene, and only a little cineol.

Eucalyptus polybractea.—Blue mallee, gave in December 1·5 per cent. of oil of good commercial quality. Sp. gr. 0·9143, $[\alpha]_D = -2·13°$. When rectified, the sp. gr. fell to 0·9109. The oil had a strong odour of cineol, and was yellowish in colour. On fractional distillation 91 per cent. passed over below 183° C. This distillate contained 57 per cent. of cineol.

Eucalyptus pulverulenta.—A specimen of this oil from Australia, examined by Schimmel's, had the sp. gr. 0·9217 and the $[\alpha]_D = +1° 4'$. It is soluble in 2 volumes of alcohol 70 per cent., and contains but little phellandrene. It might therefore be used as a substitute for the oil of *E. globulus.*

Eucalyptus umbra.—Stringy bark, bastard white mahogany, yielded 0·155 to 0·168 per cent. of oil. Sp. gr. 0·8901—0·8963; $[\alpha]_D = +41·5°$ to 43·8°. It contains much dextro-pinene, but little cineol. An acetic ester is present, the saponification number of the oil being 35·8.

Eucalyptus wilkinsonia.—(*E. haemastoma* v. F. v. M.; *E. lævopinea* var. *minor.*, Baker), gave 0·9 per cent. of oil. Sp. gr. 0·894; $[\alpha]_D = -23·9°$. 80 per cent. distils over below 170° C., and consisted chiefly of lævopinene. At certain seasons, the oil contains a little cineol, at others, some phellandrene; it also contains a small amount of an ester.

Eucalyptus woolsiana.—Mallee box, yielded 0·495 per cent. of oil. Sp. gr. 0·889, $[\alpha]_D = -13·7°$. It contains only traces of cineol. Aromadendral, which was at first supposed to be cumic aldehyde, is also present in this oil.
—J. O. B.

Lavender Oil; Adulteration of ——, with Benzoic Acid. Schimmel's Report, April 1902, 46.

The adulteration of lavender oil with 1·5 per cent. of benzoic acid is recorded. The sophistication was indicated by the unduly high acid number which was 6·6 and 6·8 for two samples, while pure oil is practically neutral.—J. O. B.

Polygonum Persicaria; Essential Oil of —— [Knotgrass Oil]. P. Horst. Chem.-Zeit., **25**, 1055; through Schimmel's Report, April 1902, 80.

Polygonum persicaria has yielded a small amount, 0·053 per cent., of a volatile oil containing volatile acids, of which acetic and butyric acids were identified, a crystalline camphor-like body, persicarol, and a liquid portion not yet completely examined.—J. O. B.

Cinnamon Oil; New Constituents of ——. Schimmel's Report, April 1902, 14—19.

In addition to eugenol, phellandrene, and cinnamic aldehyde, the previously-known constituents of cinnamon oil, the following bodies have been identified among its constituents:—Methyl normal-amyl ketone, pinene, cymene, furfural, benzaldehyde, nonyl aldehyde, cumic aldehyde, linalol isobutyrate. Methyl normal amyl ketone, furfural, and caryophyllene are also met with in clove oil, of which moreover, eugenol is the chief constituent.—J. O. B.

Citronella Oil, Java; Presence of Dextro-Citronellol in ——. Schimmel's Report, April 1902, 20.

Dextro-citronellol has been isolated, and recorded for the first time as occurring in a natural product, from Java citronella oil. It has not been found in the same oil distilled in Ceylon.

The geraniol fraction of the Java oil was treated with $CaCl_2$, and the uncombined portion removed by treatment with petroleum benzine. After distilling off the solvent the residual oil was distilled, treated with phthalic anhydride and heated on the water-bath for 12 hours. The acid phthalic ester thus formed was dissolved in an equivalent of dilute NaOH solution, the decomposed geraniol shaken out with ether, and the citronellol liberated from the aqueous solution of its ester by saponification with KOH solution. After repeating the process to remove the last traces of geraniol, the dextro-citronellol obtained, agreed in all respects except its optical rotation $[\alpha]_D = +2° 7'$ to $2° 33'$ with the lævo citronellol of geranium oil which has the $[\alpha]_D = -1° 40'$.—J. O. B.

Anthranilic Acid; Preparation of ——. Basel Chemische Fabrik in Basel. Ger. Pat. 130,301, Jan. 2, 1901. Zeits. angew. Chem., 1902, **15**, [17], 404.

The anthranilic acid is formed by boiling phthalylhydroxylamine with sodium carbonate solution. 10 kilos.

phthalylhydroxylamine and 4 kilos. of sodium carbonate are dissolved by warming with 100 litres of water, and the blood-red solution boiled vigorously till evolution of carbon dioxide ceases, and the red colour changes to a light yellow. The solution is then concentrated, and the anthranilic acid precipitated with hydrochloric acid.—A. S.

Anthranilic Acid ; Preparation of ——. Baseler Chemische Fabrik in Basel. Ger. Pat. 130,302, Jan. 22, 1901. Zeits. angew. Chem., 1902, **15**, [17], 404.

An addition to Ger. Pat. 130,301 of 1901 (see preceding abstract). The claim is for the preparation of anthranilic acid by heating, in place of phthalylhydroxylamine itself, its alkali salts in aqueous or dilute alcoholic solution with sodium or potassium carbonate.—A. S.

Methyl-n-amyl Ketone and Methyl Benzoate; Presence of —— in Clove Oil. Schimmel's Report, April 24, 1902.

In order to verify the occurrence of methyl-*n*-amyl ketone in oil of cloves, the first runnings of the distillation, which boiled at or below 159° C., were treated with sodium bisulphite. On decomposing the bisulphite compound thus obtained, a peculiar irritant odour, probably due to valeraldehyde was evolved. The ketone liberated was freed from furfural by oxidation with 1 to 2 per cent. $KMnO_4$ solution, and fractionated. The major portion boiling at 151°—153° C. was found to have the sp. gr. 0·8223 at 15° C. and was optically inactive. Its identity was established by the melting point of its semicarbazone, 122°—123° C. The fraction (of clove oil) distilling between 200°—240° C. when saponified gave a considerable quantity of benzoic acid. The acid is probably present in the oil as methyl benzoate.—J. O. B.

Glycosal. L'Union Pharm., **43**, 156. Pharm. J., 1902, **68**, [1664], 410.

Under the name of glycosal, the "glycerin ester of monosalicylic acid" has been introduced as a substitute for other salicylates. It occurs as a white crystalline powder, soluble in 100 parts of cold water.—A. S.

Essential Oils in Spices and Perfumery ; Quantitative Determination of ——. C. Mann.

See under XXIII., *page* 794.

English Patents.

...ovaleramide ; Manufacture of New Derivatives of ——. O. Imray, London. From A. Liebrecht, Frankfurt-on-Main, Germany. Eng. Pat. 13,205, June 28, 1901.

...ee U.S. Pat. 697,730; this Journal, 1902, 638.

—A. C. W.

... and β-Ionone ; Manufacture of Homologues of ——. A. G. Bloxam, London. From Société de Laire et Cie., Paris, France. Eng. Pat. 15,127, July 25, 1901.

...e processes are claimed for the manufacture of the ...omologues of α- and β-ionone, which consist in treating ...e homologues of pseudo-ionone with condensing agents, ... in condensing cyclocitrals with homologues of acetone. ...e products are also claimed; α-methylionone boils at ...0°—150° C. under 20 mm. pressure, its specific gravity ...0·925—0·931; β-methylionone has the same boiling ...int, and the specific gravity 0·935—0·940.—A. C. W.

...ffusion Process; Batteries for the ——, for obtaining ...Juices, Saps, Essences, Pigments, &c. from Matters containing them. A. Rak. Eng. Pat. 16,945, 1901.

See under XVI., *page* 783.

United States Patents.

Zinc-Gelatose Compound. A. Eichengrün and R. Berendes, Elberfeld, Germany. U.S. Pat. 698,694, April 29, 1902.

The patentees claim as a new pharmaceutical product, the zinc compound of gelatose (from gelatin and superheated steam), which is an amorphous powder soluble in water and insoluble in ether, benzene, and chloroform. The compound is obtained by dissolving gelatose in dilute alcohol, adding a solution of a zinc salt and precipitating by alcohol; it is stated to be a valuable astringent devoid of irritant action on the mucous membrane.—A. C. W.

Aloïn Derivative, and Process of making same. E. Seel, Stuttgart, Germany. U.S. Pat. 698,746, April 29, 1902.

The process consists in boiling an aqueous solution of aloïn with a persulphate, cooling, and filtering off the yellowish-red powder. The product is also claimed; it is nearly insoluble in water and alcohol, gives a reddish-brown solution in alkalis, and a red solution in strong sulphuric acid. It is stated to be of great therapeutic value as a purgative.

—A. C. W.

Methylene Citric Acid, and Process of making same. W. Sternberg. Assignor to Chemische Fabrik auf Actien vorm. E. Schering, Berlin. U.S. Pat. 699,422, May 6, 1902.

Citric acid is heated with four times its weight of polymeric formaldehyde to 140°—160° C., and the melt is allowed to crystallise. The methylene citric acid formed, which is said to be useful for the disinfection of the urinary passages, melts at 208° C., is sparingly soluble in cold and readily in hot water.—T. A. L.

Dimethylene Tartrate, and Method of making same. W. Sternberg. Assignor to Chemische Fabrik auf Actien vorm. E. Schering, Berlin. U.S. Pat. 699,423, May 6, 1902.

Tartaric acid is heated with polymeric formaldehyde to 140°—150° C. until a clear solution is obtained. After cooling to 60° C., the product is mixed with sulphuric acid, the temperature not being allowed to rise above 80° C. The melt is then poured on to ice, when the new compound, separates and can be filtered off. Dimethylene tartrate (tartaric acid dimethylene ester), is said to be useful for disinfecting the urinary passages. It dissolves in warm water with decomposition, giving off formaldehyde, and is readily soluble in alcohol, acetone, and chloroform, crystallising in fine needles melting at 120° C.—T. A. L.

Camphor ; Process of Producing ——. N. Thurlow, Newark, New Jersey, U.S.A. U.S. Pat. 698,761, April 21, 1902.

The process consists in heating (spirits of) turpentine with oxalic acid, acting on the resulting mixture with lime in order to decompose the esters, distilling to separate the borneol and camphor and then oxidising the borneol to camphor. Pinyl formate, which is one of the products of the action of oxalic acid on turpentine, is also claimed; it boils at 160°—163° C. under 680 mm. vacuum, does not solidify at −17° C., is decomposed on heating into borneol and carbon monoxide, and by caustic alkalis into hydrocarbons and a formate.—A. C. W.

XXI.—PHOTOGRAPHY.

Ammonium Persulphate "Reducer." Brit. Jour. Phot., 1902, **49**, [2193], 381—382.

Bernholt has observed that negatives treated with alum or formaldehyde are not reduced by ammonium persulphate in the usual manner. This supports the views of Lüppo-Cramer, who found that there was a notable increase of temperature accompanying the action of ammonium persulphate on silver, and that when the quantity of metal was large, the heat was sufficient to dissolve the gelatin; that the solution of the gelatin by the heat generated plays an important part in the process is supported by the fact that

hindrance of the process occurs through raising the melting point of the gelatin by a preliminary treatment with alum or formaldehyde.—J. W. H.

ENGLISH PATENTS.

Silver-haloid Layers Sensitive to Rays of Different Degrees of Refrangibility; Process of Rendering ——. C. D. Abel, London. From The Actien-Ges. für Anilin Fabr., Berlin. Eng. Pat. 11,719, June 7, 1901.

As a rule, the application of a single dyestuff to the film of a photographic plate, renders it sensitive to a narrow zone of the spectrum only; the optical effect also of a mixture of dyestuffs is not the sum of the optical effects of the components. The inventors have discovered that by soaking plates successively in the different dyestuffs, taking care to wash away the excess after each treatment, most successful panchromatic plates are obtained.—J. W. H.

Photography: Manufacture or Production of Flash Lights for ——. H. E. Newton, London. From the Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 23,292, Nov. 18, 1901.

FLASH-LIGHT powders are manufactured by mixing magnesium or aluminium, or a mixture of these metals, with magnesium peroxide (MgO_2), calcium peroxide (CaO_2), or manganese dioxide, or mixtures of these bodies, with or without the addition of other suitable substances, such as strontium nitrate.—H. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

UNITED STATES PATENT.

Matches; Ignition Material for ——. R. E. A. Gans, Pankow, Germany. U.S. Pat. 698,698, April 29, 1902.

THE specification refers to Eng. Pat. 25,102 of 1898 (this Journal, 1899, 1052), but the patentee only claims an ignition material composed of a (barium) salt of a polythionic acid, and a substance which readily yields oxygen (potassium chlorate).—A. C. W.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Electric Furnace for the Laboratory. Eng. and Mining J., May 17, 1902.

A NEW form of electric resistance laboratory furnace has been invented by Holborn, which permits temperatures up to 1,500° C. being attained with ease by use of the ordinary 110-volt electric supply. The furnaces are made in two forms, the first being adapted for heating crucibles, and the second for heating tubes 44 cm. in length. In both forms of furnace, the electric current is conducted through a resistance coil of platinum or nickel wire, wound round a thin porcelain tube or cylinder. The crucible or substance to be heated is placed within this latter, and the space between the outer side of the coil and the containing vessel is packed with asbestos or powdered quartz. Using nickel, the temperature of the furnace cannot be raised above 1,000° C. without damage to the coil, but with platinum, it is possible to attain a temperature of 1,500° C. with a current of 14 ampères and 110 volts.

UNITED STATES PATENT.

Electric Combustion Furnace. W. M. Carr, East St. Louis. U.S. Pat. 699,146, May 6, 1902.

THE furnace consists of a combustion tube enclosed in a cylinder, round the end portions of which a wire is spirally wound, whilst another and separate wire is wound spirally around its middle portion. Means are provided for passing an electric current alternatively through the wire around the end portions, and through both wires simultaneously.
—G. H. B.

INORGANIC—QUALITATIVE.

Hydrochloric Acid: Purification of —— *from Arsenic.* L. T. Thorne and E. H. Jeffers. Proc. Chem. Soc., 18, [252], 118—120.

THE author states that hydrochloric acid may be rendered free from arsenic by means of a modification of the well-known Reinsch test for arsenic in the following manner. The acid to be purified is diluted with water till its specific gravity is about 1·10, then raised to the boiling point, and a piece of the purest fine copper gauze introduced. When a couple of litres of liquid are being dealt with, the gauze should be about four inches square, and coiled very loosely (about 1½ to 2 turns) round a long glass rod flattened at the end, as in this way it can be readily introduced and removed, besides being brought into better contact with the liquid. The whole is then kept just boiling for an hour, when the gauze will have become more or less blackened, and should be replaced by a second piece and the digestion continued for another hour. If this piece is also blackened, a third is used, and so on, until the gauze remains perfectly bright after about an hour's digestion. With moderately good acid, two, or at most three, pieces of gauze are sufficient. The acid is at once transferred to a retort and distilled from a fresh piece of gauze. It is advisable, as a precaution, to reject the first 20 per cent. of the distillate, though even this is very rarely contaminated if the digestion is carefully carried out, and from 100 to 200 c.c. should be left behind in the retort. The method is simple and requires but little attention, and it is not necessary to use the purest acid; even good muriatic acid, "commercially free from arsenic," may be satisfactorily employed. The acid obtained is the constant boiling point acid, which is about the most suitable strength for use in the Marsh-Berzelius test.

The gauze must, of course, be gently ignited before being used, and should not be introduced until the acid is just beginning to boil. It is also preferable not to allow the digested liquid to cool in contact with the air before transferring it to the retort, as the copper gauze would be much attacked and its efficiency for the present purpose considerably lessened by the consequent oxidation.

Iron and Steel; A Remarkable [*Carbamine*] *Reaction of* ——. V. v. Cordier. Monatsh. für Chem., 1902, 23, [3], 217—235.

THE results of the observations are thus summarised:—When iron containing carbon and nitrogen is dissolved in dilute hydrochloric or sulphuric acid, and an excess of alkali or ammonia is added, whether during the evolution of hydrogen or afterwards, a marked odour of isonitrile is observable. Neither chemically pure iron, nor iron containing carbon or nitrogen alone, nor any mixture of such irons, gives the reaction; it is necessary that the carbon and nitrogen shall both be present in the same sample of iron. It is possible that the two elements exist in the form of a radicle in the specimens which give the reaction for a mixture of separate particles of iron containing N and no C, and of iron containing C and no N, which gives no carbamine [carbylamine] odour as it stands, gives the reaction markedly if the particles are heated together strongly *in vacuó* for some two hours before applying the test. The intensity of the reaction depends on the proportion of nitrogen accompanying the carbon in the iron. The strong smell observed during the reaction is due to a very volatile compound, which is not retained by water but is readily absorbed by dilute mineral acids, as may be shown by litmus silk (see this Journal, 1901, 1142). This volatile compound is in all probability ethylcarbamine. To identify this the vapours were led into dilute mineral acids, and by means of microchemical analysis the presence of ethylamine was established by the characteristic crystalline form of its double salt with platinum. The formic acid was also identified by collecting the vapours in dilute sulphuric acid, evaporating to dryness, heating the dried mass with phosphoric acid, and reducing palladium chloride by means of the CO evolved.

No.	Nature of Iron used.	Carbon. Combined.	Carbon. Graphite.	Si.	Mn.	P.	Lassaigne's N-Test, in Atmosphere of CO_2.	Smell of Isonitrile from HCl Solutions with NH_3 and KOH.	Crystals of $(C_2H_5.NH_2HCl)_2PtCl_4$ and Litmus-Silk Reaction.	Remarks.
1	Bessemer pig	0·58	3·30	2·90	1·80	0·093	Strong	Marked	Recognisable	
2	Forge pig	0·78	2·90	1·50	2·74	0·224	,,	,,	,,	
3	Basic pig.....	3·20	Trace	0·95	2·45	3·23	Slight	Slight	,,	
4	Flower wire	..	..	..	..	..	Marked	,,	,,	
5	Wrought-iron turnings.	..	..	..	..	..	Strong	Very marked	Recognisable	Confirmed by palladium chloride test and spectroscopically.
6	Iron powder	..	..	..	..	..	Marked	Marked	,,	Commercial ferrum hydrogenium.
7	Hard steel	0·60	..	0·094	1·15	0·016	,,	,,	,,	
8	Sheet iron	0·22	..	..	0·80	0·042	,,	,,	,,	Basic Martin steel.
9	Thicker sheet iron .	0·13	..	..	0·60	0·070	,,	,,	,,	,, ,,
10	Steel.....	0·34	..	0·094	1·15	0·024	,,	,,	,,	,, ,,
11	Angle-iron.....	0·05	..	..	0·60	0·070	,,	,,	,,	Basic Bessemer steel.
12	Pure iron	..	..	..	..	..	Failed	Nil	Not observable.	Fe_2O_3 reduced by H.
13	Fe with N, but no C	..	..	..	..	..	Strong	,,	,,	Pure Fe, heated in NO.
14	Fe with C, but no N	..	..	..	..	..	Failed	,,	Not observable.	Fe_2O_3 reduced in CO.
15	No. 13 + No. 14....	..	..	..	..	..	Strong	,,	..	Equal parts.
16	,, ,,	..	..	..	..	..	,,	Very marked	..	Same as 15, but heated for some time *in vacuo*.
17	No. 14 + nitrogen .	..	..	..	..	..	,,	,,	Recognisable	No. 14 heated in NH_3.
18	Iron containing CN	..	..	..	..	..	,,	,,	..	No. 12 heated in CN.
19	,, ,,	..	..	..	..	..	,,	,,	..	Fe_2O_3 heated in HCN.
20	,, ,,	..	..	..	..	..	,,	,,	..	No. 12 heated, first in CO, then in N.
21	,, ,,	..	..	..	..	..	Fairly well marked.	Fairly well marked.	..	No. 12 heated, first in N, then in CO.
22	Iron containing much Mn.	..	..	..	32·01	..	Failed	Nil	..	Obtained as FeMn amalgam by electrolysis of $FeCl_2$ + $MnCl_2$.
23	Iron containing much Mn, containing CN also.	..	..	..	..	..	Marked	Marked	..	No. 22 heated, first in CO, then in N.
24	,, ,,	..	..	..	..	..	,,	,,	..	No. 22 heated, first in N, then in CO.
25	,, ,,	..	..	..	..	..	Strong	Nil	..	No. 14 mixed with Mn_3N_2, and then heated *in vacuo*.

—W. G. M.

INORGANIC—QUANTITATIVE.

Iodeosin as an Indicator in Volumetric Analysis. C. Glücksmann. Zeits. Oesterr. Apoth.-V., **40**, 390—393. Chem. Centr., 1902, **1**, [19], 1131.

Iodeosin shows, according to the author's experience, similar stoichiometric relations to Methyl Orange, but if used in conjunction with ether, gives an excellently sharp change from colourless to rose colour. Iodeosin is indifferent towards chemically pure boric acid. If commercial boric acid reacts alkaline towards iodeosin, this is due to the presence of borax. The amount of borax in boric acid, and also the alkalinity of borax, can be accurately determined by means of standardised hydrochloric acid, using iodeosin as indicator. Iodeosin is also very useful for the titration of pure phosphoric acid solutions with caustic soda; ortho-phosphoric acid behaves in the titration as a monobasic acid. Baryta water cannot be used as the alkali, as even before formation of the primary salt, precipitates are produced, which, of course, interfere with the method. Still less accurate is the titration of phosphoric acid with baryta water and phenolphthalein, where a secondary salt is formed.—A. S.

Alums; Volumetric Determination of Aluminium and Free and Combined Sulphuric Acid in ——. A. H. White. J. Amer. Chem. Soc., 1902, **24**, [5], 457—466.

By titrating a solution of alum containing neutral potassium sodium tartrate, with barium hydroxide solution, only the free sulphuric acid, and that combined with the aluminium are determined, whilst that in combination with sodium or potassium is not shown (Phenolphthalein is the indicator used). Again, by evaporating a duplicate portion of the alum solution to dryness, dissolving the residue in a neutral solution of sodium citrate, and titrating the solution with barium hydroxide, the difference between the result and that obtained in the former titration is equivalent to a third of the aluminium.

From these results the amounts of sulphuric acid and aluminium can be calculated, and it can be determined whether the alum was basic or acid. Solid commercial aluminium sulphate may contain free acid, which does not appear in the solution, owing to its combining with basic portions of the solid salt. This free acid may be determined by dissolving the salt in sodium citrate solution and rapidly titrating with barium hydroxide solution, with phenolphthalein as indicator.

The precipitate of barium sulphate formed in these titrations does not appear immediately, but is retarded for a period varying from a few minutes to several hours. When formed, it has a peculiar colloidal appearance.

—C. A. M.

Lead from a Phosphoric Acid Solution: Electrolytic Deposition of ——. A. F. Linn. J. Amer. Chem. Soc., 1902, **24**, [5], 435—439.

In his experiments on the electrolytic determination of lead in a solution containing an excess of phosphoric acid, the author precipitated the metal from a definite volume of lead nitrate solution by means of disodium hydrogen phosphate or phosphoric acid, dissolved the phosphate in an excess of phosphoric acid (sp. gr. 1·71), and electrolysed the solution. The deposited metal was washed with freshly-boiled water, alcohol, and ether, and dried at 100°—110° C.

It was found that when the lead was first precipitated by phosphoric acid, the metal deposited was partly crystalline and partly spongy, but still sufficiently adherent to be thoroughly washed, unless too much lead was present, or too strong a current had been used.

The most satisfactory experiments showed that quantitative results could be obtained by using a solution containing not more than 0·1 grm. of lead, and to which about 10 c.c.

of sodium phosphate solution, and 12—14 c.c. of phosphoric acid (sp. gr. 1·71) had been added. With a current of $N.D._{100} = 0·003$ ampère and voltage 3, the deposition was complete in 12—14 hours, at the ordinary temperature.

Separation of Lead from Manganese.—A solution of manganese phosphate in phosphoric acid was hardly affected even by strong currents continued for 17 hours. When, however, a solution containing both lead and manganese was electrolysed under the following conditions—$N.D._{100} = 0·011$ ampère; voltage = 3; dilution = 130 c.c., and phosphoric acid = 14 c.c.—manganese dioxide was deposited on the anode, whilst the lead deposited also contained manganese.—C. A. M.

ORGANIC—QUALITATIVE.

Colouring Matters [Dyestuffs], in Fresh and Sour Milk; Detection of Artificial——. M. Wynter Blyth. Analyst, 1902, 27, [314], 146—153.

According to the author's experience, a large proportion of the milk retailed in this country is coloured with annatto or coal-tar dyestuffs (Methyl Orange or closely allied compounds).

Coal-tar dyestuffs are usually tested for by the addition of hydrochloric acid to the milk or separated curd; but the author points out that the pink colour is not given by certain coal-tar dyestuffs that might be employed, and that the test may fail when the milk is not quite fresh.

The milk residue from which the fat has been removed is thoroughly extracted with absolute alcohol, and the extract filtered and evaporated in three or four flat porcelain dishes. In the presence of unreduced colouring matters the residues will be orange, yellow, or brown. They are examined as described under A in the following scheme:—

A.—Alcoholic Extract, coloured Orange, Yellow, or Brown.

A. *Portion of the Residue is taken up with dilute Sulphuric Acid and shaken with Ether.*

The Ether dissolves some of the Colouring Matter.		The Ether does not dissolve the Colouring Matter.	
Natural Colouring Matters.	Non-sulphonated Acid Coal-tar Dyestuffs, such as:—	Basic Coal-tar Dyestuffs, such as:—	Sulphonated Coal-tar Dyestuffs, such as:—
Annatto. Turmeric. Saffron. Carotin.	Aniline Yellow. Butter Yellow. Victoria Yellow. Martius' Yellow.	Phosphine.	Acid Yellow. Methyl Orange. Orange IV.

B.—Aqueous Extract from the Fat.

The Colour is Noted and the Dry Residue tested with various Reagents.

Colour of Residue.	Probable Original Dyestuff.	1 drop of Fe_2Cl_6 Solution added.	Strong H_2SO_4 added to Ferric Chloride.	Other Reactions.
Brown	Acid Yellow	Dark green	Yellow, green on dilution.	
Brown	Butter Yellow	Dark blue-green	Yellow, green on dilation.	Slightly acid solution of dyestuff treated with a few drops of H_2S solution, then with ferric chloride, and heated — magenta colour.
Brown	Aniline Yellow	Yellow	Yellow	Violet colour with strong H_2SO_4 or HCl.
Yellow	Martius Yellow	Red	Yellow	Rose-red colour with strong HCl.
Yellow	Victoria Yellow	Red	Yellow	Same as Martius Yellow.
Rose-red	Methyl Orange	Fugitive scarlet	Yellow	Treated as Butter Yellow, —— blue solution.
Brown red	Orange IV.	Green	Scarlet, green on dilution.	Treated as Butter Yellow, —— dirty violet solution.
Yellow	Unreduced dyestuffs extracted by ether from alkaline solution.			

Caramel.—The following modification of Leach's method (J. Amer. Chem. Soc., 20, 207) is recommended:—50 c.c. of the suspected milk and 50 c.c. of a milk known to be free from caramel are coagulated by the addition of acetic acid, strained through fine muslin, and the colours of the wheys compared. The curds are just covered with strong hydrochloric acid and left in white basins for several hours, after which the colours are compared. A brownish-violet colour is obtained in the presence of caramel, but since the pure curd will also develop a similar colour after standing for a long time, caution is necessary in drawing a conclusion.

Sulphonated Azo Dyestuffs.—The presence of these may be confirmed by allowing the milk to become sour, and extracting the decomposition compounds; or by reducing the extracted dyestuff with zinc and hydrochloric acid, rendering the solution alkaline with ammonia, extracting it with ether, and examining the residue from the ethereal extract.—C. A. M.

ORGANIC—QUANTITATIVE.

Essential Oils in Spices and Perfumery; Quantitative Determination of——. C. Mann. Archiv der Pharm., 240, [2], 146—160, and [3], 161—166.

The distillation of the finely-ground spice previously mixed with powdered pumice stone is conducted in the apparatus shown in Fig. 1.

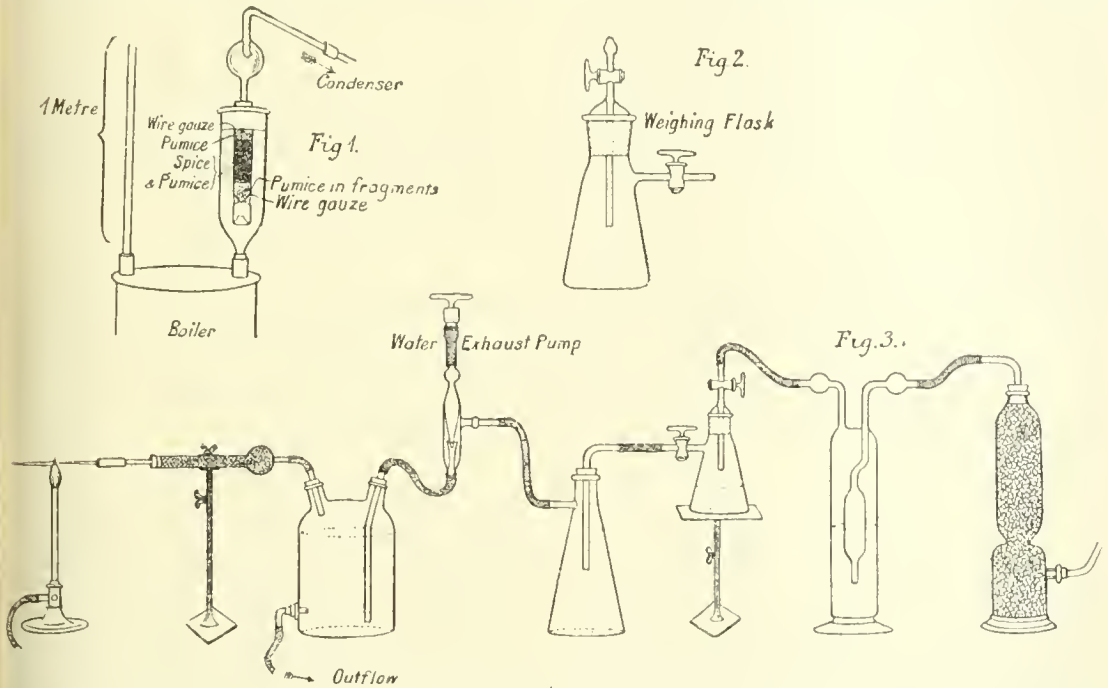
About 20 grms. of the spice are employed, which may be exhausted in one and a half to two and a half hours, with the production of 400 to 900 c.c. of distillate. The distillate is collected in a flask or measuring cylinder holding one to one and a half litres, furnished with a long neck which is graduated into 25 c.c.; sufficient pure salt dissolved in it to give a 25 per cent. solution, and the essential oil shaken out with 50 c.c. of rhigolene (light petroleum benzine) specially prepared by fractionating commercial petroleum spirit, and collecting only the portion boiling between 20°—35° C., consisting chiefly of pentane and hexane. After agitation and separation, sufficient water is added to bring the layer of rhigolene into the neck of the flask, and more rhigolene is added to make up 50 c.c. To determine the amount of oil, 25 c.c. of the rhigolene (= 10 grms. of the spice) are pipetted off, and placed in a specially constructed weighing bottle, of the capacity about 100 c.c. (Fig. 2), which is connected with an apparatus shown in Fig. 3, and the rhigolene evaporated by means of the stream of dried purified air drawn over it by means of the pump. The apparatus is so arranged that the rhigolene drawn off may be ignited at a jet, and thus indicate the completion of the evaporation of that solvent.

Experiments show that the presence of 0·0005 grm. of rhigolene can be detected in the weighing-bottle by above mentioned flame test.

To test the process, various oils were mixed with cellulose and the mixture extracted as above. The mean of 4 experiments showed a loss of 0·0136 grm. on 0·5225 grm. which compares favourably with the results obtained with other methods. Pure eugenol mixed with cellulose determined by this process, and by Thom's benzoyl eugenol method, gave results which, however, were not satisfactory. Benzaldehyde was determined by the process, and by Denner's method with phenylhydrazine. The result

obtained warrant the conclusion that the latter is incapable of yielding good results.

As a further check, mustard oil in mustard seeds was determined by Dietrich's method, and by this, with the result that more concordant figures were obtained by the method of Mann. A number of spices were treated by the method and gave the following percentages of essential oil: cloves, Amboyna, 19·204; anise, Italian, 3·104; ginger Cochin, bleached, 2·155; pepper, black, whole, 2·273; coriander, Thuringian, 0·942; cassia, 9·602; marjoram,



·022; fennel, Saxon, 4·956; caraway, Dutch, 6·027; mace, 13·212; pimento, 3·957; star-anise, Chinese, 3·801; mustard, black, Dutch, 3·941; cardamons, Malabar, 4·357.

Determination of Essential Oil in Perfumes.—If uncoloured, such as handkerchief perfumes, they may be treated as described for liqueurs not containing resins, &c. Otherwise they should be treated in the same way as liqueurs containing resins, &c., except that 5 to 10 grms. should be taken for examination instead of 100 c.c.—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Cerium Carbonates; Glucose and ——. A new Mechanism of Induced Oxidation. A. Job. Comptes Rend., **134**, [18], 1052—1054.

The author had observed the fact lately published by Baur that alkaline cerous carbonate solution, added to a solution of an alkaline arsenite, and agitated with air, acted as intermediary in the oxidation of the arsenite to arsenate. He now shows that this reaction proceeds by the initial oxidation of the (colourless) cerous carbonate to (red) perceric salt, which is then reduced by the arsenite to (yellow) ceric salt. As the ceric salt does not oxidise in the air, the amount of arsenite oxidised by a given amount of cerous carbonate is limited and definite. When for the arsenite solution glucose is substituted, the reaction is slower than with arsenite; but as the glucose reduces the perceric salt to cerous salt, which is again oxidisable by the air, an indefinitely large amount of glucose can be oxidised by a given amount of cerous salt, which thus behaves exactly like a true oxydase. Further, if to an alkaline ceric solution (which does not oxidise in the air), some glucose be added, the ceric solution, which in the first place is reduced, is ultimately converted by the air into perceric salt. The glucose has thus indirectly effected the oxidation of the ceric salt.—J. T. D.

Radio-activity of Thorium Compounds. Part II. The Cause and Nature of Radioactivity. E. Rutherford and F. Soddy. Proc. Chem. Soc., **18**, [252], 120.

The authors find that thorium from which ThX has been been separated regains its activity with time, whilst the activity of ThX decreases with time. At the end of three weeks the activity of the former again reached a maximum value, and the activity of the latter almost completely disappeared.

ThX possesses a distinct chemical behaviour which differentiates it from thorium. Ammonia is the only reagent of those tried capable of separating it from the latter. Ammonium carbonate, oxalic acid, and sodium phosphate give precipitates with normal activity, and the residues from the filtrates are inactive.

Using the radioactivity of the residues from the filtrates after precipitation of the thorium by ammonia, as a means of determining the amounts of ThX present, it was found that the amounts produced in varying intervals of time between successive precipitations agree with the requirement that ThX is being continuously produced by thorium compounds at a constant rate.

The rate of production of ThX and the rate of decay of its activity are apparently unaffected by known agencies. Both changes proceed independently of the chemical and physical conditions of the molecule.

The source of the energy required to maintain the radioactivity of thorium over indefinite periods is therefore to be found in a chemical change producing new types of matter.

Many of the results obtained by the authors in their investigation of the thorium emanation are now capable of explanation. Emanating power appears as a property of ThX, and not of thorium, and is proportional to the activity of the ThX present.

The present result, that radioactivity is the consequence of changes—independent of the conditions—in which new types of matter are formed, leads to the conclusion that radioactivity is the manifestation of sub-atomic chemical change.

Radio-activity of Uranium. F. Soddy. Proc. Chem. Soc., 18, [252], 120.

During an investigation of the radioactivity of uranium (conjointly with Rutherford), great differences arose between the results obtained and those of previous workers. These are traced to the methods employed for measuring radio-activity.

The α- or easily absorbed radiation is without appreciable action on the photographic film, and contributes by far the major portion of the ionisation effect observed by the electrometer. The β- or penetrating radiation, on the other hand, causes the whole of the photographic effect, but being little absorbed by gases, and constituting but a small proportion of the total radiation, its ionisation effect cannot be well observed by the electrometer without special arrangements.

UrX possesses all the β- with none of the α radiation, the latter being completely retained by the uranium. The β- is wholly deviable in the magnetic field, the α-radiation not at all.

The published methods of Crookes (*loc. cit.*) and Becquerel (Comptes Rend., 1900, 131, 137), fail to remove the α-radiation of uranium, or even to diminish its quantity. As in the case of thorium, this constitutes a residual activity, comprising only non-deviable radiation, and it has not yet been found possible to remove it by chemical means. Experiment shows that if it is a secondary radiation caused by UrX, it must take over a year to decay to half its value after the exciting cause is removed. It seems, therefore, more probable that it is caused by a second type of non-uranium matter, produced from the uranium by the same change as the UrX.

Barium and Calcium; Alloys of ——, with Cadmium. H. Gautier. Comptes Rend., 134, [18], 1054—1056.

Strontium hydride, prepared by the author (this Journal, 1902, 285), from the strontium-cadmium alloy, has similar properties to Moissan's calcium hydride; but the conditions of its formation are so different from those of barium hydride, prepared by Guntz from barium-amalgam, that it seemed desirable to prepare the barium-cadmium and calcium-cadmium alloys. These are obtained in the same way as the strontium-cadmium alloy, and the concentration of barium in the alloy can be increased to 45, that of calcium to 55 per cent. These two alloys are much more brittle than the strontium alloy, but their deportment towards other substances is in all respects similar to that of the latter.—J. T. D.

Alkaline Earth Metals; Conditions of Formation and Stability of Hydrides and Nitrides of the ——. H. Gautier. Comptes Rend., 134, [19], 1108—1111.

The absorption of hydrogen by the cadmium alloys of these metals begins at about the same temperature for all of them in alloys with the same cadmium-content, and is lower as that cadmium-content is lower. The three hydrides begin to dissociate at the same temperature, 675° C., and the rate of dissociation increases rapidly as the temperature rises above that initial value. The hydrides of barium and strontium absorb hydrogen mechanically at the ordinary temperature, but this absorbed gas is given off again *in vacuo*, or on slight rise of temperature. The three metals in their cadmium-alloys combine with nitrogen only at a much higher temperature (600° C.) than that at which they begin to combine with hydrogen, and the nitrides so formed are stable at 1,000° C. Barium and strontium hydrides absorb nitrogen mechanically at the ordinary temperature, and at 600° C. this nitrogen displaces the hydrogen of part of the hydride; but calcium nitride is only formed at 700° C., above the dissociation-point of the hydride.—J. T. D.

Silver Chlorate and Sodium Chlorate, and their Solutions; Mixed Crystals of ——. H. W. Foote. Amer. Chem. J., 1902, 27, [5], 345—354.

Experiments with sodium and silver chlorates showed that the composition of mixed crystals of the two chlorates at the mixing limit changes with a change in temperature. The percentage of sodium chlorate in the total amount of dissolved chlorates in a solution is greater than that in the mixed crystals from the solution; but as the temperature is raised, the percentage of the sodium salt in the solution becomes more nearly equal to that of the same compound in the mixed crystals. Silver chlorate may be obtained pure by recrystallising the mixed chlorates; but pure sodium chlorate cannot be obtained in this way, for the recrystallised product contains more silver chlorate than does the mother liquor.—W. G. M.

Lead; Chloro-, Bromo-, and Iodo-Sulphobismuthites of ——. F. Ducatte. Comptes Rend., 134, [18], 1061—1063.

The author heated the haloid compound of lead with bismuth sulphide, in the hope of getting lead sulphobismuthite. In this he was not successful, but he obtained well-crystallised compounds of the formula—

$$PbS.Bi_2S_3.2BiSX,$$

where X = Cl, Br, or I. The same compounds were obtained by direct fusion of the compound BiSX, with the appropriate amounts of lead and bismuth sulphides. They form steel-grey needles, of density 6·4—6·6, permanent in cold air, melting and oxidising in air at a red heat. They are partially decomposed by boiling with water, and are readily decomposed by dilute acids with evolution of hydrogen sulphide.—J. T. D.

Tartar Emetic; Electrolysis of ——. F. v. Hemmelmayer Monatsh. für Chem., 1902, 23, [3], 262—268.

Marchand, in 1845, reported that in the electrolysis of cold saturated solution of tartar emetic, he had obtained on the anode an oxide having the formula Sb_2O_3. This was afterwards called in question by Böttger, who obtained pure Sb on the cathode, and after a long time a slight white deposit, probably of antimonic acid, on the anode. In experiments tried by the author under different conditions, the antimony, which was deposited as a black powder at the cathode, detached itself and sank to the bottom of the vessel, where after a time crystals of tartar also separated. When these had been washed away, the antimony was found to be accompanied by oxygen, but in varying quantities in different experiments. It is, therefore, unlikely that a suboxide is present; it is rather probable that the antimony is mixed with varying quantities of antimonic trioxide, formed from the precipitation of tartar emetic by a little of the KOH formed at the cathode from K there deposited with the Sb.—W. G. M.

Acetylene; Electro-chemical Studies concerning ——. I.—Cathodic Depolarisation. J. Billitzer. Monatsh. für Chem., 1902, 23, [3], 199–216.

The results of the work are thus summarised. With electrodes of platinised platinum acetylene acts as a depolariser, the products of the action being ethylene and ethane. Within certain limits of potential, ethylene can be produced quantitatively from acetylene, whilst at higher potentials, mixtures of ethylene and ethane, and finally, of these two substances with hydrogen are produced. With platinum electrodes, the introduction of acetylene and other gases causes an increase in the discharge-potential of hydrogen, apparently in consequence of a reduction in the ionic concentration. In sulphuric acid, with mercury cathodes, acetylene yields traces of alcohol.—W. G. M.

Alcohols, Monovalent Fatty; Flashing Points of —— and of their Aqueous Solutions. P. N. Raikow. Chem.-Zeit., 1902, 26, [39], 436–439.

Since his communication on the "flashing points" of different common organic compounds (this Journal, 1899, 528), the author has made experiments to determine the

relationship between the "flashing point" and the molecular weight and structure of the different members of a homologous series of fatty alcohols.

The determinations of the ignition temperature were made in Abel's petroleum tester, in which the water-bath was completely filled, and the air-bath half filled with water. The results thus obtained are given in a table.

From the results obtained, it appears that the "flashing points" of the absolute alcohols rise with the boiling point, except in cases of differences in the structural composition as illustrated by the butyl alcohols. The increase in the temperature of ignition on dilution is not proportional to the degree of dilution, but in the case of alcohols miscible with water in all proportions, falls up to a certain point and then rises. The "flashing points" of mixtures which are incomplete except in certain definite proportions, and the abnormal behaviour of tertiary butyl alcohol are also illustrated by curve diagrams.

Although the "flashing point" curves of allyl and propyl alcohols were almost identical, yet the limit of inflammability of the former (2 to 1 per cent.) was considerably lower than that of the latter (4 to 3 per cent.).—C. A. M.

Ferments; Inorganic ——. McIntosh. J. Phys. Chem., **6**, 15—44. Chem. Centr., 1902, **1**, [18], 1041.

As a supplement to Bredig's work (this Journal, 1900, 1155; 1901, 376, 845) the author has examined the catalytic influence of colloidal silver solutions on the decomposition of hydrogen peroxide. It was found that colloidal silver decomposes hydrogen peroxide in acid and neutral solution; the silver in the course of the reaction dissolves, and thus loses its catalytic action, but this is again regenerated by the addition of alkali. The silver solution loses its activity on standing. On the other hand, in presence of alkali the catalytic action appears to be independent of the age of the solution. The catalytic action is greater in alkaline solutions; it attains a maximum just as has been observed with gold, platinum, and various organic ferments. By increasing the temperature the decomposition is greatly accelerated; light is without influence. A N/24,000 solution of Carey Lea's silver proved to be about as active as a 1/60,000 solution of colloidal silver. The addition of substances which form with the silver, compounds which are not decomposed by hydrogen peroxide, has a retarding effect on the decomposition. The catalytic action is increased by the addition of mercury salts, owing to the reduction of the latter to mercury, which in alkaline solution accelerates the decomposition of hydrogen peroxide.—A. S.

Tobacco; The Aroma of ——. S. Fränkel and A. Wogrinz. Monatsh. für Chem., 1902, **23**, [3], 236—238.

The strength of the physiological effects of tobacco when smoked is not proportional to the amount of nicotine present. Pictet and Rotsky and others have obtained other alkaloids by the distillation of tobacco, and Barral has found the volatile nicotianine to contain C 71·52, H 8·23, N 7·12 per cent., from which Gerhardt has ascribed to it the formula $C_{23}H_{32}N_2O_3$. The authors, by distilling about 1 kilo. of tobacco with steam, obtained a milky distillate with a very fine aroma, but this distillate gave no crystalline deposit like those described by the older authors. Mercuric chloride, silver nitrate, phosphotungstic acid, lead acetate, and picric acid, however, gave precipitates with the distillate. The picrate, after repeated recrystallisation from hot water, formed small yellow silky needles, melting at 214° C., with difficulty soluble in cold, but readily dissolved by hot, water or alcohol. Elementary analysis showed them to contain C 43·1, H 3·42, and N 19·88 per cent. It is evident that the cause of the aroma of tobacco is a volatile alkaloid not identical with nicotine.—W. G. M.

New Books.

Essays in Historical Chemistry. By T. E. Thorpe, C.B., LL.D., F.R.S., Principal of the Government Laboratory, London. Macmillan and Co., Ltd., London. 1902. Price 12*s.* nett. The Macmillan Company, New York.

This work, of large 8vo size, is a collection of eighteen of the best-known essays of Prof. T. E. Thorpe. They form the substance of lectures and addresses given at various times during the last twenty-five years. The book contains preface, table of contents, and subject-matter filling 582 pages. The subjects treated of are as follows:—I. Robert Boyle. II. Joseph Priestley. III. Carl Wilhelm Scheele. IV. Henry Cavendish. V. James Watt. VI. A. L. Lavoisier. VII. Priestley, Cavendish, Lavoisier and La Révolution Chimique, &c. VIII. Michael Faraday. IX. Thomas Graham. X. Fr. Wöhler. XI. J. B. A. Dumas. XII. Hermann Kopp. XIII. Victor Meyer. XIV. D. Iv. Mendeleeff. XV. St. Cannizzaro. XVI. Rise and Development of Synthetical Chemistry. XVII. Progress of Chemistry in Great Britain and Ireland during the Nineteenth Century. XVIII. Development of the Chemical Arts during the Reign of Queen Victoria.

Text-Book of Physiological and Pathological Chemistry, in Twenty-nine Lectures, for Physicians and Students. By G. Bunge, Professor of Physiological Chemistry at Basel. Second English Edition, translated from the Fourth German Edition by H. A. Starling, and edited by E. H. Starling, M.D., F.R.S. Kegan Paul, Trench, Trübner, and Co., Ltd., Paternoster House, Charing Cross Road. 1902. Price 16*s.*

This treatise contains prefaces, table of contents, 447 pages of subject-matter, and alphabetical indexes of subject-matter and authors.

Translation of Professor Bunge's lectures, which, as stated in the preface, "have had a great influence on physiological thought both here and abroad." "They have served to spread the methods of thought of Schmiedeberg's school, and to render more effective the work of men in other laboratories."

Les Nouveautés Chimiques pour 1902. Nouveaux Appareils de Laboratoire; Méthodes Nouvelles de Recherches Appliquées à la Science et à l'Industrie. Par Camille Poulenc, D. ès Sc. Libraire J. B. Baillière et Fils, 19, rue Hautefeuille. Poulenc Frères, 92, rue Vieille du Temple, et boul. St.-Germain, 122. 1902. Price 4 frs.

Small 8vo volume, containing preface, 327 pages of subject matter illustrated with 214 wood engravings; table of contents, and alphabetical index of subjects. The matters treated of refer chiefly to the forms of apparatus and methods of using them in chemical physics, and in pure and especially applied chemistry. I. General Applications of Physics and Chemistry. II. Various Forms of Laboratory Apparatus (Heating, Refrigeration, Extraction, Filtration, Vacuum, and Compressed Air, Gas Generation, Gas Purifying, &c.). III. Electricity (Electric Heating, Measuring, &c.). IV. Chemical Analysis (Burettes, Pipettes, Gas Analysis, Sugar Analysis, Metallurgy and Fuel, Foodstuffs, Medical Analysis). V. Bacteriology.

The Textile Fibres of Commerce. A Handbook on the Occurrence, Distribution, Preparation, and Uses of the Animal, Vegetable, and Mineral Fibres used in Cotton, Woollen, Paper, Silk, Brush, and Hat Manufactures. By William I. Hannan. Charles Griffin and Co., Ltd., Exeter Street, Strand, London. 1902. Price 9*s.*

8vo volume, containing preface, list of illustrations, and subject-matter filling 328 pages, with an appendix of one page, and the alphabetical index. There are 149 engravings, illustrating the fibres of various kinds of textile materials,

&c. The subjects treated of include the following:—Vegetable Fibres, Flax, Hemp, Jute, Ramie; Vegetable Silk, Cotton; Paper Fibre Plants; Brush and Hat Materials. Animal Fibres, Silk, Wool, Hat and Fur Fibres.

A Text-Book of Inorganic Chemistry. By Dr. A. F. Holleman, Prof. Ord. in the University of Groningen, Netherlands. Translated by H. C. Cooper, Ph.D. First Edition. John Wiley and Sons, New York. 1902. Price 10*s.* 6*d.* Chapman and Hall, Ltd., London.

This work on Inorganic Chemistry was written by Holleman, as stated in the preface, mainly to bring in and accentuate the modern views of van't Hoff, Ostwald, Arrhenius, and others. It contains, besides the preface and table of contents, subject-matter filling 446 pages, a chemical chart, and the alphabetical index. There are 83 illustrations. The more interesting introductory portions, with some subsequently introduced, deal with the following subjects:—I. Physical and Chemical Processes. II. Chemical Operations. III. The Elements. IV. Oxygen. V. Hydrogen. VI. The Conservation of Matter. VII. Compounds and Mixtures. VIII. Phenomena accompanying the Formation or Decomposition of a Compound. IX. Explanation of the Constant Composition of Compounds, Atomic Theory, &c. X. Stoichiometrical Calculations. XI. Molecular Weight from the Measurement of the Depression of the Freezing Point and Elevation of the Boiling Point. XII. Thermochemistry (Law of Hess. Le Chatelier's Rule. Van't Hoff's Principle of Mobile Equilibrium.) XIII. Methods of Determining Atomic Weights (Laws of Dulong and Petit, Neumann and Mitscherlich). In the rest of the work the subjects follow in much the same order as in the usual works on inorganic chemistry, but the treatment is based on the modern theories, and they are constantly applied "for the explanation of the facts communicated."

The Elements of Physical Chemistry. By J. Livingston R. Morgan, Ph.D. Second Edition, revised and enlarged. John Wiley and Sons, New York. Chapman and Hall, Ltd., London. 1902. Price 8*s.* 6*d.*

Small 8vo volume, containing prefaces to the first and second editions, table of contents, and text covering 322 pages. The final chapter comprises a series of problems, filling 22 pages. It is followed by the alphabetical index. There are 23 illustrations.

The subjects treated of are as follows:—I. Introduction. II. The Gaseous State. III. The Liquid State. IV. The Solid State. V. Solution. VI. Thermochemistry. VII. Chemical Change: (*a*) Equilibrium; (*b*) The Rôle of the Ions in Analytical Chemistry; (*c*) Chemical Kinetics. VIII. Phases. IX. Electro-chemistry: (*a*) Migration of the Ions; (*b*) Conductivity of Electrolytes; (*c*) Electromotive Force; (*d*) Electrolysis and Polarisation.

Trade Report.

I.—GENERAL.

Minerals of Milo (Greek Archipelago).

Foreign Office Annual Series, No. 2788.

The principal exports of Milo, in 1901, were 6,090 tons of manganese ore, valued at 8,741*l.*, shipped to the United Kingdom, Belgium, and Laurium, in Greece; 783 tons of sulphur, valued at 3,000*l.*, sent to Greek ports; 2,123 tons of kaolin, valued at 102*l.*, to Italy; and 308 tons of gypsum, valued at 740*l.* to Greek ports.

Mineral Production of Quebec (Canada).

Eng. and Mining J., May 17, 1902.

The report of the Inspector of Mines of Quebec, gives the mineral production of that province for the year 1901. The figures are in short tons (2,000lb.), except where otherwise noted:—

Product.	Wages Paid.	No. of Workmen.	Quantity Used.	Gross Value.
	Dols.			Dols.
Magnetic iron ore	1,200	10	1,000	2,000
Bog iron ore	28,978	120	14,489	28,978
Chrome iron ore	12,000	90	1,274	16,744
Copper ore	82,000	250	20,296	126,500
Galena	22,900	89	227	9,277
Asbestos	553,000	1,577	33,466	1,274,315
Asbestic	..	..	6,831	10,114
Mica (thumb-trimmed)	35,000	150	76	36,000
Mica, raw	..	..	65	3,600
Ochre, calcined	7,500	51	1,253	14,595
Graphite, prepared	2,500	25	31	3,100
Graphite, raw	..	..	53	1,590
Feldspar	2,000	5	420	1,271
Sulphate of baryta	1,850	7	533	2,975
Phosphate	..	..	1,033	6,280
Gold (ounces)	7,838	35	80	1,440
Slate (squares)	6,400	40	3,170	12,252
Slag-stones (sq. yds.)	1,944	8	3,000	2,700
Cement (barrels)	8,000	35	17,000	28,000
Granite	92,000	350	..	146,000
Totals	885,110	2,792	..	1,727,731

Imports of Tangier (Morocco).

Foreign Office Annual Series, No. 2787.

Candles.—Candles were imported almost entirely from the United Kingdom, but to the extent of only 6,236 cases, during 1901, as compared with 8,336 cases, during 1900; none came from Belgium. The decrease is owing to the greater facilities for sending goods direct by sea to Laraiche and Tetuan.

Chemicals and Drugs.—Chemicals and drugs came from France, with the exception of 240*l.* worth of soda, &c., from the United Kingdom.

Glass and Glassware.—The value of the amount of glass and glassware imported during the year was considerably more than in 1900.

France contributed 2,773*l.*; Belgium, 970*l.*; and the United Kingdom, 731*l.*

Matches.—The total value of matches imported was valued at 3,217*l.*, of which 1,360*l.* came from Italy, 888*l.* from France, 816*l.* from Germany, and 145*l.* from the United Kingdom.

Oils.—Cotton-seed oil, 2,099*l.*, came from France and the United Kingdom; linseed oil, 867*l.*, from France and the United Kingdom; olive oil, 693*l.*, from France and Spain; petroleum, 1,985*l.*, chiefly from Austria-Hungary.

Paper.—The total value of stationery was 5,162*l.*, of which 3,413*l.* came from France, the rest from the United Kingdom, Germany, and Spain. The principal items were writing paper, of which France sent 1,877*l.* worth; Germany, 442*l.* worth; and the United Kingdom only 174*l.* worth; brown paper from France to the value of 367*l.*; Germany, 275*l.* Paper for wrapping, exclusively from France, to the value of 448*l.*

Sugar.—Sugar, to the total value of 34,358*l.*, shows an increase of 2,662*l.* Austria-Hungary was mainly responsible for this. France sent loaf sugar to the value of 10,626*l.*

Sundries.—The principal items were: cement, 1,294*l.*, from France and Belgium; gypsum, 447*l.*, from France; perfumery, 1,135*l.*, from the United Kingdom, France, Germany, and Holland; saddlery, 435*l.*, from the United Kingdom.

Trade of Chinkiang (China).

Foreign Office Annual Series, No. 2797.

Foreign soda, amounting to 29,483 cwts., and valued at 10,694*l.*, appears for the first time as a separate entry in the import returns. The Chinese have long used soda, but the native article is inferior. A well-known British firm o

chemical manufacturers have tried their sodas, which they are able to produce very cheaply, on the China market, with immediate success. This firm's carbonate of soda (soda ash) is more than 99 per cent. pure, whilst the best native carbonate only reaches 67 per cent., and the average soda ash is only about 50 per cent. pure. Another branch of business which this firm hope to extend is the sale of chemical fertilisers, and object lessons are being given by their agent on wheat fields in the neighbourhood of Chinkiang, one half of a field being chemically fertilised, and the other half being dealt with by the farmer in his own way. If the superiority of the fertilised portions is in any way marked, a bright future for these products in China may be looked for.

Among articles of native import may be noticed vegetable tallow (66,760*l.*), obtained from the fruits of the female varnish tree (*Rhus vernicifera*), and wood oil (119,515*l.*), expressed from the seeds of the *Aleurites cordata*.

An import of sugar, foreign and native (439,700*l.*), is worthy of mention.

Among the staple articles of export are beancake, earth-nuts, and earth-nut oil, which showed a large advance for 1901.

Customs Decisions in Italy.

The following is a list of some decisions affecting the application of the Italian Customs Tariff:—

Cardboard, formed of sheets of parchment-paper glued together, is dutiable as "fine-cardboard of coloured paper," under No. 194*b* of the Tariff, at the rate of 40 lire per 100 kilos. (16*s.* 3*d.* per cwt.).

Compo-boards are dutiable as "common cardboard," under No. 191*a* of the Tariff, at the rate of 2 lire per 100 kilos. (9¾*d.* per cwt.).

Oleomargarine, or margarine, not fit for consumption as a substitute for butter, is free of duty under No. 334 of the Tariff.

Essential oil of Cajeput is dutiable as a "volatile oil, unenumerated," under No. 9*e* of the Tariff, at the rate of 3 lire per kilo. (1*s.* 1*d.* per lb.).

Neutral oxalate of potassium is dutiable as a "chemical product unenumerated," under No. 59 of the Tariff, at the rate of 10 lire per 100 kilos. (4*s.* 0¾*d.* per cwt.).

Imports and Exports of Hankow (China).

Foreign Office Annual Series, No. 2795.

Aniline dyestuffs, in sympathy with piece-goods, rose almost to the unprecedented figure of 1899.

Matches from Europe have dwindled to 1,333 gross, and Japanese to 18,885 gross, possibly from overstocking in previous years, as 114,990 gross went inland under transit pass. Shanghai matches proved unable to face local competition, as only 7,500 gross are entered in the return.

Fair likin charges enabled foreign refined sugar to compete with the Swatow produce, though the imports of foreign brown and white sugars are far short of the average up to 1898. The amount of refined sugar sent up under pass was 41,994 cwts., as against 19,933 cwts., Hunan taking four times, Honan and Shensi twice last year's amount. Native candy again showed a considerable decrease, to 1,185 cwts., as against 1,188 cwts.

The import from Kewkiang of over 940 cwts. of liquid indigo is a new item.

The import of morphia, which was only 3,328 and 3,642 oz. in the two previous years, sprang up to 5,570 oz., and a little was even re-exported westward.

Adverse circumstances caused the diminished figures for the export of albumin and egg yolk, 1,013 and 4,782 cwts., against 2,825 and 22,533 cwts. in 1900. Only one factory continues working against a glutted home market, and an extravagant local price for eggs. The trade may revive if the importation of foreign salt mixed with borax is permitted.

The export of antimony ore, partly treated at an establishment on the Wuchang bank of the Yangtse, fell from 4,353 to 3,304 tons, and none came down from the interior under transit pass. This was probably due to the floods of last summer.

Of the oils—bean, earth-nut, sesamum seed, tea, and wood—only the second showed an increase, but the value of these commodities rose to 16 per cent. of the exports to Chinese ports. The price of wood oil remained prohibitive for several months, but in spite of the heavy leakage on board of steamers, a brisk trade was latterly done with foreign countries.

The demand for sesamum seed for "olive oil" making is maintained, and 52,589 cwts. of rape-seed were also exported for oil making.

II.—FUEL, GAS, AND LIGHT.

Natural Gas in Iron and Steel Works in the United States.

Eng. and Mining J., May 10, 1902.

The *Directory* just issued by the American Iron and Steel Association shows that a larger number of iron and steel plants were using natural gas, in 1901, than in 1898, the exact number, in November, 1901, being 110, with seven additional natural gas plants in course of erection, as against 94 plants using natural gas in June, 1898, and two in course of erection. The number of plants using natural gas, in 1901, was larger than has been noted in any previous edition of the *Directory*, the nearest approach to it being 104 plants, in 1889.

IX.—BUILDING MATERIALS, Etc.

Mica Mining in India.

Eng. and Mining J., May 10, 1902.

It is stated in *Indian Engineering* that, with a view to discourage speculation, the Madras Board of Revenue has amended the mica rules by requiring that applications for mica mining leases should be accompanied by a deposit of 500 rupees, or such sum as the Government might fix.

X.—METALLURGY.

Monazite in Brazil.

U.S. Cons. Reps., May 9, 1902.

The Brazilian Government has recently granted to a German, for 10 years, the exclusive right to develop the monazite-sand deposits along the coast of Brazil; a company is being organised at Berlin for the purpose of acquiring control of this monopoly, and for exploiting similar deposits elsewhere.

Platinum Mining in British Columbia.

U.S. Cons. Reps., May 8, 1902.

Platinum has long been mined in the Similkameen, about 150 miles east of Vancouver. Chinamen have been for 15 years recovering platinum from the placer deposits of the Tulameen River, and also of Granite Creek. A company has just been formed to develop the platinum claims in that vicinity, and it will begin operations at once. It is proposed to work a tract of 320 acres on Slate Creek. Slate Creek is just over the divide of the Similkameen River, on the Washington side, but operations will be extended into British Columbia territory also.

The proportion of precious metals in the gravel, as shown by assays made by the Slate Creek Hydraulic Co., is about two thirds gold to one-third coarse platinum. Some of the nuggets are as large as the little finger of a man's hand. The gravel runs 25 cents to the yard in platinum and gold.

Another deposit of platinum is also said to have been discovered in Kennedy Mountain, near Princeton, British Columbia. Samples of the gravel have been sent east for assay, and the tests have proved satisfactory.

Tin and Tin Ore Exports from the Federated Malay States.

Bd. of Trade J., May 22, 1902.

According to the *Straits Budget* of the 17th April, 119,186 piculs of tin and tin ore were exported from Federated Malaya in January last, as against 128,809 piculs in January, 1901. The duty collected was 1,020,393 dols., a falling-off of 125,948 dols. as compared with January 1901.

Metal Production of Philadelphia (United States).

Foreign Office Annual Series, No. 2798.

The production of basic pig iron, in 1901, was 1,148,850 tons, as against 1,072,376 tons, in 1900.

The production of spiegeleisen and ferromanganese, in 1901, was 291,461 tons, as against 255,977 tons, in 1900.

The production of charcoal pig iron, in 1901, was 360,147 tons, as against 339,874 tons, in 1900. The production of mixed charcoal and coke pig iron, in 1901, was 23,294 tons, as against 44,608 tons, in 1900.

"Partinium" in France.

Eng. and Mining J., May 17, 1902.

The *Journal de l'Electrolyse* says that this material is an alloy of aluminium and tungsten. It is now largely used in automobile construction. Most vehicles at the last Paris show had partinium bodies. The alloy is very light and strong.

Manganese Ore in India.

Eng. and Mining J., May 17, 1902.

Indian Engineering reports that manganese ore is now being mined at Nagpore, and exported from Bombay. This production adds considerably to the quantity exported, which has heretofore come from the mines of Vizigapatam. Indications of manganese deposits have been found in the Bhandara and Balaghat districts, and explorations are being made.

Iron Ores of Brazil.

H. K. Scott. Iron and Steel Inst., Spring Meeting, 1902.

The author describes some huge iron ore deposits in the neighbourhood of the well-known manganese deposits situated in the State of Minas Geraës, Brazil, about 310 miles from Rio de Janeiro. One deposit, outcropping at the top or the side of a mountain range, consists of almost pure hæmatite, whilst a second series of mountains contains chiefly magnetite. The ores from the former may be divided into three classes:—1. Massive hæmatite; 2. Micaceous iron schists; and 3. Rubble or conglomerate ores, which are the result of the weathering of the other classes, and especially of the second. The massive hæmatite occurs in large beds, 30 to 50 yards in thickness, and contains from 66 to 70 per cent. of metallic iron, a small percentage of silica and alumina, and minute quantities of phosphorus and sulphur. The ores have been worked in a small way by the natives, who prefer the second-class ore to the massive hæmatite, owing to its easier reduction in the small Catalan type of furnace used. Recently, a 10-metre blast-furnace has been at work, making 5 tons of pig-iron per day, containing 0·13 per cent. of phosphorus and less than 0·01 per cent. of sulphur. The industry is retarded by the want of a satisfactory fuel, the supply of charcoal being irregular and expensive, although wood is plentiful. Moreover, owing to the insufficiently high temperature of the blast and the purity of the ore, the pig-iron does not contain sufficient silicon or phosphorus for foundry purposes, although quite suitable for chill castings. Blast-furnaces are now being erected at Rio de Janeiro to smelt the ore with coke from Pocahontas coal, and success with them is anticipated, especially with the rubble ores, which are more phosphoric than the others.

The difficulties of mining are very slight, and the Central Railway runs through the district. The value of the ore is estimated at 22*s.* per ton, as compared with Rubio ore at 15*s.* 6*d.* at English ports. The expense of delivery in England would be 18*s.*, made up as follows:—Extraction, administration, &c., 2*s.*; transport to Rio, 6*s.*; handling in Rio, 1*s.*; and ocean freight, 9*s.*; thus leaving 4*s.* per ton for contingencies, interest on capital, and profit.—A. W.

Zinc Dust and Antimony Sulphide: Customs Decisions in the United States.

Bd. of Trade J., May 28, 1902.

Zinc Dust.—Zinc dust, or indigo auxiliary, is free of duty under par. 482 of the Tariff, as "an article in a crude state used in dyeing, not specially provided for."

Sulphide of Antimony.—The product of antimony ore produced by removing the gangue or slag by heat is the crudest form of sulphide of antimony known to commerce, and is entitled to free entry under the provisions of par. 476 of the Tariff.

Platinum in New South Wales.

J. Soc. Arts, 1902, **50**, [2583], 593.

Although platinum is more or less plentiful in New South Wales, the quantities at present obtained are limited, the output, in 1900, being only 530 oz., valued at 1,007*l.*; and the total quantity raised since the beginning of 1894, 8,295 oz., valued at 12,432*l.* The great difficulty is the scarcity of water in the districts in which the metal is found. The metal is met with in a native state alloyed with iron, and with iridium, osmium, and other rare metals. It usually occurs in grains or scales, sometimes in nuggets, and rarely in crystals. It has also been found as an arsenide in the mineral sperrylite, which occurs in minute cubes or cubo-octahedral crystals, which have a tin-white colour and a black streak.

The New South Wales platinum is obtained chiefly from the Fifield district, about 322 miles west of Sydney, where it is found associated with gold. A deep alluvial "lead" containing the two metals extends for over a mile, varying in width from 60 to 150 ft. The sinking is from 60 to 70 ft., through loam, with some bands of barren quartz drift. The platinum and gold occur in fairly coarse waterworn grains, and, as a rule, are confined to the cavities in the bed-rock, and to the wash-dirt for a few inches above it. The wash-dirt contains 5 to 12 dwts. of platinum and 1 to 3 dwts. of gold per ton. The yield from 269 loads, taken from a number of claims along the "lead," was at the rate of 6 dwts. 21 grs. of platinum and 1 dwt. 23 grs. of gold, per ton.

Platinum has also been found in the Broken Hill district and other places; also on the beaches of the northern coast, where it is obtained from the auriferous sands.—A. S.

XII.—FATS, OILS, Etc.

Soap at Diarbekir (Turkey).

Foreign Office Annual Series, No. 2792.

A quantity of soap made in Aleppo is used; it is neither good nor cheap, and there certainly appears to be an opening for the introduction of British soaps into this country. The natives have their own ideas as to what is a good soap, and are particular about its degree of hardness, colour, &c. To find a large sale, the soap sent to this country must be adapted to local requirements, and must be pushed by local agents. An experiment in this direction is being tried at Sivas.

XIII. C.—INDIA-RUBBER, Etc.

India-Rubber Goods in Asiatic Turkey.

Foreign Office Annual Series, No. 2792.

Austria-Hungary and Germany supply goloshes of poor quality. During the past winter there was great discontent

as these articles frequently split the first time they were used. Several merchants declared that they would purchase in the United Kingdom next winter.

At present goloshes are sold at about 3*s.* 4*d.* a pair, but a slightly higher price would be paid for a reliable article.

Mackintoshes could probably be sold in greater numbers. They should be provided with a hood to envelop the fez in wet weather.

XVIII. A.—FOODS.

Beverages and Foodstuffs in Brazil.

Bd. of Trade J., May 22, 1902.

With reference to the notices which appeared on p. 452 of the issue of the *Board of Trade Journal* for the 6th of March last, and on p. 76 of the issue for the 10th of April (this Journal, 1902, 441, 573), on the subject of the treatment in Brazil of articles of food and drink alleged to contain deleterious substances, the Board of Trade are now prepared to consider any applications which may be made to them, by consignors of goods which have been condemned by the Analytical Department at Rio de Janeiro, for samples of such goods to be re-analysed at the consignor's expense by competent chemists, on the goods being returned to the United Kingdom. For this purpose the consignees of the goods in question should be requested to lodge samples with His Majesty's Consul-General, with a view to their being transmitted home under seal through the Foreign Office to the Board of Trade for the purpose of analysis.

XVIII. B.—SANITATION.

Trade Effluents Purification.

Public Health Engineer, May 25, 1902.

A firm of blanket and rug manufacturers, of Dewsbury, have put down an extensive plant for the purification of their sewage before turning the effluent into the Calder. The scheme is elaborate and complete, and covers a large area of land near the mills.

The whole of the trade effluent from the mill is brought to one point in the mill yard in a storage tank, which has a capacity of about 20,000 galls. The tank is constructed of concrete and brickwork in cement, and has a pumping well 19 ft. 4 ins. deep, fitted with screen and penstock complete. The pump is capable of lifting 50,000 gallons in hour a height of 27 ft. From the storage tank the effluent is pumped to six tanks, each 85 ft. long and 5 ft. wide, with an average depth of 5 ft. 6 ins., and a total capacity of 418,000 galls. In the tanks, the effluent settles, and the solids, which consist of matter of the nature of fuller's earth and bits of wool, fall to the bottom.

It is claimed that, after passing through the several tanks of these works, the effluent into the river will be such as will satisfy the requirements of the Rivers Board.

XIX.—PAPER, PASTEBOARD, Etc.

Celluloid in Germany.

U.S. Cons. Reps., May 20, 1902.

Celluloid in plates, whether white or coloured, was subject to a duty, in Germany, of 3 marks per 100 kilos. until the middle of 1901, when the custom-houses were instructed that black or tortoiseshell-plates, without preparatory work, were to be classed as "polished" and subjected to a duty of 200 marks per 100 kilos.

German celluloid is used to a great extent in the manufacture of ordinary cutlery, whilst, for the better grades of knives imported, celluloid must be used. Tests of German celluloid have shown that it is not sufficiently free from acid, which eventually affects the metal parts; and the handles themselves lose their brightness and are liable to shrink. Under these conditions, the cutlery industry of Solingen cannot do without the imported article; but the increased duty practically prevents its importation.

The Chamber of Commerce at Solingen appealed to the Government to change the duty, and the following decision has been rendered:—

Celluloid plates and sheets cut from a (soft) block, then dried and finally pressed for the purpose of removing any unevenness, shall be considered as "raw," provided the cutting grooves, whether on one or both sides, are discernible.

XX.—FINE CHEMICALS, Etc.

Drugs and Medicinal Preparations in Bolivia.

According to the *Bulletin* of the Bureau of American Republics for April, the French Chargé d'Affaires at La Paz says that the market for the following drugs and preparations is very good in Bolivia:—Peppermint liqueur, kola, uenrosine, sulphate of quinine, cocaine, cascara, medicinal creosote, antidiphtheric serum, &c. Most of the preparations now in use are of French origin.

Oil of Petitgrain in Paraguay.

Chem. and Druggist, May 24, 1902.

The bitter orange, from the leaf of which the oil of petitgrain is distilled, grows wild in great abundance in Paraguay. In the more remote parts of the country, where the tree is most abundant, there are many distilleries on a small scale, nearly all operated by Frenchmen. These men generally work for a dealer, who finances them and buys their product. This dealer, who has his headquarters in one or other of the larger towns, acts as an agent for the collection of the oil, which is then sold to one of the principal export-houses in Asuncion, by whom it is shipped to Europe. The flowers are capable of yielding a species of neroli, and the rind an inferior bergamot, as it abounds in a strong essential oil, but little has been done locally to develop the by-products of the plant, of which there are many.

The distillation of the oil is mainly confined to the districts of Yaguaron, Caraguatay, and Valenzuela, and takes place practically all the year round, but mostly between October and May. It appears that, for want of better methods of collection, the trees are cut down indiscriminately, and this has led to the destruction of large areas, although, of course, there is no lack of material. Last year, according to official statistics, the exports from Paraguay amounted to 334,675 oz.

Saccharin in France.

Chem. and Druggist, May 24, 1902.

The new law regulating the manufacture and sale of saccharin here has been duly put in force by a decree of the President of the French Republic. Manufacturers of saccharin or any other artificial sweetening substance are required to declare their industry to the local Excise authorities. Any manufacturer commencing to make saccharin must make a declaration a month before beginning work. Makers who cease, suspend, or re-commence manufacturing have also officially to announce the fact. The restrictions are also severe as to where the substances can be made, and as to keeping stock. The working days and hours have to be stated, whilst any deviation from the regulations renders the manufacturers liable to heavy penalties and fines. Manufacturers are also obliged to set a room apart for the Excise officials to use as an office, the same being furnished, lighted, and heated at the makers' expense. As regards the distribution of saccharin, it can only be sent out in boxes or bottles numbered and sealed by the Excise, and accompanied by a declaration giving quantities and weights. Other detailed formalities are required of pharmacists who distribute the substance.

Camphor in South Formosa (Japan).

Foreign Office Annual Series, No. 2796.

The shortage in the supply of camphor, amounting to over 200,000*l.*, in 1901, was caused by the competition of crude

camphor manufactured in Japan, the production of which, stimulated by the high prices fixed by the Formosan Government-General for the sale of its camphor abroad, rose suddenly from an average of between 6,000 and 7,000 cwt. to 27,600 cwt. a year. There being no restriction placed on the export of camphor from Japan, the Japanese producer was able to undersell Formosan camphor on foreign markets, thus injuriously affecting the Monopoly receipts. The Formosan Government-General has made representations to the Central Government with a view to the Monopoly being extended to Japan proper, so as to include the Japanese production, and a Bill having this for its object will be introduced into the Imperial Diet this Session (1902). The provisions of the Bill are, shortly, that the camphor industry in Japan shall be placed under the management of the Formosan Monopoly Bureau, the profits being rendered to the Central Government, and that all camphor shall be sold to the Branch Camphor Bureaux at Kōbé and Nagasaki at the fixed price of about 50 yen (say, 5*l.* 2*s.* 1*d.*) per picul (133⅓ lb.). With the exception of a yearly production of about 6,000 cwt. in the Fohkien province and a negligible quantity in Sumatra, the Bureau thus secures, practically, the complete control of the world's camphor. The price proposed to be paid to the Japanese producer is more than double the average price paid to the native producer in Formosa (about 2*l.* 2*s.* 4*d.* per cwt.).

XXII.—EXPLOSIVES, Etc.

Matches in Sweden.

U.S. Cons. Reps., May 14, 1902.

In the *Göteborgs Handles-och Sjöfarts-Tidning* of the 16th April, 1902, it is stated that another kind of match, intended to supplant the phosphorus matches which have been prohibited for a year, has lately been placed upon the Swedish market. This match looks like the well-known chlorate of potash and paraffin matches, which, however, by reason of the fact that they contain phosphorus, come under the same prohibition as the old lucifer match. But the new match, which has been named the "Repstickan" (the scratch match), possesses a property which the potash match lacks, *viz.*, it is damp-proof, and can therefore be lighted against a damp or wet surface, provided this is hard. The inventors claim that Repstickan is the least poisonous match in existence, the safety match not excepted.

The manufacture of the new matches has been entrusted to Lidköpings Tändstiksfabrik.

Match Imports of Chinkiang (China).

Foreign Office Annual Series, No. 2797.

Japanese matches hold the market to the practical exclusion of all other kinds. They are of convenient size, well made, and cheap. In 1901, 1,263,510 gross were imported.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 11,450. Longsdon. Centrifugal drying machines or hydro-extractors. May 20.

„ 11,544. Wallwork, Wallwork, and Wells. Pumps for spraying or discharging liquids. May 21.

[A.] 11,556. Godfray. Apparatus for distributing water or other liquid for watering, or feeding and spraying purposes.* May 21.

„ 11,609. Lake.—From The Atmospheric Oxygen and Power Co., United States. Apparatus for liquefying air, and for separating the constituent gases of the same.* May 21.

„ 11,622. Bamford. Controlling the temperature of superheated steam. May 21.

„ 11,695. Mauser. Means for packing bottles or carboys for conveying and storing acid, inflammable or valuable liquids, and the like. May 22.

„ 11,879. Crooke, jun. Charging apparatus for blast furnaces, calcining kilns, gas producers, and the like. May 24.

„ 12,036. Guthrie and Guthrie. Improved method and means for treating gases and liquids. May 26.

„ 12,063. Allison.—From Smoke Exterminator and Fume Condenser, United States. Means for condensing smoke, fumes, and gases.* May 27.

„ 12,103. Isaac. Machines for mixing pasty, fluid, and like substances. May 27.

„ 12,194. Mazaa. Apparatus for separating, extracting, or recovering the constituent elements of a gaseous mixture.* May 28.

„ 12,421. Moser. Improved means for mixing and delivering liquids. May 31.

[C.S.] 12,286 (1901). Hollings, Jarvis, and Bell. Appliances for evaporating, distilling, and aerating liquids or the like. June 4.

„ 12,693 (1901). Theisen. Means of causing gases or vapours to move in contact with liquids, but in an opposite direction. May 28.

„ 13,588 (1901). Scott. Treatment of liquids for the crystallisation or deposition of substances therein. June 4.

„ 13,877 (1901). Darvas. Machines for separating or packetting equal quantities of pulverulent, crystalline, granular, or like substances. May 28.

„ 14,602 (1901). Cole and Cole. Construction of apparatus for producing cold air for refrigerating purposes. May 28.

„ 15,066 (1901). Helm. Refrigerators. June 4.

„ 15,099 (1901). Ireland and Presto Gear Case and Components Co., Ltd. Combined jet and spray device for use in distributing liquid. June 4.

„ 20,549 (1901). Baleke. Cooling or evaporating apparatus. May 28.

„ 5422 (1902). Wilton. Apparatus for raising and forcing liquids. May 28.

II.—FUEL, GAS, and LIGHT.

[A.] 11,490. Faben, jun. Gas purifier grid.* May 20.

„ 11,495. Sims. Machines for generating acetylene from carbide of calcium.* May 20.

„ 11,498. Weeks. Apparatus or machines for generating acetylene gas.* May 20.

„ 11,510. Crook and Mines. Electric incandescent lamps with rare earth filaments. May 20.

„ 11,529. Griffin and Hogan. Smoke consumers. May 20.

„ 11,533. Klepetko and Evans. Roasting furnaces. May 20.

„ 11,535. Choulet. *See under* XVIII. C.

„ 11,539. Klinger. Acetylene generators.* May 20.

„ 11,540. Bermann. Vapour burning apparatus. May 20.

[A.] 11,554. Sayer. Fuel regulating mechanism for internal combustion engines. May 21.

„ 11,576. Stephens. Heater construction for steam or water. May 21.

„ 11,612. Beck. Acetylene gas lamp for table use.* May 21.

„ 11,641. Keith and Keith. Lighting devices for incandescent gas burners. May 22.

„ 11,663. Cuttell and the Anti Vibration Incandescent Gas Lighting Co., Ltd. Incandescent gas lamps. May 22.

„ 11,676. Fowler. Fire grates. May 22.

„ 11,703. Green and Martin. Improved process for converting peat into fuel.* May 22.

„ 11,705. Wilson and Heist. Hydrocarbon burners.* May 22.

„ 11,710. Choulet. Apparatus for use in the production of acetylene gas. May 22.

„ 11,767. Topping. Improved smoke consuming device. May 23.

„ 11,784. Werthen. Burners for incandescent gas lighting. May 23.

„ 11,808. Adams. Fireplaces. May 24.

„ 11,864. Johnson.—From The North American Fuel Co., United States. Manufacture and production of briquettes or blocks of artificial fuel.* May 24.

„ 11,884. Hinne. Furnaces and steam generators.* May 24.

„ 11,897. Ellis.—From Soc. de Ploeg, H. Colliez, Lonstau et Cie., France. Apparatus for feeding and distributing spirit, alcohol, or other liquid hydrocarbons for explosion engines.* May 24.

„ 11,901. Harknett. Improved gas carburetting spray. May 24.

„ 11,920. Griffin. Apparatus for spraying liquid hydrocarbon. May 26.

„ 11,971. Rhodes. Electric incandescent lamps. May 26.

„ 11,976. Redfern.—From La Soc. Anon. des Brevets Landi, France. Incandescent vapour lamps. May26.

„ 12,034. Ramsden and Smith. Improved arrangement for working gas purifiers.* May 27.

„ 12,083. Lake.—From General Electric Co., United States. Electric arc lamps. May 27.

„ 12,086. Worms. Improved incandescence lamp for spirit and similar liquids.* May 27.

„ 12,094. Rankin, Betts, Marsley, and Longsdorf. Furnaces and combustion enhancing devices for steam generators wherein the furnace is disposed in a flue in the boiler. May 27.

„ 12,152. Parizot. Self igniter for gas burners. May 28.

„ 12,156. Abel.—From Siemens and Halske Akt.-Ges., Germany. Electric incandescence lamps. May 28.

„ 12,157. Abel.—From Siemens and Halske Akt.-Ges., Germany. Manufacture of filaments or the like for electrical incandescence lamps. May 28.

„ 12,158. Abel.—From Siemens and Halske Akt.-Ges., Germany. Manufacture of filaments or the like for electrical incandescence lamps. May 28.

„ 12,159. Abel.—From Siemens and Halske Akt.-Ges., Germany. Manufacture of filaments or the like for electrical incandescence lamps. May 28.

„ 12,160. Abel.—From Siemens and Halske Akt.-Ges., Germany. Manufacture of filaments or the like for electrical incandescence lamps. May 28.

„ 12,161. Abel.—From Siemens and Halske Akt.-Ges., Germany. Electrical incandescence lamps. May 28.

[A.] 12,162. Abel.—From Siemens and Halske Akt.-Ges., Germany. Manufacture of filaments or the like for electrical incandescence lamps. May 28.

„ 12,163. Abel.—From Siemens and Halske Akt.-Ges., Germany. Method for obtaining homogeneous bodies from vanadium, tantalum, or niobium, or from alloys thereof. May 28.

„ 12,182. Imray.—From Oesterreichische Gasglühlicht und Electricitäts Ges., Austria. Improved manufacture of electrical glow lamps with osmium filaments. May 28.

„ 12,183. Imray.—From La Compagnie des Recipients et Lampes Inexplosibles, France. Vessels for holding volatile inflammable liquids.* May 28.

„ 12,241. Bremer. Electric arc lamps. May 28.

„ 12,278. Koch and Rothenburg. Incandescent gas lamps.* May 29.

„ 12,285. Stroud and Gittos. Carburettors. May 29.

„ 12,360. Bray. Burners for acetylene gas.* May 31.

„ 12,362. Crossley and Rigby. Apparatus for treating gas and air in connection with gas producers. May 31.

„ 12,363. Crossley and Rigby. Gas producers. May 31.

„ 12,409. Wiederhold. Gas burners especially adapted for use with incandescent mantles.* Filed May 31. Date applied for, Nov. 4, 1901, being date of application in United States.

„ 12,429. von Heidenstam. Method of and apparatus for producing fuel briquettes and the like. May 31.

„ 12,461. Elworthy and Williamson. Manufacture of gas for illumination, heating, and power purposes, and apparatus therefor. May 31.

[C.S.] 11,257 (1901). Quain and Turnbull. Electrolytic incandescent lamps. June 4.

„ 11,825 (1901). Chandler and Chandler. Gas purifying apparatus. May 28.

„ 12,383 (1901). Sutcliffe. Method of and machinery for making bricks, briquettes, fire-lighters, and the like. June 4.

„ 12,605 (1901). Strauss. Method and apparatus for firing and heating furnaces. May 28.

„ 13,007 (1901). Nelson and Brooke. Reheating furnaces and other furnaces. June 4.

„ 13,651 (1901). Rigaux. Lighting device for gas burners. May 28.

„ 14,165 (1901). Pohl. Manufacture of carbon electrodes and coke. May 28.

„ 14,654 (1901). Burkamper. Vapour burners. June 4.

„ 14,763 (1901). Treichler. Acetylene generators. June 4.

„ 14,806 (1901). Dobbs and Johnston. Carburetters for internal combustion engines. June 4.

„ 14,826 (1901). Imray.—From Scharf. Apparatus for exhausting electric glow lamps. June 4.

„ 15,011 (1901). Haddan.—From Deutsche Gastechnische Ges. mit Beschränkter Haftung. Igniters for gas lamps and burners. June 4.

„ 15,045 (1901). Evans. Electric arc lamps, and means for stopping heat radiation in optical apparatus. June 4.

„ 2249 (1902). Seymour. Machines or apparatus for mixing gas and air. June 4.

„ 3453 (1902). Lemp. Hydrocarbon burners for steam generators. May 28.

„ 4018 (1902). Beech and Beech. Hydrocarbon burners for heating purposes. May 28.

[C.S.] 4371 (1902). Tejada. Acetylene gas generators and portable lamps. May 28.

„ 4901 (1902). Godwin, Keil, and Dougall. Manufacture of coal gas. May 28.

„ 6291 (1902). Brodin and Schepeler. Device for feeding acetylene gas generators. June 4.

„ 6974 (1902). Denayrouze. Incandescence lamps burning vapour of liquid hydrocarbon. May 28. Date applied for under International Convention, Aug. 7, 1901.

„ 7031 (1902). Liais. Incandescence vapour lamps. May 28.

„ 7271 (1902). Wiederhold and Morse. Machine for saturating mantle material for incandescent gas lighting. May 28.

„ 8505 (1902). Dessy. Incandescent gas burners. June 4.

„ 8717 (1902). Fairburn-Hart.—From General Electric Co. Luminous gas electric glow lamps. June 4.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 11,519. Daeschner. Treatment of mineral oils for refining or purifying the same. May 20.

„ 11,868. Melsom. Bituminous or asphaltic structures or fabrics. May 24.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 11,521. Imray.—From Farbwerke, Höchst, Germany. Improved manufacture of alkylated dialkylrhodamines. May 20.

„ 11,522. Imray.—From Farbwerke, Höchst, Germany. Manufacture of products soluble in water from orthonitrophenol-β-lactic acid methyl ketone or its homologues. May 20.

„ 11,666. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Colouring matters of the acridine series. May 22.

„ 11,711. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matters of the acridine series. May 22.

„ 11,771. Ransford.—From Cassella and Co., Germany. Manufacture of sulphur derivatives of *m*-toluylene-diamine and of sulphur colours therefrom. May 23.

„ 11,898. Ransford.—From Cassella and Co., Germany. Manufacture of sulphur colours. May 24.

„ 11,979. Ellis. — From Soc. Chimique des Usines du Rhône, anciennement Gilliard P. Monnet et Cartier. Manufacture of sulphamides. May 26.

„ 12,229. Levinstein, Levinstein, and Levinstein, Ltd. Blue sulphur dyestuff, and process of making the same. May 29.

„ 12,305. Abel. — From Act.-Ges. f. Anilin Fabr., Germany. Manufacture of new polyazo dyestuffs. May 29.

„ 12,436. Abel. — From Act.-Ges. f. Anilin Fabr., Germany. Improved process for developing dye obtained by means of sulphurised colouring matters. May 31.

„ 12,444. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of new dyestuffs and of intermediate products thereof. May 31.

[C.S.] 14,735 (1901). Ransford.—From Cassella and Co. Manufacture of blue cotton dyestuffs. June 4.

[C.S.] 15,064 (1901). Ransford.—From Cassella and Co. Manufacture of new dyestuffs of the acridine group. June 4.

„ 15,682 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of new derivatives of the anthracene series. June 4.

„ 15,927 (1901). Johnson. — From Boehringer und Soehne. Production of amines from nitrogenated aromatic bodies. June 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 11,438. Bleachers' Association, Ltd., and Morris. Apparatus for damping textile fabrics and materials. May 20.

„ 11,439. Cotton. Apparatus for treating fibrous and other materials with fluids. May 20.

„ 11,440. Cotton. Apparatus for treating fibrous and other materials with fluids. May 20.

„ 11,474. Browning. Art of colour printing.* Filed May 20. Date applied for, Oct. 25, 1901, being date of application in United States.

„ 11,687. Schemel. Apparatus for the examination of dyed cloth and the like. May 22.

„ 11,790. Depetro. Decortication and separation of the gum and other incrusting matter from ramie and other fibrous substances. May 23.

„ 12,042. Woodhead and Orr. Treatment of ramie and other fibrous substances.* May 27.

„ 12,074. Sanderson. Fabric printing machines. May 27.

„ 12,277. Christie. New method of printing on paper, calico, silk, and other art fabrics for decorative advertising publications and all other purposes of lithographic printing, by a composition on canvas in substitution of stone. May 29.

„ 12,373. Owens. Dyeing of fibrous materials. May 31.

[C.S.] 8076 (1901). Hill. Process for giving cotton yarns and fabrics certain silk-like properties. May 28.

„ 8156 (1901). Hamer. Apparatus for dyeing or otherwise treating fibrous material, skins, or feathers in a raw, partly or wholly manufactured state, garment, or other made-up form. May 28.

„ 11,236 (1901). Chippier. Process of and apparatus for printing on fabrics. June 4. Date applied for under International Convention, Dec. 19, 1900.

„ 12,389 (1901). Keith and Wardle. Drying chambers and apparatus for use in drying and conditioning yarns and other goods. June 4.

„ 13,828 (1901). Bailey. Combined machine or means for steaming and cooling or exhausting the steam and moisture from piece goods, for imparting a lustre and finish to same. May 28.

„ 15,829 (1901). Wharton. *See under* XIII. C.

„ 25,589 (1901). Zschiedrich. Process for the manufacture of a covering for floors, walls, and the like. June 4.

„ 5348 (1902). Daly. Process of coating lace work and similar material with metal, and mechanism for use in said process. May 28.

„ 5421 (1902). Caldwell.—From Harvie. Machine for washing cocoons. June 4.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[A.] 12,277. Christie. *See under* V.

[C.S.] 8156 (1901). Hamer. *See under* V.

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 11,525. Feldmann. Improved saturator for the manufacture of ammonium sulphate.* May 20.

„ 11,695. Mauser. *See under* I.

„ 11,773. Kaufmann. Super-concentration of acids.* May 23.

„ 11,904. Hooker. Conversion of bicarbonate of soda into soda ash. May 24.

„ 11,969. Eschellmann, Harmuth, and Tentelevsky Chemical Works. Apparatus for the manufacture of sulphuric anhydride. May 26.

„ 12,022. Foster. Apparatus for evaporating, concentrating, and recovering salts from ammonia liquor, brine, and the like. May 27.

„ 12,115. Murray and Read. Apparatus for aërating liquids, or causing liquids to absorb gas. May 27.

„ 12,204. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of alkali-metals in an improved form, and of alkali-metal oxides. May 28.

„ 12,448. Imhoff and The United Alkali Co., Ltd. Manufacture of chlorates. May 31.

[C.S.] 11,312 (1901). Leaver and Leaver. Treatment of tinning residues containing chlorine. June 4.

„ 12,093 (1901). Hemingway. Separation of sulphuretted hydrogen from gaseous and other fluids containing the same, and the desulphurisation of sulphuretted hydrogen. June 4.

„ 13,588 (1901). Scott. *See under* I.

„ 13,733 (1901). Urbain. Manufacture of carbon tetrachloride. May 28.

„ 14,812 (1901). Vis. Process for purification of brine containing salts of calcium. June 4.

„ 15,077 (1901). Read. Capsules or containers for compressed or liquefied gas. June 4.

„ 16,337 (1901). Abel.—From Siemens and Halske Akt.-Ges. *See under* X.

„ 5718 (1902). La Cour and Rink. *See under* XI.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 11,991. Oschatz. Enamelling of metal articles.* May 26.

„ 12,002. Yarrow. Method of and means for use in the manufacture of earthenware and other pipes. May 27.

„ 12,215. Harrison. Enamel liquidiser and economiser. May 29.

„ 12,273. Chomette.—From Lamarre, France. Fitting lids to bodies of articles of china, earthenware, glass, and the like. May 29.

„ 12,295. Hanwell. Glazing. May 29.

„ 12,355. Burton and Burton. Pottery kilns or ovens. May 31.

„ 12,365. Anderson. Improved construction and arrangement of tap or cock for earthenware bottles and other earthenware vessels used for containing and delivering liquids. May 31.

[C.S.] 10,955 (1901). Rowley, Adams, Rowley, and Till. Apparatus for moulding articles in clay and other plastic material. May 28.

„ 14,108 (1901). Haviland. Apparatus for preparing designs in powdered colour for use in ceramic decoration. May 28.

„ 24,333 (1901). Brooke. Glass furnaces and other receptacles for molten material, and means for pouring such metal therefrom. June 4.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 11,473. Palmer. Machine for moulding artificial stone.* May 20.

„ 11,565. Eggert. Bricks and building blocks. May 21.

„ 11,583. Impson and Jewson. Manufacture of concrete and like bricks or blocks, and apparatus therefor.* May 21.

„ 11,620. Oulmière and Serre. Improved composition of cement. May 21.

„ 11,654. Matthews. Kilns for burning bricks, tiles, and the like. May 22.

„ 11,677. Bates, Bates, and Bates. Brick kilns and the like. May 22.

„ 12,075. Phillips. Improved method of waterproofing electrical insulating or other materials. May 27.

[C.S.] 12,589 (1901). Garchey. Manufacture of glass stone. May 28.

„ 13,835 (1901). Wallis. Machinery for making and pressing concrete goods, such as slabs and the like. May 28.

„ 14,126 (1901). Hodgkinson. Tiles for roofing purposes. May 28.

„ 15,029 (1901). Ashton, Crompton, and Kelly. Manufacture of Portland or hydraulic cement. June 4.

„ 20,235 (1901). Blizzard and Todd. Press specially constructed for pressing bricks or blocks of any desired size. May 28.

„ 3518 (1902). Jurschina. Process for the manufacture of artificial acid-proof stone. June 4.

„ 8379 (1902). Maasen. Methods of drying wood, and apparatus therefor. May 28.

„ 9303 (1902). Lake.—From Warren. Method of making and laying cement compositions for roads, pavements, foundations, and the like. June 4.

X.—METALLURGY.

[A.] 11,474. Akester and Ford. Treatment of ores. May 20.

„ 11,536. Spicer and Wright. Moulds for casting, more especially for casting metal ingots. May 20.

„ 11,671. Boult.—From Perron, Italy. Treatment of nickel and copper-nickel ores. May 22.

„ 11,674. Lidgey. Treatment of nickel ores. May 22.

„ 11,758. Daelen and Marcotty. Improved method of compressing bars of steel and steel alloys. May 23.

„ 11,867. Ingham. Manufacture of artificial gold. May 24.

„ 11,921. Marshall. Casting steel. May 26.

„ 11,983. Huck and Fischer. *See under* XXI.

„ 11,986. Sargent. Process of heating metals.* May 26.

„ 12,035. Guthrie and Guthrie. Improved mode and means for treating ores and granular material generally. May 27.

„ 12,067. Daniel. Machines for cleaning tin and terne plates from the oil or grease used in their manufacture. May 27.

„ 12,133. Edelmann. Tinning the insides of barrels, flasks, or other vessels made of steel, iron, copper, or any other material. May 28.

„ 12,204. Johnson.—From Bad. Anilin und Soda Fabr., Germany. *See under* VII.

[A.] 12,296. Neild and Campbell. Solder especially applicable to aluminium. May 29.

„ 12,464. Lake.—From International Ore Separating Co., United States. Separation of ores, and apparatus therefor.* May 31.

[C.S.] 10,859 (1901). Goldschmidt. Process for welding metals. May 28.

„ 12,291 (1901). Jones. Adding carbon to metals. May 28.

„ 16,337 (1901). Abel.- From Siemens and Halske Akt.-Ges Dry process for converting into sulphates magnesium, nickel, copper, and the like in their ores. June 4.

„ 20,202 (1901). Bosshardt. Furnace for the melting of metals, and for like purposes. June 4.

„ 5348 (1902). Daly. *See under* V.

„ 8082 (1902). Herrick. Blast furnaces. May 28.

„ 8764 (1902). Schneider. Armour for ships, turrets, and other structures. May 28.

„ 8774 (1902). Edwards.—From Rose Gold Reclamation Co. Apparatus for the separation of precious particles of gold or other relatively precious metals, and their recovery from the body of pulp or other material with which they are allied. May 28.

„ 9521 (1902). Haultain and Stovel. Concentration of ores. June 4.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 11,508. Thompson. — From Akkumulatoren- und Elektricitäts-Werke Akt.-Ges. vorm. W. A. Boese and Co., Germany. Improved process for the preparation of electrodes or secondary batteries.* May 20.

„ 11,509. Thompson. — From Akkumulatoren- und Elektricitäts-Werke Akt.-Ges. vorm. W. A. Boese and Co., Germany. Process for the production of electrodes for secondary batteries.* May 20.

„ 11,668. Schmidt-Predari. Improved manufacture of electric accumulators. May 22.

„ 11,972. Fischer. Electric accumulator plates. May 26.

„ 11,973. Fischer. Negative plates for electric accumulators. May 26.

„ 12,390. Chapman. Zinc dust secondary cell. May 31.

[C.S.] 6454 (1901). Clark. Grid or electrode for retaining plumbic oxides in accumulators to prevent disintegration during charging and discharging. June 4.

„ 13,078 (1901). Gibbs. Electric accumulators. May 28.

„ 14,486 (1901). Imray.—From Soc. Electro-Metallurgique Française. Process and apparatus for the manufacture of wrought-iron, steel, and cast-iron by electric heating. May 28.

„ 14,643 (1901). Imray.—From Soc. Electro-Metallurgique Française. Electric furnace arranged for being oscillated or tipped. May 28.

„ 14,822 (1901). Rhodin. Electrolytic apparatus. May 28.

„ 16,122 (1901). Dorsemagen. Working zinc and substances containing silicic acid in electric furnaces. June 4.

„ 5718 (1902). La Cour and Rink. Method of and apparatus for the electrolysis of alkaline chloride solutions. May 28.

„ 7660 (1902). Lake.—From Electric Furnace Co. Manufacture of steel. May 28.

„ 9438 (1902). Schiele. Silver plating and gilding processes. June 4.

XII.—FATS, OILS, AND SOAP.

[A.] 11,466. McCallum and Campbell. Construction of jars, pots, drums, and such like, for holding or containing paints, oils, or other substances. May 20.

„ 11,479. Clarkson. Improved composition to be used as a substitute for tallow. May 20.

„ 11,494. Majert. Process for the preparation of new bromine and iodine compounds of fats and of the methyl- and ethyl-esters of fatty acids. May 20.

„ 11,619. Flynn and Siegener. Machines for manufacturing linoleum. May 21.

„ 11,778. Lake.—From Reale, Italy. Production of soaps and fats. May 23.

„ 11,961. Walther. Manufacture of soap. May 26.

„ 12,341. Rattray and Hamilton. Oil filters. May 31.

[C.S.] 14,603 (1901). Kremer and Schilling. Process of and apparatus for the recovery of fats and the like. May 28.

„ 4984 (1902). Pedersen. Machines for wrapping articles of regular form, such as candles, soap, and the like. May 28.

„ 6634 (1902). McFarlane and Reinhl. Process of extracting oil from cotton seed. June 4.

„ 9283 (1902). Tate. Apparatus for heating, clarifying, filtering, and liquefying waste oils or lubricants. June 4.

„ 9313 (1902). Downs. Lubricant, and process for manufacturing the same. June 4.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 11,466. McCallum and Campbell. *See under* XII.

„ 11,552. Krokert. Process for printing with many colours on iron plates with a partially tabbed ground produced by means of a mordant. May 21.

„ 11,684. Ott. Processes for the manufacture of bronze powder. May 22.

B.—Resins, Gums, &c.

[A.] 12,450. Efrem. Production of a supple resinous coating.* May 31.

C.—India-rubber, &c.

[A.] 12,075. Phillips. *See under* IX.

„ 12,473. Lake.—From Straus, United States. Manufacture of artificial sponges.* May 31.

[C.S.] 15,829 (1901). Wharton. Process of waterproofing and preserving from decay and attacks of insects, canvas paper, wicker-ware, and other fibrous and textile materials and articles. May 28.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 11,502. Boult.—From Fratelli Dufour, Italy. Improved treatment of tanning extracts.* May 20.

„ 12,299. Bartels. Improved cement for uniting pieces on wood. May 29.

[C.S.] 12,539 (1901). Demantké and Salentey. Apparatus for use in tanning, tawing, and like processes. May 28.

XV.—MANURES, ETC.

[A.] 11,779. Hewer. Improved process for the production of a fertilising material or top-dressing for crops, applicable also as an insecticide. May 23.

[C.S.] 12,335 (1901). Schäfer. *See under* XVIII A.

XVI.—SUGAR, STARCH, AND GUM, ETC.

[A.] 11,790. Depetro. *See under* V.

„ 11,812. Laug, Blake, and Smart. Continuous liquor and syrup heating and feeding apparatus in conjunction with vacuum pans for producing sugar in crystals.* May 24.

[C.S.] 13,588 (1901). Scott. *See under* I.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 11,434. Howard. Presses used in the manufacture of cider, perry, and the like. May 20.

„ 11,645. Grant and Duff. Distillery refuse destructor. May 22.

„ 11,734. Koenitzer. New process to make malt beer free of alcohol. May 23.

„ 12,037. Guthrie and Guthrie. New or improved apparatus for treatment of grain and hops and similar purposes. May 27.

„ 12,114. Jensen.—From Underwood, United States. Pneumatic malting drums.* May 27.

„ 12,115. Murray and Read. *See under* VII.

„ 12,384. Meyer.—From Meyer and Arbuckle, Trinidad. Construction of stills for the distillation of spirits.* May 31.

[C.S.] 10,356 (1901). Haynes. Malt kilns. May 28.

„ 12,797 (1901). Larkin. Kiln or apparatus for drying malt, hops, and the like. June 4.

„ 15,158 (1901). Campbell.—From Campbell. Casks or receptacles for beer or other liquids liable to damage from contact with air. June 4.

„ 6796 (1902). Weyermann. Process for producing tasteless roasted malt decoctions. June 4.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 11,534. Bamberg. Improved food and its manufacture. May 20.

„ 11,608. Deane. Improved food product.* May 21.

„ 12,115. Murray and Read. *See under* VII.

„ 12,125. Smethurst. Treatment of frozen food. May 27.

„ 12,177. Bamberg. New or improved method of manufacturing foods. May 28.

„ 12,453. Passburg. New or improved method of desiccating fruit, vegetables, or similar produce. May 31.

[C.S.] 12,335 (1901). Schäfer. Process for the manufacture of fish powder. May 28.

„ 12,820 (1901). Wright. Manufacture and supply of aërated liquids or beverages. June 4.

„ 15,222 (1901). Helm. Process for preserving milk. June 4.

„ 4723 (1902). Gomez. Process for preserving apples. June 4.

B.—Sanitation; Water Purification.

[A.] 11,686. Springborn and Burnie. Treatment of sewage. May 22.

„ 12,303. Osbourn. Feed-water heaters, filters, and purifiers.* May 29.

[C.S.] 10,838 (1901). Boult.—From Vial. Treatment of sewage including the discharge from factories and the like. June 4.

[C.S.] 11,508 (1901). Arnold. Disinfecting apparatus for drains, sewers, and the like. May 28.

„ 12,287 (1901). Ridgway. Apparatus for controlling automatically the distribution of sewage and other liquids over filter or other beds; and for the retention of such liquids therein. May 28.

„ 13,283 (1901). Schmidt. Apparatus for supplying reagents for purifying water or other liquids. May 28.

„ 13,832 (1901). Adams and Creer. Sewage or water filters, and apparatus connected therewith. June 4.

„ 19,125 (1901). Haines. Process of and apparatus for softening waters and purifying waste liquors. June 4.

C.—Disinfectants.

[A.] 11,535. Choulet. Means for the application of acetylene as a disinfectant and insecticide. May 20.

„ 11,779. Hewer. *See under* XV.

[C.S.] 13,571 (1901). Büchelin. Apparatus for producing sterilised salves, ointments, and the like. May 28.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 11,505. Mills.—From Transparent Cellulose Products Co., United States. Collapsible tubes and other tubular articles.* May 20.

„ 11,586. Wetter.—From Lederer, Germany. Process for acetylising cellulose and materials containing cellulose. May 21.

„ 11,593. Walbinger. Processes for treating pasteboard and paper saturated with tar, asphalt, or like impregnating substances.* May 21.

„ 12,452. Schaak. Process of and apparatus for the manufacture of covers or envelopes of corrugated strawboard or similar material for the protection of bottles and the like. May 31.

[C.S.] 14,981 (1901). Franquet. Compound for use as a substitute for shell, ivory, and the like. June 4.

„ 4369 (1902). Soc. Petitcolliu. Articles of celluloid. May 28. Date applied for under International Convention, Dec. 16, 1901.

„ 4759 (1902). Tibbetts. Screens for paper pulp. June 4.

„ 7141 (1902). Hughes. Process of forming wood-pulp into sheets. May 28. Date applied for under International Convention, July 3, 1901.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 11,494. Majert. *See under* XII.

„ 11,750. Wirth. Process for the reduction of aromatic nitro-compounds containing two or more nitro-groups.* May 23.

„ 11,873. Hoyermann. Process for rendering the phosphoric acid contained in natural phosphates soluble in citric acid.* May 24.

„ 11,882. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of new pharmaceutical compounds. May 24.

„ 11,968. Coxeter and Coxeter. Inhalers for ethyl chloride and other volatile anæsthetics. May 26.

„ 12,181. Givaudan. Manufacture and preparation of a new series of derivatives of saccharine. May 28.

[C.S.] 14,366 (1901). Boehm.—From Merck. Process for preparing alkyl ethers of morphine. May 28.

„ 19,234 (1901). Ingham. Manufacture of alkaline alginate. May 28.

[C.S.] 22,629 (1901). Dreher. Process for the manufacture of titanium lactate. June 4.

„ 23,188 (1901). Dreher. Process of manufacturing mixed salts of titanic, oxalic, and tartaric acids, and of titanic, oxalic, and lactic acids. June 4.

XXI.—PHOTOGRAPHY.

[A.] 11,559. Hutchison. New or improved machine or means for developing, fixing, and washing photographic plates or flat films. May 21.

„ 11,596. Pollak, Egger, and Silberstein. Photographic developing apparatus.* May 21.

„ 11,983. Huck and Fischer. Process of rendering aluminium and its alloys fit for the direct production thereon of photographic or other printed pictures.* May 26.

[C.S.] 14,079 (1901). Reichert. Means or apparatus for developing and fixing cartridge photographic films. May 28.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 11,503. Muir and Bell. Igniting material for matches and the like. May 20.

„ 11,664. Williams. Fog signals for railways. May 22.

[C.S.] 13,355 (1901). Underwood. Combined marine torch and rocket. May 28.

„ 15,983 (1901). Nathan, Thomson, and Rintoul. Apparatus for the manufacture of nitro-glycerine. June 4.

„ 8776 (1902). Duttenhofer. Process for producing easily ignitable explosive materials. June 4.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 48

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 12.—Vol. XXI. **JUNE 30, 1902.** No. 12.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stamford	1893—1894.
T. E. Thorne, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1902.

President: Ivan Levinstein.

Vice-Presidents:

...rge Beilby. — J. M. C. Paton.
Forbes Carpenter. — Dr. Boverton Redwood.
...John Clark. — Walter F. Reid.
...C. F. Chandler, D.Sc., LL.D., Ph.D., LL.D. — *A. Gordon Salamon.*
...G. G. Henderson, D.Sc. — Dr. Jos. W. Swan, F.R.S.
R. Messel. — *R. C. Woodcock.*

Ordinary Members of Council:

...A. Brotherton, M.P. — David Howard.
...tace Carey. — Prof. E. J. Mills, D.Sc., F.R.S.
Edw. Divers, F.R.S. — Max Muspratt.
...s. Fairley. — *Dr. F. B. Power.*
...C. W. R. E. Hodgkinson, D.D. — *Dr. W. S. Squire.*
...rant Hooper. — *Thos. Tyrer.*

Sectional Chairmen and Secretaries.

CANADIAN.
...W. R. Lang. | Alfred Burton.

LIVERPOOL.
...onguet Higgins. | Dr. T. Lewis Bailey.

LONDON.
...Hehner. | A. R. Ling.

MANCHESTER.
...J. Grossmann. | J. Carter Bell.

NEWCASTLE.
...L. Rennoldson. | F. C. Garrett.

NEW YORK.
...ford Richardson. | Dr. H. Schweitzer.

NOTTINGHAM.
...rchbutt. | J. T. Wood.

SCOTTISH.
...Robert Pullar. | Dr. Thos. Gray.

YORKSHIRE.
...rge Ward. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.
Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.	Wm. Kellner, Ph.D.
G. Beilby.	Charles A. Kohn, M.Sc., Ph.D.
J. Carter Bell.	J. Lewkowitsch, Ph.D.
Joseph Bernays, M.I.C.E.	A. R. Ling.
H. Brunner.	W. Macnab.
Edw. Divers, M.D., D.Sc., F.R.S.	N. H. Martin.
Sir John Evans, K.C.B., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
A. G. Green.	B. E. R. Newlands.
Samuel Hall.	John Pattinson.
Otto Hehner.	F. B. Power, Ph.D.
John Heron.	Prof. H. R. Procter.
D. B. Hewitt, M.D.	Boverton Redwood, D.Sc.
E. Grant Hooper.	Walter F. Reid.
David Howard.	John Spiller.
Prof. J. J. Hummel.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams	I., XV.
L. Archbutt	I., XII., XVIII.B.
J. L. Baker	XVI., XVII.
H. Ballantyne	II., XII.
D. Bendix	III.
E. Bentz	IV., V., VI.
J. O. Braithwaite	XX.
J. F. Briggs	XVI., XVII.
J. H. Collins	X.
C. F. Cross	V., XII., XIX.
J. T. Dunn, D.Sc. ..	VII., X., XI.
Walter C. Hancock, B.A.	VIII., IX.
J. W. Hinchley.	I., X., XIII., XXI.
H. Ingle, Ph.D...	V., VI., XII., XIII.
R. L. Jenks	XIV., XIX.
J. B. C. Kershaw. ...	VII., XI.
M. C. Lamb	VI., XIV.
T. A. Lawson, Ph.D...	IV., XX.
F. H. Leeds..	III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc.	IV. V.
J. McCrae, Ph.D.	IV.
G.W.MacDonald, M.Sc. .	XXII.
W. G. McMillan	X., XI., XIV., XXII.
N. H. J. Miller, Ph.D.	XV.
C. A. Mitchell, B.A.....	XII., XXII.
A. More	VII., XVIII.
G. T. Morgan, D.Sc. ...	IV., V.
J. G. Parker, Ph.D.	XIV.
H. T. Pentermann	XVI., XVII.
H. S. L. Polak ...	Patent List.
T. H. Pope...	XVI., XX., XXI.
F. W. Renaut.....	Index.
G. H. Robertson	XI.
Chas. Salter	I., II., III., XV., XVI.
M. J. Salter.....	XIII.
R. Sandon	II.
J. Shields, D.Sc., Ph.D.	XI.
A. Shonk	Gen. Chem.
W. P. Skertchley	XII., XVIII., XX.
E. Sonstadt.....	III., VII., X.
E. Howard Tripp, Ph.D.	III., VII., XVI.
Charles T. Tyrer	XX.
L. J. de Whalley, B.Sc. ..	XVI.
A. Wingham	X.
Joseph T. Wood	XIV.
A. C. Wright, B.Sc., M.A. ..	IV., XVIII., XX.

Canadian Section.

Chairman: W. R. Lang.
Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.	Thos. Heys.
J. H. Bowman.	Edgar B. Kenrick.
Hugo Carlsson.	Thos. MacFarlane.
F. H. Clergue.	F. J. Smale.
W. Hodgson Ellis.	J. M. Sparrow.
W. G. Ellis.	Thos. L. Willson.
W. L. Goodwin.	

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: C. Longuet Higgins.
Vice-Chairman: Alf. Smetham.

Committee:

Percy Bateson.	*Herbert E. Davies.*
J. Campbell Brown.	*D. Herman*
A. Carey.	Julius Raschen.
Eustace Carey.	*F. H. Tate.*
G. C. Clayton.	*W. Collingwood Williams.*
Jas. T. Conroy.	

Hon. Treasurer: W. P. Thompson.
Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

The following take office in July next:—*Chairman:* F. H. Tate. *Vice-Chairman:* C. Longuet Higgins. *Committee:* Max Muspratt, Alf. Smetham, H. B. Stocks, J. W. Towers.

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.

Committee:

J. J. Bowley.	*B. E. R. Newlands.*
A. C. Chapman.	*Boverton Redwood.*
E. Divers.	Walter F. Reid.
H. Hemingway.	F. Napier Sutton.
E. Grant Hooper.	L. T. Thorne.
D. Lloyd Howard.	C. T. Tyrer.
W. Kellner.	Frank Wilson.
J. Lewkowitsch.	

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

The following take office in July next:—*Chairman:* Walter F. Reid. *Committee:* Julian L. Baker, M. O. Forster, Oscar Guttmann, Otto Hehner, A. Gordon Salamon, W. S. Squire.

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.

Committee:

J. Barnes.	*W. Irwin.*
W. Brown.	*M. J. Langdon.*
J. Craven.	*A. K. Miller.*
B. W. Gerland.	H. Porter.
W. Heys.	T. Stenhouse.
J. M. Irving.	H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

The following take office in July next:—*Chairman:* Ivan Levinstein. *Vice-Chairman:* W. H. Bailey. *Committee:* J. Allan, R. Clayton, J. Hübner, H. Levinstein, W. J. Pope.

Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.	*H. S. Pattinson.*
P. P. Bedson.	John Pattinson.
J. T. Dunn.	W. W. Proctor.
T. W. Hogg.	*G. Sisson.*
H. Louis.	Harry Smith.
F. S. Newall.	J. E. Stead.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

The following take office in July next:—*Committee:* H. S. Collins, J. Mather, C. E. Stuart.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.

Committee:

H. C. Aspinwall.	*R. W. Moore.*
M. T. Bogert.	*T. J. Parker.*
C. F. Chandler.	R. C. Schüpphaus.
A. P. Hallock.	M. Toch.
E. J. Lederle.	*G. N. Williamson.*
E. G. Love.	D. Woodman.

Hon. Treasurer: R. C. Woodcock.
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

The following take office in July next:—*Chairman:* V. Coblentz. *Vice-Chairman:* Russell W. Moore. *Committee:* L. Baekeland, G. Drobegg, W. F. Fuerst, Clifford Richardson, G. C. Stone, W. T. Schieffelin.

Nottingham Section.

Chairman: L. Archbutt.
Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.	A. L. Stern.
F. J. R. Carulla.	*J. J. Sudborough.*
R. M. Caven.	S. Trotman.
H. B. Mayfield.	G. J. Ward.
J. O'Sullivan.	J. White.
J. M. C. Paton.	

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Nottingham.

The following takes office in July next:—*Committee:* Loxley Meggitt.

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.

Committee:

W. Carrick Anderson.	*W. Foulis.*
E. M. Bailey.	D. S. Jerdan.
G. T. Beilby.	A. D. Ker.
H. Bumby.	J. G. F. Lowson.
J. Christie.	J. McCulloch.
W. J. Chrystal.	*T. L. Patterson.*
D. B. Dott.	*D. J. Playfair.*
C. J. Ellis.	

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgow.

The following take office in July next:—*Chairman:* T. L. Patterson. *Vice-Chairman:* D. J. Playfair. *Committee:* Thos. Ewan, W. Frew, Jas. Hendrick, Jas. Hope, H. Ingle, W. G. Johnston.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: T. Fairley.

Committee:

E. A. Brotherton.	S. G. Rawson.
A. W. Cooke.	A. Smithells.
W. M. Gardner.	A. Turnbull.
H. Grandage.	H. A. Watson.
Edw. Halliwell.	*Thorp Whitaker.*
A. J. Murphy.	J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

The following take office in July next:—*Chairman:* Jas. E. Bedford. *Committee:* C. S. Bedford, John W. Cobb, H. Ingle, G. W. Slatter.

N.B.—The names in *italics* are those of members of Committee who retire from their respective offices at the end of the current session.

Notices.

ANNUAL GENERAL MEETING, LIVERPOOL, 1902.

PROVISIONAL PROGRAMME.

Wednesday, July 9th.

10.30 a.m. Council Meeting, at University College.
11.0 a.m. General Meeting, at University College.
1.30 p.m. Luncheon, at the Adelphi Hotel, by invitation of the Liverpool Section. Ladies accompanying members are invited.
3.0 p.m. Garden Party, at Seaforth Hall, by invitation of E. K. Muspratt, Esq., J.P.
3.0 p.m. to 10.0 p.m. Reception at the Town Hall, by the Lord Mayor of Liverpool.

Thursday, July 10th.

Whole Day Excursions :—

(1) Works of the Telegraph Manufacturing Co., Ltd., at Helsby. Luncheon, by invitation of the Directors of the Company. Afternoon Tea, by invitation of G. Crosland Taylor, Esq.

(2) Excursion to Prescot :—
Morning—Works of the British Insulated Wire Company. Luncheon, by invitation of the Directors of the Company.
Afternoon—Works of the Lancashire Watch Company.

Half-Day Excursions :—

Morning—

(1) Visit to Port Sunlight Village and the Works of Messrs. Lever Brothers. Luncheon, by invitation of Messrs. Lever Brothers. Ladies are invited to join this excursion.

(2) Works of the United Alkali Co., Ltd., at Widnes. Luncheon by invitation of the Mayor of Widnes (W. W. Gossage, Esq., J.P.) and Directors of the United Alkali Company. It is hoped that it will be possible to convey members on this excursion by motor cars.

(3) Messrs. Ogden's Tobacco Factory and the Tobacco Warehouses of the Mersey Docks and Harbour Board.

Afternoon—

(1) Works of the Diamond Match Co. at Seaforth.

(2) Liverpool Corporation Electric Power Stations.

8.30 p.m. Annual Dinner at the Adelphi Hotel.

Friday, July 11th.

Whole Day Excursion to Llandudno and Beaumaris by Saloon Steamer "St. Elvies."

8.0 p.m. Smoking Concert at the Reform Club.

A detailed programme, with request forms for tickets, will be found in the Journal for May 31, and the ticket of membership in the Journal for June 16th.

In accordance with the provisions of Rule 18 of the By-laws, notice is hereby given that those Members whose names are placed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Ivan Levinstein has been nominated to the office of President for a second year, under Rule 10; Mr. E. Grant Hooper, Dr. F. B. Power, Sir Wm. Ramsay, K.C.B., D.Sc., F.R.S., and Mr. Thos. Tyrer have been nominated Vice-Presidents under Rule 8; and Dr. John Clark has been nominated a Vice-President under Rule 24.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Dr. J. Grossmann, Dr. J. Lewkowitsch, and Messrs. N. H. Martin and Frank Scudder have been nominated under Rule 18 to fill four vacancies among the Ordinary Members of Council. There will therefore be no Ballot.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit (alcohol) having been accepted by the Government, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

The Council has appointed a Committee, consisting of the President, Hon. Treasurer, Dr. Squire, Mr. David Howard, Mr. A. G. Green, Mr. Walter F. Reid, and Mr. Thos. Tyrer, to consider and report on this question.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. .....
.....

And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate .....

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....

Profession or Business Occupation .....

Date .....

(*Extract from Bye-laws—Rules 27, 29, and 30.*)

Each Member shall pay an annual subscription of Twenty five Shillings, due on the First of January in each

year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription: except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken t produce a reliable technical dictionary in three language —English, French, and German—and has asked this Societ to furnish the names of such scientific and industrial me as are willing to supply the technical expressions of thei own special branches of industry. The assistance to b rendered must be gratuitous, as otherwise the expens would be prohibitive; but no money is asked for by th German Society, though it has already spent considerabl sums upon the work, and has provided an editor, Dr. Huber Jansen, of Berlin, with a staff, to collate the material supplied.

The Council of this Society agreed to co-operate i the work, and appointed a special committee, consist ing of the President, Hon. Treasurer, Drs. Lewkowitsch Kohn, Messel, Redwood, and Squire, and Messrs. Beilby Hehner, Newlands, Reid, and Watson Smith to decid upon the form of co-operation. It has been determined t select one or more representatives for each class of th Journal and Patent Literature; and the committee no asks for volunteers to undertake a class or division of class. To those who intimate their wish to help, fu particulars of the plan of the work, with instructions ho to proceed, will be sent. Offers of co-operation should b addressed to the General Secretary.

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR 1901.

(Made up to the 23rd May 1902.)

REVENUE.

	£ s. d.	£ s. d.
Annual Subscriptions for 1901:—		
1 subscription received in 1899	1 5 0	
142 subscriptions received in 1900	177 2 0	
3,236 subscriptions received in 1901	4,045 0 0	
49 subscriptions received in 1902	61 5 0	
(Sundry balances and excess payments)	3 13 3	
		4,288 5 3
3,428		
Entrance Fees (319 at 1*l.* 1*s.*)	334 19 0	
Life Composition Fees (2 at 20*l.*)	40 0 0	
"Collective Index" Subscriptions	..	26 10 0
Investments:—		
Interest on Metropolitan 3 per cent. Consolidated Stock	126 14 10	
Interest on Gas Light and Coke Company's 3 per cent. Consol. Deb. Stock.	17 1 3	
Interest on North British Railway 3 per cent. Consolidated Lien Stock	30 16 7	
Interest on Midland Railway 2½ per cent. Perpetual Preference Stock	17 8 10	
Interest on Great Eastern Railway 4 per cent. Irredeemable Guaranteed Stock	24 15 11	
Interest on New Zealand 3 per cent. 1945 Stock	23 7 6	
Interest on New South Wales 3 per cent. 1935 Stock	13 15 4	
Interest on South Eastern Railway 4½ per cent. Preference Stock	23 14 1	
Interest on Southwark and Vauxhall Water Company 3 per cent. Debenture Stock	28 7 6	
Interest on Great Northern Railway 3 per cent. Debenture Stock	11 7 0	
Interest on Nottingham Joint Stock Station 3 per cent. Debenture Stock	2 16 9	
Interest on Deposit Account at Bank	35 16 7	
		306 2 2
Journal:—		
Advertisements	588 0 0	
Sales	429 6 8	
		1,017 6 8
		£5,698 4 1

EXPENDITURE.

	£ s. d.	£ s.
Journal Expenses:—		
Publishing	2,195 6 6	
Editorial:—	£ s. d.	
Editor's Salary	500 0 0	
Editor's Expenses	54 7 8	
Abstractors	555 3 10	
Indexing Journal	114 7 0	
Patent Lists	68 15 10	
Sub-Editor's salary	150 0 0	
Foreign Journals	20 6 6	
Sundry Journals	2 10 6	
	1,465 11 4	
Insurance of Stock	7 2 6	
		3,668 0
Printing Sundries		117 1
Sectional Expenses		425 18
Secretary's Salary (see also Sub-Editor)		300 0
Assistant		35 17
Library (Binding Books)		24 7
Annual Meeting Expenses		169 7
Honorary Treasurer's Assistant		52 10
Stationery		41 8
Office Expenses		133 6
Auditors' Fee		10 11
Investment:—		
200*l.* Nottingham Joint Stock Station 3 per cent. Debenture Stock	189 0 0	
800*l.* Great Northern Railway 3 per cent. Debenture Stock	818 9 0	
Sundries		12 1 6
Bank Charges		4 13
Treasurer's Petty Cash, Postage and Clerical Assistance writing up subscriptions		36 1 1
Secretary's Petty Cash and Postage		54 8
Balance of Revenue over Expenditure		610 1 1
		£5,698 1

THE TREASURER—IN ACCOUNT WITH THE SOCIETY OF CHEMICAL INDUSTRY FOR THE YEAR 1901.

Dr.

	£ s. d.	£ s. d.
Cash on Deposit (1st January 1901)	650 0 0	
Balance at Bank (1st January 1901). ...	218 14 4	
Cash in Secretary's hands (1st January 1901).....	4 6 9	
Annual Subscriptions :—		873 1 1
6 for the year 1899.....	7 10 0	
68 for the year 1900	85 0 0	
3,236 for the year 1901.....	4,045 0 0	
142 for the year 1902 (less 8s. short paid)	177 2 0	
2 for the year 1903 (less 4s. short paid).....	2 6 0	
1 for the year 1904.....	1 5 0	
(Sundry odd amounts, balances and excess payments).....	3 13 3	
3,455		
		4,321 16 3
Entrance Fees (319 at 1*l.* 1*s.*)	..	334 19 0
Life Composition Fees (2 at 20*l.*)	..	40 0 0
"Collective Index" Subscriptions.....	..	19 10 0
Interest from Investments :—		
Metropolitan 3 per cent. Consolidated Stock.... (4,476 9 2)	126 14 10	
Gas Light and Coke Company's 3 per cent. Consolidated Debenture Stock..... (600 0 0)	17 1 3	
North British Railway 3 per cent. Consolidated Debenture Stock ..... (1,084 13 4)	30 16 7	
Midland Railway 2½ per cent. Perpetual Preference Stock..... (736 0 0)	17 8 10	
Great Eastern Railway 4 per cent. Irredeemable Guaranteed Stock .... (654 0 0)	24 15 11	
New Zealand 3 per cent. 1945 Stock ..... (1,000 0 0)	28 7 6	
New South Wales 3 per cent. 1935 Stock ..... (485 4 8)	13 15 4	
South Eastern Railway 4½ per cent. Preference Stock..... (673 0 0)	28 14 1	
Southwark and Vauxhall Water Company's 3 per cent. "B" Debenture Stock..... (1,000 0 0)	28 7 6	
Great Northern Railway 3 per cent. Debenture Stock..... (800 0 0)	11 7 0	
Nottingham Joint Stock Station 3 per cent..... (200 0 0)	2 16 9	
(11,709 7 2)		
Interest on Deposit Account at Bank ...	35 16 7	
		366 2 2
Journal:—		
Advertisements	636 0 0	
Sales.....	428 15 0	
		1,064 15 0
		£ 7,020 3 6

Cr.

	£ s. d.	£ s. d.
By Journal Expenses :—		
Publishing	2,556 3 10	
Insurance of Stock	7 2 6	
Editorial :—	£ s. d.	
Editor's Salary	500 0 0	
Editor's Expenses	47 13 4	
Abstractors	531 19 2	
Patent Lists.....	69 15 6	
Indexing Journal.....	89 2 0	
Foreign Journals	20 6 6	
Sundry Journals	2 10 6	
Sub-Editor (Secretary)	150 0 0	
	1,411 6 6	
		3,774 12 10
Sundries, Printing, &c.	..	104 3 3
Sectional Expenses :—		
Liverpool Section.....	31 2 6	
London Section.....	108 11 2	
Newcastle Section	23 15 9	
Manchester Section	53 13 3	
New York (U.S.A.) Section.....	138 0	
Nottingham Section	20 1 3	
Scottish Section	38 16 10	
Yorkshire Section	11 17 4	
		425 18 1
Secretary's Salary (see also Sub-Editor).....		300 0 0
Assistant to Secretary.....		35 17 3
Library (Binding Books)		22 8 3
Stationery		57 16 1
Annual Meeting Expenses.....		169 7 7
Honorarium to Honorary Treasurer's Assistant (1900).....		52 10 0
Office Expenses, &c.:—		
Rent.....	105 10 0	
Fire Insurance.....	0 5 0	
Cleaning, Attendance, &c.....	11 19 4	
Gas and Electric Light	5 15 3	
Repairs to Furniture, Office Requisites, &c.	9 17 0	
		133 6 7
Auditors' Fee	..	10 11 6
Investments :—		
Purchase of 200*l.* Nottingham Joint Stock Station Debenture Stock...	189 0 0	
Purchase of 800*l.* Great Northern Railway 3 per cent. Debenture Stock	818 9 0	
		1,007 9 0
Sundries	..	12 18 6
Bank Charges	..	4 16 3
Treasurer's Petty Cash and Postage	21 4 7	
Clerical assistance writing up Subscriptions	15 11 6	
		36 16 1
Secretary's Petty Cash and Postage....	..	54 5 8
Cash on Deposit (31st December 1901)..	500 0 0	
Balance at Bank (31st December 1901).	317 6 8	
	817 6 8	
Less cash due to Secretary	0 0 1	
		817 6 7
		£ 7,020 3 6

have compared the above Statement with the Vouchers, Counterfoils of the Receipts issued, and other records, and are of opinion it co tly exhibits the Cash transactions of the Society for the year 1901. The amounts of the Metropolitan 3 per cent. Consolidated, 3 per ce New Zealand, and 3 per cent. New South Wales Stocks have been confirmed by the Chief Accountant to the Bank of England. Ce icates for the remaining investments have been inspected, and the Bank Balances have been certified to us by the Bankers.

, St. Swithin's Lane, Loudon, E.C.,
17th April 1902.

(Signed) MIALL, WILKINS, RANDALL, & Co.,
Chartered Accountants.

List of Members Elected

23rd JUNE 1902.

Ba er, Hugh S., 32, Cumberland Avenue, Sefton Park, Liverpool, Laboratory Furnisher.

Bl , Walter G., Basingstoke Ironworks, Basingstoke, Hants, Chemist.

Br bury S., Thornham New Road, Castleton, Manchester, Chemist.

Co ng, Allan T., The Grove, Stanford-le-Hope, Essex, Ammunition Manufacturer.

Du am, Andrew A., 74, John Street, New York City, U.S.A., Chemist.

Ea Dr. Francis S., Boulder City, Western Australia, Metallurgical Chemist.

Frenzel, Arthur B., Telluride, Col., U.S.A., Consulting Engineer.

Garratt, Elwood A., Winnipeg Collegiate Institute, Winnipeg, Man., Canada, Teacher.

Grimwade, Wilfrid R., 346, Flinders Lane, Melbourne Vic., Australia, Manufacturing Chemist.

Howard, Nelson A., 4530, Oakenwald Avenue, Chicago, Ill., U.S.A., Chemist.

Jameson, Lewis, 91, Queen Victoria Street, London, E.C., Consulting Chemist.

Masujima, Bunjiro, 19, Honjoku Midoricho Sanchome, Tokyo, Japan, Professor of Applied Chemistry.

Naef, Dr. Ernest E., 9, Market Street, Blackley, Manchester, Chemist.

North, Barker, Glenholme, Glenholme Road, Manninghaui, Bradford, Yorks, Lecturer in Chemistry.

Ockel, Reinhold, 9, Walton New Road, Warrington, Technical Chemist.
Pettit, Alfred, 691, Fulton Street, Brooklyn, N.Y., U.S.A., Chemist
Smith, Frank Gurney, 7, Luxemburg Gardens, Brook Green, London, W., Chemical Student.
Sperry, Elmer A., 855, Case Avenue, Cleveland, Ohio, U.S.A., Electrical Engineer.
Weiss, Georg A., Chemische Fabrik, Ahlden a/Aller, Prov. Hannover, Germany, Chemical Manufacturer.
Woodhead, Chas. E., 40, Westwood Street, Moss Side, Manchester, Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Boor, L. G.; all communications to 39, Mincing Lane, London, E.C.
Denham, Wm. S., l/o Holyrood Crescent; 2, Kelvinside Terrace North, Glasgow.
Dodd, T. H., l/o Old Charlton; 6, Granville Park, Blackheath, S.E.
Haines, Reuben; Journals to Haines Street, near Chew Street, Germantown, Philadelphia, Pa., U.S.A.
Hicks, E. F., l/o West 41th Street; 361, West 27th Street, New York City, U.S.A.
Ibbotson, E. C., l/o Barnsley; 3, Ashgate Road, Sheffield.
Jantzen, P., l/o 132; 133, Fenchurch Street, London, E.C.
Kenrick, Prof. F. B.; Journals to 282, Assiniboine Avenue, Winnipeg, Canada.
Lang, J. G., l/o Victoria, B.C.; Mount Sicker, B.C., Canada.
Logan, Jno., l/o Timperley; Offendene, Oakfield Drive, Ashton-on-Mersey.
Macdonald, G. W., l/o Curtis's and Harvey: c/o Pigou, Wilks, and Laurence, Dartford, Kent.
McEwen, Atholl; retain Journals.
Macindoe, G. D., l/o Christchurch; Woodlands, Southland, New Zealand.
Moore, J. H., l/o Fortville, Ind.; Saltville, Va., U.S.A.
Morgan, J. J., l/o London Road; Wann Villa, Mount Pleasant, Neath.
Perry, Jos. H., l/o 176; 276, Highland Street, Worcester, Mass., U.S.A.
Pont, P. S. du, l/o Lorain, Ohio; Wilmington, Del., U.S.A.
Ramsay, Prof. Wm.; Journals to Sir Wm. Ramsay, K.C.B., D.Sc., F.R.S.; address as before.
Renaut, F. W., l/o Tooting Common; 17, Emanuel Avenue, Friar's Park, Acton, W.
Scrutton, W. J., l/o Arizona; 18, Billiter Street, London, E.C.
Skertchley, S. A. R.; retain Journals.
Smith, Jas. F., l/o Ackroydon; 15, Second Avenue, Halifax, Yorks.
Smith, R. W., l/o Leith; 45, Millbrae Road, Langside, Glasgow.
Spencer, Robt., jun., l/o Blackburn; c/o E. Ripley and Son, Ltd., Bowling Dyeworks, Bradford.
Thomas, J. W., l/o London; Overdale, Shortlands, Kent.
Weightman, A. T., l/o Chepstow Rise; 11, Chepstow Road, Croydon.
Wood, Frank, l/o Osborne House; Hazelhurst, Doncaster Road, Barnsley.
Wright, A. C., l/o Hull; 6, Cecil Avenue, Bradford, Yorks.

Deaths.

Hartford, Jas., 3, Cedar Street, New York City, U.S.A.
Macadam, Prof. W. Ivison, Surgeons' Hall, Edinburgh. June 24.
Mooney, Morgan, 118, Pembroke Road, Dublin. June 2.

London Section.

Meeting held on Monday, June 2nd, 1902.

MR. OTTO HEHNER IN THE CHAIR.

Dr. DIVERS called attention to the fact that this was the last meeting of the Session at which Mr. Otto Hehner would preside as Chairman of the Section. He would therefore ask the members to support him in presenting to him a very cordial vote of thanks for the way in which he has performed his duties for the last two years.

The resolution having been carried unanimously,

The CHAIRMAN thanked Dr. Divers and the Members of the Section for the kindness and consideration invariably shown to him. He welcomed in the names of the Section three representatives of Chemical industry coming from other parts of the world, namely, the Hon. F. S. Grimwade from Melbourne, Dr. W. Dreyfus, of New York, and Dr. Holde, of Berlin.

CHEMISTRY OF WHISKY.—I.

BY PHILIP SCHIDROWITZ, PH.D., F.C.S.

The chemistry of whisky has hitherto received very little attention. With the exception of the work of Allen (J. Fed. Inst. Brewing, 1897, **3**, 1), of Allen and Chattaway (Analyst, 1891, 102), of Bell (Brit. and For. Spirits Comm., 1890–91) and a recent paper by Hewitt (this Journal, January 1902), there is practically no literature on the subject. This is no doubt due partly to the great difficulties with which work in this direction is attended, and partly to the fact that the great increase in the consumption of whisky in England is of comparatively recent occurrence. It is frequently stated that the conservatism of British manufacturers impedes the natural growth of applied chemical science, but I am rather inclined to think that if the chemist can clearly show the manufacturer the advantages to be gained from new and improved methods, the latter will not be slow in adopting them. The modern manufacture of beer is a striking proof of this argument. The improvements due to chemical and technological research which have during recent years been made in the manufacture of plain spirit, more particularly on the Continent, are very great. It is true that in the manufacture of pot spirit an entirely different set of conditions obtain, but quite apart from the distillation proper, a great deal might doubtless be done to rationalise and perfect the malting, mashing, and fermenting stages of pot spirit manufacture.

The chemistry of whisky falls naturally into five divisions: (*a*) the chemistry of the malting, (*b*) of the mashing, (*c*) the fermenting, (*d*) of the distillation stages, and (*e*) of the finished product (maturation). The chemistry of *a*, *b*, and *c* has so far received scarcely any attention, and what little work has been done on the chemistry of whisky as a whole is confined almost entirely to the last two sections. This is perhaps not very remarkable, for it is obviously necessary to obtain a more or less complete knowledge of the finished product before one can study the best methods for obtaining the same. It is also clear that sections *d* and *e* dovetail to a considerable extent, and that they are compared with the other sections, of primary importance inasmuch as the malting, mashing, and fermenting stages have much in common with the similar operations in the brewery. For a knowledge of the chemistry of the finished product in its various stages we are wholly, and of the chemistry of the distillation stage very largely, dependent on analytical methods pure and simple, and owing in part to the relatively minute quantities of by-products present and also to the similarity of many of these to one another it is in this connection that the first great difficulty in attacking the question of a rational study of spirit, and more particularly whisky manufacture, is encountered. It is a remarkable fact that there are no analyses of whisky of anything like a complete nature to be found in the literature on the subject. The figures given by Bell (*l*

it.) are confined to the higher alcohols, the compound thers, and the total acid. In two instances he gives figures elating to furfural, but as the samples in point were bviously blended spirits and the process of analysis was ot described, they have very little value. Hewitt (*loc. cit.*) as recently published figures relating to the furfural ontents of a number of whiskies and other spirits, but nfortunately no other data with regard to the same were iven. No definite references with regard to the *quantity* of he aldehydes generally are to be found in literature, lthough Hewitt (*loc. cit.*) states that working with a rocess, the details of which have not yet been published, e found the aldehyde contents of mature spirits appreciably ss than that of the new article. Again, there is no more an a passing reference to be found (as regards the hemistry of maturation) to the part played by the method f storage (*i.e.*, whether in plain, sherry, or refill casks), nd this I am inclined to believe has been considerably nderrated.

My primary object in undertaking the present piece of ork was to obtain, if possible, a closer insight into the mposition of typical commercial whole-malt and whole-rain whiskies class for class, and to see whether any rther light could thus be thrown on the distilling and aturing processes, before proceeding, as I hope to do in ie future, to use synthetic methods for attacking the more eneral problem. In the first place, then, I occupied yself with the examination, control, and modification vhere this seemed possible) of the analytical processes ready in existence, and in working out new methods here these appeared to be necessary, and secondly, with e examination of a number of samples of spirits which I as able to procure, by the same. The samples on which worked were neither as numerous nor as large as I might ve wished, but I can at least say that they were typical nuine samples of pot and grain whiskies respectively, blended, some new, some matured, some stored in plain od, some in sherry casks, and some which had not been wood at all. In three instances I was able to obtain mples of various ages and varying caskage, representing e same make and class of whisky in each series. These e, therefore, fairly comparable, although, strictly speaking, would be necessary to examine the same spirit at given e intervals in order to arrive at absolute results.

The Constituents of Whisky, and Methods of determining m.—The constituents of commercial whisky hitherto ognised are ethylic alcohol, higher alcohols, volatile ds, compound ethers, furfural and other aldehydes, and ractive matter, the latter derived solely from the cask. sides these there are undoubtedly small quantities of atile bases, of "ethereal oils," including terpenes, and of stances of a phenolic nature. With regard to the ethylic ohol nothing need be said, and it is solely to the quantity l quality of the "by-products" that the character of a it is due.

*The Higher Alcohols.**—I have examined three methods the determination of these substances, *viz.*, those of en-Marquardt (Analyst, 1891, June, 102; and Ber. 1882, 0 and 1661), the official German method (Röse-tzer-Windisch) (Arbeiten des kaiserl. Gesund. Amt., 9, 5, 391), and the colorimetric method employed at the is Municipal Laboratory (Frémy, Eney. Chim., 1890—1. 285). I have, unfortunately, not been able to mine the ingenious process recently published by umann (Zeits. Unters. Nahr. u. Genussm. 2, 709; and 4, 7–1064), which consists in converting the higher alco-s into their nitrites after separation from the ethylic ohol by a method of extraction similar to that employed he Allen-Marquardt method.

With regard to the methods examined, I am quite sfied that the first (that of Allen-Marquardt), with ain minor modifications, is alone capable of giving fairly ible figures, at any rate where whisky is concerned. The ewhat tiresome and inconvenient method of distillation cribed in the method in question can, I have found, be veniently and safely replaced by a simple distillation with steam. The method of working this is as follows:—To 100 c.c. of spirit (if the sample is a large one, 200 c.c. are preferable) 0·15—0·2 grm. of caustic potash is added, and the whole then boiled for an hour. The contents of the flask are then transferred to a distilling flask of convenient capacity, provided with a cork covered with tinfoil, through which passes, to within a few mm. of the bottom of the flask, a glass tube suitably bent and connected with a steam supply. First roughly 9/10ths of the liquid are distilled off in the ordinary manner by means of a gas burner, and then steam is turned on and the flame under the flask so regulated that the contents of the same are reduced to about 5 c.c. by the time 150 c.c. in all have passed over. The distillation may, as an additional precaution, be continued until 200 c.c. have passed over, but I have not found this to be necessary. After extraction with carbon tetrachloride and oxidation (*i.e.*, as described by Allen), the whole is distilled as indicated above, first by fire alone and then with steam, until about 300 c.c. in all have passed over. The German official method which appears to give good results with Continental patent spirits and "corn brandies" cannot, according to my experience, be employed for whisky. In three cases (with grain whiskies) I obtained negative results, due, I believe, to the presence of a certain substance or substances which depress the chloroform column. Although I do not wish to lay particular stress on the point, this theory received some confirmation in the case of a pot whisky, which by a fractional distillation gave firstly, a distillate which produced a positive effect equal to 0·15 c.c. (corresponding to roughly 1·8 grms. per litre of spirit), and secondly, a fraction which, on addition to the first fraction, reduced the final reading to − 0·10 c.c. (= to 1·2 grm. per litre). On evaporating the chloroform used in this determination, the residue possessed an odour strongly reminiscent of the terpenes. A trace of terpineol added to 30 per cent. alcohol slightly depresses the column, but terpene hydrate is without effect. It is of interest, in this connection, to note that according to Macreker (Handbuch der Spiritus Fabrikation) terpene and terpene hydrate occur in grain fusel oil.

The French colorimetric method (Savalle, Mohler, Saglier, *loc. cit.*), based on the coloration produced by the higher alcohols when acted upon by sulphuric acid, and which I have found to give fair results with brandy, is also not to be recommended in the case of whisky, the chief difficulty being due to the fact that the shades of colour produced differ sensibly from those obtained with the controls. Possibly this might be got over by employing a more suitable control substance, but so far I have not made any experiment in this direction. The following table gives the figures obtained by the three methods respectively. (N.B.—The whiskies are the same as those in the chief table below, but in the latter the figures for the Allen-Marquardt method alone are given.)

TABLE I.—*Higher Alcohols.*

*Results in Milligrammes of Fusel Oil per 100 c.c. of absolute Alcohol.**

Number.	Method.		
	Allen-Marquardt.	German Official.	French (Savalle).
1	263·3	453·6	..
2	182·0	579·6	..
3	265·9	138·6	178·5
4	94·3	1083·6	140·5
5	160·8	252·0	181·8
6	148·3	359·1	160·0
7	76·2	Negative	80·0
8	84·9	Negative	Trace.
9	77·4	Negative	..
10	67·7	252·0	..
11	190·3	208·9	112·2
12	258·0	236·5	127·2

The Compound Ethers.—In this case also, the separation of colouring and extractive matters is best carried out

* These figures divided by 3 roughly give grains per proof gallon.

For the general nature and properties of these and other by-ucts, see Allen and Bell (*loc. cit.*); Hewitt (*loc. cit.*); Brunton Tunnicliffe.—*Lancet*, December 8, 1902.

by a steam-distillation, much on the same lines as those indicated under *higher alcohols* (see above). Allen (Analyst, *loc. cit.*) has suggested that the simple saponification method is rendered more accurate if controlled by a check estimation in a portion of the spirit from which the aldehydes have been removed (for instance, by boiling with a solution of phosphate of aniline). I do not think his method is practicable in most cases for the estimation of the aldehydes as such, but I am certainly of opinion that it is advisable to employ it in order to obtain a corrective factor in estimating the compound ethers. In practice, when working on 100—200 c.c. of spirit, the differences between the "apparent" and "real" figures are so small in most cases that they might be ascribed to experimental error (see below, Table II.), and this is not surprising if it be remembered that a difference of 1 c.c. N/10 alkali corresponds to 0·0192 grm. of furfural, that is, according to my experience, roughly the average quantity present in a litre of pot whisky. Aldehydes other than furfural also are affected by boiling alkali, but taking them as a whole, we are unable to deduce any working figures in this connection.* I think that Hewitt's reagent (phenylhydrazinesulphonate of soda) is more satisfactory than phosphate of aniline, and I have used it throughout my experiments whenever I deemed the removal of aldehydes necessary.

The Acids.—For freshly distilled spirits the quantity of free acid is, as a rule, very small and wholly volatile. I have, however, observed that all whiskies which have been in cask for some time contain an appreciable quantity of *fixed acid* in addition to the volatile acid, and this refers not only to the sherry, but also to the plain cask. This fact has, I believe, hitherto been overlooked. I determined the volatile acid in the steam distilled product obtained in the course of estimating the compound ethers, the fixed acid by direct titration of the residue (after suitable dilution) with decinormal caustic potash, using phenolphthalein as an indicator.

The Aldehydes.—An exact gravimetric or titrimetric method for the estimation of aldehydes in spirits has not yet been devised. If the quantity of aldehyde in a spirit be very large, and an unlimited supply of the latter is to hand, a method such as that of Benedikt and Kitt (Monatsh., 1893, **14**, 270) might be seriously considered. It must, however, be remembered that as a rule the sample of spirit at one's disposal is relatively small, and this is also the case with regard to the aldehyde contents. That being so, methods which depend on titrimetric or gravimetric principles (*cf.* Hewitt, *loc. cit.*) are in the great majority of cases quite impracticable. There remain (for the present) for consideration, therefore, only the colorimetric methods, which, for the most part, have only a qualitative interest. In this category (qualitative aldehyde tests) may be placed the methods of Windisch (Zeits. Spiritus Ind. 1886, [2], 9, 519, and *id.*, 1887, 1088), of Penzoldt and Fischer (Ber., 1883, **16**, 657), of Liebig and of Tollens (Annalen, 1835, 14,158, and Ber., **14**, 1950; do. **15**, 1635 and 1828). The only process, however, which has been seriously worked out as a quantitative reaction is that of Schiff-Gayon-Mohler (Comptes Rend. 1867, 64, 482; *id.*, 1887, 105, 1182, and Frémy's Encyclop. Chim., 1890/1891, 278), which depends on the recoloration of a solution of rosaniline, previously bleached by means of sulphurous acid. Notwithstanding the strictures passed on colorimetric aldehyde processes by Schmidt and Müller, &c., (Ber., 1881, 14, 1848, and Zeits. angew. Chem., 1890, 1634), I am satisfied that the modifications of the same described by Saglier (Frémy, Encyclop. Chim., *loc. cit.*) is capable of giving very good comparative results. Schmidt and Müller (*loc. cit.*) state that ethylic alcohol also produces a reaction, but this is not the fact.* I have observed that the "absolute alcohol" of chemical dealers (which is supposed to be "pure") contains very considerable quantities of aldehyde, which may be removed by treatment with Hewitt's reagent and subsequent redistillation, preferably rejecting the first few cubic centimetres passing over. With an alcohol so purified, the Gayon-Saglier-Mohler reagent gives no coloration, or so faint a pink that a quantitative estimation is thereby entirely unaffected. (*Cf.* also Allen (*loc. cit.*) and Paul, Zeits. anal. Chem., **35**, 648.) Objections to this method (Hewitt, *loc. cit.*), based on the assumption that all aldehydes do not react in the same manner with the reagent, are, in as far as they affect the process as applied to whisky and brandy, rather of an academical than a practical nature, for Girard and Rocques have worked out the relative figures not only for acetic aldehyde (which is used in the control solution), but also for acetale, for propionic, butyric, valeric, and oenanthic aldehydes, and have found that (taking the reaction of acetic aldehyde as = 10), these bodies give figures varying from 7·5—8·5. Paraldehyde, acetone, and furfural give only the faintest rose-colour, that is quantitatively speaking, they are practically = 0. As we are able to estimate furfural separately, and as there is no reason to assume the presence of paraldehyde, this in itself is scarcely a disadvantage.

The estimation of the aldehydes in whisky by the above process has one serious drawback, and that is that when the distilled liquid is treated with the reagent, an opalescence or turbidity is produced which renders the colorimetric estimation exceedingly difficult. I observed that when the reagent was added to an undistilled sample of a colourless whisky, the liquid remained perfectly bright, and this naturally suggested that a modification of the process which would permit of the application of the same to whisky without distillation, was desirable. I first attempted to obtain the desired result by effecting a complete decolorisation of casked (that is, more or less coloured) whiskies, but found this impracticable, as the only method which led to complete decolorisation, *viz.*, that with animal black, also (as was to be expected) profoundly affected the aldehyde contents. The controls in these experiments were carried out with colourless whiskies and control solutions containing a known percentage of acetic aldehyde. At the same time it became apparent that the statements of Carles and others in literature (Allen Organic Commercial Analysis, I., 108), to the effect that cask-coloured spirits may be completely decolorised by means of lead acetate or albumen are not correct. They certainly lose rather more colour than spirits artificially coloured with caramel, but the decolorisation is by no means complete, nor is the difference sufficiently marked to permit of a differentiation between the naturally and artificially coloured articles.* Complete decolorisation being apparently out of the question it occurred to me that the end in view might be obtained by partial decolorisation of the spirit together with a coloration of the control solution, in order, so to speak, to place the sample and the control on the same platform as far as the yellow, or rather the brown, component of the mixed colours obtained are concerned. The substance I finally chose as a decolorising agent was basic lead acetate, the excess of which was subsequently removed by a saturated solution of potassium sulphate. Neither the lead acetate nor the potassium sulphate exert any specific or other influence on the colour produced by the rosaniline reagent, as the following example (one of the many controls carried out) will show:—(*a*) to 10 c.c. of colourless whisky, 0·2 c.c. of lead acetate solution, and subsequently 1 c.c. of potassium sulphate solution were added and the whole immediately filtered, (*b*) ditto, except that the whisky was allowed to stand overnight with the lead acetate before adding the sulphate, (*c*) 10 c.c. of the same whisky were diluted with 1·1 c.c. of distilled water (allowing 0·1 c.c. for the solid precipitate obtained in *a* and *b*) 5 c.c. of each of the three liquids so obtained were diluted to 10 c.c. with 50 per cent. alcohol, and an equal volume (4 c.c.) of the aldehyde reagent added. The coloration (after the lapse of the prescribed time interval) was identical in all three cases.

The Coloration of the Control Solution.—For this purpose caramel was not found to be practicable, as the

* If Gayon's *original* reagent be used, there is some justification for this statement.

* Author's process (Zeits. anal. Chem., 1885, 4, 30) for the detection of caramel is not reliable in the case of *spirits*, and I have found that spirits which were certainly not coloured with caramel gave a precipitate with paraldehyde as described by Author, whereas a plain spirit coloured with caramel made by me did not give any reaction.

reagent exerts a specific influence on this colouring matter.* I then tried (*a*) tincture of galls and (*b*) natural cask colouring matter, the latter obtained by evaporating some genuine cask-coloured spirit to dryness on the water-bath and taking up the residue with 50 per cent. alcohol. Both of these were found quite satisfactory as following figures will show:—(*a*) 10 c.c. of colourless whisky; (*b*) 10 c.c. of same whisky coloured to a certain shade with tincture of galls; and (*c*) 10 c.c. with natural whisky colour. In (*a*) the aldehyde was estimated directly, in (*b*) and (*c*), after adding lead acetate, &c., as described above, and by comparing the liquids so obtained with controls similarly coloured. In each case the result was identical. It is, moreover, immaterial to the result whether the coloration of the control takes place immediately before the addition of the reagent, or directly prior to the taking of the reading, which is additional evidence that the yellow colour factor is not affected by the reagent. Frequently, too, it was observed, that a direct comparison between two different whiskies led to results practically identical with those obtained by comparing each sample separately with the coloured control.

The Furfural.—There are several methods for the gravimetric and titrimetric estimation of furfural available, but I think it is generally admitted that these are out of the question for the determination of this substance in spirits. The first colorimetric method for the quantitative determination by means of an aniline salt is due to Chalmot (Amer. Chem. J., **15**, 25). This has been modified and much improved by Girard, Rocques, and Mohler (Frémy, *loc. cit.*). Recently Hewitt (*loc. cit.*) has described a method which, according to my experience, does not possess any considerable advantage over that of the authors last named, and I am quite unable to understand the suggestion that methylated spirit may be used instead of alcohol. Possibly Hewitt was referring to some specially purified methylated spirit. Saglier, Hewitt, &c., all recommend that the estimation should take place in the distilled spirit (when the latter is coloured), but if the ordinary distillation process possesses drawbacks in the case of the aldehydes, this is still more so the case with regard to furfural. In the first place, distillation (Windisch, this Journal, 1898, 593) in itself is likely to bring about the formation of appreciable quantities of furfural, and secondly, distillation does not overcome the colour difficulty, inasmuch as all the matured whiskies which I have examined developed (whether distilled or not) a yellow colour when treated with the aniline reagent, which colour is quite distinct from the violet furfural reaction, and the development of the same makes any attempt (in the unmodified process) to obtain accurate quantitative results impossible. I have found that there are two methods of overcoming this difficulty, the first of these is to use instead of the ordinary reagent (5 c.c. of aniline to 10 c.c. of glacial acetic acid) an acetate solution containing a large excess of aniline (about double the above amount is a practicable quantity). There is then no development of the yellow colour, or it is so slight as not to interfere with subsequent readings. Unfortunately this method reduces the sensitiveness of the reaction by fully one half. Readings obtained by this method compared with those obtained with the old reagent were in the control solution as 25 : 57, and in whiskies as 28 : 56. The second method of getting over the interference produced by the yellow coloration is by colouring the controls in a manner similar to that described above under aldehydes. The method of procedure which I adopted was as follows:—The whisky was first decolorised as far as possible by means of lead acetate solution, &c., and the reagent was then added to the sample under examination and to the control. The latter was then immediately coloured to match the former. As is the case with the aldehydes, this proceeding in no way affects the reaction.† Moreover, controls so diluted as to contain an amount of furfural equal to that indicated by this method, remained (after the lapse of 20 minutes) identical in colour when compared with the samples, showing that the yellow coloration at first produced is a constant quantity. Further proof of this was obtained by the fact that controls coloured by the method indicated could always by suitable dilution (or the reverse) be brought to the same shade as the spirit under examination, which would not be possible if the yellow factor varied or was affected by the reagent. I shall have more to say with regard to the yellow coloration below. The results obtained by this process were practically identical with those obtained by the first (basic aniline acetate) method.

B. Composition of Whiskies and Effect of Maturation.—The figures with regard to the composition of pot and grain whiskies hitherto published refer, broadly speaking, only to the higher alcohols, the acid and the compound ethers, and in no case is there any reference to caskage in connection with such figures. As a rule, too, where maturation is in question, it is not stated whether the samples compared are from the same distillery, and whether they represent the same make of that distillery. In the table given below, whiskies 1—3, 4—6, and 11—12, respectively, represent batches from the same distillery, and of corresponding makes. The figures are, therefore, fairly comparable *inter se*, although, owing to the fact that the make at one and the same distillery may vary somewhat, they cannot be taken as absolute. With regard, first, to the higher alcohols the figures are somewhat irregular, but, on the whole, they do not confirm the impression, which formerly prevailed, that the improvement in maturation is due to a disappearance of these bodies (*cf.* also Bell, *loc. cit.*). The influence of the sherry cask in this direction does not appear to be very marked, but, if anything, the sherry-casked whiskies, possibly owing to the fact that sherry casks are repeatedly used and contain from the first to some extent the less volatile residuals of wine, seem to contain rather more of the higher alcohols than the plain-casked spirits. The molecular weights of the higher alcohols, or rather of the acids corresponding to these, were determined by the method suggested by Allen (Analyst, *loc. cit.*) in a few cases, with the idea rather of controlling the method generally than of ascertaining the actual nature of the higher alcohols. In the majority of cases the figures approximate fairly closely to those calculated for valeric acid, but No. 7 corresponds more closely to the next homologue, and No. 10 to propionic acid. As No. 10 was a very highly purified spirit, this is not remarkable. With reference to the aldehydes as a whole (exclusive of furfural), the tendency certainly appears to be towards a decided increase with age. This has been observed in brandies (Lussou, Moniteur Scientif., 1896, **10**, 785—788), but not hitherto in whisky. This increase in the aldehyde contents apparently connotes oxidation. The fact that dilute alcohol (of 50 per cent. strength) does undergo a certain oxidation in the direction of aldehyde formation on storage was, moreover, proved directly. A sample of 98·5 per cent. alcohol was purified as described above, until it gave no aldehyde reaction. Part of this was diluted to 50 per cent. strength. Both samples (the dilute and the strong) were then stored in wide-mouth bottles, loosely stoppered with bungs, the latter being occasionally removed to permit of a free access of air. After one month the diluted sample gave a very marked, the strong sample a very faint, aldehyde reaction.* In this connection, the sherry cask appears to exert a specific action, probably due to the fact that in these casks, when empty, a thin film of alcoholic liquid of moderate strength is exposed to a relatively large mass of air, thus favouring oxidation.

The furfural, on the whole, appears to decrease with age. Bell (*loc. cit.*) suggests that this substance is converted into some labile modification or compound which gives the yellow colour (alluded to above) when a sample

* This might possibly be used as the basis of a method for detecting caramel.

† Control experiments which amply proved this were carried out, but are omitted here for the sake of brevity.

* On repeating this experiment, but in such a manner as to exclude the action of *light*, *no* aldehyde was formed. Ciamician and Silber (Atti. R. Accad. dei Lincei, Roma, Jan. 10, 1892 [5], 228), observed that quinone oxidises ethylic alcohol to acetic acid *only* in the presence of light, but from the author's experiment it appears that this applies also to the direct oxidation by means of air in the presence of water. The bearing of this phenomenon on the formation of aldehyde in *casked* spirits is now under examination.

of matured whisky is treated with the furfural reagent. This is, in my opinion, quite erroneous, and for the following reasons: — (1) This reaction is given by old grain whiskies which contain no furfural, and also to a minor extent by some new grain and pot whiskies. (2) As mentioned above, this yellow colour is a constant factor, and does not, as Bell suggests, become converted into the ordinary violet of the furfural reaction pure and simple; the latter develops slowly, but not at the expense of the yellow. I have not been able to determine the exact nature of the substance producing the yellow coloration, but it appears to be of an aldehydic nature, as evidenced by the following experiment. Two separate portions of whisky No. 9 were distilled, one with, and the other without, the addition of Hewitt's reagent. The distillate from the former gave no reaction, the latter a very strong yellow. Although there appears to be an increase with age in the total aldehydes, I think it is probable that these substances undergo a considerable modification. Some slight confirmation of this view is afforded by the yellow coloration alluded to, and also by the fact that, as I have observed, old whiskies give a decidedly stronger reaction with Istrati's acetale reagent (Analyst, 1898, p. 230) than the new samples. The acid clearly appears to increase with age, and in this case also the sherry cask seems to play a rôle of some importance. The presence of permanent (non-volatile) acid in all the mature samples may be ascribed, I think, in part, to extraction of soluble wood acids from the cask material (as well as of tartaric and succinic acids, &c. from sherry casks), and in part, perhaps, to condensation. The compound ethers, on the whole, as a glance at the table will show, appear to increase with age, and in this respect, therefore, I cannot confirm Bell's conclusion (*loc. cit.*). With regard to the extractive matter, it is interesting to note that a high extract does not necessarily connote the use of a sherry cask.

TABLE II.*

Analyses of Whiskies.

Results (except Alcohol, which is expressed in per cent. by volume) denote Milligrammes per 100 c.c. of Absolute Alcohol.

Number of Sample.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Description	Malt	Malt	Malt	Malt	Malt	Malt	Grain	Grain	Grain	Grain	Malt	Malt
Cask	None	Plain	Sherry	None?	Sherry	Plain	Plain	None?	Sherry	None	None	Plain
Age (years)	New	4	4	New	4	5	3	New	5	New	New	4
Alcohol per cent.	62·66	60·41	60·55	63·52	60·48	59·74	60·34	52·39	59·14	70·60	62·22	60·45
Higher alcohols†	268·3	182·0	265·9	94·3	160·8	148·3	76·2	84·9	77·4	67·7	199·4	258·0
											Direct	
Total acid (calculated)	14·3	49·6	65·9	9·4	72·6	25·1	3·3	Nil	18·6	Nil	25·4	31·1
Volatile acid (as acetic acid)	14·3	23·1	31·3	9·4	61·1	20·1	3·3	Nil	13·5	Nil	..	..
Permanent acid (as tartaric acid)	Nil	21·5	34·6	Nil	11·5	5·0	Trace	Nil	5·1	Nil	..	..
Compound ethers (real; as acetic acid ether).	73·4	112·5	85·9	75·6	110·8	100·4	76·2	60·9	77·7	35·4	61·9	69·4
Compound ethers (apparent)	90·0	112·7	96·0	82·3	111·0	109·4	69·4	56·2	72·4	47·6	..	..
Extract	16·3	316·1	264·2	10·0	122·0	22·4	124·6	17·3	164·7	7·0	27·0	29·1
Molecular weight of acids corresponding to higher alcohols.	..	..	105·1	..	106·0	103·9	114·5	106·7	108·1	74·4	..	..
Furfural	3·4	1·8	3·0	3·5	2·8	3·7	Yellow, fairly strong.	Yellow, slight.	Yellow, very strong.	No colour.	6·2	4·3
Total aldehydes (ex. furfural)	3·0	13·2	29·6	19·8	35·2	21·3	12·8	5·9	9·1	3·7	11·4	13·5

* These figures divided by 3 roughly give grains per proof gallon. † Allen-Marquardt method.

DISCUSSION.

The CHAIRMAN said this paper contained a mass of details of highly technical work which would be exceedingly difficult to discuss without reading it in print, but they would all appreciate the amount of labour the author had put into it. There were, however, some members who had special knowledge on the subject, who might have some remarks to offer.

Mr. GRANT HOOPER said he quite agreed with the Chairman, that it would be much easier to discuss this subject after having had an opportunity of reading the paper, and there was all the more difficulty in dealing with the matter from the fact that whiskies of different age, though produced at the same distillery, were not, of necessity, identical. To obtain really useful results it seemed absolutely essential to operate on the same whisky at different periods from its actual manufacture. That there were initial differences was strikingly illustrated by some of the figures given in the paper in connection with the higher alcohols, the proportions in some of the new whiskies being considerably lower than in others several years old. Of course, as he remarked not long ago in connection with a paper on the same subject, the modification which took place in the maturing of whisky was not one which meant, of necessity, a removal of the higher alcohols, but these did not increase. It was, therefore, quite obvious that they were here dealing with spirits initially of very different character, and under those circumstances it was exceedingly difficult to draw any conclusions with regard to what actually took place during maturation. Another point was, the very great differences which might be brought about in the spirit by the cask in which it was put. A "sherry cask" was not always the same. There were sherries of very different character, and that which was described as a sherry cask might not impossibly have contained a wine of a much heavier character, which had left more extract in the wood than a genuine sherry, and especially a light sherry, would have done. They were much indebted to the author for the considerable amount of work he had done, and it was of importance that the question should be studied more fully. It would be a great advantage if some of the large manufacturers, who had it in their power to deal with the larger quantities of spirit which were necessary to obtain anything like satisfactory results, would take up this question and contribute to the advancement of the science relating to their own industry.

Dr. HEWITT desired to add his thanks to the author for the interesting mass of information he had brought forward. It would be noticed that each set showed fairly constant percentage of the higher alcohols, and he gathered that each set represented products from the same distillery, and were fairly comparable with one another. Of course, it must be remembered that the spirit varied from period to period, and the question at issue (*viz.*, whether the higher alcohols appreciably diminish during maturation) could never apparently be settled until one had samples taken from the whisky directly it was made, and kept under different conditions, and examined from time to time to see where the alcohols were lost, where the acids were gained, and so on. One thing was very obvious, that non-volatile acid was picked up in the case of all whiskies which were casked.

Dr. Schidrowitz did not seem to approve the method of distilling whisky before estimating the furfural in it by the coloration methods, and he agreed with him that if one could avoid distillation it was so much the better. In some of his experiments the author had removed the colouring

matter as far as possible with basic lead acetate, and presumably in his controls he found that the basic lead acetate did not affect the aldehydes in any way. The author expressed surprise that he (Dr. Hewitt) should have recommended the use of methylated spirit, and thought there must be some misconception. He could quite understand that with the ordinary methylated spirit, containing oily or resinous impurities, a milkiness would be produced on dilution. No trouble arose from using spirit denatured simply by wood spirit, and when one had many of these estimations to make it was rather a serious matter to use alcohol, paying 18*s.* per gallon duty. With regard to the yellow colour produced with aniline acetate in the case of certain spirits he quite agreed that such colorisation was produced by some substance of an aldehydic nature. Cape Smoke, of which all sorts of horrible things were said, contained but little furfural; nevertheless, there was a distinct reek about such a spirit which was largely discharged by reagents which would keep out aldehydes. A distillate free of aldehydes would not give this yellow colour, whereas the untreated but distilled spirit gave very strong coloration. Under such conditions, the numbers given for furfural contents could not claim great accuracy. In his own paper he had made a note to the effect that the numbers given for furfural in the case of Cape Smoke were liable to serious inaccuracy. He was not surprised at the author not finding animal black very satisfactory, because there was no doubt if one passed ordinary spirit over charcoal in the presence of air the amount of aldehyde formed was relatively large, and the error introduced in this way more than outweighed the advantages of decolorisation.

Dr. Schidrowitz replied.

ON THE WILL TEST FOR NITROCELLULOSE.

BY ROBERT ROBERTSON, M.A., D.Sc., F.I.C.

It is recognised by those interested in testing explosives that the advance made by Dr. Will in his quantitative stability test is an important contribution to the means at the disposal of the chemist and manufacturer for forming a judgment on the condition of a nitrocellulose.

The principle of Dr. Will's test and his method are now well known, and may be briefly thus described:—The regularity with which nitrocellulose decomposes under conditions admitting of the removal of the products of decomposition immediately following their formation is a measure of its stability; as decomposing agent, a sufficiently high temperature, 135° C., is employed, the explosive being kept in a constantly changing atmosphere of carbon dioxide, heated to the same temperature; the oxides of nitrogen which result are swept over red-hot copper, and are thus reduced to nitrogen; and finally, the rates of evolution of nitrogen are measured and compared.

In the course of some hundreds of tests at the Laboratory of the Royal Gunpowder Factory, Waltham Abbey, the method has been found fruitful in bringing out many interesting points, and has afforded information which the other tests failed to give, while, as a rule, the history of the explosive at different stages of purification or treatment is exemplified by its stability curve.

For the purpose of rendering the interpretation of the results given by the test more intelligible, an attempt was made, on the one hand, to standardise the test, and, on the other, to increase its sensitiveness.

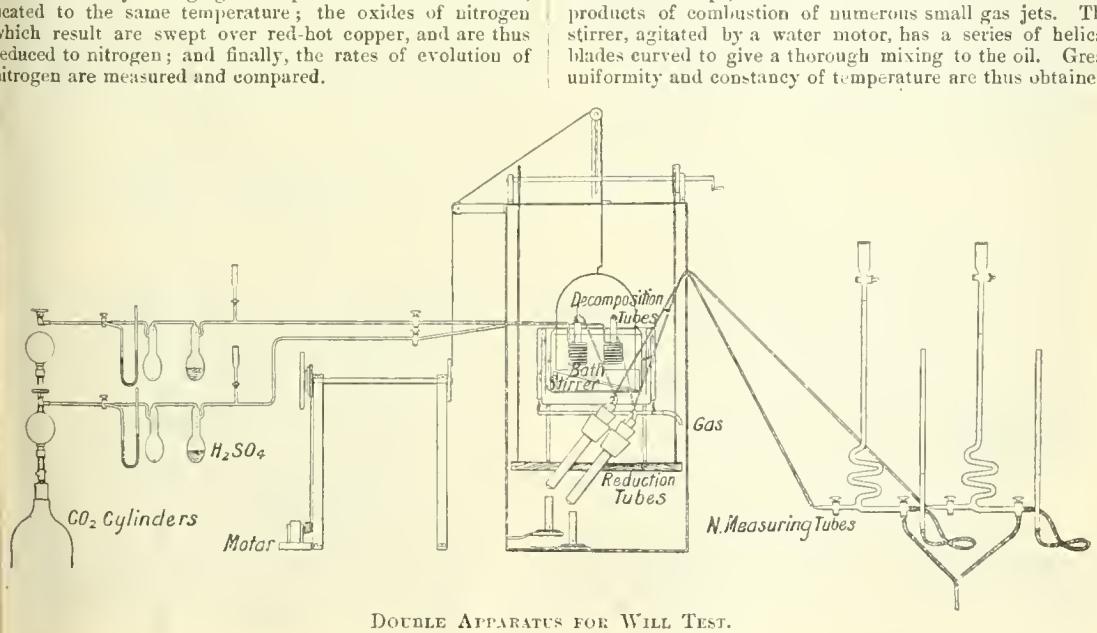
The apparatus used is essentially that proposed by Dr. Will, but the following alterations from his practice have been made:—

CO_2 Holders.—Although objection has been taken to the use of compressed CO_2 in steel cylinders, on account of the alleged large and variable amount of air present, it has, nevertheless, been found possible to obtain this gas with as little as 0·02 per cent. of air. Frequent estimations of the air present in the CO_2 of a cylinder show that even with the commercial article, after the bulk of the CO_2 has been removed, the residual gas contains only a very small amount of air, which decreases in a gradual and perfectly regular manner. For example, one cylinder which gave 0·03 per cent. of air by volume, after three months' constant use gave 0·02 per cent. The advantage of using CO_2 from this source is obvious when compared with the difficulty of evolving a stream of gas of constant composition from a Kipps or Finkener apparatus. A micrometer screw, in addition to the main valve of the CO_2 cylinder, is useful for governing the rate of flow.

Measurement of Pressure and Rate of Flow.—Great attention is paid to the measurement of the rate of flow of gas, which is arrived at by counting with a stop-watch the number of bubbles of gas per minute in a small sulphuric acid wash bottle. A mercury manometer is introduced here, and is useful for detecting a leak in the apparatus.

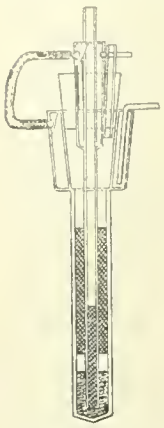
Decomposition Tube.—This is of the form and dimensions given by Dr. Will, the pre-heating worm being of the thinnest hydrometer stem tubing. The ground-in exit tube is kept in position by a small screw clamp with trunnion bearings.

Bath.—To permit of two experiments being carried on simultaneously the bath is adapted for two decomposition tubes, and is on the principle of Lothar Meyer's air bath, that is, the bath proper filled with a high-flashing hydrocarbon oil, and fitted with a lid perforated with two circular holes for the spiral tubes, is surrounded by an asbestos-covered envelope, in the interior of which circulate the products of combustion of numerous small gas jets. The stirrer, agitated by a water motor, has a series of helical blades curved to give a thorough mixing to the oil. Great uniformity and constancy of temperature are thus obtained.



Double Apparatus for Will Test.

Reduction Tube.—This is of copper, and consists of two parts, the outer tube and an inner tube reaching to nearly the bottom of the former. Into the inner tube fits a spiral of reduced copper gauze, and into the annular space between the tubes is fitted a tightly-packed reduced copper spiral. At the bottom, the inlet tube dips into a layer of copper oxide asbestos, on the top of which is a layer of reduced copper asbestos. Through the indiarubber cork passes a glass tube, which leads the CO_2 and nitrogen out of the reduction tube. As the portion of the tube containing the spirals is heated to redness, water jackets are provided on both inner and outer tubes to protect the indiarubber cork.



Reduction Tube.

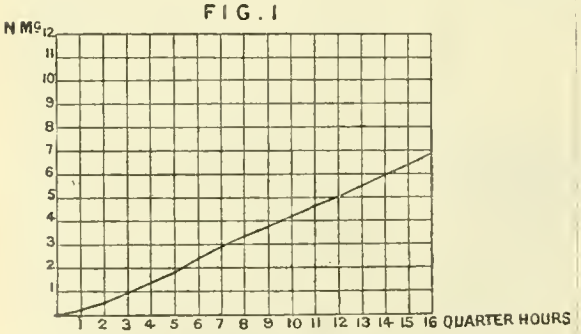
Nitrogen Measuring Apparatus.—The measuring tube with zigzag arrangement, described by Dr. Will in the Zeits. angew. Chem., 1901, p. 783, is found very serviceable and economical in potash. It is found most convenient to take readings by counterbalancing the column of potash solution and reading off the volume of gas at atmospheric pressure. For this purpose the tap immediately in front of the measuring tube is momentarily closed, this having been proved to be without ill effect on the progress of the test.

In all the experiments done by this test the air correction is subtracted from each reading, and the remainder brought to milligrams of nitrogen with the usual corrections.

As objection has frequently been taken to the test on the ground of difficulty in interpreting the results obtained, a series of experiments was made for the purpose of standardising the test and at the same time arriving at the conditions under which it could be applied in the most sensitive and efficient manner. A variety of nitrocelluloses having been tested there were chosen as typical of stable and unstable products Service guncotton on the one hand, and an experimental guncotton, which we shall call Z guncotton, on the other. The history of the latter is somewhat remarkable. Made experimentally by pulping the nitrated cotton from the immersers in the presence of alkali, and boiling the pulp till it satisfied the Government specification, the guncotton, although the Abel test was excellent, nevertheless proved eminently unstable, since, when mixed with nitroglycerin in the form of "cordite paste," it after a time developed heat and visibly decomposed. Cordite also made from it was of low stability.

The first point brought out by these experiments was the striking uniformity of Service guncotton, first in regard to the rectilinear nature of the curve of evolution of nitrogen,

FIG. 1

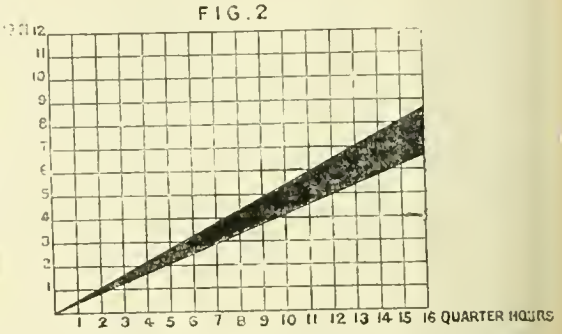


A Typical Guncotton.

and secondly in regard to the small range within which a large number of results is included, 15 samples lying between 6·6 and 8·7 mgrms. of nitrogen evolved in four hours.

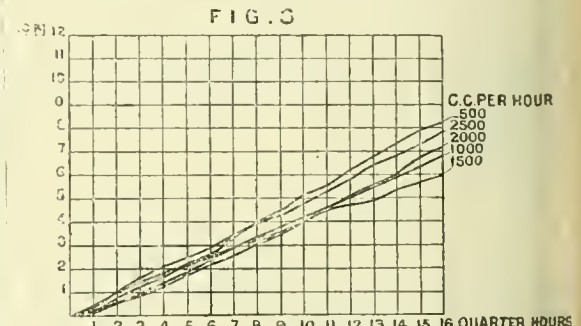
In the case of Service guncotton, little difference in the rate of evolution of nitrogen evolved is obtained on altering the rate of passage of CO_2 gas through the wide range of 500 c.c. per hour to 2,500 c.c. per hour.

FIG. 2



Uniformity of Service Guncotton. 15 Samples.

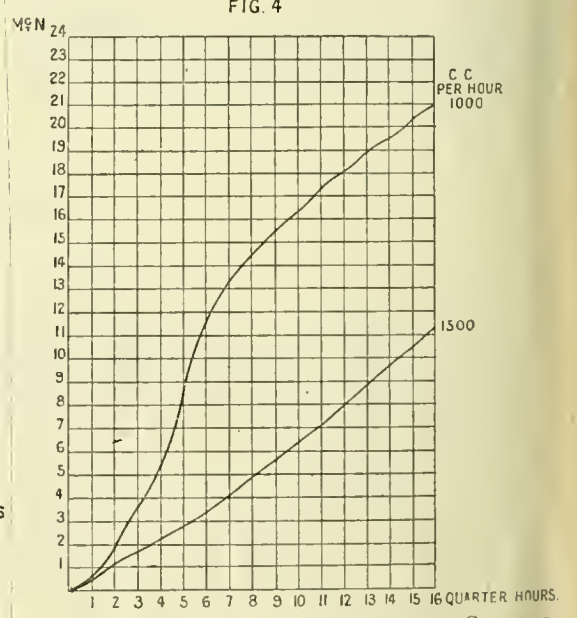
FIG. 3



Service Guncotton—Influence of Rate of Carbonic Acid.

With Z guncotton, however, the case is very different; operating at a rate of 1,000 c.c. of CO_2 per hour, a curve of nitrogen evolution is obtained which is bent and forms

FIG. 4



"Z" Guncotton—Influence of Rate of Carbonic Acid.

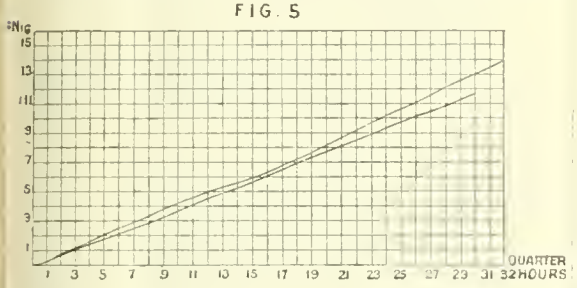
a good representation of the inherent instability of the material, as proved to exist from other considerations. Operating at the rate of 1,500 c.c. per hour, as recommended by Dr. Will, the evolution of nitrogen is represented by a straight line, steeper, however, than that of Service guncotton.

The rate of passage of CO_2 was, therefore, chosen at 1,000 c.c. per hour, or two-thirds of the rate of Dr. Will, and this rate, besides possessing the advantage claimed of rendering diagnostic the manner of nitrogen evolution in Z guncotton, has in other cases been useful in bringing out relationships which the higher rate would have entirely masked.

From the nature of the reaction which goes on in the decomposition tube, it is obvious that by the adoption of too slow a rate, irregularities might be introduced, and the progress of the test pass beyond control. Everything, however, in the course of the numerous tests carried out indicates that the rate chosen is far above this limit, as the uniformity of the following examples will show.

In Fig 5 are given the results for two guncottons, which were tested for eight hours at the rate of CO_2 of 1,000 c.c.

FIG. 5



Service Guncotton—Eight Hour Test. Two Samples.

per hour. The uniformity in evolution of nitrogen throughout the whole period of the test is noticeable.

Again, in Fig. 6 are given the results of 4 duplicates of the same sample of Service guncotton. As the numbers obtained for the 4 tests—done in pairs and at different times—all lie within the darkened zone, it will be seen that there is no sign of irregularity in duplicates.

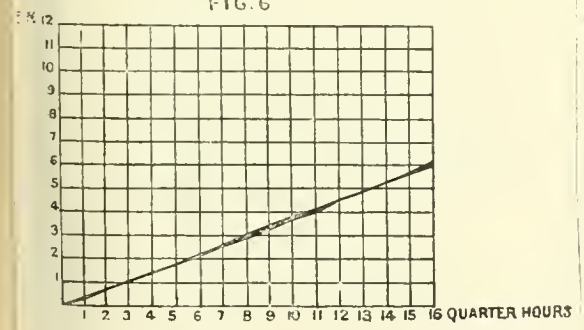
The last point is also borne out in Fig. 7, in which duplicates of a guncotton in an unstable condition gave very concordant results.

As a greater sensitiveness was obtained as well as power of discriminating between different materials, the rate of 1,000 c.c. per hour was employed for all the experiments. Ease in measurement of this rate also gives it an additional advantage.

Proceeding to describe some of the results obtained by this test, one may recall the fact mentioned above that it has been instrumental in pointing to undoubted instability in cases where the potassium iodide test fails.

Next, as regards Service guncotton, the uniformity of this product has already been referred to (Figs. 1 and 2).

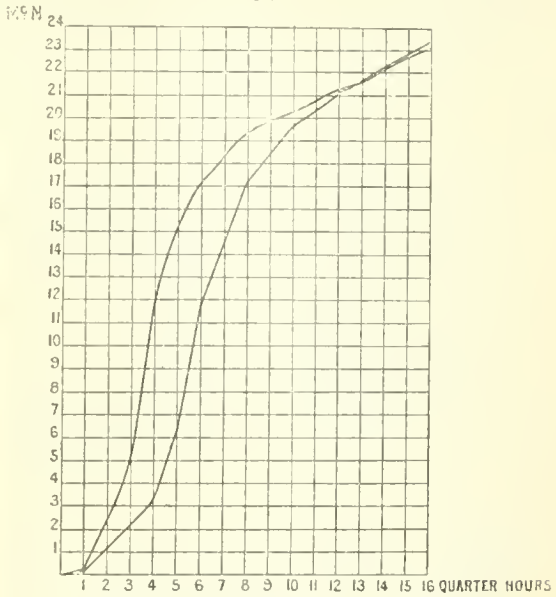
FIG. 6



Service Guncotton. Four Samples.

The average evolution of nitrogen in 4 hours is 7·5 mgrms. of nitrogen with a range of about ± 1 mgrm.

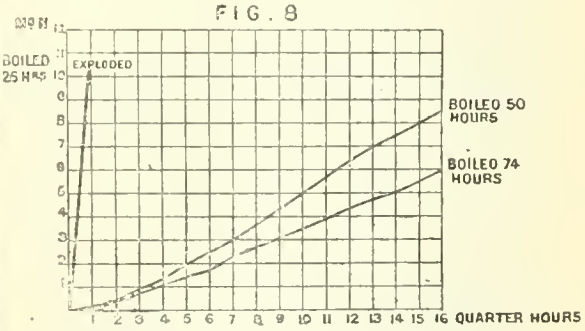
FIG 7



An Unstable Guncotton. Two Samples.

In Fig. 8 is shown the progress of Service guncotton towards stability as purification proceeds, and the following figures, Nos. 9 and 10, corroborate the result of Dr. Will

FIG. 8

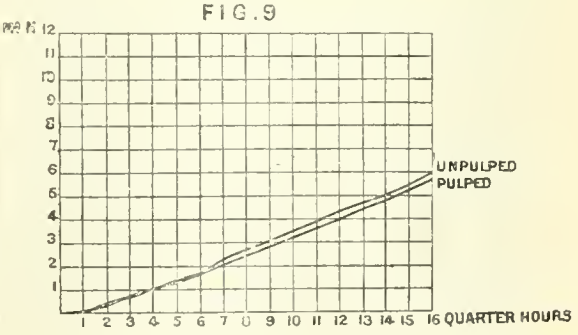


Service Guncotton—Influence of Boiling.

that the influence of pulping on fully purified material is almost inappreciable, differences in the degree of pulping being scarcely apparent.

The action of ether has no improving effect on the stability curve with stable or with unstable products.

FIG. 9

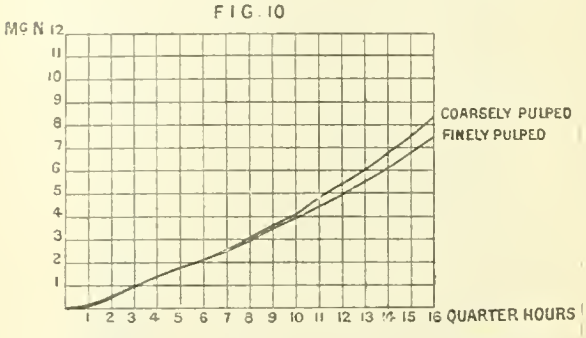


Service Guncotton—Influence of Pulping.

Examples are given in Fig. 11 in which are shown the curves for Service guncotton treated and untreated, and for an unstable guncotton treated and untreated.

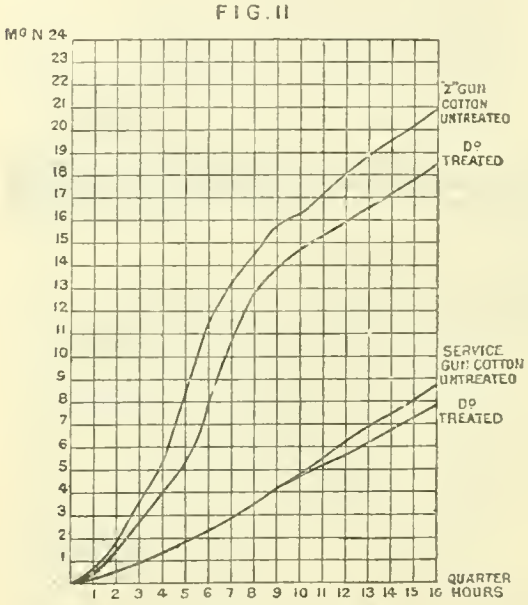
From an analytical point of view, the fact that ether has little or no interfering influence on the stability curve of an unstable guncotton is important, and has given some useful results. For example, the guncotton "Z," which,

FIG. 10



Service Guncotton Influence of Degree of Pulping

FIG. 11



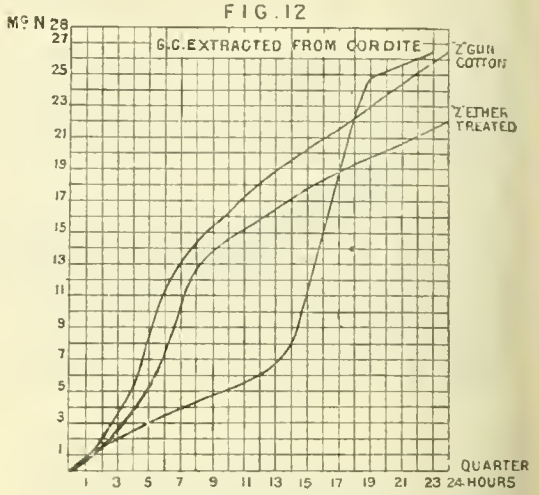
Influence of Ether.

as has been stated, would pass the Government specification as far as the ordinary tests are concerned, but which produces cordite of inferior stability, was extracted from cordite by removing the nitroglycerin and mineral jelly, both of which are soluble in ether. The stability curve of the guncotton thus extracted is interesting. For 3½ hours it proceeds in a normal fashion, suddenly rises, and after the large evolution of gas is over, the curve lies alongside and almost parallel to that of the original material. In this case the gelatinised condition of the material has evidently delayed the start of the large evolution, but in both the original and the extracted material the deviation of the curve due to an impurity is about the same.

With the necessary precautions this method should prove useful for ascertaining the condition of stability of the nitrocellulose incorporated in such an explosive as cordite.

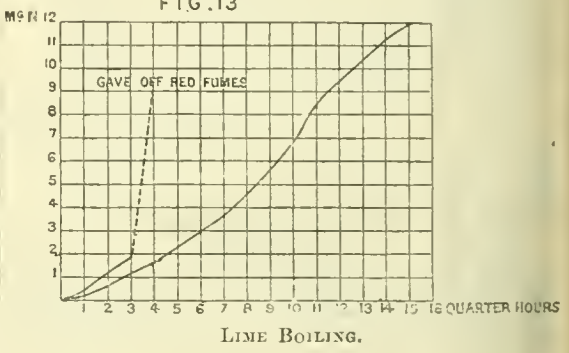
With guncotton, in which the method of purification was by boiling for at least three days with lime, the stability results have been inferior to those given by the Service process. Examples are given of samples both prepared at Waltham Abbey and obtained from another source, and the results in both cases leave much to be desired. (Fig. 13.)

FIG. 12



Extraction from Cordite.

FIG. 13

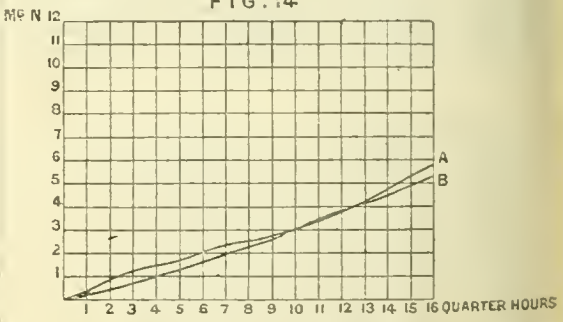


Lime Boiling.

With soluble nitrocelluloses a few tests have been made, and from the lower gas evolution obtained, Dr. Will's contention would seem to be borne out, that increased stability is produced by an increase in the water, and in the nitric acid of the nitrating mixture.

The examples shown in Fig. 14 are of pulped nitrocelluloses, soluble in ether alcohol and of nitrogen from 12—12·5 per cent.

FIG. 14

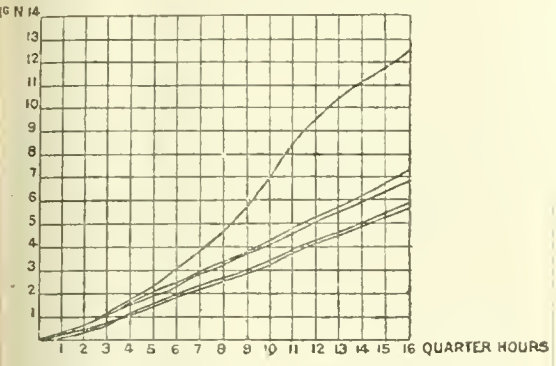


Soluble Nitrocelluloses.

Some examples are given in Fig. 15 of guncottons from other sources, all being within the Government specification as regards the other tests.

In the course of an investigation on nitrocellulose powders application was made of this test to the question of their stability, and many important results were obtained.

FIG. 15



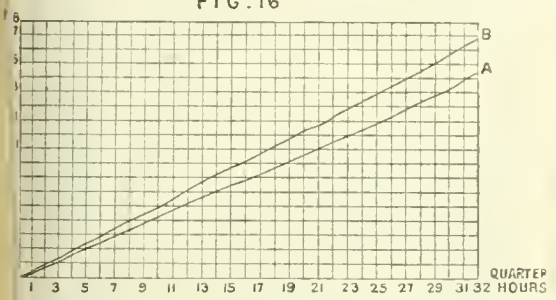
Guncottons of Private Manufacture.

The powders were prepared for the test by grinding them a mill and then passing through a sieve of 100 meshes to e inch. As with ungelatinised material 2·5 grms. were ed for an experiment.

For the purpose of ensuring that there was no delay in e evolution of nitrogen owing to the gelatinised form of ese explosives, even when in a state of fine division, periments were made in which the test was prolonged, d in which material in different states of fineness were ployed.

It will be seen from the curves on Fig. 16 that there is sign of their becoming erratic even when the experiment prolonged for eight hours. A is a good nitrocellulose

FIG. 16

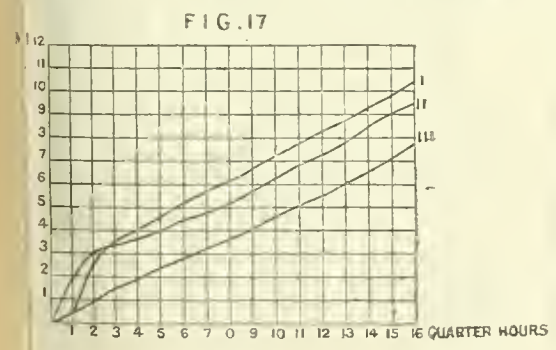


Nitrocellulose Powders—Eight Hour Test.

vder according to all the tests; B is one which on ting has passed through a stage of instability as a result which it has a diminished Abel test.

Three distinct types of nitrocellulose powders are shown Fig. 17 after they had been subjected to a temperature

FIG. 17

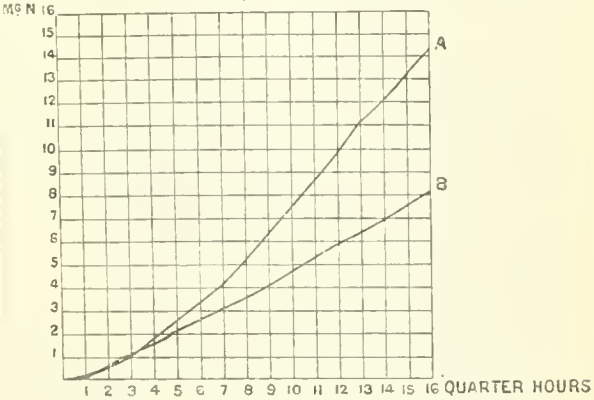


itrocellulose Powders—Effect of Heating.

of 65° C. for about six months. In the case of those with bent curves, the Abel test was only 5 mins., while with the rectilinear it was 24 mins. at 82° C.

Some remarkable cases of recovery of stability as shown by this test have been noticed, and one instance is given in Fig. 18. The powder which was undergoing a treatment

FIG. 18

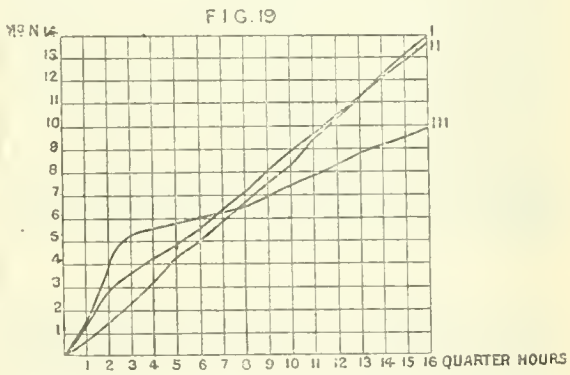


Nitrocellulose Powders—Improvement on Heating.

of subjection to a temperature of 65° C., at one period gave the steep curve shown at A. Further heating at this temperature produced an improvement in the curve, but there was no concomitant recovery in the case of the Abel heat test (B). It appears therefore, that this powder has passed through a period of instability, and on continued heating, elimination of an impurity has taken place. As evidence of the powder having passed through this unstable stage the "trace" tests alone serve as an indication.

The action of hot water and of steam—both of which treatments are applied in the manufacture of some nitrocellulose powders—has also a disturbing effect on the stability as shown by the test, and produces in the material a whitish appearance. Some results of hot water and steaming treatments are given in Fig. 19.

FIG. 19



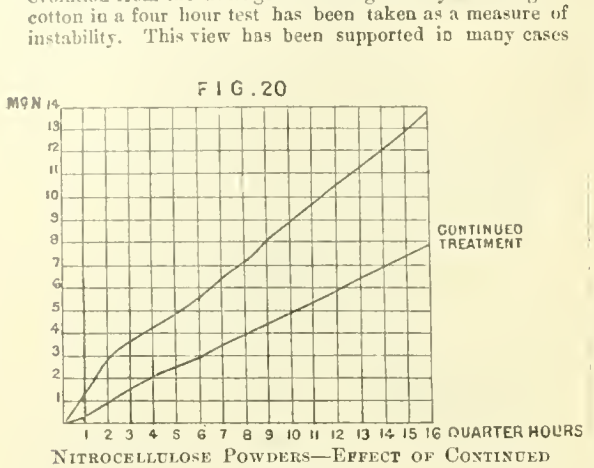
Nitrocellulose Powders—Effect of Hot Water and of Steam.

Under steaming treatment a recovery of stability similar to that mentioned above is sometimes obtained, and an example of this is given in Fig. 20. A fall in heat test, as in the former instance, served as an indication of the material having passed through a stage of questionable stability.

In the interpretation of the results from a large number of tests by Dr. Will's method, of which the preceding are examples, and in which strictly uniform conditions of temperature, rate of passage of CO_2, &c., were maintained, the uniformity of service guncotton permitted of its use as a standard to which the results of other products were

referred. Where these results show erratic curves, the presence of an unstable constituent is obvious, but where the manner of evolution of nitrogen in guncottons has been uniform, but large in amount, a condition represented by a steep straight line, the difference in milligrams of total evolution from the average number given by service guncotton in a four hour test has been taken as a measure of instability. This view has been supported in many cases

FIG. 20



NITROCELLULOSE POWDERS—EFFECT OF CONTINUED STEAMING.

by reference to the history of the explosives, by the results of other tests, and by the fact that alteration of rate of passage of CO_2 alone is capable of reducing the erratic form of a curve to a straight line of high evolution of nitrogen.

In regard to the relation between the Will test and the Abel test, examples have occurred in which the material by the older test would have been pronounced good, but in which the Will test has pointed to the certain presence of an impurity. On the other hand, excellent results, both as regards uniformity and smallness of evolution of nitrogen, have been obtained with the Will test—chiefly among nitrocellulose powders—when the Abel test was low.

Without going into the question as to what extent these traces of impurity are deleterious when the Will test is good, it may be held in forming a judgment on the condition of a nitrocellulose that consideration should be taken both of the result of the Abel test—a test which has proved so useful as a guide in the manufacture of stable materials—and also of the result of the Will test which promises to be of much service as an indicator of the condition of the explosive when tested; for separately deductions of a misleading nature might be drawn.

In conclusion, I have to thank Major F. L. Nathan, R.A., Superintendent of the Royal Gunpowder Factory, for permission to read these notes, the chemical staff for assistance, and Mr. S. S. Napper for his able help in carrying out the experiments.

DISCUSSION.

Mr. THOS. TYRER, noting the desirability of knowing the precise conditions under which operations were conducted, enquired what kind of ether was employed, since several were used in commerce.

Mr. OSCAR GUTTMANN said the Society were under a great obligation to Dr. Robertson and the staff at Waltham Abbey for having brought forward a test which was likely, if not to supersede the Abel test, at any rate to form a very useful addition to it. Since Prof. Will brought this test forward, there was scarcely any Government, or explosive chemist, who had not made careful experiments partly with his own resources and partly with apparatus supplied by Prof. Will, and it had been abundantly confirmed that the results were excellent and comparable. He should like also to point out what a great change had taken place at Waltham Abbey. People who, like himself, remembered Waltham Abbey 20 years ago would know how very little chemistry was applied there, and that now not only in the number of the staff but also in the methods a change has been made, every new scientific achievement being followed very closely. No doubt this country had every reason to be proud of the way in which the factory was now conducted. He noticed that in his apparatus Dr. Robertson advocated the use of carbonic acid cylinders, and stated that there was only 0·02 per cent. of air in the carbonic acid, but Prof. Will, in his second publication which really was a private communication, was most careful about the exclusion of air from the CO_2, and took the greatest precautions in its manufacture; treating the marble under vacuum, and opening the bottle under water, because, as he said, a certain quantity of air 0·25 c.c. could be got in otherwise. It was very interesting, therefore, to see that Dr. Robertson had found so small an amount, a negligible amount really, in the carbonic acid bottles, because anything which would tend to simplify this method, which was a little cumbersome and might fall in the hands of anyone but an expert, would be much appreciated. He also noticed that Dr. Roberts on was comparing soluble nitro-cellulose by this method, and through the whole of this paper he compared the quantities of nitrogen evolved one against the other. He did not know what his experience was in the matter, but he should like to hear how far he agreed with Prof. Will, who distinctly stated that the amount of nitrogen evolved was no measure of the stability or otherwise of the sample, but as long as the curve was regular, the nitro-cellulose was all right. If that were so, he did not see why Dr. Robertson should compare soluble nitro-cellulose with insoluble nitro-cellulose in respect of the low quantity of nitrogen evolved as being a sort of guide. As a matter of fact they knew that soluble nitro-cellulose could be made in a variety of ways, and it was not necessary that there should be such a large quantity of water in the acid mixture to produce soluble nitro-cellulose. Therefore, again, the amount of nitrogen evolved was no proof or otherwise of Prof. Will's theory, which was probably correct. With regard to the effect of heating, Dr. Robertson did not tell them how he heated the nitro-cellulose powders, but as he said he heated them to 65° C., he took it it was done in an air-bath. According to that, one could produce a stable nitro-cellulose by heating it first to 65° for a certain time, whereupon a regular evolution of nitrogen would follow. He would like to know whether that could properly be inferred from the table.

Mr. WALTER F. REID said, with regard to the reagents used, Mr. Tyrer had mentioned one, ether, which was somewhat variable, though probably precautions were taken to obtain it as far as possible of a uniform quality. Then with regard to carbonic acid he had to test some liquid carbonic acid some time ago, and found it contained a considerable percentage of ammonia. He believed it was of volcanic origin. He doubted whether ammonia would be found in the carbonic acid ordinarily made in the laboratory, but it might possibly be found in the commercial liquid carbonic acid in cylinders. It was probably present in the form of bicarbonate of ammonia and would volatilise with the acid to some extent though a considerable quantity sometimes remained in the cylinder after use. A question which interested him very much was the Z-nitrocellulose which gave such remarkable results, and any further information that could be given about it, it would be very welcome. It was apparently one which gave fairly good results with the Abel test, but did not stand the Will test. Therefore, they had in the test a method of finding defects which could not be found by the old Abel test. He should also like to add a word or two to what Mr. Guttmann had already said about Waltham Abbey. Now and then there may have been complaints about cordite, but he thought it was cause for congratulation for chemical industry generally that the peace rejoicings in the streets to-night were greatly due to the perfection of the manufacture carried on at Waltham Abbey. Not long ago he was reading a most piteous letter from one of the Admirals in the time of Queen Elizabeth complaining that he could not get any powder to fight the Spaniards with, but in the recent war no such complaints had been made, and they had every reason to congratulate Major Nathan, Dr. Robertson, and those at the head of affairs that the supply of powder had never failed us.

Dr. Robertson, in reply, said he used ethylic ether supplied according to the Government Specification which was that it should be of sp. gr. 72, of constant boiling point, free from residue, and should give no indication of hydrogen peroxide, nor of iodoform producing substances. The carbonic acid which was supplied in cylinders as stated could be obtained practically free from air, and that being so, it seemed advisable to use it from that source rather than go to the trouble of freeing marble from air, a process which was not reliable, because the pieces of marble were attacked at different times, and those pieces themselves might occlude different quantities of air. The method of obtaining the CO_2 employed was first of all to take a large cylinder containing 35 lb. of liquid CO_2, such as is used in refrigerating plant to blow off about two-thirds and use the remaining third, which was found to have not only a very small amount of air, but an amount which decreased very gradually, and what was more important with regularity, so that one could perfectly depend on the air correction.

With reference to the character of the curves as regards deepness, it was that point which had rendered the interpretation of the result of the test up to the present so difficult, because it had been supposed that a curve which was perfectly straight represented a guncotton which was a stable condition. That was not so. An example was shown in Fig. 4. The lower curve showed the evolution of nitrogen of the Z guncotton which was certainly an eminently unstable body, as straight, at the rate of the passage of CO_2 recommended by Dr. Will. The curve was a steep one, considerably steeper than Service gun cotton. Also, at the lower rate of passage of CO_2 which, as had been shown, was found to give more characteristic results and to be free from the danger of having in contact with the material unstable products that might give rise to an exothermic reaction, many cases of steep curves had been found in which the steepness went hand in hand with other proofs of instability. Working under conditions strictly comparable and capable of being reproduced without difficulty, where one had a curve of steepness considerably above that given by what one knew to be a stable gun-cotton, such as Service gun-cotton one had an unstable product.

As regards the heating of the powders at 65° this was done practically in an air bath, *i.e.*, in an experimental stove.

The point referred to in which the nitrocellulose powder after passing through an unstable stage, on further heating gave a stable curve as shown in Fig. 18, was interesting in itself, and the explanation of it was difficult; but the fact that there still remained in the body an unstable product as indicated by the Abel test would certainly cause one to pause before adopting the view that by simply heating an explosive which had shown signs of instability, one could produce a perfectly stable substance.

To what extent the explosive would be dangerous would only be brought out under conditions of storage in which the nitrocellulose powder was contained in closed cases under observation. In the examples given the powder was stored loose, not confined in the stove. With regard to Mr. Reid's remarks as to the presence of ammonia in the Cordite ammonia had not been tested for, but it certainly did not exist in any appreciable or varying quantity.

Mr. W. H. Sodeau has since written as follows:—

I have found it desirable to make a few additions to the apparatus described by Dr. Will. The employment of a Schibler electro-magnetic gas-regulator has saved much trouble in adjusting the temperature of the bath. It is advantageous to use the carbon dioxide from either (*a*) an ordinary graduated gas-holder, arranged so that the water is supplied from an aspirator bottle connected to a Kipp, or (*b*) graduated rising vessel gas-holder, having a somewhat heavy vessel, in order to give sufficient pressure to the gas, the outer wall of the tank being made much higher than usual in order to provide for the consequent displacement of the water, which latter is, of course, saturated with carbon dioxide before use. When this arrangement is employed a fairly accurate correction for the nitrogen present with the carbon dioxide can be applied, and the results represented as net loss of nitrogen, which I prefer to state as a percentage instead of as milligrammes per $2\frac{1}{2}$ grms.—the method adopted by Dr. Will.

By providing the nitrogen-collecting tube with a reservoir, and admitting the stream of gas through mercury below the zigzag portion by means of an arrangement similar to that in Schiff's nitrometer, the trouble sometimes occasioned by the formation of carbonate in the stopcock is avoided, and the nitrogen can be measured under atmospheric pressure by momentarily raising the reservoir, the correction curve being thus dispensed with. Caustic potash seems preferable to caustic soda as the absorbing fluid.

With regard to results, I may state that gelatinised nitrocellulose powders (ground and sifted as for heat-test), which gave similar results with Will's test (no upward curvature developing in four hours' heating), have shown very great differences in the rate of development of acidity when heated at 65° C. (150° F.) in an atmosphere saturated with moisture, samples being removed from time to time and titrated with standard alkali.

As the temperature employed is much lower than in Will's test, it seems probable that the results are more nearly relating to the keeping qualities under ordinary conditions of storage, but there is the obvious disadvantage of having to wait, say, one to three weeks for the result.

THE DETERMINATION OF PERCHLORATE IN SALTPETRE.

BY A. DUPRÉ, PH.D., F.R.S.

Having lately had occasion to estimate the percentage of perchlorate present in a number of samples of saltpetre, it may be of interest to members of this Society if I shortly describe the method which, after many experiments, I finally adopted.

Two portions, of 10 and 20 grms. respectively, of saltpetre are put into nickel crucibles of about 70 c.c. capacity, fitted with a shallow, dish-shaped, well-fitting cover. The crucibles are then heated to a temperature of 545° C. for a period of one hour. The furnace, or air-bath, which I have been using for this purpose, and found extremely convenient, has been devised by Dr. Gilbert, of Tübingen, on the lines of the well-known Lothar Meyer air-bath. By means of it the above temperature can readily be reached and, with a little care, maintained for hours within one or two degrees. Dr. Gilbert states that a temperature of 540° C., maintained for half an hour, is sufficient to decompose all the perchlorate, even when 25 grms. of saltpetre are used. In my experience, however, this has not been the case, and I have found that even one and a half hours at the temperature are barely sufficient. (See Table I.) I have therefore found it necessary to adopt the temperature of 545° C. and one hour's heating. (See Table II.)

The temperature is taken by a thermometer made of Jena glass, in which the space above the mercury is filled with nitrogen under pressure. Such a thermometer admits of readings up to 575° C. The temperature of the crucibles given is that shown by the thermometer, but as this is contained in a metal tube, fixed close to the side of the round air-bath, it is possible, though not likely, that the crucibles placed near the centre of the bath are at a somewhat lower temperature. In the times of heating, that taken to bring the bath to the proper temperature is not included, and this generally takes a little over half an hour.

The heating being over and the crucibles cold, the fused 20 grms. are dissolved in warm water, and, by means of a funnel, the solution is transferred directly to a 200 c.c. measuring flask. I prefer to dissolve by successive small portions of water, heating carefully to avoid loss by spirting. As 200 c.c. are more than sufficient for the purpose this can readily be accomplished. Finally the crucible, as well as the lid, is thoroughly washed with hot water both inside and out, and the solution, after cooling, made up to 200 c.c.

In 25 c.c. of this solution the chlorine present is determined by Mohr's method, the result, in my hands at least, is usually a little too high, and I use it mainly as a guide to the next step in the analysis which is as follows: 100 c.c. of the solution (or less should the preliminary test have shown that they would require more than 25 c.c. of

my standard silver solution, 1 c.c. = 0·001 of Cl) are now taken, and an amount of standard silver solution, rather more than sufficient to precipitate all the chlorine present, is run in, 4 c.c. of pure strong nitric acid are added, and the whole heated on a sand bath to the boiling point, but avoiding ebullition, for half an hour. The addition of nitric acid is necessary to dissolve any nitrite of silver, while the subsequent heating destroys the nitrous acid which, in some measure, interferes with the subsequent titration with sulphocyanide. It has been recommended to oxidise the nitrous acid in the acidified solution by means of permanganate, before adding the silver, and except that it involves an additional manipulation, there is no objection to this. As, however, in order to insure clear filtration, it is necessary in any case to heat the solution to boiling, I prefer to do without the permanganate, having satisfied myself that both methods give the same result. The solution, after cooling,* is filtered, and the precipitate thoroughly washed, special care being taken to have the filtrate perfectly clear, since, as already pointed out by Volhard in his original paper, chloride of silver decolorises the sulphocyanide of iron, and its presence thus makes the end point of the titration uncertain. I find in fact that very finely divided chloride of silver can be tritrated almost as readily as chloride of sodium. To the clear filtrate a little persulphate of iron is added, and the silver estimated by titration with standard sulphocyanide of ammonium (Volhard's method). I usually make my sulphocyanide solution about half the strength of my silver solution, and in adding it adopt a plan which I find useful in many other cases. Having decided to what degree of accuracy I wish to work, I always, when coming near to the end of the titration, add twice the amount of solution corresponding to this, and when the titration is finished deduct half the amount last added. In a case like this for example, I add four drops (0·2 c.c.), and finally deduct 0·1 c.c. from the amount used. Working in this way the final change of colour is always marked, and yet the results will be correct to 0·1 c.c., whereas by adding the solution drop by drop the change is so gradual that it may be overlooked until a greater excess than 0·1 c.c. has been added.

In 10 grms. of the saltpetre, before heating, the chlorine is now estimated in a similar manner, that is, in a smaller portion by Mohr's method, and then in the 10 grms. by Volhard's method. It is necessary to add an excess of silver, but it is advisable that the excess should not be too great, and hence the preliminary estimation by Mohr's method. As a rule I do not increase the amount by less than 5 c.c., *i.e.*, I add either 5, 10, 15, or 20 c.c. standard silver as the case may be, except in the case of saltpetre before heating, when the amount of chlorine present is usually very small, and an addition of 1 or 2 c.c. is sufficient. The difference in chlorine before and after heating is the measure of the perchlorate present, provided of course that no other chlorine compound is present. The titration may be repeated, if desired, with the 10 grms. of saltpetre, using the whole of the solution for one experiment.

I have satisfied myself that during the one hour's heating, as above, no appreciable quantity of chloride volatilises, especially when the chlorine does not exceed 0·5 per cent. which would correspond to nearly 2 per cent. of perchlorate. (See Table III.)

Duplicate estimations not unfrequently come out identical, and rarely differ by more than 0·01 per cent. of perchlorate. For an example see Table IV. If the difference is greater than this further experiments should be made.

It has been recommended to add 2 grms. of manganese dioxide to the 20 grms. of saltpetre, to facilitate the decomposition of the perchlorate, which, it is stated, can then be completely decomposed by a quarter of an hour's heating at 500° C. I, however, prefer to work without this addition. In the first place it is difficult to get the dioxide entirely free from chlorides, and if not free an allowance has to be made. In the second place the fusing mass shows, when manganese is present, a tendency to spirting, which I have not noticed in its absence.

* I find that 100 c.c. of a 4 per cent. solution of nitric acid dissolve, at the boiling temperature, roughly speaking, about 0·003 grm. of silver chloride.

The foregoing remarks refer to analysis of fairly pure saltpetre, and I must reserve the method of analysing impure saltpetre to a future communication. Here I will only add that if the saltpetre contains more than a slight trace of magnesia it is advisable to moisten the weighed sample in the crucible with a few drops of pure sodium hydrate solution, drying it in an air-bath before fusion. In case traces of iodate are present these should be estimated and allowed for in the final result.

In Table V. I give a few analyses of saltpetre, to which known quantities of perchlorate had been added. The saltpetre used was a refined sample of Indian saltpetre, free from perchlorate. The analyses are not in any way selected, but are in fact all the analyses of the kind made, and the results given are those of single experiments. The quantities added should have been simple numbers, but after the solution had been used it was found that the perchlorate, though extremely pure, contained 0·5 per cent. of moisture.

One advantage of Volhard's method is that the gravimetric method can easily be combined with it; we have simply to take the chloride of silver left on the filter and weigh it in the usual manner. If this is done special care must be taken to thoroughly wash it and the filter paper, for as the precipitation has taken place in a 10 per cent. solution of nitre, sufficient nitrate of potassium may easily be left to seriously affect the result.

TABLE I.

(Temperature 540° C.)

Time of Heating.	Perchlorate found.
	Per Cent.
1st Set :—	
½ hour	0·455
1½ hours	0·560
2nd Set :—	
1 hour	0·487
2 hours	0·559

The same sample heated to 545° C. for one hour gav 0·564 per cent. perchlorate.

TABLE II.

Time of Heating to 545°.	Perchlorate found.
	Per Cent
1st Experiment*—½ hour	0·977
2nd Experiment†—½ hour	0·945
3rd Experiment*—1 hour	0·986

* Crucible put into cold furnace, but time counted only after had reached 545°.
† Crucible put in hot furnace.

TABLE III.

Chlorine present.	Chlorine found.	Difference.	Remarks.
Per Cent.	Per Cent.		
0·034	0·035	+ 0·001	4 hours heating to 54
0·306	0·298	− 0·008	estimated volumetrically
0·610	0·600	− 0·010	5 hours heating to 54
1·217	1·205	− 0·012	estimated gravimetrical

1·100 grms. of salt, heated in a platinum crucible fitt with a lid similar to those of the nickel crucibles, lo nothing in weight during five hours' heating.

TABLE IV.

No. of Experiment.	Perchlorate found.
	Per Cent.
1st	0·753
2nd	0·749
3rd	0·749
	Mean, 0·750 per cent.

Table V.

No. of periment.	Chlorine present in Chlorides.	Perchlorate added.	Perchlorate found.	Difference.
1	0·0035	0·995	0·986	− 0·009
2	0·0035	0·498	0·492	− 0·006
3	0·0035	0·249	0·250	+ 0·001
4	0·0035	0·099	0·099	0·000
5	0·0035	0·050	0·054	+ 0·004
6	0·0035	0·025	0·028	+ 0·003

EFFECT OF THE ALCOHOL DUTY ON CHEMICAL INDUSTRY.

BY DR. O. SILBERRAD

(*Chemist to Explosives Committee*).

The question of the use of pure undenatured alcohol have come before the Explosives Committee in connection h the manufacture of Nitrocellulose, the attention of the mmittee was drawn to the far reaching effect of the obol duty on chemical industries, and I was therenpon tructed to make a brief report on the subject.

As the matter is admitted to be one of great importance, ave ventured with the permission of the Committee) to the report before this Society, which has already done much for chemical industries.

I.—Alcohol as a Finished Product.

Preparations containing alcohol as such must of course made with duty-paid spirit, as in this case the alcohol is d as such, and foreign competition does not enter into question, since these mixtures, if imported, would have pay the same duty, as the spirit has already paid. On port the duty, together with three per cent. for loss, is unded. The system is briefly as follows :—

Licensed manufacturers notify to the Excise Authorities en they wish to export a parcel of goods containing rits. An Excise officer takes a sample and seals the e, which is then exported straight away. The Authorities sequently refund the duty as calculated on the figures n by the manufacturers, provided these do not differ by re than three per cent. from the results obtained by the Excise analysts.

This system is generally admitted to work perfectly, and n be a valuable precedent to the matter now under con- ration ; it has, above all, shown English manufacturers te trustworthy. The effect of this system on the industry is early illustrated by the tincture trade with the Colonies, in hich English manufacturers have regained their original fo ng, in that English products have now replaced those of G nan make almost entirely.

I.—Alcohol as a Raw or Intermediate Product.

this class the finished products contain no alcohol and ca therefore be imported duty free from abroad where th are manufactured from untaxed spirit, so that it is ab utely impossible to make these products from duty- pa spirit at a price which can compete with foreigners.

a consequence, all branches of chemical industry in wh n pure spirit is indispensable, have been crippled or de oyed in this country by the heavy duty on alcohol.

Pure alcohol is required as a solvent for the extraction an urification of raw materials and finished products. If me ylated spirit be used it leaves behind impurities which rem r the product inferior to the foreign-made article. As, ho ver, the greater part of the spirit can be recovered lo = 5—10 per cent. in each operation), this branch of the dustry is only crippled in this country.

e following are a few examples of products of this cla —

(*In the Colour Industry.*—Certain sulphonic acids, her line, tolidine, dianisidine, Gallocyanine, Gallaniline Vio s, Gallamine Blue, Auriue, the Rhodamines, the An lines, the Eosines, &c. In washing raw materials, as nitr oluene, dinitro-toluene, &c.

(*b*) *In the Pharmaceutical Industry.*—For the crystallisation of all fine chemicals, alkaloids, &c., acetanilide, salicylic acid, salicylates, atropine, aloin, cantharidine, cocaine, emetine, jalapine, podophyllin, strychnine, &c., also numerous vegetable extracts and almost all active principles of plants.

(*c*) *In Essential Oils, &c.*—The use of methylated spirit spoils the odour of the finished product.

In the crystallisation of vanillin, piperonal (heliotropine), coumarin, the naphthyl ethers, and in washing out impurities in many instances.

(*d*) *In other general Chemical Industries.*—Pyrocollodion (methylated spirit gives rise to a coloured product). Nitrocellulose (certain varieties cannot be manufactured without the use of chemically pure alcohol as such). In general chemical manufacture. Alcohol is the most useful solvent, as in the manufacture of gallic acid, tannic acid, salicylic acid, &c., all of which have a very wide application in the arts.

2. As a Medium or Diluent where Two or more Chemicals React.

In this case some of the alcohol is destroyed, only a portion being reclaimable in a less pure condition. This branch of the industry is practically destroyed in this country.

The following are a few examples of this class :—

(*a*) *In the Colour Industry.*—The bromination and iodation of eosines. In the preparation of oxazine colours, sulphur colours, &c.

(*c*) *Essential Oils, &c.*—The isomerisation of the normal acryl group as in the preparation of isosafrol. Saponification of the complex esters occurring in essential oils, &c.

(*d*) *In other and general Chemical Industries.*—In the preparation of many scientific products as in ester condensations, &c.

3. As One of the Reacting Ingredients.

The alkyl radical of the alcohol enters into chemical combination forming products which no longer contain any alcohol.

For instance, Rhodamine (diethylmeta-amidophenolphthalein) and alcohol (in the presence of hydrochloric acid), yield anisoline and water. This branch of the industry is practically destroyed in this country, as these compounds cannot be produced from duty-paid spirit to compete with foreign products. The following figures are convincing.

Cost of manufacture of diethylaniline.—I. From duty-free alcohol, $5\frac{1}{2}d.$ per lb.; II. From duty-paid alcohol, 2*s.* $5\frac{1}{4}d.$ per lb.

The following are a few examples of this class.

(*a*) *In the Colour Industry.*—Intermediate products.—Mono and diethylaniline, ethyl-ortho-toluidine, ethylbenzylaniline, diethyl-meta-amido-phenol, ethoxybenzidine, quinaldine, aminonaphtholethers, tetraethyldiamidobenzophenone, ethylmetaamidophenol diphenetidine, diethylamidobenzaldehyde, Brilliant Green, Patent Blue, Acid Green, Ethyl Violet, Fast Acid Violet, Various Acid Violets, Night Blue, Thiocarmine, New Methylene Blue, Nile Blue 2 B, Spirit Eosine, Pyronine B, Rhodamine B, and 6 G, Quinoline Yellow, Chrysophenine, Diamine Yellow N, Diamine Scarlet 3 B, Anisoline, and a number of valuable Blues and Blacks of the diamine series.

Monomethylaniline, dimethylaniline, methylbenzylaniline, &c., Malachite Green, Patent Blue B N, Light Green S F, Victoria Green, Victoria Blue, Methyl Violet, Crystal Violet, Fast Green, Acid Violets, Indophenol, Gallocyanine, Prune, Meldola's Blue, Bâsle Blue, Nile Blue A, Capri Blue, Methylene Blue, Neutral Violet, Neutral Red, Neutral Blue, Anzine Green, Indazine, Acridine Orange, Thioflavine, Pyronine, Auramine, Benzopurpurine 10 B, Azo Violet, Benzoazamine, Heliotrope, Azoeosine, Cumidine Scarlet, and others. The annual value of these products represents at least 2,000,000*l.* sterling.

(*b*) *In the Pharmaceutical Industry.*—The duty on alcohol renders the manufacture of many "synthetic remedies" impossible, such as sulphonal, phenacetin,

antipyrine. (It is reported that Messrs. Lucius and Brüning, of Hoechst, made 60,000*l.* in one year on this product alone; English manufacturers cannot take it up because its production is dependent on acetoacetic ester for the manufacture of which pure alcohol is a necessity.) Eucain, orthoform, Iodoform, Bromal, "spirits of nitre," chloral hydrate, and alcoholate. (There is a small protecting tax on chloral, not nearly enough to admit of the possibility of competition with the imported product.)

(*c*) *In Essential Oils, &c.*—In the manufacture of esters of various acids, such as formic, acetic, butyric, valeranic, oenenthic, and numerous other fatty acids.

(*d*) *In other branches of Chemical Industry.*—Examples of products, the manufacture of which is prevented by the duty on alcohol are:—Formaldehyde, dimethyl sulphate, pure ether, methyl and ethyl chlorides, bromides, and iodides, alkyl sulphates all esters, as oxalic ester, oxalacetic ester, &c., mercury fulminate, and consequently all detonating agents and cap compositions in which fulminates are used.

4. Other Cases in which the Duty on Alcohol has a Detrimental Effect.

If a cheap pure spirit were obtainable its application could be greatly extended for domestic purposes, as a substitute for petrol in automobiles, the objectionable smell left behind would thereby be done away with.

Chloroform scarcely comes into consideration as the protective duty on foreign chloroform more than covers the difference of cost of production in England (from methylated spirit or acetone), and in Germany (from duty-free spirit). On export, however, England cannot compete. For example, the duty into Australia is the same for English-made or German-made chloroform, and as the Germans can supply in Australia (*plus* duty) at about 1*s.* 1*d.*, whilst the British firms cannot supply at less than 2*s.* 1*d.* to 2*s.* 4*d.* per lb., competition is impossible. 95 per cent. of the chloroform produced in Great Britain is manufactured in Scotland. This is due to the fact that the industry started when the duty on alcohol was lower in Scotland than in England. In the case of ether, methylated spirit may be used, but to remove the impurities resulting from the wood spirit (= 10 per cent. of the methylated spirit), a loss of about 20 per cent. is incurred on the ether manufactured.

Research Work.—In organic investigations, alcohol is far the most important re-agent, solvent, diluent, cleansing agent, &c., &c. In many purely scientific operations it is indispensable, and in that almost all new industries, scientific improvements, &c., are dependent on research, this hampering of investigation causes very serious retardation to the industrial progress of the country. All new inventions, in the application of which alcohol is essential, cannot be considered by English manufacturers, consequently many valuable processes go abroad.

Effect on the Spirit Trade itself and on Industries dependent thereon.—Any concession which would render it possible to carry on the above-mentioned chemical industries would, of course, lead to an enormous increase in the consumption of spirit. (From statistics collected by U.S. Congressional Committee, under the free alcohol laws in Germany, the spirit industry increased about 1,000 per cent. in seven years.) Such an increase would act as a great stimulus to the potatoe and beetroot industry, and might even prove the salvation of the sugar industry in Jamaica, for example; and would probably lead to the use of much waste ground, such as the Essex marshes, which is only suited for growing potatoes.

At present any increase in output of raw materials would lead to over-production. Should, however, the demand for alcohol be greatly increased, the production of all raw materials would be stimulated, for the protection tax of 4*d.* per gallon on foreign spirit would leave a margin of profit for English and Colonial made spirit. Under these favourable conditions, we might hope ultimately to be able to manufacture spirit as cheaply and as well as the Germans do. It is a notable fact that the rectifying plant in use in Germany was the invention of an Englishman.

The inferior condition of the spirit industry in this country is not only due to its relatively small dimensions, but also to the difficulties it labours under in having t account for the alcohol present in the wort, in being unde heavy bonds, &c.

Facilities for using duty-free alcohol undenatured o denatured, according to the purpose for which the spirit i required, could be granted with safety under the condition which already exist on the continent and elsewhere.

The following is a brief outline of some of the method in vogue which appear to be most satisfactory:—

1. *In Switzerland.*—The following is abstracted fro the reports of the U.S. Consul at Zürich, June 1895. T the Joint Select Congressional Committee. In Switzerlan the manufacture of alcohol is a Government monopoly, an is carried on by contract for the Government under th supervision of Government officials. The undenature spirit is sold at prices varying from 136 to 143·5 francs pe 100 litres, which brought in a net profit of 5,000,000 franc for 1894. Spirit used for technical purposes in the arts o for fuel, is sold at cost price by the Government afte being denatured, and thereby rendered unfit for drinkin purposes. The denaturing is either (*a*) absolute, where th spirit is for burning, &c. (corresponds to methylated spirit) in this case piridine bases and wood spirit are generall added; or (*b*) relative. This only applies to alcohol use in industrial pursuits, when the alcohol is so denatured n to avoid rendering it less efficient in any particular industry for instance:—Alcohol for vinegar making is denature with acetic acid, for varnish with camphor, turpentine, o shellac, for perfumery a solution of castor oil soap, for othe industries naphthaline, pyroxyline, benzine, nitric aci ether, &c. Spirits denatured in this manner are only sol to bonâ fide well-known manufacturers in possession of federal finance department's licence, and who must at a times be prepared to show the quantity of denatured spir consumed in their establishments.

In Germany.—Duty on alcohol is as follows:—Custom duty from 5*s.* 7½*d.* to 15*s.* 3½*d.* per gallon (by weight) o the whole packet spirit and other ingredients.

Internal revenue duty, 3*s.* per gallon of absolute alcohol

Rebate on exportation. On imported spirit nothing. O home-produced spirit the whole duty, plus a bonus of 5 per gallon.

Pure duty free alcohol is allowed to be used for the pr paration of tinctures, &c., in which it occurs as a ingredient.

The advantage of this is very questionable. Personall I do not see any, such a concession would scarcely stimula trade at all, as indicated under Class I. (Alcohol as finished Product). It would be almost impossible to gua against fraud in England, where the duty amounts to abo 21*s.* 6*d.* as against about 3*s.* per gallon (absolute) Germany. Further, the abolition of the duty on su products would be detrimental from a point of view of t revenue. As pointed out under Class I. (Alcohol as finished Product), our methods admit of no improveme in this line.

We can, therefore, at once pass on to the consideratio of Class II. (Alcohol as a Raw Product).

In Germany pure ethylic and methylic alcohol a supplied—

(*a*) To the universities for experimental purposes, t Professor being held responsible for its non-abuse. There apparently no restriction as to quantity supplied, nor d the universities state for what the alcohol is required.

(*b*) To well known and trustworthy manufacturers f the manufacture of artificial colouring matters, smokel powders, and other products for which the use of t undenatured spirit is essential. The quantity and streng of spirit supplied and used is checked by a customs offic and the manufacturer is obliged to keep a strict record all the spirit used, which account has to agree (with limits of working error), with the books of the exc authorities.

The general outline of the system adopted is as follows The manufacturer buys the spirit as he requires it, to b advantage, and notifies to the Government of his purchas The excise authorities seal and check the quantity f spirit. The manufacturer must then account for the u of this alcohol from time to time to the satisfaction of

authorities. Stock is taken semi-annually, and Government inspection monthly.

Denatured Alcohol.—Such a wide series of denaturing agents is permitted, that only a very few operations cannot be carried on with denatured spirit; the following are examples :—

(*a*) For the preparation of alkaloids denaturing is permissible by $\frac{1}{2}$ per cent. of oil of turpentine, or 0·025 per cent. of animal oil.

(*b*) For extraction of jalap and scammony, $\frac{1}{2}$ per cent. of oil of turpentine.

(*c*) For polishers, for polish, and if used in their own manufacture, $\frac{1}{2}$ per cent. of oil of turpentine.

(*d*) For the production of aniline dyes, 0·025 per cent. of animal oil.

(*e*) For chloroform, iodoform, sulphuric ether, antipyrin, cetic ether, chloral hydrate, 0·025 per cent. of animal oil.

(*f*) For collodion, tannic acid, salicylic acid, and salicylates, 10 per cent. of sulphuric ether.

(*g*) For white lead, acetate of lead, 0·025 per cent. of animal oil.

Such denatured spirit is not saleable, but can only be used after special permission, and is only supplied to well-known *bona fide* manufacturers of the various articles.

For general use, methylated spirit is made by the admixture of $2\frac{1}{2}$ per cent. of a mixture of wood spirit (90 per cent.), and pyridine bases (20 per cent.) to the natural alcohol.

In America. *The Report of the American Congressional Committee* on pure alcohol may be summarised as follows :—

All products, for the manufacture of which, pure alcohol is a necessity, shall be subject to a rebate where alcohol does not remain in a finished product, which may be used as a beverage. Where the alcohol is consumed or destroyed or chemically changed, a rebate shall be allowed amounting to the tax paid upon the alcohol used.

Application for the right of rebate in any case to be finally settled by a committee of experts appointed, one by the Secretary of the Treasury, one by the Secretary of Agriculture, and one by the Secretary of War.

In England the question appears to have been thoroughly gone into only from the point of view of preparations of Class 11. (Alcohol as such in finished Products). In all cases where, I have been able to obtain copies of statistics obviously gathered, the question of alcohol as a raw product appears to have been almost entirely lost sight of, though its affect on the chemical industry as a whole is undoubtedly very much more far reaching than the above, where alcohol is merely an ingredient of a mixture, in this case as already pointed out, the English system appears to admit of no improvement.

Report by Special Joint Committee of Representatives the Chemical Trade Section of the London Chamber of Commerce, of the Society of Chemical Industry, and of the Drug Club, regarding the Law relating to, and the Regulations affecting Spirits.

The Joint Committee having considered the law relating to the use of spirits, the regulations issued by the Government authorities thereunder, and the law and regulations in force in Germany and the United States, unanimously recommend :—

1. That all natural alcohol, whether used as such, or in a compounded form for the production of medicine in which alcohol remains as such in the finished product, shall be required to pay such duty on its spirit-proof content as shall from time to time be prescribed in the Chancellor of the Exchequer's Budget.

2. That this Committee seek a conference with the Officials of the Excise Department of the Inland Revenue to show—

(1) That manufacturers in Great Britain and Ireland are under great disabilities in the use of alcohol in the manufacture of pure chemical pharmaceutical and industrial products, and manufacture of sulphuric and other ethers, chloroform, chloral hydrate, &c.

(2) That the permission given about 40 years ago to manufacture sulphuric ether and chloroform from methylated spirit without excise supervision, as well as also the permission subsequently granted to make chloral hydrate from similar spirit, be withdrawn.

(3) That it is desirable to obtain permission to employ, in buildings set apart for the purpose and under Excise supervision, methylic or ethylic alcohol duty-free in all industrial or manufacturing operations in which the finished product contains no alcohol as such. (In the manufacture of chloroform, owing to secret processes and the possibility of the use of acetone or methylated spirit, together with the protection import duty on chloroform, the manufacturers do not like working in bond.)

At the subsequent conference with the officials of the Excise Department of the Inland Revenue, it was shown—

(1) That if alcohol could be bought at a price similar to the German spirit in Germany (say 6*d.* to 10*d.* per gallon), and it were possible to work under not too costly supervision, competition would be more equitable.

With regard to the home trade, if the imported product were put on a level with that made at home, *i.e.*, had to pay a duty corresponding to the spirit used in its manufacture, including the differential tax of 4*d.*, English manufacturers would then be placed on an equal footing with foreigners as far as home trade is concerned.

(2) That the manufacture of many products which necessitated the use of alcohol had drifted into German hands.

(3) That if a wide use of denaturing agents could be allowed, such agents as are not harmful to the product to be manufactured should be used, and further, that it is essential to allow the spirit to be recovered by distillation, for use in subsequent operations.

(4) That the denaturing agent should be either cheaper than the spirit or a necessary ingredient in the operation for which the spirit is used, because the cost of methylated spirit, where it can be used, places English manufacturers at a great disadvantage.

(*Cost.*—Methylated spirit, 1*s.* 6*d.* to 2*s.* per gallon. Foreign spirit, 6*d.* to 10*d.*, and 4*d.* tax, per gallon. The difference in cost is not entirely due to the high price of the wood spirit used for denaturing, but also to the fact that British grain spirit at 1*s.* 3*d.* per gallon is used in place of foreign spirit at 6*d.* to 10*d.* per gallon and 4*d.* tax. There appears to be no reason why British spirit should not ultimately be produced as cheaply as German spirit if the spirit trade received sufficient stimulus; and the protective tax of 4*d.* would make it possible for the industry to go on till the trade assumed dimensions which admitted of competition with Germany.)

The ultimate position arrived at at this interview was :—

Firstly.—That the granting of free alcohol is too big a request, and the authorities could only even entertain it in the case of some special large industry, for which special arrangements could be made, such as the making of smokeless gunpowder. It was urged as an objection that so few would take advantage of free alcohol under the necessary restrictions, that it would practically make monopolies (this, however, would scarcely matter; the manufacture of chloroform, ether, and morphia in this country are already practically monopolies).

Secondly.—That the authorities were prepared to consider some cheaper denaturing agent than naphtha (which adds about 4*d.* a gallon to the price of the spirit).

Thirdly.—That they would also consider whether, for special manufactures, they could authorise a special denaturing agent, choosing one, if possible, that formed part of the process in the manufacture of that particular article.

Fourthly.—That for export they are prepared to extend the present system of drawbacks to almost any extent.

Fifthly.—That they were prepared to consider the re-adjustment of the Import Tariff on any articles, such as chloral hydrate, where the tariff apparently does not at present take cognisance of the loss of spirit in the manufacture, so that chloral hydrate could be made by the English manufacturers here, and they would grant the drawback on exportation.

It has been stated that the loss of trade in these industries is due to lack of enterprise on the part of English manufacturers. I do not believe this to be the case. For

example, consider the manufacture of caffeine; the denaturing of tea has rendered this an English industry instead of a German one. Surely a readjustment of the alcohol laws may bring other organic industries into English hands. With regard to the value of the duty on alcohol used as a raw product in manufacturing (Class 2), I can obtain no definite statistics, but it is probably a very small item; the effect of the duty is to render its use impossible, as shown above.

In conclusion, it may be stated that the high duty on alcohol has been the chief cause of driving, one by one, the manufacture of innumerable products from this country.

These industries, unimportant individually, collectively, make up the organic side of chemical industry. Nothing that could be done now can remedy much of the evil already done to the trade. Manufacturing processes undergo continual improvement as the manufacturers gain technical experience on the subject, so that a continual reduction in the cost of producing any product is bound to go on; hence it would be impossible in many cases to catch up the start we have given our competitors. Again, even if by legislation the pursuit of these industries were made possible, the economic manufacture of raw products on which they are dependent would not be likely to revive. As an example, the case of butyric ester, in America, may be taken. The new tariff has made it possible to manufacture this product at a price to compete with the imported article (made from duty-free spirit), but the Americans are still dependent on the Germans for their butyric acid; they cannot make it themselves. Facilities in this line would, however, have the result—

(1) Of saving industries not already destroyed (such as those enumerated under sections 1 and 2 of Class 2, above);

(2) Of assisting the slow regaining of lost industries;

(3) Of placing England on a level with her competitors with regard to new industries; and

(4) Of stimulating and facilitating research, and thereby improving the condition and development of all industries.

With regard to means by which the present very undesirable state of affairs could be rectified, if I might venture the suggestions, it seems that there are two distinct courses open, viz.:—

(1) To follow the lines adopted in Germany, and permit the use of duty-free undenatured spirit for certain industries, and of spirit denatured according to the purpose for which it is required for others; or

(2) To follow the lines adopted in America, and place a protective duty on all products in the manufacture of which alcohol is required, corresponding to the alcohol used, wasted, and destroyed in their manufacture. This would put our own manufacturers on an equal footing with foreigners in the home trade. And to allow a rebate amounting to this duty on export. This would place our manufacturers on an equal footing with foreigners in the export trade.

Finally, I wish to express my thanks to Mr. Thos. Tyrer, of Messrs. Thos. Tyrer and Co., to whom I am indebted for much of the above information, and also to Prof. Bernthsen (of the Badische Anilin und Soda Fabrik), Mr. J. M. Bush and Mr. J. O. Brathwait (of Messrs. W. J. Bush and Co.), Dr. Dreyfus (of the Clayton Aniline Co.), Mr. A. G. Green, Mr. Kraftmeyer (of the Chilworth Gunpowder Co.), Mr. David Howard (of Messrs. Howard and Sons), Mr. Levinstein (of Messrs. Levinstein, Ltd.), Prof. Medicus (of the University of Wurzburg), Dr. Power (of Messrs. Burroughs, Wellcome, and Co.), Mr. Turners (of Messrs. Read Holliday and Sons), Mr. Charles Umney (of Messrs. Wright, Layman, and Umney), Prof. Will (of the Centralstelle), Geh. Dr. Otto Witt, and others, all of whom have supplied details occurring in the above report.

Discussion.

Mr. Thos. Tyrer referred appreciatively to the spirit in which the Excise Department of Inland Revenue had met the requirements of exporters of spirituous medicinal preparations and perfumes (see this Journal, 1896, 496). Not only was the duty remitted when exported, but allowance was made for waste (where proved) and for possible error in analysis. He thought such liberal treatment made by so very conservative and important department showed the confidence the Excise authorities had in the members of the manufacturing community. He did not see why similar concessions could not be arranged in other manufactures involving the use of alcohol. Considering that concessions were desirable beyond medicinal preparations and perfumes—which the sections of those trade under the London Chamber of Commerce had obtained—the Council had appointed a committee to co-operate with other bodies, or even by itself, to obtain the necessary concessions from Government.

Mr. E. Grant Hooper thought that, considering the importance of the spirit duties in this country, it was very desirable that the attention of everyone interested in the use of pure duty-free alcohol should be directed to a consideration of the conditions in each case under which such spirit could be made available for use in scientific and manufacturing operations without appreciable risk of its illicit use for potable purposes.

Mr. Walter F. Reid said the Council had appointed a committee upon this subject, and Mr. Tyrer, one of the most active members, had collected a great deal of information upon it. He did not think it would be difficult to find means to prevent the improper use of alcohol. There were means of preventing its consumption, which the German authorities were able to apply in their industries and he saw no reason why our own authorities should not be able to do the same. The revenue from spirits in Germany had not diminished, but, on the contrary, has increased, and hand in hand with that increase in the revenue there had been an enormous increase in the uses of alcohol for industrial purposes. The Germans had a great many ways of denaturing spirit, as the following figures would show:—

Consumption of Alcohol in Germany for Technical Purposes.

(Gallons of Pure Alcohol.)

	1890—1891.	1899—1900.
Free from duty for all technical purposes.	11,206,339	22,961,325
Denatured by general denaturing agent.	5,364,847	14,418,270
Denatured by 5 per cent. wood spirit.	306,406	587,484
„ „ ½ per cent. pyridine bases.	24,213	4,622
„ „ vinegar, water, &c.	3,057,098	3,558,706
„ „ oil of turpentine.	785,230	1,297,535
„ „ animal oil.....	921,748	1,734,040
„ „ sulphuric ether..	41,074	109,949
„ „ shellac solution..	27,559	36,011
„ „ other substances	54,259	167,400

Alcohol used without Denaturing.

For scientific purposes	30,266	42,985
„ curative „	284,789	545,763
„ soap and perfumery*	167,136	34,559
„ other purposes	359,630	507,132

Raw Materials used for Manufacture of Alcohol.

Potatoes.....	1,685,867 tons	2,501,843 tons
Grain	350,048 „	346,754 „
Stone fruit	199,890 galls.	644,750 galls.

* Not duty-free since 1896.

The main point was that the revenue did not suffer by this consumption. Although individual drunkards might drink denatured spirits, it was hardly right to base the fiscal policy of a great nation upon such cases. It was the respectable manufacturer who used the spirit for definite purposes whom they were considering. The German Government had treated their commercial men and manufacturers in a broad and liberal spirit, and had not lost through it, and he was glad to hear from Mr. Tyrer that

one case our own Government were treating our manufacturers in a similar way. The one important point was that the use of a larger quantity of alcohol for industrial purposes would not necessarily imply any loss in revenue, because the great proportion of these manufactures did not exist as present, and could not, as had been clearly shown in the paper. It would not only be no loss, but might mean an increase to the revenue. The influence on the prosperity of agriculture might be very considerable, for it would be seen from the figures given that the quantity of potatoes grown in Germany for the manufacture of alcohol had in ten years risen from 1,685,867 tons to 2,501,843 tons.

New York Section.

Meeting held on Friday, May 23rd, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

FURTHER NOTES ON CEMENT TESTING.

BY S. F. PECKHAM.

I have read with great pleasure and profit the "Report of the Sub-Committee on Uniformity in Analysis of Materials for the Portland Cement Industry." I think that the thanks of all chemists interested in the results discussed in this report are due to the gentlemen constituting the sub-committee, and to Dr. W. F. Hillebrand, for the skill and fidelity with which they have done their work.

To the manufacturers of Portland cement and their chemists these results must be of great value, and certainly they, too, are to be congratulated upon the success attending the efforts put forth.

I think, however, that all persons outside the committee will join me in regretting the absence in the report of any detailed statement concerning the identity of the specimens submitted to the different analysts. No one of the 17 gentlemen who made the analyses, except Dr. Hillebrand, makes any mention of the condition in which the materials analysed were received, and he only states what was on the labels. Whether the cement mixture was in large or small lumps, ground, course or fine; whether the cement was new or properly aged; whether it was a commercial sample taken from the bins or specially prepared for this work; whether the samples were taken from bins as they were asked for or whether quantities of material sufficient for this work were set aside and preserved for division when asked for, or whether a larger quantity than was likely to be asked for was properly sampled from the bins and put up as nearly as possible at the same time on the same day, in bottles of suitable size, with paraffined glass stoppers, and kept in a cool place until asked for, does not appear. The differences observed in the "loss on ignition" indicate that the cement analyses were not made of identical samples, and identical samples could not be secured from the same mass in the same bottle that had been frequently opened during several weeks.

There is no difficulty in duplicating determinations of "loss on ignition" to 1-100th of 1 per cent., and the differences recorded and lying between 1·04 per cent. and 3·20 per cent. are too great to be accounted for on any other ground than lack of identity in the samples. It is, therefore, to be regretted that the committee did not state in minute detail how the samples were taken.

Whilst Dr. Hillebrand refers to this consideration in his first conclusion, I think he fails to give this element of the problem sufficient emphasis.

There are probably a larger number of chemists at the present time interested for the users of cement than for the manufacturers of cement, and I think it is to be regretted that so few chemists, other than those interested in cement manufacture, are represented in the list of analysts, whatever may have been the cause. For, whilst the two classes of interests might be identical, they are not necessarily so, and may be opposed. Certainly, no chemist who analyses cement for the purpose of determining, so far as an analysis goes, the relative value of the cement, would think of resorting to an ultimate analysis, whilst ultimate analysis may be precisely what the manufacturer needs. Of course, all interest in the analysis of cement rock and cement mixtures centres in the manufacturers of cement, and for that reason that interest may be eliminated from any consideration here. It must not, however, be inferred that because an ultimate analysis is not sought by the user of cement that this scheme, as set forth by your committee, is of no value to them. Far from it. I am inclined to think that all talk about titanium, phosphoric acid, manganese, and strontium, as affecting the value of a cement for use, seems "to approach hyper-criticism," but if it does, the forceful plea for care and accuracy embodied in the work of Dr. Hillebrand and Mr. Richardson should not be lost on all chemists who are making cement analyses.

No one can question the accuracy of Dr. Hildebrand's conclusions as to methods, based as they are on long experience and careful research, but right methods may be rightly or wrongly applied, and in this instance I hold the same opinion still that I held a year ago, that an ultimate analysis reveals no differences between very unlike cements. If that is the case, it makes no difference whether it accords with criticism or hyper-criticism, nor to what extreme of accuracy it may be carried. The silica, alumina, and iron that exist in a cement as sand or fuel-ash, or over-burned anhydrous ferric oxide, form no part of the cementing material. The analysis should be so conducted as to separate these ingredients that are not cement from the cement. This can be completely done by careful solution in 10 per cent. hydrochloric acid. Of course, if anyone wishes to know of what this insoluble matter consists, it can be readily analysed by fusion, but the result should not be added to those obtained by the analysis of the soluble portion.

The soluble portion should be analysed with the greatest care, with due regard to the balance between time and accuracy, criticism and hyper-criticism. For ordinary practical work, I do not believe that, with proper care, the traces of silica that go over to the alumina and lime need be regarded; nor should the trace of alumina that goes to the lime. No system of analysis is perfect, and it should be always conducted with due regard to the fact that "chemistry is time-consuming business," and that life is short. The mean between criticism and hyper-criticism should be sought with due regard for the end sought.

With these suggestions, I would remark that this committee could continue their work with great profit, if they will distribute samples under such conditions as would ensure identity and secure analyses upon both a critical and hyper-critical basis of regard for time and accuracy. The result would be extremely valuable.

I note, further, in the Journal of the Franklin Institute, for February, 1902, the concluding portion of Mr. R. L. Humphrey's very valuable paper on "The Inspection and Testing of Cements," including a very interesting discussion. In this discussion, Mr. Humphrey says: "The practice of effecting a solution of the sample of cement for analysis by fusion with sodium carbonate of the thoroughly dried and finely pulverised sample is quite common, and is the most reliable way of decomposing the silicates. When the quantity of clay or insoluble silica is desired, it is determined separately. At the present time, it is an ultimate analysis that is required. Whilst Prof. Peckham's theories as to the object of chemical analysis and his proposed methods for the examination of cements may be perfectly correct, their value is yet to be demonstrated."

Mr. Humphrey, like some others who are engaged in analysing cements, appears to think that common practice and common use can be used as an argument in a scientific discussion. If my contention, that the sample should be analysed as it is received, and precisely as it is subjected to physical tests, without being either pulverised or dried, is perfectly correct, then to pulverise and dry the sample is perfectly incorrect. Common use is no argument for or against either course. The basis of any argument for or against any proposed method is the purpose served by the method. In the case under discussion, the purpose of any

analytical method proposed is not a scientific question concerning the ultimate composition of a cement, but a practical question, concerning its suitableness for certain uses. Now a correct method is one that will furnish the most information that can be made of practical use for the smallest expenditure of time and labour. I claim that an ultimate analysis does not serve this purpose, and I am perfectly willing to be convinced that I am wroog. The persistent use of methods that are wrong has never made them right and never will.

Discussion.

Dr. Hillebrand called attention to what appeared to be a misapprehension of the author as to the object of the detailed analyses reported by him. They were not intended to serve as patterns for technical practice, but to show just what constituents and how much of each the samples contained, for without this knowledge any criticism of the methods employed by the several chemists would be deprived of its chief basis of value.

Dr. Hillebrand has since sent the following further comments : "The author evidently agrees with the opinion and practice of Messrs. Stanger and Blount, that in stating an analysis, the constituents of the inert matter of a cement should not be included with those of its active principles, and from his allusion to a method of ascertaining their sum seems to be in precise accord with myself as to how this should be done. (See my substitute for Messrs. Stanger and Blount's procedure in the discussion of their paper.)

"Prof. Peckham does not think that the 'traces of silica that go over to the alumina and lime need be regarded.' This is perfectly true if two evaporations and filtrations of silica have been made, but if the author's remark is intended to apply to the silica passing over after only one filtration, I must take positive issue with him, for it is not a trace but ordinarily a very considerable amount and one which cannot be regulated so as to fall always within a conventional allowable minimum."

THE VOLUMETRIC DETERMINATION OF MOLYBDENUM IN MOLYBDENUM STEEL AND FERRO-MOLYBDENUM.

BY JAMES BRAKES.

A short time ago, upon request, I received, through the courtesy of Mr. J. Edward Whitfield and Mr. F. T Kopp, of Phil., Pa., a sample of ferro-molybdenum and molybdenum steel, in which Mr. Whitfield had determined the molybdenum by his gravimetric method on which Mr. Kopp based the volumetric method (J. Amer. Chem. Soc., Feb. 1902).

Mr. Kopp's method I have modified as follows :—

Dissolving the steel in aqua regia, and evaporating to dryness, redissolving in HCl and final evaporation with an excess of H_2SO_4, instead of dissolving the sample in dilute H_2SO_4 and fusion with $HKSO_4$, and also in the calculation of the molybdenum factor as applied to the standard $K_2M_2O_8$ solution regardless of its strength in iron.

Weigh 5 grms. of the steel or ferro-molybdenum, place in 500-c.c. beaker and dissolve in a mixture of 20 c.c. of HNO_3 + 20 c.c. of HCl and evaporate todryness, redissolve in 10 c.c. of HCl and add 20 c.c. of dilute H_2SO_4 (1:1) and evaporate to SO_3 fumes. Cool the beaker and contents, and add 400 c.c. of water; heat gently until solution is complete, transfer to 1,000-c.c. flask, add 100 c.c. of NH_4HO (sp. gr. 90), shake thoroughly, and stand flask in cold water about one hour, and when cold, dilute to the mark and mix thoroughly and filter on large dry filter, place 500 c.c. of the filtrate in 500-c.c flask, transfer to 800-c.c. beaker, wash flask three or four times with water, and add to solution in beaker, add 40 c.c. of dilute H_2SO_4 (sp. gr. 1·60), pass through modified reductor, and titrate with standard $K_2Mn_2O_8$ solution, subtract blank and multiply the iron factor by 0·605, as the following reaction indicates, described by Emmerton (Blair, p. 95, 2nd edition)—

$$5Mo_{12}O_{19} + 17(K_2OMn_2O_7) = 60MoO_3 + 17K_2O + 34MnO.$$

A comparison of the results obtained is as follows :—

—	Whitfield. Gravimetric.	Kopp. Volumetric	Modified Method. Volumetric.
	Per Cent.	Per Cent	Per Cent.
Ferro-molybdenum..	50·50	50·45	50·54
Molybdenum steel ..	..	5·04	5·04 5·03 5·03 4·97

Remove tungsten if present before evaporation with H_2SO_4, and the influence of chromium on the final titration with $K_2Mn_2O_8$ solution when present with molybdenum in the steel can be decided by the following :—

To three weighings of steel (free from molybdenum), of 1 grm. each, 0·274 and 0·3 grm. of $K_2Cr_2O_7$ were added to No. 1 and No. 2 respectively; No. 3 contained no chromium, and all were treated as in modified molybdenum determination.

Blank No. 1..... 0·2 c.c. of $K_2Mn_2O_8$
„ 2..... 0·2 „ „
„ 3..... 0·2 „ „

This indicates that at least 8·00 per cent. of chromium can be present without affecting the accuracy of the molybdenum determination.

Note.—As there may be some discussion regarding the reaction used in the paper, it would be well to state the following :—

In the paper, I have used Emmerton's reaction—

$$5Mo_{12}O_{19} + 17(K_2OMn_2O_7) = 60MoO_3 + 17K_2O + 34MnO.$$

and for this reaction I should use the factor 0·605 (to multiply the Fe factor to equal Mo factor), but should I use the reaction suggested and used by Blair—

$$5\ Mo_{24}O_{37} + 35\ K_2Mn_2O_8 = 120MoO_3 + 35K_2O + 70MnO$$

(Amer. Chem. J., Oct. 1895), I should then use the factor 0·5877.

The above factor (0·5877) is too low; this can be readily seen in the analysis of molybdenum steel or ore when the final solution is titrated with $K_2Mn_2O_8$ solution, and from the results obtained on the molybdenum steel (ore not included) it would indicate that Emmerton's reaction is correct.

ANALYSIS OF CRUDE SULPHUR.

BY FRANK B. CARPENTER.

In a recent examination of some samples of crude sulphur from Mexico, it was found that only a portion of the sulphur was soluble in carbon bisulphide, and the presence of calcium sulphate containing water of crystallisation excluded the ignition method for the estimation of sulphur. It was also found that the water of crystallisation yielded gradually at a temperature of 100° C., so that no satisfactory results on moisture could be obtained at this temperature. To overcome these difficulties, it was found necessary to determine moisture in a vacuum over H_2SO_4, and the following scheme was adopted for the determination of sulphur: Weigh two grms. of material in 8-oz. beaker, treat with dilute HCl, and boil for about ten minutes, filter on Gooch crucible, dry and weigh. This removes the calcium sulphate and leaves the sulphur and insoluble matter on the filter. This residue may then be burned, the loss representing the approximate percentage of sulphur, or the sulphur extracted with carbon bisulphide. It was found that, after the calcium sulphate had been removed with HCl, the sulphur was readily removed with this solvent. The results by ignition were slightly higher than those obtained by solution owing to a small percentage of organic matter not removed by the carbon bisulphide.

THE SPECIFIC HEAT OF GLYCERIN WASTE LYES AND CRUDE GLYCERIN.

BY AUGUSTUS H. GILL, PH.D., AND S. B. MILLER, S.B.

The object of this work was to obtain data for the proportioning of the heating surface of evaporators used in the recovery of glycerin from waste soap lyes.

The data on this subject are very meagre. A few values were found in Landolt and Börnstein's tables, which were presumably for pure glycerin; some data in regard to boiling points with corresponding percentages of glycerin and salt were obtained (Table 1), together with the data for a test of 16 hours on a double-effect evaporator at Philadelphia. This test furnished valuable matter in regard to the temperatures that prevail during the process (Table 2).

In this test, the purified lyes were fed to the first vessel and from it to the second, the proper height in each being maintained. When the liquor in the second vessel became crude glycerin, the plant was shut down and the test closed. The lyes were purified by the addition of sulphuric acid and persulphate of iron to entirely neutralise the hydrate and carbonate of soda. The resulting precipitate was separated by a filter press. The salt and sulphate were removed during the process as they precipitated.

After reviewing the data at hand, it was decided that the specific heat should be determined for a range of temperature corresponding to those developed in the apparatus as shown by the test. Hence the following method was adopted.

The lye or crude glycerin was enclosed in a platinum bottle and heated to 100° C. The bottle was then transferred to the calorimeter and the rise of temperature noted. From these observations the specific heat was calculated. This method gave the mean specific heat between 100° C. and 25° C. The temperatures varied somewhat from these limits as will be shown by the table (Table 4).

The bottle was heated in a jacketed cylindrical heater, properly lagged with asbestos; the jacket contained xylene and was furnished with a return condenser. The inner cylinder was opened at the top and furnished with a cork through which passed the thermometers, one of which gave the temperature of the chamber and the other the temperature of the liquid in the bottle. This latter thermometer bulb was inserted in the centre of the liquid by means of a platinium tube that extended through the stopper of the bottle. When the required temperature was reached the cork with the thermometers was removed and the bottle quickly lifted by means of a string and lowered into the calorimeter.

The calorimeter was of brass with a tin jacket, from which it was insulated by corks. The inner surface of the jacket was polished to diminish radiation. The stirring was done by hand, and half-minute readings of the thermometer were taken. The theremometer readings were corrected and a cooling correction applied in determining the final temperature and the rise. The calorimeter stood on a wooden base, the side toward the heater being lagged with asbestos. The time to transfer the bottle from the heater to the calorimeter was about five seconds.

Whilst the above method gave fairly satisfactory results, yet in the course of working with it several defects were noted which might be remedied in a more extended investigation. Some suggestions that would tend to increase the accuracy of the observations are here given.

(i.) An electric heater that could be kept exactly at the temperature desired. (ii.) The bottle and substance to be allowed to stand in the heater for a considerable time to obviate the possibility of the outer layers of the liquid being hotter than the centre. (iii.) The heater to be arranged so that it could slide over the calorimeter and be provided with a trap to more quickly transfer the bottle. (iv.) A mechanical stirrer for the calorimeter. The lyes high in glycerin and the crude glycerin have a very low conductivity and, therefore, the cooling correction is hard to apply and is much affected by the stirring, which must be constant and efficient.

Six samples of lyes, from the purified lye from the filter press to the crude glycerin, were used for the determinations, as follows:—

Sample A. Purified lye from the filter press ready to be evaporated.
„ B. From clear lye tank, partly evaporated.
„ C. Lye as it leaves the first evaporator.
„ D. Lye as it leaves the second evaporator.
„ E. Half crude glycerin.
„ F. Crude glycerin.

The samples do not represent the same lye which has gone through the various processes of refining, but are samples withdrawn at the indicated stages during the regular running of the apparatus.

In order to complete the study of the lyes, and the effect of their varying contents of salt, sulphate, and glycerin on the specific heat noted, the per cent. of these bodies was determined. The presence of salt is due to the "salting out" of the soap, and the sulphate from the purificatioo already referred to. Determinations of all these were made on the six samples (Table 3).

It will be seen that the increase of the percentage of glycerin is the chief factor in the fall of the specific heat. The sulphate is in a small amount throughout, and reaches its maximum in sample C. In sample E, it is extremely small, and although no determination was made, it is probably absent in sample F. The salt reaches its maximum in sample D, and then falls. The salt was present and determined in all the samples. The specific gravity of the samples was also determined at 15·5° C. by means of the Westphal balance.

The methods employed in the analytical work were the following:—For glycerin, the bichromate method.

The glycerin is oxidised with chromic acid and the excess of bichromate titrated with ferrous ammonium sulphate. The procedure is as follows:—A sample of 1·5—2 grms. is weighed into a 25-c.c. calibrated flask and 1·5 grms. of silver sulphate, weighed on the rough balance, is added, the solution made up to 25 c.c., and six drops added to make up for the displacement of the silver chloride. The solution is then shaken until it clears (about five minutes) and filtered into two beakers, half in each. The first half of the solution is used to rinse the pipette, and from the second half 5 c.c. are pipetted into a 250-c.c. beaker. Add 7—10 c.c. of bichromate and, slowly, 15 c.c. of sulphuric acid (1·84). It is heated for half an hour on the water bath, diluted to 200 c.c. and titrated.

Modifications to be observed.—For crude and half crude, use 1 grm., and dilute to 600 c.c. If the filtrate after treatment with silver sulphate do not come clear, the work must be repeated.

Standardisations.—To standardise the ferrous ammonium sulphate, run out 7—10 c.c. of the bichromate into a 250-c.c. beaker, add 15 c.c. of sulphuric acid (1·84), heat for half an hour on the water bath, dilute to 200 c.c. and titrate. To standardise the bichromate against glycerin,

TABLE 1.

Boiling Points with corresponding per cents. of Glycerin and Salt.

—	Boiling Point.	Glycerin.	Salt.
	° C.	Per Cent.	Per Cent.
1	109	16·10	20·21
2	not taken	17·30	20·02
3	112	32·86	17·05
4	120	63·28	10·74
5	240*	87·84	6·34

* Taken at point where ebullition had just ceased. The lye was boiled down in the open air, and samples taken for analysis as the boiling point was noted.

—	Specific Heat in Glycerin.	Landolt and Bornstein.
1	15—50° C.	0·576
2	15—50° C.	50% dilute 0·813

Observed by Emo.

weigh out 0·05 grm. of glycerin into a 250-c.c. beaker, add 15—16 c.c. of bichromate, then add, slowly, 15 c.c. of sulphuric acid (1·84), heat half an hour on the water bath and titrate the excess of bichromate.

Precautions to be observed.—There should be a considerable excess of bichromate and the same amount of dilution to get well agreeing results.

Strength of Solutions. — Bichromate: 75 grms. of $K_2Cr_2O_7$ and 150 grms. of H_2SO_4 (1·84) per litre. Ferrous ammonium sulphate: 300 grms. of $FeNH_4(SO_4)_2$ and 10 c.c. of H_2SO_4 (1·84) per litre.

Determination of Salt.—The salt was determined by titration with silver nitrate. 2·5 grms. of lye are weighed into a 25-c.c. flask, made up to 25 c.c., and 5 c.c. pipetted into a beaker. It is diluted with 50 c.c. of water, two drops of phenol phthalein added, and the solution neutralised, if necessary, with nitric acid. Then 15 drops of potassium chromate indicator are added and the solution titrated with N 10 silver nitrate. The silver nitrate solution is made up approximately N/10 and standardised against chemically pure salt. Potassium chromate indicator, 30 grms. per litre.

Determination of Sulphate.—5 c.c. of lye were pipetted into a 25-c.c. flask, made up to 25 c.c. and then 5 c.c. pipetted off for the determination. This gave weight of lye equal to the specific gravity of the sample. The sodium sulphate was then determined in the usual way with barium chloride.

The bichromate method for glycerin, whilst known to give results slightly high, is much more expeditious than the acetin method, which in its turn gives results too low. It is also better for lyes low in glycerin than the acetin method.

Our acknowledgments are due to Mr. G. J. Feran for hints and suggestions, to Mr. J. W. Loveland for data and samples, and to Mr. W. O. Adams for methods of analysis.

TABLE 2.

Test of Double-Effect Evaporator at Philadelphia.

Time.	Pressure in Steam Chest, 1st vessel.	Temperature, ° F., in Vapour Chamber, 1st vessel.	Inches Vacuum in Steam Chest, 2nd vessel.	Temperature, ° F., in Vapour Chamber, 2nd vessel.	Inches Vacuum in Vapour Chamber, 2nd vessel.
Aug. 15, 8.45 a.m.	1·5	262·0	14·0	158·0	25·25
9.45 „	3·0	208·0	12·0	149·0	25·0
10.13 „	4·0	211·0	11·0	150·0	25·0
12.40 p.m.	3·0	204·0	14·0	149·5	24·5
2.40 „	8·5	224·0	5·0	161·0	25·0
5.20 „	7·0	222·0	6·0	166·0	25·0
Aug. 16, 8.35 a.m.	..	192·0	16·0	146·0	25·3
10.10 „	3·0	211·0	9·0	150·0	25·2
11.00 „	5·5	221·0	6·0	156·5	25·0
11.40 „	9·0	226·0	4·0	158·0	25·25
12.00 noon	9·0	230·0	3·0	164·0	25·5
12.20 p.m.	6 5	229·0	4·0	174·0	25·5
12.30 „	9·0	234·0	1·0	180·5	25·6
12.40 „	9·0	234·0	..	183·0	26·4
12.50 „	9·0	234·0	..	188·0	26·4
1.00 „	9·0	235·5	..	193·0	26·5
1.08 „	8·25	235·0	..	195·5	26·6

Evaporators started at 8 a.m., Aug. 15. Evaporators shut down at 6 p.m., Aug. 15. Steam turned on at 8.25 a.m., Aug. 16
Test closed at 1.08 p.m., Aug. 16. Crude, finished, 1·08 sp. gr.

TABLE 3.

Observations on Lye Samples.

Sample.	Specific Gravity, Westphal Balance.	Per Cent. of Salt.	Per Cent. of Sulphate, Na_2SO_4.	Per Cent. of Glycerin.	Specific Heat.
A	1·126	11·1	2·3	6·2	0·8233
B	1·163	12·5	not determined	8·0	0·7841
C	1·206	16·4	4·2	8·1	0·7488
D	1·243	18·9	2·9	16·4	0·7313
E	1·294	9·4	0·4	55·5	0·6039
F	1·330	5·4	very small	87·0	0·4969

TABLE 4.

Specific Heat of Lye Samples.

Sample.	Observed Specific Heat.	Mean of Observed Specific Heats.	Temperature Range.
A	0·8311 0·8155	0·8233	100·3—27·07 100·9—28·4
B	0·7865 0·7816	0·7841	101·8—28·2 100·1—27·6
C	0·7526 0·7449	0·7488	100·0—26·4 100·0—27·6
D	0·7374 0·7252	0·7313	100·0—28·2 101·0—28·6
E	0·6061 0·5801	0·6039	100·0—27·4 100·0—28·8
E	0·6064 0·6222		100·0—26·2 99·9—27·8
F	0·5044 0·4946 0·4919	0·4949	100·0—24·8 100·0—26·8 104·5—26·2

THE SUGAR-BEET AS A RECLAIMER OF ARID AND ALKALI REGIONS.—II.

BY HENRY C. MYERS, PH.D.

(See this Journal, May 31, 1901, 445.)

Introduction.—At the present moment, the United States are greatly exercised over problems vital to the agricultural interests of the arid west.

The management of forest reserves, thereby controlling the melting of winter snow and the feeding of waterways; the storing up of water and the regulation of water rights; the Cuban tariff as relating to our own infant beet-sugar industry; the reclaiming of arid lands now made profitable through sugar-beet culture, are all topics of household conversation. The interest is unusual perhaps because matters affecting the farming interests affect the country's prosperity—good crops mean good times. The reclaiming of arid lands has for some time been recognised as possible by sugar-beet culture now introduces the factor of profit where it did not exist, and I can but believe that this culture under proper legislation, both as regards sugar duties and the storing up and regulation of water flows, is to be the salvation of much of our arid west. My firm belief in this statement is based upon the fact that the sugar-beet thrives where common crops fail absolutely, and besides being a most profitable crop removes alkali from the soil year by year, thereby making ordinary crops possible.

Arid Soils and their Extent.—All virgin soils result from the gradual disintegration of rock formations due largely to unequal expansion and contraction of unlike constituent parts during heating and cooling, and the action of winds and rains upon such broken parts.

Where there is heavy rainfall the soluble portions are dissolved, in part at least, and eventually carried to the

sea. Where the rainfall is slight, the soil retains largely these soluble portions. Arid or alkali soils then contain largely the constituents of sea water as well as the essential plant foods, which would be carried away either in solution or suspension by heavy rains. Such soils are excessively rich in plant food, but unfortunately contain also three salts which characterise all alkali regions the world over, and render such soils largely corrosive and obnoxious to vegetation in spite of plant food present. These three undesirables are common salt, sodium sulphate or "Glauber salt," and sodium carbonate or "sal soda." The reclaiming of arid regions, then, means largely the getting rid of these obnoxious constituents; the method of so doing being determined only on careful chemical and physical analysis of the soil to a given depth, the general location and elevation of lands under consideration, and the analysis of available waters at hand. Excessive irrigation or flooding would carry away the real plant food as well as the undesirable portions, even when properly conducted. Many plants, either native or introduced, take up alkali during growth, but must be removed without profit, or fed to cattle, in which case profit is indirect or impossible. Of these desert alkali lands, either partly under cultivation or entirely unreclaimed, the "Great Interior Basin" alone comprises an area of 210,000 square miles, embracing the whole of Nevada, the western half of Utah, portions of Idaho, Washington, Montana, Oregon, and California, and extending south into Old Mexico.

In this paper I have attempted to show the effect of sugar-beet culture upon virgin alkali soil where cultivation has never been attempted. I selected that portion of land in West Weber, Utah, which has the reputation of being the "worst belt of land between Ogden and Great Salt Lake," and did so because this strip is entirely away from

Fig. 1.

Virgin alkali soil where mountain water is impossible, and cultivation never attempted.

Fig. 1A.

Lower portion of field No. 1, showing white alkali. Even weeds refuse to grow here.

Examination of Artesian Waters.

	No. 1. 75 ft. deep.		No. 2. 135 ft. deep.		No. 3. 285 ft. deep.	
	Grains per gall.	Parts per 10,000.	Grains per gall.	Parts per 10,000.	Grains per gall.	Parts per 10,000.
tassium sulphate lium sulphate (Glauber's salt), &c. lium chloride (common salt)	2·03	0·35	0·47	0·08	2·55	0·44
lium carbonate (sal soda)	2·71	0·46	2·03	0·35	8·13	1·39
cium and magnesium carbonates, &c.	7·05	1·21	7·30	1·25	1·11	0·19
cium sulphates (gypsum) ca	7·88	1·35	7·12	1·22	10·16	1·74
anic matter and chemical combined water	4·55	0·78	2·34	0·40	3·44	0·59
	1·92	0·33	0·11	0·02	0·00	0·00
Total	26·14	4·48	19·37	3·32	25·39	4·35

streams and ditches and had no visible means of irrigation (see Figs. 1 and 1A).

The first step toward reclamation consisted, then, in the boring of artesian wells, with results as shown in table on preceding page.

The fitness of waters for irrigation can be determined only by chemical analysis. A water containing large amounts of undesirable salts would, on evaporation, deposit the same and ruin even the best fertile soils. Ordinarily, 40 grs. per gallon are allowable in waters for irrigation or drinking purposes. All three of the above waters were suitable. The deepest well, on account of its heavy flow, was used almost entirely, being assisted occasionally by No. 2.

Nitrates.

—	No. 1. 75 feet deep.	No. 2. 135 feet deep.	No. 3. 285 feet deep.
Total solids*	0·0448	0·0332	0·0435
	Per Cent.	Per Cent.	
$NaNO_3$	0·34	0·55	Trace

* Grms. per 100 c.c.

The presence of nitrates is an advantage in irrigating, as thereby valuable plant food is added to the soil.

Analysis of Soil before planting Beets.

Surface-foot.

Material.	Per Cent.	Lb. per Acre-foot.
Carbonates	0·0032	128
Chlorides.....	0·014	560
Sulphates	Trace	..
Nitrates.....	0·003	120
Total	0·0202	808

Second Foot (Hardpan).

Carbonates	0·054	2,160
Chlorides.....	0·009	360
Sulphates	0·075	3,000
Nitrates	0·002	80
Total	0·140	5,600

Two patches of beets were raised on this soil and tested occasionally as follows :—

Analysis of Beets ("Kleinwanzlebener" variety)

Patch No. I.

Date.	Sugar in Juice.	Purity.
September 5	14·3	85·2
„ 13.....	14·8	81·3

Patch No. II.

September 5	13·7	82·0
„ 13	14·1	84·9
October 17	16·8	82·3

Patch No. 1. was treated with a limited supply of artesian water; enough to prevent the alkali from rising largely to the surface, no method of draining the soil being employed. Patch No. II. was treated with running water most of the time, the water finding outlet through ditches. As regards appearance of crops the latter was most promising, the beets standing knee-high over the entire six acres (see Fig. 2).

Analyses of both patches were made on September 13, one half of each beet being retained and air-dried for tests of mineral salts, which were made in the following February, as follows.

Beets of Patch I.

(Sugar, 14·8; purity, 81·3. Average weight of beet, 1,255 grms.)

Salts.	Per Cent.	Grms. per Beet.	Lb. per Acre.
Potassium sulphate ..... } Sodium sulphate (Glauber's salt).	0·181	2·28	68·6
Sodium chloride (common salt).	0·227	2·86	64·9
Sodium carbonate (sal soda)	0·215	2·70	54·7
Water.....	82·740	1038·6	..
	Total lb. per acre...		188·2

Beets of Patch II.

(Sugar, 14·1; purity, 84·9. Average weight of beet, 839 grms.)

Salts.	Per Cent.	Grms. per Beet.	Lb. per Acre.
Potassium sulphate..... } Sodium sulphate (Glauber's salt).	0·120	1·01	41·7
Sodium chloride (common salt).	0·080	0·67	24·2
Sodium carbonate (sal soda)	0·138	1·16	36·2
	Total lb. per acre...		102·1

The "tops" belonging to the beets tested in Patch I were also air-dried and the salt composition determined similarly. In "topping" beets not only the leaves but also that part of the beet above ground are removed in the field and returned to the soil.

Beet Tops of Patch I.

(Average weight of top, 300 grms.)

Salts.	Per Cent.	Grms. per Beet.	Lb. per Acre.
Potassium sulphate..... } Sodium sulphate (Glauber's salt), &c.	0·820	4·92	30·9
Sodium chloride (common salt).	0·428	2·57	14·2
Sodium carbonate (sal soda)	0·613	3·68	59·2
Water	88·5	531·3	..
	Total lb. per acre...		134·3

Analyses of Soil after Maturity of Crops I. and II.

Patch No. I. (Surface-foot).

Salts.	Per Cent.	Lb. per Acre foot.
Carbonates	0·030	1,260
Chlorides.....	0·009	360
Sulphates.....	0·006	240
Nitrates	0·002	80
Total	0·047	1,880

Patch No. II. (Surface-foot).

Salts.	Per Cent.	Lb. per Acre-foot.
Carbonates	0·0051	204
Chlorides	0·002	80
Sulphates.....	0·002	86
Nitrates	0·0003	12
Total	0·0094	376

Conclusions. — It has been stated that "the beet crop will exhaust the soil in five years." If we extract and remove plant food from the soil we must eventually return that food by means of fertilisers or draw on the reserve food supply below the crop roots.

In Patch No. I. a limited water supply without drainage has drawn alkali from the second soil foot and carried it to the surface foot; this "rising of the alkali" occurs during maturity of the beet when irrigation ceases.

In Patch No. II., running artesian waters conducted away by ditches has removed alkali, apart from the amount removed and carried to the sugar factory by the beet-crop itself; the response of the beet itself to these soil conditions being shown by the "purity" which in Patch No. I. was 81·3 and in Patch No. II. 84·9. Artesian waters of desirable composition are possible for the entire stretch of land from Ogden to Great Salt Lake, and fortunately the more removed these lands are from the mountains and a possible supply from that source the better the artesian waters. The best waters that I have tested are just above the mud flats of the lake itself (this Journal, May 3, 1901).

Tolerance of Alkali by Crops. —The amounts of alkali salts tolerated by various cultures are still largely matters of experiment; the difficulty being that so much depends upon the mechanical condition of the soil apart from the composition. The sugar-beet seems to accept what it is given in the way of plant food, and to produce more than the required amount of sugar in spite of amounts of alkali corrosive to common crops.

Prof. R. H. Loughridge, of the University of California Experiment Station, in a publication on tolerance of alkali (Bulletin 133), shows the results of extensive experiments carried on in California. An approximate estimate of the conditions in other parts can be made possibly by a comparison of analyses of soil, remembering that much depends upon physical conditions.

The hardpan in the first analysis is almost free from clay, breaks up quite readily on addition of water, and with little care should allow of the penetration of the deeper roots of fruit trees eventually, *i.e.*, after alkali has been removed sufficiently for their tolerance.

Arid lands situated upon knolls and high ridges are, of course, much more free of alkali, and upon such exceptional spots fruit trees and common crops are possible, but on comparison with experimental results obtained in California I am led to believe that for the larger area the beet crop is the only profitable one for some years to come.

Fig. 2.

Beet crops raised on Field No. 1, showing irrigation ditch fed from reservoir of Well No. 3. Beets stand knee-high (Patch No. II).

Fig. 3.

Field No. 1 *after* boring Artesian Well No. 3 (depth 285 ft.), and showing crude reservoir fed by single well.

Profit derived.—Patch No. I. was largely injured by wind and sand storms, and the actual tonnage per acre not determined.

Patch No. II. comprised six acres and beets were weighed and paid for by the Sugar Company as follows:—

	Lb.
September	7,321
October	55,330
November	118,580
Total	181,231
Tons	90·6.

At the rate of 4·50 dols. per ton the six acres would net 407·70 dols., apart from bettering the soil by removing alkali.

The boring of artesian wells in the locality costs 30 cents per foot for 3-in. pipes, and 20 cents for the 2-in. piping used in these experiments.

If this paper calls attention to the possibilities of arid regions, or assists the struggling ranchman who at present ekes out but a scant existence from alkali districts, it will have done all that I intended for it. My hope is that the sugar factory may continue to introduce prosperity as it has thus far done without exception; that the sugar-beet may do for our arid regions what the cane and cotton have done for the South; and what corn and wheat have done for our Middle West. I am greatly indebted to the Agricultural Experiment Station of the University of California, under direction of Prof. E. W. Hilgard, for courtesies extended to me during a part of these investigations, and to the Ogden Sugar Co. for the freedom of their laboratory during the past sugar campaign.

Nottingham Section.

Meeting held at Nottingham on Wednesday, May 28th, 1902.

MR. LEONARD ARCHBUTT IN THE CHAIR.

THE APPLICATION OF KJELDAHL'S METHOD OF ESTIMATING NITROGEN IN THE TANYARD AS A MEANS OF CONTROLLING THE TANNING AND FINISHING OF SOLE LEATHER.

BY DR. J. GORDON PARKER.

Contribution from the London Leather Industries' Laboratory, Herold's Institute, Bermondsey.

The application of science in the industry of tanning and leather manufacture has, during the last 10 years, made very considerable progress, not so much in devising new methods or new processes, but more in the way of checking waste, of valuing new materials, and to perhaps a lesser degree as a means of controlling the practical processes in the factory. One by one the various processes to which the hides and skins are subjected, processes which have been handed down for generations, are lending themselves, in most cases with advantage, to scientific control.

Among the various accurate and reliable analytical methods which are capable of being applied to control the tanning process is Kjeldahl's process of estimating nitrogen, one which is perhaps capable of more varied uses than any other, and yet up to date it has not been applied to any great extent, except for the purpose of research carried out chiefly in the various leather trades' research institutes (this Journal, 1901, 426).

The investigations here recorded are based on the results obtained in professional work, but largely supplemented by further analysis made so as to obtain a complete series of figures which it was considered would have a definite value both to tanners and leather trade chemists. For the first time one is enabled to follow from the beginning to the end of a tannage the rate at which tannin is absorbed in the three principal methods of sole leather tanning common in this country.

The first set of figures represents a series of analyses carried out on what is known as a pure oak bark tannage, lasting about 12 months. The second series shows the process of tanning what is known as a West of England butt, tanned from a heavy South American salted hide; this process lasts 10 months. And these two may be compared with the final series representing the modern tannage of sole leather, by which the hide is transformed into leather for sole purposes in about five months.

In the results given, a pack of 80 well-grown hides were selected to represent the tannage, and four hides were taken as representing the bulk. At each stage of the tanning process four small pieces were punched out of each of the four hides, thus furnishing 16 samples. These were lightly pressed between filter paper, and afterwards dried, they were then ground, and a sample taken for analysis. In the case of the oak bark tannage and the mixed tannage the hides selected were Manchester market oxen, weighing 60 lb. In the West of England tannage heavy South American ox hides were those tested, samples being taken in exactly similar manner.

In the results the following analytical method was used. 0·5 grm. of the leather were placed in a Jena flask of 500 c.c. capacity with 15 c.c. of pure sulphuric acid; 0·7 grm. of mercury were added, and the contents boiled in a draught chamber until of a straw yellow colour. The flask was then cooled, 100 c.c. distilled water added, and fitted up ready for distillation. 75 c.c. of a 30 per cent. solution of caustic potash were now added, together with 25 c.c. of a 10 per cent. solution of potassium sulphide for the purpose of decomposing the mercurial ammonium salt. A small quantity of zinc dust was added to avoid bumping. The ammonia was then distilled off and collected by any convenient apparatus in standard sulphuric acid, which was then titrated in the usual manner. Every 17·8 parts of nitrogen is taken to represent 100 parts hide substance; the whole analytical operation being carried out as laid down by the International Association of Leather Trades' Chemists.

Since carrying out these analyses an extensive trial has been made of the method as modified by Niholl (this Journal, 1901, 1249), viz., in which the leather is boiled with 10 c.c. only of sulphuric acid for half an hour, a few crystals of potassium permanganate being then added, and the boiling continued for another half hour. After dilution, the ammonia is liberated by a caustic potash solution (100 c.c. of 30 per cent.), without the addition of sulphide, and distilled as before. The advantages claimed by Dr. Niholl, viz., that this method gives better results, the results are more concordant, and in each case a higher percentage of nitrogen is shown, are found to be fully established; and by doing away with the addition of potassium sulphide the sulphuric acid solution remains clear, and it is therefore more easy to see the end reaction in the titration.

The following is a description of the three tannages in concise form, so that it may be easily followed.

Oak Bark Tannage.

The butts after the usual liming, unhairing, fleshing, &c., then come into the liquor yard, and are 18 days in suspension, moved each day one pit forward; four weeks in handlers; the butts laid flat in tan liquor, the first fortnight moved every day and the second fortnight every second day. Six weeks in dusters, the dusters moved every week, and for 80 butts 2 cwt. of ground oak bark is added as dusting material. The butts are then given a series of six layers, *i.e.*, laid away in liquor with a layer of oak bark between each butt.

1st layer	2 weeks	4 cwt. oak bark.
2nd "	4 "	4 " "
3rd "	4 "	4 " "
4th "	4 "	4 " "
5th "	6 "	4 " "
6th "	6 "	4 " "

The strongest liquor was 50° Barkometer, obtained, of course, by the use of a small proportion of valonia. The rest of the pits graduated down in strength, starting with one of 6° Barkometer, containing less than a ¼ per cent. of tannin. A very small percentage of gambier was used in making up the handler liquors. The following are the analytical results in tabular form. The first four columns represent the percentage composition of the leather, the fifth column shows the amount of tannin absorbed or combined

with every 100 parts of hide substance, calculated as containing the normal percentage of moisture, viz., 14·0 per cent. This being a convenient mode of expression where two substances vary, the hide substance decreasing proportionately as the tannin increases. This method is used throughout.

TABLE I.

Oak Bark Tannage; 10 Months.

—	Hide Substance.	Tanning.	Mineral Ash.	Moisture.	Tannin absorbed per 100 parts of Hide Substance.	—
	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
End of 24 hours	80·9	2·8	2·3	14·0	3·4	Hides in suspension moved forward each day; strength of liquors 6°—14° Bk. These are old handler liquors.
„ 2nd day	79·0	5·1	1·9	14·0	6·4	
„ 4th „	76·6	7·8	1·6	14·0	10·1	
„ 8th „	71·6	13·5	0·9	14·0	18·8	
„ 18th „	60·0	25·4	0·6	14·0	42·3	
„ 25th „	56·3	29·1	0·6	14·0	51·6	Handlers, 4 weeks; handled each day; strength of liquor 14°—20° (gambier used).
„ 32nd „	55·1	31·3	0·6	14·0	56·8	
„ 46th „	53·4	32·0	0·6	14·0	59·9	
„ 88th „	49·0	36·3	0·7	14·0	74·6	End of 6 weeks in dusters liquors 20°—25° (dusted with bark, 2 cwt.)
„ 102nd „	47·3	38·0	0·7	14·0	80 3	1st layer; strength, 30°: 2 weeks. Dust, 4 cwt. bark.
„ 132nd „	46·5	39·9	0·6	14·0	87·6	2nd layer; strength, 32°; 4 weeks. Dust, 4 cwt. bark.
„ 162nd „	44·1	41·2	0·7	14·0	93·4	3rd layer; strength, 34°; 4 weeks. Dust, 4 cwt. bark.
„ 192nd „	43·4	42·0	0·6	14·0	96·7	4th layer; strength, 38°; 4 weeks. Dust, 4 cwt. bark.
„ 234th „	42·6	42·8	0·6	14·0	100·4	5th layer; strength, 45°; 6 weeks. Dust, 4 cwt. bark.
„ 278th „	41·6	43·8	0·6	14·0	105·2	6th layer; strength, 50°; 6 weeks. Dust, 4 cwt. bark.
„ 290th „	45·3	40·1	0·6	14·0	88·5	Washed up in weak liquor.
	46·5	38·9	0·6	14·0	83·6	Scoured by machine.
	47·2	39·2	0·6	14·0	83·0	Brushed and pinned by hand.
„ 310th „	47·0	39·4	0·6	14·0	83·8	Finished leather.

WEST OF ENGLAND TANNAGE.

Eighteen days in suspenders; one month in handlers, to hich a considerable quantity of gambier was added; one onth in dusters, goods dusted with a mixture of 1 cwt. ırk and 1 cwt. myrobalanes. In this tannage the goods e given a month in hemlock extract liquors, the goods ceiving four hemlock liquors, and remaining in each uor one week; then passing to the first layer of a fort-ght's duration, the second layer three weeks, and third er a month. In each of these layers oak bark and yrobalanes were used as the dusting material. The goods re afterwards given four layers of a month each, in which valonia was used as dusting material, the final strength being 90° Barkometer. In this process the tannage would be composed of about one half valonia, one-third bark, myrobalanes and mimosa bark, the other sixth gambier and hemlock. A certain proportion of oakwood extract was also used to bring the strength up of the stronger layer liquors. On the butts leaving the last layer they are "washed up" in weak liquor, allowed to drip, dried slightly, taken down, allowed to lie in pile to "samm," then scoured by machine, wiped over with a damp cloth, oiled on grain, dried, stretched, recoiled, and when nearly dry, coloured and finished.

The following are the results at the different stages.

TABLE II.

West of England Tannage; South American Salted Hide; 10 Months.

—	Hide Substance.	Tanning.	Mineral Ash.	Moisture.	Tannin absorbed per 100 parts of Hide Substance.	—
	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
End of 1st day.....	78·4	4·2	3·4	14·0	5·3	Hides in suspension, moved forward each day. Strength of liquors 10°—32°. These are old handled liquors.
„ 2nd „	75·8	8·2	2·0	14·0	10·8	
„ 4th „	74·0	10·4	1·6	14·0	14·0	
„ 8th „	65·9	19·1	1·0	14·0	28·9	
„ 21st „	58·3	26·8	0·9	14·0	45·9	
„ 28th „	53·8	31·3	0·9	14·0	58·1	Handlers; 4 weeks; strength, 35°—50° Bk. Gambier added here.
„ 35th „	51·8	33·4	0·8	14·0	64·4	
„ 56th „	49 2	36·0	0·8	14·0	73·1	
„ 88th „	44·2	41·0	0·8	14·0	92·7	Dusters; 4 weeks; strength, 50°—55°, dusted with bark.
„ 112th „	41·0	44·2	0·8	14·0	107·8	Hemlock round. 4 pits, 1 week each; strength, 55° Bk.
„ 126th „	40·8	44·4	0·8	14·0	108·8	1st layer; 14 days; 60° Bk.; 3 cwt. bark; 1 cwt. myrobalans.
147th „	39·6	45·6	0·8	14·0	115·1	2nd layer; 21 days; 60° Bk.; 3 cwt. bark; 1 cwt. myrobalans.
177th „	38·0	47·1	0·9	14·0	123·9	3rd layer; 1 month; 65° Bk.; 4 cwt. bark.
208th „	37·2	47·9	0·9	14·0	129·0	4th layer; 1 month; 70° Bk.; 1 cwt. bark; 4 cwt. valonia.
238th „	36·5	48·7	0·8	14·0	133·4	5th layer; 1 month; 75° Bk.; 4 cwt. valonia.
270th „	35·9	49·2	0·9	14·0	137·0	6th layer; 1 month; 80° Bk.; 5 cwt. valonia.
300th „	34·7	50·4	0·9	14·0	144·9	7th layer; 1 month; 90° Bk.; 5 cwt. valonia.
302nd „	38·9	46·2	0·9	14·0	118·4	Washed in weak liquor to cleanse.
	39·7	45·5	0·8	14·0	114·5	Scoured under machine.
	39·6	45·5	1·1	14·0	114·6	Finished. Product after oiling, colouring, rolling and drying.

Short Mixed Tannage.

In the more modern mixed tannage the goods were only eight days in suspenders, four weeks in handlers, the last two packs in the handler-round receiving myrobalane dust, but no separate series of dusters was given, neither did these goods receive hemlock treatment. First layer a week, second layer two weeks, third layer three weeks, fourth layer four weeks; the dusting material in the first layer being myrobalanes and mimosa bark, in the second layer valonia and myrobalanes, in the third and fourth valonia alone. The top liquor in this tannage was 90°, the tannage consisting of about one-third valonia, one-third extract, and the remainder myrobalanes, a small quantity of gambier and a certain proportion of quebracho and mimosa.

In this tannage the butts, after leaving the fourth layer are allowed to drip for three or four days, and then scoured by machine; they are then returned to a pit of strong fresh extract liquor for a week, which, as reference to Table III shows, adds considerable weight. The butts after this are then dripped for two days, and then washed for a short time in a warm sumach bath to remove the extract from the grain

Table III.

Modern mixed Tannage for Scoured Bends; 4 Months.

—	Hide Substance.	Tanning.	Mineral Ash.	Moisture.	Tannin absorbed per 100 parts of Hide Substance.	—
	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
End of 1st day	77·5	5·5	3·0	14·0	7·0	
„ 2nd „	74·5	10·0	1·5	14·0	13·4	Suspenders handled twice a day; handled forward each day; strength, 10°—25° Bk.
„ 4th „	73·2	11 6	1·2	14·0	15·8	
„ 8th „	61·1	24·0	0·9	14·0	39·2	
„ 16th „	53·2	32·1	0·7	14·0	60·3	Handler round; 4 weeks; 2 top pits act as dusters. Dusted with 1 cut myrobalans. Strengthened with quebracho; strength, 30°—45°
„ 23rd „	50·7	34·7	0·6	14·0	68·4	
„ 37th „	45·6	39·8	0 6	14·0	87·2	
„ 45th „	41·6	43·6	0·8	14·0	104·8	1st layer; 1 week; 60° Bk. Dust mimosa and myrobalans.
„ 60th „	39·3	46·1	0·6	14·0	117·3	2nd layer; 2 weeks; 70° Bk. Dust valonia and myrobalans.
„ 81st „	37·8	47·5	0·7	14·0	126·8	3rd layer; 3 weeks; 75° Bk. Dust valonia.
„ 111th „	37·5	47·8	0·7	14·0	127·4	4th layer; 4 weeks; 90° Bk. Dust valonia.
	38·1	47·3	0·6	14·0	124·1	Scoured in machine.
„ 119th „	35·4	49·9	0·6	14·0	140·0	After 1 week in liquor with chestnut extract at strength 100° Bk.
„ 120th „	38 5	46·7	0·8	14·0	121·2	After washing through sumach bath to brighten colour.
„ 136th „	40·8	44·7	0·5	14·0	109·5	Finished in warehouse.

of the leather, and so lighten the colour. After dripping, they are oiled, then hung in the sheds until semi-dry, stretched by machine and hand scoured, re-oiled, rolled and finished. The gain in weight obtained by giving the butts seven days in the extract bath appears to be all lost again in the after-treatment.

By comparing the three tables above, it will be seen that in the oak bark tannage 47 parts of pure hide substance unite with 39·4 parts of tanning matters to produce 100 parts of finished leather containing the normal percentage of moisture. In the more modern tannage (Table III.) only 40·8 parts of pure hide substance are required to make 100 parts of leather with tannin. And in the West of England tannage 39·6 parts combine with 45·4 parts of tannin.

In the different tannages the percentage of mineral ash, which mainly consists of lime salts, varies somewhat, and gradually diminishes in the first week of the process, owing to the presence in the early tanning liquors of lactic, acetic and propionic acids, which are formed by the fermentation of the non-tanning matters present in all tanning materials. In the West of England tannage the finished leather contains the higher percentage, for the reasons that these hides have a longer and heavier liming, and, secondly, the water in that district is extremely hard, and a third reason is the high percentage of valonia used as dusting material. Valonia always contains a small proportion of sand in very finely divided state. The sudden rise in proportion in the last set of figures is due to the leather being coloured with a solution of oil turpentine and ochre mixed with blood.

It will at once appear strange to those unfamiliar with sole leather tanning that so much time should be spent in getting weight into the leather, only to take it out again by washing and scouring. In Table III. the finished product is apparently in about the same condition as at the end of the forty-fifth day. Were the leather, however, removed from the pits at this stage and simply dried out, it would be soft, porous, and have practically no wearing properties. On the other hand, were the leather taken from the last layer, and simply dried and finished without washing and scouring, the leather would dry up hard, porous, and of bad colour and would be unsaleable. It is necessary to remove the uncombined tan from the grain surface by washing, to scour out the ellagic acid or "bloom" which has been deposited on the leather, and to remove any unevenness from the grain. Modern sole leather must be firm, but must not crack when bent. It must be of good even colour, and to obtain this colour the tanner must sacrifice much tan, time and trouble. In the finishing of British sole leather, more time and trouble are taken than in any other country, and apart from its other qualities, it certainly is the best in appearance, as the samples before you show. But it always seems contrary to reason that the tanner should spend so much time and trouble in producing such a highly finished, even, light-coloured article, which, on coming into the shoe manufacturer's hands, is either ground off with an emery wheel or stained black, brown, or yellow with varnish-like liquids. Even if it were not covered over, the first five minutes wear soon alters the colour and finish of a sole. More time and labour in comparison are spent in getting a good finish on sole leather than in the production of the finest calf for bindings of valuable books.

This demand on the part of English users for a light coloured, even shade of leather precludes the British tanner from using many excellent tanning materials, which exist in abundance in India, in our colonies, and elsewhere, on account of the red or brown nature of their tannage, and in many other ways increases the cost of manufacture. But if the leather is manufactured out of England, be it red or brown, highly-finished or otherwise, British boot manufacturers will use it if it is cheap, and on the finished sole hide its original colour by a black or brown stain, although the superior wearing qualities of British tanned sole leather have been frequently demonstrated.* In this respect from a national, if not Imperial, standpoint, the English tanner is handicapped by an unfair demand which is not made on his foreign competitor.

* Boot and Shoe Trades Journal Jan. 1902. Manchester and District Tanners' Year Book, 1902, p. 54.

Different Methods of Finishing Sole Leather.—In the three tannages above recorded, on the leather leaving the pits, it is subjected to different treatment. It was therefore of interest to investigate the effect in loss of weight by different methods. For this purpose 100 butts, fully tanned, were divided into ten lots of ten each, and marked A to J, and each lot treated as follows:—

Lot A.—Allowed to drip two days, oiled on grain surface, and dried out.

Lot B.—Washed in water for two hours, dripped, oiled, and dried out.

Lot C.—Washed in water for two hours, dripped, and scoured by machine, oiled, and dried out.

Lot D.—Washed in water for two hours, dripped, and scoured by hand, oiled, and dried out.

Lot E.—Scoured by machine direct, then oiled and dried out.

Lot F.—Partly dried, then wet back, scoured, then oiled and dried out.

Lot G.—Washed for two hours in weak tan liquor, scoured by machine, oiled, and dried out.

Lot H.—Washed in weak liquor, scoured, and after scouring, placed for 12 hours in a sumach bath (sumach and tan liquor) of 65° Bk., oiled and finished.

Lot I.—Washed in weak liquor, scoured by machine, and, after scouring, placed for 12 hours in a similar sumach bath of 65°, oiled, part dried, and, after stretching, redipped for four hours in a strong, warm tan liquor, allowed to drip, wiped over, re-oiled, and finished.

Lot J.—Washed in weak liquor, scoured by machine, placed for 12 hours in sumach bath, to which 1 per cent. of vitriol had been added to bleach and lighten the colour of the leather.

The following are the results:—

—	Hide Substance.	Tannin.	Ash.	Moisture.	Tannin absorbed per 100 parts of Hide Substance.	Remarks.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
A	36·2	49·0	0·8	14·0	135·3	Harsh, brittle, bad colour.
B	40·2	45·2	0·6	14·0	112·4	Harsh, poor colour.
C	42·9	42·6	0·5	14·0	99·3	Fair colour.
D	43·6	41·9	0·5	14·0	96·1	Fair colour.
*E	39·4	46·1	0·5	14·0	117·0	Dirty appearance.
F	38·5	46·9	0·6	14·0	121·8	Dirty appearance.
*G	39·2	46·2	0·6	14·0	117·8	Good colour.
*H	39·0	46·4	0·6	14·0	119·2	Lighter shade, good.
*I	38·1	46·3	0·6	14·0	121·5	Lighter shade, good.
*J	43·2	42·2	0·6	14·0	97·6	Lightest colour, but soft and porous.

* Methods in common use in this country.

The above figures are comparative only, as so much depends on the firmness of the tannage, the nature of the materials used, the time in the vats, and the "temper" of the leather when scoured, also the amount of scouring given. No doubt these figures will be of use to some tanners, who will, however, use the results as guides only when applied to their own tannage.

Before concluding this paper I should like to add one more result to show how accurately the analytical results are confirmed in practice.

Fifty butts, limed, unhaired, fleshed, and prepared for tanning, were weighed, a sample was taken from five, the moisture and mineral ash estimated. The 50 butts were then tanned, and at the end of ten months' tannage they were simply allowed to drip for two days, lightly oiled on the grain surface, and dried. Five samples were then taken from the five butts previously sampled, and the hide substance estimated by Kjeldahl's process, with the following results:—

	Per Cent.
Hide substance	38·4
Tannin matters	47·1
Mineral ash	0·5
Moisture	14·0
	100·0

The weight of the original butts having been noted, they were again weighed when dry, and weighed 1,156½ lbs. On the same basis of moisture and ash, this corresponds by weight to—

	Per Cent.
Hide substance	38·5
Tannin matters	47·0
Mineral ash	0·5
Moisture	14·0
	100·0

This result is, I consider, a triumph for an analytical process which, on a sample of 1 grm., will so closely agree with a practical test of over 1,100 lb. weight. It is only fair to suppose that the information obtained in the intermediate stages of the tanning process is equally accurate, and the tanner can then, on the strength of this, make any needful modifications in his process. Apart from this chemical method, with the exception of the general appearance of his goods in the pits, he must wait until his leather is finished in the warehouse before he knows the result of his six or ten months' labour, and it is then too late to alter the results except by further expenditure of time and money.

I desire here to express my sincere indebtedness to those tanners who allowed me to draw the samples on the analyses of which this paper is put together, and for the assistance they gave me in making the experiments reliable. I would also acknowledge the help rendered by my assistant, Mr. W. H. Gates, who carried out many of the analyses. I hope that this paper may bring forth others, so that we may have standard data to guide us in the future.

Discussion.

The Chairman said that by the modification of Kjeldahl's method, described by Dr. Parker, the leather seemed to be very rapidly oxidised. The modification most familar to him was Gunning's, and he would like to know whether that was suitable for leather.

Dr. Parker explained that half a gramme of leather was boiled with 10 c.c. of sulphuric acid for half an hour, a few crystals of potassium permanganate, say half a gramme, then added, and the boiling continued until the liquid was clear yellow in colour, which took from half to one hour. The ammonia was liberated by caustic potash solution without further addition, and distilled in the usual manner. Gunning's method was not so satisfactory for leather.

Prof. F. S. Kipping asked whether potassium permanganate was used in Kjeldahl's original process.

Mr. J. T. Wood said that he could not understand why English shoe manufacturers preferred foreign-made hemlock leather if they could get the English mixed-tanned article, finished roughly like hemlock leather at the same price. This could be done by not putting such a fine finish on the leather as is now done in this country.

Prof. Kipping asked whether chrome-tanned leather, brought out some years ago, had proved a success.

Mr. PENTECOST said that chrome-tanned leather was largely used for belting; it worked far better, and lasted much longer than oak-tanned leather.

Mr. T. H. ADAMS observed that the moisture was set down as 14 per cent. in every one of the numerous analyses given in the tables. He presumed that this was an average of the moisture in the leather, and asked what were the real limits of variation.

Mr. S. R. TROTMAN said Dr. Parker's tables would be most useful to tanners. In regard to the estimation of nitrogen by the Kjeldahl process, if one took twenty chemists, one would probably find twenty modifications.

Dr. PARKER, in replying, said that Nihoul's modification of Kjeldahl's method, which he had described, answered the purpose for leather better than any other method. It gave slightly higher results, and the nitrogen could only be obtained from the leather. He could not say whether permanganate was used in the original method, as there had been such a great number of modifications. In regard to the question of competition with foreign leathers, the shoe manufacturer had worked out the cost very closely, and it came out that a pair of soles made from the beautifully finished English leather may cost a halfpenny more than if made from the rougher American article. But he would not buy the English leather finished on American lines.

Mr. WOOD: And he grinds off the beautiful surface of the English leather after it has been put on the boot.

Dr. PARKER: Again, to illustrate the difficulties that the English tanner had to contend with, of two samples of leather, both equally good, if one had been discoloured slightly by the east wind, its value would be reduced by 1½*d.* per lb. Answering Professor Kipping, fully one half of the "uppers" of boots were now chrome leather, and a large quantity of this came from America. It was certainly more comfortable to use, and lasted longer than vegetable-tanned leather. The industry was acquiring great proportions in this country. Chrome-tanned leather had a great future for belting, harness, and hydraulic leathers, and would in time replace all other substances for this purpose. At the same time, the leather must be well made, as errors in the process might reduce it to half the strength of oak-tanned leather.

In regard to moisture, 14 per cent. had been accepted as an average. In the hot, dry summer months, it might be as low as 11 per cent., in damp weather it rose to 17 or 18 per cent.

THE ALLOYS OF COPPER AND MANGANESE.

BY ERNEST A. LEWIS, F.C.S.,

Chemist and Metallurgist to Muntz's Metal Co., Ltd., French Walls, near Birmingham.

The alloys of copper with pure manganese do not seem to have been examined pyrometrically or microscopically, and no comparative results as to tensile strength have been published. This is probably owing to the difficulty of obtaining pure manganese commercially, now that the "Goldschmidt Process" of obtaining manganese by reducing pure manganese oxide with powdered aluminium is used; manganese may now be obtained at a moderate price and of 97 per cent. purity. The chief impurities in this manganese are silicon and aluminium; these impurities would oxidise when melted and form a slag with the manganese oxide present.

In the following experiments a sufficient quantity of pure electrolytic copper, containing 99·97 per cent. of copper, was melted and granulated by pouring into cold water, and the manganese was crushed into pieces as big as peas.

The manganese was of a brilliant bluish-white colour, and the freshly-fractured surface will keep its lustre for months; there is no need to keep the metal under rock oil as is stated in text-books.

The manganese contained:—

	Per Cent.
Copper	0·234
Iron	0·309
Aluminium	0·748
Silicon	1·747
Manganese	96·962
	100·000

Copper and manganese alloy in all proportions by mixing the manganese and copper together, covering with borax to prevent oxidation as far as possible, and melting in a coke furnace. The alloys containing from 1 per cent. to 30 per cent. manganese can be rolled hot; the alloys containing more than 30 per cent. manganese are of no industrial importance; the alloys containing 70 to 80 per cent manganese fall to powder in a few weeks.

The addition of 1 per cent. manganese to copper has no effect on the microstructure of the metal, although it increases its tensile strength; the manganese is completely soluble in the crystals of copper. When 5 per cent manganese is added the large crystals of copper begin to disappear, and smaller crystals of copper surrounded by an eutectic alloy of copper and manganese are seen. When 10 per cent. manganese is added the large crystals of copper have disappeared, and the mass consists of small crystals of copper surrounded by the eutectic alloy. As more manganese is added, the crystals of copper get smaller until at about 50 per cent. manganese the eutectic alloy is the chief micro-constituent; this corresponds to a compound of Cu = Mn containing 53·39 per cent. copper and 46·61 per cent. manganese. When more manganese is added another hard constituent is seen embedded in the eutectic alloy of Cu = Mn; this constituent is manganese containing a small amount of copper in solution; the alloy of 90 per cent manganese consists chiefly of this hard constituent. These high alloys of manganese are very different to polish on account of this hard constituent. The author has determined the specific gravity of the alloys of copper and manganese containing from 1 per cent. to 50 per cent. manganese.

Composition.		Specific Gravity at 15·5° C.
Copper.	Manganese.	
Per Cent.	Per Cent.	
99	1	8·935
95	5	8·757
90	10	8·425
85	15	8·102
80	20	8·284
75	25	7·782
70	30	7·746
60	40	7·324
50	50	7·332

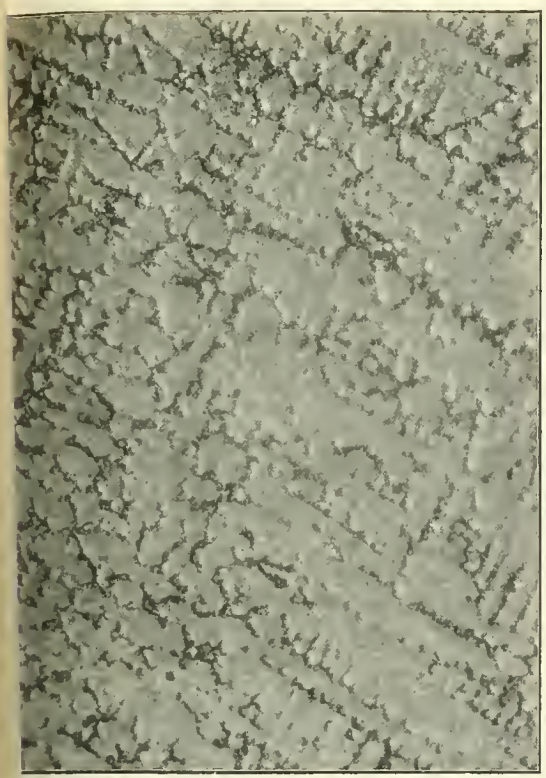
The specific gravity of the alloys containing more than 50 per cent. manganese are of no value, owing to the difficulty of obtaining them free from blowholes.

Freezing-points of the Copper-Manganese Series of Alloys

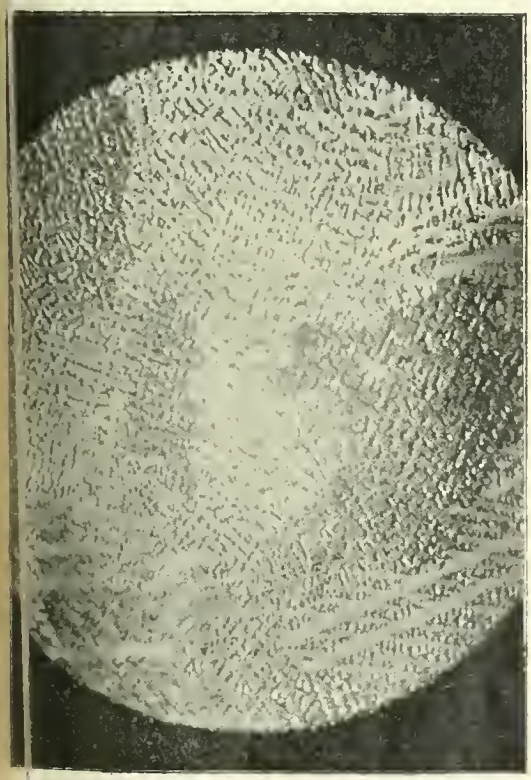
No.	Copper.	Manganese.	Temperature.
	Per Cent.	Per Cent.	° C.
..	100	..	1065
0	99	1	1080
1	95	5	1060
2	90	10	1000
3	85	15	935
4	80	20	915
5	75	25	890
6	70	30	885
7	60	40	880
8	50	50	865, 1220
9	40	60	870, 1205
10	30	70	880, 1210
11	20	80	885, 1180
12	10	90	860, 1200
13	5	95	1210

The melting-point of manganese is generally stated to be about 1900° C. I have determined the melting-point of some of the Goldschmidt manganese by means of the Le Chatelier pyrometer, and find it to be 1280° C.

Although this manganese contains only 97 per cent. pure manganese, it is very unlikely that 3 per cent. impurity will reduce the melting-point 600° C. The melting-point of chemically pure manganese, if it could be obtained in sufficient quantity, would probably be about 1300° C.

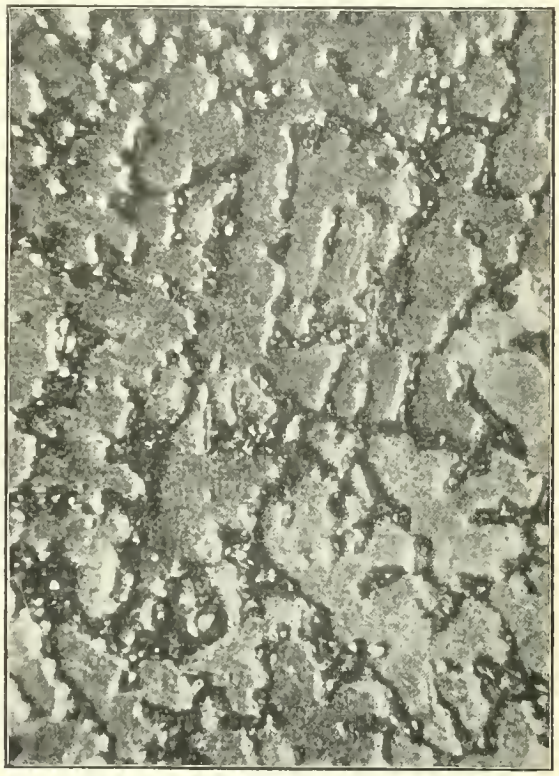


Cu. 90 per cent.; Mn. 10 per cent. × 50 diam. Etched with dil. SO_4 and electric current.



95 per cent.; Mn. 5 per cent. × 35 diam. Etched with dil. H_2SO_4 and electric current.

There is great difficulty in obtaining the melting-point of manganese, as the oxide of manganese eats through the crucible almost as soon as the metal is molten; the thin fireclay covers of the thermo-junction are generally melted



Cu. 75 per cent.; Mn. 25 per cent. × 250 diam. Etched with dil. H_2SO_4 and electric current.

away, so that each determination of the melting-point requires a new thermo-junction.

It will be noticed that the addition of 1 per cent. manganese gives copper a higher freezing-point, and the alloy with 5 per cent. manganese has a freezing-point nearly the same as copper. Further addition of manganese lowers the freezing-point to 865° C.; this is the freezing-point of the eutectic Cu Mn.

The Cu-Mn eutectic separates out from the alloys containing from 5 per cent. to 50 per cent. manganese when on the point of solidification.

I cast tests of the alloys containing from 1 per cent. to 30 per cent. manganese, and had them rolled from $\frac{1}{2}$ in. to $\frac{1}{8}$ in. thickness and annealed. Tensile test pieces were cut from them and tested, with the following results:—

Composition.		Annealed Sheet.	
Copper.	Manganese.	Tensile Strength, Tons per sq. inch.	Elongation per cent. on 4 inches.
Per Cent.	Per Cent.		
Ordinary sheet copper.		13·83	49
99	1·0	15·73	41
95·2	4·8	18·91	43
92·45	7·55	20·00	30
84·20	15·80	24·46	28
78·76	21·24	28·38	23·5
73·76	26·24	29·7	12
67·86	32·14	26·56	3

The tensile strength gradually increases up to 26 per cent. manganese when it reaches its maximum, and the elongation gradually diminishes to nothing.

In these alloys there is no secondary freezing-point at a low temperature, which would lower the tensile strength at 250° C. as in the brasses; on this account the 5 per cent. alloy is used on several foreign railways for locomotive stay bolts.

The 1 per cent. alloy is used for locomotive tubes and other tubes which have to resist corrosion.

The alloys containing up to 10 per cent. manganese roll best slightly under the heat at which copper is rolled, and those containing up to 30 per cent. roll best at a dark red heat; but all the alloys require great care in rolling, so as not to get too much pressure on at first, or the metal will crack at the edges.

Since the above paper was written, W. C. Heraeus has published a paper on the fusing-point of manganese. Using manganese of 99 per cent. purity, he gives the fusing-point as 1245° C.

Discussion.

The Chairman asked whether the melting point of pure copper, according to the latest determinations, was not higher than the author had stated.

Mr. Lewis said that was so when the copper was melted in vacuo. The figure he gave was the melting point in air, which was lower than in vacuo. The 1 per cent. of manganese probably raised the melting point and density by eliminating oxygen.

Prof. F. S. Kipping asked whether the author had applied these results to ascertain if there was any formation of definite chemical compounds and whether he had plotted out the curves. The data appeared to vary in a very regular manner. He did not gather from Mr. Lewis's remarks, although he referred to an eutectic alloy that this was a chemical compound of copper and manganese. In the case of the copper and tin alloys, there was evidence of such a combination, and it was quite possible that the same might be the case with copper and manganese.

Mr. R. M. Caven, referring to the 50 per cent. alloy of manganese and copper, which had two freezing points, viz., 865° and 1220°, suggested that it would be of interest to have an analysis of that separating out at the higher temperature. This temperature was very nearly that of the melting point of manganese. There seemed to be points of resemblance with the formation of cryohydrates.

Mr. F. J. R. Carulla mentioned, as a matter of historical interest connected with the production of pure manganese, that in 1885 he had seen a blast furnace working at the Edgar Thompson works, which was said to be making at the rate of 60 tons per day ferromanganese containing 94 per cent. of manganese. The ore used known as "Crimova," obtained from the neighbourhood of the Natural Bridge in Virginia, was a pyrolusite with only 1 per cent. of iron.

Mr. L. Archbutt enquired what advantages the copper manganese alloy had been found to possess as a material for fire-box stays and boiler tubes.

Mr. Lewis, replying, said that the 1 per cent. manganese alloy showed no eutectic, and was used for tubes which had to resist the action of corrosive waters in the Argentine railways. These waters acted very rapidly on copper and brass tubes. The alloy with 5 per cent. manganese was used on some German and Hungarian railways for stay bolts. It kept its strength well at high temperatures and was not liable to crack, a result confirmed by a microscopical examination at 250° C., the greatest heat that the alloy would attain in use under the given conditions. The experiments were made for purely practical purposes, so that the scientific points referred to by Dr. Kipping had not yet been investigated.

Mr. Archbutt asked whether any English railway company had used any of these copper and manganese alloys, and also what was the best method of etching for microscopical examination.

Mr. Lewis, further replying, said that he did not know of any English railway company that had used these alloys, either for tubes or stay bolts. In regard to the question of chemical compounds, when 1 per cent. of manganese was added to melted copper, the manganese diffused so rapidly that he had no doubt one was formed.

Mr. Archbutt: Is there any rise of temperature?

Mr. Lewis said he had not ascertained that point. The best way he had found of etching these alloys was, electrolytically, by using a 0·5 per cent. solution of sulphuric acid, making the negative pole of platinum and taking the current from a single Daniell cell. The alloy was left in the current for 5 or 10 seconds and examined, put in again if necessary for a similar period, and so on until the right degree of etching was attained.

Mr. J. W. Smith asked whether any comparative tests had been made in regard to the hardness of these alloys.

Mr. Lewis answered, the 1 per cent. manganese alloy was the softest, 5 per cent. was harder, and the 50 per cent. was so hard that it was impossible to file it with the best steel files. The alloys with 70 and 80 per cent. manganese spontaneously fell to powder, which was not the case with the 90 per cent. The copper used in the experiments was electrolytic, and the manganese was the pure metal referred to in the paper.

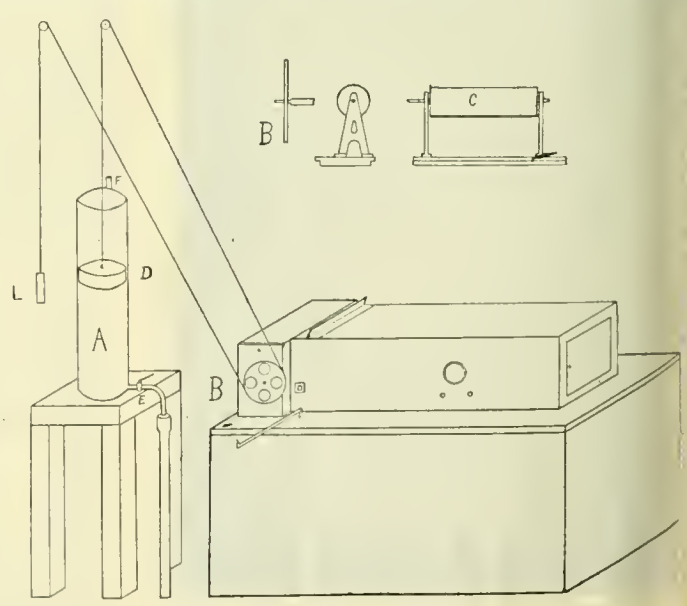
A NEW FORM OF RECORDING APPARATUS FOR A ROBERTS AUSTEN ELECTRICAL PYROMETER.

BY ERNEST A. LEWIS, F.C.S.

The usual form of recording apparatus for this pyrometer, which is used in works for taking continuous records of furnace temperatures, is of no use for taking cooling curves of small quantities of metals. It consists of a drum worked by internal clockwork carrying a sheet of bromide paper, which turns round once in 6, 12, or 24 hours.

The author has designed the following additional apparatus to the pyrometer in the laboratory of Muntz's Metal Co., Ltd., so that the same pyrometer can be used to take furnace temperatures, and also cooling curves of small weights of molten metals solidifying in a crucible.

An additional shutter was made to the dark box containing the recorder. In place of the drum for taking furnace temperatures, a smaller drum C was made of thin brass, and painted dull black, supported on two brass brackets



Recording Apparatus.

and screwed on to a piece of wood which was made to slide into the groove on the bottom of the dark box. The spindle of the drum C was filed square for five-eighths of an inch of its length at the one end, so that the spindle of the pulley B, which has a square hole made in it at the larger end, would fit into it like a clock key. A round hole was made in the shutter exactly opposite the spindle of the drum of such a size that the spindle of B will just go through and turn round easily, without letting in any light. Over the grooved pulley B runs a cord which passes over two small pulleys screwed into the ceiling; one end of the cord is attached to a float D, which slides easily inside the cylinder A, to the other end of the cord is attached a leaden weight L. The cylinder A in the author's apparatus is made of a copper tube, on the one side is a supply pipe F, which is screwed into the cylinder A at the bottom, this serves to run water into A. The tap E is connected to a waste pipe.

To use the apparatus for taking a cooling curve a whole-plate extra rapid film is put on the drum C, and fastened with a clip similar to the clip on the furnace record drum. The drum is then slid into the groove at the bottom of the dark box, and the shutter put in, the pulley B is put through the hole in the shutter into the squared end of the spindle of the drum. The drum is turned round until the end of the film is judged to be nearly opposite the slit in the pyrometer case, a little practice enables this to be easily done as the weight of the clip of the drum always causes the clip to be at the bottom, when the drum is put in. The cylinder A is filled with water and the float D put in, the cord is then put round the pulley B and over the two small pulleys in the ceiling as shown in the diagram. The pulleys and bearings of the drum must be well oiled, also the hole in the shutter through which the pulley B spindle passes must be oiled, so as to avoid friction.

The door at the end of the pyrometer is opened to obtain a datum line, the gas jet of the pyrometer is lighted; when the thermo-junction is put into the molten metal the tap E is opened, and the float descends and turns the drum with its film round. The speed at which it turns is regulated by the rate of outflow of the water. It can be made to turn round once in from five minutes to one hour. The weight of the pulley B causes the drum to turn round absolutely steady. In order to test the sensitiveness of the recorder, the author made an alloy of copper 50 per cent., tin 50 per cent., which is known to have four freezing points at 680° C., 435° C., 410° C., and 225° C., each of these breaks in the cooling curve were distinctly marked on the film.

The following are the principal dimensions of the recorder:—

Cylinder A, 2 ft. 8 ins. high × $8\frac{1}{2}$ ins. internal diameter.
Float D, $8\frac{1}{4}$ ins. diam. × $2\frac{1}{4}$ ins. thick weighted with lead to 4 lb.
Balance weight L, $2\frac{1}{4}$ lb.
Pulley B, 7 ins. diam. × $\frac{1}{4}$ in. thick, groove $\frac{1}{8}$ in. on edge.
Spindle of B, 3 ins. long + $\frac{7}{16}$ in. diam. at large end, $\frac{1}{4}$ in. diam. small end.
Drum, $9\frac{1}{8}$ ins. long × $2\frac{1}{8}$ ins. diam.
Spindle of drum, $11\frac{1}{4}$ ins. long × $\frac{1}{4}$ in. diam.

The author has found this recorder to give cooling curves which are of great value in determining the correct temperature at which metals must be rolled. The recorder is simple in construction, and is easy to work. The pyrometer should be kept in a room, the window of which is covered with two thicknesses of ruby fabric, this enables the films to be put in and developed in the pyrometer room.

Discussion.

Mr. F. J. R. Carulla said, in regard to the device used by Mr. Lewis to give motion to the recording drum of the pyrometer, the movement of the drum would be retarded as the height of the column of water in the cylinder lessens. The curves would therefore appear to require some correction.

Mr. J. W. Smith said he had used the flow of water from a cylinder for a similar purpose, and experienced the disadvantage referred to by Mr. Carulla. The water flowed faster at the beginning than towards the end.

Mr. Lewis, in reply, said, in regard to the speed of flow of the water from the cylinder as the piston descended, to which the cord that gave motion to the recorder was attached, as the piston had only to move half way down the cylinder to completely turn the photographic film, the retardation was unimportant. The difficulty could, if necessary, be got over by reversing the arrangement, and letting water flow into the cylinder at a fixed rate instead of its flowing out.

Scottish Section.

Meeting held on April 8th, 1902.

DR. WM. FREW IN THE CHAIR.

THE PHENOLS FROM SHALE OIL.

BY THOMAS GRAY, PH.D., D.SC.

The creosote with which the following experiments were conducted was supplied to me by Mr. D. R. Steuart, of the Broxburn Oil Company, to whom I desire here to express my indebtedness.

For the preparation of the creosote, 3,200 galls. of "green naphtha" were treated with 28 galls. of caustic soda solution, 60° Tw. (approx. 27 per cent. NaOH), the aqueous solution was separated, and the phenols were precipitated by addition of excess of sulphuric acid. The quantity of phenols thus separated was approximately $1\frac{1}{2}$ galls.

A portion of the brown oily liquid was subject to distillation; in the initial stage of this operation sulphur dioxide was evolved, and later on evolution of sulphuretted hydrogen in considerable quantity was observed. The water which distilled over was accompanied by a small quantity of sulphur, which was probably produced by the interaction of the sulphur dioxide and the sulphuretted hydrogen.

The following table gives the results of the distillation of 400 grms. of the creosote. At the end of the first distillation the various fractions were dissolved in caustic soda, and the phenols were reprecipitated from the aqueous solutions by sulphuric acid after removal of any insoluble material:—

Temperature.	Weight in Grms.		
	First Distillation.	Second Distillation.	Sixth Distillation.
Below 195°	10	12·4	47·8
195°—200°.....	33·6	30·9	42·4
200°—205°.....	47·5	65·5	49·4
205°—210°.....	67·9	67·3	46·2
210°—215°.....	71·5	53·3	36·4
215°—220°.....	46·9	32·2	22·7
220°—230°.....	36·3	19·2	21·6
230°—255°.....	..	7·6	3·7

The pitch-like residue above 230° from the first distillation weighed 65 grms., *i.e.* approximately 16 per cent. of the original creosote.

The further fractionation of the phenols was carried out with the aid of a "pear" still-head containing 4 bulbs; the temperature was regulated as in the previous distillations, so that the liquid passed over into the receiver at the rate of one drop per second. The results of the 10th, 12th, and 13th distillations are tabulated below: the last three columns of the table give the weights of liquid per 1° C. $\left(\frac{w}{\Delta^\circ}\right)$ which distilled over between the stated temperatures (see table on next page).

The fractions 182—185°, 185—189°, and 189—193° solidified when cooled in freezing a mixture of ice and salt, but gradually became liquid again when allowed to stand at the ordinary temperature.

On account of the difficulty of preserving a uniform rate of distillation, irregularities are evident in the above results, which would have been less marked if the distillations had

Temp.	Weight in Grms.			$\frac{w}{\Delta t}$		
	10th.	12th.	13th.	10th.	12th.	13th.
Below 182°....	2·1	2·3	3·2	..	..	..
182°—185°.....	7·6	8·5	9·6	2·5	2·8	3·2
185°—189°.....	19·2	15·7	15·6	4·8	3·9	3·9
189°—196°.....	17·1	20·9	19·6	4·3	5·2	4·9
196°—200°.....	22·3	15·4	18·0	7·4	5·1	6·0
200°—205°.....	28·7	30·8	29·6	7·2	7·7	7·4
205°—210°.....	44·3	39·0	37·0	8·9	7·8	7·4
210°—215°.....	36·0	34·6	31·9	7·2	6·9	6·4
215°—220°.....	28·7	28·3	25·6	5·7	5·7	5·1
220°—230°.....	22·9	21·0	22·4	4·6	4·2	4·5
	14·8	12·8	10·8	1·5	1·4	1·1

been conducted on a larger scale; but some information regarding the nature of the phenols can be derived from the table. The gradual increase of the weight of the two first fractions point to the presence of phenol in small quantity. From the high value of $\frac{w}{\Delta t}$ between 196° and 205°, the conclusion may be drawn that *m*-cresol or *p*-cresol is present in considerable quantity. The xylenols also evidently compose a comparatively large proportion of the whole.

As it was evident from the results of the fractionation that it would be necessary to conduct the distillation on a much larger scale, and to fractionate within closer limits of temperature, in order to effect a separation of the phenols, an attempt was made to ascertain the nature of each of the fractions by the preparation from them of derivatives of a definite character. Béhal and Choay, to whom we are indebted for the very thorough investigation of creosotes from various sources, recommend the conversion of the phenols into the corresponding benzoates as a means of identification (Comptes Rend., 1894, **118**, 1211) This method did not promise, however, to be available for the separation of the constituents of a mixture of phenols as the range of the boiling points of the benzoates is slightly less than that of the corresponding phenols. Von Boyen (Zeits. angew. Chem., 1892, 675) identified the phenols contained in a sample of creosote by conversion into sulphonic acids and subsequent crystallisation of their sodium salts. From these salts he regenerated the phenols by heating them with concentrated hydrochloric acid, but as he did not succeed in obtaining products having a constant boiling point in the case of the homologues of phenol, he identified these by converting the sulphonates into nitrophenols, which he subsequently separated by crystallisation. This latter method was employed for the examination of the fractions from the shale creosote. Each fraction was warmed with concentrated sulphuric acid, but no attempt was made to separate the sulphonic acids thus formed; the solution was diluted with half its volume of water, and nitrated directly in the ordinary way. With the object of arriving at an approximate estimate of the quantities of the various phenols present, the nitro-derivatives were separated as completely as possible by systematic fractional crystallisation and weighed. As the phenols are partially broken up by the oxidising action of nitric acid, it will be obvious that this method of estimation can have no pretentions to accuracy, but in the absence of a suitable method it may be taken to give an approximately quantitative indication. No difficulty was experienced in effecting a separation of the products obtained by nitrating the lower fractions, but the method failed to give satisfactory results in the case of the higher fractions on account of the formation of resinous products.

Fraction 182°—185°.—The principal product of nitration was picric acid, m.pt. 122°; it was further identified by conversion into napthalene picrate, m. pt. 149°. A substance which crystallised in the form of yellow prisms, m.pt. 85°, was isolated in sufficient quantity to admit of its identification as dinitro-*o*-cresol, by comparison with the same substance obtained in larger amount from the higher fraction.

Fraction 185°—189° gave on nitration picric acid and dinitro-*o*-cresol. The picric acid was extracted from the crude product by boiling it with water, and was recrystallised from this solvent. The residue, after recrystallisation from alcohol, melted at 85—86°.

Analysis: 0·195 gr. of substance gave 23·8 c.c. of N_2 a 10° and 756 mm. Found, 14·54 per cent. of N.

Dinitro-*o*-cresol, $C_7H_6O_5N_2$, requires 14·14 per cent. of N

The proportion of the amount of dinitro-*o*-cresol to that of picric acid was approximately 3·5 to 1.

Fraction 189°—193°. The principal product of nitration i this case was dinitro-*o*-cresol, but trinitro *m*-cresol, m.p 105°, was separated in small quantity. The separation o these was effected in a roughly quantitative way by suc cessive treatment with water and petroleum spirit (b.p below 45°). The trinitro-*m*-cresol was extracted from the crude product by solution in water in which the ortho derivative is very sparingly soluble. The crystals, which separated on evaporating the aqueous solution, wer extracted with petroleum spirit; the dinitro-*o*-cresol wa thus dissolved, whilst the trinitro-*m*-cresol remained sub stantially unaffected.

The *o*-cresol and *m*-cresol were estimated to be presen approximately in the proportion of 4 to 1.

The nitration of *fraction* 193—196° also resulted in th formation of dinitro-*o*- and trinitro-*m*-cresol, but in thi case the latter was obtained in larger quantity; the pro portion of *o*-cresol to *m*-cresol was estimated to be 1 to 2.

Fraction 196°—200°.—The product obtained in this cas proved to be almost entirely trinitro-*m*-cresol, but by evaporating the mother liquors, and extracting the residue with petroleum spirit, a sufficient quantity of dinitro-*o* cresol was obtained to serve to establish the identity o the substance by a determination of its melting poin (m. pt. 85°).

Fraction 200°—205° gave a product from which trinitro *m*-cresol was obtained in a practically pure form after on crystallisation from alcohol.

Analysis: 0·1854 gr. of substance gave 27·8 c.c. of N_2 16° and 766 mm. Found, N = 17·62 per cent. $C_7H_5O_7N$ requires N = 17·28 per cent.

Trinitro-*m*-cresol was the only substance isolated fro this fraction, which evidently consisted almost entirely o m-cresol.

Fraction 205°—210° was largely resinified by the action nitric acid, but the presence of *m*-cresol in relatively sma quantity was proved by the isolation of trinitro-*m*-creso The bulk of this fraction was probably composed c xylenols.

Fraction 210°—215° distilled from 215° to 225° (meteor in vapour), the greater part passing over between 217 an 220° (*p* = 758 mm.) A portion of this, dissolved in glacia acetic acid, was cooled in a freezing mixture and nitrated as the result of this treatment was the formation of a brow resinous mass, the remainder was subjected to the action bromine. For this purpose the substance was dissolved i glacial acetic acid and bromine in the proportion of 6 Br. t 1 mol. of $C_8H_{10}O$ was slowly added. A solid separated o cooling, from which by recrystallisation from alcohol, tribromoxylenol was obtained in the form of white silk needles (m. pt. 168°).

Bromine estimation: 0·1814 gr. of substance gav 0·2840 gr. of Ag Br. Found, Br = 66·63 per cent Ca culated for $C_8H_7OBr_3$. Br = 66·84 per cent.

This substance was evidently tribromoxylenol (CH_3, CH OH 1.2.4). The bulk of the brominated product remaine liquid. After removal of the acetic acid, the still liqui residue was distilled under diminished pressure; the bul of the substance passed over between 180° and 19 (*p* = 30 mm.), and the distillate solidified on standing Long white silky needles, m.pt. 66°—68°, were obtained fro the solid by crystallisation from alcohol, but it was n possible to separate the substance in sufficient quantity t admit of its identification on account of its great solubilit in the various organic solvents.

Fraction 215°—220°.—This was dissolved in glacial acet acid, and brominated; the solid which separated wa filtered off and re-crystallised from alcohol. A tribrom xylenol which crystallised in yellowish-white silky needle m. pt. 165°, was obtained in a pure form; the melting poi of the product remained unaltered after re-crystallisatio

from alcohol. This substance is probably identical with the corresponding bromine derivative of the xylenol, CH_3, CH_3, OH 1.3.5. As the work was interrupted at this stage, the mother-liquor from which these crystals separated was not further examined.

Examination for Guaiacol and Creosol.

About 350 gr. of the crude creosote were distilled; the portion distilling between 195 and 230° (uncorr.) was dissolved in caustic soda solution, the solution was repeatedly extracted with ether, and the phenols were subsequently precipitated from the solution by addition of sulphuric acid, dried and fractionated, using a "pear" still-head with four bulbs. The portion which distilled over from 200–225° (Hg. in vapour) weighed 192 gr. Of this, 100 gr. were examined for Guaiacol and Creosol by the method of Béhal and Choay [Comp. rend. 116 (1893), 197] as modified by Adrian (this Jour., 1897, 367). Hydrobromic acid gas was passed through the heated phenols, the monohydric phenols were distilled over with steam, and the aqueous residue was repeatedly extracted with ether. After drying the ethereal extract over calcium chloride, and distilling off the ether, a brownish residue weighing 0·3 gr. remained; this dissolved completely in benzene, proving the absence of methyl-catechol. After removal of the benzene, the residue was treated with water, in which it was only partially soluble. The addition of ferric chloride to the aqueous solution produced a green coloration, which changed to violet-red when sodium bicarbonate was added. These colour reactions indicated the presence of a trace of catechol. It may therefore be concluded from the results of the above experiments, that creosol is entirely absent from shale oil creosote, and that guaiacol is present in very small quantity; the latter evidently does not constitute more than a small fraction of 1 per cent. of the total creosote.

The results of the experiments described above may be summarised as follows:—The "green naphtha" creosote from shale oil contains 5 to 6 per cent. of phenol and 12 to 15 per cent. of o-cresol. The bulk of the mixture is composed of m-cresol and xylenols, which seem to be present in approximately equal quantity, viz.: 30 to 35 per cent.; of these xylenols the isomers having the configuration CH_3, CH_3, OH 1.2.4 and 1.3.5 were identified. The fraction boiling above 230° constitutes 16 per cent. of the total phenols. Para-cresol and creosol appear to be absent, and guaiacol is present in very small quantity.

I hope later on to be able to work up larger quantities of creosote, with the object of examining the xylenols more particularly, and of determining the nature of the higher phenols in the portion which boils above 230°.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, May 26th, 1902.

MR. GEORGE WARD IN THE CHAIR.

SOME EXPERIMENTS WITH THE KJELDAHL METHOD OF NITROGEN ESTIMATION.

BY H. D. LAW, B.Sc.

Contribution from the Leather Industries' Laboratory of the Yorkshire College.

In a paper by Procter and Turnbull (J.S.C.I., Vol. XIX., 130) a series of experiments was undertaken to determine the best method of carrying out Kjeldahl's process. In these experiments different oxygen carriers were used to quicken the reactions, and no account of the duration of the time of heating was taken by them; a clear solution indicating the end of the reaction. In all their experiments the amount of nitrogen obtained remained constant. In a more recent paper, however, Nihoul has shown (Bourse aux Cuirs de Liége, September 1901) that the amount of nitrogen obtained depends largely on the duration of the time of heating even after the solution has become clear. Nihoul reports that on heating for 40 minutes less nitrogen is obtained than on heating for 2½ hours, the increase being directly as the period of reaction. The author's experiments have been carried out with a view to checking this statement. Nihoul's method of working, which hardly differs from that ordinarily employed, was closely followed out. The apparatus for distillation was the same as that described by Procter and Turnbull (J.S.C.I., Vol. XIX., 130), with the addition that a current of steam was passed through during the distillation to prevent bumping and frothing. In all the following experiments 0·7 grm. of powdered leather dried till constant at 100° C. was weighed in a covered dish and shaken into a Jena flask of a litre capacity. 15 c.c. of concentrated sulphuric acid were run in, and the flask heated. After a period of time stated in the various experiments the contents of the flask were allowed to cool and 100 c.c. of water added. The flask was then connected up for steam distillation, and the ammonia estimated. In the first series of experiments 2 grms. of copper sulphate crystals were heated with the powdered leather and sulphuric acid. After heating for a quarter of an hour 7·5 grms. of potassium sulphate were added without removing the flame, and the heating continued for periods varying in the different experiments from half an hour to 2½ hours. The ammonia was expelled and absorbed in 50 c.c. of N/10 hydrochloric acid, the distillation being continued for 25 minutes. The amount of acid neutralised was then determined by titration with N/10 sodium carbonate and methyl orange. In the following table the results of experiments are given. The first column gives the number of the experiment; the second gives the duration of the time of heating, after the addition of potassium sulphate; the third gives the amount of acid neutralised by the liberated ammonia. As the reagents contain traces of nitrogenous bodies, allowance has to be made; the corrected results being in column 4 and column 5 gives the percentage of nitrogen obtained:—

No. of Experiment.	Time of Heating.	Acid used.	Corrected Value.	Percentage of Nitrogen.
	hr.	c.c.	c.c.	
1	½	34·8	34·1	6·82
2	½	34·9	34·2	6·84
3	1	35·2	34·3	6·88
4	1	35·4	34·7	6·94
5	1½	35·4	34·7	6·94
6	1½	35·4	34·7	6·94
7	2	35·4	34·7	6·94
8	2	35·4	34·7	6·94
9	2½	35·65	34·95	7·00

In the first two experiments the solutions were not quite clear, which accounts for these rather low values. In a corresponding set of experiments Nihoul gets an increase of 0·8 per cent. in the amount of nitrogen, which differs very considerably from the results tabulated above.

The next set of experiments was to determine if other oxygen carriers would give similar results. For this purpose potassium permanganate was tried. This, however, is very powerful in its action, and great care is needed, otherwise there is a loss of nitrogen. The best results were obtained in the following manner. The powdered leather was weighed as before and mixed with the sulphuric acid and heated to boiling for a quarter of an hour. The mixture was allowed to cool, and 1 grm. of potassium permanganate in crystals was added gradually, and finally the whole was kept boiling for the times specified below:—

—	Time of Heat.	Acid Neutralised in c.c.	Percentage of Nitrogen.
	hr.		
1	½	34·6 mean of two Experiments	6·96
2	1	34·3 " "	6·86
3	2	34·4 " "	6·88

Here again no marked increase is seen in the amount of nitrogen estimated after a clear solution has been obtained, and the results are fairly constant. In both these experiments, unless steam distillation is used, the solutions bump considerably in driving off the ammonia. This is due to the large amount of precipitate formed on the addition of caustic soda. To prevent this, and to avoid the use of steam, potassium per sulphate was tried as an oxygen carrier in place of copper sulphate. This substance was originally recommended by Mr. Dakin (see present vol. of J.S.C.I.). As before, the powdered leather was weighed out and digested for a quarter of an hour with sulphuric acid, and reaction mixture allowed to cool slightly. 10 grms. of potassium persulphate were then added and shaken up well, when the reaction goes on quite smoothly. The heating was then continued with the following results :—

Number of Experiment.	Time of Heating.	Acid Neutralised.	Correct Values.	Percentage of Nitrogen.
	hr.			
1	½	44·0	34·5	6·94
2	½	43·7	34·2	6·86
3	1	44·4	34·9	7·04
4	1	44·3	34·8	7·02
5	1½	43·8	34·3	6·89
6	1½	44·2	34·7	6·98

These results agree very closely with the previous ones. The last series was carried out without any oxygen carrier. The powdered leather was heated in this case with 7·5 grms. of potassium sulphate and the sulphuric acid, and the results tabulated were obtained.

Number of Experiment.	Time of Heating.	Amount of Acid Neutralised.	Colour of Solution.	Percentage of Nitrogen.
	hr.	c.c.		
1	½	33·2	Yellow	6·64
2	½	33·0	Brown	6·40
3	1	34·1	Clear	6·82
4	1	32·1	Brown	6·42
5	1	33·4	Yellow	6·68
6	1½	33·0	Yellow	6·60
7	1½	34·1	Clear	6·82
8	1½	33·4	Yellow	6·68

The colour of the solution is indicated in the 4th column. It will be seen that the solution was never quite clear except in two cases, which give good results. The above experiments show that the time of heating is much longer, and the amount of nitrogen obtained is very variable, which is not the case where an oxygen carrier is used.

The conclusion to be drawn from these experiments is that the amount of nitrogen obtained does not increase after a clear solution has been obtained, but until this stage is reached the results are always too low.

NOTE ON THE USE OF PERSULPHATES IN ANALYSES.

BY H. D. DAKIN.

The persulphates of potassium and ammonium are readily obtainable in a fairly pure state at a low cost, and it is therefore not surprising that salts possessing such remarkable properties should find extensive applications. Proposals have recently been made for the use of these salts in analysis, and the following note is intended to give an account of preliminary experiments made on this subject some four years ago, which I have been unable to extend as far as I should have wished.

The rôle which persulphates play in most reactions is that of strong oxidising agents, and they perhaps more nearly resemble hydrogen peroxide in properties than any other single substance. Hydrogen peroxide has been repeatedly recommended for use in many analytical processes, but it cannot be said to have come into general use, this being no doubt owing to the difficulty of procuring a sufficiently pure article, and also to the unstable nature of the substance. The persulphates offer great advantages in these respects : they are readily obtainable, nearly free from impurity (with the exception of a little sulphate), and may be kept for a considerable time without any appreciable deterioration. The potassium salt in particular may be preserved almost indefinitely, if kept in well-stoppered bottles.

The Estimation of Manganese.—The first reaction that was investigated was the precipitation of hydrated manganese peroxide from solution of manganese salts. The dilute solution containing the manganese salt is heated to about 50° C., and excess of persulphate added, followed by a moderate excess of ammonia. The manganese is quickly thrown down in the form of a brownish black precipitate which may be filtered off and treated by any of the ordinary methods. The details of the process are quite similar to the customary method of precipitation with bromine and ammonia. The replacement of the bromine by an almost odourless salt is a distinct advantage. Either potassium or ammonium persulphate may be employed as precipitant but in the case of the former compound, it must be remembered that the manganese precipitate "occludes" considerable quantities of potassium salts, and hence is not in a suitable condition for direct weighing. Precipitation was in all cases found to be complete, and the results are unaffected by dilution, presence of ammonium salts, or by excess of precipitant. Some of the results obtained are collected in the following table. The experiments were all made upon pure re crystallised manganese sulphate, in which the manganese had been carefully determined by the phosphate process (Zeits. anal. Chem., **39**, 784). The precipitate was weighed as Mn_3O_4, or as the anhydrous sulphate. It may be mentioned in passing that the method of weighing manganese in the form of the anhydrous sulphate as recommended by Gooch and Austin (Amer. Jour. Sci. V. p. 209), has been found to yield very accurate results.

Manganese taken.	Manganese found.	Difference.	Ammonium Chloride.	Ammonium Acetate.	Ammonium Persulphate.
			Grm.	Grm.	Grm.
0·3512	0·3517	+ ·0005	1	1·5	5
0·3159	0·3160	+ ·0001	2	..	..
0·2915	0·2917	+ ·0002	10	15	..
0·2914	0·2919	+ ·0004	50	..	..
0·2565	0·2565	..	1	..	..
0·1218	0·1222	+ ·0004	5	5	2·5
0·0241	0·0246	+ ·0005	5	5	..
0·0123	0·0123	..	25	25	..

The composition of the hydrated oxides obtained when manganese salts are precipitated in alkaline solution by means of bromine and other oxidising agents, is known to be variable, and this fact negatives the employment of volumetric methods based on the oxidising power of the precipitate. It was found that the same thing was true when ammonium persulphate was employed as precipitant. Apparently the most important factors governing the composition of the precipitate are temperature, dilution, and the amount of persulphate employed. It was also found that the presence of other substances, such as zinc salts, had a remarkable influence on the degree of oxidation of the precipitate, as is also the case when other precipitants are used. The conclusion is therefore drawn that unless precise conditions of precipitation are determined, it would be unsafe to employ any of the volumetric processes for the estimation of manganese, based on the oxidising power of the precipitate. In this connection it may be mentioned that Mawrow (Zeits. anorg. Chem., 1900, 263—268) has isolated both Co_2O_3 and Co_3O_4 as products of the action of potassium persulphate upon cobalt salts. It is a well-known fact that when manganese salts are precipitated by means of bromine from solutions containing other metallic salts there is a great tendency for the precipitated oxides of manganese to be contaminated with small quantities of impurity. The same difficulty is encountered when ammonium persulphate is used. In some experiments in which a quarter of a grm. of manganese was precipitated from solutions containing an equal weight of calcium or of zinc

salts, it was found that under varying conditions, from 20 to 50 mgrms. of foreign oxide was associated with the manganese precipitate. This error was not removed by increased dilution of the solution or by the presence of large amounts of ammonium salts. The amount of impurity was reduced by approximately one-half by dissolving the precipitate in acids and repeating the precipitation. Even on repeating the operation a third time, perfectly pure precipitates were not obtained; so that by this method of precipitation, as by others also, it is necessary to guard against the source of error indicated.

Oxidation of Chromium Salts.—Experiments were next made upon the oxidation of chromium salts. It was found that a solution of a chromic salt could be easily converted into an alkaline chromate by boiling with a large excess of caustic soda or potash, and adding potassium persulphate until oxidation was complete. In an actual experiment, chrome alum equivalent to 0·1053 grm. of metallic chromium was dissolved in about 50 c.c. of water and 5 grms. of pure caustic potash added to the solution. The solution, contained in a platinum basin, was then boiled with the addition of about 3 grms. of potassium persulphate, the latter being added in two or three portions. When the oxidation appeared complete, the solution was just acidified with nitric acid and largely diluted. The chromium was then precipitated by means of mercurous nitrate and the precipitate was filtered, washed, and ignited in the ordinary way. Chromic oxide, equivalent to 0·1052 grm. of metallic chromium, was finally obtained, this being in excellent agreement with the actual amount taken.

It was hoped to improve upon the above method by obviating the employment of fixed alkali-salts. Accordingly a solution of chrome alum was gradually added to a hot solution of ammonium persulphate containing a considerable amount of free ammonia. A large proportion of the chromic salt was oxidised to chromate, but at the same time a considerable amount of a brown amorphous precipitate was produced, which was not at all readily acted upon by the persulphate. On filtering the precipitate off, and examining it more carefully, it was identified as chromium peroxide (CrO_4). This substance which may be regarded as chromium chromate was doubtless formed by the action of chromic sulphate upon previously oxidised ammonium chromate. The fact that the complete oxidation of this substance was only effected very slowly, rendered the method of very little value for quantitative purposes.

Marshall (Proc. Roy. Soc. Edin., 1900, **23**, 163) has observed that the oxidising power of persulphates is very greatly increased by the addition of small quantities of silver salts, which appear to act catalytically; and has shown that, making use of this fact, chromium salts may be oxidised to chromic acid in acid solution. Without such addition of silver salts, it is exceedingly difficult to oxidise chromic sulphate in acid solution. It is a rather remarkable fact that mixtures of concentrated nitric acid and potassium persulphate do not precipitate manganese peroxide from manganous salts, or convert chromic salts into chromic acid, both of which reactions are readily effected by potassic perchlorate.

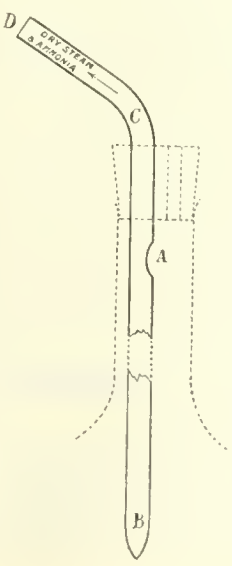
During recent years very many methods have been proposed for the separation of oxidisable salts, such as those of manganese and chromium from copper, zinc, aluminium, &c., based upon the employment of alkaline solutions of hydrogen peroxide. Friedheim and Brühl (Zeit. anal. Chem. 1899, 38, 681—710) have, however, shown that the apparently satisfactory results obtainable by the use of these methods, are frequently due to a series of compensating errors. Since the same would almost certainly be true of similar analyses effected with the aid of persulphates, no such separations were attempted, though doubtless they could be employed for qualitative purposes.

The Estimation of Nitrogen.—Since Kjeldahl's process was introduced in 1883, an almost endless number of modifications of his method have been proposed. A common feature of nearly all of the various methods consists in the employment of a mixture of concentrated sulphuric acid and potassium sulphate. Dafert (Zeit. anal. Chem. 24, 45) considers that the reactions involved are of three kinds. First, the dehydrating action of the sulphuric acid; secondly, the reduction of the nitrogenous matter by means of sulphur dioxide produced by the action of the hot sulphuric acid upon carbonaceous matter; thirdly, the *oxidation* of stable nitrogenous substances with final conversion into ammonium salts. It is mainly with the last reaction that uncertainty seems to exist, and many of the various substances that have been proposed as additions to the Kjeldahl process have had as their object the successful oxidation of the stable nitrogen compounds. It was thought that potassium persulphate would be a particularly suitable substance for this purpose, and preliminary experiments have confirmed this view. After a few trials, it was found that the best results were obtained by heating the substance to be analysed with the ordinary mixture of concentrated sulphuric acid and potassium sulphate, and then after thorough disintegration had taken place, to allow the liquid to cool to below 100° C. On now adding a few grams of potassium persulphate and then resuming heating, a vigorous evolution of oxygen occurs, and the solution previously black quickly becomes clear. If the reaction should not appear completed, the liquid should be further heated and then subsequently cooled and treated with a smaller additional quantity of persulphate. It is important to avoid adding the salt to a too hot liquid, as under these conditions a very rapid decomposition of the salt occurs and proper oxidation is not effected. The salt may be assumed to act in two special ways. Firstly, as a strong oxidising agent, and secondly, it strengthens the sulphuric acid by its decomposition—

$$4\ KSO_4 + 2\ H_2O = 4\ KHSO_4 + O_2.$$

Trials were made on a few substances, and good results were more *quickly* obtained with rather difficultly decomposable substances such as acetanilide, sulphanilic acid, alkaloids, &c., than with other processes. Although I have not as yet been able to examine the method more fully, it would appear that in the case of substances which are difficult to completely decompose in the ordinary way, potassium persulphate will find a useful application. Commercial potassium persulphate sometimes contains traces of ammonium salts, and either the persulphate should be recrystallised or a correction introduced.

It is probable that the persulphates will be of great use for the destruction of organic matter in the case of substances which are to be tested for the heavy metals, arsenic, &c. The replacement of the commonly employed mixture of hydrochloric acid and potassic chlorate by the odourless persulphate and sulphuric acid should be advantageous, especially when the ammonium salt is used, as in this case no objectionable fixed salts are introduced into the solution. A few tests made on lines similar to the Kjeldahl process previously described gave excellent results. Substances such as sugar, starch, flour, &c. are readily oxidised. I do not propose to enter further into the applications of the persulphates—many reactions in which they may be used, such as the oxidation of ferrous salts, arsenious compounds to arsenic salts, &c., will at once suggest themselves—and it is hardly to be doubted but that these salts will prove to be exceedingly useful reagents to have in the laboratory.



AN EASILY MADE, AND SAFE, DEPHLEGMATOR FOR KJELDAHL DISTILLATIONS.

BY W. JESSE LOVETT.

Take a piece of glass tube, B D, not less than 9 mm. internal diameter, bend at C to the angle best suited for the condenser.

At a distance from C, suited to the flask to be used, draw out the end of the tube at B. B should be nearly at the bottom of the distillation flask.

At the point A, which should come half an inch *inside* the cork fitting the flask, direct a fine blowpipe flame, and blow out a hole A, trimming off and fusing the edges as shown.

Pass the end D through the cork, and it is ready. It is obvious from sketch that no projected particles can reach D *viâ* A and C, and as for the condensed moisture between D and C, it falls, as fast as it is formed, to B, which is well below the surface of the distilling liquid.

This device has been in satisfactory daily use in the laboratory for seven years, and a cast-iron modification has been successfully used in a still working several tons of material.

Obituary.

JAMES HARTFORD.

MEMBER OF COMMITTEE OF THE NEW YORK SECTION OF THE SOCIETY OF CHEMICAL INDUSTRY.

A cablegram received in London on Friday, June 13, announced the death of Mr. James Hartford, Vice-President of the Schoellkopf, Hartford, and Hanna Company, of Buffalo, N.Y., and elsewhere. Mr. Hartford was manager of the New York office, and chiefly devoted himself to the drug and allied branches. A few weeks ago he was operated on for an internal trouble, but without relief. Mr. Hartford was born in Ireland fifty-six years ago, and after serving his apprenticeship to the drug trade with Messrs. Boileau and Boyd, of Dublin, he, on September 13, 1876, qualified by examination as a pharmaceutical chemist. Later he came to London and joined Messrs. Burgoyne, Burbidges, and Co.'s staff, and subsequently rose to the position of market cle which he resigned in 1884, when he went to New Yo Joining Messrs. McKesson and Robbins, in a positi similar to that which he held in London, he soon acqui a grasp of the New York drug market, and in a f years joined with the late Mr. Jacob Schoellkopf and M Maclagan in founding the firm of Schoellkopf, Hartfo and Maclagan. The growth of this business was in great measure due to the keen business capacity of M Hartford; and in January, 1900, the concern was inc porated under the laws of the State of New York, a became known as the Schoellkopf, Hartford, and Han Company, having a capital of 2,100,000 dols. This co pany also absorbed the Schoellkopf Aniline and Chemi Company, of Buffalo and Boston, and the Hann Schoellkopf Company, of Philadelphia. Mr. Hartfor close connection with this country, and the esteem which he was held, enabled him to secure the influent support of some of the leading British houses, t agencies of the company including that of Mess Howards and Sons, Messrs. T. Tyrer and Co., the G Light and Coke Company, Messrs. C. Lowe and C Dr. Julius Grossmann, and Sir J. B. Lawes (Ltd Although a citizen of the United States, Mr. Hartfo up to the time of his death, maintained his interest British affairs. It was he and the late Mr. A. H. Mas with the active co-operation of Mr. Thos. Tyrer, w laid the foundation of the New York Section of t Society of Chemical Industry. Mr. Hartford also retain his membership of the Pharmaceutical Society of Irela to which he had been on many occasions an excell friend. Mr. Hartford was Chairman of the Drug Co mittee of the National Wholesale Druggists' Associati of New York last year. He was well known on Lond 'Change. He was a good and forcible writer, an excell business man, and his loss will be widely felt.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	850
II.—Fuel, Gas, and Light	851
III.—Destructive Distillation, Tar Products, Petroleum	853
IV.—Colouring Matters and Dyestuffs	853
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	856
VI.—Colouring Wood, Paper, Leather, &c.	858
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	858
VIII.—Glass, Pottery, and Enamels	859
IX.—Building Materials, Clays, Mortars, and Cements	859
X.—Metallurgy	860
XI.—Electro-Chemistry and Electro-Metallurgy	863
XII.—Fats, Fatty Oils, and Soap	864
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	8
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	8
XV.—Manures, &c.	8
XVI.—Sugar, Starch, Gum, &c.	8
XVII.—Brewing, Wines, Spirits, &c.	8
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	8
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	8
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	8
XXI.—Photography	8
XXII.—Explosives, Matches, &c.	8
XXIII.—Analytical Chemistry	8
XXIV.—Scientific and Technical Notes	8

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, po included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

Separators; Centrifugal ——. C. A. E. Andersen, Valby, near Copenhagen. Eng. Pat. 4786, Feb. 25, 1902.

ARRANGEMENTS by which the liquid is fed into the separating chamber through a cylindrical annular feeding passage, coinciding with the "neutral zone," *i.e.*, the space in the chamber in which the liquid (when the separator is wo and completely filled) has the same specific gravity a h original liquid.—R. A.

Fire Extinguishers; Chemical ——. E. J. Chap Merrimac, U.S.A. Eng. Pat. 14,741, July 19, 1 (Under Intern. Convention.)

AN apparatus for use with alkali carbonates and acids.—

Lubricants and Lubricating Apparatus for the Cylinders of Air-Compressors. C. Oetling, Strehla a/Elbe, Germany. Eng. Pat. 23,893, Nov. 25, 1901.

SMALL quantities of a glycerin graphite mixture, and corresponding quantities of distilled or rain-water, are brought together just before they are to be used, and are drawn into the compressor cylinder in the state of a diffused spray.—R. A.

UNITED STATES PATENTS.

Vapour-Generator. M. Castelnau and C. Thialon, both of Paris. U.S. Pat. 696,797, April 1, 1902.

A CYLINDRICAL steam generator built up of segments of cast steel. It is heated from the interior.—R. A.

Explosions in Vessels Containing Explosive Fluids; Apparatus for Preventing ——. R. Scheuffgen, Salzkotten, Prussia. U.S. Pat. 695,237, March 11, 1902.

SEE Eng. Pat. 2384 of 1901; this Journal, 1901, 974.
—R. A.

Filter. C. E. Chamberland, Paris. U.S. Pat. 695,375, March 11, 1902.

SEE Eng. Pat. 25,606, 1901; this Journal, 1902, 458.
—R. A.

II.—FUEL, GAS, AND LIGHT.

ENGLISH PATENTS.

Gas and Coke; Manufacture of ——. J. Y. Johnson, London. From Deutsche Continental Gas-Ges. and J. Bueb, Dessau. Eng. Pat. 16,211, Aug. 12, 1901.

THE powdered coal recommended in Eng. Pat. 13,814, 1900 (this Journal, 1901, 697), is replaced by moistened coal, which is formed into bricks or blocks, these being subsequently distilled in retorts of rectangular cross section. The retorts are made in sections, connected together after the manner of sectional steam boilers.—R. S.

Carburetters or Vaporisers for Oil or Spirit Engines. W. Cooper, Braintree. Eng. Pat. 12,184, June 14, 1901.

IMPROVED mechanism in carburetters or vaporisers for explosion engines.—R. S.

Gas Producer; Construction of ——. O. Imray, London. From La Société Anonyme pour la production et l'emploi de la Vapeur Surchauffée, Paris. Eng. Pat. 12,307, June 17, 1901.

THE gas-producer, which is fed with fuel from above, has a central air-supply pipe extending down to the lower part of the mass of fuel, and a tubular casing, surrounding the air pipe, and having lateral holes in its upper part, by which the products of distillation from the upper part of the fuel enter the annular space surrounding the air pipe, and descend into the hot zone of the fuel. The fuel space of the producer is in the shape of two truncated cones, meeting at their smaller ends, and is surrounded by the outer wall, which forms, with the conical partition, an annular space by which the producer gas from the hot zone leaves the apparatus.
—H. B.

Gas; Production and Utilization of ——. G. Westinghouse, Pittsburg, U.S.A. Eng. Pat. 10,013, May 14, 1901.

A GAS-PRODUCER and a gas-engine are so connected that the exhaust gases from the engine flow upwards through passages in the wall of the producer, in close proximity to passages in the wall, whereby the heat of the exhaust gases is imparted to the air supply of the producer. These passages are formed by a series of tubes enclosed in an annular space surrounding the producer. A steam-raising or superheating coil, or coils, is arranged in the upper part of the producer, so that the heat of the producer gases is utilised in heating the steam supply which enters the producer along with the air. In the wall of the producer is provided the water supply, which is heated by the produced gas. The apparatus may be combined with an incinerator for the production of combustible volatile constituents from garbage, &c., and their utilisation in the producer.—H. B.

Gas; Obtaining High-Pressure ——. M. T. Sale and A. W. Onslow, Woolwich. Eng. Pat. 7608, March 29, 1902.

THE apparatus consists of a rotary blower; a gas-supply pipe leading thereto; a gas-discharge pipe; a bye-pass pipe and valve to allow gas at ordinary pressure to flow to the burners when the blower is not in use; a safety-valve and connecting pipe to enable surplus gas to pass back into the supply pipe should the pressure become too great; and an "anti-fluctuator of any suitable construction," arranged on the gas-supply pipe, to prevent fluctuations of pressure in the gas main.—H. B.

Burners for Lighting and Heating with Hydrocarbon Vapour. J. E. Bousfield, Finsbury. From La Société des Brûleurs Roger, Paris. Eng. Pat. 1242, Jan. 16, 1902.

OIL is vaporised by heat, then mixed with air, and ignited. The heavier vapours, which tend to fall back, are ignited to heat the vaporiser itself. The vertical vaporising chamber is provided with a central stem nearly fitting the casing so as to leave a very narrow vertical annular space wherein the hydrocarbon is vaporised. The central stem has, near the top thereof, circular grooves which constitute baffles for arresting the small drops of liquid carried along as well as the particles and solid impurities arising from the hydrocarbon. At the widened top of the vaporising chamber are diaphragms consisting of gratings and filtering plates. Above the latter is a conical chamber, the narrowed top of which carries a disc provided with a large number of small holes, each of which is smaller than the actual outlet opening at the top of the casing. The vapour is mixed with a supply of air, and is led to incandescent mantles for lighting purposes, or to a heating burner.—R. S.

Acetylene Gas Generators. H. Keller and J. Knappich, Augsburg, Germany. Eng. Pat. 4951, March 8, 1901.

A HAND-FED carbide-to-water apparatus. The carbide is loaded into a box which has a water-tight lid held in position by means of a cross-bar and catch. The box swings on a bent lever working in horizontal bearings, and is so arranged that at one end of its path it projects above the water of the decomposing vessel into the air, while at the other it projects above a depending partition in the water-tank. Just before reaching its second place, a stop releases the catch, and allows the top of the box, which is now the bottom, to fall, thus giving opportunity for the water to attack the carbide. The box is moved by a hand lever extending through the side of the tank.—F. H. L.

Incandescence Bodies for Electric Lighting. C. D. Abel, London. From Siemens and Halske Actien-Ges., Berlin. Eng. Pat. 10,869, May 25, 1901.

IN order to overcome the difficulties arising from the infusibility of the rare earth metals, the filaments are produced by mixing the metals with a carbide, the metal in pulverulent form being mixed into a paste with such a proportion of an organic substance, preferably caoutchouc, as will produce the desired proportion of carbide, the plastic mass formed into mantles, and the latter heated to incandescence in absence of air; or the nitrides of the metals are mixed with their carbides, and with a suitable organic substance to form a paste, and the filaments made therefrom heated until the nitrogen is expelled and a mixture of metal and carbide is left.—H. B.

UNITED STATES PATENTS.

Peat; Converting —— into Fuel. J. O. Green and H. T. Martin, Whitewater, Wis. U.S. Pat. 700,190, May 20, 1902.

THE peat is first dried, and then simultaneously ground, heated, and compressed.—R. S.

Peat Briquettes; Manufacturing ——. E. Helbing, Wandsbeck-Hamburg, Germany. U.S. Pat. 700,421, May 20, 1902.

THE peat is mixed with milk of lime and manganese oxide, or any other material capable of generating oxygen. The mixture is then pressed in moulds and dried.—R. S.

Artificial Fuel. A. E. Tucker, Birmingham, and C. Cory, Swansea. U.S. Pat. 700,389, May 20, 1902.

See Eng. Pat. 4830, 1901; this Journal, 1902, 459.—R. S.

Burner; Oil Injector ——. W. Plotts, California. U.S. Pat. 698,553, April 29, 1902.

An oil burner in which the oil is injected, by means of a steam-jet, into the combustion chamber beneath a boiler, the pressure within the boiler controlling automatically the supplies of steam and oil to the burner.—H. B.

Furnace. C. W. Stauss, Berlin. U.S. Pat. 695,503, March 18, 1902.

The fuel is admitted from a feeding hopper to a vertical gasifying chamber, beneath which is an inclined grate. One side of the gasifying chamber is formed of a vertical hinged grid, through which air is admitted, under pressure, to the chamber and also to the grate. A firebrick bridge is situated directly over the grate, and forms the side of the chamber opposite to the hinged grid. The grate is raised and lowered by chains operated mechanically.—R. S.

Furnace. A. J. F. Miller, Centralia, Ill. U.S. Pat. 695,750, March 18, 1902.

The side and end walls of the furnace are each provided with a horizontally disposed chamber, having a horizontal top wall and an inclined base wall. The inner side of each chamber is formed of a metallic perforated plate resting on supporting lugs. Air passes upwards from beneath the grate bars into these chambers, and escapes partly through the openings in the side and end plates, and partly through the openings formed between the tops of these plates and the walls of the chamber.—R. S.

Furnaces; Heating ——. L. S. Baker, Mich. U.S. Pat. 696,791, April 1, 1902.

An external casing, square or rectangular in form, is provided at the bottom with an ash-pit, above which is a "fire-pot." Over the "fire-pot" is a combustion chamber, into the centre of which descends a tube which is continued upwards and outwards through the casing and serves as a magazine passage for fuel. Above the combustion chamber are two superposed heating chambers, through which pass four smoke-pipes, one near each corner. These pipes lead from the top of the combustion chamber to a central smoke-dome.—R. S.

Carburetter. O. A. Lane and H. A. Davenport, Adrian, Mich. U.S. Pat. 696,457, April 1, 1902.

The type of carburetter is one in which a liquid hydrocarbon is vaporised in a retort, and the vapour obtained is mixed with oil, through which air is forced. At the commencement of operations, some of the air above the liquid in the oil-tank is allowed to escape. This air is charged with hydrocarbon vapour, and is led past a needle-valve to a casing beneath the retort, receiving on its way a supply of air through adjustable openings, covered with a hood, in the tube. The vapour mixture is ignited above a gauze diaphragm. When the retort is hot enough, the outlet of a tube dipping to the bottom of the oil-tank, is opened, and the oil admitted to the retort. The vapour produced, passes through a valve, is mixed with air entering through special openings, and led to the supply-pipe.—R. S.

Furnace; Electric ——. F. Morani, Rome. U.S. Pat. 701,218, May 27, 1902.

See Eng. Pat. 10,580, 1900; this Journal, 1901, 588. —G. H. R.

Apparatus for Proportioning and Mixing Gas [for Gas Engines, Furnaces, &c.]. H. Pettibone, New Rochelle, N.Y. U.S. Pat. 696,107, March 25, 1902.

The apparatus comprises three superimposed chambers, the top and bottom chambers receiving supplies of producer-gas and water-gas respectively, and the middle one acting as a mixing-chamber. In each of the two partition-plates between the chambers is a central valve-opening and seat, in which a cylindrical valve, closed at the bottom, a having rectangular openings in the sides, works up a down, for regulating the admission of the gas to the mixi chamber. On the top of the apparatus is a floating g holder, to which is attached a rod that passes centrally do through the apparatus and is attached to each of the valve a branch pipe from the main, which conducts the mix gases away from the middle chamber, enters the ga holder, so that the latter rises and falls according to t pressure in the main. The valves are thus opened or clos according to the consumption of the mixed gases.—H. B.

Oil Atomizer and Mixer for Vapor-Engines. A. D. Pa and G. Wood, New Jersey. U.S. Pat. 696,187, March 1902.

Within a cylindrical oil containing chamber, having an a inlet and a vapour outlet, a perforated cylindrical scre rotates on a horizontal shaft. The screen is surrounded a rotatable metal cylinder, having apertures coinciding wi the air inlet and vapour outlet of the chamber, and turning this cylinder, the inlet and outlet may be opened closed to any desired extent. The vapour outlet commu cates with a heated vaporising chamber, which is connect to the piston chamber of the engine, the vaporising chamb being provided with a rotary mixing fan. When t apparatus is in use, the cylindrical screen rotates, its low side being always immersed in the oil; at each stroke the piston, air is drawn through the screen, carrying t spray of oil into the vaporising chamber, whence it pass into the piston chamber.—H. B.

Gas-Purifier [Naphthalene Extractor]. J. S. Donoh Georgetown, D.C. U.S. Pat. 695,875, March 18, 1902

From the cover of a closed box a vertical chamber depen having an open bottom, which is immersed in "benzin other naphthalene-arresting liquid." A steam-pipe pas into the chamber through the cover, and the gas-sup pipe enters it laterally. The box is provided with outflow-pipe for the purified gas, an overflow-pipe for liquid, a capped opening for pouring in the liquid, a d for cleaning the apparatus, a bye-pass and valves.—H. B

Lamp; Alcohol ——. S. Sternau and L. Strassburger, N York, U.S. Pat. 696,507, April 1, 1902.

The alcohol reservoir is covered by a horizontal partit which carries a fixed vertical tube, acting as the regulat tube. Within this tube are two concentric tubes, vertica adjustable by a rack and pinion device. In the lower p of the annular space between these concentric tubes arranged one or more wicks dipping into the alcohol, wh the upper part is filled with an incombustible material, su as asbestos.—R. S.

Lamp; Hydrocarbon [Incandescence] ——. T. H. Bl Northboro', Mass. U.S. Pat. 700,475, May 20, 1902.

The lamp consists of a burner; a vaporising cham situated above the burner; a tube extending centrally fr the bottom of the chamber to the mixing chamber of burner; a mantle arranged round the tube; a valve wit the vaporising chamber, controlling the oil supply there; a diaphragm forming the top of the vaporising chamber, t connected to the valve so that the latter may be clo automatically when the pressure within the chamber ri unduly; and a rod extending from the valve down throu the tube to an operating handle at the foot of the burner —H. B

Lamps; Method of Treating Ballast Wires for Elec ——. H. N. Potter, Pittsburg, U.S.A. U.S. Pat. 699,2 May 6, 1902.

In treating ballast wires, for use with lamps of the Ner type, so as to obtain a ballast device the temperature f which will increase uniformly throughout its length on passage of a current, the wires are to be heated, in e presence of a compound containing, as one of its constitue the material of which the wires are composed, to suc temperature as to produce a deposit of the material upon e wires. For example, iron wire is enclosed in a chan r

ontaining iron tetracarbonyl, Fe $(CO)_4$, and a current is assed through it so as to produce a deposit of iron on ie wire: any inequalities in the wire are thereby adjusted, u the hotter portions, which have the greater resistance, ceive the greater amount of deposit.—H. B.

Incandescent Vapour-Burner [Lamp]. E. L. Fee, Warren, Ind. U.S. Pat. 700,634, May 20, 1902.

HE burner and globe are suspended by a tubular support, wn through which the gasoline-supply pipe passes to a lve-casing attached to the lower portion of the burner. om the valve-casing, in which is situated a valve for conlling the gasoline supply, an oil tube rises alongside the rner or burners, and is formed into a vaporising coil at its per portion, adjacent to the tops of the mantles: it then scends, and has its exit orifice directed into the open end a curved mixing-tube which communicates with a chamber the base of the burner-tube.—H. B.

etylene Gas Generating Apparatus. P. Bucher, Mannheim, Germany. U.S. Pat. 700,405, May 20, 1902.

IS is a mechanically-fed carbide-to-water apparatus. The hide is carried in a number of boxes, each separately pported on a horizontal bar. The boxes are so arranged t they tend to swing down until they come beneath a pending partition in the water reservoir into a closed erating space; but they can be retained above the waterel in the open half of the reservoir by means of hooks and s. Each box has its own eye; the hooks are fixed to an illating rod, which is operated by the movements of the der bell; while the said hooks, being curved and dually increasing length, release one box in succession h time the bell falls.—F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

roleum; Synthesis of Varieties of ——. Contribution the Theory of Formation of Natural Petroleum '. Sabatier and J. B. Senderens. Comptes Rend., **134**, 21], 1185—1188.

T liquid obtained, along with ethane, when hydrogen a acetylene are passed over reduced nickel below 180° C. sists almost entirely of paraffin hydrocarbons; and in sity, boiling points, and other physical characters, it mbles very closely American petroleum. Pure acetylene, ed over reduced nickel, has been shown by Moissan Moureu to become incandescent, and to yield carbon, rogen, and benzene hydrocarbons. If a long column of el be used, the farther portions cause the reaction of hydrogen on the benzene hydrocarbons; and if the d products of this reaction be vaporised, and passed, ther with hydrogen, over reduced nickel at 180° C., a ure of paraffin and derivatives of cyclohexane constes the liquid portion of the product, similar to asian petroleum. If the second passage over nickel arried out with the metal above 300° C., the cyclone derivatives are in part decomposed, and the liquid uct resembles Galician petroleum. The author conis that natural petroleum may have been formed from ogen and acetylene, produced by the reaction of alkali kali-earth metals and carbides on water, meeting with llic nickel, cobalt, or iron, and producing, according to proportions and to the temperature of the reaction, affins alone, or mixtures of paraffins and cyclic hydrocons, as in the above experiments.—J. T. D.

thylindenes from Coal-Tar. J. Boes. Ber., 1902, **35**, [10], 1762—1764.

T mixture of methylindenes obtained from the coal-tar fr ion boiling at 200°—210° C., freed from acid and basic oil was oxidised by boiling for some time with dilute nitric ac On evaporation, an acid mixed with a tarry residue w obtained. The former consisted of a mixture of hemim tic and trimellitic acids. The two tricarboxylic ac would be derived from the 4 (7) and the 5 (6) methylindenes (Moschner's nomenclature). Probably all the four methylindenes theoretically possible are present in the fraction, since their separation is not possible, owing to the slight differences between their boiling points and the melting points of their picrates.—T. A. L.

Hydrocarbons; Action of Nitro-Sulphuric Acid on Saturated ——. W. Markownikoff. Ber., **35**, [9], 1584.

THE author replies to recent statements of Zaloziecki and Frasch (Ber., **35**, 386), that Galician petroleum is attacked by nitro-sulphuric acid yielding nitro-derivatives, contrary to the author's view. He now asserts that nitro-sulphuric acid (2 vols. H_2SO_4 + 1 vol. HNO_3, sp. gr. 1·53, is considered as a solution of $HO.SO_2.ONO_2$ in concentrated sulphuric acid) has no action at the ordinary temperature on pure saturated hydrocarbons (paraffins and polymethylenes), and only at higher temperatures, varying with the molecular size and structure, does any action take place. The author attributes the formation of nitro-compounds in the experiments of Zaloziecki and Frasch to the presence of aromatic hydrocarbons in Galician petroleum, as shown by Lachovicz, and identifies some nitro-compounds prepared by himself in the purification of saturated hydrocarbons by means of nitro-sulphuric acid with metadinitrobenzene. In conclusion, the author points out that nitric acid, sp. gr. 1·53, acts differently to the nitric sulphuric acid mixture on the above hydrocarbons, a reaction commencing at 10° and soon becoming violent.—W. H. B.

United States Patent.

Distilling Apparatus. J. S. Roake, New York. U.S. Pat. 700,374, May 20, 1902.

MORE particularly for use in the distillation of wood, for obtaining turpentine, pyroligneous acid, and other products. The vapour pipe leading from the retort to the worm is combined with a chamber of greater cross-sectional area than the pipe, to facilitate the deposition of heavy entrained matters, by reason of the slower movement of the vapours through the chamber. A number of open-work trays, adapted to contain a reagent, such as lime, are enclosed in the chamber one above the other, each tray consisting of a series of annular troughs furnished with alternately arranged annular fins.—R. A.

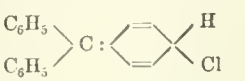
IV.—COLOURING MATTERS AND DYESTUFFS.

Triphenylmethane and Concentrated Sulphuric Acid. A. Baeyer and V. Villiger. Ber., 1902, **35**, [10], 1754.

THE authors have been informed by Kehrmann and O. Fischer that their statement regarding the yellow colour of the solution of triphenylmethane in concentrated sulphuric acid (this Journal, 1902, 607) is incorrect. The yellow colour is due to the presence of anthracene, which is always formed when triphenylmethane is prepared by the Friedel-Craft's synthesis.—T. A. L.

Triphenylmethane. F. Ullmann. Ber., 1902, **35**, [10], 1811—1813.

ACCORDING to Baeyer and Villiger (this Journal, 1902, 607), triphenylmethane dissolves to a yellow solution in concentrated sulphuric acid, and is precipitated unchanged on adding water. They ascribe the solubility to the basic properties of the hydrocarbon, which, as a halochromic substance, forms coloured salts. [See also abstract, Baeyer and Villiger above.] This view is opposed to that of Kehrmann, who assumes a quinonoid structure for the triphenylcarbinol salts corresponding to the formula—



Triphenylmethane would not be capable of an analogous salt formation.

On repeating Baeyer and Villiger's experiments, the author finds that the yellow colour is due to an impurity, or to a by-reaction. Chemically pure triphenylmethane does not dissolve in pure concentrated sulphuric acid (sp. gr. 1·84), and the filtered liquid does not become turbid on dilution with water. On the other hand, the hydrocarbon is readily soluble in fuming sulphuric acid at 15° C., yielding an easily soluble sulphonic acid. This solution on long standing, also turns yellow. When triphenylmethane is allowed to remain in contact with concentrated sulphuric acid for some time, the liquid gradually assumes the same yellow colour that a solution of triphenylcarbinol in sulphuric acid does, but the whole of the hydrocarbon does not disappear, and no precipitate is obtained on adding water to the filtrate. On warming triphenylmethane with concentrated sulphuric acid to about 80° C., oily drops are formed which dissolve with a yellow colour. After diluting with water, a slight turbidity is observed, and a small quantity of a substance is formed which, after extraction with ether, dissolves in sulphuric acid with a yellow colour. Triphenylcarbinol, on the other hand, when similarly treated, is precipitated from the yellow solution unchanged. When triphenylmethane is mixed with a trace of triphenylcarbinol or triphenylchloromethane, and treated with fuming sulphuric acid, an intensely yellow solution is at once formed. Dilute sulphuric acid (75—80 per cent.) dissolves triphenylcarbinol with the characteristic yellow colour, whilst triphenylmethane, even after boiling for a short time, remains unchanged.

It would appear that the behaviour of triphenylmethane is not opposed to the assumption that the yellow carbinol compounds have a quinonoid structure. The reactions of triphenylmethane agree with those of the leucoaminotriphenylmethane dyestuffs, which dissolve to colourless solutions in concentrated sulphuric acid. The corresponding dyestuff bases, on the other hand, dissolve to pure golden-yellow solutions, exactly like triphenylcarbinol.

—T. A. L.

Azoxy-Benzenes; Hydroxylated ——. E. Bamberger. Ber., **35**, [9], 1614.

There are now known four different hydroxy-azoxy-benzenes, *viz.*:—

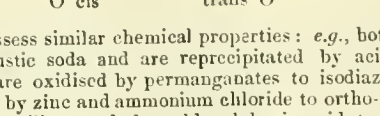
I. Para-hydroxy-azoxy-benzene, m. pt. 145°, prepared by Kekulé and Hidegh from para-hydroxy-azobenzene and PCl_5 (Ber., **3**, 235; Wallach and Kiepenheuer, Ber., **14**, 2617).

II. Para-hydroxy-azoxy-benzene, m. pt. 156—156·5°, from nitrosobenzene, Bamberger (Ber., **35**, 1610).

III. Ortho-hydroxy-azoxy-benzene, m. pt. 75·5—76°, from nitrosobenzene, Bamberger (Ber., **35**, 1610).

IV. Iso-ortho-hydroxy-azoxy-benzene, m.pt. 108—108·5°, from nitrosobenzene, Bamberger (Ber., **35**, 1610).

The two latter are, in the author's opinion, spacially related to each other; thus—



They possess similar chemical properties: *e.g.*, both dissolve in caustic soda and are reprecipitated by acids unchanged; are oxidised by permanganates to isodiazotates; are reduced by zinc and ammonium chloride to ortho-aminophenol and aniline, and by cold sulphuric acid to ortho-hydroxy-azobenzene; combine with diazo-benzene acetate, forming azo-azoxy derivatives (melting at 145—145·5° and 124—124·5° respectively), which belong to a new class of dyestuffs, and yield acetyl derivatives, acetyl ortho-hydroxy-azoxy-benzene, melting at 56—57°. The differences are of a dynamic nature, the iso variety reacting in all cases with less speed than its isomer.

The similarity between III. and IV. is not shared by the isomers I. and II., and the difference is indeed so great that the author does not consider I. to be a true para-hydroxy-azoxy-benzene. The isomer II. is dissolved by alkalis, oxidised by permanganate to isodiazotate, and yield an acetyl derivative, whereas the isomer I. enters into non of these reactions, nor does it combine with *p*-nitro-phenyl hydrazine.—W. H. B.

Catechin. St. v. Kostanecki and J. Tambor. Ber., 1902, **35** [10], 1867—1869.

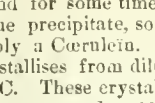
The authors, in taking up the investigation of catechin, arriv at a different formula from that given by previous observers the one they find being nearest to that of Svanberg (Annalen **24**, 215), who was the first to study this substance. B the action of dimethylsulphate on catechin they obtai catechin tetramethyl ether having the formula $C_{19}H_{20}O_6$. From this it follows that anhydrous catechin has th formula $C_{15}H_{14}O_6$, whilst the product crystallised from wate has the formula $C_{15}H_{14}O_6 + 4H_2O$. Catechin, when boile with an excess of acetic anhydride and anhydrous sodium acetate, gives penta-acetyl-catechin, $C_{15}H_9O(OC_2H_3O)_5$, melting at 131° C. Catechin probably contains a cumaran— or a chroman—ring.—T. A. L.

Dihydroxyfluoresceins and Dihydroxyeosins. C. Liebermann and F. Wölbling. Ber., 1902, **35**, [10], 1782—178

The authors have prepared a number of dihydroxy fluoresceïns and dihydroxyeosins, in order to compare th differences in shade (C. Liebermann, Ber., **34**, 1040; thi Journal, 1901, 569) caused by altering certain substituent in one particular class of dyestuffs. The compounds the have selected seemed to be especially suitable, since was to be expected that, like dihydroxyfluoresceïn (thi Journal, 1901, 1104), they would be mordant dyestuff The authors have been able in many cases to dete differences in shade: for example, the introduction halogen alters the shade from yellow to red, or fro less blue to bluer shades, in some cases very distinctly although in others the difference is only very slight. Th products examined have been obtained by condensin hydroxyhydroquinone with the anhydrides of hemipic aci 1.2-naphthalene dicarboxylic acid, quinolinic acid, and d phenyltetrene dicarboxylic acid, so that, compared wit the dihydroxyfluoresceïns from phthalic anhydride nu hydroxyhydroquinone, the new derivatives contained respe tively, two methoxyl groups in place of two hydrogens, an naphthalene, pyridine and diphenyltetrene, in place benzene. The bromination products of these compound have also been prepared. The non-halogenated fluoresceïn are very similar to one another. They dissolve in alcoh with a brownish-yellow colour and a strong greenis fluorescence, which is slightly increased on adding alcohol ammonia. On the other hand, the solution in aqueou ammonia is red, whilst aqueous alkali dissolves them wit a deep cherry-red colour. This difference from ordinar fluoresceïn is characteristic of the dihydroxyfluoresce group, and is due to the presence of the two hydroxyl The alkaline solutions show an absorption band betwee D and E, close to the latter, the differences between th dyestuffs only being detected by exact measurements. A the products are well defined mordant dyestuffs. Th from naphthalene dicarboxylic acid dyes alumina redde and ferric oxide bluer, and the quinolinic derivative dy alumina more brownish-red than dihydroxyfluoresceïn. greater difference might have been expected, but apparentl the effect of the colour-forming group predominates ov that of the substituent groups. Much greater difference are observable between the dyestuffs from tetrachloro- an dibromo-phthalic acid, the shades of the latter being abou midway between those of the non-halogenated and th tetrachlorinated dyestuffs. These halogenated dyestuf give similar shades to those obtained by brominating th dihydroxyfluoresceïn. These products, which the autho term dihydroxyeosins irrespective of the amount of bromi they contain, give much bluer shades than the fluoresceïn but only slight differences exist between the various eosi themselves. The spectrum of the alkaline solution, whic is red of a bluer shade than that of the non-halogenate products, shows a band somewhat nearer to D.

The dihydroxyfluoresceïn from 1.2-naphthalene dicar oxylic acid forms a reddish-brown powder, soluble alkali, with a cherry-red non-fluorescent colour, and

monium carbonate with a yellowish-green fluorescence. n warming, or allowing the yellow solution in concentrated ilphuric acid to stand for some time, it turns blue, and ater throws out a blue precipitate, soluble in alkalis with blue colour, probably a Cœrulein. The bromine com- ound $C_{21}H_{12}Br_2O_7$ crystallises from dilute acetone in white edles melting at 85° C. These crystals, on standing, turn ange-yellow, and, when warmed to 60° C., become a deep olden orange, and then melt at 220°—230° C. Quinolinic id anhydride (obtained from Alizarin Indigo Blue) gives dihydroxyfluoresceïn more soluble in water than the regoing. Its bromine substitution product dissolves in tash lye with a bluish-red colour. The dihydroxy toresceïn from hemipic acid anhydride was not obtained a pure state. The condensation product from hydroxy- droquinone and the anhydride of diphenyltetrene dicar- xylic acid—



ms a brick-red compound, soluble in glacial acetic acid ohol, and acetone, insoluble in water, chloroform, and nzene. The alcoholic solution shows a greenish-yellow orescence, whilst the alkaline solution is cherry-red. The mine derivative is a well-crystallised product.—T. A. L.

stazarin. C. Liebermann and W. Hohenemser. Ber., 1902, **35**, [10], 1778—1781.

n the purpose of making certain comparative dye tests is Journal, 1902, 768), the authors have identified godzinski's product from veratrol (Ber., **28**, 118) h that obtained by Liebermann from pyrocatechol l phthalic anhydride. The statements of Lorétan arding Hystazarin dimethyl ether from dimethoxy- l, zoylbenzoic acid are, in the main, correct, but the hors find that his instructions for the hydrolysis of t product to Hystazarin must be corrected. The ether uires heating for about 10—20 minutes with 40 times i weight of concentrated sulphuric acid. The brownish fcalent mass precipitated with water is extracted with tene, and the insoluble portion crystallised from glacial tic acid. The Hystazarin so obtained forms yellowish- wn needles, which do not melt at 260° C. The duct agrees in its properties with Liebermann's pre- ation; Lorétan had an impure product under examina- t. The substance extracted by toluene proved to be arin. As a matter of fact, Lagodzinski's Hystazarin er contains no Alizarin. The authors, however, find t the prolonged heating with sulphuric acid of tazarin prepared by either method yields a not incon- rable amount of Alizarin. Presumably, when Hystazarin is eated with concentrated sulphuric acid to 200° C., it d mposes into phthalic anhydride and pyrocatechol, w h then recombine to form the more stable product, A arin. Hystazarin is best prepared by heating 30 grms. o yrocatechol, 42 grms. of phthalic anhydride, and 300 g s. of concentrated sulphuric acid at 180°—200° C. fc about half an hour, until the reaction ceases. The melt is en poured into cold water, and the bulky black precipi- ta extracted with boiling water, dissolved in very dilute ac ous alkali, and the Hystazarin and Alizarin precipitated w acid. After filtering and washing free from acid, the re ue is dissolved in alcohol, evaporated to dryness, an extracted with boiling toluene, the Hystazarin which re ins undissolved being crystallised from boiling glacial ac c acid. From the above quantities there were obtained 6 ms. of Hystazarin and 1 grm. of Alizarin.

he authors also find that although Alizarin is stable to su huric acid at 200° C., when heated to 225° C. it is con- ve ed into Purpurin (1.2.4-trihydroxyanthraquinone), so alled native Purpurin, which can be separated from A arin by reason of its greater solubility in toluene. The co se of the reaction is followed by observing the colour of he alkaline solution. With 5 grms. of Alizarin about 2½ 3 hours are required. The Purpurin was identified by a re test, by spectroscopic examination, and by the ra lity with which its red alkaline solution became co letely decolorised on exposure to light and air.

—T. A. L.

English Patents.

Mono-alphyl-alpha (1) *Naphthylamine Alpha* (4) *Sulphonic Acids; Manufacture of* ——. G. W. Johnson, London. From Kalle and Co., Biebrich-on-the-Rhine, Germany. Eng. Pat. 12,326, June 17, 1901.

See Fr. Pat. 311,838; this Journal, 1902, 40.—T. A. L.

Indoxyl Dirivatives [*Indigo Dyestuffs*] *from Aromatic Glycocolls their Homologues and their Substitution Products; Production of* ——. G. W. Johnson, London. From the Deutsche Gold und Silber-Scheide-Anstalt vorm. Rössler, Frankfort-on-the-Main, Germany. Eng. Pat. 13,059, June 26, 1901.

See Fr. Pat. 312,763; this Journal, 1902, 111.—T. A. L.

Azo-dyestuffs; Manufacture of Substantive ——. O. Imray, London. From the Society of Chemical Industry in Basle, Basle, Switzerland. Eng. Pat. 5895, March 10, 1902.

A mixture of equimolecular proportions of 2.4′.2′-amino-naphthol sulphonic acid and *p*-amino-acetanilide is treated with phosgene in aqueous solution when *p*-acetamino-phenylhydroxynaphthylurea having the formula 2.4.2′-$SO_3H.OH.C_{10}H_5.NH.CO.NH.C_6H_4.NHCOCH_3$.1.4 is obtained. In place of phosgene, thiophosgene may be employed when the corresponding thiourea is formed. The product is employed as a dyestuff component for combination with diazo or tetrazo compounds which are stable to acids and tolerably fast to light. For example, the dyestuff from diazotised *p*-amino-acetanilide and the above described compound gives bluish scarlet shades on unmordanted cotton. The dyestuff when boiled with dilute soda lye splits up into *p*-phenylene diamine, acetic acid, carbon dioxide and the azo-dyestuff having the formula 2.4′.2′.NH_2.OH. $SO_3H.C_{10}H_4.N:N.C_6H_4.NH_2$.—T. A. L.

Colouring Matters [*Azo Dyestuffs*] *Directly Dyeing Cotton; Manufacture of* ——. C. D. Abel, London. From the Actien-Gesellschaft für Anilin-Fabrikation Berlin. Eng. Pat. 13,377, July 1, 1901.

See Fr. Pat. 307,719; this Journal, 1902, 45.—T. A. L.

Gallocyanines [*Oxazine Dyestuffs*]; *Manufacture of New Leuco-derivatives of* ——. O. Imray, London. From the Dye Works formerly L. Durand, Huguenin and Co., Basle, Switzerland. Eng. Pat. 4552, Feb. 22, 1902.

When a Gallocyanine is condensed with a phenol such as resorcinol, a leuco compound is obtained insoluble in sodium acetate. If a phenol sulphonic acid be employed or if the above-mentioned products be sulphonated, derivatives are obtained soluble in sodium acetate both in their leuco form and after oxidation (Eng. Pats. 24,802 of 1893 and 15,064 of 1894; this Journal, 1894, 247 and 1055). The patentees now find that leuco derivatives of Gallocyanines are formed, soluble in sodium acetate as are also their products of oxidation, when resorcinol is condensed with the gallocyanines obtained by reacting with a nitroso-alkylbenzyl-aniline sulphonic acid on gallic acid or its derivatives such as Gallamic acid, ethers of gallic acid and gallanilide or with the sulphonated Gallocyanines obtained by sulphonating the Gallocyanines from nitroso-diphenylamine hydrochloride and gallic acid or its derivatives as above. Hence the introduction of a sulphonic acid group renders in all cases the derivatives soluble in sodium acetate.—T. A. L.

Blue Dyestuff [*Sulphide Dyestuffs*] *from Para-amido-para-oxydiphenylamine; Manufacture of a* ——. O. Imray, London. From The Farbwerke Hoechst, Hoechst a/Main, Germany. Eng. Pat. 14,081, July 10, 1901.

A bright indigo-blue dyestuff, soluble in sodium sulphide or hydrosulphide, is obtained by the prolonged action of sulphur, sodium sulphide, and soda lye on *p*-amino-*p*-hydroxydiphenylamine at 100—130° C., in a vessel provided with a reflux condenser. The leuco compound first formed is subsequently oxidised in a solution of soda lye by a current of air. The dyestuff, when dry, forms a bronzy blue-black powder, insoluble in water and the usual solvents.—T. A. L.

FRENCH PATENTS.

Nitro-Compounds; Process for the Reduction of ——. Boehringer and Sons. Fr. Pat. 316,193, Nov. 23, 1901.

SEE Eng. Pat. 25,100, 1901; this Journal, 1902, 260. —G. H. R.

Alkyl-Auramines [*Diphenylmethane Dyestuffs*]; *Manufacture of* ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 316,915, Dec. 14, 1901.

AURAMINE base (tetramethyldiamino-diphenylmethane imine) is alkylated by boiling with ethyl iodide in benzene solution in presence of zinc oxide. The ethyl-auramine so obtained crystallises from alcohol in thin prisms melting at 131° C. The product dyes cotton mordanted with tannin and tartar emetic a greenish yellow shade. Similar derivatives can be obtained by employing other alkyl haloids. —T. A. L.

Blue Dyestuffs [*Sulphide Dyestuffs*] *Dyeing Unmordanted Cotton; Manufacture of* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 308,557, Dec. 13, 1901.

THE dialkylamino-indophenol thiosulphonic acids, obtained by oxidising, for example, equimolecular proportions of phenol and dimethyl-*p*-phenylene diamine thiosulphonic acid, give when fused with sulphur and sodium sulphide valuable fast blue cotton dyestuffs.—T. A. L.

Blue Dyestuffs [*Azo Dyestuffs*] *for Wool; Manufacture of* ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 316,720, Dec. 9, 1901.

DIAZOTISED *p*-amino-acetalkylaniline is combined with the sulphonic acids of 1.1′-dihydroxynaphthalene, the acetyl group being subsequently removed by boiling with soda lye. Pure blue shades are said to be obtained, very fast to light. —T. A. L.

Blue Dyestuffs [*Azo Dyestuffs*] *for Cotton; Manufacture of Fast* ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 316,762, Dec. 10, 1902.

DIAZOTISED *p*-amino-acetalkylamine is combined with 1.2′- or 1.3′-naphthylamine sulphonic acid, and after again diazotising and combining with a second molecule of the same acid, the resulting product is again diazotised, and combined with a naphthol, a dihydroxynaphthalene, an aminonaphthol, or a sulphonic acid of one of these. Finally, the product is hydrolysed by the action of acids or alkalis. The dyestuffs give blue shades on cotton fast to fulling and light.—T. A. L.

UNITED STATES PATENTS.

Azo Compounds; Reduction of ——. M. Buchner, Mannheim, Germany. U.S. Pat. 700,671, May 20, 1902. (See preceding abstract.)

THE azo compound and tin, or a mixture of the azo compound and powdered tin, with water and hydrochloric acid, are placed in the cathode compartment, and the electric current passed through them at an elevated temperature. —G. H. R.

Phenylamidoacetonitrile; Process of Making [*Indigo Dyestuffs*] ——. B. Homolka and N. Schwan, Hoechst. Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Hoechst-on-the-Maine, Germany. U.S. Pat. 701,044, May 27, 1902.

SEE Fr. Pat. 314,860; this Journal, 1902, 543.—T. A. L.

Nitro or other Compounds; Electrolytic Reduction of ——. M. Buchner, Mannheim, Germany. U.S. Pat. 700,670, May 20, 1902.

NITRO compounds, &c., reduced by tin, are submitted to the action of an electric current in the cathode space, and in the presence of tin, at the same time stirring and cooling. The tin either forms the material of the cathode, or is in solution in the electrolyte, which may be an alcoholic aqueous solution of hydrochloric acid.—G. H. R.

Azo Dye, and Process of Making same. C. Schraub and H. T. Bucherer, Ludwigshafen. Assignors t Badische Anilin und Soda Fabrik, Ludwigshafen Germany. U.S. Pat. 700,565, May 20, 1902.

THE mono- and disazo dyestuffs hitherto obtained fron 1.1′-naphthalene diamine sulphonic acid (Eng. Pat. 16,92 of 1900; this Journal, 1901, 889) have no technical import ance, since they are altered by boiling with 1 per cent sodium carbonate solution, or 5 per cent. sulphuric acid Stable compounds are obtained by reacting with diaz compounds on 1.1′.4-naphthylene diamine sulphonic acid or on 1.1′- and 3.3′-naphthylene diamine disulphonic acid i presence of acetone. The resulting products dye wool red violet, or blue shades, which withstand boiling for 1 minutes with a 1 per cent. sodium carbonate solution o with dilute sulphuric acid (about 5 per cent. H_2SO_4). —T. A. L.

Black Sulphur Dye [*Sulphide Dyestuffs*], *and Process o Making same.* W. Kelbe, Hoechst. Assignor to Farb werke vorm. Meister, Lucius und Brüning, Hoechst-on the-Maine, Germany. U.S. Pat. 701,051, May 27, 1902.

SEE Fr. Pat. 309,322; this Journal, 1902, 42.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Sodium Peroxide Baths; Heating of ——. P. Lüttring haus. Färber-Zeit., 1902, **13**, [10], 165.

OWING to the decomposition of sodium peroxide induced b the catalytic action of metallic surfaces, it is preferable t heat baths containing this reagent with wet steam rath than by steam-pipes, for by the former method the amoun of metallic surface exposed to the solution is very consider ably diminished. Favourable results are obtained when th steam is introduced by means of lead or copper tubes. —G. T. M.

Sulphur Dyestuffs; Dyeing with ——. A. Paul. Zeit für Farben- und Textil-Chem., 1902, **1**, [7], 178—182.

WHAT are technically termed Sulphur Dyestuffs are dyestuf which, with few exceptions (see Eng. Pats. 21,832 and 22,46 of 1898, 5039 and 18,658 of 1899; this Journal, 1899, 909 1900, 141 and 816), are manufactured by melting togethe organic substances, sodium sulphide and sulphur, and ar characterised by their property of dyeing unmordante cotton from baths containing sodium sulphide.

In this connection the sodium sulphide is commonly sup posed to act as a reducing agent. Instead of sodiu sulphide, trithiocarbonates (Fr. Pat. 299,373), sulphydrate (Fr. Pat. 302,338), hydrosulphites (Eng. Pat. 24,455 c 1899; this Journal, 1901, 41), and a mixture of gluco and caustic soda (Eng. Pat. 15,413 of 1900; this Journa 1901, 713) have been proposed for use, but none of the are employed in practice. In the construction of th dye-vessels, copper and alloys of copper must be avoide on account of the action of sodium sulphide upon this meta Linen is dyed by the Sulphur Dyestuffs in the same manne as cotton. Mercerised cotton has greater affinity tha ordinary cotton for these dyestuffs. Most of the dyestu of the Benzidine, Diamine, Congo, &c., classes, are decom posed by sodium sulphide. They cannot, therefore, b applied with the Sulphur Dyestuffs in the same dyebath The range of colours obtainable with the Sulphur Dyestu comprises black, blue, green, and brown.

Blacks.—The Sulphur Blacks, in virtue of their fastnes compete with Aniline Black, over which they possess th advantage of not damaging the fibre.

Browns.—The Sulphur Browns rank next in importan to the Blacks. These have to compete with Catechu, whic besides being inexpensive, gives a fast colour. The fi Sulphur Dyestuff discovered (in 1873), namely, Cach de Laval (see this Journal, 1896, 328), belongs to th group. The dyeings from this are fast to washing but n so to light.

Blues.—The earliest-known member of this group, *viz.*, mmedial Blue, is one of the most important, being largely mployed in both yarn and tissue dyeing. This dyestuff is losely related to Immedial Black, but it possesses the roperty of changing into a blue when it is treated, after yeing, with alkaline oxidising agents. It is not so bright shade as Indigo, but it can be over-dyed with basic dye-uffs and thus brightened; it is remarkably fast.—E. B.

ulphur Dyestuffs; Printing with ——. R. Fischer. Zeits. für Farben- und Textil-Chem., 1902, **1**, [7], 176—178.

OST of the commercial preparations of Sulphur Dyestuffs ntain sodium sulphide, which is used in manufacturing e dyestuffs, and which it is unnecessary to remove from em, as, in dyeing, an addition of this compound is made the dye bath. In tissue printing, however, its presence nders the direct application of the dyestuffs by means the ordinary copper rollers, impracticable, since these are pidly destroyed by printing mixtures which contain it. few of the commercial products, prepared specially for ployment in printing, are free from it, but they do not, general, give results of technical value.

The observation that the Sulphur Dyestuffs become ed when they are reduced in strongly alkaline solutions, d are then applied to cotton tissues, led to several methods printing them being devised (Eng. Pat. 19,670 of 1900; s Journal, 1901, 1110). One of them, which consists in ating with caustic soda and zinc dust, yields, especially the case of the black dyestuffs, results that are very isfactory as regards depth of shade, fastness, and nomy of production, but owing to the difficulty, so far t overcome, experienced in thickening the solutions for ntiog, the "whites" become stained, through the running the colours during the operation of steaming. More-er, many of the dyestuffs easily suffer over-reduction in process of preparing the solutions and then give duller ades.

Another method of printing is based upon the well-own fact that alkali sulphides are the best solvents and ng agents for dyestuffs of this class, the printing being omplished by means of nickel-plated rollers, as it has n found that this metal is not attacked at the ordinary mperature by sodium sulphide (Fr. Pat. 315,230 of 1901; s Journal, 1902, 406). The preparation of the printing xtures is effected by dissolving the dyestuff, along with ium sulphide and sodium carbonate in water, and adding thickening, *e.g.*, gum tragacanth paste or a mixture of and British gum solution. For example, a mixture is ple (for a dark blue) of 6 parts of Katigen Indigo B W ra, 9 parts of crystallised sodium sulphide, 3 parts of ium carbonate, 16 parts of water, and 60 parts of gum agacanth paste (65 : 1000). This is printed and steamed 1 hour without pressure. The printed tissue is then ll washed and treated for ½ hour, at a temperature of ° C., with 1 grm. of potassium biehromate, 1·5 grms. of per sulphate and 20 c.c. of acetic acid at 6° B., per litre water. The tissue is again well washed, soaped for minutes at a temperature of 60° C., and dried.

n account of their great fastness, the Katigen dye-fs, printed by this method, are to be highly commended. elvet printing, and in the shirting styles of calico print-ing especially, they should find application.—E. B.

key-Red Oil. Fürth. Färber-Zeit., 1902, **13**, [11], 149—150 and 166—170.

T: Turkey red obtained by the modern short method is n marred by stains due to an iron mordant, whereas colour produced by the older process is comparatively fr from this blemish. The iron stain is distinguished fr the brownish-black lime-stain by its superior fastness to couring agents; it is due to the presence of ferric co pounds, its appearance being prevented by adding to the m lanting bath some reducing agent, such as stannous ch ride, sodium bisulphite, acetaldehyde, or arsenious acid; th addition of 6 kilos. of the first mentioned to 1,500 litres ol luminium sulphate solution of 5° B. sufficing. This tr ment does not, however, hinder the formation of the bl stains arising from the faulty preparation of the sulphated oil. The best effect is obtained with an oil (castor, olive, or olein) which has been submitted to the action of sulphuric acid of 66° B. (1 acid : 5 oil), at the ordinary temperature for 12—24 hours.

Under these conditions about 20 per cent. of the acid enters into combination with the oil. This sulphated-oil is most economically applied to the fibre in the form of its potassium salt. The product of the action of sulphuric acid is mixed with an excess of 5 per cent. caustic potash solution and the emulsion clarified with ammonia. When steeped in this solution, the yarn removes practically the whole of the oil, only a trace being noticed in the waste liquors. This effect is due not to the "salting out" action of potassium sulphate, but to the slight solubility of the potassium salt of the sulphated oil in the excess of alkaline solution.—G. T. M.

English Patents.

Fabrics [Textile, from Gums, &c.]; and Process of Manufacturing ——. B. J. B. Mills, London. From J. Mugnier, Lyons, France. Eng. Pat. 9482, May 7, 1901.

See U.S. Pat. 692,467; this Journal, 1902, 341.—E. B.

Raw Cotton and Cotton Goods; Reducing the Inflammability of ——. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd., Manchester. Eng. Pat. 9695, May 9, 1901.

To prevent or greatly lessen their propensity to flash or take fire, when brought into contact with a flame or highly heated matter, raw cotton and cotton fabrics, more especially flannelettes, are treated with a solution of a soluble tungstate, such as sodium tungstate, to which a soluble aluminium salt is added, along with an organic acid suitable for preventing the formation of a precipitate.—E. B.

Wool-Scouring with Volatile Solvents. E. Maertens, Providence, R.I., U.S.A. Eng. Pat. 8682, April 14, 1902.

See U.S. Pats. 698,207—698,211; page 858.

—E. B.

Wool, Hair, Silk, Feathers, Leather, &c.; Bleaching and Dyeing ——. J. Brown, Cologne, Germany. Eng. Pat. 12,319, June 17, 1901.

The materials mentioned, along with vegetable fibres, "which, by nitrating, mercerising, or similar treatment, have acquired the properties of animal fibres," are dyed, &c., in a suitable apparatus, under pressure reduced to such a degree that the liquors employed boil at a temperature of 45° C. The materials, it is claimed, are thus better acted upon than when they are treated in the customary manner, while their valuable properties are preserved.—E. B.

Textile Materials in the Form of Cops, &c.; Treating [Dyeing] ——. G. de Keukelaere, Brussels. Eng. Pat. 13,395, July 1, 1901.

A perforated box is used, one of the sides of which can be raised for the purpose of introducing the cops, bobbins, or spindles carrying the materials to be dyed. The box is lined with cloth, then filled with the materials *e.g.*, cops, which are packed in layers side by side. Next, the spaces between the cops are filled with sand "or equivalent pulverulent material," which is put into the box and then uniformly distributed in it by means of a current of water. After the water has been allowed to drain away, the box is closed. It is then placed in a dye-vat, and the cops are dyed. Finally, the box is removed from the dye-vat, opened, and the cops washed to remove the sand.

Cops and bobbins of all sizes can be dyed in one and the same apparatus.—E. B.

Printing Calico and other Fabrics; Machines for ——. The Calico Printers' Association, Ltd., and G. Higginbotham, Manchester. Eng. Pat. 13,313, July 1, 1901.

The machines used in printing headings or other designs across cotton tissues at certain definite intervals, as, for example, in the printing of scarves, are so constructed that the "lift and drop" or "jumping" motion, imparted to the

printing roller, is given at precisely the same interval, according to the length to which they are set. The consequence of this is, that in the continuous printing of several lengths of tissue, a certain length of the latter is wasted on at least one side of every seam or "end."

This is avoided by giving the machine attendant such control over the "lift and drop" motion that he can print a heading immediately after an "end" is passed, which is accomplished by arranging upon the intermediate or "quarter-yard" shaft, in the machine commonly employed, a "free-wheel" motion, combined with the driving wheels of the front and back cam-shafts upon which the cams, which give the printing roller its "lift and drop" motion, are fixed. The cams can thus, by suitable mechanism, be thrown into rapid motion at any desired time. After printing in this manner, the machine goes on printing headings at the required distances until the attendant again "jumps" the printing roller close behind the next "end."
—E. B.

Resist under Indigo; White ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,421, Aug. 15, 1901.

See Fr. Pat. 313,926; this Journal, 1902, 342.—E. B.

Black produced by Oxidation or Steaming on Textile Materials; Improved Manufacture of a ——. O. Imray, London. From the Farbwerke Hoechst, Hoechst a/Main, Germany. Eng. Pat. 15,062, July 24, 1901.

See Fr. Pat. 313,035; this Journal, 1902, 114.—T. A. L.

United States Patents.

Mordanting Animal Fibre; Process for ——. Otto P. Amend, New York. U.S. Pat. 700,284, May 20, 1902.

The animal fibre is steeped in a bath containing free chromic acid at the ordinary temperature, the insoluble metallic oxide being formed within the material by the subsequent action of a reducing agent, such as sulphuretted hydrogen, ferrous sulphate, cuprous chloride, formic acid, or lactic acid. In those cases where the dye-bath itself contains reducing agents, such as the aromatic amines or their salts, the employment of an auxiliary reducing agent is unnecessary.

In developing the chrome mordant by this process, the temperature of the bath should not exceed 160° F. (71° C.).
—G. T. M.

Wool; Process of Cleaning ——. E. Maertens, Providence, Rhode Island, U.S.A. U.S. Pats. 698,207, 698,208, 698,209, 698,210, and 698,211, April 22, 1902.

Wool which has been subjected to the action of a volatile solvent, and while it still retains some of the latter, is treated with an aqueous acid or acid saline solution (prepared, for example, with sulphurous, sulphuric, oxalic, or hydrochloric acid, aluminium sulphate or chloride, alkali hyposulphites, hydrosulphites or bisulphites), the object being to liberate the fatty acids from the potash soaps present, and thus to cause them to be extracted by the volatile solvent, to destroy colouring matters, and to neutralise or remove any "chemical impurities." When the wool to be treated is heavily charged with natural soaps, these are removed by washing with water or a solution of "potash soaps" before the acid solution is applied.

In the process of scouring wool with volatile solvents, saline solutions (sodium chloride, sodium sulphate, &c.) are employed, first, in moving the solvents by displacement, *e.g.*, to or from storage tanks; secondly, in removing the residue of them from the extracted wool; and, thirdly, in preventing foaming, in consequence of the formation of an emulsion, in the stills, in the operation of recovering the solvents from the extract. Acid solutions or mixed acid and saline solutions (oxalic, sulphuric, and hydrochloric acids, sodium bisulphate, calcium and barium chlorides, &c., in conjunction with common salt) may be used for the first and third of such purposes.

Wool which, after extraction with volatile fat solvents, still contains natural soaps or potash compounds, is washed with a solution of common salt or of sulphuric acid, or of both these compounds, in order to prevent the precipitation on the fibre of insoluble soaps or substances insoluble in the solvent employed, thus avoiding emulsification when the solvent is displaced with water. The wool is afterwards washed with water, and then, if fatty matters be present, with a solution of alkali or soap.

Wool is first freed from potash soaps, then pressed, rinsed with water, again pressed, and treated with a solution of common salt or of sulphuric acid, or of both these compounds. It is then extracted, in the wet state, with a volatile fat solvent, and again washed with water or treated with the salt or acid solution. Finally, the acid in it is neutralised, and the wool is washed with water.

The greater part of the soaps and potash salts naturally present in wool is removed by washing with water; the wool is then impregnated with an aqueous saline or acid solution (prepared from sodium chloride, sodium bisulphate, sulphuric acid, or oxalic acid) in order to prevent subsequent emulsification, extracted with a volatile fat solvent, the greater part of the solvent removed by draining, pressing, or displacing with water, and the rest expelled by heating, steaming, or treating with solvent vapours under reduced pressure.—A. S.

Indigo [*Indigo Dyestuffs*]; *Process of Fixing Dyes on* ——. E. Lurati, Traun, Austria-Hungary. U.S. Pat 700,521, May 20, 1902.

The material to be dyed is treated with naphthol and Turkey-red oil, printed with a resist and diazotised *p* nitraniline, then dyed in an indigo vat, and finally treated with acid until the Paranitraniline Red is fully developed.
—T. A. L.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

United States Patent.

Marble, Stone, or the like; Process of Colouring —— W. G. Roach and A. C. Roach, both of Cincinnat U.S.A. Assignors of Three-fifths to H. C. Yeiser an O. H. L. Wernicke, Cincinnati. U.S. Pat. 700,090, Ma 13, 1902.

Either marble, stone, or the like, is heated to about 212° F and then the dyestuffs dissolved in coal-oil are applied; th dyestuffs so dissolved are said to permeate the pores of th heated marble, the surface of which is then coated wit paraffin to fix the colours.—W. C. H.

VII.—ACIDS, ALKALIS, AND SALTS.

Erratum.

This Journal, 1901, page 578, col. 2, line 15 from top Delete the formula here for Caro's acid, which is incorrect

English Patents.

Barium Chloride; Production of ——. J. Waldbaue Louvain, Belgium. Eng. Pat. 8184, April 8, 1902.

Solutions of ferrous chloride and of barium sulphide, i equivalent proportions, are mixed; after separating th precipitated ferrous sulphide, the barium chloride crystallised from the solution. Or ferrous chloride furnaced with barium sulphate and carbon, and from th cooled product barium chloride is obtained by lixiviation.
—E. S.

Common Salt (*Chloride of Sodium*); *Manufacture of* — F. P. Gutierrez, Cabezon de la Sal, Santander, Spai Eng. Pat. 11,497, June 5, 1901.

Brine is concentrated in closed vessels, in series, by mea of steam and multiple evaporation in a vacuum. The s crystallises out in the vessels, and is withdrawn from t bottoms. Glycerin or sugar, in small proportion, is add to the brine to impede the formation of incrustations.—E.

UNITED STATES PATENTS.

Sulphuric Acid; Apparatus for Making ——. A. M. G. Sébillot, Paris. U.S. Pat. 700,249, May 20, 1902. See Eng. Pat. 21,616, 1898 (this Journal, 1899, 144).

THE contact apparatus is a vertical column of acid-proof material, having a perforated partition at a certain distance from the bottom, upon which pieces of pumice stone are placed to a considerable height, the spaces between the pieces being filled with loose asbestos. Above the filling a series of perforated stoneware plates are arranged, each supporting a layer of asbestos and of spongy platinum. Into the free space above, forming the mixing chamber, the hot mixture of sulphur dioxide and air is led along with steam and a regulated supply of air, which gases and vapour are drawn through the contact material and packing beneath into the bottom chamber of the column, in which pipes are set, cooled by a current of water, whereby the acid vapours are condensed.—E. S.

Sulphuric Acid and Sulphuric Anhydride; Process of Making ——. C. Krauss and R. M. von Bernueck, both of Höchst, Germany. U.S. Pat. 700,512, May 20, 1902.

BURNT pyrites is fed into the upper end of a long inclined rotating cylinder, furnished with internal longitudinal ribs or shelves, into the lower end of which hot gases from the pyrites burner pass. The burnt pyrites used is in coarse lumps, and previously saturated with ferrous sulphate solution. The descending material meets the ascending current of gases until it falls from the lower end of the cylinder into a chamber. At the upper part of the cylinder, "sulphur dioxide is fixed by the burnt pyrites; in the next and hotter zone, the ferrous sulphate in the material is decomposed, and the sulphuric anhydride therefrom and from the SO_2 fixed in the first zone, is evolved," catalysis occurring in the third and hottest zone.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

[*Pottery*] *Biscuit Bodies.* H. Hegemann. Chem.-Zeit., 26, [40], Rep. 145.

PARTICULAR attention is drawn to the importance of fine grinding, in order to prevent the appearance of stains in the biscuit, owing to excessive porosity. In the case of bodies rich in sand particularly, imperfect grinding will result in insufficiently close texture of the biscuit when fired. Bodies rich in kaolin and low in quartz have a fine-grained, marble-like structure, *e.g.*, a body of the following composition: kaolin, 50 parts (by weight); felspar, 35; quartz, 15 parts. An especially durable body is furnished by a mixture of kaolin, 46·25; felspar, 38·5; quartz, 15·25 parts. The firing temperature of these bodies is that of Seger cone 12.—C. S.

UNITED STATES PATENTS.

Glass; Apparatus for Refining and Delivering ——. W. D. Keyes, Kittanning, Penn., U.S.A. U.S. Pat. 696,738, April 1, 1902.

In the end wall of the refining compartment of the furnace is a seat, in which is a super-refining compartment, mounted to turn on a horizontal axis. The front wall of this compartment is higher than the rear wall, and when the compartment is in its normal position, glass can flow from the refining compartment over the lower rear wall into the movable compartment, the higher front wall of which closes against the roof of the seat, and excludes the outer air. When rotated about its axis, the rear wall closes the refining compartment, and the glass in the super-refining compartment discharges over the front wall on to a table.
—W. C. H.

Ceramic Products; Manufacture of ——. M. Buchner, Mannheim, Germany. U.S. Pat. 700,673, May 20, 1902.

DIMINUTED previously-melted aluminium oxide (2 parts) is mixed with divided kaolin (1 part), the requisite amount of water added to form a plastic mass, and the latter moulded in the required shapes. The addition of the previously-melted aluminium oxide is said to prevent change of volume in the articles fired.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Portland Cement; Note on the Retardation of Setting of ——. Ed. Nihoul and P. Dufossez. Bull. Scient. de l'Assoc. des Élèves des Ecoles spéciales de Liège, No. 3.

THE rapidity of setting is often a serious disadvantage in the manipulation of mortar, and since the "setting" test has for a long while been the only criterion of the proper burning of Portland cement, manufacturers have been in the habit of adding some foreign substance, generally calcium sulphate, in order to retard the setting. Portland (or slow-setting) cement behaves differently with calcium sulphate from Roman (or quick-setting) cement; for the latter contains a large proportion of calcium aluminate, which, as Candlot has shown, can react with the sulphate before the cement sets. Dolot's researches show that small quantities of calcium sulphate have no important influence on Portland cement used for open-air work, but 2—3 per cent. may rapidly bring about destruction of marine work. The explanation given by Candlot is, that the calcium sulphate reacts with the aluminates present to form a compound of the formula $(Al_2O_3.3CaO)$, $2·5(SO_3.CaO)$, which crystallises with several molecules of water, but is only formed in the absence of free lime. He obtained the compound with chemically prepared calcium aluminate, but the authors have investigated the question, using actual cement.

The first point considered was, whether the calcium sulphate behaves, physically, merely as a mechanical diluent of the cement, or reacts chemically, after previously passing into solution.

The details of the cement used are as follows:—

Grain.—Residue on sieve of 900 meshes per sq. cm., 2 per cent.

Weight.—One litre, not heaped up, weighed 1·3 kilo.

Setting.—Beginning of setting, 8 min. End of setting, 13 min.

The chemical composition was as follows:—

Water, 0·20 per cent.; silica, soluble, 21·20; silica, insoluble, 1·60; oxide of iron, 1·27; oxide of aluminium, 7·79; lime, 65·80; magnesia, 0·59; carbon dioxide, 1·36; loss on ignition, 0·19 per cent.

(1.) Influence of the amount of admixture of calcium sulphate. In the following table, column 1 gives the percentage of admixture, column 2 the time of beginning, and column 3 the time of ending, of setting:—

Pure Cement.		8 Min.	13 Min.
		Hr. min.	Hr. min.
Plaster	1 per cent.	1 10	5 20
	1·5 „	1 40	6 0
	2 „	2 7	6 32
	3 „	2 51	6 50
	4 „	3 9	7 10
	5 „	3 33	7 12

From this the calcium sulphate would appear to play a physical part in the hardening.

(2.) Influence of the physical condition of the calcium sulphate. The authors found that the finer the grain the greater the retardation of the setting. They also employed the calcium sulphate in four different forms:—Ordinary plaster, precipitated calcium sulphate, unburnt gypsum, and burnt gypsum. With the first two varieties the retardation was proportional to the amount of substance added. With the burnt gypsum it is not the same, crystallisation occurring during the hardening. With unburnt gypsum small quantities retard the setting, but the reverse action occurs when more than 2 per cent. is added; below that limit gypsum is by far the most useful form to employ.

(3.) The authors also experimented with varying proportions of different substances, chiefly those analogous to calcium sulphate, *viz.*, strontium sulphate, barium sulphate, calcium phosphate and aluminate, and also inert bodies, sand, and precipitated silica, which is easily soluble. Most of these hastened the setting; sand and silica, even up to 10 per cent., were without effect; and calcium phosphate slightly retarded the hardening.

The following table gives a useful epitome of the results of this series of experiments, and shows that crystalline system, specific gravity, and solubility do not seem to affect the phenomenon, and also that only calcium salts affect it. Hence the action appears to be chemical.

Two per cent.	Amount dissolved per litre at 15° C.	Specific Gravity.	Crystalline System.	Setting.	
				Beginning.	End.
	Grms.			Hr. min.	Hr. min.
Calcium sulphate.	2·554	2·97	Rhombohed.	2 7	6 32
Strontium sulphate.	0·143	3·85	Orthorh.	0 3	0 5
Barium sulphate.	0·0023	4·33	„	0 3	0 4
Calcium phosphate.	1·116	3·18	„	0 8	0 18
Calcium aluminate.	0·844	—	Cubic	0 1	0 3
Silica.....	0·248	2·20	Amorphous	0 5	0 6·5

(4.) Influence of substances dissolved in the mixing water. Saturated solutions of calcium sulphate, phosphate and aluminate, strontium sulphate, and barium sulphate were employed, and only the first retarded the setting; the others tended rather to hasten it. With a concentrated solution of calcium chloride, the cement set in one minute and hardened in three minutes.

(5.) Similar results were obtained with another, but a "slow"-setting, Portland cement.

The authors conclude that with different cements different results would be obtained, varying especially with the age of the cement. The influence of calcium sulphate on the setting appears to be of a chemical nature, and it is the most suitable body to employ in practice.—W. C. H.

Cement Testing; Additions and Modifications relating to the Standards in ——. Thonind.-Zeit., 26, [29], 305.

The following additions and modifications in connection with standards in cement testing have been published by the Prussian Ministry of Public Works:—

The preparation of Standard Mortar (1 : 3), and the Test Block for Tensile Tests:—

(*a*) *Mixing the Mortar.*—The mixing shall be performed with the Steinbrueck Schmelzer mixer, 500 grms. of cement and 1,500 grms. of normal sand being first mixed together, in the dry state, with a light spoon, for half a minute. After adding the prescribed amount of water, the damp mass is stirred for half a minute longer, then spread uniformly in the machine, and mixed by 20 revolutions of the pan.

(*b*) *Determining the Amount of added Water.*—When cube moulds are used, the above proportions of dry ingredients are made up with 160 grms. (8 per cent.) of water and mixed as described, a second test being made, if necessary, with 200 grms. (10 per cent.) of water. 869 grms. of the finished mortar are placed in the mould and subjected to 150 blows in the Boehme hammering machine, the behaviour of the mortar under this treatment showing which amount of water is nearest the proper limit. The right proportion will be obtained when, between the 90th and 110th strokes, an exudation of cement pulp appears at either of the grooves. The mean obtained with three test blocks is decisive, and applies both in the preparation of the tensile and compression samples. As the water escapes more slowly when the mould top is dry, the first test with a dry mould must be disregarded as unreliable. In the case of tensile tests the exudation of pulp forms an unreliable guide to the requirements of the cement in respect of water.

(*c*) *Preparing the Test Blocks.*—180 grms. of the mortar are placed in the standard tensile test moulds, and 860 grms. in the compression test moulds; in either case the blocks are exposed to 150 blows in the Boehme machine. The mortar furnished by the first-named quantities of sand and cement is sufficient for two blocks of each kind. The blocks and moulds are laid on a non-absorbent substratum in closed, damp boxes, and left—the tensile-test blocks about half an hour, the others about 20 hours, before being removed from the moulds. At the end of 24 hours after completion, the blocks are submerged in water at 15—20° C. where they remain until immediately before the application of the tests.—C. S.

English Patents.

Cement; Machine for Damping and Mixing ——, *and the Preparation of Evenly Gauged Test Briquettes therefrom; and for Making Bricks from Powdered Materials.* A. C. Davis, Cambridge. Eng. Pat. 9617, May 9, 1901.

The machine consists of a divided hopper for holding exact amounts of cement, and water; the discharge from the hopper is received between rollers, and from them passes to spiral or paddle mixers, and then to a receptacle or mould, which is moved to a point underneath a die, which presses the briquette. The mould is provided with a false bottom, which can be lifted by a lever in order to remove the briquette.—W. C. H.

Cement; Process for Producing ——. H. Passow, Hamburg, Germany. Eng. Pat. 13,793, July 6, 1901.

The raw materials are melted together, the molten product rapidly cooled, then ground and mixed with one-half to 5 per cent. of lime. Rapidly cooled ground furnace slag may also be used. (See also Eng. Pat. 14,278, 1900; this Journal, 1901, 992.)—W. C. H.

United States Patents.

Brick and Kiln Furnace. F. E. Swift, Washington, Iowa, U.S. U.S. Pat. 695,590, March 18, 1902.

The object of the invention is to make provision in the furnace for mixing heated air with the gases, in order to ensure their perfect combustion, and for feeding the fire with air from the back part of the furnace, so that the front part thereof may be closed up whenever desired, and draughts of wind prevented from having any effect on the fires.—A. S.

Bricks, &c.; Kiln for Burning ——. E. C. Briee, Colwyn Pennsylvania, U.S.A. U.S. Pat. 695,904, March 25, 1902.

The invention relates to that class of kilns for burning bricks sometimes termed "tunnel kilns," in which the brieks are suitably set or piled upon cars or trucks, which latter are entered at one end of the tunnel, and, when the burning operation is completed, are removed from the other end. The object of the patentee's improvements is to diminish the cost of burning the bricks in such a kiln by economising the heat and fuel, and shortening the time required to effect the burning.—A. S.

Cement; Shaft Furnace for Burning ——. J. A. F. C. Seumenieht, Lagerdorf, Germany. U.S. Pat. 699,855, May 13, 1902.

See Eng. Pat. 11,347, 1900; this Journal, 1900, 827.
—W. C. H.

X.—METALLURGY.

Gas from Wood for use in the Manufacture of Steel. J. Douglas. Iron and Steel Inst., May 1902.

In view of the desirability in some localities of making fixed gas from wood for service in the gas-engine, or in the manufacture of steel, the author describes the manufacture of such gas by means of a modification of the Loomis gas-producer at the works of the Moctezuma Copper Company, at Nacozari, Mexico. The plant consists of two sets of twin generators, with a boiler interposed between each set. The wood, which at Nacozari consists of inferior oak, is fed, without previous drying, on to the t

of a layer of incandescent coke or charcoal resting on the grate bars of the generator. The process is carried on with a view of making a uniform gas of a calorific power higher than that of producer-gas, but lower than that of water-gas. For this purpose a small proportion of steam is mixed with air, and the two are drawn almost continuously downward through the incandescent fuel. Every half-hour or so the heat of the burning fuel becomes excessive; the feed-port is then closed, and steam alone in larger volume is drawn through the layer of fuel till the temperature is sufficiently reduced to permit of reopening the door and again supplying the mixed air and steam to the charge. When using wet wood the mixed water- and producer-gas can be made without the injection of any steam, the water in the freshly-cut wood supplying the necessary quantity. The mixed gas contains :—Hydrogen, 13·50 to 22·5, mean 19·90 per cent.; carbon monoxide, 11·00 to 15·5, mean 13·04 per cent.; methane, 1·67 to 3·10, mean 2·57 per cent.; olefines, 0·20 to 0·60, mean 0·33 per cent.; carbon dioxide, 14·40 to 17·90, mean 16·00 per cent.; oxygen, 0·00 to 0·40, mean 0·10 per cent.; and nitrogen, 45·19 to 55·20, mean 48·00 per cent. Its calorific power, as determined on eight samples, varied between 113·2 and 146·9, mean 136·36, B.T.U. at 62° F. and sea-level.

—A. S.

Sulphur; Removal of ——, from Coke and Pig-Iron in the Cupola Furnace. P. Reuseh. Stahl u. Eisen, **22**, 415—416. Chem. Centr., 1902, **1**, [21], 1256.

West has stated that the sulphur in foundry pig-iron has a considerable influence on the quality of the product, a difference of even 0·01 per cent. (0·03 instead of 0·02 per cent.) leading to defective castings. The author reports on experiments made with a view of reducing the sulphur to traces in the cupola furnace by the addition of manganese ore as a flux. The pig-iron used in the experiments contained 0·006 per cent. of sulphur; the coke, 0·81 per cent.; and the manganiferous clay-slate used as flux, 7·7 per cent. of manganese and 0·99 per cent. of SO_3 = ·36 per cent. of sulphur. On smelting in the ordinary way, the cast-iron contained 0·04—0·056 per cent. of sulphur; with an addition of 1 per cent. of the manganese ore and 2 per cent. of lime, the cast-iron contained 0·004—·007 per cent. of sulphur; whilst with the addition of and 3 per cent. of manganese ore the product only obtained traces of sulphur.—A. S.

Iron and Silicon; Compounds of ——. P. Lebeau. Ann. Chim. Phys., **26**, [7], 5—31. Chem. Centr., 1902, **1**, [22], 1267.

The iron silicide, $SiFe_2$ (see this Journal, 1900, 1116), has the sp. gr. 6·85 at. 20° C., hardness about 6, and fuses below 1200° C.; it is relatively stable, and dissolves unaltered in many metals. The compound SiFe (see this Journal, 1899, 586) is dissolved slowly but completely by hydrochloric acid; it dissolves in *aqua regia* the more readily the richer the latter is in hydrochloric acid. It is decomposed by molten metals, forming $SiFe_2$ and free silicon. The compound Si_2Fe (see this Journal, 1901, 479) is obtained by heating iron with a large excess of silicon in the electric furnace, washing the powdered reaction-product with dilute caustic soda, nitric acid, and hydrofluoric acid, and separating any admixed carbon silicide by means of methylene iodide. It forms small glittering dark grey crystals, sp. gr. 5·40 at 15° C., hardness 4—5. Fluorine, chlorine, bromine, and iodine decompose it with production of flame; oxygen, even at 1200° C., only oxidises it superficially. It is not acted upon by hydrochloric, nitric, and sulphuric acids and *aqua regia*; hydrofluoric acid dissolves it slowly in the cold, rapidly and completely in the warm.

Commercial ferro-silicons with less than 20 per cent. of silicon contain chiefly $SiFe_2$; those with 20—33 per cent. of silicon contain the silicides $SiFe_2$ and SiFe; those with more than 33 per cent. of silicon contain the silicides SiFe and Si_2Fe; whilst products with more than 50 per cent. of silicon contain pure crystallised Si_2Fe mixed with excess of silicon. (See also this Journal, 1902, 348.)—A. S.

Cast Iron; Influence of Aluminium on the Carbon in ——. Melland and Waldron. Oesterr. Zeits. Berg- und Hüttenw., 1902, **49**, 493. Zeits. angew Chem., 1902, **15**, [20], 493.

The material employed was white charcoal iron from Sweden; it was melted in fireclay crucibles well coated with powdered charcoal. The aluminium was placed at the bottom, with the iron at the top; the molten metal was stirred immediately before pouring. The results showed that the addition of less than 2 per cent. of aluminium had no influence on the total percentage of carbon; with additions of aluminium, from 2 to 11·8 per cent., the carbon decreased by 0·13 to 0·39 per cent. In the quickly-cooled tests the presence of aluminium up to 0·23 per cent. appeared to exert no appreciable influence on the separation of graphite, but above that proportion the quantity of the latter rose rapidly until 0·527 per cent. of aluminium was reached; thence up to 1·78 per cent. the separation remained constant, and then decreased. Between 0·23 and 1·78 per cent. of aluminium, the slowly-cooled samples were always grey, and contained about 3 per cent. of graphite; the latter decreased as the proportion of aluminium was increased, and fell to 0·2 per cent. with 11·8 per cent. of aluminium. In no case was the carbon separated completely as graphite. An aluminium content of 0·527 per cent., however, caused the separation of about 3 per cent. of graphite; a quickly-cooled test showed the same quantity of graphite as a slowly-cooled test, the former being characterised by a very fine-grained texture, even with grey iron. A proportion of aluminium of 0·25 per cent. reduced the strength of the material by 60 per cent.; increase of the aluminium up to 3·8 per cent. had no further effect.—J. F. B.

Steel; Microstructure of Hardened ——. J. O. Arnold and A. M'William. Iron and Steel Inst., May 1902.

The clear and definite constituents of hardened steel consist of (*a*) hardenite, $Fe_{24}C$, of which the whole mass consists only in the case of 0·89 per cent. carbon steel; (*b*) ferrite, Fe, which segregates more or less in unsaturated carbon steels in spite of the rapid action of quenching; (*c*) cementite, Fe_3C, which segregates more or less in supersaturated steels in spite of the rapid action of quenching. The indefinite portions of hardened steels consist of unsaturated carbon steels of hardenite, containing more or less unsegregated ferrite, or of supersaturated carbon steels of hardenite containing more or less unsegregated cementite. Martensite is not a constituent, but a crystalline structure developed at high temperatures. It is marked in saturated carbon steels by preferential etching lines, in unsaturated carbon steels by striæ of ferrite, and in supersaturated steels by striæ of cementite. The existence of the constituents sorbite, troostite, and austenite is extremely doubtful. Care should be taken in micrographic analysis not to attribute to new constituents effects which are really due to optical causes or are merely obscure polishing or etching effects. The authors' experiments were confined to pure iron and carbon steels such as are produced in the best crucible practice.—A. S.

Martin Slag. E. Lecocq. Bull. Assoc. Belge des Chim., **16**, [2], 104—106.

With regard to the proposal to utilise these slags for manurial purposes, the author points out that the phosphoric acid content is very variable, fluctuating between 1 and 10—12 per cent. Where the steel-maker purchases Thomas pig-iron, the slags will be comparatively rich in phosphorus, but where rolling-mill waste forms the chief raw material the slags will be poor in that constituent. He is of opinion that where less than 6 per cent. of phosphorus pentoxide is present, the slags would not be worth the expense of packing.—C. S.

Blendes containing Fluorine; Roasting ——. E. Prost and E. Lecocq. Bull. Assoc. Belge des Chim., **16**, [2], 99—104.

In the case of a blende containing F, 7 per cent.; SiO_2, 8·37 per cent.; Fe, 0·62 per cent., ground fine enough to

pass through a No. 130 sieve, 93 per cent. of the total fluorine was eliminated by roasting at red heat in the muffle of a cupellation furnace. With a sample containing F, 2·02 per cent.; SiO_2, 4·66 per cent.; Fe, 0·44 per cent., the results were constant, at an elimination of 31 per cent. of the total fluorine, whether ground fine or coarse (No. 30 sieve). On the other hand, a blende containing 2·30 per cent. of SiO_2 and 10·30 per cent. of Fe, when treated with an addition of 10 per cent. of fluorine and ground to pass through a 2-mm. mesh (the usual fineness adopted in practice), parted with 78 per cent. of the fluorine, the elimination being increased to 90 per cent. by fine grinding (No. 130 sieve). Finally, a blende containing 14·75 per cent. of silica and 5·48 per cent. of iron, also treated with 10 per cent. of fluorine, parted with the whole of the latter when finely ground and roasted, but only with 89 per cent. when coarsely crushed. There would therefore appear to be some connection between the percentage of silica, fineness of division, and the amount of fluorine eliminated.

From other observations made by the authors it would seem that a portion of the fluorine is liberated in the state of free hydrofluoric acid.—C. S.

Zinc-Furnace Cinder; Determination of the Proportion of Metallic Lead in Crude ——. E. Prost, J. Charon, and M. Marisal.

See under XXIII., *page* 874.

Phosphorus in Shot or Chilled Iron, Effect of Annealing on the Determination of ——; by the Permanganate Alkali Method. C. E. Manby.

See under XXIII., *page* 873.

English Patents.

Minerals; Apparatus for the Separation of ——, by the Selective Action of Oils and like Substances. A. S. Elmore, London. Eng. Pat. 15,526, July 31, 1901.

Compare U.S. Pat. 692,643, 1902, this Journal, 1902, 618. The abstract there given applies equally to the first described process and apparatus of the present invention. A modified apparatus consists in a mixing trough for ore slush and oil, delivering on to an incline having steps or baffles, over which passes the reverse way an endless canvas travelling apron, which picks up particles of oil with entangled minerals, these being again detached by passage against a scraper. The separation of the mineral from the oil is effected in a centrifugal machine, such as that described in the above-mentioned abstract. Fresh oil is continuously spread on the travelling apron. The pulp flowing from the incline is discharged into a trough, from the perforated bottom of which it falls on a rotating conical sieve, washed on one side of its surface by a warm water spray, which carries the oily particles into a launder on that side, whilst another launder on the opposite side conveys the treated pulp to the tailings dump.—E. S.

Metals, Metalloids, and other Metalliferous Substances; Improved Means applicable for Use in the Separation of Volatile from Non-Volatile ——. G. G. M. Hardingham, London. From F. Heberlein, Bundt Wattwyl, Switzerland. Eng. Pat. 10,351, May 18, 1901.

In separating arsenic or antimony from lead ore, for example, the ore is mixed with coke, coal, sulphur, or sulphides (if not already present), "or other suitable reducing agent," and is heated in, or transferred to a converter after previous heating, where the mass is treated with air, steam, or other oxidising agent, whereby the volatile metals or oxides are driven out and collected, the non-volatile metals remaining in the converter.—E. S.

Zinc; Treatment of Ores containing ——. J. C. Butterfield, Balham, Surrey. Eng. Pat. 2782, Feb. 8, 1901.

Ores containing zinc and other sulphides are roasted without fritting, and the product is ground with caking coal, to which limestone is added as a flux. The ore mixture is placed on a tray or metal plate within a horizontal cylindrical iron or iron-lined retort, projecting beyond the furnace. An air-pump is provided for obtaining a vacuum within the retort, to assist the distillation of the zinc. When complex ores, containing chiefly zinc and lead, with some copper, iron, and precious metals, are under treatment, the residue from the distillation is mixed with lime or sand and iron pyrites, and smelted to obtain a fusible copper sulphide and metallic lead with any precious metals present.—E. S.

Lead and Zinc; Improved Process for the Treatment of Mixed Ores and Compounds, for the Extraction or Separation of ——, therefrom. C. H. T. Havemann, Paris. Eng. Pat. 10,105, May 15, 1901.

Mixed ores, sludges, or sublimates, obtained in the treatment of lead and zinc ores, are mixed with carbon, and heated in a reverberatory furnace connected to condensation chambers, to which part of the zinc passes as oxide or sulphide. Melted iron is then run into the agglomerated mass in the furnace, with stirring, to reduce the sulphides; the reduced zinc oxidises or again forms a sulphide, the fumes of which condense with the first sublimate, and the liquid mass remaining in run into moulds for separation of the lead from the iron, or iron sulphide formed.—E. S.

Copper and Nickel; Extracting —— from their Ores. H. G. C. Thotehrn, Paris, and B. De Saint Seine, Widnes, Lancashire. Eng. Pat. 10,101, May 15, 1901.

Into the furnace in which sulphuretted copper ore, or copper-nickel ore, is being treated, a mixture of superheated steam and air is blown; it may be alone, or carrying mechanically sand, or mixed with chlorine, or with salt and sand. The matte obtained, whether from a rich or poor ore, is tapped in a reverberatory furnace provided either with movable tuyères, or with two rows of tuyères, one row blowing somewhat below the level of the bath, and the other above; so that a jet of superheated steam and air, carrying a suitable pulverulent flux may be forced, either into the interior or on to the surface of the bath.—E. S.

Cobalt Hydroxide, or a Cobalt Ammonium Salt, Preparing ——; the Process being applicable for Separating Cobalt from Nickel, Copper, and other Metals. H. A. Frasch, Hamilton, Canada. Eng. Pat. 19,038, Sept. 24, 1901.

Sodium chloride is added to an ammoniacal solution of the metals, the hydroxides of which are soluble in ammonia; cobalt and nickel are thereby precipitated, leaving copper, zinc, and other metals in solution. The separated precipitate is washed with ammoniated brine, and, on addition of water, nickel-ammonium chloride dissolves, while the cobalt salt decomposes thus:

$$Co(NH_3)_2Cl_2 + 4NH_3 + 2H_2O = Co(OH)_2 + 2NH_4Cl + 4NH_3$$

The cobalt hydroxide is separated. The nickel-ammonium chloride can then be precipitated by salt. The cobalt hydroxide may be dissolved by ammonia and precipitated by salt to obtain cobalt-ammonium chloride, having the formula $Co(NH_3)_2Cl_2 + 4NH_3$, which, dissolved in ammonia solution, may be used in plating. See Eng. Pat. 284, 1901 (this Journal, 1901, 580).—E. S.

United States Patents.

Ores, Complex and Refractory; Treatment of ——. F. Ellershausen, London. U.S. Pat. 700,311, May 20, 1902.

See Eng. Pat. 483, 1900; this Journal, 1901, 47.—E. S.

Fluxing and Separating Compound. A. D. Miller, Mount Pleasant, Pennsylvania, U.S.A. U.S. Pat. 700,52 May 20, 1902.

The compound consists of asbestos and a flux, such borax, with or without an oxidising agent, such potassium permanganate.—E. S.

Blast-furnace Stoves; Air Mixer and Heater for Gas-burners for ——. C. H. Björckner, Lorain, Ohio. U.S. Pat. 695,437, March 18, 1902.

The heated gases from the furnace enter a cylindrical chamber through the top, the dust settling in a lower receptacle therein. The gases pass from the chamber through a central conical nozzle in the rear wall of the chamber. Through the chamber from front to back is fixed a number of concentrically arranged tubes, through which air passes, and is thereby highly heated. This air is delivered through a conical outlet surrounding the gas cone, and mixes with the gases in a tube leading to the blast-furnace stoves.—R. S.

Furnace; Reverberatory Smelting ——. F. Nevegold. Portland, Oregon, U.S.A. U.S. Pat. 695,868, March 18, 1902.

Wood, oil, or gas, are used as fuel. Beyond the bridge-wall to the fire chamber, is the "concentrating chamber," the horizontal bottom lined with graphite tiles, and having a downwardly sloping false arched roof, continuing from over the fireplace, to near its end, the true roof above it extending into the wall terminating the chamber, below which is an auxiliary fire chamber. A blast of heated air, steam and gases is directed on to the roasting and smelting charge by the arched roof. Immediately before the passage-way between the chambers is a second arch, extending over a less inclined part of the hearth, separated from the more inclined portion by a steep step. The inclined portion of the hearth, on which the roasting is effected, is provided with a ram by which the roasted material is pushed forward till it falls on to the smaller, covered and most highly heated compartment, where it is melted, and then flows to the lower hearth of the concentrating chamber, from which the slag may be run off from the heavier matte or metal.—E. S.

Precious Metals from their Ores; Method of Extracting ——. J. Baxeres De Alzugaray, London. U.S. Pat. 701,002, May 27, 1902.

The crushed ore is added to a solution of sodium chloride, sodium carbonate and potassium cyanide, and a gaseous mixture of bromine and air is forced through the mass, after which the precious metals can be recovered from the solution by any known means, such as electrolysis.

—G. H. R.

Amalgamator. E. J. Kiss, Fort Wayne, Indiana, U.S.A. U.S. Pat. 696,452, April 1, 1902.

The amalgamator, which is intended for the treatment of refractory ores needing exposure to mercury fumes, consists of a fixed retort or cylinder of considerable diameter, horizontally mounted in the combustion chamber of a furnace, the cylinder having within it a cylindrical agitator which can be rotated, and into which ore is fed through a mercury seal. There are also means for conducting the mercurialised ore from the cylinder to a water-sealed amalgamating tank, wherein it is brought into contact with mercury, and then mechanically discharged. Everything is so arranged that the escape of mercurial fumes is impossible.—E. S.

Copper and Titanium; Process of Producing Alloys or Compounds of ——. A. J. Rossi, New York. U.S. Pat. 700,244, May 20, 1902.

A method of producing alloys of metals available in the metallic state with metals existing in the form of oxide. The metals in the metallic state are introduced into a bath of molten reducing metal (preferably aluminium), the heat of the formation of whose oxide is at a given temperature greater than that of the metallic oxide to be used, then the metals existing in the form of oxide are added, and heated till reaction takes place. The alumina combines with the oxygen of the metallic oxide, whilst the metallic residuum of the latter becomes alloyed with the metals which were introduced in the metallic state. The process of producing an alloy or compound of copper and titanium is described.—G. H. R.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Metallic Sulphides; Electrical Resistence of ——. J. Guinchant. Comptes Rend., **134**, [21], 1224—1226.

The metallic sulphides present in their physical characters a certain analogy to the metals, while they also behave as electrolytes; and the author determined the electrical conductivity of several of them at different temperatures, to discover whether rise of temperature caused a decrease (as in the case of the metals) or increase (as in the case of bad conductors and electrolytes). Three classes exist, typified respectively by *lead sulphide* (good conductor at ordinary temperature; resistance increases almost proportionately with rise of temperature, from 0·000298 at 0° C. to 0·01294 at 920° C.); *stannous sulphide* (bad conductor at ordinary temperature; resistance decreases with rise of temperature, tending to a limit near the melting point, from 1071 at 0° C. to 0·061 at 920° C.); and *ferrous sulphide* (fairly good conductor at ordinary temperature; resistance diminishes to a minimum about 550°, then increases again: 0·0998 at 13° C., 0·00087 at 580° C., 0·00171 at 868° C.). In all, the rate of variation of resistance, dr/dt, increases with the temperature, starting from a value at 0° C. which is greater as the resistivity itself is greater. This value is positive for good conductors, negative for bad conductors. The sign of the coefficient dr/dt appears to depend on the magnitude of the resistivity, not on any accessory causes.—J. T. D.

United States Patent.

Storage Battery. [*Electrodes.*] L. W. Lombard, Boston. U.S. Pat. 700,210, May 20, 1902.

The improved element comprises a number of thin sheets or strips of metal connected together, and composed alternately of oxidisable and unoxidisable sheets or strips, or of those oxidised with difficulty, all in contact with each other, the oxidisable strips being adapted to be converted into active material by chemical or electrolytic treatment, and the others holding the layers of active material between them, and thus supporting them.—G. H. R.

French Patent.

Nitro Compounds; Process for the Reduction of ——. Boehringer and Sons. Fr. Pat. 316,193, 1901.

[*See under* IV., *page* 856.

(*B.*)—ELECTRO-METALLURGY.

Gold; Electrolytic Precipitation of ——. E. D. Kendall. Eng. and Mining J., 1902, **73**, [20], 700.

The dilute cyanide solution containing dissolved gold is allowed to filter slowly through a mass of hard fragmental carbon, which is packed around the porous cup of an electrolytic cell and forms the cathode. A carbon plate immersed in a solution of caustic soda contained in the porous cup forms the anode. Upon passage of the current (at 15 volts), the double cyanides are electrolysed, the cyanogen being absorbed by the caustic soda, and the gold deposited in a pulverulent form in and through the mass of the cathode. After a considerable quantity of gold has been deposited, the solutions are drained off from the two compartments of the cell and a carbon plate, silvered and rubbed with plumbago is substituted for the carbon anode. The current connections are now reversed, and a strong solution of potassium cyanide made to flow through the cell, the flow occurring successively through the anode and cathode compartments in the order named. Under these conditions the gold is dissolved from the fragmental carbon now forming the anode, and is re-deposited, in reguline form, on the metal cathode in the porous cup.

S. B. Christy has described the advantages of the process as follows:—A plant producing 600 troy oz. of gold in

0 days would, under normal conditions, distribute this metal over 1200 square feet of cathode surface in a film approximately 0·00033 inch in thickness; by re-solution and re-deposition, this gold may be collected upon an area not exceeding 10 square feet, corresponding to a deposit 0·04 inch thick. (See also Pfleger, Eng. Pats. 23,557 1894, and 16,736 and 16,737, 1895; this Journal, 1896 119 and 601).—A. S.

ENGLISH PATENT.

Tin; Process for the Electrolytic Treatment of ——, and an Apparatus therefor. P. Nauhardt, Paris. Eng. Pat. 21,942, Oct. 31, 1901.

THE tin is dissolved by the action of an electric current of feeble voltage, in a bath composed of about 100 parts of water and 10 parts of sulphuric acid, and neutralised by the addition of an ammoniacal salt, preferably sulphate of ammonia, to such a degree as will prevent it from attacking iron, copper, brass, or the like. The process is carried out in lead-lined vessels. For the scouring or stripping of waste tin iron, tinned wire, &c., this lining constitutes the cathode on which the tin is deposited in a crystallised pulverulent form, while the anode is supplied by the waste materials enclosed in a perforated rotating drum, one part of whose inner sides is lined with sheets of lead. The articles to be tinned are connected to the negative pole of a source of electricity, and are immersed, or caused to move about in the already saturated bath, by connecting the positive pole with the leaden lining of the vessel.—G. H. R.

UNITED STATES PATENTS.

Metals from Ores and Scrap containing same; Process of Extracting ——. S. S. Sadtler, Philadelphia. U.S. Pat. 700,563, May 20, 1902.

METALS, such as zinc, the oxides of which form soluble compounds with the alkali-metal hydroxides, are extracted by dissolving the ore in a solution formed by treating a solution of caustic alkali with a halogen, separating the sulphur formed, and decomposing the remaining solution in the cathode compartment of an electrolytic cell. In the anode compartment, which is separated from that containing the cathode by a porous diaphragm, a solution from which the metal has previously been separated is simultaneously regenerated, the solution having been transferred from the cathode to the anode compartment before beginning the operation.—G. H. R.

Copper or other Ores; Process of Treating ——, for obtaining their Contents of Metals. N. S. Keith, Arlington, U.S.A. U.S. Pat. 700,941, May 27, 1902.

THIS process of obtaining a reguline metal from its ores consists in first powdering the ore, and then roasting the powder, after which it is leached with a solvent of the metal. The metal is then deposited from the lixiviate by passing the latter as an electrolyte through a succession of two or more electrolytic cells, connected in series. The anodes are insoluble, and the electrodes of each cell are in multiple series, and have gradually increasing surfaces, whereby there is a gradual reduction of the current density as the metal of the electrolyte is deposited.—G. H. R.

Zinc; Method of obtaining ——, by Electrolysis. L. Mond, London. U.S. Pat. 701,215, May 27, 1902.

SEE Eng. Pat. 5764, 1901; this Journal, 1902, 354.
—G. H. R.

Zinc; Apparatus for obtaining ——, by Electrolysis. L. Mond, London. U.S. Pat. 701, 216, May 27, 1902.

SEE Eng. Pat. 5764, 1901; this Journal, 1902, 354.
—G. H. R.

XII.—FATS, OILS, AND SOAP.

Safflower Oil. N. Tylaikow. Extract from the Moscow Agricultural Institute's Chem. Rep., 1902, 85. Chem. Rev. Fett- u. Harz-Ind., 1902, 9, [5], 106.

THE safflower, indigenous to the East Indies, is being increasingly cultivated in the Caucasus and in Turkestan, as it yields both fatty oil from the seeds and the dyestuf Carthamine. The oil has a pleasant taste, especially whe obtained from the husked seeds, when also it is of bette value than that from the unhusked seeds. The seed contain about 25 per cent. of oil, but only 17—18 per cen can be expressed by hydraulic press. Safflower oil ha a bright yellow colour, and is in taste very similar t sunflower seed oil, to the best qualities of which it is com mercially equal. Safflower cultivation is very profitabl The plant is less subject to injury by climate and insec than the sunflower, therefore great increase in its propagatio is probable.

Two kinds of oil were investigated; one expressed, an the other extracted with ether:—

——	Expressed.	Extracted.
Specific gravity at 0° C.	0·936	0·934
" 15° C.	0·916	0·925
Refractive index at 16° C. (Abbe)	1·477	1·477
Oxygen absorption test (Livache) after two days.	6·4 per cent.	..
Saponification value (Kottstorfer)	172	194
Hehner value	93·87	90·78
Iodine value	126	130
Reichert-Meissl value	0·88	0·69
Glycerin	11·91 per cent.	13·95 per cen
Acid value	10·39 mgrms.	1·25 mgrms
Water	0·33 per cent.	..

The quantities of volatile fatty acids were not large, a were not farther examined.—S. I. K.

Glycerin; Determination of Pure ——, in the Commerci Article. Deiss.

See under XXIII., *page* 874.

Glycerin; Method of Determining ——, by Iodic Ac Chaumeille.

See under XXIII., *page* 874.

ENGLISH PATENT.

Soap Tablets, Bars, and the like. J. R. Mally, Londo Eng. Pat. 13,065, June 27, 1901.

THE soap contains a core of suitable material (woo cork, &c.), either smooth, corrugated, or marked w advertisements.—C. A. M.

UNITED STATES PATENTS.

Oils; Process of Refining ——. E. Douillet, La Garen Colombes, France. U.S. Pat. 700,181, May 20, 1902.

SEE Eng. Pat. 14,329,1901; this Journal,1902, 711.—C. A.

Soap; Process of Making ——. T. Parziale, Alexandr Egypt. U.S. Pat. 700,229, May 20, 1902.

SEE Eng. Pat.10,912,1900; this Journal,1901, 591.—C. A

Detergents; Process of Making ——. G. Bambe London. U.S. Pat. 700,602, May 20, 1902.

OLEIN (commercial oleic acid) is mixed with a suita cereal (*e.g.*, oatmeal) and caustic alkali, and the mixt exposed to the atmosphere until the free alkali is carb ated. The dry powder is stated to be completely soluble cold water.—C. A. M.

Soap Press. W. S. Watson, Philadelphia, U.S.A. U.S. Pat. 701,113, May 27, 1902.

THE soap or other plastic material is conveyed to a mo where it is stamped into cakes by means of dies, the th of which can be regulated, and is then removed by mean an endless belt or other suitable device.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(C.)—INDIA-RUBBER.

English Patents.

ndia-Rubber; Impts. relating to Recovery of ——, *from Vulcanised Rubber Waste.* R. B. Price, Chicago, U.S.A. Eng. Pat. 3468, Jan. 10, 1902.

HE finely divided waste is placed in a jacketed digester, tted with stirring apparatus, where it is submitted to the tion of a previously superheated liquid (such as sodium iosulphate), under pressure produced by the admission of iperheated steam.—M. J. S.

aoutchouc; Process for the Regeneration of ——. E. Zühl, Berlin. Eng. Pat. 3855, Feb. 14, 1902.

HE waste rubber is dissolved at the lowest possible temrature in five times its weight of naphthalene, and the lution is allowed to settle. The solvent is then removed, ther by distillation with steam or by extraction with ethyl, ethyl, or amyl alcohol.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

nnin in Plants; Origin and Role of ——, *and its Transformations during Tanning.* E. Nihoul. Bulletin de la Bourse aux Cuirs de Liège, Nov. 1901.

TER a very complete *exposé* of the origin of tannins, the thor turns to the subject of the :—

Decomposition of Tannins.—The author shows that ine matters exert an important influence in the exction of tannins (see this Journal, 1901, 1005), notably the case of pine and of sumac.

The destructive influence of saline matters in hard water still more apparent from the following figures, which dicate the influence of the hardness of each water, and character of its hardness, upon the relative degree of raction in the case of each tanning agent referred to :—

Water employed.	I.	II.	III.
al hardness	21·84	23·12	26·28
manent hardness	8·76	10·28	14·62
ds per litre	910·8	842·0	1843·0
stnut:			
Organic extract	17·84	16·75	..
Tannin	11·85	10·26	..
Non-tannin total	7·96	9·16	..
Insoluble matter	69·10	70·11	..
Sumac:			
Organic extract	29·08	31·46	18·42
Tannin	12·07	6·97	2·11
Non-tannin total	23·59	32·89	26·56
Insoluble matter	55·61	51·10	62·72
Valonia:			
Organic extract	47·63	45·17	41·91
Tannin	33·18	33·27	29·11
Non-tannin total	19·15	17·71	20·56
Insoluble matter	33·19	34·75	36·19

he increase of insoluble matter is not comparable with t loss of organic extract, nor this, again, with loss in t in, and the mere formation of insoluble tannates c not account for the whole discrepancy.

n the valonia, for example, the increase of insoluble m ter is 3 units from water I. to water III., whilst the o nic extract has fallen 6 units, and the tannin only 4 its ; similarly with sumac, the insoluble has increased 7 its, and the organic extract diminished by more than 1 units. The liquors, moreover, were increasingly d cult to filter, and more and more coloured, so that the fo ation of colloidal phlobaphenes would appear to be in eated, represented in the tanyard by the sediment fo d in the tan-pits. Many extracts are extremely difficult to filter, doubtless from this same cause, quebracho being a well-known example. This difficulty is much less pronounced in the analysis of natural tanning materials, or of extracts weak in tannin and rich in soluble saline matters, which, being electrolytes, have a marked property of precipitating suspended colloidal matter (Körner). The fact that leather gives up tannin with difficulty and, after a certain limit, practically not at all, suggests that the process of tanning is essentially a deposition of phlobaphenes derived from tannins as outlined above, on to the fibres of the hide substance (compare Youl and Griffith, this Journal, 1901, 426—434).

The direct method of estimating insoluble tanning substance in leather by treatment with alcoholic soda, as described by Fahrion, would seem to prove that tannin is deposited on the hide substance in a resinous form. The quantity of material thus determined was 32·4 per cent. in the case of tanned sheep skin, and 21·68 for calf, which figures are within the limits obtained by Schroeder and Paessler's method, and the properties of the substance so isolated agree entirely with those of a resin or resinoid body. It is important, however, to extract this substance by a neutral agent, as it is possible that the alcoholic soda itself alters it to a resin-like body.—R. L. J.

Glue and Gelatin; Analysis of ——. A. Müller.

See under XXIII., *page* 874.

English Patent.

Hides, Skins, and similar Animal Tissue; Tanning and Tawing of ——. E. Maertens, Providence, Rhode Island, U.S.A. Eng. Pat. 12,332, June 17, 1901.

Nitrites of metals possessing leather-forming properties (*e.g.*, chromium nitrite), or nitrites of metals of the alkali or alkaline-earth groups, are either introduced into the tanning-bath or employed in solution upon the raw hide, or upon the hide after tanning, by the usual methods. It is stated that hides thus treated are as completely tanned after a few hours as after several days by the ordinary processes; and that by the use of a nitrite tanning-bath the preliminary "liming," "bating," or "puering" of the skins can be eliminated in many cases, and cheaper "depilating" processes employed. The leather so produced is also said to be stronger, more porous, and capable of resisting greater heat in dyeing processes than the ordinary product.

Oxides or carbonates of alkali metals possessing tanning properties may also be added to the tanning-baths, being kept in suspension by the addition of a suitable acid; also, in addition to the oxides or carbonates, a nitrite of a metal of the alkali or alkaline-earth group, together with an acid capable of acting upon the nitrite, may be employed.

—C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Colorimeter; Use of the ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [10], 1226—1228.

Stress is laid on the importance of the determination of the colour of the juice and other sugar products in order to realise the influence of temperature, and generally to obtain an explanation of the difference in colour of products of the same quality in other respects. The determination need not be absolute, but comparative. The colorimeter of Pellet and Demichel is recommended as suitable for the examination of pale coloured juice in a tube of 200 mm. in an apparatus similar to the old-fashioned colorimeter.

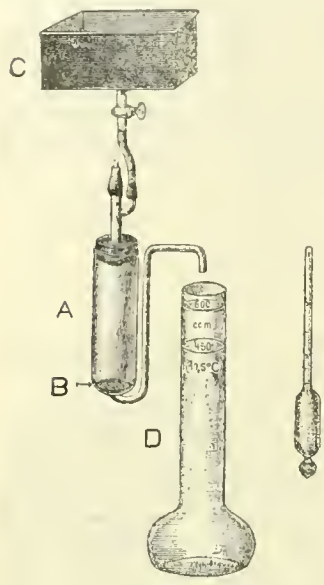
The solutions are first brought to the same density, and then the palest coloured one being taken as the type, the others are reduced to the same tint by trial by the addition of measured quantities of water. Thus a liquid which requires the addition of 37 c.c. of water to 50 c.c. of juice or syrup would be 174:100. If 48 c.c. of water are required to 30 c.c. of juice, the colour would be 260.

—L. J. de W.

Sugar Beetroots; Analytical Diffusion Apparatus for the Valuation of ——. C. Stiepel. Zeits. Ver. Deutsch. Zucker-Ind., May 1902, **52**, 493—501.

The apparatus described below was designed to carry out, on a small scale, for analytical purposes, a complete extraction of beetroot pulp by diffusion with a limited supply of water so as to imitate diffusion on the technical scale.

The diffuser A is a glass or metal cylinder 13 cm. long, 4 cm. diameter, and about 180 c.c. capacity to hold 130 grms. of pulp. From the bottom a narrow tube passes up to just above the level of the top of the cylinder, and is then bent over as shown in the figure. A very fine hair sieve B rests on the bottom of the cylinder to prevent the passage of pulp into the narrow exit tube. Through the cork passes a wide tube with a narrower side tube. The wider tube is closed by a piece of india-rubber tubing and glass rod, and serves for the escape of air from the diffuser during the admission of water by the narrower side tube. The diffusion juice is collected in the flask D, which has marks at 450 and 500 c.c. C is for the water supply. The diffuser is placed in a bath of warm water, and the flask in another bath kept at 17°·5 C. to render correction for temperature unnecessary.



Two hydrometers are used :—2°—4°·5 and 4°—6°·5 Brix, each divided to 0°·05. 130·24 grms. (five times the normal weight) of pulp are introduced loosely and uniformly into the receiver, using hot water. The diffuser is then placed in the bath and connected to the water supply and the wide tube opened to allow air to escape. The water is then shut off, the glass rod replaced, and diffusion commenced. When about 450 c.c. of juice have been drawn off, it is made up to exactly 450° c.c. The flask is closed with a greased stopper, the contents mixed and the degree Brix (*b*) determined. The stopper and hydrometer are rinsed into the flask with dilute basic lead acetate solution (1 : 3 of the normal solution) and the juice made up to 500 c.c. with the lead solution and polarised in a 200 mm. tube. This gives the actual sugar (*a*). The quotient of purity is calculated by the formula $100a \div 3{\cdot}46b$.

Experiments showed that extraction was complete at 50° C. after drawing off 300 c.c., allowing 6 minutes for each 100 c.c., so that 450 c.c. are run off in 30 minutes at least and previous digestion is unnecessary.

The apparatus is suitable for the determination of the marc or exhausted pulp, molasses cattle food or other substances containing sugar, and the valuation of beetroots for the purposes of sugar manufacture, the quotient of purity depending on the temperature during diffusion, the duration of the extraction, the quantity of juice drawn off, and the size of the fragments of pulp.—L. J. de W.

Sugar Juices; Treatment of ——, with Aluminium Powder and Ammoniacal Sulphiting. Besson. Bull. de l'Assoc. des Chim. de Suer. et de Dist., 1902, **19**, [10], 1255—1258. See this Journal, 1902, 713.

The object of this treatment is the purification and decolorisation of the liquors. The purification results from the precipitation of lime salts and the decolorisation from the reducing action of the nascent hydrogen formed in presence of ammonia, but the ammoniacal treatment, originally destined for the juices, had to be transferred to the syrups on account of the destructive action of the ammoniacal juices on the copper of the concentration apparatus.

The concentration of the juice (not previously subjected to ammoniacal treatment) in presence of subdivided aluminium presents advantages to which attention is called. Owing to the fine state of division of the aluminium and the rarefaction which exists in the concentration apparatus, the reaction of the metal on the juice is increased, the protecting layer of hydrogen being unable to envelop the metallic particles.

A remarkable decolorisation and slight purification are observed, and, owing to the slight disengagement of gas which accompanies the progressive and continuous action of the metal, ebullition is facilitated and concentration assisted. Finally, the aluminium, or even better aluminium alloy, acts as a disincrustant, and prevents the fixation of deposits on the walls of the heating apparatus, the precipitate remains almost entirely in suspension, and is afterwards retained in the syrup filters.—L. J. de W.

Cane Sugar Works; Decolorisation of Concentrated Products in ——. M. Buisson. Bull. de l'Assoc. des Chim. de Suer. et de Dist., 1902, **19**, [10], 1232—1233.

The very concentrated products (massecuites, drainage syrups and molasses) obtained in cane sugar works are incompletely decolorised by neutralised acetate of lead, and the polarisation of them is very difficult unless a very intense illumination is available.

Zamaron in 1898 proposed the use of chloride of lime to obtain a liquid easy to polarise, and the author pointed out the use of permanganate of potash for decolorising beetroot sugar products. The effects of these two reagents are compared on cane sugar products. Chloride of lime is effective, but the solution requires to be freshly made daily, and produces a persistent froth, which renders the measurement difficult. Permanganate of potash produces no frothing, but requires to be used in large quantity to obtain a pale straw colour, or a colourless solution.

To 100 c.c. of a coloured solution (20 grms. per 100 c.c.) placed in a 200—220 c.c. flask, from 20 to 80 c.c. of a saturated solution of permanganate of potash are added, according as the solution is more or less coloured. Generally 50 c.c. are required for massecuites and 80 c.c. for low syrups. After resting a few minutes it is noticed that the liquid tends to solidify; at this moment a little water is added, and the flask rotated to keep the mass fluid and prevent the formation of a coagulum. The precipitation of oxide of manganese takes place immediately. If the liquid tends to become heated, the flask is plunged in a current of cold water. When the temperature is normal, the liquid is made up to 220 c.c. with neutralised acetate of lead, mixed thoroughly, filtered and polarised. The liquid obtained is a pale yellow if the permanganate used has been sufficient, and may be polarised with facility, even with a poor illumination.—L. J. de W.

Beetroot Juice; Calcium Salts in ——. H. Pellet. Bull. de l'Assoc. des Chim. de Suer. et de Dist., 1902, **19**, [10], 1215—1219.

Calcium salts diminish or disappear almost completely from the juice when the beetroots are worked up as quickly as possible after being harvested; when diffusion is hastened and the operation effected under established rules, *i.e.*, with good chips, suitable temperature, and with water which does not import calcium salts which are not eliminated by carbonating; when the proportion of reducing sugars in the beetroots diminishes; when the proportion of lime for the purification of the juice and the quantity of fixed alkalis increases; when the purification is made at a higher temperature; when saturation follows immediately on the addition of lime; when the time of saturation is reduced; and when carbonating is carried to the point desired.

Calcium salts are increased when beetroots are used which have been preserved for a considerable time, or those

which have become heated during transport or in the silos, or have been frost bitten. In such beetroots there is an increase in the reducing sugars, and these form organic acids which retain lime not precipitable by carbonic acid. During slow work from want of beetroots, also with bad chips and with water containing calcium chloride, there is also an increase in calcium salts, and reducing sugars are increased. The temperature cannot be fixed arbitrarily as it depends on the quality of the beetroots and other conditions. Sometimes 80° to 82° C. causes no inconvenience, at other times 76° C. is too high. When insufficient lime is used, the decomposition of organic salts is incomplete and the fixed alkalis are reduced. The proportion of reducing sugars is often higher than was at first anticipated. The best fresh beets often contain 1 per cent. and frost-bitten or heated beets, 2 to 4 per cent. of reducing sugars. Salts of alkalis are not decomposed unless the temperature is high enough and the calcium salts are apparently increased. During slow carbonating, lime acts on the organic impurities and forms soluble salts; it is often remarked that the calcium salts are greater in darker coloured saturation products. There is no absolute rule as regards the point of saturation, but no lime should be required to be added in carbonating. In cases where calcium salts are not otherwise removable, carbonate of soda may be used.—L. J. de W.

Pentoses and Pentosans; Determination of ——, by means of Phloroglucinol. Also Pentosan Determination Methods; Application of the ——, to various Vegetable Substances and Paper-making Materials. E. Krober and C. Rimbach.

See under XXIII., *page* 875.

Invert Sugar; Preparation of ——. J. L. Baker.

See below under XVII.

Sugars; Analysis of a Mixture of ——, by the Kjeldahl Method. A. Gregoire.

See under XXIII., *page* 875.

English Patent.

Raw Sugars of Low Quality; Process of Refining ——. W. P. Thompson, from H. A. J. Manoury, Paris. Eng. Pat. 10,113, May 15, 1901.

The process consists in melting the sugars and boiling the syrups in an ordinary vacuum pan to massecuite; the latter is then drawn into a vacuum agitator in which the sugar is exhausted from the mother liquor of crystallisation to the desired degree by a feed consisting in the first place of washings from the centrifugals and in the second of rainings or final molasses. The massecuite arrested at the desired point is run into an open lixiviator where it is allowed to cool, the fluidity being maintained by additions of diluted final molasses. The spinnings from this massecuite constitute final molasses, only part of which is returned, whilst the washings resulting from the clarifying of the sugar are returned in their entirety.—J. F. B.

United States Patent.

Sugar; Process for Converting Cellulose into Fermentable ——. A. Classen, Aachen, Germany. U.S. Pat. 700,616, May 20, 1902.

See Eng. Pat. 4199, 1901; this Journal, 1901, 734.

—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Invert Sugar; Preparation of —— in the Brewery. J. L. Baker. J. Fed. Inst. Brewing, 1902, **8**, [3], 270—296.

The author draws attention to the economic advantage to be derived by the brewer in preparing his own invert sugar from the better sorts of crystallised beet sugar on the market. The most suitable sort of sugar for this purpose in the author's opinion is that known as continental "crystals." It is true that there is a considerable weight of opinion against the use of beet sugar of any kind for brewing purposes, but it is contended that crystals of this class, containing 99·9 per cent. of saccharose and 0·05 per cent. of ash, are so pure as to be free from any objection on the score of flavour. Two different inversion processes are suggested. The first process consists in heating the sugar as a syrup with very small quantities of acid. This process is more suitable for large breweries since the efficiency of such small proportions of acid depends entirely on the quantity of ash in the sugar as determined by frequent analysis. One ton of sugar is dissolved in 560 gallons of water and 13·5 lb. of a 10 per cent. solution of hydrochloric acid are added, the temperature being maintained at 190°—200° F. for about an hour. A table is given showing the variations in the quantity of 10 per cent. hydrochloric acid required for different percentages of ash in the sugar; the proportions range from 13·5 lb. for 0·05 per cent. of ash to 46·2 lb. for 0·075 per cent. of ash per ton of sugar. When less than 25 lb. of acid are used, the acid need not be neutralised after inversion.

In the alternative process, which is not so closely dependent on the composition of the sugar, the inversion is effected by means of yeast. The sugar is dissolved to a concentration of from 30 to 40 per cent. and the temperature of the solution is brought to 133° F. Pitching yeast is then added at the rate of 1·5 to 3 lb. per cwt. of sugar; inversion is practically complete after 5 hours at 130°—133° F. The yeast is not removed but passed on into the wort. The author estimates that by inverting his own sugar and using good quality beet crystals the brewer can save about 2s. per cwt. on his brewing sugar.—J. F. B.

Enzymes; Failure of the Test for ——. E. Pozzi-Escot. Bull. Soc. Chim., 1902, **27**, [10], 460—464.

The Bertrand reaction (the formation of a blue coloration when an enzyme is mixed with guaiacol tincture and hydrogen peroxide) is not given by the members of a class of enzymes widely disseminated in nature, among these being the hydrogenase of the author. The latter has shown experimentally that this anomaly is due to the reducing action of these enzymes on the blue "guaiacolozonide."

—T. H. P.

Beer Yeast; Influence of Concentrated Salt Solutions on the Properties of ——. L. Lepoutre. Bull. Acad. roy. Belgique, 1902, 155—162. Chem. Centr. 1902, **1**, [21], 1242.

Clerfeyt (Bull. Acad. roy. Belgique, 1901, 337) has shown that yeasts can become acclimatised to concentrated salt solutions. The author has examined the action of such yeasts on beer wort. He finds that the quantity of alcohol produced by yeasts acclimatised to concentrated salt solutions is smaller than the quantity produced by the same yeasts, if these have not been subjected to such influence. Under the same conditions, with one and the same yeast, the amount of alcohol decreases with the concentration of the medium. With the same concentration of the medium, the amount of alcohol produced by yeasts acclimatised to salt solutions varies according to the nature of the salt. The acidity of the beer produced is smaller with the acclimatised yeast than with the original material in the case of Doeq yeast, but with Burton yeast the reverse is the case.—A. S.

Fermentation from the Point of View of Yeast Crop. C. G. Matthews and F. E. Lott. J. Fed. Inst. Brewing, 1902, **8**, [3], 313—340.

From the brewers' standpoint it is necessary not only that the yeast should have sufficient vigour to produce a normal percentage of alcohol, but also that it should yield a sufficient crop of healthy yeast for further use. The production of this crop is attended by the withdrawal of nitrogenous and other matters which, if allowed to remain in the beer, would cause instability. The yeast cells in fermenting wort present relatively a very large area of cell membrane, through which the constituents of the wort diffuse, and are modified in their passage. High temperatures may prove unfavourable to the growth of the yeast by putting such a strain on its fermentative powers that all its vigour is used up in this direction; medium temperatures with full aëration by

mechanical means probably produce the largest crop of yeast. Fermentation without multiplication takes place when yeast is sown in solutions of pure sugar, but the yeast is rapidly debilitated thereby; fermentation with multiplication only takes place in the normal manner when nitrogenous and mineral nutrients are present as well as sugar; without sugar there is practically no increase. Analyses and data are given showing the quantities of nitrogenous, mineral, and carbohydrate matters removed from the beer by the cropping of the yeast; although the quantity actually removed by a good crop (5 lb. to the barrel) is not very great, it must not be forgotten that the chemical modifications of the constituents of the wort, in passing through the yeast cell, all make for stability. The whole reaction of fermentation with reproduction consists in the conversion of extremely unstable and putrescible bodies into more stable compounds. For increasing the crop of yeast, the following factors are to be taken into account:—A slow beginning with a fair quantity of pitching yeast favours increase; retarding the fermentation by aëration and rousing favours increase; a more highly saccharine wort with slow fermentation favours increase, whilst the same with quick fermentation is adverse; a too highly saccharine wort or one too rich in starch transformation products may militate against increase; soft brewing waters tend to larger crops and hard waters to smaller ones; transference of fermentations to dropping squares, in which the fermentation is continued tends to increase; mechanical aëration of the wort leads to very material increase.

An excessive crop of yeast is not desirable owing to impoverishment of the beer, but it is not easy to err in this direction. Full crops of yeast, as a rule, mean sound beer, scanty crops mean the reverse, and the yeast thus obtained will be of indifferent quality for pitching purposes.

—J. F. B.

Wooden Plugs; Danger of Infection from ——. P. Lindner. Woch. für Brau., 1902, **19**, [21], 289—290.

The author draws attention to the infection of wooden plugs and bungs of fermentation vats and storage casks. Wild yeasts and bacteria penetrate the pores of the wood more quickly than culture yeasts, on account of their smaller size, hence there is a kind of selective separation. Plugs should be sterilised by boiling after every fermention or, preferably, should be lacquered or paraffined, both on the inner portion and the outer.—J. F. B.

Pitch, Brewers'; Causes of Greyness in Cask ——. J. Wrana. Allgem. Zeits. f. Bierbrau., **30**, [10], 127—129.

The pitch lining of storage casks is found to become coated with a greyish film, which is caused by precipitated hop resins and albuminous matters. This, unless promptly removed, becomes difficult to eradicate, and at the same time forms a source of deterioration in the flavour of the beer. On this account it is advisable that such casks should be thoroughly cleansed after each time of using, the best cleansing agent being a warm solution of soda, followed by rinsing with clean water.

The tendency to become firmly encrusted with the film in question varies with the quality of the pitch and with the mode of application. For instance, unless the new lining of pitch be allowed to cool down thoroughly during several days before the cask is filled with beer, premature greyness will certainly ensue. The degree of attenuation attained by the beer during primary fermentation also has an influence on the greyness, beer that has not been highly fermented in the first stage exhibiting a coarser "break" in the secondary fermentation, whereby the precipitated matters are carried down to the bottom more rapidly, and are thus less likely to adhere to the sides of the cask than where attenuation has proceeded further in primary fermentation. The converse is, however, the case when highly hopped worts are in question.—C. S.

Beer; Bottling of ——, *with Simultaneous Carbonation.* J. Heron and W. A. Riley. J. Fed. Inst. Brewing, 1902, **8**, [3], 297—312.

The beer should be specially brewed for this purpose and should possess as little fermentable matter as possible and a very low attenuation. The gas is generated as required in an automatic safety generator by means of sodium bicarbonate and acid. The carbonator, which is the most essential part of the plant for producing good results, effects the impregnation of the beer with gas so that for each stroke, gas and beer are brought together in the proportion of 5 to 1 by volume. In the filling machine the air is exhausted from the bottle by the automatic opening of a valve, the beer valve is then opened and kept so until the bottle is filled; access of air to the bottle is entirely prevented.

The beer must be filtered before bottling and the filter employed, "the multiple perfection filter," is described in the paper; purified pulp is the medium employed. The essential point about good carbonation lies in properly impregnating the beer with gas, and after it has taken up the gas, in ceasing to agitate it further. Details as to costs are appended.—J. F. B.

English Patents.

Malt; Drying of —— *so as to Prevent Contamination with Arsenic.* F. E. Bradley, Barnsley. Eng. Pat. 10,127, May 16, 1901.

A flue of brick is employed, filled with pieces of broken material such as fire brick, in combination with chambers having sliding covers in the tops and sides, with or without the employment of tubes in the flue.

This appliance is placed on the floor of the room in which the fuel is burnt in the present system. The gases from the boiler fire or furnace are conducted down the flue until the broken material becomes red hot; the heating is then stopped. The covers of the chambers are opened and air is allowed to pass through the red hot material and then through the malt. When the tubes are employed, the fire gases are diverted around them when the bricks have been heated to redness, and air is then also admitted to the malt through the heated tubes.—J. F. B.

Brewers' and Distillers' Grains, Hops, &c.; Pressing Machinery for Treatment of ——. W. J. Menzies, Burton-on-Trent. Eng. Pat. 10,813, May 25, 1901.

A hydraulic press provided with two perforated receivers surrounded by an outer casing, is employed. The grains are conveyed to the top of the receivers and charged in in measured quantities, filtering plates, discs, or cloths being inserted between each quantity. Movable hoods or shields are placed at the top of the receivers to prevent loss of material during charging. Whilst one of the receivers is being charged the other is being pressed up. An envelope of hair or other cloth is fitted over the receivers to prevent the escape of the finer grains.—J. F. B.

United States Patents.

Malting Drum; Pneumatic ——. H. Smith, Wisconsin, U.S.A. U.S. Pat. 700,842, May 27, 1902.

The rotatory pneumatic malting drum comprises a forward air chamber, a central air-exhaust flue and air distributing flues concentric with the exhaust flue, counterbalanced pivotal gates, each arranged to control the inlet end of an air-distributing flue, a water reservoir carried by the drum and divided by radial partitions into compartments, a perforated valve-controlled pipe leading from each drum compartment along the air-exhaust flue, and means for automatically opening and closing the pipe valves to admit water to the grain at recurrent intervals.—J. F. B.

Fermented Liquors; Manufacture of ——. J. Schneible, New York. U.S. Pat. 700,833, May 27, 1902.

The primary fermentation is carried on in a closed vessel, the liquor with the active yeast in suspension is then transferred to a second vessel leaving the waste yeast and foreign matter behind. The liquor is then separated from the yeast in the second vessel and removed, the vessel being charged up again with fresh wort without removing the yeast. The fresh liquor and yeast may be aerated as soon as a rise in temperature manifests itself.—J. F. B.

rewers Grains, &c.; Apparatus for Expressing Moisture from ——. J. C. W. Stanley, London. U.S. Pat. 695,585, March 18, 1902.

HIS consists of a series of pairs of perforated expressing-inders rotating in opposite directions; a feed-hopper ove the cylinders, breaking roils in the bottom of the pper, a casing supported within each cylinder, pipes liating from the casings and engaging with their outer ls the interior surfaces of the respective cylinders, and ans for creating a suction in the casings and pipes to ry away the moisture expressed.—J. F. B.

rbonic Acid Gas; Apparatus for Charging Liquids with ——. H. Sue, Paris. U.S. Pat. 695,125, March 11, 902.

HILST in casks the liquids are charged and then delivered means of the pressure set up, through a tube in which y are supersaturated with gas as they are discharged, delivery tube is filled with a number of movable discs vided with oppositely inclined projections which produce urning of the liquid with the gas in its upward path. entrance of the delivery-tube is maintained near the face of the liquid by a float moving on a rod, the flexible er part of the delivery tube being attached to the float. —J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Boric Acid in Fruits; Natural Occurrence of ——. O. v. Lippmann. Chem.-Zeit., 1902, **26**, [42], 465.

EPOSIT formed in a vacuum pan used for the concention of lemon juice was found by the author to consist anhydrous calcium sulphate and a calcium salt of c acid, with about 0·5 per cent. of boric acid, though in t form the latter was present was not determined. ous commercial samples of lemon juice and lemous of rent origin were then examined, and in almost every ance strong boric acid reactions were obtained. In the of the lemons, boric acid was detected both in the juice rind. It was also found in other southern fruits such ranges.—C. A. M.

English Patent.

lizing Apparatus. J. Weck, Oeflingen, Baden. Eng. Pat. 12,015, June 12, 1901.

EAM sterilizer is described, consisting of a chamber or el with a lid, and provided with a holder for containing rmometer; inside the sterilizer a loose base plate or bottom with central upright, to which adjustable gs are fixed for holding down the lids of vessels within terilizer.—L. A.

United States Patents.

M; Process of Obtaining Modified (Easily Digestible) —. E. von Dungern, Frankfort-on-the-Maine, Germany. U.S. Pat. 700,631, May 20, 1902.

Tows or goats milk, which may be boiled, is added some ret t ferment. The coagulated casein is then broken up by echanical agitation so that only fine flakes remain in sus nsion in the fluid. The milk thus treated no longer coa ulates in coarse lumps in the stomach.—W. P. S.

Pasurizing (Milk, Cream, &c.) Apparatus. T. L. Cterius, Fort Atkinson, Wisconsin. U.S. Pat. 701,109, ly 27, 1902.

The apparatus consists of an inner and an outer rotary cyl der, the outer cylinder being mounted on hollow jou als through which hot or cold liquid can be circulated thr gh the space between the cylinders. The inner cyl der, which contains the liquid to be sterilized, is provid with a manhole and cover, extending through the out cylinder, for filling, and a drain tube and plug for emptying. It can also be filled during rotation, if desired, through a funnel and tube which passes through the hollow journal at one end, a tube for the escape of air being provided at the other end. Two tanks are provided, one for water at atmospheric temperature, the other for a refrigerating liquid, and these, together with a steam pipe and jet, are connected through a system of circulating pipes and valves, and through the hollow journals, with the space between the cylinders in such manner that while the cylinders are rotating, the said space can be filled with cold water, which is then heated by means of the steam jet and kept hot until the liquid in the inner cylinder has become sterilized, then replaced by cold water.—L. A.

(*B.*)—SANITATION; WATER PURIFICATION.

Water; Filtration of ——, *through Sand and Loam.* W. Spring. Annales de la Soc. géolog. de Belgique, **29**, Mémoires, 17—48. Chem. Centr., 1902, **1**, [20], 1179.

THE author's results lead him to the following conclusions. The velocity of water circulating through sand in a horizontal direction is not inversely proportional to the thickness of the filter nor directly proportional to the pressure. In thick filter columns the effect of the pressure gradually diminishes, and finally the movement of the water depends solely upon the imbibition. The action of a very strong pressure also ceases beyond a certain distance, consequently a local pressure on a sand filter is not transmitted to any considerable distance. In the case of filtration in a vertical direction, concordant results can only be obtained when the grains of sand are of uniform size, as under the influence of water moving in a vertical direction, the fine particles of sand rise to the top and hinder the free circulation of the water. If the water passing through the sand filter contains air, the latter remains adhering at certain places to the grains of sand, and hinders to a considerable extent the downflow of water. The outflow from a vertical filter decreases with the thickness of the filter only when the pressure attains a certain force; if the pressure is only slight, the amount of filtrate increases with the thickness of the filter, because the weight of the column of water has a preponderating effect. Increase of temperature heightens the efficiency of a filter; an increase of nearly 30° is necessary, however, to cause the amount of filtrate to be doubled. —A. S.

English Patent.

Sewage or other Liquid Refuse; Automatic Alternating Valves and Valve Gear for the Bacteriological Treatment of ——. T. Melvin and J. Harvey, Muir, Glasgow. Eng. Pat. 5847, May 8, 1902.

FOR the supply of sewage to or from tanks or filters, disc valves are used, worked by rods from a rocking lever actuated by buckets in the usual manner. The buckets empty by leakage through perforations of suitable size. —L. A.

United States Patent.

Water: Apparatus for Purifying ——. W. C. Clarke, Pittsburg, Penn. U.S. Pat. 699,655, May 13, 1902.

A SOFTENING tank, an inlet pipe for hard water terminating just above the bottom of the softening tank, and an outlet pipe, near the top of the tank, for softened water. A small pipe discharges a neutralising solution into the main inlet pipe, and another small pipe, which has its exit near the end of the inlet pipe, discharges a precipitating solution thereinto. The water before treatment passes through a heater, subsequently being pumped along with chemical solutions into the apparatus.—L. A.

(*C.*)—DISINFECTANTS.

English Patent.

Cleansing Compositions; Liquid ——. A. W. Ellis, London. Eng. Pat. 13,188, June 28, 1901.

THIS antiseptic liquid is an ammoniacal solution of sodium benzoate and borate, a convenient strength being 5 lb. of sodium benzoate, 25 lb. of sodium borate, and 100 gallons of 10 per cent. ammonia solution.—L. A.

UNITED STATES PATENTS.

Sulphur Dioxide; Apparatus for Generating ——. J. D. Moore, New York, and F. M. Martin, Brooklyn. U.S. Pat. 700,537, May 20, 1902.

SULPHUR dioxide is applied as a disinfectant, or in preventing or extinguishing fires. Within the generator is a system of perforated pipes connected to an air inlet, and over the pipes there is arranged a wire-work or perforated support for the sulphur introduced. The valves can be so operated as to admit a regulated proportion of air to the gas drawn through.—E. S.

Compartments; Method of Charging —— with Gas. J. D. Moore, New York, and F. M. Martin, Brooklyn. U.S. Pat. 700,538, May 20, 1902.

"COMPARTMENTS" are closed places, which it is desired to disinfect, or in which fire is to be extinguished. By "gas," sulphur dioxide is meant. The apparatus and its use are described in the preceding abstract.—E. S.

Formaldehyde-Gas Generator. R. W. Carman and F. M. Lawrence, Flushing, New York. U.S. Pat. 699,944, May 13, 1902.

A SHORT cylinder of para-formaldehyde is fixed by means of gum to the base of a conical block of vegetable charcoal, mixed with sufficient nitre to cause it to ignite and burn easily. This combination fits into a small tin capsule on feet, the bottom only of the capsule being perforated, and the sides being tall enough to entirely enclose the formaldehyde cylinder. For use, the cone of carbon is ignited at the top, and the heat generated by the flameless combustion evaporates the formaldehyde without igniting the vapour.—L. A.

Formaldehyde Lamp, R. P. Kuhn, Virginia. U.S. Pat. 11,986, May 13, 1902.

THE apparatus comprises a base containing a water-seal and a central burner pan, and an oxidising chamber containing two perforated platinised cones, said chamber being fixed on a vertical rod in such a way that it can be moved vertically and swung round in a horizontal plane. To generate formaldehyde, wood-spirit is ignited in the burner pan, and when the flame has sufficiently heated the platinised cones, the oxidising chamber is swung on one side while the flame is extinguished. The chamber is then swung back and lowered into the water-seal. The radiant heat from the glowing platinised discs, assisted by the heated water in the pan, then suffices to evaporate the wood spirit, which, mixing with oxygen admitted through openings in the sides of the chamber, and passing over the platinised surfaces, produces formaldehyde, which escapes through suitable openings.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Pentosan Determination Method; Application of the ——, to various Vegetable Substances and Paper-making Materials. E. Kröber and C. Rimbach; communicated by B. Tollens.

See under XXIII., *page* 875.

ENGLISH PATENTS.

Cellulose; Regulating the Flow of Solutions of —— through Squirting Nozzles. C. F. Topham, London. Eng. Pat. 10,029, May 14, 1901.

IN spinning filaments from cellulose solutions, the inventor ensures a continuous flow of the solution to the nozzle by means of a valve and a body, such that the body is caused to control the valve by variations in the pressure of the cellulose solution passing to the nozzle through a small space between the body and the pipe in which it is situated, the body being provided with vanes or helical grooves so that the solution causes the body and the valve to rotate.
—J. F. B.

Paper Pulp; Machinery for Forming —— into Sheet H. Parker, New Hampshire, U.S.A. Eng. Pat. 7 Jan. 1, 1902.

FOR forming paper pulp into sheets for storage or shi ment, a cylindrical paper-making machine working in a v is employed. The pulp is picked up by a suction roll an transferred to an endless felt passing over another suctio roll adjacent to the first in such a way that both sides the felt and pulp are subjected to a suction. The felt an paper then travel to a special squeezing device comprisin a top roll and two under rolls mounted in a frame, th lower rolls being parallel to each other in the same hor zontal plane and the upper roll being located in a plan above the latter, and having its axis approximately midwa between the lower rolls. The supports for the top ro are movable backwards and forwards relatively to th under rolls, and means are provided for adjusting th supports vertically. Hydraulic pressure gear is situate at the top of the machine.—J. F. B.

Paper Sizing; Impt. in ——. C. Wurster, London. En Pat. 12,769, June 22, 1901.

SEE U.S. Pat. 691,925; this Journal, 1902, 636.
—J. F. B.

UNITED STATES PATENTS.

Paper Mill Machinery; Blow-off Nozzle for ——. J. Baker, New York. U.S. Pat. 700,469, May 20, 1902.

IN the digestion of wood for paper pulp, the invento seeks to prevent the escape of sulphurous acid vapour when the charge is let down. For this purpose a blow-o nozzle is placed in a line of piping from the bottom of th digester to the receiving tank, and, as the pulp passes dow the pipe, cold water is introduced into it by means of th nozzle, cooling the pulp and absorbing the sulphurous acid
—J. F. B.

Pyroxylin Compound. E. Zühl, Berlin. U.S. Pat. 700,884, May 27, 1902.

THE inventor claims the carbonic esters of mono-oxy genated aromatic hydrocarbons (phenols) as substitutes fo camphor. (See Eng. Pat. 17,948, 1900; this Journal, 190 926.)—J. F. B.

Pyroxylin Compound. E. Zühl, Berlin. U.S. Pat. 700,885, May 27, 1902.

SEE Eng. Pat. 8,072, 1901; this Journal, 1901, 741.
—J. F. B.

Resin Size; Process of Making ——. F. Arledter, Ne York, U.S.A., and H. Arledter, Garston, England. U. Pat. 701,125, May 27, 1902.

MOLTEN resin is mixed with a mineral or vegetable oil fat, the mixture is filtered and treated with a solution of a ammonium salt and an alkali carbonate. The mixture agitated and heated; saponification of the resin commence but is arrested when the liberated carbon dioxide reaches certain pressure, and the proportion of resin le unsaponified can be regulated by adjusting the gas pressur The product contains ammonium resinate, unsaponifie resin, and free alkali. It dissolves in cold water witho forming a froth and does not foam on the paper machin When the paper in which it has been incorporated, i dried, ammonia escapes, and the free resin of the ammoniu resinate is left in the paper.—M. J. S.

FRENCH PATENTS.

Celluloid-like Compositions and Photographic Films Preparation of ——. Soc. anon. Prod. F. Bayer and C Fr. Pat. 317,008.

See under XXI., *page* 873.

Cellulose; New Derivatives of ——. Soc. anon. Prod. F. Bayer and Co. Fr. Pat. 317,007, Dec. 18, 1901.

AN acetyl derivative of cellulose is prepared by treatin 200 parts of cellulose with 890 parts of acetic anhydri and 20 parts of sulphuric acid with or without a suitab

olvent; an acetyl derivative of hydrocellulose is prepared a similar manner. The cellulose derivative is soluble in hloroform and the other usual solvents of this body, whilst ne hydrocellulose derivative is soluble in alcohol; the oncentrated solutions of the latter set to a jelly when cold. —J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

odium Methylarsenate (Arrhenal); Composition and Volumetric Determination of ——. Adrian and Trillat.

See under XXIII., *page* 874.

Bismuth Citrate. W. Duncan. Chem. and Druggist, 1902, **60**, [1166], 852.

N investigation of the causes of the difficulty of preparing smuth citrate soluble in ammonia, has led the author to e conclusion that the so-called bismuth citrate is not a salt, t an acid analogous to antimonyl-tartaric acid, and like e latter forms salts, analogous to tartar emetic. It mbines with alkali hydroxides to form soluble salts, hich with barium nitrate give a precipitate, and this, after shing, contains barium, bismuth, and citric acid. If the ecipitate be digested with ammonium sulphate to remove barium, ammonium bismuthyl citrate is formed and can washed out with water. Bismuthyl citric acid appears be a dibasic acid corresponding to the formula, $H_4OH(COOH)_2COOBiO$. It decomposes alkali carbon- s and hicarbonates in the cold. It is decomposed by sistent boiling or continuous washing, and if dried to nstant weight loses water and forms bismuth citrate, $C_6H_3O_7$, which is insoluble in ammonia. Bismuthyl citric d, soluble in ammonia can be easily prepared by making o a cream with a sufficient quantity of water, a mixture 302·64 parts of bismuth subnitrate and 208·5 parts of ic acid, and then allowing to stand with occasional ring. When the action is complete (ascertained by pping a little of the creamy paste into ammonia and ing if a clear solution is obtained), 83·43 parts of sodium rbonate are added to neutralise the nitric acid formed the product is finally washed.—A. S.

ric Acid; New Process for the Manufacture of ——. J. Ohly. Pharm. J., 1902, **68**, [1666], 454.

e author proposes a new method for the preparation calcium citrate from lime juice, based upon the f that when a concentrated solution of calcium c ride is gradually added to a solution of sodium c te, the precipitate at first produced redissolves, but on a ation, it suddenly forms a magma which becomes c talline on the application of heat. The method is c ied out as follows on the small scale:—50 c.c. of c centrated lemon juice (containing about 56 per cent. of c c acid) are diluted with 100 c.c. of water, allowed to st d overnight, the deposited acid-albumin filtered off, and th filtrate mixed with the requisite quantity (or a slight e ss) of concentrated calcium chloride solution. The m ture is then neutralised with a solution of caustic soda, st ed well, the pasty mass transferred to a filter and w ed with hot water to remove the sodium chloride fo ed and any excess of calcium chloride. The residual c um citrate is decomposed by heating with the calculated q tity of sulphuric acid (sp. gr. 1·7), the calcium sulphate fil ed off, the filtrate heated for the further separation of c um sulphate, and the final solution decolorised by m s of animal charcoal previously freed from phosphates; th citric acid is separated by crystallisation. The m od is stated to be simpler and cheaper than the old pr ss, whilst the yield of citric acid closely approaches th heoretical, and the product is of a decidedly superior ch acter.—A. S.

tarnine. M. Freund and G. Wulff. Ber., 1902, **35**, [10], 1737—1739.

By xidation with permanganate, cotarnine yields the cyclic co ound oxycotarnine, $C_{12}H_{13}NO_4 + H_2O$, and a substance, $C_{9}H_{11}NO_3$, the methylimide of cotarnic acid.—A. C. W.

Cotarnine. M. Freund and P. Bamberg. Ber., 1902, **35**, [10], 1739—1754.

An account of the reactions of cyanocotarnine methyliodide and of the products of the reactions, together with a theoretical discussion of the results.—A. C. W.

Lupinine. R. Willstätter and E. Fourneau. Ber., 1902, **35**, [10], 1910—1926.

The material employed in this investigation was an alcoholic extract of the seeds of *Lupinus luteus*; it consisted essentially of crystalline lupinine and liquid lupinidine, the former of which was isolated by treatment with petroleum ether.

Lupinine, $C_{10}H_{19}ON$, is not immediately oxidised by permanganate in acid solution, and does not reduce Fehling's solution. It contains no methyl group united to nitrogen. Lupinine unites with phenyl cyanate to form the compound $(C_{10}H_{18}N)O.CO.NH.C_6H_5$.

Anhydrolupinine, $C_{10}H_{17}N$, was the only product the authors obtained by the action of dehydrating agents on lupinine. It is best obtained by means of strong sulphuric acid in glacial acetic acid solution. Anhydrolupinine is a colourless oil, of very unpleasant narcotic odour, boiling at 216·5°—217·5° C. It is readily oxidised in the air.

Lupinic acid, $C_{10}H_{17}O_2N + 3H_2O$, is obtained by oxidising lupinine with a mixture of chromic and sulphuric acids. It crystallises with $3H_2O$ from aqueous acetone in long colourless needles. The anhydrous acid melts at 255° C. by rapid heating.—A. C. W.

Tropidine into Tropine; Conversion of ——. R. Willstätter. Ber., 1202, **35**, [10], 1870.

The author replies to Ladenburg (this Journal, 1902, 560) that the conditions for the conversion of tropidine into tropine, as now given by the latter, are entirely different from those of the original method, especially in regard to the temperature of the reaction with hydrobromic acid. The author employed pure α-bromotropane for the conversion of tropidine into tropine, and obtained ψ-tropine to the extent of 24 per cent. of the theoretical yield, whilst Ladenburg used the mixture of α- and β-bromotropanes, and obtained a mixture of tropine and ψ-tropine in much smaller yield.—A. C. W.

Coffee Oil. E. Erdmann. Ber., 1902, **35**, [10], 1846—1854.

The term "coffee oil" is here applied to the volatile oil obtained by distilling roasted and ground Santos coffee in steam of 1½ atmospheres pressure and extracting the distillate with ether. The yield of oil was 0·0557 per cent.; it was a brown liquid, with an intense odour of coffee, and of the specific gravity 1·0884 at 16° C. (water at 0° C. as unity).

The oil was strongly acid, it was therefore first dissolved in ether and shaken with soda solution, which extracted small quantities of acetic acid, and a valeric acid, which was in all probability methylethylacetic acid. The quantity of acid was about 40 per cent. calculated as valeric acid. The neutral oil was then fractionated *in vacuo*; the lowest and most considerable fraction, boiling at 75°—80° C. under 12—13 mm. pressure, was mainly soluble in water. The soluble portion was identified as furfuryl alcohol by conversion into the diphenylcarbamic ester and into pyromucic acid. Furfuryl alcohol constitutes at least 50 per cent. of the neutral oil. It colours a pine splinter moistened with hydrochloric acid a deep bluish-green.

The second and third fractions, 80°—93° C. and 93°—110° C. had a stronger odour of coffee and contained nitrogen. After removal of phenols from fraction III. by means of caustic soda, the residue distilled at 93° C. under 13 mm. pressure, it contained 9·7 per cent. of nitrogen and had the characteristic coffee odour; the quantity was not sufficient for detailed examination. The phenols, which were obtained from the caustic soda extracts of fractions II. and III., had an odour similar to guaiacol, but did not possess the coffee odour. The last fraction, 110°—150° C., also consisted mainly of phenols.

When a mixture of equal parts of sugar, coffee-tannic acid and caffeine is cautiously heated, the coffee aroma is obtained; it is not produced by a mixture of sugar and caffeine or of sugar and coffee-tannic acid.—A. C. W.

Thymol; Method for the Volumetric Determination of ——. E. Zdarek.

See under XXIII., *page* 875.

ENGLISH PATENTS.

Thorium, Zirconium, and Elements of the Ytterite Group; Manufacture of ——. C. D. Abel, London. From Siemens and Halske Actien-Ges., Berlin. Eng. Pat. 10,867, May 25, 1900.

METALLIC thorium, zirconium, yttrium, cerium, &c., are prepared by heating the nitrides or other compounds of the metals with elements of the 5th (nitrogen) group of the periodic system, in absence of air. The processes known hitherto for producing these metals have yielded them only in a pulverulent form; but if, for example, thorium nitride be shaped into rods or the like and then heated in absence of air by means of an electric current, coherent bodies of metallic thorium are obtained.—H. B.

Magnesium Carbonate and Process of making same. F. S. Young, Norristown, and W. S. Griffiths, Plymouth Meeting, U.S.A. Eng. Pat. 25,776, Dec. 17, 1901.

TO PRODUCE a light magnesium carbonate, a solution of the bicarbonate is heated to about 150° F., and sufficient calcined magnesite is added to form the compound $3MgO2CO_2.3H_2O$; the mixture is then boiled and filtered. A heavier carbonate is obtained by adding to the similarly heated bicarbonate solution magnesia estimated to give a hydrated $4MgO3CO_2$, which is separated at the same temperature (150° F.), and is stated, after drying at that temperature, to have the formula, $4MgO3CO_2.8H_2O$. A heavy crystalline carbonate, $MgOCO_2$, is obtained by adding the proper proportion of magnesia to a cold solution of the bicarbonate, agitating and heating to 165° F.—E. S.

Medicinal Compounds containing Mercury Compounds and other Substances; Process of Preparing ——. J. Rother, Katscher, Germany. Eng. Pat. 21,295, Oct. 23, 1901.

A MIXTURE of alsol (aluminium aceto-tartrate), mercuric chloride, mercury-sozo-iodol, and veratrine, made in a specified manner is mixed with a large proportion of lactose. —A. C. W.

Camphoric Acid; Manufacture and Production of New [Nitrogen] Derivatives of ——. G. W. Johnson, London. From C. F. Boehringer und Soehne, Waldhof, Mannheim, Germany. Eng. Pat. 12,325. June 17, 1901.

A SOLUTION of iminocamphoric acid, $C_{10}H_{15}NO_2$, in 65 per cent. sulphuric acid, is electrolytically reduced. After removing most of the sulphuric acid by means of calcium carbonate, camphidone, $C_{10}H_{17}NO$, is extracted by chloroform. The liquid is then made alkaline by caustic soda and camphidine, $C_{10}H_{19}N$, distilled over in steam. The process and products are claimed. Camphidone is a soft crystalline mass of faint camphor-like odour; it melts at 220° C., and boils at about 308° C.; it is readily soluble in a small quantity of hot water, but crystallises out on cooling. Camphidine melts at 186° C., and boils at 209° C.; it is soluble with difficulty in hot water, and is strongly basic.—A. C. W.

Preparations [of Malt Extract, Tannin and Vegetable Oils] for Counteracting the Deleterious Effects of Nicotine, and Processes for Producing the same. W. P. Thompson. From Exportbier-Brauerei H. Siemens and Co., Berlin. Eng. Pat. 6311, March 14, 1902.

PREPARATION intended to counteract the inflammatory effects of heavy tobacco smoking on the mucous membrane of the throat and larynx.

Malt extract is heated under pressure with tannic acid and vegetable oils (olive oil), and the mixture is then brought into the solid form by means of starch, sugar, &c. —A. C. W.

XXI.—PHOTOGRAPHY.

Silver Bromide Gelatin Plate; Action of Mercury Bichloride on the Unfixed ——. R. A. Reiss. Chem.-Zeit. 26, [40], Rep. 148.

THE author has utilised the known destructive action of mercury bichloride on the sensitiveness of silver bromide gelatin plates, for the purpose of rendering exposed plates fit for a second exposure. The exposed plate is immersed for 10 minutes in a 5 per cent. solution of the bichloride and then washed 10—15 minutes in running water. It is next treated for 1—2 minutes with amido developer which seems to facilitate the action of light during the second exposure. The plate is superficially swilled, and then exposed wet, the exposure requiring to be 100—150 times as long as the first, and development also taking considerably longer than usual. The plate, however, does not fog. The resulting negatives are well covered in the lights, and perfectly clear in the shadows. The method is particularly adapted for copying, wherein length of exposure does not matter.—C. S.

ENGLISH PATENTS.

Photographic Developers Stable in the Dry State; Manufacture of ——. C. D. Abel, London. From Act. Ges. für Anilin Fabr., Berlin. Eng. Pat. 11,866, June 10, 1901.

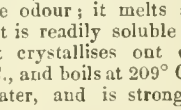
Stable developing powders may be formed by mixing the reactive body with finely-powdered anhydrous alkali sulphite and adding thereto the required quantity of alkali or alkali carbonate required to transform the phenol or amino-phenol into its alkali salt.—J. W. H.

New Chemical Compounds [Developers]; Manufacture of Production of ——. H. E. Newton, London. From Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 12,421, June 18, 1901.

THE first process claimed in Eng. Pat. 17,118, 1899 (this Journal, 1900, 848), may be applied to nitrated and halogenated phenols, the products then, by the action of water, alcohols or alkali salts of acids, yield derivatives containing the groups $CH_2.OH$, $CH_2.OR$ or $CH_2.COOR$. By the action of reducing agents on the nitro-derivatives of the hydroxybenzyl alcohols, their ethers and esters, made as just described, the corresponding amino-derivatives are obtained which are stated to be valuable photographic developers. —A. C. W.

Photographic Developers; Preparation and Employment of New ——. H. E. Newton, London. From the Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 12,421A, June 18, 1901.

AMINO compounds of hydroxybenzyl alcohols, ethers and esters having the following general formula:—



(R = an aromatic radicle, substituted or otherwise, X = hydrogen atom, alkyl or acidyl radicle) are claimed as photographic developers. They develop quickly without the use of caustic alkalis.—J. W. H.

Photographic Pictures; Improvements in Developing —— H. E. Newton, London. From the Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 24,619, Dec. 3, 1901.

ALKALI sulphites are commonly used to prevent the oxidation of organic developing substances in solution, but such solutions are not stable in contact with air. To obtain stable solutions the inventors replace the sulphite by additive compounds obtained from ketones and bisulphite, especially the so-called acetone bisulphites having the following general formula $(CH_3)_2C(OH)SO_3M$ (M = an alkali metal).—J. W. H.

FRENCH PATENT.

Celluloid-like Compositions and Photographic Films; Preparation of ——. Soc. anon. Prod. F. Bayer and Co. Fr. Pat. 317,008, Dec. 18, 1901.

ACETYL derivatives of cellulose are mixed with camphor or its substitutes with or without a suitable solvent (*e.g.*, chloroform). Photographic films are prepared by spreading compositions of the above nature dissolved in chloroform upon glass, evaporating the solvent and stripping the film.
—J. F. B.

UNITED STATES PATENTS.

Photographic Pictures; Process of Developing ——. A. Eichengrün and K. Demeler, Elberfeld, Germany. U.S. Pat. 696,019, March 25, 1902.

THE inventors claim as photographic developers substances having the general formula $C_6H_3.CH_2OR(OH)NH_2$, particularly aminoparahydroxy-benzyl alcohol. A solution of the hydrochloride of this base is mixed with sodium sulphite and potassium carbonate.—J. F. B.

Photographic Fabric and Process of Preparing same. P. M. C. Grenier, Manhattan, New York. U.S. Pat. 696,632, April 1, 1902.

PAPER, silk, or other fabric is treated before being sensitised with an aqueous extract of white algæ (*chrondrus crispus*) containing also citric acid and ammonium chloride.
—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

UNITED STATES PATENT.

Flash-light Cartridge. K. Rendschmidt, Berlin. U.S. Pat. 696,270, March 25, 1902.

THE cartridge consists of two parts; the cartridge proper made of highly compressed flash-light powder, whilst the primer, which can easily be broken off, is composed of the same powder in a looser form. When required for use the primer is broken off, powdered between the fingers, and united with saltpetre paper.—J. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Manganese; New Reaction for ——; *and for Nitrates, Chlorates, Lead Dioxide, &c., Composition of Perchlorides of Lead and Manganese.* L. L. de Koninck. Bull. Assoc. Belge des Chim., **16**, [2], 94—98.

WHEN a manganous compound is dissolved in fuming hydrochloric acid, then heated to boiling, and treated with 1-2 drops of concentrated nitric acid (sp. gr. 1·35—1·40), the mixture assumes a deep greenish black coloration presumably due to the formation of $MnCl_4$. The coloration is destroyed by prolonged heating, or, immediately, by 2- or 3-fold dilution with water. Nitric acid may be advantageously replaced by a small crystal of potassium or sodium chlorate, which develops the coloration immediately without the application of heat.

The same reaction forms a very delicate means of detecting nitrates, chlorates, hypochlorites, chromates, lead peroxide, and all the manganese compounds from Mn_3O_4 to the permanganates. For the latter the treatment with boiling hydrochloric acid alone is sufficient; for the others the author has successfully employed a 0·36 per cent. (vol.) solution of crystallised manganous chloride.

The difference in the behaviour of the two oxides of lead causes the author to consider that the perchloride of the metal is $PbCl_3$ rather than $PbCl_4$. In support of this view he adduces the following facts: (1.) If a little lead peroxide be placed in manganiferous (1 per 1000) hydrochloric acid containing lead chloride in solution, the resulting deep coloration disappears on shaking and the liquid assumes a yellow tinge. (2.) If the yellow solution obtained by dissolving minium in manganiferous hydrochloric acid be treated with the dark solution produced by the action of lead dioxide on the same reagent, the added solution is decolorised, leaving only the yellow due to lead perchloride.—C. S.

INORGANIC—QUANTITATIVE.

Iodides; Volumetric Determination of ——, *in presence of Chlorides and Bromides.* V. Thomas. Comptes Rend., **134**, [20], 1141—1143.

WHILST thallic salts react with excess of potassium iodide according to the equation $TlCl_3 + 3KI = TlI + 3KCl + I_2$ (the basis of the author's method of determining thallium, this Journal, 1902, 501), the reaction, when the thallic salt is in excess, is $TlCl_3 + 2KI = TlCl + 2KCl + I_2$. If, then, a solution of metallic iodide, in which the iodine is to be determined, be added to a known quantity (in excess) of thallic chloride solution, then the liberated iodine boiled off (which can be done completely and rapidly), and the amount of unreduced thallic salt determined by the author's method referred to above, the difference between this amount and the original amount taken affords a measure of the iodine in the iodide. Chlorides and bromides have no effect on the reaction save that, in the presence of bromides, overheating is to be avoided, and it is best not to boil, but to expel the liberated iodine from the warm solution by means of a current of air. A solution of thallic chloride is made containing 10—15 grms. per litre. To a quantity of this, excess of sodium thiosulphate is added, then iodine solution till the blue colour just appears; this operation is then repeated upon the same quantity of the thallic solution to which a known quantity of potassium iodide has been added, and the freed iodine boiled off, and then upon a third equal quantity to which has been added the solution in which the iodine is to be determined. The precipitated thallous iodide is easily reconverted into thallic chloride by boiling with hydrochloric acid and potassium chlorate, so that no large expenditure for thallium salts is necessary.—J. T. D.

Phosphorus in Shot or Chilled Iron; Effect of Annealing on the Determination of ——; *by the Permanganate Alkali Method.* C. E. Manby. Proc. Engineers Soc. of Western Pennsylvania, 1902, **18**, [3], 132—136.

IT has been observed that in the determination of phosphorus in shot or chilled iron, oxidation with permanganate gives low results, this being due to the fact that on dissolving the sample in nitric acid there remains an insoluble residue containing phosphorus, which is not acted upon by the oxidising agents at the boiling point. The author finds that this difficulty can be overcome by annealing the metal before making the determination.

The annealing is carried out as follows:—2 grms. of the sample are placed in a platinum crucible over a Bunsen flame, and heated to bright redness for two minutes with occasional stirring; "it is well to continue the flame by raising the Bunsen to the lid of the crucible and at the same time point the flame downwards against the lid, which at this moment is removed, and the gas flame will burn on the surface of the crucible, and thus exclude all air from entering or causing unnecessary oxidation of the annealed sample at the moment it is cooling off."—A. S.

Mercury; Electrolytic Determination of ——. E. Bindschedler. Zeits. für Elektrochem., 1902, **8**, [22], 329—332.

EXPERIMENTING with two methods given by Neumann, the author finds that that in which 0·5 grm. of $HgCl_2$ is dissolved in water, mixed with 1—2 c.c. of sulphuric acid and electrolysed with a current of 0·5—1·0 ampère at 3—5 volts, gave uniformly good results provided the duration of the electrolysis was not less than 7 hours, the cathode area being 100 sq. cm. The other method, in which 3 grms. of potassium cyanide were substituted for the sulphuric acid, the bulk of solution being (as before) 150 c.c., the current density 0·5 to 1 ampère per 100 sq. cm., and the p.d. 5·5—6 volts, did not give such good results, the numbers being always too low. The alternative method for the cyanide solution of using a low current density and working all night, however, was quite satisfactory, when the current density was between 0·03 and 0·1 ampères.—W. G. M.

Bismuth: Electrolytic Determination of ——. O. Brunck. Ber., 1902, **35**, [10], 1871—1873.

Wimmenauer has recently found previous methods for the electrolytic determination of bismuth to be unsatisfactory, and has proposed a somewhat tedious process (this Journal, 1901, 620).

The author finds that bismuth may be deposited on Winckler's gauze cathode (this Journal, 1899, 1156) in a coherent form under conditions which would give an unfavourable result with a sheet electrode. The metal or salt is dissolved in nitric acid; the free acid may amount to 20—25 times the weight of the metal, but its concentration must not exceed 2 per cent. The tension of the current should not exceed 2 volts; the permissible current strength varies with the concentration of the bismuth. For 0·1 grm. of metal in 100 c.c., it may exceed 0·5 ampère; with less than 0·05 grm. in 100 c.c., the current should not be greater than 0·1 ampère. Before electrolysis commences, the solution is heated to 70°—80° C.; the resistance is then low and a strong current passes. As the solution cools and becomes poorer in metal ions, the current strength sinks to a few hundredths of an ampère. In this manner large quantities of metal may be separated in little longer time than small quantities; the operation takes 2—3 hours. The bismuth deposit is pale grey, hard and coherent. If the above limiting amount of acid be exceeded, the deposit is brittle and crystalline, so that loss in washing cannot be avoided, peroxide is also deposited on the anode. When the electrolysis is finished, both electrodes are removed to a beaker of water and the current is passed for a short time longer in order that the metal dissolved by the adherent nitric acid may be again deposited. The cathode may then be washed with water, alcohol, and ether. The results quoted are satisfactory. The method succeeds in the presence of sulphuric acid, but it is not advisable to work with sulphuric acid alone, since large quantities are required to prevent the formation of basic salts. Attempts to separate bismuth from small quantities of lead did not succeed; the lead peroxide always contained bismuth.—A. C. W.

Copper; Volumetric Determination of ——, *by Means of Potassium Iodide.* F. M. Litterscheid. Zeits. anal. Chem., 1102, **41**, [3 and 4], 219—227.

If potassium iodide be added in slight excess to a neutral or slightly acid solution of a copper salt, to which sulphurous acid had previously been added, the copper is precipitated as cuprous iodide without any separation of iodine. After standing for one hour, the clear liquid can be pipetted or filtered off; excess of silver nitrate is then added and the excess of silver determined by Volhard's method.

This process is applied in the analysis of alloys as follows:—*Copper and Silver.* Dissolve 1 grm. in nitric acid and evaporate nearly to dryness with sulphuric acid. Dilute to 50 c.c. and titrate the silver by $\frac{1}{10}$ N potassium iodide, adding 1 drop of 5 per cent. potassium nitrite solution and starch paste. Transfer to a graduated flask, add a few c.c. of sulphurous acid, then potassium iodide in excess, fill up to the mark, let stand and titrate the copper in an aliquot portion of the clear liquid.

The method may be used in the presence of zinc and nickel; bismuth, lead, and tin must have been previously removed.—A. C. W.

Zinc Furnace Cinder; Determination of the Proportion of Metallic Lead in Crude ——. E. Prost, J. Charon, and M. Marissal. Bull. Assoc. Belge des Chim., **16**, [1], 41—54.

A crude cinder was examined from a charge containing 6·64 per cent. of lead, and 131 grms. of silver per ton. On screening the cinder 73·78 per cent. of the total lead was recovered, of which 37·7 per cent. was present in the finest portions of the cinder (passing through a 2 mm. sieve), whilst the same portions also contained 57·8 per cent. of the total silver. On treating the cinder by amalgamation, about 13·5 per cent. of the total lead was found to exist in the metallic state.—C. S.

Sodium Methylarsenate (Arrhenal); Composition and Volumetric Determination of ——. Adrian and Trillat. Comptes Rend., **134**, [21], 1231—1232.

By careful determinations of the sodium as pyroarsenate, of the arsenic as magnesium pyroarsenate, and of the water, the authors have established the formula $CH_3\,AsO\,(ONa)_2$, $6H_2O$ for sodium methylarsenate. Direct alkalimetric titration proved impracticable as a method for its determination, as no indicator gave sharp or constant results; the authors therefore devised the following method. A measured volume of the solution is placed in a measuring flask, and a known volume of standard silver nitrate solution (in excess) added; the liquid is made up to the mark with distilled water, and the whole left stoppered for 12 hours. To a measured portion of the decanted clear liquid a little iron alum and nitric acid are added, and the excess of silver is determined by standard ammonium thiocyanate. The method is sufficiently accurate for ordinary purposes.—J. T. D.

ORGANIC—QUANTITATIVE.

Glycerin; Method of Determining ——, *by Iodic Acid.* Chaumeille. Chem.-Zeit., **26**, [40], 453.

The oxidation proceeds in accordance with the equation $7I_2O_5 + 5C_3H_8O_3 = 15CO_2 + 20H_2O + 7I_2$, and the titration of the liberated iodine gives the amount of pure glycerin oxidised. 0·10 grm. of glycerin, 25 c.c. of sulphuric acid and 2 grms. of iodic acid, are distilled in a flask, and the iodine is collected in a standardised solution of sodium thiosulphate. Two additions of water are made to facilitate the evolution of the iodine. In the case of commercial glycerin, containing sodium chloride, a correction has to be made, the factor being determined by titrating the chlorine present. The method is suitable for determining the glycerin in glycerophosphates.—C. S.

Glycerin; Determination of ——, *in the Commercial Article.* Deiss. Chem.-Zeit., **26**, [40], 452.

Ten grms. of the substance are mixed with 6 grms. of fused pure crystalline phenol, in a 100 c.c. flask, and left to cool. The test solution (50 grms. of pure crystalline phenol and 1,000 grms. of distilled water) is run carefully from a burette into the flask until a milky turbidity is formed, disappearing on being shaken; and thenceforward the addition is continued, drop by drop, until the turbidity becomes persistent, a result effected by 2 drops in excess. With perfectly pure anhydrous glycerin, 28·15 c.c. of the test solution are required, a diminution of 1 per cent. in the "titre" of the glycerin corresponding to a reduced consumption of 0·39 c.c. of the reagent. This figure is said to be constant, and was determined from a number of tests performed at uniform temperature. No effect on the results is produced by the presence of saline and tinctorial extractives, the solubility of the phenol in presence of water depending on the glycerin.—C. S.

Glue and Gelatin; Analysis of ——. A. Müller. Zeits. angew. Chem., 1902, **15**, [20], 482—487.

The author proposes to precipitate the glutin (bone-gelatin) by an excess of a standard solution of tannin, afterwards titrating the excess of tannin with permanganate.

The following solutions are required: potassium permanganate 5·7469 grms. per litre; crystallised oxalic acid 11·4573 grms. per litre, equivalent to the permanganate; pure tannin 5 grms. per litre; pure potash alum 5 per cent.

The titre of the tannin solution is first determined; for this purpose 5 c.c. of tannin solution and 12 c.c. of dilute sulphuric acid (1:5) are heated to boiling, treated with excess of permanganate, then with excess of oxalic acid, and finally titrated to the end point with permanganate. Another 5 c.c. of tannin solution are allowed to remain with 2 grms. of hide powder for 18 hours, then filtered, washed with cold water, and the permanganate value of the filtrate is determined. The difference between the two permanganate titrations shows the titre of the tannin solution.

For carrying out the analysis, 10 grms. of the glue or gelatin are soaked over night, dissolved on the water-bath

and the volume is made up to 500 c.c. at 30° C. Three lots of 10 c.c. each are measured into separate beakers, and tannin solution is added to each to the extent of 30 c.c. for hide glue and gelatin and 25 c.c. for bone glue; 20 c.c. of alum solution are then added and the beakers are placed on a boiling water bath for a few minutes, the contents being stirred vigorously. They are then removed, and the precipitates are allowed to settle out, then filtered and washed with water at 30° C. A cloudy filtrate indicates deficiency of tannin and fresh quantities must be precipitated. The filtrate from one lot is cooled thoroughly and treated in a stoppered vessel with 2 grms. of hide powder. To one of the others 20 c.c. of dilute sulphuric acid are added, and the mixture is titrated with permanganate as described above. To the other, 3 c.c. of dilute sulphuric acid (1:5) are added for every 5 c.c. of permanganate indicated in the previous titration, and the result of this latter titration is accepted as correct. After 18 hours treatment the hide powder test is filtered and washed with cold water; the filtrate is treated with excess of permanganate, then with excess of oxalic acid, and finally titrated to the end point with permanganate. From the above data the quantity of tannin precipitated by the glutin can easily be calculated, and, in the case of the solutions mentioned above, 1 c.c. of permanganate deficit corresponds to 0·002 grm. of glutin. Naturally, care must be taken to ascertain that the reagents used, such as alum and hide powder, contain no impurities capable of reducing permanganate.—J. F. B.

Tartrates; Influence of Temperature on Crystallisation in the Determination of ——. P. Carles. Ann. Chim. anal. appl., **7**, 121—123. Chem. Centr., 1902, **1**, [20], 1178.

THE author states that the varying results obtained in the determination of tartrates by Chancel's method are due to the fact that the influence of temperature is not taken into consideration. The determinations should always be carried out at the same temperature, or else a correction made. 1 litre of water dissolves 3·20 grms. of acid potassium tartrate (cream of tartar) at 0° C., 3·60 grms. at 5°, and 4·00 grms. at 10°, 5·00 grms. at 15°, 5·70 grms. at 20°, 7·35 grms. at 25°, and 9·00 grms. at 30° C.—A. S.

Pentoses and Pentosans; Determination of ——, *by means of Phloroglucinol.* E. Kröber and C. Rimbach; communicated by B. Tollens. Zeits. angew. Chem., 1902, **15**, [20], 477—482.

TOLLENS has compiled this article from a dissertation by Rimbach (Göttingen, 1898) and a paper by Kröber (see this Journal, 1901, 396). It must be borne in mind that the method is purely empirical. For instance, a divergence in the concentration of the acid used for distillation from 1·06 sp. gr. to 1·08 causes a very large difference in the results obtained. Kröber's tables may be taken as superseding the earlier ones of Krüger and Tollens; it should be noted that methyl furfural is precipitated as phloroglucide as well as furfural itself.—J. F. B.

Pentosan Determination Method; Application of the ——, *to various Vegetable Substances and Paper-making Materials.* E. Kröber and C. Rimbach; communicated by B. Tollens. Zeits. angew. Chem., 1902, **15**, [21], 508—510.

In this paper are collected the results of pentosan estimations by the phloroglucinol method (see preceding abstract) in a large number of vegetable substances. The tables comprise results relating to substances yielding only traces of furfural on distillation; wood gums; crude fibres from straw, bran, and straw; woods; fossil woods; oxycelluloses; various plant organs; paper-making materials; finished papers.

Attention is called to the applicability of this method for the analysis of papers composed of two known kinds of fibre, one of which yields little furfural and the other a large quantity on distillation, *e.g.*, mixtures of cotton or linen with mechanical wood or (less accurately) of sulphite cellulose with mechanical wood. In order to find the percentage of one of the components, the calculation should be stated thus:—The difference between the percentage of pentosans of the two components: to the difference between the percentage of pentosan found in the paper and the percentage of pentosan in the second component = 100 : x.

As data for such analyses the following percentages of pentosans on the dry and ash-free fibre may be taken for approximate results:—Cotton or linen, 1 per cent.; soda cellulose, 6 per cent.; sulphite cellulose, 7 per cent.; mechanical wood, 12 per cent.; straw pulp, 26·7 per cent.
—J. F. B.

Sugar Beetroots; Analytical Diffusion Apparatus for the Valuation of ——. C. Stiepel.

See under XVI., *page* 866.

Sugars; Analysis of a Mixture of —— *by the Use of Kjeldahl's Table.* A. Gregoire. Bull. Assoc. Belge des Chim., **16**, [1], 26—32.

AFTER determining the rotatory power of the mixture, 25 grms. of the substance are dialysed for 50 hours through a well washed parchment-paper membrane, water being run continuously into the outer vessel, and care being taken to prevent fermentation. The residue is then made up to 100 c.c. and polarised at 15° C.; after which the reducing power of this residue and of the original substance is determined by the Kjeldahl method, the residue being examined before and after hydrolysis with hydrochloric acid (as for starch).

From the polarimeter readings an equation is established on the basis of 1° Schmidt and Haensch corresponding to 0·1234 grm. of maltose or 0·7510 of invert sugar. The amount of copper reduced by the dialysed sugars is found by deducting from the total the amount reduced by the non-dialysable matters. The result serves as a basis for the establishment of a proportion in which the total amount of reduced copper figures as the numerator and the corresponding amount of maltose (or invert sugar) in the Kjeldahl table for 50 c.c. of Fehling solution as the denominator of the first fraction, which is set down as equal to the net amount of reduced copper divided by the unknown quantity of maltose (or invert sugar). These results are referred to the weight of substance employed in the reduction tests, and thus furnish an equation which, when combined with that from the polarimeter readings, gives the percentages of maltose and invert sugar present. The dextrin is found by hydrolysing the non-dialysable portion and multiplying its reducing power by 0·90.

The results obtained in this manner were found to compare satisfactorily with those furnished by reduction, after the destruction of fructose, by the Sieben method.—C. S.

Thymol; Method for the Volumetric Determination of ——. E. Zdarek. Zeits. anal. Chem., 1902, **41**, [3 and 4], 227—231.

THE author has applied, to the estimation of thymol, Koppeschaar's method for determining phenol. The solutions required are:—Sodium thiosulphate, 9·76 grms. in 1 litre; potassium iodide, 125 grms. in 1 litre; a solution of 3·571 grms. of dry sodium bromate, and 12·178 grms. of dry sodium bromide in 1 litre. 25 c.c. of the last solution mixed with 10 c.c. of the potassium iodide solution, and 5 c.c. of strong hydrochloric acid, required 90 c.c. of the thiosulphate solution. The thymol is weighed into a small stoppered flask, and for every 0·1 grm., 20 c.c. of the bromide-bromate solution, and 4 c.c. of fuming hydrochloric acid are added. The flask is then well shaken for five minutes, 10 c.c. of the potassium iodide solution, and a little starch paste added, and the mixture at once titrated by thiosulphate. 1 mol. of thymol requires 4 Br. The results quoted vary from 98·6 to 100·2 per cent. of the theoretical. The bromine compound is not stable; when kept it loses bromine until its composition remains constant at that of a dibromothymol. By the action of a large excess of bromine on thymol, an oily product was obtained, which separated almost colourless needles, which melted at 71° C., and had the composition of a decabromothymol.

This method has been used to investigate the solubility of thymol. At 19·4° C. 1 grm. of thymol dissolves in 1176·4 c.c. of water. At the ordinary temperature (15°—20° C.) 1 part by weight of thymol dissolves in 0·24—0·28 part of strong alcohol, in 0·22—0·26 part of ether, or in 0·67—071 part of chloroform. The presence of even considerable quantities of alcohol does not affect the accuracy of the method for estimating thymol.

—A. C. W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Light; Chemical Action of ——. G. Ciamician and P. Silber. Atti. R. Accad. dei Lincei Roma, **11**, [5]. 277—284. Chem. Centr., 1902, **1**, [21], 1190.

In continuation of their previous work (see this Journal, 1901, 844,943), on the chemical action of light, the authors have obtained the following results:—In alcoholic solution, nitrobenzene gives quinaldine and aniline; the three nitrotoluenes behave in a similar manner, the *m*-compound reacting to the greatest extent, giving *m*-toluidine and the corresponding methyl quinaldine. *o*- and *m*-Dinitrobenzene, the three nitranilines, and nitronaphthalene give small quantities of brown substances, but no basic products could be isolated.

In benzene solution, *o*-nitropiperonal gives *o*-nitrosopiperonylic acid; *o*-nitrocinnamic acid and *o*-nitrosobenzoic acid remain unaltered. *o*-Nitrobenzaldehyde in benzene solution gives nitrosobenzoic acid. In ethyl and methylalcoholic solution, however, *o*-nitrobenzaldehyde or the ethyl ester of nitrosobenzoic acid gives a complicated mixture containing the diethylester of *o*-azoxy-benzenedicarbonic acid (in predominating quantity), the ethyl ester of nitrobenzoic acid, azoxybenzenedicarbonic acid, and probably also traces of anthranilic acid esters.—A. S.

Precious Stones; Action of Light on ——. Chaumet. Comptes Rend., **134**, [20], 1139—1140.

The fluorescence excited in diamonds by violet light is strongest with the best and most valuable stones, those which exhibit the most vivid play of colours in the light of a candle. This is a valuable means of diagnosis; for all diamonds, whatever their quality, are affected alike by X rays.

A particular yellow diamond examined by the author showed no fluorescence under violet light, but flashes of red light at various points. After a few minutes' exposure, the stone had become dark brown, and had lost four-fifths of its value. After 24 hours, however, its original colour and brilliancy had returned.

Though Burmese rubies are much more valuable than Siamese, it is extremely difficult to distinguish between them, either by their appearance or by radiography. Violet light, however, acts quite differently on them, causing a most brilliant fluorescence in Burmese rubies, while Siamese stones show hardly any.—J. T. D.

Liquefied Gases; New Method for Manipulating —— in Sealed Tubes. H. Moissan. Bull. Soc. Chim., 1902, **27**, [10], 420—423.

The author describes his method of studying the reactions taking place between liquefied gases and other compounds in sealed tubes. As cooling agents he makes use of mixtures of solid carbon dioxide with various liquids (methyl and ethyl alcohols, methyl chloride, acetaldehyde, ethyl acetate, acetone) contained in a vacuum-jacketed vessel to diminish the effect of radiation; evaporation of the mixture is promoted by the passage through it of a rapid current of carefully dried air. For very low temperatures, liquid air or oxygen boiling either at the ordinary or at reduced pressure is employed.

The difficulty of sealing a tube containing a liquefied gas is got over by cooling the tube sufficiently to solidify the gas and then exhausting the air by means of a mercury pump; the tube can then be readily sealed off and tube may be prepared in this way to resist pressures of 200—300 atmospheres. For these very high pressures, thick-walled tubes must be employed, those used by the author having a bore of 1·5 mm. and an external diameter of 6 mm. In the case of experiments made at temperatures of about − 200° or lower, a complication ensues, in that the tube very often breaks on being brought back to the ordinary temperature; this difficulty may be partly avoided by making the warming very gradual, the tubes being kept for some time at from − 110° to − 50° C. The study of reactions involving the evolution of hydrogen is very difficult by this method, as in order to avoid an explosion it is necessary to cool the tube to a temperature at which the hydrogen solidifies.—T. H. P.

Sulphur; Existence of the Blue or Green Modification of ——. N. A. Orloff. J. russ. phys.-chem. Ges., **34**, 52—67. Chem. Centr., 1902, **1**, [22], 1264. (See also this Journal, 1901, 943.)

The author gives some new methods of preparation of the blue modification of sulphur; the green form he considers a mixture of the blue with ordinary yellow sulphur. From S_2Cl_2 and UO_2S, PtS_2 or Ag_2S, the green product is formed together with fine crystals of rhombic sulphur. The green product obtained from CdS and S_2Cl_2 gives up the whole of its sulphur to salicyl- or cinnamic aldehyde; the liquid which is of a reddish-brown colour, is not altered by addition of alcohol or benzene, but is decolorised on long standing, with separation of sulphur. That the blue form is actually an allotropic modification is shown by its solubility; the green product is five times as soluble as ordinary sublimed sulphur in a mixture of salicylic aldehyde and benzene. The blue modification is frequently formed in the preparation of carbon tetrachloride by Müller and Dubois' method: $CS_2 + 2S_2Cl_2 = CCl_4 + 6S$. Caraven-Gil's reaction (1894), the blue coloration of alcohol by polysulphides, also depends upon the formation of blue sulphur. Acetone also gives this reaction. The different reactions given by organic sulphur compounds with ferric chloride may also be explained as due to solutions or metastable addition products of blue sulphur. The author ascribes to blue sulphur the role of a chromophoric group (in the broader sense), and states that this role is plainly evident in substances such as ultramarine, the blue compound from borimide and ammonium sulphide (see this Journal, 1901, 1252), thiobenzophenone, and others.

—A. S.

Hydroxides of the Heavy Metals; Solubility of ——, *in Caustic Soda.* J. Rubenbauer. Zeits. anorg. Chem., **30**, 331—337. Chem Centr., 1902, **1**, [21]. 1193.

The author has determined the solubility of zinc hydroxide, beryllium hydroxide, stannous hydroxide, and lead hydroxide in caustic soda, by shaking for five hours the pure hydroxide in a freshly precipitated condition with a quantity of pure caustic soda lye insufficient for complete solution. It was found that the solubility of all hydroxides of heavy metals in caustic soda depends to a very considerable extent on the concentration. With zinc hydroxide (apparently also with beryllium hydroxide), but not with stannous and lead hydroxides, a greater quantity goes into solution than corresponds to the condition of stability; in such cases, zinc hydroxide spontaneously separates again from the solution. The influence of concentration is relatively small with beryllium and tin, somewhat greater with lead, and greatest with zinc. There is no definite proportion between the concentration of the caustic soda and the solubility of the hydroxide. With a definite concentration of the alkali, a maximum or minimum point of solubility can generally be observed. This indicates that two chemical processes of opposite action are going on in the same solution. First, a decrease of the solubility in alkali with increasing dilution, owing to the increasing hydrolisis of the zincates, beryllates, &c. formed; secondly, a decrease of the solubility in alkali with increasing concentration of the lye, probably owing to the conversion into an insoluble form by partial dehydration

by the concentrated alkali of the hydroxides (produced by hydrolysis) present in solution.—A. S.

Metallic Hydroxides; Note on certain Modifications of ——. A. Hantzsch. Zeits. anorg. Chem., **30**, 338—341. Chem. Centr., 1902, **1**, [21], 1194.

Zinc hydroxide in a freshly precipitated condition dissolves easily in alkali, but, under certain conditions, spontaneously separates more or less completely from the solution, and is then much less readily soluble in alkali. In the same way, aluminium hydroxide which has been separated from alkaline solution is no longer soluble in alkali. Chromium hydroxide when freshly precipitated is completely soluble in alkali, but when dried becomes insoluble. The sulphides of nickel and cobalt behave in a similar manner towards dilute acids. Of the different hydroxides of iron, one modification is easily soluble, the others only soluble with difficulty in dilute hydrochloric acid, &c. The author considers that most of the modifications are not due to isomerism or polymerism, but to changes in the physical condition of the substance and to chemical alteration of the hydroxide condition.—A. S.

Halogen-thiobismuthites of Copper. F. Ducatte. Comptes Rend., **134**, [21], 1212—1213.

By the methods pursued in the case of the corresponding lead compounds (this Journal, 1902, 796), the author has prepared the chloro-, bromo-, and iodothiobismuthites of copper, $2Cu_2S.Bi_2S_3.2BiSX$ (where X = Cl, Br, or I). They are all well-crystallised compounds, permanent in air at the ordinary temperature, insoluble in water, partially decomposed on boiling with it, and completely decomposed, like the lead compounds, by acids.—J. T. D.

Hydrogen Electrode; Depolarisation of —— by Bodies of the Aromatic Series. A. Panchaud de Bottens. Zeits. für Elektrochem., 1902, **8**, [22], 332—346.

The depolarisation of a hydrogen electrode in the presence of reducible bodies was experimented upon, 53 members of the aromatic series being tried, including nitroso- and nitro-compounds, nitrosamines, and iso-diazo- and diazonium- compounds. The experiments were conducted in normal sulphuric acid or caustic potash, or, when necessary, in acetic acid, at 35° C. (or if required at 0° C.) attention being paid to the progress of the action in relation to time and to concentration. It was thus found that the reducing power of hydrogen on platinised platinum in regard to reducible substances can be expressed as a depolarisation value in terms of volts. Substances of analogous composition have similar depolarisation values, whilst those of similarly constituted have depolarisation values corresponding to different groups. The absolute values of the classes of bodies examined in acid solution, are as follows:—

(*a*) Nitroso compounds	0·64—0·5
(*b*) Mononitro compounds	0·33—0·23
(*c*) Nitrosamines and isodiazohydrates	0·16—0·09
(*d*) Diazonium compounds	0·47—0·37
(*e*) Isodiazo-compounds	Nil.

No definite laws have been found for isomers in any group; but, in acid solutions, among the isomers of nitro-disubstitution products, the ortho compounds have been found to exert the most powerful action as depolarisers. The method of estimating the depolarisation values shows, in the case of each of the isodiazohydrates examined, that these compounds belong to the nitrosamine group.

—W. G. M.

Nitroprussides; Action of Sulphites on ——. (*Boedeker's Reaction.*) J. Fages. Comptes Rend., **134**, [22], 1143—1145.

Zinc sulphate containing a little sodium nitroprusside gives with normal sulphites a red coloration, the sensitiveness of the reaction being increased by the addition of a little potassium ferrocyanide. The author has studied this reaction, and finds:—

1. That the red coloration is formed by the interaction of the sulphite with zinc nitroprusside.

2. That nitroprussides in general react with sulphites to form red substances, but that the colour is produced most readily by insoluble (nickel, cobalt, zinc, manganese, copper, cadmium, palladium, ferrous) nitroprussides. The red substance is amorphous, soluble or insoluble according to the metallic nitroprusside used, and not very stable, being destroyed by acids, alkalis, or dilution of the liquid.

3. The red substance is probably an addition-product, behaving in many respects as though it were a mixture of sulphite and nitroprusside.

4. The action of the potassium ferrocyanide in rendering the reaction more sensitive, is not direct. If zinc nitroprusside be used, it diminishes the sensitiveness of the reaction, and its use is probably, when zinc sulphate and sodium nitroprusside are used, to precipitate the excess of zinc, for any other precipitant of zinc can be substituted, if not added in excess.—J. T. D.

New Books.

Gas and Gas Fittings. A Handbook of Information relating to Coal-Gas, Water-Gas, Power-Gas, and Acetylene. For the Use of Architects, Builders, and Gas Consumers. By H. F. Hills. D. Fourdrinier, "Builder" Office, Catherine Street, London, W.C.; Whittaker and Co., Paternoster Square, London, E.C. 1902. Price 5*s*.

One of "The Builder" Students' Series, and designed as stated above. There are 73 illustrations.

Sewage Works Analyses. By Gilbert J. Fowler, M.Sc. (Vict.), Superintendent and Chemist, Manchester Corporation Sewage Works. P. S. King and Son, Orchard House, Westminster, London, S.W.; John Wiley and Sons, New York. 11 illustrations. 1902. Price 6*s*.

This book contains an account of the methods of analysis used in the Manchester Corporation Sewage Works.

It is a small 8vo volume, containing 131 pages, classified as follows:—I. Chemical Control of Sewage Purification Processes. II. Determination of Absorbed Oxygen. III. Of Ammonia. IV. Of Nitrites and Nitrates. V. Of Dissolved Oxygen. VI. Of Chlorine, Acidity and Alkalinity, and Iron Compounds. VII. Of Solids in Solution and Suspension. VIII. Analysis of Gases from the Septic Tank and from Bacterial Filters.

Handbuch der anorganischen Chemie. Herausgegeben von Dr. O. Dammer. IV. Band. Die Fortschritte der anorganischen Chemie in den Jahren 1892—1902. Bearbeitet von den Herren Baur, Richard Meyer, Mathmann, Nass, Nernst, Rothmund, Stritar und Zeisel. Lieferung 2. Ferdinand Enke's Verlag, Stuttgart, Germany. 1902. Price M. 4.

This forms Part 2 of Vol. IV. of Dammer's Handbook of Inorganic Chemistry, and runs from page 161 to page 320. It commences with the subjects of the *Content of Atmospheric Air in Dust and Germs*, and ends with the subject of the *Phosphoric Acids*.

Trades Waste: Its Treatment and Utilisation. With Special Reference to the Prevention of Rivers Pollution. A Handbook for Borough Engineers, Surveyors, Architects, and Analysts. By W. Naylor, Chief Inspector of Rivers, Ribble Joint Committee, &c., &c. Chas. Griffin and Co., Ltd., Exeter Street, Strand. 1902. Price 21*s*. nett.

8vo volume containing prefaee, table of contents, list of plates, list of illustrations and diagrams, list of analysts

whose results are quoted, list of authors' names quoted, list of publications quoted. Subject-matter filling 263 pages, with 21 plates, 27 folding diagrams, and 117 illustrations. The subjects treated of are classified as follows:—I. Introduction. II. Chemical Engineering. III. Woollen-Mill Waste. IV. Tanning and Fellmongery. V. Brewery and Distillery Waste. VII. Calico Bleaching and Dyeing. VII. Calico Printing and Dyeing. VIII. Paper-making Waste. IX. General Chemical Waste.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF FACTORIES AND WORKSHOPS FOR THE YEAR 1901. Part I. Reports. Eyre and Spottiswoode, East Harding Street, London, E.C. Price 4*s.* 7*d.*

THE report occupies altogether 306 pages, and contains, among other items, the amended special rules for the manufacture of earthenware and china, as established after arbitration, by the award of the umpire, Lord James of Hereford, dated 30th of December, 1901; also amended special rules for the handling of dry and drysalted hides and skins imported from China or from the West Coast of India.

Trade Report.

I.—GENERAL.

FREE ALCOHOL FOR CHEMICAL INDUSTRIES.

The Times, June 12, 1902.

In Committee on the Finance Bill—

Mr. HALDANE (Haddingtonshire) moved to add the following clause:—

"(1) Where, in the case of any art or manufacture carried on by any person in which the use of spirits is required, it shall be proved to the satisfaction of the Commissioners of Inland Revenue that the use of methylated spirits is unsuitable or detrimental they may, if they think fit, authorise that person to receive spirits without payment of duty for use in the art or manufacture upon giving security to their satisfaction that he will use the spirits in the art or manufacture, and for no other purpose, and the spirits so used shall be exempt from duty. (2) The authority shall only be granted subject to a compliance with such regulations as the Commissioners may require the applicant to observe for the security of the revenue, and upon condition that he will, to the satisfaction of the Commissioners if so required by them, render the spirits unpotable before and during use, and will from time to time pay any expenses that may be incurred in placing an officer in charge of his premises. (3) If any person so authorised shall not comply with any regulation which he is required to observe he shall, in addition to any other fine or liability, incur a fine of 50*l.*" He said that, owing to the unenlightened policy of this country, manufactures had been prevented from coming into existence, and others had been starved out of existence because it was impossible to get the cheap alcohol which was necessary for carrying out their processes. The Explosives Committee, of which he was a member, had found themselves face to face with the necessity of obtaining an adequate supply of nitro-cellulose for the purpose of bringing the powder used in our Navy and Army to perfection, and of encouraging manufacturers to establish their factories in this country and to make nitro-cellulose, which would be a source of revenue and employment for our people, and a national stand-by in the event of its being necessary to increase our supply of powder. He had the authority of the Secretary of State to move this clause, and it represented the results of the deliberations of the Explosives Committee. The difficulty in the present state of the law was, that owing to the prohibitive duty on alcohol English manufacturers were unable to compete with foreign manufacturers. The nitro-cellulose which was imported from Germany did not contain alcohol, and therefore did not pay duty. There were six or seven other industries which might become general if this clause were adopted, and the desire of the Explosives Committee was to benefit the chemical industry generally. This amendment would inure to the benefit not only of powder manufacturers, but of all those who manufactured billiard balls and other articles to resemble ivory. Then there was a large colour industry to be considered which suffered much from the want of the use of pure alcohol, and had practically shifted to Germany. Dyers imported 80 per cent. of their aniline colours from Germany. Other industries which suffered in the same way were the preparing of perfumes and scents and the preparation of drugs—what were called the synthetic remedies, such as antipyrin and sulphonal. Those valuable commodities were scarcely produced in this country owing to the difficulty caused by the existing Revenue law, and nearly all the chloral we used had to be made abroad, while the export duty on chloroform made the cost of landing it in Australia to the English manufacturer double that of the cost to the German manufacturer. In the same way, on account of the duty on pure alcohol, a great deal of most valuable research work had to be done abroad. All this, he thought, made out a case for the relaxation of the Revenue law. The conditions imposed by the clause were so stringent that there could be no practical possibility of abuse. It would lead to a larger production of alcohol, and would, he hoped, be the beginning of a more enlightened educational policy by restoring to this country a few industries which had gone from it, and of which we ought not to lose sight. He trusted the clause would commend itself to the Chancellor of the Exchequer.

Mr. COCHRANE (Ayrshire, N.) said his hon. friend had placed the case of many industries before the Committee, and he would only trouble them with one other, the manufacture of fulminate of mercury, which required assistance in the same way.

Mr. CAWLEY (Lancashire, Prestwich) testified to the prejudicial effect of the present system on the British aniline dye industry.

COLONEL SADLER (Middlesbrough) was satisfied that if the facilities asked for were granted we should see an important development of many industries.

Mr. MOULTON (Cornwall, Launceston) suggested to the Chancellor of the Exchequer that when he removed the duty on alcohol used as a means of manufacture he should at the same time remove the duty from those other most valuable agents, such as sulphuric ether, which were also used in manufacturing industries.

The CHANCELLOR of the EXCHEQUER thought they were pretty well agreed that this debate had been one of unusual interest. The hon. and learned gentleman who initiated it had done admirable service, as member of the Committee on Explosives, to the whole country, and he did not think that the least of the services rendered by the hon. member had been the manner in which he brought this matter forward that evening. He felt very much the responsibility of his position as Chancellor of the Exchequer in this matter. Nothing could be worse, to his mind, than that the Chancellor of the Exchequer of to-day should, in the idea of favouring or improving trade in this country, give a loophole to the use of alcohol in such a way as would increase drunkenness in the country. He did not speak of the Revenue alone. Of course, the matter was of great importance, and he was greatly struck with what had been said on both sides. He had carefully investigated the effect of the clause proposed by the hon. gentleman opposite, and he thought it was a clause to which he might assent. He did not wish now to enter into the further subject very properly brought before the Committee by so high an authority as the hon. member for Launceston, but he would make inquiry into that subject and see if it was possible to extend the clause in the manner suggested. This might require longer time than would elapse before the report stage, and he would not definitely promise that anything should be done in the present Session. The Committee would feel that the law on this subject was somewhat antiquated, that chemistry and science generally had made enormous strides, and that it might well be that the progress of our industries might be hindered and their development prevented by effects of the laws never anticipated by those who framed them and into which the Government would be bound to examine

with a view to a remedy. In the meantime he had great pleasure in agreeing to the clause.

The clause was read a second time and added to the Bill.

Patent Law Decision in Germany.

Chem. Trade J., June 6, 1902.

A Berlin photographer named Junk invented, some 10 years ago, a photographic emulsion to be used for canvases and papers suitable for being painted upon, after printing, with oil- or water colours. This end the inventor effected by mixing his gelatin emulsion with a large proportion of starch paste. The German patent granted to him, after having passed the scrutiny of the Board of Official Examiners, was so wide in its claims as to be held by the courts to cover all photographic bromide papers coated with an emulsion containing starch in any form—and this notwithstanding the fact that photographic papers containing raw starch had been described, manufactured, and sold for well-nigh 20 years prior to the date of the German application in question. Among the photographic papers of this class is the "Matte Solio," of Kodak, Ltd., and against this firm an action was brought by the inventor. Kodak, Ltd., was supported in its defence by another English Company—Ilford, Ltd. The suits heard in this connection were divided into three distinct issues:—One for the injunction; another for damages or royalty; and a third, brought by the defendants, for a restriction or annulment of the patent. Since it is the custom of the German courts to view a German patent which has received the sanction of the Official Examiner in the light of a Governmental decree, the plaintiff was successful throughout in the suit for injunction, which went to five hearings: first of all in the Lower Courts, then in the Court of Appeal, then in the Supreme Court, or Reichsgericht, at Leipzic, where it was on the first hearing sent down again to the Court of Appeal on account of an error of form in the phraseology of the judgment, then in the Court of Appeal again, and, finally, to its ultimate decision in the Supreme Court. In like manner, the suit for damages went to hearings in the Lower Court and the Court of Appeal.

In the meantime, the defendant company had made efforts to prove want of novelty of the patent, involving the collection of material in all parts of Europe, and, more particularly, in Spain, where the earliest photographic emulsions consisting of a combination of gelatin and starch, had been traced. Armed with proofs of this kind, and supported by the evidence of such authorities as Prof. Dr. Eder, of Vienna; Prof. Dr. Miethe, of Berlin; and Prof. Dr. Schmidt, of Carlsruhe, the German Patent Office was invited to revise its grant by a revocation of the patent or, at least, by a restriction of its claims. The German Patent Office refused to annul the patent, in spite of the altogether conclusive evidence. The defendants appealed to the Supreme Court against the decision of the Patent Office, and here, at last, they were entirely successful, all the previous judgments of the courts being overruled and set aside by the total annulment of the patent.

Trade of Ningpo, China.

Foreign Office Annual Series, No. 2804.

Sugar.—There is a total quantity of 426,585 cwt., in 1901, as against the 369,814 cwt. of 1900.

There is a slight falling-off in brown sugar; a larger, proportionately, in candy. White has advanced, whilst the increase in refined is very marked. The "origin" is not now limited to Formosa, or the "manipulation" to Hong Kong. Much of the sugar of 1900 came from Manila, and must now be credited to American trade.

Sundries.—Wood matches from Japan continue to increase (415,895 gross, as against 315,200 gross in 1900); there is a falling-off in bar soap from the United Kingdom, which, however, is more than compensated for by an increase of nearly one-half in toilet soap (16,185 dozen).

Exports of Elba (Italy).

Foreign Office Annual Series, No. 2801.

The deposits of manganese ore which have been worked with little success in by-gone years in the neighbourhood of the Gulf of Portoferraio are beginning to produce a yield worth mentioning. Between 1,000 and 2,000 tons per annum are now extracted and exported.

Porcelain clay still continues to be supplied to several Tuscan manufactories in the same proportions as formerly, averaging about 1,000 tons per annum.

Compressed Gases, Transport of ——, in France.

Chem. and Druggist, June 7, 1902.

In accordance with a decision of the Council of Hygiene of the Seine, the Paris Prefect of Police has issued an order regulating the transport of compressed gases. By the terms thereof, manufacturers, dealers, and carriers cannot forward or place on the public thoroughfare receptacles containing gases compressed at a pressure of more than 15 kilos. per square centimetre, except by strictly observing the following conditions: (1.) Oxygen, hydrogen, and all other compressed gases may not be transported at a higher pressure than 200 kilos. (2.) Consignments may only be made by persons possessing a pressure gauge of which they understand the working. These persons must, whenever required, fit the gauge to the receptacle to show that the highest prescribed pressure has not been exceeded. (3.) The receptacles must be seamless cylinders of steel or forged iron. The maximum length to be 2 metres (about $6\frac{1}{2}$ ft.), and the maximum interior diameter 21 cm. (about $8\frac{1}{4}$ ins.). These cylinders must be submitted, at the expense of the sender, to a preliminary official test to prove that they will stand, without leakage or bulging, a pressure equal to one and a half times that of the gases they will contain. This test must be repeated every three years. (4) The cylinders are only to be transported in covered vehicles, and should never be moved violently or exposed to the rays of the sun or heat. A six months' interval is to take place before the order is enforced, to allow the manufacturers to comply with the conditions.

Customs Decisions in New Zealand.

Bd. of Trade J., June 5, 1902.

The *New Zealand Gazette* for April 10, 1902, contains a copy of the Customs Commissioner's Order (No. 688), under date of April 8, 1902, notifying the following decisions under the Customs Import Tariff of New Zealand:—

Articles and how Classed.	Rate of Duty.
Dentist's cleansing paste: As soap, n.o.e.	25 % *ad val.*
"Saponine"—hard benzine soap: As soft soap	20 % *ad val.*

II.—FUEL, Etc.

Peat Production of France.

Bd. of Trade J., June 5, 1902.

According to a report of the German Consulate in Paris, issued by the German Ministry of the Interior, peat is found in 32 Departments of France, especially in the Department of the Somme between Amiens and Abbeville, in Anvergne, in the Ardennes, in the Vosges, and in Limousin. Of the deposits of peat, 159 belong to the communes and 342 are owned privately. In 1900, 51,000 metric tons of peat were extracted by the communes and 44,000 tons by private proprietors. The average price per ton was 15 francs. The peat is used chiefly as fuel and the ashes as manure. French peat is stated to contain from 30 to 40 per cent. of carbon, 60 per cent. of moisture, and from 15 to 30 per

cent. of earth. By means of dry distillation, paraffin, solar oil, creosote, charcoal, as well as a dyestuff called "béron-dine," are obtained from peat.

The following table shows the quantity and value of peat produced in France during each of the years 1898 to 1900 :—

—	Quantity.	Value.
	Metric Tons.	Francs.
1898	104,265	1,507,431
1899	99,230	1,513,187
1900	95,630	1,434,941

During the same years the imports and exports of peat were as follow :—

—	Imports into France.		Exports from France.	
	Quantity.	Value.	Quantity.	Value.
	Metric Tons.	Francs.	Metric Tons.	Francs.
1898	25,955	778,665	150	4,506
1899	22,896	686,893	138	4,154
1900	25,832	774,977	118	3,540

The imports originate for the greater part in Belgium and the Netherlands, whilst the exports are sent almost exclusively to Switzerland.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum in Mexico.

U.S. Cons. Reps., May 23, 1902.

Almost certain indications of the existence of petroleum are to be seen in many States, and especially in Tamaulipas, where in places there is an abundance of asphalt, sulphur, and oil on the surface. Besides these signs, some of the topographical features are said to be due to the great pressure of the confined natural gas beneath. It seems, as a result of powerful erosive action during past ages, that the upper strata of earth, which served as a protection, were broken up and removed, after which the pressure of the gas below was sufficient to cause a local upheaval. Through the seams thus formed, the oil, deprived of its lighter gases, escaped in the form of very heavy oil and asphaltum. In most cases the exudation does not consist of any one substance in a paying quantity, but passes through all the grades, from an inferior, dark-coloured oil to massive asphaltum rock, as hard as flint. There are also other equally encouraging indications of an abundance of gas and oil in the shale below.

Several companies, formed principally with American capital, have been organised in order to prospect and drill for oil in Mexico. The Mexican Petroleum Company has invested extensively and is now operating in the district west of Tampico. The Mexican National Oil and Development Company, recently organised under the laws of New Jersey, with a capital of 1,000,000 dols., has had its charter filed in Mexico. This company has secured valuable leases embracing over 1,000,000 acres of land, and will soon begin drilling a series of wells throughout the central part of the State of Tamaulipas.

VII.—ACIDS, ALKALIS, Etc.

Iodine Production of Chile.

Chem. Trade J., June 7, 1902.

According to the official report of the Chilean Fiscal Delegate, the production of iodine, which, in 1900, amounted to 193,497 kilos. (193 tons), rose, in 1901, to 245,949 kilos. (245 tons), although only 21 nitrate oficinas out of 78 made iodine. The quantity exported from Chile last year was 269,018 kilos., and the consumption 255,530 kilos. (against 251,160 in 1900), whilst the quantity in the hands of the consignees and in transit on October 31st was 839,960 kilos., representing more than three years' consumption. As in the case of nitrate of soda, the difficulty is to adjust supply and demand.

Salt Industry in South Australia.

Chamber of Com. J., June 1902.

Work has been commenced by a syndicate formed to test Lake Newlyn, some 300 miles west of Adelaide, with regard to its salt yield. The salt is very pure, and is two to six inches in thickness. An embankment is being made across the lake to conserve a larger quantity of brine for next season, when it is expected that 200,000 tons of salt will be obtained.

Sulphate of Copper at Corfu (Ionian Islands).

Foreign Office Annual Series, No. 2860.

The use of sulphate of copper as a remedy against *peronospora* is steadily increasing; about 28 tons were consumed with more or less satisfactory results. A large amount of a quality inferior to that imported from the United Kingdom is imported from the Piræus, and its use has produced results not quite so satisfactory. The retail market price is about 22s. 6*d.* per cwt.

X.—METALLURGY.

Zinc Production in Silesia (Germany).

Chamber of Com. J., June 1902.

The *Moniteur Officiel du Commerce* states that the production of zinc in Silesia at present exceeds 2,000,000 quintals, and requires nearly 8,000 workmen. The exportation, in 1897, amounted to 496,004 double quintals, and, in 1901, to 533,129 double quintals. Of the last-named quantity, 181,848 double quintals were sent to Great Britain. The nominal price at Breslau is now M. 16 25 pf. to M. 16 50 pf.

Mining Industry of New South Wales.

Imp. Inst. J., June 1902.

According to the preliminary figures issued by the Under Secretary of Mines, the value of the total production of minerals, for 1901, was 6,006,636*l.*, a net decrease of 564,184*l.* on that of the previous year. The total number of men employed in and about the mines of the State during the year under review is computed at 36,615, and shows a decrease of 7,130 persons on the year 1900.

Silver, Lead, Zinc.—The declared net value of silver, lead, and zinc exported during the past year was as follows:—Silver, silver lead, and ores, 1,854,463*l.*, lead (pig, &c.) 100,501*l.*; zinc (concentrates), 4,057*l.*; a total value of 1,959,021*l.*, showing a decrease of 828,429*l.* on the value of the output for the year 1900. The bulk of the output is contributed by the Broken Hill mines, and the fall in prices in silver and lead practically crippled the industry, and caused the closing down of all but three of the principal mines.

Copper.—The value of the copper produced, in 1901, was 413,302*l.*, showing a decrease of 14,734*l.*, for which the fall in the market value of this metal is likewise responsible.

Tin.—The production of tin, during 1901, is valued at 77,315*l.*, which is a decrease of 43,617 on the previous year. Most of the tin is obtained from alluvial deposits, and the severe drought has greatly interfered with washing.

Other Minerals.—In addition to the minerals already mentioned, the value of others raised during the year is as follows:—Alunite, 9,438*l.*; antimony, 1,138*l.*; bismuth, 6,665*l.*; chrome, 7,774*l.*; cobalt, 1,051*l.*; limestone (for flux and lime-making), 22,041*l.*; platinum, 779*l.*

Nickel and Cobalt Industries in the United States of America.

Bd. of Trade J., June 12, 1902.

The United States Geological Survey has completed its annual report upon the production of nickel and cobalt, in 1901, on which the following particulars are based :—

Nearly all the nickel used in the United States is obtained from the mines in the Sudbury district, Canada. The only nickel and cobalt produced in the United States, during 1901, were as by-products at Mine Lamotte, Mo., and the matte containing the nickel and cobalt was refined at Constable Hook and Camden, N.J. There were obtained 2,700 lb. of nickel, valued at 740*l.*, and 13,360 lb. of cobalt oxide, as compared with 9,715 lb. of nickel, valued at 810*l.*, and 6,471 lb. of cobalt oxide produced in 1900. This is a decrease of 3,015 lb. in the production of nickel, and an increase of 6,889 lb. in the production of cobalt oxide. The greater part of the nickel-copper matte from the Sudbury mines is refined in the United States.

The amount of nickel imported and entered for consumption in the United States, in 1901, was 117,364,437 lb. valued at 385,000*l.*, as compared with 57,955,988 lb. of nickel matte, &c., valued at 276,000*l.*, in 1900. The amount of nickel produced from matte ore imported into the United States was 10,497,097 lb., worth 1,000,000*l.* to 1,200,000*l.* There was a decided increase in the production of nickel from New Caledonia ores, in 1901. The price of nickel oxide has been about $2\frac{1}{2}d.$ lower per lb. than the metal, whilst the cobalt oxide has been sold at 9*s.* $4\frac{1}{2}d.$ per lb. The nickel industry is increasing rapidly, and there has also been a decided increase in the amount of nickel used in the United States. The export of nickel oxide and matte from the United States, in 1901, was 5,869,655 lb., as compared with 5,869,906 lb., in 1900.

The amount of cobalt oxide imported into the United States, in 1901, was 71,969 lb., valued at 27,960*l.*, as compared with 54,073 lb., valued at 18,469*l.*, in 1900.

XII.—FATS, OILS, AND SOAP.

Chinese Wood-Oil.

Henry. Chem. and Druggist, 1902, 60, [1166], 873.

This oil is obtained by pressure from the seeds of *Aleurites cordata*. Steud, of the order *Euphorbiaceæ*, a tree indigenous to China and Japan. The seeds contain about 35 per cent. by weight of oil. A small tree will bear 100 or 200 lb. of fruits, each one containing three or four large seeds. The trees soon come into bearing, and little labour is required either in planting the trees or in collecting the fruits. Two kinds of oil are known, the cold-drawn, or white t'ung oil, which is the variety imported into England, and the hot-pressed, or black t'ung oil. The author considers that the tree is very suitable for planting over large tracts in the United States and in certain British colonies, as Ceylon and the Nilgiris, in India, and perhaps in the mountainous parts of the West Indies. It can be tried in barren, mountainous regions, where farming or ordinary planting would be impossible. (See also this Journal, 1897, 195; 1898, 674; 1900, 156, 351, and 1901, 261, 485.)—A. S.

Rape-Seed and Earth-Nuts in Wuhu (China).

Foreign Office Annual Series, No. 2802.

The export of rape-seed has increased from 22,284 cwts., valued at 4,041*l.*, to 280,907 cwts., value, 59,619*l.* This remarkable rise is attributed partly to the increased price of earth-nuts, which are mixed with rape-seed to make the oil, and partly to the high prices for rape-seed offering in Japan and Kwangtung, which have stimulated the export of the product from this province at the same time that the scarcity of money has diminished the local consumption.

The earth-nuts grown at Chinkiang are said to have been superior this year, whereas the Wuhu nuts have been deficient in oil.

Soap Trade of Barcelona (Spain).

U.S. Cons. Reps., May 29, 1902.

Soap is extensively manufactured in Barcelona, there being over 100 factories engaged in this industry, with an annual production of about 25,000 tons. In the commoner grades, the duty of about 25.50 dols. per ton prevents importation. British and French toilet soaps are still imported, in spite of the rapid strides recently made by native manufacturers in this direction. The duty on these is even higher than on common soaps, being 3 pesetas per kilo. (about 42 cents. per 2·2 lb.), when imported from countries having no commercial treaty with Spain, and $2\frac{1}{2}$ pesetas, from favoured nations.

Mineral Lubricating Oils, Vaseline, &c. in Spain.

Bd. of Trade J., June 12, 1902.

The *Gaceta de Madrid* for the 4th inst. contains the text of a Royal Order, decreeing that certificates of origin will in future be required for the articles enumerated in par. 11 of the Spanish Customs Tariff, *viz.*, oleonaphtha, mineral lubricating oils, vaseline, and mixtures of these substances with animal or vegetable oils or greases, in order to entitle them to any tariff advantages.

XIII. C.—INDIA-RUBBER.

Rubber in Assam (India).

Imp. Inst. J., June 1902.

A portion of the well known Charduar rubber plantation was again worked over this year, the trees in compartments 9, 10, and 11 being tapped for the first time, and about 100 trees in compartment 4 for the third time.

Tapping operations have also been carried out in the Kulsi rubber plantation, where the trees tapped for the first time gave an average yield of 28·8 lb. per acre and 1·06 lb. per tree.

The rubber was more carefully collected than in former years, special attention having been devoted to keeping it free from vegetable debris. The total yield from the two plantations was 3,775 lb. of dry rubber and 1,035 lb. of "mat" rubber; the former brought in Calcutta 3*s.* 1*d.*, and the latter 1*s.* 8*d.* per lb., whilst 3*s.* 7*d.* per lb. was obtained in London for the produce of the previous year. The net profit of the rubber-tapping operations was about 440*l.*, as compared with 456*l.* in the previous year. An unsatisfactory feature of the Charduar plantation is the great falling-off in the yield of rubber from the trees tapped for the third time; unless future tappings show that the trees recover themselves after a rest, the value of the plantation as a source of rubber is likely to rapidly diminish.

Gutta-percha and India-rubber in German New Guinea.

Bd. of Trade J., June 5, 1902.

The South Sea Colonies Gutta-percha and India-rubber Expedition was conducted by Mr. R. Schlechter from Stephansort, in New Guinea, to the Bismarck Mountains, in January and February last, and its result, according to the report just received, has been the discovery of both gutta-percha and india-rubber of the best quality.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar in Germany.

U.S. Cons. Reps., May 21, 1902.

The overproduction goes on unabated. Since Aug. 1st, 1901, the beginning of the present season's campaign, there had been worked up in German factories, down to the end of March, 1902, 15,999,780 metric tons of beets, as against 13,253,908 tons during the same period of the previous

campaign, producing 1,995,799 tons of raw sugar, as against 1,706,030 tons during the preceding year. The exports of German raw and refined sugars, during March, 1902, reached 94,403 tons, as compared with 115,537 tons, during the same month in 1901.

Sugar Industry in India.

Imp. Inst. J., June 1902.

A large sugar plant at Ohur, in Behar, was recently started by the India Development Company. The triple crushing mills will deal with 30 to 35 tons of cane per hour; the centrifugals are worked by water motors, and the other machinery is of the most modern type. Additional plant for erection in other centres has been ordered. The prospects of the industry are regarded as most hopeful.

Raw Sugar in Paraguay.

Bd. of Trade J., June 5, 1902.

According to a supplement to the Tariff of Paraguay, unrefined sugar of all descriptions imported into Paraguay is now liable, by a law of Aug. 22nd last, to an import duty of 70 per cent. on the valuation assessed thereon in the Valuation Tariff for the time being in force.

XVII.—BREWING, WINES, SPIRITS, Etc.

Alcohol Production of Peru.

Foreign Office Annual Series, No. 2807.

The annual production of alcohol from sugar-cane is estimated at over 2,000,000 galls., of which 600,000 galls. are exported to Bolivia, but if other outlets could be secured, there would be no difficulty in increasing the production largely. Producers look forward to the use of alcohol in various branches of industry as the only means of developing their business.

Alcohol for Industrial Purposes; Drawback of Excise Duty on ——, in Belgium.

The *Moniteur Belge* of 1st inst. contains a Decree modifying the drawback on alcohol employed in refining and washing raw oils, as well as in the manufacture of aniline colours, artificial flowers, transparent soaps, tannin, pyrotechnical products, and smokeless powder, from 64 francs to 90 francs per hectol. of alcohol of 50° (Gay Lussac) at a temperature of 15° C.

Saké Industry of Japan.

Chem. Ind., 1902, **25**, 249—252.

According to a German Consular Report, the consumption of the Japanese national drink is diminishing in favour of that of beer brewed by European methods, which has increased sevenfold in the last twelve years. The greater portion of this beer is brewed in the country, imported beer now only representing about 1 per cent. of the total consumption. Locally-brewed beer is favoured by the absence of duty, whilst saké and imported beer are heavily burdened. The machinery and brewing materials, as well as the management of the local breweries, are mainly of German origin; Austria competes in the supply of malt. The quality of the European beer brewed in Japan is by no means inferior to the German article; it is, moreover, very much cheaper, a considerable quantity of it being exported to other Asiatic countries.—J. F. B.

XVIII. A.—FOODS.

Margarine in Russia.

P. Pollatschek. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [5], 102.

To carry on the manufacture of margarine in Russia certain regulations must be conformed with. Thus, a special permit is required from the Minister of Finance and the Minister of the Interior. Margarine factories can only be established in towns possessing municipal slaughterhouses and such towns are rare in Russia. To every factory a medical man is appointed by the Minister of Commerce and Industry, who continually superintends the manufacture, and who is paid by the factory. A veterinary surgeon also must be salaried by the works, to supervise the slaughter of the animals and the cutting out of the raw tallow therefrom. These officials, as well as the factory, are controlled by the State Medical Inspector at least once every three months.

Regulations, issued by the Minister of Commerce and Manufactures, and according to which the manufacture can only be carried on, prescribe minutely the method of manufacture, which is in the main Monier's process. Up to the present margarine is still produced from raw tallow and milk only, and the necessary raw margarine is expressed in the factory itself. None but the tallow from the slaughter house of the same town in which the factory is situated is allowed to be used. Purified cocoanut oil and maize oil can also be employed for the manufacture of oleo margarine.

As no law restrictions against adulteration exist in Russia 50 per cent. of oleomargarine is generally mixed with 50 per cent. of butter, and sold in the trade as butter, and this mixture is largely consumed in Russia.

Margarine proper is not eaten in European Russia, its largest sale being in East Siberia, where about 244—326,000 kilos. are consumed annually. The next most important market is the Caucasus.

Hitherto only three margarine works have existed in Russia, one each in St. Petersburg, Odessa, and Moscow. The former recently had its permit to work withdrawn. The Moscow factory produces chiefly oleomargarine, and has pretty well the whole of the European Russian trade in hand. The Odessa works make margarine chiefly, and very little butter. Their market is in East Siberia and the Caucasus and their yearly production is about 489,000 kilos.

These two factories having a virtual monopoly, the business is in a healthy condition, notwithstanding these restrictions. Unfortunately the Government does not view the erection of new factories favourably, and places as possible hindrances in the way.—S. I. K.

XX.—FINE CHEMICALS, Etc.

Perfumery Markets of Europe.

Chamber of Com. J., June 1902.

According to a report from the Italian Consul at Jerusalem, superior as well as cheap perfumery finds a market there. England and France supply the superior article, the cheaper one coming mostly from Germany. Recently a Milan firm has also succeeded in obtaining a footing for its articles there. The French Consul at Las Palmas reports that there is an exclusive demand for cheap articles, as essences in small bottles, and perfumed soaps have a sale in the Canary Islands; the latter, if ornamented with a portrait of the Pope or the picture of a Saint are preferred. German productions have also met with favour. The manufacture of perfumery in Russia has very considerably increased during recent years; the value of the productions, in 1900 is estimated at about 15 million francs. In 1880, about 650 workmen where occupied in this industry; now about 3,000 workmen are occupied in the Russian perfume works. At present the importations reach a value of 5 million francs annually. France, England, and Germany are the principal importers. The *Bulletin* of the French Chamber of Commerce at Constantinople states that the value of the imports of perfumery into Constantinople is about a million francs per annum, and into the whole Turkey, perfumery of the value of about 7 million francs annually imported, of which about 4 millions are supplied by France. In 1901, the importations into Constantinople were:—perfumery, 144,859 kilos.; essences, 15,692 kilos. and soaps, 731,615 kilos.

Chemical Imports in Natal.

According to the *Natal Government Gazette*, the value of the apothecary wares, drugs, and chemicals imported into the colony during the first three months of the present year was 20,023*l.*, as against 14,299*l.* for the corresponding period of 1901. The following values are also given, the figures in parentheses being for the first quarter of 1901 :—Acetic acid, 222*l.* (31*l.*); medicinal preparations, 16,629*l.* (13,260*l.*); drugs (free), 6,024*l.* (2,575*l.*); extracts and essences, 7,521*l.* (4,558*l.*); Kafir ochre, 14,500*l.* (200*l.*); perfumery, 3,688*l.* (2,188*l.*); photo ware, 8,024*l.* (4,516*l.*); saccharin, 53*l.* (886*l.*); saltpetre, 37*l.* (25*l.*); sheep-dip, 2,355*l.* (2,942*l.*); soaps, other than toilet, 11,229*l.* (19,888*l.*); toilet soaps, 4,821*l.* (1,868*l.*); spices, 377*l.* (693*l.*); spirit of wine, 23*l.* (12*l.*).

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 13,302A. Naef. Evaporation of liquids. Filed June 2. Date applied for, Nov. 30, 1900, being date of application in United States. An invention comprised in Application No. 13,302 of 1901.

„ 12,531. Kyrklund and Söderlund. Improved method of and means for securing immunity from fire or explosion in materials or substances stored in bulk. June 2.

„ 12,678. Harris. Refrigerating apparatus. June 3.

„ 12,703. Schäfer. Improved freezing machine. June 3.

„ 12,773. Springhorn and Burnie. Strainers or filters. June 4.

„ 12,943. Hencke. Rotary filters. June 6

„ 13,063. Black. Machines for stamping, pressing, or moulding metals, coal, peat, clay, gutta-percha, india-rubber, paper pulp, and the like, where pressure is required to mould or form the same. June 9.

, 13,150. Heiliger. Means or appliance for starting crystallisation in thermophones.* June 10.

, 13,271. Mendham. Improved method of and apparatus for controlling the delivery of viscous liquids, in measured or other quantities, chiefly designed for use in filling jars, tins, and other receptacles with such liquids.* June 11.

. 13,386. Adams. Filtering apparatus and apparatus connected therewith. June 13.

13,484. Scotch and Irish Oxygen Co., Ltd., and Carty. High-pressure stop-valves.* June 14.

13,512. Feeny.—Abwärme-Kraftmaschinen-Ges. m. b. H., Germany. Heating of liquids of low boiling points.* June 14.

[C.] 12,442 (1901). Dolphin. Agitating of liquids, and apparatus therefor. June 11.

[C.S.] 15,533 (1901). Zarnico. Apparatus for feeding and mixing with air fine granular or pulverulent substances. June 18.

„ 17,823 (1901). Jacobs. Machine for mingling powdered materials. June 11.

„ 21,172 (1901). Lake.—From Berrigan. Centrifugal machines for separating liquids from solids. June 11.

„ 26,067 (1901). Lake.—From Masexar and Bevington. Machines for pressing or stamping bars or cakes of plastic material. June 18.

„ 6958 (1902). Elworthy and De Maniu. Barrels, tubs, vats, and other vessels of like kind. June 11.

„ 7451 (1902). Rousseau. Crucibles. June 11.

„ 8392 (1902). Crossman. Filter and extractor presses. June 18.

„ 10,045 (1902). Evans. Apparatus to be used in obtaining infusions or extracts of various substances. June 18.

II.—FUEL, GAS, and LIGHT

[A.] 13,302B. Naef. Utilisation of heat from furnaces, gas engines, and air compressors. Filed June 2. Date applied for, Nov. 30, 1900, being date of application in United States. An invention comprised in Application No. 13,302 of 1901.

„ 13,302C. Naef. Heating blast for furnaces. Filed June 2. Date applied for, Nov. 30, 1900, being date of application in United States. An invention comprised in Application No. 13,302 of 1901.

„ 14,577B. Naef. Compressing, drying, heating, and utilising the waste heat of air. Filed June 11. Date applied for, Dec. 18, 1900, being date of application in United States. An invention comprised in Application No. 14,577 of 1901.

„ 14,577C. Naef. Utilisation of waste heat from furnaces, gas-engines, and the like. Filed June 18. Date applied for, Dec. 18, 1900, being date of application in United States. An invention comprised in Application No. 14,577 of 1901.

„ 12,490. Park. "Gas" generators. June 2.

„ 12,501. McQuinn and Hodgson. Oil lamps. June 2.

„ 12,502. McQuinn and Hodgson. Improved method of treating asbestos for wicks in oil lamps. June 2.

„ 12,515. Chandler and Chandler. Bearings for rotary gas-washer scrubbers. June 2.

„ 12,523. Johnson. Hydrocarbon burners.* June 2.

„ 12,552. Settle and Padfield. Manufacture of coal-gas. June 2.

„ 12,563. Petersen and Ebert. Furnaces. June 2.

„ 12,620. Jackson. Method of and means for increasing the illuminating power of lamps, employing lime or other refractory earths or substances in conjunction with an oxyhydrogen flame. June 3.

„ 12,650. Williams. Rotary kilns. June 3.

„ 12,710. Loeben. Apparatus for mixing air and gas or other fluids.* June 3.

„ 12,735. Menge. Improved petroleum lamp.* June 4.

„ 12,737. Swan. Blowing-off machines for electric lamp bulbs.* June 4.

„ 12,738. Swan. Means or apparatus for effecting an all-glass seal between the stem which carries the filament of an incandescent electric lamp and the enclosing bulb.* June 4.

„ 12,739. Swan. Bases for incandescent electric lamps, and means or apparatus for manufacturing the same.* June 4.

„ 12,754. Webb and Wright. Acetylene lamps or generators. June 4.

[A.] 12,766. Lake.—From General Electric Co., United States. Apparatus for cleaning electric lamp filaments. June 4.

„ 12,781. Chandler and Chandler. Apparatus for treating gas with regard to naphthaline at an early stage. June 4.

„ 12,827. Kleyer. Improved smoke-consuming appliance for horizontal furnaces. June 5.

„ 12,829. Ross. Acetylene gas generators. June 5.

„ 12,878. Haddan.—From Akt.-Ges. f. Fabrikation von Broncewaaren und Zinkguss, vorm. J. C. Spinn und Sohn, Germany. Incandescent burners.* June 5.

„ 12,918. Young, Glover, and Glover. Economical gasification of bituminous coal, slack, or other fuel, producers, and apparatus relating thereto. June 6.

„ 12,922. Hartmann. Incandescent lamp.* June 6.

„ 12,942. Scherding. Smoke-consuming apparatus. June 6.

„ 13,036. Bethell and Smith. Vaporisers and burners for liquid fuel. June 7.

„ 13,076. Darg. Fuel economiser. June 9.

„ 13,086. Russel and Clausen. Gas arc lamps.* Filed June 9. Date applied for, Jan. 28, 1901, being date of application in United States.

„ 13,088. Hopfelt. Electric arc lamps. June 9.

„ 13,104. Imbert and Morel. New process of obtaining gas and combustible vapours, and apparatus for their practical use.* June 9.

„ 13,114. Leistner. Furnaces. June 9.

„ 13,116. Feeny. — From Abwärme - Kraftmaschinen-Ges. m. b. H., Germany. Improved evaporator heated by steam, hot vapours, or gases.* June 9.

„ 13,120. Méguin and Méguin and Co., Akt.-Ges. Apparatus for compressing small coal for coking ovens.* June 9.

„ 13,130. Hall. Improved device for use in heating charcoal and for other purposes. June 10.

„ 13,144. Keith and Keith. Incandescent lamps. June 10.

„ 13,149. Cumming. Acetylene gas generators and the like. June 10.

„ 13,208. Harris and Vogel. Gas burners.* June 10.

„ 13,306. Haughton. Smoke-consumers for furnaces. June 12.

„ 13,327. Wills. Furnaces. June 12.

„ 13,334. Kirkham and Chandler. Gas washing and scrubbing revolving surfaces. June 12.

„ 13,339. Felt and Greene. Gas-generating retorts.* June 12.

„ 13,358. Hirigoyen. Improved lamp for producing actinic illumination. June 12.

„ 13,396. Liais. Incandescence spirit lamps.* June 13.

„ 13,447. Berntrop and van Leddeu Hulsebosch. Manufacture of fuel. June 13.

„ 13,463. Cadett and Shepherd. Lamps wherein incandescent mantles are used. June 13.

„ 13,495. Hicks. Substances and mantles for incandescent gas light. June 14.

„ 13,537. Björnstad. Furnaces with which steam superheaters are used. June 14.

„ 13,541. Bracklow, Timm, and Bünz. Smoke-consuming apparatus for boilers and furnaces. June 14.

[C.S.] 9551 (1901). Saubermann. Incandescent gas lamps. June 18.

[C.S.] 11,981 (1901). Rosenthal. Gas or vapour burners for heating purposes. June 18.

„ 12,311 (1901). Naef. Treatment of materials with gases, such as for gas making, coke making, smelting or calcining, glass making, or steel making. June 18. Date applied for under International Convention, Nov. 17, 1900.

„ 12,972 (1901). De Blanitza and Herard. Apparatus for the manufacture of gas. June 11.

„ 13,303 (1901). Wise.—From von Szalay. Acetylene gas lamps. June 18.

„ 13,852 (1901). Lockerbie and Wilkinson, Ltd., and Brand. Acetylene generators. June 11.

„ 14,653 (1901). Boult.—From Goldschmid. Manufacture of water-gas. June 18.

„ 14,759 (1901). Clark.—From Goldschmid. Manufacture of gas. June 11.

„ 15,769 (1901). Voelker. Manufacture of incandescing electric lamps. June 18.

„ 16,055 (1901). Lake.—From "Selas" Ges. mit beschränkter Haftung. Method of and apparatus for producing a mixture of gas and air. June 11.

„ 18,347 (1901). Henke. Apparatus for separating dust, soot, and the like from air, smoke, and for arresting sparks. June 11.

„ 21,244 (1901). Hughes. Incandescent gas lighting and gas heating appliances. June 11.

[C.S.] 21,642 (1901). Miller, Miller, and Klahn. Process of burning liquid hydrocarbons. June 11.

„ 1136 (1902). Gebr. Siemens und Co. and Viertel. Electrodes for arc lamps. June 18.

„ 1774 (1902). Schaefer. Incandescent gas lamps. June 18.

„ 3825 (1902). Roberts. Hot-blast stoves. June 11.

„ 5104 (1902). Soc. G. et P. de Mestral. Arc lamps and electrodes therefor. June 11. Date applied for under International Convention, Sept. 4, 1901.

„ 7163 (1902). Power.—From Swenssou. Apparatus for spraying liquid fuel. June 18.

„ 8287 (1902). Bamme and Kahl. Turf-coking ovens. June 11.

„ 8670 (1902). Carbone. Electric arc lamps. June 11.

„ 9874 (1902). Anderson. Gas-lighters. June 11.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 12,565. Singer and Pauli. *See under* XII.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 12,584. Johnson.—From Bad. Anilin und Soda Fabr. Germany. Manufacture of azo colouring matter and intermediate products relating thereto. June 5.

„ 12,680. Vidal. *See under* XIII. A.

„ 13,142. Ashworth. Production of black colouring matters. June 10.

„ 13,429. Imray.—From Farbwerke, Höchst, Germany. Improved manufacture of bromo-substitution products of indigo dyestuffs. June 13.

„ 13,430. Imray.—From Farbwerke, Höchst, Germany. Improved manufacture of bromination products of indigo. June 13.

[C.S.] 11,733 (1901). Urquhart.—From Chemische Fabriken vorm. Weiler-ter Meer. Manufacture of dyestuffs. June 18.

[C.S.] 13,619 (1901). Levinstein, Meusching, and Levinstein, Ltd. Manufacture of new azo colouring matters. June 11.

„ 16,170 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture and production of white and coloured discharges on cotton dyed with sulphurised dyestuffs. June 11.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 12,510. Schirp. Apparatus for dyeing, bleaching, treating with mordants, washing, and otherwise treating textile materials.* June 2.

„ 12,539. Green. Art of removing fibre from cotton seed.* Filed June 2. Date applied for, Dec. 2, 1901, being date of application in United States.

„ 12,603. Behnisch. Improved process and machine for shrinking woven fabrics.* June 3.

„ 12,901. Wood. Raising, brushing, dressing, and finishing textile fabrics. June 6.

„ 12,989. Graemiger. Apparatus for dyeing and otherwise treating fibrous materials in cop and other compact form. June 7.

„ 13,112. Krou, jun. Manufacture of endless strips or strings from paper-pulp, cellulose, silk, asbestos, and like fibres, and means or apparatus for use therein. June 9.

„ 13,121. Boult.—From Vogelsang, Germany. Improved method of bleaching linen yarn or threads.* June 9.

„ 13,217. Spenle. Tentering and mercerising machines. June 10.

„ 13,311. Lendrum. Processes of scouring, milling, and dyeing of fabrics. June 12.

„ 13,471. Urquhart.—From Chemische Fabriken vorm. Weiler-ter Meer, Germany. Improved process for printing with sulphur dyes. June 14.

[S.] 9720 (1901). Illingworth, Mazey, and Naylor. Apparatus for dyeing and otherwise treating fibrous material in a spun or other state. June 18.

12,388 (1901). Keith and Wardle. System of drying and conditioning yarns, fabrics, and other goods, and drying chambers and apparatus for use in such operations. June 11.

22,076 (1901). Schmitz. Process of making non-shrinkable porous foraminous textile fabrics. June 18.

1043 (1902). Anglo-French Ramie Machine Co., Ltd. Machines for decorticating ramie and the like. June 11. Date applied for under International Convention, Aug. 16, 1901.

3422 (1902). Wardwell. Method of preparing yarn and like materials in the form of cops or packages for dyeing, finishing, and other purposes, and the cop or package produced thereby. June 18.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[ ] 13,118. Grünhut. Dyeing or staining of timber. June 9.

[C] 11,444 (1901). Wehrt. Process for printing on paper or the like to resemble pictures on silk. June 11.

8371 (1902). Schmiedel. Method for producing darker shades or tints in the ground colour of coloured paper, showing a pattern or design, and means used therein. June 11.

VII.—ACIDS, ALKALIS, and SALTS.

[A.] 12,681. Hall. Manufacture of carbon articles.* June 3.

„ 12,713. Hodgson and Rowley. Process and apparatus for the manufacture of salt. June 4.

„ 12,744. Guthrie and Guthrie. New or improved apparatus for making bleaching powder. June 4.

„ 12,915. Aldred. Manufacture of carbon dioxide and other gases. June 6.

„ 13,079. Wheelwright and Threlfall. Manufacture of compounds of phosphorus and sulphur. June 9.

„ 13,344. Lake.—From Champ, United States. Apparatus for aerating liquids. June 12.

„ 13,184. Scotch and Irish Oxygen Co., Ltd., and Carty. *See under* I.

[C.S.] 12,439 (1901). Ball. *See under* XX.

„ 12,500 (1901). Martino. *See under* X.

„ 12,822 (1901). Buchhold. Apparatus for drawing off natural ferruginous mineral water without admission of air. June 18.

„ 15,250 (1901). Peyton. Utilising the waste products from the pickling of iron and other metals. June 18.

„ 17,320 (1901). Corbin. *See under* XI.

„ 8757 (1902). Consoli. Apparatus connected with the subliming and refining of sulphur. June 18.

VIII.—GLASS, POTTERY, and ENAMELS.

[A.] 12,627. Knowles. Furnaces, especially glass furnaces. June 3.

„ 12,796. Johnson.—From C. F. Boehringer und Soehne, Germany. Manufacture of ceramic, or earthenware masses, or articles. June 4.

„ 12,816. Critchlow. Apparatus for potters' slips and other semi-liquids and other materials. June 5.

„ 13,211. De Pew Kyle. New or improved process for decorating glass or other transparent or translucent material.* June 10.

„ 13,301. Hales and Paulsen. *See under* X.

[C.S.] 24,319 (1901). White.—From Foster. Apparatus for delivering melted glass. June 11.

„ 6228 (1902). Rembaux. Tables for the manufacture of plate or sheet glass. June 18.

„ 8672 (1902). Michel. Removable glazed or enamelled slab or tile coverings for walls, partitions, ceilings, and the like. June 18.

„ 9489 (1902). Severin. Manufacture of glass bottles and the like. June 11.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, and CEMENTS.

[A.] 12,648. Jenkinson. Kilns for burning bricks, sanitary tubes, and the like. June 3.

„ 12,762. Martin. Process for making white portland cement for interior or exterior decoration. June 4.

„ 12,833. Evers. Bricks for furnace crowns or arches, the firing holes of kilns or ovens, and for like purposes. June 5.

„ 12,861. Thom. Manufacture of marble. June 5.

„ 12,900. Woodhead, jun. Toggle lever presses, pressing bricks, tiles, briquettes, cement clinker, and all kinds of clay goods made upon stiff, plastic, and semi-dry systems. June 6.

[A.] 12,952. von Elefánty. Brick and other kilns. June 6.

„ 13,112. Kron, jun. *See under* V.

„ 13,235. Adams. Bricks. June 11.

„ 13,257. Bauman. Building blocks, stones, or bricks employed in the construction of bridges, archways, fireplaces, and the like. June 11.

„ 13,536. Castner-Kellner Alkali Co., Ltd., Smith, and Baker. Improved means of preparing slaked lime and of heating and purifying water. June 14.

[C.S.] 4969 (1901). Michell. Apparatus for the manufacture of flake mica from mica plates, crystals, or nodules. June 18.

„ 4970 (1901). Michell. Manufacture of non-conducting coverings, blocks, and slabs suitable for covering steam pipes, boilers, and the like, and for other purposes. June 18.

„ 8431 (1901). Brown. Fusible compositions or cements for the production of articles by casting or moulding process. June 18. Re-dated, Nov. 28, 1901.

„ 13,154 (1901). Roberts. Continuous cement and lime kiln. June 11.

„ 13,413 (1901). Kilby. Kiln for burning cement, lime, plaster, bricks, and the like. June 18.

„ 2357 (1902). Drake. Construction of arch especially applicable to ovens, kilns, and the like. June 11.

„ 3493 (1902). Jurschina. Process for the manufacture of artificial stone. June 18.

„ 7110 (1902). Gostling. Method for the production of Portland cement from chalk and clay and in conjunction with the rotary kiln process or any other kind of kiln for burning cement. June 11.

X.—METALLURGY.

[A.] 12,516. Huxley. Furnaces for annealing metal and other articles. June 2.

„ 12,561. Wright. Amalgamating plates for gold ore treatment. June 2.

„ 12,644. Samson and Bradley. Improved process for the production of steel. June 3.

„ 12,778. Lake.—From Froment, Italy. Concentration of ores. June 4.

„ 12,834. Reynolds. Metallurgical convertors. June 5.

„ 12,837. De Alzugaray. Extraction of metals from their ores. June 5.

„ 12,859. Hopkins. Improved process for obtaining zinc. June 5.

„ 12,995. Robertson. Concentration of ores. June 7.

„ 13,004. Gutensohn. Improved process for the treatment of complex sulphide ores containing lead and zinc. June 7.

„ 13,025. Jensen.—From Rübel, Germany. Manufacture of aluminium. June 7.

„ 13,158. Fyfe. Means for depositing fumes from ores. June 10.

„ 13,301. Hales and Paulsen. Improved construction of furnace for melting or heating ores, metals, glass, or the like. June 12.

„ 13,375. Sherard Cowper-Coles and Co., Ltd., and Cowper-Coles. Obtaining vanadium from ores containing it. June 13.

„ 13,376. Sherard Cowper-Coles and Co., Ltd., and Cowper-Coles. Application of vanadium in the manufacture of iron and steel. June 13.

13,401. Willington and Chandor. Metallic alloys. June 13.

[C.S.] 4713 (1901). Neild and Campbell. Solder especially for aluminium. June 11.

„ 12,500 (1901). Martino. Application of a barium compound in the precipitation of metals from their solutions. June 11.

„ 21,940 (1901). Reynolds. Process for the production of wrought iron or steel direct from the ore. June 11.

„ 4094 (1902). Harrison.—From Standard Car Wheel Co. Furnace chiefly intended for treating cast-iron articles to convert them into steel. June 11.

„ 4543 (1902). Pagan. Treating metal borings and turnings to facilitate the melting. June 11.

„ 4621 (1902). Liensson. Process for the production of bronze. June 11.

„ 6095 (1902). Wilmotte and Goddyn. Manufacture of iron and steel. June 11.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 12,547. von Liebermann. Making electrolytic baths. June 2.

„ 12,556. Kiefer. Thermo-electric batteries. June

„ 12,691. Cuénod and Fournier. Improved process for the electrolytic decomposition of alkali chlorides, and apparatus therefor. June 3.

„ 12,702. Gin. Electrical production of iron alloys with the simultaneous production of alkaline oxids and alkaline earths. June 3.

„ 12,793. The Metals Corporation, Ltd., and Cowper-Coles. Electrolytic refining of copper. June 4.

„ 12,857. Winship. Storage batteries.* June 5.

„ 13,328. Paget.—From Emmens, United States. Intensive electric and solar furnace. June 12.

[C.S.] 14,825 (1901). Tossizza. Electro-metallurgic treatment of zinc ores and especially blende. June 11.

„ 17,320 (1901). Corbin. Electrolytic manufacture of chlorates, perchlorates, bromates, iodates, and the like. June 18. Date applied for under International Convention, March 25, 1901.

„ 382 (1902). Friese. Galvanic cells. June 11.

„ 2816 (1902). Allison.—From Banks. Electric battery. June 11.

„ 7661 (1902). Betts. Electrolytic refining and depositing of lead. June 18.

„ 8843 (1902). Wiedemeyer. *See under* XVIII. C.

„ 9380 (1902). Render. *See under* XXII.

XII.—FATS, OILS, AND SOAP.

[A.] 12,511. Mence. New or improved method for cleaning and burnishing electro-plated articles, silver, steel, and other metals. June 2.

„ 12,565. Singer and Pauli. Manufacture or production of paraffin wax and lubricating oil from mineral oils and other hydrocarbons.* June 2.

„ 12,742. Oelbermann. Process and contrivance for obtaining a coloured flame with candles, bucket or fairy lamps, and the like.* June 4.

„ 12,875. Krause. *See under* XVIII. B.

„ 12,916. Leon. Improved process for preparing for the manufacture of toilet soap and glycerin. June 6.

„ 12,957. Liebreich. New or improved process for manufacturing fatty substances from fats, fatty acids, and fat-like substances of animal and vegetable origin, and of fat-like substances of mineral origin. June 6.

A.] 13,165. Cowell. Preparation of siccative oils and varnishes for the manufacture of paints, linoleum, floor cloth, insulating compositions, and like substances. June 10.

„ 13,455. Haddon.—From Edson, United States. Process of drying oil-yieldable or oil-containing materials.* June 13.

[A.] 13,049 (1901). Bamberg. Detergents and their manufacture. June 18.

26,067 (1901). Lake.—From Masexar and Bevington. *See under* I.

III.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 12,680. Vidal. Manufacture of paints and dyes.* Date applied for, Nov. 7, 1901, being date of application in France.

13,165. Cowell. *See under* XII.

13,338. Raffaëlli. Manufacture of oil colours. June 12.

[C.S.] 6337 (1902). Clauson-Kaas. Composition for coating wooden surfaces and brick walls and other purposes. June 11.

B.—Resins, Gums, &c.

[A.] 12,880. Blumer. Process for the synthetical preparation of resinous substances. June 5.

13,165. Cowell. *See under* XII.

[C.S.] 14,456 (1901). Shooter. Process, and means used in connection therewith, for dissolving shellac and obtaining varnish or composition therefrom. June 11.

C.—India-rubber, &c.

[A.] 12,807. Menzies. Process for rendering cloth, canvas, paper, and other fabrics waterproof.* June 5.

13,165. Cowell. *See under* XII.

13,294. Lake.—From Soc. Anon. le Carbone, France. New or improved process for applying an insulating, waterproofing, or other coating to various articles. June 11.

[C.S.] 8739 (1902). Boult.—From Marks. Tyre-curing or vulcanising process. June 11.

V.—TANNING, LEATHER, GLUE, and SIZE.

[A.] 13,440. Castle. New or improved adhesive or binding agent applicable for use in the manufacture of beltings, doubling cloths, and other manufactures. June 13.

XV.—MANURES, Etc.

[A.] 13,356. Newport. Treatment of garbage and manufacture of fertilisers therefrom.* June 12.

XVI.—SUGAR, STARCH, and GUM, Etc.

[A.] 13,353. Thompson.—From Anderson. Treatment of starch and materials containing starch.* June 12.

„ 13,547. Hampl. Sugar machinery.* June 14.

[C.S.] 7693 (1902). Kóstálek. Filters for sugar juices and other liquids. June 11.

VII.—BREWING, WINES, SPIRITS, Etc.

[A.] 2,493. Greenslade, Westhead, and Robinson. Appliances for drying or removing moisture from grain or similar substances, or for dressing, cleaning, or scouring meal, grain, and like substances. June 2.

[C.S.] 12,743. Guthrie and Guthrie. New or improved apparatus for drying or germinating or otherwise treating grain or other cereals or hops. June 4.

„ 12,830. Menzies. Improved means or apparatus for drying grains or the like.* June 5.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 12,888. Warner and Eskrigge. Process of ice-making. June 6.

„ 13,027. Williams and Hutchins. *See under* XX.

„ 13,416. Riedel. Preparation of castor oil. June 13.

„ 13,522. Scott. Preservation of animal, vegetable, and other products. June 14.

[C.S.] 16,756 (1901). Meulengracht. Feeding stuff. June 11.

„ 26,064 (1901). Yeldham. Egg, baking, and custard powders. June 18.

„ 7654 (1902). Vaupel. Process and apparatus for the manufacture of cattle and like foods containing molasses. June 18.

B.—Sanitation; Water Purification.

[A.] 12,635. Mountany and Farnsworth. Portable automatic sewage distributor.* June 3.

„ 12,788. Kaysser. Improved method for sterilising and maintaining sterilised drinking water. June 4.

„ 12,795. Delanuay-Belleville. Steam purifiers or apparatus for separating water from steam.* June 4.

„ 12,875. Krause. Improved method of separating oil or oily matter from water or steam.* June 5.

„ 13,374. Etherington and Atkinson. Apparatus for generating and radiating hot, cold, or moist air. June 13.

„ 13,461. Sanders. Method of and apparatus for laying the dust in, and moistening and purifying the air in underground railway tunnels and other subterraneous passages. June 13.

„ 13,508. Delmouly. Improved water purifier.* June 14.

„ 13,536. Castner-Kellner Alkali Co., Ltd., Smith, and Baker. *See under* IX.

[C.S.] 13,069 (1901). Gatecliff. Softening water. June 11.

C.—Disinfectants.

[A.] 12,877. von Zarewicz. Vaporising apparatus for disinfectants and the like. June 5.

„ 12,940. Bachmann. Composition of matter for combating scabies. June 6.

[C.S.] 8843 (1902). Wiedemeyer. Device or apparatus for disinfecting by electric light irradiation. June 11.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 13,112. Kron, jun. *See under* V.

„ 13,269. Knopf Patent Paper-pulp Syndicate, Ltd.—From Kuopf, *née* Fuchshuber, Germany. New or improved method or process for the preparation or cleansing of waste paper and the production of paper pulp therefrom. June 11.

[C.S.] 8633 (1902). De Pass.—From Wagg. Refining or pulping engines for use in the manufacture of paper. June 18.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 12,880. Blumer. *See under* XIII. B.

„ 12,957. Liebreich. *See under* XII.

[A.] 13,027. Williams and Hutchins. Manufacture of vegetable proteid products. June 7.

[C.S.] 12,439 (1901). Ball. Mass for making pills, troches, or tablets containing ferrous salts. June 11.

„ 19,501 (1901). Walther. Process for obtaining organic acids, carbohydrates, and albumenoid substances from carbonic acid. June 11.

„ 21,635 (1901). Johnson.—From Vereinigte Chininfabriken Zimmer und Co. Manufacture and production of carbonic acid ethers of the cinchona alkaloids. June 11.

XXI.—PHOTOGRAPHY.

[A.] 12,792. Weiss. Photographic films. June 4.

„ 12,818. Fry. Non-explosive and non-inflammable photographic film. June 5.

[A.] 13,216. Englefield. Treatment or preparation photographic pictures, prints, and the like facilitate the painting or colouring thereof. June 1

„ 13,463. Cadett and Shepherd. *See under* II.

[C.S.] 11,955 (1901). Gieve. Non-actinic lamp for the u of photographers in the dark room. June 18.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 12,595. De Rocco. Manufacture of matches, a compositions therefor. June 2.

„ 13,111. Az. Explosives. June 9.

„ 13,348. Hale and Bell. Detonation of high expl sives. June 12.

[C.S.] 6925 (1902). Durham. Safety blasting cartridg June 18.

„ 9380 (1902). Render. Fuse head for electric bla ing. June 11.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 13.—Vol. XXI. **JULY 15, 1902.** No. 13.—Vol. XXI.

Subscription of Members 25/- per annum ; Entrance Fee 21/- ; Election by the Council.

Price to Non-Members 36/- per annum ; To Members 25/- per Set of extra or back numbers. Single copies (Members and Subscribers only), 1882—1901, 2/6 each ; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents :

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorne, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President : Ivan Levinstein.

Vice-Presidents :

Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	Dr. F. B. Power.
Dr. John Clark.	Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Prof. G. G. Henderson, D.Sc.	Dr. Boverton Redwood.
J. Grant Hooper.	Walter F. Reid.
Dr. R. Messel.	Dr. Jos. W. Swan, F.R.S.
E. M. C. Paton.	Thos. Tyrer.

Ordinary Members of Council :

E. A. Brotherton, M.P.	David Howard.
Eustace Carey.	Dr. J. Lewkowitsch.
Dr. Edw. Divers, F.R.S.	N. H. Martin.
Thos. Fairley.	Prof. E. J. Mills, D.Sc., F.R.S.
Dr. J. Grossmann.	Max Muspratt.
Prof. W. R. E. Hodgkinson, Ph.D.	Frank Scudder.

Sectional Chairmen and Secretaries.

	CANADIAN.
Prof. W. R. Lang.	Alfred Burton.
	LIVERPOOL.
H. I. Tate.	Dr. T. Lewis Bailey.
	LONDON.
Walter F. Reid.	A. R. Ling.
	MANCHESTER.
Ivan Levinstein.	J. Carter Bell.
	NEWCASTLE.
W. L. Rennoldson.	F. C. Garrett.
	NEW YORK.
E. V. Coblentz.	Dr. H. Schweitzer.
	NOTTINGHAM.
L. Archbutt.	J. T. Wood.
	SCOTTISH.
T. Patterson.	Dr. Thos. Gray.
	YORKSHIRE.
J. E. Bedford.	Prof. H. R. Procter.

Honorary Treasurer :
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary :
Dr. Ludwig Mond, F.R.S.

General Secretary : Charles G. Cresswell.

Offices : Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address : 59, Palatable, London.

THE JOURNAL.

Publication Committee :

The President.

A. H. Allen.	Wm. Kellner, Ph.D.
G. Beilby.	Charles A. Kohn, M.Sc., Ph.D.
J. Carter Bell.	J. Lewkowitsch, Ph.D.
Joseph Bernays, M.I.C.E.	A. R. Ling.
H. Brunner.	W. Macnab.
Edw. Divers, M.D., D.Sc., F.R.S.	N. H. Martin.
Sir John Evans, K.C.B., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
A. G. Green.	B. E. R. Newlands.
Samuel Hall.	John Pattinson.
Otto Hehner.	F. B. Power, Ph.D.
John Heron.	Prof. H. R. Procter.
D. B. Hewitt, M.D.	Boverton Redwood, D.Sc.
E. Grant Hooper.	Walter F. Reid.
David Howard.	John Spiller.
Prof. J. J. Hummel.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.

Editor :

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors :

Robt. Adams .....I., XV.	C. A. Mitchell, B.A. ..... XII., XXII.
L. Archbutt..I., XII., XVIII.B.	A. More .....VII., XVIII.
J. L. Baker..... XVI., XVII.	G. T. Morgan, D.Sc. ...IV., V.
H. Ballantyne .....II., XII.	J. G. Parker, Ph.D. .....XIV.
D. Bendix .....III.	H. T. Pentermann ..... XVI., XVII.
E. Bentz .....IV., V., VI.	H. S. L. Polak ....Patent List.
J. O. Braithwaite .....XX.	T. H. Pope...XVI., XX., XXI.
J. F. Briggs .....XVI., XVII.	F. W. Renaut.....Index.
J. H. Collins .....X.	G. H. Robertson .....XI.
C. F. Cross .....V., XII., XIX.	Chas. Salter ..... I., II., III., XV., XVI.
J. T. Dunn, D.Sc. .. VII., X., XI.	M. J. Salter.....XIII.
Walter C. Hancock, B.A. ..... VIII., IX.	R. Sandon .....II.
J. W. Hinchley. I., X., XIII., XXI.	J. Shields, D.Sc., Ph.D. .....XI.
H. Ingle, Ph.D... V., VI., XII., XIII.	A. Shonk .....Gen. Chem.
R. L. Jenks .....XIV., XIX.	W. P. Skertchley XII., XVIII., XX.
J. B. C. Kershaw. ...VII., XI.	E. Sonstadt.....III., VII., X.
M. C. Lamb .....VI., XIV.	E. Howard Tripp, Ph.D. ..... III., VII., XVI.
T. A. Lawson, Ph.D...IV., XX.	Charles T. Tyrer .....XX.
F. H. Leeds..III., XIII., XXI.	L. J. de Whalley, B.Sc. ..XVI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.	A. Wingham .....X.
J. McCrae, Ph.D. .....IV.	Joseph T. Wood .....XIV.
G.W. MacDonald, M.Sc. .XXII.	A. C. Wright, B.Sc., M.A. .. IV., XVIII., XX.
W. G. McMillan X., XI., XIV., XXII.	
N. H. J. Miller, Ph.D. ....XV.	

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit (alcohol) having been accepted by the Government, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

The Council has appointed a Committee, consisting of the President, Hon. Treasurer, Dr. Squire, Mr. David Howard, Mr. A. G. Green, Mr. Walter F. Reid, and Mr. Thos. Tyrer, to consider and report on this question.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) .....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. .....
.....

And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate.....

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. .....
.....

Profession or Business Occupation .....

Date.....

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to produce a reliable technical dictionary in three languages —English, French, and German—and has asked this Society to furnish the names of such scientific and industrial men as are willing to supply the technical expressions of their own special branches of industry. The assistance to be rendered must be gratuitous, as otherwise the expense would be prohibitive; but no money is asked for by the German Society, though it has already spent considerable sums upon the work, and has provided an editor, Dr. Huber Jansen, of Berlin, with a staff, to collate the material supplied.

The Council of this Society agreed to co-operate in the work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, Kohn, Messel, Redwood, and Squire, and Messrs. Beilby, Hehner, Newlands, Reid, and Watson Smith to decide upon the form of co-operation. It has been determined to select one or more representatives for each class of the Journal and Patent Literature; and the committee now asks for volunteers to undertake a class or division of a class. To those who intimate their wish to help, full particulars of the plan of the work, with instructions how to proceed, will be sent. Offers of co-operation should be addressed to the General Secretary.

List of Members Elected

9th JULY 1902.

Adams, O. Gore, School of Mines, Stawell, Vic., Australia. Director.

Fasnacht, E. A., Clayton Mount, Newton Heath, Manchester, Technical Chemist.

Gamer, A. C. C., P.O. Box 772, Tacoma, Wash, U.S.A. Chemist.

Hall, Geo., c/o M. A. Vantine and Co., Broadway at 18th Street, New York City, U.S.A., Chemist.

Hardy, G. B., Belmont Gold Mine, Cordova, Ont., Canada. Metallurgist.

Hyde, Austin T., Box 365, Rumford Falls, Maine, U.S.A. Chemical Engineer.

Kitchen, Wm. J., Port Melbourne North, Vic., Australia. Soap and Candle Manufacturer.

Pickard, R. H., Technical School, Blackburn, Teacher and Analyst.

Smythe, Dr. J. S., c/o W. Meadowcroft and Son, 11 Regent Street, Blackburn, Analytical Chemist.

Stevens, M. White, Bedford Villa, Plymouth, Chemist.

Summerskill, Wm., M.R.C.S., 31, John Street, Bedford Row, W.C., Ethyl Chloride Manufacturer.

Tate, Francis G. H., Inglewood, Beckwith Road, Dulwich, S.E., Assistant Analyst (H.M. Customs).

Vardlaw, Thos. D., 52, Beaty Avenue, Toronto, Ont., Canada, Dye and Chemical Merchant.

Zahn, Edw., 117, Sherwood Avenue, Syracuse, N.Y., U.S.A., Chemist.

Changes of Address.

When notifying new addresses, members are requested to rite them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be voided as tending to create confusion. When sending ubscriptions, the use of the form attached to the application elps in the verification of addresses, on which the safe elivery of the Journal depends.

Axby, G. L., l/o Philadelphia; c/o The Willard Storage Battery Co., 49, Wood Street, Cleveland, Ohio, U.S.A.

Boxam, W. Popplewell; Journals to c/o Indigo Improvements Syndicate, Dalsingh Serai, Tirhoot, Bengal, India, Research Chemist.

Bramwell, Major E.; Journals to c/o E. Bramwell and Son, Chemical Works, St. Helens, Lancashire.

Bratard, Dr. T. M.; retain Journals.

Buchrau, Alf., l/o Parsons; 559, Madison Street, Brooklyn, N.Y., U.S.A.

Bucher, Paul, l/o Niagara Falls; c/o The Provident Chemical Co., St. Louis, Mo., U.S.A.

Burvey, C., l/o East Ham; 38, Shakespeare Crescent, Manor Park, E.

Calf, Hy. C.; Journals to 83, Warren Road, Leyton, Essex.

Case, FitzHugh, l/o E. Chicago; c/o The Grasselli Chemical Co., Cleveland, Ohio, U.S.A.

Cassner, C. B., l/o London; San Finx Tin Mines, Ltd., Carril, Spain.

Chay, Otto, l/o Philadelphia; Maywood, N.J., U.S.A.

Cann, Owen, l/o London; c/o J. Gilton and Co., Oriel Street, Vauxhall Road, Liverpool.

Chewson, E. P., l/o Montreal; Anaconda, Mont., U.S.A.

Dale, Dr. P. R., l/o Merrimon Avenue; c/o Asheville Printing Co., 3, West Court Square, Asheville, N.C., U.S.A.

Dargan, J. J.; Journals to Waun Villa, Mount Pleasant, Neath.

Dedi, Dr. Ph.; Journals to c/o Farbwerke, Meister, Lucius und Brüning, Höchst a/Main, Germany.

Delip, Arnold, l/o Bristol; Chemical Laboratory, H.M. Dockyard, Portsmouth.

Dye, T. H., temporary address till end of Sept., c/o Dr. A. Jörgensen, Frydensdalswej 30, Copenhagen, V., Denmark.

Robinsou, E. B., l/o Great Clyde Street; Victoria Oil Works, Nitshill, near Glasgow.

Robinson, Jno., l/o Beaconsfield Road; 8, Kaludah Terrace, Albert Road, Widnes.

Smith, Francis P., l/o New York; c/o Percy Tarbutt, 23, St. Swithin's Lane, E.C.

Swan, Wm. H.; Journals to 114, Park Road, Newcastle-on-Tyne.

Stedart, Chas. W., l/o Youkers; 1068, York Street, Denver, Colo., U.S.A., Mining Engineer and Metallurgist.

Stingman, J. Pim; retain Journals until further notice.

Tanaka, K., l/o Fukugawa; Matsuba Hotel, Kudansaka, uye Tokio, Japan.

Wingate, Hamilton M., l/o New Zealand; Glenthorpe, Cotham Grove, Bristol.

Wood, Jos. T., l/o West Bridgford; 62, Park Road, Nottingham.

Annual General Meeting.

LIST OF COUNCIL (1902—1903).

President:
Ivan Levinstein.

Vice-Presidents:

Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	Dr. F. B. Power.
Dr. John Clark.	Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Prof. G. G. Henderson, D.Sc.	Dr. Boverton Redwood.
E. Grant Hooper.	Walter F. Reid.
Dr. R. Messel.	Dr. Jos. W. Swan, F.R.S.
J. M. C. Paton.	Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.	David Howard.
Eustace Carey.	Dr. J. Lewkowitsch.
Dr. Edw. Divers, F.R.S.	N. H. Martin.
Thos. Fairley.	Prof. E. J. Mills, D.Sc., F.R.S.
Dr. J. Grossmann.	Max Muspratt.
Prof. W. R. E. Hodgkinson, Ph.D.	Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.
Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.
F. H. Tato. | Dr. T. Lewis Bailey.

LONDON.
Walter F. Reid. | A. R. Ling.

MANCHESTER.
Ivan Levinstein. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Dr. V. Cohlentz. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
T. L. Patterson. | Dr. Thos. Gray.

YORKSHIRE.
Jas. E. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary:
Charles G. Cresswell.

Offices:
Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address:
59. Palatable, London.

REPORT OF COUNCIL.

The number of members on the register is now 3,794, as compared with 3,635 at the last Annual Meeting. During the year, 340 new members have been elected, as compared with 335 last year; and the losses have been 181, as against 159.

There have been 29 deaths, as compared with 34 last year, *viz.*:—Hugh Barclay, J. H. Beckett, Dr. R. Bindschedler, Henry Bird, W. T. Case, Thos. Cotterill, Wm. Crowder,

Sir J. Henry Gilbert, F.R.S., John Glover, Thos. Glover, Jas. Hartford, M. Hatschek, Jos. Hudson, Robt. Irvine, H. A. Loos, C. W. Lyon, F. W. McKillop, W. Ivison Macadam, Wm. Martindale, Morgan Mooney, Dr. G. Harris Morris, Thos. Ness, Dr. J. H. R. Paterson, Prof. M. Perkins, W. Shapleigh, L. Siebold, Henry Tate, T. S. Tait, and Thos. Welch.

The following table gives the average number of pages in the monthly Journal, the membership, and the income for each year of the Society's existence :—

Year.	No. of Pages in Monthly Journal.	Membership.
July 1881	61 (First Proc.)	297
1882	43	1,140
1883	47	1,390
1884	56	1,809
1885	65	2,090
1886	57	2,271
1887	71	2,302
1888	74	2,395
1889	86	2,445
1890	100	2,595
1891	88	2,697
1892	88	2,782
1893	91	2,784
1894	104	2,828
1895	91	2,895
1896	78	2,971
1897	89	3,037
1898	101	3,185
1899	98	3,312
1900	98	3,459
1901	107	3,635

The Hon. Treasurer will submit his financial statement, which appeared in the issue of the Society's Journal for June 30th last.

In January, the Council acceded to the application of 32 members and 21 candidates for membership, residing in the Dominion of Canada, to form a "Canadian Section" of the Society. Prof. W. R. Lang, of the University of Toronto, was subsequently elected Chairman, with Mr. Alfred Burton, Hon. Local Secretary. Two meetings of the new Section have already been held, and the papers read printed in the Journal.

The Medal has this year been awarded to our late President, Dr. Jos. W. Swan, M.A., F.R.S., for conspicuous services rendered to applied science.

During the past session, 110 original papers, together with discussions, have appeared in the Journal, as compared with 80 last year. The Hurter Memorial Lecture was delivered on Oct. 30th, 1901, at Liverpool, by Sir Wm. Abney, F.R.S., the subject being the "Photography of Colour."

In October, the Publication Committee having considered the matter at the suggestion of the President, it was decided to issue the Journal twice a month after Jan. 1st, 1902, and to insert abstracts of French and United States patents. A new arrangement with Messrs. Eyre and Spottiswoode in consequence became necessary, and this was concluded in December last, the publication being made on a new basis. This agreement, as far as the Society is concerned, is for a period of 10 years, but is terminable by the Contractors at the end of three or seven years on six months' notice.

The Journal has been issued twice a month since the beginning of the year. This requires two meetings of the Publication Committee to be held each month, and under these circumstances it was considered advisable that the Editorial Sub-Committee should cease to exist as such; and the thanks of the Society are due to these gentlemen for their labours, to which the increased efficiency of the Journal is in a great measure due.

Arrangements have been made by the Publication Committee whereby the next Decennial Index (1896—1905) shall be made by the editor and indexer, with the aid of an advisory committee. Experience has shown how the work may be expedited, and the Council expects that the Index will be in type by the end of 1906.

In January, the Joint Committee of this Society and the Society of Public Analysts, to which reference was made in the last report of Council, presented their report "On the Detection and Approximate Estimation of Minute Quantities of Arsenic in Beer, Brewing Materials, Foodstuffs, and Fuels." This report was accepted and ordered to be printed, and the Council has since deputed the Chairman of that committee, Mr. Otto Hehner, to give evidence before the Royal Commission on Arsenical Poisoning.

In October, the Council generally approved resolutions on the Reform of the Patent Law, passed by the Associated Chambers of Commerce at their Nottingham meeting, held on Sept. 3rd, 1901, and appointed delegates to support a deputation which was about to wait on the President of the Board of Trade.

In February, the Government brought in a Patent Law Amendment Bill, based on the majority report of Sir Edward Fry's committee. The President thereupon prepared a report dealing with the second clause, *viz.*, that relating to compulsory licenses. This report was received by the Council, and ordered to be printed in the Journal.

The Council then appointed a committee to draw up a statement of objections to the Bill, to form the basis of a memorial to the Board of Trade. On March 18th, this memorial, setting forth the objections to clause 2 of the Bill, which deals with compulsory licenses, was sent in to the Board of Trade, and on March 20th, was followed by a deputation from fourteen Chambers of Commerce, nine associations, including this Society, three trades unions and six individual firms, accompanied by twenty-nine members of Parliament. The deputation strongly urged the inclusion of a clause in the Patent Law Amendment Bill which should provide for the effective and *bonâ fide* working in this country of English Patents held by foreign patentees.

In his reply the President of the Board of Trade said that he understood that, instead of compulsory licenses it was the desire of the deputation to substitute compulsory working under a penalty of revocation, and that the machinery provided in the Bill for obtaining a compulsory license was considered too complicated. He saw difficulties in accepting compulsory working, but promised to give it careful consideration, and he agreed to introduce words into clause 2, making it clear that the refusal of a foreign patentee to work his patent in this country would be among the grounds on which an application for a compulsory license would properly be made. If no compromise could be arranged, then he thought it better to pass clause 1, to which no objection was taken, and leave clause 2 for further discussion, and possibly a further measure.

In pursuance of a resolution passed by the Liverpool Section, the Council has informed the Associated Chambers of Commerce of its willingness to take part in any movement to further the passage of the Canal Traffic Bill, and in response to a suggestion from the Chambers, has written to the Board of Trade in support of the views expressed by the recent deputation.

The question of concessions in regard to the use of spirit having become pressing, a notice has been inserted in the Journal asking those members, to whose industries duty free spirit would be of advantage, to communicate with the Secretary. Meanwhile, the Council is affording every information to those members of Parliament who have taken up the question, and has appointed a committee to act alone or in association with other bodies, and to urge on the attention of the Government this long-felt want of the chemical industries. As alcohol is an essential item in the manufacture of certain modern nitro-explosives, the question has been taken up by the Explosives Committee, and the Committee on the Finance Bill, on June 11th, the following clause was accepted by the Government, and added to the provisions of the Bill :—

"(1) Where, in the case of any art or manufacture carried on by any person in which the use of spirits is required, shall be proved to the satisfaction of the Commissioners of Inland Revenue that the use of methylated spirits is unsuitable or detrimental they may, if they think fit, authorise that person to receive spirits without payment of duty for use in the art or manufacture, and for no other purpo

and the spirits so used shall be exempt from duty. (2) The authority shall only be granted subject to a compliance with such regulations as the Commissioners may require the applicant to observe for the security of the revenue, and upon condition that he will, to the satisfaction of the Commissioners, if so required by them, render the spirits undrinkable before and during use, and will from time to time pay any expenses that may be incurred in placing an officer in charge of his premises. (3) If any person so authorised shall not comply with any regulation which he is required to observe, he shall, in addition to any other fine or liability, incur a fine of 50*l.*"

The thanks of the Society are due to Mr. Tyrer for his tireless efforts, during the last 12 years, to obtain facilities in regard to the use of spirit.

A committee has been appointed to consider what action should be taken in regard to supporting the movement in favour of appointing a Minister of Commerce and Industry.

In October, the Council informed the Board of Trade that the increased duties proposed under the new German tariff to be levied on copper sulphate, ammonium carbonate, phosphorus, paints, varnishes, and india-rubber must inevitably prejudice those British industries.

Members of the Council attended the opening, by the Prince and Princess of Wales, of the National Physical Laboratory at Bushy House, Teddington, the celebration of the Jubilee of Owens College, Manchester, and the opening of the Sir John Cass Technical Institute.

An invitation will be laid before this meeting from the Yorkshire Section to meet in Bradford, in 1903, which the Council trusts will receive favourable consideration. An invitation has also been received from the New York Section to hold the Annual General Meeting of 1904 in that city.

PRESIDENT'S ADDRESS.

EDUCATION AND LEGISLATION: THEIR INFLUENCE ON TRADE AND INDUSTRY.

It was the opinion of Cobden and others, half a century since, that this country's destiny was to become the workshop and emporium of the world; that we should supply it with all kinds of manufactures, and take in exchange the foodstuffs needed for our ever-increasing population.

It was, of course, expected that the cultivation of grain in Great Britain would decrease, and that the agricultural labourers would find employment in the factories. Under the new policy, we did become the workshop of the world, and our industries expanded in a manner never dreamed of by the most sanguine Free Trader. Fortunes were made with comparative ease, and immense wealth was accumulated. Capitalists could not even find sufficient outlets for money at home, and invested largely abroad. We draw at present 50 million pounds sterling yearly in one as interest on capital invested abroad, which is estimated at 1,500 millions sterling. With such prosperity, and such a plethora of wealth, many of us find it difficult to realise that as a manufacturing nation the premier position so long held by us has been very seriously affected, if not lost, and that in the phase of industrial warfare on which we are now entering, it will be a hard struggle for us to retain our position.

Of the increasing growth of foreign industry and trade everyone is aware; but prominent British statesmen comfort us by the assurance that this increasing prosperity of foreign countries is all to our advantage. If, indeed, we could regard ourselves as the exclusive producers of articles which the foreigner is forced to purchase from us, this theory might hold water, for with his increasing prosperity he would become at once a larger and a safer customer of our own. But is it not obvious that our former customers are becoming our competitors in a continually increasing degree, and are producing the same articles that we do, in increasing quantities, and often of a quality equal to if not superior to our own? Pleasing but illusory theories of the kind we have quoted, advanced by prominent men on the one hand, and confidence in our own great wealth, accumulated in times past, on the other, strengthened by an occasional good, or apparently good year, have induced a dangerous indifference to the improvement of our educational methods and to reform of legislation affecting our industry and commerce.

Experts point to the statistics of increase in our trade; but about two-thirds of our food is imported, and as our population increases by about 350,000 persons yearly, the import of food, and our payments for this foreign supply, are bound to increase. We are bound, therefore, to increase the value of our exports. Our very existence depends upon our foreign trade. Let us now examine, by means of a few figures, whether the increase in the last few years can be regarded as satisfactory—whether we are really doing as well as we are made to believe.

In the year 1890, our total exports amounted to 328 millions sterling. The average amount of our exports during the decade 1891—1900 was only 300 millions sterling. In other words, we have, during the decade 1891—1900, exported 280 millions sterling less than we should have done, if the figures of 1890 had been maintained. The total value of imports and exports of British, foreign, and colonial produce for 1890 was, in round figures, 749 millions sterling; the average value for the decade 1891—1900 was only 747 millions sterling, with a total of about 20 millions less than the figure that would have been reached if the figures for 1890 had been maintained. The total value of imports and exports per head of population in 1890 was 19*l.* 19*s.* 7*d.*; the average for the 10 years succeeding was 18*l.* 19*s.* 6*d.* per head. Is this progress? Instead of an expansion of our foreign trade, there has been an actual contraction, which will appear the more striking when we remember that our decade includes the record year of 1900, with the largest total of exports and imports ever known, when prices were inflated, and cotton, iron, and coal, and articles produced from them, increased in value 30—50 per cent.*

Of the 280 millions sterling loss in exports in the decade mentioned, 102 millions sterling is accounted for by a decrease in exports of textiles. Whilst formerly we worked up about three-quarters of the world's production of raw cotton, our competitors are now using about two-thirds of the total cotton crop. Again, during the last 20 years, the Bradford textile industry has decreased by 15 per cent. (according to Mr. E. Wollmer), whilst the imports of woollen goods manufactured abroad have increased by 20 per cent.

According to the most recent German trade statistics, the total annual value of goods of all classes, from the raw material to the finished article, in the cotton trade in Germany, amounted to 40 millions sterling, out of a total foreign and colonial trade valued at 540 millions sterling. Her external trade in cotton goods has doubled during the last decade; during the last half-century her home consumption of cotton goods has increased more than tenfold. The profit from the manufacture of cotton goods seems, moreover, to be considerable. The value of the exports alone of cotton goods exceeds the value of the whole of the imported cotton by about 50 per cent.†

I do not propose to compare the industrial and commercial position of America with our own. America has already won the race for industrial supremacy, and her position is, so far as can be seen, absolutely secure. Her natural wealth is greater than ours; she has abundance of such commodities as coal, iron, cotton, &c.; her population is larger, and though constantly increased by immigrants, she is able to feed all these new producers and consumers without requiring supplies of foodstuffs from without.

With Germany the case is different. Germany depends, like ourselves, on foreign food supply, but our natural resources are for the most part superior to hers. We have in this country the best geographical position in Europe, an abundance of capital and of many of the more important raw materials, a temperate climate, a strong and healthy

* According to the *Statist*, 47 millions sterling of our export in 1900 are accounted for by an increase of prices, and only 2,400,000*l.* are due to increase in the quantities, taking 1898 as a standard. Again, owing to higher prices, we paid 54 millions sterling more for our imports in 1900 than we should have done had the prices of 1898 prevailed.

† *National Zeitung*, May 2, 1902.

population, full of grit and enterprise; yet there are forces at work in Germany which gravely threaten our position.

Let us not be deceived by the recent commercial crisis through which Germany has passed. It was produced in the first instance by over-production; secondly, by a number of gambling bankers who took advantage of German industrial prosperity to turn not only unsuccessful but actually fictitious concerns into companies at prices unknown even in England. But the crisis is now passing away, and the expansion of German industry and trade in some important branches is continuing. Let us compare,* as we did in our own case, trade statistics for 1890 with the corresponding averages for the decade 1891—1900. In 1890 the total of exports, exclusive of transit goods and precious metals, amounted to 3,409 million marks; the average for 1891—1900 was 3,688 million marks — an increase of 279 millions. In 1890 the total of exports and imports was 7,681 million marks; the average for the decade 1891—1900 was 8,486 million marks—an increase of 805 millions.

Thus, whilst we went back during the 10 years 1890—1900, Germany went forward during the same period. That her progress was due in part to superior education must be admitted, but not to education alone, for Germany was better educated than this country fifty or sixty years ago, when she was not even thought of as a possible rival. The following seem to me to be the chief factors that are making for Germany's advance in industry and commerce:—

1. Superior economy, thoroughness, attention to detail.
2. The possession of a far larger number of thoroughly and systematically trained men than any other country (I do not mean of men only trained technically, but with a thorough general training).
3. A close alliance of legislation and of science with the interests of trade and industry—a result no doubt indirectly due to the high average of general education and training.
4. A national system of railways and canals, with a scale of internal and external freights averaging less than one-third of our own.
5. Cheaper skilled labour, with longer hours than ours.
6. A large supply of unskilled labourers trained to habits of punctuality and discipline through a system of universal military service.
7. Protective tariffs.
8. A system of patent laws which takes the interests of the public as well as those of the inventor into consideration.

These are Germany's weapons to-day. How are we to defend ourselves? Shall we rest content as we are, or bestir ourselves and awake to the irresistible fact that continued apathy and indifference mean ruin to our national position.

Four measures seem to me to require our immediate attention:—

I. The appointment of a competent and expert minister of commerce.

II. The nationalisation and extension of our canals and waterways.

III. A measure for greatly extending and improving our secondary education.

IV. A sensible reform of our patent laws.

I. Appointment of a Minister of Commerce.

Under our present system, questions of the highest commercial importance receive but scant attention either from the Board of Trade or the House of Commons. Parliament is indifferent because it is largely constituted of lawyers and of men who, having been fortunate in the choice of a father, disdain anything appertaining to trade or commerce. They regard the House as a first-class club where one meets good society; and without the most strenuous efforts from the outside, it is difficult to get the House to consider any commercial question of national importance. The Board of Trade consists of a number of distinguished officials, often overworked with routine, and hence by no means anxious for changes which mean more work still. The appointment of a Minister of Commerce, able to command the attention of the House and to organise his own department, selected especially on account of an intimate knowledge of commercial affairs, would be an immense boon to the country.

II. The Question of Freights.

The question of cheap freights deserves our closest and most continuous attention. Successful commerce and the establishment and opening out of new industries often depend on it. Government control of railways and canals intelligently exercised, has been of immense value to German commerce. The constant development of traffic facilities on the combined network of railways and canals with a system of extremely low rates, has done more for the development of the mineral resources of Germany, and for the establishment and expansion of her trade in heavy chemicals and in other bulky, heavy, and low-priced articles than even education.

"The change in Prussia," says a recent writer,* "from private to State lines was not brought about only by political and strategic reasons, but also by the conviction that the nationalisation of railways was to assist future commercial and industrial expansion. The result of the policy has, in conjunction with other economic factors, indeed exercised extraordinary influence in assisting the expansion of commerce and industries. . . .

"The State system has also brought about other advantages, such as the construction of lines for developing certain districts, which in themselves would be unremunerative, and the direct assistance often given by exceptionally low freights to certain branches of commerce, industry, and agriculture. In some cases, a system of combined low 'exceptional rates' by the State railway and by special lines of steamer companies has been established to foreign countries under which new and extending markets have been opened up for the benefit of the export trade of the Empire."

In this country the rates charged by our railway companies handicap our heavy trades severely. In many cases they are simply prohibitive; and the railway companies no less than the traders, suffer from railway charges which render traffic impossible. The question of railway rates was brought prominently before the Liverpool Section last year in a very able paper by Mr. Max Muspratt, and in the discussion which followed it. The question of canals has been dealt with even more recently by Mr. Arthur Carey.

I personally fear that mere remonstrance with the railway companies will do little, except in the few cases where their high rates are not only high, but inconsistent, and demonstrably due to sheer ignorance.

Our railway companies are over-capitalised, their construction has been most costly, and their working expenses are much greater than those, for example, of Prussia. They have, it is true, a good deal to learn from America in the haulage and handling of goods, but even after they have learnt all that there is to be learnt, I fear we are doomed to higher railway rates than those of Germany and the United States. With regard to our canals, however, we are in an entirely different position, and here reform lies within the range of practical politics.

The question of improving our water conveyance has been for some time before the public. I trust that our Society will continue to press its importance on the proper authorities, and further support the Associated Chambers of Commerce in any movement to advance the passage of the Canal Traffic Bill. For years we have done nothing or worse than nothing, with our 4,000 miles of canals. A large part of them has been bought up by railway companies, who have let them become antiquated or go to ruin. Abroad it is another story.

In France over 400 miles of new canals and nearly 500 miles of new river navigation have been opened since 1878. Her internal waterways have now a length of nearly 7,000 miles, and her water traffic increased from 1873 to 1897

* There has been, since 1897, some change in the preparation of the statistical tables, but it does not substantially affect our comparison.

* "The German Empire of To-day," by "Veritas." Longmans, 1902, pp. 176, 177, 179.

140 per cent. Belgium has expended not less than 10 million pounds on the extension of her canals since 1860.

Prussia spent, between 1890 and 1899, more than 21 million pounds on waterways, of which she has now nearly 1,000 miles.

In the New York Commerce Commission Report for last year, it was stated that "preceding the opening of the Erie Canal, the cost of moving a ton of freight from Buffalo to Albany was 100 dols., which fell immediately to 10 dols. upon the opening of the canal. During the present year the cost of moving freight on the canal from Buffalo to New York has not exceeded, on an average, one dollar, or 4s., per ton. The distance from Buffalo to New York, *viâ* the Erie Canal, is a full 500 miles."

Mr. Kenric B. Murray, the Secretary of the London Chamber of Commerce, says:—

"The country which invented and applied steam as a means of transport disposes of probably the dearest system of land-carriage in the world. We, who built some of the earliest canals, have hardly any practicable inland water navigation at our disposal. European States, on the contrary, are devoting millions of money annually to the construction of canals and canalised rivers, with the result that it costs less to-day to bring sugar from Hungary, thousands of miles across Europe, to London, than to carry the same sugar on our own railways from London to Manchester.

It may be stated here that for bulky goods the charge in Prussia is about one-fifth of a penny per mile per ton. The cost of carriage from Manchester to Liverpool for certain intermediate organic products (*e.g.*, naphthol, naphthylamine) in 5-ton lots is, by water, 8*s.*, and by railway, 8. 4*d.* The distance from Manchester to Liverpool is not much above 30 miles. The same goods can be carried from Hamburg to Berlin, a distance of 174 miles, at 4*s.* a ton. The Berlin chemical manufacturer, for instance, can buy nitrate of soda, one of the most important raw materials in organic manufacturing chemistry, much cheaper than the Manchester manufacturer, not only because the price in Hamburg is generally lower than it is here, but because the freight from Hamburg to Berlin is only half the freight from Liverpool to Manchester, although the distance is nearly six times as great. Now let us consider for one moment what that means. A chemical manufactory, not of particularly large size, may easily have a traffic, to and fro, of 30,000 tons per annum. A difference in freight of only 1*s.* per ton means to it a difference of 1,500*l.* a year. Thus it comes about that a manufacturer at Berlin, nearly 180 miles from the nearest port, with wages higher than in any other part of Germany, and coal dearer, can manufacture and distribute goods at less cost than a rival in the largest manufacturing town in the world—the port of Manchester.

A few more illustrations will show plainly under what disadvantages our traders are, compared with their foreign rivals, as regards carriage and freight.

Cattle can be sent at less cost from Chicago to Liverpool, some 4,000 miles, than from Northumberland to Liverpool. It costs more to send a ton of goods from London to the west of Ireland than from London to Japan. A ton of woollen goods can be sent from London to New York for 1*l.*; from Chicago, 1,000 miles from the seaboard, for 1*l.* 15*s.*; to Japan for 2*l.* 10*s.* The freight of the same goods from Derby to London is 3*l.* 10*s.* It costs more to send grain from our eastern counties to Birmingham than it does to bring it from Odessa. It costs more to send cheese from Cheshire to London than from New York. Denmark can send her dairy and farm produce to London at less cost for transport than the English farmer living only 30 miles away in the home counties.

III. Education.

What has her system of education done for Germany? It has been helpful in the establishment of certain industries depending for their existence and development on scientific knowledge, as we know; but it has done a great deal more than that. It has trained, and trained thoroughly, a larger number of brains than the educational system of any other country; it has developed and enlarged the intelligence of her people; and the wise legislative measures enacted for the benefit of national trade and industries are one of the most important fruits of that universal training. Nor does Germany rest on her laurels; if her present educational system is excellent, she is unceasing in her efforts to perfect it.

What have we to show in this country to correspond to Germany's steady educational progress. For 30 years we have been quibbling about an Education Bill that shall reduce our educational chaos to order. At last we have a Bill which, with some amendments, is likely to pass. Its chief importance lies in the fact that its proposed object is to co-ordinate efficiently education of all grades. The council of every county and every county borough is to be the chief local education authority for elementary education, with important powers to organise and assist technical, secondary, and higher education. Now, for industry and commerce let us be quite clear on this one point: the burning question for us is at present neither primary education, which is already fairly satisfactory, nor higher technical, nor higher commercial education, which only exceedingly few of our young men are prepared to receive. *It is general non-specialised secondary education.*

Without this it is simply impossible to put higher technical and commercial education on a sound basis. My friend Mr. J. H. Reynolds, the Principal of the Manchester Municipal School of Technology, declared recently that so hopeless did he regard the state of technical education to be in England that it might be necessary in the interests of technical education that work upon it should be abandoned for 10 years, until the basis for it had been properly laid by a proper system of secondary education laws. Only after the ground had been so prepared could we hope to rear upon it the superstructure of advanced scientific education, such as we have seen in Germany.

Will 10 years suffice, or will it not take a generation or more? Will the new Bill really supply us with a system under which our secondary education can reach the high standard set, for instance, by Prussia? I doubt it. There were in Prussia, in 1899—1900, with a population of about 34 millions, 354 public classical secondary schools (*Gymnasien* and *Progymnasien*), with an attendance of 77,399; 97 partly classical schools (*Realgymnasien* and *Prorealgymnasien*), with an attendance of 18,731; 175 modern secondary schools (*Oberrealschulen* and *Realschulen*), with an attendance of 34,926; or, in all, 626 public schools, with an attendance of 131,056. Berlin alone has 38 public grammar schools, with an attendance of 16,082, but this number does not appear to the authorities sufficient, and the erection of two more schools is contemplated.

It is interesting to note that the number of boys attending classical or semi-classical schools in Berlin is twice as great as the number attending modern schools. The preponderance is greater still in the Prussian provinces.

In Prussia there is one secondary school for about every 51,000 of the population. The population of Lancashire is about four millions; that of the Rhine province about five millions. In the Rhine province there are 105 public secondary schools, with an attendance of 22,722. If Lancashire were provided with public schools on the same basis she would have some 84 secondary schools, with an attendance of 18,000. Of the schools existing in Lancashire to-day, there are, it will be generally admitted, few indeed that rank with an average German secondary school. The Manchester Grammar School, the Liverpool Institute, Rossall School, and a few others might be named.

Again, in the schools that we have, boys do not remain to the same age as in the German schools. If my calculation is right, in order to provide Lancashire alone with secondary education on the same scale and of the same efficiency as that of the Rhine province, we should have to erect, equip, and maintain 48 additional public secondary schools, with places for 13,200 boys. This would mean an expenditure of more than 400,000*l.* yearly, or several times the total additional expenditure which the authorities will have power to raise under the new Bill. It is therefore obvious that Government would have to make a large contribution towards the cost of secondary education. Prussia, with a population of 34 millions, spends more than 12 millions

sterling per annum on primary and secondary education, of which the State contributes about 36 per cent. of the total cost.

Supposing, however, that the necessary funds were forthcoming, and we succeeded in equipping our schools, should we find boys to fill them and stay long enough to pass a satisfactory school-leaving examination corresponding to the German *Abiturienten-Examen* (certificate of maturity)? If we could not secure this our efforts would be largely wasted. The yearly expenditure of 400,000*l.* will be, however, further increased, as we shall presently see.

We must remember that special inducements are given in Germany to lads to stay at school, which do not exist here. They are as follows:—

1. In order to obtain the privilege of serving only one year in the army instead of two, a youth must have spent at least six years in a public secondary school, and passed a satisfactory examination at the end of this period, generally reached about the age of 16.

In the case of secondary schools with a six-year course (*Progymnasien*, *Realprogymnasien*, *Realschulen*), the examination to be passed is the ordinary school-leaving examination. In the case of secondary schools of the first grade, with a nine-year course (*Gymnasien*, *Realgymnasien*, *Oberrealschulen*), one year's stay in *Secunda* and a satisfactory leaving certificate suffices, which is about equivalent to staying one year in the fifth form of a first-class grammar school on the classical side.

The one-year "volunteer," as he is called, is not only excused half his military service, but enjoys a higher status while he is serving in the army than his comrades.

2. Whereas most of the better business-class houses insist on a three years' apprenticeship, many houses remit one and a half years' apprenticeship if a youth has qualified to serve in the army as a volunteer; some houses go so far as not to engage any lad who has not got this qualification.

3. In order to attend the universities and technical high schools as a regular student, the young man must have obtained the leaving certificate of a secondary school of the first grade, with a nine years' course.* The examination is a very severe one, on the one hand; the stimulus to pass it is very great, on the other; for in order to enter the highest branches of Government service (civil service, &c.), to practice as a lawyer, a medical man, or in any of the liberal professions, this hall-mark of the *Gymnasium*, *Realgymnasium*, or *Oberrealschule* is equally necessary.

Nobody can hold a Government appointment as mining engineer or chemist, or any of the better positions in the Post Office or any other Government office, who has not been hall-marked by passing the leaving examination of a *Gymnasium* or *Oberrealschule*.

Now, since we have no incentives of this kind in England, we must use incentives of a different kind, and offer valuable scholarships to induce a sufficient number of thousands of parents to allow their children to stay at school till 16, or, for the higher careers, at least 18; that is, if we mean to obtain as many trained brains as Germany has at her disposal. This, again, involves additional expenditure. But all this expenditure will have to be faced if we really wish for a substantial improvement in the secondary education of the country within this or the next generation.

Technical Education.—Under the Technical Instruction Acts of 1889 and 1890, Government allocated the so-called whisky money to technical education, and empowered local authorities to raise rates for the same purpose. Of the whisky money, more than eight million pounds have been paid over to the local authorities, and some millions more have been raised in rates. Has not a large amount of this money been sadly wasted? Would it not have been far wiser to have spent the larger portion of the money in equipping and endowing first-rate secondary schools—I mean schools of a general character, and without very elaborate or expensive chemical and physical laboratories, to my mind totally unnecessary and useless in secondary school education. What have we to show for all the money we have spent in technical education? Practically nothing, except a system of evening continuation schools which is valuable, as far as it goes. They are indeed, however, a poor return for the money we have spent. Of our 54 so-called technical schools, there are 22 with practically no day students, and the whole number of day students taking technological courses, both in technical schools and in university colleges in the United Kingdom, is 3,87 most of them quite inadequately prepared for high technical training. In one single technical school Prussia, the Technische Hochschule in Charlottenbur near Berlin, there were, in the winter half-year for 1899-1900, 2,750 regularly matriculated students, and 1,0 other students or "hospitants."

It is a singular fact that, of the matriculated student more than 90 per cent. came from classical school Some, of course, may have intended originally to enter the university, with a view to enter a purely scientific professional career, and may have changed their minds. B there is a widespread belief in Germany that the classic training is better and more thorough than the "modern There may be a good deal in that belief. The greate German physicists and chemists in the universities hav certainly received their training in the classical schools, an it is no less true that many of the best industrial chemis in the works and many of the best clerks in busine houses have been educated in the *Gymnasium* or *Rea gymnasium*.

Commercial Education.—There is at present an agitatio for the establishment of numerous commercial academie and of a number of commercial chairs in our universit colleges. Is not the agitation somewhat premature Have we really a sufficient number of thoroughly educate young men capable of taking advantage of higher com mercial teaching, if it were available? Ought we no instead of frittering away our resources, to spend for som time every available penny on the improvement of secondar education? At present, two or three higher technic schools of the character of the Central Technical Colleg South Kensington, or the new magnificently equippe Manchester Municipal School of Technology, will amp suffice for the whole kingdom as far as higher technic education is concerned. Similarly, a small number institutions of university rank—the London School Economics; the Owens College, Manchester; Universit College, Liverpool; and the University of Birmingham would amply provide for higher commercial teaching f some years to come.

The movement for higher commercial education res largely on a misapprehension. We recognise the superiorit of the German clerk, and put down his superiority qui rightly to superior commercial training. I say qui rightly, but only on the condition that we realise, as mar fail to do, that a first-rate training for commerce ne include no "so-called commercial subjects." In the ca of many of the best German clerks it certainly includ nothing of the kind.

They come from the *Gymnasium*, and they have an exc lent general education, and they know their Latin gramm and syntax in a way that makes the grammar of mode languages easy to acquire. If I am asked why Engli boys from classical schools do not learn modern languag as easily I should say that it is because to be at an Engli classical school does not necessarily mean to learn classic it means for many boys learning no subject whatev thoroughly. This is a painful truth.

The German clerk completes his education very simp He enters a business house at home for a year or two, a sometimes studies foreign languages in the evening. then proceeds, like the German waiter, to foreign lands—b with this difference, that his education enables him to lea new languages more thoroughly. Very few German cler come to England whose English is worth anything business purposes when they arrive here; some kn hardly any English at all; they have to accept starvati wages at the start, since they are worth but little to th employers, and to trust to industry, frugality, enterprise,

* See, for details with regard to the requirements for entrance to the various faculties of a university, and various professional schools and professions, *Special Reports on Educational Subjects*, edited by Mr. M. E. Sadler, Director of Special Enquiries and Reports to the Board of Education, Vol. 9, p. 84, 1902.

make a living. When the German clerk has learnt English he goes to France, Belgium, or French Switzerland, in the same way, to learn French, and finally returns home, master not only of three languages, but of the business customs and the goods of three peoples.

It is clerks of this kind who have been of such immense service in expanding German trade. Everyone in England knows the difficulty of finding clerks or travellers to start new branches of a business in France, Germany, Spain, or Italy; in Germany there is an abundance of such men.

To achieve similar success we have only to copy German example. Give your youth as good a liberal and general education as a German gets in a first-rate secondary school. Send him abroad to learn foreign languages, business customs, and foreign goods, and he will return as well equipped for commercial life as any foreign clerk, or better. We are bound to have a supply of such men if we are to push our goods and commercial interests successfully in all parts of the world.

IV. Reform of the Patent Laws.

We have dealt so far with measures for improving our national efficiency—measures that can only take effect relatively slowly. But there is one reform that would very promptly have a great and beneficial effect on our national industries—I mean the total reform of our patent laws, and not only, as is now attempted, a part of it. This is only tinkering with this most important question.

Formerly, poor inventors were tempted to come to England in search of capital and to establish new industries here, of which we are so much in need. Capital is now to be had abroad, and, in addition, wages are lower, trade unions less powerful; transport rates, as we have seen, are lower; commercial help is more efficient; and protective tariffs may sometimes make it more advantageous to manufacture abroad and export to England than to manufacture here and send abroad. By our present patent laws we actually give an additional bonus to the foreign manufacturer.

Let me explain, briefly, how. I have dealt with the subject before in this Society, and as I intend to devote myself mainly in this final portion of my address to demonstrate the extraordinary *rôle* that patent law legislation has played in the development of the Aniline dye-stuff industry in Germany, I shall be brief in dealing with general questions. The two principles of our original patent laws were exactly the same as those borrowed from us and carried into effect in the German law of 1876. Our legislation was intended (1) to grant a monopoly only to the first and true inventor, and (2) to obtain from him, as a *quid pro quo* for the community, the introduction of a new industry or manufacture into the country. Unfortunately our actual English law fails, and fails signally, in both points. Neither do we take pains to give our patents only to genuine inventors; nor do we secure that the patents once granted shall be worked here, and thus introduce new industries into the country. We grant patents to all comers, without investigation, at the rate of more than 15,000 yearly, as against 5,500 granted in Germany; and thus we often grant monopolies to foreign rivals who cannot obtain such monopolies in their own country. The severe German system may, it is true, occasionally work to the disadvantage of the inventor; on the system works uniformly to the disadvantage of the English manufacturer and the English community; and in its failure to secure the second principle of our legislation, has simply spelt disaster to some of our older industries, while it daily checks the introduction of new ones. An article patented in Germany must be manufactured in Germany. We have no similar provision. Is it not obviously to the interests of an inventor, other things being equal, rather to set up a factory in Germany, from which he can export his patented articles freely to the English market, than to set up a factory in England. As I said, by our legislation we simply give a bonus to our rivals—which they duly appreciate and profit by. The German manufacturers on their part readily acknowledge the immense help that has been given to their chemical, electrical and allied industries by their law of 1876, and the foolishness of our own.

During the last 25 years we have introduced into this country, except perhaps the Linotype and the Westinghouse industries, very few industries indeed. In both the above cases the introduction has been due to the energy and enterprise of Sir Joseph Lawrence, M.P.; in both cases it has only been effected at an immense monetary sacrifice, in consequence of the dissimilarity between our own patent laws and those of our foreign competitors.

For years our Chambers of Commerce have made protests to the Government, but in vain. It seems almost incredible that now that the Government have at last introduced a Bill on the subject, it is one that, instead of assisting the establishment and development of native industries, must, if passed, have precisely the opposite effect. Fortunately, public attention has been roused in time, and the Bill in its present form will never pass. But what are we to say of a Government department that misunderstands so greatly the needs of our commerce?

The Decline of the Aniline Colour Industry in England; its Growth in Germany.—No better illustration of the effect of patent law could, I believe, be chosen, and none that would appeal more to those present, than one chosen from the history of coal-tar colours. My friend Mr. A. G. Green, in a very excellent paper read at the Glasgow meeting of the British Association in 1900, attributes the loss of our position in this industry to the ignorance of manufacturers, who "thought of the benzol market more than of the benzol theory." Other writers, forgetting that we have had some of the most distinguished of German, as well as of English, chemists in our works, attribute our decline to the inferiority of English chemists. A survey of the history of the subject will, I think, show conclusively that they are mistaken.

The first period of this history extends from 1856, when Dr. W. H. Perkin discovered the first coal-tar dye-stuff, down to 1876, when the German imperial patent law was passed.

A few years after Dr. Perkin's discovery Messrs. Simpson, Maule, and Nicholson erected works for manufacturing dyes, which for 14 years were the largest coal-tar colour works in the world. Other works were started in England. Messrs. Roberts, Dale, and Co. commenced working before 1860. Read Holliday and Sons; Dan Dawson; Williams, Thomas, and Dower; and our own firm were founded in 1865. All these firms employed excellent, and some of them eminent, chemists. Nicholson, the manager to Simpson, Maule, and Nicholson, was himself a very able chemist; and the firm employed as adviser the very eminent professor, A. W. Hofmann. Roberts, Dale, and Co. also employed several men of great distinction: Dr. Caro, who became chief chemist at the Badische; Dr. Martius, afterwards chief chemist of the Berlin Actiengesellschaft; Leonhardt, who, after his return to Germany, became a partner with Cassella, and, later, established the Farbwerk Mühlheim; and Peter Griess, the discoverer of the diazo reactions, and practically the founder of the azo-colours industry. The chemist to Williams, Thomas, and Dower was Dr. Otto N. Witt, now privy councillor and professor at the great Charlottenburg Technische Hochschule. There was thus plenty of chemical talent engaged by our manufacturers, nor was there either then, nor is there now, any difficulty in getting first-class chemists.

During this period a large number of valuable patents were taken out in this country, chiefly by Englishmen, by Germans employed in English works, and by Frenchmen, but not one of these patents was granted in Germany. Perkin's Violet of 1856 was followed by other similar colours patented in 1859 by Greville Williams, by R. D. Kay, by Beale and Kirkham, and by Price. Price patented three colours—Violine, Purpurin, and Roseine—produced by the oxidation of commercial aniline by means of peroxide of lead. In 1860 John Dale and Caro, and in the same year Richard Smith and Coleman, took out patents for similar Violets; and Girard and De Laire, two Frenchmen, transferred to Simpson, Maule, and Nicholson valuable patents for obtaining a better Violet than those already known. In 1862 Dr. Perkin discovered another class of Violets; and in 1863 Hofmann discovered what is known

as Hofmann's Violet. This patent, as many others, was also transferred to Simpson, Maule, and Nicholson.

The reaction produced by heating aniline under pressure with alcohol and ethyl iodide led two French chemists, Poirrier and Chapat, to the idea of methylating the aniline and oxidising the dimethylaniline obtained. They took out an English patent for the Violet produced in 1866.

The first Aniline Yellow, Phosphine, was discovered in 1862 by Simpson, Maule, and Nicholson, but not patented. Roberts, Dale and Co. followed with another Yellow, Manchester Yellow, which, like Phosphine, is still used.

The first Magenta was made by Renard Frères and Franc, who took out an English patent in 1859. Another method for its manufacture, still in use in some works, was taken out by Medlock in 1860; it was first employed by Simpson, Maule, and Nicholson.

Aniline Black, another colour still largely used by our dyers and printers, was discovered and patented by an Englishman, Lightfoot, in 1863. Bismarck Brown was first manufactured in 1866 by Roberts, Dale,and Co. Chrysoidine, and the beautiful series of orange wool-dyes allied to it, all still in use, were first produced by Williams, Thomas, and Dower. The first Aniline Blue patent was taken out and worked by Simpson, Maule, and Nicholson in 1862. The first soluble Blue was patented by Gilbee a few months later. Nicholson then succeeded in producing a soluble Blue, a monosulphonic acid of triphenyl-rosaniline, known as Nicholson's or Alkali Blue. It was an immense success at the time, being far and away the most beautiful Blue for wool-dyeing. This firm, disgusted with the fact that as soon as their English patents were published the Germans copied them, endeavoured to keep the process a secret. But in vain; a German professor determined the constitution of the Blue, and showed the way of producing it. The German colour manufacturers have netted, with this colour alone, half a million sovereigns.

Now, what was happening in Germany during this time? The patent laws in the different single German States were in such a condition of confusion that for practical purposes it was as if no patent law existed. German manufacturers were in the happy position of Swiss manufacturers to-day—they had the brains of the world at their disposal without paying for them, and this state of affairs continued till 1876. Large factories were set up to exploit discoveries made by English and French chemists. They were established and organised, not so much by chemists, but by enterprising and energetic business men. Thus the *Badische Anilin und Soda Fabrik*, started by the Brothers Klemm, owe their remarkable success in the first instance to Sigl, a most capable commercial man, who first developed them. Friedrich Bayer, the founder of the *Elberfeld Farbenfabriken*, was no chemist; the Cassella firm consisted mainly of business men; so did the firm of Meister, Lucius, and Brüning (now the *Farbwerke* at Höchst). Meister was at one time a Manchester merchant; and I could give several other instances.

Whilst the German manufacturers travelled themselves and established agencies all over the world, the British rested content with issuing circulars warning their customers against using inferior foreign-made goods, which were infringements of their patents.

It is therefore no wonder that the German competitors, who were unfettered and unrestricted by patents or monopolies, soon made headway by selling their goods at lower prices. Thus the German manufacturers, through the absence of a patent law and through commercial enterprise, quickly won an important position in the colour industry created by English ideas. Their great opportunity, however, came with the discovery, in Germany and England simultaneously, of a commercial process for the manufacture of alizarin in 1870. Patents were granted for a number of processes in England, for all of which they were refused in Germany. The stimulus given to German manufacturers by the demand for alizarin was immense; by their previous commercial efforts they had created a market in every part of the world ready to take it. Later on they combined, and, dictating to English consumers their own terms, they made immense profits. By these extraordinary profits they were enabled to write off the cost of their old works, to reconstruct them with huge laboratories, which they manned with skilled research chemists. It is a strang story. English brains created the colour industry. Englis enterprise developed it. English legislative folly has bee the principal cause of its decline.

We shall not, of course, recover the monopoly we had i the first days of the industry. But a reasonable amendmer of our patent laws on German lines would go very far t bring us back a considerable portion of what we have los Now I have spoken strongly, but, believe me, not to strongly. I have had special opportunities for observin these matters, and I love the country of my adoption to well to state less than I believe to be the truth.

Conclusion.—In dealing with three out of the fou reforms I suggested as needing urgent attention—reform o our transport system, reform of our education, reform o our patent laws—we have traversed a very wide field; w have seen, by the way, on what complex causes commercia and industrial prosperity depend. I conclude by askin once more for the first reform I spoke of—the appointmer of a Minister of Commerce capable, by his training an experience, of grasping these problems of commerce vital t the country. Mr. Holt, M.P., in supporting the recer motion of Mr. Sinclair in the House of Commons for th appointment of such a Minister, declared, in terms only to moderate, that the exigencies and the requirements of trad and commerce in this country demanded more attentio than they had received hitherto.

We must hope that this suggestion will speedily be take to heart.

Nothing could illustrate better the need of such a Minist than the embargo that has hitherto been laid on the use o duty-free spirit (denatured where necessary) in arts an manufactures. Although for 15 years members of ou Society, including at least two Past Presidents, have bee as members of the London Chamber of Commerce, labourin for its removal, yet it was not until the use of free spir was urged as a "national" necessity by Mr. Haldane, K.C on behalf of the Explosives Committee, that the Treasur granted the principle by accepting the clause which h proposed (see this Journal, 1902, 878). It is reasonable t suppose that, had a Minister of Commerce existed, he wou have been influenced earlier by the considerations of man facturers. How much has been lost to this country ca scarcely be estimated, and the recent paper and discussio on the subject in the London Section were most timel A good beginning has been made in granting a drawbac and other allowances in the exportation of spirituou medicinal preparations and perfumes. The authorities o the Inland Revenue have been justified in their conce sions by the fair and open way in which they have been m by traders, and I do not doubt that the same spirit of co cession will characterise the regulations and restrictio it may be deemed necessary to impose. Precedents ex both in Germany and France with regard to this matte and the Council has wisely appointed a Committee to co sider this question and to co-operate with any other bo or committee which may be dealing with it. I woul however, desire to emphasise one point, namely, that th authorities need fear little about loss to revenue. T concessions are for industries which have either been de troyed or have been prevented from coming into existenc The main question will be the regulation of industrial pr cedure, and this is efficiently carried out in Germany an in France.

In conclusion, gentlemen, permit me to acknowledge t debt of gratitude I owe to the Publication Committee, the first instance, for recommending the issue of o Journal twice a month, and the inclusion of United Stat and French patents; and to the Council, in the second, for cordially endorsing that recommendation. When elect as your President in Glasgow a year ago, I ventured advocate the change, giving, as I thought then, am reasons. The experience of the new issue during the pa six months has not affected my conviction of the desi bility of the departure, and I feel sure that this experien will, in the immediate future, produce results as to on enhancing the value of the matter of the Journal as w as effecting economies. It is no small matter that for years the same gentlemen, in the main, have acted on yo Publication Committee, and have assumed the burden

ıe double monthly issue. I desire to make sincere ckoowledgment of the assistance and cordial co-operation f the Editor, Sub-Editor and General Secretary, and the taff. For some time it has been my misfortune to ave been in very indifferent health, and I cannot permit his occasion to pass without acknowledging the services rendered at those Council and other meetings at which I was unable to be present, by those past Presidents who took my place, and notably by your immediate past President, Dr. J. W. Swan, F.R.S. In awarding to him our medal for Conspicuous Service in Technology and Applied Science your Council has honoured the Society.

APPENDIX A.—*Value of the Total Imports and Exports of Merchandise into and from the United Kingdom, with Proportion thereof per Head of Total Population, for the Years* 1890—1900.

Years.	Imports. Total Value.	Imports. Proportion per Head of Population of United Kingdom.	Exports. Total Value of British and Foreign and Colonial Produce.	Total of Imports and Exports. Total Value.	Total of Imports and Exports. Proportion per Head of Population of United Kingdom.	Years.
	£	£ s. d.	£	£	£ s. d.	
1890	420,691,997	11 4 6	228,252,118	748,944,115	19 19 7	1890
1891	435,441,264	11 10 5	309,113,718	744,554,982	19 14 0	1891
1892	423,793,882	11 2 5	291,640,166	715,434,048	18 15 6	1892
1893	404,688,178	10 10 7	277,138,270	681,826,448	17 14 10	1893
1894	408,344,810	10 10 7	273,785,867	682,130,677	17 11 10	1894
1895	476,689,658	10 13 1	285,832,407	702,522,065	17 19 3	1895
1896	441,808,904	11 3 11	296,379,214	738,188,118	18 14 1	1896
1897	451,028,960	11 6 6	294,174,118	745,203,078	18 14 3	1897
1898	470,544,702	11 14 2	294,013,988	764,558,690	19 0 6	1898
1899	485,035,583	11 19 2	329,534,658	814,570,241	20 1 8	1899
1900	523,075,163	12 15 9	354,373,754	877,448,917	21 9 0	1900
al	4,460,451,104	113 6 7	3,005,986,160	7,466,437,264	189 14 11	

APPENDIX B.

Germany's Imports and Exports (exclusive of Transit oods and Precious Metals) for the Years 1890—1900.

ear.	Imports. 1,000 Tons.	Imports. Million Marks.	Exports. 1,000 Tons.	Exports. Million Marks.
890	28,142	4,272	19,365	3,409
891	29,012	4,403	20,139	3,339
892	29,509	4,227	19,891	3,150
893	29,815	4,134	21,361	3,244
894	32,022	4,285	22,883	3,051
895	32,537	4,246	23,829	3,424
896	36,410	4,558	25,719	3,753
897	40,162	4,864	28,019	3,786
898	42,729	5,439	30,094	4,010
899	44,652	5,783	30,403	4,368
900	45,911	6,043	32,681	4,752
:al	302,759	47,982	255,019	36,877

Thus, the import tonnage for the year 1890 was 28,142,600 tons; the average import tonnage for the decade 1891—1900 was, in round figures, 36,276,000; so that in the decade the imports exceeded by 81,340,000 tons the figures that would have been recorded had they remained stationary since 1890. The value of imports in 1890 was 4,272 million marks; the average value of imports for the decade 1891—1900 was 4,798 million marks, showing an excess for the decade over the figures of 1890 of 5,260 million marks. The export tonnage in 1890 was 19,365,000; the average for the decade was 25,502,000, showing an excess for the decade, calculated as before, of 61,370,000 tons. The value of exports in 1890 was 3,409 million marks; the average value of exports was 3,687 million marks, showing an excess for the decade of 2,780 million marks.

The total import and export tonnage in 1890 was 47,507,000; the average for the decade was 61,780,000, showing an excess for the decade of 142,730,000. The total value of imports and exports for 1890 was 7,681 million marks; the average total for the decade was 8,486 million marks, showing an excess for the decade of 8,050 million marks.

APPENDIX C.—*Gymnasien, Progymnasien, Realgymnasien, Higher Realschulen, Realschulen in Prussia, and their Attendance at the Close of the Half-Year* 1900.

Provinces.	Gymnasien.	Attendance.	Progymnasien.	Attendance.	Realgymnasien.	Attendance.	Real-Progymnasien.	Attendance.	Higher Realschulen.	Attendance.	Realschulen.	—
Ea Prussia.....	16	4,087	1	122	3	608	0	0	1	224	4	514
W Prussia.....	13	3,287	5	417	2	302	0	0	3	1,041	4	339
Be	16	7,105	0	0	8	3,591	0	0	2	837	12	4,549
Br lenburg	29	5,934	5	252	6	1,397	4	338	1	482	18	2,729
Po rania.....	19	3,560	3	352	4	1,048	2	129	0	0	3	317
Po	17	4,437	2	183	1	405	0	0	1	248	0	0
Sil	37	9,232	4	242	8	1,446	1	91	2	458	10	2,150
Sa y.....	28	6,291	2	101	5	1,300	3	161	5	1,660	14	1,695
Sc swig-Holstein	12	2,058	1	54	4	237	0	0	2	710	14	1,744
Ha ver.....	25	4,927	3	266	10	1,940	4	356	1	465	14	2,249
We halia.....	24	5,841	10	525	8	1,243	0	0	2	757	13	1,599
He -Nassau.....	17	4,025	4	271	4	1,183	4	226	5	1,774	14	1,963
Rh land.....	41	11,676	19	1,999	13	2,610	3	120	12	3,229	17	3,088
Ho nzollern.....	1	155	0	0	..	..	..	..	0	0	1	102
otals	295	72,615	59	4,784	76	17,310	21	1,421	37	11,888	138	23,038

To grammar schools, 626. Total attendance, 131,056. One secondary school is provided for about every 51,000 of the total population.

THE MEDAL.

Mr. E. K. Muspratt, Past President, in the President's absence, said: When any member switches on the current as he lights up this evening, let him recall for a moment the fact that our city is now being honoured by the presence in it of one to whom we owe the incandescent electric lamp in its present form, and let him reflect how much poorer the world might have been but for the inventive genius of Joseph Wilson Swan. Dr. Swan's career partakes of the nature of a romance, but a romance only of hard work and indomitable perseverance. Those who heard his address as President of the Society of Chemical Industry in Glasgow last year might have been pardoned if scarcely a hint appeared to suggest a life of constant and strenuous endeavour in the pursuit of science. Born in Sunderland upwards of 73 years ago, Dr. Swan was early destined to a scientific career. His teacher, a Scotch Doctor of Divinity, encouraged his pupils to read such scientific books as were then available. Indentured as apprentice to a chemist in Sunderland, he found himself in congenial surroundings. The usual routine of a chemist's calling gave him an excellent training, and in those days the retail chemist had to make many chemicals which are now prepared on the "manufacturing scale." Having joined the Sunderland Athenæum when quite young, he there regularly read the "Mechanic's Magazine," which he had persuaded the committee to take in, and from this paper he got his early knowledge of electrical phenomena. About the same time he made the acquaintance of one Wilson, a mechanical genius, who occupied his spare time in working a lathe. Wilson made for him the frame of a frictional electric machine, and his father got for him the glass body, and with this his first experiments were made. Another formative influence in Dr. Swan's life was his hearing a lecturer of that day named Stait, who, amongst other things, showed his audience a small incandescent lamp, the filament of which was made of iridio-platinum. This seed, dropped upon virgin soil, sprang up years afterwards, and brought about the experiments that ultimately resulted in the carbon filament which is now so familiar to everyone in the Edison-Swan lamp. Leaving Sunderland, he joined Mr. Mawson, chemist, Newcastle-on-Tyne, first as an assistant, and later on as a partner. Dr Swan was the means of introducing as part of the business the manufacture and supply of philosophical and scientific apparatus, and here he too began the manufacture of collodions for photography by the wet process, in which industry his firm were the pioneers, and for which they have ever since been famed. The pyroxylin for the collodion was prepared by Dr. Swan himself. His next great achievement was the discovery of the means for increasing the sensitiveness of dry plates, and he it was who first advertised "a revolution in photography" by means of rapid plates. To us in these days of rapid modern methods it may come as a revelation that, so far back as 1882, Mr. J. P. Gibson, of Hexham, described the photographing on a Swan plate of a flash of lightning in the ten-thousandth part of a second. The invention and perfection of the incandescent electric lamp is too long a story to tell here. Dr. Swan was the first to use a filament of carbon. At first it was carbonised paper, then thread dipped in sulphuric acid, and, lastly, he fell back upon gun-cotton, and devised his method of making a filament of it by squirting collodion into a coagulating solution. Suitable lengths of the tough threads are then packed in charcoal and carbonised in a kiln. This, like many others of Dr. Swan's inventions, was an original process, but it was never patented, and its use has become general without acknowledgment to him. Dr. Swan also invented the autotype carbon process, the first method used for making permanent photographs; he was co-inventor of Woodburytype; he invented a miner's electric safety lamp, besides numerous other minor inventions. The many-sidedness of his character is well shown by quoting the words of Mr. R. S. Proctor, who tells how, on the sudden death of his partner, Mr. Mawson, it became necessary for Dr. Swan to turn his mental energy to finance as well as philosophy. He was equal to the occasion, with apparently no loss of power on the scientific side of his pursuits. "He remained the mainspring of two or three businesses—pharmacy, photographic and philosophical instrument, photographic dry-plate, Dutch yeast, stationer and fine arts—besides carrying through the great works f which his name will be long remembered in developing t incandescent electric light and the art of photograph engraving, still keeping his connection with the alk manufacture and the spelter mines, besides some oth matters in which artistic taste, scientific attainments, business energy found scope for useful work; and with this he can fill the high places in electrical engineering a chemical industry."

In making this presentation, I have the honour to be t mouthpiece of the Society, and I consider the Society Chemical Industry does honour to itself in asking t acceptance of the medal by Mr. Joseph Wilson Swa M.A., LL.D., F.R.S., Chevalier of the Legion of Hono Past President of the Society of Electrical Engineers, a last, but not least, immediate Past President of the Socie of Chemical Industry.

Dr. Jos. W. Swan, F.R.S., said in reply: In receivi this medal from your hand, sir, I am deeply sensible the great honour done me, for I remember the status the Society, and that it embraces in its membership —among English-speaking races—that is representati of enterprise and progress in relation to chemical a and manufactures. My sense of the honour is increas by the recollection of the eminence of the recipients of t medal in former years, and I acknowledge the pride I f in being reckoned of their company.

I am told that the award is made chiefly in recogniti of what I have done in connection with electric light a photography. I need hardly say that it is a great gratifi tion that that work is so highly esteemed, and to fi evidence of its influence in the development of n industries in touch with chemistry and chemical physics industries, I am glad to think, that are contributing to t pleasure and the well-being of mankind.

Davy warned Faraday not to indulge in extravag expectations of the rewards of science; he said scie was a harsh mistress. Sir, I cannot, on this occasion, ec that sentiment, though I must admit that her rewards not, as a rule, redundant, and that they are apt to capriciously bestowed—I mean, if only *that* is counted a reward which appears to the eye, or which can be expres as a ponderable quantity.

But science gives more precious rewards than those hand can grasp, and among these there are but few I va more highly than that of which this is a token.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, May 26th, 1902.

MR. GEORGE WARD IN THE CHAIR.

ON THE MARSH-BERZELIUS ARSENIC DEPO

BY WILLIAM ACKROYD, F.I.C.

At a recent private conference of public analysts h Harrogate, May 3rd, I pointed out that, in dealing h traces of arsenic, the difficulties of estimation are increa by the existence of different states of aggregation in the Marsh-Berzelius deposit, which I have distinguished as (1) brown, (2) blue, or (3) mixtures of the two. I w venture to submit the following notes on the subject.

The method of experimenting has been that of the Committee. The quantities of arsenic dealt with, calcu as As_4O_6, have been of an order of magnitude repres by thousandths of a milligram, unless otherwise stated he weight of zinc used, 20 grms. in a Tyrer apparatus wit acetate of lead paper instead of solution, and the h chloric acid brominated and of the strength left te

ecessary evaporation. The flow of hydrogen has been ept fairly constant as measured by the size of flame at e exit.

This last condition is very essential for comparisons, ecause, (1) small differences of size of flame may indicate ide differences in rate of flow of gas; thus a change from 2 3 mm. flame diameter indicates very nearly a trebled rate of olution of hydrogen, as for approximately spherical flames e volumes of gas they represent are directly proportional the cubes of the flame diameters; and (2) with the less nsitive qualities of zinc, the quantity of arsenic deposited roughly in direct relation to the rate of flow, a slow drogen current not depositing in 15 minutes so much senic as a rapid one.

Only by close attention can constancy of size of flame be sured, even with some ready and simple device for at once tecting any deviation. With a platinum wire, *c e*, Fig. 1, iled round the end of the tube, bent over at *e*, and so justed that the distance *e d* is that of the required diameter flame, it will be found when working that the red hot end *e*, ll indicate the size of flame even when the condition of

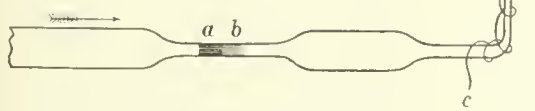


Fig. 1.

ylight is such that the flame would be otherwise invisible. glass bead of requisite diameter attached to a pin does calibrating the distance *e d*.

On looking over a large number of tubes made during the t three months, brown deposits are found wherever utions of organic materials, such as beer, sugar, and wall- er, have been tested by being added slowly and in small tions at a time, direct to the Marsh apparatus during the minutes of the experiment. On the other hand, either e or mixed deposits have been obtained where inorganic lies have been tested. I offer the following explanation his difference.

n the mixed deposit obtained with traces of arsenic, the e is nearer the generator than the brown; I therefore clude that the blue state of aggregation is heavier, or sists of larger particles, than the brown. On this othesis it ought to be possible to reverse their positions separate them in much the same way that a puff of d will move fine particles of sand and leave bullets, reas when the puff is increased to an enormous velocity, rom the barrel of a gun, it will move bullets and the sand will remain comparatively immovable.

strong current of hydrogen, as measured by a flame of or more centimetres with sufficient arsenical compound oduced into the Marsh apparatus so as slightly to tint flame, will give a double deposit at the constriction, the vn being now nearer the generator and the blue farther y. In Fig. 1 the arrow represents the direction of a le flow of hydrogen; and in the mixed deposit the vn *b* is carried farther than the blue at *a*; in Fig. 2, esenting the results of a very rapid evolution of ogen, the brown *f g* is now nearer the generator, and

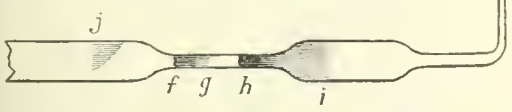


Fig. 2.

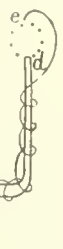
blue *h i* is completely separated from it and carried ier away. Tubes are exhibited illustrating these rences of position in the deposits.

oth the blue and brown arsenic are soluble in rine water and bromine water, the former a little more ly of the two; they are also soluble in alkaline hypo- ite and insoluble in carbon bisulphide. A solubility riment is very readily made by cutting off the capillary of the tube with its deposit, and bringing one end into solvent; on removing the tube and working the lary plug of liquid backwards and forwards, the deposit disappears if soluble. It appears to me that the brown sit is the normal colour of arsenic, as compared with the other elements in the same periodic group, *i.e.*, the amount of light absorbed by the element is intermediate between that absorbed by phosphorus on the one hand and antimony on the other, in accordance with the Law of Colour and Constitution—

Yellow to red.....	P, 31
Brown	As, 75
Black	Sb, 120

Vide The Old Light and the New, p. 55. Chapman and Hall, London; and W. F. Clay, Edinburgh.

This characteristic difference in colour is well seen on comparing the eddy deposits in arsenic and antimony tubes, as at *j*, Fig. 2.



The conditions for the exclusive deposition of brown arsenic appear to be slow and sparing evolution of AsH_3 as brought about by minute traces of arsenical compound gradually and slowly added to the Marsh's apparatus when sensitive materials are employed with a size of flame not exceeding 3 mm. in diameter. With zinc of only moderate sensitiveness larger amounts of arsenic may be added with the production of brown deposits only, while the same amounts with highly sensitive zinc would give mixed deposits. The blue and the brown together are formed whenever there is rapid evolution of hydrogen as indicated by 4-mm. flames and upwards, more especially in the absence of organic materials, lessening the viscosity of the liquid.

These various observations enforce some old lessons, as that only brown deposits are permissible for quantitative comparisons; that, as in Nesslerising, minute differences are best discerned with minimum amounts of deposit, and that dilution of an arsenical liquid is necessary where more than a given amount of the arsenic is being dealt with. Let me add one more that is forced upon us, viz., that a hard and fast set of standard tubes are not desirable, except to get a first approximation, and that the final estimation should be made with one or more standards made at the same time, in the same way, and with the same sensitive materials as have been used in getting out the arsenic from the liquid under investigation.

METHODS FOR ARSENIC DETERMINATION IN MALT LIQUORS, &c.

BY F. W. RICHARDSON, F.I.C.

The production of foam, and the liberation of sulphuretted hydrogen in the direct application of the Marsh-Berzelius method to beer, are the two great difficulties which have to be overcome. The process proposed by a Joint Committee of the Society of Public Analysts and the Society of Chemical Industry is very disappointing, inasmuch as it fails to satisfactorily cope with either of these obstacles.

To deal with the foaming difficulty, it is advised that only 10 c.c. of the beer should be used, yet even this small amount produces so much foam as to render the direct method inapplicable, and in those cases where the foam is inconsiderable, 10 c.c. of the beer is too small an amount if we are to estimate the 1/60th or 1/70th of a grain of arsenic per gallon; yet analysts have to estimate arsenic accurately to the 1/200th of a grain per gallon.

One is advised to *char* the beer residue with sulphuric and nitric acids. No process gives more uncertain results; and attempts to get comparative mirrors from beers containing known amounts of arsenic have hitherto been most unsuccessful; and I find that this is a very general experience.

Worse than the foam difficulty is the *retention of arsenic* by many malt liquors when directly treated by zinc and acid. The chief reason for the retention is that dissolved arsenic in contact with sulphuretted hydrogen forms the sulphide, and as such is retained.

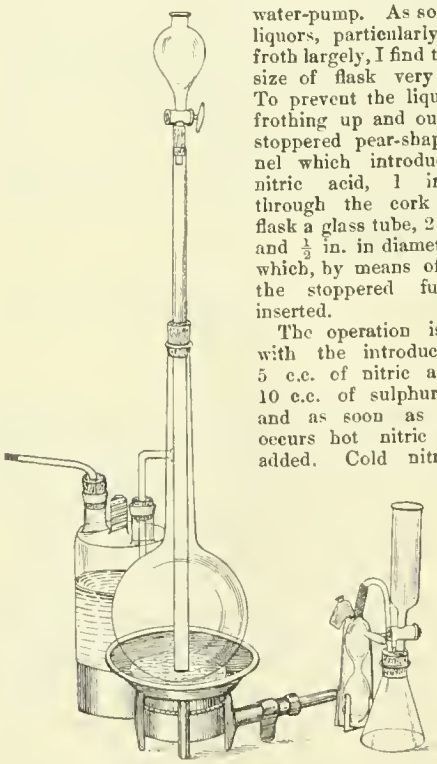
An analyst, who had failed to find arsenic in a sample of beer by the joint process, asked me also to apply the method. I did so, but always with a negative result; yet by the method I shall describe to you, an objectionable amount of arsenic was found to be present. To the flask containing the zinc, acid, and beer, which had given a negative result, fractions of a milligram of arsenious oxide were added; yet no mirror was obtained.

Yeast absorbs arsenic from beer, and tenaciously retains it when zinc and acid are added directly to it. The following figures obtained by me some months ago in this connection may be of interest:—

	Grain of Arsenic per Gallon.
A yeasty beer	1/8
The filtrate	1/50
The yeasty portion (semi-fluid)	1/4
The yeasty portion dried (assuming a density of 1·0)	1

I would urge the abolition of all direct testing of malt liquors for arsenic. Mr. Wm. Thomson has long advocated the complete destruction of all organic matters, and of all sulphides and sulphites in beer, before applying the Marsh-Berzelius method, and I agree with him.

I apply the method with some slight modifications to avoid certain difficulties, which, perhaps, the mere personal equation may cause. I prefer to use 70 c.c. (the "miniature gallon") of beer instead of 50 c.c. I use a 32-oz. flask, with side tube bent at right angles, and passing under water in a large two-necked Woulffe's bottle, the other neck of which is connected with a water-pump. As some malt liquors, particularly stouts, froth largely, I find the large size of flask very useful. To prevent the liquid from frothing up and out of the stoppered pear-shaped funnel which introduces the nitric acid, I introduce through the cork of the flask a glass tube, 2 ft. long, and $\frac{1}{2}$ in. in diameter, into which, by means of a cork, the stoppered funnel is inserted.



The operation is begun with the introduction of 5 c.c. of nitric acid, and 10 c.c. of sulphuric acid, and as soon as charring occurs hot nitric acid is added. Cold nitric acid tends to produce fractures. When charring ceases, and a little sherry-coloured liquid emitting sulphuric acid fumes remains, the flask and contents are allowed to cool. The residual liquor is washed into a shallow porcelain dish, and concentrated on a sand bath till strong fumes arise.

A further treatment is necessary to remove the last traces of nitric acid, which otherwise will retain arsenic when the Marsh-Berzelius or Gutzeit test is applied. Doubtless this retention is due to the formation of the solid arsenic hydride, a fact observed by Blondlot.

Two cubic centimetres of a 10 per cent. solution ferrous sulphate are added and the mixture again co centrated to fuming point.

A drop of this should give evidence of the presence ferrous iron to potassium ferricyanide.

The resulting liquid is made up to 50 c.c., and 25 c. are first tested by the Marsh-Berzelius method (or Gutz test); in the event of the arsenic mirror or stain being ve slight, the remaining 25 c.c. are added to the contents of t generating flask.

Applied in a special manner I find the Gutzeit method give more definite and more delicate indications than t Marsh-Berzelius process.

The Gutzeit test, as I apply it, is simpler, and has giv good results. I use a 2 oz. conical flask for the generat with a small stoppered funnel with outlet tube cut close the cork (as advised by Mr. Thomson to avoid retenti of liquid), and connect with a Bender-Hobein potash bul with first inlet bulb cut off. The bulbs contain 2 c.c. a 10 per cent. solution of lead acetate as a precauti against the remote possibility of the evolution of s phuretted hydrogen. I disconnect the chloride of calciu tube and insert a small plug of cotton wool in the sho exit tube of the bulbs, and over this secure some filter pap previously soaked in a 5 per cent. solution, of mercu chloride and dried, by means of a rubber ring, tying rou and round as if with a piece of string. A disc of 4½ mil metres is thus obtained, and even 1/1000th of a milligra of arsenic will give an appreciable yellow stain, and t differences onward between the additional 0·001 of a mil gram of arsenious oxide are distinctly marked, enablin one to estimate arsenic to the 1/1000th part of a grain p gallon.

The advantages of the Gutzeit process are:—

(1) The uniformity of the stains.

(2) The non-necessity of excluding presence of oxyge

(3) The abolition of the gas flame and drawn-out tubes

(4) The fact that one can leave the experiment alm any length of time quite unattended.

The stained papers will keep for long periods in a we stoppered flask, and the standards may be kept secur to a card in a wide-mouthed stoppered specimen bottle.

If it is ever decided that when a malt liquor contai less than, say, the 1/125th part of a grain of arsenic, need not be estimated or indicated by the test appli only 20 c.c. of the beer need be oxidised, as 0·00 milligram of arsenic in this measure of the sample wo be very readily seen and estimated.

It would be comparatively simple to oxidise 20 c.c. of malt liquor, and a deep-shaped porcelain crucible w perforated glass cover could be used; the whole operati being conducted in the ordinary fume cupboard.

I always apply the Marsh-Berzelius method as a ch in conjunction with the Gutzeit test in all cases where m than 1/100th part of a grain of arsenic has been found.

For heating the arsenic tubes a small furnace, and eas obtainable with the hood I have had specially made, gi me stronger mirrors than those got by a single Bun flame, which frequently allows some arseniuretted hydro to pass undecomposed. From the character of the furn and the rigid way in which the tube is fixed therein, no can escape unheated.

I have not been successful in applying the methods the purification of acids recommended by the Joint C mittee. It is inadvisable to use sulphurous acid in purification of hydrochloric acid, as it is difficult to rem the last traces of this gas, and even if only a fraction milligram remains, the sulphuretted hydrogen develope the Marsh apparatus proves fatal to the liberation of arseniuretted hydrogen.

I add 1 per cent. of potassium bichromate to comm hydrochloric acid, and distil in a retort provided wit safety tube, and with a funnel which allows of the admission of drops of a 10 per cent. solution of bichromate. In this way the acid is kept constan supplied with chlorine or chloro-chromic acid, which vents the formation of the trichloride of arsenic. chlorinated distillate is now free from arsenic, and ca treated with slight excess of ferrous chloride to re

e chlorine. The presence of ferrous chloride in hydro-loric acid intended for use in the Marsh apparatus is a stinct advantage, as it prevents oxygenation and the ndering of the acid more or less insensitive.

Sulphuric acid can be freed from arsenic by simply tilling with chromic acid or potassium bichromate, as commended by Thomson, but I have broken so many orts on account of the inevitable violent bumpings which e place that I have had reluctantly to abandon the thod.

As sulphuric acid and nitric acid are used together in oxidisation of the organic matters contained in the bstances to be tested for arsenic, I add 1 per cent. of ric acid to the sulphuric acid, and distil. In this way ffect a complete purification, and obtain a rapid and aquil distillation.

Recently we obtained some very peculiar and perplexing ults in our application of the Marsh tests to a pure ution of arsenious oxide. The arseniuretted hydrogen resisted decomposition by the application of tempera-es varying from the heat of an ordinary Bunsen burner that of a blast lamp; nevertheless, the escaping gases e the characteristic stain to mercuric chloride paper.

We have observed this so very frequently with quantities ying from 0·005 to 0·010 mgrm. of arsenic that we are certain of the results as we are of the fact that the ns obtained on the mercuric chloride paper have been ivalent to the missing quantities of arsenic. It is sible that there are forms of arseniuretted hydrogen, rmediate between the gaseous and the solid conditions, ch play these pranks in the Marsh-Berzelius tube, and ch are nevertheless capable of reacting with mercuric ride.

Joint Discussion.

r. A. H. Allen stated that, before the arsenic question me so prominent, he had been accustomed to determine nic in beer by boiling the suspected liquid with copper hydrochloric acid, dissolving the deposit with caustic li and hydrogen peroxide, and distilling the concentrated id with cuprous chloride and hydrochloric acid. The e of the arsenic passed into the distillate, and after alisation, its amount could be determined by titration a $\frac{1}{200}$ normal solution of iodine. The results were very factory, but the quantity of beer required for the deter-tion was not less than half a litre, and one litre was a r quantity. The process had the advantage that one ly read off on a burette the volume of standard ion corresponding to the iodine present. On the other hand, neither this nor any modification of Reinsch's process applicable to the examination of glucose and certain products, and the quantity of material required for est was often very inconvenient. He had therefore doned that process in favour of the Marsh-Berzelius od, which now gave him very satisfactory results. was not always the case, however, and he met with ng but disappointment at first, owing to the difficulty taining mirrors of constant character. They were imes brown and sometimes grey. Further, some of inc which he employed was, from extreme purity or cause, inactive. That is to say, he had met with zinc refused to dissolve either in sulphuric acid or hydro-chloric acid so as to produce a reasonable evolution of gas. Other zinc had the character of not evolving, in the form of arseniuretted hydrogen, arsenic actually added as As_4O_6 to the contents of the Marsh flask. A brother chemist granulated his zinc in an iron ladle, but he himself had employed a porcelain vessel, and it appeared probable that a trace of iron was the cause of the better results obtained by some operators. At any rate, by stirring a very small quantity (generally 0·03 per cent. was sufficient) of crystallised ferrous sulphate into the molten zinc the metal, after granulation, dissolved readily in acid, and uniformly gave the normal hair-brown arsenical mirror. From the moment he used the iron his difficulties with the abnormal mirrors had entirely disappeared. It was essential to avoid the use of too much iron.

With regard to the methods recommended by the joint committee for purifying acids, he found the one for sulphuric acid quite satisfactory, but must admit that, in the case of hydrochloric acid, treatment with bromine and sulphurous acid did not always give a satisfactory product, and the process had other disadvantages. He now purified his hydrochloric acid by adding powdered potassium permanganate in slight excess. The acid was then distilled, when the first fraction contained chlorine, and was therefore not suitable for use in the Marsh apparatus, but the whole of the acid which distilled over was quite free from arsenic and answered excellently. He habitually used acid which was freshly distilled, and did not find trouble from absorption of oxygen or contamination by arsenic from the bottles. He should certainly adopt the suggestion of employing three flasks simultaneously. Although he avoided the removal of organic matter when possible, he was inclined to think that all tests by Marsh's process ought to be preceded by the destruction of organic matter.

Mr. Fairley exhibited and described to the Section the small apparatus devised by Mr. W. Thomson, of Manchester, which he considered superior to any other. This was made by Messrs. Müller and Orme, of Holborn, London, and was about one-fourth of the size of the apparatus described by the joint committee.

Mr. Lovett was of opinion that, notwithstanding the reports of the two committees, our best tests for arsenic were still open to doubt; and that some process quite distinct as to general principles, particularly as to materials and organic matter, should be drawn up and made official as soon as practicable.

Mr. Richardson cited the case of an invert sugar which, by the application of the direct test, seemed to be free from arsenic, whilst by the oxidation method indicated and by the Gutzeit test $\frac{1}{250}$ part of a grain per lb. was found. In all probability the arsenic was present as sulphide, or in some form not decomposable by nascent hydrogen.

Mr. Branson described a new method of freeing zinc from sulphur, arsenic, and other impurities by passing through the molten metal a mixture of oxygen and chlorine gases, the fusion being arranged in a furnace free from arsenical fumes. The product was absolutely free from arsenic, and well within the limits of sensibility recommended by the joint committee. He also exhibited gutta-percha bottles said to be free from arsenic, and used for containing pure hydrochloric acid.

Journal and Patent Literature.

Class.	Page.
—General Plant, Apparatus, and Machinery	904
—Fuel, Gas, and Light	905
—Destructive Distillation, Tar Products, Petroleum	909
—Colouring Matters and Dyestuffs	910
—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	911
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	913
VIII.—Glass, Pottery, and Enamels	914
IX.—Building Materials, Clays, Mortars, and Cements	914
X.—Metallurgy	915

Class.	Page.
XI.—Electro-Chemistry and Electro-Metallurgy	916
XII.—Fats, Fatty Oils, and Soap	917
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	918
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	919
XV.—Manures, &c.	919
XVI.—Sugar, Starch, Gum, &c.	919
XVII.—Brewing, Wines, Spirits, &c.	922
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	92
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	92
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	92
XXI.—Photography	92
XXII.—Explosives, Matches, &c.	92
XXIII.—Analytical Chemistry	92
XXIV.—Scientific and Technical Notes	93

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, pos included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Solutions [India-rubber Solution, &c.]; Storing and Discharge of Inflammable and Volatile ——. R. P. Strachan and J. K. Robertson, both of Bristol. Eng. Pat. 10,190, May 16, 1901.

Closed vessels or containers are used, from which the solutions are discharged by compressed air or by gravity. The container is provided with a closable charging aperture, a compressed-air inlet, or a non-return air inlet valve, and an automatically closing discharge valve, adapted to be opened by the hand or foot.—R. A.

Evaporating, Distilling, or Aërating Liquids or the like; Appliances for ——. A. Hollings, Lancashire, G. A. Jarvis, Shropshire, and G. Bell, Suffolk. Eng. Pat. 12,286, June 17, 1901.

Specially applicable for treating and recovering the used acids from the manufacture of guncotton or nitroglycerin, but also suitable for other purposes where uniform distribution of air in liquids is required. A chamber, which is inserted in the liquid to be treated, is provided externally with one or more series of concentric rings or division pieces. The chamber is supplied with air or gas, delivered through suitable perforations in the bottom or sides, or both, between the rings.—R. A.

Filtering Apparatus. A. B. Soar, London. Eng. Pat. 12,586, June 20, 1901.

One or more rectangular hollow filtering frames, formed of woven wire or perforated material covered with filter cloth, &c., are secured to the flat surface of a collecting pipe, by means of studs passing through the inside of the frames, the collecting pipe being secured inside a cistern receiving the liquid to be filtered, and having a discharge outlet outside the cistern.—R. A.

Gases or Vapours to Move in Contact with Liquids, but in an Opposite Direction; Improved Means for Causing ——. E. Theisen, Baden-Baden, Germany. Eng. Pat. 12,693, June 21, 1901.

Revolving helical blades in a casing induce this motion. —R. A.

Steam; Method of and Apparatus for Generating and Superheating ——. O. Imray, London. From La Soc. Anon. pour la production et l'emploi de la Vapeur Surchauffée, Paris. Eng. Pat. 12,694, June 21, 1901.

Air is supplied to a gas producer, the hot gases passed from the producer through a superheater to the furnace of the boiler, where they are burned with air, thus generating steam, and the steam on its way to the engine is passed through the superheater in contact with the surfaces heated by the gases from the producer.—R. A.

Air and other Gases; Compression, Expansion and Liquefaction of ——. *Cooling, Ice-making, Cold Storage, and the like.* C. Joly, London. Eng. Pat. 12,918, June 25, 1901.

Air, oxygen, nitrogen, hydrogen, nitric oxide, and other gases are liquefied (or compressed) and evaporated (or expanded) in a closed cycle, the minimum pressure at lowest stage being not less than 8 or 10 atmosphe The cold produced in expanding from the higher to lower pressure is utilised for any required refrigerat purpose, and, after such use, for further cooling of the hig compressed gas before its expansion.—R. A.

Pulverulent, Crystalline, Granular, or the like Substa [Gunpowder, Dynamite, Tea, Tobacco, &c.]; Mach for Separating and Packetting Equal Quantities ——. A. Darvas, Budapest. Eng. Pat. 13,877, Jul 1901.

The substance to be divided, is delivered in as unifor stream as possible on to a revolving disc, the stream be prodnced by a shaking device, which subjects a hoppe rapidly succeeding shocks or vibrations. The material travelling outwards to the periphery of the disc, is divi into equal quantities by knife-like edges of receiver sheets, which direct the material into paper bags or ot receptacles.—R. A.

Cooling or Evaporating Apparatus. H. Balcke, Boch Westphalia. Eng. Pat. 20,549, Oct. 14, 1901.

The apparatus consists of triangular bars arrange staircase fashion with spaces between them, one edg apex of each bar being directed downwards. The liqui be cooled or evaporated, in falling down from bar to ba repeatedly spread out and distributed on the horizo upper faces, while the air coming from below meets the least possible resistance. —R. A.

Pulverising, Crushing, and Grinding [Clay, Rock, Qu &c.]; Machines for ——. D. S. S. Stenart, Lon Eng. Pat. 5208, March 1, 1902.

The machine contains a revolving drum, which carri series of double-headed reversible hammers, capabl partial rotation on their pivots, so that they are proje outwards into operative position by centrifugal force. jacket is provided for heating or cooling the material du treatment, and provision is also made for injecting water, or other fluid into the disintegrating chamber. material is discharged through openings, which are prov with separating boxes containing interchangeable sc and partitions, for the purpose of separating the ma into various degrees of fineness.—R. A.

French Patents.

Filter Presses and similar Filtering Apparatus. J. W Addendum to Fr. Pat. 286,115, Oct. 28, 1901. (See Eng. Pat. 26,931, 1898; this Journal, 1899, 1103.)

Upper and lower links are provided to separate at intervals the plates and the frames when the press is op The upper links are pierced with holes to receive proje on the frames, and their centres are in proximity t movable head of the press, whilst the lower links, eng the under parts of the frames, have their centres in pro to the fixed head of the press, in order to give the fra rocking motion. The bottoms of these frames are be in order to facilitate the discharge of the cakes.—J. F.

otary Filter. L. Didier. Addendum to Fr. Pat. 311,074, Nov. 4, 1901.

HE addition to the principal specification for the construc-on of a centrifugal filter, working continuously with stematic washing and automatic discharge, refers to tails for preventing the liquid from ascending to the top of e basket under the action of centrifugal force.—J. F. B.

Vacuum Pump which cannot become Unsealed. P. Verschoore. Fr. Pat. 316,306, Nov. 7, 1901.

E water coming from the vacuum pan, or triple effect, is lected in a cylindrical receiver, the lower part of which is connection with the pump. The pump, when in action, ks this water from the bottom of the receiver, and delivers nto the waste-pipe, the latter having a connection with the k end of the pump cylinder, so as to equalise the ssures on the plunger. The receiver constitutes an omatic seal on the pump as long as there is liquid in it to pumped.—J. F. B.

United States Patent.

oke, Fumes, and Gases; Apparatus for Condensing ——. W. B. Jackson, Denver, Colorado. U.S. Pat. 00,934, May 27, 1902.

ONDENSING tank is combined with means for introducing er in the form of spray, a conduit leading from the k and communicating with the tank for discharging products of combustion thereinto, means for introing a jet of steam into the tank at the discharge emity of the conduit, to give the desired velocity, and ns, consisting of an adjustable funnel-shaped receiver nted on the wall of the tank directly opposite to the harge extremity of the conduit, for temporarily suspending products of combustion in the tank so as to facilitate leusation.—R. A.

II.—FUEL, GAS, AND LIGHT.

l-Gas; Condensation of —— [*Naphthalene Removal*]. . G. Colman. J. Gas Lighting, **79**, [2038], 1486—88.

H regard to the removal of naphthalene, the author utes the chief action to the "tar fog" suspended in gas, and reasons that, when once the heavy tars have removed, it is disadvantageous to continue the slow ng in the condensers, since the light-oil fog, which is fficacious in removing the naphthalene, is largely sited before the gas reaches the cold end of the condenser, ich point the solubility of naphthalene in the light oils is

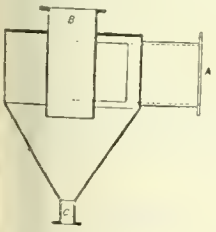


Fig 1.

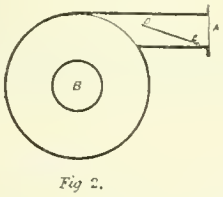


Fig 2.

st. He concludes that the most favourable conditions for moval of the naphthalene are: (1) the complete moval of the heavy tar fog before the condenser; and (2) e presence of a sufficient quantity of light-oil fog in he older portions of the condenser. To attain the first ion he advocates the supplementing or replacing of the ong condensers by a mechanical separator. The entrifugal separator illustrated in vertical section in Fig. 1, and horizontal section in Fig. 2, has been found to give good results on the small scale when employed on the condenser inlet. The gas enters at A at a tangent, through a pi of oblong section, and by the rapid circular motion of e gas in the cone, any solid or liquid particles are driv to the circumference, whence they drop through C to a seal-pot. The gas outlet is at B: the flap-valve D, hinged at E, serves for regulating the velocity of the gas. To attain the second condition mentioned above, a water-cooled condenser may be used; or Young and Glover's processes, which depend essentially upon the introduction into the main stream of cooled gases of a secondary light-oil fog, may be employed. The author is of the opinion that the amount of light oils present in the hot gas, even under the most unfavourable conditions, is sufficient, if rightly employed, to reduce the naphthalene to a safe limit, and experiments in this direction have given favourable results on the small scale.—H. B.

English Patents.

Furnaces; Method and Apparatus for Firing and Heating ——. C. W. Stauss, Berlin. Eng. Pat. 12,605, June 20, 1901.

See U.S. Pat. 695,503; this Journal, 1902, 852.—R. S.

Fuel; Furnaces for Burning Liquid ——. L. C. Boyle, Barnstaple. Eng. Pat. 5503, March 5, 1902.

For marine and other engines. A chamber of fire-resisting material is placed in the ashpit of an ordinary furnace from which the firebars have been removed. The injector enters the front of the furnace. The roof of the chamber is formed as a flat arch, and is provided with transverse outlet openings through which the flames pass.—R. S.

Gas Furnaces for Steam Boilers, or for other Heating Purposes. E. J. Duff and The United Alkali Co., Ltd., Liverpool. Eng. Pat. 13,138, June 27, 1901.

The combustion chamber, in which the air and gas expand and mix, is formed with a top perforated arch, and with inlet ports for gas running along the bottom and inlet ports for air running along each side, sloping upwards and outwards, so that the streams of gas are met and crossed by incoming streams of air proceeding from opposite sides of the streams of gas. The air passages leading to the above air inlets are arranged so as to present a large area to the flue or flues through which the hot gases leave the boiler space, but with only a small area presented to the boiler space itself.—R. S.

Furnaces. W. McClave, Scranton, Penn., U.S.A. Eng. Pat. 26,375, Dec. 24, 1901.

The furnace has an inclined grate, comprising stationary grate bars and movable grate bars. The latter are operated by a rock shaft, which also carries and actuates adjusting means designed to give either a uniform movement throughout or a graduated movement from one end of the grate to the other, or even to vary the extent of either the uniform or graduated movements of the grate bars. The movable bars are made up of body portions, with fingers projecting through the fuel and supporting projections extending in the opposite direction. Anti-friction means are mounted on the carrier bar for engaging some of the fingers and the projections. Some of the grate bars are formed with closed upper surfaces to prevent the running through of fine fuel before it becomes coked, whilst others are formed with vertical slots arranged at right angles to the body portions of the bars for introducing more air to the fuel at places where it has been coked sufficiently to prevent it running through. The fuel delivery hopper is provided near the lower portion of its rear wall with an opening, and at the bottom of the hopper with a swinging gate for controlling the discharge of the fuel. A door is pivoted to the front wall of the hopper. The door and the gate are each designed to close the opening referred to. Beneath the fuel gate is a reciprocating pusher adapted to travel backwards and forwards on the dead plate beneath the hopper, for forcing the fuel into the furnace.—R. S.

Furnaces. A. J. F. Miller, Centralia, Ill., and C. P. Marshall, Centralia, Ill., U.S.A. Eng. Pat. 6525, March 17, 1902.

See U.S. Pat. 695,750; this Journal, 1902, 852.—R. S.

Coke Ovens. R. Fabry, Brussels, and F. Linard, Island of Elba. Eng. Pat. 23,056, Nov. 14, 1901. (Under Internat. Conv.)

The ovens are coupled together in pairs, each pair being independent of the others, by means of connecting passages at the top of the dividing wall. The gases from one of the ovens pass over into, and mingle with the gases in the other oven; they then enter combustion passages in the upper portions of the dividing walls of the latter oven, whence, after mingling with an air supply, they traverse heating flues arranged in the dividing walls and beneath the floors of the ovens.—H. B.

Coke and Gas, and Apparatus employed therein; Manufacture of ——. T. S. C. Lowe, Los Angeles. Eng. Pat. 7826, April 3, 1902.

A process of continuously and progressively converting coal into coke, and intermittently recovering gas from the charge, by alternately admitting air into the upper parts of the ovens and connecting flues at successive points (whereby, through the combustion of the air and the evolved gases, the ovens are heated above the body of the coal), and then shutting off the air and passing steam through the ovens above the body of coal (whereby a kind of water-gas is produced from the volatile products from the coal), and recovering the combustible gases produced. During the steaming period, oil may be admitted to the ovens, to produce an illuminating gas; and during the heating period, a small amount of oil or tar may be sprayed over the charge, to protect the latter from any undue proportion of oxygen that may be admitted. The apparatus consists of a train of coking ovens connected by flues, and having at each end a chequer-brickwork superheater, and a generator consisting of a casing, filled loosely with crossed bars of iron, to which air and a water spray (for the generation of steam) may be admitted alternately. Air inlets are provided at successive points in the flues. The direction of the gases is reversed periodically, so as to heat up the superheater and generator at each end. To prevent explosions, the apparatus is freed from combustible gases between the periods by means of a current of steam.—H. B.

Carbon Electrodes and Coke; Manufacture of ——. E. Pohl, Weisswasser, Silesia. Eng. Pat. 14,165, July 11, 1901.

The manufacture of carbon electrodes is combined with the manufacture of coke, the method consisting in charging the chambers of a coke oven of the chambered type (*e.g.*, an Otto-Hoffmann oven) with coal, and with raw or previously burnt electrodes packed in coal dust, so that chambers charged with packed electrodes alternate with chambers charged with coal, or the lower part of the chambers is charged with coal and the upper part with the electrodes packed in coal dust, and heating the chambers to incandescence.—H. B.

Carburetting Apparatus for Explosion Engines. J. Gwynne and H. T. Crewe, London. Eng. Pat. 10,220, May 16, 1901.

A vaporising and mixing device, for use with heavy hydrocarbon oil, comprising a tube within a shell; ribs outside the tube, forming communicating passages in the space between the tube and the shell; a transverse passage through the tube; a series of discs of perforated metal or wire-gauze arranged in the end of the tube; and means for spraying or otherwise supplying oil to the discs; the arrangement being such that air will be drawn by the outward stroke of the engine piston through the heated passages between the ribs, over the discs, round the transverse passage (which may form the flue of a suitable lamp), and into the engine cylinder.—H. B.

Vapour Burners. H. Burkämper, Bielefeld, Prussia. Eng. Pat. 14,654, July 18, 1901.

Liquid fuel passes up a central vertical tube to a pyramidal vaporising chamber. The vapour formed passes down a tube surrounding the first-mentioned vertical tube, and escapes through openings to a channel, the width or section area of which is varied as required by screwing upwards downwards a sleeve carrying the preliminary heating cup. —R. S.

Burning Hydrocarbon Oils; Apparatus for Use in —— F. R. White, Lynn, Mass., U.S.A. Eng. Pat. 19,80 Oct. 4, 1901.

The liquid hydrocarbon is vaporised, and the vapour supe heated or gasified to form a fixed gas. Between t vaporiser and the gasifier there is a resistance mediu impermeable to liquid, and permeable only to vapour und high pressure, whereby only dry vapour can pass to t gasifier. From the gasifier the gas is admitted to one e of a cylindrical chamber, where it mixes with air, t mixture escaping through an elongated throat outlet the end opposite to the gas inlet. Several of these s of devices may be combined, and all connected to a di tributor, which is itself connected to a series of long burn tubes arranged parallel to one another. A series of sho burner tubes is connected with the opposite ends of the lo tubes, the short tubes being arranged in pairs adjacent and on opposite sides of the several vaporisers.—R. S.

Mixing Gas and Air; Machines or Apparatus for —— J. Seymour, Toronto, Canada. Eng. Pat. 2249, Jan. 2 1902.

Air enters a horizontal cylinder within which is a dru rotating in water. This drum has two concentric compar ments. The air enters one end of the outer or annular co partment, and is forced towards the other and closed e by helical blades, forming, with the periphery, helical a measuring chambers. The gas enters the inner compar ment through a tube surrounding the axle, and is deliver above the level of the water, and ultimately enters the a measuring chambers. The gas and air mixture passes fro the other end of the drum to an exhaust tube.—R. S.

Gas-Purifying Apparatus. S. S. and S. B. Chandler, London. Eng. Pat. 11,825, June 10, 1901.

The apparatus, designed as a tar extractor, consists of closed tank, divided by a horizontal partition into upp and lower compartments; and through a number of hol in the partition are passed removable tar-extracting pots screens, each consisting of a pipe, open at the top and the bottom, and having a flange at the top end for su pending it in the hole in the partition. Each pot is provid at the top with a handle, and has numerous lateral perfor tions towards its lower end, which is immersed in the liqu in the lower compartment; the lower ends are preferab surrounded by perforated jackets. The crude gas enteri the upper compartment passes down through the tar-p and bubbles up through the liquor, escaping then throu an outlet from the lower compartment above the liquor. —H. B.

Sulphuretted Hydrogen; The Separation of —— fr Gaseous and other Fluids containing the same, and Desulphurisation of Sulphuretted Hydrogen. H. Hemingway, Walthamstow. Eng. Pat. 12,093, June 1901.

Coal and other gases containing hydrogen sulphide desulphurised by treatment in purifiers with ferr carbonate. Gas liquor is treated, in steam-heated tan with ferrous carbonate, preferably in the form of powde spathic iron ore. It may then be distilled to obt ammonia. The ferrous carbonate employed, is exposed the air and dried, when the sulphide with which it is coa becomes oxidised, with separation of sulphur, and, peel off, exposes a new surface of ferrous carbonate, which be used again. If ferrous sulphite be used instead of carbonate, free sulphur is obtained. See Eng. Pat. 9 1899 (this Journal, 1900, 442).—E. S.

Blast-Furnace Gases; Process of and Apparatus f Cleaning ——. A. Clemang, Luxembourg. Eng. 18,575, Sept. 17, 1901.

The gases enter a vertical or horizontal casing havi a central hollow shaft. Upon the shaft is fixed a he

body, consisting of two helical blades bolted together so as to provide between the blades a narrow helical passage, through which water, entering the hollow shaft, passes to the periphery of the helix, whence it is projected in helicoidal sheets across the casing. To prevent suction by the revolution of the screw, the latter is enclosed in a cylindrical casing provided with spiral apertures corresponding with the periphery of the helix. The sheets of water wash the gases, propelling them as with an Archimedean screw, so that no resistance is offered to the passage of the gas. The apparatus is provided with a mud-collector and an overflow pipe for the water.—H. B.

Coal-Gas; Manufacture of ——. A. H. Godwin, F. A. Keil, and J. Dougall, Margate. Eng. Pat. 4901, Feb. 26, 1902.

HIGHLY superheated steam is injected into the mouthpiece of the retort or ascension pipe to meet the rising gases, for the purpose of increasing the yield of gas, preventing the formation of tar and naphthalene, and preventing the choking of pipes leading into the hydraulic main.—H. B.

Raising and Forcing Liquids [*Gas Liquors, &c.*]: *Apparatus for* ——. T. Wilton, Beckton. Eng. Pat. 5422, March 4, 1902.

THE apparatus, which is designed to avoid exposure of the working parts to the action of the liquids dealt with, comprises a chamber into which the liquid flows, a non-return valve on the inlet pipe, a discharge pipe in the bottom of the chamber, a float within the chamber, actuated by the rise and fall of the liquid and having suitable vertical guides, and a rod, attached to the top of the float, sliding through an opening in the cover-plate of the chamber. As the chamber fills with the liquid, steam being shut off, the float, with its rod, guides, &c., rises until a finger on a cross-head connected with the top of the rod engages a weighted lever and tips it over in one direction, thereby opening the steam slide valve. The steam forces the contents of the chamber out through the discharge-pipe, and the float falls until a chain, connecting a cross-head with the weighted lever, tightens and tips the latter over in the other direction. Thereupon steam is shut off, the exhaust opened, the chamber begins to refill, and the above action is repeated.—H. B.

Acetylene Generators. D. H. Treichler, Niagara Falls, U.S.A. Eng. Pat. 14,763, July 19, 1901.

A WATER-TO-CARBIDE table lamp, working on the drip principle. The water reservoir is arranged vertically above the decomposing vessel, and acts as a displacement holder for the gas. The carbide chamber can be removed for refilling without taking the whole apparatus to pieces. A purifying compartment is arranged inside the water store, and being connected with the generating vessel through a closed pipe, the purifying liquid cannot run back on to the carbide even if the lamp is upset. The safety pipe terminates as an annulus round the burner.—F. H. L.

Acetylene Gas; Apparatus for Generating ——. D. Closfeld, Ronbaix, France. Eng. Pat. 23,543, Nov. 20, 1901.

A MECHANICALLY-FED carbide-to-water generator. The carbide is stored in a large number of small boxes arranged in groups of four (having a common centre) radially round the upper part of the apparatus. The feed is effected by a pin connected with the bell of the gasholder; the latter rotates a portion of a circle on a vertical axis each time it falls, and the pin releases the bottom of each box in succession, allowing the solid to slide down a shoot into the water.—F. H. L.

Acetylene Gas Generators and Portable Lamps. J. de D. Tejada, Cuba. Eng. Pat. 4371, Feb. 20, 1902.

A SELF-CONTAINED table lamp, working on the carbide-to-water principle. The solid is contained in a central hopper closed by a mushroom valve, whilst inside the main casing there is a rising holder. Both casing and holder are fitted with glass inspection doors, so that the time for recharging can be seen, and the operation performed from outside without interfering with the behaviour of the burner.
—F. H. L.

Acetylene Gas Generators; Device for Feeding ——. C. F. Brodin and H. A. Schepeler, Stockholm. Eng. Pat. 6291, March 14, 1902.

REFERS to generators of the carbide-to-water hopper pattern. The mouth of the hopper is closed by a ball larger in diameter than the aperture. The hopper itself is continued downwards as a cylindrical tube terminating obliquely, the mouth of which is closed by a plate carried on a curved lever connected with the gas-holder. Through the centre of this plate passes an adjustable rod, which extends upwards, and is so arranged that when the plate is pressed against the bottom of the tube, the rod lifts the ball, whereby the feeding funnel is opened, whilst, when the plate moves away from the tube, the rod will allow the ball to drop and close the opening of the funnel.—F. H. L.

Lamps; Electrolytic Incandescence ——. J. R. Quain and T. T. Turnbull, London. Eng. Pat. 11,257, June 1, 1901.

ABOVE a filament of the Nernst type is arranged a solenoid having two coils so wound and connected as to be in opposition to each other, the outer coil of high resistance and the inner coil, which is in circuit with the filament, of low resistance. The vertical, soft-iron core of the solenoid is attached at its lower end to a horizontal steel bar having a groove on its under surface adapted to embrace the filament when the core is drawn down. When an alternating or intermittent current is passed, it flows through the outer coil, drawing down the horizontal steel bar, which becomes hot on account of the eddy currents set up. The filament is thus heated so as to conduct the current, whereupon the two coils act in opposition, and the core, with the steel bar attached, is drawn up by means of a spring or weight. The lamp filament has a flexible foundation or support, *e.g.*, of asbestos.—H. B.

Marine Signal [*Life-Buoy*] *Lights.* A. B. Tourle and H. Arzt, London. Eng. Pat. 12,098, June 13, 1901.

AN alloy of phosphorus and sodium is packed in a cylindrical box, having a false bottom composed of sheets of blotting paper interposed between perforated discs of heavy material, such as lead. In the upper part of the box is an air-tight, waterproof box, serving as a float, the space between the float box and the outer box being filled with a filtering material, such as "waterproof wool." This arrangement is covered by a cap with a perforation for the egress of the self-igniting gas evolved when the life-belt, with the arrangement attached, is thrown into the water.
—H. B.

Incandescent Light Mantles: Apparatus for Automatically Incinerating. A. P. Compiu, Paris. Eng. Pat. 13,197, June 28, 1901.

THE apparatus comprises an upper horizontal gas tube having projecting burners for heating the mantles from above; a removable bar provided with wire supports for suspending the mantles over a row of Bunsen burners; and two pistons, caused to move in vertical cylinders by means of water pressure or the like, for imparting an up and down movement to the removable bar and the Bunsen burners respectively.—H. B.

Arc Lamps, and Means for Stopping Heat Radiation in Optical Apparatus; Electric ——. R. C. T. Evans, London. Eng. Pat. 15,045, July 24, 1901.

ONE or both of the carbon electrodes are surrounded, except at their points, with water jackets through which cold water circulates. When the lamp is to be used for optical purposes, the casing is water-jacketted, and the lens is provided with a water screen, the water supply circulating throughout the apparatus.—H. B.

Arc Lamp with Inclined Carbons; A Continuous Burning ——. J. A. Rignon, Berlin, and E. Eisenmann, Paris. Eng. Pat. 6379, March 15, 1902.

An arc lamp with inclined carbons, having an almost air-tight globe surrounding the arc, the oxygen in the globe being consumed when the arc is formed, and the heated gases escaping through a check-valve. A conical iron core is suspended, by a cord, within a solenoid arranged in the upper portion of the lamp: the carbon holders and the carbons are suspended by the ends of the cord, and by the differential gearing of the cord, the carbons are caused to rise when the core is drawn down into the solenoid. A plunger piston, secured to the core within the solenoid, acts as an air-compressing brake to prevent any jerking of the core. In the upper part of the globe, above the points of the carbons, is arranged a horizontal porcelain cap, having a central depending projection, and carrying a glass shade surrounding the carbon points, for preventing undue movements of the arc.—H. B.

Lamps; Incandescence —— Burning Vapour of Liquid Hydrocarbon. L. Denayrouze, Neuilly, France. Eng. Pat. 6974, March 21, 1902. (Under Internat. Conv., Aug. 7, 1901.)

Refers to Eng. Pats. 22,098 of 1899, and 11,665 of 1900 (this Journal, 1900, 428; and 1901, 565). The German-silver wick tubes are surrounded by an annular space, constituting a badly conducting envelope, formed by an outer tube sunk in the lamp reservoir, the annular space being closed at the bottom. The rods for supporting the mantle, and additional heat-conducting rods, are attached to the tops of the German-silver wick tubes, and are surrounded by a casing to protect them from cold. For starting the vaporisation an insulated wick is so arranged that its flame strikes and heats a deflecting plate and the wall of the vaporising chambers at the top of the wick tubes.—H. B.

Lamps; Incandescence Vapour ——. L. Liais, Paris. Eng. Pat. 7034, March 22, 1902.

Over the wick tubes of the lamp there is fitted closely a bell-shaped cap made of sheet copper, the lower edge of which is turned up to form an external annular gutter to hold the spirit used in the preliminary heating of the lamp. The top of the cap is perforated all over, and it carries a central vertical rod to support the mantle. Air reaches the interior of the cap by a passage through the lamp reservoir, and the combustible vapour distilled from the wick, mingling with the air, burns at the top of the cap beneath the mantle. The heat transmitted by the cap maintains the vapour production after the preliminary heating has ceased.—H. B.

Mantle Material for Incandescent Gas Lighting; Machine for Saturating ——. O. Wiederhold, Bloomfield, N.J., and G. E. Morse, New York. Eng. Pat. 7271, March 25, 1902.

The woven fabric is impregnated in the piece before it is cut into lengths. The tubular fabric is led from a roller successively through a vessel containing the impregnating solution, between squeezing and guiding rollers, up one compartment of a box, through which a current of hot air is conducted, down an adjoining compartment, and then wound upon a roller.

Lamps; Luminous-Gas Electric ——. W. Fairburn-Hart, Leeds. From The General Electric Co., Schenectady, U.S.A. Eng. Pat. 8717, April 15, 1902.

Relates to mercury-vapour arc lamps, having means for starting and steadying the arc. A long, highly exhausted tube is provided at its upper end with the anode terminal, and at its lower end, which contains some mercury, with the cathode. Near its lower end is a branch tube likewise containing mercury, connected so as to form a supplemental anode. When the current is switched on, the lamp is shaken slightly to cause a momentary flow of mercury from one tube to the other: the circuit thus established is at once broken by the receding of the mercury, whereupon an arc is formed between the two bodies of mercury. This arc produces "ionised" mercury vapour, which rises to the main anode at the top of the tube and sets the lamp in operation. Means are described whereby the auxiliary arc may be started automatically by switching on the current instead of shaking the lamp.—H. B.

United States Patents.

Combustion; Fluid for Promoting ——. T. Battistini, Genoa. U.S. Pat. 700,888, May 27, 1902.

An aqueous solution of one part of sodium nitrate and two parts of sodium carbonate, which is to be sprinkled over the fuel.—H. B.

Charcoal; Apparatus for Manufacturing ——. C. J. T. Burcey, Syracuse, N.Y. U.S. Pat. 701,145, May 27, 1902.

The charcoal is obtained by the dry distillation of wood in dome-shaped chambers, which are alternately filled with the wood to be treated, the charring in one being completed at the time the treatment of the wood in the other compartment is commenced. The products of combustion from a furnace are led through passages constructed so as to transmit sufficient heat to the wood to liberate the volatile constituents and to form charcoal. The products of combustion then escape to the atmosphere. Openings are provided in the chambers to enable frequent tests to be made. By closing certain of the passages, the heat can be cut off from any part of the chamber, or concentrated on any part. The escaping gases and vapours from the chambers pass to a condenser. The excess steam at first produced is allowed to escape through branch exits. The uncondensable gaseous products may be led into the furnaces and there burned, or passed back to the chamber. The latter is done near the end of the charring process to cool the charcoal and to prevent any combustion thereof. Gauze diaphragms are used in the exit conduits to prevent the passage of the fire from the furnaces to the gases in the condenser.—R. S.

Coke; Apparatus for the Manufacture of ——. P. Nae New York, N.Y. U.S. Pat. 701,219, May 27, 1902.

The coking apparatus consists of a shaft provided at its lower end with a coke outlet, and having inlets for gaseous fuel, inlets for steam at a lower level than the gaseous fuel inlets, and inlets for water at a still lower level. All the inlets are above the coke outlet. The gases escape through an outlet at the top. In the coking apparatus, there is a part for coking fine coal, and a part for treating the coke with steam. Devices are provided for crushing the matte coke as it leaves the apparatus. Two shafts may be combined, so that hot gases from the first may be passed into the second, whilst sprays may be used for introducing liquids into the hot gas.—R. S.

Briquette, and Method or Process of Producing same. E. Meade, Philadelphia. U.S. Pat. 701,365, June 3, 1902.

A process of weather-proofing and strengthening briquettes made of coal, coke, or the like, in which molasses is the binding agent, consisting in subjecting the briquettes for a very brief period (about a minute) to a temperature (900° to 1,500° F.) considerably above that necessary to coke the molasses.—H. B.

Carburetter. E. R. Inman, Tipton, Ind. U.S. Pat. 700,77 May 27, 1902.

Oil, preferably crude petroleum, is vaporised by heat from the exhaust gases of the engine driven by the vapour produced, and is mixed with air. The oil is led to an enclosed circular chamber, having an upstanding annular rim some little way inwards from the edge, and leading to a central depression shaped as an inverted cone. The oil overflows this rim or dam, and trickles down the interior surface of the cone. The cone is enclosed within a casing, to which the exhaust gases are admitted through an opening immediately beneath the point of the cone. The exhaust gases escape through an annular opening between the top edge of the casing and the level base of the oil chamber outside the

dam. The oil chamber is provided with an air inlet, and with an outlet for the escape of the mixture of air and vapour.—R. S.

Burner; Hydrocarbon ——. J. F. Hardy, Monticello, Ind. U.S. Pat. 700,914, May 27, 1902.

The hydrocarbon is vaporised, and the vapour superheated, mixed with air, and ignited. The oil is supplied to the bottom of a short vertical tube placed immediately beneath the burner, whereby the tube becomes highly heated and the oil mostly vaporised. The vapour descends a surrounding tube to near the bottom of the first-mentioned tube, and then passes by a connecting passage to the base of another vertical tube, similar to and parallel with the first tube. Near the top of this tube it becomes superheated, and then passes downwards, through a tube surrounding the last one, to the injector tube, where it meets the air current. The mixture of gas and air ascends to a mixing chamber, and thence passes through a gauze diaphragm, above which it is ignited. The preliminary heating is performed by means of a cup heated below the injector tube, and provided with a wick comprising a wire covered with an absorbent material and coiled in a spiral form.—R. S.

Burner; Hydrocarbon ——. G. R. Elliott, Boston, Mass. U.S. Pat. 701,026, May 27, 1902.

Arrangement to prevent hydrocarbon burners of the Bunsen type from burning down.—R. S.

Burner; Oil ——. E. W. Dunn, San José, Cal. U.S. Pat. 701,177, May 27, 1902.

Oil is passed up through vertical tubes, the tops of which are covered with hoods. It is then distributed from the tops of the tubes to a horizontal plate, having a large number of conical holes passing through it, each hole being surrounded by a rim to prevent the oil passing downwards. Beneath the burner plate is a chamber into which a pipe enters for the admission of air for combustion, or for conveying away any unconsumed oil. Within this chamber is a horizontal distributing tube, receiving either a supply of natural gas direct from the source of supply or a supply of vapour from a coil arranged above the burner plate. The gas or vapour escapes from the distributing pipe partly through perforations in its upper surface, and partly through short pipes extending upwards therefrom, and passing through the holes in the burner plate.—R. S.

Water-Gas; Process of Making ——. E. Fleischer, Dresden-Strehlen. U.S. Pat. 701,556, June 3, 1902.

"More than usually concentrated producer-gas, termed "three-quarter water-gas," and containing not more than 3 per cent. of nitrogen, as compared with the 50 per cent. of Dowson gas and the 40 per cent. of nitrogen in Dellwik gas, is made by the use of two separate blasts of air in succession; the first being so arranged as to yield chiefly CO_2, whilst the second, which is passed through the fuel at a lower level, and in quantity not exceeding one-half that of the former amount, gives mainly CO. The process is applicable to ordinary coal or bituminous fuel, as well as to coke or anthracite. It is convenient to employ two producers, A and B, connected together at their tops, and charged with fuel to a depth of less than six feet. A strong blast of air is run through A, so as to evolve CO_2, which is either run to waste or used for the superheating of steam, &c. The current is then stopped, a layer of fresh coal introduced, and a secondary air blast is set up by blowing upwards through B and downwards through A; the pressure being the same as before, but the speed only one-eighth of that characteristic of the primary blast. At the end of this blow, hot steam, preferably superheated, is forced in the same direction, up through B and down through A. When water-gas ceases to be given off, the cycle of operations is finished as regards A, and the whole process is repeated, passing the primary blast through B.

According to Fisher the calorific value of Dowson gas is 1360 cals. per cb. m.; that of the three-quarter water-gas is stated to be more than 3,000 cals. per cb. m.—F. H. L.

Calcium Carbide; Manufacture of ——. D. de Vulitch and J. D'Orlowsky, Paris. U.S. Pat. 701,650, June 3, 1902.

The process claimed is similar to that described in Eng. Pat. 21,214, 1900 (this Journal, 1901, 1198). The present claim, however, is for fusing lime alone in the electric furnace.—F. H. L.

Acetylene Gas Generator. J. Quist and J. A. Bain, Cleveland, Ohio. U.S. Pat. 700,819, May 27, 1902.

An automatic water-to-carbide generator on the drip principle. The water supply is governed by the movements of a half-turn cock which is actuated by a rod set in motion periodically by the falling holder bell.—F. H. L.

Acetylene Gas Generator. A. C. Einstein, St. Louis, Miss. U.S. Pat. 700,908, May 27, 1902.

An automatic carbide-to-water generator of the hopper type, in which the feed is effected by the movements of a flexible diaphragm set in motion by variations in pressure in the generating chamber. From the latter the gas enters a rising holder through a capped pipe, the cap of which acts as a water-seal. When the bell falls, a lever lifts this cap a short distance, diminishing the depth of the seal; this causes the gas pressure in the apparatus to fall slightly, moves the flexible diaphragm, and so introduces a fresh batch of carbide into the water.—F. H. L.

Acetylene Gas Generator. J. W. Weeks, Providence, Rhode Island. U.S. Pat. 701,433, June 3, 1902.

An automatic carbide-to-water generator of the hopper pattern. Each time the holder bell falls it causes a toothed wheel, placed at the opening of the hopper, to perform a partial revolution, and this wheel is connected with a drum running on a horizontal axis provided with a number of pins arranged radially but somewhat eccentrically to the main spindle. Those pins which stand pointing upwards project a little into the mouth of the hopper, and so in their movement rake some carbide forward; afterwards they retire into the body of the drum till they approach the top of their path once more. The generating vessel and the holder are placed side by side, the feed mechanism being enclosed in a narrow tank filled with water.—F. H. L.

Acetylene Gas Generator. J. A. Mosher, Chicago. U.S. Pat. 701,598, June 3, 1902.

This is a generator of the automatic water-to-carbide, flooded-compartment type, in which the water-inlet and the gas-outlet pipes are controlled by a common cock. Between the generating chamber and this cock there is placed an inverted U-shaped pipe finally leading into the water reservoir, so that, should acetylene still continue to be evolved when the cock is closed, it can nevertheless find an exit which is not so wasteful as the usual safety valve, by driving the water back into the reservoir, and itself escaping into the said reservoir if the pressure increases to the requisite amount.—F. H. L.

Incandescent Gas Burner. J. B. Taylor, Buffalo, N.Y. U.S. Pat. 700,857, May 27, 1902.

A Bunsen burner to consume little gas and much air, and yet not to burn down. It is to be used with mantles like those of Welsbach.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum; Influence of the Water present on the Flash-Point and Combustion-Point of ——. J. Matuschek. Oesterr. Chem.-Zeit., 4, 209. Chem. News, 1902, 85, [2219], 267.

The author has found that the proportion of water present in a petroleum contaminated with bituminous products of distillation, has an influence on the flash-point and combustion-point of the petroleum, these increasing with the amount of water present. A sample of petroleum examined

by the author contained water and sulphurised bituminous products; it had the sp. gr. 0·930 at 15° C., whilst the flash-point and combustion-point, reduced to "760 mm. and 15° C.," were respectively 21° and 23° C. 50 c.c. of this petroleum were shaken up with 0·1 c.c. of distilled water until the mixture was homogeneous, and the flash-point and combustion-point again determined. The former was 22°—24° and the latter 25° C. Another 50 c.c. of the petroleum were then treated with 0·2 c.c. of water in the same manner; the flash-point and combustion-point were now found to be 27° C. and 29° C. respectively. With the addition of 0·3 c.c., the figures were 28° and 33·5°; with 0·4 c.c., 30° and 34·5°; 0·5 c.c., 27° and 29°; 0·6, c.c., 28° and 30°; and with 0·7 c.c. of water, 30° and 32° C. The regular rise of the flash-point and combustion-point is only maintained up to a certain point, the regularity ceasing as soon as small drops of water commence to form in the mixture during the experiment.—A. S.

Lubricating [Petroleum] Oil; Manufacture of ——, in Baku. A. Ragosine. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [6], 128—130.

Most of the factories obtain considerably less than the maximum amount of lubricating oils from their residues. Thus, *e.g.*, in 1887—1889 one factory obtained about 40 per cent. of engine oil, whilst another neighbouring factory produced only half that proportion. There is only a limited market for solar, spindle, and cylinder oils.

The residues from the distillation are not of equal value for the manufacture of lubricating oils; the residues from Balachany-Sabuntschy crude oil vary greatly in their fitness for the purpose. At the present time the different crude oils are mixed and pumped over together, so that it is practically impossible to determine the value of the residue in buying a crude oil.

The types of lubricating oils first fixed by V. Ragosine (solar, spindle, engine, &c.) are still recognised as possessing definite characteristics, the only difference being that there is now a demand for light-coloured oils. This first arose from the production of paler oils for the purpose of attracting customers, but by degrees the absence of colour has come to be regarded as a sign of purity. In the author's opinion the improvement of the colour of machine oil at the expense of the output was a mistaken policy.

Several large factories have their own oil-fields, and do a large export trade in the residues, with which they are able to mix more or less solar oil and *goudron* at will, by regulating the distillations accordingly. The smaller factories, however, are in a very different position. They must buy their crude oil from month to month, and often have to deal with inferior residues, whilst they are unable to utilise their *goudron* as residue, since they are forced to obtain as large a yield as possible of lubricating oil.

—C. A. M.

Thiophen; New Colour Reaction for ——. H. Kreis.

See under XXIII., *page* 930.

IV.—COLOURING MATTERS AND DYESTUFFS.

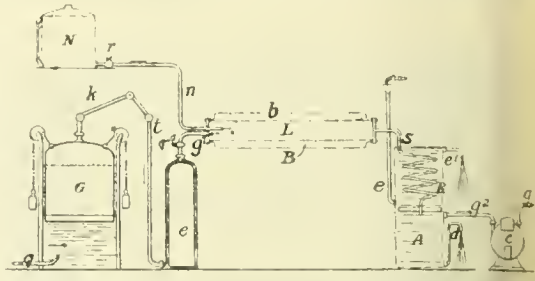
Aniline; New Method of Manufacture of ——. Rev. Gén. des Mat. Col., 1902, **6**, [66], 119.

Further details are given of the method described in Fr. Pat. 312,615 (this Journal, 1902, 169), which consists in passing nitrobenzene vapour and water-gas over finely-divided copper heated to 300° C., when the following reactions take place:—

$$C_6H_5NO_2 + 3H_2 = C_6H_5NH_2 + 2H_2O;$$
$$C_6H_5NO_2 + 2CO + H_2 = C_6H_5NH_2 + 2CO_2.$$

The yield is said to be theoretical, and the aniline obtained remains colourless on exposure to light, showing the absence of thiophene.

In the accompanying diagram, N is a reservoir of nitrobenzene provided with a regulating valve and pipe communicating with the horizontal pipe L, containing reduced copper and heated by means of an air-, oil-, o sand-bath B to the requisite temperature. A pipe *g'*, pro vided with a valve *r'* conducting water-gas (which enter by *g*) from the gasometer G, after passing through th purifier *e* to remove more especially sulphuretted hydrogen



also enters the tube L at the same end, whilst at the exi end the gases are led through a condensing worm, th aniline and water collecting in A, the former running ol by the pipe *d*. The gases then pass by the pipe g^2 through the meter *c*, which enables the rate of flow to be controlled and, since they contain carbonic oxide and hydrogen, they may ultimately be utilised for heating the plant.—T. A. L.

English Patents.

Amines from Nitrogenated Aromatic Bodies; Improvements in the Production of ——. G. W. Johnson, Lon don. From C. F. Boehringer and Soehne, Waldhof Mannheim. Eng. Pat. 15,927, Aug. 7, 1901.

See Fr. Pat. 313,599; this Journal, 1902, 169.—T. A. L.

Blue Cotton Dyestuffs [Azo Dyestuffs]; Manufacture ——. R. B. Ransford, Upper Norwood. From I Cassella and Co., Frankfort-on-the-Maine. Eng. Pa 14,735, July 19, 1901.

See Fr. Pat. 312,388; this Journal, 1902, 42.—T. A. L.

Anthracene Series [Anthracene Dyestuffs]; Manufactur or Production of New Derivatives of ——. H. E. New ton, London. From The Farbenfabr. vorm. F. Baye and Co., Elberfeld. Eng. Pat. 15,682, Aug. 2, 1901.

See Fr. Pat. 313,124; this Journal, 1902, 112.—T. A. L.

Colouring Matters [Anthracene Dyestuffs] of the Anthra cene Series, and the Employment of Colouring Matte of the Anthracene Series in Dyeing; Improvements the Manufacture and Production of ——. J. Y. John son, London. From The Badische Anilin und Soc Fabrik, Ludwigshafen. Eng. Pat. 24,354, Nov. 29, 190

According to Eng. Pat. 3239 of 1901 (this Journal, 190 249) a blue anthracene dyestuff is obtained by fusi β-amino-anthraquinone, or certain of its derivatives, wi caustic alkali, at a temperature not exceeding 300° C., ar subsequently dissolving the melt in water in presence air. The patentees now find that if the melt be carried a higher temperature (350° C.) the hydro compound of different dyestuff is formed. The melt dissolves to a bl solution in water, and, on exposure to air, deposits yellowish-brown crystalline product. In the blue hyd form into which it can be converted by the action of redu ing agents (sodium hydrosulphite, caustic alkali and zi dust, sodium sulphide, &c.), it dyes cotton blue shad which, on exposure to air, turn yellow, very fast to lig and washing. The yellow dyestuff can be obtain directly by adding certain oxidising agents, such as pota sium nitrate, to the melt, when a lower temperature (270° can be employed. Moreover, the blue dyestuff of Eng. P 3239 of 1901, and the yellow dyestuff of the present speci cation, can be obtained by oxidising β-amino-anthraquino in acid solution. Thus a mixture of lead peroxide a acetic acid give the blue, and nitric acid with mangane peroxide give the yellow dyestuff, whilst chromic acid manganese peroxide and sulphuric acid give a mixture the two, which dyes cotton green shades from a vat.

—T. A. L

)yestuffs [Acridine Dyestuffs] of the Acridine Group; Manufacture of New ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-the-Maine. Eng. Pat. 15,064, July 22, 1901.

EE Fr. Pat. 312,771; this Journal, 1902, 112.—T. A. L.

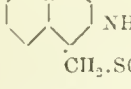
French Patents.

Blue Dyestuff [Anthracene Dyestuffs] of the Anthracene Series; Manufacture of a ——. Badische Anilin und Soda Fabrik. Fr. Pat. 309,503, Dec. 6, 1901. Supplement.

HE dyestuff formed according to the chief patent (this Journal, 1902, 42) is a mixture of two blue dyestuffs, A and B, which can be separated by the difference in solubility of the sodium salts of their hydro compounds obtained by heating them in an alkaline solution with hydrosulphites, the former giving the less soluble salt. It is found that a preponderating proportion of A can be obtained if the fusion of β-aminoanthraquinone with caustic alkalis be carried out in presence of oxidising agents (potassium nitrate or air), whilst B predominates if the fusion be effected at a low temperature, and in presence of a reducing agent (alcoholic caustic soda). See also Eng. Pat. 24,354 of 1901 above.—T. A. L.

Disazo Dyestuff [Azo Dyestuffs] for the Production of Lakes; Manufacture of a New ——. Badische Anilin und Soda Fabrik. Fr. Pat. 316,597, Dec. 5, 1901.

2.1-hydroxynaphthylmethane sulphonic acid obtained by the simultaneous or successive action of neutral sulphites and formaldehyde on β-naphthol be treated according to Fr. Pat. 297,464 with sulphites and ammonia, either simultaneously or successively, its hydroxyl is replaced by hydrogen, the compound—



being formed. The aminonaphthylmethane sulphonic acid thus produced can be employed for the manufacture of various dyestuffs. It can be diazotised and combined with various components, or the diazo compound may be converted into the hydrazine. The product resulting from the combination with β-naphthol is a red azo dyestuff, of which the alkaline salts are almost insoluble in cold water, and only slightly in hot, whilst the calcium, barium, aluminium, and lead salts are still less soluble. Owing to its slight solubility, its bluish-red shade, its resistance to acids and to light, this dyestuff is of great interest for the manufacture of lakes.—T. A. L.

Black Substantive Dyestuffs [Sulphide Dyestuffs]; Manufacture of New ——. Levinstein, Ltd. Fr. Pat. 316,576, Dec. 5, 1901.

MIXTURES of dinitrophenol and hydroxyazo compounds, or of picric or pieramic acid with hydroxyazo compounds, are heated with sulphur and an alkaline sulphide in an open or closed vessel, with or without the addition of a heavy metal such as zinc or a salt thereof, at the boiling or at a higher temperature. The dyestuffs obtained give reddish- or greenish-black, violet, blue, or olive green shades on cotton. —T. A. L.

Dyestuffs [Triphenylmethane Dyestuffs] of the Triphenylmethane Series; Manufacture of New ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 316,836, Dec. 12, 1901.

ACCORDING to Fr. Pats. 198,415 and 252,148, triphenylmethane dyestuffs are obtained by condensing a suitable tertiary aromatic amine with diphenyl-*p*-aminobenzaldehyde in presence of sulphuric acid and subsequently oxidising the leuco bases formed. If the aldehyde referred to be replaced by *p*-dialkylamino-*o*-tolualdehyde, valuable blue dyestuffs fast to light are obtained. Such an example is the product obtained by condensing diethylamino-*o*-tolualdehyde with ethylbenzylaniline sulphonic acid. Leuco bases which are subsequently transformed into dyestuffs are also obtained by condensing alkylbenzyl aniline sulphonic acids, or dibenzylaniline sulphonic acid with the tetra-alkyldiaminoditolylcarbinols obtained from dialkyl-*m*-toluidines and formaldehyde.—T. A. L.

Yellow to Orange-Yellow Dyestuffs [Acridine Dyestuffs] of the Acridine Series; Manufacture of ——. Compagnie Parisienne de Couleurs d'Aniline. Fr. Pat. 316,721, Dec. 9, 1901.

WHEN tetra-aminoditolylmethane is heated with chloracetic acid under pressure at about 140° C., in presence of an excess of a mineral acid, it yields a mixture of yellow and orange-yellow dyestuffs of the acridine series. The products may be separated by means of ammonia, the former being more soluble than the latter. A similar mixture is obtained by heating Acridine Yellow at about 150° C. with chloracetic acid and water.—T. A. L.

Green to Blackish-Green [Azo Dyestuffs] Fast Dyestuffs for Wool; Manufacture of ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 316,866, Dec. 13, 1901.

THE diazo compounds of *o*-aminophenol, 2.3-aminonaphthol, and their nitro, chloro, sulphonic, and carboxylic acid derivatives, are combined with 1.1'.4-diaminonaphthalene sulphonic acid. The shades resulting from these combinations vary from Bordeaux to violet, but are, however, unstable. By treatment with bichromate, green to blackish-green shades, fast to washing, fulling, and light, are obtained. The dyestuffs, on treatment with nitrous acid, are converted into azimino compounds by the reaction of the peri amino groups. The dyeing properties are not much altered thereby. The products dye more evenly, but duller shades, whilst the fastness to fulling and light is slightly increased.—T. A. L.

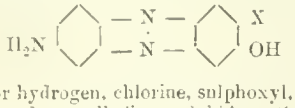
United States Patents.

Red Dye [Triphenylmethane Dyestuffs], and Process of Making same. J. Ville, Montpellier, France. U.S. Pat. 701,427, June 3, 1902.

DIALKYL-*m*-AMINOPHENOL and chloral are treated in acetic acid solution with an oxidising agent. The product dyes wool or silk red from a bath containing a small quantity of acetic acid. See Fr. Pat. 308,968; this Journal, 1902, 39. —T. A. L.

Brown-Violet Sulphur Dye [Sulphide Dyestuffs], and Process of Making same. A. Weinberg, Frankfort. Assignor to L. Cassella and Co., Frankfort-on-the-Maine. U.S. Pat. 701,435, June 3, 1902.

DYESTUFFS fast to washing, alkalis, acids, and light, giving brownish-violet shades on unmordanted cotton from a bath containing alkaline sulphides, are obtained by heating hydroxyaminophenazine—



(X standing for hydrogen, chlorine, sulphoxyl, or carboxyl) with sulphur and an alkaline sulphide. See Eng. Pat. 14,836 of 1900; this Journal, 1901, 889.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mordanting Wool with Alumina: Use of Lactic Acid in ——. F. Düring. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [5], 3.

ALUMINIUM tartrate and oxalate may be replaced with advantage, in mordanting wool, by a mixture of aluminium sulphate (5 per cent. of the weight of the wool) and lactic acid (5 per cent.). The red colour obtained by dyeing with Alizarin, a wool which has been mordanted with this mixture, is brighter than when the dyeing is effected after

mordanting with the first-mentioned compounds. By the use of the mixture, mordanting and dyeing can be accomplished simultaneously.—E. B.

Resist under Indanthrene Blue [Calico Printing]. A. Tigerstedt. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [5], 4.

A *white resist* under Indanthrene Blue is obtained with ammonium nitrate.—E. B.

Discharge for Tannic Acid Mordants; Indanthrene Blue ——. A. Tigerstedt. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [5], 4.

The tissue mordanted with tannic acid is printed with a mixture of 25 grms. of Indanthrene, 115 grms. of caustic soda-lye thickened with British gum and dextrin, 100 grms. of caustic soda-lye at 48° Baumé, and 10 grms. of ice. After being steamed for 2½—4 minutes, it is washed, and dyed with a mixture of Safranine, Auramine, and Methylene Green, a blue pattern on a bronze ground being thus obtained.
—E. B.

Indigo on Vat-dyed Fibres; Determination of ——. A. Binz and F. Rung.

See under XXIII., *page* 930.

English Patents.

Dyeing, &c. Fibrous Materials, Skins, Feathers, &c.; Apparatus for ——. J. C. Hamer, Radcliffe. Eng. Pat. 8156, April 20, 1901.

A perforated or slotted circular wall, forming an annular space into which the materials to be dyed are placed, is arranged in the cage of a centrifugal dyeing machine such as that described in Eng. Pat. 8440 of 1899 (this Journal, 1900, 347).—E. B.

Printing Fabrics; Process and Apparatus for ——. C. Chippier, Lyons, France. Eng. Pat. 11,236, May 31, 1901. (Date claimed under Internat. Conv., Dec. 19, 1900.)

Impressions which have the appearance of being in relief, and which, in the case of open-woven tissues, fill the interstices between the threads, are obtained by the following process:—A design, engraved upon metal, is coated with varnish or paint, *e.g.*, zinc oxide ground with linseed oil. After the excess of the latter has been removed, the design is transferred, first, to a moistened sheet of paper, and then from this to the fabric to be printed. In printing openwork fabrics, such as gauze, a waxed tissue, surmounted by a moist linen tissue and a sheet of paper, is placed under the fabric, which is covered, in the order stated, with the paper bearing the design to be transferred, a moist linen tissue and a waxed tissue, all the seven layers being pressed together to produce the impression. This may be done by means of a two-roller press, operated by hand, or by means of an apparatus specially devised for the continuous performance of the necessary operations.
—E. B.

Cotton Fabrics; Coating —— with Celluloid, &c. A. J. E. Hill, Twickenham. Eng. Pat. 8076, April 19, 1901.

To give mercerised cotton yarns and tissues the plasticity necessary to enable them to receive and retain, like silk fabrics, forms impressed upon them in the operation of crimping, they are treated with a solution of cellulose in zinc chloride and calcium chloride, and passed through alcohol and water to precipitate the cellulose and remove the solvents; or they are coated with casein applied in sodium carbonate solution, or with other suitable proteïd substance, such as "raw silk," albumin, &c.; or, again, a solution of lac, or one of gelatin containing a small proportion of an insoluble formaldehyde compound, decomposable under the influence of the heat of the crimping rollers into formaldehyde, which will then act upon the gelatin, or a mixture of a suitable gum (*e.g.*, gum mastic) and celluloid dissolved in acetone may be employed f the purpose.—E. B.

Canvas, Paper, Wickerware, and Fibrous and Text Materials; Waterproofing and Preserving —— fr Decay and Attacks of Insects. F. M. Wharto Worcester. Eng. Pat. 15,829, Aug. 6, 1901.

The materials are treated with a solution of an organ salt of a metal, such, *e.g.*, as resinate of copper dissolved petroleum ether, naphtha, &c., but the claim includes al the use of oleates, palmitates, and stearates of copper, chr mium, lead, zinc, calcium, aluminium, iron, manganese, a barium, and of any resinoid substance other than colophon it comprehends also a variety of organic solvents. T copper resinate solution may be produced either by pr cipitating cupric hydroxide or carbonate and shaking t wet precipitate with a petroleum ether, &c. solution colophony, or by double decomposition.—M. J. S.

Metals upon Lace and similar Materials; Process a Apparatus for Depositing ——. J. A. Daly, Washin ton, D.C., U.S.A. Eng. Pat. 5348, March 4, 1902.

Lace is coated with an acid-resisting varnish, *e.g.*, collodio and, while this is in a moist state, is covered with finel divided metal, *e.g.*, powdered bronze; or these two oper tions are combined, a powdered metal being admixed wi the varnish, and the two thus applied together. The exce of the varnish is afterwards removed by means of a blowe the meshes of the lace being left open, but the threa coated with a layer of metal and stiffened by the varnish.

According to another method, the lace is stretched in frame and brushed over with varnish, or with a solution shellac. Silver sulphide is then precipitated upon it, treating it successively with solutions of silver nitrate a potassium sulphide.

The lace prepared by either of the above methods next attached to a wire cage, a coil of copper wire wrapp round it, and the whole immersed in an electro-plating ba A layer of metal, *e.g.*, copper, is then electro-deposited up it. After this has been rendered compact by brushi or rolling, the lace is again immersed in the bath a covered with a deposit of gold, silver, or other me Gold is to be used when it is desired to retain the flexibil of the lace, as other metals impart stiffness to it.—E. B.

United States Patents.

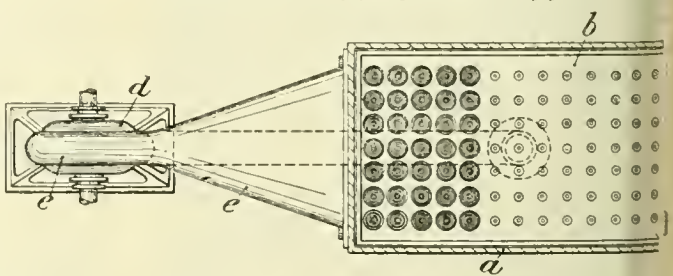
Dyeing, &c.; Apparatus for ——. P. Schirp. U.S. 700,832, May 27, 1902.

See Fr. Pat. 314,274, 1901; this Journal, 1902, 406.
—G. T. M

United States Patent.

Dyeing Yarn; Apparatus for ——. C Wolf, Schwei burg-on-the-Pleisse, Germany. U.S. Pat. 701,4 June 3, 1902.

A polygonal dye vat, fitted with a false bottom *b*, which are fitted vertical perforated seats for cops, is c nected with a rotary pump *d*, the inlet pipe *e* of whic



enlarged horizontally into a fan-shaped terminal *e'*, e in width to the vat, and situated immediately above perforated diaphragm, the exhaust port being pl centrally in the bottom of the bath. This arrange diminishes the velocity of the entrant liquid, and eas the uniform dyeing of the cops.—G. T. M

VII.—ACIDS, ALKALIS, AND SALTS.

ersulphuric Acids. H. E. Armstrong and T. M. Lowry. Proc. Roy. Soc., 1902, **70**, [460], 94—99.

ON BAEYER and Villiger (this Journal, 1901, 578) found that ie ratio of sulphur to active oxygen in Caro's acid was $O_3 : O = 1 : 1$, and they assigned to the acid the formula $H_2S_2O_5 = H_2O_2.S_2O_3$. Lowry and West (this Journal, 1900, 71) found that the chief product of the reaction of ydrogen peroxide upon sulphuric acid is pertetrasulphuric id, $H_2S_4O_{11} = H_2O_2.4SO_3$, and they considered that Caro's reparation consists of this acid, and that the salts pre-red by Marshall (this Journal, 1891, 1004) are derived om perdisulphuric acid, $H_2S_2O_8 = H_2O_2.2SO_3$. The authors ow find that if a carefully neutralised solution of Caro's id be heated until all oxidising power is lost, then the tio of the increase in acidity to active oxygen lost is $O_3 : O = 1 : 2$. This result points to the formula $H_2S_2O_9$ r Caro's acid—

$$CaS_2O_9 + H_2O = CaSO_4 + H_2SO_4 + O_2.$$

From these and other considerations the authors con-ude that at least three persulphuric acids exist, *viz.*, rtetrasulphuric acid, $\begin{matrix}HO.SO_2.O.SO_2.O\\HO.SO_2.O.SO_2.O\end{matrix}$; perdisulphuric id, $\begin{matrix}HO.SO_2.O\\HO.SO_2.O\end{matrix}$; and peranhydrosulphuric acid (Caro's id), $\left.\begin{matrix}HO.O.SO_2\\HO.O.SO_2\end{matrix}\right\}O$.—A. S.

eaching Powder; Composition of ——. W. von iesenholt. J. prakt. Chem., 1902, **65**, [11], 512—527.

IE author first examined the action of a concentrated ution of sodium chloride on a mixture of hypochlorous d and water; in order to avoid the formation of orate, the evolved chlorine was removed from the sphere action by carbon tetrachloride. Both the extract and residue were then analysed. It was found that the sum the chlorine extracted by the carbon tetrachloride and t remaining in the residue as hypochlorous acid was con-erably in excess of the amount originally present as ochlorous acid, showing that a part of the evolved orine was due to the decomposition of sodium chloride.

Examining commercial bleaching powder in the light of is result, experiments were made to prove the presence calcium hypochlorite. To this end the action of absolute ohol on hypochlorites, to form the ethyl ester of hypo-orous acid, was made use of. Bleaching powder was several es extracted with a 5 per cent. solution of ethyl alcohol in oroform, and the residue analysed. The results showed t the chlorine existing as chloride and chlorate remained stant in amount, the evolved chlorine being due to the omposition of calcium hypochlorite. In this reaction presence of water was found to have a considerable ct. Using perfectly dry materials, no evolution of orine was observed.

o prove the reversibility of the reaction of chlorine on e expressed by the equation—

$$2Ca(OH)_2 + 2Cl_2 \rightleftarrows Ca(OCl)_2 + CaCl_2 + 2H_2O,$$

reby chlorine would be evolved in equal amounts from calcium chloride and the calcium hypochlorite, the wing experiments were made:—A weighed quantity of aching powder was heated with carbon tetrachloride in a ent of air free from carbon dioxide, and the evolved orine absorbed by a solution of potassium iodide. The on tetrachloride withdraws the evolved chlorine from sphere of action, thus preventing a reversed reaction. lyses of the residue and estimations of evolved chlorine ved that whereas the quantity of chlorate in the residue ained constant, both the chlorine as chloride and as ochlorite diminished, the evolved, or active chlorine, g evidently derived both from the calcium chloride and um hypochlorite.

y grinding bleaching powder with calcium chloride, cially in the presence of moisture, an evolution of chlorine was observed, and it was found possible to prepare a mixture of calcium hypochlorite and calcium chloride having the same composition as and resembling commercial bleaching powder in its properties. The hypochlorite for this purpose was prepared by passing chlorine monoxide over dry calcium hydrate, and also by the action of a solution of chlorine monoxide in carbon tetrachloride on calcium hydrate. Both products were ground with calcium chloride, and moistened. The mixtures were then heated to 70° C. in a current of pure carbon dioxide. The results of complete analyses before and after the experiments showed that the evolved chlorine was several per cent in excess of the chlorine present as hypochlorite, and that the decomposition of the artificial mixture takes place in the same way as in the case of ordinary bleaching powder according to the equation—

$$Ca(OCl)_2 + CaCl_2 + 2CO_2 + nH_2O = 2CaCO_3 + 2Cl_2 + nH_2O.$$

—B. F. D.

English Patents.

Alkaline Chloride Solutions; Method of and Apparatus for the Electrolysis of ——. [*Mercury Cathodes.*] P. La Cour, Vejen, and J. J. Rink, Elsinore, Denmark. Eng. Pat. 5718, March 7, 1902.

THE electrolysis is carried out with the use of mercury cathodes, the working current being divided into a number of circuits which are greatly restricted in the direction of movement of the mercury, conveyed as an endless stream over the bottoms of a series of cells consisting alternately of leaching-cells, and narrow anode or chloride cells. The electrolyser comprises a series of narrow cells supplied with anodes, and between these are wider leaching-cells the partition walls of which dip down into the layer of mercury on the common bottoms, the last cell of the series being connected with the first one through a conduit with a suitable pumping or lifting device. The anode portion, closed in itself, intersects in a comb-like manner the leaching portion, which can be closed by a cover placed over the whole electrolyser.—G. H. R.

Crystallisation or Deposition of Substances therein; Treatment of Liquids for the ——. E. G. Scott, London. Eng. Pat. 13,588, July 3, 1901.

THE hot saline solution is brought under reduced pressure, which causes it to boil and at the same time to cool and to rapidly deposit small crystals. A tank containing the hot solution is set on a higher level than the crystalliser, to which it is connected by a valved pipe leading from its bottom. The crystalliser is formed in three cylindrical, vertical parts, the upper of which communicates with an air-pump, whilst the lowest part is in the form of an inverted cone, from the bottom of which the deposited crystals are suitably conveyed to a centrifugal machine. Should larger crystals be wanted, the liquor is introduced to the crystalliser before a vacuum is made, the pump being then put in action to any extent desired, for regulating the size of the crystals.—E. S.

Brine containing Salts of Calcium; Process for Purification of ——. G. N. Vis, Schweizerhalle, Switzerland. Eng. Pat. 14,812, July 20, 1901.

THE brine is mixed with a quantity of artificial magnesium carbonate sufficient to transform the calcium compounds present into calcium carbonate. The brine is boiled after separation from the precipitate, and magnesium carbonate regenerated from the mother-liquor, after removal of the separated sodium chloride crystals, by precipitating magnesium hydroxide by means of slaked lime, and treating the precipitate, preferably after washing with water to remove gypsum, with carbon dioxide. The resulting magnesium carbonate is to be re-used for treating a fresh quantity of brine. Calcium chloride may be added to the mother-liquor before the addition of slaked lime, to precipitate calcium sulphate.—E. S.

Capsules or Containers for Compressed or Liquefied Gas. H. V. R. Read, London. Eng. Pat. 15,077, July 24, 1901.

The cap to the container, which is to be perforated for the release of gas, is carried by a part so secured to the container that it can be removed after use to admit of recharging.—E. S.

Magnesium Nickel, Copper, and the like, in their Ores; A Dry Process for Converting into Sulphates ——. C. D. Abel, London. From Siemens and Halske Akt.-Ges., Berlin. Eng. Pat. 16,337, Aug. 14, 1901.

The ores are heated to a temperature between 500° and 1,000° C., and a heated mixture of sulphur dioxide and air, which has been previously dried, is passed over them; they are subsequently leached to remove the sulphates.

—J. H. C.

United States Patents.

Sulphuric Anhydride; Process of Making ——. H. S. Blackmore, Mount Vernon, New York, U.S.A. U.S. Pat. 11,995 (Reissued), May 27, 1902.

A metallic oxide, such as iron oxide, is exposed to the action of sulphur dioxide at a temperature below the dissociation point of sulphuric anhydride. The metallic residue is then heated in a current of air or oxygen, cooled, and again exposed to the action of sulphur dioxide.—E. S.

Brine; Vacuum Apparatus for Boiling ——. G. N. Vis, Schweizerhalle, Switzerland. U.S. Pat. 700,860, May 27, 1902.

The vacuum pan, which has at its lower end a tubular extension, dipping into brine contained in an open vessel, is provided with an air-cock in combination with electric means for opening and closing the same, said electric means being under the control of a manometer connected with the pan, so that, upon increasing the vacuum in the pan, the air-cock is caused to open, whilst the resulting decrease of the vacuum causes the cock to close. The salt deposited in the pan falls through the tubular extension each time the vacuum is destroyed by the inrush of air. (See Eng. Pats. 16,738, 1899, and 9344, 1900; this Journal, 1900, 1014, 1111.)—E. S.

Cyanides; Process of Making ——. G. Ottermann, Vienna. U.S. Pat. 701,604, June 3, 1902.

Nitrogenous organic matter is subjected to destructive distillation in a retort provided with an agitator, and the gases are led through a valved passage into one end of a second retort, charged near the inlet with a "neutral material," such as paper ashes, beyond that with coke, and at the opposite end is a compartmented iron receptacle containing a nitrogen-absorbing material, such as a mixture of alkali carbonates with coal. The uncondensed gases pass through a hydraulic main to a condenser and scrubber.

—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Clay; Influence of Magnesia on the Behaviour of ——. Maeckler. Thonind. Zeit., 26, [54], 705—709.

The presence of magnesia in pottery clay bodies results in the formation of dense ware at a relatively low kiln temperature, the product being superior to that furnished by calcareous clay. Hence, the introduction of magnesia stoneware might prove advantageous. Magnesia bodies might also be valuable in the porcelain industry, especially for ware that is desired to remain true to shape and sharp-edged in firing, *e.g.*, ware for electro-technical purposes. It would seem as though this valuable property of magnesia is already utilised, the analysis of an insulating cap having revealed the presence of 31 per cent. of magnesia.

In ware baked at high temperatures, the same advantage of remaining sharp-edged and true to shape is imparted by a small proportion of magnesia, whereas the presence of lime leads to distortion. The ware exhibits a compact vitreous structure at the surfaces of fracture, thus forming an excellent clinker material. A considerable difference exists between calcareous bodies and those containing magnesia, inasmuch as in the latter the sintering point and fusing point are wide apart—a matter of great importance in the manufacture of dense ware, such as pipes, plates, acid vessels, &c.

In appearance and behaviour, bodies containing magnesia fired at high temperatures greatly resemble the ceramite blocks manufactured in Hungary, one of which, indeed, was found by Tetmajer to contain 4·94 per cent. of MgO—a circumstance probably accounting for its compact structure and sharp angles, though it contained 18·15 per cent. of CaO.—C. S.

English Patents.

Glass Stone; Manufacture of ——. L. A. Garchey, Paris. Eng. Pat. 12,589, June 20, 1901.

Fluid glass is run into metal moulds, and allowed to set to a suitable consistency, when it is poured into refractory and non-conducting moulds, resting on the movable hearth of a devitrifying kiln; after passing through the kiln, the finished form is impressed on the mass by hydraulic pressure. The claims also include ornamenting glass slabs, &c., by placing enamel or glass fragments on the bottom of the metal moulds before pouring in the molten glass; and also, as new article of manufacture, devitrified glass coated with a galvanic deposit. (See also this Journal, 1900, 664.)

—W. C. H.

Glass Furnaces and other Receptacles for Molten Material, and Means for Pouring such Material therefrom. H. Brooke, Jersey City, U.S.A. Eng. Pat. 24,333, Nov. 29, 1901.

In one wall of the furnace or receptacle is an opening with a discharge mouth, such that it may be lowered when required for pouring out the molten material. The inlet to the discharge mouth is below the surface of the molten material, to avoid scum, &c. Additional claims are for (1) the arrangement of a hood over the discharge end, (2) the discharge mouth in siphon shape; (3) means for heating the lip of the discharge electrically, to maintain the flow of molten material; and (4) a conveying conduit for the molten material, provided with apertures for projecting the flame into its channel.—W. C. H.

Ceramic Decoration; Apparatus for Preparing Design in Powdered Colour for Use in ——. T. Haviland, Limoges, France. Eng. Pat. 14,108, July 10, 1901.

A spiral revolving brush acts on the sheet of ceramic paper before the latter leaves the apparatus, thus insuring the dusting away of the excess of colour. The brush is surrounded by a casing, which permits the sheet to pass and receives the colours carried off by the brush; the colours are removed from the casing by a fan. The casing is made of two metal semi-cylinders, having their edges at one side clamped together, and on the other side arranged suitably far apart to allow the brush to work; means are provided for cleaning the brush, and also for regulating the distance of the casing from the revolving cylinder which carries the ceramic paper. Guide rods are placed in the casing to prevent the paper from passing into the lower semi-cylinder.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

English Patents.

Wood and Other Substances; Apparatus for Drying, Seasoning, and Impregnating ——. H. Higgins, Cambridge. Eng. Pat. 10,124, May 15, 1901.

The apparatus is divided into three compartments, by doors which can be raised or lowered. Under the compartments at one end is a furnace for superheating steam, which is conveyed into the compartment above; the flue of the furnace forms a jacket round the chamber. In each compartment is placed a receptacle containing the material to be treated; the receptacle is provided with a perforated bottom, beneath which is a space from which the steam

onveyed by a flexible pipe to the receptacle in the next ompartment. In the roof of the first compartment is a ipe for the supply of impregnating material. (See also og. Pat. 4689, 1900; this Journal, 1901, 365; and U.S. at. 695,152, March 11, 1902; this Journal, 1902, 550.)
—W. C. H.

Cement; New Composition or ——. G. Harding, Liverpool. Eng. Pat. 11,644, June 7, 1901.

AGNESIUM chloride is made into a thick syrup with water, ien thoroughly mixed with sawdust or other waste organic atter and magnesite, and a pigment added.—W. C. H.

ement; Manufacture of Portland or Hydraulic ——. N. T. Ashton, St. Ives; J. Crompton, Chester, and J. D. Kelly, Liverpool. Eng. Pat. 15,029, July 24, 1901.

ATURAL calcareous sand, known in Cornwall as "Towan nd," is first ground to a fine powder, then kilned or fired a high temperature, and the product so obtained is -ground to a fine state.—W. C. H.

ement Compositions for Roads, Pavements, Foundations, and the like; Method of Making and Laying ——. H. H. Lake, London. From F. J. Warren, Newton (Mass.), U.S.A. Eng. Pat. 9303, April 22, 1902.

IE asphalt in the composition is incorporated with about o 22 per cent. of a permanent flux of standard petroleum idumm and with earthy or mineral matters of the usual id. To bring the finished mixture into condition for ing, it is thinned down with a volatile temporary liquefier, ch as "naphtha, benzine, and similar coal-tar light oils other rapid drying oils." This addition enables the mposition to become plastic at a lower temperature than is ually required, and therefore saves expense in fuel.—C. S.

tone; Manufacture of Artificial ——. C. K. Graham, Lee, Kent. Eng. Pat. 13,452, July 2, 1901.

RTLAND or other cement is stirred with a quantity of ter, more than sufficient for hydration, mixed with ng materials, with or without the addition of asbestos res, then placed in a mould, and submitted to pressure.
—W. C. H.

ne; Manufacture of Artificial Acid-proof ——. F. Jurschina, Stockholm. Eng. Pat. 3518, Feb. 11, 1902.

SAND or powdered stone is moistened with a solution silicate of soda of 20° to 27° B., pressed or cast in suitable ulds, and afterwards dried and baked. The following lification is for use in filtering water: a mixture of rdered *diorite* and ground chalk is moistened with water, in moulds, and afterwards dried and baked.
—W. C. H.

UNITED STATES PATENTS.

dstone; Artificial ——. H. Engbert, Hörde, Germany. U.S. Pat. 701,690, June 3, 1902.

EVEISED blast-furnace slag is agitated in the presence high-pressure steam, then mixed with material conting silicic acid, again agitated in the presence of high-ssure steam, the mixture submitted to very great ssure in suitable moulds, and the blocks dried by the on of high-pressure steam.—W. C. H.

cks; Process of Producing Silica ——. W. H. Gibson, omestead, and H. Wessling, Hopechurch, Penn., U.S.A. .S. Pat. 701,707, June 3, 1902.

RSELY-crushed silica is mixed with silica reduced to an alpable powder, and the mixture dried and burned. proportions suggested are 40 parts of the coarse to rt of the fine material.—W. C. H.

a Brick. W. H. Gibson, Homestead, and H. Wessling, opechurch, Penn., U.S.A. U.S. Pat. 701,708, June 3, 902.

brick made as described in the preceding abstract, is ined as a new fireproof material composed of substanly pure silica, and free from lime and alkali-metal ates, with a porosity of about 8·21 per cent., and a ific gravity of about 2·21.—W. C. H.

X.—METALLURGY.

ENGLISH PATENTS.

Gold, or other relatively Precious Metals; Separation of "Precious Particles" of ——, *and their Recovery from the Body of Pulp or other Material with which they are Allied.* E. Edwards, London. From the Rose Gold Reclamation Co., San Francisco, California. Eng. Pat. 8774, April 15, 1902.

A SLUICE box having a retaining surface for holding precious metals in small particles, and provided with one or more flexible floating aprons, between which and the bottom of the box the current is compelled to pass. The aprons have a rough lower surface and are waterproof above.
—E. S.

Steel; Manufacture of ——. [*Direct Process.*] H. H. Lake, London. From the Electric Furnace Co., New York, U.S.A. Eng. Pat. 7660, April 1, 1902.

IN making steel direct from iron ore, the crushed ore is mingled with sufficient carbon to combine with the oxygen of the ore under the influence of heat. The mass is then fused in a closed furnace by feeding it over incandescent plates, and collecting the molten material in a heated hearth below the heated zone or belt. The apparatus comprises a closed furnace of refractory non-conducting material, with an inner chamber with a reduced throat, through which it delivers into a hearth below it.—G. H. R.

Metals; A New and Improved Process for Welding —— H. Goldschmidt, Essen-on-the-Ruhr, Germany. Eng. Pat. 10,859, May 25, 1901.

THE welding is effected by the heat produced in the reaction between finely-divided aluminium and a metal oxide, preferably ferric oxide, the reduced and molten iron being caused to flow so as to encase and strengthen the joint.—E. S.

Tinning Residues containing Chlorine; Treatment of ——. J. R. Leaver, Glamorganshire, and H. A. Leaver, Swansea. Eng. Pat. 11,312, June 3, 1901.

THE residues from tinning iron sheets, known as "tin scruff," are placed in a series of tanks and washed with hot water, or with a heated alkaline or acid liquid, until all the "chlorine" is in solution. The solution is then allowed to run into the next tank, and a further quantity of water put into the first, and so on till the residue in the first tank is sufficiently washed. The residue is then removed, and that in the second tank put into the first, that in the third into the second, and so on, the washing being resumed. The resulting liquid may be used as a flux, or the metal in it is precipitated.—E. S.

Metals; Adding Carbon to ——. F. J. C. Jones, Leamington. Eng. Pat. 12,291, June 17, 1901.

THE metals to be carbonised are heated in the close muffle of a furnace, the muffle being heated externally, whilst a current of (unignited) carbonaceous vapour or gas is passed through it.—E. S.

Electric Furnace [*Metallurgical*]; *Arranged for being Oscillated or Tipped.* J. Imray, London. From La Société Electro-Metallurgique Française, Froges, France. Eng. Pat. 14,643, July 18, 1901.

THE furnace is arranged so that it can be oscillated or tipped. The carbon electrodes are passed within collars or loops, which hold them on a supporting arm, the current being conveyed to them by means of copper wedges pressed against them by the collars, and which are connected to the electric current.—G. H. R.

Furnace for Melting Metals and for like Purposes. E. Bosshardt, Cologne. Eng. Pat. 20,202, Oct. 9, 1901.

THE air blast or current is preheated by causing it to pass through chambers formed in the walls of the furnace or ashpit.—J. H. C.

Blast Furnaces. G. P. Herrick, New York, U.S.A. Eng. Pat. 8082, April 7, 1902.

Loss of dust from blast furnaces is prevented here, the dust being mostly collected so as to fall back into the furnace. Above the furnace is a feed-hopper having a bell valve, and around the hopper is an annular passage leading to a dust chamber surrounding the hopper, and placed between the charge level and the off-take pipe. The gases rise through the annular passages, and in consequence of the enlarged size of the dust chamber, their velocity is so decreased that the dust is deposited.—R. S.

Concentration of Ores; Improvements in ——. H. E. T. Haultain and H. R. Stovel, Nelson, B.C. Eng. Pat. 9521, April 24, 1902.

The wet pulp is treated with oil or grease on a series of travelling belts provided with scrapers, which deliver the concentrate into a tank containing hot water, whereby much of the adherent greasy matter is removed, and, rising to the surface, can be separated and used over again.
—J. H. C.

United States Patents.

Colloidal Silver; Manufacture of ——. C. Paal, Erlangen, Germany. U.S. Pat. 701,606, June 3, 1902.

Silver chloride, in quantity slightly exceeding the equivalent of the alkali present, is added to an alkaline solution of the products of the decomposition of albumins by the action of warm dilute alkalis. The mixture is heated until the precipitate redissolves, then dialysed, precipitated by dilute (acetic) acid, the precipitate dissolved in dilute caustic soda solution, the solution dialysed and evaporated. This process is claimed and also the product, which contains up to 90 per cent. of silver and forms bright scales, with a blue metallic lustre, completely soluble in water. The distinctive property of this colloidal silver is that it retains its solubility in dilute alkalis after having been precipitated from aqueous solutions by acids.
—A. C. W.

Colloidal Gold; Manufacture of ——. C. Paal, Erlangen, Germany. U.S. Pat. 701,605, June 3, 1902.

The process is essentially the same as that described in the preceding abstract. The colloidal gold contains over 60 per cent. of metal, consists of bright scales with a bronzy lustre, and has the same distinctive properties as the colloidal silver of the preceding patent.—A. C. W.

Ores; Process of Treating —— [*for Precious Metals*]. C. J. Best, Denver, U.S.A. U.S. Pat. 701,134, May 27, 1902.

Finely-powdered ores containing copper, iron, silver, and gold (but not lead), that, if sulphides, have been previously roasted, are boiled for 1—2½ hours with acidulated water, in which is dissolved a suitable quantity of a "salt mixture" composed of 2 parts of sodium chloride, 1¼ parts each of nitre and of alum, and 1½ parts of nitric acid. The solution is filtered and treated with H_2S, the precipitate heated with suitable fluxes for the recovery of the metals, and the expelled gases absorbed for use.
—E. S.

Ores; Apparatus for Lixiviating ——. P. Naef, Argentine, Kansas, U.S.A. U.S. Pat. 700,972, May 27, 1902.

The comminuted ore is delivered into the top of a column provided with a series of superimposed and inclined hoods and rings, alternating and presenting oppositely inclined surfaces for the downward passage of ore thereover, the said hoods and rings being perforated to permit the upward passage of gas therethrough. The leaching solution enters the column at the bottom and passes through the downwardly moving stream of ore, and is discharged from the top.—E. S.

Iron; Art of Puddling ——. R. A. Carter, Pennsylvania. U.S. Pat. 701,294, June 3, 1902.

An ore lining is formed on the bottom of the hearth, over which finely-divided ore is spread, and the metal to be treated is charged thereon. It is then melted, boiled, and stirred, and ore in small quantities is added from time to time after the metal has begun to boil and the charge is finally balled.—G. H. R.

Copper; Process of Hardening ——. S. L. Walter and F. W. Keiner, Pennsylvania. U.S. Pat. 701,429, June 3, 1902.

Five parts of aluminium and one of powdered charcoal are placed in a crucible and 32 parts of copper are added as a superposed mass. Heat is then applied to the crucible which causes the combustion of the charcoal and generation of carbon dioxide, which passes upwards through the copper, carrying off any moisture contained in the metals and at the same time prevents their oxidation. Upon the fusion of the metals it is stated that the copper, owing to its superior specific gravity, combines intimately with the aluminium and a harder copper alloy is formed.—G. H. R.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Ozone; Influence of Voltage on the Formation of—A. Chassy. Comptes Rend., **134**, [22], 1298—13 (See also this Journal, 1901, 1220.)

A minimum potential difference of about 9,000 volts required for the formation of ozone from air or oxyg As the voltage rises above this, the rate of production ozone increases very rapidly; but the rate of incre gradually diminishes, until when 13,000 volts is passed, rate of increase has become constant, and the productio ozone is proportional to the square of the effec difference of potential. In the production of ozo therefore, a potential difference of at least 13,000 v should be used; but from the point of view of yield, th is no advantage in using a much higher voltage, for amount of ozone produced is simply proportional to expenditure of energy.—J. T. D.

English Patents.

Electrolytic Apparatus [*Caustic Alkali*]. J. G. A. Rho Manchester. Eng. Pat. 14,822, July 20, 1901.

The apparatus consists of a trough or vessel having a recess around its internal circumference, and a plate suitable conducting material is suspended in the ve having at its edge a deep flange which projects down the recess of the trough so as to form a liquid seal, sepa ing the space above the plate from that below it. A projects upwards from the centre of the iron plate, a smaller tube projects some distance into it from the ce of the bottom of the trough which contains a laye mercury. Above the plate are fixed the anodes which connected to the positive source of electricity, whils tube is connected to the negative terminal.—G. H. R.

Batteries; Secondary ——. I. Celestre and F. Gondr both of Rome. Eng. Pat. 7629, April 13, 1901.

The lead grids are of very wide mesh, the openings b square; and each side of every mesh is curved outward a short distance at the middle, so that should the fi expand in use, the bent lead strips would straighten and so allow more room for the paste, whereby buck can be prevented. The paste is prepared in the for ribbons or filaments which are then placed together, pressed into close contact. Or thin lead shavings ma used connected to a central plate prepared with a pas suitable thickness.—W. G. M.

United States Patents.

Plastic (Insulating) Compound and the Method of M facturing same. L. M. Randolph, Newark, New Je U.S. Pat. 699,713, May 13, 1902. (See U.S. Pat. 698, this Journal, 1902, 782.)

A mixture of equal parts of "mud" and peat, with 10 to 20 per cent. of oakum, and colouring matt desired.—F. H. L.

imary (Copper Oxide) Battery. [Negative Electrode.] E. M. Fishell and W. R. Clymer, Ohio. U.S. Pat. 701,319, June 3, 1902.

The containing metallic vessel may serve also as the negative electrode, and has a sealed cover with a vent hole. An annular, perforated, metallic partition, the outer surface of which is covered with cloth, is placed in the vessel, and electrically connected with the bottom of it. A layer of solid covers the bottom of the annular space between the cloth and the vessel electrode, and above it is a layer of finely subdivided cupric oxide, the space above being sealed. The vessel contains an exciting solution of caustic soda in which a zinc electrode, is immersed, and supported by a rod attached to, but insulated from, the cover.—G. H. R.

Galvanic Battery; Reversible ——. [Oxide of Nickel.] T. A. Edison, New Jersey. U.S. Pat. 701,804, June 3, 1902.

An alkaline electrolyte is employed which remains unchanged during working, and contains two elements insoluble in it, one a conducting support carrying an insoluble oxidisable material, and a second which has as its active material hydrated oxide of nickel intimately mixed with fine graphite.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

English Patents.

Silver Plating and Gilding Processes ——. [Aluminium and Magnesium Salts.] (Miss) J. Schiele, Brussels. Eng. Pat. 9438, April 23, 1902.

Iron, steel, nickel, and other metals are silver-plated or gilded, by submitting them to a preparatory electrolytic plating bath composed of a solution of sodium pyrophosphate and of stannous chloride, to which is added a solution of nitrate of aluminium and of magnesium in suitable proportions, in order to cover them with an intermediate deposit composed of an alloy of tin, aluminium, and magnesium. The articles are then silver-plated or gilded in the ordinary manner.—G. H. R.

Wrought Iron, Steel, and Cast Iron; Process and Apparatus for the Manufacture of —— by Electric Heating. J. Imray, London. From La Société Electro-Metallurgique Française, Froges, France. Eng. Pat. 7,486, July 16, 1901.

The metal bath is protected from contact with the electrodes, which descend to a certain depth into a rectangular crucible, provided with two tapping holes, one near the upper end, which serves for the discharge of slag, scoria, and other impurities at a level above the metallic bath, whilst the other, placed at the bottom, serves for drawing off the metal. The top of the furnace is enclosed by a movable cover or set of covers, which can be raised or tilted upon one side for effecting the charging of the furnace with the ores, pig metal, scrap, and other materials to be treated.—G H. R.

Zinc and Substances containing Silicic Acid; Working —— in Electric Furnaces. A. Dorsemagen, Aix-la-Chapelle, Germany. Eng. Pat. 16,122, April 7, 1901.

"Zinc and substances containing silicic acid" are extracted in an electric furnace "in which the silicate, after being mixed in the usual manner with carbon, is heated sufficiently to form carbide of silicon, the zinc being simultaneously separated out."—G. H. R.

Metals or Compounds; Deposition of ——. Sherard Cowper-Coles and Co., Ltd., and S. Cowper-Coles, both of London. Eng. Pat. 9927, May 14, 1901.

The iron, steel (or other metallic) surface to be treated, is thoroughly cleansed by pickling or otherwise. The objects are then placed in a metallic box and covered with zinc dust or with finely-divided zinc and a little oxide, and preferably with about 3 per cent. of carbon. The whole is then heated to dull redness for a period depending upon the thickness of coating required. The zinc dust should be pressed closely into contact with the surface to be covered, or, preferably, motion is given to the receptacle so that the zinc is constantly moved over the surface. In this way a homogeneous coating of zinc is given to the objects so treated.—W. G. M.

Electrolysis: Production of Metallic Deposits by ——. P. Jensen, London. From G. Langbein and Co., Leipzig-Sellerhausen, Germany. Eng. Pat. 7995, April 5, 1902.

An addition of ethyl-sulphuric acid or of ethyl-sulphates is made with the object of producing dense tough and even deposits. The following baths are recommended, a litre of water being added in each case:—For nickel: (*a*) Nickel chloride, 100 grms., and sodium ethyl-sulphate, 50 grms.; or (*b*) Nickel ethyl-sulphate, 100 grms., sodium sulphate, 10 grms., and ammonium chloride, 5 grms. For copper: (*a*) Copper ethyl-sulphate, 200 grms., and sodium ethyl-sulphate, 50 grms.; or (*b*) Copper ethyl-sulphate, 100 grms., and copper sulphate, 100 grms.—W. G. M.

United States Patents.

Metals; Process of Depositing ——, on Metallic Surfaces, and the Product thereof. [Zinc.] S. Cowper-Coles, London. U.S. Pat. 701,298, June 3, 1902.

In this process "zinc dust," or pulverulent zinc containing not less than 8 per cent. of zinc oxide, is applied to the iron or other metallic surface, and is submitted to heat in a closed chamber, with or without the addition of a small percentage of carbon. It is claimed that a metallic object thus covered with zinc is characterised by a homogeneous coating of zinc, having a physical connection with the metal beneath, and having the appearance to the naked eye of a delicate silver-grey, not shiny like galvanised articles, and under the microscope having the distinguishing appearance of homogeneous particles free from crystalline structure.

—G. H. R.

Zinc or other Volatile Metals from Ores and Mattes; Process of Obtaining ——. [Carbon Monoxide Gas.] J. Armstrong, London. U.S. Pat. 701,458, June 3, 1902.

The ore is reduced to a finely divided state, mixed with finely divided carbon, and the mixture submitted to the requisite heat in an atmosphere of carbon monoxide in which no free oxygen or carbon dioxide is present, the volatile metal being distilled off still surrounded by an atmosphere of carbon monoxide. The vapours are passed through a bath of the same metal in a liquid state at a little above its fusing point, whereby the metal is condensed, and any neutral gas that may be present, such as carbon monoxide or nitrogen, passes through the bath and liquid metal and escapes, and the less volatile metals are then tapped off.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Rosin; Determination of ——, in Fats, Oils, Soaps, Paraffin, &c. Holde and Marcusson.

See under XXIII., *page* 930.

English Patents.

Fats and the like; Process and Apparatus for the Recovery of ——. C. Kremer, Wiesbaden, Germany, and R. Schilling, Homburg, Germany. Eng. Pat. 14,603, July 17, 1901.

The water containing the fat is poured into a vessel communicating with another vessel or vessels, so that the fat rises to the surface of the liquid in the first vessel, whilst the water is drawn off downwards into the other vessels.

In a form of apparatus claimed, the greasy water is delivered through a side-tube near the top of an inner vessel, and the aqueous layer passes from the bottom into an outer vessel, in which it rises to an overflow channel and is carried off through an exit tube.—C. A. M.

Sterilised Salves, Ointments, and the like; Method and Apparatus for Producing ——. W. Buchelen, Berlin. Eng. Pat. 13,571, July 3, 1901.

"It is known that disinfectants lose almost all their germ-exterminating properties on admixture with oil or

fat." The inventor accordingly sterilises his salves, ointments, &c., without the use of disinfectants, by merely heating them in a closed vessel to a high temperature. The details of construction of this vessel are given. When sufficiently sterilised by heating, the salve or ointment is forced out into vessels or tubes.—L. A.

Soap, Candles, and like Articles of Regular Form; Machines for Wrapping ——. J. T. Pedersen, Woodside, New York State, U.S.A. Eng. Pat. 4984, Feb. 27, 1902.

The tablets of soap or other articles are delivered one by one on to a moving strip of paper, which is then conducted to a vertically movable platform, where folders and tuckers working vertically and horizontally wrap the paper round the soap so as to form an envelope.—C. A. M.

Cotton-Seed; Process of Extracting Oil from ——. J. McFarlane and D. C. Reinohl, Columbia, U.S.A. Eng. Pat. 6634, March 18, 1902.

The cotton-seed is first treated with a solution of alkali or of alkali and saccharine matter until the kernels are softened and separated from the hulls. The kernels are then crushed and the resulting oil treated with alkali and sodium chloride and washed with water.—C. A. M.

Lubricant; Process for Manufacturing ——. W. F. Downs, Jersey City, New Jersey, U.S.A. Eng. Pat. 9313, April 22, 1902.

See U.S. Pat. 697,996; this Journal, 1902, 712.

—C. A. M.

United States Patent.

Candle. T. J. Garrigan, Boston, Mass., U.S.A. U.S. Pat. 701,557, June 3, 1902.

A given portion of the wick is treated with a mixture of cement and asbestos, which hardens when heated, so that the candle is automatically extinguished at that point without smouldering.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

United States Patents.

Paint: Process of Making ——. D. J. Ogilvie, Cincinnati. U.S. Pat. 701,308, June 3, 1902.

Zinc white is incorporated, either alone or with other pigments, with an oily vehicle, without grinding. The zinc white, which may be in a pulp, and the linseed or o oil, are placed in a suitable vessel and superheated, or h pressure steam is injected, until a temperature of 35 450° F. is attained. The pigment and vehicle are t rapidly and perfectly blended, the body and opacity of zinc white are improved, and the product is rend quicker drying.—M. J. S.

Paint; Insulating ——. L. M. Randolph, Newark, Jersey. U.S. Pat. 701,392, June 3, 1902.

Varnish residue, the sediment left in tanks in which var has been stored, is heated to about 300° F. and strai from coarse impurities. Whilst hot, there is added a 25 per cent. of powdered peat, and after incorporation stirring, the mixture is thinned to a suitable consistence adding naphtha or a similar solvent. Articles coated this composition are advantageously baked at 100°—175° or at 275° if the object is to produce an insulating coat.

—M. J. S

Paint. C. M. Hall, Niagara Falls. U.S. Pat. 701,7 June 3, 1902.

Iron, alloyed with silicon, or with silicon and titani with or without aluminium or manganese, is sufficie brittle to be pulverised and then ground with oil to a pa and this is made the basis of the claim. The allo obtained by reducing bauxite with carbon in an elec furnace.—M. J. S.

Paint. T. L. Lee, Memphis, Tennessee. U.S. Pat. 701, June 3, 1902.

A mixture is claimed of "distilled coal tar" (the resid tar left after the crude benzol and dead oil have b distilled off), dead-oil, refined benzol, and Chickasaw och for producing a cheap, durable, and efficient paint heavy structures, such as bridges, roofs, and he machinery. The Chickasaw ochre is a special prod from Arkansas.—M. J. S.

(*B.*)—RESINS, VARNISHES.

Resins; Solubility of some Soft ——. C. Coffign Bull. Soc. Chim., 1902, **27**, [11], 549—555.

In the following table, A indicates the percentage of resin left undissolved when 10 grms. of the resin

—	Oil of Turpentine.	Alcohol (95 per Cent.).	Amyl Alcohol.	Chloroform.	Ether.	Carbon tetrachloride.	Benzene.	Amyl Acetate.	Acetone.
Dammar.....	Completely soluble.	A 27·24 B 1·12 C 28·55	A 13·5 .. C 12·43	Completely soluble.	A 0·8 B 2·95 C 3·36	Completely soluble at boiling temperature.	Completely soluble.	A 1·24 B 1·52 C 2·7	..
Sandarac	A 82·04	Completely soluble.	Completely soluble.	A 54·4 C 56·00	Completely soluble.	A 77·98 C 79·0	A 84·73 C 67·85	Completely soluble.	Complet soluble hot.
Mastic.....	Completely soluble.	A 35·59 B 0·6 C 16·86	Completely soluble.	Completely soluble.	Completely soluble.	Completely soluble, hot.	Completely soluble.	Completely soluble, hot.	A 6·3 B 3·2 C 10·2

extracted with the solvent in a Soxhlet apparatus for five hours; B, the percentage which separated from the solution on cooling; C, the percentage left undissolved when 10 grms. of the resin were boiled with 50 c.c. of the solvent for an hour in a flask with inverted condenser, and the residue washed with a further 100 c.c. of the solvent.

—M. J. S.

English Patent.

Covering for Floors, Walls, &c. G. E. Zschiedrich, I burg, Germany. Eng. Pat. 25,589, Dec. 14, 1901.

Peat, or other suitable fibrous material, after lig disintegrated to separate the fibres, is impregnated t linseed oil, linseed oil varnish, india-rubber, &c. The

duced is put into a machine, such as is used in making l-boards, and is formed into boards or lengths. These y be subsequently treated as in the final processes ployed in linoleum manufacturing, or a wearing facing y be provided by attaching to them, by means of outchouc-like glue," a veneer of wood, leather, or mill- rd. The product possesses, it is stated, greater strength l elasticity than linoleum.—E. B.

United States Patent.

ctrically-insulating and Waterproofing Materials. C. Greening, Plumstead, Kent. U.S. Pat. 701,713, June 3, 902.

ANTHRACENE is melted and mixed with a carbonate, h as that of barium, to neutralise its acid and remove purities. The liquor is separated from the deposited d matter, and then incorporated, at a temperature exceeding 215° C., with a copal resin, *i.e.*, animé or ui, continuing the heat until the whole ceases to boil. a rather soft and flexible material be required, equal ts of anthracene and resin are taken; if it is required soft, some non-drying oil like shale or crude castor, is ed in the necessary proportion; but if the substance is e hard and rigid, six parts of resin are mixed with one of hydrocarbon. The composition can be cast into any red shape, or dissolved in a volatile liquid so as to luce a varnish. It may also be melted and some ng oil added. See Eng. Pat. 8575, 1900.—F. H. L.

(C.)—INDIA-RUBBER, &c.

Asphaltum; The Employment of —— in Rubber anufacture. Gummi-Zeit., 1902, **16**, [37], 694—695.

For many manufactured articles, the addition to india- ber of a small proportion, not exceeding 10 per cent., of altum, is admissible. Asphaltum being a very variable erial, it is necessary to select the most suitable variety. The melting point should not be below 100°, and for most poses the higher the better. For goloshes an asphaltum ow melting point can be used. The best asphalt has a sp. gr. of 1·05. The commoner impurities are granular um carbonate, clay, and sand. As the pure bitumen is ittle when cold, it is usual to mix it whilst fluid with r a vegetable or mineral oil, or a tar-oil, in such portions as to form a dough.—M. J. S.

English Patent.

Solutions [India-rubber Solution, &c.]; Storing or Discharge of Inflammable and Volatile ——. R. P. Strachan and J. K. Robertson. Eng. Pat. 10,190, 1901.

See under I., *page* 904.

XII.—TANNING; LEATHER, GLUE, SIZE.

[Chrome] Leather; Examination of ——, for Industrial Purposes. H. Boulanger. Bull. de la Soc. d'Encouragement pour l'Ind. Nat., May 31, 1902, 620—647. (Compare this Journal, 1902, 783.)

CONTINUATION of the previous work on the tensile strength of leather, the material in this case being chromed ox-hide made by the three bath process, uncurried, but treated with a special soap. As before, the paper is illustrated and the results of very many mechanical tests are shown in a series of tables and curve diagrams.

The complete hide was parcelled out symmetrically into thirty strips of suitable shape for the testing machine and the following factors determined.

1) Breaking load of each strip in kilos.

2) Permanent elongation produced by a total load of 40 kilos.

3) Gradual elongation up to the point of rupture.

The strongest strips were obtained from the middle of the hide near the belly, where the resistance to rupture was about 1,000 kilos., whilst across the neck it falls to 400 kilos. The elongation, on an average, was double that found in the case of vegetable-tanned leather (chestnut), the actual breaking strength, calculated for a total mean extension of 38 per cent. and a mean resistance of 3 kilos. per square millimetre being 0·57 kilogram-metre and the average modulus of elasticity (loaded to 100 kilos.) being 16.

A similar series of tests were made on various kinds of joints for belts, on straps, and on the resistance of chrome leather to direct tearing across the fibres. As regards joints, it appears that a simple glue joint is the most effective amongst eased lap-joints, as the more the leather is pierced for rivets or sewing of any kind, the weaker the joint becomes.

The author concludes as a general result, that chrome leather has a lower tensile strength than vegetable-tanned leather and a considerably greater co-efficient of extension. —R. L. J.

English Patent.

Tanning, Tawing, and like Processes; Apparatus for use in ——. F. L. Demantké, Ivry-la-Bataille, and L. Salentey, Louviers, France. Eng. Pat. 12,539, June 19, 1901.

VATS or pits are arranged, preferably in pairs, one at a lower level than the other and communicating with each other by pipes extending from one double bottom to the upper level of the following vat. Each of the vats is provided with a rotary frame with four arms carrying hooks from which the hides are suspended, these rotary frames receiving an alternating circular movement obtained by suitable worm gearing, which is caused to alternate by pulleys and belt-forks actuated by a rack moving alternately in opposite directions.—J. F. B.

XV.—MANURES, Etc.

Thomas Slag; Determination of Total Phosphoric Acid in ——. G. Aschman.

See under XXIII., *page* 929.

XVI.—SUGAR, STARCH, GUM, Etc.

Centrifugal Syrups: Purification and Filtration of —— for Returning. B. Mittelman. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [11], 1316—1320.

ATTENTION has already been drawn by Andrlik (this Journal, 1902, 713) to the improvement of drainage syrups of the first jet by filtration combined with sulphiting and crystallisation in motion, at present much used in Bohemia. The purification effected by filtering off suspended matters is improved when combined with the removal of most of the soluble matters, a result easily and cheaply arrived at by the author, and with rapid suppression of most of the molasses.

The diffusion juices are sulphited for some minutes at the ordinary temperature, 2 to 2½ per cent. of lime per 100 of beetroots added, and then sent to the heaters to be heated to 75° C. This slight sulphiting of the juice is to destroy any tendency to ulterior fermentation. The rich drainage syrups of the first jet, carefully separated, of a purity of 70 and over, are returned in their entirety to the first carbonating at the moment of liming, after having been sulphited and filtered. They may be returned to the second carbonating, but the result is not so good. Carbonating is arrested when the alkalinity reaches 1—1·2 grms. of lime per litre.

To sulphite the drainage syrups, they are brought to 30° B., heated to about 75° C., and sulphited until freely acid. There is a notable decolorisation and great diminution of viscosity. To maintain the improvement in colour, which would be destroyed later by contact with lime in the diffusion juice, the colouring matters, decomposed by the sulphurous acid, are fixed by a few kilos. of char in impalpable powder, added before or after sulphiting. They are fixed more advantageously by hydrosulphiting with the aid of zinc powder or tin paste.

The juice when carbonated is sent to the filter presses, then to the mechanical filters and to the saturation heaters,

where it receives ½ per cent. of lime per 100 of beetroots. Heated to boiling it is saturated to complete elimination of lime, heated again to 100° C., and filtered twice. The juice has an alkalinity of 0·2 due to potash, soda, and ammonia. It is sent to be evaporated.

The syrups (liquors) may be sulphited alkaline or acid.

In alkali sulphiting, it is advantageous to take the syrup between the second and third body of the multiple effect, or between the third and fourth, at a density not higher than 18° B., in order to allow the sulphurous acid to exert its full energy on the colouring and viscous matters. It is known that sugar has a solvent power on orgauic and other matters set at liberty by sulphurous acid, but if the sugar is combined with an alkaline earth, the dissolving action is destroyed and purification is complete. There is a supplementary physical action powerfully increasing the decolorisation in the fact that the precipitate tends to retain colouring matter as a lake. If the alkalinity does not reach 0·8 per litre, a little milk of lime, or, better still, baryta is added, and the liquor sulphited to 0·2 of lime per litre. The sulphite of lime formed being insoluble, the liquor is heated to 90°—95° C., filtered at a low pressure, and returned to the last body of the effect to be concentrated to 28°—30° B.

Acid sulphiting is preceded by a preliminary sulphiting to feeble alkalinity, and filtering. The syrup is cooled to 40° C., and gas injected until there is 0·5—1·0 grm. of free SO_2 per litre. Then, or before sulphiting, char is added, and after mixing for a quarter of an hour, the liquor is made alkaline with milk of baryta or caustic soda, heated to 95° C., and filtered ready for boiling.

Instead of adding char, the syrups may be treated with zinc powder or tin paste. It is not necessary to add alkali, the hydrosulphurous acid being very unstable, and being set free during heating and boiling. The masseeuite is neutral or even slightly alkaline. The acidity due to sulphurous acid should not exceed 1·2 grms. per litre. 700 grms. of zinc powder or 250 grms. of tin paste suffice for 25 hectolitres of syrup. The liquid is mixed for 20 minutes, heated to 90° C., and filtered. The increase in purity and saline quotient is indicated in decrease of viscosity and in abundant crystallisation, reducing the molasses to 1·5 per cent. on the beetroots.—L. J. de W.

Syrups; Filtration of ——. K. Andrlik, V. Staněk, B. Mysik, and F. Zdvihal. Zeits. Zuckerind. Böhmen, 1902, **26**, [9], 501—526. (See this Journal, 1902, 713.)

The results of the analysis of samples from the sugar factory of Ouzic showed that the beetroots worked up were of high sugar content and gave a diffusion juice of 90·9 apparent purity. The liquors were also very pure and bright, and the average purity 94·3. The sugar obtained was pale, of uniform grain, and faultless. The average yield amounted to 83·07 per cent. of "89·5 per cent. rendement." By direct trial 0·005 per cent. of scum was taken up in filtering the liquor. The filtration of the syrup increased the purity by only about 0·08 per cent. The working of the method indicated an increased yield of about three per cent., and five per cent. when the syrup was diluted to about 60° Balling and sulphited to neutrality. The sulphiting in the heat effected a distinct decolorisation and diminution of viscosity, and contributed therefore to a quicker crystallisation. A greater dilution of the syrup facilitated filtration and the formation of regular grain, but the cost of evaporation was thereby increased. Dilution to 52° Balling, as proposed by Eger, increased the yield by only 0·09 per cent.; it is questionable, therefore, whether the outlay is covered.

The expenses due to the introduction of the mere filtration of the syrups, with a daily working up of 4,000—7,000 quintals of beetroots amount to 6,040 krones, when the liquor also is filtered to 11,320 krones; but it is scarcely to be assumed that mere filtration without sulphiting and crystallisation in motion could lead to such favourable results. That Eger found only 1·2 per cent. of molasses on the beetroots is to be explained, not only by the small quantity of non-sugar in the juice, but also by the method of working.

In the Močovic factory the beet was of good quality, a the average purity of the diffusion juice was 89·9. T liquors were very pure and clear, and of 93—94 purity. T massecuites were uncommonly pale and short in consequer of the thorough purification of the juice and its evaporat at a low pressure and in a short time. They gave 81· per cent. first product of a rendement of 89·4. filtration of the green syrups diluted to 38° B. (= Balling), 0·038 per cent. of suspended impurities w removed. Although the chemical purity was not marke increased, the syrups were improved in physical qualiti The crystallisability was remarkable. The massecuit filtered, gave after two or three days' stirring an avera of 46·9 per cent. second product of 87 net. The sy from the third product, had a purity of 64—66.

The third syrups were, after osmosis, stirred 10 days a gave 14 per cent of sugar and molasses which, at 42° polarised 48—49. The quantity of the third massecu was 1·36 per cent. on the beetroots. The cost of filtration of the syrups with a daily work of 5,000 quint of beets with two filters, amounted to about 4,110 kron To obtain clear filtrates, Mareš recommends a special k of cotton cloth described by him. He is of the opinion t small vacuum pans (40—50 quintals = 4—5 tons) g massecuites of greater crystallising power than larger one —L. J. de W

Sugar; Crystallisation with Motion in the Manufact of ——. O. Limpricht and Masch. Akt. Gesell. vor Forstreuter, Oschersleben. Ger. Pat. 129,376, July 1901.

Solutions, principally the after-products in the manufact of sugar, are crystallised under motion by drawing the m to be crystallised from a vessel by means of a pump, a discharging it over distributing plates situated in the sa vessel. In this way a vigorous movement is imparted the mass, causing an increase of the size of the cryst present therein.—J. F. B.

French Patents.

Sugar Juices; Evaporation in Vacuum Pans with Formation of Fine Grains. W. Greiner, Brunsw Fr. Pat. 127,561, Oct. 12, 1898.

In this process the liquid is kept circulating without use of mechanical arrangements. The steam heating pi are divided into two sets, those near the periphery of pan being only heated to a slight degree, whilst central ones are heated as strongly as possible; in way the circulation of the liquid is kept up.—T. H. P.

Froth Remover, applicable to Carbonation Apparo de Smet. Addition to Fr. Pat. 291,019, Oct. 29, 190

In this apparatus, a horizontal steam-jet is separated narrow annular space from a receptacle containing which is hence drawn along by the jet; the latter is directed on to the frothy liquid as long as is requ The steam is then cut off and the fat remaining in receptacle left until wanted. (See also Fr. Pat. 291, July 20, 1899.)—T. H. P.

Diffusion; Apparatus for Continuous and Automatic G. Boutellier. Addition to Fr. Pat. 310,190, Nov 1901.

Modified extraction apparatus, by means of which marc and the juice, which travel simultaneously in oppo directions, are removed automatically, the former wh is exhausted of its sugar, and the latter when it attained its maximum density.—T. H. P.

Molasses and Sugar Juices; Purifying ——. J. Bla Paris. Addendum to Fr. Pat. 313,395, Nov. 25, (See this Journal, 1902, 629.)

The process for separating the salts from molass by precipitation and treatment with tartaric acid, is extend to the refining of saccharine juices and syrups, and it is s that no inversion results from this treatment.—J. F. B

yrups and Molasses; Purification of ——. M. Kowalski and S. Kazakowski. Fr. Pat. 315,737, Nov. 8, 1901.

ENTRIFUGAL or other drainage syrups or molasses at —60° B. are treated with 2—5 per cent. of phenol or its rivatives or other hydroxy derivatives of benzene, agitated erewith and treated with acids, preferably sulphurous acid at temperature of 45°—55° C., until decolorisation is sufficient thout taking account of the acid reaction produced under ese conditions. The phenol is then removed in convenient parators, milk-separators for example, and is found to ntain most of the non-sugars of the syrups. More enol is required in proportion to the impurity of the rups. 80 per cent. of the non-sugars are thus removed, d the phenolised syrups are protected from inversion. e phenol is regenerated by distillation with steam or by nversion into phenolates.—L. J. de W.

etroot Washer and Stoner. La Soc. Anonyme des Etablissements Alfred Maguin. Fr. Pat. 314,317, Sept. 18, 1901.

EETROOTS or other roots used in sugar works or distilleries quire, before they are cut up, to be subjected to a rough washing to free them from earth and stones or er hard bodies adhering to them after they are gathered. e washers usually employed do not completely fulfil the ect desired, inasmuch as the movement communicated the water consists merely of a sort of dabbling motion, l does not cause a regular and continuous circulation the water, which alone would secure the separation of heavy matters. By the arrangement now described, beetroots are thrown into a mass of water having a ng ascending current; they descend some distance, and n, being of a density almost equivalent to that of water, with the current, while the heavier foreign bodies fall ough a grating to the bottom of the receipient, whence y may be removed from time to time.—L. J. de W.

etroot Juices; Processes of Purification of ——. J. N. Lehmkuhl. Fr. Pat. 315,683, Nov. 6, 1901.

ENERALLY a quantity of lime is used for this, equal to —3 kilos. per 100 kilos. of beetroots, not that such a proportion of lime is necessary for the purification perly so-called, but solely because the filtration of ices to which a small quantity only of lime is added is ndered impossible by the formation of viscous impurities m the albuminoid matters which have remained in tion.

he use of sulphate of alumina is also attended with dvantages.

he new process of purification of beetroot juices is to gulate the albuminous matters previous to the addition me by heating to about 90° C. for one minute, adding —1·2 kilos. of lime per 100 of beetroots, and onating and filtering. Heating to 70° or 75° is not cient for precipitation. The scums thus obtained are ily filtered.—L. J. de W.

s for Beet Slices with Re-pressing Arrangement. A. Neumann. Fr. Pat. 316,396, Nov. 30, 1901.

beet-slice press a re-pressing arrangement is applied, e purpose of increasing its yield. Thus, the mass of s broken up by the screw is compressed and pushed definite intervals of time. A special form of such gement is also claimed.—T. H. P.

Sugars; New Process for Purifying, Bleaching, and fining ——. L. M. Lafontaine. Fr. Pat. 314,580, pt. 30, 1901.

EAD of employing energetic reducing products directly the liquid juices and syrups, and thereby transing a great quantity of crystallisable sugar into glucose, uthor proposes to apply them to the massecuite after llisation, when the molasses with its salts and colouring rs clothing the crystals may be easily removed.

e reducing agents used are sulphurous anhydride and erivatives in a liquid state, or bisulphites, and for hing the massecuite, oxygenated water or vapour. parts by volume of liquid sulphurous acid are diluted with 100 parts of water and 4 litres of this liquid added at intervals of five minutes to 100 kilos. of massecuite, previously diluted with molasses from a preceding operation. The mass is mixed to ensure complete impregnation with the acid, and then allowed to rest for an hour and centrifugalised. When the greater part of the molasses has been separated, 2 litres of the solution of sulphurous acid are added by an atomiser jet to attack any colouring matter that may have escaped action and be still adhering to the crystals. By means of a perforated tube depending into the centrifugal machine, a mixture of dry steam and oxygenated water (6-vol. strength) is injected to remove the traces of sulphurous acid not removed with the molasses. After five minutes of this treatment the crystals become remarkably white and completely transparent, indicating their purity.—L. J. de W.

Sugar Cane, Sorghum, and other Plants; Extraction of Sugar from the ——. H. Geerligs and R. Hamakers. Fr. Pat. 315,177, Oct. 19, 1901.

THE process consists in the systematic exhaustion of pressed bagasse in a series of closed vessels, heated with steam coils, by gradually weaker juice and finally with water. The process has nothing in common with diffusion, as that method cannot work without a considerable dilution of the juice.—L. J. de W.

Depulping Sieve for the Clarification of Liquids [Sugar Juices] containing Solid Matters in Suspension. E. Fourey. Fr. Pat. 315,296, Oct. 24, 1901.

THE apparatus for removing entrained pulp from sugar juices or other liquids consists of a series of perforated tubes, closed at their upper extremities, and branched at the lower extremity from the supply pipe, each tube being surrounded by a sieve drum of perforated sheet metal, and the whole enclosed in a cylindrical envelope as receiver, with an easily removable cover.—L. J. de W.

Crude Sugar Juices; Defecation of ——. M. Kowalski and S. Kozakowski. Fr. Pat. 316,039, Nov. 18, 1901.

DIFFUSION is carried out in the presence of the ammoniacal liquors obtained during the manufacture, after which such of the non-saccharine matters as are precipitable in the cold are removed by the addition of the proper quantity of lime, this being previously determined on a small amount of the juice. The juice is then defecated hot in presence of rather more than the amount of lime necessary to precipitate the non-saccharine matter.—T. H. P.

Carbonation, Sulphitation, &c.; Vessels for ——. B. Joly. Fr. Pat. 316,054, Nov. 19, 1901.

APPARATUS is described for producing an intimate mixture of liquids with lime or other matter in suspension, and for breaking up such a mixture and keeping it in continual movement while subjected to the action of a gas such as carbon dioxide.—T. H. P.

Saccharine Juices; Treatment of ——, *with Sulphurous Acid.* J. M. Lehmkuhl. Fr. Pat. 316,289, Nov. 27, 1901.

IN order to avoid the loss of time required for the titration of the acidity of the juice during the treatment with sulphurous acid, the exact weight of sulphurous acid required by the juice is calculated once for all and the total quantity so found is added all at once, either in the gaseous state or in solution by the aid of a suitable meter.—J. F. B.

Elevator Buckets; Openwork ——. C. J. Bandet. Fr. Pat. 316,324, Dec. 4, 1901.

ELEVATOR or transporter buckets with large open spaces, especially suitable for the conveyance of substances from which liquid is required to be drained, such as diffusion chips or pulps, are constructed of bars of half-round iron so as to form a grating of the shape of a bucket, through which the liquid can drain with greater ease than in the case of an ordinary perforated iron bucket.—J. F. B.

Sugar Cubes and the like; Process for Removing the Dust from the Faces of ——. F. Scheibler. Fr. Pat. 316,560, Dec. 4, 1901.

The process for removing the sugar dust from the faces of cubes, &c., cut from blocks or sticks, consists in suitably moistening the cut faces in order to melt the powder and then letting them dry.—J. F. B.

United States Patent.

Sugar; Apparatus for Purging ——. G. Desaulles, France. U.S. Pat. 701,687, June 3, 1902.

Molasses is separated from raw sugar, syrup from masse-cuite, or mother-liquors from crystals generally, by suction. The apparatus comprises a shallow vacuum pan, rotating on a fixed, hollow, central column; and having on its upper surface, near the rim, a circular channel, the latter provided with a flat perforated bottom, and so communicating with the interior of the pan. The channel is open to the air above, and over it is arranged a fixed feed-hopper which distributes the raw sugar, &c., in a layer over the perforated floor of the channel, as the pan rotates. Attached to the rear of the hopper is a curved scraper, reaching close down to the perforated surface, and so arranged that the sugar, having travelled round the circle with the pan, is banked up and so brought within reach of a screw conveyer and removed to a receiver placed alongside the apparatus.—H. T. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast Washing by the Ordinary Method and by Levigation. — Luff. Zeits. Ges. Brauw., **25**, [23], 346—348.

Washing in the ordinary manner, for 30 hours, the water being renewed four times and kept cool by floating ice, gave the following results:—

The greater portion of the glutin bodies are removed, and the colour of the yeast is lightened. A considerable diminution is effected in the relative proportion of dead cells, *i.e.*, one to 21 instead of one to 12. The percentage of ash is increased by the absorption of mineral matters from the water. Thus, one grm. of dry yeast distributed in 500 cc. of water gave 27 cells per unit of the counting chamber, before washing, but only 19 cells after washing. In the former case, the ash content was 8·35 per cent., but was increased, by washing, to 8·72 per cent. The percentage of bacteria was diminished, but not entirely suppressed. When soft water was used for washing, the above-mentioned absorption of mineral matter did not occur, and experiments have shown that the employment of such water leads to the gradual degeneration of the yeast.

In washing by levigation with the Hugenmueller apparatus, the flow of water should be regulated so as to cause a small cloud of yeast cells to appear in the centre of the upper surface of the water, the cells then travelling towards the periphery with an undulating motion. The results obtained by an hour's treatment in this machine are comparable with those furnished by 30 hours' washing, except that the colour of the yeast is better and paler. The yeast is not weakened in the least by levigation for an hour, but if the operation be prolonged, the commencement of fermentation may be retarded. When washing is a regular practice, however, the time may be further shortened, the yeast being already lighter in colour.

The loss of yeast in the washing process is about 10 per cent. of the initial quantity taken. The extraction of hop resins by the levigation method does not, so far as small experiments have shown, injure the keeping properties of the yeast, or render it an easier prey to bacterial infection. When the levigated yeast cannot be immediately used for pitching, it should be pressed and stored in a cool place, but it is preferable to postpone levigation until just before pitching, up to which time the yeast may be kept in water, though not longer than 48 hours.—C. S.

Grape Musts; Bouquet of Wines obtained by the Fermentation of Sterile ——. A. Rosenstiehl. Comptes Rend., 1902, **134**, [23], 1378—1380.

The author has been engaged in studying each year the action of yeasts of diverse origins on the same grape must, and the action of a single yeast upon musts from various vine stocks.

From previous experiments it was concluded that various yeasts in the same must developed the same bouquet in varying intensities, *i.e.*, that the nature of the bouquet depended upon the vine-stock and its intensity upon the yeast. Further experiments on the large scale, in which two portions of the same must (Beaujolais) were fermented with two different yeasts (Pinot and Gamay), have shown that the yeast does introduce a little of its original bouquet to the wine. In both cases a bouquet was imparted to the wine, which was preserved far better in bottle than in cask, but in the case of the Pinot yeast the result was a wine of rather a hybrid nature.

The author concludes that some yeasts do not confine themselves simply to fermenting the sugar, but act also upon an autophorous substance not yet isolated, which is contained only in high-class vine-stocks, and which is doubtless different in each case. This substance exists equally in the grapes ripened in less favourable situations, and in those from the choice districts, and it is capable, to a certain extent, of withstanding the attack of mildew. What characterises the "climate" of the high-class vineyards is less the quality of the grapes harvested there than that of the yeast which grows spontaneously on the grapes.

—J. F. B.

Wine; Action of Sulphurous Acid upon the Oxydase and upon the Colouring Matter of Red ——. A. Bouffard. Comptes Rend., 1902, **134**, [23], 1380—1383.

The author has studied the manner in which sulphurous acid acts as a preservative of the colouring matter of red wines against the attack of the oxydase or "casse" ferment. A wine was employed which was decolorised after 24 hours exposure owing to the presence of this oxydase; it was treated with sulphurous acid in two proportions, 0·025 and 0·05 grm. per litre. After 20 days the residual free sulphurous acid was determined and found to be 0·0012 and 0·01 grm. respectively. The oxydase precipitated from these samples by alcohol was then found to be completely inactive and incapable of bringing about "casse" in wines naturally free from oxydase or in which the oxydase had been destroyed by heat. The oxydase precipitated from the untreated wine, on the other hand, was intensely active when added to other wines; consequently, the sulphurous acid had had a specific destructive action upon the "casse" oxydase. When fresh quantities of oxydase were added to the treated wines, the wine which had received the smaller dose of sulphurous acid was decolorised, but that which still retained 0·01 grm. per litre of free sulphurous acid was perfectly resistant.

All red wines, even though naturally free from oxydase or freed from it by heating, undergo gradual decolorisation by prolonged aëration; this is a perfectly normal state, not involving the disastrous results which ensue from the rapid oxidation and precipitation by the "casse" ferment. The author found, however, that the greater avidity of sulphurous acid for atmospheric oxygen preserved the colouring matter for a very much longer period against the prolonged action of air. Sulphurous acid, therefore, in suitable proportions, acts as a perfect preservative of red wines from the objectionable action of the "casse" oxydase.—J. F. B.

Cider; Chemistry of ——. A. H. Allen. Analyst, 1902, **27**, [315], 183—192.

Apples suitable for the manufacture of cider are somewhat unpalatable, and contain more tannin than table apples but the best results are seldom to be got with one variety of apple only, a judicious blending being practised to obtain the most advantageous proportions of the various constituents.

There is, as yet, no systematic classification of all the various types of cider, apart from the district of origin and such terms as "sweet," "dry," "sparkling," &c. The proportion of sugar in cider may vary from 10 to 1 per cent., inversely as the alcohol, but the difficulty of classification is enhanced by the tendency for cider to undergo acetic as well as alcoholic fermentation. "Sweet" cider is only partly fermented, and the proportion of alcohol is generally insufficient to protect the liquid from further

change ; such ciders often contain added preservatives. A "dry" cider with more perfect fermentation is more stable, but its manufacture is difficult, and the demand is limited. In "sweet" cider the acid taste is more or less disguised by the sugar, but in "dry" cider it is apt to become too apparent. Analyses are recorded of typical apples. Many published results are misleading, owing to the failure to recognise the presence of considerable quantities of cane sugar. When the fruit becomes over-ripe and decayed, the proportion of cane sugar diminishes, and that of reducing sugars increases, as is shown by analyses of the sound and decayed portions of the same fruit. The pressed pulp or marc is of little value, owing to the high proportion of water (from 63 to 75 per cent). The author gives the results of several analyses of English apple musts and ciders, also of a few samples of perry, from various districts, quoting for comparison some published analyses of French ciders. The most usual sophistication of cider consists in the addition of water before or after fermentation, in some cases the pressed pulp is watered, and a second pressing is obtained. Salicylic acid does not appear to be used by the larger English manufacturers, but it is common in American ciders ; boric acid is said to be very frequently added. The author found small quantities of boric acid in perfectly pure ciders, and regards it as a normal constituent of apples and certain other fruits ; in one variety of cider apple 0·0076 per cent. of boric acid was found, and quinces contained half as much again (see also this Journal, 1902, 869). The dilution of cider with water is best detected by calculating the original solids of the must, *i.e.*, alcohol, per cent. by weight × 2·07 + acetic acid per cent. × 1·5 + extractive matter in the cider = the original solids. The original solids in unwatered ciders rarely fall below 12 per cent., an excessive quantity, on the other hand, indicates added sugar.—J. F. B.

Cider ; Employment of Yeasts from Sugar Canes for the Fermentation of ——. H. Alliot. Comptes Rend., 1902, **134**, [23], 1377—1378.

Attempts have long been made to effect the fermentation of apple musts by yeasts which will give a cider with a pleasant bouquet, a sweet taste, and perfect limpidity. To a certain extent good results have been obtained by means of selected yeasts from the finest apple districts, but these yeasts are too vigorous and easily lead to the complete attenuation of the cider with a loss of sweetness. The author has experimented with yeasts isolated from sugar canes from Réunion, by means of which brandies of fine bouquet can be prepared from ordinary sugar. These yeasts, being accustomed to work at high temperatures, might be expected to give in a cold climate a rather slow attenuation, which might be partially compensated by the selection of the most vigorous races. Quantities of the same apple juice were fermented comparatively with four different yeasts :—Yeast from the Auge valley apple crops ; yeast isolated from orange flowers ; wine yeast from Verzenay-Champagne, employed for making sparkling ciders ; yeast from sugar-canes.

The results showed that the yeast from sugar-canes gave a smaller attenuation than any of the others, and proved its suitability in every respect for the fermentation of sweet ciders.—J. F. B.

Brandies ; Coefficient of Impurity. A. Cardoss-Pereira. Bull. Soc. Chim., 1902, **27**, [11], 555—556.

Analyses of natural brandies, and of commercial alcohol, made in the Municipal Laboratory of Paris, gave the average coefficients of impurity 0·5184 and 0·0176 respectively. Girard and Cuniasse state that for wine-alcohol the coefficient is rarely below 0·3. Out of 27 samples of Portuguese brandy, nine, however, gave coefficients ranging from 0·2822 to 0·1483, and Roques (*Analyse des alcools et des eaux-de-vie*, Paris, p. 160) observed in an old sample of Armagnac brandy a coefficient as low as 0·1724. The Congrès de chimie appliquée (1900) agreed that a low coefficient should not by itself be considered proof of the addition of commercial alcohol to natural brandy.

—M. J. S.

Diastatic Power according to Lintner's Method ; Determination of ——. O. Mohr.

See under XXIII., *page* 931.

English Patents.

Roasted Malt Decoctions ; Process for Producing Tasteless ——. M. Weyermann, Bamberg, Bavaria. Eng. Pat. 6796, March 20, 1902.

The peculiar bitter flavour of the roasted malt extracts employed for colouring dark beers, is removed by the addition of charcoal of any kind to the coloured malt groats, or a mixture of coloured malt and kiln malt groats either before or after heating with water. The charcoal is preferably revivified by heating, immediately before use. —J. F. B.

Malt Kilns ; Impt. in ——. T. Haynes, jun., Radcliffe-on-Trent. Eng. Pat. 10,356, May 18, 1901.

In a malt kiln with a perforated malt-floor, an open fire is employed beneath a casing surrounding the fireplace, and a coiled flue leads upwards from the top of the casing. The casing constitutes a hot chamber, into the space around which air is admitted, and after being heated is caused to pass through the malt ; the products of combustion pass away through the coiled flue, imparting their heat to the current of air, but never themselves coming into contact with the malt.—J. F. B.

Malt, Hops, and the like ; Kiln or Apparatus for Drying ——. T. Larkin, East Jarrow. Eng. Pat. 12,797, June 24, 1901.

A chamber is provided to contain the material to be dried and an independent chamber to enclose the drying medium, *e.g.*, fires or gas jets ; pipes are disposed in the independent chamber through and by which air is forced and heated, and then directed through a perforated false bottom into the chamber containing the material to be dried, in such a way that the latter is preserved from any contamination or contact with the products of combustion.—J. F. B.

Yeast Extract ; Preparation of an Alimentary ——. M. Elb. Eng. Pat. 13,097, 1901.

See under XVIII. A., *page* 924.

United States Patents.

Pasteurizer [Beer]. W. J. Ruff, Illinois, U.S.A. U.S. Pat. 701,622, June 3, 1902.

Three rectangular U-tubes are fixed side by side within a framework, the limbs of the middle tube being continuous with the inner limbs of the two outside tubes. These U-tubes are filled with water, and an endless chain conveys the bottles of liquid to be sterilized right through them. The water in the limbs of the middle tube is maintained at a temperature sufficiently high to effect sterilization, by means of steam, which is admitted as required through a valve controlled by an automatic regulator. The water in the two outer tubes serves, respectively, to warm up and to cool down the bottles and their contents ; and to maintain the requisite temperatures in these tubes, a rotary pump is provided, which pumps hot water from the cooling tube to the heating tube, as required, the action of this pump also being controlled by an automatic regulator.—L. A.

XVIII.—FOODS ; SANITATION ; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Fluorides as Butter Preservatives and their Influence on Artificial Digestion. Otto and C. W. Hehner. Analyst, 1902, **27**, [315], 173—177.

The attention of the authors was drawn to samples of Brittany butter sold in London, which, contrary to custom, contained no, or very little, boric preservative. In some of these butters distinct evidence of the presence of soluble

fluorides was found by the glass-etching test. With the simultaneous presence of boric preservative, fluorides cannot conveniently be detected directly, owing to the formation under the influence of concentrated sulphuric acid of boron fluoride. It is desirable, therefore, to separate the borate; for this purpose the aqueous portion from 50 grms. of butter is treated with calcium chloride and heated to boiling, a slight excess of sodium carbonate being then added. The precipitate contains calcium borate, fluoride, carbonate and phosphate; it is filtered off, ignited and extracted with hot dilute acetic acid, which removes the carbonate, borate, and phosphate; the residue is then tested for fluoride in the usual way. Attempts to make the process quantitative, by weighing this residue before and after treatment with strong sulphuric acid, were somewhat vitiated by the incomplete extraction of the calcium phosphate; still, some indication of the quantity of fluoride could thus be obtained. The quantity of fluoride actually present in the butter would be 1—4 grs. per lb., corresponding to 0·16—0·46 per cent. in the aqueous portion. Twenty samples of butter preserved with fluorides were examined, 10 of which also contained boric preservative. Published records raise a strong presumption that quantities of fluorides such as those found would prove injurious to the animal organism; and the authors, as the result of a series of experiments, state that there can be no doubt that the employment of fluorides as preservatives for articles of food should be strongly discouraged.—J. F. B.

Boric Acid in Butter; Rapid Determination of ——. H. D. Richmond and J. B. P. Harrison.

See under XXIII., *page* 929.

English Patents.

Yeast Powder ——. H. Arzt, London, and E. Wilding, London. Eng. Pat. 12,099, June 13, 1901.

Farinaceous materials, such as well cooked and mashed potatoes are mixed with 2 or 3 per cent. of malt flour, or malt extract, allowed to stand for three to four hours at a temperature not exceeding 104° F., whereby a certain quantity of starch is converted into maltose, and the albuminous matter is peptonized by the lactic acid produced. After reducing the temperature to 60° F., an equal part of washed yeast is added, and a current of filtered air is forced through the mass from time to time during the fermentation, which usually lasts six or seven hours. The whole mass is then dried under reduced pressure.—W. P. S.

Yeast Extract; Preparation of an Alimentary ——. M. Elb, Dresden, Germany. Eng. Pat. 13,097, June 27, 1901.

Washed yeast is added in small quantities at a time to water which has a temperature between 60° and 70° C. The yeast cells are thereby killed without coagulating the albuminous matter contained in them. After filtering, the extract is concentrated under reduced pressure, to the consistency of a paste, which, it is stated, has no bitter taste.—W. P. S.

Fish Powder; Manufacture of ——. J. Schäfer, Bonn-on-the-Rhine, Germany. Eng. Pat. 12,335, June 17, 1901.

Fresh fish is cleaned, scaled, and steamed under a pressure of 18 lb. per sq. in. for about 30 minutes. The fish is cooled, disintegrated, and dried by using superheated steam. During the drying a stream of the vapour of amyl alcohol and benzene is conducted into the mass. The mass is now ground and extracted by boiling several times with a mixture of alcohol and citric acid (0·5 lb. of acid to 1 gallon of alcohol). The whole is then filtered and the residue washed with 60 per cent. alcohol, dried and finely powdered. An alternative process is to rinse the steamed fish with cold water, evaporate the liquid extract to a syrupy consistency, and, after treating with alcohol, to add it to the extracted fish residue, having previously washed the latter with alcohol and citric acid as above. The mixture is then washed with alcohol, dried and ground.—W. P. S.

Aerated Liquids or Beverages; Manufacture and Supply of ——. R. Wright, Bournemouth. Eng. Pat. 11,820, June 24, 1901.

The apparatus consists of a mixing chamber connected by pipes and valves with containers holding the water and compressed carbon dioxide supplies. The chamber is also in connection with vessels containing flavouring solutions. The arrangements are such that the aerating gas and the various other ingredients can be brought together in definite predetermined proportions, and the aerated liquid can be delivered at a regulated velocity and pressure.—W. P. S.

Milk; Process for Preserving ——. W. Helm, Berlin. Eng. Pat. 15,222, July 26, 1901.

The milk is first cooled down nearly to its freezing point before being placed in the churns, and is then partially and rapidly frozen in the latter by external refrigeration in order to prevent the separation of cream. When the milk is kept or carried, the ice formed gradually melts, and keeps the bulk of the milk cool.—W. P. S.

Sterilizing and Preserving Processes. H. H. Lake, London. From L. E. Seddon and L. D. Giroux, Brooklyn, N.Y., U.S.A. Eng. Pat. 8,301, April 9, 1902.

The perishable substance (*e.g.*, a joint of meat) is first covered with a coat of waxy material at a temperature which sterilises the surface. When the wax has solidified, a fibrous material is similarly applied. The material is then sterilised throughout by removing the protective coatings temporarily at two small patches on opposite sides, and applying electrodes through which a current from a dynamo is passed for a time.—W. G. M.

Sterilising and Preserving Apparatus; Electrical ——. H. H. Lake, London. From L. D. Giroux and L. E. Seddon, both of Brooklyn, N.Y., U.S.A. Eng. Pat. 7,851, April 3, 1902.

The liquid to be treated, is caused to circulate in an apparatus described and illustrated, in such wise, that throughout its course, it is exposed to the sterilising influence of a current of electricity of suitable strength.

—W. G. M.

United States Patent.

Biscuits [*Granular*]; *Method of Making Malted* —— J. Lambert, Michigan, U.S.A. U.S. Pat. 701,742, June 3, 1902.

One part of malt-flour is mixed with two parts of wheat-flour and made into a dough by adding water, salt "shortening" (nut-oil) and yeast. The dough is allowed to leaven, then shaped into long round loaves and baked. The baked loaves are cut into slices which are toasted, ground, and mixed with extract of malt, glucose, molasses, white of egg or similar substances. The mixture is then made into cakes or biscuits, and rebaked.—W. P. S.

French Patents.

Molasses; New Process for Manufacturing Alimentary Mixtures for Cattle Food with ——. La Soc. Sucrière Anonyme de Toury. Fr. Pat. 314,373, Sept. 20, 1901.

The straw or forage is bruised to loosen the fibre, or it is chopped very short, and treated with molasses in a mixer heated to 100° C. The mixture thus obtained is dried by passing through a horizontal cylinder against a current of hot air.—L. J. de W.

Food; Horse and Cattle —— from Molasses. L. Pilat and J. Grardel. Fr. Pat. 316,503, Dec. 3, 1901.

Finely powdered malt coombs or arachis shells mixed with molasses, with or without the addition of flour are proposed. Claim is also made for the method of converting the food into cakes by introducing the mixture into a mincing machine, the paste obtained being then compressed and cut up.—T. H. P.

(*B.*)—SANITATION; WATER PURIFICATION.

English Patents.

Sewage; Treatment of ——, including the Discharge from Factories and the like. A. J. Boult, London. From E. Vial, Brussels. Eng. Pat. 10,838, May 25, 1901.

To extract the coarser floating matter, a pivoted grating is used, provided with a shovel and gutter. When this is swung above the water, the sludge falls from the shovel and grating, and collects in the gutter. The liquid is discharged into the precipitating tank intermittently through a siphon, each discharge of which causes a tap to open and supply the requisite proportion of chemical solution. The sludge is concentrated in a cylindrical vessel, in which it is kept continually stirred and heated, whilst the water is drawn off by means of a pump connected with a chamber below a false bottom. Sludge which is too greasy to be then dried by revolution in a drum in direct contact with furnace gases, is mixed in a vat with more greasy matter, and dried by stirring it whilst heated gases are forced through. The greasy matter then drops into a closed box containing a double screw conveyor, by which it is thoroughly churned up with a volatile solvent to extract the grease, and the residue is used as manure.—L. A.

Disinfecting Apparatus for Drains, Sewers, and the like. J. Arnold, London. Eng. Pat. 11,508, June 5, 1901.

The apparatus consists of a vessel having two concentric compartments, so constructed that liquid (solution of sodium manganate) is caused to overflow from the inner compartment into a water seal, where it meets with liquid (dilute sulphuric acid), which drips from the outer compartment. Sewer gas has to escape through the seal, the overflow from which falls into the sewer.—L. A.

Water or other Liquids; Improved Apparatus for Supplying Reagents for Purifying ——. C. Schmidt, Vienna. Eng. Pat. 13,283, June 29, 1901.

The apparatus comprises troughs for the reagents (to be delivered in the dry state), provided with transport screws driven by a water wheel, which is set in motion by the water to be purified. The reagents fall through openings regulated by valves on to sloping plates upon which water is sprayed, which dissolves them, and washes them down into the mixing and settling vessels.—L. A.

Sewage or Water Filters and Apparatus connected therewith. S. H. Adams, Harrogate, and A. Creer, York. Eng. Pat. 13,832, July 8, 1901.

A circular filter bed is supplied with sewage through a revolving distributor constructed on the principle of a Barker's mill, having the arms so arranged at different levels that the minimum flow is delivered through those at the lower level, and an increased flow through those at the higher level.. The arms are adjustable at any angle, for the purpose of governing the speed of rotation. The filtering material takes the form of flat or arched tiles, so arranged as to give a zigzag, lateral, or spiral travel to the liquid to be treated.—L. A.

Waters; Process of, and Apparatus for Softening and Purifying Waste Liquors ——. C. J. Haines, Winchester. Eng. Pat. 19,125, Sept. 25, 1901.

The lime or other reagent is fed into the reagent tank, and the exact proportion of water required is introduced through a perforated cone fixed in the bottom of the tank, the water being measured by a small auxiliary pump geared to the engine that pumps the hard water. The reagent is discharged through a small bell-mouth pipe, fixed over the centre of a larger vertical pipe of the same shape which delivers the hard water into the mixing tank, and the mixed water flows under and over baffle plates fixed in a tank large enough to allow time for the completion of the reaction, and thence to filters constructed as described in Eng. Pat. 6272 of 1900.—L. A.

(*C.*)—DISINFECTANTS.

United States Patents.

Disinfectants; Process of Making ——. W. J. Kendrick, Montgomery, Alabama, and W. T. Kendrick, Administrator of G. W. Dixon, deceased. U. S. Pat. 701,352, June 3, 1902.

Ten lb. of chloride of lime are stirred with 12 galls. of water, and the clear solution is mixed with a hot solution of 16 lb. of sodium carbonate in 3 galls. of water. The clear liquid is decanted from the precipitate, and to every fluid ounce, ½ gr. of potassium permanganate, and 5 grs. of boric acid are added. After settling, the clear liquid is bottled for use.—L. A.

Disinfecting Device. L. E. Jones, Conshohocken, Penn., U.S.A. U.S. Pat. 701,485, June 3, 1902.

A flask with long neck, containing formaldehyde solution, is set in a tray containing sulphur, which, when ignited by means of wicks coiled in the sulphur, burns, and evaporates the formaldehyde. The neck of the flask must be long enough to extend beyond the sulphur flames.—L. A.

Disinfectant Powder; Process of Making ——. J. Rother, Katscher, Germany. U.S. Pat. 701,620, June 3, 1902.

A powder is produced from alsol, corrosive sublimate, sozoiodol-mercury and veratrine.—A. C. W.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Wood Pulp; Process of Forming into Sheets ——. J. S. Hughes, Nova Scotia. Eng. Pat. 7,141, March 24, 1902. (Under Internat. Convent., July 3, 1901).

See U.S. Pat. 691,771; this Journal 1902, 362.—J. F. B.

Shell, Ivory, and the like; Compound for use as a Substitute for ——. H. E. Franquet, Paris. Eng. Pat. 14,981, July 23, 1901.

See Fr. Pat. 312,846; this Journal, 1902, 134.—J. F. B.

United States Patents.

Paper; Treatment of Waste Material for Use in Manufacture of ——. R. Dietrich, Merseburg, Germany. U.S. Pat. 701,310, June 3, 1902.

Scraps and clippings of waste paper, rags, straw, &c., are conveyed by a suction conduit into a "cyclone" where they are moistened and fed into a suitable reducing apparatus for manufacture into pulp. Traps are fitted in the suction conduit to catch any heavy impurities, and the dust which is created by the suction is washed down with the materials so that the air discharged is free from inflammable particles. —J. F. B.

Paper of Variable Thickness. C. C. Jenks, Mass. U.S. Pat. 701,734, June 3, 1902.

Part of the pulpy mass of the paper material is displaced at a time when it is sufficiently soft to allow of a channel being formed therein, and the moisture is extracted from the channeled portion. The channeling is effected by rollers placed in front of the suction boxes. Sheets of this paper when cut down the centres of the channels permit the attachment of other sheets at the thin edges in book-binding without increasing the thickness of the whole.—J. F. B.

Pyroxylin Compound. J. Kitsee, Philadelphia, Pa., U.S.A. U.S. Pat. 701,357, June 3, 1902.

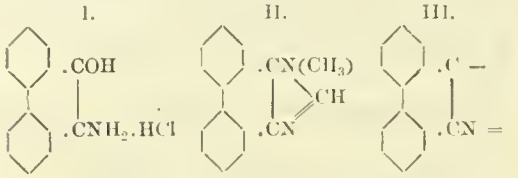
An amorphous cellulose compound is mixed with sulphur or sulphuryl chloride, &c., and cured or vulcanised with the aid of heat. The cellulose compound (celluloid, pyroxylin, &c.) is dissolved, mixed with flowers of sulphur, rolled, compressed, and heated to 150° to 250°. The proportion of sulphur may range from 2 to 10 per cent. according to requirements. The resulting substance may be used as an electric insulator.—W. G. M.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Morphine; Relation of the Chemical Constitution to the Action of ——. E. Vahlen. Arch. exp. Pathol. u. Pharmak., **47**, 368—410. Chem. Centr., 1902, **1**, [23], 1302.

The morphine molecule contains both a phenanthrene and an oxazine (morpholine) nucleus, and it is probable that the characteristic action of morphine is due to one of these nuclei. The author has succeeded in preparing a phenanthrene derivative, *morphigenine chloride* (I.), from which an imidazole derivative, *epiosine* (II.), can be obtained, which possesses a decided morphine action. He concludes that the pharmacological action of morphine is due to the presence of the atomic grouping III., which is present in the epiosice molecule.

I. II. III.



Morphigenine Chloride.—Five grms. of phenanthraquinone hydrazone were dissolved in 200 c.c. of boiling glacial acetic acid, 40 c.c. of an acid solution of stannous chloride (1 part of $SnCl_2$ in 3 parts of 38 per cent. HCl) added, and the mixture heated till decolorised. On cooling, the morphigenine chloride separated; it was washed with glacial acetic acid and chloroform. It forms colourless needles, which are coloured red by heating to 180° C., and do not melt at 290° C. It is easily soluble in boiling glacial acetic acid, and in hot concentrated hydrochloric acid, slightly soluble in cold glacial acetic and hydrochloric acids. It is decomposed by water, especially on warming; it is converted into phenanthraquinone by the action of alkalis. With zinc chloride and with concentrated sulphuric acid, morphigenine chloride gives products which in aqueous solution show distinct narcotic action.

Epiosine or N-methyldiphenylene-imidazole. 1 grm. of morphigenine chloride, 3 grms. of anhydrous sodium acetate, 12 c.c. of alcohol and 1·5 c.c. of a 30 per cent. aqueous solution of methylamine were heated for 2 hours in a pressure flask on the water bath. The reaction mixture was evaporated, extracted with chloroform, and the chloroform distilled off from the extract. The resinous residue was treated with hydrochloric acid, the base precipitated from the acid solution by soda, and then crystallised from alcohol. The base is identical with that prepared by Davison and Japp (Chem. News, **70**, 302) by heating together phenanthraquinone, methylamine and alcohol, but the melting point is 195° C., not 188° C. as stated by them. Epiosine exhibits a decided morphine action.—A. S.

Morphine; Oxidation of ——. *by the Juice of Russula delica, Fr.* J. Bougault. Comptes Rend., 1902, **134**, [23], 1361—1363.

The juice of *Russula delica* was prepared according to Bourquelot's directions by triturating equal parts of the fresh fungus, sand and glycerin, pressing and filtering the extract. One hundred c.c. of the juice were added to 50 c.c. of water containing 2 grms. of morphine hydrochloride. At the end of 24 hours the liquid had become cloudy owing to the formation of microscopic crystals, the deposition of which was complete after 3 or 4 days. The author has shown this product to be the hydrochloride of oxymorphine, and has proved its complete identity with the product of the oxidation of morphine by potassium ferricyanide in alkaline solution.—J. F. B.

Artemisin. Bertolo. Pharm. Centralh., **43**, 65. Pharm. J., 1902, **68**, [1667], 489.

Artemisin, $C_{15}H_{18}O_3$, has been isolated by Merck from the mother liquors of the preparation of santonin, $C_{15}H_{18}O_3$. It forms coloured columnar crystals, melting at 200° C., soluble in 3 parts of alcohol and in 60 parts of water. The crystals are coloured a deeper yellow by exposure to light than santonin. Artemisin has the optical rotation $[\alpha]_D = -84·3°$ in 10 per cent. alcoholic solution. It gives a carmine-red colour with aqueous or alcoholic soda solution. It forms a sodium salt on prolonged boiling with sodium carbonate, and yields an oxime with hydroxylamine and a hydrazone with phenylhydrazine. (See also this Journal, 1902, 136.)—A. S.

Rare Earth-Metals; Aromatic Bases as Precipitants for ——. Alice M. Jefferson.

See under XXIII., *page* 929.

Cinchona Bark; Determination of ——. Myttenaere.

See under XXIII., *page* 931.

English Patents.

Carbon Tetrachloride; Improved Manufacture of ——. A. E. Urbain, Ps, France. Eng. Pat. 13,733, July 5, 1901.

Anhydrous aluminium chloride, 2 parts, is added to 100 parts of dry carbon bisulphide, the mixture is boiled, cooled, and subjected to the action of a current of pure dry chlorine at 15° C., until the weight is 3·83 times the original. About 0·5 per cent. of powdered iron is added to transform the chlorosulphides into carbon tetrachloride and sulphur chloride; the former substance is then separated by distillation. The residual sulphur chloride, by the action of carbon bisulphide and 1 per cent. of powdered iron, then yields carbon tetrachloride and free sulphur, which remains dissolved in the excess of sulphur chloride, and separates on cooling: $CS_2 + 3S_2Cl_2 = CCl_4 + S_2Cl_2 + 6S$. These two operations may be combined by chlorinating carbon bisulphide, adding more carbon bisulphide, so that there is 1 mol. of CS_2 to 3 mols. of S_2Cl_2, then adding 2·5 per cent. of powdered iron, gently warming, and finally distilling and rectifying. The residual sulphur chloride is added in the next operation.—A. C. W.

Alginate; Manufacture of Alkaline ——. T. Ingham. Liverpool. Eng. Pat. 19,234, Sept. 26, 1901.

See U.S. Pat. 695,209; this Journal, 1902, 638.—A. C. W.

Morphine [*Codeïne, &c.*]; *Improved Process for Preparing Alkyl Ethers of* ——. F. Boehm, London. From E. Merck, Darmstadt, Germany. Eng. Pat. 14,366, July 15, 1901.

The process is claimed for the production of alkyl ethers of morphine, which consists in treating alkaline solutions of morphine with the ethers of benzene or naphthalene sulphonic acids.—A. C. W.

United States Patent.

Cinchona Alkaloid Carbonic Acids; Process of Making Alkyl Ethers of——. H. Thron, Frankfort-on-Main, Germany. U.S. Pat. 701, 523, June 3, 1902.

Alkyl esters of the cinchona alkaloid carbonic acids are prepared by heating the alkaloid with an alphyl ester of an alkylcarbonic acid. Thus, the ethyl ester of quinine carbonic acid is obtained by heating quinine with phenylethyl carbonate, dissolving the product in benzene, removing phenol by dilute ammonia, extracting the ethyl ester by a dilute acid, and precipitating by alkali. The product, $C_2H_5O.CO.OC_{20}H_{23}N_2O$, forms white needles, which melt at 95° C.—A. C. W.

XXI.—PHOTOGRAPHY.

Magnesium Flashlight; Velocity of Combustion and Chronophotography of the——. A. Londe. Comptes Rend., **134**, [22], 1301—1303.

The light from magnesium flashlights was allowed to fall on a moving sensitive plate through a slit carried by a vibrating tuning-fork, and thus the duration of the flash was measured. This duration was always much greater

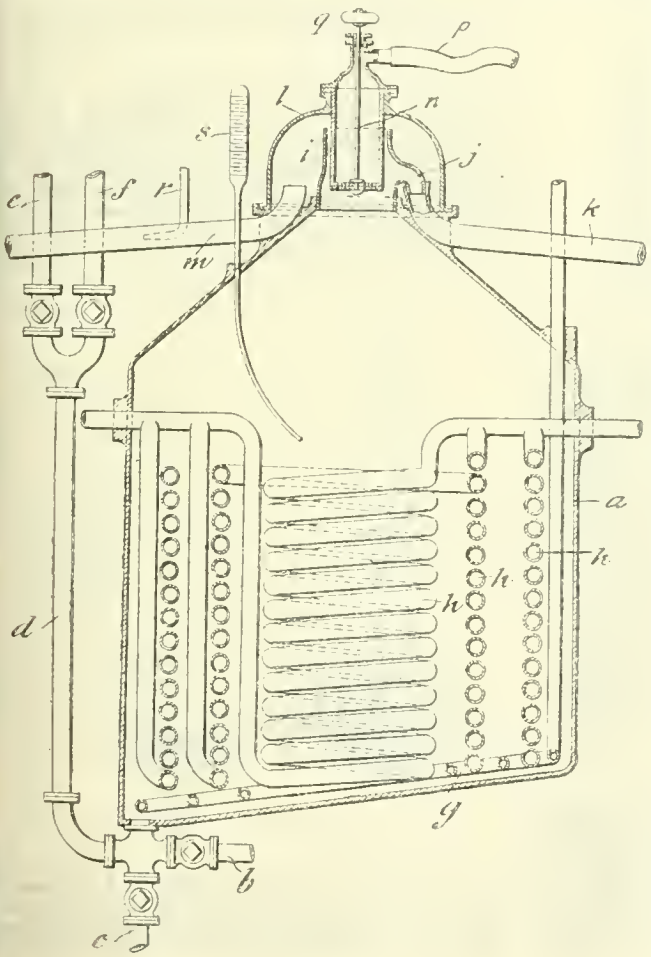
han had been supposed, lying as a rule between 1/8th and 1/15th of a second, being in some cases as much as 1/4th, and in only one, out of many examined, as little as 1/30th of a second. The duration depends on the mode of inflammation; electric fusion of a platinum wire, or explosion of a pellet of mercuric fulminate causes the most rapid combustion, while simple ignition by a match causes more gradual combustion. The duration is proportional to the quantity of powder burnt; and the powder in a heap burns more rapidly than when in an elongated cartridge. Chronophotography of the light showed that the actinic power rapidly reaches a maximum (2/100ths to 3/100ths second after inflammation), which it maintains for an appreciable time (5/100ths to 6/100ths second), and then gradually diminishes to extinction. The actinic power at the maximum is quite sufficient to allow of instantaneous photographs being taken.—J. T. D.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Nitroglycerin; Apparatus for the Manufacture of ——. F. L. Nathan, J. M. Thomson, and W. Rintoul, of Waltham Abbey. Eng. Pat. 15,983, Aug. 8, 1901.

This is so arranged that the nitration of the glycerin, the separation of the nitroglycerin produced, as well as the operation of "after-separating," are carried out in one vessel. The nitrating acid is introduced into the nitrating vessel by opening the cock of the pipe *e*. The glycerin is run in by introducing *n*, and opening the valve at its bottom, the contents being agitated by air blown through the perforations of the pipe *g*. When nitration is completed and the temperature has fallen, *n* is removed. The nitroglycerin as it separates from the acids is raised by introducing by the pipe *f* waste acid from a previous charge, the displaced nitroglycerin flowing by *j*, and the pipe *k* to the pre-washing tank. The acids may be run off by *b* to an after-separating vessel, or the nitrating vessel itself may be used for this purpose, the nitroglycerin being displaced with waste acid as it rises to the top, or skimmed off in the usual way. Cold water circulates through the coils *h*, whilst acid fumes are carried away through *m* assisted by the injector *r*. The pipe *c* leads to the drowning tank.



—G. W. McD.

Explosive Materials; Process for Producing Easily Ignitible ——. C. Dattenhofer, Hamburg. Eng. Pat. 8776, April 15, 1902.

In such materials charges of powder which have been gelatinised by the aid of ether-alcohol, acetone or other solvents, and shaped by pressing, are put into hot water or some other hot fluid, steam, hot air or the like. The mass swells up owing to the rapid volatilisation of the solvent, and the resulting forms are of voluminous extent and extreme tenuity.—G. W. McD.

Torch and Rocket; A Combined Marine ——. W. J. Underwood, Chiswick. Eng. Pat. 13,355, July 1, 1901.

Combination in a single casing of a floating marine torch, with self-projecting arrangement, such as rocket-composition, whereby the torch may be projected without the aid of a piece of ordnance, and then act as a floating torch. The tube consists essentially of three parts. The lower contains rocket composition, the products of combustion passing through holes having raised edges on one side. Thus the rocket is given a spinning motion. The next chamber contains calcium carbide, and the tube is here perforated to allow access of water. Acetylene passes up a central passage to the burners, which are put in action by calcium phosphide, contained in the upper part of the tube.

—G. W. McD.

Evaporating, Distilling, or Aërating Liquids or the like; Appliances for ——. A. Hollings and G. Bell. Eng. Pat. 12,286, 1901.

See under I., *page* 904.

United States Patents.

Gunpowder; Smokeless ——. C. O. Lundholm, Stevenston, Scotland. U.S. Pat. 701,591, June 3, 1901.

Diamyl phthalate is added, with or without "mineral jelly," to nitroglycerin and nitrocellulose, the following proportions being recommended:—Nitroglycerin, 30; nitrocellulose, 60; diamyl phthalate, 10 (or diamyl phthalate, 5; and "mineral jelly," 5.)

—W. G. M.

Powder; Smokeless ——, *and Method of Compounding same.* J. A. Denton and J. H. Preus, both of Johnston City, Tennessee, U.S.A. U.S. Pat. 701,802, June 3, 1902.

Potassium chlorate is ground and mixed with boiled linseed oil, and is then incorporated with sufficient wheat-flour and water to bring the mass to a dough-like consistency, when, after thorough mixing, it is dried and crushed or ground in order to granulate the product.—W. G. M.

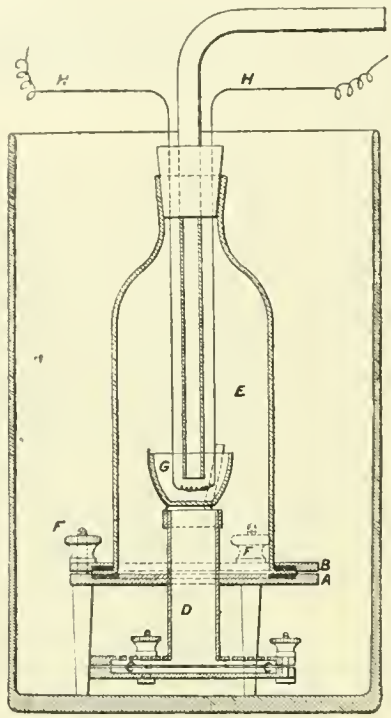
XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Fuel Calorimeter; A Simple Form of ——. C. R. Darling. Engineering, June 20, 1902, 801.

The apparatus is shown in vertical section in the accompanying figure. The thin-

welded brass tube, D, about 1 in. in diameter, passes through the centre of the circular brass plate A, supported on three brass legs, and is continued to the chamber C, which is composed of two flat brass plates screwed together, the upper plate being hollowed out and perforated with numerous fine holes. A glass cover, E, furnished with a ground flange at one end and terminating in a neck at the other end, rests with its flange on a rubber ring placed in the recess on the plate A. It is held in position by means of the brass ring B, which is screwed down on to the flange by means of the milled nuts F, F. A second rubber ring is placed between B and the glass flange, and a perfectly air-tight joint can be secured without danger of cracking the glass. The upper part of the tube D terminates in three flexible brass tongues, which



serve to hold the porcelain or platinum crucible G. The neck of the glass cover is fitted with a rubber stopper through which the thick copper wires H, H, are passed; these are connected in the crucible with a piece of thin platinum or iron wire so as to form an electric ignition. Through the centre of the stopper passes the oxygen delivery tube, of glass or metal, which reaches to the level of the rim of the crucible and is preferably widened at the extremity. The total height of the apparatus is 7 in. The combustion is carried out in the usual manner. The escaping hot gases from the crucible are compelled to pass down the tube D into the chamber C, from which they escape in extremely small bubbles, which rise and rest for a time on the under surface of A; this arrangement insures that all the heat carried over from the combustion chamber by the gases is imparted to the water before the bubbles reach the surface. The results are calculated as follows:—

$$\frac{\text{(Weight of water + water equivalent of apparatus) × rise in temperature.}}{\text{Weight of fuel taken.}} = \text{calorific power.}$$

Coal which burns with a smoky flame should be previously mixed with about half its weight of dry kaolin or calcined alumina. Liquid fuels are mixed to a stiff paste with dry kaolin or calcined alumina. It is stated that with the outer vessel made of glass, the results obtained are constant and far more correct than those obtained with Thompson's apparatus, whilst if a copper calorimeter and shield be used and a thermometer graduated in $\frac{1}{20}$° F., the results compare favourably with those obtained by means of the expensive Mahler calorimeter.—A. S.

INORGANIC—QUALITATIVE.

Ozone; A New Reagent for the Detection of ——. G. W. Chlopin. Zeits. Unters. Nahr.- u. Genussm., 1902, **5**, [11], 504–505.

Strips of filter-paper, dipped in a moderately concentrated alcoholic solution of "Ursol D" (Act.-Ges. f. Anilinfabr., Berlin), and dried, when moistened with water are coloured blue in the presence of ozone. Hydrogen peroxide has no action on the test-paper, whilst nitrous fumes, chlorine, and bromine turn the paper greenish-blue, soon changing to yellow.—W. P. S.

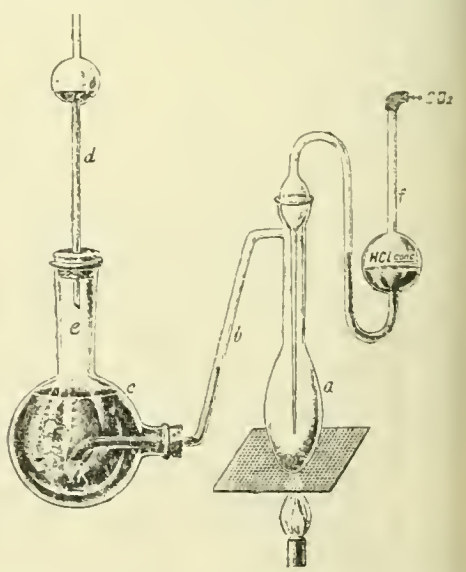
Cobalt; New Qualitative Test for ——. J. L. Dauziger. J. Amer. Chem. Soc., 1902, **24**, [6], 578—580.

The author describes a new test by means of which one part of cobalt in 500,000 parts of water can be detected, provided the solution is colourless or but slightly coloured. To about 5 c.c. of the solution rendered acid with hydrochloric acid, solid ammonium thio-acetate, CH_3COSNH_4, is added, then a few drops of stannous chloride solution (to reduce any iron present), and an equal volume of amyl alcohol, or a mixture of acetone and ether, or of alcohol and ether. The mixture is well shaken and allowed to separate. In presence of cobalt, the upper layer will be coloured a more or less intense blue. The blue colour appears to be due to the formation of the double cobalt ammonium thioacetate, $(CH_3COS)_2Co.2CH_3COSNH_4$.—A. S.

INORGANIC—QUANTITATIVE.

Chlorine; Simple Apparatus for the Determination of ——, *by Titration.* R. Marc. Chem.-Zeit., 1902, **26**, [49], 556.

Bunsen's apparatus for the determination of chlorine suffers from two disadvantages. Great care is required to prevent sucking back, and with some substances a loss of chlorine occurs before the parts of the apparatus can be connected, after adding the hydrochloric acid. The apparatus devised by the author is free from these objections. The substance under examination is placed in the conical flask *a*, and the tubulated flask *c* is filled nearly up to the neck with potassium iodide solution; the pipette *d*



also is filled up to one-third the height of the bulb with potassium iodide solution, and is closed with the finger or with a cork. The necessary quantity of concentrated hydrochloric acid is placed in *f*, which is connected with a supply

carbon dioxide. The flask *a* is gently warmed and the acid iven over by a stream of dry carbon dioxide. When the ıole of the acid is in the flask *a*, the upper end of the pette is opened, and the current of carbon dioxide is so ɣulated that it balances the evolution of chlorine. When e decomposition is complete, the pipette is withdrawn, the ceiver emptied, and the contents titrated. To be quite e from objection, the pipette should be connected to the ceiver by means of a ground joint, but the amount of lorine which is not absorbed in the receiver itself is so all, and it is so greatly diluted with carbon dioxide, that influence on the rubber stopper is not noticeable.—A. S.

pper; Note on the Volumetric Determination of ——. . W. Parr. J. Amer. Chem. Soc., 1902, **24**, [6], 580.

the determination of copper by the titration of cuprous ocyanate with permanganate first in the alkaline and then the acid condition (this Journal, 1900, 1148), the end ction is sometimes unsatisfactory, owing to the incom- te oxidation of the cuprous hydroxide by the permanate. This difficulty is overcome by the following dification. The washed precipitate of cuprous ocyanate and the asbestos pulp are treated with 10 c.c. a 10 per cent. solution of caustic potash and 10 c.c. of monia (sp. gr. 0·96) and then immediately titrated with permanganate until, upon warming (to 45°—55° C.), green colour of the supernatant liquid remains. A ht excess (about $\frac{1}{3}$ or $\frac{1}{4}$ of the amount already used) of manganate is now added, the mixture allowed to stand five minutes, acidified with 25 c.c. of sulphuric acid (one acid to one or two of water) and titrated to a pink oration with permanganate. The end reaction is sharp . the results are concordant.—A. S.

timony, Tin, Copper, and Small Quantities of Iron and ead; Separation of ——. Pontio. J. Pharm. Chim., 902, **15**, [12], 577—579.

E grms. of material are dissolved in excess of hydro- oric acid and a few drops of nitric acid (sp. gr. 1·33) and t solution made up to one litre. 100 c.c. of this solution g evaporated to about 5 c.c. and boiled with 50 c.c. of ic acid (sp. gr. 1·33) till all red fumes have disappeared. veral grms. of potassium chlorate are added and the ture boiled for 20 minutes. The solution is made up 100 c.c. and the oxides of tin and antimony are filtered washed with hot water strongly acidulated with nitric , dried, ignited, and weighed. The oxides are then med with dilute hydrochloric acid (3:1) and a piece of tinfoil added; after complete disappearance of the es, the precipitated antimony is washed on a tared filter boiling water and then with alcohol, dried at 110° C., weighed. The filtrate containing the lead, copper, and is evaporated to dryness, the residue dissolved in e hydrochloric acid, and a hot concentrated solution odium sulphide added. The precipitated sulphides filtered, washed with a hot solution of sodium sulphide, dissolved on the filter with nitric acid. The broken is then washed with hot water and nitric acid till all es of sulphur have disappeared. The resulting solution iled till all the sulphur is dissolved and evaporated to ess with sulphuric acid. The residue of lead sulphate ashed with water and alcohol and weighed. The filtrate aining copper and iron is evaporated to one-third its me and the copper precipitated electrolytically, the iron g precipitated from the solution with ammonia. The may also be estimated as oxide after two precipitations ammonia, the copper being afterwards precipitated the filtrate with metallic zinc, after evaporating excess nmonia and acidulating with hydrochloric acid.

—B. F. D.

Slag; Determination of Total Phosphoric Acid ——. C. Asohman. Bull. Assoc. Belge des Chim., , [3], 140—142.

reagents employed are: (1) nitro-sulphuric acid ion, consisting of 420 grms. of nitric acid (sp. gr. 1·2), 50 grms. of concentrated sulphuric acid, diluted to make tres; (2) citric acid solution, 500 grms. of the crystalline acid per litre; (3) magnesia mixture, 110 grms. of crystalline magnesium chloride, 140 grms. of ammonium chloride, 700 c.c. of ammonia, sp. gr. 0·967 (8 per cent.), and 1300 c.c. of water—filtered after a few days.

Five grms. of substance are placed in a half litre flask, which is filled up to the mark with the nitro-sulphuric acid, and shaken in a rotating frame for 30—40 minutes, at a speed of 40—50 revolutions per minute. Fifty c.c. of the filtered solution are treated with 10 c.c. of the citric acid solution, and ammonia is carefully added until the liquid is alkaline to litmus paper. When cool, the liquid is shaken for half an hour, in a mechanical agitator, with 20 c.c. of the magnesia mixture, and afterwards left for 1—2 hours before filtering.

Should the liquid turn black on neutralisation with ammonia, or during agitation, or furnish a flocculent turbidity due to silica, the method cannot be used; this, however, is a comparatively rare occurrence.—C. S.

Boric Acid in Butter; Rapid Determination of ——. H. D. Richmond and J. B. P. Harrison. Analyst, 1902, **27**, [315], 179—181.

Twenty-five grms. of butter are heated, with stirring, with 25 c.c. of a solution containing 6 grms. of milk sugar and 4 c.c. of normal sulphuric acid per 100 c.c. until the fat is just melted. The aqueous portion is allowed to settle for a few minutes and 20 c.c. are withdrawn; a few drops of phenolphthalein are added, the solution is brought to the boil and titrated with semi-normal caustic soda until a faint pink colour just appears; 12 c.c. of glycerin are then added and the mixture is again titrated to a pink reaction. The difference between the two titrations, less the quantity of alkali required by 12 c.c. of glycerin, multiplied by 0·0368, will give the quantity of boric acid contained in 20 c.c., and this multiplied by $\frac{100 + \text{percentage of water}}{20}$ will give the percentage of boric acid in the butter.—J. F. B.

Rare Earth Metals; Aromatic Bases as Precipitants for ——. Alice M. Jefferson, J. Amer. Chem. Soc., 1902, **24**, [6], 540—562.

The experiments were made with salts of zirconium, thorium, cerium, lanthanum, neodymium, and praseodymium; whilst the aromatic bases used were aniline, *o*-toluidine, xylidine, dimethylaniline, diethylaniline, benzylamine, pyridine, piperidine, quinoline, and phenylhydrazine. It was found that zirconium is precipitated quantitatively by nearly all of the bases. Thorium is precipitated by aniline, *o*-toluidine, xylidine, diethylaniline, dimethylaniline, piperidine, pyridine, and quinoline. Aniline, *o*-toluidine, diethylaniline, benzylamine, pyridine, and piperidine are the only precipitants of cerium, whilst with lanthanum, neodymium, and praseodymium, the precipitants are benzylamine and piperidine.

Thorium and zirconium can be separated from neodymium, and also thorium from lanthanum by means of quinoline. Thorium and zirconium can be separated from lanthanum, and thorium from praseodymium by means of aniline. Cerium can be separated from praseodymium by means of *o*-toluidine, and zirconium from lanthanum and praseodymium by means of xylidine.—A. S.

ORGANIC—QUALITATIVE.

Oil of Turpentine; The Acetic Acid Test for ——. P. W. Squire and C. M. Caines. Pharm. J., 1902, **68**, [1668], 512.

According to the B.P., oil of turpentine is soluble in its own volume of glacial acetic acid, and F. H. Alcock in 1899 suggested this as a delicate test for the strength of glacial acetic acid. In view of the variable results which have been obtained, the authors made a series of experiments with eight different samples of oil of turpentine, and with glacial acetic acid at 4 strengths, 98·3, 98·9, 99·5, and 100 per cent. respectively. They found that the 99·5 and 100 per cent. acids gave a clear solution with all the samples of turpentine, the 98·9 per cent. acid was clear with some samples and turbid with others, and the 98·3 per cent. acid separated in nearly every case.—A. S.

Thiophen; New Colour Reaction of ——. H. Kreis. Chem.-Zeit., 1902, **26**, [47], 523.

If a very dilute solution of thalline (tetrahydro-*p*-hydroxyquinoline methyl ether) in ordinary benzene be shaken with nitric acid of sp. gr. 1·4, the acid becomes coloured intensely violet. Benzene which has been freed from thiophen does not give the reaction. This reaction is extremely delicate; for example, it is still perceptible if thiophen and thalline be dissolved in light petroleum spirit, in the proportion of 1:100,000 and the solution agitated with 2 per cent. by volume of nitric acid (sp. gr. 1·4). The violet coloration is not permanent; it changes gradually to reddish and finally to yellow. It is immediately destroyed on addition of water. Toluene containing methyl thiophen also gives a colour reaction when tested in this manner, the colour produced being a pure blue. The colour reaction may be used for the detection of the smallest quantities of thalline.—A. S.

ORGANIC—QUANTITATIVE.

Indigo on Vat-dyed Fibres; Determination of ——. A. Binz and F. Rung. Zeits. angew. Chem., **15**, [23], 557.

Previous analyses of indigo (pure) B.A.S.F. by the acetic acid extraction method have given apparently accurate results. The authors now find on determining the percentage composition of the extract (by sulphonation and titration with hydrosulphite) that a considerable loss of indigo occurs which can only be explained by the destructive action of boiling glacial acetic acid. It is not known whether chemically pure indigo is affected by hot acetic acid, but in the presence of the extract of wool fibre, an actual loss occurs, consequently the value of this method of estimation needs experimental proof. With dyed fabrics the average error is one-tenth per cent. of the weight of the fibre; for comparative purposes the method is workable.

—W. H. B.

Iodine Monochloride; The Use of ——. [*in Iodine Absorptions*]. J. J. A. Wijs. Zeits. Unters. Nahr.- u. Genussm., 1902, **5**, [11], 497—504.

The solution used for the determination of the iodine values of fats and oils, and consisting of iodine monochloride dissolved in glacial acetic acid, keeps well provided that the purest acetic acid is used. The solution diminishes in strength after a time if the acid contain iodine trichloride, water, or traces of alcohol. The loss of strength which ordinary Hübl's solution undergoes on keeping, is chiefly due to the presence of water and aldehydes in the alcohol used for preparing the solution. By boiling the solution under a reflux condenser, considerable loss takes place, showing that temperature also has an influence on the solution. In using Hübl's solution, the time of action of the reagent on the oil should not be excessive, as reverse actions take place, and too low results are obtained. The iodine values obtained by the use of iodine monochloride agree with the theoretical figures in unsaturated fatty acids having one double linking.—W. P. S.

Rosin; Determination of ——, *in Fats, Oils, Soap, Paraffin, &c.* Holde and Marcusson. Mitt. techn. Versuchsanst. zu Berlin, 1902, **20**, [1], 40—49.

The three sources of error in Twitchell's method (this Journal, 1891, 804), are, (1) that part of the fatty acids may escape esterification; (2) that the colophony may contain a large proportion of unsaponifiable matter; and, (3) that resinous constituents are soluble in the acid liquid.

These drawbacks are overcome in the following method:—In the case of fats and soaps about 5 grms. of the sample are boiled for 30 minutes under a reflux condenser with 50 c.c. of alcoholic potassium hydroxide, the soap solution evaporated to dryness, and the residue dissolved in water. The fatty acids are liberated by the addition of hydrochloric acid, and dissolved in ether, the solution neutralised, concentrated to 25 c.c., acidified with hydrochloric acid, and thoroughly extracted with ether, the united extracts being evaporated.

The residue is dissolved in 50 c.c. of absolute alcohol, and saturated with dry hydrochloric acid gas at about + 10° C. the action being continued for 1 to 2 hours, after which the flask is left for 30 minutes, and its contents then boiled for 15 minutes under a reflux condenser. After cooling, the liquid is shaken in a separating funnel first with 100 c.c. and then with successive portions of 50 c.c. of ether, until no more colouring matter is extracted. The aqueous liquid is then neutralised, and the extraction repeated with several portions of 25 c.c. of ether.

The united ethereal extracts are shaken with about 50 c.c. of alcoholic alkali (10 grms. of KOH; 10 grms. of alcohol 100 c.c. of water), and the brown intermediate layer (containing a large proportion of rosin soaps) poured off with the alkali layer. The ethereal layer is thoroughly washed with water, extracted twice more with 10 c.c. of alkali solution, and again washed with water until the washings are colourless. The united alkaline aqueous extracts are shaken with 50 c.c. of ether, and the ethereal extract in turn shaken with 5 c.c. of the alcoholic alkali, this final extract being added to the main body of alkaline aqueous extracts, which are then acidified and extracted with successive portions of 50 c.c. of ether. Finally the acid liquid is neutralised, concentrated by evaporation as far as possible, and again acidified and extracted with ether. The united ethereal extracts are washed with 20 c.c. of water and evaporated, and the residue dried on the water-bath and weighed.

From 0·4 to 0·6 grm. of the impure resin acids thus obtained is dissolved in 20 c.c. of 95 per cent. alcohol in a stoppered graduated cylinder, and the solution rendered just alkaline to phenolphthalein. The cylinder is heated for a short time in the water-bath, then left to cool, and the solution made up to 100 c.c. with ether, and shaken with 1 grm. of dry powdered silver nitrate for 15 to 20 minutes. When the precipitate of silver salts of the fatty acids has subsided, 70 c.c. of the clear supernatant liquid are transferred to a second graduated cylinder, and shaken with 20 c.c. of dilute hydrochloric acid (1 : 2). The ethereal solution of resin acids is withdrawn, and the aqueous layer extracted twice with 20 c.c. of ether.

The ethereal extracts are united, washed with 20 c.c. water, and filtered into a flask, where the bulk of the ether is evaporated. The residue (about 10 c.c.) is transferred to a weighed basin, evaporated, and dried for a short time at 110°—115° C. The weight of the residue is then calculated upon the amount of substance originally taken, a mean correction of 0·4 per cent. being made for the slight amount of fatty acids still present.

When the amount of resin acids found is less than 20 per cent., a correction of + 8 per cent. on their quantity is made for the unsaponifiable matter. Or the proportion of unsaponifiable matter may be determined directly in the ethereal solution of the esters.

Determination of Rosin in Fats and Soaps, in the presence of Unsaponifiable Oils.—A portion of the sample sufficient to yield about 5 grms. of fatty acids is saponified, after the addition of benzene (free from thiophen). The unsaponifiable matter is then separated by the method prescribed by Spitz and Hönig, and the residual solution of fatty and resin acids treated as described above, the mean value of 8 per cent. being added to the resin acids for the unsaponifiable matter in the rosin.

Determination of Rosin in Ceresin and Paraffin.—The rosin is extracted by means of boiling 70 per cent. alcohol, the united cold extracts filtered and evaporated, and the residue dried at 110°—115° C., and weighed.—C. A. M.

Starch; Determination of ——. O. Lietz. Ber. Deut. pharm. Ges., **12**, 153—166. Chem. Centr., 1902, [24], 1339.

The author states that the methods in use at the present time for the determination of starch leave something to be desired in the case of substances rich in albumin and starch. He proposes the following method:—

(*a.*) If the substance does not contain much cellulose, as with the albumin preparations, roborate, energin, aleuronate, &c., 2—10 grms. (according to the content of starch) are heated for about 20 minutes in a flask fitted with a

flux condenser, with 75 c.c. of a 5 per cent. solution of otash in 90 per cent. alcohol. The contents of the flask e cooled slightly and filtered by aid of the pump through layer of asbestos resting on a perforated plate. The sidue is washed with hot 70 per cent. alcohol, then re-rned together with the asbestos to the flask, the funnel sed into the flask with hot water and the liquid made up 200 c.c. Twenty c.c. of hydrochloric acid are then added d the starch inverted by heating on the water-bath for hours. The solution is then rapidly cooled, nearly utralised with potash, made up to 300 c.c., and the xtrose determined in 25 c.c. by Allihn's method.

(*b.*) If the substance contain cellulose in larger quantities fficient to cause errors, owing to the action of the acid ring inversion, then, when the residue and the asbestos ve been returned to the flask, 30—60 c.c. of a 3—5 per nt. aqueous solution of potash are added and the whole ated on the water-bath till the greater part has dissolved. he liquid is then made up to 400 c.c., filtered through a dded filter, 200 c.c. of the filtrate neutralised with hydro-loric acid and inverted by heating for 2½ hours with a rther 20 c.c. of acid. The dextrose is then determined as fore in 25 or 50 c.c. of the solution.

The method cannot be recommended for substances ry rich in cellulose, such as distillers' residues, brewers' ins, &c.—A. S.

iastatic Power, according to Lintner's Method; Determination of ——. O. Mohr. Woch. f. Brau., 1902, **19**, [23], 313.

is well known that certain substances, which may nor-lly be present in malt in varying proportions, such as paragine, lactic acid, carbonic acid, &c., exert a remark-le stimulating influence on diastatic action. Under some cumstances the presence of these substances may increase quantity of sugar, produced in a given time by a given ntity of diastase, as much as tenfold. The author has estigated the question whether the presence of such lies has any effect on the results obtained in the deter-nation of the diastatic power of a malt extract by ntner's method. Two series of determinations were made each case, one at ordinary temperatures and one at her temperatures; the following results are calculated the basis of the diastatic power of the plain malt extract he lower temperature taken as 100:—

——		D.P. at 17°—18° C.	D.P. at 35°—35° C.
	Per Cent.		
aragine, added to the	0·0	100	300
arch solution	0·1	100	1,000
	0·000	100	300
tic acid added to the	0·001	105	340
arch solution	0·002	125	500
	0·005	80	..
	0·01	67	100
n, in air		100	300
n, in atmosphere of CO_2		100	450

lence it is concluded that, although these substances rt a powerful influence when saccharification is con-ted at higher temperatures, their presence as found ler normal conditions in malt will introduce no appre-ble errors in estimations of diastatic power, provided the perature of saccharification be kept at 17°—18° C.

—J. F. B.

nchona Bark; Testing of ——. Myttenaere. Rép. de Pharm., 1902, 218.

EN grms. of the finely-powdered bark are shaken for e hours with 140 c.c. of chloroform and 10 c.c. of monia solution, then 3 grms. of powdered gum traga-th and 20 c.c. of water added, and the whole well ated and allowed to settle. 100 c.c. of the chloroform tion are filtered off, the solvent evaporated, the residue d on the water-bath, redissolved in a little chloroform treated with 15 c.c. of decinormal hydrochloric acid. chloroform is run off, and the excess of acid titrated with alkali. The number of c.c. of acid used, multiplied by 0·0309, represents the weight in grms. of alkaloids in 5 grms. of the bark.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Volcanic Dust; Analysis of ——, *in St. Vincent.* Colonial Office Report, June 1902.

The following are the results of a mineralogical examination of the volcanic dust made by Dr. Longfield Smith, in the Government Laboratory (Barbadoes), dispatched to the Colonial Secretary, Mr. Chamberlain, and received June 18th:—

The particles from 0·5 to 0·35 mm. diameter are composed of volcanic glass occluding much gas, and containing small crystals of felspar, and brown flakes probably of ferric oxide. The gas occlusions are, in many instances, so numerous as to render the particles quite opaque.

The particles of 0·35 to 0·2 mm. diameter are composed partly of similar volcanic glass, and partly of crystals of felspar.

The particles finer than 0·1 mm. are chiefly composed of the comminuted crystal fragments of felspar and augite.

A comparison of this volcanic dust with a sample obtained from the laboratory museum of that which fell in 1812 shows a striking difference between the two. The dust of 1812 is composed of much finer particles, and these are almost wholly volcanic glass.

This points to the eruption of 1902 being of a much more violent nature than that of 1812. It is very rare to find so many mineral particles in volcanic dust scattered so far from the seat of eruption. These are generally sifted out by the wind from the lighter particles of glass. The fact that particles of magnetite, a mineral of sp. gr. 5·5 to 6·5 of over 0·1 mm. diameter, should be found in the dust over 90 miles from the seat of explosion is significant of the prodigious height to which the particles must have been ejected.

Analysis of the Volcanic Dust of 7th May 1902.—The complete material contained in 100 parts:—Moisture, 0·190; loss on ignition, 0·060; alumina, 21·648; titanium oxide, 1·000; iron oxide, 6·372; lime, 10·000; magnesia, 4·716; soda, 3·551; potash, 0·675; phosphoric anhydride, 0·141; sulphuric anhydride, 0·124; silica (by difference), 51·523; total, 100·000.

Of the above the following percentages were soluble in hydrochloric acid:—Alumina, titanium oxide, 12·460; ferric oxide, 2·890; ferrous oxide, 1·630; lime, 5·940; magnesia, 0·778; soda, 1·155; potash (soluble in 1 per cent. citric acid solution, 0·028), 0·085; phosphoric anhydride (soluble in 1 per cent. citric acid solution, 0·022), 0·038; sulphuric anhydride, 0·124; silica, 0·108.

Analysis of Volcanic Dust from Barbadoes Island, gathered May 12th, 1902.

	Per Cent.
Loss on heating	0·50
Silica, SiO_2	53·00
Ferrous oxide, FeO	4·45
Ferric oxide, Fe_2O_3	2·95
Alumina, Al_2O_3	20·75
Lime, CaO	10·00
Magnesia, MgO	3·50
Potassium oxide, K_2O	1·10
Sodium oxide, Na_2O	3·10
Phosphoric acid, P_2O_5	traces
	99·35

Mount Pelée; Ashes from the Eruptions of ——, *in* 1851 *and* 1902. A. Lacroix. Comptes Rend., **134**, [22], 1327—1329.

The ashes from the recent eruption consisted partly of volcanic glass, partly of various crystalline minerals which the author separated by the aid of acetylene tetrabromide, and identified. The results of their analysis are given below in column *a*, along with those of the analysis

of ashes from the 1851 eruption in column *b*, and, for comparison, those of the analysis of a hypersthenic *andesite* from Mount Shasta, California, in column *c* :—

	a.	*b.*	*c.*
SiO_2	59·49	60·15	62·00
TiO_2	0·30	0·39	0·17
Al_2O_3	18·51	18·31	17·84
Fe_2O_3	0·77	2·79	4·40
FeO	4·59	3·33	
MgO	2·45	2·88	2·64
CaO	6·87	5·75	5·37
Na_2O	3·77	3·11	4·29
K_2O	0·86	1·61	1·47
Loss on ignition	3·12	3·00	1·66
P_2O_5	..	..	0·29
	100·64	101·32	100·13

The analyses show that the products of the two eruptions are very similar, and that they differ little from the hypersthenic *andesite* of Mount Shasta. They are much less acid than the ashes from Santorin (1866) and Krakatoa, (which contained 68 per cent. of silica), and are richer in alkalis, poorer in alumina, lime, and magnesia. The volcanic glass is compact and uniform, nearly free from bubbles and from felspathic *microlites*, but contains many opaque globulites and occasional crystals of hypersthene. It is in no sense a glassy pumice, like that from Krakatoa and from Santorin.—J. T. D.

Colloidal Mercury and some other Colloidal Metals; Electrical Preparation of ——. J. Billitzer. Ber., 1902, **35**, [11], 1929—1935.

Colloidal mercury is formed on the electrolysis of very dilute solutions of mercurous nitrate, when platinum, zinc, iron, lead, or nickel electrodes are used. Other things being equal, the formation of the colloidal metal is favoured by the use of large electrodes. Similar phenomena are exhibited, although in a smaller degree, by solutions of silver salts. Pure colloidal mercury is obtained by subjecting to Bredig's disintegration process (this Journal, 1899, 50, 281) amalgams or mercury precipitates on metallic gauze, which is not itself disintegrated. In this way also, the author has disintegrated metals, such as copper, nickel, iron, zinc, and lead, which, up to the present, either have not been disintegrated by Bredig's method, or have not been prepared in the colloidal condition. These disintegration phenomena are favoured and in most cases only rendered possible by the use of metals having loose texture and rough surface; good results are obtained with electrodeposited metals.—A. S.

Copper Oxide; Ammoniacal —— [*Cuprammonium*]. Bouzat. Comptes Rend., **134**, [22], 1310—1312.

The ammoniacal solution of cupric hydroxide in excess of ammonia, allowed to stand over sulphuric acid till a precipitate begins to appear, has the composition expressed by CuO 25 NH_3. The author has made calorimetric measurements on the neutralisation by acids of the solution CuO 28 NH_3, and concludes that the base is formed from copper oxide and ammonia with slight evolution of heat, and that, when formed, it is a strong base, much stronger than ammonia.—J. T. D.

Carbonylferrocyanides; Action of Light on ——. G. Wyss. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [5], 2—3.

When a solution of potassium carbonylferrocyanide is exposed to light, various reactions take place according to the conditions which obtain. The simplest reaction occurs in the presence of alkalis; in contact with air, carbon monoxide is evolved and potassium ferrocyanide and ferric oxide are formed. A neutral solution, on exposure, gradually turns green and then blue, depositing a complex potassium iron cyanide, which alkalis decompose into ferric hydrate and potassium ferrocyanide. The action of light in this case diminishes as the quantity of insoluble cyanide produced increases, and it ceases before the whole of the carbonylferrocyanide has been decomposed.

Paper coloured with ferric carbonylferrocyanide chang in colour from purple to blue, on its being placed in dire sunlight.

The sensitiveness to light of carbonylferrocyanides h also been observed by H. Danert.—E. B.

Calcium Carbide and Acetylene; Some Reactions of —— O. Sandmann. Zeits. angew. Chem., 1902, **15**, [22], 54

If dry pure acetylene be saturated with the vapour of soo halogen derivative of a hydrocarbon, and the mixtu heated to a temperature of 300° C. or upwards; or if t halogen derivative in a state of vapour be led over calciu carbide raised to a similar temperature, a total decompos tion takes place, all the carbon being liberated in the fr state, the halogen combining with either hydrogen or met and sometimes free hydrogen being also produced. Typic reactions are :—

$$CCl_4 + 2C_2H_2 = 5C + 4HCl;$$
$$3CaC_2 + 2CHCl_3 = 8C + 3CaCl_2 + 2H.$$

Identical decompositions occur between carbon bisulphi and acetylene or carbide; sulphuretted hydrogen, calciu monosulphide, or calcium pentasulphide being formed a cording to circumstances. (See also this Journal, 190 545.)

Calcium carbide and potassium thiocyanate melt together in molecular proportions yield calcium monos phide, potassium cyanide, and free carbon, but the reacti is not quantitative; if the thiocyanate is in large exce calcium pentasulphide is produced. Between potassiu thiocyanate and acetylene—the former being used as solution dried down on wood charcoal—the reaction is mu as already described by Conroy, Heslop, and Shores (t Journal, 1901, 322).—F. H. L.

Educational.

SCHOLARSHIPS.

The Institution of Mining and Metallurgy.

At a meeting of the council of this institution, held June 17, it was decided to offer scholarships in mining metallurgy to the following colleges:—The Royal Sch of Mines, two scholarships of 50*l.* each; King's Coll (London), 50*l.*; the Camborne School of Mines (Co wall), 50*l.*; and the Durham College of Science (Ne castle-on-Tyne), 50*l.* These scholarships will be offe annually for three years. In addition to other work the advancement of technical education in mining a metallurgy, the institution has submitted to the Board f Education a comprehensive scheme for affording practi experience in workshops throughout the kingdom to min and metallurgical students, and it is expected shortly to put in force.

New Books.

First Book of Qualitative Chemistry. For Stud of Water Solution and Mass Action. By Albert Prescott, Ph.D., and Eugene C. Sullivan, Ph.D. of the University of Michigan. Eleventh edition, entir re-written. D. van Nostrand Company, 23, Murray, a 27, Warren Streets, New York. 1902. Price, 1.50 dr.

8vo-volume, containing table of contents, preface, d text filling 142 pages, followed by the alphabetical in x of subjects. This little work on Qualitative Analysis treated in three sections: I. Introductory, with gen al definitions, &c., including a section on "Electrolytic s sociation," one on "Equilibrium between Substances th a Common Ion," and a third on "Hydrolysis"; II. the Metals; and III. The Non-Metals. It is stated in the preface that the main purpose in preparing this ed n has been "to enable the beginner to deal with chem change in the light of present studies of water solu on and of mass action."

Grande Industrie Chimique Minérale. Soufre, Azote, Phosphates, Alun. Par E. Sorel, Ancien Ingénieur des Manufactures de l'État. C. Naud, Editeur, , rue Racine 3, Paris. 1902. Price, 14 frs.

s volume, 8vo size, contains introduction, 800 pages of ject-matter, and the table of contents. There are 113 strations. The work is divided into four sections, ling with the four main subjects:—I. Sulphur; II. rogen; III. Phosphates; and IV. Alums. These four ions are subdivided as follows:—I. Chemical Pro- TS Derived from Sulphur or Metallic Sulphides: Brimstone. (*b*) Carbon Bisulphide. (*c*) Sulphurous d, Sulphites, and Thiosulphates. (*d*) Sulphuric Acid, II. Nitrogen Compounds: (*a*) Nitrates and Nitrites 'otassium and Sodium. (*b*) Nitric Acid. (*c*) Ammonia Ammonium Salts. (*d*) Cyanogen Compounds. III. OSPHATES IN REFERENCE TO INDUSTRY AND AGRICUL- E (seven chapters). IV. Alums, Aluminium Sul- TE, Sulphates. Appendix, in which the following ects are treated:—Synthetic production of Solid or ning Sulphuric Acid. Purification of Chamber Acid. aration of Nitric Acid by Valentiner's Process. Coke ns with recovery of Tar Products and Ammonia.

Trade Report.

I.—GENERAL.

Trade of Bordeaux (France) in 1901.

Foreign Office Annual Series, No. 2817.

xports.—The pure oils exported were: olive oil, 44 cwts., as against 7,742 cwts., in 1900; and earth- oil, 16,632 cwts., as against 16,023 cwts., in 1900.

here was a falling-off all round in exports of resin and entine. Prices ruled high, and forest owners were tant to fell whilst there was a prospect of getting high es for resinous products.

nder chemical products, the principal items exported w: chestnut and other vegetable tannin extracts, 503 cwts., as against 72,000 cwts., in 1900; oxide of zinc, 1 cwts., as against 131 cwts.; crystallised acetate of er, 828 cwts., as against 536 cwts.; glycerin, 2,620 , as against 357 cwts.; raw tartar, 1,146 cwts., as ist 2,516 cwts.; and cream of tartar, 41,166 cwts., as ist 35,587 cwts.

mmon soap is the principal item under perfumery with wts., as against 234 cwts., in 1900.

hite porcelain is the only item of importance under ry and porcelain, with 65,854 cwts., as against 56,612 , in 1900. This article comes from the Havilland ries at Limoges.

nder the heading of prepared hides, the only items of were 2,129 cwts. of tanned goat and sheep skins, as st 4,150 cwts.; other, 587 cwts., as against 1,073 cwts.; d calf skins, natural colour, 540 cwts., as against wts.; and tinted or dyed dressed calf skins, 1,676 cwts., ainst 842 cwts., in 1900.

manganese ore was exported in 1901, as it was all t up in France. There were, however, exported cwts. of iron pyrites, 2,146 cwts. of copper ore, cwts. of lead ore, and 311 cwts. of zinc ore.

ports.—The principal items under fish oils were: oil, 61 cwts., as against 464 cwts.; cod-liver oil, wts., as against 627 cwts.; and other oil, 1,420 cwts., ainst 1,150 cwts., in 1900.

e amount of cotton oil imported was 12,820 cwts., ainst 9,948 cwts., in 1900.

e tons of chemical wood pulp were imported from nited Kingdom in 1901.

There was a large increase in the coal-tar imported, and there was, in addition, 23,864 cwts. of bitumen, as against 32,420 cwts., in 1900.

Whilst there was an increase in the total importation of chemicals of 232,384 cwts., there was a decrease in those from the United Kingdom of 31,047 cwts. The principal items were: bicarbonate of soda, 341 cwts., as against 72 cwts.; sal-ammoniac, raw, 6,326 cwts., as against 5,858 cwts.; refined, 416 cwts., as against 3,393 cwts.; superphosphate of lime, 1,938 cwts., as against 2,687 cwts.; chemical manure, 150,342 cwts., as against 112,188 cwts. in 1900, 166,910 cwts. in 1899, and 77,867 cwts. in 1898; creosote, 124,997 cwts., as against 124,079 cwts. in 1900, and 367,570 cwts. in 1899; sulphate of copper, 149,857 cwts., as against 217,839 cwts. in 1900, and 229,192 cwts. in 1899. The falling-off in the last item is, doubtless, due to the comparative freedom from disease of the vines during the last two years. Other items imported were: caustic soda, 237 cwts., as against 233 cwts.; oxide of lead, 199 cwts., as against 177 cwts.; carbonate of magnesia, 123 cwts., as against 34 cwts.; glycerin, 1,457 cwts., as against 1,170 cwts.; and sulphate of lime, 497 cwts., as against 716 cwts., in 1900.

The quantity of ground oil-paint imported rose to 430 cwts. (out of a total of 440 cwts.), as against 191 cwts. in 1900; 283 cwts. in 1899, and 751 cwts. in 1898. There was a falling off in coloured washes for wall papers, &c., the amount imported being 230 cwts., as against 445 cwts. in the previous year. The amount of writing and printers' ink imported was 32 cwts., as against 33 cwts. in 1900.

There was an increase in all toilet soaps, with the exception of transparent soap, of which only 11 cwts. were imported, as against 12 cwts. in 1900. Other toilet soaps figured for 108 cwts., as against 21 cwts. in 1900. The blacking imported amounted to 84 cwts. out of a total of 90 cwts.

The principal articles of pottery imported were: common earthenware, 5,600 cwts., as against 93,855 cwts.; varnished or enamelled pottery, 390 cwts., as against 503 cwts.; fine earthenware, 121 cwts., as against 107 cwts.; and porcelain, 64 cwts., as against 109 cwts. in 1900.

The principal kinds of paper imported were: fancy paper, 145 cwts., as against 33 cwts.; other writing paper, 2,608 cwts., as against 2,168 cwts.; paper hangings, 311 cwts., as against 351 cwts.; and cardboard, 189 cwts., as against 49 cwts. in 1900.

The chief items under prepared hides were tanned or dressed goat, sheep, or lamb skins, 180 cwts., as against 173 cwts.; other tanned or dressed skins, 129 cwts., as against 183 cwts. in 1900.

Trade of Baden.

Foreign Office Annual Series, No. 2816.

The chemical industry did not suffer so much as other branches in 1901. For coal-tar products there was a steady demand, notwithstanding that the colour factories, and also the acid manufacturers, were much troubled and impeded by the stagnation in the textile branches. A factory producing glycerin, ether, quinine, and other chemicals reports an active trade in the first half-year, but slackness later. Carbolic acid crystals declined considerably, whilst crude acid for disinfection was quite neglected. Superphosphate works are stated to be in continual difficulties, owing to foreign competition, whilst soda manufacturers fear the prospect of a reduction of duty.

There is great over-production in the manufacture of soap, and for the smaller soap-makers prospects are not encouraging.

The paper mills laboured also under very adverse conditions.

The large Franco-German glass factory, at Waldhof, reports that business in the Zollverein diminished so greatly, in 1901, that to keep the works employed, goods had to be placed at losing prices in Austria, Switzerland, and America.

The Portland cement factories also had a bad year; there was little or nothing doing in the building trade, exports fell off, and Germany appears likely to lose the American market altogether.

TRADE OF PERNAMBUCO (BRAZIL).

Foreign Office Annual Series, No. 2814.

Return of Exports of all Products from Pernambuco during the Year 1901.

	White Sugar and Refined.	Muscovado Sugar.	Centrifugal Sugar, 96° Polarisation.	Goat and Sheep Skins.	Rum, 21° Cartier.	Alcohol, 36° to 40° Cartier.	Cotton Seed.	Hides.	Carnauba Wax.	Valu
	Tons.	Tons.	Tons.	No.	Pipes.	Pipes.	Tons.	No.	Tons.	£
United Kingdom..	..	9,049	651	24,400	4	161	5,384	347	327	262,(
United States.....	..	73,176	16,940	1,763,600	..	..	2	3,154	234	845,(
Portugal.....	30	99	5	..	18	22	..	725	..	84,(
Native ports.....	51,358	23,603	230	10,800	12,620	8,015	97	474	1½	1,307,(
Other countries...	76	115	..	100,000	70	..	2,423	63,254	338½	39,(
Total.....	51,464	106,044	17,826	1,898,800	12,712	8,198	7,906	67,954	901	2,537,(

NOTE.—About 2,000 tons of castor seed, valued at 17,500*l.*, and 90 tons of Mangabeira rubber, valued at 13,500*l.*, have also been exported during the year.

Return of Exports of all Products from Pernambuco during the Year 1900.

	White Sugar.	Muscovado Sugar.	Centrifugal Sugar, 96° Polarisation.	Goat and Sheep Skins.	Rum, 21° Cartier.	Alcohol, 36° to 40° Cartier.	Cotton Seed.	Hides.	Carnauba Wax.	Valu
	Tons.	Tons.	Tons.	No.	Pipes.	Pipes.	Tons.	No.	Tons.	£
United Kingdom..	..	2,651	..	..	..	..	5,860	1,402	284	349,
United States.....	..	19,446	900	1,884,400	..	..	..	30,859	198	333,
Portugal.....	3	5	..	..	10	..	..	3,720	..	167,
Native ports.....	70,921	23,195	..	..	14,742	8,333	961	13	..	1,768,
Other countries...	454	..	..	92,800	454	86	..	99,262	348	68
Total.....	71,378	45,297	900	1,977,200	15,206	8,419	6,821	135,256	830	2,686,

III.—TAR PRODUCTS, PETROLEUM, Etc.

CARRIAGE OF NAPHTHA.

Bd. of Trade Notice, No. 25.

If naphtha be stowed in a cool part of the vessel, and in perfectly gas-tight iron drums with not less than 5 per cent. clearance in each drum, and the drums containing it be packed with sawdust in iron tanks similar to water tanks, the lids being carefully secured, no objection need be raised to its being carried under deck in steamships not carrying emigrants, provided the naphtha is stowed in a separate hold or compartment removed as far as possible from any hold or compartment containing explosives.

The requirements of section 446 of the Merchant Shipping Act, 1894, will, of course, have to be observed.

PITCH AND COAL-TAR AT LA ROCHELLE (FRANCE).

Foreign Office Annual Series, No. 2817.

Coal-tar pitch and coal-tar were imported from the United Kingdom, and pine pitch from Russia, to the extent of 4,972 tons, during 1901. The imports of pitch largely depend upon the demand for patent fuel, of which there is an important factory at La Rochelle, as well as one at La Pallice; a second one at La Rochelle will shortly be established, and a third at Rochefort.

CREOSOTE AT BAYONNE (FRANCE).

Foreign Office Annual Series, No. 2817.

The quantity of creosote imported direct from the United Kingdom did not exceed 150 tons, whilst about 1,000 tons were imported from Spain.

OILFIELDS IN TEXAS (UNITED STATES).

Times, June 28th.

Little attention has been paid to refining as an element in the new field. The oil contains sulphur, which it is desirable to remove before using it in large boilers or locomotives, or on board ships. In order to do this the Guffey Company has set up a small refinery, and another company has purchased from Dr. P. Dvorkovitz his patent for the separation of sulphur from the bulk. These processes are cheap, costing only about 5 cents per barrel. Among those who had been giving much attention to these he oils was Dr. Chauncey B. Forward, of Cleveland, O For several years he had been working independently the waste products of the Ohio oils, and for two or t years upon the heavy oils from Texas and Louisiana. had such faith in the future of the fields that he contir steadily to acquire lands in both these states long be the Beaumont discovery. The company hearing his a was the only one that seemed ready to take up the w of separating the oil into its constituent parts. A refi capable of handling 5,000 barrels per day is now u construction on land accessible from the sea, and only a 15 miles from Beaumont. A small refinery had bee operation in Cleveland, handling these oils on a comme scale. As this process carried the work far beyond laboratory experiments, upon which reliance has hereto been placed, a report of the average results of this test appropriately be published.

If we take 100 barrels of crude Texas oils at the w market price of 20 cents, and calculate labour, fuel, i operating expenses at the maximum cost, and the pri of the various products extracted at the minimum price following table gives the analyses, the number of gal s, the value of each product, and the value of the fini

	No. of Gallons.	Value per Gallon.	Value, Finished Product, 100 Barrels.	Value Gallon with it will Compet
		Cents.	Dols.	Cen
3 per cent. naphtha .	126	7	8.82	7
15 per cent. kerosine	630	6	37.80	6
21 per cent. intermediate and neutral.	882	4	33.28	4
17 per cent. machine oil.	714	12	85.68	1
18 per cent. heavy engine oil.	756	15	113.40	2
15 per cent. heavy cylinder.	630	30	189.00	3
10 per cent. asphalt (3,360 at 30 dols. per ton).	420	12	50.40	1
1 per cent. loss	42	..	..	.
100 per cent., total. 100 barrels.	4,200	..	518.38	.

uct, and, for comparison, the value per gallon of each le as now drawn from other sources.
owever interesting such figures may be in their relations he Texas fields, the refining element still remains a ll one.

VII.—ACIDS, ALKALIS, SALTS, Etc.

ARBONATE OF SODA AND SULPHATE OF COPPER AT LEGHORN (ITALY).

Foreign Office Annual Series, No. 2809.

here is again an increase in the import of carbonate of a, 95,450 cwts., as against 69,819 cwts. in 1900. The entage coming from British sources, however, remains ionary as compared with 1900, and has declined from per cent. in 1898. The continued development of the nufacture of Italian piece-goods is likely to call for a tinued increase in the consumption of carbonate of soda; ery few articles of import is the proportion from British rces so low, and it would seem as if home manufacturers ht to be able to secure a larger share of the business.
he business in sulphate of copper during 1901 proved atisfactory, owing to speculation. Some importers sold speculators before the demand from the country districts begun, and most of them found that they had bought price on which there was no chance of their making rofit. Great discontent prevails, but the remedy would ear to be a return to the steadier methods of a few s ago. The quantity of sulphate of copper imported inues to increase, and, in spite of competition, the ish-made article appears to be returning into the favour joyed a few years ago.

BORATE OF LIME IN PERU.

Foreign Office Annual Series, No. 2807.

future, the output of borate of lime will be lessened iderably, in consequence of a lawsuit about boundaries. h the present owners, the Borax Consolidated Company, , have with the Government. Moreover, the recent in price in European markets also influences the essful working of these deposits.

ORATE OF MANGANESE: U.S. CUSTOMS DECISION.

Eng. and Mining J., June 7, 1902.

rate of manganese is dutiable as a borate material not rwise provided for, at the rates prescribed, according to percentage of anhydrous boric acid contained in the rial, under the provisions of par. 11, Act of July 1897, and not as a chemical compound under the isions of par. 3 of the said Act.

ULPHUR AND SULPHATE OF COPPER AT BORDEAUX (FRANCE).

Foreign Office Annual Series, No. 2817.

ere were only about 1,000 tons of brimstone imported g 1901. This was in consequence of the splitting up e French Syndicate with enormous stocks of ground ur existing, which were thus thrown upon the market, which the small demand was not able to clear away. situation at the end of 1901 was bad, and it will take a or even two, before it once more becomes normal.
e total importation of sulphate of copper, in 1901, ed 8,400 tons, and came mostly from the United dom. It was nearly all consumed during the season, no stock worth mentioning remained on hand. The rstanding which has existed for some years among rincipal British manufacturers was carried on until st, when it came to a natural end in consequence of eavy competition created by the United States and by manufacturers, both British and foreign, who did not the ring. Thus, prices, high at the opening of the n, could not be maintained, and gradually dwindled without resistance, so that the dealers and retailers in e had once more a most unprofitable and disheartening to deal with. The vineyard owners, already much tried by bad vintages in the past, and difficulty in selling their wines at the present time, continue to use sulphate of copper, but in as small quantities as possible, so that they do not encourage speculation and render trade in this line dull.

ARSENIC IN THE UNITED STATES.

Eng. and Mining J., June 7, 1902.

In *Mineral Resources* of the United States, 1901, it is stated that among the new industries that have been recently developed in the United States is the manufacture of arsenious oxide. This manufacture was taken up during 1901 by the Puget Sound Reduction Co., at Seattle, Wash., and an output of 300 short tons was placed on the market. The imports of arsenic into the United States during the last five years have averaged about 340,000 dols. per annum.

IX.—BUILDING MATERIALS, Etc.

CEMENT IN POLAND (RUSSIA).

Foreign Office Annual Series, No. 2810.

The demand for cement was considerably smaller in 1901 than in 1900, owing to the complete standstill in Government works, Government being the chief consumer of cement. The nine cement works in Poland, with a producing power of 1,300,000 barrels of 160 kilos. each, sold only 560,000 barrels or 43 per cent.; owing to the syndicate, the price was maintained at 3 roubles per barrel, but this price barely sufficed to cover expenses, so that the balance sheets of the cement works do not show any profit. Very little foreign cement is imported into Poland, but owing to the over-production in the whole Empire a petition has been presented by the owners of works to still further raise the duty on imported cement. It is doubtful whether the request will meet with the approval of the authorities as regards cement imported by the land frontiers, but it is expected that the duty on cement imported by sea will be increased, which would shut out British cement, of which a certain quantity is still imported.

PUMICE STONE AT LEGHORN (ITALY).

Foreign Office Annual Series, No. 2809.

The pumice stone industry, of which Leghorn was once the flourishing centre, continues to decline rapidly. The export, in 1901, was only 537 tons, as compared with 862 tons in 1900, and 1,447 tons in 1897. It is impossible any longer for Leghorn to compete with the article ground upon the spot where it is found, *i.e.*, the Lipari Islands, and manufacturers here cannot work at a profit. It would almost seem as if the industry must cease altogether at no distant date.

KAOLIN AT LA ROCHELLE (FRANCE).

Foreign Office Annual Series, No. 2817.

There is a considerable importation of kaolin from the United Kingdom for the porcelain manufacture at Limoges, 428 tons being imported in 1901.

X.—METALLURGY.

CYANIDE POISONING.

Chem. and Druggist, June 28, 1902.

The Victorian Department of Mines has issued instructions as to the method of treating a case of potassium-cyanide poisoning. The antidote recommended is freshly made ferric hydrate, prepared from ferrous sulphate, sodium hydrate, and magnesium oxide, and instructions are given to have ready (*a*) a hermetically sealed bottle containing 7½ grms. of ferrous sulphate in 30 c.c. of water, (*b*) a hermetically sealed bottle containing 1½ grm. of caustic soda dissolved in 300 c.c. of water, and (*c*) a tube containing 2 grms. of magnesia. The two solutions are mixed in the tin vessel in which the antidote is packed, and the powder added. The whole mixture is administered to the patient, and the stomach afterwards well washed out.

Asbestos, Monazite, Fluorspar, &c., in the United States.

Eng. and Mining J., May 31, 1902.

According to an advance statement issued by the United States Geological Survey, the production of asbestos in the United States, in 1901, amounted to 747 short tons, valued at 13,498 dols., as compared with 1,054 tons, valued at 16,310 dols., in 1900.

There is an increase of nearly 100 per cent. in the value of the asbestos imported, principally from Canada. The total value of the asbestos imported into the United States in 1901 was 691,828 dols., which was nearly double the value of the imports for 1900, amounting to 355,951 dols.

The monazite industry of the United States has been revived in North Carolina by German manufacturers, who wish to obtain deposits of the mineral.

Monazite has been produced chiefly in North Carolina, with a smaller amount in South Carolina, and the product amounted, in 1901, to 748,736 lb., valued at 59,262 dols., as compared with 908,000 lb., valued at 48,805 dols., in 1900. This is an increase of 10,457 dols. in the value of the monazite produced, but a decrease of 159,264 lb. in the production of the sand.

The following table shows the quantity and value of monazite mined in the United States from 1897 to 1901 :—

—	Quantity.	Value.
	Lb.	Dols.
1897	44,000	1,980
1898	250,776	13,542
1899	1350,000	20,000
1900	908,000	48,805
1901	748,736	59,262

Owing to the discovery and development of fluorspar deposits in Kentucky, in 1898, the production of this mineral in the last three years has shown considerable increase, the output, in 1901, amounting to 19,586 tons (of 2,000 lb.), as against 18,450 tons, in 1900, 15,900 tons, in 1899, and 7,675 tons, in 1898. The value of the product, in 1901, was 113,803 dols., which was an increase of nearly 20,000 dols. over 1900, and nearly double that of 1898. Previous to 1898, nearly all of the fluorspar obtained in the United States was from Rosiclaire, Ill.

The production of marketable tungsten ore, in 1901, amounted to 179 tons, which was concentrated from 1,221 short tons of crude ore. The concentrates sold in 1901 varied from 60 to 70 per cent. of tungstic acid contents, and sold at an average price of 154·86 dols. per ton, the total value being 27,720 dols. The lowest price reported was 102 dols., whilst 333 dols. is reported as the highest price paid for high-grade concentrates.

The production of molybdenum in the United States, in 1901, did not exceed 15 tons, which varied in price from 10 cents to 1·10 dols. per lb. The principal ore is molybdenite, a sulphide of molybdenum, and it usually occurs disseminated through crystalline rocks. It has been observed in California, Washington, Montana, Utah, Arizona, New Mexico, and Alaska.

There has been some demand for uranium and vanadium for experimental work in ascertaining what beneficial properties they may impart to steel; thus far no practical results have been obtained, but experiments are still being made. The minerals containing these two metals are uranite, gummite, and carnotite. The latter contains a considerable percentage of vanadium, and is the ore chiefly used for the two metals. Vanadium also occurs as vanadinite, a vanadate of lead. The occurrences of all these minerals which have been reported are in the Rocky Mountain States. The production in 1901 amounted to 375 tons, principally from Colorado.

Lead Bounties in British Columbia.

U.S. Cons. Reps., June 9, 1902.

Resolutions recently adopted by the Rossland Board of Trade urge the Canadian Government to grant a bounty of 10 dols. per ton for the first year on the product of a lead refinery; also an increase of the duties on pig lead, wh lead, red lead, and other manufactures of lead. Boards trade in other towns and cities in the lead-producing distr have adopted similar resolutions.

Aluminium in the United States

Eng. and Mining J., June 7, 1902.

The production of aluminium in the United Stat during 1901, amounted to 7,150,000 pounds. The Pittsbu Reduction Company remains still the sole producer aluminum in this country. The price of aluminum pound remained practically stationary throughout the ye although the demand for the metal increased. The to imports of all forms of aluminum, in 1901, were valued 109,718 dols., as compared with 50,444 dols., in 1900.

Zinc, Manganese, &c., Ores at Dunkirk (France

Foreign Office Annual Series, No. 2808.

The slackening of work in the metal industry, wh commenced at the end of 1900, continued during 19 Zinc ore, which is brought chiefly from Spain and It shows an increase. India supplies most of the m ganese ore, but in 1901, some 3,000 tons came from Rus It is stated that the Russian is not so good as the Ind ore. In pyrites, there was the large increase of 30,857 tc

Arsenic and Galena Mines in the Pyrenees.

U.S. Cons. Reps., June 5, 1902.

North of Barcelona, and some 9,000 ft. above the s level, is a mining property which covers a surface over 16,000 acres, or 6,500 hectares. Although iron is least important of the minerals to be found in that dist the ore contains 54 to 60 per cent. of metal; but coppe the extent of 4 per cent., arsenic, one-half per cent., phosphorus and sulphur in excess render the ore v difficult to use.

It is only in the last few years that the present own purchased the mines and began working them on a pay basis. They extracted over 3,000,000 tons of mispicke which several thousand tons were exported. Besides arsenical pyrites, they work the rich galena veins, taining an average of 53 per cent. of lead, 60 oz. of sil and 12 dwts. of gold to the ton, as well as the copper v of about 23 per cent. of metallic copper, and 20 dwts. of to the ton.

A large metallurgical plant has been erected at Bada for the treatment of arsenical copper, lead, and silver o It occupies a surface of 18 acres. Part of the plant i full working order and will treat 30 tons of arsenical ore day. At a very early date, the plant for the treatmen lead and the extraction of silver from the galena produc the mines will be erected. At the same time, the resi of the arsenical and lead ores, and a special mud t found in large quantities on the surface of some of mispickel mines at Ribas, will be treated, and a new p for working these products will be in operation before the end of 1902.

Mineral Production of South Australia.

Eng. and Mining J., June 14, 1902.

The Mines Department of South Australia gives a s ement of the metals and minerals exported from that St during the year 1901 :—

		1900.		1901.	
		Quantity.	Value.	Quantity.	Va
			£		
Copper	Tons	4,886	371,920	6,770	43
Copper ore	,,	2,867	22,526	1,866	2
Lead	,,	383	4,382	..	
Silver-lead ore	,,	..	17,526	..	
Tin	,,	..	..	2·65	
Manganese ore	,,	..	..	132	

In addition, and not included in the exports, was salt, of ich 32,574 tons were gathered in 1900, and at least an ial quantity in 1901.

The returns from the Northern Territory, which is at-hed to South Australia, are as follows for the year 01 :—

		Quantity.	Values.
			£
ore	Tons	80	5,498
per ore	,,	482	8,460
lfram ore	,,	5	175

XII.—FATS, OILS, Etc.

Cotton-Seed Oil and its Uses.

Report U.S. Dept. of Agriculture.

Cotton-seed oil was first introduced into trade and merce as an adulterant, and its own title to considera- as a product of comestible value thereby became im- ed in the popular esteem. The exact extent to which ou-seed oil has since been used for mixing with olive oil not be ascertained, but it is notable that when used for purpose alone fancy prices attested its value, and attrac- profits for manufacturers were a powerful impulse to ease in milling capacity and in production. Naturally, cline in values followed, and cheaper high-grade cotton- l oil, mixed with certain beef products, was found to e a profitable and valuable cooking material. A product erally known as "compound lard," was placed upon the kets as a substitute for hog's lard. Later, other like tures of cotton-seed oil with animal fats were devised, e containing pure lard, others not, and the principal ket for this oil soon became centralised in the packing stries of the West. Thirty per cent. of the cotton-seed ow manufactured in the United States is purchased by cing houses, and utilised in the manufacture of various titutes for lard. In fact, the price of this oil is now ely regulated by the fluctuations in the price of lard. equent important uses to which this product has been are as a substitute for olive oil in the packing of sardines similar fish, as an ingredient in the manufacture of arti- butter, and for giving a "natural" butter colour to uargarine. In addition to its edible uses, cotton-seed as been adapted to many others. The residue from pro- s of refining and finishing the oil, and oil made from ged seed, are largely utilised in the manufacture of a valuable for wool scouring and other purposes, and are tensive demand both at home and abroad. The cylinders honographs are also made from this residue, and an llent laundry soap results from its combination with greases. An oil bleached white by sulphuric acid and d with petroleum for use in miners' lamps is made from west grades of the crude oil. Candles, glycerin, and us other products are also manufactured from oil ssed from cotton-seed.

ctically all the high grades are utilised for edible pur- s. Besides its monopoly as a substitute for lard, it is mpetitor with oils of the olive, the peanut, and the nut. On the other hand, the industrial uses of cotton- oil are, with few exceptions, limited, or are confined to cts manufactured from low-grade oil, or to the residue refining. In the three great industrial uses of oils, ination, painting, and lubrication, cotton-seed oil is n important factor. As an illuminant, its use is ed principally to the miner's lamp. Its deficiency in g qualities has thus far interfered with its commercial ss as a substitute for linseed oil in paint, and as a ant it is limited to the most ordinary uses, no process g yet been found for eliminating the gum which makes jectionable for general lubricating purposes. The industrial use of cotton-seed oil is for soap-making, r this purpose it has a large domestic and foreign nd.

Olive Oil in Tuscany.

Foreign Office Annual Series, No. 2809.

The olive oil crop in Tuscany this season has proved a failure in many districts. The aggregate production will barely reach one-sixth of an average crop. On the other hand there was an entire absence of the olive fly (*musca oleae*). With so small a crop, a rise in values of fine Tuscan oils would only have been natural, but prices have remained at the level of last season, an abundant production of oil in Apulia, and in the Riviera district, having tended to keep down prices.

The consumption of olive oil continues to be small. A large part of the olive oil imported into the United Kingdom (other than oil for industrial uses), as statistics show, is bottled there and re-exported to the Colonies and America. Were the wholesomeness of olive oil better appreciated in the United Kingdom, Tuscan oil would find a much wider outlet there. Nor would it have anything to fear, where mere cheapness is not the dominant consideration, from the competition of the growths of Provence, Nice, the Riviera, or Apulia.

Manchurian Hemp Oil in Russia.

Chem. and Druggist, June 21, 1902.

According to a report issued by the Central Bureau of the Russian Customs Department, 10,000 poods of Manchurian hemp oil were despatched from Kharbin to Vladivostok for shipment to Odessa, in January of this year. The *Novoe Vremya*, in noticing the venture, speaks of it as the first attempt in the way of importing hemp oil into Russia from Manchuria, and declares that it has been a highly successful one. This trial consignment of Manchurian hemp oil has sold so satisfactorily, and been found to be of such good quality, that a second consignment of 100,000 poods from Kharbin is already on its way to Odessa.

XIII. B.—RESINS, VARNISHES, Etc.

Resin at Bayonne (France).

Foreign Office Annual Series, No. 2817.

There was a large demand for resin, in particular by Russia, owing to the duty being less than on the shipments from America, but as the soap crisis is still at its height, and the demand for resin very limited, no advance in the prices is to be expected during 1902.

The subjoined table shows the average prices paid during 1901, and the same scale is expected to hold good during 1902 :—

Per 2 Cwts.

	Currency.		Sterling.	
	From	To.	From	To
	Frs.	Frs.	*s. d.*	*s. d.*
Resin, extra pale	22	30	17 7	24 0
,, superior	14	19	11 3	15 3
,, ordinary	11	13	8 10	10 5
Pitch, ordinary	9	10	7 2	8 0

Resin Oil.—Resin oil, a source of profit which has been somewhat neglected of late, has recently made a considerable advance ; several firms have so effectually improved the manufacture of resin oil that it can be advantageously blended with the best mineral and vegetable oils. The prices of this refined article range from 10*s.* to 14*s.* per cwt., carriage paid to Bayonne.

XIII. C.—INDIA-RUBBER, Etc.

India-Rubber in the Congo Free State.

Foreign Office Annual Series, No. 2818.

By far the most important article of export continued to be india-rubber, which accounted for 1,758,638*l.* in special, and 1,807,327*l.* in general commerce, out of the totals of

2,019,536*l.* and 2,160,302*l.* respectively. According to destination the exports of india-rubber were divided as follows :—

Exports of India-rubber from and through the Congo State during the Year 1901.

Destination.	Value. Special Commerce.	Value. General Commerce (including Transit).
	£	£
Belgium	1,713,926	1,747,323
Netherlands	43,167	56,992
Germany	272	433
United Kingdom	188	1,162
Other Countries	1,085	1,417
Total	1,758,638	1,807,327

The only other important articles of export were ivory, palm nuts, palm oil, and white copal, the development in the exportation of which since 1898 is shown in the following table :—

Articles.		Value. 1898.	1899.	1900.	1901.
		£	£	£	£
Indiarubber ..	Special	634,040	1,124,036	1,594,960	1,758,638
	General	673,850	1,158,940	1,642,586	1,807,327
Ivory	Special	172,770	233,385	210,132	158,584
	General	240,538	302,218	317,734	231,930
Palm Nuts	Special	51,191	51,736	52,752	54,920
	General	60,551	62,141	64,825	67,134
Palm oil	Special	26,675	29,380	32,532	32,108
	General	30,933	33,370	38,219	36,122
White copal...	Special	36	51	1,069	11,865
	General	1,751	80	1,069	11,914

The satisfactory development of the commerce of the independent State of the Congo continues; it is largely owing to increased exports of indiarubber, and this trade is almost entirely in Belgian hands.

The exportation of indiarubber has nearly trebled since 1898.

Rubber Crop in Brazil.

U.S. Cons. Reps., June 9, 1902.

The shipments of rubber from the Amazon Valley were, up to April 30 last, a few hundred kilos. in excess of the entire crop of the season of 1900–01. The total increase, however, will not be known until the remaining shipments are made in May and June. The best informed rubber buyers here estimate that it will amount to at least 10 per cent. of the previous crop, and that the total yield will be about 30,000 tons.

Owing to hard times, low prices, and certain unfavourable local conditions, there are various opinions as to whether the steady increase in the output of rubber during the past few years will be maintained in 1902–3. It is generally believed that the rapid development of the new rubber districts on the Upper Amazon River and its affluents will more than make up for any falling off from these causes. Already many large bands of rubber gatherers are organizing, and preparations on a large scale are being made for harvesting next season's crop.

XV.—MANURES, Etc.

Phosphates and Pyrites at Bayonne (France).

Foreign Office Annual Series, No. 2817.

Large quantities of phosphates and pyrites have been imported into that port since the opening of the large and extensive chemical works of St. Gobain, at Boucau, Bayonne. Out of a total of 20,685 tons imported during the past year, 6,981 tons of phosphates were shipped from Liverpool, 1,322 tons from Garston, 2,252 tons from Coosaw River, U.S.A., 1,73 tons from Villa Real (Portugal), 4,140 tons of pyrites fron Pomeron (Portugal), and the remainder from Stax, in Tuni and Algiers. The greater part was carried by vessels unde the British flag.

Large quantities of natural phosphates are now importe there for conversion into superphosphates for manure.

Superphosphate at Tonnay-Charente (France).

Foreign Office Annual Series, No. 2817.

The exports of superphosphate have increased by ov 3,000 tons, all sent to Portugal.

It may be well to mention that British vessels instea of Spanish could be used for this article of export when the bring coal here, instead of going in ballast to Bilba where the greatest number go. Except superphosphat all other articles are exported to the United Kingdom. Th average freight for superphosphate from Tonnay-Charen to Portugal has been 6*s.* 3*d.* per ton.

Superphosphates and Bones at La Rochelle (France

Foreign Office Annual Series, No. 2817.

The chemical manure industry at La Pallice is n only capable of supplying the increasing demand in the parts, but is now exporting superphosphates to Portug 7,890 tons having been shipped thither in 1901.

A cargo of crushed bones has also lately arrived fr British India, for the use of the gelatin works at La Palli This trade is likely to take a considerable extension.

Artificial Manures in Poland (Russia).

Foreign Office Annual Series, No. 2810.

At the end of 1901, the superphosphate works in Pola formed a ring with the object of maintaining the price of t article, of which the present price is 8½ c. (2⅛*d.*) per l cent. of soluble phosphoric acid in 100 lb. (Russian) superphosphate. The total output of the Polish work about 43,000 tons of superphosphates, of which about 32,(tons can be sold in Poland, Lithuania, Volhynia, Podolia.

The owners of the works have presented a petition t the duty may be raised on imported superphosphate, bu is doubtful whether any notice will be taken of it. It, however, likely that facilities will be granted as to duty raw materials necessary for this branch of industry, wh have to be imported to Russia. Should the duty on sup phosphates be raised, it would affect the United Kingd as one-third of the superphosphate consumed in the Ba provinces is of British origin, but would then be supp by Russian works with which it would be impossible compete.

Russian slags, containing 14—18 per cent. of ph phoric acid, appeared on the market for the first te in 1901. They came from Kertch, Mariupol, and Tagan where the iron ore is much richer in phosphorus that Polish ore. These slags have been bought up by the Aus German Company whose headquarters are at Berlin, d who monopolise the world's market in this article, in c sequence of which very small quantities of slags we imported from Germany in 1901.

Chemical Manures at Cherbourg (France).

Foreign Office Annual Series, No. 2806.

There are factories for the preparation of chem al manures at Cherbourg, Octeville, Granville, and als at Nantes and Honfleur, the phosphates used being obta from La Somme, and the nitrates being derived from Ch direct.

These facts have tended to decrease considerably th former large import trade in these manures; there is st however, a small import of them and also of the sulp te of ammonia required in the manufacture of patent manu s, the latter being shipped direct from the United Kingdo

Some shipments of Peruvian guano have also been m of late to this port.

Cattle Food and Fertilisers at Pau (France).

Foreign Office Annual Series, No. 2817.

The British Vice-Consul at Pau reports that cotton-seed e and other food for cattle might find a market there, if perly introduced and a satisfactory depôt established in department. English sulphate of copper is sold in ill quantities, but always by the middleman. The artiial manures in general use are both poor and costly, ning by rail from Bordeaux, and not by sea to Bayonne, rough at Accous and Lescar, not far from Pau, there are sphate mines now in full work. Agricultural requisites, h as these, can be more easily pushed at Pau than elsere, owing to the number of co-operative agricultural ieties in existence, the administration of which is less servative than is the typical Béarnais peasant.

XVI.—SUGAR, STARCH, Etc.

Sugar Production of Sergipe (Brazil).

U.S. Cons. Reps., May 27, 1902.

he most important product of the State of Sergipe is ar; more than one-half of the population is engaged in manufacture, and it is estimated that at least 15,000 s of land are under cultivation. The methods in vogue crude, but with scarcely any cultivation or attention thy of mention, cane once planted yields, on an average, a four to six crops in successive years. There are sugar factories, in 269 of which steam power is used, 3, water power, and in 389, animal power. Of the ories in which steam power is used, eight are more or modern vacuum pan factories, whilst in the others, m power is only used in grinding the cane. At the est and best equipped factory only 8·2 per cent. of ar is obtained from the cane, which contains 13 to 15 cent. The average density of the juice is 11·2° Bé., st the juice extracted averages about 62 per cent. of weight of the cane. With the exception of this large ral factory, the manufacture of sugar in the State seldom more than pay expenses, and will this year be carried at a loss. The canes are not properly cultivated, and ur-saving methods and agricultural implements are not to any considerable extent, and there are no good as of transport for either cane or sugar. A few years all of the molasses produced in Sergipe was distilled he preparation of rum and alcohol, but owing to the prices for these products, most of the distilleries have been working this year. The export of sugar for 1901 487,396 bags, weighing 28,313 metric tons, having an al value of about 900,000 dols., and paying 60,000 dols. port tax. In order to encourage the export of sugar reign ports, a differential export duty is now imposed, 5 per cent. on the value when shipped to foreign tries and 7 per cent. when shipped to other Brazilian p .—A. S.

Sugar Production of Pernambuco (Brazil).

Foreign Office Annual Series, No. 2814.

to 1889, the crops of sugar were exported to foreign kets, but with the advent of the Republic came an ased demand from Pará and the Amazon, and from the hern States, so that Pernambuco was freed from the petition of the sugar-producing countries of the world. the old order of things has returned, aggravated by pron in the Southern States. The enormous prices paid io de Janeiro and São Paulo between 1889 and 1894 ulated production in those States, and greatly curtailed rts from Pernambuco. Things were bad in 1900, but are worse in 1901, although the production of sugar in tate in the latter year has increased by nearly 800,000 or 60,000 tons. But this excess has proved a source s, for there is no profit upon the cost of production. loss becomes greater as the exchange has advanced 3d. per milreis between the average rate of 1900 and f 1901, whilst wages, food, and cost of material, trans- &c., have not yet found their equilibrium. In 1900, 75 tons were exported, of which 94,116 tons, valued at ,400*l.*, went to native ports, and 23,459 tons valued at 199,000*l.*, to foreign markets; but in the following year, the purchasing power of the native markets, both north and south, decreased, and with a greatly increased crop, the surplus exported to foreign markets was more than four times as much as in 1900. The financial result shows that 75,193 tons sent to native markets fetched 960,000*l.*, whilst 100,000 tons shipped to the United States and Liverpool were only worth 728,000*l.* These figures show that, at even the low prices ruling in 1900, the increased crop of 1901 should have been worth 2,180,000*l.*, but actually fell short of this figure by about 500,000*l.*, which may fairly be taken as the probable loss to sugar planters on their season's working, leaving no surplus whatever for the purchase of any imported goods. Only white and fine grade sugars are suitable for the native markets, whilst brown qualities of muscovado sugar, polarising about 87°, are manufactured for export. This, however, becomes not a question of value so much as of manufacture, because raw material would be reduced in quantity to make white, in about the same ratio as the price is enhanced from low to fine grades.

One of the features noticeable in the export of sugar in 1901 is the large amount of centrifugals of 96° polarisation.

	At per Ton.	Cost.
	s. d.	£ *s. d.*
13,490 tons at selling price	6 5	4,321 15 3
„ cost price.....	5 9½	3,905 3 3
Profit against a capital of 13,000*l.*	..	416 12 0

The above statement seems to show that it is necessary (in order to have a working margin) that cane shall give 7*s.* 9*d.* per ton, and from this it can be deduced that sugar has to give 15*s.* 6*d.* per 90 kilos. (*i.e.*, 90 kilos. of sugar equal 1 ton of cane) or, say, 10*s.* 3*d.* per cwt. for centrifugal sugar of 96° polarisation with its sugar from molasses.

As an example of the disastrous effect of taxation, a Hessian bag, sufficient to hold 90 kilos. of sugar, costs over 10*d.* or nearly 25 per cent. on the cost of cultivation of 1 ton of cane, and more than one-half of this 10*d.* is taxation.

Were it not for excessive taxation, it would be quite possible to manufacture sugar at its present low price and still make a living out of it, but with taxation at 66 per cent. on its value, this cannot be done.

The monster sugar refinery and all the rum distilleries are also abandoned, no profits being possible under present fiscal conditions. (See also this Journal, 1902, 934.)

Spirits and Glucose Import Duties.

Bd. of Trade J., June 26, 1902.

The Board of Trade are in receipt of a copy of a general order (No. 36 of 1902), issued by the Commissioners of Customs on the 17th inst., conveying instructions to customs officials with reference to the increased duties on imported spirits and glucose. The following is the text of the order:—

The following resolutions were proposed in the House of Commons on the 16th inst.:—

(1) That on and after the 17th June, 1902, the respective duties of Customs on imported spirits be increased by 1*d.*

(2) That on and after the 17th June, 1902, the duties of Customs on imported glucose, imposed by section 2 of the Finance Act, 1901, be, as respects solid glucose 3*s.* 3*d.*, and as respects liquid glucose 2*s.* 6*d.*

The increased duties are accordingly to be levied from this date inclusive.

Sugar Industry of Dunkirk (France).

Foreign Office Annual Series, No. 2808.

At the end of March, 1902, the whole of the sugar factories (322) had finished the work of clarifying. The weight of beet worked up was 9,350,850 tons, as against 8,714,442 tons in the first six months of the previous year,

showing an increase of 636,408 tons. The total quantity of sugar extracted was 1,081,815 tons, as against 1,058,072 tons in the corresponding period of last year.

The production of alcohol at the end of February, 1902, (the first five months of the season 1901–02), amounted to 24,016,400 gallons, as against 33,391,900 gallons in the corresponding period of the preceding season. The decrease was chiefly in that made from beet and farinaceous substances.

Sugar at Leghorn (Italy).

Foreign Office Annual Series, No. 2809.

The quantity of sugar imported into Leghorn, in 1891, was 40,218 cwts.: in 1900, it was only 4,069 cwts., and, in 1901, it has dropped to 2,972 cwts. The import of sugar into Italy will probably cease altogether. Even the coarse Egyptian sugar, which was at one time imported for use in the refineries, is no longer required. Italian factories turn out a sufficient quantity of beet-sugar for the Italian refineries. These refineries are now producing Macfie sugar 1, 2, and 3, and though the quality may be inferior to the real Macfie, its appearance is a very creditable imitation. This sugar is spoken of as "Macfie Nazionale." High prices have ruled in the past year for Italian sugar, and it was found possible, in spite of exorbitant Customs duty, to offer British Macfie at 4*s.* per cwt. less than Italian. But the offer met with no response, for buyers have come to look to the refineries entirely for their requirements.

Beet Cultivation in Poland (Russia).

Foreign Office Annual Series, No. 2810.

In Poland, the area under beet increased, in 1901, by about 10 per cent., as compared with 1900. Of the whole area sown with beet, 97 per cent. belonged to private persons, the remaining three per cent. being owned by factories. The total area sown was 160,421 acres, as against 143,745 acres, in 1900. Of this, 155,588 acres were private plantations, as against 138,917, in the preceding year, and only 4,833 acres belonged to sugar factories, as against 5,079 acres, in 1900, thus showing an increase of 12 per cent. of private plantations, and a decrease of 4·8 per cent. of factory plantations; there was an increase of private plantations in all the nine governments of this district where beet is grown, but factory plantations only increased slightly in the governments of Lublin, Radom, and Siedlee, whilst, in the other governments, the area decreased correspondingly.

The beet of the 1901 crop contained on the average 16·49 per cent. of sugar, as against 16·94 per cent., in 1900.

Beet-Sugar Acreage in Germany.

U.S. Cons. Reps., June 11, 1902.

When the Brussels Conference, abolishing export bounties, had concluded its work, the syndicate of German sugar producers held a meeting and sent out an earnest demand that beet growers should reduce as far as possible their beet-planting for 1902. This policy was adopted in order "to make headway against the enormous surplus of sugar that now overloads and depresses the European market." The returns show that Germany has planted this spring 1,046,396 acres, which is a decrease of 11·2 per cent. from the area planted last year. Every province shows a decrease, the reduction of acreage ranging from 1·2 per cent. in Pomerania to 36 per cent. in Baden, 45 per cent. in Bavaria, and 54·1 per cent. in Hesse-Nassau. Four large factories have been shut down and will remain closed during the coming campaign against over-production of beet-sugar.

Country.	Area.	Increase.	Decrease.
	Acres.	Per Cent.	Per Cent.
Austria-Hungary	751,011	..	16·2
France	551,774	..	23·8
Russia	1,470,566	1·0	..
Belgium	130,516	..	24·0
Holland	77,009	..	35·0
Sweden	59,887	..	16·4
Denmark	35,830	4·8	..

Returns from the other sugar-producing countries of t Continent are shown in the preceding table, which gives t variations of beet area as compared with last year.

Four factories in Belgium and eight in Holland w suspend operations during 1902–3, and the mean avera reduction in area of beet cultivation in these eight sug growing countries will be a reduction by 11·34 per cent. the total acreage of 1901.

XVII.—BREWING, Etc.

Alcohol Trust in Germany.

Foreign Office Annual Series, No. 2816.

The alcohol trust has not as yet gained a firm footho Its success in raising the price of spirit has of course led an increased production, which, in presence of the depr sion in trade and consumption, has become overprod tion. Assisted by unusually large crops of potat which could only be turned to account by distillers, stocks of spirit rapidly accumulated, and prices h fallen. A bitter war prevails between the syndicate the outside firms, whose existence it threatens. champions of the trust maintain that, but for agency, the large potato crops would have aggrava the misery of an untenable position, and that by increasing consumption of spirit as fuel for cook purposes, a practically endless trade is being gradu opened to distillers. Moreover, they assert that the t alone is in a position to regulate the price of alcol whether for exportation or for home consumption, i rational manner. The chief dangers to the syndic threaten it from within, and from the apparent dearth capital to carry through such operations.

XVIII. A.—FOODS.

Borax for Preserving Meat.

U.S. Cons. Reps., June 17.

On May 9, an important convention was held at Be by a number of scientific men, to enter a protest aga the enforcement of the new law prohibiting the use of bo and boric acid in preserving meats and other food artic which law is to take effect soon, and will practically p hibit the importation of a large quantity of Amer n preserved meats into Germany. The leading spo man in this convention was Prof. Liebreich, of Be Finally, the convention unanimously adopted the resolu that "the prohibition of borax and boric acid for preservation of food articles, as decided upon by Bundesrath, is not to be justified, and cannot be suppo by facts."

XIX.—PAPER, PASTEBOARD, Etc.

Rafia Fibre for Paper-Making in Madagasca

U.S. Cons. Reps., June 19, 1902.

In the *Journal Officiel* of Tananarivo, for April 0, there is a reference to the new employment of rafia for the manufacture of cigarette paper, and samples re now in the Commercial Museum at Tananarivo. paper presents the qualities of suppleness and strength, id the fibre from the start is tasteless, inodorous, and c n. The attention of paper manufacturers is directed to e possibilities of this fibre for other uses.

XX.—FINE CHEMICALS, Etc.

Coca at Salaverry (Peru).

Foreign Office Annual Series, No. 2807.

The exportation of coca, during 1901, as compared th that of 1900, is as follows:—

	Kilos.
1901	387,547
1900	335,771
Increase	51,776 (about 15·50 per ce).

The exportation of cocaine, both to Callao and Germany, has increased considerably, during 1901, as may be seen from the following comparison :—

	Kilos.
1901	676·86
1900	284·00
Increase.....	392·86 (about 138 per cent.).

Juniper Berries at Leghorn (Italy).

Foreign Office Annual Series, No. 2809.

There has been a demand for juniper berries. The normal price, which is 14 lire per quintal has been doubled, and stocks are almost exhausted. The greater part of this demand came from Germany, the United States being the next.

Storage of Combustibles in New York City.

Chem. and Druggist, June 28, 1902.

The New York Bureau of Combustibles have recently issued a new list of regulations regarding the storing of combustible substances, which states that permits for the keeping of explosive compounds will be issued to retail drug stores that are located in the same building as a hotel, dwelling, lodging, boarding, or tenement house for the following limited quantities only :—4 doz nitrite of amyl perles, 4 oz. of picric acid, in glass-stoppered bottles, 16 oz. of collodion, with not more than 8 oz. in a container, 16 oz. of antharidal collodion, not more than 8 oz. in a container, 6 oz. of flexible collodion, not more than 8 oz. in a container, 1 oz. of spirit of glonoin (1 per cent. solution), not more than 1 oz. in a container.

Should the store be self-contained, the permit may allow increased quantities. A licence must be obtained for, amongst other things, the manufacture, sale, or use of any inflammable gas, crude petroleum, gasoline, benzene, benoline, camphene, burning fluid, acetic ether, ether, or nitrous ether. In retail drug stores situated in other buildings, as specified, permits will be limited to :—15 galls. of alcohol, 15 galls. of wood alcohol, 10 lb. of spirit of nitrous ether, 1 lb. of acetone, 1 lb. of aldehyde, all to be stored in glass or metal containers. Of sulphur, 30 lb. will be allowed, and 1 oz. of phosphorus, under the same conditions ; whilst, for storage in self-contained buildings, 11 lb. of white phosphorus and 110 lb. of red phosphorus may be kept in a vault or fireproof closet ; and 50 lb. of metallic magnesium and 16 barrels of sulphur (5 roll, 5 sublimed, 3 washed, and 3 precipitated) will be permitted, if the store be detached.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 13,699. Lary. Machines for packetting and filling powders and like materials.* June 17.

„ 13,886. George. Construction of chemical and physical benches. June 19.

„ 14,002. Müller. Improved form of bottles or vessels which will keep liquids at any required temperature for any length of time, without the use of fire or chemical substances, and special designs. June 20.

[A.] 14,073. Bridge. Machines for crushing ice, or for crushing soda or other crystals, or the like. June 21.

„ 14,111. Linde British Refrigerating Co., Ltd.—From Linde. Method of and apparatus for separating gases from a liquefied mixture thereof. June 21.

„ 14,128. Ström. Centrifugal separators.* June 21.

„ 14,348. Laidlaw. Electrically-driven centrifugal machines. June 25.

„ 14,390. De Alzugaray. Crushing, grinding, and pulverising machines. June 25.

[C.S.] 12,712 (1901). Webber. Process for the reheating and moistening of compressed air and other fixed gases. June 25.

„ 14,679 (1901). Stumpf. Apparatus for condensing steam, or for compressing air or other gases. July 2.

„ 14,976 (1901). Naef. Treatment of solid material with gas as in the carrying out of catalytic reactions. June 25. Date applied for under International Convention, May 27, 1901.

„ 15,422 (1901). Eyre. Centrifugal machines for laboratory use. July 2.

„ 16,364 (1901). Scott. Filtering devices. July 2.

„ 16,691 (1901). Fairweather.—From Wolff. Centrifugal machines. July 2.

„ 16,973 (1901). Hatton. Apparatus for the defecation of liquids. July 2.

„ 17,075 (1901). Ross and Mackenzie. Bungs or stoppers for casks and other storage receptacles for liquids generating or giving off gases or waste vapours. July 2.

„ 19,222 (1901). Schwarz. Protective packing material for articles sensitive to light. June 25.

„ 19,914 (1901). Mackay, Fox, and Worssam. Apparatus for compressing and expanding vapour for refrigerating and other purposes. July 2.

„ 7843 (1902). Lake.—From Giroux and Seddon. Receptacles for liquids and other substances to be preserved. June 25.

II.—FUEL, GAS, and LIGHT.

[A.] 13,598. Stern. Candles for acetylene gas. June 16.

„ 13,599. Midgley. Method of and apparatus for consuming smoke and increasing the generation of steam in steam boilers. June 16.

„ 13,604. Bellina. Electric incandescent lamp. June 16.

„ 13,610. Carson and Greer. Safety household lamps.* June 16.

„ 13,611. Bergfleth. Furnaces.* June 16.

„ 13,647. Shaw. Self-lighting fittings for gas burners. June 16.

„ 13,648. Lehmann. Incandescent burners for hydrocarbons. June 16.

„ 13,732. British Thomson-Houston Company, Ltd.—From Harthan. Electric arc lamps. June 17.

„ 13,745. Lake.—From La Soc. Anon. Française des Becs Juhle. Burners for lamps and stoves.* June 17.

„ 13,750. Seymour. Apparatus for mixing gas and air.* June 17.

„ 13,754. Hooker. Combustible vapour for use in incandescent lighting. June 17.

„ 13,757. Feeny.—From Abwärme-Kraftmaschinen-Ges. m.b.H. Process or method of utilising the heat contained in waste gases from blast furnaces and the like.* June 17.

„ 13,772. Donohue and Moran. Devices for preventing the escape of smoke from chimneys and smoke stacks.* June 17.

[A.] 13,785. Kitson. Vapour-burning apparatus. June 17.
" 13,793. Hiorth. Burners for incandescent gas lighting. June 18.
" 13,812. Brooks and Butler. Carburetting appliances for oil and spirit engines. June 18.
" 13,847. Deakin and Osmond. Apparatus for burning illuminating oils. June 18.
" 13,865. Knapen. Carburettors for explosion motors.* June 18.
" 13,867. Dieudé-Defly. Manufacture of fuel. June 18.
" 13,879. Wolff. Gas generators or carburettors. June 18.
" 13,902. Holgate. Construction of burners and lauterns for incandescent gas lighting. June 19.
" 13,945. Bremer. Electric arc lamps.* June 19.
" 13,954. Dargie. "Carbide-to-water" automatic acetylene generator and gasholder. June 19.
" 13,960. West. Machines for charging and drawing gas retorts.* June 19.
" 13,996. Fletcher and Fletcher. Apparatus for generating gas from coal, wood, peat, or other similar substances. June 20.
" 14,017. Meehan. Blast furnaces.* June 20.
" 14,050. Wilson. Furnaces. June 20.
" 14,054. Hecking. Manufacture of artificial fuel.* June 20.
" 14,057. Johnson.—From La Cie. Française de l'Acétylène dissous. Apparatus for use in the production and supply of explosive gases. June 20.
" 14,058. Head. — From Wellman-Seaver-Morgan Engineering Co. Apparatus employed in connection with the charging of coke ovens in which compressed charges of coal are coked. June 20.
" 14,077. Whitfield. Gas producers. June 21.
" 14,088. Riehl. Incandescent gas-burners, lamps, and the like. June 21.
" 14,113. Michaelis. Self-lighters for gas lamps. June 21.
" 14,120. Hawkins and Hawkins. Acetylene generators. June 21.
" 14,146. Ross. Burners, particularly for gas stoves. June 21.
" 14,166. Crossley and Rigby. Treatment of gas and air in connection with gas producers. June 23.
" 14,167. Crossley and Rigby. Apparatus for removing impurities from gases. June 23.
" 14,277. King. Apparatus for stoking, or feeding and stoking, fuel into furnaces, and to promote consumption of smoke.* June 24.
" 14,287. Gilgan. Improved acetylene gas generator.* June 24.
" 14,309. Pratt. Incandescent gas burners. June 24.
" 14,319. Schwabe. Electric incandescent lighting devices. June 24.
" 14,321. Goard and Morgan. Ignition devices for lamp and lantern burners.* June 24.
" 14,344. Bremer. Electric arc lamps. June 24.
" 14,345. Baumgarten. Improved portable automatic generator for acetylene gas. June 24.
" 14,359. Wright and Darwin. Atmospheric gas burners for heating stoves. June 25.
" 14,401. Roxby. Electric incandescent lamps. June 25.
" 14,418. Thompson.—From Humphrey. Gas-burners. June 25.
" 14,429. Bachner and Bouchsein. Flame-igniters. June 25.

[C.S.] 12,579 (1901). Thomas and Podmore. Incandescent gas lamps. June 25.

[C.S.] 12,696 (1901). Heinzerling. Method of and apparatus for the direct utilisation of the heat of hot gases, for the production of motive power and other purposes. June 25.
" 12,887 (1901). Herring. Gas-producers for the production of fuel and other gases. July 2.
" 12,958 (1901). Merrifield and Checkley. Machines for producing gas from peat, sawdust, and other organic substances. July 2.
" 12,959 (1901). Merrifield and Checkley. Method of producing gas from peat and other organic substances. July 2.
" 13,191 (1901). Chamberlain. Methods of obtaining light from gases of low calorific value. July 2.
" 13,507 (1901). Kitson. Vapour-burning apparatus. June 25.
" 13,531 (1901). Meikle and Meikle. Boiler furnaces. June 25.
" 13,983 (1901). Whitfield. Apparatus for the generation, purification, and storage of combustible gas. June 25.
" 14,168 (1901). Chapman. Carburettors or apparatus for producing mixtures of vaporised oil and air. June 25.
" 14,342 (1901). Kitson. Vapour-burning apparatus. June 25.
" 15,259 (1901). Beck and Dior. Mode of and apparatus for preparing and utilising carburetted air for lighting and heating purposes. July 2. Date applied for under International Convention Feb. 18, 1901.
" 15,291 (1901). Smith. Carburettors, or method of making and supplying the explosive mixture to hydrocarbon engines. June 25.
" 15,595 (1901). Thwaite. Treatment of blast-furnace gases and the utilisation of their heat, and apparatus therefor. July 2.
" 15,751 (1901). Collin. Coke ovens. July 2.
" 16,491 (1901). Gilbert. Incandescent gas lighting. June 25.
" 16,928 (1901). Fairlie. Lamps. July 2.
" 17,093 (1901). Berthold. Pocket automatic gas lighters. July 2.
" 17,772 (1901). Prætorius. Method for the production of a pure explosive mixture for gas, oil, or hydrocarbon engines. June 25.
" 20,651 (1901). Schmidt. Electric arc lamps. July 2.
" 24,483 (1901). Smith. Incandescent vapour lamps. July 2.
" 2375 (1902). Pataky. Acetylene gas generators. July 2.
" 7594 (1902). Ledru. Acetylene gas generating plant. June 25.
" 8869 (1902). Cox. Smoke-consuming furnaces. July 2. Date applied for under International Convention, Oct. 23, 1901.
" 9237 (1902). Kyle. Combustion of fuel in boilers and other furnaces, and apparatus therefor. July 2.
" 9299 (1902). Lake.—From American Furnace Co. Furnaces. July 2.
" 9339 (1902). Nordmann. Method for producing the heads of incandescent mantles. June 25.
" 9785 (1902). Ransford. — From Cie. Universel d'Acétylène. Apparatus for the manufacture of gas by the reaction of a liquid upon a soli June 25.
" 10,169 (1902). Bloxam.—From Soc. Anon. des Cristalleries du Val-Saint-Lambert. Regenerator for lamps having a chimney. June 25.
" 10,757 (1902). Schonfelder and Stefan. Gas burner June 25.

C.S.] 11,220 (1902). Lecomte. Vapour burners for lighting and heating purposes. July 2.

„ 11,703 (1902). Green and Martin. Process for converting peat into fuel. July 2.

„ 11,864 (1902). Johnson.—From North American Fuel Co. Manufacture and production of briquettes or blocks of artificial fuel. July 2.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 13,664. Christen. *See under* IX.

„ 13,936. Fischer. Process for the continuous extraction of highly inflammable oils from petroleum discharged from condensers, refrigeratories, reservoirs, and the like, or for continuous distillation of liquids. June 19.

C.S.] 10,228 (1902). Wegelin. Process of manufacturing soot from tar and other carbonaceous substances, and apparatus for carrying same into effect. June 25.

IV.—COLOURING MATTERS AND DYESTUFFS.

A.] 13,626. Imray.—From Farbwerke, Höchst. *See under* XI.

„ 13,778. Imray.—From Soc. of Chem. Ind. in Basle. Manufacture of new nitro-alphyl-acidyl-amidonaphtholsulphonic acids, nitro-alphyl-amido-acidyl-amidonaphtholsulphonic acids, amido-alphyl-acidyl-amidonaphtholsulphonic acids, or amido-alphyl-amido-acidyl-amidonaphtholsulphonic acids, and new azo colouring matters derived therefrom.* June 17.

„ 14,049. Ellis.—From Chemische Fabr. von Heyden Act.-Ges. Manufacture of indoxyl or indigo, or indoxyl or indigo preparations.* June 20.

.S.] 14,390 (1901). Imray.—From Fabriques de Produits Chimiques de Thann et de Mulhouse. Manufacture of orthotoluene sulphochloride. June 25.

„ 15,678 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of new disazo colouring matters and intermediate products relating thereto. June 25.

„ 15,708 (1901). Urquhart.—From Chemische Fabr. vorm. Weiler-ter Meer. Process for manufacturing dyestuffs containing sulphur. June 25.

„ 16,173 (1901). Abel.—From Act.-Ges. f. Anilinfabr. Manufacture of colouring matters belonging to the triphenyl- and diphenyl-naphthylmethane series, respectively. June 25.

„ 16,811 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of azo colouring matters, and the production of new matter for use therein. June 25.

„ 16,952 (1901). Johnson.—From Kalle and Co. Manufacture and production of colouring matters containing sulphur. June 25.

„ 17,356 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of new azo colouring matters, and materials for use therein. June 25.

„ 573 (1902). Vidal Dyes Syndicate Co., Ltd.—From Vidal. Oxidising aromatic amines to obtain amido-hydroxylated derivatives. July 2.

„ 9968 (1902). Imray.—From Soc. of Chem. Ind. in Basle. Manufacture of sulphurised indophenols. June 25.

„ 9969 (1902). Imray.—From Soc. of Chem. Ind. in Basle. Manufacture of sulphurised indophenols. June 25.

V.—TEXTILES: COTTON, WOOL, SILK, ETC.

[A.] 13,982. Lang Bridge, Ltd., and Wood. Improved apparatus to be employed in connection with the mercerisation of cotton or other yarns. June 20.

„ 14,149. Crochet. Treatment of textile fibres. June 21.

„ 14,215. Moserop. Machine for automatically testing and recording the strength of yarn or thread. June 23.

[C.S.] 8147 (1901). Hoyle and Barker. Method of and machinery for the production of fibrous material known as condenser yarn. July 2.

„ 9847 (1901). Kecht and Peter Spence and Sons, Ltd. Method of discharging dyed textile fabrics. June 25.

„ 14,106 (1901). Haldan.—From Dutilleul. Process for rendering fabrics and other products impermeable to fluids. July 2.

„ 16,901 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Printing of vegetable fibre with colouring matters. July 2.

„ 16,919 (1901). Weber and Isidore Frankenburg, Ltd. Recovery of volatile solvents used in the treatment of textile fabrics, and apparatus therefor. June 25.

„ 21,894 (1901). Smith. Method of producing "watermarks" on fabrics. June 25.

„ 9812 (1902). Boult.—From Seibert and Temple. *See under* XI.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 13,587. Killen. Manufacture or rectifying of sulphuric acid. June 16.

„ 13,626. Imray.—From Farbwerke, Höchst. *See under* XI.

„ 14,073. Bridge. *See under* I.

„ 14,193. Sigafoos. Chemical fire-extinguishing apparatus or appliances. June 23.

„ 14,301. Sigafoos. Chemical generating apparatus, particularly applicable for use with fire-engines. June 24.

„ 14,386. Lederlin. *See under* XI.

„ 14,387. Lederlin. *See under* XI.

„ 14,397. Sigafoos. Stationary chemical fire-engines. June 25.

[C.S.] 16,506 (1901). Smethurst. Treatment of substances with nascent carbon dioxide to produce a chemical reaction, particularly applicable for the production of borax and boric acid. June 25.

„ 19,036 (1901). Frasch. Process of producing alkalis. June 25.

„ 22,723 (1901). Ashe. Apparatus for saturating liquids with carbonic acid gas. June 25.

„ 9545 (1902). Bock. Manufacture or production of sulphate of alumina. July 2.

„ 10,228 (1902). Wegelin. *See under* III.

„ 10,775 (1902). Caille. Cartridges of compressed gas for fire-extinguishing and other purposes. July 2.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 13,583. Burton and Burton. Muffle kilns for pottery and the like. June 16.

„ 13,643. Adams. Kilns and muffles for firing ceramic-ware and the like. June 16.

„ 14,210. Forster. Machinery for manufacturing glass bottles, jars, and other hollow-ware. June 23.

„ 14,316. Haley. Manufacture of window- or sheet-glass cylinders, and apparatus or machinery therefor. June 24.

[A.] 14,441. Miller and Trades' Progress Co., Ltd. Gathering or extraction of definite quantities of molten glass from tanks or pot furnaces, and delivering the same to moulds or other receptacles.* June 25.

[C.S.] 10,550 (1901). Lee. Printing tiles and other objects by means of collotype or other blocks with natural colours, or with other designs or patterns, and apparatus therefor. July 2.

„ 24,324 (1901). Brooke. Apparatus for dividing molten material, chiefly designed for use with molten glass. July 2.

„ 10,169 (1902). Bloxam.—From Soc. Anon. des Crystalleries du Val-Saint-Lambert. *See under* II.

„ 10,355 (1902). Keyes. Leers for annealing plate-glass. July 2.

„ 10,356 (1902). Keyes. Apparatus for the manufacture of plate-glass. June 25.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 13,641. Toope. Non-conducting coverings for steam pipes and other surfaces.* June 16.

„ 13,664. Christen. Improved manufacture of asphalt composition.* June 16.

„ 13,739. Lake.—From General Electric Co. Insulating material. June 17.

„ 14,396. Jaubert. Improved brick.* June 25.

[C.S.] 13,076 (1901). Meir. Machines for making tiles from plastic clay or dust. June 25.

„ 20,643 (1901). Berhenke. Process and apparatus for drying bricks and other earthenware or ceramic products. June 25.

„ 6844 (1902). Boult.—From Hülsberg and Co. Impregnation of wood and other porous materials. July 2.

„ 9017 (1902). Fawcett, Preston, and Co., Ltd., and Bowers. Machinery for the manufacture of slabs or blocks. June 25.

„ 10,088 (1902). Thompson.—From Richter. Methods of making artificial pavements. June 25.

„ 10,399 (1902). Loewenthal. Compositions for making stones and mortar. July 2.

X.—METALLURGY.

[A.] 13,588. Worsey and Hoal. Improved process for the extraction of gold and (or) silver from refractory ores. June 16.

„ 13,614. Dick. Separation of pieces or fragments of iron and steel from the zinc refuse or dross of galvanising works, and apparatus therefor. June 16.

„ 13,669. Boult.—From Wachwitz and Dünkelsbühler. Welding of metals. June 16.

„ 13,711. De Alzugaray. Extraction of gold, silver, and other metals from their ores. June 17.

„ 13,744. Knigge and van Holt. Improved process for hardening iron. June 17.

„ 13,981. Matthews. Treatment of ores. June 20.

„ 14,237. Gameson. New or improved process to be used in the preparation of cast-iron and other articles previous to tinning or galvanising same. June 24.

„ 14,251. Auchinachie. Manufacture of metallic vanadium from its compounds, preferably an oxide thereof. June 24.

„ 14,338. Baldt, sen. Moulding or casting of metals.* June 24.

[A.] 14,380. Wilkinson, jun. Annealing of rolled metal June 25.

[C.S.] 6077 (1901). Heathfield. Apparatus for machinery used in coating metal sheets with metals. July 2.

„ 14,146 (1901). Boult.—From Cöln-Müsener Bergwerks-Akt.-Ver. Fusion of hardened or metallic masses by a flame jet, particularly applicable to blast or other furnaces. July 2.

„ 14,576 (1901). Imray.—From La Soc. Electro-Metallurgique Française. Process and apparatus for utilising the waste heat of metallurgical operations July 2.

„ 15,342 (1901). Boult.—From Miskolczy. Hardening and tempering metal. June 25.

„ 16,338 (1901). Watzl and Frankenschwert. Method of metallically coating metals. June 25.

„ 21,424 (1901). Brandenburg. Process for recovering metals and metallic compounds from materials containing metals, and particularly residues June 25.

„ 26,446 (1901). Bates and Peard. Annealing of metals. June 25.

„ 3347 (1902). Ahrle und Metalline-Platten-Ges. m.b.H.—*See under* XXI.

„ 3357 (1902). Renstrom. Process for hardening copper, or the alloys of copper. July 2.

„ 10,953 (1902). Nagel. Process of making spelter June 25.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 13,626. Imray.—From Farbwerke, Höchst. Improved manufacture of hydroxylamine and chlorine by electrolysis. June 16.

„ 13,749. Graham and Bouton. Galvanic batteries. June 17.

„ 14,034. Evans. — From Electrochemische Werk G. m. b. H., Germany. *See under* XX.

„ 14,133. Baker and Castner-Kellner Alkali Co Ltd. Connecting carbon electrodes with electric leads. June 21.

„ 14,134. Smith, Baker, and Castner-Kellner Alka Co., Ltd. Carbon electrodes. June 21.

„ 14,135. Baker, Smith, and Castner-Kellner Alka Co., Ltd. Electrolytic cells. June 21.

„ 14,329. Marks.—From Smith Storage Battery C Storage batteries.* June 24.

„ 14,373. Lancashire Dynamo and Motor Co., Ltd and McLeod. Mode of and apparatus for regulating the charge and discharge of storage batteries used in conjunction with dynamo-electric machinery for supplying electrical energy. June 2.

„ 14,386. Lederlin. Electrolytic manufacture of chlorates and perchlorates.* Filed June 2 Date applied for, Jan. 8, 1902, being date of application in France.

„ 14,387. Lederlin. Electrolytic manufacture of chlorates and perchlorates.* Filed June 2 Date applied for, Jan. 8, 1902, being date of application in France.

[C.S.] 13,662 (1901). Raschen and United Alkali Co., Ltd. Electrolytic cells. June 25.

„ 15,463 (1901). Küttner. Secondary battery plate June 25.

„ 9812 (1902). Boult.—From Seibert and Tempe Electrolytic production of a bleaching liquor and caustic alkali lye, and apparatus employed therein June 25.

„ 10,532 (1902). Bristol. Portable secondary or other electric batteries, accumulator plates, and the like June 25.

[S.] 11,340 (1902). Heys.— From Hutchison Acoustic Co. Dry or semi-dry cells of primary or secondary electric batteries. June 25.

XII.—FATS, OILS, AND SOAP.

..] 13,677. Edmunds and Thomas. Lubricators. June 17.

13,995. Fox. Oil-filters. June 20.

14,027. Scott. Utilisation of the waste waters from the digestion of rough tallow. June 20.

14,169. Peters and Shepherd. Compound oil for use in the manufacture of linoleum or floor cloth, and for other purposes. June 23.

14,392. Goltz. New or improved soap. June 25.

[S.] 13,506 (1901). Godfrey. Machines for pressing and polishing linoleum and the like. July 2.

11,271 (1902). Garrigan. Candles. June 25.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[S.] 6061 (1901). Wass. Printers' varnish and ink. July 2.

16,390 (1901). Willock. Composition for removing paint. July 2.

8442 (1902). Harding. Composition for covering metal or other surfaces. July 2.

B.—Resins, Varnishes.

[S.] 6061 (1901). Wass. *See under* XIII. A.

C.—India-rubber, &c.

[S.] 14,106 (1901). Haddan. — From Dutilleul. *See under* V.

IV.—TANNING, LEATHER, GLUE, AND SIZE.

.] 13,584. Caldwell. Art of preparing leather for belting.* June 16.

13,748. Miller. Improved method of finishing the surface of leather.* June 17.

13,859. Vero. Utilisation of leather waste, leather cuttings, and old leather of every description. June 18.

14,122. Reichelt, Helbing, and Nienaber. Improved method and apparatus for manufacturing leather substitute belting and the like.* June 21.

[C.] 14,874 (1901). Mills.—From Duchez. Apparatus for distributing liquid materials or preparations upon hairy skins or hides. June 25.

1013 (1902). Lake.—From Turner Tanning Machinery Co. Machines for use in treating hides, leather, skins, and the like. July 2.

1018 (1902). Lake.—From Turner Tanning Machinery Co. Machines for use in treating hides leather, skins, and the like. July 2.

2247 (1902). Parga.—From De Castro. Rapid tanning process. July 2.

8594 (1902). Quigley and Gay. Machines for splitting skins or hides. July 2.

XVI.—SUGAR, STARCH, AND GUM, ETC.

[ ] 14,108. Claassen. Separation of sugar from syrup or molasses of massecuite, and especially of after-product massecuite.* June 21.

14,432. Lichtenstein. Apparatus to be employed in the manufacture of caramel. June 25.

[C.S.] 15,614 (1901). Schweitzer. Manufacture and refining of sugar. July 2.

„ 16,973 (1901). Hatton. *See under* I.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 13,767. Thompson.—From Mühlenbauanstalt und Maschinenfabr. vorm. Gebrüder Seck and Krusemark. Manufacture of malt. June 17.

[C.S.] 16,049 (1901). Nycander. Means or apparatus for the alcoholic fermentation of liquids. June 25.

„ 10,350 (1902). Hört and Marxsohn. Apparatus for washing and aërating barley for malting purposes. June 25.

„ 10,699 (1902). Schneible. Manufacture of fermented liquors. June 25.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 13,764. Simon. Improved method of and apparatus for manufacturing mineral and other aërated waters. June 17.

„ 14,340. Baker. Process for preserving fruit.* June 24.

„ 14,341. Baker. Process for preserving fruit.* June 24.

„ 14,370. Husberg. Centrifugal creamers. June 25.

„ 14,400. Nicolas. Preservation of liquids. June 25.

[C.S.] 15,987 (1901). Zimmerman.—From Nicolai. Manufacture of coffee free from caffeine. June 25.

„ 16,110 (1901). Imray.—From La Soc. "Le Lait." Process for preserving milk. July 2.

„ 16,431 (1901). Julien. Process for the production of milk rich in cream or other similar fatty matter. July 2. Date applied for under International Convention, Feb. 14, 1901.

„ 16,948 (1901). Harrison. Manufacture of clear artificial ice, and machinery or apparatus therefor. July 2.

„ 7599 (1902). Larue. Apparatus for extracting juice from lemons, oranges, and the like. June 25.

„ 7843 (1902). Lake. — From Giroux and Seddon. *See under* I.

B.—Sanitation; Water Purification.

[A.] 13,586. Honiball. Filters for boiler feed-water or the like. June 16.

„ 13,970. Lord. Improved destructor, particularly applicable for use in the destruction or consumption of sewage sludge. June 20.

„ 14,007. McPhail. Purification of water for drinking and culinary purposes. June 20.

„ 14,027. Scott. *See under* XII.

„ 14,366. Candy and Candy. Apparatus in connection with the purification of sewage and other polluted liquids. June 25.

C.—Disinfectants.

[C.S.] 15,150 (1901). Cohn. Process for the manufacture of an antiseptic containing iodine. June 25.

„ 277 (1902). Boult.—From Fournier. Disinfecting apparatus. July 2.

„ 3215 (1902). Scheele. Composition of matter for healing purposes, and process for producing the same. June 25.

[C.S.] 4866 (1902). Fleming. Fumigator or candle for diffusing antiseptics, disinfectants, perfumes, medicaments, and insect-destroying chemicals or compounds. June 25.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 13,666. Wise.—From Eichhorn. Treatment of pulp, and apparatus therefor. June 16.

„ 13,940. Abel.—From Koch. Method of and apparatus for the manufacture of eyelets and studs of celluloid. June 19.

[C.S.] 12,695 (1901). Richter. Denitration of nitrocellulose. July 2.

„ 11,505 (1902). Mills.—From Transparent Cellulose Products Co. Collapsible tubes and other tubular articles. July 2.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 14,032. Wohl. Manufacture of acetyl chloride. June 20.

„ 14,034. Evans. — From Electrochemische Werke G. m. b. H. Process for the preparation of oxalates from formates.* June 20.

[C.S.] 7599 (1902). Larue. *See under* XVIII. A.

XXI.—PHOTOGRAPHY.

[C.S.] 16,030 (1901). Collard. Flash lamps for photographs and other purposes. July 2.

[C.S.] 17,100 (1901). Mills.—From Soc. Anon. des Plaqu et Papiers Photographiques A. Lumière et s Fils. Combined toning and fixing baths for ph tographic purposes. June 25.

„ 19,222 (1901). Schwarz. *See under* I.

„ 3347 (1902). Ahrle and Metalline-Platten-Ge m. b. H. Bronze-coated plates prepared and sen tised for photographic, photo-mechanical, and oth printing processes. July 2.

„ 4365 (1902). Mauermeister. Process for the produ tion of colour filters for taking photographs. July

„ 9608 (1902). Varry. Apparatus for producing phot graphic and like prints by artificial light. June 2

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 13,758. Newton.—From Laflin and Rand Powd Co. Powder-granulating machines.* June 17.

„ 13,845. Hess. Detonators. June 18.

„ 14,188. Underwood. Marine rocket-torches. June 2

„ 14,299. Lake.—From Parker Match Co. Man facture of matches.* June 24.

[C.S.] 8821 (1901). Volpert. Manufacture of ammon explosives. July 2.

„ 12,695 (1901). Richter. *See under* XIX.

„ 14,231 (1901). Lundholm and Nobel's Explosiv Co., Ltd. Smokeless guupowders. July 2.

„ 11,001 (1902). Wright. Match-making machin July 2.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 4

JOURNAL OF THE
Society of Chemical Industry.
A RECORD
FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 14.—Vol. XXI. **JULY 31, 1902.** No. 14.—Vol. XXI.

Subscription of Members 25/- per annum; Entrance Fee 21/-; Election by the Council.

Price to Non-Members 36/- per annum; To Members 25/- per Set of extra or back numbers. Single copies (Members and Subscribers only), 1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
H. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

rston T. Bogert.
of. C. F. Chandler, D.Sc., I.D., Ph.D., LL.D.
. John Clark.
of. G. G. Henderson, D.Sc.
Grant Hooper.
R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

A. Brotherton, M.P.
tace Carey.
Edw. Divers, F.R.S.
s. Fairley.
J. Grossmann.
f. W. R. E. Hodgkinson, a.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.
W. R. Lang. | Alfred Burton.

LIVERPOOL.
Tate. | Dr. T. Lewis Bailey.

LONDON.
r F. Reid. | A. R. Ling.

MANCHESTER.
evinstein. | J. Carter Bell.

NEWCASTLE.
Rennoldson. | F. C. Garrett.

NEW YORK.
Coblentz. | Dr. H. Schweitzer.

NOTTINGHAM.
ibutt. | J. T. Wood.

SCOTTISH.
Watterson. | Dr. Thos. Gray.

YORKSHIRE.
s. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.	Wm. Kellner, Ph.D.
G. Beilby.	Charles A. Kohn, M.Sc., Ph.D.
J. Carter Bell.	J. Lewkowitsch, Ph.D.
Joseph Bernays, M.I.C.E.	A. R. Ling.
H. Brunner.	W. Macnab.
Edw. Divers, M.D., D.Sc., F.R.S.	N. H. Martin.
Sir John Evans, K.C.B., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
A. G. Green.	B. E. R. Newlands.
Samuel Hall.	John Pattinson.
Otto Hehner.	F. B. Power, Ph.D.
John Heron.	Prof. H. R. Procter.
D. B. Hewitt, M.D.	Boverton Redwood, D.Sc.
E. Grant Hooper.	Walter F. Reid.
David Howard.	John Spiller.
Prof. J. J. Hummel.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams	I., XV.	C. A. Mitchell, B.A.	XII., XXII.
L. Archbutt	I., XII., XVIII.B.	A. More	VII., XVIII.
J. L. Baker	XVI., XVII.	G. T. Morgan, D.Sc.	IV., V.
H. Ballantyne	II., XII.	J. G. Parker, Ph.D.	XIV.
D. Bendix	III.	H. T. Penter-mann	XVI., XVII.
E. Bentz	IV., V., VI.	H. S. L. Polak	Patent List.
J. O. Braithwaite	XX.	T. H. Pope	XVI., XX., XXI.
J. F. Briggs	XVI., XVII.	F. W. Renaut	Index.
J. H. Collins	X.	G. H. Robertson	XI.
C. F. Cross	V., XII., XIX.	Chas. Salter	I., II., III., XV., XVI.
J. T. Dunn, D.Sc.	VII., X., XI.	M. J. Salter	XIII.
Walter C. Hancock, B.A.	VIII., IX.	R. Sandon	II.
J. W. Hinchley.	I., X., XIII., XXI.	J. Shields, D.Sc., Ph.D.	XI.
H. Ingle, Ph.D.	V., VI., XII., XIII.	A. Shonk	Gen. Chem.
R. L. Jenks	XIV., XIX.	W. P. Skertchley	XII., XVIII., XX.
J. B. C. Kershaw	VII., XI.	E. Sonstadt	III., VII., X.
M. C. Lamb	VI., XIV.	E. Howard Tripp, Ph.D.	III., VII., XVI.
T. A. Lawson, Ph.D.	IV., XX.	Charles T. Tyrer	XX.
F. H. Leeds	III., XIII., XXI.	L. J. de Whalley, B.Sc.	XVI.
Herbert Levinstein, Ph.D., B.Sc.	IV., V.	A. Wingham	X.
J. McCrae, Ph.D.	IV.	Joseph T. Wood	XIV.
G. W. MacDonald, M.Sc.	XXII.	A. C. Wright, B.Sc., M.A.	IV., XVIII., XX.
W. G. McMillan	X., XI., XIV., XXII.		
N. H. J. Miller, Ph.D.	XV.		

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. G. Ellis.
W. Hodgson Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: F. H. Tate.

Vice-Chairman: C. Longuet Higgins.

Committee:

Percy Bateson.
J. Campbell Brown.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Max Muspratt.
Julius Raschen.
Alf. Smetham.
H. B. Stocks.
J. W. Towers.

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Walter F. Reid.

Vice-Chairman:

Committee:

Julian L. Baker.
A. C. Chapman.
E. Divers.
M. O. Forster.
Oscar Guttmann.
Otto Hehner.
H. Hemingway.
W. Kellner.
J. Lewkowitsch.
A. Gordon Salamon.
W. S. Squire.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

J. Allan.
W. Brown.
R. Clayton.
J. Craven.
W. Heys.
J. Hübner.
H. Levinstein.
W. J. Pope.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.

Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.
P. P. Bedson.
H. S. Collins.
J. T. Dunn.
T. W. Hogg.
H. Louis.
J. Mather.
John Pattinson.
W. W. Proctor.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: V. Coblentz.

Vice-Chairman: Russell W. Moore.

Committee:

L. Baekeland.
G. Drobegg.
W. F. Fuerst.
A. P. Hallock.
E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schleffelin.
R. C. Schüpphaus.
G. C. Stone.
M. Toch.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.

Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

Scottish Section.

Chairman: T. L. Patterson.

Vice-Chairman: D. J. Playfair.

Committee:

W. Carrick Anderson.
E. M. Bailey.
H. Bumby.
D. B. Dott.
C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hopo Street, Glasgo

Yorkshire Section.

Chairman: Jas. E. Bedford.

Vice-Chairman: T. Fairley.

Committee:

C. S. Bedford.
E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

Very truly yours
J. W. Swan

Notices.

PORTRAIT OF DR. SWAN.

portrait of Dr. Jos. W. Swan, F.R.S., the latest recipient ie Society's Medal, is enclosed with this number of the nal. Exigencies of space limit the size of the mount at of the Journal. Those members who require an copy, with a larger mount suitable for framing, may n one by remitting 1s. to the General Secretary.

SPIRIT (ALCOHOL), DUTY-FREE.

e principle of concessions in regard to the use of spirit hol) having been accepted by the Government, the cil would be obliged if those members who are in- ed in industries, in which partially or wholly duty-free would be of advantage, would inform the Secretary at way the power to use spirit duty-free for manu- cing purposes would affect their industries, giving, as possible, actual instances and figures:—

As facilitating present processes (crystallising, &c.).

As rendering possible the manufacture, in Great n, of products which the duty has hitherto prevented.

As affecting the position of British manufactures in d to foreign competition.

As to the branches of industry which the duty on ol has crippled or destroyed.

e Council has appointed a Committee, consisting of President, Hon. Treasurer, Dr. Squire, Mr. David rd, Mr. A. G. Green, Mr. Walter F. Reid, and hos. Tyrer, to consider and report on this question.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to ce a reliable technical dictionary in three languages lish, French, and German—and has asked this Society nish the names of such scientific and industrial men willing to supply the technical expressions of their pecial branches of industry. The assistance to be ed must be gratuitous, as otherwise the expense be prohibitive; but no money is asked for by the n Society, though it has already spent considerable upon the work, and has provided an editor, Dr. Hubert , of Berlin, with a staff, to collate the materials ed.

The Council of this Society agreed to co-operate in ork, and appointed a special committee, consisting the President, Hon. Treasurer, Drs. Lewkowitsch, l Messel, Redwood, and Squire, and Messrs. Beilby, er, Newlands, Reid, and Watson Smith to decide he form of co-operation. It has been determined to one or more representatives for each class of the rnal and Patent Literature; and the committee now r volunteers to undertake a class or division of a To those who intimate their wish to help, full ulars of the plan of the work, with instructions how eed, will be sent. Offers of co-operation should be ssed to the General Secretary.

Changes of Address.

n notifying new addresses, members are requested to them distinctly, and state whether they are temporary manent. Multiplication of addresses is also to be l as tending to create confusion. When sending ptions, the use of the form attached to the application m the verification of addresses, on which the safe y of the Journal depends.

Bevilge, Jas., l/o Manchester; "The Gables," Alderley dge, Cheshire, and (Journals) c/o The Cushing phite Fibre Co., Ltd., St. John, N.B., Canada.

Brun, Alex., l/o Woolwich; Laboratory, Hyde Park Corner, Colombo, Ceylon.

Bunker, H. E., l/o Farnworth; retain Journals.

Cowan, Fred. W., l/o Nassau Street; 105, St. George Street, Toronto, Canada.

Cowburn, A. W., l/o Bowdon; 29, Princess Street, Manchester.

Cowburn, W. H., l/o Bowdon; c/o J. R. Cowburn, 14, Verulam Street, Upper Parliament Street, Liverpool.

Cullen, Wm.; Journals to Dynamite Factory, Modderfontein, Transvaal, S. Africa.

Emery, E. G., l/o Columbus; c/o N.Y. and St. Louis Mining and Manufacturing Co., 302, Roe Building, St. Louis, Mo., U.S.A.

Harris, Booth, jun., l/o Loughton; Beeleigh, Victoria Road, Buckhurst Hill, Essex.

Haslwanter, C., l/o Flushing Avenue; 908, Willoughby Avenue, Brooklyn, N.Y., U.S.A.

Hewitt, Dr. J. T., l/o Sydenham; 8, Montpelier Road, East Twickenham.

Jackson, Rt. Hon. W. L., F.R.S., M.P.; see Allerton, Rt. Hon. Lord, (Journals) Allerton Hall, near Leeds; and (subscriptions) c/o W. L. Jackson and Sons, Ltd., Busliugthorpe, Leeds.

Karas, Jno., l/o Troy; c/o Buffalo Shirt Co., 565–577, Washington Street, Buffalo, N.Y., U.S.A.

Leuthardt, P., l/o Manchester; 33, Riggindale Road, Streatham, S.W.

McCreath, Wm. D., l/o Cornwall; Tarff Creamery, Twynholm, Kirkcudbright, N.B.

Macdonald, Peter, jun.; Journals to Mazapil Copper Co., Ltd., Concepcion del Oro, Zacatecas, Mexico.

Marshall, Wm., l/o Rochdale; Carisbrook, Queen's Road, Cheadle Hulme, Cheshire.

Martin, Alex. M.; all communications to Douglas Villa, Dunbeth Road, Coatbridge, N.B.

Newton, H. C., l/o London; Potterspury House, Stony Stratford, Bucks.

O'Brien, Fred., l/o St. Mark's; Sunningdale, Lilymead Avenue, Knowle, Bristol.

Reese, Dr. Chas. L., l/o Palmerton; c/o Repauno Chemical Co., Chester, Pa., U.S.A.

Shenstone, W. A.; Journals to Tuffleigh, St. Vincent Rocks, Clifton, Bristol.

Smith, H. Procter, l/o Motherwell; 9, Church View, Brymbo, near Wrexham.

Steinmetz, C. P.; Journals to Research Laboratory, General Electric Co., Schenectady, N.Y., U.S.A.

Watson, Chas., l/o Buenos Ayres; Dawsholm Chemical Works, Maryhill, Glasgow.

Weuse, Dr. Wm., l/o Bleicherode; Chem. Fab. Griesheim-Elektron, Griesheim a/Main, Germany.

PROCEEDINGS

OF THE

TWENTY-FIRST ANNUAL MEETING.

WEDNESDAY, JULY 9, 1902.

The twenty-first annual meeting of the Society was held in the Arts Theatre of University College, Liverpool, on Wednesday, the 9th July. Dr. Joseph W. Swan, F.R.S., occupied the chair in the absence, through illness, of Mr. Ivan Levinstein, the President of the Society.

THE PRINCIPAL OF UNIVERSITY COLLEGE (A. W. W. DALE, Esq., M.A.), in welcoming the members of the Society, said: Mr Chairman, ladies, and gentlemen, I shall content myself with expressing in the fewest possible words the very cordial welcome of the Council and Senate of University College, and convey to you their hope that your conference may be successful. We are glad to place at

your disposal our college buildings. The approach to them, we must confess, is not everything that we would desire. There is too little local colour. Though we have ample accommodation for meetings in these buildings, you will find the temptation to ease and luxury distinctly inadequate; but perhaps on an occasion like this you may not consider that altogether a disadvantage. In this College the work with which you are associated finds full and ample recognition. We were established, originally, not merely for purposes of general culture, but also to give that special instruction in technical subjects that would be of immediate service in the business of life; and, from the outset until now, that purpose has been kept steadily in view by my friend Professor Campbell Brown and my other colleagues who are specially connected with this side of the College work. During the last few weeks it has been my duty, incidentally, to trace the progress of chemical instruction and chemical industry in Germany, and it has come home to me in overwhelming force that in that country the progress and development of chemical education has at once been followed by a corresponding development of their chemical industry. What they have done in their schools, in their colleges, and in their universities, has contributed in a most remarkable way to their national prosperity and their national development. I understand that one, at any rate, of the functions of a society like this is, in a certain sense, to point the road along which similar work and similar organisation may take place in our own country, and that in the development of a system of national education on the broadest and widest lines, we may have the co-operation and guidance of a society such as that which meets in this building this morning.

The Chairman: In the name of this meeting and of the Society of Chemical Industry, I beg to thank Principal Dale for the very appreciative terms in which he has spoken of the objects of the Society. We felt quite assured in coming to Liverpool that we should meet with a sympathetic reception. We know that Liverpool is a progressive community. Whether we look at its educational institutions, as represented by this magnificent college—the resources of which are so liberally placed at our disposal—or whether we look at the city itself, we have abundant proof that the life of Liverpool—the intellectual life and the communal life of the city—is of a very active and progressive kind. The Society of Chemical Industry unites science to commerce and commerce to science, and I feel quite sure that the kindness of our reception here indicates that the Liverpool community entirely sympathises with and appreciates the objects of the Society, and recognises the value of progress in connection with the chemical industry, which touches at almost every point the commerce of a great community like this. I thank you, in the name of the Society, for your welcome.

We are met to-day under exceptional circumstances. I greatly regret to have to announce that the President is prevented by severe illness from being present with us. Although he has been out of health for some time past, he has never been negligent of the interests of the Society, but, whilst physically unfit for exertion, has devoted a large portion of his mental power to the promotion of its welfare, and the result is to be seen in the Society's proceedings, in the more frequent appearance of the Journal, and in legislation now in progress for the improvement of the laws affecting chemical industries in this country. We deeply sympathise with the President, greatly regret his absence, and especially the cause of it, and most heartily wish him complete and speedy restoration to health.

During the illness of the King the people have been moved by one common impulse and an all-absorbing anxiety that the life of his Majesty might be spared, and now that that feeling of intense anxiety has passed away and given place to a sentiment of profound thankfulness and rejoicing at the almost miraculous recovery of our beloved Sovereign, a strong desire arises in our minds to give expression to this feeling in some form. Therefore I venture to suggest that before we commence the ordinary business we pass a resolution congratulating the King on his recovery. The form of the resolution I have to propose is as follows:—"The Society of Chemical Industry, assembled in annual general meeting at University College, Liverpool, on July the 9th, 1902, before proceeding to the transaction of the ordinary business, by a unanimous vote resolved as follows:—That this meeting, in a spirit of thankfulness to God and loyalty to the throne, desires to congratulate your Majesty on a safe passage through a dangerous illness, and to express the most earnest wishes for your Majesty's speedy and complete restoration to health." I would suggest that the President be directed to convey this resolution to the King's Secretary for presentation to his Majesty.

Mr. E. K. Muspratt: The resolution requires no words from me, but I have very great pleasure in seconding it.

The resolution was adopted with enthusiasm, the meeting rising and singing "God save the King."

The General Secretary read the minutes of last annual general meeting, which were passed, and signed by the Chairman. He afterwards read the list of new members to serve on the Council, stating that, as the number nominated just filled up the vacancies, there would be no ballot (see Journal, July 15, 891).

The Chairman then announced that, upon his election to the chairmanship of the London Section, Mr. Walter F. Reid had resigned his position as Vice-President, and that Mr. Marston T. Bogert, of New York, had been elected to fill the vacancy.

The Secretary then submitted the report of the Council (see Journal, July 15, 891).

The Chairman: Of all the reports we have had, I know none containing stronger evidence of the activity, prosperity and good work of the Society. Many things strike one on listening to that report, and one of the first is the losses which the Society has sustained during the year. When we read such names as those of John Glover, Sir Henry Gilbert and Prof. Macadam, and think that they will no longer appear in our proceedings as the names of active workers with us we cannot help reflecting as to the impossibility almost of these losses being completely and adequately repaired. On gains in new membership, however, are numerically very much larger than our losses; and it is hoped—and no doubt the hope is well founded—that amongst the new additions there will be many who will be active members, and who will contribute valuable work to our proceedings. We have gained during the year more than 150 members, and now the membership represents a total of 3,790. But it is not merely the large membership that is remarkable and interesting: it is the character of the membership, and the sources from which the new members are drawn. More and more there is a tendency, one notices, for members to come from abroad—from the Colonies, from America, and other foreign countries—and applications for membership from such sources is surely testimony to the value of this Society and the work it is doing.

Prof. W. N. Hartley, F.R.S., Dublin: I rise to move the adoption of the report. I am sure it has given extreme satisfaction to all those who are members of the Society to learn that the medal this year has been awarded to Mr. Swan.

Mr. J. C. Gamble, St. Helens, formally seconded the motion, and the report was adopted.

Mr. Samuel Hall, the Hon. Treasurer, in submitting the financial statement (see Journal, June 30, 812—81), said:—

It is my pleasant duty to place before you the accounts of the Society for last year, 1901, and to explain, shortly, the nature of the details which have been published in the Journal for June 30. With your permission, I may, to save time, suggest that the account itself be taken as read.

The particular account we have to deal with is the first one, that on p. 812, namely, "Revenue and Expenditure, 1901." The second merely shows that your Treasurer has dealt faithfully with the amounts received, as is shown by your Accountant's certificate.

This first account records 5,698*l.* received, besides 3*l.* for entrance and life composition fees. This latter amount is always permanently invested. There is an increase in subscriptions of 273*l.* over the year 1900, and of *l.* income from invested property. Advertisements and [illegible] show an apparent decrease of 32*l.*, if 1900 be credited a

ale with 50*l.* recovered against some journals lost by fire. The total increase available against expenditure was 260*l.*

On the expenditure side, publishing cost 2,195*l.*, or 12*l.* more than 1900; editorial work, 1,473*l.*, or 140*l.* more than 1900; sundry printing, 63*l.* more than 1900; sectional expenses, 58*l.* more than 1900, making together in excess of 373*l.*, whilst the remaining items, including annual meeting, office expenses, rent, petty cash, extra clerical work, and part of a year's salary to an assistant whom we have added to our staff, amount to 20*l.* less than 1900.

The general outcome as regards money is a balance to the good of 611*l.* and 375*l.* entrance fees. It will be noticed that we invested 1,000*l.* during the year.

Turning to this year, you are all well aware that the Journal is much enlarged and up-to-date, and is published twice a month. We do not think that there can be any doubt that this early publication, with the addition of United States and French patents and other matters, is a very great advance, and that it makes our Journal the foremost in the world of its kind. Naturally this required a new arrangement with the publishers.

And here, gentlemen, I should be wanting in my duty if I did not tell you that the initiative of this change came from our President, Mr. Levinstein, and not only the initiative, but the satisfactory conclusion of the excellent negotiations with the publishers is wholly due to the admirable tact with which he conducted them, at the various interviews we had, and the pains he took to fairly consider their position and ours, although at the time he was suffering from the trouble which necessitates his absence from us to-day.

I will not trouble you at any length with the details of this arrangement, which has been carefully considered and agreed to by your Council, but as your Treasurer, and being somewhat specially responsible, considering the general good of the Society, it has my full sympathy.

In general outline, it is that we pay the publishers a fixed annual sum, or subsidy, for paper, printing, posting, an increased size of eight pages per issue, and also providing and keeping, as our property, a certain amount of stock.

On their side, they take the whole of the advertisements, instead of paying us a fixed sum per page as heretofore, and deal with them as they choose, subject to our approval of the matter.

On our part, we find the whole of the literary matter. Necessarily there will be an increased cost on this head. By the original agreement with our hard-working and conscientious Editor, a twice-monthly journal was provided for with an increase of salary.

It will be seen, when you know that, to the end of June, the Journal has overstepped the allowed number of pages by 155—which have to be paid for extra—that your Publication Committee—and shall I say your Treasurer—have not dealt with the Society in any niggardly way, but have considered themselves as your executive to give the members the best and quickest information available.

Although it is difficult to forecast the exact bearing of the expenses under the new arrangement, I believe we shall still have a substantial balance at the end of the year.

I shall be happy to answer any questions as to the accounts.

Mr. Eustace Carey, Liverpool: I have great pleasure in proposing that we offer to Mr. Hall, the Hon. Treasurer, our best thanks for his services during the past year. Mr. Hall has the good fortune to be the treasurer of a society which is really prosperous, and of a society which, as you have heard, has an increasing revenue, but that always brings with it an increased amount of temptation to extravagance. I can assure you, however, that Mr. Hall resists all such temptations, and keeps a very tight hand on the Society's purse-strings. We are very much indebted to Mr. Hall, and I hope he will see his way to act as Treasurer for a long time to come.

Prof. W. H. Perkin, F.R.S., Manchester, seconded the vote of thanks, which was heartily passed.

The Chairman: I feel that, however heartily you may have passed this vote, you could not thank your Hon. Treasurer enough for the admirable way in which he administers the funds of the Society. The amount of time and trouble, and the admirable exactitude with which he conducts the business, demands our warmest acknowledgment.

Mr. Samuel Hall: I am very much obliged to the members for this vote of thanks. I can assure them that it has been to me a labour of love, because I have known the Society from the very beginning, and have always felt that it is one which is not only for our own advantage, but for the general good. I can only thank you for the great kindness which you have shown towards me.

Mr. Thomas Tyrer, London, read the address of Mr. Levinstein, the President, who, as already stated, was unable to attend owing to a serious illness (see Journal, July 15, 893—899).

N.B.—The President wishes it to be clearly understood that, when he stated in his address that the Patent Law Amendment Bill "would never pass in its present form," he was writing before the second reading took place, and referred to the original clause 2, now abandoned.

The Chairman, in moving a vote of thanks to the President for his address, said: The President could not have dealt with more important topics than those which he has discussed in the address, so admirably rendered by Mr. Tyrer. It contains much food for reflection and discussion, and I trust that it will eventuate in useful action. I hope the address will be widely circulated. Of course, it will be printed in the Journal, which has a large circulation, but I hope it will also find its way into the public newspapers. The address touches upon many problems, such as the questions of free trade, the injurious effect and high rates of carriage, education, and patent law reform, and all those questions are of the most vital importance to the prosperity, not only of chemical industry, but of the country at large.

Prof. Campbell Brown, Liverpool: The very pleasant duty devolves upon me of seconding the vote of thanks to the President for his address, which, in its style, its lucidity, and its terseness, is altogether admirable. We have had from Mr. Levinstein a thoughtful exposition of our national position, for which we, as a society, and the whole nation are indebted to him. I beg to second the vote of thanks to the President for his address.

The Chairman: May I couple with this expression of your thanks our great regret at his absence, and our sympathy with him in his illness. I hope Mr. Tyrer understood that the vote of thanks included himself, for we are much indebted to him for the admirable manner in which he has read the address of our President.

Mr. E. K. Muspratt, Liverpool: The pleasing duty now devolves upon me, as a past President, of presenting the Society's medal to Dr. Swan. In doing so, perhaps I may be permitted to give a short sketch of the valuable work which Dr. Swan has done. (For this sketch and Mr. Swan's reply, see Journal, July 15, 900.)

Dr. C. A. Kohn, London, moved that Messrs. Miall, Wilkins, Randall & Co., be elected auditors of the Society at a remuneration of 10*l.* 10*s.*

Dr. D. B. Hewitt, Northwich, seconded, and the motion was adopted.

Prof. W. R. Lang, Toronto, Chairman of the Canadian Section, moved that Mr. George Beilby be elected the representative of the Society on the governing body of the Imperial Institute.

Dr. G. Archbold, Canada, seconded the motion, which was passed.

Mr. Walter M. Gardner, Bradford, moved that the next annual meeting of the Society be held at Bradford. He said that there might not be a large number of chemical industries in the Bradford district, but there was one respect in which the town would yield to no other place, and that was in the cordiality of the reception which would be accorded to the Society if it favoured the town with a visit. He was sure the members of the Yorkshire Section would do everything in their power to make the meeting a successful and a pleasant one.

Mr. George Ward, Leeds, seconded the motion, and assured the members of a hearty reception if the Society decided to visit Bradford.

The motion was unanimously adopted.

Mr. Tyrer read a letter, which had been received by the President from the chairman and secretary of the New York Section, inviting the Society to hold its annual meeting in 1904 in New York. He moved that the invitation be accepted, and expressed the hope that a large number of the members would avail themselves of this opportunity of visiting New York.

Mr. W. F. Reid, London, seconded the motion. Not only did the good old Anglo-Saxon virtue of hospitality flourish on the other side of the Atlantic, but their American friends would be able to teach them a great deal. They had heard from the President about what the Germans were doing. He believed that the Americans were doing even more than the Germans, and they would have a great deal to learn from them, as well as a great deal of warm hospitality to experience.

The motion was carried unanimously.

The Chairman moved that the thanks of the Society be given to the Senate and Council of University College for the admirable accommodation they had placed at the disposal of the Society.

Mr. C. Longuet Higgins, Liverpool, seconded, and the motion was passed.

This concluded the business, and the proceedings terminated.

Luncheon.

At the invitation of the Liverpool Section, the members adjourned for luncheon at the Adelphi Hotel. Luncheon over, Dr. Joseph Swan said he had to ask those who were guests to join with him in returning thanks to the Liverpool Section for their hospitality. They were warned that morning by Principal Dale not to expect anything in the way of luxury and ease during their visit, and already his words were to some extent falsified. Dr. Swan concluded by asking the guests to drink the health of Mr. Eustace Carey, as representing the Liverpool Section. Mr. Carey in responding, in the absence of the Chairman, said that it was a pleasure to the members of the Liverpool Section to entertain their guests on that occasion. They felt honoured by the presence of Dr. Swan, who conferred distinction wherever he went. On behalf of the Liverpool Section he thanked Dr. Swan for the kind words he had used with regard to them.

Garden Party at Seaforth Hall.

Later in the afternoon the members and their friends went to Seaforth Hall, Seaforth (the residence of Mr. E. K. Muspratt), where a garden party was held. Invitations had been issued to about 350. The guests were received by Mr. and Mrs. E. K. Muspratt. Unfortunately, the weather did not favour the gathering; however, rain did not fall continuously, and the brighter intervals were freely utilised for exploring the beautiful grounds and enjoying the fine prospects which the hall, situated as it is on the banks of the Mersey, affords of the estuary. Indoors, the police band gave selections of music, refreshments were also provided, and, altogether, thanks to the consideration and kind attentions of Mr. and Mrs. Muspratt, a very pleasant afternoon was spent.

Conversazione at University College.

In the evening a conversazione was held at University College. There was a considerable attendance. A musical programme was contributed by Mrs. Catherine Buckley, Miss Lillie Wormold, Miss Backsheen Wood, Messrs. Walter Hatton, Akeroyd, Matthews, and Black.

During the evening Prof. H. S. Hele-Shaw gave an interesting lantern lecture and demonstration on "Thin films of liquid, illustrating stream-line motion and magnetic lines of force," and, amongst other things, the application to the theory of dynamo construction and the passage of heat through boiler plates. The machinery of the engineering laboratories was in motion, and was subjected to a close inspection.

During the evening, W. P. Bayley's band played selections of music in the hall of the College.

VISITS TO WORKS AND PLACES OF LOCAL INTEREST.

SECOND DAY.—Thursday, July 10th.

Cable Works of the Telegraph Manufacturing Co., Ltd., Helsby.

At these works the following products are manufactured:—

Cables for electric light, power, and traction, insulated either with vulcanised rubber, paper, or impregnated fibre.

Dry core telephone cables.

Gutta percha insulated telegraph wires.

Flexible silk-covered instrument wires.

The following processes are carried on:

Stranding of conductors.

Preparation of rubber and gutta-percha from the raw state.

Insulating conductors with rubber, jute, paper, and gutta percha.

Testing of insulated conductors.

Protection of insulated conductors with (1) braiding of hemp or cotton, (2) lead covering.

Armouring insulated conductors with steel tapes.

Works of the British Insulated Wire Co., Ltd., Prescot.

Leader: Mr. J. W. Towers.

The British Insulated Wire Co., Ltd., was founded in 1891 for the manufacture of paper-insulated underground cables of all classes.

The company's factory at Prescot has grown from small beginnings, until it now covers a surface of 15 acres, and comprises not only the most extensive electric cable factory in this country (and perhaps in the world), but also a separate department for the rolling and drawing of the necessary copper wire, and the making and machining of joint boxes, section pillars, &c.

The company were the first makers of paper-insulated cables in this country, the first to manufacture concentric and triple concentric cables on a commercial scale, and to provide a complete system of junction boxes for underground mains. They introduced the system of twin lead-covered house wire cables. They were the first manufacturers of low capacity air-space telephone cables, and the first to use earthenware troughs for laying cables underground on the solid system.

The employees now number over 2,500, and the executive and commercial staff over 200.

The visitors were entertained at luncheon by invitation of the Directors of the firm, Mr. E. K. Muspratt, one of the Directors, in the chair. After lunch, Mr. Walter F. Reid proposed a vote of thanks to the hosts for the reception and entertainment of the members, to which Mr. Muspratt replied.

Lancashire Watch Company, Prescot.

Leader: Mr. J. W. Towers.

The buildings of the Lancashire Watch Company's factory, now completed, consist of one three-storey outer workshop and two one-storey workshops, occupying a space of 300 ft. by 260 ft., and having a total floor area of 59,325 sq. ft.

Each of the workshops is ventilated by Blackman propellers, and the buildings throughout are heated by steam.

The motive power is provided by a locomotive-type boiler, working at 140 lb. pressure, and supplying steam to a Marshall's compound engine, capable of developing 80 I.H.P., and is transmitted to the various shafts by cotton ropes working in iron grooved pulleys.

The smaller one-storey workshop is used for the making of tools, and has joiners' shop and smithy partitioned off at one end.

The larger one-storey workshop is employed in the making of watch movements.

The first-floor of the three-story workshop contains the flat steel and stem-winding departments; the second floor is used for jewelling, gilding, escapement- and balance-making; and the third floor for assembling room and dial and hand-making.

The output of the factory at the present time is close on 2,500 watches per week, and about 1,200 workpeople are employed.

The members owe a debt of gratitude to Mr. T. J. Lewitt, the Managing Director, for the admirable arrangements by which they were conducted over the works in parties of seven.

Works of the United Alkali Company, Ltd., Widnes.

Leaders: Mr. E. Shrapnell Smith and Mr. Arthur Carey.

The party which elected to go to Widnes was conveyed either by motor-cars. Notwithstanding the heavy rains, and consequently heavy roads, the journey was satisfactorily accomplished, and the visitors were conveyed to the works, and subsequently to the Town Hall and Central Hotel for luncheon, and then back to Liverpool. The private cars were kindly lent by members of the Liverpool Self-Propelled Traffic Association, the remaining ones being provided by the Road Carrying Company, Ltd.

The following works were visited, and processes seen in operation:—

Pilkington Works.—The manufacture from pyrites of sulphuric acid in leaden chambers.

The manufacture of sulphate of soda (saltcake) and hydrochloric acid by heating sulphuric acid and common salt together in furnaces of the "Deacon Plus-pressure" type.

The manufacture of alkali by the "Leblanc" method. The alkali waste is subsequently treated by the "Chance" sulphur recovery process, whereby the sulphur is extracted and the greater part of it recovered.

Sullivan Works.—The manufacture of sulphate of soda by the "Hargreaves" process, which consists in passing sulphur dioxide and air at a high temperature through properly prepared common salt, sulphate of soda and hydrochloric acid being the resulting products. The hydrochloric acid, both from the ordinary process at the Pilkington Works and from the "Hargreaves" process, is used in the manufacture of bleaching powder, partly by the "Deacon" and partly by the "Weldon" process.

The "Deacon" process consists in passing gaseous hydrochloric acid and air at an elevated temperature through heated material impregnated with a salt of copper, which acts catalytically, chlorine and water being formed. The moist chlorine is then passed through cooling apparatus and drying towers. It is then dried and used for making bleaching powder.

In the "Weldon" process, liquid hydrochloric acid is brought into contact with peroxide of manganese in stone balls, the temperature is raised by steam, and about one-third of the chlorine in the hydrochloric acid is liberated: it is conveyed to lead chambers, where it is absorbed by water. The chloride of manganese is subsequently treated by the "Weldon" process for the recovery of the manganese.

Semet-Solvay Coke Ovens.—For the making of gas, coking of coal, and recovery of the by-products, tar and ammonia water.

After their inspection of the works and processes, the visitors were hospitably entertained at luncheon by his Worship the Mayor of Widnes, Alderman W. W. Gossage, J.P., and the Directors of the United Alkali Co., Ltd. The Mayor accorded the visitors a hearty welcome at luncheon, and after the latter had been partaken of, Mr. C. Groves, F.R.S., in the name of the visitors, proposed a vote of thanks to their hosts, which was acknowledged and responded to by Mr. Max Muspratt.

Port Sunlight Village and the Soap Works of Messrs. Lever Bros., Ltd.

Leader: Dr. T. Lewis Bailey.

This excursion was well attended by ladies, in spite of rain and bad weather, and the total gathering was fully equal to the accommodation provided in brakes, which were to convey the visitors from the steamer to Port Sunlight.

Messrs. Lever Brothers started in Warrington, in January, 1886, the output at that factory being 20 tons of soap per week.

The first sod at Port Sunlight was cut on the 3rd March, 1888. In June, 1889, the firm commenced business at Port Sunlight, the output being then 800 tons per week. The present capacity is over 3,000 tons per week.

The estate covers about 220 acres, of which 51 acres are occupied by works, and 169 by village and land. The number of employees alone averages 2,500.

The general offices are divided into two wings. There are about 300 clerks engaged, and about 140 typewriters at work in these offices.

After leaving the offices, the visitors proceeded to inspect the factory, which, like the offices, is protected throughout by automatic sprinklers for extinguishing fire.

The laboratory is exclusively used for testing and analysing raw materials and soaps, finished, and in various stages of manufacture. Another laboratory is set aside for chemical and engineering work.

On leaving the laboratory, the soap works were entered. Soap wrapper printing, sorting and cutting, card-box punching, pinning, glueing, and packing are carried on here, as well as in an extension in the galleries around the printing room.

The wharf was next reached. It has a frontage of 1,400 feet, and the dock holds 25,000 tons of water on a 20-foot tide. This dock was opened in July, 1898. Near the wharf are the large oil store-tanks.

No. 1 pan room contains 54 large pans, and in No. 2 pan room, which is practically a duplicate of No. 1, there is an equal number. In No. 1 frame room, cooling and cutting of soap into bars was seen. There are over 2,200 cooling frames in this room. The cutting, stamping, wrapping, and packing of soap tablets is done in No. 1 Stamping Room. In this room alone, there are 13 power-driven stamping machines. Tablets are stamped at the rate of 180 per minute on each machine.

The factory is supplied with water direct from its own wells, of which there are two. No. 1 Well Pump supplies fresh water of first-class quality; the bore is about 500 ft. deep, and the pump throws 30,000 galls. per hour. No. 2 Well is a duplicate of this, but is worked on the American air-lift principle.

In the central electric power and light station, all electric current necessary for the works is generated. Besides the various engines and generators, there is a set of accumulators. The power current is continuous, and is supplied at a pressure of 300 volts, and the lighting current at 150 volts. There are over 300 separate motors in the works. Electrical current is also supplied to the various village institutions, for lighting purposes, through an underground cable.

After seeing the laboratories, plant, processes, and the magnificent offices, the model village, schools, dining-rooms, and institutions for the workpeople and their families, as well as the Art Exhibition, were inspected.

Village Institutions.—Among the institutions in the village worthy of notice are the following:—

The Gladstone Hall, opened by the late Right Hon. W. E. Gladstone, in 1891. The hall is used as a restaurant for men and boys. Entertainments are given here during the winter months, the hall being fitted with a stage and accessories.

At the men's club, London and provincial newspapers and magazines are provided for the use of the members, as well as billiards, draughts, and other games. There is a spacious bowling green attached.

The schools, opened in 1896, are built in the Tudor style. Scholarships are offered annually by Mr. Lever, providing three years' tuition in a higher-grade school, capable of fitting a scholar for a university career.

The schools are used for religious services on Sundays, but the building of a new church has been commenced. To provide for the increasing number of scholars, a commodious new school is now almost completed.

Hulme Hall, Bolton Road, is used as a restaurant for girls; it has a floor space of 15,400 ft., and will accommodate 1,200 diners.

Open-air bath and gymnasium (in course of erection). The bath will hold 200,000 galls. of filtered salt water, heated from 60°—65° F. Its dimensions are:—Length, 100 ft.; breadth, 75 ft.; depth, 3 ft. in shallow end and 7 ft. 4 in. in deepest part. The bath was opened on 5th July, by Lord Stanmore, G.C.M.G.

An exhibition of pictures, kindly lent from private collections, was on view in Hulme Hall. The exhibition was opened by Luke Fildes, R.A., and one of his most famous pictures, "The Doctor," forms part of the collection, which also contains works by Leighton, Alma Tadema, Reynolds, Gainsborough, Millais, Faed, Constable, Watts, MacWhirter, and other well-known artists. There are also some unique exhibits of antique china and furniture.

Mr. W. H. Lever presided at luncheon, and gave the visitors a warm welcome. He proposed as his toast, "The Society of Chemical Industry."

Mr. Tyrer responded to the toast, at the same time pointing out that the large-minded following of so high an ideal in the treatment of the workpeople and their children at Port Sunlight would, in truth, also be found to be the best policy.

Mr. A. H. Allen proposed "Success and Prosperity to Messrs. Lever Brothers, Ltd."

The vote was responded to, on behalf of the firm, by Mr. Barrie.

During lunch, music was provided, in the form of solos by the lady members of the Port Sunlight choir.

Stanley Dock Tobacco Warehouses.

Leader: Mr. Frank Tate.

Liverpool has gradually acquired the chief interest in the tobacco trade. Many important manufacturers have established themselves in the city, which has become the principal port of entry and the main centre of distribution. It imports every year from 25,000 to 30,000 tons of tobacco, and the commerce in tobacco has assumed such dimensions, that the Mersey Docks and Harbour Board has had to build this enormous warehouse to cope with it.

It is 725 ft. long, 165 ft. wide, and the height is 125 ft. It is divided into six sections by solid party walls, access from one section to the other being obtained on each floor by means of two double iron fireproof doors, with an air-space of several feet between them, and, with these closed, it would be relatively easy to localise and control any outbreak of fire.

Within the hoist-shafts are carrier pipes for salt and fresh water, and these convey water to any storey from the tanks beneath the roadway.

The tobacco landed at the other docks is brought here upon lorries, and received on the ground floor. In the centre of each section of the building a hydraulic hoist runs to the uppermost of the twelve floors, and by this means, the hogsheads are first carried to the sampling room at the top of the building. After having been sampled and weighed, the hogsheads are removed to the storage rooms.

The capacity of the warehouse may be realised from the fact that there were, in this and the adjoining warehouse, some time ago, 93,000 hogsheads of tobacco, representing a weight of about 50,000 tons, and if that quantity had been required at one time, the importers would have had to pay to the Customs no less a sum than 18,000,000*l.* to enfranchise their goods.

Messrs. Ogden's Tobacco Factory.

Leader: Mr. Frank Tate.

At the back of the offices, occupying the frontage, is the goods-receiving warehouse, including the leaf room, where the tobacco is taken from the hogsheads and handed to the pickers, who break open the leaves and lay them in heaps for the sorters. In the treating room, the tobacco leaves are moistened by sprinkling. This brings them into a workable condition, and has also an influence on the subsequent flavour.

The cutting room is arranged to contain a large number of cutting machines, and in the cooling room the tobacco is placed on canvas shelves to cool, and acquire the right condition for packing. The packing room contains five machines for packing tobaccos of all kinds.

In the spinning room the tobacco leaves are spun into twist of various thicknesses.

The cigarette factory is upwards of 200 ft. in length, and contains a large number of cigarette-making machines.

All the machinery in the factory is worked by electricity.

The firm employs upwards of 1,500 persons, of whom 1,000 are women, and, as an illustration of the magnitude of the firm's cigarette business, it may be mentioned that upwards of 1,000 millions of cigarettes were sold last year.

Diamond Match Co., Seaforth.

Leader: Mr. Frank Tate.

The greater portion of the matches manufactured in this factory are made on the fourth or top floor. There are, in all, 16 machines at work on this floor. They cut the matches automatically from the block, paraffin and tip them, and, when dry, pack them in boxes. Altogether, the number of hands employed to work a machine and pack up the matches is 12 or 13. Such a machine turns out, on the average, 50 gross of boxes in 10 hours, containing nearly 4½ millions of matches.

On every one of the pitch pine vertical supports of the roof is fixed a hydrant with 50 ft. of piping, connected with the town mains and a special supply tank. In addition to these, there is attached to the underside of the ceilings, every 10 ft. in every direction, a Grinel sprinkler nozzle, of which there are some 1,600 in various parts of the premises. All openings are fitted with doors and shutters coated with metal, which close automatically on the outbreak of fire.

In all match-making rooms the rate of air supply is such that the whole of the air can be changed in from four to five minutes. This, besides being very beneficial to the health of the workpeople, is useful for drying the matches during manufacture.

On the third floor there is, in the main building, the box making, &c. department, and the machine and fitting shop but by far the greatest interest centres in the automatic machinery for making the boxes and the box covers.

In the south wing of the third floor there is also the chemical department, where the "composition" for the match tips is manufactured. The machinery here consist of four mills for grinding, and five "mixers." The cauldrons are fitted with removable covers with chimneys, which lead to the open air and take away any noxious fumes.

The basement, north wing, contains a kitchen and cloak room. Here the workpeople have to deposit their hats and cloaks, and also any food they may have brought with them. There is also a number of sinks, with hot and cold water laid on, and it is imperative that the hands be well washed before meals. In addition to the food brought in, the employés are provided free of charge with a bowl of soup or milk and rice.

Liverpool Corporation Electric Supply Department.

Leader: Mr. A. N. Meldrum.

The Corporation of Liverpool, in 1896, purchased the undertaking of the Liverpool Electric Supply Company, Limited, which company had commenced the supply of electrical energy in Liverpool, under parliamentary powers in the year 1883.

The area of supply includes the whole of the city of Liverpool; and in 1901, 6,235,000 units of electrical energy were supplied for lighting, and 13,783,000 units for the tramway service.

Electrical energy is distributed for lighting and power at a pressure of 230 volts, and over a considerable area the

supply is given on the three-wire system, thus affording a supply for motors from the outer conductors at a pressure of 460 volts.

The two main power stations are situated at Pumpfields and Lister Drive, and are of similar design and construction. The supply from these stations is supplemented by plant installed in the four smaller original stations of the Electric Supply Company. Auxiliary stations have also been constructed in cumbination with the Corporation refuse destructors. The underground mains are laid in iron troughs filled in with bitumen. The price charged for electrical energy for lighting purposes is 3¾*d.* per unit, with a reduction to 3*d.* for any consumer taking more than 3,000 units per quarter. The prices charged for power are 2*d.* and 1½*d.* per unit on a similar basis.

Electric Tramways.—The Liverpool Corporation acquired the undertaking of the Liverpool United Tramways and Omnibus Company by purchase, in 1897. At that time, the total length of single track in this city was 68 miles, and the number of vehicles in the service, 267. The Corporation at once decided to adopt electric traction, and after careful inquiry selected the overhead trolley system, and proceeded with the reconstruction and equipment for electric traction of all the existing tramway routes in the city, and 46 miles of additional track, the whole comprising a length of about 114 miles of tramways. The electrical energy is supplied by the power stations at a pressure of 500 volts. The standard car adopted is of the double-deck type, with reversed staircases. The car is 27 feet in length, and mounted on a single truck with a wheel base of 6 ft. Seating capacity, 56 passengers—22 inside, 34 outside. The total stock of cars is 152.

Plant at Pumpfields Power Station.

Buildings.—The station buildings consist of an engine-room, 247 ft. long and 50 ft. wide, with a boiler-house 53 ft. wide on each side.

Engines.—Willans' compound and triple expansion, running at a speed of 230 revolutions, and capable of developing 1,200 i.h.p. on coutinuous load, with maximum output of 1,500 i.h.p. for short periods.

Dynamos.—Siemens' multipolar machines, with an output of 1,420 ampères at 550 volts.

Condensers.—Körtings ejector pattern, condensing water supply obtained from canal and delivered by steam-driven centrifugal pumps to overhead tanks; the water flows from the condensers by gravity in pipes along Vauxhall Road to branch of canal adjacent to Leeds Street; a large cooling area is thus provided.

Boilers.—Lancashire type, 30 ft. long, 8 ft. diameter, fitted with five Galloway tubes in each flue, working pressure 160 lb. per square inch. The boilers are fitted with Hicars' Mechanical Stokers.

Feed-Water.—The feed-water is passed through a heater which receives the exhaust steam from the pumping engines, and then through the Green's economiser, which is provided for each section of seven boilers. A vertical direct-acting steam feed-pump is provided for each set of seven boilers, and each boiler is also fitted with an injector.

Coal Supply.—Fuel can be delivered either by canal or by cart, and is elevated into the coal stores above the boilers on each side of station by belt elevators.

Ashes.—The ashes are raised from the stokeholes by elevators on to platforms from which they are delivered into carts for removal.

The distribution for the tramways is at 500 to 550 volts pressure, with an earth return, and the distribution for lighting and power is on the three-wire system, with 460 to 500 volts pressure between the outer conductors, the middle wire being earthed at the station.

BROUGHTON COPPER CO., LTD., OF MANCHESTER (DITTON WORKS).

Leaders: Mr. G. FITZBROWN and Mr. THOS. GIBB.

The thanks of the Society are due to the Directors of this company for kindly throwing open their Ditton works for inspection to several members of the Society, who were shown round by the above-named gentlemen.

THE DINNER.

On Thursday evening the annual dinner of the Society took place at the Adelphi Hotel. Mr. E. K. Muspratt, Past President, presided.

The CHAIRMAN proposed the loyal toasts, remarking that they all rejoiced to know that the King was on the fair way to recovery.

Mr. W. F. REID, London, proposed "The Society of Chemical Industry." He said the place of meeting on this occasion was a particularly appropriate one for the toast he had to propose, because the county of Lancashire was the birthplace of the Society. Although formally and officially the Society was first instituted in London, still, Lancashire was the county which had the credit of the conception of the Society. Those who first thought of the Society originated a very grand idea, of which they could not at present anticipate the full fruition. They had been through many factories or works that day where industrial processes were carried on, and they found that at the bottom of them all was chemical industry. As to their Society, it occupied a position, at present, of great prosperity. They had now close upon 4,000 members, and Mr. Cresswell, their Secretary, thought that some day they would attain to 5,000. He saw no reason why they should not attain to 50,000. Chemical industry as yet was only touching the fringe of the field which it ought to occupy, and would occupy in the future. Take the greatest industry of all—agriculture. What had they done for it in comparison with what they might do? True they had done something, but they were only on the fringe of it. At present they were content to gather from all over the world a number of raw materials, including a material in which he was particularly interested, namely, india-rubber. In order to obtain it they wandered through pestilential forests, where people were in danger of their lives. Why not make it in the laboratory? It had been done on a small scale, and it might be done on a large scale. They were utilising large tracts of land for the production of sugar. That was a purely chemical substance, not always definite, and why should they not make it? They had heard rumours about electrical sugar. At any rate it was quite possible that a product of that kind could be chemically produced. What had they done towards the synthetic production of such materials? They had made a few colouring matters that had certainly upset great industries and produced new ones, but they had not touched, for instance, the food of the people. The time would come when the human race would overspread the whole of the earth's surface, and in view of that he thought there was no more interesting paper than that of Sir William Crookes with regard to the production of materials from the elements. There were a number of scientific reactions and processes which they were not utilising at all, or only in a very slight degree. There was the chemical action of light, which opened up a wide field for the chemist, but was at present only utilised in photography. Then electrolysis was just in its infancy and would, no doubt, be developed. The future field of chemical industry would be infinitely greater than anything they had behind them, and therefore he saw no reason for any limit to the expansion of their Society. The Society had a small beginning, but it had gone on progressing from year to year, and at the present moment, they held a position of influence in the country which they had never occupied before. On several occasions they had taken steps in public matters which had been productive of great good. Under the guidance of their President, they had taken very useful action with regard to the patent laws. That subject was still under discussion, and he trusted that those who had any influence in the matter would see that we did not have patent laws which would fetter our industries and hamper our trade. Another matter which had received attention was the industrial use of alcohol, and he might say the success of that movement was almost entirely due to the efforts of Mr. Tyrer. He had not only collected information on the subject from all parts of the Continent, but he had been most indefatigable in placing his views before the authorities and giving them every assistance. Then, again, they had two representatives on the Council of the National Physical Laboratory. At first it was

conceived to be an entirely physical matter, but the Council of the Society approached the authorities, with the result that representatives were appointed. They were, therefore, now represented on the National Physical Laboratory, and some of the experiments and researches to be carried out would be of distinct advantage to chemical industry generally. The amount of money which the Government granted to the National Physical Laboratory was much less than was required. It was a disgrace to this country, but, of course, political exigencies very often came before scientific and commercial ones. Next week there was to be a meeting in London to try and raise a larger sum than the Government granted simply that they might get on with urgent work, especially in connection with alloys and their properties, and other things which were of interest to chemists and manufacturers generally. He came now to the most agreeable part of his remarks, and that was to ask them to couple the toast with the name of their chairman, Mr. E. K. Muspratt. Mr. Muspratt was not only a Past President of their Society, but he had done much for their comfort and for their instruction at the present meeting. He had opened most interesting works to them, and he had extended to them most cordial hospitality at his own residence. Therefore, he asked them to join him in drinking the health of Mr. Muspratt and prosperity to the Society of Chemical Industry.

The CHAIRMAN, in responding to the toast, regretted that the chair was not occupied by the President, Mr. Levinstein, but perhaps, as one who was present at the birth of the Society, it was not inappropriate that he should preside over their banquet on this their third visit to Liverpool. The Society was practically inaugurated by a union between Manchester and Liverpool. The first idea came from Liverpool, and the first committee meeting was held in the Medical School, now attached to University College. The object of the Society, from the outset, was to do something for uniting science with industry. They did not think at that time that the Society would grow so rapidly, although those who were responsible for its inception knew that chemistry was necessary in practically every manufacture. They all now recognised that this was so, and, further, that chemistry entered also into the great industry of agriculture. The great disadvantage under which they suffered at present lay in the fact that their legislators—at least with few exceptions—were not scientifically trained. A Minister of the Crown, the other day, had gone so far as to say that the instruction given in the elementary schools might add to the knowledge of the students, but did not develop their characters, whilst, on the other hand, in the high secondary schools great attention was given to athletics, which served for the formation of character, but that the instruction was not of a nature to be retained by the students. It would be a very unfortunate thing for this country if it were found impossible to unite the development of character with the training of thought and in science; but he did not believe that it was so. Where education had been studied as a science, as in Germany, the people were in no wise deficient in character. They had united the two, and he trusted that in this country we would also effect such a valuable unity. Some years ago the Liverpool Chamber of Commerce, of which he was then a member, had closely interested itself in the subject of patent laws, railway rates, and the metric system. At that time the Chamber was told that it was exceeding its functions, and that the discussions which arose on the question were purely academic. They were now realising, however, that unless they gave such matters their attention, and unless they guided their legislators by scientific thought, our people, as a nation, would fall back in the race, and find that the Americans and Germans were advancing by leaps and bounds whilst we remained stationary. He regretted that whilst the markets of this country were being so fiercely attacked abroad, we were only just beginning to talk about doing something for technical education. When the first Technical Education Act was passed, as he contended, by a fluke, and when the "whisky money" was given to the County Councils in order to do something for technical education, he warned the Council—of which he was then a member—that unless they proceeded very carefully with the distribution of the money, the greater portion of it would be wasted. Mr. Levinstein, their President, in his paper on the previous day, had told them that a great portion of it had been wasted. Since then they had advanced to a small extent. At any rate, in Liverpool and Manchester they had done something, because in both of those cities there had been founded university colleges, which were doing a great work. In Liverpool, they hoped very soon to have a university of their own. That would give them freedom of teaching in accordance with the industries and the wants of the particular locality, which would be of immense benefit. They must not, however, depend simply on examinations; the important thing was that students must be trained to think. But in order that universities in such cities as Liverpool and Manchester should do the greatest good, it was necessary that the students should be properly trained at the secondary schools. Our most urgent need of the present day was an improvement in our secondary educational system, and for this it was impossible to depend solely upon private munificence. We must impress upon our legislators the necessity of science and thorough scientific training, as well as the improvement of the whole secondary education of this country, in order to enable us meet the competition of other countries. We had enough genius in England. In no other country in the world had there been greater scientific men or greater inventions and discoveries, but we were deficient in the matter of education. He hoped we should not lag behind in the future. It was very sad to find that those who had enjoyed a one-sided education at our older universities, and who formed the majority of our educated legislators, were so blind. Schiller said, "With stupidity the gods fight in vain," and the stupidity which arose from a one-sided education was the greatest of all. When they approached the Chancellor of the Exchequer for a small contribution to assist the University College, he seemed to think that the only possible university was one on the lines of Oxford and Cambridge. That was not the kind of university which was required in a commercial town like Liverpool. They did not despise the arts, for a university must have its arts side as well as its scientific side, but they wanted scientific thought to be developed on the arts side as well. The Germans knew how to apply science to the industries of the country, and that was the reason Germany had progressed so rapidly. In conclusion, he was sure that they all wished success to the Society of Chemical Industry in the future.

The following telegram from the President of the Society, Mr. Levinstein, was read by the Chairman:—"Heartiest greeting to all; greatly disappointed at not being amongst you. I drink your very good health, coupling with it success to the meeting and the new Patent Amendment Bill, which I believe will be of immense value to our industries."

Mr. TYRER, London, proposed "The Trade and Commerce of Liverpool." At the outset, he alluded to the fortnightly issue of the Journal, which he said was one of the best signs of the Society's growth, and was entirely due to the initiative of their absent President. He also reminded them that Messrs. George Beilby and W. F. Reid were the Society's representatives on the Board of the National Physical Laboratory, and that it was to their efforts that the Society owed much of its influence on that Board. Coming to the subject of the toast, he remarked that in London they had port, and they had also recently had a report about the port. If ever there were a complete condemnation, it was in that just issued. He did not believe that Liverpool would ever have been what it was as a port, if they had not had the docks under one authority, and displayed an enterprise which had been lacking in London. It was a disgrace to our national enterprise that London had not tackled the subject long ago, and it was only because they were not ashamed that something was likely to be done. If the enterprise of Liverpool were indicated by the men he knew belonging to the city, then Liverpool was a very fortunate place. There were 25,297,000 tons of shipping, the rates amounted to 1,190,000*l*., and the quayage of their docks extended to 24 miles 1,099 yards, and there were 24,3 vessels. If the trade and commerce of Liverpool were all proportionate to these figures, then they were indeed

be congratulated and envied. He coupled the toast with the name of Mr. Henry Wade Deacon, a name dear to every technologist, and also with that of their friend Mr. John J. Evans, member of a firm whose enterprise was well known.

Mr. H. Wade Deacon acknowledged the toast, and in doing so referred to Mr. Tyrer's approving comments regarding the Liverpool dock system. It seemed to him that the great advantage of having one body was that one could criticise it, and their Dock Board was subjected to a great deal of criticism. Their Chamber of Commerce was an exceedingly active body. It had gone whole-heartedly and entirely in favour of the Manchester amendment to the Patent Bill. He assured the company that the commerce and trade of Liverpool would appreciate the kind manner in which they had received the toast.

Mr. John J. Evans also responded to the toast. He said that notwithstanding the gloomy predictions which were sometimes indulged in, he was inclined to believe that the British race would always be in the front rank of commerce, as they had been in the past. He was glad to find that Mr. Tyrer, who was a London man, recognised that in Liverpool they were more go-ahead than they were in the metropolis. In Liverpool they had a noble river, a magnificent system of docks, the finest ships in the world, and the dock estate administered by a very able body of men, and he had no doubt the city would be able to hold its own.

Prof. W. R. Lang, Toronto, proposed "The Local Section." He said that he hoped the time would come when the section of which he had the honour to be Chairman would be able to welcome the Society in their midst and entertain them as well as Liverpool had done, in that wrongly-called land "Our Lady of the Snows." He should like to take that opportunity of thanking the members of the Council for the kind way in which they received the proposal that was put before them for bringing together the various interests of the great Dominion of Canada and confederating them into one section, which was inaugurated some six months ago. They were largely indebted for the formation of the Canadian Section to the great assistance which had been rendered by that very powerful society in Canada, the Canadian Manufacturers' Association. He should like to place on record his cordial thanks for the assistance which had been rendered them by the Manufacturers' Association. Their object was to bring together the manufacturers of Canada, and the manufactures which were concerned with chemical industry were increasing enormously in the Dominion. They also wished to see a thorough chemical education given in their universities, so that their youths might go out into the world and take positions in the big works that were growing up all round. Eighteen months ago the Government of Canada brought in a new Universities Bill, and they recognised the importance of a thoroughly good all-round scientific education. They stated that they would relieve the universities of the expense of maintaining the chairs of Physics, Geology, Mineralogy, and Chemistry, these being, as they pointed out, chairs which would help to exploit the enormous resources of the country. They were much indebted to the Local Committee in Liverpool for the energetic way in which they had taken up the work of the present Annual Meeting, and for the way they had arranged for the entertainment of the visitors.

Mr. C. L. Higgins said that, on behalf of the Local Section, he thanked them very heartily for the kind way in which they had received the toast proposed by Prof. Lang. They had present in the room with them Mr. W. Kitchen, who was Vice-Chairman of the Australian Society of Chemical Industry. He believed Mr. Kitchen was anxious to form a section in Australia connected with their own Society, and they wished him every success in so doing. They were proud in Liverpool that theirs was the oldest section in the Society. Many of them had watched with interest and pleasure the surprising development of the Society. Although the Liverpool Section was not numerically strong, they had done their very best to further the interests of the Society, and he hoped that they would continue to do so in the future. It had given them great pleasure to have the Annual Meeting of the Society in Liverpool this year, and they looked forward with equal pleasure to the time when their turn would come round again. The Annual Meeting had a stimulating effect on a local section which was very valuable. He was afraid the weather had been rather unfortunate, but in spite of that he hoped the Annual Meeting of 1902 would leave very pleasant memories behind. He thought their sections generally were happy in possessing energetic local secretaries. He could assure them they had one in Liverpool, and he had done a very large amount of work in connection with the present Annual Meeting.

Dr. T. L. Bailey, the hon. local secretary, also responded to the toast. As Mr. Higgins had said, it was always a great pleasure for chairmen of sections and hon. local secretaries to receive the Society, and do what they could for the entertainment of the members. In Liverpool, on this occasion, they had done what they could, and he only regretted that the weather had not been quite so propitious as could have been desired. Referring to the work of the Society in general, he said the Society was at present doing a good deal in connection with legislation, but he did not think that such work should necessarily come only from the Council or from individuals. He would like to see the initiative taken by the various sections. That might be done by the sections bringing up at their meetings points in which they were intimately concerned, and difficulties which they found, and then forwarding the result of their deliberation to the Council. In this way they might do a great deal to advance the chemical industries of the country, and also make their Society even more useful than it now was.

Prof. W. N. Hartley, F.R.S., proposed "The Chairman;" and Mr. Muspratt, having briefly acknowledged the toast, the proceedings terminated.

During the evening music was provided by a quartette party, under the direction of Mr. Josef Cantor.

THIRD DAY.—Friday, July 11th.

An excursion was made to Llandudno, Beaumaris, and Menai Bridge, and in the evening a Smoking Concert was held at the Reform Club, Dale Street.

New York Section.

DEATH OF Mr. JAMES HARTFORD.

At a joint meeting of the Committees from the Chemists' Club, the New York Section of the American Chemical Society, the New York Section of the Society of Chemical Industry, and the New York Section of the Verein Deutscher Chemiker, held on June 18, 1902, a resolution of sympathy with the relatives and friends of the late Mr. James Hartford was adopted. (See also this Journal, June 30, 1902, 850.)

Yorkshire Section.

Meeting held on Monday, May 26th, 1902.

MR. GEORGE WARD IN THE CHAIR.

TWO POSSIBLE CAUSES OF DISCREPANCY IN ARSENIC ANALYSIS.

BY A. J. MURPHY.

The Marsh-Berzelius test for arsenic, as formulated by the Joint Committee of the Society of Public Analysts and the Society of Chemical Industry, has met with so large a

measure of favour at the hands of those of us engaged in searching for very minute quantities of this poison, that it may fairly be said to "hold the field." Like most devices of earthly origin, it is not absolutely perfect, and any contribution, however small, which may lead to further knowledge regarding it will probably help to widen its sphere of usefulness; certainly, our efforts should be in the direction of removing its difficulties rather than formulating any brand-new modification of other tests now practically discarded.

That there are disturbing and, so far, unknown factors in the method we consider to be fully proved by the existence of such discrepant analytical reports as have recently been put in evidence at Halifax and elsewhere. It is unfortunately too common an experience to find that several chemists working upon the same sample by this method, send in to their clients quite conflicting reports.

No doubt many of these discrepancies are due to improper collection of sample, but they are more properly caused by neglect of the Committee's instruction to prepare standards sufficiently often. It is not sufficient to prepare fresh standards for every fresh lot of zinc and acid. Having found a zinc and an acid which may be described as normally sensitive, we have repeatedly proved that the *sensitiveness of the acid varies almost day by day*, according as the bottle containing it is more or less full, and according as it is stored in concentrated or dilute form. So far as I am aware, this behaviour of acid has not been publicly referred to, but it is unnecessary to detail the experiences which have led to this conviction; it originated in the fact that attempts to purify samples of H_2SO_4 from a variety of sources by distillation without (and with) addition of NaCl frequently produced an insensitive acid, that is, with a normally sensitive zinc, it gave no trace of mirror with 0·000005 grm. of As_4O_6. As the only influence at work here seemed to be atmospheric oxygen, samples of concentrated and of dilute acid were freely exposed to the air and sets of standards were prepared about every third or fourth day, with the result that the later standards invariably showed fainter mirrors than the earlier ones, the loss of density being directly proportional to the time of exposure of the acid to air, the loss being more marked in the case of the dilute acid. In these experiments the question of insensitive zinc was eliminated by using normally sensitive zinc from one and the same granulation. It is obvious that serious variations may arise from this cause unless standards are prepared every day or two.

Another possible cause of discrepancy in reports is that under certain conditions the arsenic does not come off completely within the time allotted to the experiment, especially when it is present in both the -ic and the -ous forms; in order to effect complete and instantaneous reduction to the -ous form, a certain condition of equilibrium in the system seems to be essential. This is proved by the experience often repeated that 0·000005 grm. of As_4O_6, in the form of sodium arsenite or sodium arsenate, will give mirrors in agreement with each other, but the *same amount of* As_4O_6, in the form of a *mixture* of arsenite and arsenate, will rarely give a mirror concordant with the former in 20 or 30 minutes. If this experience be generally confirmed, as we believe it will, it is not difficult to imagine a case in which, though the materials are slightly arsenical, no arsenic will be given off in, say, 20 minutes, and yet, after the addition of the substance to be tested, a mirror may be formed even though the substance under examination be quite free from arsenic. Evidently such a mirror would be ascribed to the substance, which would therefore be reported as containing arsenic.

The remedy for the first of these two possible sources of error would be to prepare fresh standards almost daily, and for the second to allow a blank to run for the same length of time as that which contains the substance under examination.

It is inconvenient to prepare *complete* sets of standards so frequently, and to obviate this I have ventured to suggest a simple means of removing the difficulty in an effective manner, and at the same time of eliminating the question of a sudden or gradual change in the sensitiveness of the system, to whatever causes this may be due.

Having tested a substance according to the method of the report, I compare the resulting mirror with any set of standards, preferably of course with that set which gives what I believe to be the best average values. I regard this as my first (rough) approximation, and I conduct the final or check test by setting up three Marsh flasks, instead of one, as follows:—

(1) A blank which runs for the whole period of the experiment, say, 30 or 40 minutes.

(2) With the addition of As_4O_6 as found by the first approximation.

(3) With addition of the substance under examination.

It is essential that in this final test we should use zinc from the same granulation and acid from the same bottle, and therefore of the same age, degree of dilution, and aëration.

Flask No. 1 serves to determine the purity of the materials and guards against any error due to what I have described as the erratic sensitiveness of the system.

Flask No. 2 serves not only as a check upon the sensitiveness of the acid and zinc, but it gives us practically a new set of standards, or at any rate the means of judging the intensity of the set which could be prepared *at that moment* and *with those materials*, for it may be assumed that the same ratio of intensity as determined by reference to a complete set would run through the whole series of a new set if all its members were prepared.

Flask No. 3 serves to confirm the first test made upon the substance, and by comparison with results simultaneously obtained in the two control flasks (Nos. 1 and 2), the rough approximation may be corrected to a much closer degree.

This slight refinement has been found to work well in practice, and closely concordant values have been obtained from the same sample when operated upon by different men and with different materials. Another advantage it possesses is that the materials need not be absolutely pure, as the amount of impurity may be estimated from the first flask by means of the proportion established by the second flask.

One further criticism may be made upon the method of examining coke and coal. If they contain much sulphur as well as arsenic it seems possible that, especially upon ignition with lime or magnesia, there may be some loss of arsenic by the action of too great a heat upon the thio-arsenate probably formed, and in extracting this thio-salt by means of HCl there might also be loss by precipitation of As_2S_3. If, further, they contain sufficient iron sulphide, the H_2S formed on addition of HCl, and which is often very apparent, would tend to decompose any soluble arsenate with a similar result.

Perfection can only be arrived at by collating our various experiences in a sympathetic manner. Many useful suggestions have been made, and amongst others I have derived great help from Allen's proposal to add a trace of pure iron salt to zinc, which is thus rendered more sensitive and much less erratic in its action, and from the simple but excellent idea of Briant, who hangs a piece of constantly-moistened blotting-paper over the tube just beyond where the mirror is expected.

(See also Joint Discussion, 1902, 903.)

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	959
II.—Fuel, Gas, and Light	959
III.—Destructive Distillation, Tar Products, Petroleum	964
IV.—Colouring Matters and Dyestuffs	965
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	968
VI.—Colouring Wood, Paper, Leather, &c.	969
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	969
VIII.—Glass, Pottery, and Enamels	971
IX.—Building Materials, Clays, Mortars, and Cements	971
X.—Metallurgy	974
XI.—Electro-Chemistry and Electro-Metallurgy	978
XII.—Fats, Fatty Oils, and Soap	980
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	981
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	982
XV.—Manures, &c.	...
XVI.—Sugar, Starch, Gum, &c.	982
XVII.—Brewing, Wines, Spirits, &c.	982
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	984
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	986
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	986
XXI.—Photography	988
XXII.—Explosives, Matches, &c.	989
XXIII.—Analytical Chemistry	990
XXIV.—Scientific and Technical Notes	993

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Non-Conducting Coverings, Blocks, and Slabs suitable for Covering Steam Pipes, Boilers, and the like, and for other Purposes. H. C. Michell, London. Eng. Pat. 4970, March 8, 1901.

The non-conducting coverings consist of an outer non-hygroscopic layer composed of flake-mica, silicate of soda, and acetate of lead, with or without addition of lime, and a core composed of flake-mica and loose filling material, such as wood fibre, asbestos, or cork.—W. C. H.

Powdered Materials [Meal, Colouring Matters, &c.]; Machine for Mingling ——. P. Jacobs, Berlin. Eng. Pat. 17,823, Sept. 6, 1901.

Purely mechanical patent.—R. A.

Centrifugal Machines for Separating Solids from Liquids. H. H. Lake, London. From J. J. Berrigan, New York. Eng. Pat. 21,172, Oct. 22, 1901.

See U.S. Pat. 689,572; this Journal, 1902, 244.—R. A.

Crucibles. L. Rousseau, Argenteuil, France. Eng. Pat. 7451, March 27, 1902.

The crucible is built up of a base section of strongly compressed refractory material, and a number of annular sections having a smooth or corrugated outer surface. The sections are joined together by a fireproof cement, such as fireclay mixed with liquid silicate of potash.—R. A.

Filter and Extractor Presses [Brewers' Mash, &c.]. J. G. Crossman, Watford. Eng. Pat. 8392, April 10, 1902.

The filter is pivotally mounted on hollow trunnions, which serve as inlets for the material to be treated and for the washing liquor, provision being made for reversing the flow. The frames of the press are formed with annular recesses, adapted to form continuous external pipes, having communication with the compartments. The washing liquor is passed into and out of the compartments through orifices between the filter cloth and the partitions, and corrugated diaphragms are employed to direct the liquor to or from the orifices. The filter is mounted, by means of rollers and guides, on an expansible supporting frame, the guides of which extend to support the filter frames when separated.—R. A.

Liquids; Impts. in or in connection with the Agitating of ——, and in Apparatus therefor. H. E. Dolphin, Liverpool. Eng. Pat. 12,442, June 18, 1901.

Liquid under pressure is introduced into the bottom of each cell through a feed pipe with an injecting nozzle, the orifice of which is diminished so as to discharge the liquid in a fine stream, whereby, it is claimed, its velocity at the nozzle is increased, and the liability of short-circuiting from vat to vat is diminished. A barrel surrounds the nozzle, having one or more orifices immediately adjacent to it, so that the liquid issuing from it at high velocity sets up an induced current of fluid through the orifices.

—G. H. R.

United States Patents.

Liquids, Partial Liquids [Liquors], or the like; Device for Mixing ——. H. C. Wehmeier and W. J. Daubenbis, both of Cincinnati. U.S. Pat. 697,579, April 15, 1902.

Purely mechanical patent.—R. A.

Filtering Press. K. Enzinger, Worms, Germany. U.S. Pat. 702,051, June 10, 1902.

See Eng. Pat. 7063 of 1901; this Journal, 1902, 458.

—R. A.

Centrifugal Separator [Purifying Water for Steam Generators, &c.]. I. V. Holmes, Chicago. U.S. Pat. 702,795, June 17, 1902.

The revolving drum of the separator has an inlet at one end, and is fitted with a centrally-arranged hub, through which two concentric discharge pipes extend. A ring surrounding the hub forms inner and outer outlet passages between the hub and the interior of the drum, the inner passages being in communication with an outlet chamber having a forcing worm, while the outer passage communicates with a surrounding chamber.—R. A.

II.—FUEL, GAS, AND LIGHT.

Coal-Gas; Some Modern Competitors with ——. A. Lecomte. J. Gas Lighting, 1902, **80**, [2042], 36.

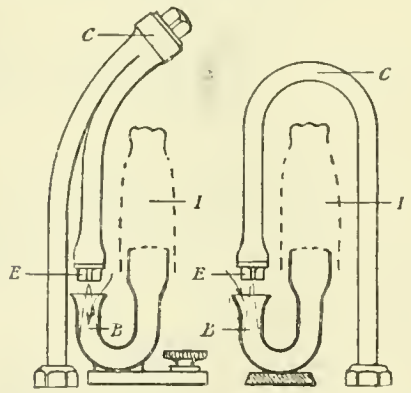
The author describes the latest developments in the use of carburetted air, "alcoholene" (ether), petroleum, and alcohol as illuminants. A new carburetter—that of Laitte—has been introduced. It consists of a series of inclined planes, placed accordion fashion, one after the other. The air and hydrocarbon are admitted at the upper end, and

travel together in such a manner that the liquid is completely evaporated by the time the other end of the apparatus is reached. The heat is dissipated to a certain extent by the surfaces of the inclined planes; and in practical working it is found that an appreciable time is required for the volatilisation of the liquid. The time depends on the vapour tension of the hydrocarbon, the surface area of the carburetter, and the surrounding temperature. With petroleum of 0·680 sp. gr. and a difference of 5 C., the time is from 12 to 15 seconds for a saturation of 350 grms. per cubic metre.

For use with ether a special carburetter has been designed by M. Bouchaud-Praceiq, in which the wood, or rather fibre of a tree allied to the palm is used as an absorbent material for the ether. This material has an apparent sp. gr. of 0·114—0·122, and is extremely porous; it will absorb nine times its weight of ether, and will completely discharge it again by subsequent evaporation. Experiments with ether-gas by Langlois show that, with an incandescent burner, the consumption is about 6·7 grms. of ether per carcel-hour. No condensation could be detected on pumping ether-gas for an hour through an apparatus cooled to −6° C., and photometric tests revealed no difference between the cooled and uncooled gas. On dilution with air, ether loses its luminous flame, but any desired degree of luminosity can be imparted by enrichiug with benzol, a stable gas similar to oil-gas being obtained with an expenditure of 40 or 50 grms. of benzol per cubic metre. The cost of ether-air gas enriched with benzol is about twice that of oil-gas; its chief advantage is the ease and rapidity with which a small plant may be installed to meet any temporary requirement.

Incandescent lighting with petroleum has not made much progress since 1900, but the burner invented by Kihière, shown in Fig. 1, gives good results. The curved tube C serves as the heater. The burner B is movable, and can be withdrawn from beneath the vaporiser. The ejector E is one with C, and is fixed by a triple union joint. Alcohol is used for starting the burner, and the petroleum is afterwards admitted under a pressure of 2—4 kilos. The

Fig. 1.

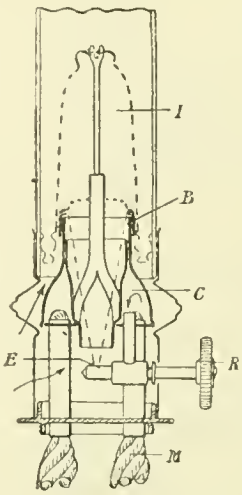


hydrocarbon is vaporised in C, arrives at the ejector E, where it draws in air and proceeds in admixture with the latter to the burner I. The flame maintains the temperature of the tube C, and so vaporises hydrocarbon in proportion to the quantity consumed. A high-flash oil is used and a 35-carcel incandescent light is produced for 175 grs. (0·2 centime per carcel-hour); with mantles of 85 mm. diameter, a light of 135 carcels is obtained with an expenditure of 3·5—4 grs. per carcel-hour.

Alcohol carburetted with 50 per cent. of benzol is a less expensive motive power than when used alone. Sorel found that a litre of "mineralised" alcohol yields 4,900 calories, whilst a litre of the carburetted spirit yields 6,700 calories. For use in automobiles, it is stated that on the basis of 800 litres per horse-power hour for motors of from 1 to 5 horse-power, and 700 litres per horse-power hour for motors of from 6—16 horse-power, "alcohol works out as equal to (ordinary illuminating) gas, at 22·5 and 25·5 centimes."

For incandescent lighting, the Denayrouze, Hantz, and Washington pressure lamps give "from 10 to 103 carcels with an efficiency of 15 grs. of mineralised alcohol per carcel-hour (with a minimum of 10 grs.); or of 10 grs. of carburetted alcohol (50 per cent.) with a minimum of 5 grs.—*i.e.*, at 0·7 to 0·5 centime for mineralised alcohol, or 0·5 to 0·25 centime for carburetted alcohol. This is equal to from 10 to 15 litres of gas at 0·20." The Denayrouze "Alvéolaire" lamp (new model) is of simple construction, and works without pressure. Two wicks are used, the vapours rushing into a chamber above their upper extremities. It gives very good results with 50 per cent. carburetted alcohol, the mean consumption being 10·7 grs. per carcel-hour for intensities of 0·36 to 8·5 carcels. In the Lecomte burner, the alcohol is fed by capillarity, but the pressure of alcohol in the heater attains 6 cm. of water.

Fig. 2.



The burner (Fig. 2) consists of three pieces for moving the heater C, into which enter the four wick-tubes, M. A cock, R, controls the supply of alcohol vapour escaping from the ejector E to the burner B. The efficiency of the lamp is stated to be 7·38 carcels per 72 grs., or 9·75 grs. per carcel-hour. A smaller burner gives 4·16 carcels for 44·4 grs. or 10·7 grs. per carcel-hour.—A. S.

Calcium Carbide Formation; Reactions in ——. G. Gin. Zeits. für Elektrochem., 1902, **8**, [25], 397.

It is found that free oxygen is present in the neighbourhood of the vertical electrode, whilst metallic calcium exists in the gases escaping from the interior of the furnace; but the oxygen is found only where the temperature is highest, the calcium in the somewhat cooler part. Remembering the known tendency of carbon monoxide to dissociate at high temperatures, it is probable that none is formed at the electrode, but only in those outer and cooler layers traversed by the escaping gases. Probably the actual equation of formation is $2CaO + 4C = 2CaC_2 + O_2$. It is pointed out that CaO is always added in slight excess (varying with the type of furnace used) in the charge, calculated in accordance with the older equations. Two equations are given to explain the production of calcium, of which the former is hypothetical, whilst the latter has been verified by Moissan; they are as follows:—

$$mCaC_2 + nCaO = (m + n)Ca + C_{2m}O_n$$
$$CaC_2 + 2CaO = 3Ca + 2CO.$$

These equations demonstrate the necessity for an excess of lime in the charge.—W. G. M.

Acetylene; Acid Nature of ——. J. Billitzer.
See under XXIV., *page* 995.

English Patents.

Coking Ovens; Turf ——. G. Bamme, East Friesland, and A. Kahl, Hamburg. Eng. Pat. 8287, April 9, 1902.

The ovens have a very steep hearth, and a nose projecting from the inner surface of the wall over the outlet. The nose prevents the turf passing out without being coked. Four ovens are employed, which are filled and discharged separately. The gas and tar-vapours pass to a common tar reservoir. The gas, after purification, is used to heat the ovens.—R. S.

Vapour-burning Apparatus. A. Kitson, London. Eng. Pat. 13,507, July 2, 1901.

A vapour-burning apparatus, wherein liquid fuel is vaporised under pressure considerably exceeding that of the atmosphere, is provided with a special starting apparatus. The air under pressure is led partly to a cylinder, thereby driving a piston upwards against the action of a spring, and partly through a carburetter to a preheating burner. The valve controlling this passage of air is connected with an electric circuit, so that when the valve is opened as above, the circuit is closed and a spark lights the preheating burner. The valve is then again closed, thereby breaking the electric circuit, and allowing the piston to drive out air to the carburetter and preheating burner. As the piston gradually falls under the action of the spring, the oil-admission valve to the vaporising tube is gradually opened, and, finally, the supply of air to the preheating burner is exhausted, the flame being thereby extinguished, while the main vaporiser becomes self-supporting.—R. S.

Vapour-burning Apparatus. A. Kitson, London. Eng. Pat. 14,342, July 13, 1901.

The burner is designed to heat to incandescence a single specially large mantle. The vaporising device is of the usual kind. The burner consists of a cylinder having the lower end closed. The air and vapour mixing-tube enters at the side of the cylinder, and opens downwards so as to direct the mixture towards the bottom of the burner. The mixture rebounds therefrom and moves upwards, where it escapes through a gauze-covered annulus, and is ignited. —R. S.

Liquid Hydrocarbons; Process of Burning ——. T. and E. Miller and E. Klahn, New Jersey. Eng. Pat. 21,642, Oct. 28, 1901.

Air, in excess of that required to support combustion, is forced, along with a spray of oil, through a vaporising coil into a closed combustion chamber, fitting closely on to the boiler to be heated. The vaporised oil burns completely in the excess of air, and the flame plays round the vaporising coil.—H. B.

Fuel; Apparatus for Spraying Liquid ——. E. H. Power, London. Eng. Pat. 7163, March 24, 1902.

A tubular vessel is charged with the liquid under pressure, and has, at the outlet end, which is removable, a gauze filter allowing the liquid to pass through to two or more symmetrically arranged jet orifices. In front of each orifice is a pointed pyramidal "disperser." The jets and dispersers are enclosed within a perforated guard tube.—R. S.

Gases, such as those for Gas Making, Coke Making, Smelting or Calcining, Glass Making, or Steel Making; Treatment of Materials with ——. P. Naef, New York, U.S. Eng. Pat. 12,311, June 17, 1901. (Under Internat. Conv., Nov. 17, 1900.)

The objects of this invention are (1) to facilitate the use of bituminous fuel or other materials which cake or partially melt when subjected to such operations, (2) to facilitate the use of fine material, (3) to recover by-products from the fuel, (4) to utilise the waste heat, and (5) to provide means for heating gases. Apparatus is described for making water-gas, illuminating gas, or producer-gas, &c. 8 claims.—R. S.

Gas; Apparatus for the Manufacture of ——. L. F. de Blanitza and J. Herard, both of Lyons. Eng. Pat. 12,972, June 25, 1901.

An air-carburetting apparatus is formed of a closed casing, within which one or more drums are mounted on a horizontal shaft, and are driven by means of a falling weight. The drums are immersed up to the level of the shaft in the carburetting fluid. Spiral blades are secured to the insides of the drums and extend to the shaft. They are furnished with sectors of plate iron on both sides, forming perpendicular partitions. The air is delivered through pipes to the interiors of the drums, and is carried down into the fluid, from which it escapes impregnated with the liquid. —R. S.

Combustible Gas; Apparatus for the Generation, Purification, and Storage of ——. C. Whitfield, Kettering. Eng. Pat. 13,983, July 9, 1901.

A gas-producer has two adjoining and communicating fuel chambers, the grate of one chamber, designed for soft or bituminous coal, and provided with means for injecting steam into it, having much larger air passages than the grate of the second chamber, which is designed for non-bituminous fuel, and is provided with a gas outlet. In use, air is drawn or forced through the adjacent ends of both chambers, so as to produce a zone of combustion in each, but the air will pass more freely to the bituminous fuel chamber. The gas, volatile vapours, and distillation products produced in the bituminous fuel chamber are caused to pass through the connecting passage into and through the mass of incandescent fuel in the second chamber, and so pass to the outlet. The gas-holder used is provided with a circulating pipe and a valve, so that while gas is being drawn for use from the holder, fresh gas is being produced and is drawn through the purifying apparatus to the holder, but that when no gas is being used, some of the gas in the holder is sent round a circuit, and the suction on the producer is stopped, thereby practically stopping for the time being any further production.—R. S.

Water Gas; Manufacture of ——. A. J. Boult, London. From J. E. Goldschmid, Frankfort-on-the-Maine. Eng. Pat. 14,653, July 18, 1901.

See U.S. Pat. 701,556, 1902; this Journal, 1902, 909. —H. B.

Gas; Manufacture of ——. A. M. Clark, London. From J. E. Goldschmid, Frankfort-on-Maine. Eng. Pat. 14,759, July 19, 1901.

Water-gas is admitted to gas retorts in a quantity just sufficient to prevent the decomposition of the heavy hydrocarbons evolved during destructive distillation. The heavy hydrocarbons being evolved in decreasing proportion as the process proceeds, the quantities of water-gas admitted are correspondingly varied, being greatest during the first quarter of an hour, and then decreasing. At the end of two hours the supply is cut off altogether.—R. S.

Gas and Air; Method of and Apparatus for Producing a Mixture of ——. H. H. Lake, London. From "Selas" Ges. mit beschr. Haftung, Berlin. Eng. Pat. 16,055, Aug. 9, 1901.

Exhausting device draws into one or two separate compartments predetermined quantities of gas and air, which are subsequently forced out into one pressure pipe or main. —R. S.

Acetylene Gas Lamps. W. L. Wise, London. From E. von Szalay, Pressburg, Hungary. Eng. Pat. 13,303, June 29, 1901.

This is a small mechanically-fed carbide-to-water apparatus intended for the supply of acetylene to isolated street lamps. The lamp-post is provided with an enlarged portion, within which is a carbide-feeding device. Underground is the generator, which communicates with the feeding device by means of a pipe, through which the carbide cartridges fall into the water. When the carbide is decomposed, the empty case drops into a side sump, whence the sludge and the case are lifted by means of a long-handled bucket. The generator comprises a rising holder working in a separate glycerin seal, the movements of the bell actuating the drum of the carbide store.—F. H. L.

Acetylene Generators. Lockerbie and Wilkinson, Ltd., Birmingham, and J. C. Brand, Tipton, Staffs. Eng. Pat. 13,852, July 8, 1901.

In this portable generator of the automatic water-to-carbide drip class, the carbide is held in a horizontal cylinder lying inside the base of the main casing, and is supplied with water through a siphon pipe from the reservoir above. The upper part of the apparatus forms a displacement holder, the pressure in it serving to govern the rate at which water is admitted to the carbide.—F. H. L.

Acetylene Gas Generating Plant. J. Ledru, Hainaut, Belgium. Eng. Pat. 7594, March 20, 1902.

An automatic water-to-carbide generator of the flooded-compartment type, the carbide being held in an upright cylindrical vessel, subdivided step-fashion into a number of small trays. The water supply is governed by a needle-valve, which is actuated by levers set in motion by the holder bell.—F. H. L.

Gas [Acetylene] by the Reaction of a Liquid upon a Solid; Apparatus for the Manufacture of ——. R. B. Ransford, London. From La Compagnie Universelle d'Acétylène, Paris. Eng. Pat. 9785, April 28, 1902.

An automatic water-to-carbide apparatus, in which the upper part of the generator is a displacement holder, and the supply of water is governed by the gas pressure. The carbide holder is an annular vessel divided radially into a number of compartments, level as to their tops, but with their bottoms rising, step-fashion, one above the other. In each of these compartments are put several blocks of carbide, resting one on the other, and the lowest one resting on the perforated bottom of the enge. By this arrangement, all the blocks in the first compartment must be decomposed before the water can reach any in the second. —F. H. L.

Incandescent Gas Lamps [Mantles]. S. Saubermann, Vienna. Eng. Pat. 9551, May 8, 1901.

Asbestos, mixed with 10 to 15 per cent. of cotton, is carded, spun, and woven into mantles, which are impregnated and burnt off as usual.—H. B.

Incandescent Gas Lamps. J. Thomas and A. E. Podmore, London. Eng. Pat. 12,579, June 20, 1901.

A lamp in which heated air is mixed with the gas before ignition. Air is led from a chamber surrounding the upper, metallic part of the lamp chimney, down a pipe to the mixing tube of the burner, the usual air inlets being dispensed with.—H. B.

Incandescent Gas-lighting and Gas-heating Appliances. W. G. Hughes, Pittsburg. Eng. Pat. 21,244, Oct. 23, 1901.

A suspended incandescent gas lamp having a gas-supply pipe which passes centrally down through the casing up which the hot products of combustion pass, conical metallic bodies within the burner tubes for heating the mixture of air and gas before combustion, and a cock by which the supplies of gas and air are increased or diminished simultaneously.—H. B.

Incandescent Gas Lamps. W. Schaefer, Hamburg. Eng. Pat. 1774, Jan. 22, 1902.

A method of increasing the luminosity with the ordinary gas pressure. A number of burners, carrying incandescence mantles, and being separately adjustable as regards their supply of gas and air, are enclosed in a single chimney of suitable form.—H. B.

Electrodes for Arc Lamps. Gebr. Siemens and Co. A.G., and H. Viertel, Charlottenburg. Eng. Pat. 1136, Jan. 15, 1902.

In electrodes having cores of volatilisable metallic salts, &c., the cores are arranged in such position and of such cross-section that the material at the points of the electrodes is situated entirely at the spot of highest temperature, at which the current emerges. For example, in electrodes for use one above the other, the core is provided in the centre of the carbons, and if the carbons are to be inclined towards each other, or used side by side, the core is arranged somewhat aside from the centre. By this means all the added material is volatilised as the carbon is consumed, and no slag is formed.—H. B.

Arc Lamps, and Electrodes therefor. La Société G. et P. de Mestral, Paris. Eng. Pat. 5104, Feb. 28, 1902. (Under Internat. Conv., Sept. 4, 1901.)

In lamps having electrodes containing metallic salts, the negative carbon is to be placed above the positive. A dome or cap of refractory material is arranged above the arc, for concentrating the heat and light of the latter. The dome may consist of a carbon block, serving as the negative electrode, and having a coating of reflecting substances. A chamber for condensing the vaporised salt surrounds the dome, and an inverted glass shade protects the arc from air currents. The arc is steadied by electro-magnetic devices. When alternating currents are used, the electrodes are placed side by side, points uppermost, and are actuated by mechanism for keeping the arc in the same position under the dome.—H. B.

United States Patents.

Furnace. G. S. Gallagher, New York. U.S. Pat. 697,833, April 15, 1902.

See Eng. Pat. 15,811, 1901; this Journal, 1901, 1099. —R. S.

Furnace; Fine-Fuel ——. W. H. Fenner, Chicago, Ill. U.S. Pat. 698,190, April 22, 1902.

The fine fuel is supplied from a hopper through a series of pipes to the furnace, each pipe having a feed-chamber and an adjustable valve for cutting off or admitting the fuel. A slide-valve simultaneously controls the ports leading from the hopper to the feed-chambers. There is also an air-chest, from which a number of pipes, corresponding in number to the fuel pipes, lead air to the furnace. A series of valves controls the discharge of the air from the chest. There is valve-connection between the air-valves and the fuel-valves. The air and fuel are intermingled in a chamber leading to the furnace.—R. S.

Fine-Fuel Combustion. W. H. Fenner, Chicago, Ill. U.S. Pat. 698,191, April 22, 1902.

Fine fuel and liquid fuel are fed, in certain definite proportions, into a closed combustion chamber by means of rapidly-succeeding interrupted blasts.—R. S.

Furnace for Burning Fine Fuel. R. Herzberg, Stettin, Germany. U.S. Pat. 700,198, May 20, 1902.

Pulverised fuel is fed from a hopper to a combustion chamber below. Pipes for the circulation of water surround the interior of the combustion chamber, and cross it backwards and forwards at all levels. A contracted chamber containing a grate is placed below the combustion chamber. —R. S.

Furnace. W. W. Peasley, Iowa. U.S. Pat. 700,230, May 20, 1902.

The furnace is divided by an arch into two chambers, a lower fire chamber and an upper coking chamber. The front wall is provided with filling and discharge openings. The side walls of the fire chamber are extended forwards and support a grate inclining downwards and inwards. Flues are provided in each side wall of the furnace, and communicate with each chamber. One damper is arranged in each flue between the chambers, and another one at the top, cutting off communication, when desired, with the external air.—R. S.

Electric Furnaces; Terminal for ——. E. G. Acheson, Buffalo. U.S. Pat. 701,986, June 10, 1902.

The electrode is formed of graphitic carbon, and various means are described for joining it with a connector in the shape of a plate provided with a flange, which also forms the side and bottom walls of a cooling tank, the front wall consisting of a plate united to the flange.—G. H. R.

Burner for Crude Oil. T. E. Lewis, A. J. Ray, and J. B. Wesson, Texas, U.S.A. U.S. Pat. 701,902, June 10, 1902.

Crude oil burners for locomotives, &c., are here described. —R. S.

Oil-Burner. A. Johnson, San Francisco. U.S. Pat. 702,008, June 10, 1902.

JECTOR burners for furnaces, &c., are formed of two bes, one inside the other, the outer one for air only, the ner for air and oil. The oil is delivered vertically on to inclined distributing plate concaved in the direction of length, and provided with an upturned notched lower ge.—R. S.

Oil-] Gas Generating and Burning Furnace. C. M. Gearing, Brownwood, Texas, Assignor of three-fourths to C. W. Drown, A. Grivot, and A. C. Landry, New Orleans, Louisiana. U.S. Pat. 702,418, June 17, 1902.

E fire-box of the furnace, which is closed and built in sonry, has a bottom of refractory material, and a recess ending entirely round the fire-box. An air-pipe, ated within the recess and encircling the fire-box, is vided with perforations, whereby air is injected towards centre of the latter. A portion of the air-pipe is med into a nozzle, into which an oil-supply pipe extends, l the oil is projected through the nozzle into the fire-box. —H. B.

drocarbon Vapour Burner. L. G. Heist, Philadelphia Assignor of one-half to C. J. Wilson, New York. U.S. Pat. 702,553, June 17, 1902.

E burner comprises a tubular base, burner heads mounted reon, a vaporising chamber situated above the burner ds, a trap chamber communicating with the vaporising mber for removing impurities from the vapour, a vertical n connecting the tubular base with the vaporising mber, vapour and oil passages in the stem, and needle-ves adapted to control simultaneously the supply of our from the trap chamber and the supplies to the ner heads.—H. B.

drocarbon Burner; Retort ——. A. D. Duncan, Galveston, and W. H. Wafer, Chicago. U.S. Pat. 702,638, une 17, 1902.

HIN a casing attached to the fire-box of a furnace is a ged a spherical retort or chamber of fireclay, or the li having a discharge-opening communicating with the box and another opening in its lower portion. A ical tube, supplied with steam or air under pressure, nds up through the latter opening into the retort. An upply pipe passes centrally up the tube into the retort; is spiral ribs on its outer surface, to impart a whirling on to the air or steam supply, and carries at its upper a valve having curved corrugations on its under side ted to impart to the oil a whirling motion in the direcopposite to that of the air- or steam supply. The ial combustion which ensues within the retort after preliminary heating of the apparatus, maintains the risation of the oil.—H. B.

Gas Retort [Vertical]. C. W. Isbell, New York. U.S. Pat. 699,870, May 13, 1902.

gas retort is an upright one, and is heated by an nal furnace. It is provided with vertical grooves or nels on its inner surfaces, and with a grate for supng the fuel. Below the grate is a chamber for air and n, and a valve regulating communication between the ber and the retort.—R. S.

from Gas; Apparatus for Extracting ——. P. antinga, Fort Wayne, Indiana. U.S. Pat. 699,563, ay 6, 1902.

apparatus is for extracting tar from illuminating gas. erous small streams of gas are caused to impinge against t surfaces with the result that the tarry globules are ired and the gas they contain liberated, whilst the tar ested.—C. S.

rbide Cartridges. E. M. Rosenbluth, Pa., U.S.A. U.S. Pat. 702,594, June 17, 1902.

AL claim is made for a cartridge for holding calcium de (see U.S. Pat. 693,069; this Journal, 1902, 606). in modifications in detail are given.—F. H. L.

Acetylene Gas Generator. A. Davis, Chicago. U.S. Pat 701,852, June 10, 1902.

AUTOMATIC water-to-carbide drip generator, in which the carbide is decomposed in a perforated horizontal cylinder placed inside a water-jacket, the lower part of which forms a trough containing a conveyor to remove the lime shaken off the carbide lumps as the main cylinder revolves. Mechanism of the usual type, actuated by the holder bell, rotates the cylinder, admits water to the jacket, and also to a fixed spraying pipe extended horizontally inside the carbide cage. Said cage is periodically replenished with carbide from a hopper extending slopingly upwards through the jacket. The inventor lays special stress on having a large excess of carbide present during decomposition, so as to generate dry gas; on cooling the solid thoroughly; and on removing the waste lime immediately it is formed.—F. H. L.

Acetylene Gas; Method of Purifying ——. J. A. Burgess, Bradford, Canada. U.S. Pat. 701,995, June 10, 1902.

AFTER issuing from a condenser, the acetylene is led through one or more vessels charged with charcoal impregnated with ferrous sulphate, next through one or more chambers containing calcium carbide, then through one loaded with "lava" or similar porous material, next into the holder, and finally through one more ferrous sulphate purifier and one carbide drier. The charcoal is prepared by soaking it in a solution of the salt, connecting the pieces to the negative electrode of an electric circuit, a plate of metal being attached to the positive electrode, and passing a current until a thin layer is obtained. Other soluble salts of iron may be employed, or salts of other metals, such as copper or zinc, but ferrous sulphate is to be preferred. It is claimed that the lava removes vesicles of oily hydrocarbons.—F. H. L.

Acetylene Gas Apparatus. A. W. Edwards, Sacramento, Cal., U.S.A. U.S. Pat. 702,092, June 10, 1902.

A MECHANICALLY-FED carbide-to-water generator of the hopper type, taking granulated carbide. The holder bell is directly coupled through a chain to a horizontal lever of the second class, so that when the bell falls it depresses a mushroom valve and admits carbide to the water of the decomposing vessel. Below the mouth of the hopper proper, an upright cone is fixed, and this is claimed to direct any condensed moisture away from the valve and its seat, thus minimising corrosion. The pipe for admitting water enters the bottom of the decomposing chamber, which has the usual conical form. Said pipe extends horizontally across the cylinder, and has a central downwardly projecting piece, all perforated with holes; by this arrangement the entering water stirs up the deposited lime, and prevents the sludge aperture from becoming choked. The upper part of the decomposing vessel, with the hopper, is detachable, having a water seal; and the rod of the feed valve also is water-jacketed to stop egress of gas.—F. H. L.

Acetylene Gas Generator. D. H. Treichler, Niagara Falls. U.S. Pat. 702,604, June 17, 1902.

SEE Eng. Pat. 14,763, 1901; this Journal, 1902, 907. —F. H. L.

Acetylene Gas Generator. J. D. Buckley and E. D. Phinney, Brunswick, Maine. U.S. Pat. 702,772, June 17, 1902.

A mechanically-fed carbide-to-water generator of the hopper type, in which the parts are interlocked. The carbide store has its lid fastened in position by means of a stirrup, and when this is swung on one side for recharging, it opens a communication between the hopper and the vent pipe (to remove any gas accumulated in the said hopper), and also disconnects the mechanism which opens the feed valve at the base of the hopper. The apparatus is fed with water from an outside funnel provided with a stopcock, and, when the lever of the latter is moved, it opens a communication between the decomposing chamber and the vent pipe, and also frees the lever of the sludge cock, which is usually locked.—F. H. L.

Incandescent Mantles; Process of Manufacturing ——. G. Buhlmann, Berlin. U.S. Pat. 698,102, April 22, 1902.

See Eng. Pat. 12,413 of 1901; this Journal, 1902, 763.
—H. B.

Burner: [Incandescent] Gas ——. H. Eldridge, Memphis. U.S. Pat. 697,461, April 15, 1902.

Upon a gas nipple is screwed an upwardly-converging conical Bunsen tube, expanding abruptly at its upper end into an enlarged chamber. The upper end of the latter is contracted abruptly to form an upwardly-converging conical nozzle, over which a mantle is suspended.—H. B.

Burner; Incandescent Gas ——. J. W. Blakey, Bradford, Assignor of two-thirds to W. G. Stansfield, Bradford. U.S. Pat. 698,432, April 29, 1902.

See Eng. Pat. 5022 of 1901; this Journal, 1902, 333.
—H. B.

Burner [Incandescent Lamp]; Hydrocarbon ——. A. Mende, New York. Assignor to the Pan-American Light Company, New Jersey. U.S. Pat. 702,449, June 17, 1902.

The vaporiser, which is situated above the burners, consists of three horizontal, parallel tubes so connected as to form a zigzag passage for the oil, whereby the latter is heated gradually to vaporisation. A trough containing a volatile liquid is adapted to be pushed through a tubular guide beneath the vaporiser, for the preliminary heating of the latter; or, when a gas supply is available, a horizontal tube having gas jets on its under side, is arranged above the vaporiser.—H. B.

Burner; Incandescent Gas ——. C. W. Taylor, Sioux City, Iowa. U.S. Pat. 702,830, June 17, 1902.

The sides of the burner top are corrugated and surrounded by a cap, so as to form passages for an air supply to the interior of the mantle. A gas-regulating plate is mounted in the burner tube, and is adapted to be engaged by a rotatable hood which surrounds the air-inlets at the base of the tube.—H. B.

Lamp; [Incandescence] Hydrocarbon ——. J. G. Branch, St. Louis. U.S. Pat. 703,231, June 24, 1902.

Oil is supplied to a horizontal vaporiser and a vertical pipe, both within the heat zone of the burner, the pipe leading down to a vapour jet surrounded by an annular cup. Above the jet a double-walled burner-tube is attached to the vertical pipe, and the vapour from the latter is caused to circulate through the annular space between the walls of the tube before reaching the jet.—H. B.

Electrode for Arc Lamps. R. Hopfelt, Berlin. U.S. Pat. 700,495, May 20, 1902.

The electrodes are formed of a carbide (*e.g.*, calcium carbide) having a protecting envelope which is impervious to water. The envelope may be formed of a metal, such as aluminium. The statement is made that "arc-light electrodes made of carbides decomposable by water, give a much more powerful arc than ordinary carbon electrodes do."—R. S.

Electrode for Arc Lamps. R. Hopfelt, Berlin. U.S. Pat. 700,649, May 20, 1902.

The electrode is formed of a mixture of a carbide and powdered carbon, within which is embedded a metallic wire. The whole is coated with a substance impervious to water.—R. S.

Glower for Pyro-electric Lamps, and Process of making same. C. P. Steinmetz, Scheneetady. U.S. Pat. 701,959, June 10, 1902.

See Eng. Pat. 26,133 of 1901; this Journal, 1902, 462.
—H. B.

Lamp; Electric Arc ——. H. Bremer, Neheim, Germany. U.S. Pat. 697,439, April 15, 1902.

Two downwardly-pointed, parallel or converging carbons, containing a high percentage of metallic salts, are enclosed within a chamber, or a reflecting plate is arranged above the points of the electrodes, in order to conserve the heat o the arc and to minimise the renewal of the atmosphere c the arc. To increase the area of the luminous arc, a electro-magnet, energised by the current of the lamp, i arranged beneath the points of the carbons.—H. B.

Lamp; Electric [Enclosed-] Arc ——. J. Auerbach an F. Gubing, New York, Assignors to the Stanley Electri Manufacturing Company, New Jersey. U.S. Pat. 698,38 April 22, 1902.

The arc is enclosed in a practically air-tight globe provide with tubes or other elongated, unrestricted passages leadin to the atmosphere, the passages being of such diameter an length as to permit the free outflow of gases from the glob and prevent the ingress of air.—H. B.

Lamp; Electric-Tube ——. D. McF. Moore, Newark, N. U.S. Pat. 702,319, June 10, 1902.

A lamp, in which the light is emitted from a column c rarefied gas, contained in a long translucent tube, throug which an electric current is passed. The tube is provide throughout its length with a backing or layer of non conducting, reflecting substance extending only partiall round the tube. The conducting caps or terminals, applie to the exterior of the tube at each end, also extend onl partially round the tube, or a small portion may encirc the tube completely. Thus the whole length of the tul is available for light-emission.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Naphthofurfurane in Coal Tar. Boes. Zeits. öffen Chem., **8**, 151—152. Chem. Centr., 1902, **1**, [25], 135

The author has detected compounds of benzene and nap thalene with furfurane in coal tar. From the fracti boiling at 282°—292° C., after separating the phenols a bases, he isolated, by repeated fractional distillation and crystallisation of the picric acid compounds, the α-naphth furfurane, an oily liquid, sp. gr. at 15° C., 1·1502, b. 282°—284° C.; and the β-naphthofurfurane, glistening wh needles, m. pt. 60°—61°, b. pt. 284°—286° C. It is pr bable that furfurane, which up to the present has only be found in wood oil, is also present in coal-tar naphth although only in minute quantities.—A. S.

Petroleum from Grosny; Characteristics and Constitue of ——. K. Charitschkow. Westn. schirow. weschtsc 1902, **3**, 133. Chem.-Zeit., 1902, **26**, [50], Rep., 179.

Grosny crude petroleum is distinguished from that of Ba by its higher specific gravity and by containing a greater pr portion of low-boiling constituents (benzine). There is a considerable difference in the characters of differe specimens of Grosny petroleum. Thus, samples from t north-west are characterised by a lower specific gravi corresponding with their greater proportion of benzine a kerosine, and also by a lower specific gravity of th residue. The viscosity of the latter is also smaller, a approximates to that of Baku residues.

The following constituents have been isolated by t author from Grosny petroleum:—Benzine (sp. gr., 0· —0·715), 4 to 5 per cent.; kerosine (sp. gr., 0·81—0·82 19 to 20 per cent.; and residue (sp. gr., 0·93—0·946), to 67 per cent. The fraction between the benzine a kerosine (ligroin) amounted to 10—12 per cent. In pr tice hardly more than 10 per cent. of kerosine is obtain since the residue is the most valuable product.

Petroleum of sp. gr. 0·906 was found to have the follow elementary composition:—Carbon, 86·41; hydrogen, 13· nitrogen, 0·07; sulphur, 0·1; oxygen (by difference), 0· and ash, 0·12—0·30 per cent. The fractions of lowe boiling point (13°—20° C.) yielded further fractions boili at 14°—17° C. and 17°—20° C., and consisting of mixtu of butane and pentane. The fractions boiling at 28°—32°. and 32°—36° C. were judged to consist of normal pentane. T fraction boiling at 68°—71° C. consisted of normal hexane. 80° C. the specific gravity rose rapidly. The fraction boil at 84°—93° C. yielded a hydrocarbon with specific grav

·715, and having a composition approximating to that of eptane. Toluene, xylene, and octane were identified in the ractions boiling at 97°—99° C. and above. Sulphur com- ounds were present in large proportion in the lower frac- ons, so that the crude benzine had an unpleasant odour. he ligroïn had the following elementary composition :— arbon, 89·87 ; hydrogen, 14·72 ; and oxygen, 0·41 per ent. ; whilst the composition of the residue of specific ravity 0·942 was as follows :—Carbon, 85·63 ; hydrogen, 2·47 ; nitrogen, 0·07 ; sulphur, 0·04 ; and oxygen, 2·75 er cent.—C. A. M.

United States Patent.

Distilling Apparatus [*Wood Distilling*]. J. S. Roake, Brooklyn, N.Y. (assigned to W. K. Hale and C. W. Kuerstciner). U.S. Pat. 700,373, May 20, 1902.

In connection with stills for the distillation of wood, and specially in connection with means for introducing alkali for the purpose of facilitating the removal of phenols, &c., carried over with the turpentine vapour, the inventor claims the combination of a condenser-coil, a pipe leading from a retort, an elbow connecting this pipe with the coil, a boss on the elbow, fitted with a detachable tapered casing, a jet nozzle extending into said casing, and connected with a source of steam supply, a pipe connecting this casing with an elevated tank, and another pipe connected with the casing and with an open funnel.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Aromatic Nitro Compounds ; Reduction of ——, by Tin and Hydrochloric Acid. J. Pinnow. J. prakt. Chem., 1902, **65**, [12], 579—585.

The reduction of aromatic nitro compounds by means of tin and hydrochloric acid is accelerated by the presence of graphite (J. prakt. Chem., **63**, 352). The graphite plays the same part as the platinum touching the zinc in the solution of hydrogen under the action of dilute sulphuric acid. In parallel experiments on the reduction of *m*-nitro-methyl-*p*-toluidine by means of powdered tin and hydro- chloric acid, the temperature at the commencement of the action rose more rapidly when graphite was added. Under these conditions a temperature of at least 50° C. is necessary to produce dimethylbenzimidazole, which, however, is produced in large quantity when the reduction takes place in a short-circuited cell, with tin and carbon poles, at a temperature not exceeding 20° C.

A cell consisting of tin in hydrochloric acid, and platinum foil in a solution of nitrodimethyltoluidine in hydrochloric acid, gave a current equivalent to 34·8 per cent. of the tin consumed ; 63 per cent. of the products of the reduction consisted of dimethylbenzimidazole, which results from the intermediate formation of the nitroso compound and its internal condensation. With a similar cell containing a carbon plate in place of the platinum, the current was equivalent to 81·6 per cent. of the tin consumed, and the yield of dimethylimidazole amounted to 39 per cent. of the isolated products. The reduction is thus more energetic and more complete with a carbon than with a platinum pole. In view of the absence of dimethylimidazole from the reduction by tin, graphite, and hydrochloric acid, it is evident that the nitroso compound is not an essential intermediate product. The above experiment with a carbon pole was repeated, interposing a gradually - decreased resistance ; the velocity of the reduction was thus dimin- ished, whilst the velocity of transformation of the nitroso compound would remain unaltered. The proportion of methylbenzimidazole was not increased ; hence its forma- tion in the cell, and non-production in reducing under ordinary conditions, cannot be due to different ratios between the velocities of reduction and condensation.—A. C. W.

Diazo Compounds of Acetylacetone. C. Bülow and F. Schlotterbeck. Ber., 1902, **35**, [12], 2187—2191.

The *o*-, *m*-, and *p*-nitrodiazobenzenes combine in presence of hydrochloric acid with acetylacetone, but the resulting products cannot be acetylated even by employing the method by which aniline-azo-acetylacetone is converted into the symmetrical α-acetylphenylhydrazone of the diacetylketone. It appears therefore that diazobenzene, in contradistinction to its nitro derivatives, does not combine to any appreciable extent with acetylacetone in presence of hydrochloric acid, and that the diazonium solutions of the nitranilines react more readily, whilst the resulting products possess a greater stability.

Aniline-azo-acetylacetone is readily prepared by allowing a mixture of diazobenzene chloride and acetylacetone to stand in a sodium acetate solution for 24 hours. The product which separates, crystallises from hot water in long yellow needles melting at 90° C. It dissolves in dilute soda lye and in concentrated sulphuric acid with an intense yellow colour, and is precipitated unchanged from the former by carbon dioxide. When boiled for some time with dilute soda lye, it decomposes into aniline and a product, $C_{15}H_{16}O_3$, which crystallises from alcohol in white needles melting at 186° C. On cohobating equimolecular proportions of phenylhydrazine and aniline-azo-acetylacetone in acetic acid solution for half an hour, 1-phenyl-3.5-dimethyl-4-aniline-azopyrazole, melting at 62° C., is obtained.

For the preparation of *p*-nitraniline-azo-acetylacetone, *p*-nitro-isodiazobenzene sodium is combined with acetyl- acetone in presence of sodium carbonate or of hydro- chloric acid. The condensation product crystallises from glacial acetic acid in shining brownish-yellow needles melt- ing at 222° C. The *o*-compound melts at 180° C., and crystallises in yellowish-red needles, whilst the *m*-derivative forms orange-yellow plates melting at 140° C. All these compounds, on suitable treatment, yield the corresponding pyrazoles and isoxazoles.—T. A. L.

Chloro-m-diaminobenzene and Triaminobenzene Carboxylic Acids. P. Cohn. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [8], 205—206.

Chloro-m-phenylenediamine carboxylic acid—

$$COOH : Cl : NH_2 : NH_2 = 1 : 2 : 3 : 5,$$

the carboxylic acid of the developer "Nerogen D," is pre- pared by reducing the corresponding dinitro compound with stannous chloride and hydrochloric acid. The hydrochloride crystallises in pale yellow needles ; it is very soluble in water. The sulphate crystallises from dilute alcohol with $1H_2O$, which it loses at 115° C. The platinichloride is readily soluble. The diacetyl compound forms colourless or brown crystals, m. pt. 288°—289° C.

Triaminobenzoic acid [$COOH : NH_2 : NH_2 : NH_2 = 1 : 2 : 3 : 5$], is formed on reducing dinitro-anthranilic acid [$COOH : NH_2 : NO_2 : NO_2 = 1 : 2 : 3 : 5$] with tin and hydrochloric acid, separating on adding sodium acetate to the solution of the easily soluble hydrochloride. The sulphate is precipitated on adding sodium sulphate to the crude solution of the hydrochloride obtained by reducing the dinitro compound as described ; it is nearly insoluble in water. The acid quickly turns red when it is exposed in solution to the air, and an amorphous brown precipitate separates ; this is immediately formed on adding ferric chloride. The acid is identical with that described by Griess as 2.3.5-triaminobenzoic acid, and obtained, along with sulphanilic acid, by the reduction of *p*-sulphobenzene- azo-2.4-diaminobenzoic acid.—E. B.

Mordant Dyestuffs of the Benzaldehyde Green and the Rosamine Groups. C. Liebermann. Ber., 1902, **35**, [12], 2301—2303.

With a view of conferring mordant dyeing properties on the members of certain important groups of dyestuffs, the author has, in the Benzaldehyde Green series, replaced benzaldehyde by protocatechuic-aldehyde, which contains two *o*-hydroxyls. By condensing this aldehyde with dimethyl- aniline, a leuco dyestuff is obtained which is converted on oxidation into a violet-blue dyestuff, giving violet to blue on alumina- and blackish-violet shades on iron-mordanted cotton. The product will also dye unmordanted wool and silk bluish-violet shades. Similarly, protocatechuic aldehyde condensed with *m* - dimethylaminophenol — benzaldehyde, under similar conditions, giving Rosamine (phenylpyronine)

—gives a product which dyes alumina violet-red and iron oxide greyish-violet. These compounds are most probably Dihydroxybenzaldehyde Green and Dihydroxyrosamine. The change from green to blue presented by these dyestuffs is not a new observation. Hydroxybenzaldehyde Greens are known technically which show the same change, and a Glacier Blue has been prepared from dichlorobenzaldehyde and dimethylaniline (Ger. Pat. 71,370. Eng. Pats. 957 and 22,741 of 1893; this Journal, 1894, 31 and 1055). The Patent Blues are Hydroxymalachite Greens, which do not dye the ordinary mordants, although their sulphonic salts dye some of Scheurer's mordants (this Journal, 1902, 768) blue. Blue mordant dyestuffs belonging to the benzaldehyde series have also been prepared by condensing tetramethyldiaminobenzophenone with pyrogallol and dihydroxynaphthalene (Eng. Pat. 4688 of 1891; this Journal, 1892, 236).—T. A. L.

Thiopyronine [*Sulphur Dyestuffs*]. J. Biehringer and W. Topaloff. J. prakt. Chem., 1902, **65**, [11], 499—510.

The preparation of bluish-red dyestuffs containing sulphur from tetra-alkyldiaminodiphenylmethane, has been patented by J. R. Geigy and Co., in 1892 (Ger. Pat. 65,739). These products are pyronines, containing sulphur in place of oxygen, but do not appear to have come into the market. The authors have now investigated the tetramethyl derivative of this class, and obtain thiopyronine by the action of a solution of sulphur (60 grms.) in sulphuric anhydride (25 per cent.) (600 grms.) on tetramethyldiaminodiphenylmethane (60 grms.) at a temperature not exceeding 35° C. The orange yellow sludge, after stirring for a few hours, is poured into two litres of water, boiled, cooled, filtered from precipitated sulphur (54·8 grms.), and treated with a concentrated zinc chloride solution. On standing, the zinc chloride double salt (43 grms.) crystallises out in reddish plates, with a greenish reflex. The mother liquor contains unaltered tetramethyldiaminodiphenylmethane and the corresponding carbinol. The base, obtained by decomposing the zinc chloride double salt or the hydrochloride with soda lye, is a violet flocculent precipitate. It could not be obtained in a pure state, but always contains some tetramethyldiaminothioxanthone. The base is soluble in warm alcohol, acetone, chloroform, or benzene, with a red colour and a very faint yellow fluorescence. If the alcoholic solution be treated with a very small quantity of soda lye the red colour disappears, and the solution shows a blue fluorescence, due to the formation of the thioxanthone derivative. The hydrochloride has the formula, $C_{17}H_{20}N_2SCl_2$, crystallises in shining greenish golden needles, and melts with decomposition at 245° C., whilst the platino-chloride $(C_{17}H_{19}N_2SCl)_2PtCl_4$ is derived from the monohydrochloride. The leuco base obtained by reduction with hydrochloric acid and zinc dust crystallises in colourless needles or plates, and melts at 130° C. It yields the dyestuff on oxidation.

It has already been shown (see this Journal, 1897, 134) that the secondary alcohol radicle of the pyronine base can be oxidised to the ketone group, and a similar reaction holds good in the case of the thiopyronine base. On oxidation with permanganate in presence of soda lye, the zinc chloride double salt is converted into tetramethyldiaminothioxanthone, but a better yield is obtained by warming an alcoholic solution of the thiopyronine base with soda lye. 3.6-Tetramethyldiaminothioxanthone crystallises from a mixture of benzene and alcohol in yellowish prisms melting at 288° C. The alcoholic solution possesses a bluish fluorescence, but comparative tests of the tetramethyldiaminothioxanthone and of tetramethyldiaminoxanthone show that the latter fluoresces 5—6 times stronger than the former. The substance dissolves to a yellow solution in concentrated sulphuric acid with an intense green fluorescence which disappears on adding water and becomes blue on dilution with alcohol. Hence, whilst the solution in concentrated sulphuric acid has the specific fluorescence of the thioxanthone ring, the alcoholic solution shows the same blue fluorescence as tetramethyldiaminoxanthone in which sulphur is replaced by oxygen in the central ring. The hydrochloride has the formula, $C_{17}H_{18}ON_2.2HCl + 3\frac{1}{2}H_2O$, and forms a crystalline reddish-yellow mass, which on warming loses water and hydrochloric acid.—T. A. L.

Aniline Dyestuffs and Albuminoids; Chemical Reaction between ——. M. Heidenhain. Pflüger's Arch., 9[illegible] 115—230. Chem. Centr., 1902, **1**, [25], 1370.

The author gives the results of a series of experiments [illegible] the action of aniline dyestuffs on albuminoids (serum albumin and casein). Aromatic sulphonic acids, if sufficient acidity, precipitate albumin. Also, the azo dyestuff sulphonic acids (set free from the commercial sodium salts by acetic acid) if they possess sufficient acidity produce (coloured) albumin precipitates. If amino-azo sulphonic acids, which (in aqueous solution) have entirely different colours when converted into their alkali salts, are added to albumin solutions, then, as a rule, the "salt colour" is produced, even when the albumin solution contain 10 per cent. of acetic acid; if the amino-azo sulphonic acids are present in sufficient amount, albumin precipitates are produced showing the characteristic "salt colour." The amino-azo sulphonic acids thus appear, even in presence of a large excess of acetic acid, to unite chemically with the albumin. The compounds formed are decomposed (decolorised) with difficulty by 5 per cent. sulphuric acid, and in some cases not at all by glacial acetic acid; they are, therefore, more stable than the sodium salts of the sulphonic acids. Salts of basic dyestuffs (Thionine and Toluidine Blue) produce dark-coloured precipitates in solutions of the sodium salts of amino-azo sulphonic acids, but not in solutions of the albumin compounds of the latter. The acidulated yellow aqueous solution of the quinoid ethyl ether of tetrabromphenolphthalein, the alkali salts of which have a deep blue colour, dyes wool and silk, according to Nietzki, not yellow, but blue; in the same way, if to the yellow solution, serum albumin or casein dissolved in 10 per cent. acetic acid be added, a blue coloration is produced. The alizarins also react with albumin solutions, with formation of colorations, which, according to the author, are not due merely to the presence of salts in the albumin preparations, although similar colorations are produced, for example, by the reaction between alizarins and alkali carbonates. The colours of the alizarin-albumin compounds resemble most those of the corresponding alizarin-ammonium compounds.

Characteristic reactions also take place between the salts of basic aniline dyestuffs and albuminoids. With the salts of weak dyestuff bases, the acid unites with albumin, and the base, with its characteristic colour, is set free; with the salts of stronger dyestuff bases, on the other hand, the base unites with the albumin. If small quantities of strong basic aniline dyestuffs (in the free condition) be added to albumin solutions, the colour is altered in the same ways by the addition of acid.

The author states that the reactions described are due to the formation of definite dyestuff albumin compounds, and are not of a "physical nature."—A. S.

Indigo; Volumetric Determination of ——, *by Means of Sodium Hydrosulphite.* A. Wangerin and D. Vorländ

See under XXIII., *page* 991.

English Patents.

Dyestuffs [*Sulphide Dyestuffs*]; *Manufacture of* ——. R. J. Urquhart, Manchester. From The Chemische Fabriken vorm. Weiler-ter Meer, Uerdingen-on-the-Rhine, Germany. Eng. Pat. 11,733, June 8, 1901.

According to Ger. Pat. 105,632, identical dyestuffs are obtained by fusing with sulphur and sodium sulphide either *p*-amino-dinitrodiphenylamine (from *p*-phenylene diamine and 1.3.4-dinitrochlorobenzene) or trinitrodiphenylamine. The patentees find that this is incorrect, and that, whilst trinitrodiphenylamine gives under all conditions a nearly worthless greyish black, aminodinitrodiphenylamine yields blue to black and olive dyestuffs according to the temperature (160°—240° C.) at which the melt is made. In order to keep the melt fluid, water and glycerin are added. The following typical example gives the quantities employed. A solution of 180 kilos. of crystallised sodium sulphide, 60 kilos. of sulphur, 60 litres of water, and 15 kilos. of glycerin at 90°—100° C. is mixed with 36 kilos. of aminodinitrodiphenylamine, and slowly heated in a

-bath, so that the temperature of the latter reaches)° C. in four hours. The melt at the end of three hours : 165° C.) suddenly froths, becomes thick, and the nperature sinks to 145° C. For the preparation of a ue dyestuff, the heating is continued for about half an ur, until the temperature of the melt rises above 155° C. cooling, the melt becomes hard, and can be powdered. dyes cotton, blue from a bath containing sodium sulphide, shade becoming fuller on subsequent chroming. For preparation of a blue-black dyestuff, the melt is heated about 175° C., whilst if it be heated to about 220° C. olive dyestuff results. If more glycerin be used, a lower nperature (135° C.) can be employed, but the melt uires to be heated for a longer time. The dyestuffs said to be fast to light, acids, alkalis, and washing.

—T. A. L.

o Colouring Matters [Azo Dyestuffs]; Manufacture of New ——. I. Levinstein, C. Mensching, and Levinstein, Ltd., Manchester. Eng. Pat. 13,619, July 4, 1901.

E nitrotoluidine sulphonic acid having the constitution $)_2 : NH_2 : CH_3 : SO_3H = 6 : 2 : 1 : 4$ combines after diazo- tion with dyestuff components to form valuable dye- ffs. The combinations can be effected according to the thods usually employed for the preparation of azo, disazo, azo, &c. dyestuffs.—T. A. L.

French Patents.

rmylmethylanthranilic Acid [Indigo Dyestuffs]; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 317,122, Dec. 21, 1901.

E methylo-chloride or bromide of quinoline, on oxida- n in aqueous solution with an alkali permanganate in sence of magnesium sulphate, yields formylmethyl- hranilic acid. This product, having the formula—

$$1.2.C_6H_4(CO_2H)NCH_3CHO$$

stallises from water in yellowish prisms, melting at ° C., and smells somewhat like coumarin. It serves for manufacture of Indigo.—T. A. L.

loxyl [Indigo Dyestuffs] from Methylanthranilic Acid; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 317,081, Dec. 20, 1901.

DAMIDE is caused to react on the alkali salts of methyl- hranilic acid, or of formyl or acetyl-methylanthranilic l, together with caustic potash or soda, at a high perature. When the reaction is complete, the yellowish- nge melt is cooled, dissolved in water, and converted) indoxyl or Indigo in the usual manner.—T. A. L.

loxyl [Indigo Dyestuffs]; Manufacture of ——. Cie. r. de Coul. d'Aniline. Fr. Pat. 317,082, Dec. 20, 1901.

s salts of methylanthranilic acid or of acidylmethyl- hranilic acid are heated, out of contact with the air, h an amalgam of sodium and lead, tin, zinc, or mercury i vessel provided with an agitator. After the reaction omplete the melt is extracted with water, filtered, and solution of indoxyl obtained is converted in the usual ner into Indigo.—T. A. L.

loxyl [Indigo Dyestuffs] and its Homologues; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 17,121, Dec. 21, 1901.

OMATIC organic compounds containing the group $N.CH_2.CO-$ one or more times, where R represents nyl, tolyl, xylyl, &c., are converted into indoxyl by ting at a high temperature with inorganic substances able of decomposing water, such as the alkali metals their amalgams (also with heavy metals), the metals he alkaline earths, alkali amides, nitrides, and carbides. order to moderate the reaction it is advisable to add stances like caustic alkalis, alkali cyanides, and especially olecular mixture of caustic soda and potash. For mple, 42 kilos. of caustic potash, 30 kilos. of caustic soda, and 5 kilos. of sodium are fused at 180°—200° C., and 10 kilos. of the potassium salt of phenylglycin are added to the melt. Gas is evolved, and the colour of the melt changes from yellowish-orange to brown. After cooling, the melt is dissolved in water, filtered, with exclusion of air, and the indoxyl or Indigo is separated in the usual manner.—T. A. L.

Blue Dyestuff [Anthracene Dyestuffs] of the Anthracene Series; Manufacture of a ——. Badische Anilin und Soda Fabrik. Fr. Pat. 309,503, Dec. 19, 1901. Supplement.

See Eng. Pat. 24,354 of 1901; this Journal, 1902, 910.

—T. A. L.

Brownish Yellow Sulphide Dyestuffs; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 317,063, Dec. 20, 1901.

Dyestuffs giving brownish yellow shades on cotton, fast to soap and acids, are obtained by fusing the mono- and dinitrobenzylsulphonic acids with sulphur and sodium sulphide at 150°—200° C., and afterwards heating to 240°—250° C. The dyestuffs can be diazotised on the fibre and combined with phenols and amines.—T. A. L.

Dyestuffs [Sulphide Dyestuffs] for Cotton; Manufacture of ——. Weiler-ter Meer. Fr. Pat. 310,713, Dec. 20, 1901. Supplement. (See Eng. Pat. 11,733, 1901; this Journal, page 966.)

Para-aminodinitrodiphenylamine, or its products of reduction obtained by heating with alkali sulphides, is heated with alkali polysulphides with or without the addition of glycerin. Different shades are obtained according to the length of time the heating is continued, varying from blue to black, and finally dark olive.—T. A. L.

Alkyl Derivatives [Sulphide Dyestuffs] of p-Amino-p'-hydroxydialphylamines and of Blue Dyestuffs containing Sulphur; Manufacture of Sulphonic Acids of ——. Fabr. de Coul. d'Aniline et d'Extraits ci-dev. J. R. Geigy. Fr. Pat. 310,809, Dec. 19, 1901. Supplement.

The indophenols of the chief patent, when treated with bisulphites or with free sulphurous acid, yield sulphonic acids isomeric with those previously obtained by employing normal sulphites. The new products, as for example those obtained from dimethyl-*p*-amino-*p*-hydroxydiphenylamine, are more soluble in water, and when fused with sulphur and alkali sulphides yield darker blues than those of the chief patent. The addition of copper or of its salts to the melt lead to the formation of olive to green dyestuffs.

—T. A. L.

Aniline, Toluidines, and their Analogues; New Process for the Manufacture of ——. J. B. Senderens. Fr. Pat. 312,615, Dec. 24, 1901. Supplement.

The process described in the chief patent (this Journal, 1902, 169) is applicable for the reduction of α-nitronaphthalene to α-naphthylamine.—T. A. L.

p-Amino-tolyl-p-hydroxyphenylamine [Sulphide Dyestuffs] and of Blue Sulphide Dyestuffs derived from it; Manufacture of ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 317,219, Dec. 24, 1901.

By simultaneously oxidising *p*-aminophenol and *o*-toluidine in an acid solution, and reducing the product formed, a good yield of *p*-aminotolyl-*p*-hydroxyphenylamine is obtained. When this substance is heated with polysulphides, it yields a dyestuff giving blue shades on unmordanted cotton.

—T. A. L.

United States Patents.

Indigo [Indigo Dyestuffs]; Purifying Raw ——. B. Homolka, Frankfort. Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. U.S. Pat. 702,730, June 17, 1902.

See Fr. Pat. 314,681; this Journal, 1902, 401.—T. A. L.

Mordant Colours; Process of Making ——. M. Lange and T. Emilewicz, Amsterdam. U.S. Pat. 702,445, June 17, 1902.

By condensing a fatty or aromatic carboxylic acid with 1.1′-dihydroxynaphthalene or its mono- or diacidyl derivatives, dyestuffs are obtained which give yellow to orange shades on alumina mordants. For example, 60 kilos. of 1.1′-dihydroxynaphthalene, 100 kilos. of acetic acid, or 39 kilos. of acetic anhydride and about 80 kilos. of zinc chloride are heated together until the dihydroxynaphthalene has disappeared. The product after purification in the usual manner forms small yellowish needles melting at about 101° C., and dyes a yellow shade on an alumina mordant. —T. A. L.

Blue Wool-Dye [Azo Dyestuffs] and Process of making same. A. Weinberg, Frankfort. Assignor to L. Cassella and Co., Frankfort-on-the-Maine, Germany. U.S. Pat. 703,105, June 24, 1902.

The diazo compound from *o*-chloro-*p*-nitraniline is combined with 1.1′.3.3′-dihydroxynaphthalene disulphonic acid, the nitro group is reduced, and the resulting compound is treated with an alkylating agent. (See Fr. Pat. 313,119; this Journal, 1902, 112.)—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk; The Fibroïn and Glue [Sericin] of ——. E. Fischer and A. Skita. Zeits. phys. Chem., 1902, **35**, 221. Chem.-Zeit., 1902, **26**, [50], Rep. 177—178.

In continuation of their work on this subject (this Journal, 1901, 1108) the authors have detected traces of diamino acids in the products of the hydrolysis of purified fibroïn, and have identified arginine with certainty. They have also proved that serine, which has previously only been obtained from the sericin, is one of the decomposition products of fibroïn. The silk glue (sericin) yields hydrolytic products, from which a considerable quantity of diamino acids can be separated by dialysis. Among these the authors have identified arginine. In their opinion the difference between the composition of sericin and fibroin is only a quantitative one, the same monamino acids being obtained from both. In addition to tyrosine and serine, previously found by Cramer, the authors have identified traces of leucine and phenylalanine in the products of hydrolysis of silk glue. (See also this Journal, 1902, 610.)—C. A. M.

Silk; Weighted [Defects in] ——. R. Gnehm, O. Roth, and O. Thomann. Färber-Zeit., 1902, **13**, [9], 133—134; [10], 155—156; [11], 170—172; [12], 184—187.

The authors first give a historical review of the practice of weighting silk, and refer to the investigation of Gnehm and Bänziger (this Journal, 1897, 234) on the defects caused by excessive weighting. Meister and Gnehm, in 1896, recommended that in no case should the weighting exceed 50—60 per cent. of the original weight of the material. More recently (since 1899) the authors have received knowledge of defects, occurring almost without exception in taffetas of light colour, which are of quite a different nature to those described by Gnehm and Bänziger. Some time after dyeing, usually after storing for a month, brownish spots (some round, and about the size of a pea; some from 2 to 8 cm. long) become perceptible on the fabric; in some cases the forms of finger impressions can be recognised fairly distinctly. Most of the defective goods had been manufactured in hot countries, or had been stored for a long time, and in many cases it was known that the necessary cleanliness had not been observed in the working of the silk. The numerous experiments of the authors led them to the following conclusions:—The defects described are not caused by micro-organisms, by fruit juices, or by bodies used in weighting, dyeing, and finishing the silk, such as tin compounds, sulphuric acid, &c. Spots can be produced with perspiration, which resemble in their appearance and characteristics the defects described, and it is stated that in many cases the injury is undoubtedly due to contact with sweaty hands. The spo are probably produced in such cases by the concurrent acti of different agents (sweat, and finishing materials, such oil). The authors admit that in some of the samples t spots are of such shape and size that the explanation giv is not sufficient to account for their presence.—A. S.

Calico Printing; Some Novel Effects in ——. E. Kayser. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [210—212.

Conversion effects may be obtained by over-dyeing wi basic dyestuffs cotton tissues dyed with substantive a dyestuffs, and printing a mixture of a stannous salt a tannic acid; or by printing with an alkali sulphite tissu dyed with mixtures of basic dyestuffs of the following t classes, which are respectively (*a*) dischargeable, and (not dischargeable with sulphites:—(*a*) Brilliant Cresyl Blu Capri Blue, Methylene Blue, Turquoise Blue, Methyl Gree Magenta, Pyronine G, Rhodamine, and Bismarck Brow (*b*) Rhoduline Red and Violet, Safranine, Brilliant Gre Victoria Blue B, Methyl Violet, and Acridine Yellow.

Patterns in red, white, yellow, and other colours on a bla ground are produced by dyeing red with Benzopurpurin 4 printing with a concentrated paste of stannous hydra admixed with ammonium citrate or citric acid, and thicken with a natural gum, steaming for an hour, padding with slightly thickened Aniline Black mixture, drying at a lo temperature to avoid formation of the black, over-printi with sodium acetate, drying and passing through a stea ageing machine to develop the black in the unprinted pa of the tissue, finally washing and soaping as usual. produce a yellow discharge, Xanthanin (Geigy) is added the stannous hydrate mixture, Ceruline Blue being used f a blue, and a mixture of these two dyestuffs for a gre dischnrge. The black obtained by this method, is reddis A black of better appearance is obtained by printing t red-dyed tissue with stannous sulphocyanide, steaming for few minutes, padding with Nitroso Blue M R mixtu over-printing with potassium sulphite, steaming for a sh time, fixing with tartar emetic, washing, and soaping.—E.

English Patents.

Textile Fabrics; Recovery of Volatile Solvents used in t Treatment of ——, and Apparatus therefor. C. Weber and Fraukenburg, Ltd., Salford. Eng. Pat. 16,9 Aug. 23, 1901.

The material is made to travel almost entirely round horizontal steam-heated drum, which is surrounded concc trically by a cylindrical vessel charged with cold water, or a concave sheet of copper cooled by the air, for condensi purposes. Special features of the apparatus are that t solvent vapours fall, through their own weight, upon t condensing surface, and are there more perfectly condens than usual, because they have not been diluted with air. —F. H. L

White and Coloured Discharges on Cotton dyed w Sulphurised Dyestuffs; Manufacture and Product of ——. H. E. Newton, London. From the Farbenfa vorm. F. Bayer and Co., Elberfeld, Germany. Eng. P 16,170, Aug. 12, 1901.

White, green, and yellow discharges on cotton dyed w a sulphide dyestuff, as, for example, Katigen Black Katigen Blue, are obtained by employing a paste containi aluminium chlorate, chromium chlorate, or chlorate of ir with or without the presence of another oxidising age After steaming for about 1—3 minutes without pressure, t goods are rinsed and soaped, the discharge being resp tively white, green, or yellow. If now the goods be dy with a mordant dyestuff, a coloured design on a black grou is obtained according to the particular discharge and dyest employed.—T. A. L.

French Patents.

Artificial Silk Threads and Ribbons; Process for Manufacture of ——. Vereinigte Kunstseide Fabrik A.G. Fr. Pat. 317,094, Dec. 21, 1901.

The nitrocellulose threads or ribbons remain stationary a circulating bath, in order that they may not beco

tangled during the denitrifying, scouring, and bleaching ocesses.

The operation of denitrification is greatly accelerated by e use of a 2·5 to 6 per cent. solution of sodium, potas-um, ammonium, calcium, strontium, barium, or magnesium drosulphide. A solution of this strength, employed in a culating bath, cleanses the fibres without impairing their rength and elasticity.—G. T. M.

esist on Tissues Dyed with Sulphur Colours. Farben-fabr. vorm. F. Bayer and Co. Fr. Pat. 317,145, Dec. 23, 1901.

RESIST for sulphur colours is obtained by printing on e fabric a paste containing a salt of chromium or of minium, or a mixture of two such salts. On subsequent eing, insoluble aluminium or chromium hydroxide is oduced by the action of the sodium sulphide.—G. T. M.

inting on Vegetable Fibres with the Dyestuffs of Fr. Pat. 309,503, *and of its Supplement of July* 10, 1901. Badische Anilin und Soda Fabrik. Fr. Pat. 313,772, Dec. 26, 1901. Supplement.

E yellow dyestuff obtained from β-aminoanthraquinone d anhydrous aluminium chloride or caustic alkalis at)°—350° C., in presence of oxidising agents, can be ployed for printing by mixing with alkali, with or without educing agent, and steaming. An alternative method is print with a mixture of the dyestuff and a reducing nt, and pass through an alkaline bath. The mixture of e and yellow obtained by the action of acid oxidising nts on β-aminoanthraquinone, giving yellowish or bluish ens, can be employed in a similar manner. (See Eng. t. 24,354 of 1901; this Journal, 1902, 910.)—T. A. L.

UNITED STATES PATENTS.

k Filaments; Apparatus for Spinning Artificial ——. R. W. Strehlenert, Stockholm. U.S. Pat. 702,163, June 0, 1902.

E Eng. Pat. 3832, 1897; this Journal, 1897, 533.
—J. F. B.

xtile Fibres or Filaments from Solutions of Cellulose, &c.; Apparatus for Producing and Twisting ——. C. F. Topham, Kew. U.S. Pat. 702,382, June 10, 1902.

E solution of cellulose is forced through a valve-con-led opening and a knuckle-joint, into a tube surrounded a filtering medium, the walls of the tube being perforated d grooved externally. The filtered solution then passes wards, between the filter and an enclosing cap, into a bent e carrying the forming nozzles. At the junction of the t tube with the cap an air space is provided, in which any bles of air in the solution may collect. The filaments ned at the nozzles are conducted through a setting tion, and up over a grooved roller. Hence, they pass ically downwards through a funnel into a covered box, ting at a high speed. The centrifugal action in this box s a twist to the filaments, and causes them to be de-ited in the form of a coil at the periphery of the drum.
—J. F. B.

aching, &c.; Keir for ——. W. W. L. Lishman, T. W. Haughton, J. J. Kirkpatrick, Assignors to the Lishman Process Bleaching Co., Cornholme, England. U.S. Pat. 02,309, June 10, 1902.

Eng. Pat. 15,486, 1900; this Journal, 1901, 892.
—G. T. M.

ist and Discharge on Textile Fabrics; Process of ——. E. Knecht, Manchester. U.S. Pat. 702,566, une 17, 1902.

place of the reducing agents hitherto used, the patentee eploys a titanous salt, preferably the chloride $TiCl_3$, er as a resist or a discharge.—T. A. L.

ing Yarn; Apparatus for ——. J. C. Hamer, Rad-cliffe, England. U.S. Pat. 702,002, June 10, 1902.

his apparatus, which is a modification of the centrifugal of dyeing machine already described (see Eng. Pat. 4279, 4280 of 1901; this Journal, 1902, 171), the material (yarn in cop or other compact form) is placed in the annular space formed by a slotted or perforated inner wall, disposed concentrically within the rotating cage, the flanged bottom of this cylindrical diaphragm resting on that of the movable receptacle. The inlet pipe for introducing the dyeing liquor is suspended in the rotating cage within the cylindrical space enclosed by the inner wall.—G. T. M.

Dyeing; Process of ——. G. de Keukelaere, Brussels. U.S. Pat. 703,122, June 24, 1902.

See Eng. Pat. 13,395, 1901; this Journal, 1902, 857.
—G. T. M.

Oxidising Apparatus. A. N. Dubois, Philadelphia, Pa. U.S. Pat. 701,860, June 10, 1902.

THE oxidising apparatus, suitable for fast black dyeing, consists of a suitable casing or compartment, enclosing two cylinders perforated in the sides and ends, and rotating on a horizontal axis. The cylinders are fitted internally with a series of pins or projections arranged in longitudinal rows, and inclined at an angle of 45° in the direction of rotation; these serve to hold the material in position until the uppermost position is reached, when the articles fall to the bottom of the rotating drum, and in this way are thoroughly exposed to the action of the hot gases circulating through the enclosure.

The fixed compartment is fitted with a ventilating shaft and damper, which serve to regulate the temperature, the latter being indicated by means of a thermometer connected with a bell, battery, and switchboard, so that electrical contact is made when the end of the mercury column reaches a given point.—G. T. M.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

ENGLISH PATENT.

Coloured Paper showing a Pattern or Design; Method for Producing Darker Shades or Tints in the Ground Colour of ——. F. R. Schmiedel, Dresden, Saxony. Eng. Pat. 8371, April 10, 1902.

DARK patterns on a coloured paper, having a ground of the same colour in a lighter tint, are obtained by printing or otherwise applying a solution of some almost colourless substance dissolved in a volatile solvent, which leaves a dark deposit on evaporation. A suitable solution consists of 30 parts of colophony, dissolved in 80 parts of alcohol and 3 parts of glycerin. A cheaper mixture contains 10 parts of gum arabic, 30 parts of water, 20 parts of alcohol, and 6 parts of glycerin. In both cases the glycerin is added to prevent any shiny appearance in the finished product.—G. T. M.

VII.—ACIDS, ALKALIS, AND SALTS.

Pyrophosphoric Acid; Acidity of ——. H. Giran. Comptes Rend., **134**, [25], 1499—1502.

THE author has prepared the four pyrophosphates of sodium, and has determined the heats of their successive formation, starting from pyrophosphoric acid. These (referred in all cases to the solid substances) are as follows:—

	Cal.
$P_2O_7H_4 + Na = P_2O_7NaH_3$	64·80
$P_2O_7NaH_3 + Na = P_2O_7Na_2H_2$.....	59·90
$P_2O_7Na_2H_2 + Na = P_2O_7Na_3H$.....	46·56
$P_2O_7Na_3H + Na = P_2O_7Na_4$	45·18

These differences are accounted for by applying to pyrophosphoric acid the theory suggested by De Forcrand for polyhydric alcohols:—Pyrophosphoric acid

$$\begin{matrix}(2)\ OH \\ (4)\ OH\end{matrix}\!\!>\!PO-O-PO\!<\!\!\begin{matrix}OH\ (1) \\ OH\ (3)\end{matrix}$$

has four identical acid functions. The first two substitutions of sodium (in positions 1 and 2, say) are each

accompanied by intramolecular (exothermic) combination with the neighbouring unsaturated acid function, and the further substitutions (in positions 3 and 4) necessitate the (endothermic) breaking up of these intramolecular compounds. Hence the thermal effects of the first two substitutions are above, and those of the last two below, the mean or true figure, 54·11, representing the thermal effect of a single substitution. This mean figure is higher than the corresponding figure (49·20) in the case of orthophosphoric acid.—J. T. D.

Hydrochloric Acid and Oxygen; Chlorinating Properties of a Mixture of ——. C. Matignon. Comptes Rend., 134, [25], 1497—1499.

Hydrochloric acid in presence of oxygen attacks platinum, tellurium, and gold at temperatures far below that at which oxygen reacts on hydrochloric acid itself. The mixture forms a chlorinating agent of very general application.
—J. T. D.

Ammoniacal Cupric Oxide; Displacement of Strong Bases by ——. Bouzat. Comptes Rend., 134, [25], 1502—1505.

The author has investigated the effect of adding bases to ammonio-cupric salts, and of adding ammonio-cupric hydroxide to salts of these bases, by determining the resulting thermal changes. The ammonio-cupric base displaces ammonia completely from its salts, while ammonia has no effect on the ammonio-cupric salt. In the case of potash and the ammonio-cupric salt (or ammonio-cupric base and potassium salt) there is partition, the potash taking the greater part of the acid; but the amount of ammonio-cupric salt increases as the excess of ammonia present increases. This partition is shown also by adding potash to a solution of ammonio-cupric salt, which then acquires the power (possessed by the base but not by its salts) of dissolving cellulose; or by adding a potassium salt to a solution of cellulose in ammonio-cupric hydroxide, when some of the cellulose is precipitated (see Wright, this Journal, 1884, 121). In the case of lime (or calcium salts) there is also partition; but when the ammonio-cupric liquor is strongly ammoniacal, it will displace lime almost completely from calcium salts, forming a considerable precipitate of lime in the liquid. The ammonio cupric hydroxide is thus shown to be a very strong base. (See also this Journal, 1902, 932.)—J. T. D.

English Patents.

Alkalis; Producing ——. H. A. Frasch, Hamilton, Canada. Eng. Pat. 19,036, Sept. 24, 1901.

Sodium (or potassium) chloride is added to an ammoniacal solution of nickel (or cobalt) hydroxide until all the nickel is precipitated as nickel-ammonium chloride, which is separated from the caustic soda solution and decomposed by milk of lime to recover nickel hydroxide for re-use, and the solution is heated to recover the ammonia. The caustic soda solution may be subjected to repeated similar treatment, and, finally, any sodium chloride present removed by concentration and crystallisation. See Eng. Pat. 284, 1901, and Eng. Pat. 19,038, 1901; this Journal, 1901, 580; and 1902, 862.
—E. S.

Liquor and Caustic Alkali Lye; Improvements in the Electrolytic Production of a ——, and in Apparatus therefor. [*Anode Cell.*] A. J. Boult, London. From H. Seibert, Kötzschenbroda; and G. Tempel, Radebeul, Germany. Eng. Pat. 9812, April 28, 1902.

A metal receptacle contains one or more diaphragm anode cells, consisting of carbon plates or rods, surrounded by pieces of coke to increase the effective surface and lessen the electrical resistance. An alkali chloride solution is first electrolysed in the anode cell, and the chlorine liberated is partly absorbed in the electrolyte and partly in absorbing columns, some of which are fed with the electrolyte from the anode cell and some with water. When a hot solution is electrolysed, the chlorine should be fed to a cold mixture containing alkali chloride to produce "hydrate of chlorine," and the alkali chloride solution remaining after bleaching should be used to replace the alkali chloride decomposed by the electric current.—G. H. R.

Borax and Boracic Acid; Treatment of Substances with Nascent Carbon Dioxide to Produce a Chemical Reaction, particularly applicable for the Production of ——. W. Smethurst, Dolgelly, N. Wales. Eng. Pat. 16,50 Aug. 16, 1901.

A composite gas burner, with a bell-shaped attachment, supplied with a mixture of a carbonaceous combustible gas and air in suitable proportion, and after lighting, is submerged in water containing the substance to be acted on, solution or suspension. To obtain boric acid, calcium borate is mixed with the water, and the solution is subsequently decanted whilst it is warm.—E. S.

Chlorates, Perchlorates, Bromates, Iodates, and the like, Electrolytic Manufacture of —— [Chromic Acid]. E. C. Corbin, Chedde, France. Eng. Pat. 17,32 Aug. 29, 1901. Under International Convention.

Chromic acid is used as an auxiliary agent in the electrolytic production of chlorates, bromates, and the like, from solutions of chlorides or chlorates, or mixtures of the same the chromic acid being maintained during the whole electrolytic process wholly or partially in the state of bichromate by the addition of a small quantity of a diluted acid, preferably hydrochloric acid, to the liquid, either continuously or intermittently during electrolysis, or all at once after. In the case of very soluble chlorates, &c., especially the chlorates and perchlorates of sodium, by the employment of chromic acid, crystals of chlorate or perchlorate of the corresponding metal may be obtained by simply cooling the liquor coming from the electrolyser without having to concentrate it. The dilute hydrochloric acid maintains the chlorometric strength very low during electrolysis, destroying very rapidly without any other operation and without any liberation of chlorine gas, the chlorometric strength of the liquors coming from the electrolyser, enabling those which have become non-oxidising to be used before being returned to the electrolyser. It also permits of the employment of receivers or conduits of any desired metal.—G. H. R.

Sulphur; Apparatus connected with the Subliming and Refining of ——. A. A. Consoli, Catania, Italy. Eng Pat. 8757, April 15, 1902.

In this apparatus, adapted for continuous working, the sublimation retort has the supply melting vessel by its side, the communication being through a curved tube ending below the level of the molten sulphur, so that the level in the vessel is kept the same as in the retort, whilst the liquid in the latter lowers in consequence of the sublimation.
—E. S.

United States Patents.

Cooling Tower. [*Ice-making or Liquid Ammonia Plant Acid Tower.*] W. H. A. Halsall and S. Lapham, both of Charleston, U.S.A. U.S. Pat. 698,013, April 1902.

The tower is devised to lower the temperature by evaporation of water supplied at the top and delivered into a cistern near its base, such cooled water being delivered upon a system of cooling coils supported at the base of the tower, the coils being traversed by the acid or other fluid or gas to be cooled. The tower is a framework, open on all sides to the atmosphere, having a hooded roof, immediately below which a water-pipe enters, having a spraying nozzle discharging water on to a spreader, from which it falls on to a stepped incline, successive inclines beneath being disposed alternately in opposite directions, so as to expose the water in a thin stream to evaporation, the arrangements being such as to permit air to circulate freely over the steps. A deflector is placed above the cooling coils at the base of the tower to prevent heated air from passing over the evaporating surfaces.—E. S.

Hydrogen Chloride and Sodium Sulphate, Method of Making ——. T. Meyer, Buergel, Germany. U.S. Pat. 702,877, June 17, 1902. Compare U.S. Pat. 698,704, 1902; this Journal, 1902, 772.

A MIXTURE of sodium chloride and bisulphate is heated to about 400° C., the HCl evolved is condensed by water or otherwise, and sodium sulphate is obtained as residue.—E. S.

Caustic [Alkali] Process of Producing ——. H. K. Moore, Massachusetts. U.S. Pat. 703,289, June 24, 1902.

AN aqueous solution of the chlorides, chlorates, or sulphates of alkali metals, is brought into contact with one face of a diaphragm of sufficient porosity to permit the free flow of the solution, and an electric current is passed through the latter and the diaphragm to an unsubmerged, foraminous cathode in contact with the other face of the diaphragm, thereby converting the metal ion into hydrate by the water in the undecomposed percolated solution, the electrolysis of which is continued in the pores of the cathode.—G. H. R.

Brine; Vacuum Apparatus for Boiling ——. G. N. Vis, Schweizerhalle, Switzerland. U.S. Pat. 702,264, June 10, 1902.

THE combination with a brine vessel open to the atmosphere, a pan provided at its lower end with a tubular extension located in said vessel, a system of heating-pipes located in said pan, means for creating a vacuum in said pan, a pipe ascending from the top part of the pan, and a liquid seal for the lower open end of the pipe, of a pipe connecting the pan at a point above the heating-pipes with the brine-supply reservoir, a heat-exchanging apparatus, and a pipe for supplying the heat-transmitting member of the apparatus with the condensed water formed in the heating system of the pan. See also U.S. Pat. 700,860, 1902; this Journal, 1902, 194.—E. S.

Oxygen; Retort for Generating ——. F. B. Felt, Chicago. U.S. Pat. 702,855, June 17, 1902.

OXYGEN is produced from air and steam, by means of a suitable liquid, such as manganate of soda, successively and continuously oxidised by the air and de-oxidised by the steam. The air and steam are supplied respectively to oxidising and deoxidising chambers formed by partitions in the retort, each chamber being subdivided into a series of compartments in communication with each other. Means are provided for the escape of nitrogen from the oxidising chamber, and for the withdrawal of the oxygen from the deoxidising chamber.—R. A.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

Mica; Apparatus for the Manufacture of Flake —— from Mica Plates, Crystals, or Nodules. H. C. Michell, London. Eng. Pat. 4969, March 8, 1901.

MICA-PLATES are passed through bending rolls to bring about a preliminary loosening of the flakes, and are then brought into a "flaking" chamber, where they encounter sideways a blast of air, which carries them into another chamber, divided into two parts by a vertical partition, on one side of which partially disintegrated plates collect, and are returned for further treatment, while the lighter flakes are carried on by the blast of air, and collect in the second compartment.—W. C. H.

Glass; Apparatus for Delivering Melted ——. C. M. White, London. From C. W. Foster, New York, U.S.A. Eng. Pat. 24,319, Nov. 29, 1901.

A PRIMARY furnace is connected by a conduit with a supplementary furnace. In the latter, the conduit opens into an annular space, connected by ports with a central discharge-chamber in which is a plunger for forcing the melted glass out through the discharge passage which leads from the lower part of the chamber and extends upwards above the plane of inlet thereto.—W. C. H.

United States Patents.

Glass-Furnace. J. P. Putallaz, Brooklyn, New York, U.S.A. U.S. Pat. 699,972, May 13, 1902.

THE furnace is open at both ends, and is provided with a horizontal partition in the centre, which forms the bottom of the furnace chamber. In the centre of this partition is a plate, which can be moved vertically up or down by means of a lever. There are rails for trucks through the furnace, and over the front-end is a hollow conical casing, the bottom of which is provided with a grating, on which cylinders of glass can undergo a preliminary heating. On one side of the furnace-chamber is a fuel space to which oil or gas can be supplied.—W. C. H.

Glass; Manufacture of ——, *by Electrical Heating.* A. Voelker, Ebrenfeld, Germany. U.S. Pat. 702,081, June 10, 1902.

SEE Eng. Pat. 12,673, 1900; this Journal, 1900, 1113.
—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Cements; Influence of Calcium Sulphate on ——. L. Deval. Thonind.-Zeit., 26, [69], 913—915.

THE author first determined the increase in volume produced by the addition of calcium sulphate to cements. With this object the finely-ground cement was completely hydrated by mixing with 50 per cent. of water, and storing the blocks under water for three months out of contact with carbon dioxide. The mass was then dried, reground, passed through a sieve with 4,900 meshes per sq. cm., mixed with half its weight of calcium sulphate and 33 per cent. of water, and made up into rods, which were kept moist and protected from carbon dioxide by storage on moistened filter paper under a glass bell. At the end of 21—24 days the increase in length of the rods was measured, with the following results, the percentage of alumina in the cement being given in each case:—

——	Elongation.	Alumina.
	Per Cent.	Per Cent.
Portland cement	12	6·2
Slag-cement, from Vitry	27	15·5
,, from Champignolles	16	14·5
Cement, from Grappier de Beffes	14	7·8
Besses lime	4	4·7

The variation of the elongation with the percentage of alumina present is probably due to the formation of calcium sulphaluminates.

In order to determine the amount of calcium sulphate so combined and rendered insoluble in distilled water, when the maximum elongation was attained, a quantity of the test rods equivalent to 1 grm. of cement was rubbed down in a quantity of water, more than sufficient to dissolve the entire amount of calcium sulphate taken. The precipitate was filtered after 24 hours, then washed with lime water, and the operations repeated until the washings ceased to extract any more calcium sulphate. On then boiling the residue with ammonium chloride to decompose the aluminium sulphate, and filtering, the amount of sulphuric acid in the clear liquid was determined, thus giving the amount of combined calcium sulphate present. The results show that, except in one or two instances, the amount of calcium sulphate combined is far less than the maximum possible were the alumina entirely present as tricalcium aluminate. The duration of the experiment influences the extent to which calcium sulphate is fixed by the cement, one sample being found to have combined with 0·146 part of sulphate after 15 days, 0·171 after 30 days, and 0·224

after 45 days. In another set of experiments, prolonged to the point of saturation of the calcium aluminate, or until the combined calcium sulphate reached a constant figure the following results were obtained :—

Cement.	Duration of Test.	Increase in Volume. Per Cent.	Cement containing Water. Amount of Calcium Sulphate. Capable of being combined by the Calcium Aluminate.	Cement containing Water. Amount of Calcium Sulphate. Actually combined.	Anhydrous Cement. Amount of Lime Combined.	Remarks.
Cement with excess of lime	1 month	54	0·150	0·162	0·065	
	6 months	54		0·247		
„ „ „	1 month	48	0·180	0·126	0·085	
	3 months	85·5		0·184		
	6 „	85·5		0·279		
Portland cement with excess of alumina	1 month	54	0·171	0·121	0·088	
	6 months	78		0·213		
Longnety Portland cement (plastering)	1 month	66	0·204	0·177	0·097	
	2½ months	75		0·296		
	7 „	..		0·360		
„ „ „ for brickwork	40 days	96	0·224	0·206	0·115	
	5 months	..		0·328		
Mantes Portland cement (ordinary fineness)	1 month	75	0·248	0·221	0·121	
	8 months	..		0·332		
„ „ „ (sifted through 4900-mesh sieve)	1 month	103	0·243	0·211	0·148	
	7 months	..		0·316		
Portland cement from Havre (ordinary fineness)	1 month	69	0·233	0·218	0·143	
	8 months	..		0·330		
Portland cement from Havre (sifted through 4900-mesh sieve)	8 days	21	0·219	0·143	0·143	
	22 „	75		0·170		
	75 „	117		0·202		
Ruoms cement	11 months	57	0·139	0·337	0·082	
	2½ „	..		0·114		
	10 „	..		0·162		
English cement	21 days	23	0·236	..	0·119	The cement set hard, and did not bind any more calcium sulphate.
	2 months	..		0·143		
	7 „	..		0·140		
Portland cement from Desvre Fourmantreaux	3 „	96	0·233	0·248	0·122	
	7 „	..		0·325		
Laboratory cement, with excess of alumina	17 days	102	0·400	0·335	0·387	
	1½ months	..		0·351		
	2½ „	..		0·546		
„ „ with one-third the amount of alumina	26 days	66	0·175	0·187	0·272	The anhydrous cement absorbed a large amount of calcium sulphate than the other.
	2 months	..		0·267		

To prevent the setting of the anhydrous cements, a 20-fold weight of water was added, and the samples were frequently agitated in the flasks; a considerable increase in volume occurred, but could not be measured. In the cements containing water some irregularity in the elongation was noticeable—chiefly due to the resistance offered by the moistened paper support. The increase in volume is accompanied by progressively increasing quantities of calcium sulphate; by prolonging the experiments beyond the period (1—3 months) at which the alumina would be saturated with calcium sulphate if entirely present as tricalcium aluminate, the amount of combined sulphate continues to increase, and indeed exceeds the amount theoretically necessary to the saturation of the aluminate assumed at present.

Apart from calcium ferrite, which does not occur in Portland cement, calcium aluminate is the only constituent of cement that can combine with calcium sulphate; and it is found that the amount of sulphate fixed in excess of that combined with the aluminate is retained mechanically, and can be extracted by frequent and prolonged steepings in milk of lime.

The action of carbon dioxide on the sulphaluminate is one of dissociation, resulting in the liberation of calcium sulphate.

The conclusion to be drawn from the experiments is that calcium sulphate produces changes of form and an increase in volume in the case of hydraulic mortars, with a tendency to diminish the tensile strength. In cements, like Portland cement, containing sufficient lime to ensure the complete conversion of the alumina into tricalcium aluminate, the formation of sulphaluminate continues until the whole of the alumina is involved; the calcium aluminate is thus neutralised and the hardening of the cement is facilitated. The action of calcium sulphate extends still further, an additional quantity, varying from 34 to 76 per cent. entering into combination with the cement, producing an increase in volume and leading to the decomposition of the mortar. In cements containing no alumina, or an insufficiency of lime, calcium sulphate has no effect; hence it is the aluminous cements with a low modulus of hydraulicity (*e.g.*, Portland cements, that are most exposed to the decomposing action of the sulphate.—C. S.

Cement; Abnormalities in the Initial Setting of —— N. Ljamin. Thoniud-Zeit., 26, [66], 874—876.

Occasionally cements that are slow-setting when fresh undergo conversion to quick-setting on storage, and then either retain that character or revert to the original state. According to the proved theory of Le Chatelier, that the hardening of cement is due to the formation of hydrated calcium hisilicate, which is generally connected with the formation of calcium hydroxide, it follows that the speed of the reaction can be accelerated by facilitating the precipitation of the latter, or retarded by preventing same. This view was confirmed by the author in a series of experiments wherein the cement was treated with calcium chloride, sodium chloride, sodium and potassium carbonates, calcium sulphide, and carbon dioxide (dissolved in the mixing water). In the latter case, the acceleration is considerable although the amount of CO_2 contained in water at the ordinary pressure is small. Calcium chloride in small quantity retards setting, but accelerates the same when the amount is increased, the reason for this being the comparatively small amount of calcium hydroxide entering into the formation of the insoluble oxychloride formed, so that it is

only when the proportion of chloride is high that any appreciable accelerative effect is produced, the soluble chloride at first retarding the setting.

Calcium sulphide, which is also often present to a small extent in cement, forms an insoluble compound with the hydroxide; but its effect is relatively low, about three parts of the sulphide being required to combine with one of the hydroxide.

An increase in the proportion of alumina in the cement also facilitates precipitation of the calcium hydroxide, and accelerates the setting; and enquiries addressed to several Russian cement makers resulted in expressions of opinion that the conversion of slow setting cements into fast setting, as a result of storage, is often due to the presence of high percentages of alumina, especially when the cement is prepared by the dry process. The addition of gypsum, which is soluble, also retards the setting at first; but when the latter enters into combination with the calcium aluminate present, its restraining action is removed. A similar effect is produced by the calcium oxide which is invariably present in freshly-burned cement clinker, but which is gradually converted into carbonate on storage. An examination of cement stored in casks shows that when the calcium hydroxide undergoes conversion into carbonate, the outer layers set more quickly than those near the centre. In one instance the cement in the inner portion of the cask began to set in 26 minutes and finished in 45 minutes, whereas that in the outer portion commenced and finished in 13 and 26 minutes respectively; whilst, at the end of three months' storage, the inner layers commenced to set in 15 minutes, and finished in 35 minutes, the setting of the outer portion being complete in 15 minutes.—C. S.

English Patents.

Kiln; Continuous Cement and Lime ——. W. L. H. Roberts, Rochester. Eng. Pat. 13,154, June 27, 1901.

The upper part of the cooling chamber is of the same diameter as the calcining chamber, but increases in diameter lower down, the bottom part being in the form of an inverted cone. At the bottom of the kiln is a pinnacle to facilitate the removal of the clinker, &c., through drawing eyes. The draw-bars are supported by cross-bars at either end. The calcining chamber is surrounded by an air-chamber, and there are several blowers in the side of the kiln. The hood consists of a skeleton frame covered with metal lathing and mortar. A horizontal course of fire-clay blocks is arranged above, and another below the fire zone, to enable the kiln lining between the courses to be repaired without disturbing the rest of the lining.—W. C. H.

Cement, Lime, Plaster, Bricks, and the like; Kiln for Burning ——. F. Kilby, Pylle, Somerset. Eng. Pat. 13,413, July 2, 1901.

The kiln is parallel-sided, about 3 ft. by 3 ft. by 6 ft. high, with two doors on the side for charging and discharging. A forced draught of live steam or hot air is introduced below the fire-bars to promote combustion.—W. C. H.

Fusible Composition or Cements for the Production of Articles by Casting or Moulding Processes. L. A. Brown, St. Louis, Missouri, U.S.A. Eng. Pat. 8431, Nov. 28, 1901. (Under Section 2 of the Patents Act, 1888.)

1 parts of sulphur are liquified by heat, and 10 parts of cement (such as Portland cement), mixed therewith, and 1 parts of heated sand added; the temperature is then increased to 750° F. and 5 parts of lampblack and 5 parts of colouring matter added; the temperature is reduced till the mass is viscid, and it is then poured into moulds to cool and set.—W. C. H.

Portland Cement; Production of ——, *from Chalk and Clay, in conjunction with the Rotary Kiln Process or any other kind of Kiln for Burning Cement.* C. R. Gostling, Lyme Regis, Dorset. Eng. Pat. 7110, March 24, 1902.

The chalk, and any flints present, are ground dry in suitable machinery. The clay is dried sufficiently to pass through edge-runners, and then mixed with the chalk, and conveyed to a revolving cylinder, heated by waste heat from the rotary kiln, or to drying floors. The material is then elevated into hoppers and passed into grinding machinery, from which it is taken by a worm conveyor to the rotary kiln, being mixed on its way with a certain amount of moisture. The claims for this process are—economy of fuel in burning the cement composition, as the moisture is reduced to a minimum; an increased output of clinker, since the materials contain 30 per cent. less moisture; saving in the cost of production by the application of the waste heat of the rotary kiln to the drying of the composition; and also great economy in labour.

—W. C. H.

Stone; Manufacture of Artificial ——. F. Jurschina, Stockholm, Sweden. Eng. Pat. 3493, Feb. 11, 1902.

Finely-ground, easily-fusible mineral or mineral slag or refuse is mixed with and partially dissolved by a solution of sodium silicate; finely-ground sand or pulverised stone is moistened with this solution, and the mass obtained pressed or cast, dried and burned.—W. C. H.

Coating Wooden Surfaces and Brick Walls, and for other Purposes; Compositions for ——. A. V. H. F. C. Clauson-Kaas, Copenhagen. Eng. Pat. 6337, March 14, 1902.

The addition of aluminium hydroxide, or that of any other metal of the iron group, to an alkali or alkaline-earthy albuminate, causes it to remain permanently elastic after drying, and suitable for a covering, fixing, or binding composition.—M. J. S.

United States Patents.

Cement [Portland Cement]; Process of Making ——. F. G. Jordan, Washington, U.S.A. U.S. Pat. 702,009, June 10, 1902.

Limestone is calcined and mixed, whilst in an incandescent state, with a sufficient quantity of moist silicious clay, to which a solution of silicate of soda may be added as a flux. The mixing is conducted in an air-tight holder, and the material agitated in the presence of a hydrating agent. The mixture is afterwards moulded into blocks, which are burned, and then ground to fine powder.—W. C. H.

"Matter" [Cement]; A Composition of ——. G. Le Roy De Lenchères, France. U.S. Pat. 702,140, June 10, 1902.

The composition, intended for use in the construction of maritime work, dykes, pipes, flagstones, &c., consists "of a heated and cooled mixture of simple or double salts of alumina and potash, silica, oxide of manganese, sulphate of lime, sulphate of baryta, a hydrocarbon, and gravel." For example, the composition may be formed by heating together clay, 60—70 per cent.; tar, 22—35 per cent., gypsum, 2—3 per cent.; barium sulphate, 1—2 per cent.; silica, 3—5 per cent.; and manganese oxide, 5—8 per cent.—E. S.

Matter [Cement for Floors, Walls, &c.]; Composition of. T. O. Pause, Atlanta, Georgia, U.S.A., Assignor of one-half to J. S. Clarke, Atlanta. U.S. Pat. 703,151, June 24, 1902.

This consists of several layers of burlap, treated with "a solution of magnesium chloride, magnesite, and whiting," and to which a surfacing compound is applied, consisting of magnesium chloride, magnesite, sawdust, and silica. To this surface a soap solution is applied, then a filler, and a sizing of soap solution, which latter is polished.—W. C. H.

Stone; Apparatus for the Manufacture of Artificial ——. F. Marx, Leipzig, Germany. U.S. Pat. 702,573, June 17, 1902.

See Eng. Pat. 4202, 1901; this Journal, 1901, 810. The apparatus consists of a drum, which can be closed hermetically, and can be made to rotate. The magnesium chloride solution is supplied to the drum from a tank by an easily detachable pipe. Diametrically opposite the opening

by which the materials are introduced, is another opening for drawing off the liquid, the latter opening being protected by a sieve to prevent the mixing balls in the drum from coming out.—W. C. H.

Stone or Brick; Manufacture of Artificial ——, and the Preparation of Lime therefor. O. H. Anderson, Stockholm, Sweden, Assignor by Mesne Assignments to Silicate Brick Syndicate, Montreal, Canada. U.S. Pat. 702,611, June 17, 1902.

NINETY-FIVE parts by weight of sand are mixed with five parts by weight of dry, finely-divided (slaked) lime, and with the minimum amount of water necessary for moulding the mixture into shapes; to harden the moulded articles they are placed in a chamber, together with a quantity of unslaked lime, approximately equal to that contained in the batch of articles to be hardened, and treated with dry steam at a pressure of not less than 100 lb. to the sq. in., the lime being slaked simultaneously. As an alternative process, the sand may be added to a mixture, previously heated to redness, of sand and slaked lime, the mass being moistened with hydrochloric acid, moulded, and treated as above.—W. C. H.

X.—METALLURGY.

Metal of Railway Bearings; An Investigation of Causes of Hot Boxes in Railway Service, and Methods for their Prevention. R. Job, Chemist to the Philadelphia and Reading Railway Co., Reading, Pa. J. Franklin Inst., June 1900.

DUDLEY has already investigated the influence of the general chemical composition of the alloys used, on the efficiency of bearing-metal alloys (this Journal, 1892, 440).

The author's experiments relate more particularly to the influence of the structure of the metal on the quality of the bearings. A large number of bearings were taken, which had been removed from cars belonging to different railroads, owing to their having run hot while passing over the Philadelphia and Reading Railroad. Fractures of these were examined to ascertain the general physical characters of the metal; micro-photographs were obtained of polished and etched sections; and analyses were made, especially in cases where marked segregation or crystalline structure existed, in order to find out whether the defect was due to the use of an improper mixture or to faulty foundry practice. In most cases, the tensile strength and elongation of test sections were also determined. As the work proceeded, alloys were prepared in the foundry to check the accuracy of deductions made from the preceding examinations, and also to discover the conditions of foundry practice which lead to excessive friction, as well as those necessary to secure the best results. The bearings examined varied widely in composition, the most numerous containing copper, tin, and lead, others copper and tin, others phosphor-bronze, and others copper-zinc alloys running as high as 35 per cent. of zinc, "an alloy which had seldom been discarded owing to heating resulting from defects in the bearings themselves, but which showed evidence of exceedingly rapid wear." The main causes which led to heating were found to be—

1. Segregation of the metals.
2. Coarse crystalline structure.
3. Dross or oxidation products, and gas cavities.

Imperfect lubrication seemed to have been the sole cause of relatively few failures.

Segregation was found to be due in many cases to an attempt to alloy the metals in improper proportions, notably to the use of excess of lead with ordinary foundry practice, resulting in a liquation of part of the lead and often also the separation of part of the copper as "copper spots." Pouring the metal too rapidly, at too high a temperature, is a very frequent cause of segregation, since the metal then remains molten too long in the mould, giving time for alloys of different composition to crystallise out separately, tending to produce surfaces of unequal hardness and heat capacity, a condition which localises friction and ultimately results in excessive heating. A fine-grained and practically uniform structure may be obtained, even with a mixture of metal which do not truly alloy, by comparatively slow pouring so that the metal solidifies as soon as possible after it has entered the mould, but not pouring too slowly, as this leads to the formation of "shot" in the bearing, through the freezing of the metal before it has flowed completely into the mould. The proper rate of pouring must be determined by experiment.

The coarse crystalline structure often seen in defective bearings was, in some cases, found to be due to the composition of the alloy, antimony especially tending to produce it. In many cases it resulted from rapidly pouring the metal at too high a temperature, and often it was traced to an excess of phosphorus, silicon, or other deoxidising agent. A coarse structure is detrimental in two ways. It tends to localise friction, and secondly, by decreasing the ductility and tensile strength of the metal, it causes an excessive rate of wear, for it has been proved by different experimenters that, with a given tensile strength, rapidity of wear increases with brittleness.

Another very common defect in the bearings was the presence of dross or oxidised metal, and of large amounts of occluded gas. The former, by abraiding the journal causes increased friction and heating; the latter, by reducing the area of the bearing surface, increases the pressure and the wear and tear. Dross causes the metal unless raised too highly in temperature, to pour sluggishly in casting, and it also prevents clean and sharp castings being obtained. This sluggishness can be entirely cured by the chemical action of any good deoxidising material. Thus, a small amount of phosphorus causes a marked increase of fluidity, and imparts to the metal a much denser microscopical structure, as well as greater strength and ductility. Phosphor bronze is noted for its fluidity, closeness of structure, strength, and wearing qualities, provided it does not contain excess of phosphorus. Excess leads to the formation of a network of crystalline metallic salts, which increases with repeated re-melting until finally the metal is more defective than if no deoxidation had been attempted. Excess of silicon leads to similar results.

Zinc and sodium are useful deoxidisers—the action of zinc in producing sound castings has long been known—but, as Dr. Dudley pointed out in 1892, the amount of zinc added should not be more than 1 or 2 per cent., or enough to combine with the oxygen present, and pass away as slag and fume. The same applies to sodium. Any excess of these metals left in the alloy, although not directly increasing friction, tends in a marked degree to cause weakness, and to decrease both tensile strength and ductility. In large railway foundries, "yellow brass" is apt to accumulate in the scrap heap, and if much of such metal is added to the pot, a considerable proportion of zinc may be introduced into the mixture, and comparatively rapid wear results. Such yellow metal should be kept separate, and only added in just sufficient amount to each pot to introduce the requisite proportion of zinc. Zinc alone does not, however, effect complete deoxidation, and it is desirable to add also a very little silicon, after adding the spelter or yellow metal. In this way a very close-grained and ductile metal is obtained at moderate cost. The amount of silicon needs to be very carefully regulated, in order to avoid the partial crystallisation caused by excess. A section obtained from a casting is examined microscopically, and if any crystallisation is observed, the amount of silicon added to the next batch is reduced until the correct structure is obtained. In the author's experience, he has found the amount of silicon required for different lots of scrap fairly uniform, and the correct proportion having been once ascertained, it is merely necessary to check the foundry by taking bearings at random from the daily output for microscopic examination, a practice which is considered indispensable for maintaining efficiency among the workmen.

All the above-named defects, viz.:—Segregation, coarse crystallisation, dross, and porosity of the metal, as well as excess of deoxidisers, especially zinc and sodium, tend to reduce the tensile strength and ductility of the metal, and thus, when a metal of known composition is regularly

ubjected to these tests, with analytical and microscopic ork as a basis, it becomes possible to raise the foundry a high degree of efficiency.

Very carefully conducted experiments made by placing earings of practically the same composition, but differing idely both in tensile strength and ductility, upon opposite nds of the same axles, have invariably shown that increase f strength and ductility result in increased life of the earings, confirming the observations of Dudley. An nstance is given in which eight bearing brasses, each omposed of copper-tin-lead mixtures, were placed under enders of fast passenger locomotives, one bearing of each et being placed upon one end of each axle. All the earings were practically of the same chemical composition, nt one set had a tensile strength of about 16,500 lb. per quare inch, with an elongation of about 6 per cent., whilst ne other set had a tensile strength of about 24,000 lb., ith an elongation of about 13 per cent., the difference eing due to the fact that in the one case the metal was orous, whilst in the other it was thoroughly deoxidised, lose-grained, and homogeneous. The set of defective rasses wore 35 per cent. more rapidly than the other set.

For microscopical examination, the author recommends utting sections from the centre of the bearing, and tching with an approximately decinormal solution of odine in potassium iodide, the time of etching being minute. In a few cases, dilute chromic or nitric acid ows the structure better. In ordinary work, a magnifiation of 30 diameters is sufficient.—L. A.

Melting and Refining of Metals simultaneously; Vessel for ——. Stahl u. Eisen, 1902, **22**, 550; through Chem.-Zeit., 1902, **26**, [44], Rep. 160.

A MELTING and refining process, described by Schwartz, nvolving the use of a new kind of converter, has now been sted for three months in the works of the Hawley Low-ressure Converter Company, in Chicago. The vessel, hich is heated with crude petroleum as a fuel, may be sed for the production of cast-iron, or steel, or tombac. he experimental vessel is constructed like a Bessemer onverter. The petroleum (sprayed by an air-blast at 14 atmosphere pressure, produced by a Root's blower) introduced through two tuyères on either side, and near he mouth of the converter, so arranged that the flame roduced receives a circulating movement. The lining of he vessel is of Dinas brick. The results obtained with rey cast-iron and with malleable iron were excellent, the ormer requiring 25 minutes, the latter 2½ hours to run. here is no absorption of sulphur, and the loss by oxidation small; moreover the grey cast-iron was both more dense nd purer than that produced in the cupola. The cost of eating grey cast-iron in the small converter is practically he same as in the cupola; but the converter produces alleable iron more cheaply than does the reverberatory rnace.—W. G. M.

Copper, Silver, and Gold; Application of the Phase Rule to the Melting Points of ——. T. W. Richards. Amer. J. Science, Silliman, **13**, [4], 377. Chem. Centr., 1902, **1**, [26], 1397.

OLBORN and Day have shown that the melting point of old is constant at 1064° C., that of silver varies conderably, whilst that of copper is constant either at 1065° 1084° according to whether air is present or absent. he variations of the melting points can be explained by ibbs' phase rule, according to which each point of a stem is a definite one, when the number of the phases fluencing it is greater by two, than the number of comonents, provided no disturbing influences are introduced. the case of gold, there are three phases, solid, liquid, nd gaseous gold, and one component (the atmospheric essure), therefore the melting point is constant. With lver, oxygen comes into consideration as a new component, hilst the number of phases remains unaltered, consequently e melting point is variable. In the case of copper, uprous oxide is formed in presence of air, and the melting oint falls until the copper is saturated with the oxide. here are now two components, namely Cu and O, and four hases (solid copper, the solution of cuprous oxide in liquid copper, liquid cuprous oxide, and gas), and therefore, according to the rule, the melting point is constant. In the absence of air on the other hand, the case of copper is similar to that of gold and the higher melting point is constant.—A. S.

Sulphide Ores; Process for Treatment of ——. H. L. Sulman and H. K. Picard. Inst. of Mining and Metallurgy, 1902 [6].

THIS process has been devised to treat complex lead-zinc ores of the Broken Hill type.

The roasted ore with not more than 3 per cent. of total sulphur is mixed with 20 per cent. of crushed coking coal, and the mixture briquetted with pitch or some other carbonaceous binding material. The briquettes are then submitted to distillation in an ordinary zinc retort furnace. The residue in the retorts containing all the lead, silver, and gold, with 5—8 per cent. of zinc, can be readily smelted in the ordinary lead blast furnace with no more than the usual smelting losses. The great advantage of the process is, that on distillation, the coked coal retains the whole of the lead and slag-forming materials in a finely divided state in the briquettes, so that with large percentages of lead (as much as 24 per cent.), no abnormal destruction of the retorts takes place, at the same time the distilled zinc contains less than ½ per cent. of lead. An ore containing 25 per cent. of zinc and 24 per cent. of lead gave a recovery of 70 per cent. of the zinc and 90 per cent. of the lead.

The authors append a table of actual costs incurred at their works.—B. F. D.

Zinc Ores, and Zinc-bearing Intermediate- and Waste-Products, hitherto not, or with difficulty, fusible; Treatment of ——. W. Borchers. Zeits angew. Chem., 1902. **15**, [26], 637—642.

The author points out that the lead peroxide produced in Rontschewsky's process (see this Journal, 1900, 831) can be readily converted into red lead by heating to 200° C., a simple process, which adds to the value of the method commercially. Galena containing blende and dressing products of this ore, and blende containing heavy spar, can be treated by chlorination in aqueous solution, combined with leaching and electrolysis of the evaporated and dehydrated chlorides. The crushed ore is mixed with a dilute saline solution ($NaCl$, $MgCl_2$, or the like), in a rotating drum, and is there treated with electrolytic chlorine introduced through a channel in the shaft on which the drum revolves. The temperature is, meanwhile, kept at 30°—40° C. Under suitable conditions, chlorination may be complete with the expenditure of but a slight excess of chlorine. The lead ore being softer, crushes more readily, and so is more easily chlorinated than are the larger particles of the harder blende. The complete conversion of the zinc would, in practice, take a long time, and is unnecessary since, as it is practically free from lead, it can, after washing, be treated by well-known methods; indeed, a portion of it dead-roasted is useful, in a subsequent stage of the process, in precipitating iron from the solution. On leaving the chlorination vessel the solution is allowed to stand quietly to deposit, as it cools, the greater portion of the lead chloride contained in it. The iron is then removed from the clear zinc solution by the addition of, for example, lime or zinc oxide. The mixed zinc and lead chlorides are dried, fused, and electrolysed, no attempt being made to separate the lead from the zinc until they are both reduced to the metallic state. Zinc dust may be added towards the end of the evaporation to prevent the formation of oxychloride; or hydrochloric acid may be used, and an addition of ammonium chloride may be made to the fused bath before electrolysis. Iron electrolytic vessels give good results when lead is present, but when zinc chloride is used alone they are badly attacked, and yield an impure zinc. The lead and zinc are allowed to separate, as far as they will do so, by gravity. Their further treatment is by well-known processes. The sulphur is recovered from the residue from chlorination by melting out under pressure; the blende then left, whilst almost free from lead, is rich in silver. Blendes mixed with heavy-spar and free from lead might possibly be treated with chlorine, and the resulting solution electrolysed without evaporating

it and fusing the residue. The complete extraction of the blende from the barium sulphate residue may be ensured by previous mechanical dressing if the blende is in large and dense grains.

Ores containing much silica may be treated by the Dorsemagen process, in which the ore is mixed with carbon, sufficient not only to reduce the ZnO, but to react with the SiO_2 and form carborundum, and the mixture is then heated in the electric furnace, under which conditions the zinc contained in the charge is distilled off. Similarly, blendiferous pyrites may, after roasting, be heated, mixed with carbon, in the electric furnace, whereby the zinc is distilled and the iron may be recovered in the form of ferrosilicon. Galvanisers' waste may be treated by v. Kugelgen's method, in which the material dissolved in hydrochloric acid, and evaporated dry, is mixed with calcium carbide and an oxide, such as copper oxide, and ignited, the reaction being completed in a crucible furnace, whereby a zinc alloy, such as brass, is obtained.—W. G. M.

Cadmium; Alloys of ——, with Magnesium. O. Boudouard. Comptes Rend., 134, [24], 1431—1434.

The author prepared a number of alloys of cadmium and magnesium with varying proportions of the two metals. The curve of melting points of these shows maxima at points corresponding with the alloys CdMg, $CdMg_4$, and $CdMg_{30}$. By acting on alloys approximately representing these compositions with weak ammonium chloride solution, crystalline powders were separated agreeing with the first two; but the author could not isolate the third, which he is inclined to regard as a solid solution of $CdMg_4$ in excess of magnesium. All these alloys are white, soft, and easily filed, but brittle, especially after long continued hammering or vibration. They are not affected by dry air, but oxidise very rapidly in moist air.—J. T. D.

Manganese in Steel; Rapid Determination of ——. C. Ramorino.

See under XXIII., *page* 991.

English Patents.

Pickling of Iron and other Metals; Utilising the Waste Products from the ——. E. P. Peyton, Birmingham. Eng. Pat. 15,250, July 27, 1901.

The pickling liquor, after neutralisation of free acid by scrap iron, is treated with ammonia gas, ammonium sulphide vapour, or with a mixture of these. The vessels of the first series through which the ammonia passes are heated, the remainder being cool, but after some time the vessels of the first series are allowed to become cool, and those of the second series are heated. The precipitate formed is separated and roasted to obtain ferric oxide; if sulphides are present, sulphur dioxide is also obtained. The liquor, freed from iron, &c., as described, and containing ammonium chloride or sulphate, is evaporated. —E. S.

Metals; Hardening and Tempering ——. A. J. Boult, London. From J. Miskolczy, New York, U.S.A. Eng. Pat. 15,324, July 29, 1901.

The steel is hardened and tempered at one operation. It is electrically heated to a dark cherry red in a chamber in which a vacuum is produced, and, at the moment of stopping the current, receives a powerful blow from two damp, independently-moving chill-hardening mould-hammers, one on each side, such hammers being hollow, and cooled to a low degree by passage through them of a refrigerating medium. In this process, oxidation of the steel is prevented, and the withdrawal of gases is stated also to prevent warping or cracking.—E. S.

Wrought Iron or Steel; Process for the Production of ——, Direct from the Ore. D. Reynolds, New York. Eng. Pat. 21,940, Oct. 31, 1901.

Oxide ores are granulated, mixed with granulated carbonaceous material and flux, placed in a suitable closed furnace and heated, at first with a "neutral" flame and afterwards with a powerful blast flame, the slag being drawn off as it is formed.—J. H. C.

Metals; Annealing ——. D. Bates, Huyton, and G. W. Peard, Prescot. Eng. Pat. 26,446, Dec. 27, 1901.

The articles to be annealed are placed in a horizontal c inclined retort, set in a furnace, with its ends protruding The charging end is closed air-tightly by a removabl piece having a valved outlet; the other end, if the retort b inclined, dips into a cistern of water or other liquid; but the retort is horizontal, a downwardly inclined extension i provided, similarly sealed. When the retort is charged, non-oxidising gas is passed in through a pipe entering th discharging end of the cylinder, the air escaping throug the opened valve. After suitable heating the charge i withdrawn into the cistern by a flexible appliance passe through the water, up through the mouth-piece, into th retort to the metal.—E. S.

Steel-Making. A Furnace chiefly intended for Treatin Cast Iron Articles to convert them into Steel. G. Harri son, London, from Standard Steel Car Wheel Co., Ne Jersey, U.S.A. Eng. Pat. 4094, Feb. 18, 1902.

The furnace has a main chamber with a covered openin on the top, and flame-inlets on each side but near the to and flame-outlets near the bottom. Combustion chamber with hydrocarbon burners are constructed outside the mai chamber, the flame-outlets being connected with the flame inlets of the main chamber by passages provided wit dampers.—J. H. C.

Iron and Steel; Manufacture of ——. C. Wilmott St. Ouen, and M. Goddyn, Paris. Eng. Pat. 609 March 12, 1902.

An oscillatory furnace or converter having hollow trunnion is employed, through which air and steam superheated t 1200° C. are introduced, whilst producer gas is supplied t the upper part of the furnace.

The products of combustion pass away by a removabl pipe into a smelting furnace from which the molten meta flows into the oscillatory furnace.—J. H. C.

Metals [Gold, Silver] from their Solutions; The Applica tion of a Barium Compound in the Precipitation of —— F. W. Martino, Sheffield. Eng. Pat. 12,503, June 1 1901.

Gold can be recovered from its cyanide, chloride an bromide solutions, and silver from its cyanide or nitrat solutions by acidifying the solution and treating it at raised temperature with barium sulpho-carbide. Or i recovering metals, the sulphides of which are insoluble from solutions containing them, the barium sulpho-carbid may first be treated with acidified water, and the ga evolved led into the solution.—G. H. R.

Aluminium; Solder especially applicable to ——. E. F Neild and F. Campbell, London. Eng. Pat. 471 March 5, 1901.

The solder consists of aluminium 5 per cent., antimon 5 per cent., zinc 90 per cent. The aluminium is firs melted, the zinc is added, and when this mixture is flui the antimony is added; the whole mixture is then puddle with salammoniac, the cinder removed and the meta poured into sticks.—J. H. C.

Metals and Metallic Compounds, Recovering ——, fro Materials containing Metals and particularly fro Residues. H. Brandenburg, Kempen-on the-Rhine Germany. Eng. Pat. 21,424, Oct. 25, 1901.

The residues, ashes, slags or the like, are fused wit sodium bisulphate, and the product is extracted by wate to separate soluble from insoluble constituents, which ar suitably treated for the recovery of metals, &c. Or h residues may be treated with solution of sodium bisulphate —E. S.

Metal Borings and Turnings; Treating ——, to Facilitat Melting ——. J. T. Pagan, Sheffield. Eng. Pat. 4543 Feb. 22, 1902.

The fragments are placed within a thin casing of shee metal or woven wire, an entire casing of suitable meta being then cast around the same.—J. H. C.

Bronze; Production of ——. G. Lieussou, Paris. Eng. Pat. 4621, Feb. 24, 1902.

The bronze consists of copper, 90 parts, tin, 10 parts, and sodium half to ten parts. The sodium and tin are separately melted, the latter cooled till it is about to solidify and then poured upon the sodium with exclusion of air. The copper is melted and when at a temperature of 760° to 800°, pieces of the tin-sodium alloy are introduced; the temperature at once rises to 1100° or 1200° and the alloy is poured into moulds.—J. H. C.

Spelter; Process of Making ——. O. Nagel, Palmerton, Pennsylvania, U.S.A. Eng. Pat. 10,953, May 13, 1902.

See U.S. Pat. 699,969; this Journal, 1902, 776.—E. S.

UNITED STATES PATENTS.

Bessemer Steel Plant ——. C. H. McCullough, Jr., and L. C. B. Holmboe, Chicago, U.S. Pat. 697,740, April 15, 1902.

The claim is for a combination of groups of converter vessels, receiving-cranes and casting-cranes peculiarly arranged.—J. H. C.

Steel; Apparatus for Making ——. E. C. Wills, Peru, Indiana. Assignor of one-half to H. Evans, Philadelphia. U.S. Pat. 698,610, April 29, 1902.

Various combinations of a cupola (with stack and smoke-hood) with a swivelled dome-section and a wind-box ladle-section. Both dome-section and ladle-section are provided with adjustable tuyères by which gas or ore may be introduced when desired.—J. H. C.

Steel-Convertor. S. K. Behrend, Washington. Assignor to H. Evans, Philadelphia. U.S. Pat. 698,787, April 29, 1902.

The convertor comprises a stationary stack provided with a series of vertically adjustable tuyères, corresponding with a series of slag openings and a movable ladle mounted on a truck which forms the bottom of the stack when in use.
—J. H. C.

Iron or Steel; Method of Removing Scale Oxide from the Surface of ——. A. K. Eaton, New York. U.S. Pat. 702,050, June 10, 1902.

The metal is plunged into a bath consisting of 100 parts of sodium bisulphate, dissolved in 500 parts of water, to which has been added a solution of two parts of stannous sulphate in three parts of water.—J. H. C.

Metal Parts; Process of Heating [*Welding*] ——. R. Deissler, Treptow, Germany, Assignor to C. B. Schultz, Berlin. U.S. Pat. 12,003, June 24, 1902.

The parts are embedded in a mass of finely-divided metallic aluminium, mixed with a metallic sulphide or oxide, and the mixture is ignited. When the reaction is complete, the slag is removed and the parts are found to be firmly united.—J. H. C.

Molten Metal; Process of Drawing ——, *from Receptacles.* L. Lincoln, Boston, Massachusetts, Assignor of one-half to C. S. Gooding, Boston. U.S. Pat. 697,638, April 15, 1902.

The metal is collected into a suitable receptacle, and then forced outwards or upwards by air-pressure.—J. H. C.

Ore-Roasting Furnace. T. D. Merton, Spottiswoode, Australia. U.S. Pat. 697,863, April 15, 1902.

Several superposed communicating hearths are provided with hollow water-cooled vertical shafts passing through them and operating rabbles or stirrers.—J. H. C.

Soft Metal Castings; Method of Producing ——. G. H. Brabrook, Taunton, Massachusetts. U.S. Pat. 697,972, April 22, 1902.

The porous non-metallic mould is coated with a vegetable-fatty acid, such as palmitic acid (Japan wax) before running in the molten metal.—J. H. C.

Cyanide Tank [*Gold*] ——. J. J. Hervey, Randsburg, California. U.S. Pat. 698,016, April 22, 1902.

The tank has a tapering bottom, a central cone and an annular lining open at the bottom and divided into a series of compartments into each of which air- and water-pipes are led. There are also charging and discharging pipes and a filtering screen.—J. H. C.

Precious Metals; Process of Extracting ——, *from their Ores.* E. D. Kendall, New York. U.S. Pat. 702,305, June 10, 1902.

The ores are treated with a solution containing from one-tenth to one-half per cent. of potassium cyanide together with potassium percarbonate.—J. H. C.

Blast Furnace. E. Bertrand, Kladno, Austria-Hungary. U.S. Pat. 698,248, April 22, 1902.

The blast furnace has a stationary feed-bell or cone and a vertically-movable hopper above the cone. The hopper is normally closed, and has an external liquid seal so that it may be raised without causing an escape of gas. The furnace has a central gas-collecting chamber below the feed-bell, an outer annular gas-discharge chamber, and hollow radiating arms connecting the two chambers.
—R. S.

Furnace; [*Metallurgical*]. W. Stubblebine, Pennsylvania. U.S. Pat. 698,336, April 22, 1902.

A metallurgical furnace employing gaseous fuel is provided with air-blast passages or pipes and with pipes taking combustion gases from the furnace, both sets of pipes being arranged within the furnace walls, but the latter arranged so as to enclose the former. Two sets of air-pipes are employed, an upper and a lower set, connected by conduits having ports opening into the combustion chamber.—R. S.

Furnace; Metallurgical ——. J. A. Hunter, Philadelphia. U.S. Pat. 699,759, May 13, 1902.

A combination of a working chamber with entrance and discharge, and return flues and dampers; with means for introducing gaseous products of combustion from gas or oil burners; and also a fluid combustible.—J. H. C.

Blast-Furnace [*Ore-Dust Consuming*]. F. C. Noreross and J. Mitchell, Lorain, Ohio. U.S. Pat. 700,549, May 20, 1902.

Ore-dust from a collecting pipe is injected by means of air or steam into the blast furnace through the tuyères and a series of pipes inserted through the walls of the furnace from top to bottom.—H. B.

Metals; Method of Extracting ——, *from their Oxide Ores.* J. Rudolphs and J. Landin, Stockholm. Assignors to A. Jacobi, Stockholm. U.S. Pat. 698,739, April 29, 1902.

A process of briquetting which consists in mixing pulverised oxide ores with carbon, hydrocarbon and a solid or liquid organic nitrogen compound, then compressing the mixture and heating to from 300° to 500° C.—J. H. C.

Quicksilver Furnace. R. Scott, San José, California. U.S. Pat. 699,822, May 13, 1902.

The furnace is constructed with a series of cast-iron tiles and flues, over and through which the ore and fumes are made to pass by the aid of adjusting rods in a zigzag path.
—J. H. C.

Ores; Apparatus for Roasting and Cooling ——. W. C. Davis, Denver, Colorado. U.S. Pat. 700,135, May 13, 1902.

A rabble-carriage comprising hollow side bars forming water receptacles, open to allow of evaporation, is placed in the roasting chamber or hearth and made to travel longitudinally on opposite sides of it by means of cogged

propelling wheels, the motion of which is automatically reversed from time to time.

A cooling hearth is placed above the roasting-chamber to which the roasted ore is raised by means of a bucket elevator and there stirred and advanced as required.

—J. H. C.

Ores; Treatment of Complex and Refractory ——. F. Ellershausen, London. Assignor to the Sulphides Reduction (New Process) Ltd., London. U.S. Pat. 700,311, May 30, 1902.

Ores containing lead, silver, and zinc are smelted raw; the fumes are drawn off and churned with water; lead, silver, and part of the zinc being subsequently settled as a sludge which is dried. The dried sludge is fused with crude caustic alkali containing sulphur, thus producing metallic lead. The mass is treated with water to dissolve out caustic soda and separate sulphide of zinc. This caustic soda solution is then mixed with the liquid from which the sludge was separated, whereby another portion of sulphide of zinc is precipitated, sulphate of sodium being thereby produced and subsequently recovered.—J. H. C.

Ores; Process of Treating ——. A. D. Miller, Mount Pleasant, Pennsylvania. U.S. Pat. 700,530, May 20, 1902.

The ores are mixed with asbestos, a flux, and permanganate of potash, and heated in the presence of oxygen.

—J. H. C.

Sulphides; Process of Rendering Metallic —— Soluble. C. G. Collins, Woodmere, U.S.A. U.S. Pat. 702,047, June 10, 1902.

Crushed sulphide ore (containing copper, &c.) is drenched with ammonia solution, the excess of which is drained off, and the moist ore is exposed to the action of air or oxygen, after which the pulp is leached, and the process repeated as often as may be necessary to extract the metal or metals. When the ore is finely powdered it is preferred, after the moistening with ammonia, to force or draw air through the pulp to hasten the oxidation.—E. S.

Antimony; Treatment of Ores and Materials containing ——. J. P. Van Der Ploeg, The Hague, Netherlands. U.S. Pat. 702,153. June 10, 1902.

See Eng. Pat. 12,308, 1901; this Journal, 1902, 552

—G. H. R.

Copper-[Mine] Water; Precipitant for Treatment of ——. A. J. Polmeteer, Montana, U.S.A. U.S. Pat. 702,244. June 10, 1902.

Acid water from copper mines, containing copper sulphate in solution, is treated with a reagent prepared by boiling 4 parts of lime as milk of lime with 1 part of sulphur. The calcium sulphide precipitates the copper, and the excess of lime neutralizes the free acid present.—L. A.

Spelter-Furnace. A. J. Ash, Peterswood, Eng. U.S. Pat. 702,526. June 17, 1902.

A reverberatory liquation furnace for hard spelter having an inclined liquation bed and numerous collecting pits near its lower edge. A fire-grate at the upper end supplies hot products of combustion directly upon the crude metal. There is a second fire-grate from which the products are discharged directly over the collecting pits.—J. H. C.

Metals [Copper]; Process of Recovering ——, *from Ores.* J. W. Neill and J. H. Burfeind, Salt Lake City. U.S. Pat. 702,582, June 17, 1902.

Crushed copper ores are mixed with water and sulphurous acid gas is forced through the mixture in a series of tanks, beginning with that in which the ore is subjected to the final operation. The solution thus produced is separated from the pulp. The metal is precipitated from the solution, thereby releasing gas which is used to enrich the original gas stream.—J. H. C.

Ores containing Silica or Silicates; Art of Treating —— G. Guirand, Cripplecreek, Colorado. Assignor t R. McKnight, Philadelphia. U.S. Pat. 702,943, June 2 1902.

The crushed ores are mixed with common salt or othe alkali haloid, and roasted with agitation and free access c air at temperatures varying from 500° C to 1000 C°. Par of the metals passes off as fumes which are caught an recovered; the other part remains in the residue which ca be treated as a free-milling ore.—J. H. C.

Alloy (Aluminium, &c.). W. Pruskowski, Schodnic Austria-Hungary. U.S. Pat. 702,996, June 2 1902.

Metals of the iron group are melted with aluminium i the proportion of one atomic weight of the latter to two o the former, thus forming alloys which have a much highe melting point than that of their constituents and being har when heated to redness are suitable for making edge tool In order to increase the hardness, small quantities c chromium, tungsten, molybdenum, uranium, vanadium, c silicon may be added.—J. H. C.

Tin; Process of Separating ——, *from Metals.* T Twynam, Moortown, England. U.S. Pat. 703,165, Jun 24, 1902.

The tin-scraps or cuttings are dipped into a strong solutio of sodium chloride which has been thickened with carbo dust, and then exposed to the air. Afterwards the carbo dust and tin oxide are washed off the scrap and separate in any convenient way.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Phosphoric Acid; Behaviour of Lead Anodes in —— F. Fischer. Zeits. für Elektrochem., 1902, 8, [25] 398.

The author, associated with Elbs, has described th electrolytic production of lead persulphate (see thi Journal, 1901, 132). In that case strong acid had to b used. But with lead anodes in dilute phosphoric aci solution (sp. gr. = 1·02) a gold-yellow solution of tetravalent lead compound is formed; the current densit with flat electrodes may be 0·05 amp. per sq. dm., an then this yellow colour is strongly marked after electrolysi for 24 hours. With H_2O_2 the clear yellow or wine-re solution evolves oxygen, deposits white plumbous phosphat and becomes colourless. Ferrous salts decolorise the liquic throw down plumbous phosphate, and form ferric salt HCl evolves chlorine, and potassium iodide liberates iodin and deposits PbI_2. Acids or salt solutions which do ac decompose the perphosphate deposit a lemon- or orange yellow voluminous precipitate. The addition of water doe not at once cause hydrolysis; but frequent decantatio with water throws down lead peroxide, which, however dissolves again in phosphoric acid (the more readily th stronger the acid), yielding a yellow solution with tendency to gelatinise like that produced electrolytically Ammonia or alkalis first precipitate, next decompose, an then re-dissolve the lead salt. Charged positive accumu lator plates are found to be surrounded with a yellow green layer of solution when the sulphuric acid contain phosphoric acid. This yellowish layer contains plumbi phosphate.—W. G. M.

Copper Sulphide; Electrolytically produced ——. Rieder. Zeits. für Elektrochem., 1902, 8, [23], 370—373

It is found that when copper in contact with sulphur made the cathode in a copper sulphate bath, combinatio takes place, and the sulphur gradually becomes covere with a film of steel blue, gradually deepening to a blue blac colour. The compound formed is of greater volume tha the sulphur from which it is produced, and detaches itse after it has attained a certain thickness. It is readil

lecomposed by dilute sulphuric acid with evolution of ydrogen sulphide, but its composition has not yet been letermined. The action is believed to be electrolytic; it ommences at the point of contact between metal and ulphur. If finely divided metal, such as zinc, be heated vith sulphur to such a temperature that the sulphur just nelts (avoiding so high a temperature that rapid, or almost xplosive combination takes place between them), the ixed material so produced becomes almost instantaneously overed with a steel blue coating on immersion in the bath nder like conditions. A mixture of copper oxide, manganese peroxide, or graphite and fused sulphur produces a imilar result. It is necessary that the sulphide produced should be a conductor of electricity, and that the lectrolyte employed should not attack the deposit too trongly; very acid copper sulphate solutions, for example, revent the formation of the copper sulphide. The presence f non-conductors, such as india-rubber, in intimate contact ith the sulphur does not hinder the action, and the sulphur f vulcanised rubber behaves like pure sulphur when laced in contact with copper under favourable conditions. t is even conceivable that a means may thus be found of vulcanising india rubber. The nearest approach to an llusion to this reaction in the literature of the subject the account of the use of sulphur as a depolariser in a alvanic battery. It is now suggested that a new battery ay ultimately be devised with zinc and electrolytically rmed copper sulphide as the two electrodes.—W. G. M.

English Patents.

lectrolytic Cells. [*Fused Salts.*] J. Raschen and the United Alkali Co., Liverpool. Eng. Pat. 13,662, July 4, 1901.

HE lower part of the cell for the electrolysis of fused salts divided into the cell proper and a reservoir, by a weir or eirs, over which the metal as it forms at the cathode can ss from the portion of the cell where electrolysis is fected into the reservoir, so that a constant cathode level automatically maintained in the cell.—G. H. R.

lectric Battery. C. A. Allison, London. From W. C. Banks, New York, U.S.A. Eng. Pat. 2816, Feb. 4, 1902.

IE electrolyte is contained in a glass jar or cell, provided th a cover, through which a terminal passes and supports e negative element which is in the form of a perforated tallic basket, filled with oxide of copper, part of which tends above the solution line. The zinc positive electrode, hich is provided with a terminal, is suspended against the ll of the negative element, and is completely submerged neath the electrolyte, whilst the oxide is at least one sixth ove the upper level of the zinc and of the solution line.
—G. H. R.

lls of Primary or Secondary Electric Batteries; Dry or Semi-dry ——. W. E. Heys, Manchester. From the Hutchison Acoustic Co., New York, U.S.A. Eng. Pat. 11,340, May 17, 1902.

E cell consists of a sealed vessel with a vent for the ape of gases in the cover, and contains plates or ctrodes alternating with porous material which projects o a free space for liquid at the bottom of the cell and interposed between the reservoir and the vent. There plug in the bottom of the reservoir through which it be filled with liquid.—G. H. R.

United States Patents.

emicals in Electric Furnaces; Art of producing ——. *Bisulphide of Carbon*]. E. R. Taylor, New York. U.S. Pat. 702,117, June 10, 1902.

USIBLE ingredient of the charge is fed to the heat zone n beneath upwards and is fused on its way to the rior of the furnace in contact with the electric ductors which are cooled thereby. The less fusible redient is fed downwards to the heat zone, where a able electric current is passed through the charge and path through the furnace changed occasionally to burn out, or to prevent the formation of any pieces of the less fusible ingredient that may hinder its regular descent. A bath of a non-conducting liquid is maintained at any desired level in the furnace with reference to an electrode, more or less of the working surface of which is covered, which regulates the electric current. Bisulphide of carbon can be continuously produced by the above process by melting the sulphur on its way to the working chamber, feeding it upwards to the heat zone, and feeding carbon downwards on the sulphur, introducing conducting material in fragments between the two and passing an electric current through the fragments to the furnace till the sulphur is vaporised and the reaction effected, after which the CS_2 vapour is carried off and condensed.—G. H. R.

Secondary-Battery Electrodes; Process of Forming ——. W. Morrison, Chicago. Assignor to the Helios-Upton Company, Chicago, U.S.A. U.S. Pat. 701,915, June 10, 1902.

In order to prevent "blowing," or the forcible detachment of portions of the "spongy or granular lead" by the occluded gases generated during the process of forming, the plates having grooved faces are enclosed between perforated sheets of thin, practically rigid material (hard rubber) or sheets of permeable material, so that whilst the "spongy lead," cannot become detached from the body of the plate, the gases can escape through the perforated or permeable sheets.—A. S.

Electric Battery [*Dry*]. P. Delafon, Paris. U.S. Pat. 702,544, June 17, 1902.

This comprises a carbon electrode consisting of a carbon plate or rod surrounded by binoxide of manganese, the whole retained in position by an enclosing wrapper. The annular zinc electrode, which has openings, has on both sides of it an electrolyte composed of chloride of zinc and an inert material, such as felt-dust.—G. H. R.

Electrodes; Method of Graphitising ——. E. G. Acheson, New York. U.S. Pat. 702,758, June 17, 1902.

Electrodes and other articles composed of carbon and impurities capable of conversion into graphite when subjected to a high electrical temperature, are arranged in piles, with their longest dimensions in the same direction, and are surrounded by a mass of material having a lower co-efficient of electrical conductivity than themselves. An electric current is then passed through them in a direction approximately transverse to their longest dimensions, at a temperature sufficiently high, and long enough to convert a proportion of the amorphous carbon into graphite.
—G. H. R.

Asbestos; Insulating Metallic Surfaces with ——. J. A. Heany, Philadelphia, Pa., U.S.A. Assignor to the Teter-Heany Developing Company, Philadelphia, Pa., U.S.A. U.S. Pats. 703,198, 703,200, 703,201, June 24, 1902.

An insulating material, suitable for application to metallic surfaces and wire, is prepared from a paste of albuminous or gelatinous material and lime by embedding in the same dry and flakey asbestos impregnated with chemical salts, the whole being covered with a coat of the paste combined with chemical salts.

The asbestos is prepared by first impregnating it with a solution containing boric acid, sulphates, and chlorides of ammonia and soda, drying it, and picking it into fibrous or flakey form.—W. C. H.

Fireproof, Composition; Water-, Acid-, and ——. J. A. Heany, Philadelphia, Pa, U.S.A. Assignor to the Teter-Heany Developing Company, Philadelphia, Pa, U.S.A. U.S. Pat. 703,199, June 24, 1902.

The composition for the insulation of metallic conductors consists of a layer of asbestos, which covers the surface to be insulated, and a coating of oil combined by boiling with lithage and red lead, until the free acids of the oil have been expelled.—W. C. H.

(B.)—ELECTRO-METALLURGY.

Tin-plates Scrap; Electro-chemical Process for Stripping the Tin from ——, by Caustic Soda Solution. H. Meunicke. Zeits. für Elektrochem. 1902, 8, [21], 315—320; [23], 357—370; and [24], 381—395.

The largest works using the "Stannate" tin-recovery process are at Essen, some of the purest electrolytic tin comes from Kempen on the Rhine, and there are other works in Uerdingen (Rhine), Hanover, Nürnberg, Ludwigshafen, Emmerich, Flushing, and Pfaffstatten, near Vienna. The success of the process depends upon the price at which the scrap can be purchased. Fresh cuttings usually yield from 2 to 3·5 per cent. of tin, rusty scrap less.

In the process, sodium hydrate is electrolysed into sodium, which decomposes water and separates H at the cathode, and OH which oxidises Sn and forms soluble Na_2SnO_3 at the anode. The latter compound is then decomposed thus:—$Na_2SnO_3 + 2H_2 = 2NaOH + H_2O + Sn$. The first stage of the electrolytic stripping process is simple, the current-efficiency remaining constant; but in time polarisation takes place, and the efficiency falls; also the last portion of tin, from scrap with a thicker coating and from the iron-tin alloy which forms on the surface of iron in the tin-pots of the manufacturer, it does not pay to recover. W, Cu, and Ag remain as a deposit on the surface of the iron, but Pb, Fe, Sb, and As pass into solution and deposit with the Sn, so that impure scrap always yields impure tin. The presence of haloids in the electrolyte favours the solution of iron, and is, therefore, to be avoided. In practice the electrolysis is stopped when the scrap attains a brown colour, about 0·2 per cent. of tin will then remain undissolved; but pressing the process beyond this, leads to an alteration in the composition of the electrolyte, and, therefore, in the nature of the deposit, as well as to diminished efficiency. The bath is originally made up with 10 per cent. NaOH (= 9 per cent. by volume of NaOH), and is used at about 70° C. The temperature and the proportion of free alkali in the bath exert a preponderating influence on the result. Usually there should be, after working for some time, 6—7 per cent. by volume of total alkali reckoned as Na_2O, of which 2·5—3·5 per cent. are free Na_2O, 1—1·5 per cent. are combined as $Na_2O.SnO_2$, and 1·7—2·8 per cent. as Na_2CO_3. This corresponds to 2·34 per cent. by volume Sn in the bath. The absorption of CO_2 by the bath must be guarded against, the motion of the liquid in contact with the air in introducing or stirring the scrap facilitates this absorption, which is of course greatest with new solutions. The carbonate, as it increases in quantity, reduces the conductivity, extends the time required, and, in time, causes precipitation of stannic hydroxide, forming a coating on the scrap which hinders, and may quite prevent, the solution of the tin. The electrolyte must then be renewed or regenerated; and in practice the latter method is adopted.

The process of regeneration is effected by removing a portion of the solution daily, treating it first with carbon dioxide to precipitate the tin as hydroxide, and then after filtration, with calcium oxide to convert the sodium carbonate into caustic soda. For the precipitation of the tin oxide from relatively pure solutions, the compressed carbon dioxide to be purchased in the market is recommended, but for impure solutions containing iron and lead, such as result when chlorides are present in the electrolyte, flue gases or the like may often be utilised. Of the tin recovered by the process as a whole, about 9 per cent. is obtained in course of this regeneration. Taking into account all the attendant expenses and crediting to it the value of the tin recovered, the clear gain on the working of the regenerative part of the system should be at least 360*l.* per annum on a plant dealing with 9,000 tons per annum. Contrary to previously published statements, the treatment of solutions containing much iron need not give special difficulty especially if the electrolyte be free from chlorides. The solution containing tin, lead, and iron, may be treated directly with lime, but in that case a mixed precipitate is obtained from which the tin is recovered only at considerable expense. The lacquer, resins and fats that gradually accumulate in the solution as soaps, must be removed from time to time; this is best done by cooling the solution to 10° C. when they tend to precipitate out and so can be removed. By cooling still more, a further purification can be effected, about two-thirds of these substances originally present being thus removed. During the course of the circulation of the liquid through the electrolytic cells, considerable mechanical loss is sustained, and it is shown that for a plant treating 9,000 tons of scrap per annum, the total loss in this way amounts to at least 800*l.* in a year. In order to keep this loss as low as possible, care should be taken that the solutions do not become too rich in tin.

Influence of Temperature and Composition upon the Conductivity of the Electrolyte.—A temperature of 70° C. is best; in small experiments the deposit is good at temperature approaching the boiling point, but on a large scale, spongy tin is deposited after a time under these conditions, and it is more liable to re-oxidise than in cooler solutions. When the tin is crystalline, coherent, free from oxide, and pure, there is no difficulty in melting it, but it may conveniently be pressed into briquettes first.—W. G. M.

English Patents.

Zinc Ores and especially Blende; Electro-metallurgical Treatment of ——. C. J. Tossizza, Paris. Eng. Pat. 14,825, July 20, 1901.

This process is a modification of that described in Eng. Pat. 14,751. 1901, which is applicable to sulphide ores in general, but is not suitable to those of zinc. With zinc ores, the electrolysis is carried out in two separate operations. In the first, a zinc salt is electrolysed, using soluble anodes, at a voltage below that required for decomposing water; and in the second, the salt formed at the anodes by the previous operation is decomposed, and depolarisation and reduction of voltage are ensured by maintaining around the insoluble anodes a solution of sulphurous acid obtained from roasting of the blende, the two operations together effecting, it is stated, electrolysis of zinc sulphate, and producing non-spongy zinc, with an E.M.F. of about 1·75 volt, or less than that required for a direct operation.
—G. H. R.

Lead; Electrolytic Refining and Depositing of ——. A. G. Betts, New York, U.S.A. Eng. Pat. 7661, April 1, 1902.

A solution of a lead salt of "a fluoric acid," preferably lead fluosilicate, with the addition of an agent, such as gelatin capable of restraining or modifying the crystallisation of the electro-deposited lead, is subjected to electrolysis. The product is said to have all the properties of cast lead.
—G. H. R.

XII.—FATS, OILS, AND SOAP.

Olive Oil; Treatment of ——. U.S. Consular Reports, No. 1361, June 7, 1902.

The olives are collected, as a rule, when they are of a reddish-brown colour, before they come to maturity. A olive tree about 10 years old should yield about 6 lb. of fresh olives; when 20 years old, about 12 lb.; and when 50 years old, from 22 to 26 lb. In the south of France and in Italy the olives are stored in layers 6—8 ins. in thickness for 24—48 hours, until they commence to wrinkle and lose a little of their water, but not sufficiently long for fermentation to set in. In other countries, and particularly in Spain, the fruit is stored in piles, which should not exceed 6 ft. 6 in. in height, and is allowed to stand for 12—15 days; fermentation sets in, but is not allowed to proceed beyond a certain point. The olives are now crushed in a mill, and the crushed fruit placed in round mats, of which 22 are usually placed one above the other, the weight of olives averaging about 165 lb. By subjecting the mats to pressure, the virgin oil is obtained, and is drawn together with the expressed water, into tubs. The mats are then removed from the press, the pulp raked over and treated with hot water, and then subjected to a second pressing, the oil and water being kept separate from the

irgin oil. The residue is removed from the mats, and the ernels separated from the pulp; from the latter a very ow grade of oil is separated by extraction. The oil in the abs is carefully skimmed off, decanted three or four times rom one barrel to another, stored until spring in earthen- are jars, and then again decanted into barrels. The ater is poured into stone or tiled cisterns and allowed to tand for three or four months; the oil separated in this ay is of low quality and is sold as "huile d'enfer." The ost important operation in the treatment of the crude oil its filtration. Until comparatively recently the oil was ltered through cotton, but specially prepared paper is ow generally regarded as the most satisfactory filtering aterial. The oil is passed through paper either by means force pumps, hydraulic pressure, or the application of e standpipe principle.—A. S.

Glycerin; Determination of ——. S. Zeisel and R. Fanto.

See under XXIII., *page* 992.

English Patents.

Detergents and their Manufacture. G. Bamberg. London. Eng. Pat. 13,049, June 26, 1901.

E U.S. Pat. 700,602; this Journal, 1902, 864.—C. A. M.

astic Material; Machines for Pressing or Stamping Bars or Cakes of ——. H. H. Lake, London. From J. R. Masecar and T. Bevington, Toronto Junction, Ontario, Canada. Eng. Pat. 26,067, Dec. 20, 1901.

E U.S. Pat. 699,887; this Journal, 1902, 782.—C. A. M.

United States Patents.

ts or the Like; Apparatus for Recovery of —— C. Kremer, Wiesbaden, Germany. U.S. Pat. 700,056, May 13, 1902.

E Eng. Pat. 14,603, 1901; this Journal, 1902, 917. —C. A. M.

Soap Granulator. J. Schwechler, Philadelphia, U.S.A. U.S. Pat. 698,144, April 22, 1902.

E soap introduced into a vertical cylinder is guided by ns of a central rod, provided with a weight and head, a horizontal cylinder, where it is granulated by means revolving shaft carrying an arrangement of toothed ves.—C. A. M.

ap Cake. W. R. Bowen, San Francisco, U.S.A. U.S. Pat. 702,531, June 17, 1902.

DISH-SHAPED metallic plate is attached to the under side cake of soap by means of an imbedded flanged edge, air space being left between the metal and the soap, so the cake will float when placed in water.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

United States Patents.

L-Drying Oils; Process of Effecting the Drying of ——, *nd Product of such Process. Pigments; Process of im- arting Drying Properties to* ——. *Processes of Treating r Paints* ——, *and Processes of Manufacturing Paints d the Paint Compounds thereby obtained.* W. N. akeman, Jun., Manhattan, New York. U.S. Pats. 2,172, 702,173, 702,174, 702,175, 702,176, 702,177, d 702,178, June 10, 1902.

ACCORDING to U.S. Pat. 702,172, non-drying oils, such as co n-seed oil, sunflower oil, corn oil, and the like, are re ered drying by combining them with a metallic oxide ca ble of forming a hard soap, the most suitable oxide be that of zinc, employed in proportion substantially equal to that of the oil; the addition of a drier, such as turpentine-japan, accelerates the drying. U.S. Pat. 702,173 refers to the use of driers, especially of a salt of manganese, dissolved in water with zinc white, the water being evaporated before grinding the pigment in either a drying or a non-drying oil. In 702,174 reference is made to an earlier U.S. Pat. 716,913 of May 15, 1899, in which it was shown that the body or spreading-power of an oil pigment is much improved if certain substances, *viz.*, stearic acid, spermaceti, and a variety of waxes dissolved in organic or alkaline solvents are added to the pigment before it is ground in oil. According to the present patent, driers such as those claimed in U.S. Pat. 702,173, are also incorporated, a special claim being made for the incorporation of substances of these two classes with zinc white before grinding it in oil. U.S. Pat. 702,174, refers to the grinding of such treated pigments with non-drying oils, and the heating of the oils with an oxidiser such as manganese dioxide, by which their drying properties are improved. In U.S. Pat. 702,176 there is claimed the product of such processes. U.S. Pat. 702,177 relates particularly to the treatment of pigments with a solution of basic lead acetate before grinding in oil, the treatment rendering unnecessary the subsequent addition of a drier, and at the same time improving the body of the paint, and No. 702,178 claims the simultaneous addition of a manganese salt for accelerating the drying.

Reference is made to U.S. Pats. 59 of Jan. 2, 1900; 734,698 of Oct. 25, 1899; 740,576 of Dec. 16, 1899; and 735,438 of Oct. 31, 1899.—M. J. S.

(B.)—RESINS, VARNISHES.

English Patent.

Shellac; Improved Process for dissolving ——, *and obtaining Varnish or Composition therefrom.* W. L. Shooter, Hornsea, Yorkshire. Eng. Pat. 14,456, July 15, 1901.

SHELLAC is dissolved in a hot aqueous solution of borax or boric acid and ammonia.—M. J. S.

(C.)—INDIA-RUBBER.

Copper Sulphide (Devulcanising rubber); Electrolytically produced ——. J. Rieder.

See under XI. A, *page* 978.

United States Patents.

Sponge Substitutes; Method of Forming ——. A. Straus, New York. U.S. Pat. 702,162, June 10, 1902.

CRUDE rubber is mixed with sufficient sulphur to vulcanise it, next with a certain quantity of a hydrocarbon such as melted paraffin, and also if desired, with some water, and the whole is ground by running it through the rollers of an open mill. During this process the paraffin dissolves part of the rubber and distends the remainder, whilst the water is absorbed and assists in the distention. Finally the composition is heated, when gases are liberated, which further increase the porosity of the mass, and at length the temperature is raised to the point of vulcanisation. So prepared, a material is obtained which is stated to possess substantially all the properties of natural sponge in regard to elasticity and absorbing power, and in durability, whilst much greater cheapness is claimed for it.—F. H. L.

Matter [Rubber Substitute]; Composition of ——, *and Preparation of Same.* W. Prampolini, San Luis Potosi, Mexico. U.S. Pat. 702,678, June 17, 1902.

SEE Eng. Pat. 6972, 1900; this Journal, 1901, 373. The gummy matter therein referred to is vulcanised with sulphur in the manner usually adopted in the case of caoutchouc, with or without loading materials and colouring agents, and the whole is employed as a substitute for vulcanised rubber.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannin; New Method of Determining ——. E. Crouzel.

See under XXIII., *page* 992.

UNITED STATES PATENTS.

Leather; Method of Finishing the Surface of ——. C. J. Miller. Philadelphia. U.S. Pat. 702,450, June 17, 1902.

THE leather is pressed between two parallel metal surfaces, one of which is heated to 270° F., for from five seconds to a minute and a half. For a sheep or goat skin, a pressure of from 5,000 to 9,000 lb. is applied.—J. T. W.

Tanning; Method of Preparing Skins for ——. W. L. Albee. Buffalo. Assignor of one-half to Schoellkopf and Co., Buffalo. U.S. Pat. 702,864, June 17, 1902.

THE skins, after the hair or wool is removed, are steeped for 10 hours in a solution composed of sodium sulphide two parts, sodium bicarbonate one part, borax one part, water 96 parts. They are then drummed for three hours in the main cleansing solution composed of sodium sulphide two parts, sodium bicarbonate two parts, borax one part, caustic soda one part, water 94 parts, at a temperature of 80° F., and finally cleansed for two hours in a solution consisting of one part of sodium bicarbonate, and one part of borax in 98 parts of water. The skins are then rinsed in cold water for 10 minutes, pickled in sulphuric acid and salt, and are then ready for tanning.—J. T. W.

Tanning Agents from the Saw Palmetto. Process of Producing ——. S. F. Gray. Titusville, Florida. U.S. Pat. 703,058, June 24, 1902.

THE usual methods of leaching tanning materials give only a very weak liquor from Saw-Palmetto roots, owing to the presence of starchy and resinous bodies in the roots. The patentee extracts the tannin by passing the cleansed roots through crushing rolls, allowing the juices thus squeezed out to settle, and then racking off the clear portion and concentrating it *in vacuo*.—J. T. W.

Gelatin Yieldable Liquids. Process of obtaining——. E. R. Edson, Cleveland, Ohio. U.S. Pat. 703,240, June 24, 1902.

FISH waste or other material capable of yielding gelatin is heated in a steam-jacketed vessel, and is prevented from boiling or frothing by the admission of compressed air (20 lb. per square inch) above the surface of the liquid. It is run out of the vessel through a filtering material whilst at a temperature of 212° F., the pressure of air assisting the filtration. (See also U.S. Pats. 689,471 and 689,473, 1902, and Eng. Pat. 24,604, 1901; this Journal, 1902, 263, 265, and 357.)—J. T. W.

XVI.—SUGAR, STARCH, GUM, Etc.

Starch Manufacture; Process for Treatment of the Lower Grade Products in ——. E. Kesztler. Zeits. Spiritusind, 1902, **25**, [23], 249.

THE impure starch collected in the settling tank from the waste-channels, is placed in a vessel with mechanical stirrers. The starch milk is acidified with sulphuric acid and permanganate is added. Since no precipitation of manganese peroxide occurs in this way, the addition of permanganate can easily be continued until the products are fully bleached. The starch is then allowed to settle, the liquor is decanted off, and the starch is washed until pure; traces of acid may be neutralised with sodium carbonate. The starch so treated is stated to be quite fit for working up into first quality product. (See Siemens and Witt, this Journal, 1896, 366.)—J. F. B.

Mowose- and Biose-Acetates; Velocity of Saponification of ——. R. Kremann.

See under XXIV., *page* 996.

ENGLISH PATENT.

Sugar Juices and other Liquids; Filters for ——. J. Kostalek, Prague. Eng. Pat. 7693, April 1, 1902.

THE said filter consists of a reservoir containing vertical perforated or sieve walls adapted to receive between them suitable filtering media; a vertical stack or row of horizontal tubes is also provided between the perforated walls, each tube being formed with slits or openings; these tubes are in connection with the supply of liquid to be filtered which escapes from the tubes, and flows through the filtering medium towards the perforated walls at a practically constant velocity. An airtight cover may be applied.—J. F. B.

UNITED STATES PATENTS.

Syrups; Apparatus for Cooling [*Candy*]——. W. Walter, Richmond, New York. U.S. Pat. 701,971, June 10, 1902.

THIS apparatus is for the use of manufacturers of candy, for cooling the syrup, which usually consists of melted sugar and glucose. This apparatus chiefly consists of a sealed receptacle with means for cooling its contents, and connected at its upper end with an exhaust pump, and at a point below its upper end with a "kettle" containing the syrup.—R. A.

Sugar Products; Intermediate ——. C. A. Spreckels and C. A. Kern, New York. U.S. Pat. 703,219, June 24, 1902.

REFERRING to the process specified in U.S. Pat. 698,150 (this Journal, 1902, 715), an intermediate product, consisting of sugar crystals freed from all the natural impurities, but containing an admixture of a sulpho-oleaginous defecating substance is claimed. It is stated that raw sugar thus freed from its impurities keeps much better during shipment and storage, the defecating compound being subsequently removed when required.—J. F. B.

Starch; Process of Manufacturing ——. J. Loiselet Paris. U.S. Pat. 702,571, June 17, 1902.

RICE, maize, or other material is steeped in one or more baths of sulphurous acid solution, washed several times in water, and then ground in contact with a jet of water. It is then sifted, the starch is deposited and purified on inclined planes, and then collected and diluted. In this form it is subjected to electrolysis, and the organic precipitate which is thereby formed is removed by means of very fine sieves. Subsequently the starch is deposited, purified on inclined planes, and prepared in a suitable manner for drying. In this way fermentation during drying is prevented.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malting; Practical ——. A. D. Currie. J. Fed. Inst Brewing, 1902, **8**, [4], 428—439.

TO secure a well-modified malt without forcing, the barley must be thoroughly but not excessively steeped; damaged corns should first be removed. English barley requires from 48 to 54 hours; thick-skinned foreign barley requires much longer, up to 70 or 80 hours. The temperature of the water should lie between 50° and 60° F. When the grain leaves the steep it should be heaped on the couch, the temperature of which should not exceed 57° F. When the rootlets begin to show through the husks the grain is floored. The temperature here should be between 54° and 57° F., never being allowed to exceed 60° F. until the withering period. Sprinkling must not be overdone; 2 to 3 gallons of water per quarter is the right amount applied half on the evening of the sixth day and half on the morning of the seventh. The malt should lie on the floor for six days after the last sprinkling. It is turned three times in 24 hours before sprinkling, and twice after sprinkling. Withering should be done in 24 hours at about 64° F., if possible without turning. As much water

possible should be removed before loading on the kiln; the remaining water is removed on the kiln rapidly at low temperatures by means of thin spreading and powerful draught. Loaded at 80° F., the temperature should not exceed 100° F. in the first 12 hours, it should then gradually rise to 120° F. in the next 24 hours, and finish at 125° F. in the last 12 hours. The malt is then practically dry and ready for curing; this should be done in thick layers of about 16 inches with little draught, the temperature being raised to 160° F. in 24 hours, and then during the next 24 hours to the maximum, which should be maintained for eight hours.—J. F. B.

Malt Analysis. A. R. Ling. J. Fed. Inst. Brewing, 1902, **8**, [4], 441—456.

Two complaints are often heard from the brewer with regard to the valuation of malt by analysis, first that the results obtained in the laboratory are never the same as those obtained in practice, and secondly that the results of different analysts working with presumably the same sample of malt are not concordant. The first point is not serious; it would be impossible even if it were desirable to reproduce in the laboratory all the different and variable conditions of mashing practised in different breweries; so long as a suitable and constant method of analysis is followed, the results are always capable of intelligent interpretation on the practical scale. The second complaint is certainly more serious, and some general understanding is urgently required among brewing chemists in this country.

Diastatic Power.—The diastatic power determined by Lintner's method is liable to be misleading. The validity of the method depends entirely on Kjeldahl's law of proportionality which requires that the ratio of diastase to starch shall be so small that the maltose produced shall not exceed 40 per cent. of the total solids. The brewer invariably uses proportions of diastase vastly in excess of this ratio and carries the conversion much further, consequently under practical conditions the maltose to dextrin values of the worts frequently do not follow in the order of the diastatic powers of the malts. Kjeldahl's law of proportionality does not hold good in the case of starch conversions made with green or low-dried malts at the ordinary temperature. Moreover, the diastatic power, when the determination is carried out by Lintner's method, is liable to large variations under the influence of certain substances, *e.g.*, asparagine and phosphates. Fluctuations will also occur according to the quantity and nature of the acidity of the malt.

Extract.—One of the most unsatisfactory points about the determination of the extract is the coarseness of the grist used for mashing. It is impossible to take a fair sample of prepared grist; the only way is to weigh out whole corns and then grind all of them. The mashing of fine meal does not reveal the presence of steeliness in the malt. The solution of the difficulty probably lies in the employment of a laboratory mill capable of turning out a uniform size of grist, such as devised by O. Saare (Jahrb. d. Versuchs. u. Lehranst für Brauerei, Berlin, 1901, 236). In calculating the concentration of the wort, it is not satisfactory to apply a constant correction for the volume of the spent grains. The best way is to mash 50 grms. of malt containing a known amount of water in a tared flask with 400 c.c. of water at 155° F., digest in the water-bath at 150° F. for 1 hour and then make up the weight with water so that the total quantity of water present (excluding the moisture of the malt) shall be 500 grms. The volume, V, occupied by the matter [as sugar] extracted from 50 grms. of malt can be calculated from the formula :

$$\frac{100\,S\,(509 \times W)}{15{\cdot}9\,(D - 10\,S)}$$

where S = the dissolved matter in grms. per 100 c.c. of wort (3·93 factor); W = weight of moisture in 50 grms. of malt; D = sp. gr. of wort compared with water as 1,000.

The total volume of the wort will then be 500 + W + V, and the yield of extract can be accurately calculated.

—J. F. B.

Brew-house Work; Sources of Error in the Control of ——. W. Windisch and R. Hasse. Woch. f. Bran., 1902, **19**, [25], 339—340.

In Germany the yield of extract from malt on the practical scale is controlled by the official Vienna method of malt analysis in the laboratory. The authors have investigated certain possible sources of error, which might be introduced by fundamental differences in the two methods.

Influence of the Method of Mashing.—The Vienna method of mashing is purely an infusion process, whereas the decoction process is almost universal in German breweries. The authors have mashed quantities of the same malt grist in the laboratory by the Vienna method, and by different modifications of the decoction process. The results showed that there is practically no error involved by employing the infusion method for controlling the yield of extract obtained by the decoction method, provided the malt be normally modified.

Influence of the Hop-Boiling.—In the laboratory the yield of extract is calculated from the gravity of an unboiled, unhopped wort, whereas in practice it is deduced from that of the wort after boiling. In this case there might be an error due to the gravity of the matter extracted from the hops, and an opposite error due to the removal of coagulated albuminoids. The authors have determined the alteration in the gravity of an unhopped wort caused by boiling it with various proportions of hops. A steady increase of gravity was observed as the proportion of hops was increased; for average proportions of hops this increase amounted to about 0·5 per cent. in a wort containing 12·6 per cent. of extract.

Influence of the Brewing Water.—According to the Vienna method the laboratory mashes are always made with distilled water. The authors have determined from comparative mashings that the employment of various brewing waters containing dissolved mineral matters has a very considerable effect upon the gravity of the worts obtained. This effect may be due partly to the actual gravity of the water employed, by reason of its dissolved solids, and partly to the influence of these dissolved matters upon the extraction of the malt. The effect of the different waters was different with different types of malt; in none of the experiments did the increase of gravity of the worts equal the original gravity of the water employed. The influence of the different waters upon the apparent yield was large when calculated on the malt dry substance (1·5 to 5 per cent.), but it is not easy to bring this factor into use for controlling the yield in the brewery. The proportions of water to malt are different on the two scales, and the wort in the brewery loses more water by evaporation than does that in the laboratory, still in certain cases the laboratory mashes might be made with the same water as is used in the brewery if the conditions be made comparable.—J. F. B.

Beer Wort; Contraction of —— on Cooling. O. Mohr. Woch. f. Brau., 1902, **19**, [25], 340—341.

In estimating the yield of extract in practice the volume of the wort is generally measured either in the wort-copper at or near a temperature of 100° C. or else in the fermenting tuns at a temperature of 5° C. These measurements have then to be reduced to the normal temperature of 17·5° C. by calculation. The factors hitherto employed for this calculation have been shown to be erroneous, and the following numbers are now given as correct :—

In cooling from 100° C. to 17·5° C., beer wort contracts 4·2 per cent., and in being warmed from 5° C. to 17·5° C., it expands 0·23 per cent.

The numbers in the table show the results from which an expansion curve has been constructed; this curve follows exactly the same course as the corresponding curve for water.

In most cases the volume of the wort is estimated in practice with no allowance for the alteration in volume of the vessel. The error thus introduced is somewhat larger than might be expected. Assuming that the vessel has been gauged at 20° C., it will contain more wort at 100° C. than

Temperature. C.	Sp. Vol. of the Wort.	Vol. at 17·5° C., taken as unity.
1·8	0·9505	0·9976
15·0	0·9523	0·9995
17·5	0·9528	1·0000
20·3	0·9534	1·0006
46·9	0·9625	1·0102
67·8	0·9725	1·0207

is apparent from the gauge mark. The author reckons that the correction for the expansion of the vessel is about 0·28 per cent. for iron vessels and 0·4 per cent. for copper vessels, and the volume measured should be increased by this amount.—J. F. B.

Mashes [Distillery]; Higher Pitching Temperatures for Fermenting ——. G. Heinzelmann. Zeits. Spiritusind., 1902, **25**, [22], 237.

Ordinarily, low temperatures are preferred for pitching the mash; before vat-coolers were introduced, mashes were pitched at 12·5°—15° C., and subsequently, with cooling pipes, the temperature was regulated at 17·5°—21° C. Mashes are often pitched at 15°—16° C. and warmed up next morning with hot water to bring on the primary fermentation. The idea of such procedure is to avoid putting too great a strain on the fermentative capacity of the yeast at first and to allow it time for multiplication before fermentation. Recently, however, Hesse has found no practical differences as regards the yeast increase between mashes pitched warm (26° C.) and those pitched cold. The yeast multiplies more rapidly at higher temperatures, the most vigorous reproduction taking place at 28° C. Hesse has also found that there is no falling off in the yield of alcohol with higher pitching temperatures, the only drawback lies in the fact that primary fermentation sets in during the night, necessitating special attention and a supply of cooling water at that period. Under some conditions these drawbacks can be overcome. An instance is quoted where a cooler is employed for three mashes a day. The mashes are set up in the vats at a temperature of 27·5°—28·5° C., the pitching yeast prepared with lactic acid having been added in the cooler at a temperature of 34°—35° C. The third batch of mash gets into the fermentation vat by 11.30 a.m. and primary fermentation starts in about three hours and lasts for 10—12 hours, so that a large portion of it takes place in the day-time. The cooling water is so accurately under control that an excessive rise of temperature during the night never occurs. The total time of fermentation is cut down to 72 hours, instead of the 96 hours frequently required, without any diminution in the yield of alcohol. With high pitching temperatures, the shorter time on the cooler and the earlier production of alcohol, reduce the danger of infection very considerably. Special attention during the night is not necessary, provided a sufficient quantity of cooling water can be stored.—J. F. B.

Ethyl Alcohol; Action of—— on Barium Ethylate. (Synthesis of Normal Butyl Alcohol.) Normal Propyl and Butyl Alcohols; Action of—— on their Sodium Derivatives. (Synthesis of Dipropyl and Dibutyl Alcohols.) Methyl Alcohol; Action of—— on its Sodium Derivative. M. Guerbet. Bull. Soc. Chim., **27**, 578—581; 581—584; 584—585.

Like amyl and œnanthyl alcohols (this Journal, 1899, 387) normal propyl and normal butyl alcohols, when heated to 220°—230° C. with their respective sodium derivatives, yield dipropyl and dibutyl alcohols, the reaction being as follows —

$$2C_3H_8O + C_3H_7NaO = C_6H_{14}O + C_3H_5NaO_2 + 2H_2.$$

Ethyl alcohol does not behave in this way with sodium ethylate; but with barium ethylate it does yield, among other products, normal butyl alcohol. Methyl alcohol, heated with sodium methylate, gives no alcohol of higher molecular weight; at 200° C. it remains unchanged, and at 230°—240° C. it decomposes with production of gaseous substances sufficient to burst the tubes in which the experiment is conducted.—J. T. D.

English Patents.

Filter and Extractor Presses [Brewers' Mash, &c.] J. G. Crossman. Eng. Pat. 8392, 1902.

See under I., *page* 959.

Barley for Malting Purposes; Apparatus for Washing and Aërating——. R. Hört and L. Marxsohn, Geran Germany. Eng. Pat. 10,350, May 5, 1902.

For washing and aërating barley which has to be malted a stream of water passing through a pipe from above to the bottom of the cistern is caused to draw in air from the out side in its passage; or else the air may be injected into the pipe under pressure by means of small tubes inserted at the top of an inverted U bend.—J. F. B.

Fermentation of Liquids; Apparatus for the Alcoholic ——. O. E. Nycander, London, Eng. Pat. 16,049, Aug. 9, 1901.

One or more receptacles open at the base are submerged in the fermenting wort so that a large surface of the latte comes into contact with the air or gas contained in them These may either be plunged into the wort intermittently o a stream of air or gas may be introduced by a pipe at th bottom of the vat into the lowermost receptacle, in whicl case open-ended tubes are carried from the top of the lowe receptacles so as to conduct the overflow of air into th next higher ones.—J. F. B.

Fermented Liquors; Manufacture of ——. J. Schneible New York. Eng. Pat. 10,699, May 9, 1902.

See U.S. Pat. 700,833; this Journal, 1902, 868.—J. F. B.

Aëration of Liquids [Aerated Waters, Wine, Beer, &c.] F. G. Hampson, Clapham, Surrey, and H. Swales, Bays water, Middlesex. Eng. Pat. 11,612, June 6, 1901.

The gas and liquid are admitted to the aërating chambe from separate sources, the supplies being cut off, and pressure-reducing valve and a discharge outlet opened, b the pressure within the chamber.—R. A.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Pepper; Analysis of Kissi —— from Upper Guine A. Barillé. Comptes Rend., **134**, [25], 1512—1514.

The fruit of *Piper Famechoni*, a new species from Upp Guinea. The berries are smaller than those of *Piper nigrum* They give a reddish-brown powder, with a peculiar aromat taste.

The piperine present to the extent of 3·654 per cent., ca not be separated as such, on account of the large amoun of fatty and resinous matters. The soluble ash contain sodium, potassium, and manganese; the insoluble ash, lim and silica. The alcoholic extract is bright red, and has sharp burning taste; the aqueous extract is strongly coloure and has a pleasant taste, and a smell like walnut extrac This plant may be used as a spice and a condiment.

—J. T. D.

English Patent.

Food for Cattle, &c.; Manufacture of ——, containin Molasses. H. Vaupel, Fürstenstein, Germany. En Pat. 7564, March 29, 1902.

The molasses is mixed with the sugar and other ingredien forming the artificial food in a longitudinal vessel provid

with a funnel and rotary mixing blades; the vessel is heated externally by means of a steam jacket, so that during the mixing, the water of the molasses is volatilised, the impregnated food being passed out through a pipe at the end of the vessel.—J. F. B.

UNITED STATES PATENTS.

Separator: Centrifugal [Cream] ——. P. L. Kimball, Bellows Falls, Vermont. U.S. Pat. 702,141, June 17, 1902.

CHIEFLY a cream separator. Mechanical details given. —R. A.

Food; Malted Cereal ——. J. K. Lippen, Michigan, U.S.A. U.S. Pat. 703,209, June 24, 1902.

WHOLE wheat or other cereal is soaked in water, then cooked without breaking the outer coating of the grains (preferably in a closed, steam-heated vessel) and the cooked grain dried in an oven. The dry grain is crushed and baked at a temperature of about 300° F., 10 per cent. of barley malt and 5 per cent. of water added, and the mixture baked. —W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Drinking Water; Hünermann's Method for the Sterilisation of ——. Schüder. Zeits. Hyg., **39**, 379—403. Chem. Centr., 1902. **1**, [25], 1374.

THE author sets out the conditions which he considers should be observed in determining the value of methods for the sterilisation of water, in order to attain results that can be relied upon. He has examined the process of Hünermann and Deiter (this Journal, 1901, 828) for the sterilisation of drinking water by means of concentrated sodium hypochlorite solution, in the same manner as he previously examined Schumburg's method (this Journal, 1901, 828). The following conclusions are drawn from the results. With an impure water, strongly contaminated with bacteria, the number of germs is considerably diminished by the treatment; in some cases, perhaps, the water is made quite free from germs. In some cases, all cholera germs present are destroyed, but these are exceptions; as a rule, only a very considerable diminution takes place. Typhus bacilli are not destroyed with certainty by the process, though a diminution in the number is unmistakeable in individual cases. Dysentery bacilli also are not destroyed with certainty, although, according to present knowledge, they are among the least resistant of pathogenic germs. On the whole, Hünermann's process appears to be more efficacious than Schumburg's method.—A. S.

Water; Determination of Ammonia in ——. O. Emmerling.

See under XXIII., *page* 990.

Organic Nitrogen in Waters; Determination of ——. H. Causse.

See under XXIII., *page* 992.

ENGLISH PATENTS.

Ferruginous Mineral Water; Apparatus for drawing off Natural —— without Admission of Air. K. L. G. Buchholz, König, Germany. Eng. Pat. 12,822, June 24, 1901.

THE apparatus comprises a water-tank connected with the spring, communicating with a pressure-regulating chamber; a pneumatic trough connected with the communicating pipe between the tank and chamber by a vertical pipe terminating in the trough in numerous outlets; a horizontal vessel connected with the water tank at the bottom and with the pressure chamber at the top, provided with an agitator; a second horizontal vessel below the first one, connected with the upper vessel and with the pressure chamber; and supply pipes on both horizontal vessels connected with a source of carbon dioxide.—E. S.

Softening Water. J. Gatecliff, Bingley. Eng. Pat. 13,069, June 27, 1901.

IN connection with water-softening apparatus, such as described in Eng. Pat. 22,520 of 1898, an oscillating concave quadrant mounted in the reagent tank is driven from a water-wheel actuated by the hard water, and at each oscillation a definite volume of reagent is discharged into the decanter of the apparatus. A floating indicator is fixed in the reagent tank which, if the tank is filled up with water before the reagent is entirely exhausted, shows on a scale the number of pounds of solid reagent which require to be dissolved in the water to produce a solution of constant strength.—L. A.

UNITED STATES PATENTS.

Sewage: Apparatus for the Treatment of ——. A. J. Prevost, junr., Brooklyn, New York. U.S. Pat. 699,345, May 6, 1902.

A CLOSED rectangular vault, through which the sewage flows at constant level, is divided into four compartments. The two first compartments are anærobic septic tanks, only partially separated from each other by a straining wall rising just above the level of the liquid, which retains the coarser suspended matter in the first chamber to be broken down by bacterial action. The second and third chambers are completely separated by a wall which is finely porous below the water level only, and retains practically all the remaining suspended matter in the second chamber. The partially clarified liquid filtering through this wall meets, in the third chamber, with a limited amount of air admitted through pipes in sufficient quantity to encourage the growth of ærobic bacteria, and overflowing through a sealed outlet into the fourth chamber, the liquid is cascaded down inclined planes in presence of abundance of air and flows away through a suitable outlet.—L. A.

Sewage-Disposal Plant. G. H. Anderson, J. W. Stevens, and A. Lutz, New York. U.S. Pat. 701,827, June 10, 1902.

THE plant within a building is so constructed and arranged that the sewage is first mixed with ground lime, next strained through a series of vertical filters, then aerated by being sprayed through a chamber through which a current of air is driven, and finally filtered through horizontal filtering beds.—L. A.

(*C.*)—DISINFECTANTS.

ENGLISH PATENTS.

Antiseptic containing Iodine; Manufacture of an ——. M. Cohn, Berlin. Eng. Pat. 15,150, July 25, 1901.

A SUBSTITUTE for iodoform is made by dissolving iodide of potassium and gelatin in water, adding to the solution free iodine, and then a gelatin-hardening agent. After cooling, the liquid is dried on threads and ground to powder. —L. A.

Fumigator or Candle for Diffusing Antiseptics, Disinfectants, Perfumes, Medicaments, and Insect-destroying Chemicals or Compounds. J. Fleming, London. Eng. Pat. 4866, Feb. 26, 1902.

A CYLINDER of asbestos, brought to an apex at one end, is coated on the inside with an absorbent material saturated with the antiseptic, and on the outside with paper saturated with saltpetre. The smouldering of the "touch paper" produces heat sufficient to volatilise the antiseptic, the vapour of which fills the inside of the cylinder and escapes through the apex.—L. A.

UNITED STATES PATENT.

Disinfecting; Apparatus for ——. C. J. Walz, New York. U.S. Pat. 702,041, June 10, 1902.

THE apparatus is intended to supply a liquid disinfectant at a uniform rate through a wick siphon. The cup containing the latter is attached to the lower end of a closed cylinder containing the liquid, which is fed into the cup through an intermittent siphon, which keeps the level constant.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

English Patent.

Paper Manufacture; Refining or Pulping Engines for ——. E. de Pass, London. From S. R. Wagg, Wisconsin, U.S.A. Eng. Pat. 8633, April 14, 1902.

In a conical refining engine of the "Jordan" class the working surface of the blades is largely increased by substituting for the single blades, composite blades, two to four together, the members being separated by narrow filling strips, and each group being spaced by wider blocks to allow of a flow of pulp between them. Details are also claimed relating to the method of fixing the blades to the core.—J. F. B.

United States Patents.

Paper; Plant for Treating ——. J. Wezel, Leipzig, Germany. U.S. Pat. 697,761, April 15, 1902.

See Eng. Pat. 18,942, 1901; this Journal, 1902, 114.
—J. F. B.

Paper Pulp; Method of Bleaching ——. F. H. Long, Chicago. U.S. Pat. 702,142, June 10, 1902.

A mixed charge of pulp and dilute sodium chloride solution is subjected to an electrolysing current in a closed vessel, the gaseous and other refuse cathode products being simultaneously isolated from the body of the charge. The whole charge is confined under pressure and maintained bodily in forced circulation between the anode and the cathode elements. A little lime may be added advantageously to the charge.—J. F. B.

Pulp Washing Apparatus. A. Hinzke, Maine. U.S. Pat. 702,556, June 17, 1902.

The washing tank for paper pulp (*e.g.*, wood cellulose) has a zigzag passage way, consisting of vertical chambers arranged in longitudinal and transverse rows. The chambers are formed by longitudinal and transverse stationary partitions and longitudinal and transverse movable partitions, the longitudinal stationary partitions forming underflow and the movable partitions overflow passages, the movable partitions being capable of an upward adjustment to form also underflow passages for the circulation of water along the bottom of the tank. Thus the pulp is caused to travel alternately upwards and downwards through a considerable distance, whilst the impure water is drained off through a perforated bottom.—J. F. B.

Paper or Pasteboard; Impregnating ——. A. B. Glass, Assignor to J. Back, Vienna. U.S. Pat. 703,341, June 24, 1902.

See Eng. Pat. 7344, 1901; this Journal, 1902, 493.
—J. F. B.

Nitrocellulose and Caseïn Compounds; Manufacture of ——. C. Bernadac, Paris. U.S. Pat. 700,471, May 20, 1902.

See E. Franquet, Fr. Pat. 312, 846; this Journal, 1902, 134.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Hydrogen Peroxide; Crystallised ——. W. Staedel. Zeits. angew. Chem., 1902, **15**, [26], 642—643.

It is stated that a 95—96 per cent. solution of hydrogen peroxide can be prepared. It is found to be crystallisable, and the crystals melt again at −2° C. The liquid remains fluid at −20° C., but in ether-carbon dioxide it crystallises to a solid mass. The eutectic point of the mass lies somewhere between −20° and −23° C.; a fragment of the solidified portion brought into a fresh solution even at −8° C. induces the immediate formation of clean, colourless crystals throughout the liquid. If the mother-liquor be now poured off and the crystals melted, pure anhydrous H_2O_2 is obtained. As more dilute (90 or even 80 per cent.) solutions give these crystals on cooling, a simple way is thus provided for the production of the anhydrous peroxide. The properties of the pure H_2O_2 thus produced have been examined. A trace of platinum black or powdered manganese dioxide produces catalytic dissociation with almost explosive rapidity. Carbon or magnesium powder mixed with a trace of MnO_2 is ignited on immersion in the H_2O_2 (or even in a 90—95 per cent. solution). A few drops of the anhydrous H_2O_2 dropped on cotton wool, or even on a moist sponge, at once set fire to it. Lead-dust immediately ignites in contact with the compound; but finely-divided iron (*ferrum reductum*) is not attacked unless a trace of MnO_2 be present, in which case it inflames at once. Sulphuric acid monohydrate may be mixed with the anhydrous H_2O_2, if care be taken to keep the temperature low; otherwise quantities of ozonised-oxygen will be given off. Crystalline products containing H_2O_2 can be produced, as, for example, by adding a 90—95 per cent. H_2O_2 solution to a strong solution of cadmium chloride, whereby a pasty mass is produced containing fine white silky plates with 23 per cent. of H_2O_2. The pure peroxide is found, when properly packed, to bear transport perfectly.
—W. G. M.

Mercury Lactates. M. Guerbet. J. Pharm. Chim., 1902, **16**, [1], 1—11.

Mercurous Lactate. — The lactic acid employed is first deprived of the accompanying anhydrides—which, according to Wislicenus, are always present in the concentrated acid—by boiling for 30 minutes with 10 times its volume of water. Mercurous oxide, prepared by the cold precipitation of mercurous nitrate with caustic potash, the precipitate being washed in the dark, is then dissolved in just sufficient of the acid to insure complete solution, which takes place immediately. On evaporating the solution at ordinary temperatures over H_2SO_4, mercurous lactate separates in the form of colourless prismatic crystals, having the composition $Hg_2(C_3H_5O_3)_2 + H_2O$. It is decomposed by water, throwing down a white powder, which gradually becomes greyish. It is, however, soluble in water containing free lactic acid. Probably water alone causes dissociation, the lactic acid thus liberated dissolving a part of the salt, while the rest is thrown down as a more basic compound. This, in turn, is decomposed into mercuric lactate and mercury.

Mercuric Lactate is obtained by adding excess of yellow mercuric oxide to lactic acid, previously boiled with 10 times its volume of water. The solution, evaporated over H_2SO_4, gradually deposits groups of colourless prismatic needles, having the composition $Hg(C_3H_5O_3)_2$. Notwithstanding extreme precautions in precipitating the mercuric oxide, and in the saturation of the acid therewith to avoid all rise of temperature, a small amount of mercurous lactate is always formed, which remains in the mother-liquor on crystallising. Mercuric lactate is very soluble in water, to the extent of 2·75 : 1 at 20° C. When heated, this solution undergoes decomposition. Although, on boiling, the salt does not appear to be decomposed, it is in fact, entirely converted into mercurous lactate, evolving, at the same time, carbon dioxide and aldehyde, and setting free a molecule of lactic acid, according to the equation $2Hg(C_3H_5O_3)_2 = Hg_2(C_3H_5O_3)_2 + CO_2 + C_2H_4O + C_3H_6O_3$.

Mercuric lactate, prepared as above indicated, is the only salt which should be employed in medicine, on account of its ready solubility and relatively greater constancy. Commercial mercury lactate, as at present met with, is almost exclusively the mercurous salt, and is insoluble in water.

The author considers the so-called salts described by Engelhardt and Maddrel and by Bruening, to be mixtures more or less basic mercurous or mercuric lactates.—J. O.

Tartaric Acid; Synthesis of ——, from the Scientific and Industrial Points of View. S. Zinno. Monit. Scient., **16**, [727], July, 1902, 493—495.

Succinic acid, in a cold strong aqueous solution, is oxidised by excess of hydrogen peroxide (10 volumes, pure and neutral) to tartaric acid. The reaction requires 2—3 days

h frequent shaking. A similar result is obtained with assium hydrogen succinate. Calcium hypochlorite also dises calcium succinate, on the water-bath, to calcium trate. Ordinary malic acid, when heated with hydrogen oxide at 120° C., is oxidised to tartaric acid; the same ction takes place in the cold when the solution is shaken 15—20 days. A strong ethereal solution of hydrogen oxide gives a mixture of racemic and tartaric acids.

f a solution of glyceric acid of 26° B. be exactly neutra- d with caustic potash of 1·34 sp. gr., and the potassium cerate be treated with carbon dioxide under a pressure three atmospheres, and the mixture then left at rest for ne days, potassium bitartrate is obtained—

$$C_3H_5KO_4 + CO_2 = KHC_4H_4O_6.$$

ceric acid is obtained by boiling 100 parts of glycerin ° B.) with 200 parts of water, 35 parts of nitric acid 44), and 45 parts of lead dioxide, filtering the boiling uid, allowing to cool, washing the lead glycerate with l water (nearly at 0° C.), and decomposing by sulphuric l. It would be more economical to oxidise with red l, and to decompose the glycerate with potassium bicar- nate, when potassium glycerate would be obtained ready l the next operation—

$$Pb_3O_4 + 2C_3H_8O_3 + 6HNO_3 = 2Pb(NO_3)_2 + Pb(C_3H_5O_4)_2 + 6H_2O + 2NO.$$

m 1 kilo. of glycerin the author has obtained 1·384 s. of potassium bitartrate. The author calculates that assium bitartrate would be produced at a cost of about l francs per quintal, without reckoning the value of 60 s. of lead carbonate obtained as a by-product. At sent cream of tartar costs in France 180—200 francs quintal.—A. C. W.

ntipyrine; Salts of ——. A. Reychler. Bull. Soc. Chim., **27**, [12], 612—615.

ipyrine hydrochloride, $C_{11}H_{12}N_2O.HCl$, obtained in stals by evaporating on the water-bath 30 grms. of anti- ine, 50 c.c. of alcohol, and 20 c.c. of strong hydrochloric , re-evaporating the residue twice with alcohol and a ll quantity of acid, washing with alcohol and ether, and ng over sulphuric acid. They form thick tabular stals, melting at 158°—160° C., very deliquescent and ble in water, less soluble in alcohol, almost insoluble in r or benzene. The aqueous solution is strongly acid, hat the amount of the salt can be determined by tion with soda and phenolphthalein. When the salt is ed with five parts of benzene and one part of alcohol, it olves, and the solution, on cooling, deposits small prisms aining benzene of crystallisation ($C_{11}H_{12}N_2O.HCl.C_6H_6$); e prisms are dissolved by water, which liberates the zene they contain.

ntipyrine dextrocamphorsulphonate—

$$C_{11}H_{12}N_2O.C_{10}H_{15}OSO_3H,$$

ined by dissolving antipyrine and camphorsulphonic a in molecular proportions in hot benzene, and allowing ol and evaporate. Recrystallised from a mixture of one and alcohol, it forms hard, bulky prisms, melting at ° C., not deliquescent, but very soluble in water. The tion is acid, and can be titrated like that of the hydro- ride. The alcoholic solution is neutral.—J. T. D.

pineol; A New ——, *of Melting Point* 32° *C.* ($\Delta^{8\cdot9}$-*erpen-1-ol*). K. Stephan and J. Helle. Ber., 1902, **5**, [12], 2147—2158.

T crystalline terpineol hitherto known melts at 35° C., a gives as the first product of oxidation by permanganate, a hydroxyhexahydrocymene, which is then transformed i a ketolactone, $C_{10}H_{16}O_3$, the active modification of w h melts at 48°—49° C., and the inactive at 62°—63° C. T terpineol is doubtless Δ^2-terpen-8-ol.

he liquid terpineol, which is prepared by boiling terpin h ate with dilute acids, gives on fractionation two n portions boiling at 212°—215° C. and 218°—220° C. B fractions solidify on long keeping, in the cold they were purified by repeated recrystallisation from alcohol. Fraction II. melted at 35°—36° C., and was found to be identical with the inactive terpineol found in cajeput oil. Fraction I. melted at 32°—33° C., boiled at 209°—210° C. under 752 mm., and at 90° C. under 10 mm. pressure; its specific gravity at 20° C. was 0·919, and refractive index n_D 1·47470 (both constants determined in the superfused condition). This substance crystallised in needles, formed a phenylurethane, which melted at 85° C., and a nitrosochloride, which melted at 102°—103° C. By oxidation with permanganate it was converted into a glycerin, *viz.*, trioxyhexahydrocymene, $C_{10}H_{20}O_3$, which crystallised in small, colourless prisms, melting at 118°—118°·5 C. Further oxidation with chromic acid produces a ketone, $C_9H_{14}O$, and a hydroxyketone, $C_9H_{16}O_2$. The ketone boils at 68°·5—70° C. under 4 mm. pressure; its semicarbazone melts somewhat above 160° C.; sodium hypobromite acts on the ketone, forming bromoform and an acid which melts at 98°·5—99° C.

The hydroxyketone, $C_9H_{16}O_2$, forms a semicarbazone, which melts at 195°—196° C.; it is converted by sodium hypobromite into bromoform and a δ-hydroxy-acid, $C_8H_{14}O_3$, melting at 153° C., which gives the acid of melting point 98°·5—99° C. on warming with dilute sulphuric acid. By the action of strong sulphuric acid, oxidation takes place in addition to loss of water, and the hydroxy-acid is converted into *p*-toluic acid.

The new terpineol is to be regarded as $\Delta^{8\cdot9}$-terpene-*1*-ol. The ketone $C_9H_{14}O$ has been already regarded by Wallach as tetrahydro-*p*-methyltolylketone.—A. C. W.

Pine-Needle Oil; Manufacture of ——. U.S. Consular Reports, No. 1361, June 7, 1902, 6—8.

Pine-needle oil and extract are prepared in South Germany from the needles and very young shoots of the various kinds of pine trees, more particularly those of *Pinus pumilio*. The needles, &c., are collected at the end of May or beginning of June, cut up into small pieces, and subjected to steam distillation.

The condensed water in the still, containing resinous, albuminoid, and tannin matters, is run off, evaporated in a vacuum apparatus to the desired consistency, and the extract then perfumed by the addition of pine-needle oil. The residual pulp in the still is dried, disintegrated, perfumed with pine-needle oil, and sold as a stuffing material (for mattresses, &c.); it is stated to be vermin-proof.—A. S.

Oil of Bergamot Leaves. S. Gulli. Chem. and Druggist 1902, **60**, [1170], 995.

The oil of bergamot leaves has been produced for several years in the Reggio Calabria district, Italy; the production varies with the demand, but may be stated as about 20·25 kilos. per annum. The yield is limited, 100 kilos. of leaves giving only 150 grms. of oil. The pure oil of this season has a sp. gr. of 0·871—0·873, optical rotation + 25° 31′ to + 26°, and an ester content, calculated as linalyl acetate, of 32—34 per cent.; it is soluble in 90 per cent. alcohol (1:1). The oil contains methyl anthranilate. The commercial oil is rarely pure; adulteration is extensively practised by the addition of peel essences, whilst oil of turpentine and the leaves and young saplings of bitter orange are often distilled with the bergamot leaves. The oil is used for the adulteration of the oils of both bitter and sweet orange flowers, but such adulteration can easily be detected by reason of the change in the sp. gr. and optical rotation, and the increase in the ester content.—A. S.

Peppermint Plants; Influence of Sodium Nitrate on ——. E. Charabot and A. Hébert. Comptes Rend., **134**, 1228.

The authors have previously examined the influence of sodium chloride (this Journal, 1902, 561), and they find that sodium nitrate has a similar action, the application of a 1:40 solution once, early in the season, causing a marked increase in the ester content of the oil, a diminution in the amount of water in the plant, and an increase in the amount of organic matter. The relative quantity of menthol and of menthone in the oil is diminished.—A. S.

English Patents.

Titanium Lactate; Process for the Manufacture of ——. C. Dreber, Freiburg, Germany. Eng. Pat. 22,629, Nov. 9, 1901.

Solutions of titanic acid in lactic acid are prepared by acting simultaneously with lactic acid and an alkali or alkaline earth lactate upon freshly precipitated hydrated titanic acid, and similar solutions without excess of lactic acid by decomposing a solution of titanic acid in hydrochloric, sulphuric, or oxalic acid by the lactate of a base, which does or does not form an insoluble salt with the acid in which the titanic acid was dissolved. Further claims are for the manufacture of neutral solutions of salts of titanic acid with lactic acid, by neutralising the solutions obtained as above, or solutions of titanic acid in an excess of lactic acid, by alkalis, alkali carbonates, &c.—A. C. W.

Salts of Titanic, Oxalic, and Tartaric Acids, and of Titanic, Oxalic, and Lactic Acids; Process of Manufacturing Mixed ——. C. Dreber, Freiburg, Germany. Eng. Pat. 23,188, Nov. 21, 1901.

Neutral mixed salts of the type $(C_2O_4HM)TiO_2(C_4H_5O_6M)$ and $(C_2O_4HM)TiO_2(C_3H_5OH)(C_3H_5OM)$, in which M denotes an alkali metal, are prepared by treating hydrated titanic acid with the proper proportions of oxalic and tartaric or lactic acids, and their salts, or by adding the acids to a solution of titanic acid in hydrochloric acid, neutralising, and heating. The neutral salts may then be obtained by neutralising with ammonia.—A. C. W.

Acids, Carbohydrates, and Albuminoid Substances from Carbonic Acid; Process for Obtaining Organic ——. J. A. C. Walther, St. Petersburg, Russia. Eng. Pat. 19,501, Sept. 30, 1901.

The process is claimed for obtaining organic acids (oxalic, tartaric, and citric), and carbohydrates (hexoses, cane sugar, and celluloses) by electrolytically reducing carbonic acid, which acid, or substances containing it, is supplied to the cathode, whilst a different concentration is imparted to the cations to that imparted to the anions. If ammonia compounds are added to the electrolyte, albuminoid bodies are obtained. Further claims relate to modifications, in which vegetable albumin or similar material of low conductivity and high molecular weight is added to the electrolyte, the anode liquid is warmed, or the cathode (of large size in proportion to the anode) is composed of a substance, "which assumes a pronounced negative attitude towards the anode material."—A. C. W.

Cinchona Alkaloids; Carbonic Acid Ethers [Esters] of ——. G. W. Johnson, London. From Vereinigte Chininfabriken Zimmer and Co., Frankfort-on-Maine, Germany. Eng. Pat. 21,625, Oct. 28, 1901.

The manufacture of carbonic esters of the cinchona alkaloids is claimed, by a process which consists in heating 2 mols. of the base with 1 mol. of a phenol carbonate, $2(C_{20}H_{24}N_2O_2) + CO(OC_6H_5)_2 = CO(C_{20}H_{23}N_2O_2)_2 + 2C_6H_5.OH$.

—A. C. W.

United States Patents.

Chemicals [Carbon Bisulphide] in Electric Furnaces; Art of Producing ——. [*Bisulphide of Carbon.*] E. R. Taylor, New York. U.S. Pat. 702,117, 1902.

See under XI. A., *page* 979.

α-Ionone; Process of Making ——. P. Chuit and F. Bachofen, Geneva, Switzerland. U.S. Pat. 702,126, June 10, 1902.

See Fr. Pat. 312,790, 1901; this Journal, 1902, 137.

—A. C. W.

Phthalic and Benzoic Acids; Process of Making ——. A. Bischler, Basle, Switzerland. U.S. Pat. 702,171, June 10, 1902.

See Eng. Pat. 1901, 15,527; this Journal, 1901, 1139.

—A. C. W.

Menthol; Chlorinated Methyl Ether of ——. E. Weskind, Tübingen, Germany. U.S. Pat. 703,104, June 24, 1902.

See Eng. Pat. 1902, 5293; this Journal, 1902, 722.

—A. C. W.

XXI.—PHOTOGRAPHY.

Photographic Action; The Strain Theory of ——. J. C. Bose. Proc. Roy. Soc., 1902, **70**, [461], 185—193.

The author considers that the formation of the latent image is not due to chemical action, but is the effect of molecular strain with consequent modification of chemical activity. Dewar has shown that at the low temperature of −180°, there is a cessation of all chemical action, yet an Eastman film is still fairly sensitive to photographic influence. The chief conclusions drawn by the author from the results of his investigation are as follows:—Molecular strain is produced by the action of light, and as the physico-chemical properties of a substance are changed by strain, it is possible to develop the latent image through the difference in the following properties between the exposed and unexposed portions produced by light: (*a*) Difference in adhesive power, *e.g.*, development of daguerreo-type by mercury vapour, development by water vapour; (*b*) difference of chemical stability, *e.g.*, development by reducing agents.

Molecular strain may not only be produced by visible or invisible radiation, but also by electric induction and by mechanical distortion. Latent images produced by such means may be developed, *e.g.*, inductoscripts, development of pressure marks.

Nearly all substances are sensitive to radiation, but the effect cannot in all cases be rendered visible, (*a*) owing to want of suitable chemical developers, (*b*) owing to quick self-recovery. The molecular effect due to radiation can, however, be demonstrated by the conductivity or electromotive variation method. Owing to the tendency to self-recovery and consequently to the relapse of the image, the radiation effect does not solely depend on the total quantity of light, but depends also on the time-rate of illumination. Hence the photographic effects of intermittent and continuous illumination are not the same. The molecular effects produced by light and by electric radiation are similar. The continuous action of radiation produces recurrent reversals. Thus starting with a neutral condition, the first negative is obtained with a moderate exposure; longer exposure will tend to reduce the intensity of the negative and give rise to a neutral condition. Further exposure gives rise to a positive, then a second neutral, and again a succeeding negative stage, and this often goes on in recurrent series.—A. S.

Photographic Progress. M. A. Granger. Monit. Scient. 1902, **16**, [726], 401—411.

Borax in Developers.—According to Waterhouse, borax may replace alkalis in hydroquinone and "eikonogen" developers. The following formulæ are given:—

Hydroquinone	10	..
Eikonogen	..	10
Sodium sulphite	100	100
Borax	30	25
Water	1,000	1,000

Iodine in Developers.—Very dense negatives may be obtained by the use of a hydroquinone developer to which iodine has been added.

Three drops of a solution of iodine, 0·5; potassium iodide, 5; water, 10; are added to 100 c.c. of a bath made up of: Hydroquinone, 10; anhydrous sodium sulphite, 40; potassium bromide, 1; saturated solution of sodium carbonate, 100; and the whole is made up to 250 c.c.

Intensification.—In ordinary mercurial intensification the image may be blackened by a solution containing 2 per cent. of tartaric acid and 2 per cent. of stannous chloride

Positive Work: Kallitype.—The paper is sensitised with ric oxalate, 17·3; silver nitrate, 6·9; water, 100; and ay be developed in one of the following baths:—

	Black Tones.	Purple Tones.	Sepia Tones.
	Per Cent.	Per Cent.	Per Cent.
rax	13·5	13·5	...
mmon salt	9·0	2·0	5·6
ater	100·0	100·0	100·0
tassium bichromate, 1 per cent. olution.	20·0	20·0	10·0

A Cheap Platinum Paper.—The paper must be carefully osen: gelatin-sized paper is useless, resin-sized papers are t. The arrowroot solution used for sizing need not be k. Sensitising is carried out with lead oxalate (freshly cipitated), 1 grm.; 20 per cent. solution of ferric oxalate, 0 c.c.; 5 c.c. of this solution are used for a sheet of paper x 40 cm. This paper keeps better than ordinary paper, l needs less precaution against damp while printing. e developer is made up of one part of a solution of assium chloroplatinite, 1:6, and 10 parts of a solution sisting of:—Potassium oxalate, 100; potassium phos- ate, 50; distilled water, 1,000. Time of development, two nutes. The image is fixed in an acid bath containing –20 c.c. of hydrochloric acid per litre, weaker baths, and ally pure water being used for washing.

Carbon Paper with Salicylic Acid.—The keeping qualities carbon paper sensitised in the hot weather are much proved by the addition of salicylic acid to the sensitising h.

Positive Collodion Process.—Wandolleck has described a ple collodion contact-printing process. The glass, pro- ed with a rubber substratum, is coated with negative lodion, sensitised in the following bath:—Silver nitrate, grms.; nitric acid, 25 drops; 3 per cent. solution of assium iodide, 5 c.c.; water, 1,000 c.c.; and finally ated with a 3 per cent. solution of tannin. For develop- nt, 5 c.c. of a 1 per cent. solution of silver nitrate is ed to 30 c.c. of: pyrogallol, 1 grm.; citric acid, 1 grm.; er, 300 c.c.

Colour Photography.—Goddé gives the following direc- s for working the Lippmann process. The emulsion st never be heated above 32° C., or the requirements of nsparency, continuity, and grainlessness may be lost:— —Drescher gelatin, 4 grms; potassium bromide, 3 grm.; alcoholic solution of methyl violet, 1,500, c.c.; distilled water, 90 c.c. B.—Silver nitrate, 0·75 .; distilled water, 10 c.c. The solutions are made in h covered flasks; B is added to A in small quantities h agitation, and the resulting emulsion put through a ver filter at 32° C. The coated plates are placed in 90 p cent. alcohol for 30 minutes, washed in running water, a allowed to drain and dry. In this state they may be kept several months. For use they are sensitised in:—Silver ate, 1 per cent. solution, 2; erythrosine, 0·25; ammonia 2°, 5; distilled water, 50; after exposure the plates are eloped (in 15 to 20 seconds) in:—Ammonia at 22°, 2; assium bromide, 10 per cent. solution, 10; water, 35; er cent. solution of pyrogallol, 10; the image is fixed washed rapidly. Should the colours not appear on ng, intensification may be resorted to.—J. W. H.

Oxidising Agents for the Destruction of Sodium Thiosulphate. Lumière Brothers and A. Seyewetz. Monit. ient., 1902, **16**, [726], 416—419.

ine water, bromine water, iodic acid, hypochlorites, oxide of sodium, chromic acid, bichromates, and potas- permanganate, are all useless for eliminating the last s of thiosulphate from photographic prints, on account eir action on the film or the image. Ammonium per- ate with the addition of substances such as alkali nates, bicarbonates, phosphates, borates, tungstates, tes, &c., to neutralise the acid liberated, proves itself best eliminator.—J. W. H.

Persulphuric Acid and Persulphate of Ammonium. [*Photographic Reducers.*] Brit. J. Phot., 1902, **49**, [2196], 444, 445.

With solutions of ammonium persulphate of lower strength than two per cent., the formation of spots and markings on the negative under reduction, does not take place. It is not absolutely essential, as generally stated, that the solution be freshly made. It is unwise to immerse the negative in a bath of sodium sulphite, immediately after reduction; a preliminary washing should always be given. If speed be an object, the negative, after remaining a few minutes in the "sulphite" bath, may be transferred to a fresh normal "hypo" fixing solution.—J. W. H.

English Patent.

Packing Material for Articles Sensitive to Light. C. L. A. Schwarz, Steglitz, Berlin. Eng. Pat. 19,222, Sept. 26, 1901.

Sensitised paper is exposed to light, or exposed and developed, till it has become black. Such a material is stated to be much more opaque to actinic rays than ordinary black paper, and is necessarily free from any injurious action upon the articles wrapped up in it. In the case of a continuous film, part of that film may be exposed and developed, and then used to protect the remainder. Celluloid or fabric can be employed instead of paper as the support.—F. H. L.

Photographic Images, Pictures, or Records; Method and Apparatus for the Production of ——. [*Hertzian Waves.*] A. Koro, Munich, Germany. Eng. Pat. 1325, Jan. 17, 1902.

The photographic image in the transmitter is transferred to sensitive paper, or the like, in a receiver by radiations from an electrode supplied in a vacuum tube with Hertzian waves, which can be regulated. The vacuum tube is provided with a coating impenetrable by photographically active rays, but has a small aperture for them, past which the sensitive paper is moved synchronously with the movement of the picture bearer in the transmitter. The active electrode of the tube is connected to one pole of the secondary coil of a Tesla apparatus, and in the connection a spark gap is provided which is regulated by the higher or lower degree of illumination of the selenium cell.—G. H. R.

Photographic and Like Prints by Artificial Light; Apparatus for Producing ——. E. C. Varry, Paris. Eng. Pat. 9608, April 25, 1902.

A modification of Eng. Pat. 8886, 1901. The movable reflector there described is closed top and bottom with more or less sloping partitions, which are pierced for the passage of the lamp, and serve as a support therefor. The reflectors are so constructed as to give uniform illumination.

—F. H. L.

United States Patent.

Photographic Developer; Process of Making ——, *and of Developing Photographic Pictures.* A. Eichengrün and K. Demeler, Elberfeld, Germany, (Assignors to the Farbenfabriken of Elberfeld Co., New York). U.S. Pats. 703,241, 703,242, and 703,243, June 24, 1902.

See Eng. Pat. 10,721, May 23, 1901; this Journal, 1902, 723.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

United States Patents.

Nitroglycerin; Apparatus for the Manufacture of ——. F. L. Nathan, J. M. Thomson and W. Rintoul, Waltham Abbey, England. U.S. Pat. 702,325, June 10, 1902.

See Eng. Pat. 15,983 of 1901; this Journal, 1902, 927.

—G. W. McD.

Detonating Composition. H. von Dahmen, Vienna. U.S. Pat. 702,357, June 10, 1902.

A substitute for fulminate of mercury consisting of copper-ammonium nitrate (30 to 40 parts), potassium nitrate (42

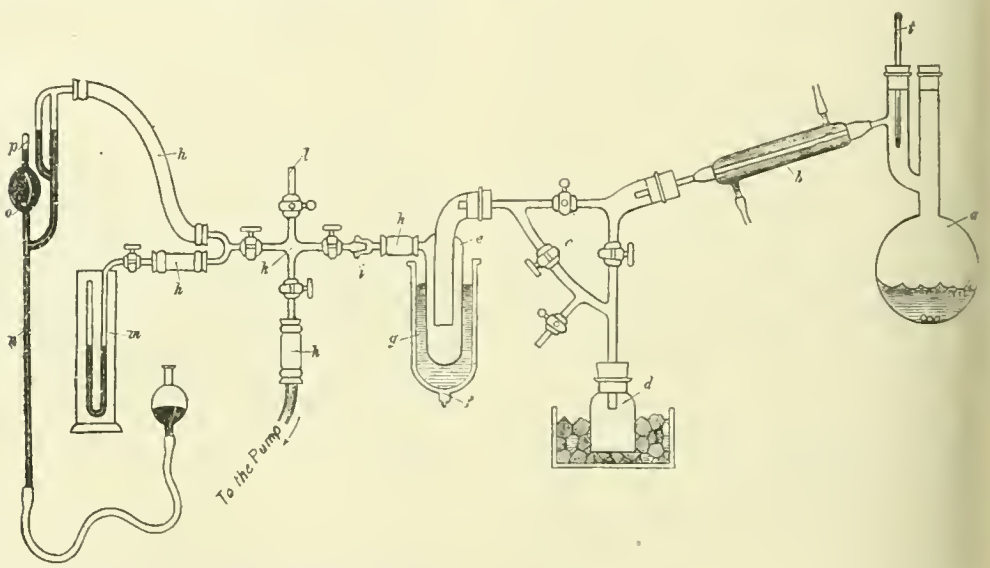
to 25 parts), sulphur (10 to 7 parts), aluminium (18 to 28 parts). The addition of from one-fourth to one-third of ammonium nitrate is said to give increased effect. From 2—3 grms. of the above composition act as an efficient detonator and can be ignited by means of a strong powder-fuze or small nipple cap.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Vacuum Distillations. E. Fischer and C. Harries. Ber., 1902, **35**, [12], 2158—2163.

Krafft constructed an apparatus for distillations at pressures of about 0·5 mm., produced by a mercury pump: the fall in boiling point for the decrease in pressure from 15 to below 0·5 mm. is 70°—105° C. (this Journal, 1896, 214; Ber., **29**, 1316, 2240). Krafft's apparatus is suitable for the distillation of pure substances, which produce a vapour of sufficiently low tension at the temperature of an ordinary condenser. It is, however, insufficient when gases or volatile liquids—ether, alcohol, hydrocarbons—are present or are produced during the distillation, and is unsuitable when large quantities of substance are to be fractionated, since air enters on changing the receivers, or through leakages in the receiving apparatus. The action of the mercury pump



is then much too slow. These difficulties have been removed by the use of a mechanical air-pump, and by interposing a receiver cooled by liquid air, which condenses all vapours and most gases.

The pump used was the "Geryk" vacuum pump, type C, which requires about ½ h.p. to drive it; probably type B would suffice for most purposes. The distilling flask *a* is heated in an oil bath; the side tube is filled with glass beads and carries the thermometer; it should be surrounded by asbestos. The condenser is supplied, in the case of low-boiling substances, with a cooled solution of calcium chloride. The arrangement *e* with four taps enables the receiver *d* to be changed without diminishing the vacuum. The receiver *e*, which is entered by a very wide tube in order to avoid danger of stoppage, stands in a Dewar's vessel filled with liquid air. The four taps of the glass apparatus *k* make connection with the pump, the atmosphere and the manometers, of which there are two, *m* and the MacLeod gauge *o*, as modified by Kahlbaum. For convenience in setting up the apparatus there is a ground-glass joint at *i*; all other connections are made with rubber, the glass being first wetted with rubber solution. A constant vacuum of 0·15—0·2 mm. can be maintained; with a 1-litre distilling flask this vacuum is reached in about 10 minutes.

Oleïc acid distilled from a 250 c.c. flask at the rate of 30 drops per minute, with the bath at 200° C.; the temperature of the vapour was 143° C. The distillation is much accelerated by raising the temperature of the oil bath. α-Methylglucoside was heated over the open flame; the vapours were at 200° C. The distillate at once solidified to a colourless, crystalline mass. In the dry distillation of Para rubber over the open flame, the pressure remained constant at 0·25 mm., but when the cooled receiver was removed, the pressure at once rose to 15—20 mm. Under these conditions, isoprene and dipentene were formed in small quantity; the main product boiled at 180°—300°.

The liquid air may be replaced, not quite with equal effect, by a mixture of solid carbon dioxide and ether. Water vapour may be removed by drying tubes, as used by Krafft.—A. C. W.

INORGANIC—QUANTITATIVE.

Ammonia in Water; Determination of ——. O. Emmerling. Ber., 1902, **35**, [12], 2291.

In determining the ammonia in water by Nessler's reagent the reagent is often added directly to the water, without first distilling. This method may lead to error, if ammonous substances be present in any quantity, which may be the case in sewage rich in organic matter. Small quantities of peptone, albumin, or glue entirely prevent Nessler's reagent from giving a coloration with water containing 0·001 grm. of NH_3 in 100 c.c. In the case of highly contaminated waters, distillation with caustic lime or better with magnesia, is therefore essential. The author has used lead hydroxide with success in place of magnesia. Amino-acids do not prevent the coloration with Nessler's reagent.—A. C. W.

Thiocyanates; Determination of ——. Rupp and A. Schied. Ber., **35**, [12], 2191—2195.

Thiocyanates react with iodine in the presence of an alkali carbonate according to the equation—

$$KSCN + 8I + 4H_2O = H_2SO_4 + 6HI + KI + IC.$$

A known quantity of thiocyanate solution is allowed to stand with excess of decinormal iodine solution and about 1 grm. of sodium bicarbonate in a stoppered bottle for half an hour in the dark and the excess of iodine titrated with sodium thiosulphate. Shaking the bottle should be avoided in order to prevent the evolution of carbon dioxide. The presence of cyanogen iodide prevents the use of starch as an indicator and on account of the yellow colour produced

he same compound with potassium iodide, it is advisable ork with such quantities that not more than 20 c.c. of odine solution are required. The end reaction can be taken as the disappearance of yellow colour from olution. The method gives good results in estimating yanates in the presence of chlorides. In the presence anides, boiling with about half a grm. of tartaric acid 5 minutes in an open flask, is sufficient to get rid of ydrocyanic acid, and the thiocyanates may then be ated as above.

the same way a mixture containing thiocyanates with ides and chorides can be estimated.

c.c. of the solution are precipitated with 20 c.c. of ormal silver nitrate, acidified with nitric acid, the ion is made up to 100 c.c. and filtered, excess of silver estimated in the filtrate with decinormal potassium yanate.

c.c. of the original solution are boiled for 15 minutes 1 grm. of tartaric acid to decompose the cyanide, and olution made up to 100 c.c. In 20 c.c. of this diluted ion, the chloride and thiocyanate are determined by ard's method and in a further 10 c.c., the thiocyanate imated with iodine solution as above.—B. F. D.

r; Losses of ——, *in Cupelling with Varying Amounts Lead and Silver.* W. H. Kauffman. Eng. and ning J., 1902, **73**, [24], 829.

author made a series of experiments to determine the s of silver on cupellation (1) with the same amounts ver and varying amounts of lead; and (2) with varying nts of silver, from 25 to 200 mgrms; also the influence pper, varying temperatures and various grades of s on the result. Cupels of three kinds were used: ter" cupels made from 3,000 grms. of bone ash, and c.c. of water; "potash" cupels made with the same rtions of bone ash and water, but with 60 grms. of ash dissolved in the water; and "borax" cupels, in the 60 grms. of pearl-ash were replaced by 20 grms. of . The results obtained are set out in tabular form; they to the following conclusions:—The percentage loss of in cupellation is greater with small amounts of silver with larger. The loss is appreciably greater when ead button weighs 25 grms. than when it weighs but as., except with the buttons containing 25 mgrms. of . With 10 and 15 grm. buttons the losses are generally er than with 25 grm. buttons, and larger than with m. buttons. The losses are not increased by the nce of copper up to 100 mgrms. The nature of the appears in general to have no influence on the loss ver. Excessive heat causes greater losses than large nts of lead. The smallest losses occur when a small utton is cupelled at a low temperature.—A. S.

nganese in Steel; Rapid Determination of ——. Ramorino. Monit. Scient., 1902, **16**, [726], 119.

grms. of the steel filings are dissolved in 30 c.c. of acid (1·2 sp. gr.) and the solution boiled to drive off is fumes. 20 c.c. of hrominated hydrochloric acid e by adding 10 c.c. of strong bromine water to 10 c.c. drochloric acid (sp. gr. 1·19) are then added. The on is boiled for 10 minutes for the expulsion of the ine, diluted to 200 c.c. with cold distilled water and erred to a litre flask; 25 grms. of pure precipitated xide and 200 c.c. of boiling water are now added, and ixture allowed to stand. Titration is carried out with ard permanganate solution.—J. W. H.

dium; Electrolytic Determination of ——. P. chot. Ann. Chim. anal. appl., **7**, 165—167. Chem. tr., 1902, **1**, [26], 1423.

NTLY ammoniacal hot solution of sodium vanadate is posed by the electric current with the separation of ium in the form of a hydrated oxide. The vanadium t of the solution may vary between 0·012 and 0·05 of V_2O_5 per 200 c.c. The electrolysis is carried out —90° C., with a current of 2—2·5 volts at 0·3 ampère cathode surface of about 8 sq. cm.; the time required ut 8—10 hours. During electrolysis the volume of the liquid is kept constant by the addition of hot, faintly ammoniacal water. When the separation is complete, the brownish-yellow deposit is washed with water and alcohol, and ignited, whereon it melts and is converted into the dark reddish-yellow V_2O_5, which on slow cooling in dry air solidifies in the form of long needles. A blue or green colour indicates incomplete conversion into V_2O_5.—A. S.

Vanadium from Molybdenum; Detection of Small Quantities of Vanadium and Separation of ——. P. Truchot. Ann. Chim. anal. appl., **7**, 167—168. Chem. Centr., 1902, **1**, [26], 1424.

THE precipitate obtained by the method already described (see preceding abstract) may be distinctly recognised, even if it contain only 0·0001 grm. of V_2O_5. After washing with water and alcohol, and removal of the latter, it is fused with potassium bisulphate, and the melt treated with two or three drops of sulphuric acid. The vanadium gives a characteristic yellow colour, which on the addition of a few crystals of strychnine sulphate, changes first to bluish violet and then to a vivid rose colour. In this way as little as $\frac{1}{1000000}$ grm. of V_2O_5 can be detected. Atropine, caffeine, and santonine do not give a colour reaction. With phenol a dark green, and with pyrogallol a brownish-black, colour is produced.

In separating vanadium electrolytically under the conditions described (*loc. cit.*) molybdenum is also deposited as black hydrated sesquioxide which on ignition is converted into molybdic acid and as such is volatilised at a red heat. Molybdenum and vanadium can therefore be separated by removing the electrolytic deposit and carefully igniting it to constant weight.—A. S.

ORGANIC—QUANTITATIVE.

Indigo; Volumetric Determination of ——, *by means of Sodium Hydrosulphite.* A. Wangerin and D. Vorländer. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [11], 281—289.

THE volumetric method of estimating indigotine in Indigo, proposed in 1880 by Bernthsen (Ber., **13**, 2277), is stated to possess the following advantages:—(1) It gives the most exact results, the hydrosulphite not being affected (as are the reagents employed in other methods) by the impurities present in the Indigo; (2) It requires the least time (5—6 hours) and the smallest amount of substance (0·1—0·2 grm.) for a determination; and (3) it is subject to the fewest sources of error, the end-reaction being well defined.

Preparation of Pure Indigotine.—In order to obtain pure indigotine, it is unnecessary to crystallise it from phthalic anhydride, as recommended by the Badische Co. The following treatment suffices for the purpose:—1 part of "Indigo pure" in powder (98 per cent.), is reduced and dissolved by means of 12 parts of caustic soda-lye (sp. gr., 1·21), 30 parts of concentrated sodium hydrosulphite solution and 10 parts of water, the mixture being heated at 40°—50° C., and occasionally stirred, while a stream of coal gas is passed into it. The solution thus produced is filtered as quickly as possible, and the indigotine precipitated from the clear yellow or greenish yellow filtrate by a current of air. The precipitate is collected on a filter and washed in succession with hot water, hot dilute hydrochloric acid (30 parts of fuming acid per litre), water, alcohol (several times) and a little ether. The hydrochloric acid and alcoho remove a colouring matter which dissolves in the former reagent with a purple colour. The residne is then dried at 105°—110° C.

Standard Solution of "Indigo."—Sixty per cent. sulphuric acid, even when applied in large excess, is without action upon indigotine. Ordinary concentrated acid (94 per cent.) acts rapidly and completely; at a temperature of 95°—100° C., with frequent stirring of the mixture, 10 parts dissolve 1 part of indigotine in half-an-hour's time; an excess of acid of this density has no destructive action on the sulphonic acid which is formed. At 100° C., 100 per cent. acid in excess, causes a slight loss of indigotine sulphonic acid, whilst anhydro-sulphuric acid, containing 8 per cent. of sulphuric anhydride, occasions a loss of 2—14 per cent. of the latter. Ordinary concentrated acid is,

therefore, to be preferred for the sulphonation. The following method was adopted :—1 grm. of finely powdered pure indigotine is heated in a small flask with 10 c.c. of 94 per cent. sulphuric acid, on the water bath for ½—1 hour, the mixture being frequently stirred. After cooling, the solution is poured into a beaker containing 100—150 c.c. of water; it is then filtered through a hardened filter, the residue is washed with warm water, and the combined filtrate and washings, when cold, are diluted to a litre.

Standard Sodium Hydrosulphite Solution.—A modification of the method given by the Badische Co. is recommended. This consists in saturating 500 c.c. of sodium bisulphite solution (sp. gr., 1·37—1·39) with sulphur dioxide, diluting to 750 c.c. and gradually adding 35 grms. of powdered zinc suspended in 250 c.c. of water, while passing a stream of coal gas into the mixture, cooling it externally with ice, and gently stirring it. The mixture is allowed to stand for 1—2 hours; the clear solution is next withdrawn into a 2 litre flask containing 200 c.c. of milk of lime (25 per cent.) with which it is shaken; the mixture is then left overnight in an atmosphere of coal gas. Finally the clear solution is removed, rendered distinctly alkaline with caustic potash (5—7·5 c.c. of a lye of sp. gr. 1·383), and standardised by means of the 0·1 per cent. solution of Indigo, 1·5—2·0 c.c. being required to decolorise 50 c.c. of the latter. For use, the solution should be diluted so that 30—40 c.c. are needed for 100 c.c. of the 0·1 per cent. solution of Indigo. Under a layer of benzene, and in an atmosphere of coal gas, it may be kept for several hours with very little change.

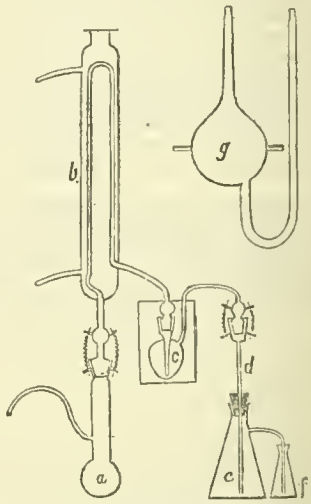
Determination of the Oxygen-Value of the Water used.—Experiments were made with water boiled and cooled in atmospheres of coal gas and of hydrogen, and with water treated with carbon dioxide, in all of which dissolved oxygen was found. The same was the case when the titration was made in an atmosphere of hydrogen. As it is thus found to be impracticable to make the titrations in water free from oxygen, it is necessary in order to obtain exact results, to ascertain the oxygen-value of the water employed. To this end a measured volume of the standard Indigo solution is taken and titrated with the standard hydrosulphite solution. A measured volume of the distilled water of the laboratory, after having been allowed to stand exposed to the air for several hours, in order that it shall be saturated with oxygen, is then added to a similar volume of the Indigo solution, and the mixture is titrated under the same conditions as before.

Correction of the Analytical Results.—100 c.c. of a solution of 0·1 grm. of Bengal Indigo, which was dissolved in sulphuric acid and diluted to 1000 c.c., required for decolorisation 21·80 c.c. of standard hydrosulphite solution. The same volume of the standard Indigo solution required 31·60 c.c., and, after the addition of 100 c.c. of distilled water, 33·94 c.c. of the latter solution; that is 100 c.c. of water required 2·34 c.c. of the hydrosulphite solution. Deducting this volume from the volumes observed in the determination, namely 21·80 and 31·60 c.c., the percentage of indigotine in the sample is found to be $\frac{19·46 \times 100}{29·26} = 66·5$.

—E. B.

Glycerin ; Determination of ——. S. Zeisel and R. Fanto. Zeits. landw. Versuchsw. Oesterr., 1902, **5**, 729 ; through Chem.-Zeit., 1902, **26**, [50], Rep. 173—174.

The authors' new method is based upon the formation of isopropyl iodide by the action of boiling hydriodic acid (sp. gr., 1·7) upon the glycerin. The volatile alkyl iodide is conducted into an alcoholic solution of silver nitrate, where it forms an equivalent quantity of silver iodide, which is determined gravimetrically or volumetrically. The apparatus is a modification of that used by Zeisel for methoxyl determinations. It consists of a boiling flask *a*, of about 40 c.c. capacity, provided with a side tube for the introduction of carbon dioxide ; a condenser, *b*, which contains tepid water and is attached at its openings to Ehmann's heating arrangement, *g* ; a bulb apparatus, *c*, immersed in water, for counting bubbles, and filled to about a third with a thin mixture of pure red phosphorus in water or with potassium arsenite solution ; and Erlenmeyer flasks, *e* and *f*, the larger with a mark at 45 c.c. and the smaller with a mark at 5 c.c. The water in the condenser is maintained at a temperature of 50°—70° C., and a small flame is placed below the beaker containing the bulb, *c*, so that the water here is of about the same temperature as that in the condenser. The two receivers, *e* and *f*, are charged to their respective marks with clear silver nitrate



solution, and the glycerin weighed out into *a*, the amount being regulated so as not to produce more than 0·4 grm. of silver iodide. A fragment of pumice stone is introduced, then 15 c.c. of the hydriodic acid solution, and the flask immediately connected with the condenser, and by its side tube with a Kipp's carbon dioxide apparatus, from which the gas is passing through dilute sodium carbonate solution at the rate of 3 bubbles per second. If the glycerin be anhydrous, hydriodic acid of specific gravity 1·7 is used ; in other cases acid of specific gravity, 1·9. The boiling-flask is immersed in a glycerin bath, so that the level of the liquid inside and outside are the same, and the bath is heated by a small flame so as to keep the hydriodic acid gently boiling throughout the determination. When the liquid above the precipitated silver iodide becomes clear, the contents of the Erlenmeyer flasks are transferred to a large beaker, water added to make about 450 c.c., then 10 to 15 drops of dilute nitric acid, and the silver iodide determined.—C. A. M.

Tannin ; New Method of Determining ——. E. Cronzel. Rep. Pharm., 1902, **14**, 248 ; through Chem.-Zeit., 1902, **26**, [50], Rep. 174.

The method is based upon the insolubility of the tannate of analgesin (dimethyl-phenylpyrazolone) in water. The tannin under examination is dissolved in water, analgesin added until no more precipitate is formed, and the amount of tannin calculated from the quantity of precipitant employed. When it is difficult to determine the end of the reaction, an excess of analgesin is added, and then about twice that amount of sodium bicarbonate, which causes the precipitate to separate out sharply. The analgesin tannate is collected on a weighed filter, washed with water dried at 100° C., and weighed. It is a brownish yellow mass which hardens in the air, and acquires a resin-like odour. The method can also be employed volumetrically though the final point of the reaction is difficult to determine.—C. A. M.

Malt Analysis. A. R. Ling.

See under XVII., *page* 983.

Organic Nitrogen in Waters ; Determination of —— H. Causse. Comptes Rend., **134**, [25], 1520—1522.

As a substitute for the albuminoid ammonia process, the author uses the following :—To the water add, for each

li . 25 c.c. of saturated baryta water containing 20 per
c . of barium chloride, close the flask and allow to
r ain 24 hours. Collect and wash the precipitate, place
in flask, treat for 20—25 minutes on the water-bath with
t e its volume of 10 per cent. potassium carbonate
s tion, decant off the solution through a filter, repeat the
t tment of the precipitate with half the former quantity
o tassium carbonate solution, filter and wash. To the
u ed filtrates add sulphuric acid till strongly acid, and
e orate. Transfer the dry residue to a small flask, and
b with 5 c.c. of concentrated sulphuric acid till the
o nic matter is completely destroyed. After cooling add
1 c.c. of distilled water, boil off any sulphur dioxide, cool,
a phenolphthalein and potash till in slight excess, make
u o 200 c.c. and distil. Collect 25—30 c.c., cool, distil
a her 25—30 c.c., unite the two distillates, and Nesslerise.
I he water of the Rhone, by this method, the average
a unts of organic nitrogen found, were January—March,
0 ; April—May, 0·05; June—October, 0·06 to 0·08;
N ember—December, 0·04 to 0·03 mgrm. per litre.

he author finds that Methyl Violet decolorised by sul-
p ous acid is a delicate reagent for organic nitrogen,
b g coloured by waters free from it, but not by those
c ining it in sufficient quantity; he proposes to take as
t limit of admissible organic nitrogen in a water that
a nt which will just give no indication with this solution
— 08 mgrm. per litre. This limit agrees very well with
t long ago suggested by Wanklyn.—J. T. D.

XIV.—SCIENTIFIC & TECHNICAL NOTES.

A lysis of Volcanic Dust collected at Sea off St. Vincent Captain Edwards, SS. "Louisianian." First Report P. Carmody, Government Analyst.

Chemical Composition.

uble in water :—		
hlorine	0·05 per cent.	
otash	trace.	
oda	„	
ime	„ (large).	
ulphates	„ „	0·45 per cent.
able in acids (3 hours) :—		
on oxide as FeO	5·60	
ilica, alumina, &c.	11·81	
ime	2·94	
lagnesia	trace.	
ulphates	traces.	
hosphates	„	20·35 per cent.
oluble in acids :—		
ilica and silicates of iron, lime, &c.		78·10 „
oss on ignition		0·50 „
		99·40 „

marks.—The water solution is neutral, and contains
ch ly sulphate of lime with perhaps a small proportion
of icate of lime.

e dust consists chiefly of silica, and silicates of iron
a ime. The iron is present mostly in the form of ferrous
si te.

e portion insoluble in acids was fused, and found to
co st of—

Silica	42·90 per cent.
Iron silicates, &c.	28·35. „
Lime	6·85 „

anurial Value.—This is very low. Potash and phos-
ph c acid are present only in traces, and nitrogen is
al ether absent.

arly 10 per cent. of lime must have [a beneficial effect
on ay soils, and probably accounts for the local belief in
th igh manurial value of these volcanic ashes. But the mechanical advantages of these ashes in loosening and drying heavy clay soils are appreciable.

Microscopic Appearance.—Under the microscope there are three distinct minerals visible :—

1. Clear crystals, many showing cross markings.
2. A pale bottle-green crystal—a silicate of iron.
3. A black lustrous crystal.

Fineness.—The following proportions remained on sieves of the following sizes :—

Meshes per Inch.	Per Cent.
30	Nil.
40	0·0
50	1·0
60	3·0
70	7·0
80	28·0
90	25·0
100	10·0
Passed through 100 sieve	26·0

Density.—The specific gravity is shown and compared with the corresponding figures for dust from other sources :—

Name.	Specific Gravity.	Weight per Cubic Foot in Ounces or per Cubic Metre in Kilos.
"Louisianian" dust	1·08	1080
Barbados dust	1·23	1235
St. Pierre „	1·28	1287

It is remarkable that the Barbados dust (sent by the Imperial Department of Agriculture) is nearly as heavy as that which fell at St. Pierre.

Magnetic Condition.—Three and a half per cent. of the dust is attracted by a magnet. This portion is the magnetic oxide of iron and not metallic iron.

It is remarkable that the same percentages were attracted from the Barbados and St. Pierre dusts.

The Barbados dust is similar in chemical and microscopical composition to that from the "Louisianian"; but under the microscope the St. Pierre dust differs from the other two.

Volcanic Dust : Comparative Results of Analysis.
Second Report, P. Carmody.

	SS. "Louisianian."	Barbados.	St. Pierre, Martinique.
	Per Cent.	Per Cent.	Per Cent.
Soluble in water :			
Chlorine	0·05	0·09	0·05
Soda	0·05	0·09	0·05
Lime	0·05	0·09	0·05
Sulphates	0·05	0·09	trace
Total	0·45	0·45	0·30
Soluble in acids (two hours) :			
Iron oxide as FeO	5·60	5·01	3·59
Silica, alumina, &c.	11·81	6·89	2·01
Lime	2·94	3·36	1·13
Magnesia	trace	0·40	0·22
Potash	—	0·05	0·05
Potash	trace	trace	trace
Soda	—	0·44	0·22
Sulphates	traces	0·23	0·02
Phosphates	traces	traces	0·11
Total	20·35	16·38	7·35
Insoluble in acids : Silica and silicates of iron, lime, &c.	78·10	83·30	92·23
Loss on ignition	0·50	0·40	0·40
Total	99·40	100·53	100·28

The insoluble in acids was fused and found then to consist of :—

—	SS. "Louisianian."	Barbados.	St. Pierre, Martinique.
	Per Cent.	Per Cent.	Per Cent.
Silica	42·90	48·48	59·80
Iron silicates, &c..	28·35	31·57	27·73
Lime	6·85	3·25	4·70
Total	78·10	83·30	92·23

Fineness.—The following proportions remained on sieves of the following sizes :—

Meshes per Inch.	SS. "Louisianian."	Barbados.	St. Pierre, Martinique.
	Per Cent.	Per Cent.	Per Cent.
30.....	Nil.	Nil.	2
40.....	Nil.	1	12
50.....	1	1	10
60.....	3	2	7
70.....	7	6	11
80.....	28	41	8
90.....	25	12	7
100.....	10	6	4
Passed through 100	26	31	39

Remarks.—There is practically the same amount soluble in water, and volatile on heating in all three samples.

The proportion soluble in acids differs very considerably. The amount of lime is greatest in the dust of lowest specific gravity.

As regards fineness the St. Pierre dust contains, as might be expected, coarser particles than the other two.

The St. Pierre dust contains a reddish mineral in the form of short cylinders which is not present in the other two, and there is also a slight difference when viewed by polarised light.

(See also this Journal, 1902, 931.)

Radio-active Bismuth (Polonium). W. Marckwald. Ber., 35, [12], 2285—2288.

A residue, obtained by treating pitchblende from Joachimsthal with concentrated sulphuric acid and washing out with water, was found to contain about 1 per cent. of radio-active bismuth, which, after the lapse of several months, showed no decrease in its activity.

By immersing a polished rod of bismuth in a hydrochloric acid solution of the chloride of this metal, the whole of the radioactive element was, in the course of three days, deposited on the rod, to the amount of about 0.1 per cent. of the material employed. The bismuth salt left in solution was inactive, and no further precipitation could be obtained on a fresh rod. The deposit on the bismuth bar is easily detached. It melts to a white, brittle, metallic globule, giving off at the same time a small amount of a chloride. The metal is soluble in nitric acid, and the solution gives the characteristic reactions of bismuth. Both the metal and its salts are strongly radioactive. The coated bismuth rod energetically discharges an electroscope, but the radiations have little penetrative power, being arrested by wrapping the rod in filter paper.—M. J. S.

Gold; Colloidal Form of ——. C. Paal. Ber., 35, [12], 2236—2244.

Protalbinic acid dissolved in caustic soda gives a yellow precipitate with gold chloride; by addition of more caustic alkali, and warming for several hours on the water bath, the precipitate dissolves to a deep red solution transparent only in thin layers. Dialysis causes no separation of the gold. With alcohol, the purified solution gave a red precipitate which, after drying and keeping for two years, was still completely soluble in water. Heating to 100° C. *in vacuo* did not destroy its solubility. Hydrazine hydrate and metallic mercury had no action on these solutions. Ammonium sulphide in the cold had no effect, but on warming, a black precipitate was thrown down. Acetic acid gave a precipitate, which, after drying and heating to 100° C. *in vacuo*, was still completely soluble in alkalis to a deep red solution.

A number of similar preparations were made from lysalbinic acid. They were characterised by their great stability as compared with the corresponding silver preparations. Sodium chloride and phosphate had no effect on these solutions, but calcium chloride, after long standing, produced a blue coloration and precipitation of insoluble gold.—B. F. D.

Silver Oxide; Colloidal Form of ——. C. Paal. Ber., 35, [12], 2206—2218.

The silver salts of protalbinic and lysalbinic acids were prepared by precipitating the soluble sodium salts with silver nitrate. The white precipitates so obtained were soluble in caustic soda to a brown turbid solution transparent only in thin layers. On dialysis of this solution a trace of silver diffuses through the membrane. On addition of ammonia the solution becomes clear, and silver readily diffuses through the dialyser. Acetic acid produces a white precipitate soluble in excess, and from this solution silver is also readily diffusible. Sodium chloride and potassium iodide give no precipitate, but a milky appearance is produced. The freshly prepared solution, allowed to stand in the dark, becomes gradually dark brown in colour without any appearance of a precipitate; ammonia destroys this coloration and clears the solution. Ammonium sulphide gives a brown coloration but no precipitate, even on boiling.

The author concludes that the silver in these alkali solutions is not present in organic combination, but as colloidal silver hydroxide held in solution by the albinic acid compounds present. On standing, the silver hydroxide is converted into oxide, hence the brown coloration removed by ammonia. On warming the alkaline solution and also on addition of hydrazine hydrate, the silver oxide is rapidly reduced to colloidal silver.

The solution of silver albinate in caustic soda can be precipitated with alcohol, the whole of the silver being found in the precipitate in a soluble form. This precipitate can be dried and heated to 100° C. *in vacuo* without losing its soluble properties. Silver nitrate added to the original solution produces a precipitate soluble in excess of caustic soda. By repeated additions of silver salt and caustic alkali solutions are obtained rich in silver; these are purified from sodium salts by dialysis, and obtained in a dry soluble form with over 70 per cent. of silver. Such preparations remain soluble in water and caustic alkalis for over a year.

—B. F. D.

Silver; Colloidal Form of ——. C. Paal. Ber., 35, [12], 2224—2236.

The solution of colloidal silver hydrate described in the preceding abstract, after long standing becomes dark in colour. Addition of ammonia fails to reproduce the original clear yellow colour entirely. This is due to the presence of colloidal silver, produced by reduction of silver oxide by the organic compounds present. The same reduction may be brought about by warming with excess of alkali on the water-bath and by the addition of hydrazine hydrate. In these cases the reduction proceeds quantitatively from silver hydroxide to metallic silver. These solutions of colloidal silver purified by dialysis, are considerably more stable than solutions prepared by inorganic methods. An electric current produced no change in the organic preparation nor had metallic mercury any solvent effect on the silver. Sodium and calcium chlorides in large excess produce no precipitate in the cold, although on warming, a brown precipitate insoluble in alkalis was thrown down. Dilute ammonium sulphide, even on warming, gave no precipitate. Dilute acids throw down a precipitate insoluble in water and alcohol, but soluble in alkalis. This precipitate can be dried and retains its solubility in alkalis. A preparation with over 90 per cent. of silver was kept for two years and was then completely soluble in caustic soda.

Experiments showed that the stability of these preparations is directly proportional to the quantity of organic matter present.—B. F. D.

Mercuric Oxide; Colloidal Form of ——. C. Paal. Ber., 35, [12], 2219—2223.

The mercury salts of the albinic acids were prepared by precipitating hot solutions of the sodium salt with mercuric chloride. They dissolved in caustic soda to yellow turbid solutions in which ammonium sulphide produced no precipitate in the cold; on warming, however, a precipitate was thrown down. Diffused sunlight reduced the solution slowly, and hydrazine hydrate precipitated metallic mercury at once; metallic copper had no effect. From these solutions mercury did not diffuse on dialysis, but on addition of hydrochloric or acetic acid, soluble salts of mercury are formed, which readily pass through the dialyser. In the same way as with silver, solutions containing large percentages of mercury may be prepared by addition of caustic soda and mercuric chloride to the original solution. Such preparations, purified by dialysis and evaporated *in vacuo*, contained over 40 per cent. of mercury, and did not lose their soluble properties by keeping in the dark.—B. F. D.

Aluminium Chloride; Compounds of ——, *with Hydrogen Sulphide.* E. Baud. Comptes Rend., 134, [24], 1429—1431.

Gaseous hydrogen sulphide has no action on aluminium chloride unless the latter be, as in Wöhler's experiments, in the state of vapour; but liquid hydrogen sulphide will dissolve solid aluminium chloride, forming a compound $Al_2Cl_6.2H_2S$, which dissociates at $-45°$ C., giving off hydrogen sulphide, and leaving a compound, $Al_2Cl_6.H_2S$, which is stable at the ordinary temperature.—J. T. D.

Zinc Oxide; Polymerisation and Heat of Formation of ——. De Forcrand. Comptes Rend., 134, [24], 1426—1429.

Favre, Andrews, Favre and Silbermann, and Marignac found, respectively, for the heat of formation of zinc oxide 86·37, 86·93, 84·22 to 84·98, and 85·27 calories. The first two measurements were direct, the others differential. Thomsen, however, found that the heat of formation varied with the source of the oxide, that obtained by calcining the nitrate at dull redness giving 88·30 for the value, whilst that made by dehydrating the precipitated hydrate gave values which decreased, as the temperature and time of dehydration or ignition increased, from 87·77 to 83·27. That polymerisation, arising from prolonged ignition, should thus be an endothermic change, appeared to the author so unusual as to necessitate further investigation. The results of his determinations are as follows:—(1) Zinc oxide prepared by dehydrating at 125° C., the crystallised hydroxide obtained by Runge's method, 80·29 calories; (2) That prepared by decomposing the nitrate at 300° C. and heating the residue for several hours at 350° C. in a current of air, 83·98 calories; (3) That prepared by igniting the precipitated hydroxide at a bright red heat, 84·30 calories; (4) That prepared by the combustion of zinc in oxygen, 84·70 calories. These differences are no doubt due to polymerisation at the higher temperatures, but they show that that polymerisation is exothermic, as was to be expected. It is, moreover, not reversible; the ignited oxide retains its value, however slowly cooled and however long kept.—J. T. D.

Antimony Hydride; Preparation of ——. A. Stock and W. Doht. Ber., 35, [12], 2270—2275.

Of all the antimony alloys examined, that of magnesium is the most advantageous for the preparation of gaseous antimony hydride. The alloy should be prepared by fusing antimony with twice its weight of magnesium, and heating the mixture to a red-heat in iron boats in a stream of hydrogen; it should not be fused. The brown friable powder treated with strongly cooled dilute hydrochloric acid (12 per cent. of HCl) yields a mixture of hydrogen and antimony hydride, containing up to 14 vols. per cent. of the latter gas, and free from other impurities. Nearly three-fourths of the antimony taken is converted into the hydride. By condensing with the aid of liquid air, and fractionally distilling, the antimony hydride is obtained pure. It melts at $-88°$ C. to a colourless liquid and boils at $-17°$ under 760 mm. pressure without leaving any residue. At ordinary temperatures it can be preserved in well-cleaned glass vessels for some hours, but gradually deposits antimony, and at 150° C. decomposes rapidly.—M. J. S.

Sodium Sulphate; Heat of Dilution of ——. A. Colson. Comptes Rend., 134, [25], 1496—1497.

In the case of salts which do not form a number of hydrates the heat of dilution is usually zero at some particular temperature; but where different hydrates may be formed, this will not always be the case. The author has investigated sodium sulphate as a type of such compounds. Three supersaturated solutions, containing, with 200 grms. of $Na_2SO_4.10H_2O$, respectively, 100, 300, and 500 grms. of water, and two unsaturated solutions, containing with the same amount of sulphate 700 and 750 grms. of water, respectively, were prepared; and at various temperatures 100 c.c. of each of these solutions were mixed with 400 c.c. of water, and the resulting absorption or evolution of heat measured. On plotting the results, the curves indicated in every case a temperature at which no heat-change resulted from dilution; but these temperatures were not the same (59°·5, 59°·5, 57°, 52°, and 53° C., respectively, for the solutions in the order given above) for concentrated or dilute solutions, showing that the dissociation of the primitive salt changes with the dilution.—J. T. D.

Arsenic; Existence of —— *in the Organism.* G. Bertrand. Comptes Rend., 134, [24], 1434—1437.

The author has carefully investigated, by Marsh's process, with specially purified materials, the thyroid glands of calves and pigs, pig's bristles, goose quills, cow's horns, dog's skin and claws, and has always found arsenic, in quantities up to 5 mgrms. per kilo. The same result was given by the organs of a heifer and a calf which had been reared in the veterinary school of Alfort, and which were known never to have had arsenical food or medicine; and also by the thyroid glands of seals captured near Spitzbergen. The author considers that his work completely confirms Gautier's statement that arsenic is to be looked on as a naturally occurring constituent of the animal organism. —J. T. D.

Acetylene; Acid Nature of ——. J. Billitzer. Monatsh. für Chem., 1902, 23, [5], 489—501.

The author has measured the solubility at 15° of acetylene and ethylene in water and in aqueous solutions of various concentrations of ammonia, sodium, potassium, barium, and calcium hydroxides, sodium sulphate, and sulphuric acid. The influence on the solubility of the gas exerted by ammonia or barium hydroxide is very small, but increasing amounts of sodium or potassium hydroxide cause very considerable and almost identical diminutions in the quantity of acetylene dissolved. From a comparison of the influences exerted on the solubilities of acetylene and ethylene by the electrolytes given above, it is calculated that in saturated solution under atmospheric pressure, acetylene functions as an acid the dissociation of which is about one-tenth of that of water, and which has a strength about one four-thousandth of that of carbonic acid. The evolution of acetylene from calcium carbide by the action of water must be regarded as a distribution of the base between the two acids, water and acetylene, each of which takes up a quantity of the base proportional to its acidity, assuming that the two salts have the same solubility. The solubility of calcium carbide is unknown, but according to Bodländer's theory, it is about proportional to the acidity of the acetylene, and, calculating on this assumption, it is found that at atmospheric pressure, 99·993 per cent. of the theoretical quantity of gas is evolved in the action of water on calcium carbide. Under a pressure of about 12,000,000 atmospheres, however, no gas would be evolved, whilst acetylene and calcium hydroxide in aqueous solution would yield the theoretical amount of calcium carbide. The stability of silver, copper, and other carbides, towards water is a consequence of their slight solubility.—T. H. P.

Carbon; Formation of Ions of ——. J. Billitzer. Monatsh. für Chem., 1902, **23**, [5], 502—511.

The author has studied the electrolysis of the silver and copper derivatives of acetylene and of ammonia and sodium hydroxide solutions through which acetylene is passing. The solutions named, exhibit a common decomposition voltage of about 0·75 at 18° C. The mean heat absorption of the reaction calculated from the author's measurements is 49·5 Cals., a number agreeing well with the value (53·2 Cals.) obtained by direct measurement. The fact that acetylene salts undergo electrolysis, as well as the observations recorded in the previous abstract, indicate the acid nature of acetylene, so that in aqueous solutions of the gas, the anions, ·C:CH and ·C:C·, must exist; aqueous solutions of the copper or silver derivatives or alkaline solutions of the gas contain the anions ·C:C· and ·C:CR, R representing K, Na, Cu, Ag, &c. Attempts to obtain diacetylene compounds by the discharge of ·C:CR ions were unsuccessful.—T. H. P.

Monose- and Biose-Acetates; Velocity of Saponification of ——. R. Kremann. Monatsh. für Chem., 1902, **23**, [5], 479—488.

The author has measured the velocities of hydrolysis of the pentacetyl- and tetracetylchloro-derivatives of dextrose and galactose, of tetracetylgalactose, and of the octacetyl-derivatives of lactose, maltose, and saccharose by means of sodium hydroxide of various concentrations. The results show that the velocities of hydrolysis of the pentacetyl- and tetracetylchloro-compounds are not constant but diminish as the reaction proceeds, until in some cases they fall to about one-half their initial values. The formation of sodium acetate only accounts for a small part of such retardation, so that it must be assumed that the different acetyl groups are not saponified at the same rate, but that at least one is saponified more quickly than the others. This view is supported by the numbers obtained for tetracetylgalactose, which gives almost constant values for the velocity of saponification, and also by the fact that in the chlorination or nitration of the pentacetyl compounds, and in the partial saponification of tetracetylchlorogalactose, only one acetyl group enters into the reaction. The saponification velocities are smaller for the acetyl-derivatives of dextrose than for those of galactose; this explains why tetracetylchlorodextrose, when treated in ethereal solution with silver nitrate and sodium, yields the tetracetylnitro compound of the sugar, whilst the corresponding galactose derivative gives rise to tetracetylhydroxygalactose. The difference between the saponification velocities of the acetyl-derivatives of dextrose and galactose is also seen in the cases of octacetyl-maltose and octacetyl-lactose; the latter, which contains both a galactose and a dextrose residue, is saponified much more rapidly than the former, which is composed of two dextrose residues. The values for octacetylsaccharose lie between those for the other two octacetyl-derivatives examined.—T. H. P.

Albumin: Action of Caustic Alkalis upon ——. C. Paal. Ber., **35**, [12], 2195—2206.

Albumin is dissolved as completely as possible by heating on the water-bath for about one hour with caustic soda (3 parts in 100 of water). On acidifying the filtered solution with dilute acetic acid, a white precipitate of *protalbinic acid* is thrown down. For the preparation of *lysalbinic acid* the alkaline solution is precipitated with dilute sulphuric acid instead of with acetic acid, and, after filtering, the solution is neutralised with sodium carbonate solution, concentrated, treated with dilute sulphuric acid and dialysed. The residual solution is neutralised with barium hydrate, filtered, and from the filtrate lysalbinic acid is precipitated with alcohol. Both these acids were purified by dialysis, and a number of salts were prepared and examined.—B. F. D.

Amino-acids as Foods for the Lower Plants. O. Emmerling. Ber., 1902, **35**, [12], 2289—2290.

The experiments were conducted by dissolving a small quantity of the amino-acid in a large drop of water containing inorganic nutritive salts free from nitrogen, in the hollow of an object glass, adding spores of the mould, covering with the cover-slip, keeping in a moist chamber at the temperature proper to each mould, and observing the growth every third day. The results are contained in the following table:—"0" indicates no growth, "+" slight growth, "++" fairly considerable, and "+++" very considerable development.

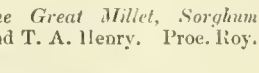
	Glycocoll.	Serine.	Isoserine.	Alanine.	α-Amino-butyric Acid.	β-Amino-butyric Acid.	γ-Amino-butyric Acid.	α-Amino-n-valeric Acid.
Penicillium glaucum	+++	++	0	++	+	0	+++	+
Aspergillus niger	+	+++	0	+++	0	0	+++	+
Aspergillus clavatus	+	+++	0	+++	0	0	+++	0
Aspergillus Oryzae	+++	+++	0	+++	+	0	+++	+
Mucor mucedo	+	+++	0	0	0	0	+++	0

	α-Amino-methyl-ethylacetic Acid.	β-Aminoiso-valeric Acid.	*i*-Leucine.	Asparaginic Acid.	Glutamic Acid.	Phenyl-alanine.	Tyrosine.	α-Pyrrolidine carboxylic Acid.
Penicillium glaucum	+	0	+	+++	+++	+++	+	+++
Aspergillus niger	+	0	0	+++	+++	+	0	+++
Aspergillus clavatus	0	0	0	+++	+++	0	0	+
Aspergillus Oryzae	0	0	0	+++	+++	+	+	+++
Mucor mucedo	0	0	0	+++	+++	0	0	0

Serine is the synthetic α-amino-β-hydroxypropionic acid, isoserine is β-amino-α-hydroxypropionic acid. The difference in the nutritive value of these compounds is noteworthy.—A. C. W.

Cyanogenesis in Plants. The Great Millet, Sorghum Vulgare. W. R. Dunstan and T. A. Henry. Proc. Roy. Soc., 1902, **70**, [461], 153.

The plant *Sorghum vulgare*, the great millet or Guinea corn (the *Juár* of India or *Dhurra shirshabi* of Egypt), is cultivated in tropical countries for the sake of the seed, which is important as a food grain. The authors find that the young plants, but not the seeds or old plants, when crushed with water furnish hydrocyanic acid (about 0 per cent. on the weight of the dried plant). The acid is not present in the plant in the free state, nor is it produced by the action of boiling water or of alcohol. It is produced by the action of a hydrolytic enzyme, apparently identical with the emulsion of bitter almonds, on a cyanogenetic glucoside, which has been named *dhurrin*, and has the constitution—



Dhurrin crystallises well, and is soluble in both water and alcohol. When hydrolysed by emulsin or by dilute acid,

t is converted into parahydroxybenzaldehyde, dextrose, and ydrocyanic acid, according to the equation—

$$C_{14}H_{17}O_7N + H_2O = C_6H_5.CHO + C_6H_{12}O_6 + HCN$$

When warmed with alkalis dhurrin is converted into dhurrinic acid and ammonia, whilst if the dhurrinic acid be further warmed with dilute hydrochloric acid, it is converted into parahydroxymandelic acid and dextrose.

$$(1)\ C_{14}H_{17}O_7N + 2H_2O = C_{11}H_{13}O_5 + NH_3$$
$$(2)\ C_{14}H_{18}O_9 + H_2O = C_8H_8O_4 + C_6H_{12}O_6$$

Dhurrin differs from the other two known cyanogenetic glucosides, the amygdalin of bitter almonds, and the lotusin found by the authors in *Lotus arabicus* (this Journal, 1900, 140; 1901, 929), in being derived from dextrose, and not from maltose.—A. S.

Tobacco; Influence of Iron on the Inflammability of ——. G. Ampola and S. Jovino. Gaz. chim. ital., **32**, [1], 367—380. Chem. Centr., 1902, **1**, [25], 1380.

The author sought to determine whether there are present in tobacco, substances which have favourable influence on the combustion of charcoal, to which the inflammability of tobacco is ultimately due. In conjunction with A. Mayer (Landw. Ver.-Stat., **38**, 101), he has found that tobacco grown with the aid of Thomas slag fertilisers burns better than that grown with the aid of other phosphate manures. The results of a number of analyses of the leaves dried at 100° C. are given, showing the content of nicotine, HNO_3 and N in different forms (NH_3, albuminoid nitrogen), the alkalis and alkaline earths, and also MnO, Al_2O_3, CuO, Cl, SO_3, P_2O_5, SiO_2, CO_2, and Fe_2O_3. It is concluded that the direct factors governing the inflammability of the charcoal and consequently of the tobacco are the state of division and the content of metals especially of iron, capable of exerting a catalytic action.—A. S.

New Book.

TABELLARISCHE UEBERSICHT DER IM HANDEL BEFINDLICHEN KÜNSTLICHEN ORGANISCHEN FARBSTOFFE. Von GUSTAV SCHULTZ und PAUL JULIUS. 4te umgearbeitete und stark vermehrte Auflage. Herausgegeben von Dr. GUSTAV SCHULTZ, Professor der Chem. Technologie an d. k. technischen Hochschule zu München. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schöneberger-strasse 26, Berlin, S.W. 1902. Price, M. 28.

In this fourth edition no less than 178 new dyestuffs are introduced, or, in other words, that number have appeared since the third edition was issued in 1897. The volume, close upon quarto size, contains 277 pages of tabular matter and an alphabetical index filling 20 pages. The dyestuffs are grouped and classified as follows:—I. Nitro Dyestuffs. II. Azo and allied Dyestuffs. III. Diazoamido Dyestuffs. IV. Azo Dyestuffs. V. Auramines. VI. Triphenylmethane and Diphenylnaphthylmethane Dyestuffs. VII. Pyronine Dyestuffs. VIII. Acridine Dyestuffs. IX. Nitroso Dyestuffs. X. Oxyketone and allied Dyestuffs. XI. Indophenol. XII. Oxazine and Thiazine Dyestuffs. XIII. Azines. XIV. Thiohenzenyl Dyestuffs. XV. Quinoline Dyestuffs. XVI. Indigo Group. XVII. Sulphur Dyestuffs. XVIII. Dyestuffs of Unknown Constitution; and Appendix. Each dyestuff is treated as follows in the tables:—The trade name is first given, then the scientific name; Constitutional Formula; Substance or Substances the Dyestuff is prepared from; Discoverer and year of Discovery; Details of Patent or Patents; Literature; and, finally, Properties and Behaviour; and Mode of Using, and Shade.

Trade Report.

I.—GENERAL.

Patent Law Amendment Bill.

The Times, July 5, 1902, and Manchester Guardian, July 5, 1902.

Mr. G. BALFOUR (Leeds, Central), in moving the second reading of the Patent Law Amendment Bill, said that the Bill had been drafted strictly in accordance with the recommendations of the Fry Commission, which was appointed by the Board of Trade to inquire into the question of search, not into novelty, but into anticipation in previous letters patent, and into the matter of compulsory licences. With respect to the first of these questions, there was not very much difference of opinion. It was generally admitted that the changes proposed in the Bill would be a valuable amendment of the patent law. It was otherwise with the question of compulsory licences, upon which he had received many representations since the Bill was introduced, among other bodies from a deputation representing the Chambers of Commerce of the country. He could not entirely agree with all the representations which were made by that deputation, but he recognised that there was some force in many of them, and he had done his best to meet the objections raised so far as possible. He believed that the changes which he proposed to introduce into the Bill in Committee were of a kind which would prove satisfactory to the commercial community generally, and would be accepted as a reasonable solution of a somewhat difficult problem. He would confine himself to a short explanation of the main respects in which the amended second clause, which he would have to move in Committee, differed from the clause in the Bill as introduced. The first point dealt with the phrase "reasonable requirements of the public." It had been represented to him that the phrase was not sufficiently explicit, and, in particular, that it took no account of the reasonable requirements of the producer as apart from the consumer. He did not think the Committee intended that the phrase should exclude all reference to the producer, and to make the matter clear the amended provision would run: "The reasonable requirements of the public shall not be deemed to have been satisfied if, by reason of the fault of the patentee to work his patent, to manufacture the patented article to an adequate extent in the United Kingdom, or to grant licences on reasonable terms, any existing industry or the establishment of any new industry is prejudiced or the demand for the patented article is not reasonably met." It had been represented to him by the deputation that there were instances in which the grant of compulsory licences would not effectively remedy the evils complained of. It was not denied by anybody that there were a good many cases in which such a grant would be sufficient, and in these cases he thought it would be very hard upon the patentee, and also by no means in the public interest, that the patent should be forfeited. What he proposed to do was to retain the principle of the granting of compulsory licences as the basis of the amended clause, but at the same time to give the court in certain extreme instances the power to revoke the patent if they were of opinion that the reasonable requirements of the public would not be satisfied by the grant of licences. There would be a proviso that no order of revocation should be made before the expiration of three years from the grant of the patent, or if the patentee gave satisfactory reasons for his default. He thought that was a reasonable compromise. He also proposed to amend the Bill in regard to the tribunal. As the Bill was originally drafted, the High Court was substituted for the Board of Trade as the tribunal to determine whether or not compulsory licences should be drafted, with the right of appeal to the House of Lords. He now proposed that the tribunal should be the Judicial Committee of the Privy Council—a body which had for many years dealt with petitions for the extension of patents—and that there should be no appeal. The last point on which he proposed to amend the second clause referred to the question of the onus of proof. He proposed that in cases which seemed to afford *primâ facie* evidence

that the patent in this country was really being used to prevent manufacture, and so that the patentee might work his patent in a foreign country and import the produce into United Kingdom, the onus of proving that the reasonable requirements of the public had been met should lie on the patentee, whilst, in ordinary cases, where the patent was not mainly or exclusively worked abroad, the onus should be not on the patentee but on the applicant. He hoped that the House would enable the Bill to pass its second reading that afternoon, so that it might be referred to the Standing Committee on Trade.

Mr. Caldwell (Lanark, Mid.) said the right hon. gentleman had not mentioned Clause 1, which made most important changes in patent legislation. The examiner was charged with the responsibility of examining specifications over a period of 50 years. Upon this report it might be necessary for an applicant to amend his specification, and there appeared to be no limit to examination and amendment. There was no reason why the period for lodging a complete specification should be reduced from nine to six months; and it was to be regretted that the tribunal which decided the question whether a patent was being worked to the public advantage was to be changed from the Board of Trade to the Judicial Committee of the Privy Council.

Sir W. Houldsworth (Manchester, N.W.) said he had the good fortune to sit upon the Departmental Committee which considered the reform of the patent laws, and also had the honour of introducing a very important deputation to the President of the Board of Trade on the subject of the second clause of the Bill. The last speaker seemed to object to the Bill root and branch, and his arguments seemed to go to the extent of objecting to any reform of our patent laws whatever. He thought there was a very large concensus of opinion in the country and in that House that some reform was necessary. There were those, at any rate, who felt very strongly on the subject, and desired to see very drastic alterations in the present patent laws, thinking that they handicapped the industries of this country. With regard to the first part of the Bill, the changes which the hon. member objected to so much were recommended by the Committee after very careful consideration and on very moderate grounds. They did not wish to make a revolution in the laws. There were many proposals before them which were of a drastic character, approaching in many respects to the laws on this subject in other countries. But what they desired was, at any rate, to make use of all the information that was within the purview of the Patent Office, and to make that available both to the patentee and the public. It was put before the Committee very strongly that there was an immense amount of valuable information in the Patent Office tabulated in a form which might be made available to those who were proposing to take out patents and to the public generally. All that this first clause did was to provide that the information should be gradually carried further and made available when anyone desired to or thought of taking out a patent. No doubt the examiner under this clause had certain duties to perform to the patentee, but he did not enforce anything. He was simply put in the position of an assistant to the patentee. He investigated the tabulated specifications for the previous 50 years to see if there were any specifications previously which seemed in whole or part to anticipate the patent. He could not but think that every patentee would be thankful for such information. If the patentee liked, he could withdraw or amend his specification so as to avoid the differences that might have been pointed out to him. There was no responsibility upon the examiner in the office. That was taken by the proposed patentee, who then amended his specification, and that amended specification was subject, not to the *ipse dixit* of the examiner, but to any assistance he could give. After the amended specification had been examined, if the examiner still thought there was some previous specification which anticipated it, he then had to decide whether it would be necessary in the interests of the public to indicate that there were such specifications. He did not condemn the specification, which might go forward under certain circumstances with certain marks upon it referring to previous specifications which were in the office, and which in the opinion of the examiner more or less anticipated the specification. The object of that clause was first of all to protect the patentee and ultimately the public, and the appeal that the hon. gentleman objected to was in order that the patentee might be protected again, because if the previous specification simply were referred to upon his specification, it had been said that that to some extent was a black mark upon his specification. That was not intended. It was a proceeding which the patentee very naturally would wish to avoid if he could, and therefore there was an appeal given that he might before that step was taken amend his specification. There was nothing revolutionary in the clause, and it did not make any change in the rights of patentees. All it did was to throw in some cases a further light upon the mind of the patentee and the public, and in many cases save a patentee from going forward with a patent which was found to be anticipated. With regard to the second clause, he could say from his own knowledge that the industrial public ought to be very grateful indeed to the President of the Board of Trade for the very great trouble he had taken to consider their statements and to try to meet their wishes, consistent with his public duty. It was a very difficult, technical, and thorny question, and those whom he represented at the deputation some months ago, who had been in constant communication with him since, had very strong views upon the subject, and put very drastic proposals before the Board of Trade. They decided, and they had high authority for it, that anything like compulsory licence would not meet the case they had to deal with. They had to meet foreign patentees, who took patents out in this country, and, in an entirely dog-in-the-manger way, prevented the working of those patents in this country, but sent the produce of those patents into this country to handicap our own industries by producing in foreign countries what ought to be produced here, seeing that they got the privilege of a patent in this country. The consequence was that our industries were starved for the benefit of the foreigner under our own laws. We were quite prepared to enter upon fair competition with foreign rivals, but when the laws of our own country handicapped us in that competition, they thought a case was made out for some revision of those laws. Those who felt strongly on that subject thought there was no way of dealing properly with that question except by the absolute power of revocation within two years, and the Chairman of the Departmental Committee expressed that opinion. The President of the Board of Trade did not feel that he could go quite as far as they wanted, but he had met them very fairly, because he had now introduced in his amended clause power of revocation under certain circumstances, either compulsory licence or revocation. Consequently, he was in a position to say that those for whom he had been acting, who included all those in the country specially interested in the question, were very well satisfied indeed with the clause as ultimately proposed. It did not fulfil their ideal, but at the same time it went a very long way in the direction they wished to go, and was an immense improvement on their present position. With regard to the tribunal, whilst the Committee felt, perhaps, that the time had come when the question of compulsory licence or revocation could no longer remain with the Board of Trade, he was bound to say that there had been very little objection, among those who had to deal with the matter, to the Board of Trade. Their complaint had been much more with the limited character of section 12 of the old Act. On the whole, they were very fairly prepared to trust the Board of Trade, although the Committee had a very strong opinion that there was an amount of delicacy and difficulty about the question which would be far better dealt with after argument on both sides before a regularly constituted tribunal, composed of men accustomed to deal with evidence, rather than in the informal way in which the Board of Trade did its business. The mode of procedure was not a satisfactory and was scarcely a fair one. The High Court was suggested, but it was thought that the question of delay and costs rendered that court inadvisable. Whether the Committee of the Privy Council would relieve them of these difficulties he did not know. He believed that the reason why the President of the Board of Trade had adopted the present course was, because it would do away with the necessity of any appeal, which he thought

his friends would appreciate very much. They were quite satisfied to go before a properly constituted court, and they would far rather go there and have it settled once and for all than have appeals. He certainly thought the House would be well advised to pass the second reading of the Bill. No doubt questions might arise in Committee, but they could be thoroughly investigated there. He thanked his right hon. friend for the great trouble he had taken over the second clause.

Sir R. Rein (Dumfries Burghs) thought the Bill ought undoubtedly to be read a second time. As to the necessity of legislation, he agreed that nothing could be more absurd than that a foreign patentee should come here and get a patent, which, instead of encouraging the industries of this country, was so used as to prevent our own people doing what otherwise they would do, using our own laws to give a preference to foreign enterprise. To allow our laws to be used for that purpose was ridiculous. In regard to the question of the tribunal, while he had some doubt whether it would not be better to have an administrative department, assisted by the best legal and technical ability, to deal with patent questions, he was satisfied that the Privy Council was after and away the ablest and most satisfactory that could be found.

The Attorney-General said it must be satisfactory to his right hon. friend that the Bill had met with general approval. The first clause carried out almost exactly the recommendations made by the very strong Committee, and in the whole course of the representations made to the Board of Trade since the Bill was introduced, no dissent had been made to the proposals of the clause. The evil which that clause was intended to deal with was most serious. Any steps that could be taken to restrict the number of patents, which investigation subsequently proved to be invalid, would undoubtedly be a benefit to trade and commerce. As to the second clause, he thought that that also was most valuable. A patent was supposed to be granted for the encouragement of manufacture in this country, but under the existing law a large number of patents were taken out by foreigners solely for the purpose of preventing manufactures in this country; and such was the state of the law that there was no means of grappling with the evil. He thought the Judicial Committee of the Privy Council was the proper body to refer proceedings under the clause, as the matters at issue involved considerations of the rights of property; and it was desirable also that there should be a unanimous current of decision.

Mr. Caldwell asked whether the Judicial Court would take evidence as a court of first instance.

The Attorney-General said that, of course, evidence would be taken. He agreed with his hon. friend the member for Dumfries, that the Judicial Court was a better tribunal than the High Court. What was wanted was unanimity of decision. In the High Court there were judges of the highest eminence, but there were many of them, and it was not certain that they would all look at the same matter in the same way. But by sending these questions to the Judicial Court of the Privy Council, the rules on which decisions were arrived at would be laid down from the first, and every one concerned in patents would get to know the result that was to be expected in a given case.

Mr. Whitley (Halifax) said that every one connected with commerce was painfully aware of how far behind our chief competitors in the markets of the world we were in the matter of our patent laws. He regretted that the Bill was not more drastic. He had hoped that the Board of Trade, after its many years' consideration of the matter, and the pressure put upon it by the commercial community, would have been more bold, and have gone a little further in the reform of the patent laws. He was prepared to support the establishment of a skilled department of the Board of Trade, to deal finally with all questions of patents.

Sir J. Lawrence (Monmouth Boroughs) said there was no doubt that English inventors were seriously handicapped under the present law. He felt that the principle of compulsory licences would not suffice. He would desire rather to see the introduction of the Belgian law, which required compulsory working after three years. The clause in the Bill if amended as suggested by the President of the Board of Trade, whilst stopping short of an absolute acceptance of the principle of compulsory working, still gave a liberal measure of relief. Although the Bill could not be regarded as an ideal measure, if it were allowed to go to a committee, and the amendments the President of the Board of Trade had agreed to make were adopted, he believed it was capable of being made into a very useful measure of patent law reform; and he desired to associate himself with the hon. baronet below him, in the hope he had expressed that the Bill, with the amendments foreshadowed by the President of the Board of Trade, might be passed into law.

Mr. Brigg (York, W.R., Keighley), on behalf of a large number of working-men inventors, thanked the President of the Board of Trade for the Bill, and expressed the belief that some good would certainly come from it. The first clause, which provided for further examination, would be distinctly advantageous to working-men inventors.

Sir J. Leng (Dundee) thought that, although this was neither a great nor a courageous measure, it was desirable that it should pass. The objection, that it would throw a serious amount of work and responsibility on a department, should carry no weight. Our officials never objected to do any work which they were called upon to do in the interests of the country. He wished that more could have been done for patentees, who were too highly taxed already. It was to be wished also that British and Colonial patents should be recognised throughout the whole of the British dominions.

Mr. Platt-Higgins (Salford, N.) hoped subsection 1 of the second clause would be strengthened, for it was now thrown on any person interested to prove a negative—that the reasonable requirements of the public had not been satisfied—not as regarded himself, but the public generally.

Mr. Cripps (Lancashire, Stretford) approved the provisions of the Bill as reconciling general industrial interests with those of the patentee, and ensuring that industry should not be prevented from developing because of a mere paper protection which was used to prevent anyone else from undertaking similar work. The objection of the last speaker, he thought, was met by the amendments to be proposed in Committee.

Sir W. Allan (Gateshead) said the state of the Patent Laws checked invention in this country. When he was in the habit of taking out patents he paid heavily for them, and they ran for very short periods. He had to contend with claimants to priority of invention, and his patents were liable to be declared invalid. Looking at the American system, he found that a working man there, however humble his position, could lay his model before the Patent Office and obtain his patent, unless the office declared it was not a valid invention. In this country it was just the opposite. The Patent Office took a man's money, but would not say if a patent was valid or not. The Patent Laws of this country should follow the principle of charging the inventor the lowest possible terms and giving him the longest possible time. In some department there should be a committee of search, whose duty should be to investigate the validity of an invention before taking the money for a patent. The present system gave no encouragement to inventive working men. The present Bill was too wordy and not practical; there should be a simple statement of the charge and the time, and the inventor should be left free to settle his other business arrangements.

The Bill was read a second time.

(See also this Journal, 1902, 287, 433.)

Sauerbeck's Tables.

Times, July 5, 1902.

The following are the index numbers of the prices of 45 commodities, the average of the 11 years 1867–77 being 100 :—

	Average.
1878–1887	79
1892—1901	66
1884	76
1889	72
1896	61
1897	62
1898	64
1899	68
1900	75
1901	70

	Monthly Numbers.
December, 1889	73·7
February, 1895	60·0
July, 1896	59·2
July, 1900	76·2
December, 1900	73·4
June, 1901	69·8
December, 1901	68·4
March, 1902	69·2
April, 1902	69·7
May, 1902	70·9
June, 1902	70·4

The small reduction in the index number last month is equally due to articles of food and materials. Among the former, wheat, barley, rice, sugar, and coffee ruled slightly easier, but beef was again higher, though the best prices of the month were not maintained to the end. In the case of materials, iron remained firm, but copper, and particularly tin, declined. Cotton and hemp were a little lower, whilst flax and jute advanced.

Taking articles of food and materials separately, the index numbers compare thus (1867–77 = 100):—

—	1878-87. Aver.	1892-1901. Aver.	1895. Feb.	1895. July.	1896. Feb.	1900. Dec.	1901. May.	1902. June.
Food....	84	67	63·8	60·0	65·8	66·1	69·4	68·9
Materials	76	65	57·0	58·6	81·9	70·0	72·0	71·5

Articles of food are about 4 per cent., materials 2 per cent., higher than in December last year.

The position of the six separate groups of commodities at the end of the half-year, in comparison with December and with former periods, is illustrated by the following index numbers (1867–77 = 100):—

—	1878-87. Aver.	1892-1901. Aver.	1901. Dec.	1902. June.	Last Six Months. Per Cent.	
Vegetable food (corn, &c.)	79	60	63·2	62·9	Fall	½
Animal food (meat and butter).	95	80	83·1	92·9	Rise	12
Sugar, coffee, and tea .	76	59	42·0	39·0	Fall	7
Minerals	73	75	80·6	82·6	Rise	2½
Textiles	71	56	58·2	60·4	„	4
Sundry materials	81	64	71·8	72·5	„	1

The most striking figures are those of the second and third group. Animal food is far above the average of the last 10 years, and is not much below the decade 1878–87; in fact, the present figure is the highest since May, 1886, when mutton was exceedingly dear, whilst beef is now higher than at any time since 1883. On the other hand, the aggregate index number of sugar, coffee, and tea is the lowest on record, owing to the enormous increase in the production, particularly of sugar and coffee.

Minerals are still on a high level, considerably above the average of 1878–1901, and this is mainly due to tin and coal. The three remaining groups—corn, textiles, and sundry materials—are on a more moderate basis, though above the average of the last 10 years.

Trade, on the whole, has been fairly active during the first half-year, but there does not seem to be an improvement of importance in any branch.

The prices and index numbers of silver were as follows (60·84*d.* per oz. being the parity of 1 gold to 15½ silver = 100):—

—	Price.	Index No.
Average, 1892—1901	30¼*d.*	49·7
End Aug., 1897	23⅝*d.*	39·2
End Dec., 1900	29 7/16*d.*	48·6
End Dec., 1901	25⅝*d.*	42·3
End April, 1902	23½*d.*	38·6
End May, 1902	23 13/16*d.*	39·1
End June, 1902	24⅛*d.*	39·9

(See also this Journal, 1894, 762A; 1895, 609; 1896, 755.)

Chemical Industry of Germany.

U.S. Cons. Rep., June 23, 1902.

Among the reasons assigned for the depression in the chemical industry of Germany, in 1901, are a tendency towards over-production, the increased cost of raw materials, the high price of coal and of labour, and proposed changes in the tariffs on many articles which enter into chemical manufacture.

One hundred and twenty-one stock companies, having a combined capital of about 83,000,000 dols., paid, in 1900, an average dividend of 12·33 per cent., as against 13·32 per cent., in 1899. Nineteen companies paid no dividends in 1900, 20 paid less than 5 per cent.

As will appear from the following figures, the gain in imports, in 1901, was marked in certain articles, particularly in colouring matters:—

Article.	Gain in Imports in 1901. Marks.	Dols.
Ammonium sulphate	4,500,000	1,071,000
Peruvian bark	1,000,000	238,000
Iodine	750,000	178,500
Chile saltpetre	750,000	178,500
Superphosphate	2,000,000	476,000
Cyanide of potassium	1,500,000	357,000
Chloride of lime	750,000	178,500
Explosive materials	1,000,000	238,000
Alizarin	2,000,000	476,000
Aniline	4,000,000	952,000
Zinc-white	1,000,000	238,000

The exports of aniline colours for the past six years have been—

Year.	Quantity. Metric tons.	Dols.
1901	25,029	19,213,000
1900	23,781	18,402,000
1899	22,705	17,839,000
1898	19,712	17,131,000
1897	17,530	15,969,000
1896	16,232	15,460,000

III.—TAR PRODUCTS, PETROLEUM, Etc.

Uses of Petroleum in California (United States).

Foreign Office Annual Series, No. 2825.

The railroad companies in the State are introducing oil burning furnaces in their locomotives and discarding th use of coal. The Southern Pacific Co., up to the end o 1901, had 130 locomotives running on the Pacific divisio which had been so converted. Many engines of th Santa Fé Railroad Co. have been similarly equipped, an other companies are following suit. One ferry-boat ha been run as an oil burner for some time, and many othe vessels are to be fitted with oil furnaces, 43 permits havin been issued.

All the power-houses for cable roads in San Francisco ar using oil only.

Two or three years ago the consumption of oil in thi city for fuel purposes did not exceed 1,000 barrels pe annum, whilst at the present time it approximates 1,000,00 barrels.

The experiment of using oil instead of water for layin the dust has been tried in the Golden Gate Park, in Sa Francisco, and is considered a success. The roadway are kept in better condition than formerly at less expens the oil mixing well with the dirt and gravel, making smooth, hard surface resembling asphalte pavement. Know ledge of the proper methods of applying the oil unde varying conditions has resulted in minimising the objection raised. There is practically no dust, and the grass an foliage bordering the driveways look bright and clean. number of counties in the State are now using oil for th purpose, and the result is said to be entirely satisfactory.

Oil Fields in California (United States).

Foreign Office Annual Series, No. 2825.

The following table, showing the production of oil in California for 1901, has been prepared by the *Pacific Oil Reporter*, and is believed to be approximately correct :—

Producing Fields.	Number of Wells.			Production.
	Producing.	Capped.	Being Drilled.	
				Barrels.
ewhall, Santa Paula, and Ventura.	203	..	33	612,000
uente	34	..	3	141,500
os Angeles	1,013	..	29	1,255,000
mmerland	207	..	..	128,000
oalinga	41	33	8	740,000
Whittier	55	..	20	612,000
ullerton and Brea Canyon.	69	..	27	724,000
ern River	184	234	25	3,870,000
cKittrick	22	41	4	430,000
nset	25	32	26	188,500
idway	2	12	20	4,000
nta Maria	5	3	6	7,500
Total	2,040	355	201	8,712,500

The above figures show the rapid increase of the industry. ie production of 1900 being given at 4,329,950 barrels, and at of 1899 at 2,677,875 barrels.

IV.—COLOURING MATTERS, Etc.

Indigo Valuation Tariff in Egypt.

Bd. of Trade J., July 10, 1902.

The Egyptian *Journal Officiel* for the 28th ult. contains e Valuation tariff in use by the Egyptian Customs uthorities for the purpose of assessing Customs duties on digo. The tariff, which came into operation on the)th ult., and is to remain in force for 12 months or ntil denunciation, is as follows :—

Description of Indigo.	Valuation per Kilo.
	Millièmes.
ngal Aal Kaleb Kasr, Wassat and Tourah	280
rpa Madras Aal, Madras Wassat, Kasr, and Tourah	180
uraty	270
ule	270

Indigo at Damascus (Turkey).

Foreign Office Annual Series, No. 2832.

India has a monopoly in indigo. It was feared a few ars ago that aniline dyestuffs would oust this and other getable dyestuffs from the market, but it is most satisctory to learn that the natives prefer the latter, and the portation of indigo, which had sunk to little over 6,000*l.* ree years ago, has risen again to double that amount, hough even now it is much less than it was nine or ten ars ago. A German chemist is now established here aking experiments in the manufacture of an artificial bstitute for indigo. Should these experiments succeed, d the natives adopt the composition so produced, the dian article will, it is to be feared, gradually cease to be ployed, owing to its greater cost. Indigo is used for eing the coarse unbleached cotton cloth known as "khani" nported from the United Kingdom), which is universally rn by the poorer classes.

VII.—ACIDS, ALKALIS, Etc.

Production of Graphite in the United States.

U.S. Geol. Survey, 1901.

The production of crystalline graphite, in 1901, was 167,612 lb., valued at 135,914 dols., as compared with reported production of 5,507,855 lb., valued at 178,761 dols., in 1900. The greater part of this product was derived from the mines at Ticonderoga, N.Y., in Chester Co., Pa. The mine in Clay Co., Ala., which was in operation in 1900, produced about 150 tons of graphite, during 1901.

The production of amorphous graphite, in 1901, was 809 short tons, valued at 31,800 dols. Under this head is included the so called graphitic anthracite of Rhode Island, and also the so-called Baraga graphite of Michigan. In addition to this production, there has been considerable activity in developing graphite mines in Georgia, Montana, Dakota, and New Jersey; and, in the aggregate, some 2,500 tons of material have been mined, and are awaiting the proper concentrating processes.

The amount of graphite imported into the United States, in 1901, was 14,320 long tons, valued at 895,375 dols. It appears that the domestic production of crystalline graphite amounted to but little more that one-tenth of the consumption for that year. The greater part of the imports of higher grade graphite is derived from the mines of Ceylon.

The production of Canadian graphite, in 1901, amounted to 2,190 short tons, valued at 41,380 dols., the output being mainly derived from the Brougham mines, in Renfrew Co., Ontario.

The manufacture of artificial graphite has increased greatly, the production, during 1901, amounting to 2,500,000 lb., valued at 119,000 dols., as compared with 800,750 lb., valued at 68,860 dols., in 1900, and with 162,382 lb., valued at 10,119 dols., in 1897, the first year of commercial production. More than one-half of the output for 1901 was in the form of graphitised electrodes for use in the manufacture of alkali and bleach by electrolytic processes, the remainder being consumed in the manufacture of paints, lubricants, pencils, motor brushes, crucibles and dry batteries.

Production of Barytes in the United States.

U.S. Geol. Survey, 1901.

The output of crude barytes, in 1901, was 49,070 tons, valued at 157,844 dols., a decrease of 18,610 tons from the production of 1900, which was 67,680 tons, valued at 188,089 dols. There was a gradual decline in the price per ton, from 3·46 dols., in 1898, and 3·33 dols., in 1899, to 2·78 dols., in 1900, which was partly due to the large production of low-grade barytes. In 1901, however, the average price per ton was 3·22 dols., which is a decided increase over that of 1900, and is accounted for by the fact that a better grade of barytes was put on the market.

Barytes has been found in quantity in Connecticut, Virginia, North Carolina, Tennessee, and Missouri, and, except Connecticut, these States have been producers of the mineral during the last few years. The mining is largely by open cuts, deep mining being too expensive in comparison with the price obtained for the product. The Virginia mines are in Bedford, Pittsylvania, Campbell, and Tazewell counties, centreing for the most part around Evington, Campbell Co., and Richlands, Tazewell Co. At Evington, the Hewitt mines have been worked almost continuously since 1874. The product is shipped to Lynchburg, Va., where it is cleaned and ground. In the vicinity of Richlands, Tazewell Co., the Tri-State Mining and Manufacturing Co. is erecting a plant of 50 tons capacity for grinding the barytes obtained from its large tract. In North Carolina, barytes has been mined in Madison Co., near Marshall and Hot Springs; and it has been found also near Hillsboro, in Orange Co. The deposits of Tennessee are in Bradley, Monroe, Loudon, Cocke, and Greene counties. The Del Rio region, which is the most prominent, extends for 30 miles across Cocke and Greene counties, from Wolf Creek to Newport, with barytes outcropping at intervals throughout this distance. Mines are worked also near Niota, Sweetwater, and Cleveland.

The Missouri deposits of barytes, the largest producers in the United States, are in Washington, Miller, and Cole counties, most of the mines being in Washington Co., where the mineral is found over a large part of the surface.

Barytes is imported into the United States at the rate of a few thousand tons per year. The imports come chiefly from Germany, and the crude ore is brought over as ballast.

Nitrate of Soda Statistics.

Shipments, Consumption, Stocks, and Prices for Three Years ended June 30th, 1902. W. Montgomery and Co.

	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Shipments for six months ended 30th June	532,000	555,000	592,000
Shipments for the 12 months ended 30th June	1,351,000	1,452,000	1,275,000
Afloat for Europe on 30th June	196,000	236,000	201,000
Stocks in United Kingdom ports :—			
—	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Liverpool	10,000	3,000	8,500
London	3,500	2,500	5,800
Out ports	9,500	6,500	12,700
	23,000	12,000	27,000
Stocks in Continental ports on 30th June	77,000	81,000	122,000
Consumption in United Kingdom for six months ended 30th June	92,000	83,000	76,000
Consumption in Continent for six months ended 30th June	756,000	807,000	668,000
Consumption in United Kingdom for 12 months ended 30th June	126,000	126,000	111,000
Consumption in Continent for 12 months ended 30th June	1,026,000	1,042,000	897,000
Consumption in United States for 12 months ended 30th June	170,000	200,000	185,000
Consumption in other Countries for 12 months ended 30th June	28,000	14,000	16,000
Consumption in the World for 12 months ended 30th June	1,350,000	1,382,000	1,209,000
Visible supply on 30th June (including the quantity afloat for Europe and Stocks in United Kingdom and Continent)	298,000	332,000	350,000
Price on 30th June ..... per Cwt.	8*s.*	8*s.* 10½*d.*	3*s.* 9*d.*

Chilean Nitrate Industry.

Bd. of Trade J., July 3, 1902.

The following particulars relating to the Chilean nitrate industry in 1901 are taken from the report of the Fiscal Nitrate Delegate :—

During 1901, there were 66 nitrate works in operation, and 19 remained closed. Of the former, 56 were in Tarapacá, one was in Antofagasta, five were in Tocopilla, and four in Taltal; and of the latter, 18 were in Tarapacá and one was in Taltal. The works in operation produced 13,258,687 metric quintals* of nitrate, which quantity is 1,819,307 metric quintals less than the production in the previous year, when there were 61 works in operation.

Notwithstanding the decrease in the production in 1901, as compared with 1900, there was an increase in the number of workmen employed. The total number employed in 1901 was 20,264, as compared with 19,672, in 1900. The increase in the number of men employed, in 1901, as compared with 1900, although there were fewer works in operation in 1901 than in 1900, is explained in a manner which seems to indicate that a further increase in the proportion of men to works in operation may be expected in the near future.

The richest and most easily exploited grounds in the Tarapacá zone have been worked out, and only the poorer grounds at a greater depth remain, for the working of which a larger number of men, in proportion, is required.

Notwithstanding these drawbacks, capital continues to be invested in new works, which will probably commence operations before the present year draws to a close. The construction of the works at Camiña and at Pan de Azucar is already well advanced. New works at Jazpampa Bajo, and a railway to connect them with Pisagua, will probably be commenced during the current year. Of the grounds lately sold, four lots will be provided with works, two being already in course of construction. It is probable that all these works will show an output at the end of this year, or at the beginning of 1903. The Rica Aventura works in the Toco district will be in a position to produce towards the end of the current year. New works will also be erected on the Grutas claim. The construction of new works on the Pepita grounds at Aguas Blancas is being actively proceeded with, and it is expected that they will be ready to produce in August or September of this year. Establishments will be erected in this district on the Pedregosa grounds, and, finally, the new undertaking of the Lautaro Co. at Taltal will very shortly be commenced.

* Metric quintal = 220·4 lb.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Cement and Hydraulic Lime at Beirût (Turkey).

Foreign Office Annual Series, No. 2836.

The importation of cement for private industries amounted to about 4,000 barrels, whilst 12,000 barrels were received by the Damascus-Hama and the Hedjaz railways. This is all sent from France, and costs on an average 4*s.* the barrel, f.o.b. Beirût.

The cement known here as Portland is entirely of French make. Some years ago a small quantity of real Portland cement was received from the United Kingdom, but the French cement was preferred, as it dries much more quickly, which is sometimes a necessity, especially in rainy weather.

The imports of hydraulic lime are increasing every year, as native builders are now using it for many purposes. It is brought from Marseilles, and the importation is reckoned at 15,000 bags, sold at 2*s.* each, for private purposes, whilst the railways received some 30,000 bags.

Cement at San Francisco (United States).

Foreign Office Annual Series, No. 2825.

The following table shows the quantity of cement imported during the last two years :—

From	Quantity.	
	1901.	1900.
	Lb.	Lb.
Belgium	63,195,082	122,182,290
Germany	42,198,477	75,412,551
United Kingdom	22,800	69,442,000
China	..	2,964,146
Japan	..	981,200
Total	105,416,359	270,982,187

The amount of British cement imported was only nominal. Not many years ago it enjoyed almost a complete monopoly of this market, and its present position is entirely due to the manufacturers, who ignored the warnings given them to produce a finer article until the trade had passed out of their hands.

It seems likely that the entire needs of the State will be supplied from local sources within a few years.

X.—METALLURGY.

Mineral Production of Carthagena (Spain).

Foreign Office Annual Series, No. 2824.

Shipments in 1901 were :—

Silver Lead.

From	To	Quantity.
		Tons.
Carthagena	United Kingdom	27,309
	France	18,704
	Belgium	512
	Total	46,525
Porman	United Kingdom	3,961

Soft Lead.

From	To	Quantity.
		Tons.
arthagena	United Kingdom	8,077
	France	3,378
	Total.....	11,455
	Spain (Barcelona)	4,168

These figures show an increase of 456 tons in the shipents of silver lead from Carthagena and Porman, as compared with 1900. They also show an increase of 1,618 tons the shipments of soft lead abroad, and a decrease of 28 tons to Barcelona. Taking both kinds of lead together, e net increase, for 1901, is 1,946 tons.

The price of lead at the beginning of the year was *l.* 6*s.* 3*d.* per ton. It rose immediately to 17*l.* 1*s.*, and at ice began to fall again until it reached the lowest 0*l.* 5*s.* 7½*d.*) at the end of the year.

During the year, the following quantities of blende were ported to the countries named:—

	Tons.
United Kingdom	3,750
Belgium.....	45,900
Germany.....	2,080
Total	51,730

This is 12,440 tons more than in 1900.

The United Kingdom took 1,210 tons less; Germany, 0 tons less; and Belgium, 14,470 tons more. The ntinued low price of spelter and the restricted output of nes has kept down exports, as compared with 1899, when pments were practically 80,000 tons.

The shipments of calamine were:—

	Tons.
Belgium	2,512
Germany.....	1,690
United Kingdom.....	197
Total	4,399

about 1,000 tons more than in 1900. This class of zinc e, if of sufficient percentage, meets with a ready market, , unfortunately, there is little of it to be got in this ning district.

As will be seen from the annexed list of exports, the antity of copper ore shipped, during 1901, was only about tons to France and Belgium, as compared with 670 tons the United Kingdom and France in 1900.

No matte has been shipped in 1901.

The shipments of ochre were, in 1901, almost the same (ly 100 tons less) as in 1900. They were—

	Tons.
United Kingdom	2,540
Germany.....	54
Total	2,594

Mineral Production of Los Angeles (California).

Foreign Office Annual Series, No. 2,825.

Large deposits of molybdenite and other rare ores have been found here, and there are immense deposits of infusorial earth, asbestos, sulphur, borax, salt, nitre, and other substances, some of which are not worked at all, and others to a very limited extent.

XII.—FATS, FATTY OILS, AND SOAP.

Cotton-seed Oil (Edible) in Canada.

Bd. of Trade J., July 3, 1902.

The *Canada Gazette* for 14th June last, contains an Order in Council, dated June 4, 1902, providing for the free importation of refined cotton-seed oil (edible), for canning fish, into the Dominion of Canada from that date.

Beans, Bean-Cake, and Bean-Oil at Newchwang (China).

Foreign Office Annual Series, No. 2828.

Beans and their products, bean-cake, and bean-oil were exported to the amount of 1,131,442*l.* (3,778,386 cwts.), 1,037,935*l.* (5,156,547 cwts). and 210,231*l.* (749,032 cwts.) respectively, or a total value of 2,379,808*l*, leaving a balance of only 392,479*l.* for other exports, among which was sesamum seed, 41,081*l.*

There are now four bean mills with foreign plant at work in this port. One was burned down in February of the present year, but will soon be rebuilt. They are engaged in extracting oil from beans and in disposing of the residuum in the shape of bean-cakes so much in demand in China and Japan, and, more recently, in Java, as a fertiliser.

XIII. A.—PIGMENTS, PAINTS, Etc.

Paint and Linseed Oil at Beirût (Turkey).

Foreign Office Annual Series, No. 2836.

485 barrels of linseed oil, and 150 barrels of paint (each containing 55 lb.), and 700 barrels of zinc-white were received from the United Kingdom. The price of the linseed oil was 6*l.*, f.o.b. Beirût, for the barrel of 6 cwt., 2*l.* for paint, and 1*l.* 12*s.* for white zinc.

There were also about 180 barrels of dry colour received from France and Belgium, weighing 275 to 330 lb., and fetching from 4*s.* to 4*s.* 10*d.* the cwt.

XIV.—TANNING; LEATHER; GLUE, Etc.

Glue Manufacture of Damascus (Turkey).

Foreign Office Annual Series, 2832.

In the manufacture of glue, in which two factories are engaged, a little over 17 tons of glue are made per annum. There are four qualities of glue, known as the "ashkar" (dark yellow), the "ahmar" (red), the "thalithé" (third quality), and the "aswad" (black), the prices varying from 1*s.* 4*d.* for 5·65 lb. to 1*s.* 11¾*d.*

This glue is used in the carpentering, weaving, and painting trades, and finds a ready sale throughout Syria, Palestine, and Egypt.

Leather in Eastern Roumelia.

Foreign Office Annual Series, 2827.

Sole leather is mostly imported from Turkey. The best calf is of French origin, whilst some comes from Italy; but latterly, the Buda-Pesth tanneries have been exporting a very good and very cheap article made from prime Austro-Hungarian hides, whereas Italy is dependent upon Buenos Ayres for its raw material. It is said that this large Austro-Hungarian tannery is really selling at unremunerative prices, getting interest on the working capital only, but none on the large amount sunk in the installation. The heavy duty on ready-made boots and shoes has nearly put an end to this once flourishing Austro-Hungarian import trade.

XVI.—SUGAR, STARCH, Etc.

Sugar Industry in Bahia (Brazil).

U.S. Cons. Rep., June 6, 1902.

The land in the Bahia cane district is divided into three classes—massape, salao, and areia. Massape soil is almost black in colour, and when wet becomes a sticky mass; it sells at 70 milreis (16·8 dols.) per tarefa (0·72 acre). Salao soil, which is of poorer quality, and is chiefly found on the hillsides, appears to be a mixture of Massape with sand, or ordinary clay; it sells for 50 milreis (12 dols.) a tarefa. Areia land is the least productive grade cultivated, and is composed chiefly of sand.

The cost of production of Demerara sugar testing 96°, is given as follows :—

	Cost.	
	Milreis.	Dols.
Cost of cane per ton	4·500	1·08
Freight on same to factory	0·500	0·12
Wood and other fuel	1·350	0·324
Sugar makers and labourers	1·250	0·30
Diverse	0·100	0·024
Freight to Bahia	0·700	0·168
Sack	0·700	0·168
Necessary repairs in factory	0·700	0·168
Commissions in Bahia	0·230	0·055
Total cost of 75 kilos. (165 lb.) of sugar	10·330	2·407

A ton of cane will produce 75 kilos. of Demerara sugar, value 11·85 milreis (2·84 dols.), and 30—40 litres of molasses, value 1·30 milreis (31·2 cents.), or a total value of 13·15 milreis (3·15 dols.). The cost as shown above is 10·33 milreis (2·40 dols.), consequently the profit is 2·72 milreis (75 cents) per ton of cane. In the figures given, however, no account has been taken of the salary of manager, depreciation of factory, and interest on capital invested. In Bahia there has been little effort made to properly cultivate the sugar cane, and modern agricultural implements are not used to any considerable extent. A better class of field labour is also needed. After the present period of depression is over, there will probably be a demand for new machinery.—A. S.

Starch Manufacture of Damascus (Turkey).

Foreign Office Annual Series, No. 2832.

Starch-making is carried on in some 22 factories, each of which makes about 3 cwts. of starch per diem, in all about 1,000 tons per annum. The starch is manufactured mostly from "beledi" wheat, although the "Haurani" wheat, which is the best in the market, contains more gluten; but it is dearer than the other, which, on the other hand, is heavier and contains more bran. The present price of Damascus starch is about 2*d.* per lb. $1\frac{1}{6}$ bushels of wheat will yield $56\frac{1}{2}$ lb. of fresh starch, which, when dried, becomes only $36\frac{1}{2}$ lb. of dry starch. This is exported to various parts of Turkey, but never abroad.

Sugar Industry of Queensland (Australia).

Bd. of Trade J., July 3, 1902.

The following particulars relative to the sugar industry of Queensland, in 1901, are from the recent report of the Registrar-General :—

The yield of sugar for the whole State, for 1901, was 120,858 tons, being an increase on the previous year of 28,304 tons. The average yield of sugar per acre for the past five years was 1·55 tons, exceeding that for 1900 by 0·27 ton per acre. There was a large increase in both yield of cane and yield of sugar in the Southern and Central divisions, and the season was much more favourable during the past year than during the previous one. The cane fields of the Northern divisions of Queensland have yielded a higher percentage of sugar per acre than they have done for the previous three years. For the whole State, the average weight of cane required to produce a ton of sugar was 9·76 tons. Last year the quantity of molasses produced was 3,679,952 galls. A large quantity of the latter is, in many cases, allowed to run to waste, but in other cases, it is used for distillation. During the year 171,625 galls. of proof spirit were obtained.

XVII.—BREWING, WINES, SPIRITS, Etc.

Brewing Industry of India.

Chamber of Com. J., July 1902.

According to a memorandum prepared by the India Office, 5,558,653 galls. of beer were brewed in India last year, of which about half was bought by the Army Commissariat. The average purchases of the Commissariat for the last five years have amounted to 2,727,163 galls. yearly, the average production in the same period having been 5,481,122 galls. Fourteen of the breweries are situated at stations in the Himalayas, from Murree to Darjeeling, and much of the beer is brewed there. A large quantity is also brewed at Lucknow, Rawalpindi, Poona, Bangalore, Jubbulpore, at and near Ootacamund, and at Quetta and Mandalay. The largest of the breweries is at Murree, the Poona brewery standing next. More than one-third of the whole production is brewed in the Punjab. The quantity of beer brewed in India and imported during the last five years is as follows :—

	Brewed in India. Galls.
1897	5,428,383
1898	5,896,594
1899	5,570,313
1900	4,951,666
1901	5,558,653

	Imported. Galls.
1897-8	2,835,298
1898-9	3,227,164
1899—1900	3,207,180
1900-1	3,226,534
1901-2	3,673,844

XIX.—PAPER, PASTEBOARD, Etc.

Waterproof Wrapping Paper: Tariff Classification in Spain.

Bd. of Trade J., July 10, 1902.

The *Gaceta de Madrid* for the 27th ult. contains the text of a Royal Decree, according to which waterproof wrapping paper is to be dutiable, on importation into Spain under No. 232 of the Tariff, at the rate of 40 pesetas per 100 kilos. (16*s.* 3*d.* per cwt.).

XX.—FINE CHEMICALS, Etc.

Attar of Roses in Eastern Roumelia.

Foreign Office Annual Series, No. 2827.

The total yield of attar of roses this year is said to have been 20 to 25 per cent. less than in 1900. Notwithstanding the stringent measures taken by the Government, adulteration is rather on the increase than otherwise. Prices here ruled slightly above those of last season, yet attar of roses did not fetch any better value than before in the various foreign markets. Stocks lie on the hands of the export merchants, and consumers of Bulgarian attar have lost confidence in it owing to the adulteration practised.

Some of the so-called better brands have been offered abroad at from 26*l.* to 28*l.* per kilo., a price which would not cover first cost. Those who have paid a higher price for pure attar have reaped no profit, owing to indifference of consumers abroad as to purity, which is an encouragement to adulteration.

At Karlovo, a large distillery on the European system has been set up by some Frenchmen from Grasse with foreign plant imported at heavy cost, but as the quantity of rose leaves required to feed the machinery is beyond the output of the district, it is not expected that the venture will prove successful. However, the distillery will be ready for work when the season begins.

Saccharine in Germany.

Chamber of Com. J., July 1902.

The Saccharine Bill, which was passed by the Reichstag on June 11, contains the following, among other provisions :—The production or import of saccharine is prohibited except under licence from the Federal Council, which is empowered to give the necessary permission to one or more manufacturers or importers. This permission may be recalled at any time; the business of the licenceholders will be subject to constant official inspection.

saccharine may only be retailed in chemists' shops, and only to persons officially licensed to use it for scientific or medical purposes. The present factories are to receive compensation upon the basis of six times their net average annual profit, which is to be reckoned at 4 marks per 100. The Imperial Chancellor is empowered to fix the *maximum* of saccharine to be produced by each factory.

Coca Leaves from Perené (Peru).

Chem. and Druggist, July 5, 1902.

The output of coca leaves from Perené (Peru) last year was 40,000 lb., the greater part of which was disposed of for consumption in Jauja and Huancayo. The business is in the hands of two native planters, who are able to sell it from their plantations as fast as they can gather it for 50 c. (2s.) per lb. There are various other small patches owned by Indians, and producing but a few pounds each, but all of their produce is consumed in the vicinity.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 14,483. Macfarlane. Centrifugal machines. June 30.

" 14,484. Macfarlane. Centrifugal machines. June 30.

" 14,615. Lynes. Casting crucibles and other vessels for the purpose of carrying away injurious fumes arising therefrom. July 1.

" 14,665. Bishop. Withdrawal of liquids from casks, jars, and other vessels. July 1.

" 14,684. Rothe. Filters. July 1.

" 14,686. Gray. Improved composition. July 1.

" 14,916. Zimmer.—From Köhnlein. New or improved door for chemical chambers, retorts, and other receptacles. July 4.

" 15,066. Andrews. Apparatus for transmitting heat from one fluid to another fluid, such as evaporators, water-heaters, condensers, and the like. July 7.

15,348. Bergner. Cans for containing inflammable liquids.* July 9.

15,401. Lichtenberg. Spouts for vessels containing explosive liquids.* July 10.

15,429. Maitland. Floating appliance for measuring the discharge of liquids, to be called "Maitland's floating module." July 10.

15,500. Willats. Vats, barrels, casks, hogsheads, and the like. July 11.

[S.] 13,302A (1901). Naef. Evaporation of liquids. July 9. Date applied for under International Convention, Nov. 30, 1900. Previously included in No. 13,302.

13,302B (1901). Naef. Utilisation of heat from furnaces, gas engines, and air-compressors. July 9. Date applied for under International Convention, Nov. 30, 1900. Previously included in No. 13,302.

14,577C (1901). Naef. Utilisation of waste heat from furnaces, gas engines, and the like. July 16.

[C.S.] 15,426 (1901). Vavasour. Valves for air, gases, steam, or liquids. July 9.

" 16,368 (1901). Oliphant. Jars for containing and delivering liquids. July 9.

" 16,977 (1901). Kückenhöner. Process and apparatus for drying pasty material. July 9.

" 17,777 (1901). Cooksey. Fittings for laboratories and the like. July 9.

" 3896 (1902). Bollé.—From Riensch. Apparatus for straining liquids. July 16.

" 5520 (1902). Hewer and Briggs. Apparatus for adding priming, colouring, finings, or other matters to casks or vessels, or for filling same. July 16.

" 6736 (1902). Paul and Gundlach. Collapsible tanks for supplying air or gas under pressure. July 16.

" 11,350 (1902). Burdon. Apparatus for effecting the mixing of different substances, such as solids and fluids. July 9.

II.—FUEL, GAS, and LIGHT.

[A.] 14,486. Bottomley. Means for consuming smoke in furnaces. June 30.

" 14,516. Foster. *See under* VII.

" 14,517. Albrecht. Method of promoting combustion in furnaces.* June 30.

" 14,520. Bray, Bray, and Bray. Steam boiler furnaces.* June 30.

" 14,527. Trautmann. Smoke-consuming devices for fire grates.* June 30.

" 14,548. Newton.—From Standard Oil Co., of New York. Stoves, and grates therefor. June 30.

" 14,560. Francisco and Eden. Fuel-saver and smoke-consumer.* June 30.

" 14,563. Boult.—From Inchauspé. Furnaces. June 30.

" 14,568. Thorley. Automatic generator for acetylene gas, for motor lamps and other purposes. June 30.

" 14,584. Graetz. Lamp-burners. June 30.

" 14,586. Thompson. — From Dillemann. Incandescence alcohol lamp. June 30.

" 14,612. Hegner. Incandescent electric lighting. June 30.

" 14,652. Westinghouse. Electric arc-lamps. July 1.

" 14,657. Nehmer. Statical machines for lighting gas. July 1.

" 14,680. Schwehr and Wagner. Electric arc-lamps. July 1.

" 14,713. Bracklow, Timm, and Bünz. Smoke-consuming apparatus for boilers and furnaces. July 1.

" 14,733. Pease and The Cargo Fleet Iron Co., Ltd. Method of cooling, for subsequent purification, by the extraction of dust, of the combustible hot gases exhausted from blast and other furnaces. July 2.

" 14,765. Boult.—From Guyot. Incandescent vapour lamps. July 2.

" 14,767. Gill. Electric lamps, and switches therefor. July 2.

" 14,768. Gill. Portable electric lights. July 2.

" 14,771. Thwaite. Rough cleaning of blast-furnace gases. July 2.

" 14,791. Marks.—From Warren. *See under* VIII.

" 14,799. De Lavalle. Process of manufacturing blocks from peat or lignite. July 2.

" 14,805. Bachner. Gas-burners. July 2.

" 14,839. Blanchard. Igniting or pre-heating devices for hydrocarbon vapour-burners. July 3.

" 14,869. Lake.—From Cuénod. Electric arc-lamps. July 3.

" 14,870. Husband. Gas-lamps. July 3.

" 14,873. Gindra. Regenerator, especially for gas heating-stoves. July 3.

[A.] 14,878. Hegner. Construction of electric incandescent lamps. July 3.

„ 14,893. Fielding. Gas producers and furnaces. July 4.

„ 14,943. Blackstone, Carter, and Carter. Oil-engine vaporising and igniting apparatus. July 4.

„ 14,977. Harpur and Woodman. Improved type of electric reflector glow-lamp. July 5.

„ 15,038. British Thomson-Houston Co., Ltd., Ireland, and Samuelson. Electric arc-lamps. July 5.

„ 15,043. Stratton. Furnaces. July 5.

„ 15,087. Gibbs. Liquid-fuel burners. July 7.

„ 15,106. Boult. — From Hooley and Ford. Apparatus for automatically controlling an injection of steam and air into boiler furnaces for smoke-consuming purposes.* July 7.

„ 15,126. Bouchaud-Praceiq. Carburetting air, and apparatus for that purpose. July 7.

„ 15,140. Krebs. *See under* XXI.

„ 15,141. Garde. Apparatus for carburetting air. July 7.

„ 15,154. Johnson. — From Deutsche Continental Gasges. and Bueb. Apparatus for the manufacture of lighting and heating gas. July 7.

„ 15,243. Grönberg. Furnaces.* July 8.

„ 15,255. Svenson. *See under* X.

„ 15,257. Hendunen. Treatment of peat. July 8.

„ 15,261. Bullier and Maquenne. *See under* VII.

„ 15,311. Andersson. Arc-lighting lamps. July 9.

„ 15,340. Ross. Acetylene gas generators. July 9.

„ 15,347. Lake.—From Gen. Electric Co. Arc-lamps. July 9.

„ 15,350. Thompson.—From Toerring. Arc-lamps. July 9.

„ 15,359. Elworthy and Williamson. Manufacture of gas for illuminating, heating, and power purposes, and apparatus therefor. July 9.

„ 15,375. Goldthorpe. Method for testing and indicating the temperature in ovens. July 10.

„ 15,413. Davy. Electric arc-lamps. July 10.

„ 15,425. Byass. Annealing furnaces. July 10.

„ 15,446. Lovell. Lamps and the like. July 10.

„ 15,460. Thornley. Smoke-consumers for boiler furnaces and the like. July 11.

„ 15,493. Fischer. Explosive mixture. July 11.

„ 15,498. Tonkin and Puplett. Gas-producers, and apparatus connected therewith. July 11.

„ 15,520. Scott-Snell. Incandescent gas-lamps and the like. July 11.

„ 15,528. Montupet. Furnaces for heating asphalt and other material.* July 11.

„ 15,574. Kent. Vapour- or gas-burners. July 12.

[C.S.] 13,302 (1901). Naef. Purifying heating gases, and recovering by-products therefrom. July 9. Date applied for under International Convention, Nov. 30, 1900.

„ 13,302c (1901). Naef. Heating-blast for furnaces. July 9. Date applied for under International Convention, Nov. 30, 1901. Previously included in No. 13,302.

„ 13,438 (1901). Parkman. Convertible open or closed fire-grate, and fuel-economiser for use therewith. July 9.

„ 13,587 (1901). Rainforth. Furnaces and flues of steam-boilers and the like. July 9.

„ 13,653 (1901). Smith, Gidden, Salamon, and Albright. *See under* XX.

„ 15,503 (1901). Thirion. Apparatus for crushing and removing or transporting cinders, ashes, or the like. July 9.

[C.S.] 15,968 (1901). Thompson. — From Rostin and Szubert. Automatic safety gas-valves. July 16.

„ 16,109 (1901). Down and Godfrey. Mechanical calcining or roasting furnaces. July 9.

„ 16,500 (1901). Stanley. Hydrocarburetted air for motor-car engines and for other purposes. July 9.

„ 16,551 (1901). Bennett and Moorwood. Carburettor for use in motors and other purposes. July 9.

„ 16,941 (1901). Codd. Electric arc-lamps. July 9.

„ 18,063 (1901). Bailey. Steam-boiler furnaces. July 16.

„ 18,066 (1901). Lowe. Furnaces. July 16.

„ 19,734 (1901). Reichenbach. Method of and means for igniting the combustible charges in internal combustion motor engines. July 9.

„ 20,573 (1901). Howard and Rolls. Acetylene hand lamp. July 9.

„ 24,491 (1901). Dobson. Method of and apparatus for cutting and drying peat. July 9.

„ 26,315 (1901). Johnston and Dobbs. Petroleum and like burners for motive power and other purposes. July 9.

„ 218 (1902). Hygienic Stove Co., Ltd., and Greenwood. Gas heating-stoves or fires. July 16.

„ 5524 (1902). Liet and Claudel. Volatilisation of combustible liquids and the admixture of steam thereto. July 9.

„ 6621 (1902). Macquet. Acetylene gas generator. July 9. Date applied for under International Convention, Sept. 13, 1901.

„ 9404 (1902). Beck and Dior. Vapour-burners for lighting and heating. July 16.

„ 9641 (1902). Windham. Acetylene generator. July 9. Date applied for under International Convention, April 26, 1901.

„ 10,426 (1902). Robin. Manufacture of incandescent gas mantles, and apparatus therefor. July 9.

„ 11,495 (1902). Sims. Machines for generating acetylene from carbide of calcium. July 9.

„ 11,539 (1902). Klinger. Acetylene generator. July 16.

„ 11,987 (1902). Ellis.—From Soc. de Ploeg H. Colliez, Lousteau, et Cie. Apparatus for feeding and distributing spirit, alcohol, or other liquid hydrocarbons in or to explosion engines. July 9.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 15,061, Craveu. Method of and apparatus for the distillation of coal-tar and other like products. July 7.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 14,576. Imray.—From Farbwerke, Höchst. Manufacture of substantive secondary disazo-dyestuffs from monoacetylparadiamidohydroquinonedialkyl ether. June 30.

„ 14,606. Johnson.—From Bad. Anilin und Soda Fab. Manufacture of indol and derivatives thereof. June 30.

„ 14,935. Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture and production of theophylline. July 4.

„ 15,355. Kessler. *See under* XVI.

„ 15,599. Johnson.—From Bad. Anilin und Soda Fab. Manufacture and production of azo colouring matter, of colouring matter lakes, and intermediate products relating thereto. July 12.

„ 15,600. Johnson.—From Bad. Anilin und Soda Fab. Manufacture and production of colouring matter containing sulphur. July 12.

S.] 16,417 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of new basic dyestuffs. July 9.

„ 16,875 (1901). Imray.—From Farbwerke, Höchst. Manufacture of indoxyl and its homologues. July 9.

, 17,273 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of new substantive colouring matters containing sulphur, and intermediate products relating thereto. July 9.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

] 14,525. Calico Printers' Assoc., Ltd., and Warr. Means employed in the mercerisation of fabrics, and in recovering the caustic alkali or other liquor used in the process. June 30.

14,581. Ransford.—From Cassella and Co. Production of two-coloured effects on tissues composed of cotton and silk by dyeing with sulphur colours. June 30.

14,675. Klauder. Apparatus for mercerising and treating fibres, fabrics, warp, and the like.* July 1.

14,909. Gray. Machines for treating fibrous plants. July 4.

15,219. Eck. Means for producing a silk-like gloss on woven fabrics. July 8.

15,479. Budd, Swallow, and Sackville. Treatment of textile materials for rendering the same fireproof. July 11.

15,537. Cock and Cock. Dyeing machine. July 12.

] 16,765 (1901). Mellor. Means to be employed in dyeing yarns of woollen, worsted, silk, or other like fibres. July 9.

20,537 (1901). Lecloux. Printing machines for textile materials. July 9.

26,391 (1901). Boeken. Machine for treating fibre-yielding plants. July 9.

11,474 (1902). Browning. Art of colour printing. July 9. Date applied for under International Convention, Oct. 21, 1901.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A 14,518. Pfister. Apparatus for impregnating or dyeing timber.* June 30.

, 14,685. Pfister. Staining of wood.* July 1.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A 14,516. Foster. Manufacture of sulphate of ammonia from gas liquor and the like. June 30.

, 14,543. Hansen and Clausen. *See under* XII.

„ 15,213. Boulton and Spaull. Treatment of waste salt from the manufacture of artificial saltpetre. July 8.

„ 15,261. Bullier and Maquenne. New solid compound containing alkaline hypochlorite and the various applications thereof, particularly for the purification of acetylene or other gases.* July 8. Date applied for, July 9, 1901, being date of application in France.

„ 5,266. Vasseuse. *See under* XV.

„ 5,462. Miller. Applying carbonic acid gas to extinguish fire. July 11.

[C.S 15,803 (1901). Baron de Morley. Apparatus or machine for the manufacture of aërated waters and the like. July 16.

„ 1,525 (1902). Feldmann. Saturator for the manufacture of ammonium sulphate. July 9.

„ 2,691 (1902). Hall. Manufacture of carbon articles. July 9.

VIII.—GLASS, POTTERY, and ENAMELS.

[A.] 14,476. Watson. Adhesive substance, compound, or composition, to be used as a backing for glass tiles. June 30.

„ 14,689. Thompson.—From Fontaine et Cie. Flashing of glassware with coloured glass.* July 1.

„ 14,727. Storr. Manufacture of window and other glass, vases, and other objects of glass, porcelain, or other ceramic material. July 1.

„ 14,791. Marks.—From Warren. Lamp and like chimneys.* July 2.

„ 14,849. Franzek and Weigl. Process for manufacturing porcelain. July 3.

„ 14,938. Cambon. Glass water-gauges for boilers. July 4.

„ 14,959. Zapf. Presses for making hollow and shaped artificial stoneware. July 4.

„ 15,100. Weatherley. Securing taps to earthenware bottles, jars, and like vessels. July 7.

„ 15,230. MacIntyre. Manufacture of hollow glass articles.* July 8.

„ 15,231. MacIntyre. Apparatus for manufacturing hollow glass articles.* July 8.

[C.S.] 17,656 (1901). Redfern. — From Soc. Anon. de l'Industrie Verrière et ses dérivés. Manufacture of glass by electricity. July 9.

„ 9405 (1902). Becker. Process for the utilisation of glass gall, to obtain glass therefrom. July 9.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, and CEMENTS.

[A.] 14,493. Cocking. Method and appliance for forward-drying of bricks, &c., in continuous down-draught kilns. June 30.

„ 14,510. Redfern. Construction of potters' ovens, kilns, terra cotta, encaustic tile, brick, and other kilns, for the saving of coal, and prevention of smoke. June 30.

„ 14,518. Pfister. *See under* VI.

„ 14,590. Saunders. Absorbent mineral preparation, and process for the manufacture thereof.* June 30.

„ 14,735. Porteous and Bannerman. Covering of steam pipes and the like with non-conducting compositions. July 2.

„ 15,153. Lauer. Regenerator for employment in lime kilns and cement kilns, for utilising the heat of escaping gases to heat the injected air. July 7.

„ 15,176. Knox and Helps. Producers and kilns for burning bricks, terra-cotta goods, and the like. July 8.

„ 15,225. Brookes. — From Wilkinson. Asphaltic pavements, or pavement mixtures or compositions. July 8.

„ 15,269. Schwarz. Archplates, stones, or slabs for building purposes, and apparatus for manufacturing the same.* July 8.

„ 15,318. Waxin. Cement or artificial stone.* July 9.

„ 15,332. Haley and Schouten. Method of manufacturing tiles, and means or apparatus therefor. July 9.

„ 15,437. Koeniger. Manufacture of bricks, or artificial stone articles, or blocks, or the like, and apparatus therefor. July 10.

[C.S.] 10,958 (1901). Hurry and Seaman. Process of manufacturing Portland cement, and apparatus therefor. July 9.

„ 12,724 (1901). Hindshaw. Treatment of plaster of Paris. July 16.

„ 16,508 (1901). Nobis and Wenzel. Composition for use as concrete. July 9.

[C.S.] 16,916 (1901). Heap. Roofing tiles. July 16.

„ 18,077 (1901). Steinbach and Duderstadt. Composition of a mixture of asphalt and other substances, and the formation of blocks or slabs. July 16.

„ 18,248 (1901). Herdman. Non-conducting composition for preventing the radiation or transmission of heat. July 16.

„ 18,719 (1901). Strübing. Process for producing heat non-conducting material for building purposes, and steam and like pipe coverings. July 9.

„ 18,744 (1901). Blitz. Manufacture of artificial marble, or compositions having more or less the appearance of marble. July 9.

„ 7232 (1902). Fiske. Kilns, or means or apparatus, for facilitating the drying of bricks and the like. July 9.

„ 8463 (1902). Berry and John Bennet Lawes and Co., Ltd. Material or substance, and process or method, to be employed in the manufacture of heat non-conducting compositions. July 16.

„ 9511 (1902). Randolph. Insulating compounds, and the method of manufacturing same. July 9.

„ 11,583 (1902). Impson and Jewson. Manufacture of concrete or like bricks or blocks, and apparatus therefor. July 9.

X.—METALLURGY.

[A.] 14,666. Bartos. Manufacture of pig and cast iron, half steel, steel, and similar products.* July 1.

„ 14,693. Meslans and Poulenc. Manufacture of cast steel.* July 1.

„ 14,707. Miller. Process for the treatment of sulphide ores. July 1.

„ 14,739. Ewan. Manufacture of sodium. July 2.

„ 14,751. Marks. — From Harzugghi. Process for manufacturing directly, during flow, perforated ingots intended for the fabrication of weldless tubes. July 2.

„ 14,776. Carroll. Method of and apparatus for smelting ores. July 2.

„ 14,936. Warrington and Warrington. Manufacture of certain alloys of aluminium. July 4.

„ 14,942. Boulton, Bishop, and Wirtz. Manufacture of potassium and sodium cyanides. July 4.

„ 14,949. Neuhaus. Device for applying small quantities of acid liquid to metallic surfaces as a preparation for soldering, and generally applicable for moistening surfaces.* July 4.

„ 14,970. Renard and Becker. Process for the treatment of iron ore.* July 4.

„ 14,982. Down. Treatment of zinc ores. July 5.

„ 15,035. de Alzugaray. Extraction of gold, silver, and other metals from their ores. July 5.

„ 15,041. Clark. — From Metallurgische-Ges. A.-G. Drying apparatus for pyrites and blends, applicable to the Herreshoff roasting furnaces and similar apparatus. July 5.

„ 15,044. Tresidder. Manufacture of steel armour-plates, or other plates of steel, with a hardened face. July 5.

„ 15,045. Tresidder. Manufacture of steel. July 5.

„ 15,066. Mitchell. Method of reducing copper matte to refined copper.* July 5.

„ 15,127. Rawson and Littlefield. Refining metals, and apparatus for that purpose. July 7.

„ 15,222. Stone. Process for freeing copper from arsenic and antimony. July 8.

„ 15,255. Svenson. Soldering lamps.* July 8.

„ 15,272. Miller. Process for the elimination of sulphur from sulphide ores. July 8.

[A.] 15,280. Scammell. Separating metals from the ores. July 9.

„ 15,354. Estève Steel Co., Ltd.—From Candido Estève-Llatas. Manufacture of armour plates, a apparatus therefor. July 9.

„ 15,358. Girardot. Metallic body for motor ro vehicles.* July 9.

„ 15,370. Davies Bros. and Co., Ltd., and Davi Method of, and apparatus for use in, galvanisi sheet metal, or otherwise coating it with metal alloy. July 10.

[C.S.] 7157 (1901). Sulman and Kirkpatrick - Pica Treatment of ore slimes. July 16.

„ 17,779 (1901). Eckert. Manufacture of chrom iron. July 16.

„ 18,429 (1901). Gröndal. Furnace for burning blocks or briquettes. July 16.

„ 6385 (1902). Roberts. Ore roasters. July 16.

„ 6969 (1902). Thompson.—From Nicolai and Born Solders, specially applicable for soldering alu nium and aluminium alloys. July 16.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 14,781. Mills.—From Atmospheric Products Process and apparatus for subjecting gases to hi tension electrical discharges.* July 2.

„ 14,887. Booth. Electric battery. July 4.

„ 15,128. Bloxam.—From "Columbus" Electricit Ges. m. b. H. Apparatus for electrolytic coating sheet metal with zinc. July 7.

„ 15,271. Keller. Process for the electric smelting refining of metals and other substances.* July

„ 15,312. Génard. Accumulators or secondary b teries.* July 9.

„ 15,435. Lake.—From Consolidated Batteries Secondary or storage batteries.* July 10.

[C.S.] 13,984 (1901). Barham. Electrical storage batte July 16.

„ 14,466 (1901). Stiens and Smith. Electrical stor batteries or accumulators and electrolytes electric batteries. July 16.

„ 15,876 (1901). West. Electrical storage batte July 16.

„ 17,656 (1901). Redfern. — From Soc. Anon. e l'Industrie Verrière et ses dérivés. *See under* VI.

„ 18,023 (1901). Bristol. Electric storage batte July 16.

„ 12,547 (1902). von Liebermann. Making elec lytic baths. July 9.

„ 12,870 (1902). Soc. Lespagnol and Mérigt. Apparatus for charging electric accumulats. July 16. Date applied for under International Convention, Nov. 14, 1901.

XII.—FATS, OILS, AND SOAP.

[A.] 14,543. Hansen and Clausen. Apparatus for mi ing together oil and graphite or similar lubric June 30.

„ 14,903. Pudenz. *See under* XVIII. B.

„ 15,586. Perrelet. Processes for saponifying substances. July 12.

[C.S.] 979 (1902). Straup. Lubricants and lubric ing oils. July 9.

„ 9985 (1902). Lewy. *See under* XX.

„ 10,926 (1902). Boulton and McNeil. Soap fr or moulds. July 9.

III.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 15,107. Bertrand. Paint or protective composition.* July 7.

„ 15,193. Geary. Ink for tissue-copying by dry process, up to 12 hours after writing, without letter-press. July 8.

C.—India-rubber, &c.

[A.] 14,712. Weinreb and Tichauer. Method of producing a weather-proof material or substance. July 1.

„ 15,009. Bowley. Material capable of being used as sponge, and suitable for many other purposes, and the method of creating the same. July 5.

„ 15,468. Hull. Composition or mixture for dressing oil-skin jackets, south-westers, railway sheets, and other similar articles. July 11.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

[A.] 14,476. Watson. *See under* VIII.

„ 14,983. Haley. Machines for samming, pressing, or squeezing leather and the like. July 5.

[C.S.] 9304 (1902). Pianko. Grain and pebble leathers, and the manufacture thereof. July 9.

XV.—MANURES.

[A.] 15,266. Vasseuse. Process of treatment of saccharin solutions for the production of nitrogenous matters and potassium products rich in fertilising elements, and means for carrying out the said process.* July 8.

[C.S.] 10,461 (1902). Dolle. Manufacture of artificial manure. July 9.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 15,031. Czapikowski. Means for boiling sugar.* July 5.

15,266. Vasseuse. *See under* XV.

15,355. Kessler. Treatment of sugar-cane, sugar-beets, bagasse, dye-woods, and other materials, and apparatus therefor.* July 9.

[C.S.] 24,847 (1901). Scheibler. Manufacture of cube sugar or analogous forms of sugar. July 16.

3642 (1902). Kowalski. Process for purifying by extraction of the syrups, drainings, and molasses obtained in the manufacture of sugar. July 9.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 14,852. Stang. Method for the conversion of albumin in the manufacture of yeast and spirit.* July 3.

15,102. Adams. Improved appliance for freezing, aërating, and acidifying alcoholic or other beverages by compressed air without the use of chemicals. July 7.

15,252. Thompson.—From Pfaudler Vacuum Fermentation Co. Mechanism to regulate the admission of air to liquids in a fermentation apparatus during the process of fermentation.* July 8.

[C.S.] 14,104 (1901). Scott. Treating or ageing spirit. July 16.

15,683 (1901). Stockton. Malt houses. July 9.

20,468 (1901). Knüttel. Malt drums. July 9.

[C.S.] 4418 (1902). Oram. Apparatus for the disposal of liquid by-products of distilleries and breweries and the like. July 9.

„ 11,442 (1902). Colby. Apparatus for racking beer. July 9.

„ 12,114 (1902). Jensen.—From Underwood. Pneumatic malting drums. July 9.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 14,729. Prinzen and van der Hagen. Manufacture of a humanised milk which is easily digestible for infants, similar to woman's milk. July 2.

„ 14,795. Nicolaïdi. Apparatus for the treatment and preservation of milk and the like. July 2.

„ 14,814. Buckler. Milk refrigerators or apparatus for cooling milk. July 3.

„ 14,826. Evenden and Daw. Improved compound for making beverages. July 3.

„ 14,865. Laessig. Process of manufacture of preservable milk.* July 3.

„ 14,945. Crowley. Apparatus for use in the sterilisation of milk or other liquids. July 4.

„ 15,016. Boult.—From Gautreau. Improved preservative treatment for meat, fish, and other decomposable substances. July 5.

„ 15,161. Howse. New or improved soluble disc, tablet, or pellet, for producing effervescing beverages. July 7.

„ 15,351. Heitzmann. Improved iced food, and process for making same. July 9.

[C.S.] 6303 (1902). McDonnell. Edible compounds of the nature of butter. July 9.

B.—Sanitation; Water Purification.

[A.] 14,644. Clark, Bleakly, and Carson. Liquid purifier.* July 1.

„ 14,789. Bez. Prevention of incrustation and corrosion in steam-boilers and the like. July 2.

„ 14,903. Pudenz. Devices for separating oil from steam-water.* July 4.

„ 15,086. Candy. Apparatus for the distribution of sewage or polluted waters upon filter-beds. July 7.

„ 15,336. Babbage. Apparatus for separating water from steam. July 9.

„ 15,369. Hocking. "Feed-water" and analogous filters or purifying apparatus. July 10.

„ 15,534. Southall. Treatment of sewage and purifying other liquids. July 12.

[C.S.] 18,305 (1901). Harris. Apparatus for the treatment or purification of condensed steam and other waters for boiler feed and other purposes. July 9.

„ 12,795 (1902). Delaunay-Belleville. Steam purifiers or apparatus for separating water from steam. July 16.

C.—Disinfectants.

[A.] 15,329. Cummins. Improved apparatus for sterilising excreta, medical appliances, and the like. July 9.

„ 15,514. Dronke. Sterilisation of catgut or other threads or filaments for surgical use.* July 11.

[C.S.] 13,392 (1901). Groppler. Method for producing a solid composition containing formaldehyde. July 9.

„ 16,736 (1901). Sieber. Process and apparatus for the gasification of disinfecting media. July 9.

„ 17,953 (1901). Lutz. Manufacture of a preservative material for gut strings. July 9.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 14,539. Klüver. Treatment of peat and other cellulose material.* June 30.

„ 15,267. Bevan. Collodion. July 8.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 14,699. Ellis.—From Soc. Chimique des Usines du Rhône, anciennement Gilliard, P. Monnet, et Cartier. Manufacture of acetyl-salicylic acid and esters thereof. July 1.

„ 14,921. Dreber. Process for the manufacture of faintly acid and neutral solutions and salts respectively of titanic acid and lactic acid.* July 4.

„ 14,935. Newton.—From Farbenfabr. vorm. F. Bayer and Co. *See under* IV.

„ 14,942. Boulton, Bishop, and Wirtz. *See under* X.

„ 15,517. Ellis.—From Chem. Fabr. von Heyden Akt.-Ges. Manufacture of salts of acetyl-salicylic acid.* July 11.

[C.S.] 13,653 (1901). Smith, Gidden, Salamon, and Albright. Treatment of coal-gas for the manufacture of sulphocyanides. July 9.

„ 8640 (1902). Lorimer and Co., Ltd., and Joyce. Salt of quinine. July 9.

„ 9985 (1902). Lewy. Method of preparing oils and and other liquids for medicinal use. July 9.

[C.S.] 10,934 (1902). Nissel. Process for manufacture of a compound of guaiacol, cinnamic acid, and tannin. July 16.

XXI.—PHOTOGRAPHY.

[A.] 14,714. Fiedler. Improved method for developing, fixing, and washing photographic films and other flexible picture-carriers. July 1.

„ 15,140. Krebs. Compounds for the production of smokeless flash-light. July 7.

„ 15,328. Lumière North American Co., Ltd., Grat and Stedman. Trichromatic photography. July

[C.S.] 10,813 (1902). Szczepanik. Production of photographs in natural colours. July 16.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 14,585. Wetter.—From Westfälisch - Anhaltisch Sprengstoff - Akt. - Ges. Safety explosives blasting compositions. June 30.

„ 15,259. Scott. Explosive charges for guns.* July

„ 15,401. Lichtenberg. *See under* I.

„ 15,493. Fischer. *See under* II.

[C.S.] 18,161 (1901). Jones. Explosive, and process for the manufacture thereof. July 16.

„ 12,760 (1902). Broderick. Base fuses for explosive projectiles. July 16. Date applied for under International Convention, June 19, 1901.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 50

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 15.—Vol. XXI. AUGUST 15, 1902. No. 15.—Vol. XXI.

Subscription of Members 25/- per annum
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
B. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
T. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
H. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
W. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D, LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Ferston T. Bogert.
Prof. C. F. Chandler, D.Sc., LL.D., Ph.D., LL.D.
John Clark.
Prof. G. G. Henderson, D.Sc.
Grant Hooper.
R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

H. Brotherton, M.P.
Horace Carey.
H. Edw. Divers, F.R.S.
Charles Fairley.
H. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.	
Prof. W. R. Lang.	Alfred Burton.
LIVERPOOL.	
F. Tate.	Dr. T. Lewis Bailey.
LONDON.	
Walter F. Reid.	A. R. Ling.
MANCHESTER.	
Ivan Levinstein.	J. Carter Bell.
NEWCASTLE.	
W. Rennoldson.	F. C. Garrett.
NEW YORK.	
Dr. Coblentz.	Dr. H. Schweitzer.
NOTTINGHAM.	
L. Archbutt.	J. T. Wood.
SCOTTISH.	
T. Patterson.	Dr. Thos. Gray.
YORKSHIRE.	
Jas. Bedford.	Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.	Wm. Kellner, Ph.D.
G. Beilby.	Charles A. Kohn, M.Sc., Ph.D.
J. Carter Bell.	J. Lewkowitsch, Ph.D.
Joseph Bernays, M.I.C.E.	A. R. Ling.
H. Brunner.	W. Macnab.
Edw. Divers, M.D., D.Sc., F.R.S.	N. H. Martin.
Sir John Evans, K.C.B., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
A. G. Green.	B. E. R. Newlands.
Samuel Hall.	John Pattinson.
Otto Hehner.	F. B. Power, Ph.D.
John Heron.	Prof. H. R. Procter.
D. B. Hewitt, M.D.	Boverton Redwood, D.Sc.
E. Grant Hooper.	Walter F. Reid.
David Howard.	John Spiller.
Prof. J. J. Hummel.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams	I., XV.
L. Archbutt	I., XII., XVIII., B.
J. L. Baker	XVI., XVII.
H. Ballantyne	II., XII.
D. Bendix	III.
E. Bentz	IV., V., VI.
J. O. Braithwaite	XX.
J. F. Briggs	XVI., XVII.
J. H. Collins	X.
C. F. Cross	V., XII., XIX.
J. T. Dunn, D.Sc. ..	VII., X., XI.
Walter C. Hancock, B.A.	VIII., IX.
J. W. Hinchley.	I., X., XIII., XXI.
H. Ingle, Ph.D...	V., VI., XII., XIII.
R. L. Jenks	XIV., XIX.
J. B. C. Kershaw. ...	VII., XI.
M. C. Lamb	VI., XIV.
T. A. Lawson, Ph.D...	IV., XX.
F. H. Leeds..	III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc.	IV., V.
J. McCrae, Ph.D.	IV.
G. W. MacDonald, M.Sc. .	XXII.
W. G. McMillan	X., XI., XIV., XXII.
N. H. J. Miller, Ph.D.	XV.
C. A. Mitchell, B.A.....	XII., XXII.
A. More	VII., XVIII.
G. T. Morgan, D.Sc. ...	IV., V.
J. G. Parker, Ph.D.	XIV.
H. T. Pentermann	XVI., XVII.
H. S. L. Polak	Patent List.
T. H. Pope...	XVI., XX., XXI.
F. W. Renaut.....	Index.
G. H. Robertson	XI.
Chas. Salter	I., II., III., XV., XVI.
M. J. Salter.....	XIII.
R. Sandon	II.
J. Shields, D.Sc., Ph.D.	XI.
A. Shonk	Gen. Chem.
W. P. Skertchley	XII., XVIII., XX.
E. Sonstadt.....	III., VII., X.
E. Howard Tripp, Ph.D.	III., VII. XVI.
Charles T. Tyrer	XX.
L. J. de Whalley, B.Sc. .	XVI.
A. Wingham	X.
Joseph T. Wood	XIV.
A. C. Wright, B.Sc., M.A. ..	IV., XVIII., XX.

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit (alcohol) having been accepted by the Government, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

The Council has appointed a Committee, consisting of the President, Hon. Treasurer, Dr. Squire, Mr. David Howard, Mr. A. G. Green, Mr. Walter F. Reid, and Mr. Thos. Tyrer, to consider and report on this question.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to produce a reliable technical dictionary in three languages —English, French, and German—and has asked this Society to furnish the names of such scientific and industrial men as are willing to supply the technical expressions of their own special branches of industry. The assistance to be rendered must be gratuitous, as otherwise the expense would be prohibitive; but no money is asked for by the German Society, though it has already spent considerable sums upon the work, and has provided an editor, Dr. Hubert Jansen, of Berlin, with a staff, to collate the materials supplied.

The Council of this Society agreed to co-operate in the work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, Kohn, Messel, Redwood, and Squire, and Messrs. Beilby, Hehner, Newlands, Reid, and Watson Smith to decide upon the form of co-operation. It has been determined to select one or more representatives for each class of the Journal and Patent Literature; and the committee now asks for volunteers to undertake a class or division of a class. To those who intimate their wish to help, full particulars of the plan of the work, with instructions how to proceed, will be sent. Offers of co-operation should be addressed to the General Secretary.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Alexander, D. Basil W., l/o San Francisco; c/o Barber Asphalt Paving Co., 53, Railroad Building, Denver, Colo., U.S.A.

Bennie, P. McN., l/o Niagara; International Acheson Graphite Co., 48, Rue de Malte, Paris.

Carlsson, Hugo; Journals to c/o Dominion Iron and Steel Co., Sydney, C.B. (Cape Breton), Canada.

De Cew, J. A., l/o Toronto; c/o Canada Paper Mills, Windsor Mills, Quebec, Canada, Chemist.

Durant, H. T., l/o Utah; Rhodesia Goldfields, Ltd., Buluwayo, Matabeleland.

Ede, Henry E., l/o Arklow; 256, Eccleshall Road, Sheffd.

Gormly, S. J., l/o Butte; P.O. Box 32, Anaconda, Mt., U.S.A.

Heriot, T. H. P., l/o Trinidad; 23, Wolseley Road, Cr ch End, N.

Hurry, E. H., l/o Bethlehem; 16, Connaught Street, Hde Park, London, W.

Jacoby, Areli H., l/o Boston; retain Journals.

Laist, Fred., l/o California; Chemical Department, Uer. sity of Utah, Salt Lake City, Utah, U.S.A.

Millar, J. H., l/o Box 38; Stowel Lodge, Rondebosch, pe Town, S. Africa.

Neilson, Alex. McG., l/o Greenock; c/o Arthur May Co., Durban, Natal.

Pope, Prof. W. J., F.R.S., l/o Cawdor Road; 7, A Road, Fallowfield, Manchester.

Rogers, Jno., l/o Ardrossan; Ardeer Factory, Stevet Ayrshire, N.B.

Rogerson, J. W., l/o Leadenhall Street; The La Green Street Green, Orpington, Kent.

Shepard, Dr. Charles U., l/o Summerville; P.O. Box Charlestn, S.C., U.S.A.

Sholes, C. E., l/o Syracuse; c/o General Chemical 25, Broad Street, New York City, U.S.A.

Sims, W. Edgar, l/o Cheetham; Portinscale Lodge, Ha Crumpsall, Manchester.

Thomson, J., l/o Alexandria; c/o Manufacture d'In sions de Malaunay, Seine Inférieure, France.

Wedlake, H. D., l/o Hayle; 6, Clarence Place, Pen Cornwall.

Wilson, Gordon, l/o Mexico; Benallan, Kirkintilloch, B

Death.

Robbins, John, 57, Warrington Crescent, Londo W Aug. 8.

New York Section.

THEORY OF THE INCANDESCENT MANTL.

BY A. H. WHITE AND A. F. TRAVER.

Contribution from the Chemical Laboratory of t University of Michigan.

In previous studies published from this laboratory, dling with the phenomena connected with the incandesce gas mantle, the influence of the heating value of the gas upo the amount of light emitted and the conditions for best efficiency with a given mantle have been investigated with some thoroughness, and the question of the temperat of the mantle has received a preliminary treatment.*

It is the purpose of the present paper to present ther data on the temperature of the flame and the mant the relation existing between the temperature and illumi ion, and to discuss the question as to whether the illum tion is a pure "temperature" effect, or whether other agen come into play.

The temperatures reported in the former pape were obtained by Le Chatelier thermo-couples of compar ely fine diameter (0·19 mm. and 0·25 mm.). It was recognised and stated that the temperatures thus recorded were necessarily low, owing to radiation from the wires, t the correction necessary to obtain the real temperatu was unknown at that time. We have since been able to determine this correction. To obtain it we used a series of thermo-couples made from the same stock of w diameters varying from 0·05 mm. to 0·33 mm. he couples were standardised with great care, the u

* "Relation of Heating to Lighting Power of Gases, with Reference to the Incandescent Mantle." A. H. White and Russell. Amer. Gas Light J., 1901, 74, 468. J. Gas Lighti 77, 878. "Theory of the Incandescent Mantle." (First Pap A. H. White, A. F. Traver, and H. Russell. Amer. Gas Light 76, 143. J. Gas Lighting, 1902, 79, 892. (See also this Journ 1020.)

standard being a thermo-couple calibrated by the Reichsanstalt. Electromotive forces were determined by a direct reading reflecting galvanometer permanently installed in a separate room. This galvanometer has been in use for this purpose for several years, and has proved itself an extremely reliable instrument. It was calibrated just before the series of measurements, and again at the close, and had not changed.

The standardisation was carried out as follows:—From one wires of 0·45 mm. diameter was made one thermo-couple with was arbitrarily chosen as the laboratory standard. The couple and the Reichsanstalt standard were insulated in uble bored porcelain tubes which were bound together. The couples projected about 25 mm. out of their insulating tubes, and were within 2 mm. of one another. An asbestos cap was placed over both and pressed closed to the porcelain tube so that the couples were protected from air currents. The couples thus protected were placed in a larger porcelain tube which was incased first in an asbestos jacket and then slipped into an iron tube which could be heated in a gas line furnace. The thermo-couples extended as far as the middle of this furnace, and after they were in place, the end of the larger tube were closed by asbestos cement. The thermo-couples were thus in an air space in a closed asbestos tube which, in turn, rested in a closed porcelain tube which could be externally heated. The secondary junctions of the thermo-couples, those with the copper leading wires, were kept in a bath of ice water. The comparison of these couples was carried out both by direct determination of electromotive forces by means of a potentiometer and by comparison on our galvanometer, one observer checking one couple by one method at the same time that another observer checked the second couple. The observers checked the couples alternately. In this way direct comparison was made between the couples up to 1,414° C. To obtain a comparison at a higher temperature a portion of the wire was cut from the Reichsanstalt couple and drawn down to 0·33 mm. diameter, which was as fine as we could draw the rhodium alloy without breaking it. Holborn and Day (Ann. der Phys., 1900, **307**, 541), in their report from the Reichsanstalt, state that the wire used in the pyrometer couples is so uniform that the electromotive force is the same for any junctions. We therefore feel safe in assuming that this finer couple possesses the same electromotive force as the Reichsanstalt certified couple. This finer Reichsanstalt couple was directly compared with a 0·33 mm. couple of our own wires in a free burning Bunsen flame from a Welsbach burner. The maximum temperature of such a flame may be determined with much accuracy. This gave us a direct comparison at 1,457° C. It was assumed that for points between this, our couple followed the same law of increase as between 1,000° and 1,450°. This couple of 0·33 mm. diameter is one of those used in our measurements. Though the wire from which all our couples are made is drawn from the same lot, and the couples of larger diameters are practically identical, we find this does not hold true of the finer couples. This may be due in part to the oxidation of the rhodium in the oxy-hydrogen blowpipe flame when fusing the couple. Holborn and Day have also noted that it is much more difficult to get homogeneous fine wires than coarse wires. On account of this uncertainty, each couple used was calibrated separately to 1,100° C. In ordinary practice the electrical resistance of the couples even when heated is considered as negligible. This may not safely be done with couples of small diameters. Our couple of 0·05 mm. diameter has a resistance cold of about 80 ohms. When placed in the flame, as in our experiments, its resistance nearly doubles. To prevent error from this cause, a resistance box was inserted and the resistance of the whole external circuit was kept constant at 175 ohms. This was done in the standardisation as well as in the temperature measurements, the resistance being adjusted before taking each reading by balancing against a 175-ohm and a 1 resistance by means of a Wheatstone bridge.

Before proceeding to discuss measurements of mantle temperature, it is necessary to show that these thermo-couples as we have used them, when placed against the mantle, are to determine with considerable certainty the mantle temperature. The couple and its wires are placed vertically in direct contact with the mantle, but a large part of the surface of the wires is necessarily in contact with the gas, and not with the mantle. The interchange of heat between two solids is, under normal conditions, relatively rapid compared with the interchange between a solid and a gas, and the couple would tend to attain more completely the temperature of the mantle than of the gas. In order that the couple should be of a markedly different temperature from the gas, there must be some source of heat loss or increase which affects the wires in a different degree from the mantle. Our discussion is limited to a small area of the mantle in its hottest zone, and the thermo-couple and the portions of the wires in direct proximity to it. The thermo-couple may lose heat by conduction, convection, and radiation. To minimise loss of heat from the couple by conduction, we placed not only the couple in contact with the mantle, but also its wires, so that they were heated to redness for a distance of about two inches from the couple. In order that a loss of heat may be experienced by the couple through conduction, it is necessary that the influence of the cold conducting wires should extend through the two inches of hot wire at practically the same temperature as the couple. We believe that this almost eliminates the error even for our larger wires. In any case, the heat conducted away will vary with the cross-section of the wires, will decrease rapidly with wires of diminishing diameter, and will become zero with a wire of infinitely small diameter.

The loss of heat due to convection has also been very largely eliminated by the method of experiment employed. In these experiments, where a chimney could not be used because of the difficulty of properly placing the couples, the air currents move so sluggishly that the zone of secondary combustion instead of being at the surface of the mantle is removed to a zone at a distance of about two millimetres, where a much hotter temperature is noted than on the mantle. Cold air currents, therefore, in order to cool the couple would have to break through this continuous zone of flame, and, as is actually the case, would become somewhat hotter than the couple. They would thus tend to warm instead of cool it.

There remains to be considered loss of heat by radiation. Radiation from the wires will vary with the surface, and for a given temperature the loss of heat from a small wire will be less than from a large one. The wire receives most of its heat by direct contact with the mantle. This surface is a narrow strip, theoretically a line, independent of the size of the wire. The amount of heat received by the wire is therefore practically a constant, whatever the size of the wire. The loss by radiation decreases directly as the surface, that is, as the diameter of the wire, and is a linear function. Hence, by using wires of progressively smaller diameter, we should get increasing temperatures, and in the limit for a couple of infinitely small diameter should eliminate entirely any loss by radiation and attain the correct temperature. This theoretical view of the case has been confirmed by experiment.

Evidence was given in the previous paper showing that when a fine thermo-couple was placed against a mantle the thermo-couple would record the temperature of the mantle and not of the flame. Some of the evidence may be repeated. A fragment of a mantle, about ½ in. wide and 1 in. long, was suspended by a fine platinum wire in the flame of the burner, so that it was surrounded on all sides by the flame. A thermo-couple, 0·19 mm. in diameter, placed vertically in the flame about a millimetre from the surface of this fragment, showed a temperature of 1,453° C. When moved over slightly so that the couple and wires were flat against the fragment, the temperature dropped to 1,353°. The free flame, a similar distance on the other side of the fragment, showed 1,430°, while the couple, moved over slightly until it was flat against the mantle again, showed 1,353°. The couple then shows a difference of 90 when placed against the mantle or in the free flame. This difference can be due only to the mantle being colder; a difference which the couple indicates perhaps incompletely but decisively. In order to more closely follow the conditions prevailing in actual use, a slit about ½ in. wide was cut vertically out of a mantle from near the top down almost to the level of the

up. This allowed the couple to be introduced to get the temperature of the inside of the mantle. The wires were bent at right angles so that about an inch of the wires above the couple was in contact with the mantle, both in measurements inside and outside. According to one experiment, the temperature of the free flame on the inside 1 mm. from the mantle was 1,523°; with couple touching mantle on inside, 1,373°; with couple touching mantle at same point on outside, 1,370°; with couple moved ½ mm. off mantle on outside, 1,360°: 1 mm. off, 1,342°, &c. This decrease in temperature of the flame on the outside is due to the large opening in the mantle through which passed a considerable part of the gas which would normally have gone through the meshes of the mantle. Experiments like the above, repeated at different times and with different mantles, have shown that the thermo-couple, when placed in contact with a mantle, will, in every case, indicate clearly a large difference between the temperature of the flame and of the mantle.

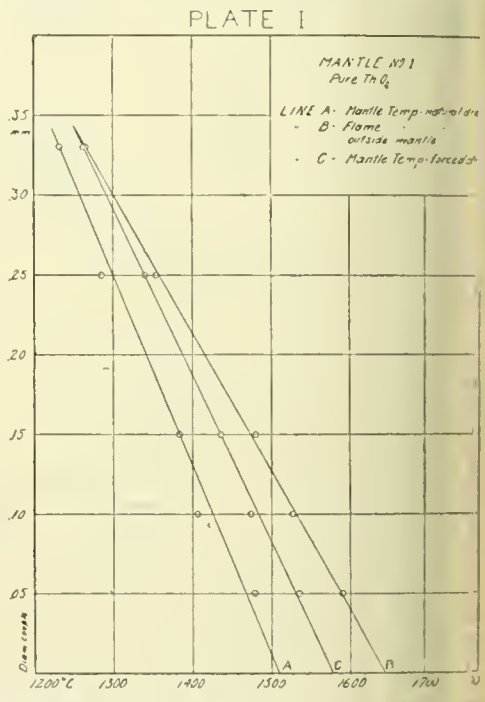
In making the measurements in the series of tests here recorded, the same burner was used, the mantles being transferred to it successively. Each mantle had been burned at least twenty-four hours before testing, but had not been in use for a much longer time. The gas consumption, pressure, and all other conditions pertaining to the burner were kept as constant as possible throughout the series. The gas used was from the city mains, an uncarburetted coal-gas whose composition and heating value are unusually constant. In making the temperature measurements the couples were placed vertically, the couple touching the mantle at its hottest portion and the wires closely fitting the mantle, so that they were heated to redness for a distance of about two inches. Measurements of mantle temperatures made in this way may be duplicated with great accuracy. Each temperature reported is the mean of at least three observations, the couple being withdrawn from the flame each time and then reset at the same point on the mantle. Results thus obtained will duplicate within five degrees of one another. In order to fit the couples on the mantle it was necessary to dispense with a chimney. The absence of the draught caused by the chimney renders the combustion at the surface of the mantle much more sluggish, so that the hottest zone of the flame is at a distance of from one to two millimetres from the surface. In a mantle burning under its most favourable conditions this zone of combustion is right at the surface of the mantle. This necessary deviation from ordinary practice is in some respects to be regretted, but the presence of a hotter zone outside the mantle prevents any possibility of the couple being cooled by air currents.

In making these measurements, as in the standardisation, the junction between the wires of the couple and the copper leading was kept at zero Centigrade, each junction being placed in its own small dry test tube immersed in ice-water. This precaution of placing in separate dry tubes found to be necessary in the case of the 0·05 mm. couple, where a slight electromotive force was noticeable when both junctions were immersed in the same bath of ice water. This action was less noticeable with the 0·10 mm. couple, and could not be detected with couples of larger diameter.

The following tables and plates show the results of measurements of two different mantles and the corresponding flame temperatures. The two mantles were kindly furnished us for these tests by the Welsbach Company, No. 1 being pure thorium oxide, and No. 2, 99·5 per cent. of thorium oxide and 0·5 per cent. of cerium oxide. With this exception, the two mantles are supposed to be identical, and no differences can be detected by photomicrographs. The gas pressure was held constant at seventeen-tenths inches throughout the tests, and the consumption as close to 3 cubic feet per hour as possible, this figure being chosen after experiment had showed it to give the highest illumination. The couples were placed against the mantle in the hot zone about 18 mm. above the bottom of mantle, and by repeated trials the wires were bent so that they fitted the mantle closely while the couple was exactly on the mantle. After the measurement of the mantle temperature the couple was withdrawn until by experiment the highest temperature of the flame burning outside the mantle at that level was found. These measurements were repeat at least three times. The next couple was then insert and the procedure repeated. After all the couples had be used, the first one tried was introduced again to ma certain that conditions had not changed during the test.

With each of these mantles also a test was made w forced draught, the air supply being adjusted till t thermo-couple showed that the mantle was hotter than a point off it. This is the condition obtained in actual pr tice when a proper chimney is used, and the candle po obtained by this method is closely that obtained from th same mantles when a chimney is used. With mantle No immediately after completing the tests, the mantle w removed from the burner, and the maximum temperat of the flame taken at exactly the same height above burner as with the mantle.

Candle-power determinations were made with each t both of the light of the whole mantle and the light fro small area of practically constant temperature in the hot zone, in the centre of which was placed the thermo-cou This is recorded in the tables as candle-power "slit." The light from the rest of the mantle was cut off from photometer by a screen with a rectangular slit, 0·342 sq. in area. Details of arrangement are given in our for paper. The numerical data are given complete in Tabl Plate I. shows graphically the temperature curves mantle No. 1, and Plate II. does the same for ma e



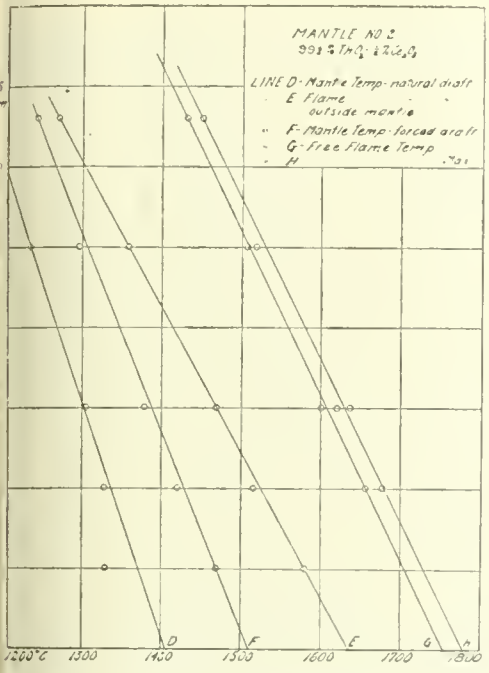
Temperatures as determined by thermo-couples of v diameters. Mantle of pure thoria.

No. 2. In these plates the abscissæ represent temper in degrees Centigrade, and the ordinates the diamet of the wires used expressed in hundredths of millimetres

It will be noted that there is an increase in tempeture recorded by each successively finer thermo-couple, and that the points lie with fair regularity on a straight line. This is in agreement with the theory previously stated. The authors believe that the points obtained by continuing these lines to zero diameter give the temperature which would be attained by a couple not affected by loss of heat due to conduction, convection, or radiation, and th the temperature thus indicated may be accepted as the correct temperature. By reference to Plates I. and II. it ll be seen that the lines representing the flame temperature tside the mantle (lines B and E) have a different slope fr the

rs. This is due to the method of experiment. As these peratures were taken alternately with measurements he mantle, the wires were left bent as they fitted the tle. In this position when they were moved into the r flame envelope the wires were not heated for so great stance above the couple, and there was evidently some of heat from the couple by conduction or convection, a

PLATE II



peratures as determined by thermo-couples of varying di ters. Mantle 99·5 per cent. of thoria and 0·5 per cent. of ce

lo which is greater for couples of larger diameter, and wi makes itself evident by change in the slope of the lin In the temperatures of the free flame in Plate II. (li G and H) the wires were bent so that they fitted the fla , and the lines have much the same slope as those re senting mantle temperatures.

ermo-couples of varying diameters have also been us to measure flame temperature by E. L. Nichols (Phys. Re 1900, **10**, 246), with the difference that he placed his th o couples horizontally with only the tip in the flame, so at the loss of heat by conduction along the wires pr nted his thermo-couples from attaining the flame te erature as closely as did ours. Nevertheless, the results gi by Nichols of 1,775° C. for the non-luminous envelope of uminous gas flame agree almost perfectly with the 1,7 ° we obtained with a Bunsen flame. The temperature of mantle has been determined by Le Chatelier (Comptes Re , 1898, **126**, 1863), who compared spectrophotometri- ca the light from a portion of a mantle with that from a fla ied disc of a thermo-couple $1\frac{1}{2}$ mm. in diameter co ed with the same mixture of oxides. The temperature of thermo-couple was gradually raised till the intensity of chosen wave lengths, from its surface, was as nearly as ght be that of the mantle. Under these circumstances the antle was held to be at the same temperature as the te o-couple. Temperatures thus obtained varied from 1,5 ° C. to 1,710° according to the wave length chosen for co arison, averaging 1,650°. Lummer and Pringsheim (Verhandl. der deutsch. phys. Ges., 1899, **1**, 235), on the ass ption that the mantle behaves approximately like a bla body, have, by pure photometric means, placed the tem rature at from 2,450°—2,200° absolute, or from 2,177° —1,7 ° C. Our measurements of mantle temperatures are in y fair agreement with Le Chatelier's. The gas we are using is of rather low calorific power, but we have determined temperatures of commercial mantles, burning under normal conditions, to be as high as 1,580° C.

The most interesting point in these results is the fact that No. 1 mantle, pure thorium oxide, attains a temperature of 1,510°, and has an illuminating value of 1·2 candles, whilst No. 2 mantle shows 15·7 candles, with a temperature of only 1,404° C. These experiments were made using the same burner, the same gas consumption and pressure. The maximum temperature of the flame burning outside the mantle is closely the same in both cases, being only 12° higher in the case of the mantle having the higher temperature. This relation between illumination and temperature is in direct contradiction to the theories of Nernst and Le Chatelier, who hold the illumination from a mantle is a function of temperature alone. Yet we find that the mantle which has the lower temperature by 100° C. gives thirteen times the light which the other does. It is evident that the illumination here is dependent to a greater degree upon some specific property of the mantle than upon the temperature. It appears as if the No. 2 mantle containing one half per cent. of cerium oxide was acting as a transformer. It receives the same amount of heat energy as the No. 2, does not attain so high a temperature by a 100° and emits 13 times the light. The fact that the flame burning outside the mantle has practically the same temperature in both cases indicates that the energy abstracted by the mantle from the flame is practically the same in both cases. It is, therefore, worth while to consider whether there be any correspondence between the larger amount of energy radiated by No. 2 as light and the larger amount of heat radiated by No. 1.

The marked inequalities in temperature and illumination between various portions of the same mantle have caused us to consider only the small area of 0·342 sq. in. This area has been calculated to be four per cent. of the total area of the mantle, and it has been assumed that 4 per cent. of the total heat of the gas burned passes through it. The gas consumption was 3 cb. ft. (0·085 cb. m.) per hour, and from this the volume of combustion gases was calculated, the chemical composition of the gas being known, and, theoretically, complete combustion being assumed. The temperature on the inside of the mantle was experimentally determined to be 1,600° C. We now have the amount and composition of the gases passing through the unit area of mantle, and the temperature of these gases before and after passing through the mantle. The energy may be calculated from these data and the specific heats of the gases in question. The specific heats used were those given by Ihering (J. f. Gasbeleucht., 1901, **44**, 66) as harmonised from the results of Berthelot and Le Chatelier.

The results may be summarised :—

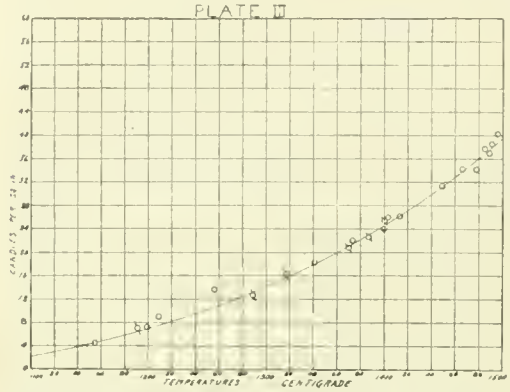
	No. 1.	No. 2.
	° C.	° C.
Temperature on inside of mantle	1,600	1,600
Temperature on outside of mantle	1,510	1,410
Heat conveyed to unit area of mantle (calories per hour).	15,790	15,790
Heat conveyed from unit area of mantle (calories per hour).	14,380	13,170
Heat transformed by unit area of mantle (calories per hour).	1,410	2,620
Illumination per unit area	0·2 candle	4·0

We have a difference in the heat transformed by this unit surface of the two mantles of 1,210 calories per hour or $140 \cdot 10^5$ ergs per second. This is for a mantle surface of 0·342 sq. in. or 2·20 sq. cm. For 1 sq. cm. the difference in energy transformed would be $64 \cdot 10^5$ ergs per second, and the difference in light emitted 1·7 candle-power.

According to the measurements of Tumlirz (Drude, Lehrb. d. Optik, p. 445) the mechanical equivalent of the light from a Hefner lamp is $1 \cdot 51 \cdot 10^5$ ergs per second. Thus, if all the $64 \cdot 10^5$ ergs per second were converted into visible light, we would have 42 Hefners or 37·2 candle-power as the difference in illumination between these two mantles per square centimetre of surface in the hottest zone. (Actually the difference per square centimetre is

1·7 candle-power, or 4·5 per cent. of the theoretical. This is nearly twice as large a percentage as in the Hefner lamp, where, according to the same authority, only 2·4 per cent. of the total energy produces visible light.

Although the illumination from a mantle is not the same as would be given by a black body at the same temperature, the illumination given by an individual mantle varies with its temperature, and we have been able to determine approximately the extent of this variation for a limited range of temperature. For these experiments one mantle and burner were used, and one couple, the temperatures obtained being afterwards corrected to a couple of infinitely small diameter. The illumination and temperatures were measured for a small area as before described, and the illumination calculated to candle-power per square inch. The differences were brought about by enriching the gas or diluting it with nitrogen or carbon dioxide. Two different series of experiments were made, one using a rectangular aperture in the screen of 0·342 sq. in. (2·20 sq. cm.). As it was feared that this area might be so large that it could not be at a uniform temperature, a second series was made with a smaller circular screen aperture of 0·110 sq. in. (0·710 sq. cm.). The results of both series are calculated to candle-power per square inch of mantle surface, and given in Plate III., the series made with the smaller aperture being indicated by a line through the circle. The agreement between the two series is as that could be expected.



Variation in candle-power of a mantle with change of temperature, expressed in degrees Centigrade and candle-power per square inch of mantle.

In studying the causes of the exceptional illuminating power of the mantle, it seemed worth while to see whether a mechanical mixture of thorium and cerium oxides might act differently from the oxides obtained by igniting the mixed nitrates. No way suggested itself for testing this on a mantle, but it seemed likely that some information might be obtained from the behaviour of thin pats of the oxides exposed to the flame. Mixtures of oxides were accordingly made into a paste with sugar solution and moulded into pats about 6 mm. long, 4 mm. wide, and 1 mm. thick. A thermo-couple 0·20 mm. in diameter was pressed into each pat, the couple being about 2 mm. from the bottom and the wires being completely bedded in the pat for about 4 mm. After this pat had been dried and gently ignited, it was hung in the hottest portion of the flame of a Welsbach burner placed on the photometer bench. Any change in temperature or illumination could thus be studied. Unfortunately, the unavoidable inequalities in the thickness of the pats and the position of the couple render great caution necessary in comparing the temperatures obtained in the different experiments with one another. One series of experiments was made, starting with a commercial chemically pure thorium nitrate and cerium nitrate. Each of these was ignited separately, and portions of the ignited oxides in the proportion of 99 per cent. of thorium oxide to one per cent. of cerium oxide were ground together. A solution of the nitrates was mixed in the same proportions, evaporated to dryness and ignited. The results of tests made with these materials are given in the adjoining table. The pats were examined frequently the first few hours, and then at longer intervals. They remained in the flame until they had ceased to show any notable change in 12 hours.

Tests of Pats in Flame.

Material.	Initial Conditions.		Final Conditions.				
	Temp.	C.P.	Hours Burned.	Temp.	C.P.	Change in Temp.	Per Cent Change C.P.
	° C.			° C.		° C.	
ThO_2	1,509	0·19	60	1,335	0·17	+ 24	− 10
Ce_2O_3	931	..	50	996	0·019	+ 65	..
99 ThO_2 } 1 Ce_2O_3 } mechanically mixed	1,116	0·17	189	1,262	0·29	+ 116	+ 70
Duplicate	1,120	0·19	158	1,240	0·44	+ 120	+ 130
"	1,021	0·10	120	1,230	0·33	+ 209	+ 230
99 ThO_2 } 1 Ce_2O_3 } from mixed nitrates	1,210	0·30	17	1,221	0·30	+ 11	..
Duplicate	1,135	0·14	92	1,176	0·19	+ 41	+ 35

An inspection of these figures shows that all have increased in temperature. The pats shrink noticeably in the flame, becoming very dense and hard and hence better conductors for heat. The rise in temperature indicated by the thermo-couple in the case of the pure thoria, pure ceria, and the thoria and ceria from mixed nitrates is ascribed to this cause. The change in illumination with these same pats varies from a loss of 10 per cent. to a gain of 35 per cent. The behaviour of the mechanically mixed thoria and ceria is in marked contrast to the others. The rise in temperature is much greater than in the other cases and extends over a longer period, while the illumination increases wonderfully, varying from a minimum increase of 70 per cent. to a maximum of 230 per cent. This exceptional increase takes place gradually and can be due only to some slowly progressing change, which may most simply be held to be a gradual solid solution of the ceria in the thoria. In the case of the oxides obtained by the evaporation of a solution of thorium and cerium nitrates and subsequent ignition, it seems that solution is already complete, for the increase in temperature is no more than in the case of a single oxide, although the increase in illumination does in one case reach 35 per cent. Inasmuch as this series was made entirely on oxides prepared by ignition of the nitrates in a crucible, and it was possible that the physical condition of the oxide might be different from that of oxides from mantles, another series of tests was made with pats made from mantles. One of the pure thoria mantles furnished by the Welsbach Company was gently burned off and then ground up and made into pats. A new mantle containing 99 per cent. of thorium oxide and 1 per cent. of cerium oxide was similarly treated.

These pats all show decrease in illumination, which is accounted for, at least in part, by the shrinkage in size

Tests of Pats made from Mantles.

Material.	Initial Conditions.			Final Conditions.			
	Temp.	C.P.	Hours Burned.	Temp.	C.P.	Change in Temp.	Per Cent. Change in C.P.
	° C.			° C.		° C.	
T	1,468	0·56	17	1,486	0·40	+ 18	− 30
Duplicate	1,522	0·55	3	1,528	0·45	+ 6	− 18
„	1,584	0·62	71	1,535	0·45	− 49	− 27
99 ThO_2 } 1 Ce_2O_3 }	1,408	1·08	21	1,451	0·87	+ 43	− 20

surface of the pat, amounting in one case to 33 per cent. Although, as we have previously stated, comparison of temperature between the various experiments must be made with caution, we call attention to the fact that in every series the highest temperatures are those with pats made from pure thorium oxide. Le Chatelier has in a somewhat similar way determined the temperature attained by a thermo-couple coated with various oxides and placed in a flame. His experiments show that a couple coated with oxides from a Welsbach mantle attained a higher temperature than one coated with oxide of thorium alone or with any other oxide, and he has founded his theory of the incandescent mantle to a large degree on this. He holds that since the mantle a relatively small amount of energy as red rays, the proportion of energy radiated in the form of visible radiations is consequently very large, but the absolute value of the energy thus radiated in luminous form is less than that which would be emitted by a black body at the same temperature. But a black body placed in the same conditions of heating and with the same extent of radiating surface would have a much lower temperature and only a feeble illumination.

If we assume that the mechanical mixture of thoria and ceria has by long heating gradually changed into the same substance as is present in a mantle, the great rise in temperature and illumination which it undergoes during the change is entirely in accord with the theories of Le Chatelier and Nernst, who hold that the mantle attains a higher temperature than any other substance when placed in a flame, and hence emits more light. But according to our experiments, both on mantles and pats, the pure thoria attains a higher temperature than the mantle oxides. If the illumination was purely a "temperature" effect, the pure thoria mantle (Plate I.) should have higher illumination than that containing one-half per cent. of ceria, because its temperature was 100° higher. Instead it gave only one-thirteenth the light. Similarly the pats made from pure thoria showed in every case a higher temperature than a pat of the same thoria with ceria, but yet in every case the pure thoria pats gave the lower illumination. The conclusion seems to us irresistible that the illumination is to a greater degree a specific function of the material than it is of temperature, and that the mantle is acting as a transformer, which is more economically changing the heat of the flame into light than any other substance yet known.

The results may be summarised as follows :—

The temperature of the commercial mantle burned under usual conditions will vary from 1,500°—1,600° C. For any single mantle the illumination will vary with the temperature, as shown by the curve in Plate III. For different mantles, the illumination will depend to a greater degree upon the composition of the mantle than it will upon the temperature. The mantle with the highest temperature does not necessarily give the most light. A mechanical mixture of thorium and cerium oxides when exposed to a flame gradually increases in temperature and illumination till these approximate what would initially be shown by oxides prepared from the mixed nitrates, but the temperature remains below that which pure oxide of thorium would attain in the same flame. It is concluded that the exceptional efficiency of the mantle is due to a solid solution of the oxide of cerium in the oxide of thorium, and that this substance is capable of transforming the heat of the flame into light more economically than a black body or any other substance yet known.

Table I.

Temperature and Illumination.

Thermo-couple.	Mantle No. 1, Pure ThO_2.			Mantle No. 2, 99·5 Per Cent. ThO_2, 5 Per Cent. Ce_2O_3.			Mantle Removed, Free Flame.	
	A. Mantle Temp., Natural Draught.	B. Flame outside Mantle, Natural Draught.	C. Mantle Temp., Forced Draught.	D. Mantle Temp., Natural Draught.	E. Flame outside Mantle, Natural Draught.	F. Mantle Temp., Forced Draught.	G, Free Flame, same Position.	H. Free Flame, Max. Temp.
	° C.	° C.	C.	° C.	° C.	C.	C.	C.
·33	1,234	1,266	1,263	1,168	1,270	1,240	1,430	1,450
·25	1,285	1,355	1,343	1,230	1,360	1,295	1,505	1,518
·15	1,385	1,480	1,434	1,313	1,468	1,377	1,598	{1,638 {1,615
·10	1,405	1,527	1,470	1,320	1,515	1,420	1,655	1,675
·05	1,480	1,590	1,535	1,330	1,581	1,470	..	..
	Candle Power.			Candle Power.				
Slit	0·2	..	1·3	4·0	..	11·6	..	..
Total	1·2	..	3·4	15·7	..	29·1	..	..

Canadian Section.

SOLUBILITY OF THE SULPHIDES OF ARSENIC, ANTIMONY, AND TIN.

BY W. R. LANG AND C. M. CARSON.

In a former paper (this Journal, June 16, 1902, 748), an account was given of a short investigation into the accuracy of the methods recommended for the separation of the sulphides of arsenic, antimony, and tin. The following are the results of further experiments with reference to the solubility of the three sulphides in hydrochloric acid :—

I. *Arsenic Sulphide in Hydrochloric Acid.*—One gramme of arsenious oxide was dissolved in hydrochloric acid, and the solution made up to 250 c.c. Into each of several flasks 25 c.c. of the solution were measured, the arsenic precipitated as the sulphide, and filtered.

(*a*) The precipitates were treated with equal volumes of hydrochloric acid of different concentrations and allowed to stand, at the room temperature, for four hours, when they were again filtered, the filtrates diluted with water, and tested by passing in hydrogen sulphide.

Hydrochloric Acid (Sp. Gr., 1·16).	Water.	Filtrate after passage of Hydrogen Sulphide.
c.c.	c.c.	
60	0	Slightly coloured.
50	10	" "
40	20	" "
30	30	Colourless.
20	40	"
10	50	"
0	60	"

(*b*) The sulphides were treated with hydrochloric acid as in (*a*), but, before filtering, hydrogen sulphide was passed into each. The filtrates were tested as before with hydrogen sulphide.

Hydrochloric Acid.	Water.	Filtrate after passage of Hydrogen Sulphide.
c.c.	c.c.	
60	0	Showed no colouration.
40	20	" "
30	30	" "
20	40	" "
0	60	" "

(*c*) The sulphides were obtained as in (*a*), and were again treated with hydrochloric acid, but, instead of being allowed to stand at the room temperature, were boiled for 15 minutes. The mixtures were then filtered, and the filtrates tested.

Hydrochloric Acid.	Water.	Filtrate with Hydrogen Sulphide.
c.c.	c.c.	
60	0	Sulphide had almost completely dissolved.
40	20	Filtrate gave precipitate with hydrogen sulphide.
30	30	" "
20	40	" "
0	60	" "

(*d*) The procedure was the same as in (*c*), except that, before filtering, the mixture was cooled and then saturated with hydrogen sulphide.

Hydrochloric Acid.	Water.	Filtrate when tested with Hydrogen Sulphide.
c.c.	c.c.	
60	0	No colouration.
40	20	"
30	30	"
20	40	"
0	60	"

Arsenious sulphide may, then, be treated with hydrochlori acid (sp. gr., 1·16) without danger of solution, if hydroge sulphide be passed into the mixture to saturation.

II. *The Solubility of Antimony Trisulphide in Hydrochloric Acid.*—A solution was made containing 1 grm of antimony tetroxide in 250 c.c. ; 25 c.c. of the solutio were measured out, the antimony precipitated as th sulphide, and the precipitate filtered. The sulphide wa then washed into a flask by means of 8 c.c. of concentrate hydrochloric acid (sp. gr., 1·16) being completely dissolve but giving an orange colouration to the solution. O addition of another 2 c.c. of acid the colouration disappeare

The sulphide of antimony was again obtained by precip tation of 25 c.c. of the original solution. This was filtere and dissolved in 50 c.c. of concentrated hydrochloric aci Into this solution, hydrogen sulphide was passed co tinuously, whilst water was added from a burette. Wh 18 c.c. of water had been added, a slight colouration w visible, and when the amount of water had reached 21 c.c the sulphide began to precipitate. To again obtain a cle solution, 8 c.c. of hydrochloric acid were required.

The sulphide of antimony is soluble, then, in a mixtu of hydrochloric acid (sp. gr., 1·16) and water in the pr portion of 50 to 18, even when hydrogen sulphide is pass in to complete saturation.

III. *Stannous Sulphide* is soluble in hydrochloric ac slightly more dilute than that which is required to dissol antimony trisulphide.

In order to separate the sulphides of arsenic from the of antimony and tin, the mixture should be treated w hydrochloric acid diluted with not more than one-third its volume of water, and then completely saturated w hydrogen sulphide. The arsenious sulphide will be dissolved, and on filtering, will be left free from antimo and tin. The precipitate may be washed with a mixture hydrochloric acid and water in the proportion of 50 to , or with hydrochloric acid (sp. gr., 1·16), if hydrogen sulph be passed into the acid before washing.

This method, which is substantially the same as t given by Pattinson and Pattinson (this Journal, 1898, 2, 214), was employed to estimate the arsenic in 25 c.c. f a solution containing 1 grm. of arsenious oxide, 1 gr. of antimony tetroxide, and 1 grm. of tin oxide in 250 . The sulphide of arsenic, after separation, was dissolved i nitric acid, the arsenic precipitated by magnesia mixtu and weighed as magnesium pyro-arseniate :—

—	As_4O_6 (calculated).	As_4O_6 (estimated).
(1)	0·1000	0·0981
(2)	0·1000	0·0983

In qualitative work, the solution of the sulphides in yel ammonium sulphide may first be precipitated by di hydrochloric acid. The mixture of sulphides, on be filtered and washed, may then be separated as descri above. This is preferable to the method of pouring e solution into concentrated hydrochloric acid.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1019
II.—Fuel, Gas, and Light	1019
III.—Destructive Distillation, Tar Products, Petroleum	1022
IV.—Colouring Matters and Dyestuffs	1022
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1024
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1026
VIII.—Glass, Pottery, and Enamels	1027
IX.—Building Materials, Clays, Mortars, and Cements	1027
X.—Metallurgy	1029
XI.—Electro-Chemistry and Electro-Metallurgy	1030
XII.—Fats, Fatty Oils, and Soap	1032
XIII.—Pigments and Paints; Resins, Varnishes, &c.: India-Rubber, &c.	1032
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1032
XV.—Manures, &c.	...
XVI.—Sugar, Starch, Gum, &c.	1033
XVII.—Brewing, Wines, Spirits, &c.	1033
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1035
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1036
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1037
XXI.—Photography	1038
XXII.—Explosives, Matches, &c.	1038
XXIII.—Analytical Chemistry	1039
XXIV.—Scientific and Technical Notes	1041

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

quids; Evaporation of ——. P. Naef, New York. Eng. Pat. 13,302A, June 29, 1901. (Under Internat. Conv., Nov. 30, 1900.)

ɔr air is passed through the liquid to be evaporated, in a ary cylinder, the moist air arising therefrom being led o a gas-producer. The air may be heated by passing it ough a heat-interchanger, through which the hot gene- or gases are conducted. Instead of air, hot generator ses, or the exhaust gases from a gas engine, may be led ough the cylinder, either directly in contact with the uid or through pipes immersed in it.—H. B.

ying Pasty Material [*Wet Clay, &c.*]; *Process and Apparatus for* ——. H. Kückenhöner, Darligen, Switzerland. Eng. Pat. 16,977, Aug. 23, 1901.

E material is directed on to the head of a core arranged ler the filling hopper of a drying drum, the head being intained at a high temperature by hot furnace gases sed into the drum, so that the material falling on the d is suddenly converted into a fragile crust.—R. A.

ngs or Stoppers for Casks and other Storage Recepacles for Liquids Generating or Giving off Gases or Waste Vapours. J. Ross and A. W. Mackenzie, both f Edinburgh. Eng. Pat. 17,075, Aug. 26, 1901.

E bung, stopper, vent-peg, or the like is provided with automatic pressure-relieving valve, in the form of a ly punctured disc or diaphragm of india-rubber, &c. —R. A.

e Extinguishing; Cartridges of Compressed Gas for —— and other Purposes. C. Caille, Le Perreux (Seine), France. Eng. Pat. 10,775, May 10, 1902.

E cartridge, a metal cylinder, hollowed out and rounded ts lower end, is adapted to be filled with, for instance, uid carbon dioxide. When, with its casing, it is secured, a metal reservoir containing water and provided with delivering pipe, the gas, on a metal septum being ctured, finds access to the reservoir, and the gas-charged er may be forcibly discharged against any desired spot. —E. S.

ring of Different Substances, such as Solids and Fluids; Apparatus for Effecting the ——. C. B. Gardon, Hornsey. Eng. Pat. 11,350, May 17, 1902.

a solid material, in a powdered or comminuted state, is by a suitable conveyor at a variable speed towards the mouth of a fluid-delivery pipe, so that, in falling into said pipe, it is caught by the stream passing through the latter, and intimately and uniformly mixed therewith.—R. A.

II.—FUEL, GAS, AND LIGHT.

Fuel, Powdered; for Boiler Furnaces. Engineering News, June 20, 1901, 452—453. Proc. Inst. Civil Eng., 1902, **147**, [1], 517.

POWDERED fuel has been successfully used by the Alpha Cement Company for firing a 250-H.P. Stirling (American) boiler. The plant, which was designed with a view of providing means for powdering the coal as rapidly as it is wanted, and keeping only a trifling quantity stored, comprises a crusher, in which the raw coal (bituminous slack or other cheap quality) is pulverised to the size of "rice" or "buckwheat"; a drying furnace, which is used when the coal contains more than 6·5 per cent. of moisture; a grinding machine; an air-separator; and a burner, through which the dust fuel is admitted to the boiler furnace. The powdered fuel is fed automatically by a vertical pipe from the storage bin of the air-separator to the burner, which is a short horizontal pipe with a centrally placed nozzle for a jet of compressed air. The air and coal dust issue well mixed, and burn very much like a stream of gas issuing from an orifice. In most cases, the cost of pulverising amounts to from 5*d.* to 1*s.* per ton. The machinery for crushing, grinding, and separating 75 to 100 tons of coal per 24 hours requires about 25 H.P., or less than 1 per cent. of the power produced by the coal when burned under a boiler to raise steam.

As the result of a number of tests, it was found that the best combustion-results are obtained when the coal is ground so fine "that 90 per cent. will pass through a 150-mesh sieve."—A. S.

Alcohol as a Source of Motive Power. Behrend. Locomotion Automobile, Aug. 8, 1901, 503. Proc. Inst. Civil Eng., 1902, **147**, [1], 79.

THE author has made some experiments with a Koerting engine of 6 H.P. nominal, with:—(1) Alcohol denatured in the ordinary manner for commercial purposes; (2) alcohol with "benzene" added to the extent of half the volume of the ordinary denaturing agent; (3) the same as (2) with the further addition of 18 per cent. of "benzene." Taking the cost of alcohol as 25 francs per hectolitre, with a reduction of 0·837 franc per hectolitre by the addition of "benzene," the results obtained were as follows.

Mixture.	Quantity consumed per B. H.P.-Hour.	Cost of Spirit per B. H.P.-Hour.
	Kilo.	Franc.
1	0·595	0·149
2	0·585	0·146
3	0·519	0·130

With "petrol," the cost is about 0·125 franc per B. H.P.-hour.—A. S.

Gas; Enrichment of ——, with Benzol. A. Lecomte. J. Gas Lighting, 1902, **80**, [2043], 92.

The author describes two installations for the enrichment of coal-gas by benzol, capable of making 17,600 and 88,300 cb. ft. per day respectively. The experiments made show that the effect of carburetting does not appear until 15 minutes after starting the apparatus. During five months' working in winter, it was found that the naphthalene could be kept within satisfactory limits by the presence of 3—5 grms. of benzol per cubic metre. No action of the benzol on india-rubber joints was observed. As much as 30 grms. of 90 per cent. benzol per cubic metre can be taken up without any abnormal behaviour of the ordinary or incandescent gas burners being noticed. The output of gas can vary 40 per cent. without any alteration in its illuminating power, benzol proportional to the volume passing being, of course, introduced.—A. S.

Incandescent Mantles; Relation of Heating to Lighting Power of Gas, with Special Reference to ——. H. Russell and A. H. White. J. Gas Lighting, 1901, **77**, [1977], 879—881. (See also under New York Section, pages 1012—1017.)

In this preliminary paper the authors endeavour to show that:—(1) The consumer's method of adjusting an incandescent burner to give a maximum illuminating power, also gives him the greatest efficiency. (2) This method of adjustment is also the proper one when gases are to be tested with incandescent mantles. A test with a fixed consumption for several gases will be unfair to one or all. (3) Under a gas-pressure of 2 ins. of water, when the burner is adjusted to give the maximum illuminating power, the number of candles per cubic foot of gas consumed will increase almost directly with the net calorific value—increasing at the rate of one candle per cubic foot for every four calories increase in the net heating value. (4) The maximum temperature of a mantle does not vary markedly with a change in the illuminating power. The average temperature of the mantle may vary. The temperature of the mantle is less than that of the hottest zone of a freely burning flame under the same conditions.—A. S.

Cyanides from Gas; Extraction of ——. M. Guillet.

See under VII., *page* 1026.

Sulphuretted Hydrogen in Coal-Gas; Detection and Determination of Minute Quantities of ——. W. J. Dibdin and R. G. Grimwood.

See under XXIII., *page* 1040.

English Patents.

Fuel; Process of Converting Peat into ——. J. O. Green and H. T. Martin, Wisconsin. Eng. Pat. 11,703, May 22, 1902.

See U.S. Pat. 700,190; this Journal, 1902, 851.—H. B.

Fuel; Manufacture of Briquettes or Blocks of Artificial ——. J. Y. Johnson, London. From North American Fuel Co., Philadelphia. Eng. Pat. 11,864, May 24, 1902.

See U.S. Pat. 701,365 of 1902; this Journal, 1902, 908. In the manufacture of briquettes from lignite coal, finely-divided lignite is subjected suddenly to a high temperature (1,000°—1,500° F.) or a short time, to expel combined water and reduce the fuel to rough, porous particles; it is then incorporated with molasses and pressed into briquettes, which are dried and then coked.—H. B.

Coke Ovens. F. J. Collin, Dortmund, Germany. Eng. Pat. 15,751, Aug. 3, 1901.

The ovens are heated by gaseous fuel burned in vertical flues. To distribute the gases uniformly to these flues, the air and the gas are supplied by a number of parallel flues arranged beneath and opening under the vertical flues. —R. S.

Furnaces. H. H. Lake, London. From American Furnace Co., New York. Eng. Pat. 9299, April 22, 1902.

To promote combustion within the furnace and prevent the emission of smoke, the combustion chamber is provided with an arch composed of cantilever sections of fireclay or the like, supported at the sides and united at the centre. The arch covers the greater portion lengthwise of the chamber. Openings are arranged between the front wall of the furnace and the arch, and between the rear of the arch and the bridge wall; and air inlets at the front of the furnace are directed along the surface of the arch, so that the entering air is highly heated before mixing with the furnace gases.—H. B.

Heat from Furnaces, Gas Engines, and Air Compressors; Utilisation of ——. P. Naef, New York. Eng. Pat. 13,302B, June 29, 1901. (Under Internat. Conv. Nov. 30, 1900.)

The hot gases are led through a liquid in an agitating apparatus, and the heated liquid is then used for heating the air-blast of a furnace. Two revolving cylinders may be employed, the liquid (which may be of high boiling point) encountering the hot gases in the upper cylinder and being agitated with the air-blast in the lower. The liquid is returned to the upper cylinder. (See also Eng. Pat 13,302A, page 1019.)—H. B.

Hot Gases [Furnace Gases, Waste Gases from Gas Motor Engines, &c.] for the Production of Motive Power and other Purposes; Direct Utilisation of the Heat of ——. C. Heinzerling, Frankfort-on-the-Maine, Germany. Eng. Pat. 12,696, June 21, 1901.

The hot waste gases, at about atmospheric pressure, are passed through a motor to a refrigerating device, so that by the consequent reduction of their temperature and pressure, a difference of pressure is produced between the inlet and outlet ends of the motor that operates as a motive force.—R. A.

Compressed Air and other Fixed Gases; Preheating and Moistening of ——. W. O. Webber, Boston, Mass. U.S.A. Eng. Pat. 12,712, June 21, 1901.

Moisture is introduced into the compressed air or gas, and the temperature of the latter is simultaneously increased. This treatment is continued progressively in successive stages, without permitting the free expansion of the air or gas, or a reduction of its temperature.—R. A.

Gas Producers for the Production of Fuel- and other Gases. W. R. Herring, Edinburgh, N.B. Eng. Pat. 12,887, June 25, 1901.

The gas-outlet port is situated at a point below the normal surface of the fuel bed, but sufficiently high above the base of the fire to ensure the conversion of the carbon dioxide into carbon monoxide. The volatile products, in passing downwards to the outlet, become fixed. Outlets at various levels may be provided, so as to obtain different products, namely, illuminating gas from the upper one, inferior gas from lower ones, and water-gas or an incondensable gas from the lowermost one.—R. S.

Gas from Peat, Sawdust, and other Organic Substances; Machines for Producing ——. L. L. Merrifield and E. J. Checkley, Toronto, Canada. Eng. Pat. 12,95 June 25, 1901.

Two vertical peat-burning chambers are enclosed within one casing. Each chamber has a feed-hopper and a conic

retort above it. Air is forced into the bottom of one chamber, and the gas formed is drawn off through outlets at the top. The outlets lead to an annular passage, which is in communication, by means of passages similar to the outlets in the first chamber, with the top of the second chamber, so that the gases are then forced downwards through this second chamber, finally escaping from outlets at the bottom thereof to the main gas-supply pipe. The course of the air and gas is reversed at frequent intervals, so that each chamber is alternately first and second. Steam may be mixed with the air-blast.—R. S.

Gas from Peat and other Organic Substances; Method of Producing ——. L. L. Merrifield and E. J. Checkley, Toronto. Eng. Pat. 12,959, June 25, 1901.

Peat, or similar material containing much moisture, is fed into a pair of connected producers, and the material in the lower parts of the producers is brought to incandescence, fresh material being fed continuously to the top. The gas and vaporised moisture from the one producer are drawn off from points between the fresh fuel and the incandescent material, and are led into the other producer at similar points, and pass down through the incandescent material only to the gas-outlets at the bottom thereof. The direction of the gases is reversed frequently. The heat of the gases is utilised in heating the air blast.—H. B.

Heating-Gases; Purifying ——, *and Recovering By-Products therefrom.* P. Naef, New York. Eng. Pat. 13,302, June 29, 1901. (Under Internat. Conv., Nov. 30, 1900.)

Sulphuretted hydrogen is removed from the gas by passing the latter through a revolving cylinder containing oxide of iron. The oxide is revivified in the same or another cylinder by means of a current of air.

Ammonia is recovered by scrubbing the gas with dilute sulphuric acid, at a temperature near its boiling point, until a saturated solution of ammonium sulphate is obtained; this, on cooling, deposits crystals of the sulphate. The mother-liquor is again saturated at a higher temperature, and the process repeated. Evaporation is effected, if required, by passing hot air through the liquor in a rotating cylinder, the moist air being led into a gas producer; or hot waste gases may be used instead of air. Ammonia may also be recovered from gases by mixing them with a gas containing sulphur trioxide vapour, and then washing the gaseous mixture.—H. B.

Carburetted Air; Preparing and Utilising ——, *for Heating and Lighting Purposes.* N. Beck and R. Dior, Granville, France. Eng. Pat. 15,259, July 27, 1901. (Under Internat. Conv., Feb. 18, 1901.)

Three vertical carburetting vessels are employed, each having a perforated coil at the bottom connected with a supply of air under pressure, and an outlet tube leading to the burner. The vessels are used successively; namely, No. 1 is first used; when that is becoming exhausted, No. 2 is started; when that shows signs of exhaustion, No. 3 is put into operation, while No. 1 is cut out and refilled.—R. S.

Light from Gases of Low Calorific Value; Obtaining ——. J. Chamberlain, Catford, Kent. Eng. Pat. 13,191, June 28, 1901.

For raising a mantle to incandescence by means of low-grade gas, the gas, at a pressure of 2 ins. and of a volume of not less than 30 cb. ft. per hour, is mixed with about one and two-fifths its bulk of air. The mixture passes up a tube about 6 ins. long, which gradually increases in diameter, and is burned at the top over a wire gauze.—R. S.

Burners; Vapour ——, *for Lighting and Heating Purposes.* A. Lecomte, Paris. Eng. Pat. 11,220, May 15, 1902.

Alcohol, or other volatile combustible liquid, conveyed by a wick into a vaporising chamber near the flame of the burner, is vaporised by the heat of the latter, by means of a metallic rod or plate within the flame, the vapour being mingled with air before combustion. The burner tube and the outer casing of the vaporising chamber are of copper, to ensure a high temperature, whereas the parts in contact with the wick are of brass or other metal, to prevent charring of the wick. The intensity of the vaporisation is regulated automatically by the cold air flowing over the vaporising chamber, the draught being proportional to the temperature of its walls.—H. B.

Acetylene Gas Generators. C. Pataky, Berlin. Eng. Pat. 2375, Jan. 29, 1902.

An automatic generator of the dip principle, in which the carbide container is fastened to the holder bell. The carbide container has a coarse grating near its upper end, and a finer one lower down, the latter being usually below the water level. By this arrangement much of the gas is generated below the surface of the water, and overheating is claimed to be avoided.—F. H. L.

Incandescent Vapour Lamps. H. F. Smith, Philadelphia. Eng. Pat. 24,483, Dec. 2, 1901.

A suspended incandescent oil lamp, in which oil flows down a coiled tubular reservoir, situated within the upper casing of the lamp, and passes through a governor to a series of horizontal vaporising and superheating tubes immediately above the burner, whence the vapour flows down, mingled with air, to the burner, which is fitted with a mantle. Part of the vapour generated is led to the upper convolution of the tubular reservoir, the pressure therein keeping up the supply of oil to the vaporisers. A branch pipe from the reservoir conveys oil to a starting burner, which is situated near the vaporisers.—H. B.

United States Patents.

Carboniferous Colliery Waste; Process of Utilising ——. C. Dörr, Cologne. U.S. Pat. 703,696, July 1, 1902.

See Eng. Pat. 15,476 of 1900; this Journal, 1901, 30. —H. B.

Water-Gas; Apparatus for Generating ——. H. Strache, Vienna. U.S. Pat. 703,619, July 1, 1902.

An apparatus, comprising a generator, having an inclined step-by-step grate for the fuel; a regenerator, consisting of an open or reticulated body of fireclay; and an evaporator, containing pieces of cast iron, through which the gases from the regenerator pass during the heating period. The generator, regenerator, and evaporator are arranged horizontally.—H. B.

Gas-producing Apparatus. J. H. Miller, Pennsylvania. U.S. Pat. 703,943, July 1, 1902.

Across the top of three vertical generator chambers, which are in communication through passages in the upper parts of the dividing walls, a horizontal retort-like chamber extends. It is in communication with one of the generator chambers, and is provided with a valved flue and an outlet to the gas main. On the top of the apparatus is a vaporising chamber, filled with chequer-brickwork and having a valved flue. Fuel contained in the vertical generators is first brought to incandescence by means of an air-blast, the waste gases heating up the vaporiser, &c. Fresh coal is then introduced into the generators, a steam blast is turned on, oil is admitted to the vaporiser, and tar is injected into one of the generators, the carburetted water-gas produced passing through the horizontal retort to the outlet.—H. B.

Gas Generator [Oil Engine]. F. E. Caton and F. B. Warring. Assignors to Caton's Foundry and Machine Co., San Jose, Cal. U.S. Pat. 703,995, July 8, 1902.

A gas generator in which oil is vaporised by causing it to flow over a surface which is heated by the exhaust gases from the engine. The exhaust gases are led up a vertical tubular vaporiser, which is expanded at one or more points to form conical protuberances, the latter having spiral grooves on their upper surfaces, for the oil to flow down, and heat-deflecting cones inside. The vaporiser can be rotated on its axis, and is enclosed in a casing constructed of telescopic sections, for facilitating the cleaning of the

vaporiser. The joints between the sections are filled with temporary packing, forming a safety-joint to relieve abnormal pressure within the casing.—H. B.

Burner; Oil ——. A. H. Fox, Wissahickon, Penn. U.S. Pat. 703,566, July 1, 1902.

The oil drips regularly into a tube through which is forced a current of air or steam. The mixture meets a conical obstruction, and escapes through apertures surrounding the cone. The resulting jet is directed into the furnace, and draws in fresh air along with it, whereby a perfect mixture results, which, when ignited, produces a flame of uniform and high temperature.—R. S.

Burner; Hydrocarbon-vapour ——. J. Johnston, London. U.S. Pat. 703,591, July 1, 1902.

The oil is led to a stationary annular vaporising chamber having an inclined upper face. From thence it passes to a vaporising coil fixed above the annular chamber. The vapour formed is led to the bottom of the burner, and escapes past a needle-valve to an annular burner head provided with peripheral outlets, and enclosed within the stationary annular chamber. The head may be raised or lowered by means of a lever, so as to raise the jets of the burner more or less from the annular chamber, whereby a correspondingly larger flame is obtained. The same movement causes the needle-valve to rise, admitting more vapour to the burner.—R. S.

Burner; Vapour ——. A. Lecomte, Paris. U.S. Pat. 703,661, July 1, 1902.

See Eng. Pat. 10,556 of 1900; this Journal, 1901, 32. —H. B.

Burner; Crude-oil ——. J. A. Meyer, San Francisco, Cal. U.S. Pat. 703,706, July 1, 1902.

The burner consists of a barrel terminating in a discharge tip. Within the barrel is concentrically arranged a smaller perforated pipe, encircled by a number of perforated collars reaching to the outer tube. The crude oil is supplied under pressure to the barrel, and steam to the inner tube. The steam and oil are so intimately mixed that they form an atomised spray, which burns without depositing soot.—R. S.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Ammonia in Tar. M. Guillet. J. Gas Lighting, 1902, **80**, [2043], 88.

In order to obtain a complete extraction of the ammonia, the author recommends that the cistern be so arranged that the tar, on entering it, flows in a helicoidal stream under water for a distance of about 20 yards. It is stated that in this way about $8\frac{3}{4}$ galls. of liquor are obtained per ton of coal.—A. S.

Petroleum Spirit ("*Benzine*"); *Sumatra*——. A. Flachs. Allgem. Oesterr. Chem. u. Techn. Zeit., **20**, [14], 3.

The petroleum spirit from Sumatra refineries is water-white, inodorous, and can be used for many technical purposes without any further chemical treatment. Owing to the presence of naphthene hydrocarbons, it has a good illuminating power, and is suitable for use in miners' safety lamps, the consumption in such lamps being at the average rate of 5·5 grms. per normal candle-hour.

When distilled in a Le Bel apparatus, 35 cm. high (4 bulbs), the samples examined by the author gave, approximately, the following results:—

——	Per Cent. Vol.	Sp. Gr. at 15° C.
Crude product	..	0·718
Distillate, 34°— 60° C. ...	14·00	0·658
60°— 80° C. ...	22·80	0·697
80°—100° C. ...	34·80	0·730
100°—120° C. ...	18·00	0·751
Above 120° C. ...	9·20	0·772

—C. S.

English Patent.

Soot from Tar and other Carbonaceous Substances; Manufacturing ——, *and Apparatus for carrying the same into Effect.* G. Wegelin, Kalscheuren, Germany. Eng. Pat. 10,228, May 3, 1902.

Hot air is blown through burning tar contained in an apparatus in the upper part of which the soot produced condenses. Details of the method, and a descriptive sectional elevation of the plant, are given.—T. A. L.

IV.—COLOURING MATTERS AND DYESTUFFS.

Methylanthranilic Acid. G. Schultz and J. Flaehsländer. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [13],353—354.

Anthranilic acid is heated on the water-bath in methyl alcoholic solution with methyl iodide in presence of sodium carbonate for about two hours. The melt is then made alkaline, the unaltered methyl iodide is distilled off with steam, and the methylanthranilic acid formed, is precipitated with acetic acid. It crystallises from alcohol in greenish plates melting at 177° C., the yield being about 82 per cent. The acid is almost insoluble in water, and dissolves in alcohol and ether to blue fluorescent solutions. Heated above its melting point, it gives off carbon dioxide, yielding methylaniline, whilst, when fused with caustic potash, it gives Indigo. The hydrochloride $C_8H_9NO_2HCl$ forms white needles melting at 141° C., readily soluble in alcohol, sparingly soluble in water and ether. Acetylmethylanthranilic acid melts at 192° C., and forms white needles sparingly soluble in cold water and ether, readily soluble in hot water and alcohol. Methylanthranilic methyl ester is obtained by saturating a methyl alcoholic solution of methylanthranilic acid with dry gaseous hydrochloric acid, and subsequently heating on the water-bath. The separated oil, smelling of jasmine, boils at 192° C. under 13 mm. pressure. Methylphenylnitrosamine carboxylic acid is obtained in reddish-yellow crystals, and on intramolecular change gives an 80 per cent. yield of *p*-nitroso methylanthranilic acid. The hydrochloride of this product when heated, gives off carbon dioxide and yields *p*-nitroso methylaniline. When nitrosomethylanthranilic acid is reduced, it gives a base of which the solutions are coloured bluish-green by ferric chloride or chromate.—T. A. L.

Azoxybenzylidene Bases. F. J. Alway. Ber., 1902, **35** [13], 2434—2438.

With a view of reconciling certain conflicting statement with regard to *p*-azoxybenzaldehyde, the author has undertaken the investigation of this substance, which, according to one method, is formed by decomposing with dilute acid *p*-azoxybenzylidene-bases, and has also been obtained by Gattermann (Ber., **29**, 3037) by oxidising with ferric chloride the electrolytic reduction product of *p*-nitrobenzaldehyde.

The author describes the preparation of the *p*-azoxybenzylidene bases from aniline and the three toluidines, and shows also that all these substances can be obtained directly from *p*-nitrobenzyl chloride, aniline or toluidine, and caustic potash without previously preparing *p*-nitrobenzylaniline or the corresponding toluidine.

p-Azoxybenzylidene-aniline, $C_{14}H_{10}ON_2(:NC_6H_5)_2$, can be produced from *p*-azoxybenzaldehyde and aniline, or by adding solid caustic potash or soda to a boiling alcoholic solution of *p*-nitrobenzylaniline, but the best yield is obtained by boiling one molecular proportion of *p*-nitrobenzyl chloride with six molecular proportions of aniline, cooling, and adding six volumes of alcohol. This mixture is raised to the boil, solid caustic soda is added, and the two volumes of hot water. A vigorous reaction ensues, the solution becomes red, then nearly black, and finally a rapid deposition of yellow plates takes place. The precipitate is filtered off, and washed with alcohol until the mother liquor is colourless. The yield is about 75 per cent. of the theoretical amount. The product is very sparingly soluble in ether and alcohol, readily soluble in hot benzene, and melts at 185° C. The *o*-, *m*-, and

p-toluidine derivatives crystallise in orange plates, and melt at 183°, 133°, and 190° C. respectively. For the decomposition of the azoxybenzylidene base, the finely-powdered substance is treated with dilute nitric acid (about 27 per cent.), and allowed to stand for two hours. The solid product is then filtered off, washed with water, and crystallised from glacial acetic acid. The aldehyde separates in long yellowish needles melting at 194°—195°·5 C. (corr.), and dissolves in concentrated sulphuric acid with an orange colour. On heating this solution to 110°—120° C. for one hour, the aldehyde is converted into an oxyazo dyestuff.

—T. A. L.

Dimethylaniline on Chloride of Sulphur; Action of ——. E. Ehrmann. Sealed Communication, March 22, 1892. Bull. Soc. Ind. Mulhouse, May 1902, 147.

Chloride of sulphur, S_2Cl_2, is dropped into three times its weight of dimethylaniline, with constant agitation. The melt is then heated to 120°—130° C. for half an hour, and is subsequently dissolved in acid water, from which the dyestuff is precipitated by salt and zinc chloride. The product gives yellow shades on tannin-prepared cotton.

—T. A. L.

Acrylic Aldehyde [*Acroleïn*] *on Metadiamines; Action of* ——. E. Ehrmann. Sealed Communication, March 22, 1892. Bull. Soc. Ind. Mulhouse, May 1902, 144—145.

Acroleïn or allylic aldehyde, $CH_2{:}CH.CHO$, condenses with *m*-tolylene diamine in alcoholic or aqueous solution, in presence of hydrochloric acid, to compounds which can readily be converted into dyestuffs. The products dye tannin-prepared cotton yellow shades. If *m*-aminodimethylaniline be employed in place of *m*-tolylene diamine, a fast brown is formed. Nascent acroleïn (from glycerin and potassium bisulphate) will give the same results, but the yield is inferior.—T. A. L.

Nitrosodimethylaniline and of Paranitroso Derivatives of Secondary and Tertiary Amines on certain Aromatic Alcohols; Action of ——. E. Ehrmann. Sealed Communication, March 22, 1892. Bull. Soc. Ind. Mulhouse, May 1902, 146—147.

Nitrosodimethylaniline is boiled with tetramethyldiaminodiphenylcarbinol or with dimethylaminodiphenylcarbinol in alcoholic solution. After distilling off the excess of alcohol, the residue is treated with dilute acid, and the dyestuff is precipitated with salt and sodium acetate. It dyes tannin-mordanted cotton reddish-brown shades. The dyestuff from dinitrosoresorcinol gives yellower and less soluble browns.—T. A. L.

Nitrosodimethylaniline on β-Naphthoquinone; Action of ——. E. Ehrmann. Sealed Communication, March 22, 1892. Bull. Soc. Ind. Mulhouse, May 1902, 148.

Nitrosodimethylaniline hydrochloride readily reacts in alcoholic or acetic acid solution with β-naphthoquinone. The mixture is heated to 80° C. for half an hour, the alcohol distilled off, and the residue taken up with hydrochloric acid (10 per cent.). The dyestuff is precipitated by adding salt. It dries to a brown powder, is very readily soluble in water, and dyes tannin-prepared cotton grey shades.

—T. A. L.

Indulines obtained by reacting with Trimethylamine on Amino-azobenzene; Soluble ——. E. Ehrmann. Sealed Communication, March 22, 1892. Bull. Soc. Ind. Mulhouse, May 1902, 149.

When amino-azobenzene together with its hydrochloride are heated with trimethylamine hydrochloride, soluble indulines are obtained giving violet, blue, and grey shades according to the temperature and duration of the melt.

—T. A. L.

Sulphide Dyestuffs obtained by adding Sulphur to the Induline Melt; New ——. E. Ehrmann. Sealed Communication, March 22, 1892. Bull. Soc. Ind. Mulhouse, May 1902, 150—151.

By adding flowers of sulphur to the induline melt, the author finds that the reaction takes place at a lower temperature, and that the resulting product has a bluer shade. For instance, 4 kilos. of amino-azobenzene, 2·5 kilos. of aniline hydrochloride, 6 kilos. of aniline, and 2—3 kilos. of sulphur are heated together for two hours to 160° C. The product obtained has the same shade as that formed without sulphur by heating for several hours to 180° C. These dyestuffs, which contain sulphur, are said to be very fast to soap.—T. A. L.

Report on the Sealed Communications, Nos. 677—682, of La Société anon. de Prod. Chim. et Mat. Col. de St. Denis. E. Noelting. Bull. Soc. Ind. Mulhouse, May 1902, 143—144. (See preceding Abstracts.)

The author reports that the results obtained by E. Ehrmann have not been anticipated, but with regard to No. 679, describing the formation of a yellow dyestuff by the action of chloride of sulphur on dimethylaniline, it is to be noted that Merz and Weith (Ber., **19**, 1571) obtained a dithiodimethylaniline, $S_2[C_6H_4N(CH_3)_2]_2$, by carrying out the reaction in petroleum spirit and at a low temperature. Ehrmann, on the other hand, works without any diluent and at a comparatively high temperature. The two products are quite different, and whilst Merz and Weith's substance has no tinctorial properties, that of Ehrmann dyes yellow shades on silk, wool, and tannin-mordanted cotton.

—T. A. L.

Benzidine Blue (*certain Reactions of Benzidine*). G. Saget. Rev. Gen. des Matières Col., 1902, **6**, [67], 153—154.

A bright blue precipitate is produced on slowly adding a cold solution of potassium permanganate to one of benzidine hydrochloride. The filtrate from this insoluble substance has a crimson colour, and contains a soluble oxidation product together with manganese chloride and unaltered benzidine. Excess of the oxidising agent totally destroys the blue, the formation of which is prevented by the presence of free hydrochloric acid, but not by that of acetic acid.

The insoluble Benzidine Blue is also produced by the action of manganese dioxide on the hydrochloride of the base—a result which can be obtained on fibres mordanted with the peroxide by treating these with a solution of the benzidine salt. The blue is, however, very unstable, and rapidly changes to a dull grey; it also decomposes when suspended in water at 65°, and is destroyed by hydrochloric acid, ammonia, sodium carbonate, or oxidising agents such as potassium bichromate and sodium hypochlorite.

Tolidine gives rise to an equally fugitive blue of somewhat duller shade.—G. T. M.

Diazotisation; Elimination of a Nitro Group on ——. *Dinitro-p-anisidine.* R. Meldola and J. V. Eyre. Proc. Chem. Soc., **18**, [254], 160.

Dinitro-*p*-anisidine—

$$C_6H_2NO_2.NO_2.NH_2.OCH_3 = 2:3:4:1,$$

obtained by nitrating acet-*p*-anisidide and hydrolysing the acetyl derivative, on diazotisation in acetic acid in presence of sulphuric or nitric acid, forms a dinitrodiazonium salt, which, on heating with alcohol, gives dinitro-anisol, $C_6H_3.NO_2.NO_2.OCH_3 = 2:3:1$, of m. pt. 119°. The dinitrodiazonium salts combine with alkaline β-naphthol in the ordinary way to form the azo compound, $CH_3O.C_6H_2(NO_2)_2.N_2.C_{10}H_6.OH\beta$. When diazotised in the presence of hydrochloric and acetic acid, one of the nitro groups is eliminated, as in the case of dinitro-*o*-anisidine (Trans. Chem. Soc., 1900, **77**, 1172; Proc. Chem. Soc., 1901, **17**, 131, and this Journal, 1901, 572; Trans. Chem. Soc., 1901, **79**, 1076). The authors showed that it is the 3-nitro group, that is, the group which is *ortho* with respect to the diazonium group, which is thus eliminated.

The displacing of the nitro group in the two dinitroanisidines now investigated tends to show that the elimination of this group follows the ortho-para law.

Vital Colorations by means of Coal-Tar Dyestuffs. M. Nicolle.

See under XXIV., *page* 1042.

ENGLISH PATENTS.

Indoxyl [*Indigo Dyestuffs*] *and its Homologues; Manufacture of* ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 16,875, Aug. 22, 1901.

THE action of sodamide on phenylglycine-phenylglycide, $HO_2C.CH_2.N(C_6H_5).CO.CH_2.NHC_6H_5$, at about 200° C. gives a good yield of indoxyl. Since the reaction is a violent one, it is advisable to add to the melt a suitable diluent, such as an alkali hydroxide or cyanide, or mixtures of the two. For example, 15 kilos. of the potassium salt of phenylglycine-phenylglycide are added to a fused mixture of 45 kilos. of caustic potash, 35 kilos. of caustic soda, and 15 kilos. of sodamide, or to a mixture of 15 kilos. of potassium cyanide and 15 kilos. of sodamide at 180°—210° C. There is evolution of ammonia, and when this diminishes, the melt is allowed to cool, dissolved in water, and converted in the usual manner into indoxyl or Indigo.
—T. A. L.

Amidohydroxylated Derivatives; Oxidising Aromatic Amines to Obtain ——. Vidal Dyes Syndicate, Ltd., London. Eng. Pat. 573, Jan. 8, 1902.

SEE Fr. Pat. 307,631; this Journal, 1902, 38.—T. A. L.

Orthotoluene Sulpho-Chloride; Manufacture of ——. O. Imray, London. From Les Fabriques de Prod. chim. de Thann et de Mulhouse. Eng. Pat. 14,390, July 15, 1901.

SEE Fr. Pat. 312,797; this Journal, 1902, 112.—T. A. L.

Colouring Matters [*Triphenylmethane Dyestuffs*] *belonging to the Triphenyl- and the Diphenyl-Naphthyl Methane Series respectively; Manufacture of* ——. C. D. Abel, London. From The Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 16,173, Aug. 12, 1901.

SEE Fr. Pat. 313,500; this Journal, 1902, 112.—T. A. L.

Basic Dyestuffs [*Diphenylmethane Dyestuffs*]; *Manufacture of New* ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 16,417, Aug. 15, 1901.

SEE Fr. Pat. 308,033; this Journal, 1902, 112.—T. A. L.

Disazo Colouring Matters [*Azo Dyestuffs*] *and Intermediate Products relating thereto; Manufacture of New* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 15,678, Aug. 2, 1901.

SEE Fr. Pat. 312,899; this Journal, 1902, 112.—T. A. L.

Azo Colouring Matters [*Azo Dyestuffs*] *and the Production of New Matter for use therein; Manufacture of* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 16,811, Aug. 21, 1901.

SEE Fr. Pat. 313,671; this Journal, 1902, 169.—T. A. L.

Azo Colouring Matters [*Azo Dyestuffs*], *and Materials for Use therein; Manufacture of New* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 17,356, Aug. 29, 1901.

SEE Fr. Pat. 314,134; this Journal, 1902, 402.—T. A. L.

Substantive Colouring Matters [*Sulphide Dyestuffs*] *containing Sulphur, and Intermediate Products relating thereto; Manufacture of New* ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 17,273, Aug. 28, 1901.

SEE Fr. Pat. 313,902; this Journal, 1902, 170.—T. A. L.

Dyestuffs [*Sulphide Dyestuffs*] *containing Sulphur; Manufacturing Permanent* ——. R. J. Urquhart, Manchester. From Chemische Fabriken vorm. Weiler-ter Meer, Uerdingen-on-the-Rhine, Germany. Eng. Pat. 15,708, Aug. 3, 1901. Supplementary to Eng. Pat. 11,733 of 1901; this Journal, 1902, 966.

SEE Fr. Pats. 310,713 and 313,052; this Journal, 1902, 112.
—T. A. L.

Colouring Matters [*Sulphide Dyestuffs*] *containing Sulphur; Manufacture of* ——. G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine, Germany. Eng. Pat. 16,592, Aug. 17, 1901.

SEE Fr. Pat. 313,737; this Journal, 1902, 170.—T. A. L.

Indophenols; Sulphurised [*Sulphide Dyestuffs*]. O. Imray, London. From The Society of Chemical Industry, Bâle, Switzerland. Eng. Pat. 9968, April 30, 1902.

ACCORDING to Eng. Pat. 5385 of 1900 (this Journal, 1900, 530), the dyestuffs therein described are obtained by filtering the reacting mixture. The patentees now find that it is preferable to distil off the alcohol and to mix the residue with dry metallic salts, sodium chloride or carbonate, or else to dissolve the residue in water, filter if necessary, and precipitate the sulphurised indophenol by a current of air or other feeble oxidiser, such as hydrogen peroxide or a hypochlorite, with or without the presence of metallic salts
—T. A. L.

Indophenols; Sulphurised [*Sulphide Dyestuffs*]; *Manufacture of* ——. O. Imray, London. From The Society of Chemical Industry, Bâle, Switzerland. Eng. Pat. 9969, April 30, 1902.

THE action of sulphur and an alkali sulphide on an indophenol is conducted in a closed vessel, or in one provided with a reflux apparatus and with an agitator, at a temperature above 100° C.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Indigo; Fixing ——, *by Steaming.* W. Elbers. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [13], 356—360.

THE author has found that prolonged steaming of Indigo in the absence of reducing agents gives rise to the production of Indigo Grey on the fibre, and this colour can be worked with any known dyestuffs which are fixed by steaming. It is important to employ a proper thickening; gum is useless, the resulting shades not being fast to washing. The best results were obtained with wheaten flour. The Badische Anilin und Soda Fabrik, by suitably modifying Schlieper's process (steaming the goods for a short time, *i.e.*, 25 seconds, after printing with Indigo and a reducing agent—grape sugar), employing air-free steam, obtain blue shades, using British gum for thickening. A somewhat similar process has been proposed by P. Wilhelm. Kalle and Co. have patented a method employing dry steam at 104°—112° C., but the maintenance of these conditions is scarcely practicable. The author's modification consists in padding the cloth with 10 per cent. grape-sugar solution, printing with a wax-resin, and cover-printing with Indigo. The goods are then steamed for three-quarters of an hour in a continuous steaming plant when this has been in action for half an hour. After washing and soaping, it is found that the parts protected by the wax are blue, the other coloured portions being grey. Blue shades can also be obtained by employing A. Rahtjen's halogen Indigos (Eng. Pat. 17,022, 1901; this Journal, 1901, 1205), since the products appear to be more readily reduced than ordinary Indigo.—T. A. L.

Black-dyed Cotton; Examination of ——. C. G. Whittaker. Zeits. f. Farben- u. Textil-Chem., 1902, [14], 397.

BLACK dyeings on cotton can be produced according to four different methods:—(1) Black from substantive dyestuffs.

2) Black from substantive dyestuffs by diazotising the ame on the fibre, and subsequently developing with a uitable agent; (3) Logwood Black; (4) Aniline Black; 5) Black from sulphur dyestuffs, topped with Aniline lack; (6) Black from sulphur dyestuffs. These different yeings may be distinguished in the following manner:— lacks obtained by means of substantive dyestuffs by direct yeing, bleed strongly when the sample is treated with oiling water. If the sample be warmed with dilute hydroloric or sulphuric acid, Logwood Black is extracted from ie fibre, the acid liquid acquiring an orange red to red olour, changing to violet on adding excess of alkali, whilst ie cotton itself is left purple to reddish-brown. Blacks btained from azo dyestuffs diazotised on the fibre and eveloped with β-naphthol, or the like, are completely estroyed by boiling with sodium hydrosulphite; Aniline lack and Blacks from sulphur dyestuffs are only tranently decolorised, the colour returning when the sample is ashed with water. If the sample be placed in a boiling loride of lime solution of 3° B., Aniline Black changes to it-brown; a Sulphur Black topped with Aniline Black comes yellow to light brown (according to the proportion Aniline Black); and a Sulphur Black is completely colorised. If the sample be carbonised with concentrated lphuric acid, then, on diluting with water, a light green lution indicates the presence of Aniline Black and a olourless solution that of a Sulphur Black.—A. S.

English Patents.

extile Fabrics; Process of Making Non-Shrinkable, Porous, Foraminous ——. W. Schmitz, Aix-la-Chapelle, Germany. Eng. Pat. 22,076, Nov. 1, 1901.

SSUES, woven partly with yarns composed of animal ool) fibres and partly with yarns composed of vegetable res, are first fulled, and are then carbonised to destroy e vegetable fibres, being thus rendered unshrinkable and rmeable.—E. B.

Nitrocellulose; Denitration of ——. H. Richter. Eng. Pat. 12,695, 1901.

See under XXI., *page* 1038.

arn and like Materials in the Form of Cops or Packages; Preparing ——, *for Dyeing, Finishing, and other Purposes.* S. W. Wardwell, Providence, R.I., U.S.A. Eng. Pat. 3422, Feb. 11, 1902.

RNS are wound upon flexible tubes, composed of opensh fabrics, into porous cops, with protecting and aining covers formed by extending the tubes over the ds and sides of the cops, and are dyed, &c., in this state. —E. B.

eing, &c., Fibrous Material in a Spun or other State Yarns]; Apparatus for ——. R. Illingworth, J. T. Mazey, and G. Naylor, Coventry. Eng. Pat. 9720, May 10, 1901.

E apparatus in question consists essentially of a dyesel of a cylindrical shape and open at the top, into which itted a piston furnished at its upper side with means for rying the cops to be dyed, and with holes communicating h the liquor-space below. The reciprocating motion of piston causes the dye-liquor to be alternately drawn and ed through the cops.—E. B.

ed Textile Fabrics; An Improved Method of Discharging ——. E. Knecht and P. Spence and Sons, Ltd. Eng. Pat. 9847, May 13, 1901.

CHARGES are produced on textile fabrics dyed with dyestuffs, by the use of titanium salts derived from the des TiO or Ti_2O_3, titanium sesquichloride, $TiCl_3$, being the mpound commonly employed.

A white discharge on a cotton fabric dyed with Benzopurin 4 B, is obtained by printing with a paste of highly ined British gum (100 parts) containing 0·5 part parts of titanium sesquichloride. This mixture may be d in discharging Crystal Scarlet by the addition of 5—10 parts of ammonium thiocyanate. A red discharge paste is prepared by the introduction of Safranine, citric acid, and either sodium acetate or a convenient thiocyanate. —G. T. M.

Printing Vegetable Fibres [with Indanthrene]. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,901, Aug. 22, 1901.

THE dyestuffs obtained from β-amino-anthraquinone by fusion with alkalis or in other ways (Eng. Pats. 3239 and 24,354, 1901; this Journal, 1902, 249, and 910) are applied in printing fabrics composed of vegetable fibres, according to the methods described below.

(1) The fabric is printed with a dyestuff of the abovementioned class, in admixture with a reducing agent and alkali, and is steamed. Thus a mixture is prepared of 56 parts of gum, 60 parts of dextrin, 188 parts of water, 546 parts of caustic soda-lye (containing about 41 per cent. of NaOH), 50 parts of stannous chloride or of stannous oxide, and 100 parts of a 10 per cent. paste of the dyestuff. This is printed upon the fabric, which has previously been prepared with oil or with glucose, and the fabric is then steamed with damp steam for 5—10 minutes.

(2) The fabric is printed with a mixture containing a reducing agent, and is then passed through a solution of alkali. A mixture suitable for this purpose consists of 115 parts of gum, 82 parts of flour, 533 parts of water, 70 parts of stannous chloride, 100 parts of water, and 100 parts of a 10 per cent. paste of the dyestuff. The fabric printed with this is dried, and passed, for about half a minute, into a bath of caustic soda-lye (containing about 10 per cent. of NaOH) at a temperature of about 65°—75° C.; it is then washed and dried. The stannous chloride may be replaced by other reducing agents or mixtures of reducing agents. If ferrous sulphate be used to effect the reduction, ferric oxide is formed during the treatment with alkali, and this must be removed by passing the fabric through a bath of dilute sulphuric acid, but the ferric oxide is most readily removed if tartaric acid be added to the printing mixture. During the passage through the alkali bath, the unprinted parts of the fabric tend to become discoloured. This can be prevented by adding sodium bichromate to the bath.

(3) A mixture of the dyestuff and caustic alkali, with or without a thickening agent, is printed upon the fabric, which is then steamed for about half an hour.—E. B.

Fabrics and other Products; Process for Rendering ——, *Impermeable to Liquids.* H. J. Haddan, London. From G. Dutilleul, Lille, France. Eng. Pat. 14,106, July 10, 1901.

THE following solutions are employed:—(1) Alum and tannic acid (15 grms. of each per litre of water); (2) potash (25 grms. per litre of water); and (3) paraffin (1 grm.), vaseline (11 grms.), and heavy mineral oil (2 grms.) in light petroleum (1 litre). Textile fabrics, in the dry state, are immersed for 10—15 minutes, in solution (3) alone, or they are passed successively through solutions (1) and (2), and are then immersed in solution (3), being allowed to dry after each operation. Paper, ropes, cork, &c. are treated with the several solutions by means of brushes. Dyestuffs may be added to the solutions to colour the materials which are rendered waterproof in this manner.—E. B.

United States Patent.

Fibres from Reeds, Rushes, or similar Plants; Process for producing Long and Short ——. L. v. Ordody, Buda-Pesth. U.S. Pat. 703,814, July 1, 1902.

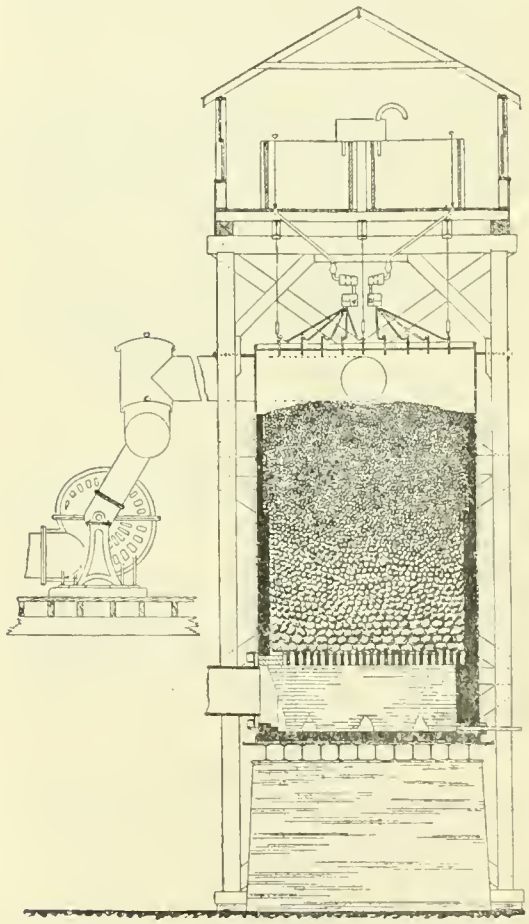
REEDS, rushes, and the fibrous stalks of similar plants are macerated in water for six hours at 40°—45°, the upper and lower parts of the stems being treated separately throughout the entire process. The maceration is twice repeated, and then the stalks are squeezed out, cut into thin horizontal strips, and boiled in a lye containing 2—3 per cent. of caustic soda or potash, mixed with an emulsion of milk of lime and petroleum. The materials are subsequently washed, the long and short fibres being separated, and

passed through a bath containing a dilute solution of acetic acid. The long fibres are then broken in suitable machines, combed, heckled, and spun like hemp ; the product resembles jute, but is stronger and cheaper. The short fibres are employed in paper manufacture, and, when mixed with cow-hair, form a useful felting material.—G. T. M.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture ; The Fan in ——. A Contribution to the History of the Sulphuric Acid Process. O. Mühlhäuser. Zeits. angew. Chem., 1902, **15**, [27], 672—674.

For many years the only means employed to increase or regulate the draught in the chamber process was the chimney-stack, but of late the fan has come more and more into use for this purpose, and the chimney has been retained simply as a means of delivering the waste gases of the process into the atmosphere at a height sufficient to insure their spreading and dilution, and to prevent nuisance arising from them. Mechanical means to create or regulate the draught were first introduced by Hagen in 1878, at the Halsbrücke Vitriol Works, two Root's blowers in lead being erected, of which one was placed between the Glover and the first chamber. These completely overcame the difficulties of draught, arising especially in hot weather, from the great distance between the burners and the



chambers. The idea was developed by E. C. Hegeler, in a zinc works at La Salle, Illinois, U.S.A. In 1882, he substituted a fan for Hagen's blowers. This was made in the first instance of iron, afterwards covered with lead. But as this did not last, the fan was ultimately made of hard lead and worked in a case of soft lead. For many years the La Salle works have used two fans, one between the Glo and the first chamber, the other between the last cham and the Gay-Lussac. The increase in the use of the fan the United States is largely due to F. J. Falding. I fan consists of a cast-iron case, lined internally w lead ; the fan itself is made of an acid-resisting hard l alloy, and is mounted on a cast-iron bed-plate, a balanced with the greatest exactness, so that it can be r at a high speed. It is made so large that it will feed chamber-space of 100,000 to 700,000 cb. ft., and the sp can be regulated, by means of an Evans friction pull, between 100 and 700 revolutions per minute. The acco panying figure shows how the fan is mounted and connec with the Glover tower.

The author considers the introduction of the fan in chamber process to be one of the most important impro ments of the past 25 years ; through it the process acquired a machine-like regularity. He points out t Lunge's plate towers, by diminishing the resistance to travel of the gases, have also contributed largely to m the process capable of regulation.—J. T. D.

Cyanides from Gas ; Extraction of ——. M. Guille J. Gas Lighting, 1902, **80**, [2043], 89.

The author has made some experiments on the metho extracting cyanogen from gas containing much ammonia means of ferrous sulphate solution (see this Journal, 1 999). The amount of ammonia present should be about 7 of that of yellow cyanide produced from the cyanogen. much ammonia be present, it is preferably reduced the proper amount before passing the gas to the cya washer. As a guide to the proper condition of the ga a piece of turmeric paper strongly acidified with tartaric d is recommended. The paper is changed about every hours ; it becomes blue if excess of ammonia be pres t. The following is the best method of treating the liquor f the cyanide washer. The action is arrested exactly at t point when the cyanide is all in the insoluble state, d pure ammonium sulphate alone remains in the solution. To the crude liquor dilute sulphuric acid is added, and t hydrogen sulphide evolved, is allowed to escape. The lio is now stirred and a drop transferred to a piece of fi paper, and a drop of ferric chloride solution and potass ferrocyanide solution, respectively, brought on either sid of the drop of liquor. A blue colour with the ferric chlo indicates the presence of cyanide in the liquor, and mo acid should be added. Absence of colour with the f ic chloride, and a blue or green colour with the ferrocya e indicates iron in solution, *i.e.*, the addition of too mu h acid ; in this case, a further quantity of liquor must be added. At the right point no colour is given on either le of the test drop. If the liquor has been subjected a large excess of gas containing ammonia, the iron sulph e produced may be attacked to such an extent that the is not enough left in the liquor to ensure the formatio of insoluble double cyanide. If this be so, the liquor is or ge coloured and is turned blue by the ferric chloride. In s h a case, the ferrous sulphate solution used in the wash is added instead of acid, and the tests on filter-paper are continued as before. It is stated that by this metho the extraction of the cyanogen is complete, and a very pu ammonium sulphate is obtained.—A. S.

Calcium Sulphaluminate ; Composition of — L. Deval. Thonind. Zeit., **26**, [78], 1081—1082.

Two methods of preparation were employed. In the fi a clear solution containing 5·627 grms. of lime from the calcination of precipitated calcium carbonate, was allowed to act for three months on a similar solution conta ing 5·537 grms. of aluminium sulphate (alumina, 1·1 ; sulphur trioxide, 3·385 grms.), this second solution bei gradually added to the first. In the second method, 1 m. of finely pulverised, dried hydrated tricalcium aluminate (containing 0·377 grm. of alumina) was treated for fi e months with a solution of calcium sulphate containing 0·920 grm. of sulphur trioxide. The product has the following composition :—Alumina, 0·048 (0·048) ; sulphur trioxide, 0·113 (0·115) ; lime, 0·170 (0·186) ; carbon dioxide, 0 (0·028) ; the extra lime and the carbon dioxide

the second case being due to the formation of calcium carbonate during the experiment. In both cases the composition approximated very closely to the formula $Al_2O_3 3CaO$ O_3CaO), and the amount of water taken up during crystallisation was ascertained to be 28·5 mols., the composition of the crystalline substance being: water, ·8; alumina, 8·5; sulphur trioxide, 20·0; lime, 28·8 per nt.—C. S.

English Patents.

lid Material with Gas; Treatment of——, as in the carrying out of Catalytical Reactions. P. Naef, New York. Eng. Pat. 14,976, July 23, 1901. (Under Internat. Con., May 10, 1901.)

PLICABLE in the manufacture of sulphuric anhydride m sulphurous acid. The claims (131 in number) refer successive treatment and intermediate adjustment of mperature during the progress of the reaction, agitating l drying appliances, the removal of impurities, the ification of agents with acid and alkali, the treatment of nt agent, and various arrangements of apparatus for erating, heating, cooling, supplying, and directing the w of the gas.—R. A.

phate of Alumina; Manufacture of ——. J. Bock, Oberlössnitz, near Dresden, Germany. Eng. Pat. 9545, April 24, 1902.

UTION of aluminium sulphate is concentrated under a uum until crystals are formed, the growth of which is eased by adding more of the solution. When the ired crop of crystals has been obtained, the latter are arated from the magma by centrifugal action or other able means.—E. S.

monium Sulphate; Manufacture of ——. A. Feldmann, Bremen, Germany. Eng. Pat. 11,525, May 20, 1902.

o saturator vessels are connected in series, the second higher one being covered and connected with the first an overflow pipe opening into the bell of the lower el, which is thus supplied with relatively fresh acid.

—E. S.

United States Patents.

phurous Acid; Apparatus for Making ——. W. Weud, Appleton, Wisconsin. U.S. Pat. 704,412, July 8, 902.

fames from a sulphur burner are passed through a pipe verted U-shape into the lower part of a closed tank aining water, from the upper, vacant space of which a passes upwards, and is then curved downwards, to r near the bottom of a second similar tank, also con- ng water. From the top of this tank a pipe is led nwards to enter an ejector pipe communicating by a zontal tube of greater diameter with a water supply, so the flow of water about the end of the vertical pipe induce a vacuum in the connected tanks.—E. S.

imony Oxide; Process of Making White ——. A. S. Plews, London. U.S. Pat. 704,367, July 8, 1902.

IMONY ore is heated with smokeless fuel to a bright in an oxidising and reducing atmosphere alternately ng as antimony fames are evolved; steam is injected the fames, and the product is received in condensing abers provided with means for absorbing any traces of nony from the exit gases.—E. S.

li-Metal Sulphates; Process of Separating —— from ixed Solutions. C. Hoepfner, Frankfort-on-the-Maine, ermany; H. Orth, Jr., Administrator of said Hoepfner, ceased. U.S. Pat. 704,036, July 8, 1902. (Compare g. Pat. 15,873, 1900; this Journal, 1901, 987.)

concentrated mixed solution containing alkali sulpes is caused to flow into a strongly cooled solution of table chloride (such as NaCl or $ZnCl_2$, or both), with ant stirring. The chloride solutions are drawn off time to time, and the alkali sulphate crystals ed, removed. The cold solution is used to reduce the erature of the cooling gases employed in the process.

—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

English Patent.

Glass by Electricity; Manufacture of ——. C. G. Redfern, London. From La Société de l'Industrie-Verrière et ses derivés, Brussels. Eng. Pat. 17,656, Sept. 3, 1901.

THE raw material, instead of being subjected to the action of the electric current in the form of powder or grains, is fused by it after an initial compression into the shape of sticks, balls, briquettes, &c., or preferably into the form of ribbon or an endless chain.—G. H. R.

United States Patents.

Glass; Composition for Ruby ——. R. Zsigmondy, Jena, Germany. U.S. Pat. 703,512, July 1, 1902.

THE composition consists of a barytiferous glass, made up mainly of silicic acid, soda, and baryta (the last added preferably as nitrate), to which from 0·25 to 1·7 part of gold is added for every 10,000 parts of quartz sand.

—W. C. H.

Stained-Glass Window or Similar Object, and Process of making same. J. Taluau. Assignor for one-half to H. W. Scattergood, Philadelphia. U.S. Pat. 704,399, July 8, 1902.

SECTIONS of glass and other electrically non-conducting material are arranged on a temporary conducting surface or foundation on a removable support, with their edges apart, and then the whole is exposed in an electrolytic bath until the interstices are filled by the deposit formed on the conducting surface, after which the latter and the support are removed to expose the faces of the finished object.—G. H. R.

Glass; Method of Framing ——. J. Taluau and H. W. Scattergood, Philadelphia. U.S. Pat. 704,400, July 8, 1902.

IN this process, which is an improvement on the preceding patent, a metallised support of wax or other material is provided for the component parts of the object during the electro-deposition of the frame, which is built up by a combination of an electro-deposited shell or base, and a filling of material which amalgamates with it, or serves simply as a packing or filling.—G. H. R.

Glass; Method of Framing ——. J. Taluau. Assignor of one-half to H. W. Scattergood, Philadelphia. U.S. Pat. 704,401, July 8, 1902.

RELATES to certain specific forms of the invention described in U.S. Pat. 704,399 (see above).—G. H. R.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Woods of British Guiana; The Constructional ——. L. M. Hill. Proc. Inst. Civil Eng., 1902, **147**, [1], 3—8.

GREENHEART (*Nectandra Rodiei*), sp. gr. 1·41. One of the eight first class woods at Lloyd's. This wood, which is used as a building material and is highly valued for all classes of submerged work, is found in all gradations of colour between green and black; it varies in weight between 62 and 75 lb. per cubic foot, the oldest timber being the darkest and heaviest.

BULLET TREE (*Mimusops Balata*), sp. gr. 1·084. The source of the caoutchouc gum known as balata. A dark red and very close-grained wood of excellent and durable quality. Its uses are similar to those of greenheart, whilst it should also be serviceable for street-paving.

CRABWOOD (*Carapa Guianensis*), sp. gr. 0·656. A brown wood much resembling mahogany.

WALLABA (*Eperna Falcata*), sp. gr. 1·050. A dark red wood saturated with a red resin which renders the freshly-exposed surface sticky. It forms a durable building

material, standing exposure to all conditions, wet or dry, but above ground it is subject to attack from wood ants.

Mora (*Dimorphandra Mora*), sp. gr. 1·029. One of the eight first-class woods at Lloyd's. A light-red, close-grained, exceedingly tough and durable wood. It resists dry rot and is used in shipbuilding. It makes excellent railway sleepers and should be useful for street paving.

Cirouanalli (*Nectandra*), sp. gr. 0·610—0·830. This wood, which is insect-resisting, occurs in two varieties, known as "brown" and "yellow" silverballi or siruaballi.

Suradanni (*Meliaceae Cedrela*), sp. gr. 0·846. A dark deep-red-coloured wood with black streaks.

Simaruba (*Picraena officinalis*), sp. gr. 0·475. A light yellow wood, cheap and plentiful in the Colony. It might be used in place of the white pine wood of the northern hemisphere. It resists the attacks of wood ants and other insects, but will not stand exposure to the weather.

Cedar (*Icica altissima*), sp. gr. 0·560. A reddish-brown wood valuable for cabinet-making. It is not so plentiful as the variety known as white cedar, which is very durable underground for foundation timbers.

Lignum Vitæ (*Guaiacum officinale*), sp. gr. 1·250. True *lignum vitæ* is not plentiful in British Guiana. It is often confounded with hackia (*Siderodendron triflorum*), which is equally hard, close-grained, and heavy, and grows abundantly in the Colony. Both woods are stated to be practically indestructible.

Locust (*Hymenæa Courbaril*), sp. gr. 0·942. A streaked brownish close-grained wood. The tree is the source of the gum animi of commerce, largely used in the manufacture of varnish. The gum is found buried in large quantities, where a tree has rotted away; it may also be obtained in small amounts by tapping.

Kakaralli (*Lecythis ollaria*), sp. gr. 1·010. A hard, close-grained, durable and very tough wood, of a purple colour on all cut and exposed surfaces. It would probably be better as a street-paving material even than bullet tree or mora.

Houbooballi (*Mimosa guianensis*), sp. gr. 0·895. A wood of a light brown colour, variegated with vertical veins of black and brown. It is very durable under water. It is stated that the kinds of timber described above can be supplied from British Guiana in large quantities at reasonable prices.—A. S.

Cement; The Hydraulic Modulus of Portland ——. O. Lieven. Thonind.-Zeit., 26, [75], 981—983.

In support of the Le Chatelier theory, and in opposition to the Russian standard of hydraulic modulus, wherein the ratio $(CaO, Na_2O, K_2O) \div (SiO_2, Al_2O_3, Fe_2O_3) = 1·7—2·2$, the author cites two examples of Russian Portland cement. In the one case, that of Novorossisk cement, the upper chalk rock used consists of a series of marls, with clay partings, exceedingly fine in grain and with a very high percentage of silica, but varying in composition. Here it is found that only a very inferior cement is obtained from the strata which agree with the Russian standard in composition, and that the limits of $CaCO_3$ therein prescribed must be considerably exceeded in order to obtain a good article; on the other hand, the best cement is furnished by the strata complying with the limits of composition laid down by Le Chatelier. A good commercial product, harmonising with the Russian standard of hydraulic modulus, is, however, obtained by suitably blending different strata. The extreme limits of fluctuation in the composition of the different layers are as follows:—CaO, 72·01—66·07 per cent.; SiO_2, 23·75—29·02; Al_2O_3, 3·11—3·40; Fe_2O_3, 0·85—1·24; MgO, 0·30—0·20 per cent., corresponding respectively to the Le Chatelier factors: $(CaO, MgO) \div (SiO_2, Al_2O_3) = 3·03—2·28$, and $(CaO, MgO) \div [SiO_2 - (Al_2O_3, Fe_2O_3)] = 3·59—2·67$.

The second case cited is that of Amwrosiewka cement. Here the rock is friable and of chalky consistence. The composition is regular in places, but fluctuates in others, the variation being more difficult to detect owing to the absence of decided stratification. The grain is exceedingly fine, and the proportion of silica high, the limits of composition in the usable portions being CaO, 67·64—70·96 per cent.; SiO_2, 23·84—22·34; Al_2O_3, Fe_2O_3, 8·12—5·96 per cent. A uniform commercial product is obtained by careful mixing.—C. S.

Calcium Sulphaluminate; Composition of ——. L. Deval.

See under VII., *page* 1026.

English Patents.

Bricks and other Earthenware or Ceramic Products; Process and Apparatus for Drying ——. C. Berhenke, Billerbeck, Germany. Eng. Pat. 20,643, Oct. 15, 1901.

The hot combustion gases from annular kilns and the like are led through pipes arranged in the drying space, in which the goods to be dried are stacked, and escape by a flue from these pipes to the kiln chimney. The vapours derived from the drying goods escape through openings in the roof of the drying chamber into transverse channels opening into longitudinal channels, which conduct the vapours to a chimney.—W. C. H.

Wood and other Porous Materials; Impregnation of ——. A. J. Boult, London. From Hülsberg and Co., Charlottenburg, Berlin. Eng. Pat. 6844, March 20, 1902.

Porous material is subjected to the action of air or gas under considerable pressure, whereby the cells, pores, or cavities are filled with compressed gas; the impregnating liquid is then applied under still greater pressure, and when this is lowered to atmospheric pressure, or below, it is said that the gas compressed in the cells, &c. forces out the excess of the impregnating liquid from them, leaving only the walls impregnated.—W. C. H.

Metal and other Surfaces; Composition for Covering ——. G. Harding, Liverpool. Eng. Pat. 8442, April 11, 1902.

The kind of composition referred to is that for covering tiles, blocks, &c.

A coating of an aqueous solution of magnesium chloride of about 1·186 sp. gr. is applied to the cleaned surface to be covered, and on this coat is spread the composition consisting of some of the magnesium chloride solution mentioned above, mixed with hard-wood sawdust, cork dust, peat moss, or the like, to which, just before application, magnesite and a further quantity of magnesium chloride solution are added. The proportions suggested are equal parts of magnesite, of sawdust, &c., combined with the magnesium chloride solution, and of magnesium chloride solution. See Eng. Pat. 11,644, 1901; this Journal, 1902, 915.—W. C. H.

United States Patents.

Wood; Apparatus for Impregnating ——. J. Borne, Rahway, N.J., U.S.A. U.S. Pat. 703,522, July 1, 1902.

An apparatus consisting of a tank or boiler closed at one end, with a central opening provided with a flexible gasket-like device at the other, through which the log passes. Inside the closed end is a funnel-shaped chamber in which steam and the impregnating fire- or water-proofing mixture are pumped. The smaller end of this chamber is provided with a delivery throat and perforated thimble with spring plates, which engage one end of the log, the latter being held in position by the pressure exerted by a travelling car, working on a rack, and supporting the other end of the log outside the tank.—W. C. H.

Stone; Process of Making Artificial ——, *and Forming Articles therefrom.* G. P. Chappell, New York, U.S.A. U.S. Pat. 703,640, July 1, 1902.

One part by weight of magnesium chloride is dissolved in one part of water, and mixed with two parts of magnesium oxide; to this mass a filling material, such as wood-flour, leather-powder, marble dust, &c. is added, and the whole

oroughly worked until it acquires a putty-like consistency. rom this compound articles can be moulded, which retain eir form sufficiently to be removed quickly from the oulds.—W. C. H.

X.—METALLURGY.

Gold] Diehl [Cyanide] Process. H. Knutsen. Paper read before Inst. of Mining and Metall., June 19, 1902.

HE Diehl process is peculiarly suitable to some of the algoorlie ores, of which typical examples are given owing an assay value of from 16 dwt. to 5⅓ oz. of gold r ton in rock containing from 10½ to 30½ per cent. of CO_3, from 9½ to 38¾ per cent. of $CaCO_3$ (and a little gCO_3), and from 40¾ to 77½ per cent. of insoluble matter. ich a rock after fine-crushing and roasting, yields a aterial which forms a cement and sets hard in the reolators.

In the Diehl process this difficulty is obviated by eating the material raw. The ore is first crushed, eferably in a Krupp tube-mill ("flint-mill"), which nsists of a cylinder, 13 ft. long by 4 ft. in diameter, arged with four tons of flint balls. The whole of the mes formed will pass a sieve of 200 meshes, whilst only ree per cent. remain on a sieve of 220 meshes per lin. in. ie slimes are concentrated, by means of a series of spitz-sten, to a pulp containing 40—50 per cent. of dry aterial, and the latter is charged into agitators, having a pacity of 100—125 tons of pulp, where it is kept in otion by stirrers for 1—1½ hours with an addition of tassium cyanide (4·4 lb. of KCy per ton of dry material ay suffice for slimes containing 1—3 oz. of Au per ton). bout 1·1 lb. per ton (of dry material) of cyanogen omide is then added, and the mixture is again agitated, til after 24 hours from the time at which the potassium anide was added, the action may be stopped. In the antime, if the ore was very rich in gold, a further pply of potassium cyanide and cyanogen bromide is ded after eight hours from the start; and, about two urs before the end, lime to the extent of from 1 to 4 lb. ually 3 to 4 lb.) per ton is added, as it is found that pleaner precipitate is thus obtained in the zinc boxes. anogen chloride is shown to be far less efficacious than nogen bromide. The sludge is then filter-pressed in sses with 50 compartments, each yielding a cake × 39½ × 2½—3 ins. and weighing, dry, about 1¾—2 . Compressed air is used to force the material into the mes, the initial pressure being 30 lb., and the final uired 50—75 lb. per sq. in. The cakes are then washed *situ* with about (per five tons of charge) 350—500 gallons weak solution, and then with a like amount of water. er which the cakes are "dry-blown," by forcing a rent of air at about 80 lb. per sq. in. pressure for 10—15 utes. The time required for the operation is about hours. The gold solution is then passed through a r-bottom, a plate-filter or small filter-press to the zinc es. The solution from the filter boxes and the overflow n the spitzkasten are pumped back to the storage tank n which the battery or ore-mixer is fed; the former will tain 0·05—0·15 per cent. of potassium cyanide or some-es more, but this is not found to interfere with the progress he process. If mercury passes into the solution from plates when amalgamation is used, or from the ore (for goorlie ores often contain coloradoite HgTe), it may be overed by retorting the gold slimes from the zinc boxes re roasting. The only drawback to the presence of assium cyanide in the return water is that the copper es wear out more rapidly. Details are given of the lication of the process at three Kalgoorlie mines: the nan's Star, the Lake View Consols, and the Hannan's wn Hill; schemes of working being given for the first and named. At the second-named, a comparison of costs ved that during August 1901, whereas by the roasting pro-the expenditure per ton of ore treated was 37*s.* 4·295*d.*; he Diehl process, including 1*s.* 9·196*d.* royalty, it was 9·03*d.* per ton, whilst the value of gold extracted per was 5*l.* 12*s.* 1·4*d.* by the roasting and 5*l.* 15*s.* 9·4*d.* by Diehl process.—W. G. M.

English Patents.

Furnaces; Heating Blast for ——. P. Naef, New York. Eng. Pat. 13,302c, June 29, 1901. (Under Internat. Conv., Nov. 30, 1900.)

Molten slag is sprayed into a rotary cylinder by means of the blast, which passes on to the furnace, the pulverulent slag passing into a hopper at the lower end of the cylinder. Or a liquid of high specific heat and boiling point, such as oil, salt solution, or molten metal, is heated in a revolving cylinder by leading hot combustion gases through it, and the liquid is then agitated in another revolving cylinder through which the blast is passed.—H. B.

Blast-Furnace Gases; Treatment of ——, *and Utilisation of their Heat, and Apparatus therefor.* B. H. Thwaite, London. Eng. Pat. 15,595, Aug. 1, 1901.

See U.S. Pat. 690,795; this Journal, 1902, 352.—R. S.

Blast or other Furnaces; Fusion of Hardened or Metallic Masses by a Flame Jet, particularly applicable to ——. A. J. Boult, London. From Cöln-Müsener Bergwerks-Aktien-Verein, Creuzthal, Germany. Eng. Pat. 14,146, July 11, 1901.

The burner jet comprises two gas-passages, one for hydrogen or a hydrocarbon gas or vapour, and the other for oxygen. The burner head has a water-cooled casing, or is otherwise protected. When the mass to be fused is brought to a glowing heat, the pressure of the gas, or of the oxygen only, is increased; the latter especially in case the mass is of iron or is combustible. The invention is applicable in the release of clogged tap-holes to blast- and other furnaces, and for the fusion of hardened or metallic masses generally.—E. S.

Metallurgical Operations; Process and Apparatus for Utilising the Waste Heat of ——. J. Imray, London. From La Société Electro-Métallurgique Française of Froges, France. Eng. Pat. 14,576, July 17, 1901.

A furnace, which may be of the electrical type, communicates at one end with a vertical shaft, into which, through a valved hopper at the top, the ore to be reduced is charged. Fuel is introduced through a hopper at the opposite end of the furnace, into which air to support combustion is also admitted. The highly heated carbon monoxide produced burns amidst the ore in the shaft (the waste gases having outlet near the top), and the ore thus heated descends by gravity into the furnace, which may be adapted to receive either solid or gaseous fuel. In every case, the ore and the carbonaceous fuel are kept separate until they are required to enter into reaction with each other.—E. S.

Furnaces; Mechanical Calcining or Roasting ——. J. R. Dowu and J. Godfrey, Swansea. Eng. Pat. 16,109, Aug. 10, 1901.

An improvement on Eng. Pat. 17,462, 1898. The furnace has a rotatable lower hearth and a fixed upper hearth, above which blades fitted to revolving arms impel the ore from the periphery, as it is received from the hopper, towards a passage near the centre, through which it falls on to the lower hearth, and is distributed outwardly to an exit way, which is also an air inlet.—E. S.

Metal Sheets; Apparatus or Machinery used in Coating —— *with Metals.* R. Heathfield, London. Eng. Pat. 6077, Mar. 22, 1901.

A pair of subsidiary submerged rolls is provided, in close proximity to the ordinary partially submerged exit rolls, guides being located between the two pairs, in addition to the usual guides beneath.—E. S.

Copper or the Alloys of Copper; Process for Hardening ——. Mrs. C. Renstrom, Seattle, U.S.A. Eng. Pat. 3357, Feb. 10, 1902.

Sulphur is sprinkled upon the suitably heated copper or alloy, which is then, in the heated state, immersed in a bath of cupric sulphate solution, and subsequently reheated, and allowed to cool without chilling.—E. S.

Erratum.

In col. 1, page 976 of this Journal, July 31, 1902, for "Eng. Pat. 15,324," read "Eng. Pat. 15,342."

United States Patents.

Steel; Manufacture of Crucible ——. E. B. Clarke, Pittsburg. Assignor to Firth Sterling Steel Company, Pennsylvania, U.S.A. U.S. Pat. 703,543, July 1, 1902.

The raw materials of steel or iron for making crucible steel are melted in a suitable receptacle, without treatment with oxidising or metallurgical agents, and the molten mass is run into a previously heated crucible. The required proportion of carbon or other agents is then introduced, the crucible is covered, and heated for as long as may be necessary to produce the crucible steel.—E. S.

"Bricking" [Briquettes of Iron Ore, &c.] Pulverised Material; Apparatus for ——. T. A. Edison, New Jersey. U.S. Pat. 703,562, July 1, 1902.

An apparatus for briquetting, comprising a chamber in which the pulverised material is heated, a mixer in which the heated material is admixed with a binding agent, a cooling device for reducing the temperature of the mixture, a briquetting machine, an oven for baking the finished briquettes, and means connecting the various parts for automatically moving the material continuously through the apparatus.—R. S.

Rotary Cutters; Process of Manufacturing ——. B. Jansen, Meiningen, Germany. U.S. Pat. 703,930, July 1, 1902.

A mixture of wrought- and cast-iron and steel, containing in the aggregate the percentage of carbon required for the material of the rotary cutters, is melted with addition of highly carburetted iron to promote its fusibility and homogeneity; the charge is then vigorously puddled to remove the excess of carbon, and when the fused metal begins to thicken, aluminium is added to prevent disengagement of gases or porosity while casting.—E. S.

Cupellation Furnace. D. Laird, Forfar, Scotland. U.S. Pat. 704,198, July 8, 1902. (Compare Eng. Pat. 21,195, 1900; this Journal, 1901, 255.)

The furnace has a fireclay body, enveloped in sheet metal, a hearth of refractory material having ribs on its under side, over an inclined flame bed, the ribs serving to divert the heated gases to side passages, whence they pass to impinge directly on the removable tray of cupels resting on the hearth, and dampers closing the hearth end, whereby air may be admitted. The flame bed is heated by means of a burner of oil or gas and air under pressure.—E. S.

Ore-testing Tablet. H. E. Way. Assignor of one-half to H. B. Griffith, Custer, South Dakota. U.S. Pat. 704,409, July 8, 1902.

The tablets, which have numerous deep depressions or recesses to admit the powdered ores to be tested, are composed of charcoal and potassium nitrate, preferably in the proportion of 16 parts of the former to 27 parts of the latter, by weight. The tablets, on being ignited, act both as oxidising and reducing agents, since potassium cyanide is one of the products of the combustion. Oxidising agents other than potassium nitrate may be used with the charcoal, as, for instance, potassium chlorate, with a little potassium cyanide.—E. S.

Furnace; [Metallurgical] ——. P. Corrigan, Wakefield, N.Y. U.S. Pat. 703,768, July 1, 1902.

Metallurgical furnaces of moderate size which burn gaseous fuel under pressure, are provided with "burners" (tuyères) which pass through the walls so as to enter the furnace tangentially. All the pipes are in sight, allowing of constant inspection and of easy repairs or adjustment.—R. S.

Fumes from Smelting Furnaces; Apparatus for Recovering the Minerals carried off in ——. W. R. Lee, Marion, U.S.A. U.S. Pat. 704,199, July 8, 1902.

The fumes pass from the furnace through a ∩-shaped tube, into the lower limb of which, nearest the furnace, steam is injected, whilst a water spray is introduced into the opposite limb, which limb enters one end of a long, closed chamber, compartmented by baffle plates, in which the fumes are sprayed with water. The inclined floor of the chamber terminates in a trough, for the reception of the matter carried down by the water. The passage of the gases through an eduction flue at the exit end of the precipitating chamber is promoted by a fan.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Accumulators of other Metals than Lead. S. v. Laszczynski Elektrotechn. Zeits., Aug. 8, 1901, 821—827. Proc. Inst. Civil Eng., 1902, **147**, [1], 105.

The author points out the advantages of nickel oxide Ni_2O_3, for use as a depolariser for the positive plate of an accumulator. Whilst the reduction of cuprous oxide diminishes the electromotive force produced at the negative plate by 0·95 volt, the electromotive force is increased by 0·04 volt where nickel oxide is used, as the latter compound is slightly endothermic, and gives out energy during the reduction. The plates can be made much lighter than in the case of lead, as the metallic nickel gauze that is used as a basis for the plate is quite unattacked, and can be made of very thin wire. The zinc negative plate is immersed in an alkaline electrolyte; the nickel, unlike copper, is quite insoluble in the alkali, and there is no tendency for it to be deposited on the zinc. The cell has an electromotive force of 1·84 volts; it is not damaged by overcharging, by complete discharge, or by leaving uncharged. The author considers that the cell is quite practicable for stationary batteries, but for traction work the limited solubility (15 per cent.) of the zinc in the alkali necessitates the use of too large a bulk of electrolyte.—A. S.

Dithionates; Electrolytic Production of ——. F. Foerster and A. Friessner. Ber., **35**, [13], 2515—2519.

By the electrolysis of solutions of sulphuric acid or of sodium hydroxide between platinised electrodes, with a current of constant strength and at a constant temperature, a continuous rise in E.M.F. between the electrodes is observed. This has been shown to be due solely to a rise of potential at the anode, due to absorption of oxygen by the platinum.

The results of electrolysing a solution of sodium sulphite between such polarised electrodes have been observed by the authors. By electrolysing a concentrated solution of sodium sulphite between freshly-prepared, unpolarised platinised electrodes, sodium sulphate is alone formed. By previously polarising the anode by electrolysis of a solution of sodium hydrate and subsequent electrolysis of the sodium sulphite solution, 47 per cent. of dithionate is formed. In a third experiment, in which the anode polarisation was destroyed by subsequent cathode polarisation, electrolysis of the sulphite gave only 8 per cent. of dithionate to 92 per cent. of sulphate formed. By using an anode of lead peroxide, the yield of dithionate was as much as 50 per cent.—B. F. D.

English Patents.

Electrolytic Baths. [*Glycerin.*] F. von Liebermann, Berlin. Eng. Pat. 12,547, June 2, 1902.

The addition of glycerin to electrolytic baths prepared according to Eng. Pat. 22,022, 1898, is said to decrease their viscosity, and to permit of their being used at a lower temperature.—G. H. R.

Carbon Articles [*Electrodes*]; *Manufacture of* ——. C. M. Hall, Niagara Falls, U.S.A. Eng. Pat. 12,681, June 3, 1902.

Carbon articles, such as electrodes, are baked by placing them in piles transversely to a conducting path or core, with their ends in proximity to it, interposing refractory insulating material between the articles or groups of articles, and passing a current through the core. Other electrodes may be piled outside the first set, and warmed by the heat transmitted through them, receiving a final baking by being subsequently placed next the core.—G. H. R.

United States Patents.

Storage Batteries; Active Material for ——, and Process of making same. W. E. Winship, San Francisco, California. U.S. Pat. 703,875, July 1, 1902.

Oxide of lead, or a lead salt, is mixed with a suitable binder, such as a glycerin solution, and the set mass is reduced by electrolysis in an alkaline forming-bath, in which the lead salt is soluble, to spongy lead, consisting of a compact mass of lead trees running essentially parallel to each other and perpendicular to its exposed surfaces, the mass occupying the volume of the unreduced salt from which it is formed.—G. H. R.

Electrode for [*Storage*] *Batteries.* T. A. Edison, New Jersey. Assignor to Edison Storage Battery Co. U.S. Pat. 704,305, July 8, 1902.

The electrode comprises a grid carrying a plurality of pockets arranged in the same plane, and made of "elastic metal" (spring-steel) with walls corrugated horizontally. The pockets have their outer faces perforated, and are formed of two sections, one of which is deeper than the other, and is turned over on it. The active material which is contained in them is so proportioned in bulk to the elasticity of the elastic metal that any changes in its volume will be within the elastic limits of the walls of the receptacle.—G. H. R.

Battery; Reversible Galvanic ——. [*Mercury Electrode.*] T. A. Edison, New Jersey. Assignor to Edison Storage Battery Co. U.S. Pat. 704,303, July 8, 1902.

The electrode is a perforated receptacle filled with finely-divided oxide of mercury mixed with flake graphite, the size of the particles of the latter being larger than the perforations. The electrolyte is an alkali zincate, and a piece of magnesium receives the deposited zinc.—G. H. R.

Battery; [*Alkaline*] *Reversible Galvanic* ——. [*Oxide of Cobalt.*] T. A. Edison, New Jersey. Assignor to Edison Storage Battery Co. U.S. Pat. 704,304, July 8, 1902.

A conducting support carries a mixture of a hydrated oxide of cobalt, containing more oxygen than the black oxide (Co_2O_3), mixed with flake graphite, and capable of furnishing oxygen on discharge, and forms the depolariser in an alkaline electrolyte which remains unchanged during all conditions of working. A second conducting support carries finely-divided electrolytically active iron when charged.—G. H. R.

Battery; Reversible Galvanic ——. [*Oxide of Nickel or Cobalt.*] T. A. Edison, New Jersey. Assignor to Edison Storage Battery Co. U.S. Pat. 704,306, July 8, 1902.

A conducting support, with perforated pockets or receptacles, is filled with a mixture of finely-divided copper and flake graphite, and a second conducting support has pockets which contain a mixture of an electrolytically active oxide of nickel or of cobalt with flake graphite. The electrolyte is one that remains unchanged during all conditions of use.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Steel and Iron; Electrical Resistance of ——. K. Benedicks. Zeits. phys. Chem., **40**, 545—560. Chem. Centr., 1902, **2**, [1], 1.

The author determined the resistance of different samples of a very homogeneous steel in the tempered and untempered conditions. The samples contained varying quantities of carbon, sulphur, silicon, phosphorus, and manganese. It was found that equivalent quantities of different substances, if they are dissolved in the iron, cause an increase in the electrical resistance by the same amount: this increase is about 5·9 microhms per c.c. for each atomic weight dissolved in 100 atomic weights of the iron. The segregated carbide present in the iron has no appreciable influence on the resistance. Experiments with untempered steel containing 0·45 to 1·70 per cent. of carbon showed that at the ordinary temperature, there is present with the cementite, not pure iron, but a solid solution of the same, with 0·27 per cent. of hardening carbon, that is identical with sorbite; this confirms the results of the purely chemical investigations of Osmond and Werth, Carnot and Goutal, Osmond and Brustlein, Arnold and Stansfield. If no large excess of carbide carbon is present in the iron—for instance, if the carbon amounts to only 0·2 per cent., then only 0·06—0·07 per cent. of carbon is dissolved in the iron. The perlite of iron poor in carbon does not therefore, like that of iron rich in carbon, consist of cementite and sorbite, but of a eutectic mixture of a substance richer in carbon with almost pure iron. At the ordinary temperature, the electrical resistance of steel is $7·6 + 26·8\,\Sigma\,C$, where $\Sigma\,C$ represents, in per cent. by weight, the sum of the hardening carbon and of the "carbon value" of the other substances dissolved in the iron. Absolutely pure iron has the resistance 7·6 microhms per c.c. Recent investigations of Barrett, Brown and Hadfield (this Journal, 1900, 911; 1902, 411, 621) confirm the author's results as to the influence of aluminium on the electrical resistance of iron. Chromium, nickel, and tungsten have a different effect, probably owing to the fact that, in the steel examined, they were not present in the dissolved condition.—A. S.

United States Patents.

Iron, Manganese, and Alloys of these Metals by aid of Electricity; Manufacture of ——. [*Fluoride of Calcium.*] A. Simon, Bordeaux, France. U.S. Pat. 704,393, July 8, 1902.

Carbon is added to the material to be treated, and the electrolyte consists of fluoride of calcium in sufficient quantity to dissolve the latter. The mass is then subjected to the action of a continuous electric current, to cause electrolytic decomposition and keep the metals or alloys produced, in a fluid condition.—G. H. R.

Electro-plating Apparatus. T. F. Taylor, New Jersey. U.S. Pat. 703,623, July 1, 1902.

A tank contains the electrolyte, and a stationary axle, on which is mounted a rotating receptacle, is suitably supported over it. The receptacle has openings at its ends for the admission of the electrolyte, and has a fibrous lining on its inner surface, on which are metallic rings electrically connected with a contact ring carried by, and insulated from the receptacle, and in contact with a brush which is in electrical connection with the negative poles of a generator. The anode, which is secured on the axle, dips down into the electrolyte, and is electrically connected through the axle with a binding post on it.—G. H. R.

Zinc Ores, and especially Blende; Electro-metallurgical Treatment of ——. C. J. Tossizza, Paris. U.S. Pat. 703,857, July 1, 1902.

See Eng. Pat. 14,825, 1901; this Journal, 1902, 980.

—G. H. R.

XII.—FATS, OILS, AND SOAP.

Cotton-Seed Oil; Chilled ——. P. Pollatschek. Chem.-Zeit., 1902, **24**, [58], 664—665.

After referring to the necessity of maintaining a uniformly low temperature in the manufacture of "winter oil," the author describes experiments he carried out to remove the stearin by some other means than by prolonged standing—in some works from two to three months—and subsequent filtration. The addition of solid fats (cocoanut oil, stearin, &c.) to the oil, with subsequent standing for about 14 days, did not give satisfactory results. Proceeding on the principle that triolein is saponified with more difficulty than tripalmitin and tristearin, the removal of the stearin by partial saponification was tried, and after several trials, the method of shaking the oil with 14 and 16 per cent. of 25 per cent. potash lye and then allowing the clear oil to separate was adopted, whereby yields of 72 per cent. and 78 per cent. of oil were obtained. In order to determine whether the stearin was removed to a sufficient extent by this method, the oils obtained as described above, were examined, together with two samples of American winter oil and one English sample, by immersing the oils, contained in thin glass-stoppered tubes, in ice for 24 hours. All solidified. They were then placed in a warm room (at about 18° C.). After two days all had become clear, with the exception of the English sample, which required $3\frac{1}{2}$ days to clear completely. By prolonged standing in ice—from two to seven days—a correspondingly long time was required to completely liquefy; the treated samples, however, always proved equal to the American and much superior to the English.—S. I. K.

Beeswax; Influence of Bleaching upon ——. R. Berg. Chem.-Zeit., 1902, **26**, [53], 605—606.

Samples of pure beeswax of different origin were examined by the author, to determine the influence of bleaching by different methods upon the analytical values, and the following facts were observed:—The acid value was invariably increased—to a small extent by natural bleaching, and most by chromic acid bleaching. The ester value remained practically unchanged by permanganate bleaching, whilst in the case of chromic acid bleaching there was an invariable diminution caused by hydrolysis. In every instance the Hübl ratio was diminished to such an extent as to make the wax appear adulterated, whilst the saponification value was invariably raised by a few units. The iodine value, contrary to expectation, was raised by chromic acid bleaching, except in the case of Italian wax. On the other hand, natural and permanganate bleaching reduced the iodine values in every case. Buehner's value showed a slight diminution in natural and permanganate bleaching, but in chromic acid bleaching it remained constant or even increased, except, again, in the case of Italian wax, in which it showed a tendency to fall. In natural or permanganate bleaching the refractometer-reading of the wax usually remained constant or rose to a slight extent, though here, too, Italian waxes formed an exception, their refractometer-readings falling not only in chromic acid bleaching, as in the case of other waxes, but also in permanganate and natural bleaching. The melting point was lowered by natural and permanganate bleaching, whereas in chromic acid bleaching it often showed a considerable rise. Thus, in the case of a sample of Morocco wax, it rose from 64·5° to 67·5° C.—C. A. M.

English Patents.

Soap Frames or Moulds. T. B. Bolton, Grangemouth, Stirlingshire, and J. McNeil, Govan, Lanarkshire. Eng. Pat. 10,926, May 13, 1902.

The soap frame is fitted at the ends with a special device to enable the entire frame to be detached from the soap block, so that it can be raised in one piece and transferred to another base plate to receive a fresh charge of soap.
—C. A. M.

Lubricants and Lubricating Oils. J. F. Straup, Lansford, U.S.A. Eng. Pat. 979, Jan. 14, 1902.

The lubricants are mixed with hard-wood ashes, soft water sal-soda, quinine, and animal fat or tallow in specified proportions, the object being to render them fireproof, give increased body, and prevent heating.—C. A. M.

United States Patents.

Naphtha from Oil; Apparatus for Separating ——. E. R. Edson, Cleveland (O.), U.S.A. U.S. Pat. 704,011 July 8, 1902.

The apparatus, which is designed for recovering volatil solvents from extracted oils, consists of a reservoir for th solvent, an extractor, vessels for receiving the extracted o and solvent, an evaporator, and a condenser, all connecte by pipes and valves. The evaporator contains a series o superimposed horizontal heating coils, arranged in sever columns, each of which is surmounted by a trough. Th mixed oil and solvent are pumped into the evaporator an delivered into the troughs, whence the oil trickles down ou side the coils. The vaporised solvent is drawn by suction int the condenser and returned thence to the reservoir.—C. S.

Soap. H. C. Peffer, New Kensington, Penn., U.S.A. U.S. Pat. 704,364, July 8, 1902.

The soap contains hydrated alumina, preferably in th proportion of about 30 per cent.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Prussian Blue; Solubility of ——, *under certain Con tions.* C. Coffignier. Bull. Soc. Chim., 1902, **27**, [1 696—698.

Prussian blue dissolves very slightly in hydrochloric aci 2 grms. per litre can be dissolved and will remain solution, but when the amount reaches 5 grms. per lit hydroferrocyanic acid separates. The solubility is great increased by mixing the hydrochloric acid with an equ bulk of an alcohol of the ethylic series. Using eth alcohol, a solution is obtained which gradually deposits t Prussian blue again (though the addition of 0·4 per ce of lead chloride greatly retards this deposition); l propyl, isobutyl, and amyl alcohols with hydrochloric a dissolve as much as 20 grms. per litre, giving bro coloured solutions which are permanent. The addition water to these solutions precipitates the Prussian blue.
—J. T. D

Soot from Tar and other Carbonaceous Substance Manufacturing ——, *and Apparatus for carrying t same into effect.* G. Wegelin. Eng. Pat. 10,228, May 1902.

See under III., *page* 1022.

(*B.*)—RESINS, VARNISHES.

English Patent.

Varnish and Ink; Printers' ——. A. G. Wass, Peckh Eng. Pat. 6061, March 22, 1901.

A cheap printers' varnish is obtained by dissolving ro in about an equal weight of hot mineral oil of sp. gr. 0·0 —0·920. Any desired viscosity can be produced y varying the proportions.—M. J. S.

XIV.—TANNING; LEATHER, GLUE, SI

English Patent.

Rapid Tanning Process. R. Parga, London. From C. de Castro, Santiago, Chili. Eng. Pat. 2247, Jan. 3, 1902.

Ammonia solution is forced by atmospheric pressure through the hides, which are stretched out flat, with spe between each, in a specially designed air-tight tan or

eceptacle. The hair, if present, is thus rapidly loosened nd is removed on the beam, whilst the fatty matters are ecovered as a soap from the liquor at the bottom of the ank. The hides, if they have been removed for unhairing, re replaced in the tank, and tan-liquor is now forced hrough instead of ammonia. The whole process occupies hout one hour. The author considers that ordinary anning depends on the natural formation of ammonia in he liquors, and claims the use of ammonia solution as escribed for the specific purpose of accelerating the rocess.—R. L. J.

United States Patent.

Enamel and Patent Leathers; Varnish for making ——. H. C. McKay, Essington, Penn., U.S.A. Assignor to American Patent Kid Co., New Jersey. U.S. Pat. 704,082, July 8, 1902.

One quart of linseed oil is boiled with ½ oz. of "raw umber," nd about an equal bulk of amyl acetate added. This is hen mixed with a solution of 16 oz. of guncotton in 2 galls. f amyl acetate, and 1½ oz. of a suitable aniline dyestuff issolved in 1 quart of methyl alcohol. The varnish is pplied to the leather, dried in an oven at 110° F., and then oated with any of the known enamel varnishes.—J. T. W.

XVI.—SUGAR, STARCH, GUM, Etc.

Manneotetrose and Manninotriose; Two New Sugars obtained from Manna. C. Tanret. Comptes Rend., 1902, 134, [26], 1586—1589.

Manna is an exudation from the ash tree, *fraxinus ornus*, ontaining from 40 to 60 per cent. of mannitol. From the sidue, the author has isolated two new sugars to which e has given the names *manneotetrose* and *manninotriose*. hey are obtained by fractional extraction with alcohol and e separated by fractional precipitation of their baryta ompounds with alcohol.

Manneotetrose is obtainable in the form of minute crystals aving the composition $C_{24}H_{42}O_{21}$, 4·5 H_2O. It is dextrotatory, $[\alpha]_D = +150°$ calculated on the anhydrous sugar; the pure state it does not reduce Fehling's solution. he hydrolysis of manneotetrose by dilute acids takes place two stages; in the first, one molecule of fructose is split f and a new triose, manninotriose, is formed; in the second age, this latter sugar is resolved into 2 mols. of galactose nd one of glucose.

The first stage of hydrolysis takes place very readily; e fructose residue is split off by acetic acid, enzymes emulsin, invertase, diastase, &c.), and slowly even by ater alone; consequently the sugar cannot be obtained the anhydrous state without partial hydrolysis. Basic mpounds of the sugar are precipitated by ammoniacal ad acetate and by baryta in presence of alcohol. *Manotriose* as existing in the products from manna is obably formed by the spontaneous hydrolysis of manneotrose. It is prepared by heating the tetrose in a closed ssel for 4 hrs. at 100° C. with 20 per cent. acetic acid d removing the fructose by means of alcohol. It has not en obtained in definite crystals; its rotatory power is $]_D = +167°$ and its cupric reducing power is one-third of at of glucose. When oxidised by bromine it yields anninotrionic acid, which yields on hydrolysis 2 mols. of lactose and 1 mol. of gluconic acid, the free aldehyde oup of the triose being therefore localised in the glucose idue.—J. F. B.

Starch; Preparation of Soluble ——. P. Thomas. Ann. de la Brass., 5, [12], 267—268.

Starch, containing a known percentage of moisture, is xed with distilled water, so that the mixture contains actly 2 per cent. of dry starch. After gelatinisan, the paste is heated to a temperature of 140° C. = 2½ atmos. pressure), for three hours in the autoclave, slightly yellow, opalescent liquid being then cooled, ered, made up to initial volume with water, and stored in all flasks plugged with cotton wool, and sterilised for 15 minutes at 120° C. At the end of several weeks, a white gelatinous sediment is deposited, but quickly redissolves on warming.—C. S.

Sugar; Colorimetric Method for Detecting Traces of ——. Ventre Pacha.

See under XXIII., *page* 1040.

Starch and Sugar; Primary Action of Iodine and other Oxidising Agents in the Hydrolysis of ——. F. E. Hale.

See under XXIII., *page* 1040.

English Patents.

Sugar; Manufacture and Refining of ——. J. O. Schweitzer, Paris. Eng. Pat. 16,614, Aug. 1, 1901.

A method of extracting and crystallising some of the sugar remaining in the mother liquor, consisting in placing the massecuite, while hot from the pan and before it enters the centrifugal, in a macerator with strong alcohol, and afterwards cooling it. The alcohol used in the operation is recovered by direct distillation from the residue of the mother liquor coming from the centrifugals or other special apparatus, or the mother liquors may be treated with milk of lime or powdered lime to form a calcium sucrate, which is insoluble in alcohol, concentrated above 50°, for the purpose of extracting all the sugar, the alcohol being recovered by a simultaneous distillation of the sucrate and the mother liquors from which it has been separated. The final residue of the distillation is a molasses of low quality.—L. J. de W.

Defecation of Liquids; Apparatus for the ——. J. E. Hatton, Santo Domingo. Eng. Pat. 16,973, Aug. 23, 1901.

See Fr. Pat. 313,929; this Journal, 1902, 629.—R. A.

Syrups, Drainings, and Molasses; Process for Purifying by Extraction ——. M. Kowalski, Warsaw, Poland. Eng. Pat. 3642, Feb. 12, 1902.

The solution of saccharine matter is mixed with phenol or its derivatives, hydroxybenzenes, hydroxynaphthalenes, hydroxyanthracenes, or other compounds capable of extracting non-saccharine matter, the extraction being aided by the addition of acids, preferably sulphurous acid, benzene, toluene, petroleum spirit. The phenol is extracted with benzene or other solvents, and the sugar inverted to prevent crystallisation.—B. F. D.

United States Patent.

Rice-Starch and other Amylaceous Substances; Manufacture of ——. E. Leconte, Estaues, and J. Loiselet, Paris, France. U.S. Pat. 704,349, July 8, 1902.

Starchy substances are treated with successive alkaline (caustic soda) solutions of decreasing strength, washed and milled, and subjected finally to an alternating current whilst in an alkaline solution.—B. F. D.

XVII.—BREWING, WINES, SPIRITS, Etc.

Permanent Yeast; Preparation of ——. R. Albert, E. Buchner, and R. Rapp. Ber., 35, [13], 2376—2382.

The zymase of yeast can be preserved by drying the yeast at a low temperature and sterilising, or by treatment with alcohol and ether. The authors recommend acetone as a more suitable reagent.

The washed yeast is subjected to a pressure of 50—100 atmospheres to remove water, and then thoroughly mixed with acetone for 15 minutes. After filtering, the residue is again washed with acetone, and then with ether, and dried first for one hour in the air, then at 45° C. for 24 hours.

Experiments showed that the yeast cells were dead and free from moulds. After keeping for six months at the ordinary temperature, the preparations had lost from 10—20 per cent. of their fermentative activity. In all cases acetone preparations were more active than those prepared by treatment with alcohol.—B. F. D.

Antiseptic Function of the Hydrogen Ions of Dilute Acids. M. Bial. Zeits. physik. Chem., 40, 513—534. Chem. Centr., 1902, 2, [1], 3.

The author determined the action of different acids on alcoholic fermentation by yeast fungi. With an equal concentration of the acid, the fermentation was greatly weakened by hydrochloric and nitric acids, less by sulphuric acid, and still less by phosphoric and acetic acids. Trichloracetic, oxalic, formic, propionic, and butyric acids exert a retarding influence on the fermentation corresponding to their respective degrees of dissociation. The addition of sodium acetate to acetic acid diminishes its antiseptic action in accordance with the theory of dissociation. The antiseptic action of hydrochloric acid is also strongly diminished by addition of sodium chloride. With high concentrations—about 0.3—0.5 normal—of sodium chloride, however, an increase of antiseptic action or a retardation of the fermentation again occurs. This latter effect corresponds with the strengthening of the inverting power of hydrochloric acid by large additions of sodium chloride, and probably depends upon a catalytic action of the chlorine ions.—A. S.

Malt Enzymes; Isolating ——. The Proteolytic Enzyme of Malt. C. J. Lintner. Zeits. ges. Brauw., 25, [24], 365—368.

The best method of isolating that malt enzyme which exerts a catalytic action on hydrogen peroxide, is to concentrate malt extract by repeated freezings, instead of by evaporation *in vacuo*, and to afterwards salt out the enzyme with ammonium sulphate, the deposit being freed from the precipitant by dialysis and the residual solution concentrated, *in vacuo*, over sulphuric acid. The diastatic power of the enzyme prepared in this way is greater than when alcohol is employed as the precipitant; the catalytic action on hydrogen peroxide and the proteolytic power are also greater. Thus, whereas Windisch and Schellhorn's product, obtained by extraction with glycerin, required 60 hours to liquify gelatin, the author's preparation (0·03 grm. per 10 c.c.) liquefied 20 c.c. of an 8 per cent. solution of gelatin in one hour at 50° C., the reaction being less energetic at 60° C., and ceasing entirely at 70° C. Unlike Windisch and Schellhorn, the author found the liquefactive power of the enzyme to be lowered rather than improved by the addition of sodium carbonate.

The results are regarded as affording little support to the hypothesis that the proteolytic enzyme of malt discharges any important function in the mashing process, or that the enzyme itself is of a tryptic character, and degrades the albumiuoids during germination; the fermentative action is too slight. In short, the action resembles that of a malt extract weakened by boiling, so as to be incapable of saccharifying starch, though still able to produce liquefaction. Even when allowed to act on previously liquefied gelatin for 48 hours at 40° C., no further dissociation of the glutin was effected by the enzyme, nothing more than a slight peptonisation being revealed by the biuret reaction.—C. S.

Malt; Relation between Character of ——, and Liability of Wort to Infection. Deutsche Bierbrauer, 17, [25], 339—340.

Owing to an accident to the mash tun, the temperature of a wort prepared from lightly kilned malt, was allowed to recede to 27½ C. for about 4½ hours. The wort became infected by lactic acid bacteria, and the brew was entirely spoiled. This result is attributed to the malt having been allowed to felt twice whilst on the floor, and to the ensuing extensive degradation of the albuminoids, products being formed which were readily attacked by the bacteria, these not having been destroyed by the low temperature employed for kilning the malt. This explanation is considered the more probable, inasmuch as, under somewhat similar circumstances, no turbidity or lactic fermentation was produced in the case of a wort from a malt that had not been allowed to felt, and that had been kilned at a higher temperature.

To confirm this view, experiments were made with three different kinds of malt, of Pilsen, Dortmund, and Vienna type respectively, all three of which were mashed in the same way, and allowed to cool down to 21° C. for four hours during the operation. On filtering the wort after mashing, that from the Pilsen malt (which was initially more acid than the other two) exhibited decided lactic turbidity followed by glutin haze after hopping, and after fermentation, was found to be affected with a greenish haze. The other two samples clarified more slowly, and in all three the microscopical examination of the sediment yeast revealed strong contamination by bacteria. On the other hand, the samples when mashed in the ordinary manner, without being allowed to cool down, gave perfect normal results.—C. S.

Beer, 12½ Years old, Concentrated by Freezing; Examination of a ——. A. Lang and C. Braun. Zeits. ges. Brauw., 25, [27], 409—411.

The beer, which originally had the gravity 12° Ballin, was brewed in 1889, and was concentrated by freezing in the cask, the liquid portion being bottled and re-bottled several times on account of the sediment; the last bottling was performed about five years ago. The sample was dark brown in colour, rather muddy, with a vinous taste and smell, the flavour being also somewhat acid. The sp. gr. was 1·03458; the actual extract, 11·87 per cent.; alcohol, 7·66 per cent.; ratio of alcohol to extract, 1:1·55; corresponding original gravity of wort, 25·61 per cent.; actual attenuation, 53·68; apparent attenuation, 66·49 per cent.; maltose 3·22 per cent.; lactic acid, 0·4 per cent.; ash, 0·37 per cent.; nitrogen, 0·12 per cent.; protenoids, 0·75 per cent. When compared with the results obtained by Aubry with very strong beer, the above figures show that the result of the concentration was to produce a beer corresponding to wort of double the actual original gravity, except that the acidity was lower. In the absence of analytical data for the beer in its original form, no conclusion can be drawn as to the alteration sustained during freezing and storage; apparently, however, little had been removed besides water, though Lermer, some years ago, noticed that freezing caused the separation of a considerable proportion of albuminoid constituents from beer, and characterised the method as useful for beers intended for shipment to hot countries.

The turbidity was traced to the presence of numerous living lactic acid bacteria and wild yeasts, associated with *Sacch.-apiculatus* in smaller quantity. Whilst it cannot be decided whether the infection was of the primary or secondary order, it is evident that the micro-organisms present had been able to survive several years' exposure to 7·6 per cent. of alcohol.—C. S.

White Wine; The Clouding of ——. R. G. Smith. Proc. Linnean Soc. of N.S. Wales, 1900, [4], Oct. 31, 650—65

A variety of South Australian wine known as Chabl shows a great tendency to develop a cloudiness soon aft it is bottled. On account of the low acidity of the wi the fermentation is prolonged while a trace of sugar is l unfermented. The formation of the turbidity does n appear to affect the flavour and bouquet of the wine, but gives it a bad appearance. The author has isolated t organism which causes this trouble; from certain protube ances resembling buds, it was suggested that the organis might be a yeast, but appearances point rather to its bei a bacterium. The cells are very small; they might described as short, stout rods, but in some media th assume a more rounded form. The greater the surface wine exposed to the air the sooner does the turbidity a pear. The organism is of an aërobic nature, it cann develop under anaërobic conditions and the slight aërati of the wine during the process of bottling would appear stimulate its development, previously restricted by t anaërobic conditions in the storage casks; the turbidity w develop even when the wine is placed in sterilised bottl The most favourable temperature for the growth of t organism is about 25° C. The particular constituent of t wine which is active in stimulating the growth of t organism is the alcohol. The organism produces acid as develops, this acid giving a readily soluble calcium salt. probably belongs to the group of acetic acid formi bacteria. Fortunately the wine can be fully protected fr

e appearance of this turbidity by pasteurisation at a latively low temperature; heating the wine for five minutes 43° C. is sufficient to remove all danger of attack by this ganism.—J. F. B.

ine; Cure for "la Casse" by the Addition of Sulphurous Acid to ——. J. Laborde. Comptes Rend., 135, [2], 116—118.

IE author upholds his opinion previously expressed, that the cure of this wine sickness, the sulphurous acid must present in the free state and free access of oxygen must allowed. He considers that the colouring matter and e oxydase of the wine are united to form a soluble com- nation which is, however, insoluble in the presence of ygen. Sulphurous acid breaks up this combination, and ms a compound with the colouring matter. Free access air under these conditions oxidises both the sulphurous d and the oxydase.—B. F. D.

Alcohol as a Source of Motive Power. Behrend.

See under II., *page* 1019.

Cognac; Test for Choline in ——. H. Struve.

See under XXIII., *page* 1040.

ENGLISH PATENTS.

er; Apparatus for Racking ——. H. W. Colby, Chicago, U.S.A. Eng. Pat. 11,422, May 17, 1902.

tationary cylinder is connected with the beer reservoir l combined, on a swinging frame, with the filling tube. e filling tube has a valve at the lower end operated by a arate cylinder and piston. Sliding on the filling tube is caling head with compressed-air buffer. The cask is ed by a hydraulic lift, and presses up the sealing head the filling tube nearly touches the bottom of the cask, this way lessening the disturbance of the beer. In ering the cask, the filling tube is swung aside before ring the bung.—B. F. D.

uid By-Products of Distilleries, Breweries and the ke; Apparatus for Disposal of ——. E. Oram, Carron, Morayshire. Eng. Pat. 4418, Feb. 21, 1902.

e liquids are evaporated in suitable tanks by the heat ved from an electric current traversing wire coils, which t on the surface of the liquid.—B. F. D.

UNITED STATES PATENT.

pirits; Art of Ageing or Treating ——. R. C. Scott, Liverpool. U.S. Pat. 704,389, July 8, 1902.

: spirit is cooled to 32° F., and sprayed into a stream of which may be either at a warmer temperature or may lternately warmed and cooled to 32° F., according to kind of spirit.—B. F. D.

VIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Lithin in Milk; Determination of ——. F. Bordas and S. de Raczkowski.

See under XXIII., *page* 1041.

Salicylic Acid in Foods; Detection of ——, *by the Ferric Chloride Reaction.* H. Taffe.

See under XXIII., *page* 1040.

ENGLISH PATENTS.

Milk, Rich in Cream or other similar Fatty Material; roduction of ——. M. Julien, Paris. Eng. Pat., 16,431, g. 15, 1901. (Under Internat. Conv., Feb. 14, 1901.)

Milk and fatty matter, such as cream or butter, are thoroughly mixed in the apparatus described in Eng. Pat., 14,0, 1893, (this Journal, 1894, 787). The product is th filled into tins or bottles and sterilised.—W. P. S.

Milk; Process for Preserving ——. J. Imray, London. From Société "Le Lait," Paris. Eng. Pat. 16,110, Aug. 10, 1901.

MILK, either alone or mixed with sugar, coffee, cocoa, &c., is placed in gas-tight vessels and heated for 30 minutes at a temperature 70°—75° C., under a pressure of oxygen amounting to 3 to 10 kilos. per sq. cm. When it is required to keep the milk for a long time, the temperature may be raised to 100° C. for some seconds, or successive heatings to 60° C. with alternate coolings, can be employed. —W. P. S.

Receptacles for Liquids, or other Substances, to be Preserved. H. H. Lake, London. From L. D. Piroux and L. E. Seddon, New York, U.S.A. Eng. Pat. 7843, April 3, 1902.

A BOTTLE-SHAPED vessel is formed of wood pulp, paper stock, or the like, and treated with a stiffening material (glue) and an alcoholic solution of shellac, less of the stiffening material being applied to the neck of the vessel, so that it shall remain relatively flexible. The vessel is lined inside with a metal (aluminium), which serves as an electrode, a second electrode passing through the stopper. After filling the receptacle with the liquid to be stored, the latter is sterilised by means of an electric current. The stopper is fitted with a sliding shutter for closing the orifice formed by the electrode passing through the cork, when the electrode is withdrawn.—W. P. S.

Coffee free from Caffeine; Manufacture of ——. A. Zimmermann, London. From H. Nicolai, Berlin. Eng. Pat. 15,987, Aug. 8, 1901.

UNROASTED ground coffee is steamed in a Papin's digester and when all air has been expelled, the valve is closed, and the digester rapidly cooled. The coffee is now extracted several times with boiling water, eventually with a little dilute ammonia, strained, rinsed, and pressed. The fat and oil are removed from the extract, and treated with ammonia. From the viscous substance formed, the caffeine is extracted with hot water, whilst by heating the residue on the water-bath, the ammonia is expelled and the fats are obtained free from water and caffeine. The aqueous extracts containing tannin, extractive matters, and caffeine, are collected, treated with ammonia, evaporated, and the caffeine extracted with chloroform, alcohol, or other solvent. The residual matter is then mixed with the fats, and finally, after the addition of a little sugar, with the coffee bean residuum. On drying, pressing into tablets, and roasting the product, any remaining traces of caffeine are sublimed.—W. P. S.

(*B*).—SANITATION; WATER PURIFICATION.

Sewage; Discharge of ——, *into a Tidal Estuary.* W. K. Parry and W. E. Adeney. Proc. Inst. Civil Eng., 1902, 147, [1], 3—39.

THE authors have investigated the effects of sewage pollution in the estuary of the River Liffey. The crude sewage from the whole of the population of Dublin and the neighbouring townships (with three exceptions), amounting in all to about 260,000 people, is discharged into the Rivers Liffey and Tolka immediately above the estuary. The sewage from the townships of Rathmines and Pembroke, which have a total population of 60,000, is discharged directly into the estuary, flowing into a deep-water channel which at the time of the discharge has a strong current running seawards. The following conclusions are drawn from the results of the investigation.

In a tidal estuary, under conditions similar to those of the Liffey, during calm weather, the surface water alone is affected by the discharge of sewage into it, the bottom water of the less shallow portions of the estuary remaining practically unpolluted; the bed of the channel is not fouled provided the heavy solids are removed before the sewage is discharged. The sewage rapidly becomes diluted with 8—10 times its volume of clean water, but further dilution and dispersion proceed far less rapidly, except in stormy weather.

If sewage be discharged under conditions similar to those at the Rathmines and Pembroke outfall, the discharge can

be carried on indefinitely, without causing accumulation of sewage-matter within the estuary, the liquid discharged day by day being carried out to sea by tidal action.

In general, with regard to the discharge of sewage into a tidal estuary similar to that of the Liffey, it may be stated that :—

(1) The discharge should be made into a definite deep-water channel with a current setting seawards.

(2) The width of the water in the deep channel at low tides must be sufficient for the adequate dilution of the sewage.

(3) The whole of the sewage should reach open water before the turn of the tide.

(4) The heavy solids and the floating matter should be separated from the sewage before its discharge. This can be done efficiently by simple subsidence and screening.

(5) Dilution of the sewage with subsoil- or surface-water prior to discharge is distinctly advantageous, as it tends to encourage purification by promoting healthy bacterial action.—A. S.

Albuminoid- and Proteid Ammonia ; Determination of ——. L. W. Winkler.

See under XXIII., *page* 1041.

ENGLISH PATENT.

[*Water*] *Filtering Devices.* G. L. Scott, Manchester. Eng. Pat. 16,364, Aug. 15, 1901.

A PORTABLE filter, consisting of separable concentric perforated sleeves, having wrappings of cloth, &c., and provided with a suction tube and mouth-piece. A modified form is adapted for application to domestic taps, &c.—R. A.

UNITED STATES PATENTS.

Water Purifier. C. C. Clark. Assignor of one-half to J. C. Carson, Philadelphia. U.S. Pat. 703,541, July 1, 1902.

THE apparatus consists of a horizontal tubulated cylinder, chambered at each end, with openings into the chambers through which water or steam may be passed for cooling or heating the water in the cylinder. The water to be purified is admitted into the cylinder through an inlet chamber furnished with perforated electrodes of copper, platinised copper or iron, and the purified water passes out through a pipe at the opposite end of the cylinder. The heavy precipitate formed by the electrolysis, is drawn off through valves placed along the bottom of the cylinder, and the scum rises into a dome and escapes through another valve.—L. A.

Purifying Water ; Apparatus for ——. C. L. Kennicott, Chicago, Illinois. U.S. Pat. 703,596. July 1, 1902.

THIS apparatus is similar to that described in Eng. Pat. 4,735, 1900 (this Journal, 1900, 552), with improvements in the general arrangement and in details, mainly with the object of storing a supply of softened water and of providing against freezing. An annular storage tank into which the softened water is discharged surrounds the whole upper part of the apparatus, and on top of this a boarded-in and roofed hut is built to enclose the reagent-tanks, water-wheel, &c. The lime-water vessel is fixed within the downtake conduit, and the hard-water supply-pipe is brought up from the ground through the softening tank.—L. A.

Water ; Apparatus for Purifying ——. J. Davis, Pittsburg, Pa. U.S. Pat. 704,244, July 8, 1902.

AN apparatus for thoroughly mixing water with a chemical reagent previous to filtration. A vertical closed cylinder with conical bottom is fitted with supply and delivery pipes on opposite sides of an internal gauze screen. The supply pipe has a branch through which a chemical solution is admitted into the pipe, and the latter terminates inside the cylinder in a submerged revoluble rose or mixer having radial arms with vanes through which the water containing the chemical is discharged.—L. A.

(C.)—DISINFECTANTS.

ENGLISH PATENTS.

Disinfecting Media ; Process and Apparatus for t Gasification of ——. B. Sieber, Attisholz, Switzerlan Eng. Pat. 16,736, May 20, 1901.

FORMALDEHYDE is vaporised by bubbling steam throu the solution which is heated over a water-bath.—L. A.

Formaldehyde ; Producing a Solid Composition containi ——. R. Groppler, Berlin. Eng. Pat. 13,392, July 1901.

THE method consists "in dissolving common or dri neutral or acid, soda soap of a suitable fatty or resin acid an aqueous solution of formaldehyde." 2—5 parts of sodi stearate suffice to solidify 100 parts of a 35—40 per ce solution of formaldehyde.—L. A.

UNITED STATES PATENTS.

Disinfecting Apparatus. W. H. Francis, Philadelphia, P U.S. Pat. 704,182, July 8, 1902.

A JACKETED horizontal cylinder is provided with a val controlled pipe for forcing steam under pressure into t jacket to heat the chamber externally, a valve-control pipe leading steam from the jacket directly into the chamb means for exhausting the chamber at intervals prior to admission of steam and subsequently, and means for he ing air and for forcing the heated air into the chamber order to dry the articles after disinfection.—L. A.

Formic Aldehyde ; Composition for the Production Vapours of ——. J. J. A. Trillat, Paris, Assignor Fries Bros., New York, U.S.A. U.S. Pat. 704,4 July 8, 1902.

FORMALDEHYDE is dissolved in a saturated solution f calcium chloride or other neutral salt of an alkali or alka earth. From such solution, when heated, formaldehyd given off in a nearly dry state, whilst the soluble st diminishes the tendency to polymerization. See Eng. P 19,744, 1896, and 20,773, 1896 (this Journal 1896, 821 a 754).—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Beating ; Theory and Practice of ——. C. Beadle, Papermaker, April, May, June, and July, 1902.

DETAILS are given showing the amount of power consum d at different stages of the "beating," by means of diagra , and summaries showing the power consumption per cwt f pulp for different papermaking materials, and by the us f various types of beaters.—C. B.

Wood-Pulp ; Colour Reaction for ——. J. Herfkorn

See under XXIII., *page* 1041.

UNITED STATES PATENTS.

Paper-Pulp Screener. N. L. Vrooman and R. R. K land, New York State, U.S.A. U.S. Pat. 703,682, Ju 1, 1902.

A POLYGONAL cylinder, with its sides formed into sie plates according to U.S. Pat. 703,683, July 1, 1902 e following abstract), revolves on a horizontal axis, insi a tank which is partly filled with unscreened stock and wa The stock is sifted by floating upwards through the s merged sieve-plates, and this process is assisted by a exhaust pump, which removes screened stock at suc a rate that the level of the screened stock inside the cyli er is always below that of the unscreened stock in the t k itself.—R. L. J.

Screen-Plate for Pulp-Strainers. N. L. Vrooman d R. R. Kirkland, Watertown, New York State, U.S. U.S. Pat. 703,683, July 1, 1902.

MECHANICAL details given.—R. L. J.

Paper-making Machine. G. Ehrhart, Fulton, New York State, U.S.A. U.S. Pat. 703,775, July 1, 1902.

In order to produce single-ply paper of uniform tensile strength in every direction, a pump is affixed to the vat which withdraws pulp from one corner and delivers it through a pipe to an opposite corner. Owing to the cross current thus set up, the fibres are deposited on the cylinder in various directions instead of being in a position mainly parallel to the direction of motion of the cylinder.—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Aloïns; Constitution of the ——. Comparison with that of the Glucosides. E. Léger. Comptes Rend., 1902, **134**, [26], 1584—1586.

The investigations of the author on barbaloïn and isobarbaloïn point to the conclusion that these bodies are products of the condensation, with the loss of $1H_2O$, of methylisohydroxychrysasin with a methylaldopentose. The optical activity of the aloïns themselves, and the production from them of optically active derivatives, negative the view that they are direct derivatives of anthraquinone. The formula $C_{16}H_{16}O_7$ formerly assigned to barbaloïn must now be changed to $C_{21}H_{20}O_9$. Barbaloïn and isobarbaloïn differ in the point of attachment of the sugar residue to the aromatic nucleus. These aloïns are isomeric with frangulin, but whilst the latter is hydrolysed by dilute acids, the aloïns are not. The aloïns in this sense constitute a new class of glucosides. The sugar of frangulin may perhaps be regarded as being attached to the aromatic nucleus by way of its aldehydic group after the nature of an acetal, whilst that of the aloïns is attached at the opposite end by the terminal alcohol group.—J. F. B.

Camphor Oil; Formation of ——, in the Camphor Tree. A. Tschirch and H. Shirasawa. Arch. der Pharm., **240**, [4], 257—260.

From examination of fresh material derived from living plants in the Bern botanical garden, and dried material from Java and Japan, the secretion of camphor is found to take place in oval oil-cells, which are found in all parts of the plant. The formation of these cells occurs at an early period of the growth, for they can be recognised immediately behind the growing point. The formation of the oil-cells proceeds rapidly, and drops of colourless very volatile oil are soon secreted in them. Camphor is a transformation product of this oil. As the oil is very volatile, its vapour penetrates throughout the plant, and deposits especially in the cavities of the wood, where it changes into camphor. Simultaneously with the secretion of oil, mucilage is found, the epidermal cells of the leaf being especially rich in that substance. The number of oil-cells depends upon climatic conditions, those in the material grown in the Bern botanical gardens being considerably less than in the material from Java.—J. O. B.

Sandal Oil; West Indian ——. E. Deussen. Arch. der Pharm., **240**, [4], 288—293.

On distilling West Indian sandal oil at 26 mm. pressure, four main fractions were obtained:—(1) 155°—159°; (2) 159°—163°; (3) 163°—166°; (4) 166°—170° C. After repeatedly refractionating, the lower-boiling fractions were found to contain an odorous body, the supposed ester, to which the odour of the oil is due; the higher-boiling fractions were odourless. The lowest-boiling fractions gave crystals when heated with hydrochloric acid. The fraction boiling at 155°—159° C., and having a rotation of +40°, was purified by repeated fractionation, and gave a product boiling at 153°—154° C. at 26 mm., and at 260°—261° C. at atmospheric pressure; its rotation was +50°. On boiling this with hydrochloric acid, crystals were obtained, which, on recrystallisation from acetic ether, melted at 117°—118° C. This is the melting point of cadinene hydrochloride. The physical characters of cadinene and of the body found are as follows:—

Cadinene: b. pt., 274°—275° C.; sp. gr., 0·921 at 16° C.; $[\alpha]_D = -98·56°$; m. pt. of hydrochloride, 117°—118° C.

Body found: b. pt., 260°—261° C.; sp. gr., 0·9247 at 15° C.; $[\alpha]_D = +54°$; m. pt. of hydrochloride, 117°—118° C.

The author therefore names this substance "dextro-cadinene."

The oil regenerated from the hydrochloride boiled at 272°—274° C. (four-fifths thermometer in vapour), and had a rotation of −88° to −108°. It is a colourless and odourless liquid, which is very prone to resinify. (See also this Journal, 1900, 464.)—J. O. B.

Bignonia Catalpa; The Acids of ——. A. Piutti and E. Comanducci. Boll. Chim. Farm., **41**, 329—335. Chem. Centr., 1902, **2**, [1], 50.

According to S. Sardo (Gaz. chim. ital., **14**, 134) and also to text-books, the pods of *Bignonia Catalpa* contain an acid, $C_{14}H_{14}O_6$, named by Sardo catalpic acid. The authors have identified this acid as *p*-hydroxybenzoic acid, $C_7H_6O_3$, by means of its physical, crystallographic, and chemical properties. The unripe pods yield, besides the acid named, when extracted with dilute sulphuric acid and then with ether, a compound of *p*-hydroxybenzoic acid and protocatechuic acid ($C_7H_6O_3.C_7H_6O_4 + 2H_2O$), m. pt. 188°—190°, which has previously been prepared by Hlasiwetz and Barth (Annalen, **134**, 278) by fusing gum benzoin with caustic potash.—A. S.

Taxine: The Alkaloid of Yew. T. E. Thorpe and G. Stubbs. Proc. Chem. Soc., **18**, [253], 123.

Autumn-gathered leaves of male and female trees of the species *Taxus Baccata* have been investigated. The alkaloid was extracted by digesting the powdered air-dried leaves with 1 per cent. sulphuric acid for five or six days. The acid liquid was strained and pressed from the leaves, and at once, without concentration, rendered alkaline and extracted with ether. Taxine was obtained in the form of very fine glistening particles by crushing down the residue from the ether extract. It gives precipitates with most of the alkaloidal reagents, and colour reactions with strong sulphuric acid alone, and when this reagent is mixed with nitric acid, molybdic acid, or chromic acid.

Pinene and other Terpenes; Preliminary Notice of some New Derivatives of ——. W. A. Tilden and H. Burrows. Proc. Chem. Soc., **18**, [254], 161—164.

Pinene nitrosochloride is remarkable as being the only known compound containing the elements of pinene from which that hydrocarbon may be regenerated. The addition of one molecule of hydrogen chloride to pinene gives the familiar monohydrochloride (artificial camphor, m. pt. 128°), from which, by withdrawal of hydrogen chloride, camphene, and not pinene, results. The addition of two molecules of hydrogen chloride to pinene gives rise to dipentene dihydrochloride (m. pt. 50°), from which, by removal of two molecules of hydrogen chloride, a mixture of liquid isomerides of pinene is obtained. On the other hand, when pinene combines with nitrosylchloride, a compound is formed which contains a nitroso group. This is indicated by the fact that it is capable of reacting with aniline to yield a diazotised product, leaving a hydrocarbon which is apparently identical with pinene, though optically inactive (Wallach, Annalen, 1889, **252**, 132; this Journal, 1890, 964).

An alcoholic solution of dipentene dihydrochloride, digested with potassium cyanide in the cold for 14 days, gave the liquid monohydrochloride, $C_{10}H_{16}$, HCl, and the latter, by continuing the action of the cyanide at about 120°, gave very pure terpinene.

Methylanthranilic Acid. G. Schultz and J. Flachsländer.

See under IV., *page* 1022.

Guanidine; Determination of ——. A. Vozárik.

See under XXIII., *page* 1041.

United States Patent.

Naphtha from Oil; Apparatus for Separating ——. E. R. Edson. U.S. Pat. 704,011, July 8, 1902.

See under XII., *page* 1032.

XXI.—PHOTOGRAPHY.

Photographic Printing Paper ; Manufacture of ——, in Alsace. A. Wehrlin, E. Zuber, and Clément. Bull. Soc. Ind. Mulhouse, 1902, 72, 102—105.

Blue Negative-printing Paper. — White paper, of good quality, is coated on one side only with a mixture of potassium ferricyanide and ferric ammonium citrate. The paper, in the form of a continuous band, from a roll, is floated on the surface of a solution of the salts named, and the excess of the solution afterwards removed. The band is then passed slowly through a drying chamber, heated to a temperature of 50° C., then again wound into a roll, and finally, before being packed for sale, it is drawn across a heated table, where it is examined and cut into lengths of 10—50 metres, which are finally placed between three layers of paper, one of which is waxed. The paper thus sensitised keeps for 6—8 months in a dry, cool atmosphere. The time of exposure required in printing varies from 5—6 minutes in bright, summer weather, to 25—30 minutes in dull weather. After exposure it is washed in cold water and dried.

Brown Negative-printing Paper. — To prepare this, white paper is coated with a mixture of ferric ammonium citrate, silver nitrate, and lactic acid, in the manner described above. Out of contact with light, and in a dry, cool place, it may be preserved for about two years. In printing with it, an exposure of 1—2 minutes' duration in direct sunlight, in summer, is sufficient. The prints obtained are successively washed in water, fixed with sodium thiosulphate, washed, and dried. Positive prints may be produced from the negatives thus obtained.

Blue and white, negative printing tissues, are also prepared by the method described.

White Positive-printing Paper. — The paper is first coated with a mixture of gelatin, ferric chloride, and ferrous sulphate, as in the previous cases, except that it is in this instance dried at a lower temperature. It is then drawn over a smooth marble slab and covered with powdered gallic acid, which is poured automatically upon it in quantity regulated by the speed of the engine driving the drawing apparatus. The powder is distributed over the surface by two felt-covered rubbing appliances, which are rapidly moved to and fro across the band of paper, the excess being finally removed by a brush. In this way it is possible to prepare daily 800—1,000 metres of paper. A direct exposure of 6—8 minutes is required in summer for this paper. After exposure it is simply rinsed in water and dried. Prints in black upon a white ground are obtained.

Tracing Paper is manufactured by steeping white paper in a mixture of paraffin-wax, poppy oil, and turpentine. It is dried in the air at the ordinary temperature, 2—3 months' time being required.—E. B.

English Patents.

Nitrocellulose ; Denitration of ——. H. Richter, Berlin. Eng. Pat. 12,695, June 21, 1901.

The following methods are claimed for denitrating nitrocellulose, whether in a raw or manufactured condition:—

(1) The general method of treatment with an acid solution of a metallic salt which is in a lower state of oxidation and is capable of passing to a higher state of oxidation.

(2) The special use of cuprous chloride or oxychloride in hydrochloric acid solution. Example: nitrocellulose, 1 kilo.; cuprous chloride, 5 kilos.; concentrated hydrochloric acid, 5 litres: the solution of the salt to be diluted with water until precipitation is imminent, *i.e.*, acid strength is 1 to 10 per cent. Temperature, 45°—60° C.

(3) The special use of a cuprous compound in ammoniacal or saline solution. Example: (*a*) nitrocellulose, 1 kilo.; cuprous chloride, 2·5—6 kilos., according to nitrogen content; hydrochloric acid, 5 litres; dilute with water to 60—100 litres, and add ammonia until 1—5 per cent. of free ammonia is present. (*b*) Nitrocellulose, 1 kilo.; cuprous chloride, 5 kilos.; common salt, 15—20 kilos.; water, 60 litres.

(4) In conjunction with the above, the use of liquid which have a solvent or swelling effect on nitrocellulose, t facilitate the process and maintain the tensile strength c the material under treatment.—R. L. J.

Photographic, Photo-mechanical, and other Printing Pro cesses ; Bronze-coated Plates Prepared and Sensitise for ——. C. P. H. Ahrle and The Metalline Platte Gesellschaft, Frankfort-on-the-Maine. Eng. Pat. 334; Feb. 10, 1902.

The bronze-coated plates described in Eng. Pat. 6246, 190 (this Journal, 1902, 139), are covered with a layer c gelatin, of gelatin with formalin, &c., or of some sensitiv gelatin emulsion.—F. H. L.

Colour Filters for taking Photographs ; Production c ——. A. Bauermeister, Leipzig. Eng. Pat. 436. Feb. 20, 1902.

A glass plate is provided with edgings so as to form shallow trough. Into this is poured a solution of gelatit &c., in pure glycerin, stained to the desired colour. A second glass plate is then applied, and the whole is allowe to cool under pressure, The feature of the invention is th avoidance of water as a solvent, which causes the screens t be more permanent than usual.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives ; Twenty-sixth Annual Report of H.M. Inspectors of ——, for the Year 1901.

The only modifications of the law during the year hav been two Orders, the one dealing with the packing electric detonators, the other granting an exemption f acetylene when compressed into certain porous substanc from being a prohibited explosive.

The growth of trade in explosives continued during th early part of the year; but there were signs during th latter half of the year that the rate of increase was n sustained.

The number of deaths (10) from accidents by fire explosion during the course of manufacture is above th average for the decade (5·4).

The number of factories under continuing certificate license is 150, seven new licenses having been confirm during the course of the year.

The condition and management of the various factori and magazines are favourably reported upon, but regret expressed that stores and registered premises leave ma to be desired.

Dr. Dupré's report, which is given *in extenso*, states th out of 835 samples examined by him 44 were rejecte The somewhat large number of "rejections" is due main to the fact that, owing to requirements under the Mines A the compositions of explosives permitted to be used a fixed more closely than in former years, and in consequen a larger proportion had to be rejected. The compositio of explosives generally are becoming more complicate and this is especially the case with regard to explosiv permitted to be used in mines. Some of the explosiv contain as many as eight constituents, and their corr analysis is often a matter of some difficulty, as the lim within which variations are allowed are drawn more a more narrowly.

The most striking feature in connection with the co position of explosives is that oxalate of ammonium coming more and more into use as an ingredient lowering the temperature of explosion, and Dr. Du considers it not improbable that oxalate of ammonium w replace all other salts which have from time to time be proposed for this purpose.

In connection with an explosion in the drying room a hat factory at Manchester, experiments were made ascertain—(1) the flashing point of the methylated sp used; (2) the smallest quantity of spirit which at a giv temperature would render a given volume of air explosiv (3) the smallest quantity of spirit which at a giv temperature would so fully charge a given volume of with vapour as to render it non-explosive; (4) witl

at limits of temperature a given volume of air in contact h excess of spirit would be explosive; (5) the approxite temperature at which an explosive mixture of spirit pour and air would take fire. The experiments proved t all the conditions necessary to bring about an explosion re present at the time of the accident.

Dr. Dupré states that considerable activity is still notice- e among inventors, but chlorate mixtures, which formed most striking among new explosives during 1900, upy a subordinate position in the year under review.

Captain Desborough's report on the year's work at the ing station at Woolwich points out that the original mitted list of explosives has been withdrawn, and losives have now to pass the special test instituted in ober 1899. Out of 53 explosives tested, 25 have been horised. The results obtained from the use of the istic pendulum in determining the charges for the test, tinue to be satisfactory. It has been observed that, en a well-manufactured explosive and complete onation, the variation in the distance of recoil of the gun any explosive should not exceed 10 per cent. of the an recoil of the rounds fired with equal charges of the losive. The attention of manufacturers is especially cted to the necessity of thorough incorporation if explos are to successfully pass the test. The material of the ridge case is also a point of importance. Several losives, of which sulphur formed an ingredient, were ed when contained in lead alloy cases, and invariably l the gaseous mixture, although when contained in er wrappers they were successful. Attention is drawn he fact that in the test, complete explosion is attained, lst in practice the circumstances are at times quite erent. A suggestion is made that it would be well if losives could be tried by practical men in those coal es which are not proscribed by order of Secretary of e, and where the failure of the particular explosive ld not involve the risk of an accident.

he importation figures for explosives have been as ows :—

——	1901.	1900.
oglycerin compounds	1,473,950 lb.	998,030 lb.
nitroglycerin	142,900 lb.	129,750 lb.
ber of detonators.....	13,666,570	8,732,500

is noted that a great percentage of the trade in d nators is still allowed to remain in foreign hands.

n the course of an account of the disastrous explosion picric acid at the Griesheim factory, the remark is e "that, whether by reason of the explosive properties he picric acid itself, or owing to the fact that it is tically impossible to prevent the formation of picric in the course of a disaster of which an extensive lagration forms a part, it is essential that this material ld be in all respects treated, during manufacture, ge, and conveyance, like any other nitro compound."

—G. W. McD.

sphorus Sesquisulphide (P_4S_3) and its Behaviour with Mitscherlich's Test. E. G. Clayton.

See under XXIV., *page* 1042.

English Patents.

losives [*Ammonia*]; *Manufacture of* ——. F. Volpert, Dortmund. Eng. Pat. 8821, April 29, 1901.

xplosives of the ammonium nitrate class, ground r containing resin and starch, or barks containing tannin, added to the composition. This causes a certain "coherence" in the explosive, and allows it to be well n home in the borehole while still retaining its full sive power. The following is given as an ple:—Dinitrobenzene (1 part); ginger root (12 parts); onium nitrate (86 parts); barium nitrate (1 part).

—G. W. McD.

Gunpowder; Smokeless ——. C. O. Lundholm, Stevenston, and Nobel's Explosives Co., Ltd., Glasgow. Eng. Pat. 14,231, July 12, 1901.

See U.S. Pat. 701,590, 1901; this Journal, 1902, 927.

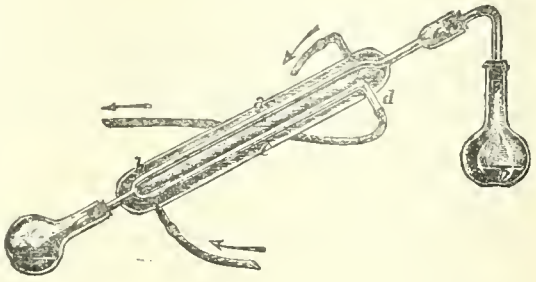
—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Condenser; New Form of ——. H. Goeckel. Chem.-Zeit., 1902, **26**, [55], 633.

The inner tube of this condenser is bent into a U-form as shown in the figure. The open end *d* passes through



and is fused to the outer jacket at the upper end, and serves either as a connection for a vacuum pump or as an outlet to the air. The bend *b* is connected by a short tube, sealed to the jacket, with a corked receiver. In practice the condenser is placed so that the arms *a* and *c* of the inner tube are on the same level, thus preventing any liquid from collecting in the bend *b*.

—B. F. D.

English Patent.

Centrifugal Machines for Laboratory Use [*Bacteriological Examinations, &c.*]. J. W. H. Eyre, London. Eng. Pat. 15,422, July 30, 1901.

A revolving disc or basket, which may be adapted to carry test-tubes at a slight angle with the horizontal, is suspended, above its centre of gravity, from a conical or spherical seating on the driving spindle of the machine. The seating is flexibly attached to the spindle, but turns therewith, and drives the basket by frictional contact. Provision is made for limiting the lateral deviation of the seating, and for firmly supporting the basket when at rest.

—R. A.

INORGANIC—QUALITATIVE.

Arsenic; The Decomposition of Compounds of Selenium and Tellurium by Moulds, and its Influence on the Biological Test for ——. O. Rosenheim. Proc. Chem. Soc., **18**, [253], 138.

Maassen (Arb. Kais. Ges. A., 1902, **18**, 475) has recently contributed a paper on the biological test for arsenic and the formation of organic compounds of arsenic, selenium, and tellurium by moulds. In view of Maassen's publication it has been thought advisable that the author should give a short *résumé* of his results confirming those of Maassen.

The biological test for arsenic (Gosio, Ber., 1897, **30**, 1024) is said to be characteristic of this substance (Abel and Buttenberg, Zeits. f. Hyg., 1899, **32**, 449). The test consists in the formation of gaseous organic arsenic compounds, possessing a characteristic garlic odour, produced by the vigorous growth of certain moulds (*Aspergillus, Mucor*, and *Penicillium*) in media containing arsenic, and permits of its detection where chemical methods fail. When applying this test to certain substances (beer and sugar) which contained selenium and arsenic, the author noticed a pronounced faecal odour different from that produced by arsenic alone. It was thought that this was due to the presence of selenium, and experiments with soluble selenium compounds confirmed this view. It was also found that tellurium compounds were decomposed by

Penicillium brevicaule, giving rise to the production of a very characteristic odour. Owing to the extreme sensitiveness of the test with regard to arsenic, absolutely pure compounds of selenium and tellurium were used. The odour produced by the decomposition of seleniam compounds is of a very disagreeable character (somewhat like skatol or mercaptan), whilst the gases formed by tellurium compounds possess a pronounced garlic odour. The test is extremely sensitive: 0·01 mgrm. in 1 c.c. of liquid is easily demonstrated by a vigorous growth of the mould. Unlike arsenic, pure selenium and tellurium are not attacked by the mould. It was found best to perform the test by using the medium proposed by Abel and Buttenberg (*loc. cit.*), namely, sterilised bread crumbs, to which the sterilised liquid in question is added after infection with the mould.

The author has drawn attention elsewhere (Chem. News, 1901, **83**, 277) to the influence of selenium on certain chemical tests for arsenic, and it is evident from the above results that in applying the biological test for arsenic, it is also necessary to take the possible presence of selenium (and tellurium) into consideration.

INORGANIC—QUANTITATIVE.

Sulphuretted Hydrogen in Coal-Gas; Detection and Determination of Minute Quantities of ——. W. J. Dibdin and R. G. Grimwood. Analyst, 1902, **27**, [316], 219—223.

For the detection and estimation of sulphuretted hydrogen in coal-gas, the authors allow the gas to impinge upon dry lead-acetate paper, and note the time required for the production of a dark colour. With gas containing a given proportion of H_2S, it is found that the time required is a constant, provided the paper is fixed at a definite distance from the gas-nozzle. The test-paper is prepared by moistening it with a 12 per cent. solution of lead acetate, and placing it, while still wet, in an atmosphere of ammonia for a few minutes. The mercury-sealed bell-jar in which the paper is arranged is fitted at the top with a cock and a jet burner, and the flame of the latter is adjusted in height so that the gas passes at the rate of 0·5 cubic foot per hour. On preparing mixtures of coal-gas with known proportions of H_2S, it was found to be possible to detect, within a reasonable time, one volume of H_2S in 1,000,000,000 of coal-gas, equivalent to approximately 1 grain in 600,000 cubic feet. The following abridged table gives some of the results obtained :—

	Distance of Lead Paper from Nozzle.					
	Close to.		1/8th Inch.		1/4th Inch.	
Time taken to produce a colour spot on lead paper by gas containing 1 volume of H_2S in :—	Min.	Secs.	Min.	Secs.	Min.	Secs.
10,000 vols.	0	2	0	4	0	8
1 million vols.	0	8	0	15	0	30
10 „	1	7	1	30	1	50
100 „	5	0	..		12	0
1,000 „	11	30	..		21	30

—H. B.

Starch and Sugar; The Primary Action of Iodine and other Oxidising Agents in the Hydrolysis of ——. F. E. Hale. Amer. J. Science, Silliman, **13**, [4], 379—399. Chem. Centr., 1902, **2**, [1], 26.

In titrations where starch is used as an indicator, there is sometimes a loss of iodine, which is connected with the red coloration frequently observed. The author's experiments led him to the following conclusions:—(1) In titrating an arsenite or tartar emetic solution with iodine, impure starch causes a loss of iodine, a compound being formed which gives a red coloration with the latter. (2) This compound is also formed if impure starch be boiled with potassium permanganate and potassium bicarbonate, or treated with hydrogen peroxide and potassium bicarbonate. (3) Pure starch does not cause a loss of iodine, nor does it show any tendency, in presence of potassium bicarbonate and hydrogen peroxide or potassium permanganate, to form a compound giving a red coloration with iodine. (4) The compound formed with impure starch behaves like erythrodextrin towards polarised light, but pure erythrodextrin does not cause any loss of iodine in the titration of arsenite solution. (5) Impure starch also contains a compound which gives a blue coloration with iodine, and the iodide of which is not precipitated by sulphuric acid. (6) The last-mentioned impurity is an intermediate product between starch and erythrodextrin, since its iodide is more stable than that of the latter, but is more soluble than starch iodide. (7) Pure amidulin causes a loss of iodine in the titration of arsenite or tartar emetic solution with iodine, and yields under the conditions given under (2) a compound which gives a red coloration with iodine. (8) Amidulin iodide is not precipitated by sulphuric acid. (9) Amidulin appears to stand between starch and erythrodextrin both with regard to the solubility of its iodide, and its behaviour on digestion with saliva. (10) Erythrodextrin is the first product of the hydrolysis of amidulin, and since it is present in impure starch, the compound which gives the blue coloration may be identical with amidulin, and the erythrodextrin be formed from the latter.—A. S.

ORGANIC—QUALITATIVE.

Sugar; Colorimetric Method for Detecting Traces of ——. Ventre Pacha. Bull de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **19**, [12], 1475.

The method consists in the action, aided by heating, of a sugar solution acidified with sulphuric acid, on a mixture of ammonium molybdate solution and essence of mirbane (nitrobenzene). The sugar solution is filtered, clarified or defecated with acetate of lead avoiding excess. To 10 c.c. of the solution in a test tube, 12 drops of sulphuric acid are added, then in succession, 5 drops of essence (equal volumes of nitrobenzene and alcohol), and 20 drops of a saturated solution of ammonium molybdate. The mixture is boiled for three minutes, when a blue coloration is produced, the intensity of which is dependent on the quantity of sugar present. One part of sugar per million of water gives an appreciable coloration. The most suitable concentration for comparisons is about 1 : 10,000.

The process may be combined with the polarimeter to determine the sucrose, dextrose, and levulose in cane juice.

—L. J. de W.

Cognac; Test for Choline in ——. H. Struve. Zeits. anal. Chem., 1902, **41**, [5], 284—289.

Artificially prepared cognac invariably contains choline, whereas natural cognac is free from this. The choline may be detected by the following method:—50 c.c. of cognac, after evaporation of the alcohol, are digested for a few seconds with a few drops of dilute sulphuric acid, and the liquid evaporated to dryness with excess of lime or lead oxide. The residue is extracted with 97 per cent. alcohol, and the extract evaporated to dryness. This residue is dissolved in a few drops of water, and a small part of the solution evaporated to dryness at 100° C. on a glass slide. The whitish residue is moistened with iodine solution (Florence's), and examined microscopically. The presence of choline is indicated by the appearance of needle-like crystals of choline iodide; these disappear in time, but can be reproduced, even after long standing, by a further addition of the reagent.—B. F. D.

Salicylic Acid; Detection of ——, *in Foods by the Ferric Chloride Reaction.* H. Taffe. Bull. Soc. Chim., 1902, **27**, [3], 701—702.

In examining foods for salicylic acid, the usual solvent employed to extract the acid is ether. The author has formerly urged the advantage of using a mixture of ether and light petroleum spirit (sp. gr. 0·700); and he now recommends the use of petroleum spirit alone. This solvent is not hygroscopic, and takes up any mineral acids only to a very slight extent; hydrochloric acid, for example, arising

from the decomposition by acids of the salt in salted foods, is not extracted by it, and thus the sensitiveness of the reaction with ferric chloride is not impaired.—J. T. D.

Wood-Pulp; Colour Reaction for ——. J. Hertkorn. Chem.-Zeit., 1902, **26**, [55], 632.

Amyl sulphuric acid gives a red or blue coloration with ligneous matter according to the quantity of the reagent used (see this Journal, 1902, 725). All the alkyl sulphuric acids and the aromatic sulphonic acids give the same coloration, notably the higher members of the series. Naphthalene sulphonic acid gives a blue coloration, whilst anthracene sulphonic acid produces a deep red with ligneous matter, cellulose giving no coloration under the same conditions. By heating benzene with sulphuric acid till sulphurous acid is evolved, a reagent is produced, which gives an intense blue with wood-pulp. Cellulose is also slightly coloured by this reagent.—B. F. D.

Black-dyed Cotton; Examination of ——. C. M. Whittaker.

See under V., *page* 1024.

ORGANIC—QUANTITATIVE.

Milk; Determination of Lecithin in ——. F. Bordas and S. de Raczkowski. Comptes Rend., 1902, **134**, [26], 1592—1594.

One hundred c.c. of milk are poured, with constant stirring, into a mixture composed of 100 c.c. of 95 per cent. alcohol, 100 c.c. of distilled water, and 10 drops of acetic acid. A coagulum is thus obtained which can be easily filtered; it is drained and the stem of the funnel is closed with a piece of rubber tubing and a pinch-cock. Three separate lots of 50 c.c. each of warm absolute alcohol are then poured successively on to the coagulum in the filter, each lot being stirred and allowed to remain for a few moments before letting through the filter by opening the pinchcock. The three alcoholic extracts thus obtained are mixed and evaporated. The residue is dissolved in a small quantity of ether-alcohol mixture (1:1) and the solution is filtered. The ether is then driven off and the residue is saponified by potash or baryta; the soap is decomposed by water acidulated with nitric acid, the fatty acids are separated and the filtrate which contains the glycerophosphates of the milk is evaporated to dryness. The residue is treated with 10 c.c. of concentrated nitric acid, and powdered permanganate is added in minute quantities at a time until the red colour is permanent for some minutes. The manganese oxide is then dissolved by the addition of a little sodium nitrite, the solution is boiled to expel nitrous fumes, and the phosphoric acid is precipitated by ammonium molybdate and weighed as magnesium pyrophosphate. The weight of the latter, multiplied by 1·5495, gives the glycerophosphoric acid per 100 c.c. of milk. It is preferable to express the results in this form rather than as lecithin, since the nature of the lecithin of milk has not been definitely ascertained.—J. F. B.

Albuminoid- and Proteid-Ammonia; Determination of ——. L. W. Winkler. Zeits. anal. Chem., 1902, **41**, [5], 290—300.

The following method is recommended for the determination of organic nitrogen in water:—

100 c.c. of the water are mixed with 5 c.c. of N/5 sulphuric acid and 5 c.c. of a 1 per cent. solution of potassium persulphate, and heated on the water-bath for 15 minutes in a covered flask. The contents are cooled and mixed in a glass cylinder with 5 c.c. of a mixture of equal parts of Nessler's reagent, and a 50 per cent. solution of Rochelle salt. In a similar cylinder 100 c.c. of the water are mixed with 5 c.c. of the same sulphuric acid, and 5 c.c. of the Nessler's reagent; to this mixture ammonium chloride solution (1 c.c. = 0·1 mgrm. of NH_3) is added till both cylinders show the same coloration. The results are expressed in mgrms. of proteid ammonia in 1 litre of the water.

The results of many experiments showed that the ammonia found is a measure of the organic nitrogen present, and that water showing more than 0·1 mgrm. of ammonia per litre is unfit for drinking purposes.—B. F. D.

Guanidine; Determination of ——. A. Vozárik. Zeits. angew. Chem., 1902, **15**, [27], 670—672.

The guanidine solution should contain not less than about 0·8 per cent. The author dissolves 8 grms. of the guanidine salt, makes ammoniacal, and dilutes to a litre. After two or three hours any lead present has settled out, and 25 c.c. of the solution are precipitated by ammonium picrate solution containing 8 grms. per litre, added drop by drop. After 6 to 12 hours, the precipitate is brought on to a Gooch filter, and washed with more of the ammonium picrate solution till free from everything but ammonium picrate; it is drained as thoroughly as possible by the pump, dried at 110° C., and weighed. The precipitate has the composition $CH_5N_3.OHC_6H_2(NO_2)_3$. It is much less soluble (1 in 13000) in the precipitant than in water; but the precipitate and asbestos of course both contain some ammonium picrate adherent to them, and the author's experiments have established that 1 per cent. of the weight of the precipitate and 2·5 per cent. of the weight of the asbestos must be deducted on this account from the gross increase in weight of the crucible. Eight test-analyses on a pure guanidine gave results varying from 99·31 to 100·90 per cent. instead of 100, the mean result being 100·06 per cent., with a probable error of ± 0·55 per cent. for a single determination.

—J. T. D.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Silicon: New Properties of Amorphous ——. H. Moissan and S. Smiles. Comptes Rend., 1902, **134**, [26], 1552—1553.

When the vapours of liquid hydrogen silicide Si_2H_6 are decomposed by a series of small induction sparks, hydrogen and silicon are produced. This silicon appears in the form of long woolly filaments of a pale coffee colour; it possesses reducing properties which are not found in the case of the amorphous silicon produced by Vigoureux's process. This very finely divided silicon reduces permanganate, copper sulphate, mercuric chloride, and gold chloride. The authors attribute the reducing properties of their amorphous silicon to the very much finer state of division of the product as compared with that of Vigoureux. It may be noted that pure boron possesses these properties in a far more marked degree, the action in this case is continued, apparently because the boric acid produced is soluble in water, whereas silicon soon becomes coated with hydrated silica, which ultimately protects the silicon from further action.—J. F. B.

Lime in Fusion; Some Properties of ——. H. Moissan. Bull. Soc. Chim., 1902, **27**, [13], 660—666.

By means of the electric furnace, lime was melted in larger quantity than was possible by means of the oxy-hydrogen blowpipe, and a number of substances were exposed in the furnace to its action. Carbon was converted into calcium carbide with evolution of carbon monoxide, and with excess of lime the calcium carbide was oxidised to carbon monoxide, vapours of metallic calcium being emitted at the same time. Silicon, boron, titanium, chromium, manganese, iron, nickel, and cobalt were all oxidised, the oxide in some cases forming a salt with the excess of lime. Platinum was volatilised, and its vapour diffused through the lime, giving it, when cooled, a dark, smoky tint; the unvolatilised platinum took up at the same time from 2½ to 3 per cent. of calcium.—J. T. D.

Zinc Peroxides; Constitution and Properties of ——. Forcrand. Comptes Rend., 135, [2], 103—107.

In a previous paper (this Journal, 1902, 505), four peroxides of zinc were described. These substances are stable below 100° C., but at higher temperatures, from 190°—210° C., yield water and oxygen, with zinc protoxide as a residue. Dilute sulphuric acid dissolves the peroxides without the evolution of oxygen. This reaction has been used by the

author to calculate their heats of formation in the case of the two possible hypotheses for their constitution. They may be considered either as hydrated peroxides of zinc or as addition compounds of the anhydrous or hydrated protoxide with hydrogen peroxide. The heats of formation found, considered in relation to the stability of the different numbers of the series, point to the second hypothesis as the more probable.—B. F. D.

Sulphammonium; Preparation and Properties of ——. H. Moissan. Bull. Soc. Chim., 1902, **27**, [13], 652—660.

Octahedral sulphur, prismatic sulphur, and sulphur insoluble in carbon bisulphide, react with liquefied ammonia at −38°, −15·5°, and −11·5° C., respectively. In sealed tubes at 20° C., perfectly dry liquefied ammonia takes up about 30 per cent. of its weight of sulphur; the purple substance so formed is a compound, and not merely a solution, for it solidifies as a whole on cooling, instead of depositing sulphur, and is stable up to 90° C., above which temperature dissociation sets in. At lower pressures, this dissociation of course occurs at lower temperatures, being at the atmospheric pressure practically complete at −35° C. At low temperatures and high pressures the amount of sulphur taken up reaches 39 per cent. of the weight of the liquefied ammonia, and a sort of red hoarfrost of crystals of sulphammonium appears on the tube. The vapour pressures of solutions of sulphammonium in liquefied ammonia of different concentrations were determined at different temperatures, and gave curves parallel with the corresponding ammonia curve of Regnault. The absorption-spectrum is very characteristic and delicate, and may be used as a means of detecting small amounts of sulphur. Sulphammonium dissolves at low temperatures in alcohol, or in ether, giving purple solutions which become bluer on adding excess of the solvent It reacts with iodine, with calcium, ammonium, mercury, lime, and the chlorides of manganese, lead, and mercury, forming for the most part coloured substances which decompose at the ordinary temperature and pressure, leaving sulphides of the metals.

—J. T. D.

Platinum; Note on the Recrystallisation of ——. W. Rosenhain. Proc. Roy. Soc., 1902, **70**, [462], 252—254.

Platinum, on prolonged exposure to a high temperature becomes brittle, and the surface shows markings "resembling the appearance of galvanised iron." This phenomenon has generally been ascribed to the action of carbon, and by Redwood specifically to the action of acetylene (this Journal, 1898, 1107). The author, however, has observed that if the surface of the "changed" platinum be examined with the microscope, it is seen to show a pattern characteristic of the etched surface of a crystalline metal, and a closer examination clearly proves that the appearance is due to genuine metallic crystals which have been etched on the surface by some chemical agent. The "changed" platinum is very weak and brittle when hot; the crystals seen on the surface are not a thin superficial layer, but genuinely represent the entire structure of the metal. The author concludes that the action is simply one of recrystallisation. In the case of platinum "annealed" in a gas flame, however, there is a further action; simple annealing or recrystallisation, although it will completely alter the interior structure of a piece of metal, will not of itself alter the appearance of the surface, even in a microscopic detail. To develop a surface pattern corresponding to the changed internal structure, the surface must be etched after the recrystallisation has taken place. The etching action is in this case undoubtedly due to the gases of the flame, and the temporary formation of a carbide may play a part in the process. (See also this Journal, 1900, 1115.)—A. S.

Phosphorus Sesquisulphide (P_4S_3) and its Behaviour with Mitscherlich's Test. E. G. Clayton. Proc. Chem. Soc., **18**, [253], 129.

When pure, this is a lemon-yellow, crystalline solid, with a strong odour of hydrogen sulphide, soluble at 15° in 1·6 parts of carbon bisulphide, and igniting in the air at about 100°. Commercially, several qualities of this substance are manufactured. Amongst those which have come under observation have been a coarsely granular lemon-yellow powder; a fine-grained yellow powder of somewhat duller tint; and a grey product, sometimes very impure. The following are typical analyses:—

—	A. Yellow (fine-grained).	B. Yellow (fine-grained).	C. Yellow (coarse-grained).	D. Grey (finely granular).
Water and volatile matter (loss at 100°, in an atmosphere of carbon dioxide).	0·19	0·18	8·74	7·31
Phosphorus sesquisulphide, P_4S_3.	97 86	97·62	84·95	83·34
Red phosphorus	..	..	..	1·81
Phosphoric acid, H_3PO_4	1·30	1·63	2·14	1·23
Sulphur, uncombined (soluble in carbon bisulphide).	..	..	4·17	..
Sulphur uncombined ("insoluble in carbon dioxide").	0·46	0·49	..	0·17
Calcium phosphate ...	..	..	..	3·35
Calcium sulphate	..	..	..	0·27
Iron oxide, &c.	..	..	..	1·72
Siliceous matter	0·19	0·17	..	0·80
	100·00	100·00	100·00	100·00
Temperature at which the specimen became luminous in the dark.	92°	93°	..	58°
Temperature of ignition.	94°	95°	83°	72°
Reaction with Mitscherlich's test.	negative	negative	distinct	distinc

Mörner has recently stated (Svensk Farmaceutisk Tidskrift, 1901, **12**, 177) that phosphorus sesquisulphide gives "more or less positive results" with Mitscherlich's test for phosphorus. The author has examined various specimens of commercial phosphorus sesquisulphide by this test, and finds that the results with comparatively pure specimens, such as A and B, are absolutely negative, no the faintest luminosity being perceptible in any part of the apparatus. It is evident that pure, or even approximately pure, phosphorus sesquisulphide gives no reaction with Mitscherlich's test, and that Mörner's results were obtained with samples containing small quantities of phosphorus, or of phosphorous oxide.

Phosphorus sesquisulphide may be subjected to friction in air at a temperature very considerably exceeding the ignition point of phosphorus without becoming luminous and with a total absence of "phosphorus fume"; it neither ignites nor begins to glow in the dark until a temperature of 92—96° is reached and the finely-divided residue of a solution in carbon bisulphide, evaporated on filter-paper at the ordinary temperature, neither glows in the dark fumes, nor ignites spontaneously.

Vital Colorations by Means of Coal-Tar Dyestuffs. M. Nicolle. Rev. Gén. des Mat. Col., 1902, **6**, [67] 143—153.

The so-called "vital colorations," produced by injecting solutions of dyestuffs into the tissues of living animals render it possible to examine the mechanism of the normal and pathological secretions, the reducing power of the tissues, and even, in certain cases, the development of various parts of the organism. The colorations thus obtained enable the investigator to localise the action and mode of elimination of drugs or poisons. Moreover, they demonstrate the histological details of tissues recently removed from the organism by selectively staining certain cells or parts of cells.

In the case of the protozoa, the cell nuclei of even living organisms may be distinctly stained.

In the vegetable kingdom the use of dyestuffs unravels the phenomena of the ascension of liquids, and of the

absorption and elimination of dissolved substances. These colour reactions have also been successfully applied to the study of moulds, fungi, and virulent bacteria.

These so-called vital colorations do not, however, usually affect the parts essentially concerned in the life of the cell; they produce more striking results when applied to cells which are already dead. Nevertheless, the colorations thus produced often differ greatly from those obtained by staining after fixation by the aid of reagents.

Reference is made to nearly all the commoner coal-tar dyestuffs, those which are most often employed in these researches being Methylene Blue, Methyl and Crystal Violets, Methyl Green, Bismarck Brown, Safranine, Magenta, Cyanine, Eosin, and various azo-derivatives.—G. T. M.

Mannitol, Picric Acid, and Anthracene: Solubility of ——. A. Findlay. Proc. Chem. Soc., 18, [254], 172.

Determinations of the solubility of mannitol in water, of picric acid in water and in benzene, and of anthracene in benzene, have been made at several temperatures between 25° and 60°.

It has already been shown by the author (Proc. Roy. Soc., 1902, 69, 471) that if the solubility curve of one substance is known, that of another substance can be calculated from two, or better, three, determinations of the solubility of the second substance at different temperatures. The formula used for this purpose is one analogous to that employed by Ramsay and Young for the calculation of vapour pressures, and has the form $T_1/T_1' = T_2/T_2' + c(t' - t)$, where T_1/T_1' and T_2/T_2' denote the absolute temperatures at which the two substances have the same solubility; c is a constant, and t' and t are the temperatures at which one of the substances has the solubility corresponding to the absolute temperatures T_1 and T_2 or T_1' and T_2'. This formula has been employed in the present case for calculating the solubilities of the above substances between 0° and 25°, and between 60° and 100° (in the case of anthracene and picric acid, in benzene up to the boiling point of the latter).

New Books.

Higher Mathematics for Students of Chemistry and Physics, with Special Reference to Practical Work. By J. W. Mellor, D.Sc., Research Fellow, the Owens College, Manchester. Longmans, Green, and Co., 39, Paternoster Row, London. 1902. Price 12*s.* 6*d.* New York and Bombay.

8vo volume, containing dedication, preface, table of contents, and subject-matter filling 506 pages, 16 pages of reference tables, 4 pages of miscellaneous examples, and the alphabetical index. The work is divided into 13 chapters, as follows:—Part I. Elementary: (I.) The Differential Calculus. (II.) Co-ordinate or Analytical Geometry. (III.) Functions with Singular Properties. (IV.) The Integral Calculus. (V.) Infinite Series and their Uses. Part II. Advanced: (VI.) Hyperbolic Functions. (VII.) How to Solve Differential Equations. (VIII.) Fourier's Theorem. Part III. Useful Results from Algebra and Trigonometry: (IX.) How to Solve Numerical Equations. (X.) Determinants. (XI.) Probability and the Theory of Errors. (XII.) Collection of Formulæ for Reference.

Arsenic. By Prof. J. Alfred Wanklyn, M.R.C.S., &c. Second Edition, Revised. Kegan Paul, Trench, Trübner, and Co., Ltd., Paternoster House, Charing Cross Road, London. 1901. Price 2*s.* 6*d.*

The present is a revised edition of the work issued in 1901 (this Journal, 1901, 397). It also contains an appendix, as an addition, on the subject of the "Canary-Yellow Arsenite of Silver" and on "Marsh's Test."

Trade Report.

I.—GENERAL.

Imports of the Canary Islands (Spain).

Foreign Office Annual Series, No. 2830.

Of glassware, cheap German goods were most in favour, in 1901, but there was an increasing demand for Belgian glass. Business all round was much better than in the previous year, large shipments being made from Spain, Belgium, the United Kingdom, and France. French shippers possessed the largest share of the trade in earthenware, tiles, &c., but the business with Spain was much better, in 1901, than previously, and showed signs of further improvement. British shippers mostly confined their attention to the better class of goods. There was an increased demand for cement, met chiefly by shipments from Belgium, the imports from that country rising from 1,113 tons in 1900 to 2,120 tons in 1901. About 500 tons came from the United Kingdom (15 tons in 1900), and 580 tons from France (724 tons in 1900). The trade in peat (mostly from Holland) and sawdust (chiefly from Norway and Sweden) for packing purposes was steady. The whole of the soap imported came from the United Kingdom; owing to large stocks being held over from the previous year, the imports in 1901 fell to 452 tons, as against 773 tons in 1900. The trade in paints and varnish was increasing, and was almost exclusively in British hands, the shipments from the United Kingdom being 10 times the amount of those of the closest competitor, Germany. Chemical manures, the demand for which is also increasing year by year, came chiefly from the United Kingdom, but Italian manufacturers have now entered the market. Practically the whole of the starch imported came from Belgium. The trade in alcohol was chiefly in the hands of German shippers. The demand in 1901 was met to a considerable extent by the large stocks imported in 1900, in anticipation of the new tariff. The figures were: for 1900, 162,360 galls.; for 1901, 20,148 galls. A large distillery was recently established in Teneriffe by a local German firm. Paper was imported chiefly from Germany, the United Kingdom, and Spain, in the order named; cheap paper was in most demand. The increasing demand for drugs was met chiefly by Spain and the United Kingdom.—A. S.

Chemical Products at Hamburg (Germany).

Foreign Office Annual Series, No. 2821.

Including the oil- and soap industries, there were at Hamburg, in 1901, 148 establishments connected with chemical industries, an increase of 22 over the figures for 1899. If the establishments in the towns of Altona, Harburg, and Wandsbeck be also included, the total number is 256. The more important factories are eight for refining nitrate, two for the manufacture of borax, eight for the manufacture of sulphuric, hydrochloric, nitric, and carbonic acids, &c., and four for making matches and fireworks. There are also three works for refining gold and silver ores and other minerals; several factories for artificial manures and cattle food; glue and gelatin; ether and chloroform, ethereal oils, and essences; beet- and cane-sugar refineries; and factories for making artificial honey and various kinds of syrup. In addition to these, there are smaller establishments for making pharmaceutical preparations, photographic chemicals, disinfectants, and antiseptics; five old-established factories for dyeing- and tanning-extracts; and a camphor refinery. The manufacture of explosives in the Hamburg district is of considerable importance; there are eight explosives factories in the neighbourhood. The total value of the explosives exported by sea from Hamburg, in 1900, amounted to about 420,000*l.* There are 13 establishments for manufacturing varnishes, lacquers, and paints; and 14 for the various products derived from mineral oils, coal-tar, and resin. There are four factories for making both hard and soft india-rubber goods, at one of which asbestos-ware is also made; several smaller works where gutta-percha and miscellaneous india-rubber articles,

such as tyres, belting, &c., are made; and one establishment for the manufacture of a material called cork-stone, chiefly used as a building material.—A. S.

Soap-Glue and Lined Sheets of Paper: Customs Decisions (Germany).

Bd. of Trade J., July 17, 1902.

The following is the substance of certain orders recently issued by the Hamburg Customs authorities, affecting the classification, for tariff purposes, of certain articles imported into the German Customs Union:—

Soap-Glue ("Seifen-leim"), a mixture of Turkey-red oil with 24 per cent. of mineral oil and 16 per cent. of "resinous oil," is dutiable, under No. 29 of the Tariff, as mineral lubricating oil, at the rate of 10 marks per 100 kilos. (5*s.* 1*d.* per cwt.).

Lined Sheets of Paper, consisting of two thin layers of white paper, held together by india-rubber, and printed black on both sides, with white lines, are dutiable, under No. 27 *f* (2) of the Tariff, at the rate of 12 marks per 100 kilos. (6*s.* 1*d.* per cwt.).

Trade of Swatow (China).

Foreign Office Annual Series, No. 2839.

The increase in the import of cheap Japanese matches was steady during 1901, the import being 748,966 gross, as against 739,160 in 1900.

The import of bean-cake and all kinds of beans for manuring purposes, in 1901, amounted to 1,281,422*l.*, and though this would at first appear to be only some 48,000*l.* more than in 1900, the value of the tael for that year was taken at 3*s.* 1¼*d.* Had that value been the same in 1901, the above import would have amounted to 1,344,590*l.*, or nearly 111,000*l.* more than in 1900.

Earth-nut oil was exported in large quantities, chiefly to Hong Kong, the export in 1901 amounting to over 500,000 taels, the largest on record, the figures for 1900 being 405,000 taels.

Sugar, both brown and white, was a very large export, the figures for the last three years being:—

Year.	Quantity.	Value.
	Cwts.	£
1899	2,163,843	1,125,971
1900	1,639,623	843,755
1901	1,650,714	859,437

The falling-off, in comparison with 1899, is almost entirely due to the disturbed state of the country round Newchwang, a most important market for Swatow sugar.

Effect of Proposed New Customs Tariff in Germany.

Foreign Office Annual Series, No. 2851.

Heavy rates of duty are proposed on several products of the coal-tar industry, involving a heavy taxation of aniline colours. In the manufacture of these and of synthetic indigo, which is steadily increasing its demand for acetic acid, wood-spirit is essential.

Phosphorus, which now enters free, is in future to pay, if amorphous, a duty of 10 marks per 100 kilos., and if vitreous, 5 marks per 100 kilos. The contemplated taxation would mean an increase of 5 per cent. of its value for the match industry, which already is in a precarious condition, and would see its export further handicapped.

Cinnabar (vermilion) was hitherto on the free list, but is now to pay 25 marks per 100 kilos. The imported vermilion amounts annually to only about 100 metric centners—this being natural vermilion needed for some special manufacturing process—as against an export of 2,000 metric centners, the latter being vermilion prepared by the wet process.

Ammonium carbonate is imported free; a duty of 5 marks per 100 kilos. is now proposed. The German article does not equal in quality that imported from the United Kingdom. Some trades even now pay a higher price for the British product, and will have to pay the higher prices which will follow the raising of the rates of duty.

Lactose (milk sugar) is now duty free, but a duty of 40 marks per 100 kilos. is proposed for the future. Milk sugar has become very popular of late years for infants' food, as it renders cow's milk as easily digestible as human milk.

The Bill in its present form is prompted by the twofold desire (1) that, if possible, every branch of home industry should be protected against foreign importation; (2) that upon every article of importation a special rate of duty should be fixed. The proposed rates of duty are not definite rates, but constitute the basis upon which negotiations for new commercial treaties are to be opened.

Patents in Germany.

Foreign Office Annual Series, No. 2851.

The number of patent applications has risen from 3,21[illegible] in the second half of 1877, to over 25,000 in 1901, and the number of patents granted, from 4,200 in 1878, to over 10,000 in 1901. On the other hand, 2,965 applications were opposed in 1890 (which is the highest number opposed in any one year), as against 1,756 in 1900; the majority proportionately coming from the chemical world. The number of the simpler patents granted, under the name of "Gebrauchsmuster," has even more rapidly increased, inasmuch as the applications, which, in the last quarter of 1891, numbered 2,095, have risen to 25,000 during the same period of 1901. Nearly 70 per cent of all patent applications for "Gebrauchsmuster" are now made through patent agents.

Exports of Wuchow (China).

Foreign Office Annual Series, No. 2840.

Articles.	Value.	Increase or Decrease.
	£	£
Star-aniseed	34,000	+ 2,500
"Liquid indigo"	10,500	+ 800
Leather	26,000	+ 8,700
Aniseed oil	16,800	+ 14,500
Wood-oil	29,000	+ 6,200
Hides	47,800	− 1,800

Hides were sent to Singapore; leather to Japan, Singapore, Siam, and Hong-Kong; wood-oil, used for coating boats, to Singapore; star-aniseed to France, the United Kingdom and America; and tallow was consumed in Eastern dockyards.

"Cartels," Syndicates, and Rings in Germany.

Foreign Office Annual Series, No. 2845.

The repeated disputes between "cartels," and syndicate rings, &c., has compelled the Government to interfere. First, inquiry is to be made as to the effect of this system of rings and syndicates upon the general economic condition of the country. This inquiry will include an examination of the various disputes between rings and independent manufacturers or owners, and what economic reasons exist which make the formation of rings desirable. The formulation of laws for the mutual protection of all parties concerned in this modern trade development is also projected.

The Prussian Minister of Commerce has issued an order to the presidents to furnish information as to the "cartels" existing in their respective provinces, and as to their effect upon the economic conditions there. Exceptions are made of the potash, coal, coke, and raw-iron syndicates, as the Government is presumably sufficiently informed as to their working and effects.

II.—FUEL, GAS, AND LIGHT.

Incandescent Mantles: Customs Decision (Italy).

Bd. of Trade J., July 24, 1902.

By a Law, dated June 19, the following new heading has been introduced into the Italian Customs Tariff:—

No. 352 *bis.*—Incandescent gas mantles, prepared with salts of rare metals, whether burnt and treated with collodion or not; 50 lire (2*l.*) the thousand.

Oil as Fuel in the United States.

Bd. of Trade J., July 24, 1902.

According to the *New York Tribune*, of 15th inst., a Board of Engineers, under the direction of Admiral Melville, has succeeded in producing one-third more steam from a standardised boiler with oil than was possible with the best coal, and it is thought that the use of liquid fuel for marine purposes is on the point of great development. In careful tests, extending over a whole year, the value of coal as fuel has been accurately determined, and the same boiler has recently been fired with oil in the preliminary series of exhaustive tests, which will last several months.

Two official trials were recently conducted under the supervision of the same Board of Naval Officers who carried on the coal tests. In both of these tests, it was found that the volume of steam generated by the oil was greater than that secured by the coal test of like character. Compared with like conditions when coal was used, the efficiency of oil was 40 per cent. greater than that of coal. The experiments will be conducted for a considerable period, for not only will various qualities of oil be used, but many forms of burners will be tried.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Oil Industry of Echigo (Japan).

Foreign Office Annual Series, No. 2841.

The development of the Echigo oil industry is proceeding apace. The oil in Amase and Kamada, hitherto the largest oil-producing district in Echigo, is reported to be showing signs of failing, and attention has been attracted towards the Kitano district, where the wells owned by the Nagaoka Industrial Co. have been yielding a large amount of oil since last autumn. Two of the wells, it is said, yield 1,600 gallons a day. The oil is carried by means of pipes to Takada Station on the Thinyetsu Railway, a distance of 10 miles.

An American company is about to start operations in the Umaya district, the plant having now arrived. The company applied in February for permission to lay down pipes from the oil fields to the company's oil refinery at Naoyetsu, a distance of 10 miles.

The Nippon Kerosene Co. is making trial borings in the Kitano district, and the Zowo Kerosene Co., in the Nashihira district. The Iwai Co., of Osaka, with a capital of 2,000*l.*, is making borings at Kokaya. The Koshiyama Kerosene Co., the Ton Kerosene Co., and a capitalist of Tokio have bought several leases, and will be starting operations shortly.

The International Oil Co. of Echigo has placed on the market the oil refined by the company. As to quotations the Naoyetsu delivery is quoted at 4*s.* 2*d.* per box, and it can be put on the Yokohama and Tokio markets at about 5*s.* 11*d.* per box. The oil is clear and transparent, the flash-point being 110 degrees. At present the company has a stock of 45,500 boxes in Echigo.

Tar and Pitch Trade of the Hamburg District (Germany).

Foreign Office Annual Series, No. 2821.

Hamburg.—The imports of tar, in the autumn of 1901, were very limited, and it is expected that prices will continue to improve during 1902. The imports of pitch from Archangel amounted to 1,100 barrels, at 21*s.*—22*s.* per 150 kilos. The price of Finland pitch, franco Hamburg, was about 34*s.* per barrel.

Lübeck.—During the early part of 1901, the high prices of the preceding year were not maintained for the rather large stock in Finland, the competition of Russian tar of inferior quality bringing the prices down. In consequence of the destruction by fire of about 16,000 tons of Russian tar at Uleäborg in the middle of June, business remained dull till October. The winter stock is less than in 1900, and it is expected that the prices for Finnish tar will attain their normal height.

	Tar.		Pitch.	
	Barrels.	Half Barrels.	Barrels.	Half Barrels.
Stock on Jan. 1, 1901....	16,972	6,199	687	268
Imports in 1901.....	16,195	7,223	618	131
Exports in 1901	19,603	8,086	844	259
Stock on Jan. 1, 1902....	13,564	5,336	461	140

—A.S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Dyewoods and Indigo in Hamburg (Germany).

Foreign Office Annual Series, No. 2221.

Although the transactions in most kinds of dyewoods were extensive at Hamburg, the tone of the inland markets was depressed, the inactivity being specially marked after the outbreak of the many financial calamities in Germany. Matters began to mend somewhat at the end of the year, and there seems a fair prospect of the improvement continuing. The imports to Hamburg of the prominent sorts of dyewoods during 1900 and 1901 were:—

	1900.	1901.
Campeachy logwood.....	372,000 cwts.	286,000 cwts.
Domingo and Jamaica logwood	240,000 ,,	94,000 ,,
Yellow wood	37,000 ,,	35,000 ,,
Lima redwood.....	27,500 ,,	3,500 ,,
Algarobilla.....	32,400 ,,	45,000 ,,
Dividivi	135,000 ,,	220,000 ,,
Myrobalans	260,000 ,,	212,000 ,,
Valonia	104,000 ,,	84,000 ,,
Cochenille.....	550 sacks	485 sacks

There was a brisk demand for indigo, at the beginning of 1901, and prices advanced during the first six months. A decline followed, and although a slight rise took place towards the end of the year, the outlook is not considered favourable, as only a small portion of the new Indian crop is said to have been sold up to the end of December, and European importers are awaiting the further development of affairs. It is stated that natural indigo can now only compete with its artificial substitutes if the price be kept low.

The total imports of indigo to Hamburg amounted to 4,180 lb. and 735 packages, as against 3,800 lb. and 350 packages in 1900.—A. S.

Indigo in Germany.

Foreign Office Annual Series, No. 2851.

In the manufacture of artificial indigo, two of the largest factories in the world are underbidding each other. The prices of vegetable and synthetic indigo at present are about equal, so that the price of one or the other can no longer tempt the consumer. There are some who, in the case of equal prices, prefer the natural product, for if the planters ceased growing indigo, the consumers would be entirely at the mercy of the indigo manufacturers. The lesson taught by the arrangement come to in the middle of last year by the chemical factories, for the purpose of raising very considerably the price of Alizarin Blue, has not been

forgotten. Such a step certainly served as a warning, for the attempt to drive indigo from the market with the help of Alizarin Blue had been continued with great energy for many years previously.

VII.—ACIDS, ALKALIS, SALTS, Etc.

Potash, &c. in the Hamburg District (Germany).

Foreign Office Annual Series, No. 2821.

Hanover.—Owing to a decline in demand, and the consequent wish to effect realisations, the prices in potash undertakings have experienced an all-round reduction. On the whole the trade has produced favourable results, the total output being increased by 2,500,000 marks. There was a remarkable increase in the sale of cheaper sorts of potash, whilst of pure potash the output in 1901 exceeded that of 1900 by 386,350 double centners.

The "Hohenzollern Company," at Alfeld on the Leine, after expending about 300,000*l.* in fruitless attempts, have discovered a potash mine which promises to be valuable. In the Magdeburg district, considerable loss was sustained through an influx of water in the mines. At the Bentheberg mines near Hanover, potash of unprecedented quality has been discovered at a depth of 3,250 ft. Attempts to sink shafts have up to the present failed, owing to the inrush of water. Of the 20 potash undertakings belonging to the syndicate, 12 of the older ones, and also that of Carlsfund, at Gross Rhüden, of more recent date, have turned out profitable investments. The others are in process of development, but are being worked at a considerable profit. Eight works not belonging to the syndicate are also engaged in sinking shafts. The use of potash manures is growing, but it is stated that Germany might use annually 23 times as much as at the present time. In 1901 Germany and North America used—

—	Germany.	North America.
	Double Centners.	Double Centners.
Chloride of potassium....	686,225	651,312
"Manure salts".....	579,260	478,714
Kainite.....	746,241	1,767,983

Barytes is found in considerable quantities in the Harz Mountains, chiefly in and near Lauterberg and in Thüringia. A syndicate has been formed with a view to regulate the prices, but has not yet attained its object. It is expected that the trade in barytes will be widely developed in the early future.

Harburg.—The imports of china clay were below the average, in consequence of the financial embarrassment prevailing in Germany.—A. S.

Potash Industry of Germany.

Foreign Office Annual Series, No. 2851.

The potash industry has, from the beginning, steadily developed its production and sales. In the past year, the works were in a position to increase their total output of rock-salts from about 30,370,000 metric centners, in the previous year, to 34,850,000 metric centners, of which 20,460,000 metric centners (1900, 18,790,000 metric centners) served industrial and 14,390,000 metric centners agricultural purposes. The development is due, in the first place, to the fact that Germany, with her production of potash salts, possesses a monopoly. It was also materially assisted by the far-sighted policy of the works in recognising the benefit of a coalition, organised 20 years ago, under the style of the Potash Selling Syndicate. The total consumption of pure potash at home and abroad has risen during the years 1889—1900 from 615,843 to 2,315,218 metric centners, for agricultural purposes, and from 462,185 to 608,276 metric centners, for industrial purposes. At the same time, the value of the total sales through the syndicate (exclusive of the chloride of potassium used for the manufacture of potassium, caustic potash, saltpetre, &c.) rose from 23,710,000 to 55,710,000 marks. During the aforesaid period, the average value of 1 metric centner was the highest in 1889, with 21 marks 99 pf.; it receded gradually to 17 marks 87 pf. in 1898, but rose again in 1899 to 18 marks 51 pf., and to 19 marks 6 pf. in 1900.

Ammonia and Nitrate of Potash in Germany.

Foreign Office Annual Series, No. 2845.

The British export of ammonia to Germany (33,000 tons) showed an increase in 1901. The entire import into Germany was 44,407 tons (the year before, 23,000 tons). The leaders of the union for the sale of ammonia in Germany were of opinion that the sudden lowering of British prices in March of the previous year was only a temporary phase, and they therefore kept back their sales. That this was wise has been proved by the turn of affairs during the last months. The unfavourable weather of last year had a very injurious influence on the goods sent.

Saltpetre was in a slightly better position than sulphate of ammonia. The imports amounted to 529,566 tons, as compared with 484,543 tons in the previous year, and the price rose from 8 marks 80 pf. at the beginning of the year, to 9 marks at the end. The demand for sulphate of ammonia has increased in Germany by 13,000 tons. The market in liquid ammonia, the price of which averaged the same as that of sulphate of ammonia, was regular; it amounted to 2,060 tons (1,170 tons the year before) of concentrated and 7,459 tons (17,713 tons the previous year) of diluted liquid ammonia. The entire production of sulphate of ammonia in Germany in 1901 was 130,000 tons; in the United Kingdom, 220,000 tons.

Iodine in Chile.

Chem. and Druggist, July 26, 1902.

According to the official report of the Chilean Government, the production of iodine, which in 1900 rose to 193,497 kilos., increased in 1901 to 245,949 kilos., although only 21 out of 78 nitrate works manufactured iodine. The quantity exported from Chile, last year, amounted to 269,018 kilos., and the consumption to 255,530 kilos., as against 251,160 in 1900. The quantity in the hands of the consignees and in transit, on October 31, rose to 839,960 kilos., representing more than three years' consumption.

Borate of Manganese: Customs Decision (United States).

Bd. of Trade J., July 17, 1902.

The following decision affects the application of the United States Customs Tariff:—

Borate of manganese is properly dutiable as a borate material not otherwise provided for, at the rates prescribed according to the percentage of anhydrous boric acid contained in the material, under the provisions of par. 11 of the Tariff, and not as a chemical compound under the provisions of par. 3, the former being held to be the more specific provision, and to include within its terms the merchandise in question.

IX.—BUILDING MATERIALS, Etc.

Cement and Asphalt at Hanover (Germany).

Foreign Office Annual Series, No. 2821.

For the cement industry, 1901 was the record bad year. The Hanover Syndicate, comprising all the Portland cement works of North Germany, was formed on Jan. 1, 1901, but owing to the keen competition during the summer months by outsiders, especially by the East German Mills, it was powerless to regulate production and consumption. It was dissolved by general agreement in December. The competition in the home trade is much keener than that in the export trade.

There are extensive asphalt mines in Linden, which adjoins Hanover, and in Vorwohle (about 25 miles distant). Several new companies have been formed in recent years, but this has led to over-production, with the consequent collapse of weaker firms. The demand has considerably diminished during 1901, but whilst the home consumption is much reduced, large orders have been received for South Africa and the far East.—A. S.

X.—*METALLURGY.*

Copper Mines of Roumania.

Bd. of Trade J., July 24, 1902.

The copper mines of the Dobrudja are situated in a triangle with the Danube from Macin to Tulcea as its base, and Hamandji as its apex. In this region, iron and copper are found, the latter in the form of the carbonate.

The explorations have, so far, been confined to the four following points, which, by their geographical position, seem to form a centre for mining operations, *viz.*, Balabancea, Islam-Gèafer, and Carapelit, near Ortachioï, and Altan-Tepe, near Tcheamourli.

In the Carpathians, pyrites, copper pyrites, and malachites are found in Valea lui Stan, Valea Choboroasa, which contain 7 per cent. of copper oxide, and deposit gold after washing.

Mining Industry at Wuchow (China).

Foreign Office Annual Series, No. 2840.

Some silver, lead, and copper mines farther up the River Si-Kiang are being worked by a Chinese company, with he assistance of a British engineer, and with good manage-ment, they are said to be capable of a large production at a handsome profit. In the neighbourhood of Wuchow, here are several coal mines worked by native methods, the produce of which is sold in Canton at about *11. 2s.* per ton for use by steam launches. Minerals of many kinds abound n the province.

With a view to pushing the export of antimony, a local British firm is prepared to supply, placed in Hong-Kong, limited amount of this metal in half-ton lots.

Ground Sulphide of Antimony: Customs Decision (United States).

Bd. of Trade J., July 24, 1902.

Ground sulphide of antimony is held to be dutiable, nder Section 6 of the Tariff, as an unenumerated manu-ctured article, at the rate of 20 per cent. *ad val*, and not be free of duty as crude sulphide of antimony, under ir. 476.

Bismuth Production of the United States.

U.S. Geological Survey, 1901.

The production of bismuth ore in the United States in 01 amounted to 318·6 short tons, as compared with 220 ort tons, in 1900. Colorado supplied the entire output, ke Co. contributing 253·6 tons, carrying from 4 to 10 r cent. of bismuth, and Ouray Co., 65 tons, which varied in muth contents from 6 to 12 per cent. The price for the muth content varied from 8 dols. to 11 dols. per unit. e demand for metallic bismuth is limited, and producers this country are little inclined to report the details of ual production and market conditions. As nearly as can ascertained, the value of the 318·6 tons was 25,488 dols., s deductions for transportation and treatment charges, or average of 80 dols. per ton. The ore was purchased by Leadville Sampler, at Leadville and the State Ore Samp-; Works, at Denver; or was shipped direct to England. t is stated that the supply of this metal greatly exceeds demand, and that this condition has necessitated a com-ation of interests in order to maintain the price at a figure ch would be remunerative to mine owners. The sche-e of prices for ore is based upon the market price of the al, and with the latter at 1.25 dols. a pound, the following es were paid on delivery at the smelting works, all uctions for treatment having been made:—Ten per . ore, 150 dols. per ton; 15 per cent. ore, 250 dols. ton; 20 per cent. ore, 350 dols. per ton; 30 per cent. 550 dols. per ton; 40 per cent. ore, 750 dols. per ton; per cent. ore, 1,000 dols. per ton.

he imports of bismuth into the United States in were 165,182 lb., valued at 239,061 dols., as against 433 lb., valued at 246,597 dols., in 1900. In addition is, there was a small importation of bismuth in medi-preparations.

The monthly average wholesale prices per lb. for the metal, f.o.b. works, during 1901, were:—Jan. to March, 2.25 dols.; April to June, 2.05 dols.; July and Aug., 2.02½ dols.; Sept., 1.64 dols.; Oct. to Dec., 1.50 dols.

The occurrence of bismuth is widespread, and it is found in both the combined and the free state in many of the Western States. The principal bismuth minerals occurring in Colorado are bismuth carbonate, which is found in Lake, Larimer, Boulder, and Chaffee counties; native bismuth, in Summit, Jefferson, Boulder, and Larimer counties; bismuth tellurate and telluride, in Boulder and Ouray counties; and sulpho-bismuthite, in Park, Custer, Ouray, Hinsdale, Clear Creek, La Plata, Boulder, San Juan, and Lake counties.

Tin Production and Consumption of the World.

Chem. Trade J., July 26, 1902.

An estimate of the world's production of tin gives it approximately for three years past, in long tons of 2,240 pounds, as follows:—

—	1899.	1900.	1901.
Straits to Europe and U.S.A.	44,501	46,058	50,382
Straits to India and China ..	1,480	1,800	2,650
Total Straits.....	45,981	47,858	53,032
Australian shipments.....	3,370	2,975	3,276
Banka, Billiton, and Singkep	14,935	18,013	19,400
Bolivian exports	5,100	6,965	9,670
English production	4,500	4,500	4,500
Total production.....	73,886	80,311	89,878
Estimated deliveries.....	80,900	79,500	87,700
Surplus or deficit	D. 7,014	S. 811	S. 2,178
Estimated stocks.....	21,572	21,505	25,620

In addition to the production given above, there is a small quantity of tin ore found in Germany and in the vicinity of Guadalajara in Mexico. Prof. Louis believed that in China the output exceeded 10,000 tons yearly, and might possibly be as high as 20,000 tons. It is all consumed in the country. Japan produces a small quantity, which is used almost entirely in making the bronze alloys for which the country is famous.

The production of the tin mined in the Malay Peninsula is by far the most important, constituting last year 59 per cent. of the total. Moreover, it is part of the production which has shown the greatest increase in recent years. The Banka and Billiton outputs are believed to be capable of considerable development, but the actual growth has been moderate. More attention has been paid recently to the mining of tin in Bolivia, and the possibilities of that country as a producer are not yet fully known. The Australian production does not grow, and seems to be rather neglected at present; whilst the mines of Cornwall are likely to decrease rather than to increase their output.

The United States is not a tin producer. There are now rumours of the finding of deposits of stream tin in the Cape York region of Alaska. Arrangements are being made to explore it thoroughly.

Although not a producer, the United States is the largest consumer of tin. During 1901 the total imports of the metal into that country were 33,286 long tons, or 37 per cent. of the world's production. The tin which goes to that country is chiefly Straits tin, part being imported directly, though a considerable share is received by way of British ports. Some Banka tin also goes there, chiefly by way of Holland.

Great Britain is the second largest consumer of tin, whilst Germany is the third. Holland, though it transacts a large trade in tin, consumes only a small quantity, most of the metal received from the east by the Dutch ports being sold and re-exported to other countries.

The stocks of tin in sight, including those in transit, amount usually to 25—30 per cent. of a year's output. In the past three years they have decreased for various reasons. For some three years previous to 1900 the estimated consumption of tin was somewhat less than the production. In 1899 the conditions were nearly

balanced; whilst in 1900 and 1901 the production was slightly in excess. The estimated stocks on hand at the close of each of the past three years are given below, in long tons:—

	1899.	1900.	1901.
In store and afloat, U.S.A. and Europe	16,522	15,480	17,523
Banka and Billiton reserves	4,500	5,530	7,251
Bolivian unsold	550	495	846
Total stocks	21,572	21,505	25,620

It will be noted that the stocks reported at the close of last year were greater than for several years past. The active demand for tin during the first four months of the current year has reduced these accumulations somewhat, and the current supply is hardly equal to the demand.

XI.—ELECTRO-CHEMISTRY, Etc.

Manufacture of Electro-Steel in Sweden.

U.S. Cons. Reps., July 10, 1902.

At the meeting of the Iron Manufacturers' Association at Jernkontoret, information was given on the production of electro-steel at Gysinge.

In the latter part of February, 1900, the first furnace was finished and ready for trial, and after a few experiments, the first ingot was produced. The steel was found to be of excellent quality. The problem was thus solved technically, but not economically; for, with the dynamo of 78 kilowatts used, not more than 270 kilos. of steel were obtained in 24 hours, and in the furnace, there was not room for more than 80 kilos. A larger furnace was completed in November 1900, and proved to be a great improvement. In the second furnace, which held 180 kilos., from 600 to 700 kilos. of steel were produced in 24 hours. The Gysinge sulphite factory having been burned down, it was decided to build steel works in its place, and to use the water-power available there. For the steel furnace there was utilised a turbine of 300 horse-power, with direct-coupled generator. The new furnace is to hold 1,800 kilos., and the production is estimated to be at least 1,500 tons a year, if charged with cold raw material.

The steel produced is stated to be of superior quality; it can be worked cold, even when containing a high percentage of carbon. Compared with other steels, it also has less tendency to crack or warp when hardened.

The reason why this steel in certain qualities differs from other steels, especially in its softness when unhardened, is considered to be its freedom from gases. The manufacture of special steels, with nickel, chrome, manganese, or tungsten, will not be difficult. The chrome-steel and tungsten-steel produced at Gysinge have proved to be excellent for lathe tools. When used for permanent magnets, the Gysinge tungsten-steel has been found to give stronger magnets than other tungsten-steels, and has not warped in the hardening.

The furnace used at Gysinge, which is simple in construction and easily managed, has prospects of competing, as to cost of operation, with the furnaces heretofore used for fusion of steel, especially as it yields steel of a better quality.

Steel ingots from Gysinge have been found to be uniform and homogeneous. Microscopic examinations indicate that there is no difference between electro-steel and crucible-steel, which is remarkable, as electro-steel differs from it in other respects.

XII.—FATS, OILS, Etc.

Oils, &c., in the Hamburg District (Germany).

Foreign Office Annual Series, No. 2821.

Hamburg.—The German Oil Co. have a large edible-oil factory at Harburg. Other oils produced in the district (chiefly at Hamburg) are cocoanut oil, cotton-seed oil, palm oil, and especially linseed oil; there are also several establishments for refining these oils. Refined petroleum is imported into Hamburg to the extent of about 6,000,000 cwts. per annum, for local consumption and in transit for the interior of Germany; eleven-twelfths of the petroleum comes from the United States, the remainder from Russia. There are six factories for lubricating oils, vaseline, and grease (for machinery), three or four tallow-melting works, seven soap manufactories, and several small factories for wax, stearin, paraffin, and ceresin candles.

In the first half of 1901, the general demand for tallow was small, and the unusually large importations from Australia caused a fall in prices of about 1s. per cwt. The imports from the United States showed a great decrease, and this, in conjunction with a falling off in the imports from Australia during the latter part of the year, caused the prices to rise considerably above the figure ruling in the early months. Prices of linseed oil declined slowly, in 1901, and it is stated that the mills will find it more and more difficult to induce customers to contract for large quantities in future, and will thus have to limit their production. Cotton-seed oil experienced a considerable advance in price, and the high quotations in the United States caused Hamburg importers to obtain their supplies from the United Kingdom. Rape-seed and sunflower-seed oils were in good demand. Cocoanut oil was only imported in very small quantities at high prices. The total imports of beeswax were 22,250 cwts., as against 23,800 cwts. in 1900; and of Carnauba wax, 7,800 cwts., or 25 per cent. less than in 1900. Exporters of Japanese vegetable wax now mostly trade directly with the interior of Germany, and this article is consequently losing importance on the Hamburg market.

Bremen.—The impending duty on raw materials had a bad effect, especially on the linseed oil manufacture. The sweet oil factory was again compelled to enlarge its works. The production of palm oil and cocoanut oil was less satisfactory.

Harburg.—The linseed-crushing business was considerably restricted, owing to the slackness of trade, and also to the high prices of the raw material, which made the oil unable to compete with substitutes such as tallow and palm-kernel and cotton-seed oils. Linseed crushing in Germany is endangered by the measure proposed in the German Parliament, aiming at the introduction of a protective import duty upon all cereals and linseed. The export of oil-cakes, which are stated to be of high purity and rich in oil, to the United Kingdom, was more active than in 1900. Shipments of oil-cakes afford paying employment to British coasting vessels bringing slates and china clay to Harburg.

—A. S.

Olive Oil Production of Italy.

Bd. of Trade J., July 17, 1901.

The following table, showing the production of olive oil in the several provinces of Italy, during the seasons 1900–1 and 1901–2, is taken from the official organ of the Italian Ministry of Agriculture, Industry, and Commerce for June:—

	1900-1.	1901-2.
	Hectolitres.	Hectolitres.
Lombardy	2,500	3,300
Venetia	4,160	4,130
Liguria	103,000	184,070
Emilia	6,600	2,900
Marches and Umbria	182,670	149,500
Tuscany	242,900	160,500
Latium	70,000	110,000
Southern Adriatic	355,200	1,004,300
Southern Mediterranean	359,070	902,900
Sicily	413,000	575,000
Sardinia	50,900	53,400
Total .... Hectolitres	1,790,000	3,150,000
Total .... Gallons	39,380,000	69,300,000

Soaps at Mosul (Turkey).

U.S. Cons. Reps., July 14, 1902.

Austria exports soaps which are inodorous, as the residents of Mosul have a pronounced dislike for all article appealing to the sense of smell.

XIII. B.—RESINS, VARNISHES, Etc.

Resin and Turpentine in Hamburg (Germany).

Foreign Office Annual Series, No. 2821.

The imports of resin from the United States were larger than in 1901, whilst those of French resin show a falling-off. The following table shows the respective imports during each of the last four years from America and France:—

Year.	American Resin.		French Resin.	
	Imports.	Stock. Dec. 31.	Imports.	Stock. Dec. 31.
	Casks.	Casks.	Casks.	Casks.
1898	161,040	5,885	6,781	909
1899	224,065	11,338	9,403	1,265
1900	249,017	4,989	10,130	924
1901	270,576	12,226	7,440	642

The business in turpentine is said to have been, upon the whole, unprofitable for merchants here, and satisfactory prices were only obtainable towards the end of the season. The imports and sales in 1900 and 1901 were—

	American Turpentine.	French, Spanish, and Portuguese Turpentine.
	Casks.	Casks.
Stock, Dec. 31, 1899	8,688	59
Imports, 1900	60,460	2,161
	69,148	2,220
Sales in 1900	57,480	2,220
Stock, Dec. 31, 1900	11,668	..
Imports, 1901	46,434	3,892
	58,102	3,892
Sales in 1901	53,982	3,536
Stock, Dec. 31, 1901	4,120	356

It is reported that production in America will be limited during the coming year, and that the producers intend to come to an understanding with a view to fix prices.—A. S.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Exports of Pará (Brazil).

Foreign Office Annual Series, No. 2844.

The total exports of Amazonian rubber, including that from the States of Pará and Amazonas and the Republics of Bolivia and Peru, during the year 1901, stating qualities, quantities, and destination, were as follows:—

Qualities.	Quantity.		
	Europe.	United States.	Total.
	Tons.	Tons.	Tons.
Fine	7,949	8,052	16,001
Medium	1,562	1,890	3,452
Coarse	2,557	4,284	6,841
Caucho"	2,723	1,322	4,045
Total	14,791	15,548	30,339
„ 1900	..	..	25,807

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Leather, &c. Industry in Hamburg (Germany).

Foreign Office Annual Series, No. 2821.

The imports of hides from oversea countries to Hamburg now exceed the aggregate imports of this article to the United Kingdom, Antwerp, and Havre; more than 50 per cent. of the Hamburg imports are re-exported to foreign countries. The Hamburg leather industry is now considered to be comparatively of greater importance than that of any other German town. There are in the district 12 factories for tanning and preparing ox- and horse-hides, and for manufacturing sole and other kinds of leather, and also four factories where only leather belting (for driving machinery) is made.

The imports of quebracho wood amounted to 1,786,000 cwts. in 1901, as against 2,200,000 cwts. in 1900; and of quebracho extracts, 98,000 cwts., as against 80,000 cwts., in 1900. Prices stood highest at the beginning of January, after which they very gradually declined almost up to the end of the year, when they closed firm. It is considered in Hamburg that the import duty on quebracho wood proposed in the new German tariff will be very prejudicial to the already suffering interests of the German leather industry and trade.

The total value of ivory imported annually into Hamburg is about 150,000*l.* (about 4,000 cwts.); ivory nuts are imported to the total value of about 200,000*l.* per annum.

—A. S.

Leather in Germany.

Foreign Office Annual Series, No. 2845.

The German foreign trade in leather was very unfavourable in 1901. Of common shoes, saddlers' wares, and leather straps the import was 1,323 cwts., and the export was 3,087 cwts., less than in 1900. Superior saddlers' wares were imported to the same amount, but show 13,230 cwts. less export. Bookbinders' goods show the same import, and an increased export of 2,646 cwts. The import of kid gloves was 2,104 cwts., and the export 1,934 cwts., less than in 1900.

The United Kingdom took, in 1901, large quantities of raw ox-hides; other raw hides, such as horse-skins, &c., could not find such a good market. Good raw sheep's hides were an exception, this article finding a considerable sale.

Of tanned goods, the United Kingdom, as in 1900, took large quantities of sole leather. At the end of the year, this business diminished, as the United Kingdom preferred American. The import trade from the United Kingdom remained the same as in the previous year.

Leather in Russia.

Bd. of Trade J., July 24, 1902.

Manufacturers who wish to obtain a share of the Russian leather trade are advised to establish a depôt at Warsaw, with one or more representatives, placing them in a position to compete with the existing wholesale houses which are supplied by Germany. The articles to which particular attention should be given are black and coloured calf-skins, grained goatskins (coloured), patent leathers of all kinds, chamois leathers and kids, and coloured sheep's leather (chiefly grained).

Leather and Esparto Exports of Tripoli.

Foreign Office Miscellaneous Series, No. 578.

Exports consist chiefly of Soudan-tanned goat-skins from the pits of Kano, all of which are sent to New York for boot and glove manufacture, European countries being apparently incapable of utilising them. Esparto grass forms the bulk of the exports to the United Kingdom.

XV.—MANURES.

Fertilisers at Hamburg (Germany).

Foreign Office Annual Series, No. 2821.

The accompanying table shows the imports of nitrate into Hamburg and into the United Kingdom, and also the total imports to Europe during the past two years.

The stock remaining on hand at Hamburg, at the end of last year, was 56,600 tons, as against 35,200 tons, at the end of 1900. Comparatively high and steady prices ruled throughout the year, which closed with rising quotations,

and it is considered unlikely that prices will fall for the present.

The business in refined nitrate was very limited, most consumers holding back, in view of the high prices, which showed a rising tendency throughout 1901.

To—	Quantity.	
	1900.	1901.
	Tons.	Tons.
United Kingdom	134,300	118,000
European Continent	993,700	1,043,000
Total	1,128,000	1,161,000
Of which to Hamburg	435,500	487,000

Low prices ruled in the phosphate trade, freights being low and the supply constantly in excess of the demand. It is stated that a union was established last year by a large proportion of the Florida mine-owners (representing about three-quarters of the total phosphate production in Florida) with a view of fixing prices, and though this result has not yet been attained, it is anticipated that, in view of the increased consumption during autumn, the phosphate market will assume a firmer tone before long. It is pointed out that any deficiency in the exports from Florida can be made up by phosphates from Algiers and Christmas Island, and also by purchases of Tennessee and "Land and River Pebble" phosphates. The total imports of all kinds of phosphate to Hamburg (and Harburg), in 1901, were 111,600 tons, as compared with 106,200 tons in 1900.—A. S.

XVI.—SUGAR, STARCH, Etc.

Sugar and Potato Products (Starch) at Hamburg (Germany).

Foreign Office Annual Series, No. 2821.

According to the Union of Hamburg Sugar Merchants, 1901 was the most unfavourable year, from an economic point of view, the sugar trade has ever yet experienced. Prices fell to a very low point, and although a brisk export trade to the United States, the United Kingdom, and Japan developed during the first part of the year, during the second half, shipments came almost to a standstill. The increased cultivation of beet in Europe, the unfavourable returns from other sugar-producing countries, and the competition of cane-sugar, all caused much depression in the Hamburg sugar market. Prices, during 1901, were as follows:—For sugar on hand at the beginning of January, 9*s.*, advancing, after the middle of the month, 2*d.* per centner (110¼ lb.); values then fell to 8*s.* 10*d.*, and remained at this point until April, when, gradually improving, they reached the highest point of the year, *viz.*, 9*s.* 6½*d.* on May 20. In August, prices stood at 8*s.* (as against 12*s.* 2*d.*, in 1900), and after that time they fell gradually lower and lower, reaching at the end of December, 6*s.* 4*d.*, a figure which had never been known before. The total sales of sugar amounted to 8,553,000 cwts., as against 5,600,000 cwts. in 1900, and 5,927,000 cwts. in 1899. The total exports, *viâ* Hamburg, amounted to 10,172,300 sacks, as against 9,395,400 sacks in 1900; of this, about 2,767,000 sacks were exported to the United States, as against 3,083,700 sacks in 1900, and 2,105,000 sacks in 1899, whilst 5,394,800 sacks went to the United Kingdom, as compared with 4,727,000 sacks in 1900, and 5,416,000 sacks in 1899. In the supply of potato products, Germany quite out-distanced Holland in most markets, during the latter part of 1901. It is stated that a brisk export trade is only possible in conjunction with low prices, otherwise German trade cannot cope with Dutch competition. The condition of the spirit-distilling industry has a very important, if not determining, influence upon both the production and prices of potato products in Germany. Attention has been drawn at Hamburg to the need of establishing a better system of estimating the results of the potato harvest. For example, if the excellent results of the September harvest had been properly known to merchants here, they would have been able to place a far larger quantity of potato products in foreign countries than was actually the case. The export trade in dextrin from Germany experienced a further increase last year, but of grape-sugar, comparatively smaller quantities were exported.

—A. S.

Sugar Production in Germany.

Foreign Office Annual Series, No. 2845.

According to a statement published in the *Reichs-anzeiger* of the 12th inst., the quantity of raw sugar produced in Germany, in June last, amounted to 7,074 metric tons, and the quantity of refined, to 100,937 metric tons.

The output of raw and refined sugar in Germany, in the period from 1st Aug., 1901 to 30th June, 1902,—the first eleven months of the 1901-2 sugar campaign—compares as follows with the corresponding period of the 1900-1 campaign:—

——	August 1900 to June 1901.	August 1901 to June 1902.
	Metric Tons.	Metric Tons.
Raw	1,729,255	2,020,725
Refined	1,198,480	1,248,463

Note.—Metric ton = 1,000 kilos. = 2,204 lb. av.

The export of sugar from Germany to the United Kingdom in 1901 amounted to 633,316 tons of raw and refined sugar, as compared with 554,000 tons in 1900. The year opened steadily, and the price was, for No. 1 product, f.o.b. Hamburg, 9*s.* 0¼*d.*, basis 88 per cent., which price, with unimportant fluctuations, kept on till April. Speculators tried to monopolise a great part of the Hamburg stock in order to rule the market, and to be able to dictate the price in July and August, a time at which the American refiners are obliged to buy, but the latter were able to obtain as much Colonial sugar as they wanted, and the disappointed speculaters were obliged to sell at a great less, No. 1 product going back to 8*s.* 0½*d.* f.o.b. Hamburg; at the end of September, prices quoted were 7*s.* 4½*d.* Hamburg, and at the end of December, 6*s.* 6*d.*

It was feared that the re-introduction of the duty on refined sugar (4*s.* 2*d.*) would lessen the consumption, and consequently the import; but these fears were proved to be idle, for the United Kingdom imported 1,080,000 tons of refined sugar, 100,000 tons more than in the previous year.

Sugar Duties in British India.

Bd. of Trade J., July 17, 1902.

The "Indian Tariff (Amendment) Act, 1902" (No. 8 of 1902), provides for the imposition of a special duty, in certain cases, on sugar imported into India.

The present Act amends Section 8 A of the Indian Tariff Act, 1894 (No. 8 of 1894), as amended by the Indian Tariff (Amendment) Act, 1899 (No. 14 of 1899), by adding the following section:—

"8 B (1) Where the rate of duty or other taxation imposed in any country, dependency, or colony upon sugar not produced therein exceeds the rate of duty or other taxation imposed upon sugar produced therein by more than the equivalent of 6 frs. per 100 kilos., in the case of refined sugar, or 5 frs. and 50 centimes per 100 kilos., in the case of other sugar, then, upon the importation of any sugar from such country, dependency, or colony into British India, whether the same be imported directly from the country of production, or otherwise, and whether it be imported in the same condition as when exported from the country of production, or have been changed in condition by manufacture or otherwise, the Governor-General in Council may, by notification in the *Gazette of India* impose in addition to any other duty or taxation imposed under this Act or any other law for the time being in force, a special duty not exceeding one moiety of such excess."

The present Act will remain in force until the 31st August 1903, but it will not apply to any imported article or substance, the bill of lading for which was signed and given before the 23rd May 1902.

A Customs Circular (No. 10 of 1902) imposes under Section 8 B, Sub-section (1), of the Indian Tariff Act, 1894, as amended by the Indian Tariff (Amendment) Act, 1902, (No. 8 of 1902) (see above), a *special* duty upon all sugar imported into British India from the under-mentioned countries :—

Country.	Rate of Special Duty per Cwt.
	Rs. a. p.
Austria-Hungary	3 3 9
Germany	2 13 9

Sugar Production of Spain.

U.S. Cons. Reps., July 11, 1902.

The following table shows the sugar production of Spain, for 1901, with comparative figures for 1900 :—

Article.	Production.	
	1900.	1901.
	Tons.	Tons.
Cane-sugar on hand, Jan. 1, 1901	..	4,468
Beet-sugar on hand at same date	13,491	25,753
Total	13,491	30,221
Cane-sugar produced from Jan. 1 to Dec. 31.	33,217	27,645
Beet-sugar produced for same period	59,629	58,489
Sorghum produced for same period	221	109
Total	93,067	86,243
Cane-sugar sold during each year	28,749	29,471
Beet-sugar sold for same period	47,366	56,769
Sorghum sold for same period	221	99
Total	76,336	86,339
Cane-sugar on hand, Dec. 31	4,468	2,644
Beet-sugar on hand at same date	25,753	27,473
Sorghum on hand at same date	..	10
Total	30,221	30,127
Résumé.		
On hand, Jan. 1	13,491	30,222
Produced during the year	93,067	86,243
Total	106,558	116,465

Sugar in Japan.

Foreign Office Annual Series, No. 2841.

The proposed imposition by the Japanese Government of a heavy consumption-tax on sugar caused speculation on the market, during the spring of 1901, when considerable business was done in the produce of the Hong Kong refineries. This was checked when it became known that the date of its operation would be October 1, thus opening the door to the importation of Continental beet-sugars, and consequent loss of revenue to Japan. In July, there was some revival in the demand for Hong Kong refined sugars. Beets, however, continued to pour in, and for the remainder of the year, the market was overloaded with supplies. Any important rise in prices was always held in check from fear of the influence of beets, and with heavy accumulated stocks of these sugars at the end of the year, prices showed in the end little improvement on those of January, notwithstanding the imposition in the meantime of the consumption-tax ranging from 2*s.* 0½*d.* to 5*s.* 8½*d.* per picul.

The imports of Java sugar during the past year amounted to 186,500 bags, and of Cantons, to 194,000 bags.

XVII.—BREWING, Etc.

Spirit Import Duties in the United Kingdom.

Bd. of Trade J., July 17, 1902.

According to a General Order (No. 38 of 1902) issued by the Commissioners of Customs on the 19th ult., the increase of import duties on spirits does not apply to brandy or rum, nor to liqueurs, cordials, mixtures, &c., entered not to be tested, nor to perfumed spirits.

According to this General Order, the following is a complete list of the duties now payable on spirits :—

Description of Spirits.	Rates of Duty.	
	Imported in Casks.	Imported in Bottles.
Spirits and strong waters:	*s. d.*	*s. d.*
For every gallon computed at hydrometer proof of spirits of any description (except perfumed spirits), including naphtha or methylic alcohol purified so as to be potable; and mixtures and preparations containing spirits—		
Enumerated spirits—		
Brandy ..... per proof gall.	11 4	12 4
Rum ..... „	11 4	12 4
Imitation rum .... „	11 5	12 5
Geneva ..... „	11 5	12 5
Unenumerated spirits, sweetened, per proof gall.	11 7	12 7
(Including liqueurs, cordials, mixtures, and other preparations containing spirits, if tested.)		
Unenumerated spirits, not sweetened ..... per proof gall.	11 5	11 5
(Including liqueurs, cordials, mixtures, and other preparations containing spirits, provided such spirits can be shown to be both unenumerated and not sweetened; if tested.)		
Liqueurs, cordials, mixtures, and other preparations containing spirits, in bottle, entered in such a manner as to show that the strength is not to be tested, per liquid gall.	..	16 4
Perfumed spirits ..... per liquid gall.	18 1	19 1
Any importations of naphtha or methylic alcohol purified so as to be potable are rated under the heading of unenumerated spirits.		

Spirit Industry in Germany.

Foreign Office Annual Series, No. 2851.

The crisis in the spirit-distilling trade is due to the rich harvest of potatoes, since the production of spirits far exceeds the demand, and their export, once so flourishing, cannot be recovered (in spite of the "bonus" for exportation), owing to the altered circumstances on the world's market.

Distillers have formed a ring, which, whilst it rules the home market, has proved too weak to regulate production. The result of the existing customs legislation and the operations of the syndicate has been an over-production, which is at present seeking an outlet in vain. In spite of reductions in price, and endeavours to create a demand for alcohol by recommending it for technical purposes, the inland consumption of alcohol will need years to become even with the constantly advancing production.

Spirit in Germany.

Foreign Office Annual Series, No. 2845.

The export of German brandy to the United Kingdom did not increase in 1901. There was a slightly increased demand for inferior spirit for technical purposes, but German manufacturers did not consider it of much importance, the demand being manifestly caused by the high price of "melasse," the material used for the production of spirit. "Melasse" has now become cheaper.

Ilges, of Cologne-Fayenthal, has succeeded in perfecting an apparatus which produces fine spirit without re-distillation, and which, at the same time, separates the first runnings and the fusel oil.

Currant Wine in France.

U.S. Cons. Reps., July 14, 1902.

The currants mostly employed in France for making wine are the Corinth, the Thyra from Smyrna, the Samos, and the Vourla.

Wine made from currants is always of a pale colour, although the currants are red, for desiccation tends to destroy the colouring matter.

In France, the Corinth currants are considered the best for wine, and the process is as follows:—The fruit is placed in water in order to recover the moisture lost by drying. The quantity of water is determined by the degree of alcohol desired. It is said that usually 100 kilos. of dried Corinth currants contain enough sugar to give 30° or 32° of alcohol. When 100 kilos. are used, 150 litres of water give 19° to 22°; 175 litres of water give 16° to 18°; 200 litres, 14° to 15°; 225 litres, 13° to 14°; 250 litres, 12° to 13°; 275 litres, 11° to 12°; 300 litres, 10° to 11°; 325 litres, 8° to 10°.

The temperature of the fermenting-room should be from 15° to 20° C.

The fermentation is finished in 10 or 15 days; in winter, the time is usually longer. When the temperature of the must in the vat is no more than 21° C., fermentation usually ceases. Usually, after the fermentation ceases, the wine is left for 24 hours.

After the liquid is drawn off, it undergoes a slight fermentation, which completes the operation. All the water that has been absorbed by the currants should be pressed out quickly, in order that the skins may be in contact with the air as short a time as possible.

This wine, although it has fermented regularly, is more likely to undergo secondary fermentation than wine made from fresh grapes. All likelihood of this should therefore be destroyed by burning a little sulphur in the barrel before the wine is put away. As the product contains very little tannin, 5 to 6 grms. of tannin are usually added to each hectolitre.

XVIII. A.—FOODS.

Margarin in Austria.

U.S. Cons. Reps., July 8, 1902.

The law passed by the Austrian Parliament, Oct. 25, 1901, regulating the traffic in butter, cheese, lard, and their substitutes took effect in May. Artificial butter, made from oils and suet, can no longer be sold, except specifically as margarin. All preparations of or from margarin must be labelled so as to show exactly what they are. The sale of mixtures of margarin and real butter is forbidden. To make recognition easier, 10 per cent. of margarin must be sesame oil, which is easy of detection.

Milk Powder in Sweden.

U.S. Cons. Reps., June 25, 1902.

According to the inventor, M. Ekenberg, powder made from skimmed milk keeps better than that made from pure milk. The maximum cost of production of the milk powder is about 1 öre per litre ($\frac{1}{5}d.$ per gallon) of milk exsiccated. The quantity of skimmed milk corresponding to the butter produced in Sweden is about 600,000,000 kilos., and it is stated that this would yield about 60,000,000 kilos. of milk powder. J. Landin finds that the average composition of the milk powder is:—Albuminous matter, 36·0 per cent.; "sugar of milk," 49·0 per cent.; fat, 1·0 per cent.; "milk salts," 7·5, and moisture, 6·5 per cent. Paying regard only to the albuminous matter, 1 kilo. of the milk powder is equal in nutritive value to 1·8 kilos. of boneless meat from "neat cattle," or to nearly 3 kilos. of white of egg. The real value is comparatively higher still, owing to the large quantity of sugar and the "milk salts" contained in the milk powder. It is estimated that at a price of 2—3 öre per litre ($\frac{1}{2}d.$—$1\frac{1}{2}d.$ per gal.) for skimmed milk, the milk powder can be sold with good profit for 70 öre per kilo. (4·3*d.* per lb.) (See this Journal, 1902, 734.)—A. S.

XIX.—PAPER, PASTEBOARD, Etc.

Paper in Germany.

Foreign Office Annual Series, No. 2845.

The paper trade had a favourable year in 1901. The Berlin firms state that their returns are only 5 per cent. less than in former years. The home market and the British market were unsatisfactory; in many cases, the value of the quality made up for the smallness of the quantity dealt in; the paperware manufactories were not allowed to reap much advantage, as the paper manufacturers kept the prices high.

Of writing, printing, and drawing paper, 33,128 cwts. were imported, in 1901, with a value of 62,549*l.*, as compared with 35,974 cwts., with a value of 68,382*l.*, in 1900, so that the import was 2,846 cwts., or 7·9 per cent., less in quantity, and 5,833*l.*, or 8·5 per cent., less in value.

Among the countries which sent paper to Germany, the United States, which threatened to be a great danger to the German market, are altogether absent.

Of imported paper, 14,039 cwts., or 42 per cent. of the entire German import, came from France; the United Kingdom sent 6,546 cwts., or 19·7 per cent.; and Austria-Hungary sent 5,176 cwts., or 15·5 per cent. The export from Germany of the three kinds of paper above mentioned amounted, in 1901, to 567,115 cwts., with a value of 551,569*l.*, as compared with 826,780 cwts., with a value of 723,922*l.*, in the previous year. The decrease last year amounted to 259,665 cwts., or 31·4 per cent., in weight, and of 172,353*l.*, or 23·8 per cent., in value.

This smaller consumption was probably due to the dry weather, during which the cellulose and wood-cutting works, on which the paper manufacture depends for its raw material, could not be fully employed. Of German writing, printing, and drawing paper, the United Kingdom took, in 1901, 134,705 cwts., or 23·7 per cent., and British India 6,937 cwts., or 1·2 per cent.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

1.—PLANT, APPARATUS, and MACHINERY.

[A.] 15,719. Adams. Percolating filters, and apparatus connected therewith. July 15.

" 15,828. Macfarlane. Centrifugal machines for separating fluids of different densities. July 16.

" 15,881. Tolhurst and Skinner. Roller-mill for crushing and grinding cement, clinker, ore, and the like. July 16.

" 15,970. Mower. Apparatus for heating or cooling air or other gases.* July 17.

" 16,019. Höhl. Carboys. July 18.

" 16,108. Bluxam.—From Chem. Fabr. Rhenania. Pumps for raising liquids by compressed air. July 19.

" 16,295. Hemingway. Means applicable for use in concentrating solutions. July 22.

" 16,355. Roper and Haigh. Means for protecting perishable objects from the atmospheric influences, and for other useful purposes. July 23.

[A.] 16,436. Keith and Keith. Gas or air compressors or pumps. July 24.

„ 16,579. Lacy-Hulbert. Pump for compressing or exhausting air and gases. July 25.

„ 16,679. Tauner. Optical apparatus for use in testing liquids. July 28.

„ 16,684. Wollaston. Apparatus for removing suspended matter from liquids by continuous decantation. July 28.

„ 16,730. Romey. Drying chambers. July 28.

„ 17,011. Bell. Clarification of liquids. Aug. 1.

„ 17,131. Cribb. Condensers for distillation and like purposes. Aug. 2.

[C.S.] 14,567 (1901). Engels. Manufacture of crucibles, retorts, receivers, muffles, or other like fire-proof articles for metallurgical or similar uses. July 23.

„ 14,577A (1901). Naef. Process and apparatus for cooling and refrigerating. July 23. Date applied for under International Convention, Dec. 18, 1900. Previously included in No. 14,577.

„ 14,577B (1901). Naef. Compressing air or gas, drying and cooling it, and utilising its waste heat. July 30. Date applied for under International Convention, Dec. 18, 1900, previously included in 14,577.

„ 14,977 (1901). Naef. Treatment of solid material with gas, especially applicable to catalytic actions. July 23. Date applied for under International Convention, May 10, 1901.

„ 16,568 (1901). Drake and Gorham. Apparatus for cleaning casks. July 30.

„ 16,984 (1901). Coupe. Apparatus for filling casks, barrels, tanks, and other receptacles for holding liquids. July 30.

„ 17,087 (1901). Cambier and Leclerc. Devices for superheating and drying steam. July 30.

„ 17,582 (1901). Thwaite. Method of melting snow, ice, and solid or plastic hydrocarbons, and apparatus therefor. July 30.

„ 17,947 (1901). Read and Campbell. Valves or valved stoppers, more especially intended for use as retaining valves for bottles or other receptacles containing aërated liquids. Aug. 7.

„ 18,233 (1901). Greenhalgh. Distilling apparatus. July 23.

„ 18,242 (1901). Intze. Construction of tanks for liquids. Aug. 7.

„ 18,262 (1901). Morrell and Leigh-Hunt. Regulators for controlling gases of high pressure. July 23.

„ 18,567 (1901). Selby. Heads of casks, vats, and like vessels for aërated water and other contents. July 23.

„ 18,623 (1901). Sheen. Steam generators and evaporating pans. Aug. 7.

„ 1187 (1902). McDougall. Apparatus for filling casks or other vessels with liquids. Aug. 7.

„ 3504 (1902). Mautell, Prim, and James Keith and Blackman Co., Ltd. Refrigerators and cold-air chambers. July 23.

„ 6380 (1902). Merckx. Device for the drums of centrifugal separators. July 23.

„ 6606 (1902). White. Machines for moulding plastic or granular material or the like. July 23.

„ 7167 (1902). Larsen. Centrifugal apparatus for determining the relative proportions of the components of compound liquids. July 30.

„ 10,218 (1902). Luft. Process for producing plastic compounds. July 23.

„ 11,294 (1902). Abrahams. Apparatus for delivering measured quantities of substances in the form of powder. July 23. Date applied for under International Convention, Oct. 28, 1901.

[C.S.] 13,250 (1902). Dent. Venting device and overflow fitting for casks, barrels, and the like. Aug. 7.

„ 13,699 (1902). Lary. Machines for packetting and filling powders and like materials. Aug. 7.

II.—FUEL, GAS, AND LIGHT.

[A.] 15,621. Barbour. Recovery of products from furnace gases and the like, and the prevention of smoke. July 14.

„ 15,691. Laurenius. Charcoal retorts and furnaces.* July 14.

„ 15,730. Montel. Acetylene gas generators.* July 23.

„ 15,731. Stefan and Schönfelder. Gas burner.* July 15.

„ 15,770. Lake.—From Hardt. Bunsen burners. July 15.

„ 15,806. Crosthwaite. Furnaces for steam boilers and the like. July 15.

„ 15,808. Wrightson. Method of converting refuse matter into fuel. July 15.

„ 15,809. Wrightson. Utilising refuse matter in the manufacture of block-fuel. July 15.

„ 15,810. Wrightson. Method of producing block or moulded fuel, and utilising refuse matters therefor. July 15.

„ 15,855. Brown. Dissolvers for the supply of acetylene and other gases to optical lanterns and the like. July 16.

„ 15,857. Osborn. Burners for liquid fuel. July 16.

„ 15,860. Potter. High-power intensifying incandescent burner and the like. July 16.

„ 15,887. Abner. Spirit burner.* July 16.

„ 15,900. Gearing and Rainforth. Machinery or apparatus for the manufacture of steam boiler furnaces and flues. July 16.

„ 15,917. Weir. Burning liquid fuel in steam boilers. July 17.

„ 15,957. Jilek. Manufacture of briquettes from fuel waste or refuse. July 17.

„ 15,958. Collins. Manufacture of briquettes. July 17

„ 15,973. Keogh. Smoke consumers for furnaces. July 17.

„ 16,027. Stociet. Manufacture of block-fuel.* July 18.

„ 16,053. Soc. F. Charron, Girardot, and Voigt. Carburators for internal combustion engines.* July 18. Date applied for, Nov. 6, 1901, being date of application in France.

„ 16,059. Soc. F. Charron, Girardot, and Voigt. Carburators for internal combustion motors.* July 18. Date applied for, Feb. 6, 1902, being date of application in France.

„ 16,095. Wise.—From Schömann and Co., G. m. b. H. Incandescence burners. July 19.

„ 16,096. Wise.—From Schömann and Co., G. m. b. H. Incandescence gas light burners. July 19.

„ 16,105. Bock. Manufacture of briquettes. July 19.

„ 16,152. Close. Powder sprinkler furnace. July 21.

„ 16,175. Bloxam.—From Treat. Regenerative furnaces. July 21.

„ 16,207. Johnson.—From Verein Chem. Fabr. in Mannheim. Calcining or decomposing furnaces or ovens. July 21.

„ 16,232. Thorin. Regulating devices for electric arc lamps.* July 21.

„ 16,258. Blodgett. Safety attachment for gas-burners for controlling the supply of gas thereto.* July 22.

„ 16,267. Lancaster. Acetylene generators. July 22.

„ 16,282. Murphy. Furnaces.* July 22.

„ 16,285. Reagan. Furnaces.* July 22.

„ 16,291. Webb. Gas lamps. July 22.

„ 16,301. Pfeiffer and Staples. Oil burners.* July 22.

[A.] 16,321. White, Griffin, and Campbell. Manufacture of peat fuel. July 22.

„ 16,388. Schmitt. Generators for acetylene gas. July 23.

„ 16,452. Limper. Wicks for lamps or burners.* July 24.

„ 16,461. Tcherniac. Process for extracting valuable products from the spent lime of gas-works. July 24.

„ 16,510. Haigh. Method of and means for making compressed fire-lighters, compressed fuel, and the like. July 25.

„ 16,573. De Laitte. Processes for making mixtures of air and gas, and apparatus therefor.* July 25.

„ 16,613. Bottomley. Means for consuming smoke in furnaces.* July 26.

„ 16,643. Lamure and Megè. Gas-burners.* Filed July 26. Date applied for, Dec. 6, 1901, being date of application in France.

„ 16,646. Keyling. Blast furnaces. July 26.

„ 16,663. Wilson. Appliance for removing soot, dust, ash, and the like, from combustion chambers, furnace and boiler flues, dust-collecting pits, and the like. July 28.

„ 16,668. Clapham. Condensing apparatus for use in the manufacture of gas. July 28.

„ 16,681. Brookes.—From Bradley. Apparatus for feeding and burning pulverulent or dust fuel.* July 28.

„ 16,682. Brookes.—From Bradley. Pulverulent or fuel-feeding apparatus.* July 28.

„ 16,683. Brookes.—From Bradley. Pulverulent or dust fuel-feeding devices.* July 28.

„ 16,702. Sugg. Lamps for incandescent gas lighting. July 28.

„ 16,723. Western. Collection and treatment of certain fumes. July 28.

„ 16,726. Dobson. Method of pressing peat blocks.* July 28.

„ 16,772. Nicolai and Bulding. Self-acting igniters. July 28.

„ 16,734. Lake.—From S. Bernstein Co. Gas-lamps, chiefly designed for use in connection with incandescent burners.* July 28.

„ 16,800. Featherstone. Carburettors for vaporising hydrocarbons for use in internal combustion engines. July 29.

„ 16,807. Poetter. Coke ovens. July 29.

„ 16,816. Apsey. *See under* XVII.

„ 16,832. Doebbel. Smoke-consuming apparatus. July 29.

„ 16,849. Oving. Gas-mixing apparatus. July 29.

„ 16,850. Bergner. Electric igniters for gas-burners. July 29.

„ 16,885. Hindle. Chimneys for use in connection with incandescent gas-lighting. July 30.

„ 16,889. Elliott. Apparatus for purifying fumes and gases. July 30.

„ 16,923. Lake.—From General Electric Co. Manufacture of incandescent electric lamps. July 30.

„ 16,995. Lowden. *See under* VII.

„ 16,986. Thwaite. Method of producing power-gas, and apparatus therefor July 31.

„ 17,006. Schwab and H. Greene and Sons, Ltd. Apparatus for lighting gas-burners.* July 31.

„ 17,039. Murray. Atmospheric spirit-lamp. Aug. 1.

„ 17,136. Newton and Neville. Incandescent electric lamps. Aug. 2.

„ 17,143. Adler. Electrical systems for lighting and power. Aug. 2.

„ 17,145. Jeavons. Vaporising-trough for vapour-burners.* Aug. 2.

[A.] 17,149. Hughes. Smoke- and spark-preventing devices.* Aug. 2.

„ 17,154. Archer. Gas and air mixers. Aug. 2.

[C.S.] 12,577 (1901). Rehkop. Smoke-consuming furnaces. July 30.

„ 14,483 (1901). Leneauchez. Purification of gases, such as those obtained from gas-generating furnaces, high furnaces, and so forth. July 23.

„ 14,634 (1901). Caboone. Stoves. July 23.

„ 15,171 (1901). Lowe. Fuel compositions. July 30.

„ 15,397 (1901). Herring. Retort settings combined with the gas producer and regenerative chambers for heating secondary air supply by means of the waste gases leaving the setting of the retort. July 30.

„ 15,411 (1901). Riley and Strathy. Vaporisation of oil or liquid combustibles for various purposes. Aug. 7.

„ 15,479 (1901). Roots and Venables. Vapour burners. July 23.

„ 16,011 (1901). Hibell and Hibell. Consuming smoke and saving fuel. July 30.

„ 16,275 (1901). Sugg. Incandescent gas-lighting apparatus. Aug. 7.

„ 16,699 (1901). Westinghouse.—From Knox. Process and apparatus for the manufacture of gas. July 23.

„ 16,700 (1901). Westinghouse.—From Knox. Supply of heat to ovens or receptacles employed in the operations of coking, annealing, lime-burning, drying, and the like. July 23.

„ 16,701 (1901). Smith. Carbide holders. Aug. 7.

„ 16,702 (1901). Smith. Acetylene gas generators. Aug. 7.

„ 16,737 (1901). Bormann. Combustion of fuel in furnaces. July 30.

„ 16,848 (1901). Bray, Bray, and Bray. Steam-boiler furnaces. Aug. 7.

„ 17,058 (1901). Bonwick. Manufacture of devices for promoting the combustion and economising the consumption of fuel in grates, ranges, or the like. July 30.

„ 17,455 (1901). Doman and Bullas. Acetylene generating apparatus. July 23.

„ 17,637 (1901). Wolf. Process and apparatus for incinerating, shaping, and hardening incandescence mantles. July 30.

„ 17,774 (1901). Anderson and British Fuel Economiser and Smoke Preventer, Ltd. Smoke consuming apparatus for steam-boiler and other furnaces. July 30.

„ 17,789 (1901). Tapp and Akester. Utilisation of liquid hydrocarbons for heating purposes. July 30.

„ 18,096 (1901). Grout and Grout. Hydrocarbon burners. July 23.

„ 18,159 (1901). Koppers. Method of preventing the leakage of gases through the walls or partitions of coke-ovens, retorts, and other heating appliances. Aug. 7.

„ 19,152 (1901). Dihdin and Woltereck. Process of producing illuminating or heating gas. Aug. 7.

„ 19,241 (1901). Boult.—From Ziegler. Furnaces for coking peat or the like. Aug. 7.

„ 20,000 (1901). Talbot. Smoke arrester for gas-burners. July 30.

„ 22,648 (1901). Doman and Bullas. Apparatus for purifying gases. Aug. 7.

„ 23,212 (1901). De Brouwer. Apparatus for charging retorts in the manufacture of gas. Aug. 7.

„ 25,000 (1901). Boult.—From Baumann. Boilers or heating apparatus for asphalt, bitumen, pitch, and other substances. July 30.

[C.S.] 26,220 (1901). Boult.—From Comstock. Apparatus for impregnating air, steam, or other gas with hydrocarbon vapour. July 23.

„ 26,576 (1901). Brookes.—From Bradley. Fuel feeders for furnaces. July 30.

„ 26,577 (1901). Brookes.—From Bradley. Furnaces or apparatus for burning pulverulent or dust fuel and the like. July 30.

„ 46 (1902). Tigges. Incandescent gas-light candle. July 30.

„ 2102 (1902). Johnston. Steam apparatus or ovens for heating, baking, and drying. Aug. 7.

„ 5707 (1902). Brunn. Process and apparatus for heating boilers with mazut or oil converted into spray by means of an air-current. July 30.

„ 7285 (1902). Schünemann. Process and apparatus for vaporising spirit and liquid hydrocarbons. July 30.

„ 7809 (1902). Scott, Tyzack, and Wright. Electric arc lamp. July 23.

„ 8678 (1902). Burrows. Air and gas mixing and supplying apparatus. July 30. Date applied for under International Convention, Nov. 29, 1901.

„ 10,539 (1902). Derval. Inclined gas retorts. July 23.

„ 11,490 (1902). Faben. Gas purifier grids. Aug. 7.

„ 11,498 (1902). Weeks. Apparatus or machines for generating acetylene gas. July 30.

„ 11,612 (1902). Beck. Acetylene gas lamp for table use. July 23.

„ 12,015 (1902). Adamson. Oil lamps. July 23.

„ 12,183 (1902). Imray.—From Cie. des Récipients et Lampes inexplosibles. Vessels for holding volatile inflammable liquids. Aug. 7.

„ 12,194 (1902). Mazza. Apparatus for separating, extracting, or recovering the constituent elements of a gaseous mixture. Aug. 7.

„ 13,026 (1902). Feeny.—From Abwärme-Kraftmaschinenges m. b. H. Method of reducing the quantity of liquid to be evaporated in vapour generators. Aug. 7.

„ 13,042 (1902). Lake.—From Vereinigte Maschinenfabr. Augsburg und Maschinenbauges., Nürnberg Act.-Ges. Pumps for liquid fuel. July 30.

„ 13,757 (1902). Feeny.—From Abwärme-Kraftmaschinenges. m. b. H. Process or method of utilising the heat contained in waste gases from blast furnaces and the like. Aug. 7.

„ 13,865 (1902). Knapen. Carburetters for explosion motors. July 30.

„ 14,054 (1902). Hecking. Manufacture of artificial fuel. July 30.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 16,511. Archdale. Method of and means for dehydrating or distilling coal-tar, applicable also for other and like purposes. July 25.

C.S.] 18,233 (1901). Greenhalgh. *See under* I.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 15,659. Imray.—From Soc. of Chem. Ind. in Basle. Manufacture of acridine dyestuffs.* July 14.

„ 15,660. Imray.—From Farbwerke, Höchst. Manufacture of phenylglycine-ortho-carboxylic acid. July 14.

„ 15,684. Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of halogen-substituted indigos. July 14.

„ 16,050. Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of colouring matters containing sulphur. July 18.

[A.] 16,114. Ellis.—From Soc. Chimique des Usines du Rhône, anciennement Gilliard, P. Monnet, et Cartier. Manufacture of azo colouring matters July 19.

„ 16,138. Urquhart.—From Chem. Fabr. vorm. Weiler-ter Meer. Manufacture of dyestuffs dyeing cotton directly. July 21.

„ 16,174. Abel.—From Akt.-Ges. f. Anilin-Fabr. Development of dyes obtained by means of sulphurised colouring matters. July 21.

„ 16,823. Ransford.—From Cassella and Co. Manufacture of new aromatic compounds and of colouring matters therefrom. July 29.

„ 16,897. Imray.—From Farbwerke, Höchst. Sulphurised dyestuffs for printing fabrics. July 30.

„ 16,917. Ellis.—From Soc. Chimique des Usines du Rhône, anciennement Gilliard, P. Monnet, et Cartier. Manufacture of indigo and intermediate product. July 30.

„ 16,931. Johnson.—From Kalle and Co. Manufacture and production of green dyes containing sulphur. July 30.

„ 16,932. Johnson.—From Kalle and Co. Manufacture and production of sulphur dyes for dyeing cotton directly. July 30.

„ 17,090. Johnson.—From Kalle and Co. Isolation and application of the methyl ketone of ortho-nitro-beta phenyllactic acid. Aug. 1.

[C.S.] 16,420 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of initial materials relating to the production of indigo colouring matters. July 23.

„ 16,957 (1901). Imray.—From Farbwerke, Höchst. Manufacture of disazo dyestuffs for wool, and an intermediate product. July 23.

„ 17,094 (1901). Imray.—From Farbwerke, Höchst. Manufacture of orange-yellow to red mordant dyestuffs. July 30.

„ 17,564 (1901). Abel.—From Akt.-Ges. f. Anilin Fabr. Manufacture of colouring matters directly dyeing cotton. July 23.

„ 17,635 (1901). Sadler and Co., Ltd., and Driedger. Manufacture of pure anthraquinone. July 23.

„ 17,807 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of new colouring matters, and of intermediate products therefor. July 23.

„ 18,897 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of black sulphur colouring matter. July 23.

„ 18,912 (1901). Levinstein, Mensching, and Levinstein, Ltd. Manufacture of black sulphur colouring matters directly dyeing cotton. July 30.

„ 19,332 (1901). Johnson.—From Kalle and Co. Manufacture and production of colouring matter and material for use therein. Aug. 7.

„ 19,663 (1901). Imray.—From Farbwerke, Höchst Process for purifying raw indigo. Aug. 7.

„ 19,721 (1901). Ville. Manufacture of red colouring matters or dyes. July 30. Date applied for under International Convention, March 14, 1901.

„ 19,998 (1901). Imray.—From Farbwerke, Höchst. Manufacture of phenylamidoacetonitrile and homologues, and substitution products thereof. Aug. 7.

„ 20,200 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of azo colouring matter and of intermediate products relating thereto. July 30.

„ 20,551 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture of azo colouring matters and intermediate products relating thereto. July 23.

„ 1789 (1902). Johnson.—From Bad. Anilin und Soda Fabr. Production of indigo in an improved condition for transport, storage, and use. July 23.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 15,632. Callender. *See under* XIX.

„ 15,836. Cox Bros., Ltd., and Methven. Colouring of cloth. July 16.

„ 15,876. Bloxam.—From Koursanoff. Mordants for dyeing. July 16.

„ 16,003. Rössler. Apparatus for the dyeing of textile fabrics. July 18.

„ 16,070. Chamley. Method of conditioning worsted, cotton, or other textile yarns. July 19.

„ 16,087. White, Holt, Priestman, and Carding and Combing Machine Makers, Ltd. Apparatus for drying wool or other fibres or like materials. July 19.

„ 16,240. Lever. Means for supplying steam to bleaching kiers, and for other heating purposes. July 22.

„ 16,372. Grimshaw. Fireproofing of textile materials. July 23.

„ 16,438. Calico Printers' Assoc., Ltd., and Nuttall. Process of obtaining by embossing and subsequent printing certain colour effects upon woven fabrics. July 24.

„ 16,746. Perkin, jnr., and Whipp Bros., and Tod, Ltd. Treatment of raw cotton and flax and cotton and linen goods to reduce the inflammability thereof. July 28.

„ 16,841. Bradford Dyers' Assoc., Ltd., and Krais. Process for producing white or coloured effects in textile fabrics. July 29.

„ 16,980. Imray.—From Jung. Mordanting wool.* July 31.

„ 17,174. Printing Arts Co., Ltd., Black, and Mowbray. Multi-colour printing machines for calico printing or printing repetitions of designs on continuous webs of fabric or other material. Aug. 2.

[C.S.] 14,516 (1901). Lepetit, Dollfus, and Gansser. Combined dyeing and tanning baths. July 23. Date applied for under International Convention, Jan. 15, 1901.

„ 14,688 (1901). Wiley. *See under* XIII. C.

„ 15,038 (1901). Goddard. Method of and apparatus for dyeing warps for weaving. July 30.

„ 18,500 (1901). Beard and Hayne. Machines for removing or separating the fibre contained in vegetable leaves. Aug. 7.

„ 19,013 (1901). Williams. *See under* XIII. C.

„ 19,312 (1901). Playne and Macdonald. Preparation of substances for indigo vat dyeing. Aug. 7.

„ 19,532 (1901). Ferreira. Finishing plain, dyed, or printed cotton, linen, and other fabrics. Aug. 7.

„ 3178 (1902). Long. *See under* XIX.

„ 9625 (1902). Wittenberg, Brock, and Koch. *See under* XIII. C.

„ 12,306 (1902). Abel.—From Zschorner. Peat-fibre carding and spinning machinery. Aug. 7.

„ 12,510 (1902). Schirp. Apparatus for dyeing, bleaching, treating with mordants, washing, and otherwise treating textile materials. July 23.

„ 12,807 (1902). Menzies. *See under* XIII. C.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 14,516 (1901). Lepetit, Dollfus, and Gansser. *See under* V.

„ 18,440 (1901). Lyon. Method of and apparatus for colour shading wood. July 23.

„ 8390 (1902). Anders and Anders. Process and apparatus for marbling paper. Aug. 7.

„ 13,118 (1902). Grünhut. Dyeing of timber. Aug. 7.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 15,658. Bloxam. — From Soc. Anon. d'Etudes Electro-Chimiques. Manufacture of lead oxide. July 14.

„ 15,666. Carmichael. Apparatus for carbonating liquids.* July 14.

„ 15,667. Osenbrück. Absorber for ammonia-absorption refrigerating and like machines.* July 14.

„ 15,788. Cowper-Coles and Cowper-Coles Metals Extraction Syndicate, Ltd. Manufacture of white lead. July 15.

„ 15,978. Woltereck. Process of producing ammonia by synthesis. July 17.

„ 16,206. Johnson.—From Verein Chem. Fabr. in Mannheim. Contact apparatus for the production of sulphuric anhydride. July 21.

„ 16,272. Brünjes. Process for obtaining sulphide of zinc from copper slag containing zinc and barium.* July 22.

„ 16,338. Ramage. Process of treating ferrous liquors.* July 22.

„ 16,363. Swan. Improved method for the more efficient and more economical aëration of liquids. July 23.

„ 16,397. Howard and Hadley. Treatment of spent hydrochloric acid from galvanising works and the like, and the manufacture of ferric oxide. July 23.

„ 16,569. Weber. Treatment of metallic oxides. July 25.

„ 16,615. Lévy and Helbronner. Separation of gases from their mixtures, especially oxygen and nitrogen from atmospheric air, and apparatus therefor. July 26.

„ 16,862. Parker. Production of phosphorus. July 30.

„ 16,955. Lowden. Method of and apparatus for treating "gas" lime and other spent lime for the purpose of enhancing its value as an article of commerce.* July 31.

„ 16,965. Reisert. Method of removing sulphuric acid from water.* July 31.

„ 17,084. Von Gernet Copper, Ltd., and Von Gernet *See under* X.

[C.S.] 232 (1902). Thompson. — From Solvay and Co. Manufacture of carbonate of soda and other crystalline salts. July 23.

„ 7048 (1902). Kamm. Oxygen generators. July 23

„ 9336 (1902). Daub and Deuther. Apparatus for making anhydrous sulphuric acid. July 30.

„ 9605 (1902). Darling and Harrison. *See under* X.

„ 9875 (1902). Clark.—From Gen. Chem. Co. Manufacture of hydrochloric acid. July 30.

„ 11,873 (1902.) Hoyermann. *See under* XX.

VIII.—POTTERY, GLASS, and ENAMELS.

[A.] 16,326. Simon. Process of manufacturing table-glass. July 22.

„ 16,385. Harvey and Sureties. Method for producing raised surfaces on mica or other material for printing or moulding purposes. July 23.

„ 16,616. Schuler. Self-luminous glass mosaic surfaces July 26.

„ 16,675. Haley. Moulds for manufacturing glassware.* July 28.

„ 16,720. Lautensall. Method of depositing metal upon porcelain, glass, or the like. July 28.

„ 16,718. Crabtree and Mason. *See under* XXI.

[C.S.] 16,700 (1901). Westinghouse.—From Knox. *See under* II.

„ 17,708 (1901). Bridgwater and Haley. Apparatus for charging an annealing oven with glasses or like articles. July 30.

[C.S.] 18,345 (1901). Aufort. Tunnel kilns for burning ceramic articles. July 30.

„ 19,235 (1901). Smith. Roller-printing machines for pottery and other purposes. Aug. 7.

„ 19,803 (1901). Chance. Glass-facing tiles, slabs, or the like. Aug. 7.

„ 23,603 (1901). Scholefield. *See under* IX.

„ 2585 (1902). Dupont. Machine for mechanically enamelling baths and other metal objects. July 35.

„ 11,991 (1902). Oschatz. Enamelling of metal articles. July 30.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 15,675. Norman. Artificial stone. July 14.

„ 15,768. Sutcliffe, Speakman, & Co., Ltd., and Sutcliffe. Process for making artificial stone, bricks, paving-flags, and the like. July 15.

„ 15,838. Jarvis. Manufacture of Portland cement. July 16.

„ 15,849. Sutcliffe, Speakman, & Co., Ltd., and Sutcliffe. Process for making artificial stone, bricks, paving-flags, and the like. July 16.

„ 15,881. Tolhurst and Skinner. *See under* I.

„ 16,066. Thwaite. Method of manufacturing Portland cement. July 19.

„ 16,100. Heinrich and Haardt. Fire-proof material.* July 19.

„ 16,215. Collins. Manufacture of a refractory material. July 21.

„ 16,254. Hewett, Hewett, Churcher, and Churcher. Moulds used in brick-making machines. July 22.

„ 16,259. Adams. Kilns for fire-clay and other goods.* July 22.

„ 16,344. Kilby. Process for drying cement slip or compo with waste gases from cement kilns. July 22.

„ 16,422. Ryan. Economisers for lime kilns. July 24.

„ 16,461. Tcherniac. *See under* II.

„ 16,519. Brindle. Bricks for building. July 25.

„ 16,651. Brodie. Facing block or brick for building purposes. July 28.

„ 16,665. Newton, Soar, Dickenson, and Mitchell. Compositions for and manufacture of imitation marble, stone, or the like. July 28.

„ 16,670. Venables. Artificial flags for pavements, or covers for buildings. July 28.

„ 16,854. Gonnella. Colouring in the mass of plastic material composed of plaster, alabaster, or the like, with applications for the purpose of imitating objects of art, or the like. July 29.

„ 16,996. Lake.—From Warren. Preparation of ingredients for use in the manufacture of street pavements and the like.* July 31.

„ 16,997. Lake.—From Warren. Apparatus for preparing ingredients of bituminous macadam and other pavements or roadways.* July 31.

„ 17,012. Angus. Means for impregnating wood.* Aug. 1.

[C.S.] 12,764 (1901). Oakland and Oakland. System of drying green bricks by hot air in continuous kilns before being burnt. July 30.

„ 15,554 (1901). Harrisson. Artificial or imitation stone or rock. Aug. 7.

15,621 (1901). Thame. Waterproof compositions for the manufacture of floor-coverings, wall decorations, and the like. Aug. 7.

„ 15,929 (1901). Hippe and Holm. Method of providing marble and other stones or cement with deeply-penetrating designs in colour. July 23.

[C.S.] 16,493 (1901). Bernfeld. Treatment of asbestos goods to enable them to resist liquids. Aug. 7.

„ 16,700 (1901). Westinghouse.—From Knox. *See under* II.

„ 17,540 (1901). Dyson. Red aggregates for the manufacture of artificial stones, pavings, slabs, cements, and plasters, applicable to brickmaking for decorative sanded surfaces, and for use in hour-glasses, toys, and the like. Aug. 7.

„ 18,209 (1901). Hartill. Roofing tiles. July 23.

„ 19,283 (1901). Horak. Manufacture of highly fire-proof bricks. July 23.

„ 19,666 (1901). Zastrow. Drying rooms and trucks for bricks. Aug. 7.

„ 23,603 (1901). Scholefield. Glazing roofs and structures. Aug. 7.

„ 5710 (1902). Anderson. Manufacture of artificial stone or brick and the preparation of lime therefor. July 23.

„ 9431 (1902). Weill. Manufacture of imitation marble. July 23.

„ 10,218 (1902). Luft. *See under* I.

„ 11,473 (1902). Palmer. Machine for moulding artificial stone. July 23.

„ 13,325 (1902). Parker. Brick-moulding machines. July 23.

„ 13,641 (1902). Toope. Non-conducting coverings for steam pipes and other surfaces. July 23.

„ 14,396 (1902). Jaubert. Brick. Aug. 7.

„ 14,590 (1902). Saunders. Absorbent mineral preparation and process for the manufacture thereof. Aug. 7.

X.—METALLURGY.

[A.] 15,771. Cowper-Coles and Cowper-Coles Metal Extraction Syndicate, Ltd. Treatment of sulphide ores for the recovery of metals. July 15.

„ 15,804. Haddan.—From American Universal Mill Co. Ingot moulds.* July 15.

„ 15,881. Tolhurst and Skinner. *See under* I.

„ 15,916. De Alzugaray. Extraction of gold, silver, and other metals from their ores. July 17.

„ 15,934. Lowe. Solder and flux preparations. July 17.

„ 16,122. De Alzugaray. Extraction of gold, silver, and other metals from their ores. July 19.

„ 16,182. Goldschmid. Process for drying and roasting manganese and such like ores. July 21.

„ 16,272. Brünjes. *See under* VII.

„ 16,306. Ellershausen and Western. Treatment of zinc ore and other zinciferous matter whether containing cadmium or otherwise. July 22.

„ 16,274. Shadforth. Furnace for use in fusing or otherwise treating metals, minerals, or other substances where high temperatures are required.* July 22.

„ 16,720. Lautensall. *See under* VIII.

„ 16,774. Davies Bros. and Co., Ltd., and Davies. Apparatus for use in galvanising sheet metal. July 29.

„ 16,926. Lake.—From Gen. Electric Co. Method or process of renovating foundry sand. July 30.

„ 16,993. Vanstone. Manufacture of steel ingots plated with copper.* July 31.

„ 17,084. Von Gernet Copper, Ltd. and Von Gernet. Extracting copper from its solutions and production of sulphuric acid, and apparatus therefor. Aug. 1.

[C.S.] 14,567 (1901). Engels. *See under* I.

„ 15,541 (1901). De Alzugaray. Mode of extracting gold, silver, and other metals from their ores. Aug. 7.

[C.S.] 16,700 (1901). Westinghouse.—From Knox. *See under* II.

„ 18,843 (1901). Twynam. Separation of tin from tinscrap or cuttings. July 30.

„ 18,949 (1901). Hirschmann and Heilmeier. Process and means for the restoration of burnt steel. Aug. 7.

„ 9501 (1902). Martino. Treatment of ores containing noble metals. July 30. Date applied for under International Convention, Sept. 30, 1901.

„ 9605 (1902). Darling and Harrison. Manufacture of alkaline cyanides. July 23.

„ 9890 (1902). Wills and Evans. Apparatus for the manufacture of steel and the like, applicable also for use in melting metals. Aug. 7.

„ 10,353 (1902). Hunter. Metallurgical furnaces especially designed for conversion of iron castings into steel. July 23.

„ 10,929 (1902). Allison.—From Hannes. Processes of and apparatus for smelting. July 30.

„ 11,427 (1902). Baxter, Clark, and Hillman. Endless electric conveyer for conveying tin-plates from the bath of molten metal to a suitable or desirable place. July 30.

„ 11,986 (1902). Sargent. Process of heating metals. July 23.

„ 13,023 (1902). Stanning. Coating of moulds for casting metal. Aug. 7.

„ 13,289 (1902). Geiger, Bauer, and Pejchar. Manufacture of moulds for casting precious metals. July 23.

„ 14,322 (1902). Baldt. Moulding or casting of metals. July 30.

„ 14,338 (1902). Baldt. Moulding or casting of metals. July 30.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 15,658. Bloxam.—From Soc. Anon. d'Etudes Electro-Chimiques. *See under* VII.

„ 15,696. Bouneau. Electric furnaces. July 14.

„ 15,735. Bailey. Mode and means for electro-plating. July 15.

„ 15,747. Sutherland and Marcuson. Electric storage batteries. July 15.

„ 15,772. Shepard. Electric batteries. July 15.

„ 15,807. De Sadneff. Electric accumulators. July 15.

„ 15,963. Vellino. Manufacture of lead plates for secondary electric batteries. July 17.

„ 16,015. Thorp. Electrolysing apparatus. July 18.

„ 16,130. Sim. Electric furnaces. July 19.

„ 16,354. Danzer. Electric accumulators. July 23.

„ 16,358. Gurwitsch. Electrolytic processes and apparatus therefor. July 23.

„ 16,556. Brewer.—From Taylor. Electric furnaces and the production of chemicals in such furnaces.* July 25.

„ 16,706. Strickland. Galvanic cells. July 28.

„ 16,824. Marichal. Apparatus for use in electro-plating. July 29.

„ 16,984. Gouin. Electrodes for secondary batteries. July 31.

[C.S.] 15,069 (1901). Krebs. Lead fuse for electrical plant. Aug. 7.

„ 15,427 (1901). Marino, Marino, Marino, and Ratchkowsky. Process for the electrolytic deposition of metals and alloys. July 23.

„ 15,579 (1901). Boult.—From American Alkali Co. Electrolytic apparatus. Aug. 7.

„ 16,677 (1901). Pörscke. Manufacture of electrodes for galvanic batteries. July 23.

[C.S.] 10,457 (1902). Redding and Deering. Storage batteries. July 23.

„ 14,329 (1902). Marks.—From Smith Storage Battery Co. Storage batteries. July 30.

XII.—FATS, OILS, AND SOAP.

[A.] 15,619. Barker. Manufacture of soap-stock or soap. July 14.

„ 15,628. Morris and Bunch. *See under* XVIII. B.

„ 15,656. Thompson.—From Bremer Linoleumwerke, Delmenhorst. Processes for making linoleum or the like with veins passing completely through the material. July 14.

„ 15,889. Seeser. Processes for making linoleum and the like with double layers of material, and apparatus therefor. July 16.

„ 15,890. Seeser. Processes for making linoleum or the like, and apparatus therefor. July 16.

„ 15,891. Seeser. Processes for producing linoleum or the like having patterns resembling wood or fabric. July 16.

„ 15,897. Johnson. — From Elektrizitats Akt.-Ges. vorm. W. Lahmeyer and Co. Apparatus for testing lubricating oils. July 16.

„ 15,960. Hearson. — From May. Labricators. July 17.

„ 16,260. Davies. Storage tanks for oil and the like liquids. July 22.

„ 16,548. Watkins and Sereeton. Composition for cleansing painted, varnished, or polished surfuces. July 25.

„ 16,618. Barratt and United Asbestos Co., Ltd. Waste oil purifier.* July 26.

„ 16,735. Bruun. *See under* XVIII. B.

[C.S.] 14,174 (1901). Goetze, Sander, Sander, and Buchmann. Method of and apparatus for indicating and recording the quantity, quality, and efficacy of lubricants used in connection with the motive power fluid in cylinders and the like. July 23.

„ 14,846 (1901). Howfield and Colliver. Superheated steam pan for boiling fat, sugar, and sundry other materials. July 23.

„ 15,225 (1901). Fletcher. *See under* XVIII. B.

„ 17,213 (1901). Smith and Smith. Means or apparatus for filtering or cleansing oil and other liquids. July 30.

„ 5164 (1902). Rottkamp and Handlung und Fabrikation Technischer Neuheiten für Sport und andere Zwecke "Turf" m. b. H. Process and apparatus for cleaning, waxing, and polishing inlaid floors, linoleum, and wax-cloths. Aug. 7.

„ 10,218 (1902). Luft. *See under* I.

„ 11,149 (1902). Ambler and Asquith. Filtering and storage of oil and like liquids. July 23.

„ 13,455 (1902). Haddan.—From Edson. Process of drying oil-yieldable or oil-containing material. July 23.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 16,337. Ramage. Manufacture of pigments.* July 22.

„ 16,783. Ogilvy. Process of producing black and dark carbonaceous pigments.* July 29.

„ 16,933. Knoche and Issleib. *See under* XIII. B.

[C.S.] 14,707 (1901). Mullay. Preserving and anti-fouling composition or coating, particularly applicable for the bottom of ships. July 30.

„ 19,023 (1901). Walker, Newsum, Newsum, and Geo. Newsum and Co., Ltd. Machinery or apparatus for bronzing or the like. July 30.

„ 22,081 (1901). Cussen. Distemper wash or water paint. July 30.

B.—Resins, Varnishes.

[A.] 16,377. Riddles. Polish for furniture and the like. July 23.
„ 16,685. Skinner. Boot and leather polishes. July 28.
„ 16,933. Knoche and Issleib. Manufacture of varnish, paint, or the like. July 30.
„ 17,077. Arledter and Arledter. *See under* XIV.

C.—India-rubber, &c.

[A.] 16,406. Heyl-Dia. Processes for waterproofing covered or insulated wires and apparatus therefor. July 23.
„ 16,814. Higgins, Hanbury, and Gardner. Process of treating india-rubber. July 29.
„ 17,014. Gubbins. Treatment of india-rubber waste, and rolling and cutting machines for the same and other purposes. Aug. 1.
[C.S.] 14,688 (1901). Wiley. Apparatus for rendering textile fabrics waterproof or water-repellent. July 30.
„ 19,013 (1901). Williams. Method of waterproofing and rot-proofing textile materials. Aug. 7.
„ 9625 (1902). Wittenberg, Broek, and Koch. Process and apparatus for vulcanising rubber articles of soft and hard india-rubber, or of rubber substitutes in any combination with fibres, spinnings, cloth, and other materials, metals, asbestos, minerals, wood, cork, and the like. Aug. 7.
„ 12,807 (1902). Menzies. Process for rendering cloth, canvas, paper, and other fabrics waterproof. Aug. 7.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 16,038. Parsons. Tanning. July 18.
„ 16,710. Schmalfuss. Process of manufacturing adhesive mediums.* July 28.
„ 16,815. Marter, Hanbury, and Gardner. Manufacture of artificial leather. July 29.
„ 17,077. Arledter and Arledter. Manufacture of resin size.* Filed Aug. 1. Date applied for, Jan. 25, 1902, being date of application in United States.
C.S.] 14,516 (1901). Lepetit, Dollfus, and Gansser. *See under* V.
„ 3371 (1902). Boult.—From Freelandt. *See under* XXI.
„ 11,502 (1902). Boult. — From Fratelli Dufour. Treatment of tanning extracts. July 30.
„ 13,748 (1902). Miller. Method of finishing the surface of leather. July 30.

XV.—MANURES.

[A.] 15,976. Lake.—From Cyanid-Ges. m. b. H. Manufacture of artificial manures.* July 17.
C.S.] 18,326 (1901). Jonas. Fertiliser. Aug. 7.
„ 13,356 (1902). Newport. Treatment of garbage and the manufacture of fertilisers therefrom. July 23.

XVI.—SUGAR, STARCH, GUM, Etc.

A.] 17,035. Scheibler. Double cutting machines for cutting sugar and packing the cubes ranged. Aug. 1.
„ 17,175. Passburg. Treatment of refined green sugar.* Aug. 2.
„ 17,177. Passburg. Sugar moulds.* Aug. 2.
„ 17,178. Passburg. Covering and drying of sugar in moulds.* Aug. 2.
S.] 14,846 (1901). Howfield and Colliver. *See under* XII.
„ 1792 (1902). Nodon and Piettre. Purification of sugar juice. Aug. 7. Date applied for under International Convention, Aug. 7, 1901.
[C.S.] 4455 (1902). Partridge.—From "Trust Chimique" Soc. Anon. Sweetening substance, and process of manufacturing same. Aug. 7.
„ 9331 (1902). Kostálek. Filters for sugar, juices, and other liquids, and means for cleansing the filtering medium thereof. July 23.
„ 14,108 (1902). Claassen. Separation of sugar from syrup or molasses of massecuite and especially of after-product massecuite. Aug. 7.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 16,523. Nicholas and Evans. Preparation for bottling of malt liquors, cyder, perry, and wines and spirits. July 25
„ 16,580. Briant. Treatment of beer. July 25.
„ 16,816. Apsey. Apparatus for increasing combustion in steam-boiler and brewing-copper furnaces, and the like. July 29.
„ 17,029. Giles. Powdered malt preparation. Aug. 1.
[C.S.] 18,233 (1901). Greenhalgh. *See under* I.
„ 11,412 (1902). Overbeck. Apparatus for cleaning malt, grain, seeds, and other material. July 30.
„ 12,384 (1902). Meyer.—From Meyer. Construction of stills for the distillation of spirits. July 23.

XVIII.—FOODS, SANITATION, Etc., AND DISINFECTANTS.

A.—Foods.

[A.] 15,738. Garnall and Porter. Method of testing samples of milk for butter fats. July 15.
„ 15,816. Heilmann-Taylor. Machine for the production of coated alimentary products. July 16.
„ 16,310. Raabe. Process for the manufacture of provender from wood waste. July 22.
„ 16,363. Swan. *See under* VII.
„ 16,590. Shaw. Production of extract of coffee and apparatus suitable for use therein. July 25.
„ 17,007. Reinhardt. Method and means for treating eggs.* July 31.
[C.S.] 8346 (1902). Ammon and Dressler. Refrigerating apparatus for beverages in casks. July 23.
„ 11,054 (1902). Barlow. Process for preservation of new-laid eggs. July 23.

B.—Sanitation; Water Purification.

[A.] 15,628. Morris and Bunch. Apparatus for separating oil and water from steam. July 14.
„ 15,646. Candy and Candy. Apparatus for use in the distribution of sewage or other liquids. July 14.
„ 15,835. Latmuth, jnr. Method of and means for removing sludge from sewage tanks and the like. July 16.
„ 16,193. Hailwood. Apparatus for heating, softening, and purifying water. July 21.
„ 16,271. Lewis. Retaining of liquids such as sewage or the like for fixed periods in filters or tanks.* July 22.
„ 16,304. Clark.—From Moore and Bromwell. Process and apparatus for cooling, drying, purifying, and circulating air. July 22.
„ 16,375. Prött. Apparatus for moistening air and saturating the same with vapours.* July 23.
„ 16,611. Bennett. Filter beds for purifying and clarifying fluids. July 26.
„ 16,666. Malabar. Purification or filtration of sewage or other foul and impure liquids. July 28.
„ 16,735. Bruun. Apparatus for separating air, water, and oil particles from exhaust steam.* July 28.
[C.S.] 15,225 (1901). Fletcher. Method of and apparatus for separating oil and grease from exhaust steam, applicable also as a steam dryer. July 30.

[C.S.] 18,233 (1901). Greenhalgh. *See under* I.
„ 18,366 (1901). Newton. Apparatus for sewage treatment. Aug. 7.
„ 18,405 (1901). Peake. System of sewage purification. Aug. 7.
„ 9926 (1902). Adams. Filters for sewage and liquid, and apparatus connected therewith. Aug. 7.
„ 10,571 (1902). Rnach. Automatic distributing and alternating apparatus for use with bacteria beds for the treatment of sewage and other liquids. Aug. 7.
„ 13,187 (1902). Jones. Filter and splash preventer for water-taps. July 23.

C.—Disinfectants.

[C.S.] 15,271 (1901). Spengler. Manufacture of a disinfectant. July 30.
„ 20,884 (1901). Munford and Newlands. Washing and disinfecting powder. July 23.
„ 22,081 (1901). Cussen. *See under* XIII. A.
„ 2188 (1902). Von Vamossy. Antiseptic, disinfectant, and purgative preparations. Aug. 7.
„ 4669 (1902). Fournier. Disinfecting apparatus. Aug. 7.
„ 13,177 (1902). Constan. Portable ozonising apparatus applicable for inhaling and disinfecting. Aug. 7.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 15,632. Callender. Process for the treatment of peat moss or other fibres to render them suitable for paper-making or other purposes. July 11.
„ 15,633. Callender. Process for the treatment of the waste liquors arising from the manufacture of peat moss fibre or paper. July 14.
„ 16,568. De Ballore. Manufacture of paper-pulp. July 25.
„ 16,633. Hoffmann. Process for making strengthened paper or pasteboard.* July 26.
„ 16,669. Lowson. Process for the treatment of esparto and other grasses for the manufacture of paper and other pulp. July 28.
„ 16,770. Noble. Appliance for straining pulp for paper-making. July 29.
[C.S.] 8911 (1901). Lever Bros., Ltd. — From Meek. Machinery for cutting and punching box and carton blanks of paper or other material specially applicable for use in connection with printing and like machinery. Aug. 7.
„ 17,853 (1901). Masson. Paper-making machinery. Aug. 7.
„ 3178 (1902). Long. Processes for bleaching paper-pulp and the like. July 23.
„ 12,807 (1902). Menzies. *See under* XIII. C.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 16,037. Ransford.—From Pharmaceutisches Institut. Ludwig Wilhwlm Gans. Obtaining the contents of yeast cells. July 18.
[A.] 16,238. Spence and Peter Spence and Sons, Ltd. Manufacture or production of a new titanous chloride. July 22.
„ 16,298. Lake.—From Cyanid-Ges. m. b. H. Preparation of cyanamide salts.* July 22.
„ 16,885. Hanssen. Process of producing medicinal preparations of hæmoglobin.* July 29.
[C.S.] 16,968 (1901). Newton.—From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of pharmaceutical compounds. July 30.
„ 17,635 (1901). Sadler and Co., Ltd., and Driedger. *See under* IV.
„ 20,074 (1901). Mills.—From Lumière and Lumière. Process of manufacturing organo-metallic compounds of mercury. Aug. 7.
„ 4455 (1902). Partridge. From "Trust Chimique" Soc. Anon. *See under* XVI.
„ 9605 (1902). Darling and Harrison. *See under* XV.
„ 11,873 (1902). Hoyermann. Process for rendering the phosphoric acid contained in natural phosphates soluble in citric acid. July 30.

XXI.—PHOTOGRAPHY.

[A.] 16,071. Ludwig. Process for developing photographic plates, films, and the like in open daylight. July 19.
„ 16,131. Hoh and Hahne. Photographic developing bath.* July 19.
„ 16,136. Alston. Apparatus for agitating liquids, and chiefly designed for use in treating photographic plates, films, prints, and the like.* July 19.
„ 16,718. Crabtree and Mason. Vitrifiable photographic decoration.* July 28.
„ 16,968. D'Anter. Process and materials to be employed in re-touching photographic negatives. July 31.
[C.S.] 17,471 (1901). Soc. Derepas Frères. Photographic paper. Aug. 7. Date applied for under International Convention, March 20, 1901.
„ 3371 (1902). Boult.—From Freelandt. Manufacture of gelatine films for photographic purposes. July 23.
„ 14,105 (1902). Vilim and Hauser. Method for producing photographic half-tone in printing and lithography. Aug. 7.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 15,903. Beutner. Detonators. July 17.
„ 16,357. Norton. Automatic fog-signal for railways. July 23.
[C.S.] 14,676 (1901). Steele, Bower, and Pochlman. Explosives. July 30.
„ 15,141 (1901). Hengst. Manufacture of smokeless powder or explosive material. July 30.
„ 16,694 (1901). Maxim. Fuses for armour-piercing projectiles. July 30.
„ 11,675 (1902). Miners' Safety Explosive Co., Ltd., and Levett. Cases for blasting and mining cartridges. Aug. 7.
„ 13,758 (1902). Newton.—From Ladlin and Rand Powder Co. Powder granulating machines. July 30.

Printed and Published by EYRE and SPOTTISWOODE, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 5115.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 16.—Vol. XXI. **AUGUST 30, 1902.** No. 16.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Marston T. Bogert.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

	CANADIAN.
ol. W. R. Lang.	Alfred Burton.
	LIVERPOOL.
H. Tate.	Dr. T. Lewis Bailey.
	LONDON.
lter F. Reid.	A. R. Ling.
	MANCHESTER.
n Levinstein.	J. Carter Bell.
	NEWCASTLE.
L. Rennoldson.	F. C. Garrett.
	NEW YORK.
V. Coblentz.	Dr. H. Schweitzer.
	NOTTINGHAM.
Archbutt.	J. T. Wood.
	SCOTTISH.
. Patterson.	Dr. Thos. Gray.
	YORKSHIRE.
E. Bedford.	Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.
L. Archbutt..I., XII., XVIII., B.
J. L. Baker..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
J. B. C. Kershaw. ... VII., XI.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D... IV., XX.
F. H. Leeds..III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .XXII.
W. G. McMillan X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ....XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ...IV., V.
J. G. Parker, Ph.D. .....XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak ....Patent List.
T. H. Pope...XVI., XX., XXI.
F. W. Renaut.....Index.
G. H. Robertson .....XI.
Chas. Salter ..... I., II., III., XV., XVI.
M. J. Salter.....XIII.
R. Sandon .....II.
J. Shields, D.Sc., Ph.D. .....XI.
A. Shonk .....Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt.....III., VII., X.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer .....XX.
L. J. de Whalley, B.Sc. .XVI.
A. Wingham .....X.
Joseph T. Wood .....XIV.
A. C. Wright, B.Sc., M.A. .. IV., XVIII., XX.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: { G. P. Girdwood. / Harold Van der Linde.

Committee:

G. W. Campbell Arnott.	Thos. Heys.
J. H. Bowman.	Edgar B. Kenrick.
Hugo Carlsson.	Thos. MacFarlane.
F. H. Clergue.	F. J. Smale.
W. G. Ellis.	J. M. Sparrow.
W. Hodgson Ellis.	Thos. L. Willson.
W. L. Goodwin.	

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: F. H. Tate.

Vice-Chairman: C. Longuet Higgins.

Committee:

Percy Bateson.	Max Muspratt.
J. Campbell Brown.	Julius Raschen.
Eustace Carey.	Alf. Smetham.
G. C. Clayton.	H. B. Stocks.
Jas. T. Conroy.	J. W. Towers

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Walter F. Reid.

Vice Chairman:

Committee:

Julian L. Baker.	J. Lewkowitsch.
A. C. Chapman.	A. Gordon Salamon.
E. Divers.	W. S. Squire.
M. O. Forster.	F. Napier Sutton.
Oscar Guttmann.	L. T. Thorne.
Otto Hehner.	C. T. Tyrer.
H. Hemingway.	Frank Wilson.
W. Kellner.	

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

J. Allan.	H. Levinstein.
W. Brown.	W. J. Pope.
R. Clayton.	H. Porter.
J. Craven.	T. Stenhouse.
W. Heys.	H. Terry.
J. Hübner.	

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Reynoldson.

Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.	J. Mather.
P. P. Bedson.	John Pattinson.
H. S. Collins.	W. W. Proctor.
J. T. Dunn.	Harry Smith.
T. W. Hogg.	J. E. Stead.
H. Louis.	C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: V. Coblentz.

Vice-Chairman: Russell W. Moore.

Committee:

L. Baekeland.	Clifford Richardson.
G. Drobegg.	W. T. Schieffelin.
W. F. Fuerst.	R. C. Schüpphaus.
A. P. Hallock.	G. C. Stone.
E. J. Lederle.	M. Toch.
E. G. Love.	D. Woodman.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.

Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.	J. M. C. Paton.
F. J. R. Carulla.	A. L. Stern.
R. M. Caven.	S. Trotman.
H. B. Mayfield.	G. J. Ward.
Loxley Meggitt.	J. White.
J. O'Sullivan.	

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

Scottish Section.

Chairman: T. L. Patterson.

Vice-Chairman: D. J. Playfair.

Committee:

W. Carrick Anderson.	Jas. Hope.
E. M. Bailey.	H. Ingle.
H. Bumby.	D. S. Jerdan.
D. B. Dott.	W. G. Johnston.
C. J. Ellis.	A. D. Ker.
Thos. Ewan.	J. G. F. Lowson.
W. Frew.	J. McCulloch.
Jas. Hendriek.	

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgow

Yorkshire Section.

Chairman: Jas. E. Bedford.

Vice-Chairman: T. Fairley.

Committee:

C. S. Bedford.	S. G. Rawson.
E. A. Brotherton.	G. W. Slatter.
John W. Cobb.	A. Smithells.
H. Grandage.	A. Turnbull.
H. Ingle.	H. A. Watson.
A. J. Murphy.	J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit (alcohol) having been accepted by the Government, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures:—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

The Council has appointed a Committee, consisting of the President, Hon. Treasurer, Dr. Squire, Mr. David Howard, Mr. A. G. Green, Mr. Walter F. Reid, Mr. A. Gordon Salamon, and Mr. Thos. Tyrer, to consider and report on this question.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to produce a reliable technical dictionary in three languages English, French, and German—and has asked this Society to furnish the names of such scientific and industrial men as are willing to supply the technical expressions of their own special branches of industry. The assistance to be rendered must be gratuitous, as otherwise the expense would be prohibitive; but no money is asked for by the German Society, though it has already spent considerable sums upon the work, and has provided an editor, Dr. Hubert Hansen, of Berlin, with a staff, to collate the materials supplied.

The Council of this Society agreed to co-operate in this work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, Mann, Messel, Redwood, and Squire, and Messrs. Beilby, Carpenter, Newlands, Reid, and Watson Smith to decide upon the form of co-operation. It has been determined to select one or more representatives for each class of the Journal and Patent Literature; and the committee now asks for volunteers to undertake a class or division of a class. To those who intimate their wish to help, full particulars of the plan of the work, with instructions how to proceed, will be sent. Offers of co-operation should be addressed to the General Secretary.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Branegan, J. A., l/o Brooklyn; 4523, North Uber Street, Philadelphia, Pa., U.S.A.
Bunker, H. E.; Journals to 19, Napier Street, Toronto, Ont., Canada.
Chamberlain, G. E., l/o Rockford; Flat A, 1457, Rokeby Street, Chicago, Ill., U.S.A.
Colley, B. T., l/o Argentine; c/o American Smelting and Refining Co., Omaha, Neb., U.S.A.
Davis, Wm. A.; Journals to 55B, Fulham Park Gardens, London, S.W.
Freozel, A. B., l/o London; c/o Arthur Lord, 53, State Street, Boston, Mass., U.S.A.
Gent, P. W.; Journals to Springfield, Misterton, Gainsborough.
Grimwade, W. R.; Journals to c/o Grimwade, Ridley, and Co., 6, Trinity Square, London, E.C.
Hess, Dr. A.; Journals to Kirkstall Road, Leeds.
Lester, Isaac E., l/o Barrow; 57, Westminster Road, Handsworth, Birmingham.
Parker, Chas. E., l/o Orange; 164, New Street, New Brunswick, N.J., U.S.A.
Ralston, W., l/o Lagos; 3, Windsor Terrace, Linthouse, Govan, Glasgow.
Roller, H. C., l/o New York City; Ampère Electrochemical Co., Port Chester, N.Y., U.S.A., Superintendent.
Rust, Robt. R., l/o Bound Brook; Beaumont, Texas, U.S.A.
Spurge, E. C., l/o Göttingen; Witham, Essex.
Tribe, P. C. M., l/o Oswego; retain Journals.
Waite, C. N., l/o Gray's Ferry Road; General Artificial Silk Co., 32, South Broad Street, Philadelphia, Pa., U.S.A.
Wedlake, H. D., l/o Penzance; Poste Restante, Johannesburg, South Africa.
Weed, H. T., l/o Livingston Street; 651, Greene Avenue, Brooklyn, N.Y., U.S.A.
White, W. G., l/o Levenshulme; 9, Prince's Square, Strathbungo, Glasgow.
Wielandt, Dr. Wm., l/o Karlsruhe; Parkveien 8, Christiania, Norway.

Deaths.

France, G. T., Ford House, Gateshead. Aug. 10.
Milner, Edw., Hartford Manor, Northwich. Aug. 21.
Richards, W. A., of Sandbach, Cheshire, at Bonn. Aug. 6.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1064
II.—Fuel, Gas, and Light	1065
III.—Destructive Distillation, Tar Products, Petroleum	1070
V.—Colouring Matters and Dyestuffs	1070
VII.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1073
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1074
VIII.—Glass, Pottery, and Enamels	1077
IX.—Building Materials, Clays, Mortars, and Cements	1077
X.—Metallurgy	1079
XI.—Electro-Chemistry and Electro-Metallurgy	1082
XII.—Fats, Fatty Oils, and Soap	1083
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1084
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1085

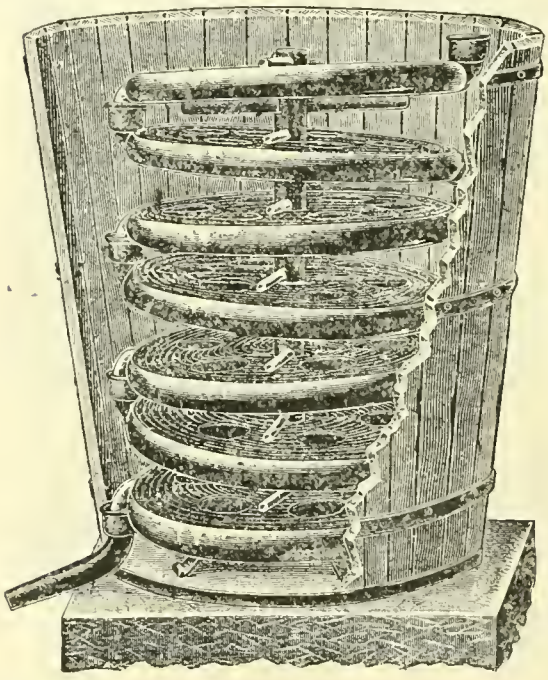
	Page.
XV.—Manures, &c.	1085
XVI.—Sugar, Starch, Gum, &c.	1085
XVII.—Brewing, Wines, Spirits, &c.	1086
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1090
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1092
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1093
XXI.—Photography	1097
XXII.—Explosives, Matches, &c.	1097
XXIII.—Analytical Chemistry	1097
XXIV.—Scientific and Technical Notes	1102

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

Plate-Cooler [*Parobek's System*]. W. Gladbach. Chem.-Zeit., 1902, **26**, [63], 735.

The apparatus shown in the figure consists of a system of hollow circular earthenware plates connected together by pipes, and fixed by means of felt-covered pins upon a central iron support (gas-tube). The plates have corrugated surfaces, and are perforated so as to afford greater cooling facilities. The apparatus is immersed in water like the ordinary cooling worm, whilst the acid vapours, &c., pass through the plates in succession. It affords a much greater cooling surface than a worm. Thus, a battery of seven plates of 650 mm. in diameter goes into the same cooling tank as a worm composed of tube 35 mm. in diameter, 650 mm. in breadth, and 900 mm. high. Such a worm affords a cooling surface of 1·64 sq. m. as compared with 4·64 sq. m. afforded by the plate-cooler, which is therefore equivalent to



three worms in efficiency. This calculation was confirmed by practical experiments. Further advantages possessed by the plate-cooler are that in case of fracture the particular plate can be readily replaced, whereas a damaged worm cooler is practically useless.—C. A. M.

English Patents.

Cooling and Refrigerating; Process and Apparatus for ——. P. Naef, New York. Eng. Pat. 14,577A, July 17, 1901. (Under Internat. Conv., Dec. 18, 1900.)

Ice, or its water of liquefaction, and a cooled gaseous fluid, are caused to pass through a jacket or other channel in opposite directions. The cooling capacity of the water of liquefaction is further utilised by passing the water and a supply of fresh air or gaseous fluid through a revolving cylinder, or through a stationary chamber filled with porous substances. After being cooled by the water, the air or gaseous fluid may be passed through ice.—R. A.

Non-conducting Composition for Preventing the Radiation or Transmission of Heat. G. A. Herdman, Redcar Yorks. Eng. Pat. 18,248, Sept. 12, 1901.

A plastic non-conducting composition for covering steam boilers, &c., is made of slag-wool, dried clay, silicate of soda solution, and a fibrous material, such as cow-hair or cocoa nut fibre, which is worked in to act as a binder until the composition sets to a hard coherent mass.—W. C. H.

Heat Non-conducting Compositions; New Material or Substance and Method or Process to be Employed in the Manufacture of ——. G. F. Berry and J. B. Lawe and Co., London. Eng. Pat. 8463, April 11, 1902.

Calcium sulphate, obtained as a by-product in the manufacture of tartaric acid, &c., is mixed with animal, vegetable or mineral fibre, and with a silicate, silicate colloid, or by-product, amylose, as a binding material. (See Eng. Pat. 24,683, 1901; this Journal, 1902, 550.)—W. C. H.

Straining [*Waste or other*] *Liquids; Improved Apparatus for* ——. C. Bollé, Manchester. From H. Riensch, Charlottenburg, Germany. Eng. Pat. 3896, Feb. 1902.

The receiver of the apparatus is formed by an inclined horizontal travelling perforated bottom, and stationary suspended side walls extending over part only of the bottom. The bottom may be annular and rotated, or may be formed like an endless conveyor band travelling in a straight line. The deposited solid matter is removed from the bottom by scrapers arranged at its upper uncovered part. Roller brushes are provided for keeping the bottom clean.—R. A.

Metal Vessels [*Tin Cans, &c.*] *Hermetically Tight; Rendering the Joints of Sheet* ——. B. Adrian, Brooklyn, U.S.A. Eng. Pat. 8513, April 11, 1902.

The joints are immersed in a bath of palm oil or other suitable fluid, which is heated to a temperature higher than the fusing point of the fusible coating of the sheet metal, the immersion being maintained until the coating at the joints fuses and forms one integral body.—R. A.

United States Patents.

Centrifugal Separator [*Soda, Spent Grain, &c.*]. C. Friesleben, Halle-on-the-Saale, Germany. U.S. Pat. 705,066, July 22 1902.

This separator consists of a conical drum rotated from the top, a conical filling-chamber on the top of the drum in communication with the interior through openings, a spiral conveyor mounted vertically in the drum and adapted to convey the material to be separated from the top to the bottom of the drum, means for rotating the conveyor on the bottom, a collecting-dish for receiving the separated material as it falls from the conveyor, and a wheel with depending blades for forcing the separated material down a chute on the dish.—R. A.

Liquid-Separator. S. C. Hauberg, Copenhagen. U.S. Pat. 705,669, July 29, 1902.

The object of the invention is such an arrangement, that the inner structure of the apparatus is kept so firmly in position, that, in spite of the quick rotation, it cannot be displaced. A drawing is given and full mechanical details.—C. S.

Oil from Water; Method of Removing ——. A. E. Krause, Jersey City, New Jersey. U.S. Pat. 705,253, July 22, 1902.

Insoluble or sparingly soluble magnesium compounds, especially the oxide, hydroxide, carbonate, or silicate, if agitated with oily water, possess in a remarkable degree the property of removing the oil from the water. Magnesite, dolomite, serpentine, olivine, asbestos, and allied minerals, especially the fibrous variety of serpentine known as chrysotile, possess this property. After thorough agitation, the water is either filtered or allowed to settle.—L. A.

II.—FUEL, GAS, AND LIGHT.

Peat Briquettes by Electric Power: Making ——. Engineer, 1902, **93**, 633.

Ebsen's process of drying peat and manufacturing fuel briquettes therefrom by the use of electric power (Eng. Pats. 22,194, 1896, and 15,513, 1897; this Journal, 1897, 589 and 746) has been in actual operation at Stangfiorden, Norway, since 1898, with favourable results. The plant deals with 100 metric tons of air-dried peat per day, and the power is derived from five 80-kilowatt dynamos direct coupled to five turbines of equivalent—128 horse-power. The wet peat is first pressed into blocks weighing about 2 kilos. each, which are passed on wagons through a drying tunnel, the air draught passing through which is heated by the waste gases from the retorts. The dried peat is then introduced into the retorts, which are upright, cylindrical vessels of iron, lined with asbestos, about 2 m. in height, and 1 m. in diameter. Each retort has a removable cover, a discharge hole below, gas-exit pipes, and a pressure gauge. The retorts are heated by spiral resistance coils of special construction, and the blocks of peat are built up in contact with these, until the vessel is entirely filled with a pigeon-holed mass of peat, in the centre of which is the heating agent. The gaseous products pass away by openings in the cover of the retort, and, after scrubbing, are employed for heating the air used in the drying tunnels. The tarry liquid condensed in the gas pipes and in the scrubbers, yields gas-oil, ozosote, paraffin, methyl alcohol, ammonia, and acetic acid. 100 kilos. of the air-dried peat yield on the average:—charcoal fuel, 33; tar, 4; tar water, 40; and gaseous products, 23 per cent. The peat fuel is stated to be dense and compact, and to burn well, yielding little soot and ash. It has a specific gravity of 0·30, whilst its theoretical calorific value is 7,250 thermal units.—A. S.

Peat Briquettes. Foreign Office Annual Series, No. 2845 [Germany].

Peat briquettes made by Stauber's process (this Journal, 1901, 233) have been analysed at the Royal Chemical Institution of Berlin, with the following results:—Carbon, 51·14; hydrogen, 4·54; oxygen, 29·34; and ash, 9·09 per cent. Heating power, 3,806 calories. One great advantage of the peat briquette is its comparative freedom from sulphur, which is present in other fuel briquettes to the extent of from 1·04 to 2·64 per cent.—A. S.

Calcium Carbide; The Sampling of ——. E. Odernheimer. Chem.-Zeit., 1902, **26**, [61], 703—704.

The proper sampling of calcium carbide is a difficult operation, which should only be entrusted to qualified men; a respirator should be worn during the process. The pieces vary greatly in size, from large lumps to fine dust; the composition of the carbide is also very variable, owing to the presence of unconverted material and particles of coke. The German Acetylene Association directs that two samples should be taken from each drum opened, one from the middle and one from the top or bottom. But by this method the results are not always correct, because the dust is liable to be overlooked. The dust consists of that portion of the contents which will pass through a sieve of 1 mm. mesh; it generally accumulates at the bottom of the drum, and, when excessive, is a frequent cause of dispute; the proportion of dust should not exceed 5 per cent. The best way of sampling is to empty out the whole contents of the drum on a large sheet of metal, and, after spreading them out and distributing the dust evenly, to take samples of 1 lb. each from two places. When a large consignment of carbide has to be sampled, it is more convenient to take a somewhat larger sample from each drum emptied, and place the samples in a well-closed vessel of sufficient size. Subsequently the contents of the vessel should be thoroughly mixed and carefully sampled. With consignments of 100 drums and over, it is sufficient to sample one in ten, but with smaller consignments a larger proportion should be opened. Samples should be placed in tins and soldered at once; in opening drums of carbide the solder should not be melted off, owing to the great danger of explosion.

—J. F. B.

Acetylene; Standards Adopted for Apparatus for ——. Gesundheits-Ingenieur, Oct. 31, 1901, 332. Proc. Inst. Civil Eng., 1902, **148**, [2], 54.

The following are the standards of construction for stationary apparatus for acetylene gas, adopted by the German Acetylene Society in August, 1901:—

(1) All apparatus for the production, purification, and storage of acetylene gas must be constructed of wrought- or cast-iron.

(2) The size of the producer will depend upon the number of burners to be regularly supplied, reckoned at a consumption of 0·35 cb. ft. per hour per burner.

(3) The thickness of the sheet- or galvanised iron employed for the apparatus must not be less than 0·0295 in. for a plant supplying 5 burners, 0·039 in. for from 6 to 30 burners, 0·049 in. for from 31 to 100 burners, 0·059 in. for from 101 to 250 burners, and 0·078 in. for more than 250 burners. The thickness of the metal must be such as to guard against deformation of any kind, unless special precautions are taken to insure rigidity of construction; but in no case should the sheet-metal used for scrubber, purifier, and driers, &c., be less than 0·039 in. in thickness.

(4) The bottom, the cover, and the man-holes, unless they are made of cast-iron, must in all cases be half as thick again as the other metal-work specified above.

(5) The cast-iron used should conform to the standards prescribed by the German Society of Gas and Water Engineers.

(6) The joints of all apparatus must be either welded or double-lapped and soldered.

(7) Apparatus which is not circular in cross-section must be so constructed as to avoid deformation.

(8) All pipe-connections or stuffing-boxes must be of cast- or wrought-iron, but brass or bronze may be employed for screws, taps, or valves.

(9) Separately erected gas-holders must be constructed of metal of thicknesses, varying in accordance with the capacity, from 0·039 in. to 0·098 in., with bottom and top plates half as thick again.

(10) In those cases in which the generator serves partly as a gas-holder, the above rules must also be adhered to.

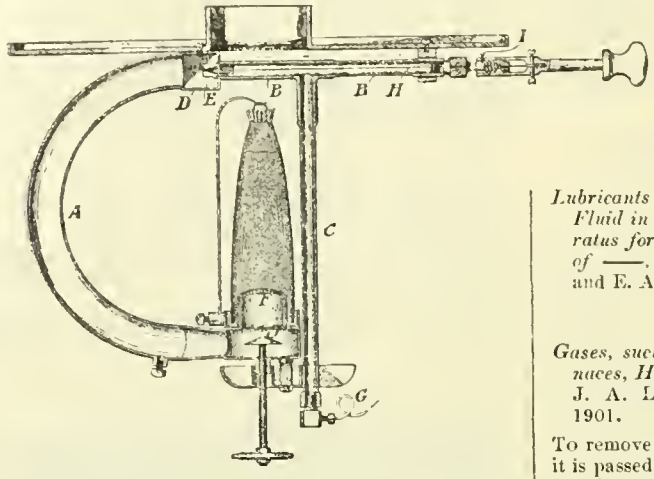
(11) In the case of apparatus for more than five burners, in which the charge of calcium carbide which may be added from time to time is not at once converted into gas, the supply of carbide and water must be accessible from the exterior without interruption to the regular working. The available storage capacity must at least be equivalent to 0·27 cb. ft. for each normal burner, calculated at 0·35 cb. ft. per hour. The outlet for any gas, which is in excess of the capacity of the gasholder, must at least be equal in size to the inlet pipe to the holder.

(12) Such precautions must be taken as will render the freezing up of the apparatus impossible.

(13) The materials used for purifiers and scrubbers must be such as will be unacted upon by the substances employed in these processes.—A. S.

Lamp; The Kornfeld Alcohol ——. J. Gas Lighting, 1902, **80**, [2045], 215.

THE lamp consists of two separate parts—the curved Bunsen tube, A, surrounded by an incandescent mantle, and the vaporiser with regulating tube B, and its vertical feed-branch C. The gases generated in the vaporiser issue under pressure from the orifice D, which can be regulated by means of the needle H, and draw in the air necessary for combustion, through a tube E, of square section, open at both ends, and arranged at right angles to the plane along which the section shown in the figure is taken. The combustible mixture issues from the burner by the dished and



perforated plate F, and the flame renders the mantle incandescent and at the same time heats both the vertical tube C of the vaporiser and the portion of the tube B immediately above the mantle. The oil or alcohol under pressure reaches the vaporiser through the small tube G; it rises in C, where it is transformed into vapour by contact with the heated metal, and the pressure of the vapour soon balances that to which the liquid is subjected in the receiver. From this time the liquid can only advance in the vaporiser in proportion as the vapour issues from the orifice D, the diameter of which is only 0·3 mm. for heavy petroleum, and 0·5 mm. for rectified petroleum or alcohol, with corresponding pressures on the liquid of 3 and 2 kilos. per sq. cm. (42 lb. and 28 lb. per square inch) respectively. This orifice occupies the centre of a special part of the lamp, made of two pieces—the plug proper and the filter carrier, on which is wound an asbestos cord for filtering the vapour before it enters the orifice. The quantity of air admitted to the burner can be regulated by the conical valve J. For starting the lamp, the vaporiser is heated by burning a little alcohol in the oval dish fastened below the burner, whilst for bringing it quickly into action, a little alcohol should also be poured into the groove round the burner.

It is stated that, according to the size of the lamp, 700 candles per litre can be obtained for about four hours' lighting, or 300 candles per litre for double that period. Official trials by the Paris Municipal Council show that the lamp has an illuminating power of 634 candles, with an expenditure of only 230 grms. (7 oz.) of carburetted alcohol per hour.—A. S.

ENGLISH PATENTS.

Ovens or Receptacles Employed in the Operations of Coking, Annealing, Lime Burning, Drying, and the like; Supply of Heat to ——. G. Westinghouse, Strand. From W. J. Knox, Edgewood Park, Penn., U.S.A. Eng. Pat. 16,700, Aug. 20, 1901.

A QUANTITY of gas or a gaseous mixture is circulated through a heating chamber, thence into a receptacle where the heat is utilised, and thence into a cooling chamber where heat is extracted. The gas is then again passed through the heating chamber, and so on. The direction of the gas is periodically reversed, but before using what was the cooling chamber as a heating one, it usually requires to have additional heat imparted to it, which may be done by burning fuel therein. One or more of these stoves may be arranged at opposite ends of the chamber to be heated. —R. S.

Furnaces, Gas Engines, and the like; Utilisation of Waste Heat from ——. P. Naef, New York. Eng. Pat. 14,577c, July 17, 1901. (Under Internat. Conv., Dec. 18, 1900.)

METHODS of utilising waste gases from combustion engines &c., for various purposes, such as evaporating, distilling drying, calcining, or heating solid or liquid materials, or heating buildings, &c. Reference is made to Eng. Pat. 14,577A of 1901. —R. A.

Sulphocyanides; Treatment of Coal-Gas for the Manufacture of ——. H. W. Smith, W. T. Gidden, A. G. Salamon and G. S. Albright. Eng. Pat. 13,653, 1901.

See under VII., *page* 1077.

Lubricants used in connection with the Motive-Power Fluid in Cylinders and the like; Method of and Apparatus for Recording the Quantity, Quality, and Efficacy of ——. P. C. E. Goetze, C. F. Sanders, J. A. Sander and E. A. Buehmann. Eng. Pat. 14,174, July 11, 1901.

See under XII., *page* 1083.

Gases, such as those obtained from Gas-generating Furnaces, High Furnaces, and so forth; Purification of —— J. A. Leneauchez, Paris. Eng. Pat. 14,483, July 1, 1901.

TO remove finely-divided suspended matters from the gas it is passed through a centrifugal pump, into which water or other washing liquid, either hot or cold, is injected. The apparatus is essentially constituted of two rotating fans with a series of blades or vanes so arranged as to atomise the liquid by the shock and friction upon the successive blades thus producing a very intimate commingling of the gas and liquid.—H. B.

Gas; Process and Apparatus for the Manufacture of —— G. Westinghouse, London. From W. J. Knox, Edgewood Park, U.S.A. Eng. Pat. 16,699, Aug. 20, 1901.

IN the production of gas by endothermic reaction (e.g. water-gas), two recuperative stoves are used in conjunction with one or more gas-producers, each stove acting alternately as a heater for the gases entering the producer and an absorber of the heat of the gas leaving them. The whole of the gas from the producers passes through a heat-absorbing stove; part of the gas is then led off through an economiser to the place where it is to be used; the balance of the gas is conducted through the heating stove and enters the producers along with the necessary supply of steam; and the cycle of operations is repeated. The direction of the circulation is reversed periodically, so that the heat-absorbing stove becomes the heater, and *vice versâ*. The heat absorber, before it is used as the heater, usually requires to have additional heat imparted to it.—H. B.

Hydro-carburetted Air for Motor-Car Engines and other Purposes. L. W. Stanley, Leeds. Eng. Pat. 16,500, Aug. 16, 1901.

THE carburetted air is passed through a layer of cotton wool or other like material, whereby only the gaseous matter can pass to the motor or burner. The liquid contents are retained by the wool, and these are gradually given out to succeeding quantities of air which are not sufficiently saturated.—R. S.

Hydrocarbon Vapour; Apparatus for Impregnating Air, Steam, or other Gas with ——. A. J. Boult, London. From E. Y. Comstock, Summitville, U.S.A. Eng. Pat. 26,220, Dec. 23, 1901.

A CARBURETTING apparatus in which air or steam is blown through heated crude petroleum, and is led down a heated

spiral pipe to vaporise liquid particles which may be carried over. By means of a valved pipe communicating with the top of the spiral pipe and leading down to near the bottom of the carburetting vessel, any sediment which settles out from the petroleum can be conducted into the spiral tube and there vaporised.—H. B.

Combustible Liquids; Volatilisation of ——, and Admixture of Steam thereto. J. P. E. Liet and C. H. Claudel, Paris. Eng. Pat. 5524, March 5, 1902.

The combustible liquid is led through an adjustable valve to a "helicoidal chamber," wherein it is vaporised. A portion of the vapour is led to a burner for heating the apparatus, the products of combustion passing away through a horizontal tube surrounded by the "helicoidal passage." The remainder of the vapour is led either to a cooling coil, or to a Woulff's bottle for taking up steam, before passing to the burner.—R. S.

Burners [Vapour Burners] for Motive Power and other Purposes; Petroleum and like ——. J. Johnston and A. E. Dobbs, London. Eng. Pat. 26,315, Dec. 24, 1901.

The oil is led to an annular chamber having a downwardly- and inwardly-inclined inner surface, and acting as a vaporising chamber and as a deflector for the flame. The oil and vapour pass to an upper coil or coils, where the vaporisation is completed. The vapour is then carried downwards to the needle-valve inlet of a movable central vertical tube leading to a central circular burner having outlet openings facing the inclined surface of the vaporiser. The central tube is raised, and the needle-valve is opened simultaneously by a bell-crank lever.—R. S.

Incandescence] Vapour Burners for Lighting and Heating. N. Beck and R. Dior, Granville, France. Eng. Pat. 9404, April 23, 1902.

A burner for use with alcohol, benzene, &c., in which the vapour, issuing from the top of a central wick-tube, flows down a tube surrounding the wick-tube into a conical annular nozzle, whence it passes up into the burner-tube and is mixed with air as usual.—H. B.

Acetylene-generating Apparatus. W. Doman, Amblecote, and S. W. Bullas, Cradley Heath, Staffs. Eng. Pat. 17,455, Aug. 31, 1901.

An automatic generator of the water-to-carbide, flooded-compartment type. The decomposing vessel is an upright cylinder containing a number of perforated carbide trays, which are placed so far apart that the carbide itself only occupies one-fifth of the available space, thus leaving room for the expansion of the lime sludge. Several of these vessels are connected to the one holder, and the water supply (governed, as usual, by the movements of the bell) is so arranged that sufficient water enters the generator each time wholly to decompose the contents of one tray. Locks are provided which enable any one or more generating vessels to be opened for recharging without permitting escape of gas.—F. H. L.

Acetylene Gas Generator. J. B. Macquet, Wailly-Beaucamp, France. Eng. Pat. 6221, March 13, 1902. (Under Internat. Conv., Sept. 13, 1901.)

A hand or mechanically fed carbide-to-water apparatus having its shoot, or its carbide store, carried by the bell of the rising holder, and using for its holder tank and gas pit a brick well sunk in the ground. The brickwork is carried up above the ground level clear of the bell, and is provided with a lid; thus the whole apparatus is protected from frost.—F. H. L.

Acetylene Generators. F. Windham, London. Eng. Pat. 9041, April 25, 1902. (Under Internat. Conv., April 26, 1901.)

A portable acetylene generator working on the contact system, and taking carbide in the form of "cartridges," either "treated" or not.—F. H. L.

Acetylene from Carbide of Calcium; Machines for Generating ——. F. L. H. Sims, Toronto. Eng. Pat. 11,495, May 20, 1902.

A mechanically fed carbide-to-water generator of the hopper type without any separate holder. The upper part of the decomposing chamber serves as a small displacement holder, and an annular float, connected with the feed mechanism, operates in the water thereof, falling if gas accumulates, and cutting off the supply of carbide. The gas is made to travel upwards through some of the carbide in the hopper before reaching the service, whereby it is thoroughly dried. The outlet and inlet of the hopper are interlocked.—F. H. L.

Acetylene Generators. R. Klinger, Gumpoldskirchen, Lower Austria. Eng. Pat. 11,539, May 20, 1902.

A hand-fed carbide-charging device consisting of a plunger movable in a cylinder extending into the gas generator, and having a recess for the reception of the carbide. The cylinder is provided at its outer end with a gutter for catching the water flowing out of the recess when the plunger is raised, whilst a pipe extends from the gutter into the generator.—F. H. L.

United States Patents.

Coke Oven. M. E. Rothberg, Lebanon, Penn. U.S. Pat. 705,446, July 22, 1902.

The oven is provided with a system of heating or combustion flues between and underneath the coking chambers, which are built in adjacent pairs. The air is heated by the waste gases passing to the chimney.—R. S.

Coke Ovens or other Kilns; Process of Making —— Tight. R. Kuhn, Brueh, Germany. U.S. Pat. 705,681, July 29, 1902.

Ore dust is mixed with finely-ground ashes or other dusty material, and then blown into the hot chamber, the walls or sides of which are intended to be tightened, the floating dust gradually settling into, and closing the pores and cracks therein.—C. S.

Coking Coal; Continuous Process of ——. J. Hemingway, Chicago. Assignor of three-fourths to C. J. Joel, Spring Valley, Minn., and W. E. Rothermel, Chicago. U.S. Pat. 705,926, July 29, 1902.

Bituminous or semi-bituminous coal is pulverised, mixed with about 4 per cent. of boiling water and about 10 per cent. of coal-tar, and the coking ovens are charged with the mixture. The heavy portion of the distillate (containing tar, pitch, and similar substances) is returned to the ovens during the coking operation, along with a fresh charge of coal moistened with hot water.—C. S.

Fuel] Fibres of Annual Growth; Process of Treating ——, for Industrial Purposes. S. O. Edison, New Jersey. U.S. Pat. 704,698, July 15, 1902.

Fibres of annual growth, such as grasses, straw, sugar-cane, &c., are heated either in water or by steam in closed vessels until they become softened, but without, however, entirely losing their structure. The moist heated mass produced is then subjected to a heavy compression, by which water will be expressed from the product, and the latter is formed into blocks, which, with or without further drying, can be used as fuel.—G. T. M.

Fuel; Artificial ——, and Method of Preparing same. B. M. Thomas, San Francisco. U.S. Pat. 704,717, July 15, 1902.

Briquettes, &c., composed of "tule peat, such as occurs in the valleys of the San Joaquin and Sacramento rivers," and crude petroleum, mixed with an "alkali earth, such as occurs in a natural state in the deserts of California."
—H. B.

Fuel; Artificial ——. J. T. Davis, San Francisco. U.S. Pat. 705,216, July 22, 1902.

An artificial fuel, composed of fine coal and "pitch hardened and toughened by free carbonic acid gas."

About 100 parts of pitch, mixed with 30 parts of carbonate of lime, are heated at a minimum temperature of 250° — 300° F., "to obtain free carbonic acid gas," and about 1,000 parts of carboniferous material are then incorporated with the mass.—H. B.

Gas-Producer. W. J. Evans and F. Klepetko, Greatfalls, Mont. U.S. Pat. 704,527, July 15, 1902.

The gas producer is provided with a rotary cover, which carries inclined stirring rods dipping down into the incandescent fuel. The air and steam are supplied through a covered tube rising up from the centre of the bottom. The fuel is supplied mechanically from a hopper above, the feeding arms being mounted upon a hollow vertical shaft, through which steam or other gaseous fluid under pressure is directed into the upper part of the producer, whereby such a pressure is produced therein that no gas will escape through the fuel-feeding openings.—R. S.

Oil- and Air-mixing and Gas-generating Apparatus. J. Behm, San Francisco, Cal. U.S. Pat. 704,732, July 15, 1902.

Two interdependent superposed vapour-generating devices are arranged within one casing, each supplied with compressed air and oil. The lowermost has burner openings to serve as a heater for the upper chamber, which has a discharge nozzle. The mixing devices for the air and oil are protected from the heat, and the connecting tubes and inlet and outlet circulating pipes are provided with a water jacket. The mixing device consists of a propeller-wheel located in the passage connecting with the generators, a disc carried upon the rear end of the shaft of the propeller, a tubular conductor through which compressed air is discharged against the disc, an annular chamber surrounding this conductor, means for delivering oil into the chamber, and convergent tapering channels connecting the chamber with the space containing the disc.—R. S.

Carburetter [for Oil-Gas Engines]. J. F. Bennett and H. S. Moorwood, Sheffield. U.S. Pat. 705,021, July 22, 1902.

Liquid hydrocarbon and air are sucked simultaneously through a cylinder containing a spring-controlled piston valve, and the mixture, mingled with a further supply of air, is drawn down a pipe, the end of which dips into heated liquid hydrocarbon. The latter is contained in a vertical cylindrical reservoir, and is heated by means of the exhaust gases from the engine, which pass through a casing surrounding the reservoir. The carburetted air, issuing through perforations at the end of the pipe and bubbling up through the hot oil, passes to the explosion cylinder of the engine.—H. B.

Gas-Producer. J. A. Herrick, Jenkintown, Pa. U.S. Pat. 705,840, July 29, 1902.

A gas-producer, constructed so as to provide for supplying to the mass of fuel therein air in large volume, but so uniformly distributed throughout the mass as to have no disruptive action upon any portion of the same. Means are also provided for regulating the blast and preventing any clogging of the tuyères.—C. S.

Oil-Fuel Generator. W. H. Dye, Indianopolis. Assignor of one-half to J. M. Wharton, Indianopolis. U.S. Pat. 705,565, July 29, 1902.

The generator consists of a natural-gas chamber, with supply pipe; an air-chamber surrounding the gas-chamber, and held in place by perforated end-caps screwing on to the gas-chamber; a steam-chamber surrounding the air-chamber, and screwed on to each end of the same, and also provided with an outlet near the bottom at one end, and a steam-inlet opening near the top at the other end; a water- and oil-chamber surrounding the steam-chamber; a steam-pipe and also an oil-pipe entering one end of said chamber near the top, the other end of the chamber being provided with an outlet at a point above the steam-chamber; and a conical nozzle, screwed on the outlet end of the water-and-oil chamber.—C. S.

Burner; Oil ——. E. B. Raymond, St. Louis, Miss. U.S. Pat. 704,374, July 8, 1902.

A tube carrying the oil burner passes through the furnace wall. Oil is led into a chamber of the burner, where it is heated by means of a steam jacket, and then passes through a valve having spiral coils to a globular chamber, where it mixes with air. The mixture passes through another valve, also having spiral coils, to the furnace. The two valves are simultaneously operated.—R. S.

Burner; Crude Oil ——. H. G. Tucker, Hereford, Texas. U.S. Pat. 704,669, July 15, 1902.

The crude oil is supplied to a fire-pan having a number of air-inlet openings and an inturned top edge which nearly meets a central removable flame-spreader resting, by means of feet, on the bottom of the pan. The bottom of the pan is covered with an asbestos sheet.—R. S.

Burner; Hydrocarbon ——. H. C. Martin, Cincinnati, Ohio. U.S. Pat. 704,895, July 15, 1902.

The oil flows into a trough or pan, and is ignited therein. Above the pan are two curved plates, running the length of the pan, which allow air to pass around the pan and then deflect it on to the oil. There is a central longitudinal space between the plates, which allows the flame to pass upwards. The flames are caused by a pivoted damper to pass to any desired part of the fire chamber.—R. S.

Burner; Hydrocarbon-Vapour ——. E. le Pelletier, Vienna. U.S. Pat. 705,258, July 22, 1902.

The burner is formed of a main vaporising tube having a double bend, the ends being vertically above one another. Extending from the top of the main tube is a small tube leading to a vapour-jet nozzle, arranged in line with the two ends of the main tube, and serving to vaporise the oil therein. This nozzle is made in two parts, which are screwed together, the lower one carrying a spindle for regulating the vapour feed, while a tight joint is formed between the two parts by a fusible metal. Surrounding the two tubes is an outer burner-tube, above which is a burner gauze over which the main flame is produced.—R. S.

Burner; Oil ——. J. W. Lewellen, Philadelphia, Penn. U.S. Pat. 705,413, July 22, 1902.

Oil is led into an annular tray, having a central annular depression. It is allowed to cover the tray, and is then burned by air passing upwards through the centre of the tray, and delivered through openings above the surface of the oil. Air also enters between the top of the casing and a hood above it. The burner is formed of a good conductor, such as of brass, but is raised on screws from the ground so as to have an air space beneath.—R. S.

Burner [Gas or Vapour] for the Removal of Hardened Masses in Furnaces or the like. H. A. E. Meyer, Creuzthal, Germany. U.S. Pat. 705,418, July 22, 1902.

The gas or vapour is supplied to an outer tube, and oxygen to an inner concentric tube. The burner end is protected either by a casing of refractory and slowly-combustible material, such as compressed coal, graphite, coke, gas-retort carbon, magnesite, or carborundum, or by providing it with a water-cooling jacket.—R. S.

Burner; Vapour ——. W. J. Smart, Orange, N.J. U.S. Pat. 705,459, July 22, 1902.

Oil is delivered to the bottom of a vaporiser, consisting of a tube which passes upwards, then over the flame, and then downwards to near the starting point, delivering the vapour through an adjustable needle-valve to a nipple or burner. The top of the vaporiser may be formed as a flattened cone-like plate having a series of inter-communicating channels. Alcohol, &c., may be led into a small chamber containing cotton or like absorbent material, and be ignited to start the vaporiser; or a Bunsen gas jet may be used for the purpose.—R. S.

Burner; Hydrocarbon ——. J. F. Higgins, Corsicana, Texas. U.S. Pat. 705,550, July 22, 1902.

Oil is admitted into one compartment of a chamber, and steam into a lower one. The oil is heated by the steam, and is withdrawn with the latter through an outlet regulated by a needle-valve. The oil and steam enter a circular passage immediately in front of the needle-valve, where they thoroughly mix. The mixture is then deflected upwards against a hood by an inclined portion of the passage, so as to form a spray, which is ignited.—R. S.

Burner; Hydrocarbon ——. M. W. Morgan, Mount Vernon, Indiana, U.S.A. U.S. Pat. 705,948, July 29, 1902.

The burner consists of a shell, forming a mixing chamber for gas and air, provided at the top with a perforated gauze burner. One wall of the chamber is curved inwards, leaving an inlet space covered with two gauze screens. A mixture of air and gasolene under pressure passes through a tube over the burner, and then in a heated condition into the chamber, where it is mixed with more air entering through the gauze screens.—C. A. M.

Furnace; (Revolving) Electrical ——. [*Calcium Carbide.*] H. Maxim, Brooklyn. U.S. Pat. 704,649, July 15, 1902.

The revolving furnace has an interior electric conductor which is adapted to receive independent currents from a series of outer electrodes disposed at successively advancing points along the furnace, each successive and additional current reaching the interior electrode from the successive outer ones, increasing the current already flowing through the common interior conductor, and thus generating an intense heat, which increases in degree towards the place of discharge of the material to be treated.—G. H. R.

Acetylene Gas Generator. I. L. Harris, Assignor of one-half to H. Partridge, both of Florida. U.S. Pat. 704,032, July 8, 1902.

An automatic carbide-to-water generator of the hopper type, and self-contained, the gas-holder being made annular so as to surround the carbide store, both being fixed above the decomposing chamber. A special feature of the apparatus is that all the parts are interlocked.—F. H. L.

Acetylene Gas Generator. A. Winch, Chicago. U.S. Pat. 704,226, July 8, 1902.

A water-to-carbide table lamp in which the supply of water is partly governed by the pressure in the decomposing chamber and partly by a needle-valve. The latter is manipulated by turning one part of the casing upon the other.—F. H. L.

Acetylene Gas Generator. P. B. Perkins, Los Angeles, California. U.S. Pat. 704,664, July 15, 1902.

An automatic water-to-carbide generator working partly on the dipping principle. The carbide cage is carried by the bell, and when the latter rises, not only is the cage lifted above the water level in the decomposing chamber, but that level is lowered by special mechanism.—F. H. L.

Acetylene Gas Generator. C. W. Söderberg, Christiania, Norway. U.S. Pat. 704,945, July 15, 1902.

A mechanically-fed carbide-to-water generator in which the carbide is stored in boxes arranged horizontally in a circle on the top of the generating vessel. Actuated by the holder bell, mechanism comes into action periodically which releases the bottoms of these boxes in succession, allowing their contents to fall into the water.—F. H. L.

Acetylene Gas Generator. F. L. Kincaid, Stockton. Assignor to Pacific Acetylene Gas Co., San Francisco, Cal. U.S. Pat. 704,967, July 15, 1902.

An automatic water-to-carbide apparatus. The carbide is carried in a long horizontal cage constructed of metal slats united together at either end by sprocket chains. By means of four sprocket wheels on two parallel horizontal axes, the cage is supported at its upper part, the lower being loaded with carbide. Driven from the holder bell, one of the axes revolves, thus periodically agitating the carbide; the sprocket wheels on the other spindle are idle, the shaft being hollowed and provided with lateral apertures through which jets of water escape. Under the cage, within the same casing, is a spiral conveyor to remove sludge.—F. H. L.

Acetylene Gas Generator. W. S. Hamm and J. A. Mosher, Chicago. Assignors to the Adams and Westlake Co., Ill. U.S. Pat. 705,078, July 22, 1902.

A holderless drip apparatus, the supply of water to which is governed by the gas pressure. The generator is a vertical cylinder with removable end, so that an internally sub-divided basket of carbide can be inserted. The separate water reservoir is a modified "bird-fountain."—F. H. L.

Acetylene Gas Generator. J. A. Mosher, Chicago. Assignor to the Adams and Westlake Co., Ill. U.S. Pat. 705,115, July 22, 1902.

An automatic water-to-carbide generator working on the drip principle, the water supply being governed by the pressure. The apparatus comprises no holder, but as the water collects in an intermediate reservoir on its way from the store tank to the carbide, some space is provided to hold the gas of "after-generation" without unduly increasing the pressure at the burners.—F. H. L.

Acetylene Gas Generator. D. J. van Praag, London. U.S. Pat. 705,166, July 22, 1902.

An automatic drip generator intended for portable work. The water drips through a glass or porcelain tube choked by a gilt or other non-corrodible wire, the rate of supply being governed by the gas pressure. The carbide is pressed against the perforated top of its cage by means of coiled springs—an arrangement which is claimed to render gas production more regular than usual.—F. H. L.

Acetylene Gas Generator. L. Montel, New York. Assignor to Acetyvone Manufacturing Co., New York. U.S. Pat. 705,272, July 22, 1902.

A table lamp on the contact system, preferably taking carbide in the form of sticks, as described in U.S. Pats. 648,349 and 648,350. Means are provided for lifting the carbide stick out of the water by the same action that stops the supply of gas to the burner. The stick can also be scraped clear of lime residue without disconnecting the apparatus. Part of the interior acts as a displacement holder.—F. H. L.

Burner [*Incandescence*] *Cap.* W. H. and R. W. Miller, Henry Clay, Del. U.S. Pat. 704,653, July 15, 1902.

A cap forming the top of an incandescence gas burner, consisting of a straight, open-ended, vertical tube with an inner conical ring, the latter being closed at the top by an inverted conical body, and having elongated, inclined lateral openings formed by inclined ribs with intervening spaces. The mixture of gas and air passes through these spaces in thin tangential streams, and flows with a whirling motion up beneath the mantle.—H. B.

Lamp; Hydrocarbon Incandescent ——. P. B. Curran, Philadelphia. Assignor to Kitson Hydrocarbon Heating and Incandescent Lighting Company, West Virginia. U.S. Pat. 705,044, July 22, 1902.

Kerosene is supplied to a vertical vaporising tube, at the top of which a conical jet, controlled by a needle-valve, opens into a mixing chamber having air-inlets. Over the mixing tube, which rises from the latter chamber, is inverted a short tube, covered with wire gauze at its upper end; this tube constitutes a partial baffle for the gaseous mixture, one part of which passes through the gauze to the usual burner tube, which surrounds the whole, while the other part is deflected downwards through the annular spaces between the tubes to a circular chamber communicating with a cluster of Bunsen burners which surround the vaporising tube. The Bunsen burners act as auxiliary burners for maintaining the vaporisation, the preliminary heating being effected by means of gas burners, or otherwise.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Oil Field; The Newcastle ——. W. C. Knight and E. E. Slosson, Wyoming School of Mines Bulletin, Petroleum Series, No. 5.

The Newcastle oil field is situated near Newcastle, Weston County, Wyoming, oil indications extending along the base of the Black Hills for six to seven miles south-east of the town, and for five to six miles to the west and north.

The oil is heavy, and is chiefly suitable for fuel or lubrication, the percentage of burning oils furnished on distillation being small. The crude oil itself forms an excellent lubricant, having a high specific gravity, a low cold test, high viscosity, and an absence of paraffin or asphaltum. The flashing and burning points are too low for the oil to be used as a cylinder oil, but a good product of this class can be obtained by moderate distillation with the aid of a pump and superheated steam—the process used with Salt Creek oil at the Casper refinery.

Weight for weight, the heating power of the Newcastle oil is about one and seven-tenths greater than Rock Springs coal; and, in view of the greater economy, convenience in handling, &c., has over twice the value as fuel. Owing to the absence of sulphur, it is superior to Beaumont (Texas) oil; and it is well adapted for the manufacture of gas.—C. S.

Asphalt; Investigations on ——. J. Kovács.

See under IX., *page* 1077.

Oils, Lubricating; Determination of the Viscosity of ——. A. Zega.

See under XII., *page* 1083.

United States Patents.

Wood, Sawdust, Peat, or the like; Apparatus for Drying and Distilling ——, *and for Treating other Substances.* E. Larsen, Copenhagen. U.S. Pat. 704,886, July 15, 1902.

An apparatus for simultaneously drying and charring or distilling wood, sawdust, peat, &c. The processes are carried out without any arrangements for moving the material, the same passing through the apparatus solely by its own weight. The products of distillation generated in the coking or distilling chamber are carried away immediately after formation, without passing other parts of the apparatus or the material therein, and it is stated that by these means the wood, &c. is carbonised in such a manner that decomposition and condensation of the products of distillation are entirely prevented. In the drying chamber, the heating flues are so arranged that the heating gases need only pass through a certain number thereof, and then leave the apparatus.—A. S.

Carbonising Organic Materials; Method of ——. O. Daube, New York. U.S. Pat. 705,213, July 22, 1902.

A mixture of air (2 vols.) with the combustible gas (1 vol.) stored up from a previous carbonising operation is blown, at a pressure of 5 to 8 lb. per square inch, through a coal fire, to produce a hot, non-combustible gas, consisting mainly of N and CO_2. This gas is led through flues in the bottom of a series of chambers, containing wood, bones, or other material to be carbonised, and passes up through perforations in the flues into the material at about 400° to 600° F., driving off the water, which escapes as steam through ports in the walls of the chamber. When the moisture has all been expelled, the ports are closed, and the carbonisation of the material is effected by continuing to pass the hot, incombustible gas through it, the gases produced being led through channels in the walls of the chambers to a condenser, for recovery of the by-products, and the washed combustible gases being stored for use in the next operation. —H. B.

Hydrocarbon Oils; Process of Purifying ——. J. W. Warren, Omaha, Nebraska, U.S.A. U.S. Pat. 705,168, July 22, 1902.

In addition to "Wyoming rock clay" (see Eng. Pat. 1014, 1901; this Journal, 1901, 352), the inventor claims the use of other clays or substances of similar composition.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Nitro-Derivatives; Direct Reduction [Hydrogenation] of ——, *by Contact with finely divided Metals of* ——. P. Sabatier and J. B. Senderens. Comptes Rend., 1902, **135**, [4], 225—227.

The study of the general reaction for the production of amines by the reduction of nitro-bodies by means of hydrogen and heated, finely-divided metals has been extended (see this Journal, 1901, 978).

α-Nitronaphthalene is reduced to the amine by the use of reduced copper as the contact agent, at a temperature of 330°—350° C., without appreciable production of ammonia. When reduced nickel is employed at the same temperature, the formation of naphthylamine is accompanied by a more fundamental reduction, ammonia and a hydride of naphthalene being produced.

Nitromethane is easily reduced by an excess of hydrogen in presence of reduced nickel at 150°—180° C., with the production of methylamine only. But if the nickel be heated above 200° C. to 300° C., the production of methane and ammonia ensues in increasing proportions. The reaction in contact with reduced copper only takes place at a temperature between 300° and 400° C., and the production of methylamine is never complete, a combination of methylamine and nitromethane being also obtained.

Nitro-ethane is reduced satisfactorily in presence of reduced nickel at about 200° C.; at a temperature of 340° C. a certain amount of ammonia is formed together with ethane and methane. Reduced copper at temperatures between 300° and 400° C. reacts normally, but more slowly than nickel.—J. F. B.

Hofmann's Reaction (Conversion of Amides into Amines). C. Graebe and S. Rostovzeff. Ber., 1902, **35**, [14], 2747—2752.

Sodium hypochlorite is more stable than the hypobromite. Chlorine and bromine were dissolved in 10 per cent. caustic soda solution in such quantity that each solution contained 2 atoms of halogen to 3 mols. of NaOH. The solutions were titrated with sodium arsenite. After two weeks the hypochlorite solution, which contained 4·7 per cent. of active chlorine, had not diminished in strength, whilst a hypobromite solution had decreased in strength from 9·6 per cent. (corresponding to 4·26 per cent. of chlorine) to 5·2 per cent. of active bromine. Hypobromite is generally preferred, because it is easy to weigh or measure the bromine, but if a sodium chlorate solution of known strength and the proper apparatus (this Journal, 1901, 473) are provided, it is equally simple to prepare a hypochlorite solution. In experiments on a small scale it is more convenient to use potassium permanganate than sodium chlorate (see page 1076).

Phthalimide and its chlorine derivatives were converted into anthranilic acid and the choranthranilic acids respectively by the action of sodium hypochlorite and hypobromite under otherwise parallel conditions. The yields were always greater, and generally much greater, with the hypochlorite than with the hypobromite. The bad yields and the large quantities of reagent necessary, which are frequently mentioned in the literature, are due mainly to the instability of the hypobromite. If this reagent is used it must be prepared immediately before use, must contain more than 2NaOH to Br_2, and the bromine must be very slowly added, otherwise bromate is formed in quantity.

The first two stages of Hofmann's reaction are represented by the following equations :—

$$(1)\ C_6H_5.CO.NH_2 + NaOCl = C_6H_5.CO.NCl\,Na + H_2O.$$

$$(2)\ C_6H_5.CO.NCl\,Na \longrightarrow C_6H_5.N(COCl)\,Na$$

The third stage has not previously been cleared up. It is frequently supposed that phenylisocyanate is formed, but the results given below make this improbable. If there is sufficient alkali present and ring formation cannot occur, the reaction takes its normal course : $(3a)\ C_6H_5.NNa.COCl + 2NaOH = C_6H_5.NH_2 + NaCl + Na_2CO_3$. If there is an excess of alkali, only a portion of the carbon dioxide is removed and diphenylurea is formed :—

$$(3b)\ 2C_6H_5.NNa.COCl + H_2O = (C_6H_5.NH)_2CO + 2NaCl + CO_2.$$

If a stable ring can be formed, no carbon dioxide may be removed, so in the case of salicylamide :—

$$(3c)\ NaO.C_6H_4.N(Na)OCl = C_6H_4\begin{cases}NNa\\O\end{cases}CO + NaCl.$$

These three equations (3*a*), (3*b*), and (3c) may be regarded as typical of this phase of Hofmann's reaction. On this explanation the third phase in the production of benzoylenurea from phthalamide is represented by the equation :—

$$NH_2CO.C_6H_4.N(K)CO.Br = C_6H_4\begin{cases}NK.CO\\CO.NH\end{cases} + HBr.$$

According to a patent of Meister, Lucius, and Brüning, phthalimide is converted into the sodium salt of isatoïc acid by treatment with 1 mol. of NaClO and 1 mol. of NaOH. In this case the third phase is :—

$$NaCO_2.C_6H_4.N(Na)COCl = C_6H_4\begin{cases}NNa.CO\\CO—O\end{cases}$$

Benzoylchloramide, $C_6H_5.CO.NHCl$, was obtained in a yield of 95 per cent. of the theoretical by shaking benzamide (1 mol.) in the cold with a sodium hypochlorite solution containing $2\frac{1}{2}$ mols. NaOH and 2 atoms Cl, and acidifying with acetic acid. When benzoylchloramide is treated with exactly 1 mol. of NaOH, it is almost quantitatively converted into diphenylurea (see above) ; 3 mols. of NaOH convert it smoothly into aniline.

In the conversion of salicylamide into oxycarbanil (see equation above), it is necessary to use a large excess of caustic soda, otherwise the product contains chlorine compounds. After heating with caustic soda and sodium hypochlorite on the water-bath, oxycarbanil is precipitated by a current of carbon dioxide ; after recrystallisation from hot water it is pure. The precipitation by carbon dioxide makes it probable that sodium oxycarbanil and not the salt, $C_6H_4(ONa)NH.CO_2Na$ is present in the solution ; the latter would also readily pass into aminophenol on heating the aqueous solution. Oxycarbanil is stable towards alkalis ; long boiling with caustic soda is requisite to effect decomposition.—A. C. W.

Dyestuffs produced by the Action of Isatin on Extracts of Isatis tinctoria. L. Marchlewski. Anz. Akad. Wiss. Krakau., 1902, 227—230. Chem. Centr., 1902, **2**, [2], 138.

An extract prepared from the fresh leaves of *Isatis tinctoria* gives, with an aqueous solution of isatin, a red precipitate of Indirubin. Extracts of the dried leaves behave differently. On treatment with isatin solution, they give, after some time, a dark precipitate, which can be purified by washing with water and dilute caustic soda solution, dissolving in phenol, and reprecipitating with ether. It forms a dark brown powder, readily soluble to a blue solution in glacial acetic acid, slightly soluble in alcohol and ether, insoluble in alkalis, and soluble in concentrated sulphuric acid to a yellow solution, which changes to blue on standing. Two independent nitrogen determinations show that the substance is a definite chemical compound, and it has been given the name *isatocyanine*. Its absorption spectrum differs from that of Indirubin.—A. S.

Azo Dyestuffs ; Compounds of Sodium Tetrazoditolyl Sulphite with Aromatic Amines and Phenols, and their Transformation into Azo Dyestuffs. A. Seyewetz and Biot. Bull. Soc. Chim., 1902, **27**, [14], 747—751.

Sodium tetrazoditolyl sulphite reacts with ethyl-β-naphthylamine to produce a crystalline compound, which is transformed into a dyestuff by exposure to light or long boiling with alcohol (this Journal, 1901, 888).

Ethyl-α-naphthylamine reacts in the same manner, producing a brownish oil, which becomes crystalline on agitation with a little alcohol. The compound forms small, light brown needles, which decompose at 160° C. without melting. Dilute acids, on prolonged boiling, decompose the compound with a slow evolution of sulphur dioxide. Boiling with alkalis regenerates the original substances. On exposure to light, or boiling with alcohol in the dark, the compound yields a dyestuff identical with that obtained by the action of tetrazoditolyl on α-ethylnaphthylamine.

α- and β-naphthylamine, aniline, *o*-toluidine, and *p*-phenylenediamine give similar compounds, which behave in the same manner. The compositions previously assigned (*loc. cit.*) to these compounds are now confirmed.

Only those compounds, in which the diazo groups have been able to enter the amine in the position *para* to the NH_2 group, can be diazotised. Thus the compounds obtained from α-naphthylamine, aniline, and *o*-toluidine can be combined by means of the diazo compounds, with phenols and amines, yielding new dyestuffs.

Phenols in alkaline solution react with sodium tetrazoditolylsulphite under the action of light to yield dyestuffs. No intermediate sulphite compounds, similar to those formed from the amines, could, however, be isolated.—A. C. W.

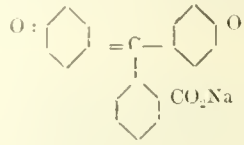
Dyestuffs ; Ionic Phenomena in ——. A. G. Green. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [15], 413—414.

O. Fischer's interpretation of several colour reactions in the triphenylmethane series as ionic (Zeits. f. Farben- u. Textil-Chem., **1**, 281) raises the question whether, in general, the appearance of colour should not be referred to ions rather than to molecules. Such an hypothesis seems capable of explaining many colour phenomena in those dyestuffs which are salts of strong acids or strong bases, and therefore ionisable. But it hardly accords with other facts, such as the strong coloration of benzene by benzene-azo-β-naphthol—a body which is practically neutral. And, again, if the red colour of aminoazobenzene in hydrochloric acid be ascribed to the organic ions, to what can the yellow colour of aminoazobenzene base be due? However important a rôle ionisation may play in colour changes, the latter cannot be simply an outward sign of the former, for all dyestuffs are not electrolytes.

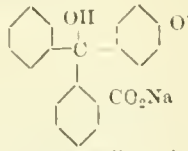
The author examines in detail two series of colour changes in the triphenylmethane dyestuffs, which, he contends, are difficult to explain on the ionic theory, but easy on the assumption that the appearance of intense colour is due to a change of molecular structure from the carbinol to the quinoid type.

A. If a strong aqueous solution of phenolphthalein sodium salt be nearly decolorised by an excess of caustic soda, and then diluted with water, the excess of alkali can be completely neutralised with acetic acid without any increase of colour, which remains a pale pink. If the addition of acid be continued until the solution is slightly acid, it becomes quite colourless, and a little weak alkali will merely restore the pale pink colour. But if the slightly acid solution be boiled and cooled (at which stage a white precipitate may be observed in it), and then made alkaline, the deep red colour of phenolphthalein sodium salt makes its appearance. According to Herzig and Meyer's theory, adopted by Fischer, the decolorisation by strong soda lye is due to reassociation of the ions. If so, the colour should

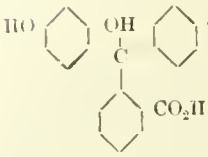
return on neutralising the excess of alkali, which is not the case. In the author's opinion all these colour changes are better explained by the following formulæ :—



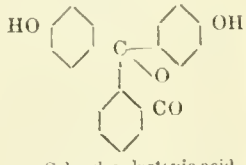
Red sodium salt.



Colourless sodium salt (excess of soda lye).



Colourless carbinol acid (cold faintly-acid solution).



Colourless lactonic acid (dehydration of the carbinol acid on heating).

In the carbinol acid, the tendency to anhydride formation is greater between the carbinol hydroxyl and the carboxyl group than between the former and the phenolic hydroxyl, and this determines the formation of a colourless lactone in preference to a coloured quinoid body. On the other hand, the addition of alkali to the lactone appears to change it at once into a quinoid sodium salt without the intermediate formation of carbinol.

B. If Magenta, Crystal Violet, or Malachite Green be dissolved in just enough hydrochloric acid to make an orange-yellow solution, and diluted with water until the characteristic colour of the dyestuff appears, the yellow colour may be brought back by the addition of common salt or other metallic chloride. Chlorides, therefore, determine the same colour change as an excess of hydrochloric acid. Sodium acetate added to the yellow solution changes it again to the characteristic red, violet, or green. On the ionic theory it is not clear why sodium acetate should reverse the effect of sodium chloride. The author's view is that the yellow acid solutions contain carbonium salts analogous to triphenylmethyl chloride. The latter has been shown by Walden (Ber., **35**, 2018) to combine with metallic chlorides, forming intensely yellow double salts of high electric conductivity. The carbonium salts of the dyestuffs, in which chlorine is attached to the linking carbon as well as to the amino groups, are probably, when diluted with water, transformed into the corresponding carbinol, which at once changes to the red, violet, or green quinoid anhydride. A large excess of acid prevents the carbinol formation and consequently the quinoid formation. A metallic chloride has a similar effect, because it forms with the carbonium salt a double chloride of greater electric conductivity, just as the stability of many inorganic chlorides is increased by combination with chlorides of the alkali metals.

The fact that alcohol has not the same effect as water, when added to the strongly acid Rosaniline solution, may be attributed to the partial neutralisation of the acid by the alcohol, of which the basic properties have been noticed by Baeyer.—T. A. L.

Aniline Dyestuffs as Precipitants of Albumin. M. Heidenhain. Münch. med. Wochenschr., **49**, 437—440. Chem. Centr., 1902, **2**, [3], 226. (See this Journal, 1902, 966.)

In the case of acid dyestuffs in general, the power of precipitating albumin increases with the number of acid groups in the dyestuff molecule, but is diminished by the introduction of amino groups. Exceptions to this rule have, however, been observed. For example, the albumin-precipitating power of Blue Black B (with one OH and three SO_3H groups) is only one-quarter, and that of Brilliant Black 3 B (with one OH and four SO_3H groups) only one-twentieth as great as that of analogous dyestuffs. On the other hand, Violet Black (B.A.S.F.) possesses only slight acidity, but has a strong albumin-precipitating power, producing precipitates even at a dilution of 1 : 40,000 or 60,000.—A. S.

English Patents.

Indigo Colouring Matters [Indigo Dyestuffs]; Manufacture of Initial Materials relating to the Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 16,420, Aug. 15, 1901.

See Fr. Pat. 313,872; this Journal, 1902, 170.—T. A. L.

Indigo [Indigo Dyestuffs] in an Improved Condition for Transport Storage and Use; Production of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1789, Jan. 22, 1902.

Indigo in the form of paste is mixed with starch, sugar (syrup), kieselguhr, tripoli, magnesia, clay, talc, chalk, or laminaria powder with or without gypsum, dextrin, or gum to act as a binding medium. The mass is filter-pressed, cut into pieces of a convenient size, and slowly dried. The laminaria powder is obtained by drying certain kinds of seaweed (for instance, *laminaria cloustoni*), which then forms a pulverulent mass, swelling up when moistened. By employing laminaria powder, the dry indigo, when finely powdered, can be mixed with it, pressed, and cut into pieces of a convenient size. The products so formed readily disintegrate when moistened, forming an easily reducible indigo vat.—T. A. L.

Black Sulphur Colouring Matter [Sulphide Dyestuffs] Manufacture of a ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 18,897, Sept. 21, 1901.

See Fr. Pat. 312,773; this Journal, 1902, 169.—T. A. L.

Azo Colouring Matters [Azo Dyestuffs], and Intermediate Products relating thereto; Manufacture of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 20,55[illegible] Oct. 14, 1901.

See Fr. Pat. 315,932; this Journal, 1902, 701.—T. A. L.

Disazo Dyestuffs [Azo Dyestuffs] for Wool and an Intermediate Product; Manufacture of ——. O. Imray, London. From Die Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/Main, Germany. Eng. Pat. 16,957, Aug. 23, 1901.

See Fr. Pat. 313,748 and U.S. Pat. 693,670; this Journal, 1902, 169 and 471.—T. A. L.

Colouring Matters [Sulphide Dyestuffs] directly Dyeing Cotton; Manufacture of ——. C. D. Abel, London. From The Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 17,564, Sept. 2, 1901.

See Fr. Pat. 313,947; this Journal, 1902, 170. See also Fr. Pat. 303,524 and Eng. Pat. 5580 of 1901; this Journal, 1902, 41 and 249.—T. A. L.

Anthraquinone; Manufacture of Pure ——. Sadler and Co., Ltd., and A. Driedger, Middlesbrough, York. Eng. Pat. 17,635, Sept. 3, 1901.

Crude anthraquinone (92—94 per cent. of $C_{14}H_8O_2$) dissolved in three times its weight of boiling aniline. On cooling, pure anthraquinone (99·8 per cent. of $C_{14}H_8O_2$) crystallises out in bright yellow needles.—T. A. L.

Colouring Matters [Anthracene Dyestuffs], and of Intermediate Products therefor; Manufacture of New —— H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 17,807, Sept. 5, 1901.

See Fr. Pat. 243,315; this Journal, 1902, 402.—T. A. L.

United States Patents.

Indoxyl [Indigo Dyestuffs], &c.; Process of Making ——. B. Homolka and O. Liebknecht, Frankfort. Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/Main, Germany. U.S. Pat. 704,804, July 15, 1902.

Sodium amide is heated with phenylglycinphenylglycide to a high temperature in presence of suitable diluents. (See Eng. Pat. 16,875 of 1901; this Journal, 1902, 1024.)
—T. A. L.

Anthraquinone Dye [Anthracene Dyestuffs], and Process of Making Same; Blue ——. C. Hartmann. Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/Main, Germany. U.S. Pat. 704,798, July 15, 1902.

Tetra-amino-anthraquinones are treated with formaldehyde and sulphurous acid in presence of hydrochloric acid. The resulting products are dark blue powders, soluble in water to greenish-blue solutions which are not altered by dilute acids or alkalis. They are acid dyestuffs, giving level greenish-blue shades, tolerably fast to alkalis, light, and boiling.—T. A. L.

Leucogallocyanine, and Process of Making Same. C. de la Harpe, Basle. Assignor to the Dyeworks, formerly L. Durand, Huguenin, and Co., Basle, Switzerland. U.S. Pat. 704,301, July 8, 1902.

The sulphonated gallocyanines, obtained by the action of nitrosoalkylbenzylaniline sulphonic acids on gallic acid or its derivatives, or those obtained by sulphonating the product of the action of nitrosodiphenylamine on gallic acid or its derivatives, are reduced by the reducing agents mentioned in U.S. Pat. 629,666 (for example, zinc dust, acetic and hydrochloric acids). The leuco derivative thus obtained from nitroso-ethylbenzylaniline sulphonic acid is a greenish paste, soluble in hot water to a yellowish-green solution, in sodium acetate to a pale blue, and dyeing chromium-mordanted fibres blue shades.—A. C. W.

Azo Dye; Red ——. W. Herzberg and O. Siebert. Assignors to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 704,825, July 15, 1902.

Diazotised *p*-nitro-*o*-amino-salicylic acid is combined with 1-amino-*p*-toluene-*p*-sulphaminotoluene formula. The resulting dyestuff gives deep yellowish-red shades of great fastness on a chromium mordant.—T. A. L.

Azo Dye; Red ——. W. Herzberg and O. Siebert. Assignors to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 704,826, July 15, 1902.

Diazotised picramic acid is substituted for the *p*-nitro-*o*-aminosalicylic acid in the preceding specification, the dyestuff formed giving deep Bordeaux-Red shades of great fastness on chromium-mordanted wool.—T. A. L.

Dyes; Process of Making Extract ——. R. Lefretil and E. Tagliani, Susa, Italy. U.S. Pat. 704,843, July 15, 1902.

Aqueous extracts of Old Fustic (*Morus tinctoria*), New Fustic (*Rhus cotinus*), or Quercitron (*Quercus tinctoria*) are treated under pressure at 110°—150° C. with an alkali sulphite or bisulphite. The resulting products are said to give shades of greater brilliancy and permanence than the extracts as ordinarily employed.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Indigo; Recovery of ——, *from Waste Textile Material.* Textile Colorist, 1902, **24**, [283], 199.

Two air-tight iron vessels are connected by a rotary pump; one is charged with the waste material, and the other with fresh material, preferably loose wool, cops, or slubbing. A sufficient quantity of water, hydrosulphite of soda, and caustic soda is then introduced and allowed to circulate, until transfer of the dyestuff from the waste to the fresh material has reached its limits. The newly-dyed material is treated successively with weak acid and water, and exposed to the air to develop and fix the colour. In this way light and medium blues, which might eventually serve as bottoms, are obtained.—A. S.

Printing; Improvements in ——. E. C. Kayser. Färber-Zeit., 1902, **13**, [13], 229—231. (See this Journal, 1902, 770.)

The fact that freshly developed azo dystuffs are not affected by the agents commonly employed in preventing their production on the fibre leads to the following general method of attaining reserve effects.

An azo-pink design, produced by means of *o*-nitrophenetidine on a β-naphthol ground, is over-printed with a thickened emulsion of sulphite white, the design on the second roller being a little broader than that on the first. In this way the first colour is effectually protected, and the material is subsequently developed with paranitraniline in the ordinary manner, the final result being a pink pattern on a red ground. A blue ground is conveniently obtained, after protecting the printed azo-colour with the reserve, by padding the material with a Nitroso Blue solution prepared by mixing 15 grms. of Nitroso base M R (50 per cent.), 30 grms. of tannin, 40 c.c. of orthophosphoric acid (50 per cent.), 6 grms. of oxalic acid, 20 grms. of resorcinol, and 750 c.c. of dilute gum tragacanth; the resorcinol may be omitted, but the shade produced is redder and weaker. Other examples of the use of this reserve are indicated.

A red design on a black ground is formed by printing the ordinary Paranitraniline Red on a β-naphthol ground, covering the pattern with an insoluble reserve, such as a starch emulsion of magnesium carbonate or zinc oxide, and finally treating with Aniline Black. The red design may be surrounded by a contour of a different colour by over-printing with the starch emulsion to which a basic colouring matter such as Rhodamine or Auramine has been added.

The employment of diazotised naphthionic acid as a white reserve under Paranitraniline Red is recommended; the soluble azo-compound formed by interaction with the β-naphthol is readily removed by washing and scouring, leaving a well-defined white.

It is sometimes convenient to use a more soluble reducing agent than neutral sodium sulphite in the reserves for azo-compounds and the very soluble compound obtained by combining this salt with acetone in molecular proportions may be conveniently employed for this purpose.

An excellent reserve for all dyestuffs printed with albumin is obtained by using a solution of metaphosphoric acid in British gum. A colour pattern under pigment colours may be produced by first printing on a tannin ground with metaphosphoric acid and a basic dyestuff, and then padding or over-printing with the albumin emulsion of the pigment. In this way a pink design in Rhodamine may be formed on a ground of Chrome Green, Ultramarine, or Prussian blue.—G. T. M.

Dextrins; Examination and Analysis of Commercial ——. F. Lippmann.

See under XXIII., *page* 1101.

English Patents.

Dyeing Yarns of Woollen, Worsted, Silk, or other like Fibres [at Intervals]; Means for ——. R. Mellor, Huddersfield. Eng. Pat. 16,765, Aug. 21, 1901.

To dye yarns at certain definite intervals, they are stretched in the form of hanks across a number of laths or bars, arranged parallel to one another in a frame, the frames thus filled with hanks being placed in between empty frames upon a movable skeleton platform. Pressure is exerted upon the pile of frames with the object of compressing those portions of the hanks which lie immediately above and

below the laths, while the other portions of them remain free. On immersing the frames in a dyebath, the latter portions of the banks alone become dyed.—E. B.

Printing Machines for Textile Fabrics ——. O. Lecloux, Stembert, Belgium. Eng. Pat. 20,537, Oct. 14, 1901.

PRINTING is accomplished by means of adjustable bars which are so arranged that each may be immersed, as required, in its own separate colour receptacle. The fabric to be printed passes, face downwards, under an indiarubber pad against which it is pressed while it is being printed by the bars from below.—E. B.

UNITED STATES PATENTS.

Cellulose Fabrics; Improved ——. A. J. Hill, Twickenham, Eng. U.S. Pat. 705,244, July 22, 1902.

COTTON yarn or fabric is hydrated (mercerised) in an unstrained condition, then sprayed or immersed in a solution of a proteid (*e.g.*, albumin, 20 parts; borax, 1 part; water, 79 parts; or casein, 15 parts; Na_2CO_3, 1 part; water, 84 parts), dried and finally varnished with a solution of gelatin (10 per cent.) containing paraformaldehyde (0·1 per cent.), which is converted to formaldehyde by the agency of heat. Alternatively a cellulose solution may be precipitated on the fibre previous to the treatment with proteid; the material may be crimped with hot rolls before or after the varnishing process; or the varnishing (waterproofing) process may be omitted.—R. L. J.

Fluids; [Artificial Fibres] Method of Dispersing ——. W. J. Morton, New York. U.S. Pat. 705,691, July 29, 1902.

THE composite fluid (collodion solution, liquid glue, &c.) is delivered in a viscous condition into the path of a convective discharge of high-tension electricity which breaks it up, and simultaneously evaporates the volatile liquid component, and solidifies the fixed component into multiple fibres. Several forms of apparatus are described.
—G. H. R.

Bleaching Vat. F. Taylor, Doagh; A. Cooke and B. W. D. Montgomery, Belfast. Assignors to the Lishman Process Bleaching Company, Limited. U.S. Pat. 704,402, July 8, 1902.

SEE Eng. Pat. 3518 of 1901; this Journal, 1901, 712.
—E. B.

Mercerising Machine. M. Frings, Paris. U.S. Pat. 704,531, July 15, 1902.

SEE Eng. Pat. 23,470, 1900; this Journal, 1902, 171.
—G. T. M.

Dyeing; Apparatus for ——. R. Illingworth, J. T. Mazey, and G. Naylor, Coventry. U.S. Pat. 704,191, July 8, 1902.

SEE Eng. Pat. 9720, 1901; this Journal, 1902, 1025.
—G. T. M.

Dyeing; Apparatus for ——. R. Weiss, Mulhouse, Germany. U.S. Pat. 704,283, July 8, 1902.

SEE Eng. Pat. 486, 1900; this Journal, 1900, 345.
—G. T. M.

Stiffening and Making Impervious to Water Starch-filled and Ironed Laundry-finished Substances of Bodies of Collars, Cuffs, &c; Process for ——. H. A. Mann, Troy, New York, Assignor to the Antiaqua Co., Albany, New York. U.S. Pat. 700,793, May 27, 1902.

STARCH-filled, laundry-finished articles such as cuffs, collars, &c. are stiffened and rendered impervious to water by treatment with a solution of "soluble cotton" in alcohol, ether, amyl acetate or acetone, this solution being pressed into the body of the fabrics by means of revolving flexible rollers. The soluble cotton thus introduced may be again removed when required simply by washing the goods with alkaline solutions.—G. T. M.

VII.—ACIDS, ALKALIS, AND SALTS.

Monopersulphuric Acid; Action of Hydrochloric, Hydrobromic, and Hydrofluoric Acids on ——. E. Wedekind. Bull. Soc. Chim., 1902, **27**, [14], 712—714. (See also this Journal, 1900, 172, 278, 777; 1901, 578.)

BAEYER'S dry reagent obtained from potassium persulphate and strong sulphuric acid, oxidises hydrochloric and hydrobromic acids in the cold, with evolution of heat. The dry gaseous acids react in the same manner, but less violently. Since monopersulphuric acid oxidises the hydracids, and since the water formed in the reaction can be retained by the sulphuric acid, it became a natural question, "What is the action of this reagent on hydrofluoric acid?" Potassium sulphate and sulphuric acid are not sensibly attacked by fluorine in the cold, but decomposition does take place at a high temperature. If anhydrous hydrofluoric acid be mixed with the dry monopersulphuric acid, there is at first no action, but the hydrofluoric acid is soon given off in gaseous form. A current of gaseous hydrofluoric acid was passed over the dry reagent; the gas did not then ignite crystallised silicon. Anhydrous hydrofluoric acid was added drop by drop, to the dry reagent contained in a long platinum tube closed at each end by plates of fluorspar; no blue coloration, due to ozone, could be observed. Thus hydrofluoric acid differs from the other halogen acids in regard to its action on Caro's reagent.—A. C. W.

Bleaching Powder; Constitution of ——. H. Ditz. Zeits angew. Chem., **15**, [30], 749—755.

THE different views held as to the composition of bleaching powder have arisen chiefly over the occurrence in the substance of unchloriuated lime, and over the question of the existence or non-existence in it of calcium chloride. Even the latest text-books regard the question as not yet settled. Ostwald, for instance, says that bleach may be regarded either as a compound with Odling's formula or as a mixture of calcium chloride and hypochlorite, and that to decide the question a comparison should be made between the physical properties of bleaching powder and those of a mixture artificially prepared of these two salts. Recently von Tiesenholt has formulated a new view as to the composition of bleaching powder (this Journal, 1901, 248) he looks on it as a mixture of calcium chloride and hypochlorite, formed according to the reaction

$$2Ca(OH)_2 + 2\,Cl_2 \rightleftarrows Ca(OCl)_2 + CaCl_2.2H_2O,$$

which he regards as reversible, and consequently tending to a limit and never carried completely through in one direction, so that the product always contains free lime and never contains the theoretical quantity of available chlorine.

The author criticises v. Tiesenholt's views, chiefly on the ground of his own former work on the subject (this Journal 1901, 247). He points out that he prepared a bleach of exactly the composition $CaO.CaCl(OCl).H_2O + H_2O$ and that this on heating loses half of its water at 100° C. (or in a desiccator over sulphuric acid), gives off oxygen at 150°—180° C., leaving a residue of $CaO.CaCl_2.H_2O$, and loses the remaining water only at a red heat. This bleach gives off no chlorine when heated, but more highly chlorinated bleaches (according to the author, mixtures of the substances just formulated with the substance $CaCl(OCl).H_2O$) do. According to v. Tiesenholt any water present in the bleaching powder must be attached to the calcium chloride (which does not give up its water till heated above 200° C.) or present as calcium hydroxide which only loses water at a red heat, so that no sample of bleaching powder should give off water below 200° C., a conclusion not in accordance with the facts. Moreover his explanation of the evolution of chlorine on heating is that the water acts on the hypochlorite giving hypochlorous acid, which then reacts on the chloride, producing free chlorine and calcium hydroxide. According to this all samples of bleaching powder should evolve chlorine when heated, and probably with greater readiness as they contain more water; yet not only, as stated above, does

leach of a certain composition give off no chlorine when eated, but those samples which do give it off contain less ater than that which does not.—J. T. D.

Bleaching Powder; Formation of ——, from the Point of View of the Law of Mass Action. F. Winteler. Zeits. angew. Chem., **15**, [31], 773—780.

THE author's investigations arose from difficulties experienced in making bleaching powder from electrolytic chlorine. A grey slimy mass was produced, containing ut little available chlorine, and much chlorate and chloride. his was found to be due to carbon dioxide in the gas, rising from the carbon electrodes used in the process; but he difficulty was overcome through the investigations ummarised below.

Hitherto, it has been assumed that the formation of leaching powder is a reaction between gaseous chlorine nd calcium hydroxide, and opinions have been divided as whether partly slaked lime would react with chlorine, or hether a small excess of water above that required to ydrate the lime completely was necessary. The author as shown that quicklime, to which water insufficient for omplete hydration has been added, may yet contain water such, and will then react with chlorine, whilst a ompletely hydrated lime which has been dried at 120° C. t which temperature the hydroxide does not dissociate all) is absolutely inert towards perfectly dry chlorine. he conflicting results of former experimenters are obably explained by these facts and by the difficulty of oroughly drying chlorine prepared in the ordinary way he author's gas was derived from cylinders of liquid hlorine).

The excess of water now proved to be necessary for action shows that not chlorine gas but chlorine water is e reacting substance; and chlorine water must be looked as a substance in which a state of equilibrium exists tween the reversible reactions $Cl_2 + H_2O \rightleftarrows HCl + HOCl$. illon in 1849 showed that hydrochloric and hypochlorous ids could coexist in very dilute solutions, and Göpner, er, proved the presence of hypochlorous acid in chlorine ater.) When chlorine water acts on calcium hydroxide, e velocity of reaction of each of the two acids is conioned by the concentration, chiefly of the hydrogen ions d hydroxyl ions, and the temperature. The highly sociated hydrochloric acid reacts first, producing calcium oride and oxychloride, and by its disappearance causing e formation of more hypochlorous acid, which then reacts t only on the calcium hydroxide, but on the calcium oride and oxychloride now present. Thus bleaching wder may contain Ca(OH)Cl, Ca(OH)(OCl), $CaCl_2$, $(OCl)_2$, and Ca(OCl)Cl, together with excess of cium hydroxide, and hypochlorous acid. Moreover, ere conditions exist favourable to the decomposition of cium hypochlorite, the products of that decomposition, cium chlorate and chloride, will also be present.

Calcium oxychloride undoubtedly exists as a constituent bleaching powder. Calcium oxychloride when prepared e exists as white feathery crystals, which, when treated h a great excess of water, are hydrolysed, yielding cium chloride and hydroxide; and the latter appears as white precipitate, exactly similar to that yielded by the atment of bleaching powder with water. The author has eated Kingzett's experiment of cooling a strong solution bleaching powder, when feathery crystals separate. ese can be washed free from hypochlorite by concentrated cium chloride solution, but are decomposed by excess of er, exactly like calcium oxychloride. It is thus clear t hydrochloric acid reacting on excess of lime may duce calcium oxychloride, and that this substance is a stant constituent of bleaching powder, to which, erefore, no single formula can be given. Hypochlorous d is able, in turn, to react not only on calcium oxychloride (Faut) but also on calcium chloride (Lunge and Naef), th production of the compound $CaOCl_2$.

The author collects the various formulæ that have been posed for bleaching powder, and points out that none can be considered satisfactory, or can indicate all the mpositions of which bleaching powder is capable, for it cannot be considered as a chemical unit. He then siders the modes of decomposition of bleaching powder.

The production of chlorine with evolution of oxygen occurs to greatest extent in strongly alkaline solution at high temperatures, *i.e.*, with high hydroxyl ion concentration. These conditions arise at the beginning of the chlorination, when pure chlorine passes over moist calcium hydroxide, and the reaction proceeds with considerable evolution of heat. The slight solubility of lime in water limits the possible OH-concentration, and explains why lime is the most suitable base for the production of hypochlorites; but the evolution of oxygen does occur under these circumstances, and is minimised by lessening the excess of water in the lime, by diluting the chlorine with air, and by external cooling, measures which lower the temperature and the concentration of the hydroxyl ions. The author's experiments show clearly that increasing concentration of the hydroxyl ions, brought about by addition of varying quantities of caustic soda solution to portions of the same solution of bleaching powder, increases rapidly the rate at which, at a given temperature, decomposition into calcium chloride and oxygen occurs.

Similar experiments show that the ordinary text-book statement that chlorates are produced by leading chlorine into hot concentrated solutions of alkali hydroxides is not founded on fact, for the direct decomposition of hypochlorite into chloride and oxygen proceeds more and more rapidly as the concentration of the hydroxide increases. In fact, no chlorate production occurs with more than 36 per cent. concentration of sodium hydroxide.

But too low concentration of hydroxyl ions is also inimical to the formation of hypochlorite. If anything be present which will remove the hydrogen ions (by neutralising the hydrochloric acid), such as calcium carbonate, there is formation of free hypochlorous acid which readily, especially at high temperatures, forms chloric and hydrochloric acids —$3HOH = HClO_3 + 2HCl$. In the author's experiments, dry chlorine was without action on dry calcium carbonate; but chlorine led through calcium carbonate suspended in water gave, at the ordinary temperature, 5·8 per cent. of chlorate and 11·3 per cent. of chloride; at 100° C., 8·5 per cent. of chlorate and 23·6 per cent. of chloride (evolution of oxygen having here occurred also). The hydrochloric acid of the chlorine water reacts on the calcium carbonate; the hypochlorous acid is unable to do so, but resolves into chloric and hydrochloric acids, both of which can react, forming chlorate and chloride respectively. Two samples of pure hypochlorous acid, containing 10·62 per cent., were left at the ordinary temperature, one without addition, the other with addition of calcium carbonate; after 8 days the percentages of hypochlorous acid in them were respectively 10·37 and 3·84.

That the hypochlorite may not react with the moisture present in the sense $KOCl + H_2O = KOH + HOCl$, the presence of hydroxyl ions—in bleaching powder either as Ca(OH)Cl or $Ca(OH)_2$—is necessary, otherwise free hypochlorous acid and alkali are formed, until the OH-concentration necessary for equilibrium is thus secured. If, by excess of chlorine (that is, HCl + HOCl), the whole of the alkali is destroyed (and the OH-ions removed), the formation of chloric and hydrochloric acids from the free hypochlorous acid goes on, and these acids decompose more hypochlorite; this process will go on till the whole of the hypochlorite has been converted into chlorate and chloride. The effect of excess of chlorine in producing the deliquescent calcium chlorate is thus explained, and it is clear that the chlorination should be stopped while a certain amount of free alkali (in the case of bleaching-powder, 6—8 per cent., expressed as quicklime) remains.

The author determined how far the formation of hypochlorite could be carried in presence of excess of caustic soda. He passed 125 bubbles of chlorine per minute at the ordinary temperature through a solution containing 10 per cent. of potassium chloride and 5 per cent. of caustic soda (proportions having a bearing on the electrolytic production of hypochlorites), and found that 0·81 per cent. of chlorine as hypochlorite, leaving about 4 per cent. of caustic soda, was the maximum production. Further passage of the gas caused decrease of hypochlorite and increase of chlorate.

In making bleach from electrolytic chlorine, containing carbon dioxide, it must be remembered that the latter will

decompose hypochlorite, and will also form carbonate by direct reaction on the lime. Thoroughly dried carbonic anhydride will do neither of these things; but neither will the accompanying dry chlorine react on the lime. The author has been able, by making use of very tall chambers so as to effect a partial gravitational separation of the chlorine from the carbon dioxide, and by using a minimum amount of excess water in the lime, so that the chlorine, having the greater velocity of reaction, will act preferentially to the carbon dioxide, to make good bleach of 36 per cent. of available chlorine from an electrolytic gas containing (after dilution with air) 42—45 per cent. of chlorine and 6 per cent. of carbon dioxide. The lime contained 0·2 per cent. of water over $Ca(OH)_2$, and the maximum temperatures inside and outside the chamber were 32° and 19° C. respectively.—J. T. D.

Hypochlorites and Hypobromites; Stability of ——. C. Graebe. Ber., 1902, **35**, [14], 2753—2756.

When sodium hypobromite is made by dropping bromine into caustic soda solution, the quantity of hypobromite formed is equivalent to that of the bromine, only when the latter is very slowly added with stirring, and the liquid is well cooled. When chlorine is introduced into caustic soda, the difference between the quantity of hypochlorite formed and that of chlorine used is very small and within the limit of errors of experiment. In making hypochlorite solution for the transformation of amides into amines, it is preferable to use potassium permanganate (see under IV., page 1070, and this Journal, 1902, 284) for the preparation of the chlorine, since the strength of the hypochlorite can then be calculated: 10 grms. of permanganate give 11 grms. of chlorine.

Hypochlorite solutions are more stable than hypobromite solutions, but they must always contain free alkali. The strength of a solution of 2Cl + 2NaOH sank in 24 hours, owing to the formation of chlorate, from 5·4 to 0·35 per cent. of available chlorine; a solution of 2Cl + 2½NaOH from 5·75 to 5·03 in six days; a solution of 2Cl + 2.5NaOH from 5·63 to 5·18 in 17 days; a solution of 2Cl + 3NaOH from 5·60 to 5·41 in 17 days. A solution, the strength of which decreased in the dark in 14 days from 5·1 to 4·8 per cent., sank in the light to 3·3 per cent.

Sodium hypobromite solutions containing 3NaOH and 4NaOH to 2Br are much less stable than the above hypochlorite solutions, and the solution of 2Br in 4KOH is not more stable than the sodium solutions.—A. C. W.

Chromic Sulphate; Action of Hydrochloric Acid on ——. A. Recoura. Comptes Rend., **135**, [3], 163—165.

The author is investigating the action of excess of hydrochloric acid on aqueous solutions of this salt, and gives his results. By adding chromic sulphate to fuming hydrochloric acid, boiling for some time, and setting aside, a mass of minute crystals is obtained, having the formula $CrSO_4Cl.6H_2O$. The crystals are very soluble in water, but the fresh solution, though it yields a precipitate with barium chloride like any other sulphate, gives no indication of chlorine with silver nitrate. Gradually, however, the water acts on the dissolved substance, converting it into a mixture of chromic sulphate and chloride. The water in the formula is constitutional, and cryoscopic determinations show that the formula given is molecular. If the salt be kept at 85° C. it loses water, and leaves $CrSO_4Cl.5H_2O$, which is soluble in water, but in the (dilute) aqueous solution of which neither sulphate nor chloride can be detected by the usual tests. The substance then contains SO_4 and Cl combined in a complex radicle with Cr, and is not electrolytically dissociated in solution, while $CrSO_4Cl.6H_2O$ is so. Cryoscopic measurements confirm these conclusions.—J. T. D.

Cupric Chloride and Bromide; Precipitation of ——, *by Sulphuric Acid.* G. Viard. Comptes Rend., **135**, [3], 168—170.

If strong sulphuric acid be added gradually to an aqueous solution of cupric chloride till in large excess, the copper is almost wholly precipitated as brown anhydrous cupric chloride, the clear liquid containing not more than 0·65 mgrm. of copper per c.c. If the sulphuric acid be not in such great excess the precipitate is blue, and consists of the hydrated chloride. The decomposing action of sulphuric acid on cupric chloride is slight, but sensible, for if air be passed continuously through the liquid above the precipitate, so as to remove the hydrochloric acid contained in it, the cupric chloride is ultimately converted into sulphate.

Cupric bromide behaves similarly to the chloride, but the precipitation is still more nearly complete, and the precipitate is black.

It is proposed to utilise these reactions for the qualitative distinction between chlorides and bromides; one volume of 10 per cent. solution of cupric sulphate is mixed with 10 volumes of strong sulphuric acid, and to a small quantity of this reagent a few drops of the solution to be tested are added; a chloride gives a yellow, a bromide a black precipitate.—J. T. D.

Cadmium, Mercury, and Tin; Precipitation of the Chlorides and Bromides of —— *by Sulphuric Acid.* G. Viard. Comptes Rend., 1902, **135**, [4], 242—244.

An excess of concentrated sulphuric acid precipitates the chlorides and bromides of cadmium, mercury, and tin (stannous) from their solutions. These salts, therefore, cannot be characterised by the reagent proposed by the author, consisting of copper sulphate and sulphuric acid in large excess, since they only yield white precipitates (unaltered salts) instead of the usual yellow precipitate for chlorides and black for bromides.

Cadmium chloride is precipitated with more or less completeness according to the excess of acid employed; on pouring 2 volumes of concentrated acid into 1 volume of 1 in 10 solution of the chloride, the filtrate will only retain 0·14 mgrm. of cadmium per grm. According also to the excess of sulphuric acid the salt precipitated will be either the monohydrated variety or the anhydrous. The cadmium chloride is gradually decomposed, the rapidity of the evolution of hydrochloric acid depending on the strength of the final solution of sulphuric acid. Cadmium bromide is always precipitated in the anhydrous form; the precipitate is not attacked at all by the sulphuric acid at the ordinary temperature; precipitation is very nearly complete.

Mercuric chloride is always precipitated in the anhydrous form; it is somewhat more soluble in the acid than the cadmium salt. Stannous chloride and bromide are also precipitated by sulphuric acid; the reagent containing copper sulphate and sulphuric acid does not work for this reason, and also because the stannous salt reduces some of the cupric chloride or bromide first produced to the white cuprous salts.—J. F. B.

English Patents.

[*Sulphuric Acid*] *Catalytical Reactions; Treatment of Solid Material with Gas especially applicable to* —. P. Naef, New York. Eng. Pat. 14,977, July 23, 1901. (Under Internat. Conv., May 10, 1901.)

Applicable for the production of sulphuric acid from sulphurous acid. The claims relate mainly to methods of and apparatus for bringing the gas and material in intimate contact, regulating the temperature of the reaction and the materials, roasting ore, removal of impurities, cleaning devices, &c.—R. A.

Carbonate of Soda and other Crystalline Salts; Manufacture of ——. W. P. Thompson, London. From Solvay and Co., Brussels. Eng. Pat. 232, Jan 3, 1902.

Small crystals are formed by rapidly cooling and stirring a hot concentrated solution of the salt, and these, together with a little of the original solution, are strongly compressed in a mould to form a solid block. Or ordinary crystals may be placed in the moulds, with some hot saturated solution of the same salt, and hydraulic pressure be applied as in the previous case. The moulds may be furnished with sunken or raised characters or a trade mark.—E. S.

Alkaline Cyanides; Manufacture of ——. A. D. Darling and C. L. Harrison, Philadelphia, U.S.A. Eng. Pat. 9605, April 25, 1902.

See U.S. Pats. 698,462—3 and 4, 1902; this Journal, 1902, 773.—E. S.

Sulphocyanides; Treatment of Coal Gas for the Manufacture of ——. H. W. Smith, Sutton Coldfield, W. T. Gidden, Birmingham, A. G. Salamon, London, and G. S. Albright, Birmingham. Eng. Pat. 13,653, July 4, 1901.

The gas is passed through a scrubber containing a quantity of ammoniacal or gas-liquor, or water, insufficient to absorb the whole of the ammonia present, in which liquor, or water, free sulphur is suspended, and thence to a second scrubber to remove the remainder of the ammonia. A solution of ammonium sulphocyanide, containing as much as 200 grms. per litre may thus be obtained.—A. C. W.

Oxygen Generators. L. Kamm, London. Eng. Pat. 7048, March 22, 1902.

A long, tubular horizontal retort, movable in the direction of its axis, over a stationary source of heat, is so connected to its gasholder that the movement of the latter due to the consumption of the gas, may cause such movement of the retort as to bring another portion of it over the flame, this action continuing automatically until the charge in the retort is exhausted.—E. S.

United States Patents.

Sulphuric Acid from Sulphur Dioxide in Aqueous Solution by Electrolysis; Process of Manufacturing ——. C. B. Jacobs, East Orange. Assignor to the Ampère Electro-Chemical Co., New Jersey. U.S. Pat. 704,831, July 15, 1902.

Sulphur dioxide is forced through a porous anode under pressure, and is oxidised by the oxygen of water decomposed at the anode. The oxygen is conducted upwards, so that the sulphur dioxide is oxidised in the lower region of the bath, and the oxidation product is retained remote from the cathode. A sufficient current density is maintained at the latter to prevent the access of sulphur dioxide to it, and to cause the rapid escape of hydrogen without acting on the sulphur dioxide.—G. H. R.

Chlorine and Alkali; Electrolytic Apparatus for the Production of ——. J. Mactear, London. U.S. Pat. 705,264, July 22, 1902.

See Eng. Pat. 16,874, 1901; this Journal, 1901, 1121.—G. H. R.

Sulphocyanides from Coal-Gas; Method of Making ——. H. W. Smith, W. T. Gidden, and A. G. Salamon, Assignors to the British Cyanides Co., Ltd., Oldbury, England. U.S. Pat. 705,152, July 22, 1902.

See above, Eng. Pat. 13,653, 1901.—A. C. W.

Salt-Making Apparatus. J. S. Clarke. Assignor of one-half to Maria J. Clarke, both of St. Clair, U.S.A. U.S. Pat. 705,381, July 22, 1902.

The pan has an upwardly-inclined draining board, from which the salt falls into a transversely arranged receptacle, in which it is passed by a conveyor and suitable mechanism into a receiving bin below, divided into independent compartments, a laterally-movable longitudinally-disposed conveyor acting above the bin. The pan is provided with a rake, having its upper and lower edges slotted, hooks mounted in its upper edge, adapted to engage the operating means to secure the rake thereto, and depending devices flexibly connected to the rake. The rakes are secured transversely to endless chains mounted on transverse shafts. The salt receptacle is provided with lateral discharge openings. The bearings of the shafts are located outside and above the top edges of the pan, whereby escape of oil into the latter is prevented.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

English Patent.

Glass-Gall; Utilisation of —— *to obtain Glass therefrom.* F. H. Becker, Köln-Nippes, Germany. Eng. Pat. 9405, April 23, 1902.

The mixture of glass-gall with finely-powdered graphite is melted, and it is stated that the sulphates are completely reduced.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Asphalt; Investigations on ——. J. Kovács. Chem. Rev. Fett- u. Harz-Ind., 1902, 9, 156—161. See this Journal, 1900, 564.

For the determination of hard and soft grade asphalts the following apparatus is described.

On a sandbath S, (Fig. 1) 160 mm. diameter, with a 10 mm. layer of sand, a beaker O is placed, of about 110 mm. diameter and 160 mm. high, containing sufficient rape-seed oil or glycerin to cover the beaker L—of 90 mm. diameter and 160 mm. high—three-quarters of its height. In this airbath the dropping frame is placed, Fig. 2, top view; Fig. 3, side view. It consists of a strong brass disc, 3 mm. thick and 83 mm. diameter perforated in the centre for a thermometer and with four perforations of 2 mm. diameter, around each of which a brass cylinder of 12 mm. inner diameter and 15 mm. high is soldered. The disc is supported on three feet, each 160 mm. high. A

Fig. 1.

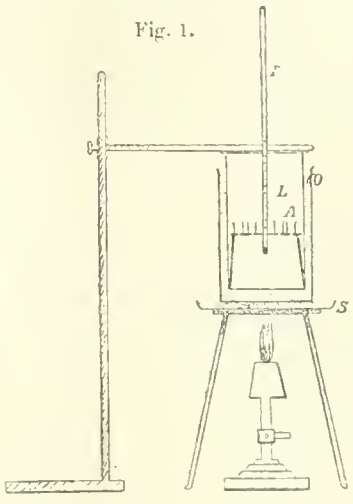


Fig. 2.

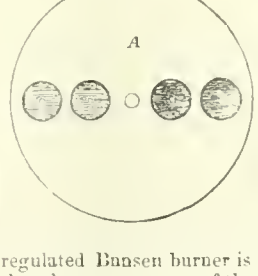
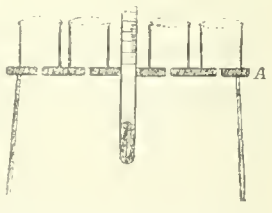


Fig. 3.



regulated Bunsen burner is placed under the sandbath, so that the temperature of the airbath is evenly raised in each determination. The airbath is covered with a cork or glass plate.

In testing hard-grade asphalts, ½ grm. is weighed out, formed into a pellet, and allowed to stand for from 10 to 20 minutes. A pellet is then inserted in each of the small tubes of the dropping frame, this is immediately placed in the airbath with a thermometer, a thermometer is also suspended in the oilbath, and a gas-burner is placed under the sandbath.

After some time the softened asphalt is visible underneath the perforated disc, and immediately it drops the temperature of the airbath is noted. Asphalts for foot pavements must not drop under 80° C., and for roadways, not under 105° C. It is useful to keep a standard bitumen of known hardness to be used with each determination.

This method should be of great value to the briquette maker, and some temperatures obtained thereby are appended :—

—	Asphalts.	Dropping Temperature.
Tube 1.....	Dalmatian.....	97·0° C.
„ 2.....	Trinidad.....	93·5° C.
„ 3.....	Tataros.....	114·0° C.
„ 3.....	Normal asphalt.....	105·0° C.

It is impossible to give a process for precisely determining the adulteration of an asphalt with petroleum pitch up to 20—25 per cent., but its presence can be proved quite well by the chemical tests previously described, *loc. cit.*

Holde's proposal to classify asphalts and allied products into four groups, *i.e.*, tar, pitch, asphalt, and coke, according to their hardness is not considered satisfactory to the asphalt expert as the origin of the material is not taken into account, whereas it is greatly to be desired that the name "asphalt" should in no case be applied to coal tar and naphtha products. Further only three classes are held necessary, viz., tar, pitch, and coke, as the pitch could be sub-divided into hard and soft qualities if expedient.

For the classification of tar, pitch, and asphalt materials, it is recommended :—

That the distillation products of coal tar and mineral oils be divided into three classes, viz., tar, pitch, and coke. That the name "asphalt" shall refer only to natural products, which occur either in the pure state or mixed with lime or sand, being, in the pure state, black and lustrous, and at the ordinary temperature tough and sticky or also solid and brittle, with a dropping point not under 35° C.; easily and completely soluble in carbon bisulphide, turpentine and chloroform, with difficulty soluble in petroleum spirit and benzene and almost entirely insoluble in alcohol.

—S. I. K.

Cement Testing and Manufacture of Cement Ware. S. Oftedal. Teknisk Ugeblad, Christiania, 1901, 581—583 and 589—592. Proc. Inst. Civil Eng., 1902, **148**, [2], 67.

The time of setting should be ascertained by moulding upon glass a number of $\frac{3}{8}$- to $\frac{5}{8}$-inch cakes, and noting when the setting begins and ends. Before testing or using a quick-setting cement, the whole barrel should be emptied, and the contents well mixed, in order to ensure uniformity throughout. The mould should be made in halves, divided transversely at the waist, and cottered together for moulding; for testing, the cotter is removed, and the test-piece is pulled asunder without being taken out of the mould. In this way, besides the tensile strength of the cement, a criterion is also obtained of its solidity; if defective in this respect, the test-piece develops cracks in the neighbourhood of the fracture. The sand has a very considerable influence in cement mortar; according to its cleanness and fineness, the strength of cement mortar (1 : 3) may range from 103 to 263 lb. per square inch.

Cement wares fresh from the mould should not be submerged under water, but should only be sprinkled, and exposed alternately to wetting and to air, and, after some time, to the weather, with precautions in winter against frost. Cement does harden under water, but it hardens best under the joint action of water and air. Test-pieces of cement mortar (1 : 3) gave 292 lb. per sq. in. after one month under water, followed by two months in very moist air; 434 lb. after one month of sprinkling, followed by two months of sprinkling out of doors; and 348 lb. after one month of sprinkling, followed by two months in a damp place. The sprinkling must be done regularly, say twice a day.—A. S.

English Patents.

Asphalt and other Substances; Improvements in the Composition of a Mixture of ——, and the Formation of Blocks or Slabs. J. Steinbach and F. Duderstadt, both of Vienna. Eng. Pat. 18,077, Sept. 10, 1901.

A mixture of powdered asphalt mastic, powdered sulphur, iron oxide, and small granular hard stone, such as porphyry, syenite, flint, and the like, is heated in revolving sheet metal drums over a slow fire to a temperature of about 80°—90° C.; the heated mixture is then placed on concrete foundations in moulds, and the whole formed into slabs under hydraulic pressure.—W. C. H.

Coverings; Heat-Non-conducting Material for Building Purposes and Steam- and like Pipe ——. M. Struebing Celle, near Hanover, Germany. Eng. Pat. 18,719, Sept. 19, 1901.

A mixture of peat fibre (80 per cent.) with a small percentage (12 per cent.) of gypsum and 8 per cent. of infusorial earth, is moulded into slabs, or the like.

—W. C. H.

Bricks; Manufacture of Highly Fire-proof ——. J. Horak Königswinter, Prussia. Eng. Pat. 19,283, Sept. 27, 1901.

A mixture of lime and sand, or broken quartz-containing mineral fragments, is moulded into blocks, which are burnt at a high temperature.—W. C. H.

Stone or Brick; Manufacture of Artificial ——, and the Preparation of Lime therefor. O. H. Anderson, Stockholm. Eng. Pat. 5710, March 7, 1902.

See U.S. Pat. 702,611, 1902; this Journal, 1902, 974.

—W. C. H.

Marble and other Stones or Cement; Method for Providing —— with Deeply Penetrating Designs in Colour. E. E. Hippe and T. Holm, Copenhagen. Eng. Pat. 15,929, Aug. 7, 1901.

Fine, deeply penetrating contour lines are painted on marble or the like, with, say a solution of water-glass, and on either side of the lines, colours ground or dissolved in heterogeneous fluids can be simultaneously applied. The pores on one side of a contour line may be closed by applying to that side a volatile fluid, easily eliminated by heat. The claims also include the use of wax, either uncoloured or mixed with colour, and applied to the marble when heated; the fixation of the design by means of resin dissolved in alcohol, and the employment of a suitable suction arrangement to promote the penetration of the colours.—W. C. H.

Artificial Marble or Compositions having more or less the Appearance of Marble; Manufacture of ——. A. Blitz, Bootle. Eng. Pat. 18,744, Sept. 19, 1901.

Gypsum and clay are made into a paste with gums or resins, so that the surface of the product may be highly polished, whilst to prevent the paste setting too quickly, a retardent, such as silicate of soda, is added. The veins are imitated by spreading either colours, or threads of silk, &c., dipped in the desired colour, on a smooth non-absorbent surface, and pouring the above composition on to the colours or threads, the product being afterwards removed from the smooth surface and polished. To apply the composition to rounded or moulded surfaces, it is spread on a sheet of oil-cloth, canvas, oil-paper, or the like, which can be peeled off after the composition has been brought to the rounded surface.—W. C. H.

Marble; Manufacture of Imitation ——. S. Weil, Johann a. d. Saar, Germany. Eng. Pat. 9431, April 1902.

A mixture of anhydrous alum or sulphate of alumina and anhydrous gypsum is worked into a stiff paste with water, kneaded with a colouring matter, and moulded into the required shapes, which are allowed to harden.

—W. C. H.

Plaster of Paris; Treatment of ——. J. Hindshaw, Manchester. Eng. Pat. 12,724, Aug. 1, 1901. (Under Sec. 2 of the Patents, &c. Act, 1888.)

POWDERED whitening is added to the plaster of Paris, and the water used for mixing the plaster contains alum (or dilute sulphuric acid) which liberates carbon dioxide from the whitening, and causes the plaster to harden with a honeycombed or cellular structure due to the bubbles of gas formed in the semi-liquid mass.—W. C. H.

Portland Cement; Manufacture of ——, *and Apparatus therefor.* E. H. Hurry, Bethlehem, Penn., U.S.A., and H. J. Seaman, Catasauqua, Penn., U.S.A. Eng. Pat. 10,958, May 28, 1901.

RAW materials, containing carbonate of lime, silica, and alumina, are mixed with carbonaceous fuel, the combustion of which is supported by a blast of air, supplied through tuyères, and a pressure about 10 to 20 lb. above that of the atmosphere is maintained in the furnace, whereby the materials are melted, the molten cement being afterwards drawn off, cooled, and pulverised. The carbon dioxide derived from the carbonate of lime is reduced to carbonic oxide by the incandescent fuel, and in this atmosphere any oxide of iron in the raw materials is said to be reduced to metallic iron, which sinks and can thus be separated from the molten cement, whereby a superior product is obtained. The carbonate of lime may be preliminarily calcined and the carbon dioxide introduced together with air into the calcining furnace, where it is reduced and then again returned to carbon dioxide. The increased pressure is maintained either by arranging the height of the kiln so that the combustion gases formed in the lower part are prevented from escaping freely by the height of the mass of materials above, or by a throttle-valve arranged in the outlet at the top of the kiln. See also Eng. Pat. 7139, 1900; this Journal, 1900, 666.—W. C. H.

Concrete; Composition for Use as ——. L. Nobis and A. Wenzel, both of Vienna. Eng. Pat. 16,508, Aug. 16, 1901.

MIXTURE is made of 35—50 per cent. of blast-furnace slag and 40—30 per cent. of asbestic (the product obtained by grinding the rock usually associated with fibrous asbestos) to which is added a mixture composed of 20—16 per cent. of Portland cement and 5—4 per cent. of asbestos powder, the whole mass being thoroughly mixed with a sufficient quantity of water. This substance is rammed into moulds, in layers, in each of which insertions are laid of asbestos braids prepared as follows—braids 2—5 mm. thick, and 4—6 metres long are stretched on a frame and impregnated first in a thin liquid bath, and then coated in a thick liquid bath; the bath contains a mixture of 50—65 per cent. of powdered glass and 50 to 35 per cent. of asbestos powder, to which water glass, at 35° to 50° C. is added in quantity sufficient to form a thin or thick liquid as required. See Eng. Pat. 11,514, 1900; this Journal, 1901, 562.—W. C. H.

United States Patents.

Artificial Marble; Process of Manufacturing ——. J. Herzermak, Düsseldorf, Germany. U.S. Pat. 704,621, July 15, 1902.

SERIES of cracks are formed through the entire thickness of a plastic body, such as plaster, cement, mortar, &c., which has partially set, and are filled with a differently coloured mass; the whole is allowed to set, and then a second series of cracks is formed and filled with a second differently coloured mass. By this means imitation veins penetrating the thickness of the slab are produced.

—W. C. H.

Plaster Composition. M. T. J. Ochs, Allentown, Penn., U.S.A. U.S. Pat. 705,542, July 22, 1902.

MIXTURE of one part of powdered aluminium silicate (clay) and one part of carbonate of lime is saturated with water, and added to two parts of powdered hydraulic (Portland) cement.—W. C. H.

Moisture-proof Coating for Brick or Stone. W. A. Tucker, Indiana, U.S.A. U.S. Pat. 705,625, July 29, 1902.

ONE part of beeswax, three parts of paraffin, three parts of Venice turpentine, one part of dissolved glue, one part of raw linseed oil, and three parts of coal oil are mixed hot and applied to the brick or stone. This coating is water-proof and prevents the exudation of any saline substances which the building materials already contain.

—M. J. S.

X.—METALLURGY.

Ores [Gold] of the Republic District, Washington; Treatment of ——. J. C. Ralston. Eng. and Mining J., 1902, 74, [3], 71—77.

THE clean gold bearing ores of the district consist almost entirely of a white to bluish-gray quartz, of a very dense character, hard and tough, usually with a rather plentiful coating of very friable, soft, white substance, probably amorphous silica, with frequently considerable quantities of pure quartz crystals. They contain about 90 per cent. of silica, average 0·5 per cent. of calcium carbonate, about 0·5 per cent. of sulphur, 0·01 per cent. of copper, and occasionally traces of lead, zinc, arsenic, and antimony. The proportion of silver to gold is about 3·2 oz. to 1 oz. The method of treating is essentially dry grinding to 60 mesh, roasting to as nearly a dead or sweet condition as practicable, cyaniding the roasted ore by direct percolation without agitation, and precipitating the gold by means of zinc dust. The chief characteristic of the ores is the necessity of unusually fine crushing in order so to liberate or unmask the gold that it may be attacked by solvents. By calcination, however, it is possible to keep the degree of fineness of crushing to a point where the ores can be satisfactorily extracted by direct percolation in deep tanks.

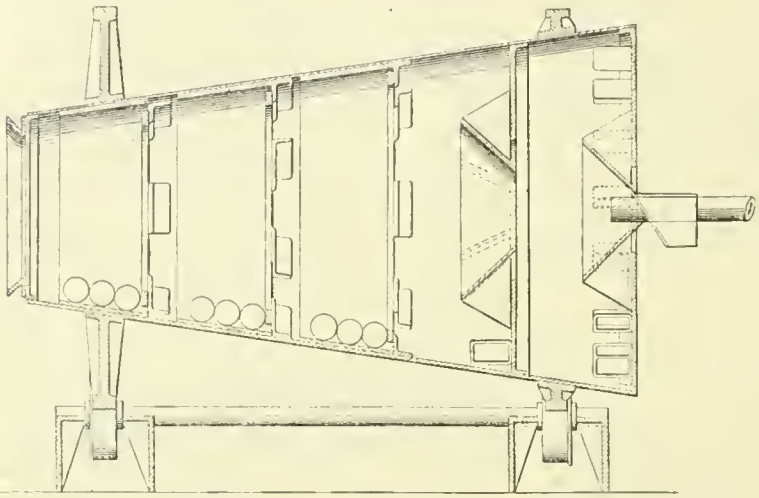
The fine crushing is effected with two sets of 15 in. by 36 in., and two sets of 15 in. by 26 in. Gates rolls, six 30-in. Griffin mills, six 8-ft. Jeffrey Columbian separators, and the necessary elevators, &c. For the collection of dust, large exhausters are provided, discharging into a system of settling chambers. When a certain quantity has accumulated, it is mixed in small quantities with the fine crushed ore and fed with the latter to the calcining furnaces. For the roasting, three straight-line furnaces are used, having hearths 100 ft. long by 12 ft. wide, and using wood for fuel. The ore requires a high temperature and long exposure, since if the sulphur is not almost completely expelled, poor extraction and large consumption of cyanide will result. The hot ore is sprayed on a cooling floor for the double purpose of avoiding dust in subsequent handling and of obtaining a less compact charge in the leaching tanks. For leaching there are 16 steel leaching tanks, each 22 ft. square and 6½ ft. deep, and three steel solution and standardising tanks, each 14 ft. in diameter and 10 ft. deep. The solutions, both strong and weak, and the wash-water run from the leaching tanks into the steel gold-solution tanks, of which there are two, each 14 ft. in diameter and 10 ft. deep. After the precipitation of the gold in two steel tanks, each 10 ft. in diameter and 8 ft. deep, the liquor is used as the "weak" solution for succeeding leaches, "strong" solution being made from it by adding the requisite quantity of cyanide. When the amount of free lime in the ore is small, caustic soda is added to the strong cyanide solution, the alkalinity of the mixed solutions coming from the leaching tanks being maintained at about 0·3 per cent. (in terms of KOH). A considerable quantity of lime in the ore has a beneficial effect on the silver extraction. For the precipitation, about 0·95 lb. of zinc dust is used per ton of ore, this being sifted into the solution, whilst the latter is kept in agitation by means of compressed air. With solutions containing appreciable amounts of copper, zinc shavings appear to give better results than zinc dust. The precipitates and slimes are collected in four 24-in. 36-section Johnson filter presses.

The gold extraction in actual bullion produced for the entire period of operation of the mill (since October 1900) on an ore averaging 0·75 oz. of gold per ton, was

91·3 per cent. The silver contents averaged 2·3 oz. per ton, and the recovery varied from 11 to 25, average 15·6 per cent. The total recovery of all values was a little over 85 per cent.—A. S.

Slime Problem in Cyaniding Talcose Ores; New Treatment of the ——. M. D. Stackpole. Eng. and Mining J., 1902, **74**, [2], 42.

A DESCRIPTION of the apparatus used for the treatment of an ore, consisting of a mixture of talc and clay with a small amount of limestone and chert. The ore, when crushed to a quarter mesh, contains 60 per cent. of slimes, and is so impervious to solutions that, although over 90 per cent. of the values in the clay are soluble, the ordinary methods only permit an extraction of 50 per cent. The plan adopted was that of separating the slimes and sands and treating each independently, the apparatus used being a modification of one designed by G. Moore for the treatment of furnace products with acid in copper-leaching works. It consists of a hollow truncated cone revolving on



a horizontal axis; it is 10 ft. long, 6 ft. in diameter at one end, and 3 ft. at the other. In the centre of the large end is a circular opening 1 ft. in diameter, and at the opposite end a corresponding opening 2 ft. in diameter. The interior of the cone is fitted with three rings projecting from its circumference; between these rings are placed a number of iron balls which prevent the slimes from attaching to and piling up on the sides. Two feet from the large end is a partition arranged similarly to the large end itself. The ore crushed to a quarter mesh is introduced through the hole in the small end, whilst cyanide solution is introduced through a pipe in the centre of a conical apron at the large end of the cone. The ore passes through the cone, in contact with the cyanide solution, to the larger end, where the sands, free from slimes, are picked up by a series of buckets, and discharged on to the conical apron, which conducts them out of the apparatus. The cyanide solution flows continuously out of the small end, carrying the slimes with it, and is subsequently treated in filter-presses, &c. as usual. It is stated that by making the separator sufficiently long, practically all the gold can be dissolved from the slimes before they leave the apparatus.—A. S.

Copper Refining with Magnesium. Oesterr. Zeits. für Berg- u. Hüttenwesen, 1901, 546. Proc. Inst. Civil Eng., 1902, **148**, [2], 44.

MAGNESIUM is now largely used in Germany as a deoxidising agent in producing copper of high conductivity for electrical purposes. When the molten copper is ready for casting, the slag is skimmed off, and magnesium in the form of cubes or hydraulically-pressed rods previously heated, is plunged below the surface. The magnesium may be enclosed in a thin case of sheet copper, or it may be bound with copper wire to the end of a copper rod, and the molten metal stirred vigorously with the latter. When the magnesium is melted, a very energetic action is set up, free oxygen, together with that contained in the bath as cuprous oxide, sulphur dioxide, and carbon monoxide, being expelled, whilst sulphur and carbon burn at the surface; the magnesia passes into the slag. The copper, after this treatment, casts into perfectly solid ingots. The process gives satisfactory results, but careful manipulation is required, especially to prevent loss of magnesium, by burning to waste at the surface. A better method is to use an alloy of equal parts of copper and magnesium; this alloy is brittle, with a fibrous fracture and reddish grey colour, melts at 450° C., and has a sp. gr. 2·97. It dissolves in the copper bath without any loss of the more combustible constituent. The alloy should be added 20 grms. at a time, and a total addition of 50 grms. per 100 kilos. of copper (1 in 2,000) is usually sufficient. A larger addition, up to 1 part in 1,000, acts beneficially in improving the strength and density of the copper. The copper-magnesium alloy may also be used to improve gun-metal, bronze, brass &c. for casting. Copper and copper alloys containing magnesium up to about 5 per cent are likely to prove of value for technical purposes.—A. S.

Cores for Castings; Preparation of, from Potatoes and Sand ——. H. Königsdorf Magdeburg, Germany. Ger. Pat. 129,930, Sept. 28, 1900 through Zeits. Spiritusind. 1902, **25**, [31], 340.

A USE for diseased or otherwise valueless potatoes is found by employing them as binding material for sand-cores in metal castings. The potatoes, without previous preparation, are boiled and crushed to a pulp; the pulp is mixed with 5 to 10 times its weight of sand, and worked up in a kneading machine. The mass for the core is then ready and, so long as it remains hot, is easily moulded. When the core is formed it is dried at the ordinary temperature; it is then hard, and rings with the blow of a hammer. When the casting is made, the organic matter of the core is completely burnt away, and the sand, though blackened, is perfectly suitable for using over again. In spite of this, however, there is no danger of the core collapsing before the casting is fully solidified.—J. F. B.

Iron and Steel; Flask for the Determination of Carbon in ——. A. Klein.

See under XXIII., *page* 1097.

ENGLISH PATENTS.

Chrome-Iron; Improved Manufacture of ——. C. Eckert, Jr., St. Johann-Saarbrücken, Germany. Eng. Pat. 17,779, Sept. 5, 1901.

THE ore is mixed with a "strong acid flux," such as a mixture of quartz, glass, wood-charcoal, lime, and clay, and the mixture is reduced mainly from the hearth of a furnace by means of a fettling, in which a mixture of graphite and other form of carbon is the predominating constituent.

—E. S.

Iron Castings into Steel, Conversion of ——; *Metallurgical Furnaces, especially Designed for.* J. Hunter, Bradford, U.S.A. Eng. Pat. 10,353, May 1902.

SEE U.S. Pat. 699,759, 1902; this Journal, 1902, 977.

—E. S.

Metals; Process of Heating ——. G. W. Sargent, Reading, U.S.A. Eng. Pat. 11,986, May 26, 1902.

The metal to be annealed, hardened or tempered, is heated in a non-oxidising medium, such as a molten salt, soluble in water, of the haloid group. Iron or steel is immersed in a fused bath of a mixture of the chlorides of sodium and potassium, with some caustic soda.—E. S.

Ore-Slimes; Treatment of ——. H. L. Sulman and H. F. Kirkpatrick-Picard, both of London. Eng. Pat. 7157, April 4, 1901.

The bulk of the residual water is separated from the slimes in a centrifugal machine, and so much leaching liquor is added as may be equal to the water remaining in the slimes, which water is then displaced by centrifugal action. The slimes, now wet only with solvent liquor, are removed, leached in a separate vessel, drained, and placed in a second centrifugal machine, where water, corresponding to the liquor in the pulp, is added to expel such liquor.—E. S.

Crucibles, Retorts, Receivers, Muffles, or other like Fire-proof Articles for Metallurgical or similar Uses; Manufacture of ——. W. Engels, Essen-on-the-Ruhr, Prussia. Eng. Pat. 14,567, July 17, 1901.

Crucibles and other highly fire-proof articles are made of finely-divided carborundum mixed with a binding agent, such as clay, chamotte, soluble glass, &c.—R. A.

Furnace for Burning Ore Blocks or Briquettes. G. Gröndal, Stockholm. Eng. Pat. 18,429, Sept. 14, 1901.

A gas furnace of the channel type, in which the supply of gas is directed, through an aperture in the roof, vertically downwards, so that it becomes mixed with air (heated by passage over bricks on the way to being discharged), passing across it, the combustion chamber being formed by raising the arch of the baking chamber beside the gas aperture. The products of combustion escape through a preliminary heating chamber.—E. S.

Ore Roasters. F. C. Roberts, Philadelphia, U.S.A. Eng. Pat. 6385, March 15, 1902.

The furnace consists of two sets of longitudinal chambers, placed side by side with a space between occupied by the back flue, the whole supported by a steel frame. Each of the ore chambers has on one side a combustion chamber, and on the other, a waste-product chamber, from both of which valved branch pipes lead into a main chimney flue, to which latter a power fan is connected. The furnace is heated by gas, provision being made for the admission of air for burning the same, and for regulation of the temperature. The chambers are, or may be, divided into compartments.—E. S.

Solders, specially applicable for Soldering Aluminium and Aluminium Alloys. W. P. Thompson, London. From O. Nicolai, Biebrich-on-the-Rhine, and F. Börner, Frankfort-on-the-Maine, Germany. Eng. Pat. 6969, March 21, 1902.

Soldering salt, suitable for the purposes named, for use with or without a metallic solder, consists of a mixture of cadmium chloride, zinc chloride, and sodium chloride. The soldering alloy, having a melting point lower than that of aluminium or its alloys, may be formed of five parts each of tin, zinc, and cadmium, one part of aluminium, and half a part of lead. The soldered articles or parts are steeped for an hour or more in a dilute solution of sodium hypophite.—E. S.

United States Patents.

Metals; Leaching and Extraction of —— from their Ores. C. Hoepfner, Frankfort-on-the-Maine, Germany. U.S. Pat. 704,639, July 15, 1902. Compare Eng. Pat. 15,873, 1900; this Journal, 1901, 987.

The ores are leached with a hot solution of cupric chloride, containing, but not saturated with, a solvent for the cuprous chloride formed in the process, such as an alkali- or alkaline-earth chloride. In the case of copper ores, the solution obtained deposits, on cooling, cuprous and other chlorides, and the solution, separated from these, may either be used for a second leaching, or at the anode compartment of an electrolytic cell, in which the dissolved cuprous chloride is converted into cupric chloride (available for re-use), while the precipitate (Cu_2Cl_2, &c.) is added to the cathode solution, copper being deposited. When complex ores containing zinc, copper, silver, lead, iron, &c. are treated, the solution obtained is cooled, and after separation of lead chloride, &c., the cuprous chloride remaining in the liquor is converted into cupric chloride by chlorine, or by the electrical process. Iron is precipitated by copper oxychloride, obtained from part of the cuprous chloride by oxidation. Copper and silver are obtained from the purified liquor electrolytically.—E. S.

Copper and Nickel; Process of Extracting —— from Sulphide Compounds. C. Hoepfner, Frankfort-on-the-Maine, Germany. U.S. Pat. 704,640, July 15, 1902. See Eng. Pat. 13,336, 1893; this Journal, 1894, 744.

The sulphide ores or mattes of copper and nickel are roasted, the SO_2 evolved is condensed, and the oxidised mass is lixiviated. The cupric sulphate contained in the solution is converted into cupric chloride by means of an alkali chloride, and the cupric chloride is reduced to cuprous chloride by sulphurous acid, and by heating the solution with incompletely roasted ore, still containing copper and nickel sulphides. The cuprous chloride separates on cooling, and the solution may be repeatedly used in lixiviating the roasted ores, the copper being separated as described each time, until the liquor is sufficiently enriched in nickel, which, after removal of sodium sulphate by crystallisation, is precipitated as oxide by lime. The cuprous chloride resulting from the process may be used to obtain copper by electrolysis.—E. S.

Zinc or other Metals; Process of Extracting —— from their Ores. C. Hoepfner, Frankfort-on-the-Maine, Germany. U.S. Pat. 704,641, July 15, 1902. See Eng. Pats. 11,724, 1894; 5662, 7560, and 8449, 1895; and 24,573, 1896; this Journal, 1895, 581; 1896, 198, 356, and 450; and 1897, 1015.

Ores or materials containing oxygen compounds of zinc, copper, cadmium, and nickel, or of zinc only, are treated with water and sulphur dioxide gas, and sufficient sodium chloride is added to form a concentrated solution at a temperature above normal; sodium sulphite or bisulphite then separates, leaving zinc (or other metal) chloride in solution, which is freed from remaining sulphite by a suitable precipitant; lime is then added to precipitate the zinc as oxide, and the resulting calcium chloride solution is returned into the cycle of operations; or it may be used to react with the sodium sulphite, obtained as described, to reproduce sodium chloride. The ore residue, on to which the sodium sulphite is precipitated, is smelted to recover the metals present.—E. S.

Copper; Method of Reducing Copper Matte to Refined ——. G. Mitchell, Naco, Arizona, U.S.A. U.S. Pat. 705,109, July 22, 1902. See Eng. Pat. 1682, 1902; this Journal, 1902, 775.

Air is blown through molten copper matte in a converter, until the iron in the charge passes into the slag, which is then removed, and the charge is reblown to produce a small proportion of copper suboxide, such as may be sufficient in the subsequent process to oxidise and remove the impurities. The molten contents of the converter are then removed to a reverberatory furnace, to be subjected to poling, and are finally cast into pigs or anodes. It is preferred to charge the contents of two or more converters into the reverberatory furnace, and to add an additional converter charge, so blown as to contain such a proportion of copper suboxide as may bring the total charge into the desired condition.—E. S.

Cleaning and Preserving Metals; Composition for ——. W. C. Oberwalder. U.S. Pat. 705,956, July 29, 1902.

See under XII., *page* 1081.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

English Patents.

Storage Batteries; Electrical ——. [*Electrodes.*] H. K. P. Barham, Portsmouth. Eng. Pat. 13,984, July 9, 1901.

Both the negative and positive electrodes are folded within a double tray, and an absorbent substance is interposed between them to divide the active material.
—G. H. R.

Electrical Storage Batteries, or Accumulators; and Electrolytes for Electric Batteries. [*Dry or Semi-dry-Electrolyte.*] P. Stiens and P. J. Smith, London. Eng. Pat. 14,466, July 16, 1901.

The frames constituting the electrodes are covered or filled with a mixture of metallic oxides, to which is added a certain proportion of sulphides or sulphates. About 55 per cent. of peroxide of lead or of copper oxide, or other suitable metallic oxide, is mixed with 30 per cent. of litharge and 15 per cent. of sulphate or sulphide of zinc, and the compound is exposed to heat, and at the same time a current of electricity is passed through it, the direction of which is reversed at intervals, an acid being afterwards added and mixed with the mass to form a paste. Or pulverised vegetable materials, prepared by first washing them in dilute sulphuric acid and then drying and partially carbonising them, are thoroughly mixed with 30 per cent. of peroxide of lead or copper oxide, a current of high tension being flashed intermittently through the mixture during the process of heating, after which it is dried and more acid added, and the compound is thoroughly mixed and heated till dry or in a semi-dry or pasty condition. The vegetable materials may be used in a completely carbonised state and mixed with dilute sulphuric acid and heated till dry, when about 10 per cent. of oxide of zinc or protoxide of lead is added, and the mixture treated as in the first example. Animal matters may be employed instead of the vegetable materials, which may also be used without the addition of metallic oxides. The conducting plates or rods are formed of carbon coated mechanically or electrically with metal or other conducting material, or other metal-coated materials may be used.—G. H. R.

Electrodes for Galvanic Batteries; Manufacture of ——. R. Pörscke, Hamburg. Eng. Pat. 16,677, Aug. 20, 1901.

Conducting and porous electrodes, rich in oxygen, are made by filling a grid or frame constructed of angular strips of sheet metal riveted to vertical bars, with a paste formed of a pulverised depolariser mixed with a suitable binding agent, and united to the frame by heating to 120° C., and afterwards to redness in an open fire.—G. H. R.

Electrodes for Electric Accumulators; Method for Producing ——. E. W. Jungner, Kneippbaden, Sweden. Eng. Pat. 1684, Jan. 21, 1902. (Under Internat. Conv., Jan. 22, 1901.)

The surface area of mass supports, which are chemically indifferent in an alkaline solution, is increased by mixing the latter, in which the metal body with roughened surface to be treated is placed as anode, with a salt the acid radicle of which forms a soluble salt with the metallic body, and imparts to it increased capacity as a carrier of active material. Or the metal body may be placed with a smooth surface as anode in the alkaline solution, the points of attack for the electrolytic current being either produced by providing the cathode with points and an indifferent, electrically non-conducting coating which leaves them exposed, or by giving the anode a perforated coating, the perforations of which expose the metal surface in order to produce points of attack.—G. H. R.

Insulating Compounds, and Method of Manufacturing the same. L. Randolph, Newark, New Jersey, U.S.A. Eng. Pat. 9511, April 24, 1902.

See U.S. Pats. 698,856; 699,713; and 701,392; this Journal, 1902, 782, 916, and 918.—W. C. H.

United States Patents.

Battery; Secondary ——. [*Antimonious Lead Grid.*] J. B. Entz, Assignor to the Electric Storage Battery Company, both of Philadelphia. U.S. Pat. 704,739, July 15, 1902.

The grid, which is made of antimonial lead, is punctured and bent, or bent without being punctured, to form tangs or keys for holding the active material, or material to become active, of a storage battery plate.—G. H. R.

Battery; Secondary ——. [*Crystalline Lead.*] E. C. Steinmetz, Assignor to the Electric Storage Company, both of Philadelphia. U.S. Pat. 704,767, July 15, 1902.

An amorphous body of a lead compound, preferably chloride of lead, is made and subjected as a cathode to electrolytic action in a bath in which it is soluble, thereby changing its structure into a coherent mass of crystalline lead, free from blow-holes.—G. H. R.

Electric (Bichromate) Battery. [*Copper Cathode.*] M. W. Robinson, Massachusetts. U.S. Pat. 705,143, July 22, 1902.

Perforated nickel-plated copper cathodes, secured together by a binding screw, are alternated with zinc plates, also connected with a screw, and non-conducting buffers hold apart the electrodes which are immersed in a bath of sodium bichromate and sulphuric acid.—G. H. R.

Plates of the Planté Type; Manufacture of Secondary Battery ——. H. M. Martin, Assignor to the Electric Storage Battery Company, both of Philadelphia. U.S. Pat. 704,751, July 15, 1902.

The improvement claimed consists in controlling the temperature of the electrolyte during formation of the plate, and maintaining it below 115° F. by abstracting heat from it.—G. H. R.

Carbon Electrodes; Manufacture of ——. C. M. Hall, Niagara Falls. U.S. Pat. 705,076, July 22, 1902.

See Eng. Pat. 12,681, 1902; this Journal, 1902, 1031.
—G. H. R.

(B.)—ELECTRO-METALLURGY.

English Patent.

Metals and Alloys; An Improved Process for the Electrolytic Deposition of ——. [*Electrolyte.*] P. Mari, Q. Marino, G. Marino, and A. Ratchkowsky, Paris. Eng. Pat. 15,427, July 30, 1901.

Two methods are given for preparing electrolytes for the deposition of metals such as aluminium, glucinium, antimony, chromium, palladium, lead, vanadium, zinc, gold, silver, copper, nickel, cobalt, manganese, and iron. In the first method, to a solution (A) of a salt of the metal to be deposited, soda or potash is added, and the hydrate precipitated, which is then dissolved in an excess of the alkali employed. A second solution (B) is made by adding a solution of chloride or of nitrate of barium to one of the alkali phosphate or pyrophosphate, when a white precipitate of phosphate or of pyrophosphate of barium is produced, which is dissolved in hydrochloric acid. The two solutions (A) and (B) are then mixed and heated to boiling; on cooling, hydrate of barium is deposited, and eliminated in any appropriate manner, and the solution, after having been rendered alkaline, preferably by means of carbonate of potash, is ready for use as an electrolyte. In the second method, the phosphate or pyrophosphate of the metal to be deposited is rendered soluble by boiling it with 10 times its weight of water, and four times its weight of

carbonate of potash or of soda. To this solution is added one of nitrate or chloride of barium, which produces a precipitate of phosphate or pyrophosphate of barium, which is dissolved by the addition of hydrochloric acid. This solution is heated to boiling, and then mixed with one of potash or of soda heated to the same temperature as the first. On cooling, hydrate of barium is deposited, and on being separated, the filtrate is ready to serve as an electrolyte. To effect the deposition of alloys, an electrolyte is composed of a mixture of various metals prepared in accordance with either of the methods described.—G. H. R.

United States Patents.

Metals [Cast-iron and Steel] from their Ores, &c.; Reduction of —— in Electrically-heated Furnaces. R. C. Contardo, Sevres, France. U.S. Pat. 705,651, July 29, 1902.

The lower end of a descending column of ore is heated solely by radiation and convection from a voltaic arc, whereby a temperature is obtained sufficiently high to fuse ores more refractory than iron ore, and a current of heated reducing-gas containing a carburising agent is simultaneously caused to flow upwards through the column of ore, so that approximately the exact amount of carbon desired may be combined with the iron.—G. H. R.

Tin; Process of Recovering Metallic ——. D. H. Browne, Cleveland, and J. M. Neil, Toronto. U.S. Pat. 704,675, July 15, 1902.

The material containing tin is treated with an acidulated solution of ferric chloride, thereby forming a solution of chloride of tin and ferrous chloride, which is led successively past a suitable cathode to electro-deposit the tin and an insoluble anode to regenerate the ferric chloride solution, the latter being then returned to the tin-bearing material.
—G. H. R.

Copper, Bronze, or like Surfaces; Iridescent Coating of ——. D. Sinclair, Coalbrookdale, Salop. U.S. Pat. 705,456, July 22, 1902.

See Eng. Pat. 10,977, 1900; this Journal, 1901, 727.
—G. H. R.

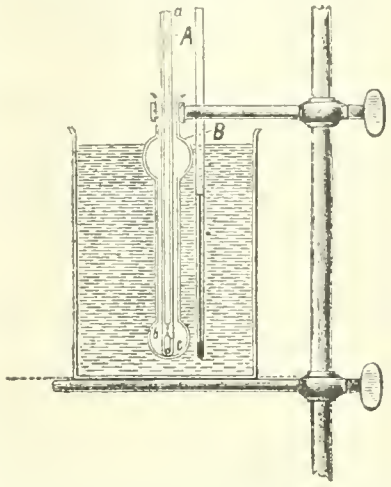
Smelting Furnace; Electric ——. F. C. Weber, Chicago. U.S. Pat. 704,993, July 15, 1902.

An elongated furnace-chamber has several superposed series of electrodes projecting laterally into it from opposite sides and at different planes of inclination, "with an arcing space between the companion electrodes of each series for the superposed arcing space to form a continued smelting and arcing space extending vertically downwards." Means are provided for regulating and graduating the voltage or temperature of each separate series of electrodes, and a feed-spout projects downwards into the furnace-chamber and to the smelting space. There is a feed or discharge arrangement for the material from above into the vertically extended smelting space below, and the chamber has openings for the escape of gases evolved, so that such hot gases may in their passage impart heat to the delivery or feed spout.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Oils, Lubricating; Determination of the Viscosity of ——. A. Zega. Chem.-Zeit., 1902, **26**, [63], 734.

The simple apparatus here illustrated was devised by the author for the determination of the viscosity of oils of which only a small quantity was available. It consisted of a glass tube, A, about 25 cm. in length and 0·4 cm. wide, with a constriction of about 5 mm. in length at *b*, and a side opening at the bottom, *c*. It was surrounded by a tube, B, 9 cm. long and 1·2 cm. in diameter, with a bulb at the bottom and below the top, the whole being immersed in a beaker of water with a thermometer alongside. In making a determination, the tube, B, was filled with the oil up to the upper bulb, and the tube, A, closed with a rubber tube and clip and placed in B. At the right temperature (50° C.) the apparatus was allowed to stand for five minutes, and the tube A then opened for exactly two minutes and again closed. The distance from *a* to the outer oil meniscus, and afterwards from *a* to the inner meniscus, was measured with a centimetre rule, and it was found by practical results that



the difference between the two figures multiplied by two gave the viscosity as determined in Engler's apparatus. The measurements in duplicate determinations agreed within 0·5 mm.—C. A. M.

Cod Liver Oil; Kremel's Test for ——. Bedall.

See under XXIII., *page* 1099.

Soap Nuts. Rev. des Cultures Coloniales, **10**, 282.

See under XX., *page* 1094.

English Patents.

Oil-yieldable or Oil-containing Material; Process of Drying ——. H. J. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 13,455, June 13, 1902.

The material is partially dried *in vacuo* below 300° F., then mixed with an absorbent substance such as sawdust, and the mixture again heated under the same conditions as before.
—C. A. M.

Lubricants used in connection with the Motive Power Fluid in Cylinders and the like; Method of and Apparatus for Recording the Quantity, Quality, and Efficacy of ——. P. C. E. Goetze, C. F. Sauders, J. A. Sanders, and E. A. Buchmann, Hamburg. Eng. Pat. 14,174, July 11, 1901.

During the working of the machine a jet of steam or other fluid from the power cylinder is made to impinge upon a surface (*e.g.*, of paper) moving across the jet and synchronising with the movements of the piston. The oil carried by the steam leaves a deposit upon this surface and from its colour and intensity an estimate can be formed of the relative quantity and distribution of the lubricant within the jet.—C. A. M.

Boiling Fat, Sugar, &c.; Superheated Steam Pan for ——. A. J. Howfield and G. V. Colliver. Eng. Pat. 14,846, July 22, 1901.

See under XVI., *page* 1085.

Washing and Disinfecting Powder. J. B. Mumford and P. R. Newlands, Eng. Pat. 20,884, Oct. 18, 1901.

See under XVIII. C., *page* 1092.

UNITED STATES PATENTS.

Cotton-seed; Process of Extracting Oil from ——. J. McFarlane and D. C. Reinohl, Washington, U.S.A. U.S. Pat. 695,474, March 18, 1902.

THE cotton-seed is hulled by being treated with a solution of alkali and "saccharine matter in which, some fermentation having taken place, corrosive agents have been developed" until the kernels separate. The kernels are then crushed, and the oil extracted and purified by treatment with alkali and sodium chloride.—C. A. M.

Cotton-seed; Process of Hulling ——. J. McFarlane and D. C. Reinohl, Washington, U.S.A. U.S. Pat. 695,475, March 18, 1902.

THE method of hulling cotton-seed (see preceding abstract) is claimed in detail. The saccharine matter, preferably black molasses, has undergone some degree of fermentation, or has been treated with "foreign agents" so as to develop "corrosive agents."—C. A. M.

Cotton-seed; Process of Hulling ——. J. McFarlane, Assignor of one-half to D. C. Reinohl, Washington, U.S.A. U.S. Pat. 695,476, March 18, 1902.

THE seeds are treated with a solution of alkali, but without the saccharine matter claimed in the two preceding patents. —C. A. M.

Cotton-seed Oil; Producing ——. C. O. Phillips, New York, Assignor to The American Cotton Oil Co., New York, U.S.A. U.S. Pat. 705,785, July 29, 1902.

THE cotton-seed is crushed, heated, mixed or sprayed with alkali, and expressed.—C. A. M.

Oil; Process of Extracting ——. La Fayette Denton Vorce, Chicago, U.S.A. U.S. Pat. 704,989, July 15, 1902.

THE material is treated with a volatile solvent in a closed vessel and the solution of oil withdrawn into a volatilising chamber. Steam is then passed into the residual material to separate the remaining solvent, and then conducted, together with the vapour, into the volatilising chamber, where their heat is utilised in the separation of the solvent from the oil.—C. A. M.

Oils; Apparatus for Separating Solvent from ——. La Fayette Denton Vorce, Chicago, U.S.A. U.S. Pat. 704,990, July 15, 1902.

THE steam and vaporised solvent passing from the extraction percolators are sprayed upon condensing coils and condensed. It is stated that in the type of apparatus claimed, heat wasted in other apparatus is utilised in the separation of solvent from the extracted oil. (See preceding abstract.)—C. A. M.

Rendering Apparatus. D. Cameron, Kansas City, U.S.A., Assignor to Cudahy Packing Co., Chicago, U.S.A. U.S. Pat. 705,033, July 22, 1902.

MEANS are provided for heating and sub-dividing the material, then subjecting it to pressure in a closed separator, drawing off the oil through tubes, and drying the residue. —C. A. M.

Grease; Process of Extracting ——. D. Cameron, Kansas, U.S.A., Assignor to Cudahy Packing Co., Chicago, U.S.A. U.S. Pat. 705,034, July 22, 1902.

THE process is similar to that described in U.S. Pat. 705,033, but after treatment in the closed separator, the products are agitated, and the lighter oil is allowed to rise, and is then withdrawn, without adding water to the materials. (See preceding abstract.)—C. A. M.

Deodorising [Corn Meal, Cotton-seed Meal, &c.]; Process of ——. F. M. Pratt, Decatur, U.S.A. U.S. Pat. 705,787, July 29, 1902.

THE substance, *e.g.*, maize or cotton-seed meal, after the oil has been extracted, is first conveyed through a hot chamber, out of contact with steam, and then subjected to the direct action of live steam—C. A. M.

Soap Cutting and Spreading Machine. T. Gaynor, jun., Assignor of four-fifths to R. G. Harseim and S. M. Gusdorf, Indianapolis, U.S.A. U.S. Pat. 705,067, July 22, 1902.

THE slabs of soap made to travel continuously over a stationary platform come into contact with vertical and horizontal wires or cutters, whilst a rack moving from under the platform receives the cakes as cut.—C. A. M.

Glycerin; Apparatus for Refining ——. H. B. Schmidt, Cincinnati, and O. T. Joslin, New York, U.S.A. U.S. Pat. 705,712, July 29, 1902.

A HOLLOW drum revolves in an outer vessel containing a shallow layer of the glycerin solution. A heating material, preferably oil, circulates through this drum from heating coils arranged in the wall of a furnace. As the drum revolves, it carries up a thin film of liquid and at the same time heats it to the distillation temperature, whilst a current of superheated steam conveys the vapour to the lowest section of a separator. The glycerin is gradually deposited in the successive chambers of the separator until eventually only steam escapes from a condenser at the top.—C. A. M.

Removing Paint or Varnish; Composition for ——. F. Priestman, Burlington, Iowa, U.S.A. U.S. Pat. 705,139 July 22, 1902.

A MIXTURE of sodium carbonate and ammonia solution with fusel oil and kerosene.—E. S.

Cleaning and Preserving Metals; Composition for —— W. C. Oberwalder, New York, U.S.A. U.S. Pat 705,956, July 29, 1902.

A MIXTURE of infusorial earth or similar material, sodium sulphate, borax, pulverised camphor, magnesium carbonate and soap or the like, in proportions approximately specified —C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

UNITED STATES PATENTS.

Paint. W. Lennard-Foote, Brooklyn, New York, U.S.A. U.S. Pat. 705,938, July 29, 1902.

A MIXTURE is made of 1 part of talc, 2 parts of kaolin, 3 parts of silex, 2 parts of corundum, $\frac{3}{4}$ part of dissolved rubber, 4 parts of zinc oxide, $1\frac{1}{2}$ part of hydrofluoric acid (diluted with 8 parts of water), $\frac{1}{2}$ part of saturated aqueous solution of alum, and sufficient of a mixture of equal parts of sodium and potassium silicates to produce a suitable consistency. This paint is said to be water-proof, fire-proof and acid-proof.—M. J. S.

Lampblack: Process of Producing ——. D. J. Ogilvy, Cincinnati, Ohio, U.S.A. U.S. Pat. 706,001, July 2[illegible] 1902.

THE smoky flame from any suitable combustible substance is caused to impinge upon the surface of water in motion or upon the wetted surface of any porous material. Solutions which wet the tarry carbon more readily than pure water may be employed with advantage.—M. J. S.

(*B.*)—RESINS, VARNISHES.

UNITED STATES PATENT.

Varnishing; Process of ——. G. Tüschel, Odessa. U.S. Pat. 705,723, July 29, 1902.

ONE thousand parts of white lead, 125 parts of white Russian glue, 1 or 2 parts of soluble Aniline Yellow, and 1,500 parts of water are boiled together, and the mixture is applied hot.—M. J. S.

(C.)—INDIA-RUBBER, &c.

India-Rubber; Regenerated ——. F. Frank and E. Marckwald. Gummi-Zeit., 1902, **16**, [13], 817—820. (See this Journal, 1902, 712.)

The treatment of vulcanised rubber with alkali only removes the sulphur which has escaped actual combination, consequently the product only admits of partial revulcanisation, and most commercial samples contain 8—10 per cent. of added mineral oil removable by various solvents. Weber has shown, however, (1) that the physical condition of the material before vulcanisation determines the properties of the resulting product, and (2) that successful revulcanisation depends not on the removal more or less completely of sulphur, but on the production of a plastic mass. The procedure indicated, therefore, is to extract with alkali and wash, and then to incorporate with a neutral oil or other suitable material, aided by heat, so as to obtain, as nearly as possible, a colloidal solution. Rubber regenerated in this way is a more suitable material for mixing with new rubber than the mineral substances or oils commonly employed.—R. L. J.

English Patent.

Plastic Compounds. A. Luft, Lemberg, Austria Hungary. Eng. Pat. 10,218, May 3, 1902.

Phenol, its homologues or substitution derivatives (100 parts), an aldehyde, *e.g.*, formaldehyde (100 parts of 40 per cent. solution), and an acid, *e.g.*, sulphuric acid (70—80 parts of 16—17 per cent. solution), are heated together, until spontaneous heating occurs and the white viscous mass resulting thereby is separated, washed, and dried. This material is not attacked by hot acids or alkalis, may be dyed or finished in various ways, and becomes transparent if treated with alkali in the fresh state, washed, and then dissolved in formalin or glycerin. The addition of glycerin, alcohol, or of camphor or rubber in solution makes the mass still more plastic, whilst variations in the original proportions of the mixture or pressing the viscous mass in warm moulds makes it hard and elastic.—R. L. J.

United States Patent.

Gutta-Percha; Process of Purifying ——. A. Combanaire and J. de la Fresnaye, Paris. U.S. Pat. 704,677, July 15, 1902.

Gutta-percha is freed from resin by treating it, in a powdered condition, with a solvent such as petroleum or one of its derivatives at a temperature of about 35° C., until the resin is extracted, but the solvent still remains colourless. —F. H. L.

V.—TANNING; LEATHER, GLUE, SIZE.

Tannin; Absorption of ——, *by Filter Paper.* H. R. Procter and F. A. Blockey.

See under XXIII., *page* 1100.

English Patent.

Skin and Pebbled Leather; Manufacture of ——. M. Pianko, Woodhaven, New York State, U.S.A. Eng. Pat. 9304, April 22, 1902.

The outer "buffing" or "grain" split of a hide is cemented to a flesh split, leaving the middle split available for other purposes. To produce a pebbled effect, scraps of leather are cemented to the flesh split, in a definite or indefinite pattern, before the grain split is applied, and the whole is pressed and boarded. Any suitable textile may be used in place of the grain split, and the whole finished as when no leather is employed.—R. L. J.

XV.—MANURES, Etc.

English Patent.

Manure; Manufacture of Artificial ——. G. E. Dolle, Bremen, Germany. Eng. Pat. 10,461, May 6, 1902.

A dilute solution of iron chloride is stirred into a solution of sodium pyrophosphate or phosphate, and the resulting precipitate is filtered off, dried, and, if desired, freed from excess of sodium chloride by means of aqueous alcohol in which it is insoluble as long as traces of common salt are present. The neutral iron phosphate formed has the composition $Fe_4(P_2O_7)_3$, $9H_2O$, and dissolves slowly but entirely in water.—R. L. J.

United States Patent.

Fertiliser and Method of Making same. G. H. Smith, New York, U.S.A. U.S. Pat. 705,462, July 22, 1902.

A mixture of night-soil, phenol, calcium carbonate, and aluminium silicate, in stated proportions, is dried by air-exposure and powdered. The presence of the phenol (about 8 per cent. of the mass) is stated to be effective against the ravages of insects when the fertiliser is seasonably employed.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

d-Arabinose, d-Arabonic Acid, and the Quantitative Determination of Arabinose. C. Neuberg and J. Wohlgemuth.

See under XXIV., *page* 1103.

Ketoses; Isolation of ——. *II.* C. Neuberg.

See under XXIV., *page* 1103.

Starch Syrups; Composition and Analysis of ——. M. Hönig.

See under XXIII., *page* 1100.

Dextrins; Examination and Analysis of Commercial ——. F. Lippmann.

See under XXIII., *page* 1101.

Cores for Castings; Preparation of ——, *from Potatoes and Sand.* H. Königsdorf.

See under X., *page* 1080.

English Patent.

Boiling Fat, Sugar, and sundry other Materials; Superheated Steam Pan for ——. A. J. Howfield, Merthyr Tydfil, and G. V. Colliver, Bristol. Eng. Pat. 14,846, July 22, 1901.

A jacketed steam boiling pan, in which the steam is passed first through the heating coil of the pan and then through the jacketing space.—R. A.

French Patents.

Sugar in Lumps of any desired Dimension and Form; Apparatus for Manufacturing ——. G. Fereira. Fr. Pat. 316,756, Dec. 10, 1901.

A flat box mould fitted at the bottom with a loose sheet-iron plate on which the sugar is cast. The box is provided with a lid having a series of parallel slots; and a cutting blade which when pressed down through the slots successively, divides the sugar into strips. The lid being then rotated through 90°, a second series of cuts as before will divide the sugar into blocks.—H. T. P.

Sugar; Process for Refining Raw ——. J. V. P. Lagrange. Fr. Pat. 317,128. Dec. 28, 1901.

One portion (70—80 per cent.) of the raw sugar to be refined is dissolved, clarified, filtered, and boiled to grain (boiling point in air, 110° C., density 1·40) in the usual way; and is then mixed with the remainder (30—20 per cent.) in a special crystalliser. The latter is in the form of a trough, which can be tilted, fitted with a rotatory, helical stirrer, and provided with a double bottom for the admission of steam for heating purposes. The temperature being kept at 80—95° C., an abundant crystallisation takes place; and when sufficiently advanced, the mass is run out into settling tanks, where it is allowed to solidify. It is then conveyed to the centrifugals, cleared by steam, moulded,

dried, &c., in the usual manner. In this way 88 per cent. of the raw sugar is obtained as the refined article, together with 17 per cent. of syrup. This syrup, together with other by-products, may be again concentrated to a somewhat higher degree (1·46 density) and treated in the crystalliser with about 50 per cent. of raw sugar, as before described. —H. T. P.

Acetone from Saccharine Substances; Manufacturing ——. G. Pereire and G. P. Guiguard. Fr. Pat. 316,061, 1901.

See under XX., *page* 1096.

United States Patents.

Sugar; Apparatus for the Manufacture of ——. J. A. Morrell, Lansdale, Pennsylvania. U.S. Pat. 703,439, July 1, 1902.

A combined plant for manufacturing sugar from the raw cane juice, without the aid of chemicals, and comprising an inclined sieve for removing the coarser particles from the juice, and a wire cloth basket, connected to wires forming part of an electrical circuit, through which the juice percolates into a receiving vessel, and is thence pumped up and forced through and into a terra-cotta filter-pan. From this it is syphoned into a tank and then passes through a heater, fashioned something like a Liebig condenser, the juice entering the inner, and steam the outer tube. On emerging from the heater, the juice is forced by a hot-air jet through a spraying tube arranged inside a cone-shaped hopper, and falls thence through a second wire basket (electrically connected) into a settling tank. The clear portion is then forced through a filter (U.S. Pat. 513,551, 1894, or 242,216, 1881) into a heating tank provided with a steam-coil and thence into a tubular heater resembling the one already described. The hot defecated juice is then atomised by a blast of hot air (300° F.) and blown in this condition through a spiral tube, placed in the furnace stack and maintained at 800°—1,000° F. In its rapid passage through this coil, the atomised juice is concentrated, and on emerging is received under a conical hood which arrests the concentrated syrup, but allows the air and water vapour to escape.—H. T. P.

Sugar Boiling; Process of ——. C. Steffen, Vienna. U.S. Pat. 703,496, July 1, 1902.

In order to bring about a more perfect circulation of the mass, in boiling to "grain," one or more wide, open stand pipes are arranged in the vacuum-pan, the lower ends of the pipes approaching fairly near to the bottom of the pan, the upper end reaching to the surface, or even above it. Steam (or air) at just sufficient pressure being introduced near the bottom of the pipes, large bubbles are formed, which, ascending in the pipes, force up the liquid in a very thorough manner.—H. T. P.

(Sugar) Centrifugal Machine. A. Holland, Magdeburg, Germany. U.S. Pat. 703,728, July 1, 1902.

A device for collecting separately the molasses of different densities obtained at consecutive stages of the centrifuging process. The centrifugal machine comprises a casing having a suitably supported base-plate that is provided with discharge-openings, a rotatable drum mounted in said casing, and an adjustable collecting-plate for guiding the flow of molasses to one or other of said discharge-openings. —H. T. P.

Sugar Juices; Process of Purifying. H. Gouthiere, Paris. Assignor to G. E. Junius, London. U.S. Pat. 704,027, July 8, 1902.

Concentrated ferric fluoride solution is added to the diffusion juice at 40° C., then a little milk of lime added, the juice heated to 70—80° C, and the precipitate filtered off. The slight excess of lime in the filtrate is then thrown down by the addition of acid calcium phosphate or phosphoric acid, after which the juice is heated to 80—90° C. and again filtered. By this process a higher degree of purification is claimed to be obtained than by double or treble carbonating, and in much less time; whilst a portion of the apparatus, ordinarily used, may be suppressed. —H. T. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast Invertase; Further Experiments on ——. T. Bokorny. Chem.-Zeit., 1902, **26**, [61], 701—703. (See also this Journal, 1901, 824.)

In order to test the most favourable concentration of sug for the invertive action of yeast, a series of five experimen was conducted. Pressed yeast was digested in sugar sol tions of different concentrations for 15 minutes at temperature of 45° C. and the cupric reducing power w then determined. In three experiments fresh pressed yea in presence of toluene was employed: with a 10 per cen solution of sugar, 77·9 per cent. was inverted; with a 20 p cent. solution, 69·8 per cent. was inverted; and with 40 per cent. solution, 67·8 per cent. was inverted. With 20 per cent. solution of sugar and fresh pressed yeast wit out toluene, the inversion was 79·2 per cent.; and in t case of an equivalent quantity of dried pressed yeast in 20 per cent. solution of sugar, 82·2 per cent. was inverte on account of the short duration of the experiments, t employment of toluene was unnecessary.

Action of Alcohol on Invertase.—Fresh pressed ye was kept for three days in excess of absolute alcohol at t ordinary temperature; it was then freed from alcohol a its invertive power was determined under the above co ditions (15 minutes at 45° C.) in a 10 per cent. solution sugar. The degree of inversion was found to have be reduced to 52·8 per cent., showing a slightly unfavourab effect of the alcohol on the enzyme; in this and sub quent tests the proportion of yeast dry-substance to sug was about 20 per cent. Another lot of yeast, howev which was kept for the same length of time in absol alcohol at 45° C., was found to have lost its power inversion almost completely, although this temperat alone, without alcohol, is most favourable to the action invertase.

Action of Formaldehyde.—Fresh pressed yeast was k for three days in a 5 per cent. solution of formaldehyde the ordinary temperature. In spite of the strongly poisono nature of this substance, the invertive power of the ye was subsequently found to be quite unaffected. The act of the formaldehyde solution at a temperature of 45° C., the other hand, was found to have completely destroyed invertive power of the yeast.

Action of Acids: Oxalic Acid.—Dry pressed yeast w kept in a 0·25 per cent. solution of oxalic acid for two d and then tested in a 20 per cent. solution of sugar; e extent of inversion was found to be 86·2 per cent., show no diminution of invertive power; similar exposure to a 5 solution of oxalic acid was also found to be harmless the invertase.

Hydrofluoric Acid.—Dry pressed yeast was kept for 2 days in a 0·1 per cent. solution of hydrofluoric acid, wh is known to be a powerful poison towards the living ce On testing the degree of inversion of a 10 per cent. sug solution, it was found to be 71·4 per cent., showing on a slight reduction of invertive power. Similar experime were performed with solutions of 0·25 and 0·5 per cent f hydrofluoric acid, and even these had no considerable eff upon the invertase.

Acetic Acid and Lactic Acid in concentrations o 2 per cent. had no action on the yeast invertase. Hence is concluded that the invertase of yeast is relatively insensi e towards the action of acids.—J. F. B.

Amylomyces-β; Behaviour of —— in Potato Mashes d other Starchy Liquids. W. Henneberg. Zeits. Spiritusi., 1902, **25**, [19, 20, 21, 24, 25, 28, 29], 205, 217, 228, 1 —262, 271, 303—304, 313—317.

The author has investigated the conditions of the growt of this mould fungus, which has been employed to some exte in the saccharification of mashes for the production of alcohol according to Calmette's process. The growth of the fungus is considerably restricted by heating the potato at high pressures, either in the preparation of the mashes or their sterilisation. The fungus grows very well in pota mashes which have not been heated above 100° C., but re

subsequent production of alcohol in this case is not satisfactory, owing to the imperfect modification of the starch without pressure. The author has studied the growth in starch paste media with the addition of various nitrogenous nutrients, also the saccharifying power and the production of alcohol by the fungus itself, and subsequently by the addition of yeast. In these experiments the saccharifying power was by no means so high as the vigorous growth of mycelium might be expected to indicate. The addition of sugar to the culture media always restricted the production of the saccharifying enzyme. The heating of the potato mashes under three or four atmospheres pressure caused such an alteration in their composition that the development of the fungus was considerably restricted; in mashes which had been heated under five or six atmospheres pressure no growth occurred at all. The author found that the restriction of the growth in potato mashes which had been heated above three atmospheres was due to the formation of acid products with a restricting action. Maize mashes even after steaming at 3—4 atmospheres were very favourable media. The subsequent addition of chalk to the highly heated potato mashes enabled them to support the growth of the fungus. Hence it is important to steam and sterilise the potato mashes at as low a temperature as possible; a series of experiments showed that sterilisation could be safely performed by steaming for one hour under one atmosphere pressure.

The submerged mycelium may occur in four different forms, globular, star-shaped, thread-like, and flocculent. It seems to develop less diastatic enzyme in artificial media than in natural; the addition of peptone, however, is very favourable to the diastatic power. In most cases the saccharifying power is not weakened by drying the mycelium. The mycelium, besides its diastatic properties, also possesses some starch-liquefying properties and invertase; in the living state it liquefies gelatin, but loses this power after drying. The mycelium when grown on the surface possesses considerable saccharifying properties. When the mycelium is grown in starch-free media it secretes little diastase, but speedily acquires saccharifying properties when starch is added. Diastase is scarcely perceptible in the filtrates from cultures of the fungus. Acids are very harmful to the growth of this fungus, 0·05 per cent. of sulphuric acid and 0·5 per cent. of lactic acid are powerfully restrictive.

Unfortunately, infection of the cultures by bacteria takes place very readily, and the fungus is extremely sensitive to their action, which is a great drawback to its industrial application.—J. F. B.

Barley; Cause of Large Deficiency of Yield in Malting Heavy ——. A. Grohn. Woch. für Brau., 1902, **19**, [27], 370—371.

The author's experience shows that light, small, but full-formed barleys, with low weight per 1,000 corns and per hectolitre, give higher yields of malt than heavy, large-formed, thin-husked barleys. The malts obtained give just the same yield of wort, and, since the light-weight barleys are generally cheaper, they are far preferable to the heavy ones. The cause of this difference in yield is traced to the greater loss by respiration on the floor in the case of heavy barley, owing to its greater tendency to become warm. Heavy barleys mostly contain a high proportion of nitrogen, and this brings about a more intense respiration, necessitating thinner layers and more frequent turning over to keep the temperature on the floor within the proper limits. Such barleys often cannot be left long enough to "felt," and growth continues not only during the withering process, but subsequently also on the upper floor of the kiln. This activity at higher temperatures involves considerable loss of substance. Another cause of deficient yield in the case of heavy barley lies in the steeping. In small-corned, light barley, the cells of the endosperm are loosely packed, and the steep water penetrates uniformly to the centre, but in heavy barleys the cells are densely packed and, the corns being large, the water does not penetrate to the centre until the outer layers, including the embryo, have become overheated. It is well known that such conditions will lead to intense local respiration, a tendency to get warm and to a greater development of the rootlets, all tending to reduce the yield of malt. A table is given showing that a heavy barley required turning over 20 times during malting, whilst a light barley under similar conditions only required to be turned 14 times, and still kept cooler than the heavy barley. Reduction of the time of steeping the heavy barley resulted in an increase of yield, but the malt was imperfectly modified. Just as heavy barleys are more difficult to steep than light ones, they also part with their water less easily when the green malt has to be dried. Malt made from heavy barley lies sodden on the kiln, and is most difficult to dry even in good weather; and consequently the enzymes remain active for a much longer period at an elevated temperature. Thus, although heavy barleys with large corns are generally more highly prized than light barleys, quite as good a product can be more easily obtained from the latter with higher yields.—J. F. B.

Diastase; The Action of Barley —— on Starch. J. L. Baker. J. Chem. Soc., Aug. 1902, 1177—1185.

When the diastase from ungerminated barley is allowed to act at 50° on a solution of soluble starch, hydrolysis proceeds until at the end of an hour to an hour and a half the constants of the dissolved matter are $[\alpha]_{D3\cdot93} = 160°—165°$ and $R_{3\cdot93} = 60°—65°$. After this the reaction is a comparatively slow one, and if continued for 96 hours the reducing power is only increased to $R_{3\cdot93} = 70$, the iodine reaction being still blue.

An examination of the products, after the reaction had proceeded for 1½ to 2 hours, showed that a dextrin and maltose were the sole products. After 24 hours, evidence of the presence of glucose was obtained, the amount of this sugar apparently increasing in proportion to the time of conversion.

The dextrin, isolated by precipitation with alcohol from the products of the conversion, gave a blue iodine reaction, a specific rotation of $[\alpha]_{D3\cdot93} = 190°—195°$, and a reducing power of $R_{3\cdot93} = 0\cdot55°—1°$. The alcoholic solutions from which the dextrin was precipitated were found to contain maltose, glucose if the conversion period was prolonged, but no trace of any dextrin of less complexity than already described.

Barley diastase acts on the above-mentioned dextrin very slowly, the constants of the solutions after 90 hours at 45°—50° being $[\alpha]_{D3\cdot93} = 160°$ and $R_{3\cdot93} = 32°$. The products, which give a blue iodine reaction, consist of maltose, unaltered dextrin, and glucose. The presence of glucose could be detected in 18 hours, but after 90 hours the amount formed had only slightly increased. The action of malt diastase on this dextrin was more vigorous. After 18 hours at 55° the solution, which no longer gave an iodine reaction, had the constants $[\alpha]_{D3\cdot93} = 149\cdot3°$ and $R_{3\cdot93} = 50°—51°$. An examination of the products showed that they consisted of maltose, a mixture of achroo-dextrins, and a considerable quantity of glucose.

Since barley diastase is without action on maltose, the glucose found in the products from the prolonged action of barley diastase on soluble starch must be derived from the dextrin. Barley diastase completely liquefies starch paste in two to three hours at 50°, the products consisting of the already described dextrin and maltose.

The dextrin obtained by the action of barley diastase on soluble starch or starch paste differs markedly from Nägeli's "amylodextrin," which was reinvestigated by Brown and Morris (Trans. Chem. Soc., 1889, **55**, 449). In consideration of its general behaviour and close relation to the parent substance starch, the author proposes to term the new dextrin *α-amylo-dextrin*.

The most convenient way to prepare it is to allow barley diastase to hydrolyse 3 per cent. starch paste or soluble starch at 50° C. until the solution "breaks." The flocculent precipitate is removed by filtration, and the filtrate evaporated to a thin syrup, poured into boiling 95 per cent. alcohol, and boiled under a reflux condenser for an hour. The alcoholic solution containing the sugars, is decanted off, and the dextrinous residue extracted several times with boiling alcohol. It is then dissolved in cold water and poured into cold 90 per cent. alcohol. It separates as a bulky precipitate, and in the dry state is a snow-white powder.

—A. S.

Malt Diastase; Experiments with ——. A. R. Ling and B. F. Davis. J. Fed. Inst. Brewing, 1902, **8**, [4], 475—500.

The authors have followed the course of the action of malt diastase prepared by Lintner's method and previously heated to various temperatures, both in the dry state and in solution upon starch paste, the hydrolysis being conducted at different temperatures. The results are given in tables. It has been established that the most favourable temperature for the action of malt diastase is 55° C., and that when the diastase is heated in solution above 60° C., its activity is considerably restricted and modified.

Action of Unrestricted Diastase on Starch Paste.—The diastase was prepared from malt which had been dried at a temperature not exceeding 90° F. The reactions were conducted at 55° C. on starch pastes made with potato, maize, and rice starches respectively, samples being withdrawn and examined at intervals. The reactions were followed out to the end, this point being clearly indicated by a slight reversion, especially in the value of the cupric reducing power. The so-called "No. 8 equation" of Brown and Heron is not really a resting stage in the reaction, but only marks a slowing down of the reaction which continues at the slower rate until the end. This slackening point was reached in these experiments after about $1\frac{1}{2}$ hours; the constants then were—

$$[\alpha]_{D\ 3{\cdot}03} = 149{\cdot}5°—150°. \quad R_{3{\cdot}03} = 77—78.$$

The constants of the final products were substantially those of maltose, and no other product than maltose could be detected in the solutions. In the case of most kilned malts the constants of the final products were well below those of maltose; this was not only the case with brewery malts which had been kilned, but also with low-dried malt which had been grown in the laboratory under somewhat abnormal conditions. The nature of the residual product other than maltose in these cases has not been determined, but there certainly was no glucose produced in any of the experiments with unrestricted diastase.

Restricted Diastase.—The action of diastase which has been heated in solution to temperatures from 65° to 70° C. for some time, as indicated by the constants of the solution from time to time, is very much slower and very much less complete than that of unheated diastase. The final point of the reaction is characterised by the reversion mentioned above, and glucose is found among the final products of the reaction. The longer the diastase solution is heated at the above temperatures the greater is the degree of restriction, but the reaction proceeds further if larger quantities of diastase be taken.

In practice, the heating of the malt at high temperatures on the kiln whilst still moist—as in the case of Munich malt—would appear to have a similar effect as regards restriction, but not as regards the production of glucose. The actual temperature of kilning, however, and the value of the diastatic power on Lintner's scale, do not (considered alone) afford an indication of the behaviour of the diastase towards starch.

The heating of the diastase gradually in the practically dry state to temperatures of 240°—248° F. restricted its action upon starch, but the final products contained no glucose, as is the case when the diastase is heated in solution. Heating the diastase rapidly to the same temperature had the same effect in a more marked degree. It would appear that this crippling of the diastase by heating (not in solution) may be due merely to the destruction of some of it, since the use of larger proportions of diastase tended to bring the reaction more on a level with that of unrestricted diastase. It also seems as if the presence of the last traces of moisture in the diastase has a great influence in bringing about this restriction by heating.—J. F. B.

Malt; Determination of Water in ——. J. H. Schulze. Woch. f. Brau., 1902, **19**, [29], 404—405.

In a preceding number (Woch. f. Brau., 1902, [22], 301), J. F. Hoffman describes a new apparatus and process for rapidly determining the moisture in various cereals. It consists in heating the material with a mixture of oils, in a metal still, provided with three openings, two narrow ones for a tap-funnel and a thermometer respectively, and one wide one for the outlet tube, which is connected with a condenser hanging vertically downwards. The outlet tube of the condenser passes into a graduated tube for measuring the volume of the water which distils over. The author has modified the process slightly so as to make it suitable for malt, and the following are the details, which must be rigidly adhered to.

200 c.c. of good lubricating oil, 10 c.c. of turpentine and 10 c.c. of toluene are poured into the still. 100 grms of malt (unground) are then added and well shaken with the oil. The condenser (charged with ice-water in warm weather) and the measuring tube are attached, and 50 c.c. of a mixture of turpentine and toluene in equal volumes placed in the tap-funnel, but not admitted to the still. The thermometer is now introduced into the still, so that the bulb dips into the liquid, and the latter is heated up to 160° C. in eight minutes, and kept at this temperature for exactly 15 minutes. The flame is now taken away, the turpentine and toluene run into the still and the temperature rapidly raised to 175° C. As soon as this temperature has been reached, the flame is extinguished, and the receiver immediately removed when the temperature has fallen to 160° C. The volume of the water is then read off at the line of demarcation between it and the turpentine, and 0·2 c.c. added in the case of pale malts. With high-dried and coloured malts no correction is needed.

Before each determination the apparatus must be washed with turpentine, and if it has been for any length of time unused, the next determination is likely to be inaccurate and should be rejected.—H. T. P.

Attenuation in the Brewery. M. Delbrück. Woch. f. Brau., 1902, **19**, [29],397—400.

The author discusses the various factors which decide the final attenuation of beer in the brewery, and summarises his conclusions as under. The degree of attenuation depends on :—

I. The composition of the wort as regards (*a*) maltose, dextrin, and malto-dextrins; (*b*) nature and amount of the nitrogenous substances. A plentiful supply of nitrogenous food accelerates fermentation, but also favours deposition of the yeast, so that attenuation may actually be diminished; (*c*) nature of the salts present. On this point very little is definitely known; (*d*) separation of indifferent substances which help to throw down the yeast, such as hop-resin gluten.

II. The species of yeast, *e.g.*, Saaz and Frohberg types give low and high attenuation respectively. And again light yeasts which remain long in suspension ferment to a further degree than those which settle out readily.

III. The physiological condition of the yeast. Active yeast is obtained under conditions which favour reproduction, *i.e.*, low pitching rate, aëration, high temperature, whereas slow yeast is obtained under the reverse conditions as regards temperature, aëration, and pitching.

IV. Temperature.—A low pitching temperature checks fermentation and the effect is enhanced by sudden cooling at a later stage. On the other hand, a high starting temperature, not followed by cooling later on, increases attenuation.

V. Generally speaking, a yeast rich in zymase and yielding large crops will attenuate furthest.

VI. The conversion of an active into a slow yeast, and *vice versâ*, takes place gradually and can only be effected by systematic cultivation under suitable conditions.

—H. T. P.

Beer; Sulphur Dioxide in ——. E. Jalowetz. Allge. Zeits. f. Bierbrau., **30**, [29], 381—383; [30], 395—3.

The author considers that sulphured hops, when used in a fresh state, may yield very small quantities of sulphur dioxide to boiling wort, though if the hops have been stored for some time, none of the dioxide (present as sulphite) is extracted. On the other hand, the use of sulphites in the brewery, and the employment of sulphured malt, results in an increase of the sulphur dioxide in the. During the primary fermentation of worts and sm

olutions, an increase in the amount of sulphur dioxide is ecorded, but this disappears again during secondary ermentation; and in some cases there is no increase in rimary fermentation. These facts differ from those eported by Pfeifer.

An attempt was made to determine the proportions free and combined sulphur dioxide in beer; and as ipper has shown that, in the case of wines, the dioxide nters into combination with aldehyde, an endeavour was ade to ascertain the presence of this latter substance in er. This proving successful, the Ripper method of idising the uncombined dioxide (leaving that in combina- on with aldehyde untouched until the solution is made kaline) was applied. The results, however, reveal it as suitable, the figures obtained being in excess of those rnished by the distillation method. This discrepancy is lieved to be due to the presence, in beer, of other bstances (probably tannic acid) which absorb iodine, and as falsify the results. The amount of aldehyde-sulphurous id present in any case is small, and not more than about per cent. of the total sulphur dioxide in the beer.

—C. S.

ne; Mildew and Oïdium of the —— ; Combined Remedies by one Treatment. J. M. Guillon. Comptes Rend., 1902, **135**, [4], 261—262.

the French vineyards the attacks of the vine-mildew *lasmopara viticola*) are combated by the application of ious cupric washes ("bouillies") and those of the oïdium *rysiphe Tuckeri*) by the application of sulphur. As a e these applications are made by two separate treatments, the author has found that a great saving of labour can effected by combining the two remedies and applying m in one operation. In the ordinary way, if sulphur be led to any of the "bouillies" it does not mix, but lies vetted on the surface. But in the case of the Bordeaux -h, the proper amalgamation of the sulphur can be dily effected by mixing it with the lime before pouring it the solution of copper sulphate. Similarly with gundian and other "bouillies," the sulphur should be ed first with the sodium carbonate or other alkali, ough in these cases it is not always so thoroughly wetted; metimes the addition of rosin is an improvement. The er of adherence of the constituents of the washes is erally quite unaffected by the presence of the sulphur. ll cases the sulphur is merely in the state of admixture does not enter into combination with the copper. The hes are ready for spraying as soon as they are made, wherever tried they have answered their double purpose ctually.—J. F. B.

ines; Natural Occurrence of Salicylic Acid in ——. . Windisch. Zeits. Unters. Nahr.- u. Genussm., 1902, [14], 653—662.

A account is given of the controversy at the Brazilian oms house in 1900, and the researches of F. da Silva the natural occurrence of a substance resembling lic acid in Portuguese wines. Since then the matter been investigated by several chemists, notably by M. baum (Chem.-Zeit., 1901, 465); crystals have been ned and identified, and there is now no doubt that the tance really is salicylic acid, resulting possibly from aponification of an ester elaborated in the grapes. In ope of obtaining further quantities of the substance, author has extracted several kilos. of grape skins of us origins of the 1901 crops. In no case, however, e succeed in obtaining any trace of reaction with ferric ide either with or without saponification. The con- on drawn from this result, in confirmation of that of M baum, is that salicylic acid may occur in some years e absent in others in grapes of the same origin. The ity of salicylic acid occurring naturally is far too to have any preservative action, and no difficulty d arise in detecting its addition for this purpose; tainty might arise, however, in the case of blends of ved with unpreserved wines, and in the case of wine l in casks which had previously contained salicylated The recent discovery of the natural occurrence of acid in fruits is an interesting observation of the same —J. F. B.

Wines; Process for the Concentration of ——. Bandoin and Schribaux. Comptes Rend., 1902, **135**, [4], 263—265.

The authors have experimented with methods for concentrating wines by natural means, *i.e.*, the withdrawal of some of the water. Attention was first paid to the method of freezing out, but it was found that the ice, however separated, always contained from 0·5 to 1·5 per cent. of alcohol as well as some of the colouring matters, and that the wines after a few months developed a yellow colour. The process which has been found to be successful consists in distilling the wine *in vacuo* at a low temperature; a systematic freezing treatment then separates the distillate into two parts. The first contains, together with a proportion of water which can be varied at will, the whole of the alcohol, the bouquets and other useful matters worth preserving; this portion is returned to the wine. The second portion consists of the water, which always possesses an acid reaction due to acetic acid, the removal of which considerably improves the quality of sharp wines. An apparatus has been constructed for the continuous treatment of wine on the industrial scale, the wine only remaining in contact with the heated surfaces for a few seconds. Analyses of concentrated wines show that by this method the wine retains the whole of the alcohol, sugar, sodium chloride, potassium sulphate, and natural colouring matter. The volatile acid, ash, and extract are diminished. This diminution is due to the removal of the acetic acid and to the precipitation of some of the tartar by the increased percentage of alcohol. A very slight flavour is imparted by the boiling process, which, however, disappears after a few months. Otherwise the concentrated wines retain all their natural characteristics, and are well suited for blending purposes.—J. F. B.

Alcohol; Production of ——from Yams. Fr. Pat. 314,443; Ann. de la Brass. et de la Dist., 1902, [8], 184; Zeits. Spiritusind., 1902, **25**, [24], 262.

The French Railway Company of Dahomey have taken out a patent for the preservation of yams, a tropical substitute for the potato, and for the utilisation of the tubers in the manufacture of spirit. The fresh yam tubers deteriorate very readily, with loss of starch on the one hand and with putrefactive changes on the other. The process of preservation consists in cutting the tubers into slices at the time of harvesting and drying the slices in the sun until they have become quite hard and dry right through. The product so obtained can be kept for any length of time, and contains only 10—12 per cent. of moisture. When required for fermentation the dried slices are steamed in the potato-steamer and saccharified in the usual way; the spent wash is used as cattle food.—J. F. B.

Molasses Spirit; Manufacture of ——. F. Haug. Zeits. Spiritusind., 1902, **25**, [29], 311—312.

Preparation of Pitching Yeast.—The author prefers to acidify the mash by lactic fermentation rather than by hydrofluoric or mineral acid, the mashing, acidification, and cooling being conducted in one vessel and the fermentation in another. The yeast mash is made with 4 kilos. of kilned malt, 8 kilos. of rye meal, and 30 litres of water per 1,000 litres of wash. The rye meal is first digested at 80° C. and the malt is subsequently added at 65° C. The lactic fermentation is conducted at 52° C. and the seed yeast is added at 20° C. in the usual way, the whole operation occupying 48 hours. The acidity of the ripe pitching yeast is 2·4°—2·6°. If it be desired to acclimatise the pitching yeast to molasses, a grain mash is made as above with 1 kilo. of rye, 0·3 kilo. of malt, and 3·75 litres of water per 1,000 litres of wash. After lactic acidification it is pitched with the seed yeast and molasses wash (100—120 litres) is added in three portions at intervals of eight hours, fermentation being carried on for 24 hours with suitable aëration.

Boiling and Acidification of the Molasses.—The molasses are heated at 50° C. and the necessary quantity of sulphuric acid is then added. The mixture is agitated by means of an air injector; digestion is carried on at a temperature of about 85° C.

Preparation of the Wash.—The heated molasses are pumped off to the mixing tank and diluted with about twice their weight of water; the acidity is adjusted to 0·5° to 0·8°.

Fermentation.—The time generally allowed for fermentation is 72 hours; it can, however, be completed in 48 hours by suitable treatment. The conditions necessary for good and rapid fermentation are mechanical aëration, artificial cooling, and a system of adding the wash in separate portions. The wash is generally added in three separate portions; the first with a density of 24° Balling is mixed in the fermenting vat with the whole of the pitching yeast at 28° C. and fermentation is started with aëration, the other two portions at slightly increasing densities (up to 30° Balling) are added at intervals of six or eight hours. The temperature must never be allowed to rise above 30° C. or 31° C. for the secondary fermentation. Aëration is conducted continuously for the first 24 hours. Cooling pipes which can be adjusted to any desired height in the vat are strongly recommended. Owing to the aëration the froth may rise to the height of 3 ft.; this can be controlled by the use of the oil residues which settle at the bottom of the tanks in oil factories.

Distillation.—The stills should be heated with steam coils, and owing to frothing, plenty of room should be allowed in the wash chamber; the copper of the stills is subject to considerable wastage under the action of the wash.

The Spent Wash is not often directly applicable as a fertiliser, the only thing to be done is to concentrate it and burn it for potash; the falling price of the latter, however, renders this course no longer profitable. Furnaces of the Porion or Gamer type are very suitable with utilisation of the waste heat. Latterly a furnace for soda recovery has been introduced by Knösel of Neustadt, which is highly recommended for this purpose; the spent wash, however, corrodes all metals most seriously.—J. F. B.

French Patent.

Alcohol, Denatured: Process for Manufacturing ——, by Double Fermentation. G. Pereire and G. P. Guignard. Fr. Pat. 316,062, Nov. 19, 1901.

In any suitable saccharine solution an "amylic" fermentation is induced by means of an added culture of the amylic *vibrio*, the process being conducted at 40° C. in presence of an excess of chalk. When sufficiently advanced, the wort is cooled to 24° C. and transferred to another vat, where it is pitched with distillers' yeast and fermentation completed in the usual manner. On distillation a spirit highly charged with amyl and other higher alcohols is obtained, suitable for motive purposes without further addition of denaturing agents.—H. T. P.

United States Patents.

Beer-Coolers; Attachment for ——. O. Schell, New Ulm, Minnesota. U.S. Pat. 703,481, July 1, 1902.

An arrangement for treating the boiled copper wort with fresh hops, just before turning out, so as to secure the full hop aroma. A secondary object is to do away with the hop-back. The apparatus consists of an upright cylindrical vessel, installed close to the refrigerator, provided with an air-tight cover, and fitted internally with an open wire-work cylinder, rather smaller than the outer vessel, to hold the hops. The boiling copper wort is passed through this apparatus, and thence distributed over the "frig." A tube conveying compressed air is provided, to force the last portion of wort out of the cylinder.—H. T. P.

Sparkling Wines; Preparing ——. P. Garrett, Weldon, North Carolina. U.S. Pat. 704,533, July 15, 1902.

The grape-must is fermented in a closed receptacle under pressure of the carbon dioxide given off. It is then drawn off under pressure, through a filter, into a second closed vessel, where the wine is clarified. And here it may be blended with other wines similarly fermented under pressure; or primed, or otherwise treated in bulk, and afterwards bottled under pressure.—H. T. P.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Cocoa Essences. E. G. Clayton. Chem. News, 1902, **86**, [2227], 51.

The author gives the results of the analyses of five sample of "cocoa essences" (cocoas deprived of a part of the fa and otherwise treated):—

	1.	2.	3.	4.	5.
Water	4·62	3·22	3·59	5·33	4·2
Fat	35·11	32·69	30·50	22·30	27·4
Theobromine	1·82	0·93	0·88	0·83	2·6
Caffeine	0·48	0·02	0·42	0·66	0·1
Starch	5·63	6·56	..	5·06	..
Proteids	15·56	14·31	14·19	19·50	12·1
Maltose	..	..	..	1·64	..
Cellulose	5·65	9·29	6·97	5·59	4·21
Cocoa-red, dextrin, tannin, &c.	27·82	25·15	37·35	32·47	42·77
Ash	5·71	7·83	6·10	6·62	6·3
	100·00	100·00	100·00	100·00	100·0
Soluble ash	3·20	7·44	5·67	4·67	3·1
Insoluble ash	2·51	0·62	0·43	1·81	3·1
Alkalinity (as K_2O) of soluble ash.	1·16	2·91	2·21	1·48	0·8
Total phosphoric acid (P_2O_5).	1·91	1·72	1·93	1·92	1·2
Soluble phosphoric acid	..	..	..	..	1·1
Insoluble phosphoric acid.	..	..	..	..	0·1
Silica	..	0·36	..	0·69	..
Iron oxide	..	trace	..	0·32	..
Proteid nitrogen	2·49	2·29	2·27	3·12	1·9
Cold water extract (total).	17·90	17·20	14·56	18·25	..
Cold water extract (organic).	15·10	12·30	10·48	13·29	..
Alkalinity of cold water extract.	2·76	3·39	2·72	2·75	..
Ash of cold water extract.	2·80	4·90	4·08	4·96	..

Numbers 4 and 5 contained minute quantities of foreig starches, so that the starch in the former was nearly—b not quite—all cocoa starch. Some of the caffeine also No. 4 and the maltose were extraneous.—A. S.

Albumin; Aniline Dyestuffs as Precipitants of ——. M. Heidenhain.

See under IV., *page* 1072.

English Patent.

Eggs; Preservation of New-laid ——. E. H. Barlow, London. Eng. Pat. 11,054, May 14, 1902.

The eggs are dipped in spirit varnish of the kind known spirit gum, and then allowed to dry.—W. P. S.

United States Patents.

Stock Food [containing Molasses], and Process for Mak same. S. L. Fraser, Chicago, U.S.A. U.S. Pat. 704,5 July 15, 1902.

The process consists in mixing molasses heated to 180° 230° F., with a finely-divided dry base such as corn, o bran, linseed meal, and the like, and drying the product a low temperature.—W. P. S.

Coating-Tray [Desiccation of Eggs]. P. B. Tay Newark, New Jersey, U.S.A., Assignor to the Pure Fd Company. U.S. Pat. 704,592, July 15, 1902.

The apparatus claimed consists of a revolving drying-dr combined with a coating-tray, the latter consisting o bottom and three enclosing sides, and open towards e drying surface of the drum. A close contact is ma between the tray and drum by means of flexible str The tray is provided with arrangements for adjusting e distance between it and the drum, so that close con may always be obtained.—W. P. S.

Milk-Albumin; Process for Producing Oxidised ——. I. Oppermann, Berlin. U.S. Pat. 704,662, July 15, 1902.

ASEIN is mixed with about 50 per cent. of water, and then eated with 4 to 8 per cent. of magnesium peroxide. The sulting paste, either alone, diluted with water, or mixed ith 5 to 10 per cent. of glycerin and 1 to 2 per cent. of elted cocoa-butter, is applied as a preservative coating to ticles of food.—W. P. S.

'eat; Apparatus for Curing ——. J. C. Lincoln, Cleveland, Ohio, U.S.A., Assignor to B. B. Quinn. U.S. Pat. 705,367, July 22, 1902.

IE joints are placed in an open wooden tank filled with ine, the latter being caused to circulate from end to end the tank, and through an external pipe by means of a mp. While in the brine, the joints are subjected to a rrent of electricity, carbon electrodes in porous cups ing placed at each end of the tank. The positive poles e covered by a gas-tight box, open at its lower side, ich dips into the brine. The chlorine evolved at the said les is collected in this box and removed by a blower.

—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

r in a Room of the Museum and Art Gallery, Birmingham [Influence of Illuminant]; Examination of the ——. Report by P. F. Frankland.

E author made a series of analyses of the air, with a view ascertaining whether artificial illumination by electric lamps, or by incandescent gas lamps respectively, is ferable from the point of view of possible damage to tures. The experiments showed that in the absence of artificial illumination, there was a slight increase in the centage of carbon dioxide in the air of the room during course of the day. With the arc lamp illumination, increase in the percentage of carbon dioxide was inctly more marked. With the incandescent gas illuation, on the other hand, there was a distinct diminution he percentage of carbon dioxide in the air. The fact t the percentage of carbon dioxide diminishes during use of incandescent gas burners shows that the prots of combustion from which damage to the pictures ht be apprehended are completely carried off by the tilation, and therefore the incandescent gas illumination o be preferred to the arc lamps, since the latter are ch less effective in promoting ventilation, and although do not give rise to sulphur compounds, they do generozone and oxides of nitrogen, which are calculated to prejudicially on pictures.—A. S.

des Waste; Bacterial Treatment of ——. W. Naylor. Proc. Inst. Civil Eng., 1901–2, **148**, [2].

author was induced to pay special attention to this ect for two reasons: *first*, the oft-recurring statement the sewage of a particular place was difficult to treat use of the admission to the sewers of trades waste; and, *ndly*, the unexpected behaviour of samples of trades e kept in unstoppered bottles. As regards the first t, whilst the cost of sewage treatment is undoubtedly eased by the influx of trades waste, it has very rarely ened that difficulty has occurred in treating such ge by the ordinary methods; and in an experience ding such waste liquors as galvaniser's pickle, tannery e, alkali waste, brewery waste, woollen waste, and h waste, the author knows of only two cases where real ulty has arisen.

lvaniser's pickle is often used as a sewage precipitant. It only necessary to neutralise the free acid with lime, the effluent becomes normal. Alkali waste, when ed with ferric salts, gives a normal effluent, and the ides in the sludge are quickly oxidised on exposure. waste from tanneries is merely strong sewage. The objection to wool-scouring and similar liquors is rease contained in them. But much depends upon the ity of the fat; for whilst at Nuneaton such waste s no difficulty in treating the sewage by ordinary s, at Bradford the sludge has hitherto almost defied ing or handling in any form, although the tank effluent is satisfactorily treated on bacterial filters. At Burnley, bleach waste, and at Blackburn, brewery waste, is received into the sewers without causing trouble; but at Horwich and at Shepton Mallet, similar wastes cause trouble, owing to the larger proportion admitted to the sewers.

It had been observed that the majority of the samples of trades waste obtained by the inspectors of the Ribble Joint Committee, which were free from acid, underwent gradual self-purification when kept in open bottles. Experiments were, therefore, instituted with the object of discovering whether these changes could be hastened by artificial means. A small bacterial filter was constructed, provided with a revolving feeding sprinkler, and seeded with sewage. It was found that many waste liquors, if well diluted, could be satisfactorily treated on this filter, provided much chlorine were not present. Starch products, however, caused an acid fermentation to be set up, which was found to proceed very slowly, needing as many as 15 successive filtrations before satisfactory purification and clarification was effected. An experiment was made to try the effect of mixing starch paste with putrid sewage sludge, and it was found that after allowing the mixture to stand for five days, and then slowly filtering it through a 3-ft. filter, a very much more rapid breaking down of the organic matter was effected than by allowing the paste to ferment naturally previous to filtration.

The success of this and other experiments led to the installation of plant at the bleach works of Messrs. Peel, Tootal, and Co., of Baxenden, for the purification of their effluent containing lime, soda, and chlorine, besides starchy sizes, china-clay, &c., removed from the grey cotton cloth treated. The effluent is first received into an open septic tank which holds three days' flow, whence it overflows, through a sprinkler, on to a filter made of furnace ashes, 11 ft. in depth, graduated in size from 2½ in. at bottom to ¼ in. at top. When first started, about 4 tons of old sewage sludge were put into the tank, which was then filled up with the liquor and allowed to stand until putrid. The filter was then started. To maintain putridity, the water-closet refuse from the works is discharged into the tank. The effluent from this plant is very satisfactory, although the waste liquors are strongly coloured. It is sweet, neutral, contains nitrates and little albuminoid ammonia. The free chlorine in no way interferes with the action of the filter, which treats successfully 350 galls. per square yard. Presumably, the chlorine becomes removed in the septic tank.

Brewery and distillery wastes are treated with difficulty on bacterial filters directly, owing to acid fermentation. But by previous septic tank treatment with putrid sewage sludge, a good effluent is easily obtained. A successful process of the kind is in operation at the Hook Norton Brewery Company's brewery, Hook Norton, near Banbury, and similar installations are being made elsewhere.

The difficulty with regard to free chlorine having been overcome in the case of bleach dye-works, a paper mill effluent was taken in hand. The effluent in question was fairly clear, having been settled and filtered through animal charcoal. This effluent sprinkled on bacterial filters gave fairly good results, but as the effluent was turbid, probably owing to the presence of fine particles of china clay, sewage was added, and since then highly satisfactory results have been obtained—one result of no little importance being the absence of turbidity due to the coagulating effect of the sewage. This is likely to be of great value in mills where esparto grass is used, as hitherto much difficulty has been experienced in obtaining a clear effluent from such mills.

—L. A.

Sewerage Systems of Sydney, N.S.W., and its Suburbs. J. Davis. Proc. Inst. Civil Eng., 1901–2, **148**, [2].

THE extensive systems of sewerage described in this paper in detail were commenced in 1880, and are now nearing completion. The total area drained is 140 sq. miles, the population served is 426,950, and the capital outlay involved has amounted to over 3,300,000*l.*

One system of sewers drains a large part of the city through a main sewer running east, and discharging directly into the ocean four miles from the city, near Bondi. The southern area of 1,306 acres, with a population of about 62,000, is drained by a sewer running south, on to a sewage

farm at Shea's Creek, near Botany Bay. This farm covers 510 acres of fine drift sand overlying clay, very suitable for filtration purposes. The sewage is first roughly screened and then treated with lime, the sludge being dug into the land. Twelve years' use has converted the barren sand into a good loam, from which very satisfactory crops of lucerne, rye, sorghum, cabbages, &c, have been raised. A third main system of sewers, drains an area of 22 sq. miles in the western suburbs, and serves an ultimate population of 400,000. This sewage is treated by intermittent downward filtration, on an area adjoining the sewage farm at Botany.

On the north shore of the harbour, opposite the city, an area including North Sydney and Mosman, containing about 2,500 acres, has been provided for by gravitation sewers, the sewage being treated by precipitation with lime, and intermittent downward filtration through sand. The sludge is reduced to cake in presses, and is burnt in destructors, after being mixed with one-third of its bulk of coke-breeze dust. The filter-beds, eight in number, and having an area of about eight acres, are formed of sea-sand, with an average depth of about five feet. Glazed pipes, perforated with $\frac{3}{16}$-inch holes, and covered with six inches of fine coke-breeze, are laid at the bottom to carry away the effluent, which is discharged into Willoughby Bay. Samples of this effluent have been examined by the Government Analyst, W. M. Hamlet, and found satisfactory.

The elevated residential suburbs of Chatswood and Willoughby, six miles north-west of the city, are being sewered on a separate system, and the sewage is to be treated by septic tanks and intermittent bacterial filters. Provision has been made for about 6,500 persons, with room for further extension. There are two septic tanks, each having an effective capacity of about 107,000 gallons. The effluent is treated by four filter beds, each having an area of about 2,500 sq. ft., and consisting of 12 ft. 10 ins. of fine coke breeze underlaid by 10 ins. of broken stone, and covered by six inches of pea gravel. The filtered effluent passes into tidal waters.

Manly, a watering place with a population of 3,000, seven miles from the city, and near the entrance of Port Jackson, has been provided with a gravitation system, having an ocean outfall. At Paramatta, a town of 13,000 inhabitants, 14 miles west of Sydney, at the head of an estuary of Port Jackson, a pumping scheme has been prepared, which includes the treatment of the sewage by septic tanks and filters.—L. A.

Sewage containing Acid Iron Salts. L. P. Kinnicut and H. P. Eddy. From the Third Annual Report of the Connecticut Sewerage Commission.

The sewage used in these experiments was that of Worcester (Mass.), which differs from the sewage of most cities in the amounts of iron and free acid which it contains. The following average analysis gives a good general idea of the composition of the sewage:—Dissolved solid matter, 57·70; suspended solid matter, 16·50; total solid matter, 74·20 parts per 100,000.

The dissolved solid matter includes ferrous sulphate, 15·8; aluminium sulphate, 0·4; ammonium sulphate, 4·3; and free sulphuric acid, 10·3 parts per 100,000.

The sewage also contains 3·5 parts of Fe, 0·15 part of Al, and 0·09 part of S per 100,000, in suspension.

The results of the experiments made with this sewage during the past 15 months lead to the following conclusions.

About one-fourth of the total solid matter is removed by the passage of the sewage through a septic tank.

The amount of soluble matter removed (= about 21 per cent. of the total) is greater than is usually removed by septic tank action, and the amount of suspended matter removed (= about 25 per cent. of the total) is very much less than usual; these results being due to the conversion of the soluble ferrous sulphate into insoluble ferrous sulphide, a comparatively large amount of which is carried away in the effluent.

The amount of organic matter removed (26 per cent. in Worcester sewage) is much less than is removed from an alkaline domestic sewage. The amount is greater in summer than winter, but no direct relationship has been found to exist between the temperature and the amount of organic matter removed.

The amount of gas given off depends largely upon the amount and character of the sludge at the bottom of the tank, and is a measure, not of the amount of organic matter being removed, but of the total bacterial action taking place. The amount of gas is less in winter than in summer, and has averaged at Worcester 2·2 gallons per 1,000 gallons of sewage, which is probably less than would be obtained from a tank whose sludge contained more organic matter. The gases given off from Worcester sewage have been found to contain methane, nitrogen, and carbon dioxide, with little, if any, hydrogen.

The amount of sludge dissolved or gasified (28 per cent.) is probably less than would usually be the case, owing to the large amount of FeS present. The sludge in a septic tank contains less organic matter in autumn than in spring. The crust on the surface contains a much larger proportion of organic matter than the sludge; but the formation, non-formation, and disappearance of the crust appears to be an incident rather than a result of bacterial action.—L. A.

United States Patent.

[*Sterilising Water, &c.*] *Temperature Exchanging Apparatus.* J. Desmaroux, Paris. U.S. Pat. 704,818, July 15, 1902.

An apparatus chiefly designed to bring back to the normal temperature, water which has been sterilised by heat.

A cylindrical member is furnished with two non-communicating spirally-disposed passages, which open at opposite ends of the member, where they are closed by detachable plates, means being provided for admitting, and permitting the escape of, fluids to and from the passages. (See this Journal, 1902, 634.)—R. A.

(*C.*)—DISINFECTANTS.

English Patent.

Washing- and Disinfecting Powder. J. B. Mumford and P. R. Newlands, London. Eng. Pat. 20,884, Oct. 15, 1901.

Anhydrous sodium carbonate is added to a solution of sodium hypochlorite. A dry powder is thus produced consisting of hydrated carbonate of soda containing a quantity of hypochlorite of soda.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

English Patent.

Paper-pulp, and the like; Bleaching ——. F. H. Lon, Chicago, Illinois, U.S.A. Eng. Pat. 3178, Feb. 7, 1902.

A mixed charge of pulp and dilute sodium chloride solution is placed in a gas-tight receptacle of special construction and kept in forced circulation between the anodes (carbon) and cathodes (copper). The latter are so arranged that the cathode products are expelled from the vessel as rapidly as they are formed.—R. L. J.

United States Patents.

Pulp; Process for Reducing Fibrous Material to ——. H. Lee, Boston, Massachusetts, Assignor to Bagasse Pulp Co., Maine. U.S. Pat. 701,271, May 27, 1902.

The thoroughly damped material (bagasse, waste flax, jute, cornstalks, or the like) is subjected to the action of gaseous chlorine for 30 to 60 minutes. The time required is lessened by previously cutting, stripping, or breaking up the material. The disintegration of the materials is stated to be the result of a double decomposition during which hydrogen chloride and a soluble organic chloroderivative are formed, and these products are next removed with water.

—G. T. M.

Fibrous Substances [Paper Pulp]. Process of Treating ——. T. Holmes, Assignor of one-third to J. C. Brocklebank, Chicago. U.S. Pat. 704,259, July 8, 1902.

Flax, hemp, straw, or other fibrous material, is heated with a solution of caustic soda or potash of 6° or 7° B. at a pressure of 80–120 lb.; 50 galls. of liquor are employed for 100 lb. of straw. It is claimed that in from four to six hours, according to the pressure and temperature employed, the woody parts dissolve, leaving the fibrous portions intact, and in a condition suitable for the manufacture of paper pulp or other similar products.

—G. T. M.

Paper Making. A. Onterson, Windsor Locks, Connecticut, U.S.A. U.S. Pat. 704,572, July 15, 1902.

Two Fourdrinier machines are placed end to end, with the delivery ends adjacent. The pulp coming from one machine is superimposed, by a suitable system of felts, upon the pulp from the other, and with the "wire" side of each innermost. Adhesion of the two layers is aided by spraying with water, and the double film is passed through primary and secondary pressure-rolls. The resulting solid sheet has no "wire" side, but is of equal finish on either side, and both are suitable for writing or printing purposes.

—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Thoria Earths; A new Method for Precipitating and Separating ——. A. Kolb. J. prakt. Chem., 1902, **66**, [13], 59—64.

The treatment of monazite sand results in a crude thorium sulphate, which contains, in addition to small quantities of ceric oxide and phosphoric acid, only the rare earths as impurities, the complete removal of which is, however, essential. These earths differ markedly from thoria only in respect of their basic properties, and for their separation, a substance is required of more basic character than thoria, and less basic than the other cerite earths. Aniline fulfils these condition; the chlorides and nitrates of cerium, lanthanum, didymium, yttrium, and erbium are not precipitated from aqueous solution by aniline, whilst the thorium salts are completely separated. Zirconium oxide is also precipitated by aniline; if necessary, zirconia and thoria could be separated by means of dimethylaniline.

The following is the method of operating in pure thorium solutions:—A little dilute hydrochloric or nitric acid is added to the dilute solution of the nitrate, which is then neutralised as far as possible with ammonia, heated to boiling, and aniline run in, a drop at a time, shaking well, until the liquid is distinctly turbid. The thorium hydroxide then soon separates, especially if the liquid be shaken and again heated. Too large an excess of aniline should not be added, and the warm liquid containing the precipitate should be diluted with warm water, and allowed to settle in a warm place. The precipitate is washed by decantation with water at 50° C. Occasionally basido-solutions form towards the end of the washing; these may be avoided by the addition of a little aniline to the wash-waters. The precipitate contains a little colouring matter derived from the aniline, but after ignition the residue is quite white. In order to precipitate 0·2 grm. of thorium nitrate dissolved in 50 c.c. of water, there was required 1·5 c.c. of aniline without the addition of hydrochloric acid and neutralisation by ammonia, or 0·4 c.c. of aniline after the addition of 5 c.c. of dilute hydrochloric acid and neutralisation by ammonia. Under similar conditions, with the nitrate dissolved in 100 c.c. of water, 4·5 c.c. and 1·8 c.c. of aniline respectively were required. The analytical results quoted are satisfactory.

In the case of thorium sulphate, the bases must be precipitated by ammonia, washed free from sulphuric acid and dissolved in hydrochloric acid before precipitating by aniline; much aniline is required to precipitate directly the solution of the sulphate, and the subsequent complete removal of the sulphuric acid is difficult. Before precipitating by aniline, ferric oxide and cerium dioxide must be reduced by the addition of sulphurous acid, otherwise coloured precipitates are obtained, and the residue on ignition is brown. If the quantity of ferrous oxide, or of the cerium and yttrium earths is great in comparison with that of the thoria, a second precipitation is necessary, since the thorium hydroxide carries down the other metals with it.—A. C. W.

Cerite Earths; Action of Alcoholic Hydrochloric Acid on the ——. R. J. Meyer and M. Koss. Ber., **35**, [14], 2622—2626.

If a concentrated solution of the chlorides, obtained by dissolving the cerite earths in absolute alcohol which has been saturated with gaseous hydrochloric acid, be cooled by means of a freezing mixture, the chlorides which crystallise out always contain alcohol of crystallisation. On adding some water to a similar solution, however, the hydrated chlorides separate out. The solubilities of the hydrated chlorides of the different earths in alcoholic hydrochloric acid vary greatly; thus, on adding water to a concentrated solution of didymium chloride in alcoholic hydrochloric acid, didymium chloride hexahydrate separates out almost quantitatively, whereas lanthanum chloride under the same conditions remains in solution, a partial separation only occurring on cooling the solution in a freezing mixture. From a solution containing both lanthanum and didymium, both chlorides are separated almost completely, so that this offers no advantages as a method of separation. When certain organic bases, pyridine for example, are added to the alcoholic hydrochloric acid solutions of the earths, crystalline double chlorides, containing alcohol of crystallisation, are obtained. The authors have obtained the following salts:—

1. *Alcoholates.*—$DiCl_3.3C_2H_6O$; $LaCl_3.2C_2H_6O$.
2. *Hydrates.*—$DiCl_3.6H_2O$; $PrCl_3.7H_2O$; $NdCl_3.6H_2O$; $2CeCl_3.15H_2O$; $2LaCl_3.15H_2O$.
3. *Pyridine Double Chlorides.*—$PrCl_3.3C_5H_5N.HCl.xC_2H_6O$; $NdCl_3.3C_5H_5N.HCl$; $CeCl_3.C_5H_5N.HCl.2C_2H_6O$; $2LaCl_3.3C_5H_5N.HCl.2C_2H_6O$.—H. B.

Lanthanum containing Didymium and Praseodymium; Influence of the presence of Cerium upon ——. R. Marc. Ber., 1902, **35**, [13], 2370—2376.

Ordinary didymia, which was supposed to be free from ceria and gave no reaction with hydrogen peroxide or ammonium persulphate (this Journal, 1900, 932), was dissolved in hydrochloric acid, the solution made slightly alkaline with caustic potash, cooled, and a current of chlorine passed through for one hour. The hydrate dissolved to a greenish-yellow liquid, whilst a small portion remained undissolved. The oxide prepared from the liquid was pale grey, whilst the oxide obtained from the insoluble portion had the ordinary brown colour of didymia. The spectra showed that the grey oxide contained as much praseodymia as the original brown oxide. The grey oxide also kept its colour unaltered on reprecipitation, and did not evolve any chlorine when dissolved in hydrochloric acid; it was, therefore, free from the peroxide present in ordinary didymia. The undissolved brown oxide was now found to give a cerium reaction with hydrogen peroxide, and when 1—2 per cent. of a cerous salt was added to the solution of the grey oxide, the oxides precipitated and ignited, a brown didymia was obtained, which dissolved with evolution of chlorine, but gave no cerium reaction with hydrogen peroxide, although this test is regarded as very sensitive.

A number of preparations of the grey oxide were made from different materials, two fractionations being sometimes requisite; in the case of a mixture of the oxides of praseodymium, lanthanum and cerium containing a very small quantity of neodymia, four precipitations were necessary. To solutions of the didymium oxides, definite quantities of cerous salt were added, the oxides precipitated, ignited for 10 minutes, and then dissolved in hydrochloric acid. The chlorine evolved was passed into potassium iodide, and the liberated iodine determined by centinormal thiosulphate; the apparatus was constructed with regard to the fact that the evolution of chlorine begins immediately on the addition of the acid. The results were not quite the same with all the specimens of didymia; one specimen gave

with 0·25 per cent. of cerium, no peroxide; with 0·5 per cent. of cerium, 0·25 per cent. of peroxide; with 2 per cent. of cerium, 2·25 per cent. of peroxide; with 10 per cent. of cerium, 35·89 per cent. of peroxide. The didymium which is generally regarded as free from cerium, gave always 1—2 per cent. of peroxide. It was only possible to detect cerium when the oxides contained not less than 1·5—2 per cent. Both neodymia and praseodymia are converted into the peroxides under the influence of the cerium.

A blackish-brown specimen of praseodymia, which showed practically no neodymium bands, evolved a quantity of chlorine corresponding to 44·12 per cent. of peroxide; no cerium could be detected in it, and it behaved in the same manner as cerium when attempts were made to free it from that metal by the chlorine method given above. It was not therefore possible to decide whether praseodymium oxide is converted into the peroxide by means of cerium. Mixtures of this praseodymium oxide with lanthanum oxide, made by precipitating and igniting, contained no peroxide until the Pr_2O_3 amounted to twice the La_2O_3; mixtures with didymia behaved in a similar manner. Brown oxides were, however, obtained, whence there is a probability that this praseodymium contained cerium. Pure neodymium gave no brown coloration and no peroxide when mixed with cerium. Hence lanthana and neodymia, even in traces, hinder the formation of praseodymium peroxide by means of cerium.

—A. C. W.

Di-iodophenol: A new ——. P. Brenans. Comptes Rend., **135**, [3], 177—179.

Orthonitraniline treated with iodine monochloride yields iodo-orthonitraniline $C_6H_3(NH_2)(NO_2)(I)(1:2:4)$. The diazo-derivative of this, decomposed by potassium iodide gives a di-iodonitrobenzene $C_6H_3(I)(NO_2)(I)(1:2:4)$ or $C_6H_3(NO_2)(I_2)(1:3:6)$. Reduction of this by tin and hydrochloric acid gives the corresponding di-iodoaniline, from which by diazotising in presence of water the di-iodophenol $C_6H_3(OH)(I_2)(1:3:6)$ is prepared.

Monoiodo-orthonitraniline has already been described by Michael and Norton. The substance prepared as above is identical with theirs.

Diiodo-nitrobenzene.—Small yellow needles, melting at 109°—110° C. Slightly soluble in water; soluble in alcohol, ether, chloroform, or benzene.

Diiodo-aniline.—Colourless needles, smelling like naphthalene, melting at 88°—89° C. Distils in steam. Soluble in organic solvents; the solutions alter in the light.

Diiodophenol.—Flattened prisms, melting at 99° C. Slightly soluble in water or ether; readily in alcohol, chloroform, acetic acid, benzene, or petroleum spirit. Its acetic ester crystallises in colourless prisms melting at 70° C.—J. T. D.

Soap Nuts. Rev. des Cultures Coloniales, **10**, 282. Pharm. J., 1902, **69**, [1675], 85.

The fruits of *Sapindus mukorossi* (var. *carinatus*) are used in Algeria not only for cleaning silks and other fabrics, but for imparting to them a peculiar brilliancy which other saponaceous materials, such as quillaia, do not appear to give. A single tree may yield as much as 100 kilos. of fruit, though usually not so much. The dried pulp of the fruit separated from the seeds is said to contain from 62 to 67 per cent. of saponin.—A. S.

Arrow-Poison from German East Africa: Investigation of the ——. L. Brieger and G. Diesselhorst. Ber., 1902, **35**, [13], 2357—2359.

The authors have examined the arrow-poison of the Wapogorro, who inhabit the Ulunga plain in the south-west of German East Africa. The poison forms hard blackish masses, and has the same physiological action as digitalis and all the East African arrow-poisons yet investigated. The arrow-heads were digested in hot water, the solution precipitated by lead acetate, the filtrate, which contains the active principle, evaporated after removal of the excess of lead, and the residue extracted by alcohol. The solution of the alcoholic extract in water deposits crystals on standing, the poisonous dose of which is 0·0005 grm. per kilo. in the case of rabbits. The poison is a glucoside which crystallises in large colourless tablets united in clumps; it melts at 93° C. in its water of crystallisation. After drying at 110° C., it melts at 185°—187° C. The mother liquors contained a second poisonous glucoside melting at 175°—181° C., and an amorphous hygroscopic non-poisonous glucoside.—A. C. W.

Anthraquinone; Derivatives of ——, *obtained by means of the Aloïns.* E. Léger. Bull. Soc. Chim., 1902, **27** [14], 751—756.

Barbaloïn was oxidised by adding sodium peroxide in small quantities at a time to an aqueous solution heated on the water-bath, cooling rapidly, acidifying, and recrystallising the precipitate from toluene and then from alcohol. Orange-yellow needles were obtained presenting the characters of the aloëmodin of Tschirch (Ber. Pharm. Ges. 8, 174) and Œsterle (Arch. Pharm., 1899, 81). Isobarbaloïn gives the same product; it is a trihydroxymethylanthraquinone [probably OH:OH:OH = 1:4:6], and the author terms it methylisohydroxychrysasine. On heating with zinc dust it yields β-methylanthracene.

Chlorobarbaloïn and chlorisobarbaloïn, when oxidised in the same manner, yield tetrachloromethylisohydroxychrysasine, $C_{15}H_6Cl_4O_5$, which crystallises with one mol. of water in long brilliant orange-red needles, melting at 228°—230° C. or 229°—231° C. The triacetyl compound of this chlorine derivative is obtained by the very prolonged action of a mixture of acetyl chloride and acetic anhydride; it melts at 270°—271° C. and is hydrolysed with very great ease.

Bromobarbaloïn, on oxidation, gives a small yield of cinnabar-red needles, $C_{15}H_6Br_4O_5$, which melt at 264°—266° C. The corresponding compound obtained from bromisobarbaloïn contained less bromine and was evidently not pure.

The author proposes to show in a future paper that the aloïns should be represented by the formula $C_{21}H_{20}O_9$. The action of sodium peroxide decomposes them into anthraquinone derivatives, a pentose, and other compounds. —A. C. W.

Anthraquinone: Derivatives of ——, *obtained by means of the Aloïns of Natal Aloes.* E. Léger. Bull. Soc. Chim., 1902, **27**, 756—758.

When nataloin and homonataloïn are oxidised by sodium peroxide (see preceding abstract), and the product recrystallised from methyl alcohol, a body of the composition of a methyl ether of trihydroxymethylanthraquinone is obtained, which the author terms methylnataloemodin. It is characterised by giving a magnificent violet coloration with strong sulphuric acid and an orange-red with caustic soda. It sublimes, partially unaltered, in the form of yellow needles, which melt at 238° C. (corr.). When heated with hydrochloric acid, it is transformed into natalo-emodin, $C_{15}H_{10}O_5$, which melts at 220·5° C., gives a red coloration with sulphuric acid and a violet with caustic soda. The formulæ of nataloin and homonataloin are given as $C_{23}H_{26}O_{11}$ and $C_{22}H_{24}O_{10}$ respectively.—A. C. W.

9-Amino-10-hydroxyphenanthrene (Vahlen's Morphigen) and 9.10-Diamino-phenanthrene. R. Pschorr. Ber., 1902, **35**, [14], 2729—2740.

9-Amino-10-hydroxyphenanthrene is obtained by reducing phenanthraquinone monoxime, phenylhydrazone, or imide, by means of stannous chloride and hydrochloric acid. The crude product must be repeatedly washed with the solvent used in the reduction—alcohol or glacial acetic acid—and then with ether. The aminophenanthrol hydrochloride as obtained is purified by dissolving in alcohol and precipitating by dilute hydrochloric acid or ether. It turns red at 120° C. and decomposes at a high temperature. When heated with water or dilute hydrochloric acid, it is converted into hydrophenanthraquinone. Dilute nitric acid or nitrous acid rapidly converts it into the quinone. Free aminophenanthrol is obtained by grinding the hydrochloride with water, covering with ether, replacing the air by carbon dioxide, adding a solution of sodium sulphite, acetate or carbonate, and shaking well. The ethereal solution is then dried over

fused sodium acetate and evaporated nearly to dryness in a current of carbon dioxide; well-formed yellowish-brown needles separate, which turn red at 100° C., sinter at 150° C., and melt at 417° C. The base dissolves in cold alkalis without decomposition in the absence of air, and is reprecipitated by carbon dioxide, acetic acid, or sulphurous acid. Aminophenanthrol is an unstable compound; on keeping, the melting point falls to 140°—150° C., and ammonia is given off. When the alkaline solution is boiled in an atmosphere of carbon dioxide, 9.10-dihydroxyphenanthrene is formed; strong alkaline solutions separate green needles, probably composed of the quinhydrone. On standing in the air, the alkaline solution separates phenanthraquinone.

9.10-Diaminophenanthrene is produced when phenanthraquinone dioxime (Ber., 22, 1991) in alcoholic solution is reduced by a solution of stannous chloride in strong hydrochloric acid. On cooling, the hydrochloride $C_{14}H_8(NH_2.HCl)_2$, separates in fine colourless needles, which are washed with alcohol and ether. The free base, which readily passes into diphenanthrylenazotide, was obtained in an impure condition by the action of sodium carbonate.

Vahlen (this Journal, 1902, 926) attributes to episine and a derivative of aminophenanthrol a physiological action similar to that of morphine. The author states, on the contrary, that these substances are blood-poisons and not nerve-poisons, as is morphine, that the sulphonation (which was requisite in order to obtain soluble compounds) of morphigenine (aminophenanthrol) hydrochloride leads to nitrogen-free compounds—apparently phenanthraquinone sulphonic acids—and finally that these sulphonic acids have a similar physiological action.—A. C. W.

Morphine; Oxidation of ——, by the Juice of Russula delica. J. Bougalt. J. Pharm. Chim., 1902, 16, [2], 49—52.

Bourquelot has observed the production of a precipitate by the action of the juice of *Russula delica* on an alcoholic solution of morphine (J. Pharm. Chim., 4, 382; compare this Journal, 1897, 169). From morphine hydrochloride in aqueous solution, mixed with the juice of the mushroom, and exposed to the air, the author obtained a crystalline deposit of oxymorphine hydrochloride. The transformation is complete in 10 days, when the mother liquor no longer contains morphine. The oxymorphine obtained was identical with the product of the oxidation of morphine by alkaline ferricyanide (Ber., 13, 87).

Oxymorphine is very insoluble: 200 c.c. of chloroform, amyl alcohol, ethyl acetate or ether do not dissolve 0·1 grm. of the base. The best solvent for extraction purposes is ammoniacal amyl alcohol. The salts with neral acids are little soluble in water, and less soluble acidulated water and alcohol. The oxalate and tartrate are somewhat readily soluble in presence of excess of acid, but are insoluble in alcohol. A mixture of morphine and oxymorphine would be best separated by means of the phates: morphine sulphate is fairly soluble in water, but oxymorphine sulphate requires about 500 parts.

Oxymorphine gives an intense blue coloration with Fröhde's reagent; morphine gives a violet. A solution of oxymorphine in strong sulphuric acid gives with a crystal ammonium selenite a violet coloration, whilst morphine gives a green reaction. The solution in strong sulphuric acid, on addition of one drop of a very dilute solution of formaldehyde, gives a green coloration; morphine gives a very deep violet-red. The latter reaction appears to be the better one.—A. C. W.

Strychnicine. M. G. Boorsma. Bull. de l'Inst. Bot. de Buitenzorg, [14], 3. Pharm. J., 1902, 69, [1674], 65.

The author has obtained a new alkaloid, *strychnicine*, from the fresh and dried leaves of *Strychnos nux vomica*, by treating an alcoholic extract of the leaves with water, adding acetate of lead, removing the excess of lead by hydrogen sulphide, then concentrating the solution, washing with benzene, making alkaline and extracting the free alkaloid with benzene. It is purified by fractional crystallisation of its tartrate, which is much less soluble in cold water than the corresponding salts of strychnine and brucine. Strychnicine forms white crystalline needles, which contain no water of crystallisation; it begins to turn brown at 240° C., and at a higher temperature forms a dark mass. It is only slightly poisonous compared with the other alkaloids of *nux vomica*. One kilo of the fresh leaves yielded 100 mgrms. of strychnicine. It occurs in young as well as in old leaves, in ripe fruit pulp, in the hard fruit shell, and in the thin orange epidermis which covers it; it is not present in the bark and wood of the twigs. The seeds of *nux vomica* from the Buitenzorg Botanic Gardens yielded no strychnicine, but the commercial seeds yielded a small quantity. The leaves of *Strychnos tieute* yielded strychnine and strychnicine, but no brucine. The percentage of strychnicine in the young leaves was found to be less than in those of *nux vomica*.

Strychnicine gives with concentrated sulphuric acid, a colourless solution, which, on heating, becomes yellowish. This solution does not become coloured by the addition of potassium bichromate or permanganate, chromic acid, cerium oxide, ammonium vanadate or ferricyanides. Fröhde's reagent gives a colourless solution, which, on long standing, becomes blue; nitric acid gives a permanent light yellow colour; concentrated hydrochloric acid gives a colourless solution, which, after boiling with a little nitric acid, gives a yellowish-red colour. The most characteristic reaction is that given by soda or baryta. A neutral solution of the chloride or nitrate of strychnicine gives, on the careful addition of sodium or barium hydrate solution, a white precipitate soluble in excess of the precipitant, the solution slowly becoming of an orange colour, which, on acidifying, changes to a purple-violet colour, which gradually becomes more intense. Sulphuric, phosphoric, acetic and tartaric acids do not give the reaction. The reaction is tolerably delicate, a 0·01 solution of strychnicine giving a colourless solution when the hydrochloric acid is added to the sodium or barium hydrate solution, but which becomes distinctly violet after half-an-hour. Strychnine and brucine do not essentially hinder the reaction.—A. S.

Photochemical Reactions. Quinine; Oxidation of ——, by Chromic Acid. E. Goldberg. Zeits. phys. Chem., 41, 1—10. Chem. Centr., 1902, 2, [3], 181.

A solution of quinine sulphate reduces chromic acid with appreciable velocity only in the presence of sunlight. In accordance with Vogel's law, the only active rays are those which are absorbed, namely, the blue, violet, and the neighbouring ultra-violet rays. In confirmation of Bunsen and Roscoe's law, it was found that the chemical action of a particular class of rays is proportional to the product of the intensity and duration of the illumination. Substances which weaken the fluorescence of the quinine solution also reduce the velocity of the reaction. The reaction-velocity of photochemical processes is accelerated much less by increase of temperature than is the case with reactions which are not dependent upon the action of light.—A. S.

Cinnamon Oil; Ceylon ——. H. Walbaum and O. Hüthig. J. prakt. Chem., 1902, 66, [13], 47—58.

Cinnamon oil is obtained by the steam-distillation of the waste portions of cinnamon bark. Though it contains only 70—75 per cent. of cinnamic aldehyde, it has a higher value than oil of cassia containing an equal or greater quantity of the aldehyde, and also than the pure aldehyde. Of the other constituents of the oil, which are of importance to the aroma, only phellandrene and eugenol have hitherto been known. The material for the present research consisted of the 3·7 kilos. of first runnings obtained from 29 kilos. of cinnamon oil. This first fraction was distilled under ordinary pressure until the boiling point rose from 32° to 160° C., and then *in vacuo*. The first portions of the distillate were too small for examination.

The fraction boiling below 160° C. gave a crystalline compound with sodium bisulphite, from which a ketone of fruity odour boiling at 147°—160° C. was isolated. It was

identical with the methyl-*n*-amylketone found in oil of cloves (this Journal, 1897, 557).

The fraction, 160°—165° C., contained pinene. The fraction, 170°—174° C., contained phellandrene. It gave, by Wallach's method, a nitrite which melted at 103°—104° C. after repeated recrystallisation. The nitrite of high melting point (this Journal, 1901, 927), could not be obtained.

Fraction 175°—180° was treated with permanganate in the cold to destroy pinene and phellandrene; it then contained cymene, which was identified by its oxidation to *p*-hydroxyisopropylbenzoic acid.

The next fraction gave a solid bisulphite compound, which (also the mother liquor) gave a mixture of aldehydes, benzaldehyde being the chief. Nonyl aldehyde accompanied the benzaldehyde; it could be obtained in rather larger quantity, but not pure, from the fraction of the original oil boiling at 90°—92° C. under 6—7 mm. pressure. A pure semicarbazone could not be obtained, but in recrystallising the latter, a compound was isolated from which an aldehyde of the odour and composition of phenylpropionicaldehyde, $C_6H_5.CH_2.CH_2.CHO$, was liberated. The quantity was, however, too small to obtain the correct melting point. The presence of furfural in the aldehyde fractions was indicated by the colour reaction with hydrochloric acid and aniline.

The last fraction, after separation of the aldehydes, had the odour of linalool, which was obtained tolerably pure by fractionation, and identified by oxidation to citral. The linalool, when heated with two parts of strong formic acid, gave a turbidity owing to the production of terpenes and polyterpenes insoluble in formic acid. This reaction may be applied to the detection of linalool in mixtures; *e.g.*, the mixture with benzyl alcohol in jasmine oil and other essential oils. Benzyl alcohol containing only 5—10 per cent. of linalool gives a distinct turbidity when warmed with crystallisable formic acid. Terpineol and geraniol, which react in a similar manner, must previously be removed by fractionation. Certain sesquiterpene alcohols—cedar, ledum, patchouli, ylang-ylang and cypress camphors—are also decomposed by formic acid into water and sesquiterpenes, but these compounds all have a high boiling point, and can thus readily be separated from linalool.

The higher fractions contained considerable quantities of cinnamic aldehyde; they were shaken and heated with bisulphite solution until the solid bisulphite compound was entirely converted into the soluble sodium cinnamic aldehyde sulphonate. It was necessary to repeat this process several times in order to remove the last traces of cinnamic aldehyde. The residual oil contained a sesquiterpene boiling at 260°—261° C., and with the odour of caryophyllene; it was converted by sulphuric and acetic acids into the corresponding caryophyllene alcohol, melting at 95° C., the phenylurethane of which melted at 136°—137° C.

The bisulphite solution, on distillation with excess of soda, gave an oil, which was found to be identical with cumic aldehyde, $C_{10}H_{12}O$. The higher fractions, which had been freed from aldehydes, were shaken with dilute caustic soda, which extracted eugenol. Iso-eugenol was not present. The residual oil, free from aldehydes and phenols, was fractionated and examined for esters: the fraction boiling between 80° and 110° C. under 6—7 mm. pressure contained a small quantity of esters, which yielded an acid of the odour of isobutyric acid. Other alcohols than linalool could not be found. Ceylon cinnamon oil therefore consists principally of cinnamic aldehyde, phellandrene, caryophyllene, linalool, pinene and cymene, with small quantities (but important to the aroma) of methylamylketone, benzaldehyde, cumic aldehyde, eugenol, nonoic aldehyde and probably furfural, hydrocinnamic aldehyde, and isobutyric acid as an ester.—A. C. W.

Jasmine Flowers; Artifical Essential Oil of ——. Ger. Pat. 132,425, March 5, 1899. Heine and Co., Leipzig. Zeits. angew. Chem., 1902, **15**, [28], 720. (See also this Journal, 1901, 1137.)

The artificial oil is a mixture of benzyl acetate, linalyl acetate, linalool, and benzyl alcohol.—A. C. W.

Eucalyptol from Eucalyptus Oil or other Liquids containing Eucalyptol; Preparation of ——. Ger. Pat. 132,606, June 20, 1901. E. Merck, Darmstadt. Zeits. angew. Chem., 1902, **15**, [28], 720.

According to Ger. Pat. 80,118 eucalyptol is separated from eucalyptus oil by stirring with concentrated phosphoric acid and decomposing the crystalline compound which forms, by the action of water. According to the present patent, arsenic acid is substituted for phosphoric acid; the former is cheaper, and, unlike the latter, can be regenerated in porcelain or earthenware vessels.—A. C. W.

Methyl Anthranilate in Essential Oils; Determination of ——. A. Hesse and O. Zeitschel.

See under XXIII., *page* 1102.

English Patents.

Guaiacol, Cinnamic Acid and Tannin; Manufacture of a Compound of ——. A. Nissel, Beuthen, Germany. Eng. Pat. 10,234, May 3, 1902.

Equimolecular quantities of guaiacol, cinnamic acid, and tannin are dissolved in excess of alcohol, and phosphorus pentachloride or oxychloride added, in the cold. The mixture is then heated, cooled, neutralised with ammonia gas or ammonium molybdate, filtered, and the filtrate evaporated.—A. C. W.

Quinine; New Salt [Camphorate] of ——. Lorimer and Co. and T. G. Joyce, London. Eng. Pat. 8640, April 14, 1902.

Quinine camphorate, $(C_{20}H_{24}N_2O_2)_2.C_{10}H_{16}O_4.4H_2O$, is obtained by adding a boiling solution of camphoric acid (not in excess) to the freshly precipitated alkaloid, filtering, and allowing to crystallise.—A. C. W.

Oils and Other Liquids for Medicinal Use; Preparing ——. P. Lewy, Charlottenburg, Germany. Eng. Pat. 9985, April 30, 1902.

The oil or other liquid is formed into an emulsion with gum arabic and water, the emulsion mixed with magnesia or magnesium carbonate and heated or cooled, when a solid mass is formed, which is then powdered.—A. C. W.

United States Patents.

Cocaine; Process of Sterilising and Preserving ——. W. C. Riley, San Francisco, California, U.S.A. U.S. Pat. 704,758, July 15, 1902.

The receptacle (which is provided with a mark to indicate the volume of solution to be prepared from the amount of cocaine in it) is sterilised by heating, the dry cocaine hydrochloride is inserted, the mouth plugged with dry absorbent material (cotton-wool), the whole heated to 145° C. for 15 minutes, the plugs removed and the vessel hermetically sealed.—A. C. W.

Cineol [Eucalyptol] Arsenate. Watson Smith, London. Assignor to E. Merck and Co., Darmstadt, Germany. U.S. Pat. 705,545, July 22, 1902.

See above, Ger. Pat. 132,606, June 20, 1901.—A. C. W.

French Patent.

Acetone; Process for Manufacturing ——, *from Saccharine Substances.* G. Pereire and G. P. Guignar. Fr. Pat. 316,060, Nov. 19, 1901.

Any kind of saccharine or polysaccharide material (molasses, glucose, cellulose, &c.) is intimately mixed with 2—5 times its weight of lime (calculated on the dry substance of the raw material) or other alkaline earth or alkali, and after thorough drying, submitted to dry distillation in a capacious retort. The vapours are passed through a chamber containing acid calcium phosphate, aluminium sulphate, or other ammonia absorbent, and then into a rectifying column where the acetone (and alcohol &c.) are condensed.—H. T. P.

XXI.—PHOTOGRAPHY.

Colour Photography. K. Worel. Brit. J. Phot., 1902, 49, [2202], 562. From Phot. Corr.

The author's process depends upon the facts:—(1) That certain red, yellow, and blue dyestuffs when spread upon paper, reproduce the colour of the incident light, if the mixture be suitably proportioned to the sensitiveness of the different dyestuffs, and the exposure be sufficiently prolonged. (2) Certain essential oils enhance the sensitiveness of organic dyestuffs to the action of light. The evaporation of these oils by heat, and their solubility in certain liquids which do not dissolve the dyestuffs, afford the means by which the dyes may be reduced from the supersensitive to the normal state. Oil of anise was found to be the most powerful sensitiser, and the property was found to be due to the anethol. (3) Solutions of copper salts fix the dyes to an extent sufficient for practical purposes.

The process is carried out in the following manner:—Writing-paper, free from wood-pulp, is drawn through a bath composed of alcoholic solutions of Primrose, Victoria Blue, a few drops of Cyanine, Curcumin, and Auramin, and a certain amount of anethol. The composition of the bath is tested with a negative formed of red, yellow, green, and blue strips of glass, by exposure to sunlight; if correctly adjusted, the four colours should be well rendered. The temperature of the bath should be 20° C., and the paper should be dried at the same temperature. Prints are taken through a stained glass picture or a coloured positive. The bath rapidly deteriorates. In general, great transparency of the original weak colour baths, excess of anethol and strong light give quick prints, whilst strong originals, strong colour bath, a small amount of anethol and weak light give slow prints. Weak colour baths and excess of anethol also give weak prints, whilst strong colour baths and less anethol give strong prints and greater permanence. After printing, the picture is transferred to a bath of pure benzine, left there protected from the light for an hour, and then dried at 40° C. It is essential that the anethol be completely removed in this bath. The prints are fixed in a saturated solution of copper sulphate for two or three hours, and then washed and dried.—A. S.

English Patents.

Gelatin Films for Photographic Purposes. A. J. Boult, London. From C. L. F. Freelandt, Moscow. Eng. Pat. 3371, Feb. 10, 1902.

A solution of gelatin is treated with 2 or more per cent. of alum, 5·5 per cent. of formalin, and about 4 per cent. of glycerin, and the mixture is heated for one or two hours at 75° C. until the whole has become jelly-like. The product is poured on to glass plates, allowed to set, coated with a layer of collodion containing glycerin (in order to protect the sensitised emulsion from contact with the above hardening substances), and finally covered with the required photographic emulsion. This treatment of the gelatin substratum is claimed to give a film which does not curl, stretch, or become distorted during its manipulation.—F. H. L.

Photographs in Natural Colours; Production of ——. J. Szczepanik, Vienna. Eng. Pat. 10,813, May 10, 1902.

From three "three-colour" negatives, prepared with light filters but without ruled screens, diapositives are made. These are then printed in succession under complementary colour screens upon a paper which contains three suitable sensitive dyes. Under the diapositive for red, the paper is exposed to green rays of light, and these cause the fading of the green dye, &c.; the combined action thus yielding a correctly coloured, but optically reversed, print. Claims are also made for special methods of manufacturing the "three-colour paper," the idea being to keep the three dyes in contact one with another, as if mixed together they have sensitiveness, &c. It is proposed to rule the paper in parallel lines, to sprinkle it, or to coat it with three separate layers of one dye each with some insulating varnish.

—F. H. L.

Erratum.

This Journal, 1902, page 1038, col. 1, line 34 from top, after "*gelatin*" insert "*tartaric acid.*"

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patent.

Explosives; New or Improved and Process for the Manufacture thereof ——. F. W. Jones, Barwick, Hertford. Eng. Pat. 18,161, Sept. 11, 1901.

Insoluble guncotton (5 parts) is incorporated with nitroglycerin (2 parts) and dinitrotoluene (1 part). This mixture is gelatinised with acetone (2 parts) and formed into grains. The dinitrotoluene should have a melting point below 40° C., and remain liquid when mixed with an equal weight of nitroglycerin at 15° C. The advantages claimed are that the solvent is more easily got rid of, exudation and erosion are lessened, and no "untamed" nitroglycerin is present.

—G. W. McD.

United States Patent.

Nitro-Compounds [Drying Smokeless Powder]; Process of Separating Solvents from ——. E. Gathmann, Washington, Columbia, U.S.A. U.S. Pat. 704,628, July 15, 1902.

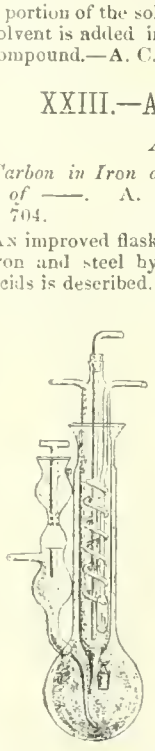
The solvent is removed from colloidal nitro-compounds (smokeless powders) by heating them in a sealed vessel, yet retaining the vapour of the solvent in the vessel in order to keep the grains porous, until the compound is practically dry; or the compound, with its residual solvent, is maintained in a bath of (another) solvent vapour, heat is applied, a portion of the solvent is permitted to escape and additional solvent is added in order to maintain the porosity of the compound.—A. C. W.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Carbon in Iron and Steel; Flask for the Determination of ——. A. Kleine. Chem.-Zeit., 1902, **26**, [61], 704.

An improved flask for use in the estimation of carbon in iron and steel by combustion with chromic and sulphuric acids is described. The flask (see figure) is of the type of that of Corleis, but a more perfect cooling and condensation of the moisture in the gases evolved are effected by causing them, after passing around the condenser to the top of the neck, to enter a coiled tube which passes down again inside the condenser, at the bottom of which the gases enter a straight tube with a bulb-trap (*b*), leading upwards to the absorption apparatus. In order to prevent the water which collects on the outside of the condenser from dripping directly into the hot acid, the bottom of the condenser tube is drawn out to a point and bent round so as to conduct the water quietly down the air tube into the acid. The substance to be analysed is contained in a thimble hung on a hook at the bottom of the condenser, whence it can be displaced by tilting the flask.



—J. F. B.

Extraction Apparatus; New ——. O. Stephani and T. Böcker. Ber., 1902, **35**, [14], 2698—2700.

The apparatus may be used for the extraction of liquids by specifically heavier solvents or for the extraction of solids by any solvent. In the former case the tap *g* (see Fig. I.) is closed, the solvent introduced through H up to the level *a* and then the liquid to be extracted up to the level . The flask D is half-filled with the solvent; when it is heated, the vapour passes by F, F_1, F_2 to the condenser S, whence it passes to the extractor through the sprinkling arrangement V (shown in section in Fig. II.). Continuous working is obtained by regulating the opening of the tap, *g*, so that the level of the solvent in A remains constant. A little slag-wool in the neck of A removes any emulsions which

may form. The cooling coil, G, prevents the substance under treatment from being heated by the solvent, and also prevents loss of solvent.

In extracting solids, G is removed, the substance introduced up to the level *b*, and several layers of filter-paper are placed over it in order to distribute the solvent. The extraction may be so conducted, according to the extent to which *g* is opened, that the substance is completely covered by the solvent or that the latter trickles through the former.

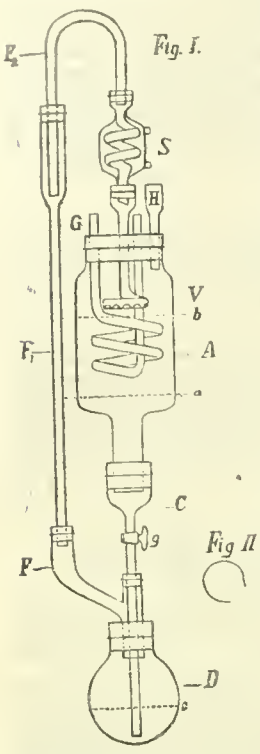


Fig. I.

Fig II

If a high boiling solvent is used, F_1 may be surrounded by a steam-jacket. If the solvent readily penetrates cork, the tube, C, carrying the tap, *g*, may be inserted in the neck of the vessel, A, so that it projects a short distance above the cork, which is covered by a layer of mercury or other suitable substance.—A. C. W.

ENGLISH PATENT.

[*Water*] *Distilling Apparatus.* J. R. Greenhalgh, Leigh-on-Sea, Essex. Eng. Pat. 18,233, Sept. 12, 1901.

THE apparatus comprises a tank the lower part of which is formed as a reservoir for the water to be distilled, whilst the upper part, with inverted cone-shaped bottom, acts as a condenser and reservoir for the condensing water, and the intermediate portion is formed as an annular receiver for the distilled water, and is furnished with means for drawing the water off. The contents of the upper reservoir are automatically changed by means of a ball supply valve and a siphon or equivalent overflow, and the contents of the lower reservoir are replenished from the upper reservoir.—L. A.

INORGANIC—QUALITATIVE.

Uranium Salts and Hydrogen Peroxide; Colour Reaction of ——. J. Aloy. Bull. Soc. Chim., 1902, **27**, [14], 734—735.

WHEN to a uranium compound, hydrogen peroxide is added, followed by potassium carbonate (solid or strong solution), a fine red solution is obtained. This reaction may be applied to the yellow salts, the uranous compounds, and also to the anhydrous oxides, which should however be first converted into the nitrate by nitric acid. It may also be used in the presence of metals, the carbonates of which are insoluble in excess of potassium carbonate. The delicacy of the method is increased by adding to the red solution 2—3 volumes of strong alcohol, when a red precipitate is obtained, which rapidly collects on the bottom of the vessel.

In applying the reaction to the detection of hydrogen peroxide, uranium nitrate is treated with sufficient potassium carbonate to dissolve the precipitate; hydrogen peroxide then produces the red coloration. In the case of traces of hydrogen peroxide, it is better to make a solution of uranium nitrate in 95 per cent. alcohol, then add a few drops of the liquid and some crystals of potassium carbonate. A red precipitate is formed, or a red liquid collects at the bottom of the vessel.

The red compounds soon lose oxygen at the ordinary temperature; when dissolved in water and reprecipitated by alcohol they are partially decomposed. The author has, however, obtained red crystalline compounds by using methyl alcohol in place of treating with ordinary alcohol and water.—A. C. W.

Cupric Chloride and Bromide; Precipitation of ——, *by Sulphuric Acid. [Qualitative Distinction between Chlorides and Bromides.]* G. Viard.

See under VII., *page* 1076.

INORGANIC—QUANTITATIVE.

Filter Paper, A Cause of Error in Analytical Chemistry: I. Fixation of Compounds on Paper and Cotton. Mansier. J. Pharm. Chim., 1902, **16**, [2], 60—65.

ATTENTION is called to the errors which may result in analysis through the fixation of compounds on filter paper. The following experiments are amongst those quoted:—Ten c.c. of N/1 caustic soda were poured on a 15 cm. filter paper, the 4 c.c. of filtrate required 3·8 c.c. of N/1 acid; a loss in strength of 5 per cent. Potash and ammonia are similarly absorbed. A Prat-Dumas filter paper, 33 cm. in diameter, was cut up and immersed in 30 c.c. of N/10 caustic potash, after leaving for a few minutes the liquid was expressed; its titre had decreased by 47 per cent. This fixation of alkali is much less if the paper be not totally immersed. A quarter of a sheet of Prat-Dumas paper was moistened with 4 c.c. of N/10 caustic soda, the paper was then washed with boiling water in quantities amounting to a total of 50 c.c.; the wash waters only required 2·1 c.c. of N/10 acid. The absorption by plugs of cotton-wool is of a similar nature. Lime and baryta are also fixed in the same manner, sodium carbonate to a smaller extent.

Sodium chloride is not absorbed; calcium chloride in 0·2 per cent. solution loses no chlorine to paper, but one-fifth of the calcium is fixed. Mercuric chloride, in 1 per cent. solution, loses ¼ of the mercury and 1/20th of the chlorine.

Phenol appears to be absorbed. Thirty c.c. of a 0·1 per cent. solution of morphine hydrochloride were poured on 3 grms. of filter paper; the determination of morphine in 10 c.c. of the liquid showed a loss in strength of 22 per cent. The neutral quinine sulphate is fixed on cotton and paper in the same proportions. Strychnine sulphate (0·1 per cent.), atropine sulphate, pilocarpine nitrate, and narceine hydrochloride (all 0·5 per cent.) lose about the same proportion.—A. C. W.

Standard Sulphuric Acid Solutions; Preparation of —— *by Electrolysis.* Dauvé. J. Pharm. Chim., 1902, **16** [2], 65—66.

THE method of obtaining standard solutions of sulphuric acid by electrolysing a solution of pure copper sulphate and weighing the copper deposited on the cathode, cannot give very exact results, because solutions of copper sulphate not containing free acid give a dark non-coherent deposit formed in part of the suboxide. It is only when the liquid has become acid by reason of the electrolysis that pure copper is deposited.—A. C. W.

Arsenious Acid; Colorimetric Determination of —— J. Mai. Zeits. anal. Chem., 1902, **41**, [6], 362—365.

ATTEMPTS to convert arseniuretted hydrogen, evolved as in Marsh's test, into arsenic sulphide were abandoned on account of experimental difficulties: high temperatures were requisite. Arsenious acid is readily converted into arsenious chloride and this into the sulphide, the quantity of which can be gauged colorimetrically. When the hydrochloric acid gas conveying the arsenious chloride is conducted against cloth impregnated with zinc sulphide, the sulphuretted hydrogen is too rapidly carried away. The method would, however, be applicable in qualitative work.

The process finally adopted was as follows:—Arsenic trioxide is heated with strong hydrochloric acid in a wide thick-walled test tube, into which is conducted a regular current of dry carbon dioxide. The gases pass along the tube, bent upwards at a slight angle and then vertically downwards, which is attached to a tube of the kind used to support Gooch crucibles. The wide end is greased inside with vaseline to prevent the liquid from creeping up, and a piece of wet cloth, in which are made four holes by means of a needle, three at the edge and one in the middle, is fastened over it by means of an indiarubber ring. Carbon dioxide is passed for five minutes to remove moisture;

deposit on the glass is expelled by warming. A dish containing fresh, saturated sulphuretted hydrogen water is then placed below the cloth, so that it is wetted over the whole surface. The test tube is warmed with a small luminous flame, so that the acid just boils. Towards the end of the operation the temperature may be somewhat raised, but aqueous hydrochloric acid must not be allowed to distil over, otherwise the arsenic sulphide may float off the cloth. The experiment should not last more than one hour. During the heating the current of carbon dioxide should remain constant (2—4 bubbles per second).

0·1 mgrm. of arsenic produces a distinct coating; differences of 0·1 mgrm. up to a limit of 0·6 mgrm. can be clearly distinguished, but beyond this an increase of 0·2 mgrm. is required to produce a distinct difference. If the area of the deposit be diminished, smaller quantities of arsenic can be estimated. By treatment with ammoniacal silver nitrate the arsenic sulphide may be converted into silver sulphide; the colour is then deeper, but the difference in the appearance of the deposit cannot be estimated beyond the upper limit at 0·5 mgrm. of arsenic.—A. C. W.

Free Alkali in the Presence of Nitrites; Titration of ——. L. Arndt. Zeits. anal. Chem., 1902, **41**, [6], 359—362.

The author desired to estimate free ammonia in ammonium nitrite. It is not possible to obtain the ammonia by distillation, since the nitrite produces a little ammonia in its decomposition; for the same reason it is useless to acidify the solution and evaporate, and also because ammonium salts lose ammonia when their aqueous solutions are boiled.

The nitrous acid, liberated by the addition of acid to a solution of pure sodium nitrite, does not redden methyl orange. Litmus gives better results: 10 c.c. of ammonia solution required 11·5 c.c. of 1/10 N sulphuric acid, 11·6 c.c. in the presence of neutral sodium nitrite, and 11·4—11·45 in the presence of neutral ammonium nitrite obtained from equivalent quantities of barium nitrite and ammonium sulphate. If carbonates are present, which is usually the case, they must be precipitated by barium chloride and filtered off before titrating, otherwise the end reaction is indistinct. If a barium salt is present in titrating with sulphuric acid, the litmus colouring matter is precipitated with the sulphate; it is then necessary to titrate with hydrochloric acid or to precipitate the barium with sodium sulphate.

Aurin is better than litmus, the colour change being sharper; it must be used in aqueous, not alcoholic, solution, since nitrous acid acts on alcohol. Fairly concordant results were obtained in titrating ammonium nitrite solutions, containing free ammonia, with hydrochloric and sulphuric acids, using Aurin as indicator.—A. C. W.

Ferrocyanides and Ferricyanides; Iodometric Method for ——. E. Rupp and A. Schiedt. Ber., 1902, **35**, [13], 2430—2434.

The permanganate method, which is generally used for the determination of potassium ferrocyanide, has the disadvantage of an uncertain end-reaction. Potassium ferrocyanide is completely oxidised to ferricyanide by excess of iodine in 15 minutes in the presence of sodium bicarbonate; after several hours too high results are obtained. In neutral solutions the reaction requires about 60 minutes; in acid solutions it is not complete, but if the acetic acid solution be heated on the water-bath in a well-stoppered flask for 20 minutes the results are good. In the presence of mineral acids the process is reversible, but the difficulty may be removed by the addition of sodium acetate. The determination is best conducted by oxidising in the presence of not too much bicarbonate, without shaking, and titrating after 15—20 minutes.

Potassium ferrocyanide is best obtained pure by precipitating a strong solution with alcohol, it is then anhydrous. It may be used to control the strength of silver nitrate solutions, adding as indicator a little copper sulphate; ferric salts as indicators give too low results.

Potassium ferricyanide is best reduced by the method given by Mohr: 5 grms. are dissolved in a 250 c.c. flask, the solution made strongly alkaline with potash, heated to boiling, and a solution of 5 grms. of iron powder in dilute sulphuric acid added. The flask is then heated on the water-bath for 15 minutes, cooled and made up to the mark; 25 c.c. of the alkaline filtrate are neutralised with acetic acid, sodium bicarbonate added, and 25 c.c. of decinormal iodine solution, and the excess of iodine titrated by thiosulphate as before. Reduction by means of hydrogen peroxide in alkaline solution is complete and immediate, but too large an excess produces dark solutions and high results. 10 c.c. of decinormal ferricyanide solution are mixed with a few c.c. of N 1 potash and 10 c.c. of hydrogen peroxide of 2·5 per cent. strength. The decolorised solution is rapidly heated to boiling to destroy the excess of peroxide, cooled, neutralised, and treated as before.

—A. C. W.

Copper; Determination of, as Sulphocyanide ——, in the presence of Bismuth, Antimony, Tin, and Arsenic. R. G. van Name. Zeits. anorg. Chem., 1902, **31**, 92. Zeits. angew. Chem., 1902, **15**, [29], 735.

The gravimetric determination of copper as sulphocyanide in the presence of antimony, bismuth, or tin presents difficulties, since in slightly acid solutions these metals readily form insoluble basic chlorides, whilst the use of stronger acid interferes with the quantitative separation of the copper. In the case of antimony and tin in the stannic state, the difficulty can be obviated by the addition of tartaric acid, which helps to prevent the separation of basic chlorides. The separation of copper from bismuth by the addition of a slight excess of sulphocyanide is less readily effected, and in this case it is necessary to keep the proportion of hydrochloric acid relatively small, even in the presence of tartaric acid, and, at the same time, to increase the volume of the liquid so as to prevent the simultaneous precipitation of bismuth. If a larger proportion of acid be preferred, a considerable excess of sulphocyanide must be added, which has the advantage of yielding precipitates which can be readily filtered off. Tin in the stannous condition can be separated by the following method, when it is not present in greater proportion than the equivalent amount of copper. The solution is first treated with ammonium sulphocyanide and then with ammonium bisulphite, with the result that the stannous tin reduces an equivalent amount of copper, and is itself converted into the stannic condition. When more stannous tin is present, it is best oxidised before the precipitation. In the separation of arsenic from copper, care must be taken to avoid too large an amount of hydrochloric acid in the solution.—C. A. M.

Zinc Sulphide: Turbidity in Filtrates from ——. O. Mühlhaeuser. Zeits. angew. Chem., 1902, **15**, [29], 731—732.

The author shows by test experiments that the zinc sulphide is completely retained by the filter, and attributes the turbidity in the filtrate to the separation of sulphur. In the following volumetric method no notice need be taken of any turbidity; 10 c.c. of a 0·75 per cent. solution of zinc in hydrochloric acid are rendered decidedly alkaline with ammonia, then treated with 15 c.c. of acetic acid, and diluted to about 400 c.c. with water. The flask is then heated on the water-bath to about 90° C., and frequently shaken, whilst a current of hydrogen sulphide is passed through it. After standing for 24 hours the liquid is filtered whilst still warm, and the precipitate washed with hydrogen sulphide solution containing acetic acid, and dissolved in dilute hydrochloric acid (1 : 1). The solution is boiled to expel the hydrogen sulphide, oxidised with bromine water, neutralised with ammonia, and filtered, and the filtrate slightly acidified with hydrochloric acid, and titrated with potassium ferrocyanide.—C. A. M.

ORGANIC—QUALITATIVE.

Cod-Liver Oil; Kremel's Test for ——. Bedall. Pharm. Centr., 1902, **43**, 118. Zeits. angew. Chem., 1902, **15**, [29], 736.

According to the results of the author's experiments, Kremel's test for the identity of cod-liver oil, which has recently been made official in Germany, is only applicable in the case of fresh oil.—C. A. M.

Aldehydes and Ketones; Thiosemicarbazide as a Reagent for ——. M. Freund and A. Schrader. Ber., 1902, **35**, [14], 2602—2606.

The production of the thiosemicarbazones affords a ready method for isolating and recognising aldehydes and ketones. The authors describe a number of these compounds: *Acetaldehyde thiosemicarbazone*, $CH_3.CH:N.NH.CS.NH_2$, is obtained by mixing equal parts of the constituents, cooling, and evaporating off the excess of aldehyde. White crystals melting at 146° C. *Citral thiosemicarbazone* forms white flocks which melt at 107°—108° C. *Benzaldehyde thiosemicarbazone* separates as a yellowish-white crystalline mass on shaking an aqueous solution of thiosemicarbazide hydrochloride with an alcoholic solution of the aldehyde. It sinters at 155° C. and melts at 160° C. *o-Hydroxybenzaldehyde thiosemicarbazone* is obtained in a similar manner; when recrystallised from hot water it is white. It melts at 231° C. *p-Hydroxybenzaldehyde thiosemicarbazone* forms a yellow precipitate, which crystallises in fine needles. It melts at 224° C. *Cinnamic aldehyde thiosemicarbazone* separates in yellow flocks, which are precipitated from alcohol in the crystalline form by water. It crystallises from ether in white needles, which melt at 123° C. *Vanillin thiosemicarbazone* is obtained by mixing a solution of vanillin in dilute alcohol with an aqueous solution of thiosemicarbazide, and adding a drop of acetic acid. It forms white needles, melting at 196° —197° C. *Acetone thiosemicarbazone* is made by gently warming acetone with thiosemicarbazide, cooling and adding water. It is recrystallised from much hot water. It melts at 179° C. *Aceto-acetic ester thiosemicarbazone* separates from hot water as an oil, which crystallises on cooling. It melts at 97° C. *Succinylsuccinic ester bis-thiosemicarbazone*, $(C_{12}H_{16}O_4)(:N.NH.CS.NH_2)_2$, separates on long standing from an alcoholic solution of the constituents in theoretical proportions. It turns brown at 250° C. and does not melt at 275° C. It is insoluble in almost all solvents. *Diketohexamethylene bis-thiosemicarbazone*, $C_6H_8(:N.NH.CS.NH_2)_2$, forms a white crystalline mass, which turns black and melts between 210° and 215° C.—A. C. W.

ORGANIC—QUANTITATIVE.

Tannin; Absorption of ——, by Filter Paper. H. R. Procter and F. A. Blockey. Collegium, 1902, **1**, [18], 145—148, and [19], 151—158.

In the analysis of tanning materials by the hide-powder filter method, the "total soluble" can only be determined on a perfectly clear solution. This is usually obtained by filtration through paper, which, however, is a specific source of errors. To control these errors, the International Association of Leather Trades Chemists (I.A.L.T.C.), and the (American) Association of Official Agricultural Chemists (A.O.A.C.), prescribe special filter papers and special modes of filtration. The errors, however, are not thus eliminated, and no one medium has been devised that filters all tan liquors equally well.

The authors describe a method of correction which can be determined by the analyst, and applied to any given tanning material, and in conjunction with any filtering medium found most suitable. The steps in this investigation may be summarised as follows:—

I. The material absorbed by filter paper really is tanning matter, and should be returned as such. Two perfectly soluble extracts, Mimosa D and oakwood, after five filtrations through paper, 605 (one of the official filter papers), lost 4·2 and 3 units per cent. of soluble matter respectively, whilst the non-tannins remained practically unaltered.

II. *Nature of the Error due to this Absorption.*—The error in successive 50 c.c. of filtrate was found to vary slightly, but was practically constant for any given mode of filtration and any particular class of material, being greatest in the first 50 c.c., and almost constant in the fourth and later 50 c.c. Serious errors arise when filtration is prolonged, so it was decided to filter 150 c.c. for use in the hide-powder filter, and collect the next 50 c.c. for the estimation of total soluble, adopting this as a general method of procedure.

III. *Method of Correction.*—On the foregoing evidence the following method of correction for filter paper was devised:—

Filter 500 c.c. of the tanning solution quite clearly by the method to be employed in analysis. Mix thoroughly, and evaporate 50 c.c. to determine its total soluble (1); refilter 200 c.c., and evaporate the last 50 c.c. of this quantity for a second determination of total soluble (2). *The difference between* (2) *and* (1) *is the correction required.* It represents the error due to absorption by the paper, and is to be added to the total soluble (3), obtained by filtering more of the original liquor and evaporating the fourth 50 c.c. of filtrate; (3) may or may not be identical with (1), though it will be nearly so.

The same method is applicable in correcting for filtrations in which kaolin is employed, as was proved by many experiments made practically on the lines laid down by the Association of Official Agricultural Chemists (American).

IV. *Theoretical Errors in this Mode of Correction.*—(*a*) The filter paper might have a special affinity for some substance present in small quantity in the solution, and which might be almost wholly removed in the first filtration. This was disproved by definite experiments.

(*b*) Soluble matter might become insoluble as a result of oxidation or fermentation. This was proved to be the case by keeping liquids for various periods of time. This source of error only requires to be realised to be avoided.

V. *Practical Value of the Correction under various Conditions.*—(*a*) A solution of quebracho extract was analysed by the use of three different filter papers, *viz.*, 605, 590, and 595, together with kaolin. The results, after applying the correction, were identical.

(*b*) Mimosa D extract (chestnut) was filtered through the above three papers, both with and without kaolin, and the correction was applied. The results were almost identical, but the kaolin produced a uniformly low result, as has been previously noted (Liège Conference).

(*c*) Similar experiments were made with a faintly opalescent chestnut extract solution, showing 0·8 per cent. insoluble, a clear oakwood extract yielding 0·0 per cent. and 0·1 per cent. insoluble, and with two different hemlock extracts, the results in all cases being concordant when corrected, except when paper 605 was employed.

VI. *General Conclusions.*—The method gives concordant results, and may probably be used in connection with cheap filter paper, instead of the expensive varieties officially prescribed.

Paper 605 (official) behaves with special irregularity, and gives rise to more serious errors than does kaolin, though the latter generally increases the amount of absorbed material.

VI*a*. A higher temperature than 50° C. is required to dissolve some of the constituents of quebracho extract. Thus, a solution made at 100° C. contained 83 per cent. of soluble matter after filtration through paper 605 and kaolin. When dissolved at 50° C., only 81 per cent. was soluble, although it filtered more readily, *viz.*, through paper 590 and kaolin.—R. L. J.

Starch Syrups: Composition and Analysis of ——. M. Honig. Zeits. Unters. Nahr.- u. Genussm., 1902, **5**, [14], 641—653.

The ordinary dextrins of commercial starch syrups can be precipitated by König's method, by means of 87 per cent. alcohol, and when fractionated themselves by alcohol are separable into erythrodextrin and achroodextrin with cupric reducing powers of 10·7—12·3 and 22·2—24·5 per cent. of that of glucose respectively. The author describes a simpler method for the precipitation of these dextrins from solutions of starch syrups:—100 c.c. of the solution, containing not more than 1 grm. of glucose (or fructose, invert sugar, or maltose), are treated in a graduated 200 c.c. flask with 50 c.c. of cold, saturated baryta solution; sufficient 95 per cent. alcohol is then added to bring the volume of the whole, after thorough shaking and cooling, exactly up to the mark. In this way the whole of the precipitable dextrins are separated and the glucose passes quantitatively into the filtrate, the accuracy of the method having been proved with known quantities of the pure substances. In commercial starch products, there

mains in solution along with the glucose a dextrin-like ody, soluble in alcohol, which may perhaps be regarded as reversion product of glucose. It is freed from the ucose by fermentation of the evaporated filtrate, and is ien obtainable as a syrup with rotation $(\alpha)\gamma = 80°$, and a ipric reducing power equal to about 10 per cent. of that glucose. This dextrin is soluble in 95 per cent. alcohol id is precipitated by ether-alcohol as a sticky hygroscopic ass; it yields no osazone and is completely hydrolysed to ucose by heating for one hour in a boiling water bath ith hydrochloric acid (sp. gr. 1·125).

As a result of the above observations the author has rmulated a scheme for the analysis of commercial starch rups; the following determinations are made:—

(1) Dry substance, by evaporation of 50 c.c. of a lution of 10 grms. of syrup in 500 c.c., and drying the sidue *in vacuo* for four hours at 100° C.

(2) Ash, as usual.

(3) Cupric reducing power of a solution of 10 grms. per e, volumetrically by Soxhlet's method.

(4) Cupric reducing power of the filtrate after the removal of the precipitable dextrins:—20 grms. of syrup are dissolved to 500 c.c.; 100 c.c. are treated with baryta and alcohol as described above, filtered through a dry filter and 150 c.c. of the filtrate are treated with sulphuric acid to remove barium, neutralised with soda, made up to 200 c.c., and the cupric reducing power is determined after filtration and suitable dilution.

(5) Cupric reducing power of the inverted solution of the original starch syrup:—2 grms. of substance in 100 c.c. are heated for three hours in a boiling water bath with 10 c.c. of hydrochloric acid (sp. gr. 1·125).

(6) Cupric reducing power, after inversion, of the filtrate from the precipitable dextrins:—150 c.c. of the filtrate are treated with sulphuric acid to remove barium, and heated for one hour in a boiling water bath with 15 c.c. of hydrochloric acid.

From these data it is possible to calculate the composition of the starch syrup as illustrated in the table below:—

No.	Water.	Glucose.	Dextrins.			Ash.	Dry Substance.	
			Precipitable by Alcohol.	Soluble in Alcohol.	Total.		Calculated.	Found.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
I.	17·83	34·01	26·43	21·68	48·11	0·24	82·36	82·41
II.	17·20	34·40	25·78	22·33	48·11	0·21	82·72	83·01
III.	20·33	31·70	24·67	23·00	47·67	0·20	79·60	79·87
IV.	23·54	30·11	24·43	21·82	46·25	0·32	76·68	76·78
V.*	14·38	49·38	12·19	22·97	35·16	0·14	84·68	85·76

* Sample No. V. was a solid starch sugar, for which products the method is not quite so accurate.

n analyses as usually performed, in which the pertage of glucose is calculated directly from the cupric ucing power of the sample, neglecting that of the trins, the real percentage of glucose may be found roximately by deducting 6 per cent. for starch syrups 3 per cent. for solid sugars from the percentage ulated from the total reducing power. Similarly, in id analyses of starch products, the real percentage of ose may be found approximately by deducting 2 per t. from that calculated from the cupric reducing er of the filtrate from the precipitable dextrins.

—J. F. B.

trins; Examination and Analysis of Commercial ——. Lippmann. Zeits. Spiritusind., 1902, **25**, [22—29], 37—238, 249, 269—271, 291, 304—306, and 316—17.

DER the general term of "dextrin" are included a vast ber of commercial products differing so widely in their ire and properties that even the enormous number of es under which they are sold are not sufficient to characie the various sorts. Chemical analysis, as usually apl in the estimation of the moisture, soluble and insoluble ter, ash, dextrin, sugar, and acidity, does not suffice to e the identity of two samples of dextrin; differences in sical properties, all-important from the industrial point view, will often nullify the value of chemical tests. mmercial dextrins occur in the pulverulent, granulated, fluid forms, the pulverulent form being by far the most eral. Powdery dextrins retain the form of the original ch granules; granulated dextrins are in the state of rphous lumps resembling gum-arabic; fluid dextrins r as opaque, milky syrups. Dextrins are manufactured oasting starch, either alone or after the addition and ng off of a volatile acid (hydrochloric or nitric acid) at eratures above 100° C., until the desired state of rinisation is reached. The exact imitation of a given ple of dextrin is a matter of the greatest difficulty, and manufacturers confine themselves to the production few constant sorts. *Analysis of the raw material* ists in examining the starch microscopically to determine its origin, quality, according to the size of granules, and purity; also in determining moisture, acidity, and freedom from chlorine; lower qualities of starch are frequently employed.

The control of the process consists of the control of the quantity and uniformity of the acidification, the control of the preliminary drying, but principally the control of the degree of dextrinisation. For the last purpose the methods are chiefly empirical, such as feel, colour, appearance when moistened on a glass plate, &c. Attempts have been made to apply the iodine reaction for estimating the degree of conversion, but the method fails to distinguish between the more highly dextrinised products. For rapidly estimating the percentage of matter soluble in cold water, 100 c.c. of water are placed in a flask of about 500 c.c. capacity, 20 grms. of the dextrin are then dusted in and another 100 c.c. of water are added. The whole is shaken for about five minutes and filtered through a dry filter; the soluble matter is then determined in the filtrate by means of a Brix spindle. The operation can be carried out in less than 15 minutes, and is accurate to 2 or 3 per cent. But dextrins of the same cold water solubility may consist of very different products; the rapidity of solution and of filtration, also the clearness or opalescence of the solution should be noted. The consistency of a syrup made by heating 30 grms. of dextrin with 30 c.c. of water over a free flame until homogeneous should be noted after cooling. The determination of the viscosity of a fairly dilute solution of the dextrin dissolved either by cold water or hot water is perhaps more useful than the determination of the solubility.

Examination of the Final Product.—Products made with acids are white or pale coloured, plain roasted dextrins are drab or brown; hydrochloric acid gives reddish dextrins, nitric acid gives greyish products. Coloured dextrins are almost entirely soluble in cold water; white dextrins are not so soluble. Best potato-starch dextrins have a high lustre, wheat and maize dextrins are dull. The taste and smell of the product will afford much information to the expert, as also will the feel. Microscopic examination will reveal the origin and quality of the starch and the presence

of or freedom from mechanical impurities and particles of burnt gluten.

The chemical analysis should include determinations of moisture, ash, sand, matters soluble and insoluble in cold water and in hot water, acidity and iodine reaction. The proportion of pure dextrin may be taken as the difference between total soluble matter in cold water and the sum of the sugar and ash, or else it may be determined directly by precipitation with alcohol. Unaltered starch very seldom be present, but if so it will be found on the filter as a jelly in the determination of the solubility in hot water. The soluble starch will be found from the difference between the matter insoluble in cold water and that insoluble in hot, since it is filtrable in the latter state. Unconverted starch differs from soluble starch in giving a paste with alkalis. The consistency and permanence of a concentrated syrup made by boiling (see above) should be observed, also the nature of the deposit left on evaporation of the same spontaneously. The viscosity, preferably of a cold water solution, is a very important factor, that of the hot water solution may also be determined; results of viscosity tests should be tabulated comparatively for determining the type of dextrin. The absence of free chlorine should be ascertained. The author describes several methods proposed for the above determinations and discusses the value of the conclusions to be drawn from each. It is advisable to make direct tests of the suitability of the dextrin for calico-printing and its effect upon colours, details of which tests are described in the paper.—J. F. B.

Malt; Determination of Water in ——. J. H. Schulze.

See under XVII., *page* 1088.

Formaldehyde; Determination of ——. R. Pfaff. Chem.-Zeit., 1902, **26**, [61], 701.

Formaldehyde when digested with hydrazine hydrate yields formalazine, $C_2H_4N_2$. This reaction may be utilised for the quantitative titration of formaldehyde in solutions. A solution of hydrazine hydrate of known strength is required, and since this rapidly alters on keeping, it must be standardised every time before use by titration with decinormal sulphuric acid, using methyl orange as indicator; 1 molecule of H_2SO_4 combines with 2 molecules of $N_2H_4H_2O$. The formaldehyde solution is digested with excess of the standard hydrazine hydrate solution in a closed vessel for one hour, and the excess of hydrazine is then titrated back with standard acid.—J. F. B.

Methyl Anthranilate in Essential Oils; Determination of ——. A. Hesse and O. Zeitschel. Ber., 1902, **35**, [13], 2355—2357.

The authors have examined the method proposed by Erdmann (this Journal, 1902, 283), for the determination of methyl anthranilate; they find that the titration gives excellent results, but that the method for the isolation of the ester from essential oils extracts only a portion. Thus, by Erdmann's method, they found only 0·324 per cent. in a synthetic oil, which had originally contained 0·5 per cent., and now, after keeping for 11 months, gave results indicating 0·47—0·46 per cent. by their own method (this Journal, 1901, 289, 1139), and 0·484 per cent. when the ester was isolated by their method, and then determined by Erdmann's. Since the authors' method is simple, they propose to retain it for ordinary cases, but, when other bases are present, to isolate them by their method, divide into two portions, determine the total bases by their method, and the methyl anthranilate by Erdmann's process.—A. C. W.

Calcium Carbide; Sampling of ——. E. Odernheimer.

See under II., *page* 1065.

Arabinose; Quantitative Determination of ——. C. Neuberg and J. Wohlgemuth.

See under XXIV., *page* 1103.

XXIV.—SCIENTIFIC & TECHNICAL NOTES

"Activating" Actions of Reducing Substances, Colloid Noble Metals, Alkaloids and other Basic Substances various Oxidising Compounds. E. Schaer. Annale 323, [1], 32—82.

Schönbein (J. prakt. Chem., **89**, 1; also see Schaer, th Journal, 1901, 742) found that sulphurous acid had remarkable "activating" (*activirende*) effect on vario oxidising substances, *i.e.*, they were considerably mo active in the presence of small quantities of sulphuro acid. The present paper deals with a number of simil phenomena. The "activating" substances belong to fo classes: (1) Reducing agents. Sulphurous acid a sulphites in aqueous solution (1—5 per cent.); hydrog peroxide (0·5—1 per cent. aqueous solution). 2. Colloid noble metals. Solutions of platinum and gold, prepared Bredig's method. (3) Various basic substances. Alkaloi insoluble carbonates, and salts of alkaline reactio (4) Soluble haloid salts. The oxidising agents may divided into 3 groups: (1) Metallic Salts. Capric a ferric salts, mercuric chloride, and silver nitrate. (2) Inc ganic acids (and their salts), chromic, hypochlorous, chlor bromic, iodic, nitric, and permanganic acids. (3) Orga oxidising substances of peroxide nature. Benzoyl peroxi and quinone. The oxidisable substances, employed indicate the occurrence of the "activating" effect, we as follows: (1) Solution of potassium (zinc or cadmium iodide, and starch. (2) A 1—2 per cent. alcoholic soluti of guaiacum resin, or a 0·5—1 per cent. chloroform soluti of guaiaconic acid. (3) Indigo; a dilute aqueous soluti of Indigo Carmine of slightly acid reaction. (4) Pyrogall 1 per cent. aqueous solution. (5) A 1—5 per cent. soluti of guaiacol in dilute alcohol. (6) *p*-Phenylenediamine 0·5—1 per cent. aqueous solution. (7) Leucaniline 0·1—0·5 per cent. aqueous solution. (8) Aloin; 0·5 cent. solution of aloin, containing isobarbaloin, with 5 cent. of alcohol. This reagent gives a raspberry purple-red coloration under conditions parallel with th in which guaiacum resin gives a blue. (9) Cyanine soluti 5 parts of 1 per cent. alcoholic solution diluted with wa to 100 parts. The decolorisation is due to the form tion of an unstable oxygen compound of the dyestu (10) Saturated aqueous solution of aniline. (11) A 0·1 cent. solution of brasilin in dilute alcohol.

The experiments were conducted by diluting a moderat concentrated solution of the oxidising agent with about times its volume of water, adding a suitable quantity indicated by a preliminary test) of the oxidisable substar and then a few drops of the "activating" substance. parallel experiment was performed without the "activatin agent. The degrees of activity imparted are indicated tables which are given in the original.—A. C. W.

Ammonium Amalgam. H. Moissan. Bull. Soc. Chim 1902, **27**, [14], 714—719.

Gay-Lussac and Thénard found that ammonium amalg prepared in an aqueous solution of ammonium chlor contained 2·5 vols. of ammonia to 2 vols. of hydrog Landolt obtained from the amalgam prepared by elect lysis, 2·15—2·4 vols. of ammonia to 1 vol. of hydrog but this amalgam did not give double decompositions wh copper and silver salts, and should not be regarded as metallic amalgam.

In the first place it is necessary to determine volumes of ammonia and hydrogen evolved by the amalg in its decomposition; the solubility of ammonia in wa is so great, and the drying of the pasty (*i.e.*, decomposi) amalgam by filter paper so impossible, that it is necessy to produce the amalgam in the absence of water, wh condition is obtained by employing a solution of ammon chloride in liquefied ammonia. Sodium amalgam was fo d to be without action on liquefied ammonia at −35 o −39° C.; a little perfectly dry ammonium iodide was t added. The amalgam reacted with the salt and becam more fluid without the evolution of any gas. After lo longed agitation, the amalgam was several times wash with liquefied ammonia, and the iodides of ammonium d

dium removed by decantation. The metallic residue was xt cooled to −80° C., at which it was quite hard; it was moved from the vessel, washed with ether at −80° C. aturated with hydrogen), and placed in a glass tube tached to a mercury pump. A perfect vacuum was tained without any decomposition, the temperature being pt at −80° to −90° C. When the temperature is lowed to rise, the mass melts, begins to increase in lume at −30° C., and at 15° C. occupies 25—30 times original volume. When decomposition sets in, the temrature rises above the normal atmospheric temperature. ie ammonia was collected in water, and titrated or ighed as ammonium chloride, the hydrogen being deterined eudiometrically. In all the experiments 2 vols. ammonia were obtained to 1 vol. of hydrogen. The oportion was unaltered when the amalgam was washed liquid sulphur dioxide or ether saturated with hydroloric acid gas, in place of ether alone, but a portion of e amalgam was destroyed.

Though this result is in agreement with what theory mands for an amalgam of NH_4, yet the author considers not evidence of the existence of NH_4, but rather of a uple or double ammoniacal metallic hydride formed om the hydrogen of the hydriodic acid, and the decomsition of which produces the increase in volume of the malgam." Pasty sodium amalgam acts on (aqueous) mmonia, producing a slow evolution of hydrogen without elling up. But a solution of sodium hydride in sodium malgam, under the same conditions, swells enormously, d produces a buttery mass which keeps for several days the ammoniacal solution. When hydrogen is passed ough sodium kept in a glass tube at 320° C., the drogen dissolves, and a transparent crystalline compound parates. This hydride, when in fine powder, takes fire the air; takes fire in chlorine and oxygen at slightly vated temperatures, is very hygroscopic, and is violently composed by water. When heated *in vacuo* it is deposed into its elements. The hydride can be separated om excess of sodium by the action of dry liquid ammonia, ich removes the sodium as sodamide.—A. C. W.

Arabinose, d-Arabonic Acid, and the Quantitative Determination of Arabinose. C. Neuberg and J. Wohlgemuth. Zeits. physiol. Chem., **35**, 31—40. Chem. Centr., 1902, **1**, [17], 985.

eparation of d-Arabinose. — The author uses a odification of Wohl's method, which only differs from original in that the diphenylhydrazone of *d*-arabinose prepared directly from the crude solution of the rabinosediacetamide, without first isolating the latter. this way a yield of almost 35 per cent. of the theoretical obtained, as against only 8 per cent. by Wohl's method. Pentacetylgluconic nitrile (100 grms.), prepared by acetyion of *d*-glucosoxime with acetic anhydride and anhyous sodium acetate, is dissolved in 280 c.c. of 96 per t. alcohol, a solution of 34 grms. of silver oxide in) c.c. of 30 per cent. aqueous ammonia is added, and, r 48 hours, the silver cyanide is filtered off. The resulting ution of *d*-arabinosediacetamide, after removal of the amnia by boiling, and of the dissolved silver by sulphuretted drogen, is heated on the water-bath for three-quarters of hour with 37 per cent. fuming hydrochloric acid (100 to about 500 c.c. of solution), then neutralised with d carbonate, concentrated, and an equal volume of 96 cent. alcohol added. The filtered alcoholic solution is ated with the calculated amount of diphenylhydrazine l the mixture heated on the water-bath. The *d*-arabinose prepared from the hydrazone in the usual manner means of formaldehyde or benzaldehyde. 1 grm. of rabinosediphenylhydrazone is soluble at 15° C. in 400 of water, 600 c.c. of alcohol, or 310 c.c. of pyridine.

Preparation of d-Arabonic Acid.—The solution of rabinosediacetamide, prepared as described above, is drolysed with hydrobromic acid (sp. gr. 1·49) instead with fuming hydrochloric acid as in the preparation rabinose. The solution is then treated with bromine grms. to each 50 grms. of pentacetylgluconic nitrile d in the preparation of the *d*-arabinosediacetamide), wed to stand two days, the bromine removed by urrent of air, and the hydrobromic acid precipitated with lead carbonate and silver oxide, which metals are removed by means of sulphuretted hydrogen, the boiling solution is saturated with calcium carbonate, concentrated, and treated with twice its volume of alcohol. The precipitated calcium *d*-arabonate is purified by crystallising from water, the yield being 70 per cent. of the theoretical.

Determination of Arabinose.—The method is suited for the determination of arabinose in presence of other furfural-yielding substances (pentoses, pentosans, free and combined gluconic acids), that is, in cases where Tollens' method (determination of the furfural formed on boiling with hydrochloric acid) is not applicable; it can also be used when hexoses are present. The solution is treated with two drops of strong acetic acid, concentrated, and an equal volume of 96 per cent. alcohol added. After cooling, the mixture is filtered and the filter washed with 50 per cent. alcohol. The filtrate is heated with diphenylhydrazine for half an hour on the water-bath, alcohol being added to replace that lost by evaporation. The precipitated hydrazone is filtered into a Gooch crucible, washed with a little 30 per cent. alcohol, carefully dried at 80° C., and weighed. The method is a convenient one for the separation of arabinose and xylose. Thus, from a mixture of 1 grm. of glucose, 1 grm. of fructose, 1·5 grms. of xylose, 0·5 grm. of gluconic acid lactone, and 1·0066 grms. of *l*-arabinose, 1·0035 grms. of *l*-arabinose were recovered in the form of the diphenylhydrazone, or a yield of 99·7 per cent.—A. S.

Ketoses; Isolation of ——. *II.* C. Neuberg. Ber., 1902, **35**, [14], 2626—2633.

The ketose sugars unite with methylphenylhydrazine $(CH_3)C_6H_5.N.NH_2$ to form osazones (this Journal, 1902 506). This reaction is common to the ketoses of all series. Solutions containing ketoses are obtained by oxidising the polyvalent alcohols. The various methods of oxidation—by nitric acid, sodium hypobromite (E. Fischer), hydrogen peroxide and ferrous sulphate (Fenton), lead peroxide and hydrochloric acid (E. Fischer)—give very different yields of ketose. The last method is most generally applicable, but Fenton's method gives the best result with erythritol; with the alcohols of other series it yields strongly-reducing sugars, which contain, however, little ketose, and a portion of the sugar is entirely decomposed.

i-Erythrulose methylphenylosazone is obtained by oxidising erythritol by hydrogen peroxide and ferrous sulphate, evaporating with barium carbonate *in vacuo* at 40° C., extracting with alcohol, treating the extract with methylphenylhydrazine and acetic acid, and crystallising the deposit from boiling benzene. The osazone melts at 158°—159° C., but after two days the melting point sinks to 140°—143° C. without any perceptible alteration in the compound.

i-Xyloketose methylphenylosazone. — Syrupy xylite is oxidised by lead peroxide and hydrochloric acid, and the resulting sugars treated with methylphenylhydrazine as above. The osazone forms fine yellow matted needles, which melt at 173° C. *i-Riboketose methylphenylosazone*, obtained from the sugars formed by the oxidation of adonite, softens at 171° C., and melts at 175° C. *I-tagotose methylphenylosazone* is obtained in the same manner from dulcite. It melts at 148°—150° C.

The products of the condensation of glycol aldehyde and glycerose under the action of alkalis were also examined. Glycol aldehyde, prepared by Fenton's method (J. Chem. Soc., **67**, 774), was treated by Fischer and Landsteiner's process (Ber., **25**, 2549), the product neutralised by acetic acid, and heated with methylphenylhydrazine acetate for a long period. No osazone could be obtained, but the phenylosazone was obtained in quantity. Thus Fischer's hypothesis is confirmed, that glycol aldehyde condenses to aldotetrose.

Wohl and Neuberg have shown that "glycerose" contains no glycerylaldehyde, and that the same products are obtained by condensing aldotriose and ketotriose (Ber., **33**, 3108). Acrose was prepared from glycerin by the method given by Fischer and Tafel (Ber., **20**, 2566, 3384), and treated with methylphenylhydrazine; the osazone, after a difficult purification, crystallised from 10 per cent. alcohol in reddish-yellow, matted needles, which melted at 158° C. (corr.). It was identical with *d*-fructose methylphenyl-

osazone; hence, acrose consists, in part at least, of *d*-fructose, as Fischer had assumed.

The "formose," obtained by Loew by the condensation of formaldehyde by the action of lime (J. prakt. Chem., 33, 321) yields a pentose methylphenylosazone, which crystallises from ethyl acetate in fine yellow needles, grouped in stars, and melting at 137° C. (corr.), thus differing considerably from the isomerides hitherto known. Consequently the ketopentose must have a branched carbon chain, or not have the ketose group in the α-position.

—A. C. W.

Tobacco; Chemistry of ——. R. Kissling. Chem.-Zeit., 1902, **26**, [59], 672—673.

The author, in continuing his work on this subject (this Journal, 1900, 696, 787), has made a series of experiments to determine the variation in the different constituents during the growth of the plant and the subsequent drying and fermentation processes. The nicotine, wax, and resins were determined as described in the former communications. For the isolation of the malic, citric, and oxalic acids, t following simplified method was adopted:—A mixture 10 grms. of the tobacco and 10 grms. of pumice stone w triturated in a mortar with 10 grms. of dilute sulphuric ac (20 per cent. strength), and then extracted with ether f 20 hours. The ethereal extract was distilled, and t residue taken up with water so as to form 100 c.c. in a Half of this liquid was then taken for the determination the malic and citric acids by titration with bariu hydroxide, and separation of the barium salts by treatme with definite quantities of alcohol; whilst the oxalic ac was determined in the remainder of the liquid by the usu methods.

The results thus obtained are shown in the subjoin table where (1) denotes the young plants before planting (2) the plants after the development of the four leave (3) shortly before pruning; (4) shortly after pruning; (. the ripe tobacco; (6) the dried tobacco; and (7) t fermented tobacco. The results are calculated upon t anhydrous tobacco.

Constituents.	1.	2.	3.	4.	5.	6.	7.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Wax	0·414	0·331	0·444	0·378	0·270	0·248	0·297
Nicotine	0·15	0·21	0·36	0·45	..	0·54	0·60
Resin soluble in petroleum spirit	1·90	1·89	1·99	1·92	2·78	2·40	2·01
„ „ ether	0·71	1·00	0·71	0·51	0·91	0·68	0·75
„ „ alcohol	2·35	2·85	2·54	1·13	4·26	2·67	3·21
Citric acid (anhydrous)	3·41	5·80	5·75	5·79	..	5·90	4·73
Malic acid „	4·98	6·34	6·08	6·21	..	5·17	5·36
Oxalic acid „	1·51	1·89	1·93	1·95	..	1·98	2·13

With regard to these determinations the author states that the mean amount of wax found in 17 samples of fermented tobacco was 0·27 per cent., the maximum being 0·39 per cent. The relative and absolute increase in the amount of nicotine is in accordance with the results of V. Kosutany (Chem. Unters. der Tabakssorten, Buda-Pest, 1882, p. 41), who found that a plant which contained no nicotine for 21 days after planting, contained 0·47 per cent. after 55 days, and 1·92 per cent. after 77 days. In general, the proportion of nicotine diminishes during the fermentation (Kosutany), but this was not the case with the sample examined by the author.—C. A. M.

New Books.

Board of Trade. Memorandum on the Comparative Statistics of Population, Industry, and Commerce of the United Kingdom and some leading Foreign Countries. [Cd. 1199.] Price 5½*d*. Eyre and Spottiswoode, East Harding Street, London, E.C.

This memorandum contains the results of an examination of the statistics relating to the trade of the United Kingdom, and of France, Germany, and the United States, in recent years, with a view to supplementing and bringing up to date the information contained in a similar memorandum issued in 1897 (*British and Foreign Trade — Memorandum* [*C.*—8322]. *Price* 6*d*.) The conclusions now arrived at do not differ materially from those stated in the earlier Return, *viz.*, that whilst the United Kingdom is still ahead of Germany and the United States in its power of manufacture for export, those countries, beginning from a lower level, are travelling upwards more rapidly than the United Kingdom, which occupies a higher eminence.

Various statistical tables dealing with the foreign trade of various countries are appended to the memorandum.

Census Bulletin [12th Census of the United States]. June 16, 1902. No. 190. Bureau of Statistics, Washington, D.C. The Utilisation of Wastes and By-Products in Manufactures.

This Bulletin, a quarto pamphlet of 26 pages, was prepared and compiled, under the direction of the Chief Statistician for Manufactures, Mr. North, by Henry G. Kittredge, of Boston, U.S.A. This is set forth in a prefatory letter to the Director of the Census, the Hon. Wm. R. Merria Special reference is made in this Bulletin to the decade 1890—1900, and the following are the branches of manufa ture under which information is given on the subject state —I. Iron and Steel Industry. II. Lumber and Timber Pr ducts. III. Paper Manufacture. IV. Slaughterhouse Pr ducts. V. Woollen Industry. VI. Cotton Manufacturi Industries. VII. Cottonseed Oil Industry. VIII. Leath Industry. IX. Dyeing Industry. X. Silk. XI. Star Industry. XII. Old Rubber. XIII. Breweries. XI' Tin and Mussel Shells. XV. Glass. XVI. Ashes, & XVII. Corn Pith. XVIII. Glycerin. XIX. Printers' I Rollers. XX. Powdered Milk. XXI. Corn Oil.

Chemicals and Allied Products. June 25, 190 Bulletin, No. 210. Bureau of Statistics, Washington, D.C

This Bulletin, a quarto volume of 306 pages, was prepare under the direction of the Chief Statistician, by Mess Dr. C. E. Munroe and Dr. T. M. Chatard. In t bulletin we have: *Firstly*:—A series of special repo relating to the manufacture of chemicals, classified und 19 groups: I. Acids. II. Sodas. III. Potashes. I Alums. V. Coal-tar Products. VI. Cyanides. V Wood Distillation. VIII. Fertilisers. IX. Bleachi Materials. X. Chemicals produced by the aid of Electricit XI. Dyestuffs. XII. Tanning Materials. XIII. Pain Pigments, and Varnishes. XIV. Explosives. XV. Plasti XVI. Essential Oils. XVII. Compressed and Liquefi Gases. XVIII. Fine Chemicals; and XIX. Gener Chemicals. There is also a sub-group, XIX. A., and final group, XX., termed "Miscellaneous." These repo give concise general descriptions of the branches industry referred to, followed by more particular da as to the actual factories and plants in operation, w statistics as to consumption, yields, total output, & *Secondly*:—From page 97 to 157 there is a series of elabor tables, shewing Imports for Consumption for the Ye ending June 30, 1891—1900: "Fertilisers: Summary States, 1900." "Dyestuffs and Extracts: Summary States, 1900"; and similar tables for Paints; Varnish Explosives; Essential Oils; Chemicals; Bone, Ivory, a Lampblack; Chemicals and allied Products. *Thirdly*: As an Appendix, there is a classified "Digest of Unit States Patents relating to the Chemical Industries" (P ducts and Processes). The groups are those already giv

I. to XIX.). Under these groups in the table of contents ere is an index referring to pages 164 to 306, where oncise abstracts are given of the U.S. Patents issued up and including 1900.

NTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE. First Annual Issue. D. CHEMISTRY. Published for the International Council by the Royal Society of London. Vol. II., Part I. 1902 (June). Harrison and Sons, 45, St. Martin's Lane, London. Price 21s.

vo volume, containing 444 pages of subject-matter, a list journals, with abbreviated titles, and an alphabetical dex to organic substances, ending on page 468. The lume consists of three parts:—(*a*) Schedules and Indexes four languages, English, French, German, and Italian; *b*) An Authors' Catalogue; and (*c*) A Subject Catalogue. y a special scheme of numbering a worker on any rticular subject is enabled to find the various papers aling with that subject, grouped together. Such papers n be found in two ways: either by consulting the hedule or else the index to the Schedule. But if only e name of the author of a paper be remembered, the bject, with reference, can be gleaned by reference to the uthors' Catalogue. With regard to the abbreviated titles journals referred to, if these be not understood, a key provided at the end of the volume.

NDBUCH DER ANORGANISCHEN CHEMIE. Herausgegeben von Dr. O. DAMMER. IV. Band. Die Fortschritte der anorganischen Chemie in den Jahren 1892—1902. Bearbeitet von den Herren Baur, Richard Meyer, Muthmann, Nass, Nernst, Rothmund, Stritar, und Zeisel. Lieferung 3. Ferdinand Enke's Verlag, Stuttgart, Germany. 1902. Price M. 4.

IS forms Part III. of Vol. IV. of Dammer's Handbook Inorganic Chemistry, and runs from page 321 to page). It commences with the subject of the *Compounds of osphorus with Oxygen*, and ends with *Ammonium, its lts, and the Hydroxylamine Salts.*

Trade Report.

APPLICATION OF SCIENCE TO INDUSTRY.

London County Council, Technical Education Board. ort of the Special Sub-Committee on the Application of Science to Industry, July, 1902.

he report embodies the conclusions drawn from an iry into the relation of science to industries, especially espect to the training required by those who desire to lify themselves to take leading positions in scientific istries. On account of the many statements that have eared within recent years in reference to the transfer to r countries of industries once carried on in London and ther parts of the United Kingdom and of the relative ng behind of the United Kingdom, including particuly the County of London, in certain other chemical and trical industries, attention has been given to—(1) The s of business to the United Kingdom, so far as it is owing nferiority of scientific training; and (2) the nature of training required and the present provision of such train- in England, and especially in London, together with means for bringing the training within the reach of those require it.

ealing first with the question of the loss of business, committee state that they are unable to resist the clusion that various branches of industry have, during the 20 or 30 years, been lost to this country owing to gn competition; that in many others our manufacturers fallen seriously behind their foreign rivals; that London, in particular, has distinctly suffered; and that these losses are to be attributed, in no small degree, to the superior scientific educatinn provided in foreign countries. Reference is made to the transfer from England to Germany and America of numerous departments of manufacturing chemistry and electricity, including the aniline colour industry, the manufacture of fine glass for scientific and optical purposes, of the finer kinds of pottery, of dynamos, magnet steel, the materials used for resistance coils, and the paper employed for insulating underground cables. In addition, it is pointed out that, following the establishment of an elaborate scientific study of brewing, the exports of beer from Germany and Holland have risen from 736,750*l.*, in 1890, to 1,177,600*l.*, in 1901. Attention is also drawn to the fact that a large proportion of the mining engineers, metallurgists, and chemists employed in the numerous mining enterprises of our colonies are drawn, not from the mother country, but from Germany or the United States, thus involving a serious loss of well-paid posts, many of which one might naturally have expected to be filled by Londoners. Details of the extent and nature of the loss in each industry referred to are given. The far-reaching effects of the loss of any industry, or of a part of any industry, are concisely summarised; it prevents the birth of cognate industries, which every healthy industry tends to produce: it discourages research, and by forcing buyers to seek goods abroad induces them to purchase other goods there which can be obtained equally well at home.

In respect to the causes of this loss of trade, different industries have been affected by different causes, but there was practically a consensus of opinion amongst the witnesses examined by the committee that the relative backwardness of our scientific industries is in the main due to the deficiencies of our educational system. Economic conditions, patent laws, and legislative restrictions have, according to the views of certain witnesses, contributed to the loss of trade; temporary prosperity and temporary demand for a certain class of goods have deterred those in authority from entering upon fresh developments, and the immense progress of scientific industries abroad has rendered the manufacturer here timorous in his efforts to advance.

That industries are affected by education is shown by the vitality of scientific industries in those countries in which the system of secondary education is supplemented by scientific education of university rank, for the perfecting of which no expense is spared. This condition obtains in Germany, Switzerland, and the United States, and there is ample evidence of the rapid development of scientific industries in these countries.

Summing up the evidence, the committee is convinced that the main causes of our relative failure in the chemical, optical, and electrical industries are: (*a*) The lack of scientific training of the manufacturers themselves, and their consequent inability to recognise the importance of scientific assistance; (*b*) the defective condition of our secondary education, and the consequent lack of sufficiently prepared recruits for advanced technological training; (*c*) the lack of a sufficient supply of young men who have been trained in scientific principles and methods, and in the application of science to particular industrial processes; (*d*) the lack of any institution providing advanced technological training which is sufficiently endowed to enable it to give adequate attention to post-graduate or advanced work.

Dealing next with the nature of the training required for future leaders of industry and the present provision for such training, the committee states its conviction that scientific industries have suffered, not only through defects in higher scientific education, but even to a greater extent through defects in general and secondary education. The science teaching in secondary schools, it is pointed out, is to be regarded as valuable almost entirely for its mental training; for scientific instruction the subsequent years of university education must be mainly relied on. The committee is further of opinion that, "In the majority of secondary schools the curriculum has been so hampered by the exigencies of examining authorities and of examinations that the teacher has been compelled to devote undue attention to storing the minds of the students with facts for reproduction at the expense of the time which should

be devoted to stimulating their reflective powers and making them think. In after life, those who enter upon industrial pursuits too often regard science with distrust, and to some extent this distrust is merited, owing to the insufficient preparation and training of those who offer themselves for responsible posts in scientific industries."

In respect to science instruction at the university and at institutions of university rank, there is undoubted evidence of the need for providing increased and more accessible opportunities for the young chemist, electrician, and engineer. Reference is made to the evening work of the London Polytechnics, and it is recognised that the highest grade of technical education must be carried on in an institution of university rank open during the day. The existing institutions of this rank in London are hampered in their attempts to supply the requisite training by deficient endowment, deficient accommodation, deficient teaching power, deficient equipment, and by the deficient preparatory training of the students. The high fees charged in London as compared with those of German and American universities and colleges and the dependence of the salaries of the teaching staff upon fees are two of chief factors that necessitate increased endowments. The fees at University College and King's College amount to about 50*l.* a year, whereas the cost in Germany is from 10*l.* to 20*l.* The Committee recognises that there is much overlapping and waste of energy and accommodation in London due to the attempt of several of the institutions to embrace all subjects, and suggest the co-ordination of the courses of study in the different colleges as a means of improving their teaching efficiency, equipment, and of keeping them up to date; these objects necessitate in addition a moderate increase in the incomes of the institutions from a reliable source.

Apart, however, from the mere undergraduate science teaching, the committee is specially impressed by the need for more advanced training in the application of science to industrial processes, such training to be of the nature of post-graduate work and specialist teaching. The greatest need of London at the present time is the co-ordination of the provision for the highest grades of education, and the development of new departments, so that professors of the highest distinction and practical training should have under their supervision post-graduate or other advanced students carrying out research work in such subjects as the various branches of chemical technology, electro-chemistry, optics, the different applications of electricity to industry, railway engineering, hydraulics, naval architecture, and marine engineering. It is further recognised that it is of the highest importance to our industrial well-being that adequate provision should be made for original investigation and discovery. As stated by one of the witnesses, "one of the most pressing requirements of the the moment, demanded not only in the interest of chemical industry, but in that of our manufacturing industries generally, is the adequate endowment and encouragement of research. Original scientific research is the fountain-head of new knowledge, the vital stimulus of industrial growth, the originator of new industries and the sustainer of old."

The committee states that the education of a leader of a scientific industry should include (1) a good general education on the classical or modern side of a secondary school up to the age of 17 or 18; (2) three years' training for the B.Sc. degree, followed by (3) two years' "post-graduate" work, in order to obtain the D.Sc.

The necessity for training in subjects beyond those principally applicable to the industry in view is regarded as of great importance, and the desirability of including some knowledge of economics and of commerce in the curriculum for leaders of industry was strongly advocated by many witnesses. It was pointed out by some, for instance, that "leaders of industries are not of necessity men possessing great scientific knowledge, but rather men with commercial organising power or business ability, and that the leading position of Germany in certain chemical industries is due more to the appreciation by her commercial leaders of scientific methods, than to the mere possession of a multitude of highly-trained graduates in science, who are willing to devote their talents and acquirements to the service of industry for a very moderate remuneration." In this country it is necessary to increa the knowledge and respect for science of our business me and also to develop in our students of applied science corresponding respect for the business and economic aspec of industry. There is already a demand for highly-train electricians, and it is to be regretted that many studer are tempted to enter works before they have finished th course of training, which even when finished is far fro complete. Well-paid posts for chemists are at present ra but the demand is slowly increasing and will further increa as soon as fully-trained men have had the opportunity prove their commercial value. It is for men who are w qualified, but at the same time are prepared to enter up their industrial career at low salaries with the determinati to work their way up, that the higher training is special needed, and it is to such men that we must look for t renewal of our vitality in scientific industries.

Concluding their report with a review of the work the Technical Education Board, the committee states th the expenditure required to put London in a positi to equip itself as well as, say, Berlin, is altogether beyo the range of the sums with which the County Council h entrusted the Technical Education Board, and even beyo the amount which it could legally spend on technic education.

The matter is one of national concern, and it is hop that either out of private or public funds something may done to repair the negligence of the past.

The Committee recommends that the Technical Educati Board of the London County Council should continue present policy of improving the amount and efficiency the science training in the secondary schools; of enabli the polytechnics to improve and extend their chemical a physical laboratories and their electrical and engineeri workshops; of aiding the university colleges and t University of London in their technical departments; a of awarding substantial scholarships to deserving candida of scanty means. It is specially impressed by the need higher salaries being provided for science teachers, alike the secondary schools and university colleges, in order secure and retain the best men, and to make them indep dent of students' fees; by the desirability of lowering t fees at the university colleges, and by the importance extending the scholarship ladder, in respect of exceptio students, to a later age than is at present customary. does not, however, feel able, in the present financial positi of the Board, to press any specific recommendations.

The following paragraphs conclude the report of t committee:—

"It is sometimes stated that all money expended higher technical education is so much lost to the poo or wage-earning classes. This is very far from the tru for unless the highest technical training is provided, a adequate provision made for research and discovery, t creation of new industries will be checked, existing industri may decay, and the demand for skilled labour may decrea. Moreover, if the scholarship ladder is completed, the ele son of the mechanic will be in as good a position, so far a training is concerned, as the son of the capitalist."

"If it is asserted that England has fallen so far beh in the application of science to industry, that it is usel to expend large sums of money in an attempt to regai position which has been irrevocably lost, we would re that there is no finality in any industry; that all industr if they are to survive, must become scientific industri; and that if machinery is set in motion by which new knc ledge is created, old industries will be developed, and n industries will arise. If it is urged that no decisive s should be taken to place the machinery for training po graduate students in technological research on a satisfac basis until prolonged inquiries have been carried out Germany, Switzerland, and the United States, to ascert the latest developments of technical education in th countries, we would reply that there have already b sufficient inquiries, and that delay is dangerous. The ca of the want of vitality in our scientific industries is not t to seek; it is due to defects in secondary educatio. th the lack of adequate provision for training in research. f secondary education can be more widely extended; f

eneral and scientific education, both in secondary schools nd schools of university standing, can be made more norough; and if further opportunities can be provided to iable post-graduate and advanced students to obtain lequate training in technological research, there is no ason to fear for the future prosperity of our scientific ndustries."

The appendices to the report include :—

I. Letter and memoranda addressed to witnesses.

II. Précis of evidence received by the sub-committee.

III. Extract from Lord Playfair's Hofmann Memorial Lecture.

IV. Extract from the *Appointments Gazette* (Cambridge) on employment in breweries.

V. Extract from a letter from Mr. Conrad Beck on necessity of a mono-technic school of optics.

VI. An account of the Royal Technical High School at Charlottenburg.

The sub-committee consisted of Mr. H. J. Powell (chairan), Mr. A. A. Allen, Mr. W. Bousfield, Mrs. Bryant, e Rev. R. S. de Courcey Laffan, Mr. W. Leaf, Sir Philip agnus, Mr. T. A. Organ, Sir Owen Roberts, Mr. F. W. erney, Mr. Graham Wallas, Mr. H. Ward, Mr. Sidney ebb, Dr. C. A. Kohn (hon. secretary of the sub-committee), d Dr. Garnett (secretary of the Technical Education oard). The witnesses were Dr. J. W. Swan, F.R.S., Sir ernhard Samuelson, F.R.S., Sir Henry Roscoe, F.R.S., Dr. rank Clowes, Prof. James Dewar, F.R.S., Dr. J. T. Merz, r. W. H. Perkin, F.R.S., Prof. Sir W. Ramsay, R.S., Mr. Thos. Tyrer, Prof. Meldola, F.R.S., Mr. George ilby, Dr. T. E. Thorpe, C.B., F.R.S., Prof. W. E. Ayrton, R.S., Prof. H. E. Armstrong, F.R.S., Mr. I. Levinstein, r. Alex. Siemens, Mr. Herbert Jackson, Mr. Hugh Bell, incipal Sir Arthur Rücker, F.R.S., Mr. A. G. Green, and r. J. Gordon Parker. Written reports were also received om Prof. M. J. M. Hill, F.R.S., Prof. Cormack, Prof. eming, F.R.S., Prof. Lunge, and Mr. B. S. Rowntree.

At a meeting of the London County Council, held on ly 22, it was resolved, "That the report be received, pplied to public bodies and libraries, and placed on sale the usual manner; and that the Technical Education oard be instructed to report as to the steps it proposes to ke in order to give practical effect to the suggestions ntained in the Report."

I.—GENERAL.

Comparative Statistics of Industry and Commerce in the United Kingdom and certain other Countries.

E. Bateman, Comm. Dept., Bd. of Trade, May 1902.

Table C compares in detail the imports into the United ates from the United Kingdom and from France and ermany. Its object is to show the differing character of ose imports. The United States is one of the most importt neutral markets for European exporters, and there are oups of articles in its import trade in which one exporting tion or the other has a predominance, and that competition not general throughout. Although one of most considerable the gains of Germany in recent years as an exporter to the ited States has been in regard to sugar (which the United ngdom does not produce), her other gains have been portant and deserve attention.

Table G gives some details with regard to our "direct" ports from Germany. These details are interesting as aring upon the question of the extent of the advance

Articles.	Total Value of Imports from Germany. (Average of 1896—1900.)	Increase over 1880-84.
	£	£
utchouc manufactures.	328,000	236,000
ina and earthenware ...	301,000	198,000
ass manufactures.....	603,000	303,000
seed cake	384,000	371,000
per and pasteboard.....	544,000	180,000

which Germany is alleged to have made in our home market in recent years. Although in several items there is a distinct advance in our imports from Germany, yet the whole amount of the trade, in some of the articles, is insignificant in comparison with our own home and export trades in those articles. The items in which important increases are noticeable in our "direct" imports from Germany are as given above.

Of caoutchouc manufactures we exported of our own produce, in 1896—1900, an annual average of 1,327,000*l.* worth; of china and earthenware, 1,954,000*l.* worth; and of paper and pasteboard, 1,532,000*l.* worth.

There are certain descriptions of goods which appear in the returns as imports from Holland which that country does not produce for export, and are really of German production. The particulars as to the average annual values of some of the more important of these articles which we received from Holland in 1880-84 and 1896—1900 are given below :—

Description of Articles.	Average Annual Value of Imports in 1880-84.	Average Annual Value of Imports in 1896—1900.	Increase or Decrease.	
			Increase.	Decrease.
	£	£	£	£
Chemical manufactures.	251,256	348,380	97,144	..
Dyes obtained from coal tar.	*407,897	586,505	178,608	..
Glass, window	40,158	121,351	81,193	..
" manufactures.....	142,551	288,525	145,974	..
Leather.....	255,439	300,445	45,006	..
" gloves.....	237,226	641,039	403,813	..
Metals, unenumerated, wrought.	79,002	144,103	65,101	..
Painters' colours and pigments.	401,186	439,918	38,732	..
Paper and pasteboard of all sorts.	267,960	927,558	659,598	..
Zinc, crude	201,924	384,009	182,085	..
" manufactures	152,612	244,054	91,442	..

* Average of the three years 1882, 1883, and 1884.

The whole of the increases shown are not due to increased trade with Germany. But some of them, and possibly a large proportion, are due to this cause. If this "indirect" trade could be accurately measured, the increase apparent from a comparison of the figures of the "direct" trade only would be increased by at least 50 per cent. But whatever may be said in regard to the above figures, the fact of the existence of the "indirect" trade with Germany must not be left out of account.

Conclusions.—Some of the main conclusions of this Memorandum may thus be summarised :—The increase of population in Germany and the United States has recently been greater than the increase in the United Kingdom, and those countries have rapidly developed manufacturing and industrial power. As with ourselves, so with those countries, the trend of population has been to the towns: necessarily, therefore, there has been a more vigorous search than formerly for an outlet for the power above referred to. We are still ahead of either country in our power of manufacture for export, but beginning from a lower level, each country is travelling upwards more rapidly than we are who occupy a higher eminence. If peace is maintained, both Germany and the United States are certain to increase their rate of upward movement. Their competition with us in neutral markets, and even in our home markets will probably, unless we ourselves are active, become increasingly serious. Every year will add to their acquired capital and skill, and they will have larger and larger additions to their population to draw upon. It is necessary, therefore, more than ever, that the change of conditions should be recognised, and we can scarcely expect to maintain our past undoubted pre-eminence, at any rate without strenuous effort and careful and energetic improvement in method. The problem how best this can be done is of vital interest to all classes of the industrial and commercial community alike, though the assistance which the State can give in the matter must necessarily be of a limited character.

Table C.—United States.

Statement showing the Value of the Imports into the United States from the United Kingdom, Germany, and France during the Year ended June 30, 1900.

I. Duty-free Articles.

Articles.	United Kingdom.	Germany.	France.
	Dols.	Dols.	Dols.
Antimony ore, and regulus or metal.	2,712	1,069	..
Asbestos, unmanufactured	..	125	..
Beeswax	2,464	1,003	..
Bismuth	216,992	250	..
Bones, horns, and hoofs unmanufactured.	137,798	9,003	56,722
Chalk, unmanufactured	60,122	..	22,043
Chemicals, drugs, and dyes:			
Alizarine, natural or artificial, including extract of madder.	68,142	691,525	..
Barks, cinchona, or other, from which quinine may be extracted.	134,351	16,009	..
Cochineal	12,995	25	..
Dye woods: not specially mentioned.	2,708	636	..
Gums:			
Arabic	12,864	1,789	9,635
Camphor, crude	112,521	..	81
Copal, Kauri, and Dammar	146,669	1,488	1,016
Gambier, or terra japonica	11,962	..	..
Shellac	249,320	..	..
All other gums	395,175	135,900	206,128
Indigo	157,754	319,329	12,465
Liquorice root	86,209	2,756	79,275
Potassium:			
Chloride	2,799	1,768,220	..
Nitrate or saltpetre, crude	..	11,342	..
All other	66,716	923,888	131,698
Quinine sulphate and all alkaloids or salts of cinchona bark.	134,936	617,007	24,411
Sodium nitrate	11,152	19	..
Sulphur or brimstone, crude	155,882	..	..
Vanilla beans	32,113	358	272,803
All other chemicals, drugs, and dyes not elsewhere specified.	1,362,399	1,571,656	185,793
Clay, common blue, for the manufacture of crucibles.	14	102,360	..
Cobalt, cobalt ore, and zaffer	6,192	492	..
Copper:			
Ore and regulus	96,974	91,136	..
Pigs, bars, ingots, old, and other unmanufactured.	7,856,350	148,029	851,350
Fertilisers:			
Guano	2,784	..	..
Phosphates, crude or native	2,339	354,019	..
All other	23,629	863,938	3,705
Grease:			
Grease and oils	125,205	29,715	262,451
Hides and skins, other than fur skins:			
Goat skins	1,428,855	713,807	2,809,291
All other	4,986,378	2,774,117	2,059,129
Hide cuttings, raw, and all other glue stock.	535,795	275,965	68,714
Indiarubber and gutta-percha:			
Unmanufactured:			
Gutta-percha	91,792	53,369	..
Indiarubber	5,562,680	692,246	745,592
„ old scraps or refuse fit only for remanufacture.	44,460	665,271	7,449
Minerals, crude, not elsewhere specified.	15,661	10,524	437
Oil cake	..	106	137
Oils:			
Mineral	213,482	1,308	..
Vegetable:			
Fixed or expressed:			
Other than olive	740,086	26,385	326,476
Volatile or essential	232,518	161,464	235,171
Ores not elsewhere specified:			
Chrome	44,021	..	..
Emery	3,364	..	..
Manganese ore	8,420	41,953	21,065
Nickel and nickel matte, containing not more than 2 per cent. of copper.	14,802	18,059	..
Sulphur ore, as pyrites, &c., containing in excess of 25 per cent. of sulphur.	18,825	..	..
Paper-stock, crude:			
Rags, other than woollen	187,619	596,624	126,622
All other	1,249,592	151,756	138,974
Paraffin	4,665	457	381
Parchment and vellum	26,102	2,390	1,211

I. Duty-free Articles—continued.

Articles.	United Kingdom.	Germany.	France
	Dols.	Dols.	Dols.
Platinum, unmanufactured	657,447	610,314	501,67
Platinum vases, retorts, vessels, &c. for chemical uses.	27,256	2,164	32,68
Plumbago	124,780	7,875	..
Spirits distilled:			
Of domestic manufacture returned (subject to internal revenue tax).	9,205	585,593	..
Tanning materials, not elsewhere specified.	1,752	..	8
Tar and pitch:			
Coal tar, crude, and pitch of coal tar.	148,969	865	..
Tar and pitch of wood	408	8,117	..
Tin in bars, blocks, pigs, or grain or granulated.	7,177,134	110,176	28,90

II. Dutiable Articles.

Antimony, as regulus or metal	216,130	29,294	88
Asphaltum or bitumen, crude	..	185	2,20
Beverages not elsewhere specified:			
Cherry juice and other fruit juice not elsewhere specified.	498	25,487	2,85
Ginger ale and ginger beer	247,898	..	..
Lemonade, soda-water, and other similar waters.	35,104	89	..
Prune juice or prune wine	17,807	15,010	33
All other beverages, not elsewhere specified.	155	1,235	5
Blacking	17,756	4,656	40,74
Bone and horn, manufactures of	86,802	35,247	63,23
Brass, and manufactures of	8,779	6,097	4,89
Candles and tapers	13,683	8,476	1,97
Carbon	..	77,524	14,94
Cement, Roman, Portland, and other hydraulic.	377,630	1,885,702	23,94
Cement for bicycles, &c.	29,816	15,244	27
Chalk:			
Prepared and preparations of	22,953	2,404	2,09
Chemicals, drugs, and dyes:			
Argols or wine lees	2,301	..	1,219,69
Coal-tar, colours, and dyes	230,287	3,822,162	32,96
Dye-woods, extracts and decoctions of.	45,744	5,333	63,42
Glycerin	777,443	10,126	792,11
Lime, Chloride of, or bleaching powder.	1,140,559	177,682	102,67
Mineral waters	3,548	395,677	111,66
Opium	285,283	86,961	1
Potash, chlorate of	59,781	7,776	10,96
Soda:			
Caustic	173,350	4,507	..
Sal-soda	31,031	30	..
Soda-ash	648,442	8	..
All other salts of	133,138	134,635	12,46
Sumac, ground	1,120	..	54
All other chemicals, &c.	1,942,549	3,145,275	572,17
Clays or earths of all kinds, including china clay, or kaolin.	815,417	80,667	11
Coal, bituminous	850,064	428	..
Coke	119,668	20,465	..
Collodion, manufactures of	15,160	32,510	329,88
Copper, manufactures of	10,519	18,736	1,61
Cotton, manufactures of:			
Cloth:			
Bleached, dyed, coloured, stained, painted, or printed.	6,449,887	500,988	814,89
Earthen, stone, and china ware:			
China, porcelain, parian and bisque, earthen, stone, and crockery ware:			
Not decorated or ornamented	784,699	92,567	172,29
Decorated or ornamented	2,225,128	2,619,737	1,269,07
All other	225,566	74,859	20,83
Emery:			
Grains and ground, pulverised or refined.	27,107	514	36
Wheels, files, and manufactures of.	8,828	384	2,17
Fibres, manufactures of:			
Oilcloths	405,622	18	8
Glass and glassware:			
Bottles, vials, demijohns, carboys and jars, empty or filled.	42,676	136,359	134,22
Cylinder, crown and common window glass, unpolished.	176,219	42,091	4,4
Cylinder and crown glass polished:			
Unsilvered	700	516,748	8
Silvered	..	88	1

II. Dutiable Articles—continued.

Articles.	United Kingdom.	Germany.	France.
lass, &c.—*cont.*	Dols.	Dols.	Dols
Plate glass:			
Fluted, rolled, or rough	5,390	153	1,846
Cast, polished, unsilvered	12,506	16,987	12,438
" silvered	156	2,445	334
All other	164,329	694,446	485,617
lue	149,622	99,250	256,978
rease:			
Grease not elsewhere specified	32,207	167,088	13,131
unpowder and explosive substances:			
Gunpowder, &c.	11,971	2,668	..
Percussion caps, cartridges, &c.	11,939	28,681	10
ides and skins, other than fur skins:			
Hides of cattle	838,171	1,226,292	511,375
dia-rubber and gutta-percha:			
Manufactures of:			
Gutta-percha	69,516	157,609	24,741
India-rubber	291,647	163,942	98,599
k and ink powders	54,118	10,128	5,517
ad, and manufactures of:			
Lead in ore and base bullion	..	7,851	..
Pigs, bars, old and other in ore	10,788	70	..
Manufactures of	1,096	11,828	..
ather, and manufactures of:			
Belt, or belting, and sole leather	40,943	..	..
Calf skins, tanned, or tanned and dressed, and patent, enamelled and japanned.	20,043	45,263	52,320
Skins for morocco	1,325,303	93,285	3,282
Upper leather, dressed, and skins dressed and finished.	516,332	1,966,263	490,680
Gloves of kid, or other leather	413,622	2,785,103	2,260,697
All other manufactures of	380,603	133,525	47,860
ne	21	2,036	..
lt Extract, fluid and solid	384	3,926	..
tches, friction or lucifer	12,239	21,911	..
tals, metal compositions, and anufactures of:			
Bronze manufactures	2,997	647,426	103,030
All other	1,235,152	1,459,270	1,124,492
neral substances:			
ica	101,330	13,633	..
ineral substances, not elsewhere specified.	4,685	5,029	1,580
:			
inal or rendered:			
Whale and fish	1,121	13,193	96
Other	170	2,759	..
ineral	2,225	642	..
getable:			
Fixed or expressed:			
Olive, salad	42,529	959	456,012
Other than olive	256,478	51,652	81,766
olatile or essential	27,283	162,347	135,314
ts, pigments and colours.	526,472	708,866	197,642
r, and manufactures of:			
hographic labels or prints, not lsewhere specified.	95,478	764,061	23,836
rchment papers	8,833	29,133	1,552
other	507,393	1,491,259	326,118
il leads, not in wood	1,217	62,716	..
meries, cosmetics, and all et preparations.	47,251	21,204	444,118
er of Paris, ground or calned.	836	27	2,397
ning and finishing powders	4,255	880	781
	449,520	1,342	122
:			
seed or flaxseed	93,672	..	..
other	311,569	98,442	124,620
cy, perfumed and all descriptions of toilet soap.	203,036	13,986	112,226
other	36,343	6,574	58,969
s, distilled:			
ndy	39,360	6,019	625,423
other	1,251,200	82,974	258,816
	21,094	90,857	1,584
molasses, and confectionery:			
sses above 40° polariscopic st.	247	..	..
r, not above No. 16 Dutch ndard in colour:			
Beet sugar	49,228	12,290,739	..
Cane and other sugar	179,213	..	..
e No. 16 Dutch standard	6	55,995	563
ectionery	5,136	1,930	16,475
hes, spirit and all other	96,488	3,474	2,399
r	21,430	939	7,485
r spelter, and manufactures of:			
blocks or pigs, and old	24,603	96,512	..
nufactures of	1,106	16,149	436

TABLE G.

Statement showing the Average Annual Value of the Imports of the under-mentioned Articles into the United Kingdom from Germany during the Quinquennial Periods 1880-84, 1891-95, *and* 1896-1900.

Principal Articles.	Average Annual Value of Imports in 1880-84.	Average Annual Value of Imports in 1891-95.	Average Annual Value of Imports in 1896-1900.
Beer:			
Mum and spruce	12,105	10,651	9,233
Other sorts	23,173	36,222	36,902
Brass and bronze, and manufactures of, unenumerated.	10,091	28,640	54,619
Butter and margarine	709,313	753,023	819,153
Caoutchouc, manufactures of	91,792	205,134	347,903
Chemical manufactures, unenumerated.	271,320	326,072	272,739
China and earthenware	102,990	238,326	300,688
Drugs, unenumerated.	60,346	103,871	102,502
Farinaceous substances, unenumerated.	252,891	270,165	279,560
Glass, window	117,888	59,515	84,640
" manufactures, unenumerated	300,483	631,774	603,108
Hides, raw	145,778	161,690	221,098
Lead, pig	58,910	96,595	101,448
Leather	326,847	289,453	367,528
" gloves	15,493	17,380	134,187
Manures, unenumerated	97,747	103,547	172,916
Oil, seed	223,615	155,918	104,326
Oilseed cake	12,863	199,264	383,960
Painters' colours and pigments	183,612	209,142	220,206
Paper and pasteboard	363,762	605,818	544,123
Parallin	25,890	3,985	1,852
Plumbago	28,708	19,690	25,783
Rags and other materials for paper	234,378	156,810	79,661
Saltpetre	86,808	89,117	75,885
Spirits:			
Unenumerated, not sweetened	67,184	53,957	46,656
Sweetened, or mixed or perfumed.	8,762	12,974	11,375
Sugar:			
Refined or candy	587,457	5,837,915	6,951,105
Unrefined	5,257,382	3,863,287	2,242,020
Glucose	254,392	47,733	21,771
Yeast, dried	182,784	117,626	40,315
Zinc:			
Crude	257,672	347,127	295,966
Manufactures	132,224	105,284	141,042

TRADE OF CANTON (CHINA).

Foreign Office Annual Series, No. 2862.

Lead has fallen from 27,352 piculs in 1891 to 2,727 in 1901.

In aniline dyes the import has year by year continued to increase, until in 1901 it amounts in value to no less than 197,175 taels, against 98,236 taels in 1891.

Japanese matches alone seem to be imported into South China, to the exclusion of the product of all other countries. Cheapness is the sole recommendation. Kohé is the great centre of manufacture. Economy in labour and low freights enable the Japanese article to monopolise the market. The import in 1901 was 257,624 gross, against 118,076 gross in 1891 and 175,683 gross in 1896.

Of earth-nuts, in 1900, nearly 700,000 piculs were imported, but in 1901 the amount fell to 442,731 piculs, valued at 2,500,000 and 1,500,000 taels respectively. In 1891 barely 200,000 piculs reached Canton, valued at less than 500,000 taels.

Of earth-nut oil 78,979 piculs were imported, valued at 822,180 taels. Of other oils, bean-oil figures for 165,523 piculs, valued at 1,356,777 taels. Year by year the import of these oils has been increasing; in 1891 only a small quantity appears in the Customs returns.

TRADE OF ALICANTE (SPAIN).

Foreign Office Annual Series, No. 2856.

There has been a slight variation in the importation of manures, but an enormous increase in importation of materials for manufacture of all classes of artificial manures. Of these materials more than one-third of the

quantity imported, say some 3,200 tons, came from the United Kingdom.

The exportation of esparto grass was considerably less than in 1900. Except about 100 tons, all was shipped to the United Kingdom.

The exportation of wine lees was well sustained; some 850 tons went to the United Kingdom, the remainder chiefly to France.

The exportation of lead shows a heavy decline. Of the 9,500 tons shipped here, 4,400 tons went to the United Kingdom, the remainder almost all to France.

Institutions for Testing Materials in Germany.

Bd. of Trade J., Aug. 7, 1902.

A report has now been received from H.M. Commercial Attaché at Berlin, which contains detailed information with regard to the various institutions existing in Germany for testing materials, and especially the Prussian Mechanical Testing Institute at Berlin, which tests metals, building material, paper, and oils. Mr. Gastrell's report, together with detailed printed reports and other matter issued by the institutions in question, may be seen on application to the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, London, S.W., on any day between the hours of 10 a.m. and 5 p.m.

Trade of Orange River Colony.

Bd. of Trade J., Aug. 7, 1902.

The following table shows the value of the principal articles imported during the first quarter of 1902, as compared with the corresponding period of 1901:—

Articles.	First Quarter of 1901.	First Quarter of 1902.
	£	£
eather manufactures:		
Boots and shoes and leather-ware.	2,713	16,458
Saddlery and harness.....	238	1,259
Hardware, brass, and copperware, &c.	1,600	15,098
Drugs and chemicals.....	3,445	13,729
Soap and candles	1,855	5,324
Oils of all kinds.....	644	1,406
Total of all imports	89,503	363,823

II.—FUEL, GAS, AND LIGHT.

Coke in Great Britain.

Eng. and Mining J., July 19, 1902.

The British Iron Trade Association reports that in the Durham and Northumberland districts in 1901 there were in existence 17,058 coke ovens, of which 12,962 were in use and 4,096 idle. The total coke made was 4,659,643 tons, as against 5,460,965 tons in 1900; showing a decrease of 801,322 tons, or 14·7 per cent., last year. No reports from other districts are made.

Liquid Fuel in Ceylon.

Bd. of Trade J., Aug. 7, 1902.

Liquid fuel with a flashing-point not under 150° F. is to be exempt from the payment of harbour dues and customs rent on importation into Ceylon, pending the amendment of Ordnance No. 20 of 1898, by which liquid fuel, the product of petroleum, was exempt from Customs duty when the flashing-point was not under 200° F.

Production of Coke in the United States.

Eng. and Mining J., July 26, 1902.

The production of coke in the United States in 1901 amounted to 21,795,883 short tons, valued at 44,445,923 dols., as compared with 20,533,348 short tons, valued at 47,443,331 dols. in 1900, and 19,668,569 short tons, valued at 34,670,417 dols., in 1899. The increase in production in 1901 over the preceding year was 1,262,535 short tons or 6·15 per cent. The value of the product, however, showed a decrease of 2,997,408 dols., or 6·3 per cent.

Notwithstanding the fact that the demand for coke was maintained throughout 1901, the average price per ton showed a decline from 2·31 dols. in 1900 to 2·04 dols. in 1901. During the spring of 1900, prices were abnormally high. In 1901 over 5,500 new ovens were added.

The total number of ovens in existence in 1901 was 64,001, as compared with 58,484 in 1900.

Since 1893 the production of coke in the United States has included that made in by-product retort ovens, and in 1901, 1,179,000 short tons, or a little over 5 per cent. of the total, was by-product coke. The manufacture of coke in by-product ovens has shown a considerable increase since the first Semet-Solvay ovens were built at Syracuse in 1893 but last year was noticeable rather for the new ovens building than for any decided increase either in the number of completed ovens or in the increased output. There were 1,096 by-product ovens building at the close of 1900, but only 80 of these were added to the completed ovens in 1901, increasing the total from 1,085 to 1,165. The production of by-product coke increased from 1,075,727 short tons to 1,179,900 tons. There were, however, at the close of 1901 one and one-third times more ovens of this type building than were in existence in that year. The total number of by-product ovens building, at the close of 1901 was 1,533. The ovens completed and building, at the close of 1901 according to the type of ovens, were as follows:—

	Ovens Built.	Ovens Building.
Semet-Solvay	375	210
Otto-Hoffmann.....	730	896
Newton-Chambers.....	69	..
Schniewind.....	..	427
Totals	1,165	1,533

Of the 1,165 by-product ovens in existence at the close of 1901, 595, or a little more than half, were operated in connection with iron and steel plants, and of the 1,533 ovens building at the close of the year, 1,176 will be directly associated with blast furnaces or steel works.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Production and Imports of Java.

Foreign Office Annual Series, No. 2863.

The following figures indicate the imports and production of petroleum as compared with the three preceding years:

	Quantity.			
	1898.	1899.	1900.	190
	Cases.	Cases.	Cases.	Case
American Devoes.....	879,477	1,084,090	1,276,713	1,344,
„ Tiger.....	446,956	171,500	43,523	24.
Russian	365,284	764,887	747,083	550,
Langkat.....	625,559	216,556	365,092	624.
	2,317,276	2,237,033	2,423,411	2,543.
Java oil, Wonokromo ...	546,101	596,656	544,201	478
„ Blora.....	967,141	1,041,913	717,000	1,201
Total.....	3,830,518	3,875,602	3,684,612	4,223

Note.—1 case = 8·14 gallons.

Petroleum Production in U.S.A.

Bd. of Trade J., Aug. 7, 1902.

According to an advance statement, issued by the United States Geological Survey, the petroleum production, in 1901, was greater than for any previous year, amounting to 69,389,194 barrels of crude oil, valued at 66,417,335 l. This value shows a decline from 1900, when 63,620,29 barrels were valued at 75,989,313 dols. In the order of

production, Ohio comes first, with over 21,000,000 barrels; then West Virginia, with over 14,000,000 barrels; Pennsylvania, over 12,000,000; California, with over 8,000,000; Indiana, over 5,000,000; and Texas sixth, with over 4,000,000 barrels. The average price paid for all petroleum marketed in the United States, in 1901, was 95·7 cents per barrel, as compared with 1·19 dols., in 1900. But the average price for Pennsylvania oil per barrel was 1·21 dols. In 1901, 14,250 wells were completed, with 3,220 estimated to be dry. The cost of these 14,250 wells is estimated at 21,375,000 dols., or about one-third of the value of the total crude product for that year. In 1901, 1,062,750,305 galls. of petroleum and its derivatives was exported, valued at 71,479,124 dols.; the average price paid for this exported oil was 6·73 cents per gall., as compared with 7·52 cents received in 1900.

IV.—COLOURING MATTERS, Etc.

Dyestuffs in Turkey.

A report of the commercial expert attached to the German Consulate at Constantinople states, that Germany and England supply the largest quantity of colours and dyestuffs. Amongst the latter, indigo is far and away the most important. Natural indigo is still chiefly used, Kurpah indigo by preference, since this is cheaper than Bengal indigo. The native dyers do not yet understand how to employ the artificial indigo.

Indigo-Seed Industry of Natal.

Bd. of Trade J., Aug. 7, 1902.

An accredited agent of the Government of India, and also of the indigo planters in that country, is at present in Natal making inquiries in regard to the indigenous indigo plants of Natal, with a view to obtaining a large supply of indigo seed for the use of Indian planters. It is probable that some hundreds of tons of the seed will be required every year.

The most valuable seed is produced by a bush which grows to a height of two or three feet, and is known to the natives under various names.

It is suggested that this would be a valuable crop to grow in Natal, for seed purposes, if for no other. The yield of seed for plants growing six feet apart is stated to be about 1 lb. per plant, or 1,210 lb. per acre. The present price for the seed is 1*s.* 6*d.* per lb., but if transactions were on a large scale it would, no doubt, be less. Yet even at 6*d.* a lb. such a crop would be worth 30*l.* per acre.

Indigo in Java.

Foreign Office Annual Series, No. 2863.

The total exports of indigo during 1901 amounted to 1,411,310 lb., against 1,537,149 lb. in the previous year. Most of this was from Middle Java, and the bulk found its way to the Japanese, Russian, and German markets.

Prices were very low and planters lost money.

The export duty on indigo has been abolished, and this will tend to prevent this trade being entirely exterminated in favour of artificial indigo, which is making great headway.

Indigo at Marseilles.

Foreign Office Annual Series, No. 2855.

The British Consul General at Marseilles thinks that the future of natural indigo depends upon whether it can be produced at a much lower price than it is now. The Consul thinks that it can.

Synthetic indigo is preferred by small dyers on account of its easy employment in small quantities, and does not, like natural indigo, require to be stored and carefully watched; because it is easy to keep: easy to prepare for use; is economical, every bit of the dye in the vat being utilisable; because of its great purity and vivid colouring, dual shades being obtainable with almost mathematical precision.

It differs only from natural indigo in that it does not contain the resin which gives solidity to the cloth. Synthetic indigo cannot yet supply the demand made upon it, but so soon as it can it will control the market. To meet this, the growing and preparing of Indian indigo must be so improved that it can be placed upon the market at a profit at a much lower price than at present. It is still in demand for the dyeing of cloth that is to stand much exposure to weather, and the French Government insist upon its use for uniforms. The markets in the Levant also, from conservatism, refuse the synthetic dye.

Imports were as follows:—1898, 233 tons; 1899, 154 tons; 1900, 192 tons; 1901, 162 tons. Within the year natural indigo has lost 10 to 12 per cent. in value, notwithstanding the short crops in Bengal, which were 85,000 maunds, as against an average of 127,000 maunds for 10 years. Term sales at Havre are now 2*s.* 9$\frac{1}{2}$*d.* per lb. for Bengal indigos giving 60 per cent. of colouring matter. The German manufacturers have sold at 9$\frac{3}{4}$*d.* for paste containing 20 per cent. of colouring matter, equivalent to a price of 2*s.* 4$\frac{7}{8}$*d.* per lb. for a natural indigo of 60 per cent. strength. That is 4$\frac{3}{8}$*d.* per lb. in favour of the artificial product. The competing firm of Hoechst-on-Main, in Germany, and the Société Chimique des Usines du Rhône, at Lyons, are said to be able to sell at 3*s.* 2$\frac{1}{2}$*d.* per lb. of pure indigotin, which is equivalent to 7$\frac{5}{8}$*d.* per lb. of paste containing 20 per cent. of indigotin, a fall of 2*d.* per lb. of the 20 per cent. paste.

These manufacturers sell direct to the consumers. The indigo merchants must then buy at a still lower price in order to cover their expenses and secure a reasonable profit. In the belief that Indian planters are not prepared to meet the fall in prices, indigo importers will only buy what is strictly necessary, and enterprise is thus paralysed.

The Badische Anilin und Soda Fabrik no longer manufacture their product in France. That firm produced indigo for some years at Neuville-sur-Saône, near Lyons, but now all the indigo supplied by them to France comes from Ludwigshafen.

The second process for manufacturing indigo is owned and worked by the Société Chimique des Usines du Rhône, at Lyons. That process, which takes toluene as a starting point, and is of great simplicity, was discovered by the French firm when making experimental investigations on the basis of the process discovered in 1882 by Prof. Baeyer. This French company manufactures artificial indigo by that process at St. Fons, near Lyons, and has given to the German firm of Farbwerke, of Hoechst-on-Main, a license to use it, which they are now doing for German consumption.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Kapok in Java.

Foreign Office Annual Series, No. 2863.

(See also this Journal, 1893, 923.)

Shipments of kapok have again exceeded those of any previous year. The quantities, compared with those of the three preceding years, are as follows:—

Year.	Quantity.	Of which to—		
		Holland.	Australia.	United States and other Ports.
	Packages.	Packages.	Packages.	Packages.
1901	74,123	45,631	23,192	5,300
1900	68,903	38,419	17,032	13,452
1899	51,682	33,263	11,790	6,629
1898	51,919	35,024	12,735	4,160

Small quantities have also found their way to the West Coast of America, and also to Mediterranean and German ports. In the British markets this useful article still attracts no attention.

There has been a continued demand, and prices have ruled high.

VII.—ACIDS, ALKALIS, Etc.

Nitrate Industry in Chile.

Eng. and Mining J., July 26, 1902.

Since the formation of the producers' combination in March, 1901, there has been a change in the nitrate industry of Chile. In the first year's operations under the combination, the oficinas have adjusted their production to the demand. Heavy consumption has favoured higher prices, so that properties that for years were earning nothing now show a profit. Most concerns now mining are of British origin. There are still plants under individual management, but these are giving way to the big companies. The Chilean Government sold at auction 28 nitrate properties last November for 2,447,671 pesos (893,399 dols.). Most of these have been taken by companies which will enter the combination. Before the November auction sale there were 85 oficinas, of which 66 were at work. These produced, in 1901, a total of 31,258,687 metric quintals, which, owing to the regulation of the combination, was 1,215,895 quintals less than in 1900. Of the 1901 production, there were exported 27,386,112 quintals, and a quantity was used in the manufacture of blasting powder for use in mining the nitrate.

There is an enormous low-grade area, which is being worked at a profit, since selling prices of nitrate of soda are higher and ocean freight rates lower than a year ago. It is estimated that 20,264 men were employed in the nitrate industry last year, which shows a gain over 1900, when copper mining was more profitable to the labourer.

New works are being erected in the various districts, and some that were started several months ago are nearing completion. By Sept. 1st it is likely many new producers will be in the field.

The cost of production shows little change, since most large plants are equipped with labour-saving devices.

The future of the industry will depend on the consumption of nitrate of soda in the United States and Germany, principally, as any falling off in these markets means lower prices and reduced profits.

Sulphate of Copper and Flake Graphite in Germany.

Bd. of Trade J., Aug. 7, 1902.

The United States Consul General at Berlin reports that two articles for which there is an active and reliable demand in Germany are copper sulphate and flake graphite.

IX.—BUILDING MATERIALS, Etc.

Slag Cement in Europe.

Eng. and Mining J., July 19, 1902.

In a recent paper quoted in *Le Génie Civil*, it is stated that in France there are now ten factories making cement from blast-furnace slag; one of the important plants is that of the Société des Ciments de Laitier de Doujeux, which produces 80 tons a day. There are five factories in Belgium, two in Luxembourg, and one in Switzerland. In Germany there are 12 plants turning out about 150,000 tons yearly; in Austria two plants making 100,000 tons yearly.

German Cement Industry.

U.S. Cons. Reps., July 30, 1902.

The efforts of the German Cement Syndicate to control production and to regulate prices have failed, and the syndicate has been dissolved.

So many new factories have sprung up that the syndicate could not absorb them. At the same time, dissensions have arisen within the syndicate. While there was little demand for the brands of the new factories which had been taken into the trust, some of the old factories were overcrowded with orders. Complaints arose as to the apportionment of sales, some works declaring that they did not receive the number to which, on account of their productive capacity, they were entitled.

While in 1898 the dividends of the leading factories varied between 8 and 33 per cent., many now return nothing on the capital invested in them, others are issuing preferred stock to create new working capital, a number have stopped work, and one has gone into bankruptcy. The struggle, which has lasted since September, 1900, has culminated in a conflict of extermination between the larger factories and the smaller. Prices of cement have fallen so that they are now at least 20 per cent. below the cost of production of the most capably managed works.

One factory reports that lime costs 120 marks per car, while the cement, upon large orders, is offered at 130 marks per car.

Another factory reports that Portland cement is offered at 125 marks per 10,000 kilos. at the place of manufacture, while the cost of production for the same quantity varies from 180 to 190 marks. These price reductions can have but one result: only those factories which have large capital reserves and can produce at the least cost will be able to sustain themselves.

The domestic consumption and export in Germany amount to about 14,000,000 barrels, and the productive capacity of the factories is 30,000,000 barrels; consequently, the factories can only work at half their capacity, and the supply of cement on hand is so great that it has to be stored.

In South Germany, there existed 20 Portland cement factories in 1899 and 25 in 1901. In this interval, the capacity of production increased from 5,000,000 barrels to about 8,500,000 barrels. In middle Germany, there were, in 1899, about 28 factories, with a capacity of 6,100,000 barrels; in 1901, these had increased to 39, with a production of 13,000,000 barrels. In Silesia, there were, in 1899, 6 factories, with a capacity of 1,500,000 barrels; in 1901, there were 7, with a production of 2,000,000 barrels. North Germany had, in 1899, 14 factories, with a capacity of 4,000,000 barrels; these works, in 1901, showed a production of 4,700,000 barrels. There are, besides, 11 large slag-cement factories in Germany, with a total production of 800,000 barrels.

From 1895 to 1900, the number of workmen employed in the factories increased from 30,000 to 35,000. During the past year, the number employed has receded, although the number of factories has increased. Wages have fallen 25 per cent. since 1899.

The decrease in building throughout Germany has also affected the industry, and the sales of cement in Berlin during the past year are said to have been one-fourth less.

In order to stem further depression in prices, a meeting of the North West and Middle German Portland Cement Syndicate was held in Hanover, on July 1, 1902. Thirty factories were represented by thirty-seven delegates. The object of the meeting was the creation of a price convention which should go into operation on January 1, 1903. The meeting was of the unanimous opinion that no anticipatory sales should be made for the year 1903.

X.—METALLURGY.

Zinc Production in Upper Silesia (Germany).

Recent statistics show that, in 1901, there were 24 zinc smelting works in Upper Silesia having in use 542 furnaces of which 406 were gas-fired. These furnaces contained a total of 23,934 retorts. The material used was 219,33[illegible] metric tons of calamine, 253,770 tons of zinc-blende, 3,01[illegible] tons of linings, and 3,604 tons of zinc dross and flue-dus[illegible] There were used 1,160,052 tons coal and 41,418 tons fir[illegible] clay. The output was 107,977 metric tons of spelte[illegible] 1,182 tons of lead, and 13 tons of cadmium. The averag[illegible] of spelter made was 22·5 per cent. of the furnace charge.

Copper Discovery in Rhodesia.

Bd. of Trade J., July 31, 1902.

According to the *Cape Argus* of 2nd July, a find [illegible] copper has just been made on the Baron Rothschild re[illegible] situated close to Francistown.

The ore consists of 60 to 70 per cent. copper, and w[illegible] found accidentally whilst prospecting for gold.

Mineral Exports of Spain.

Eng. and Mining J., July 19, 1902.

Exports of minerals for five months ending May 31 are given by the *Revista Minera* as below, in metric tons :—

	1901.	1902.
Copper ore	434,641	390,128
Zinc ore	81,732	28,164
Lead ore	1,906	1,387
Pyrites	158,418	211,408
Salt	153,446	120,207

Exports of metals included 10,268 tons of copper, as against 9,400 tons for the corresponding period in 1901 ; and 67,344 tons of lead, as against 65,186 tons last year.

Blast Furnaces in France.

Eng. and Mining J., July 26, 1902.

On July 1, 1900, there were 97 blast furnaces in operation in France, as against 93 on Jan. 1, 1902, and 111 on July 1, 1901. The daily capacity of the furnaces now in blast is 7,841 metric tons of pig iron, against 7,556 tons on July 1, 1991, the capacity showing an increase, although the number is less. There has been a considerable increase in the number of furnaces making Thomas or basic pig.

Open-Hearth Steel Furnaces in Great Britain.

Eng. and Mining J., July 19, 1902.

The number of open-hearth steel furnaces in Great Britain in 1901 was 482, of which 428 were acid and 54 basic furnaces. The average number in operation was 337·2 acid and 43·5 basic, a total of 380·7, the average number idle being 101·3. Of the open-hearth steel made last year a total of 2,946,614 tons, or 89·3 per cent., was acid, and 351,177 tons, or 10·7 per cent., basic. The average yearly make for furnace was 8,738 for the acid and 8,073 tons for the basic furnaces in operation.

Bessemer Converters in Great Britain.

Eng. and Mining J., July 26, 1902.

The number of Bessemer converters in use in Great Britain has been decreasing for several years, but in 1901 it was the same as in 1900. The total number reported last year was 76, of which an average of 59 were in use and 17 idle ; against 62 in use and 14 idle in 1900. The average production of steel per converter for the year in 1901 was 19,225 tons. Of the converter steel made last year, 1,115,985 tons, or 69·5 per cent., were acid, and 490,268 tons, or 30·5 per cent., basic steel.

Mineral Production of Queensland.

Bd. of Trade J., July 31, 1902.

Silver and Lead.—The year's production of silver was 1,561 oz., valued at 62,241*l.*, being an increase in quantity of 458,571 oz., and in value of 49,529*l.* The yield of lead for the year was 561 tons, valued at 6,993*l.*, an advance over the preceding year of 356 tons, and in value of 3,634*l.*

Copper.—The very pronounced increase in the yield of copper is entirely due to three mines situated in the Herberton district. First of these mines is Mount Garnet, which has for some time past been furnishing the smelters with a continuous supply of ore. The output of copper and silver from Mount Garnet up to Dec. 31 last is valued at 163,000*l.*

The total yield of copper in 1901 was 3,061 tons, valued at 194,227*l.*

Tin.—Although the year's yield of tin shows a substantial increase, a check to production is the inability of the milling power to cope with the output of the mines. Of the total output—1,661 tons—Herberton, the tin-producing district of the State, has furnished 1,137 tons.

Tungsten, Molybdenite, and Bismuth.—The high prices obtained for tungsten caused a search for this mineral at Wolfram Camp, in the Hodgkinson field, where considerable deposits of good quality have been proved to exist. The demand being limited, over-production was speedily followed by a fall in value that has led to the abandonment of most of the claims. Latterly tungsten has been sold for 20*l.* a ton, a price that does not cover the cost of mining and dressing by the primitive methods in vogue, and the miners have been turning their attention to molybdenite, which appears to be superseding tungsten in the manufacture of steel, and last year has very appreciably risen in value. Bismuth has also been found associated with tungsten and molybdenite, and a fair price has been obtained for the mineral; but the tedious method of hand treatment observed in separating and washing the ore lessens the profit.

Manganese.—Gladstone is the district that chiefly produces manganese, and hitherto the only consumers have been the Mount Morgan Company. Manganese is also required in glazing pottery, and a late trial has shown the local mineral to be quite equal to, and considerably cheaper than that imported. The metal is largely used in ironworks, and the owner of one of the Gladstone mines states that were he better able to open up his mine in a systematic manner, he would have no difficulty in establishing a considerable export trade with iron manufacturers in England. The total quantity of manganese raised last year was 218 tons, valued at 795*l.*

Gems.—With respect to sapphire mining at Anakie, in the Clermont district, the Assistant Government geologist reports that the deposits resemble those of shallow alluvial gold or tin. The stones are of numerous tints, the green and yellow being most beautiful. The yellow are rare, and the blue are so dark as almost to appear black. Green stones, rare elsewhere, are abundant and in great demand. The hyacinth, of a deep blood-red colour, the Oriental cat's eye, and, most important of all, a diamond, absolutely colourless, weighing 1¼ carats, have been also found.

The number of persons employed in gem mining is 200, and the value of last year's output was 6,000*l.*

The production of opal for 1901 was valued at 7,400*l.*

The following table shows the production of minerals, other than gold, in the year 1901, as compared with the preceding year :—

Mineral.	1900.		1901.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Tin	1,123	74,041	1,661	93,723
	Oz.		Oz.	
Silver	112,980	12,712	571,561	62,241
	Tons.		Tons.	
Lead	205	3,359	561	6,993
Coal	497,132	173,705	539,472	189,877
Copper	384	23,040	3,061	194,227
Opal	..	7,500	..	7,400
Tungsten	189½	6,605	72	1,145
Molybdenite	11	561	..	..
Manganese	75	205	218	795
Bismuth	8	1,865	20	3,684
*Bismuth, tungsten, and molybdenite.	..	..	26	1,609
Lime	3,634	3,862	6,514	4,901
Gems	..	900	..	6,000
Iron	..	..	436	215
Total	..	308,355	..	572,810

* Found associated in 1901.

Mineral Production of Spain in 1901.

Foreign Office Miscellaneous Series, No. 579.

The total output of mines and metal works in 1901 was valued at 15,227,958*l.*, a decrease of 995,415*l.* as compared with 1900, minerals showing a decrease of 376,081*l.*, and metals of 619,334*l.* In 1901, 3,049 mines were worked, an increase of 279, and the metal works numbered 138, a decrease of 5.

The following table shows the respective increases and decreases in the production of minerals :—

Increase.	Quantity.	Decrease.	Quantity.
	Tons.		Tons.
Anthracite	16,839	Mineral waters	933,274
Arsenic (pyrites)	813	Mercury	1,849
Barytes	234	Sulphur	14,508
Zinc	33,549	Copper	42,349
Tin	68	Silicate of magnesia	3,229
Phosphates	50	Iron	769,232
Iron (argentiferous)	1,378	„ (pyrites)	685
Coal	52,046	Kaolin	1,574
Lignite	4,734	Manganese	52,572
Ochre	106	Silver	351
Gold	295	Asphalt	237
Lead	42,889	Common salt	104,978
„ (argentiferous)	25,172	Tungsten	1,952

Production and Values in 1901.

Mines.	Number (Productive).	Quantity.	Value.
		Tons.	£
Mineral waters	28	18,306,654	28,226
Anthracite	2	85,266	38,028
Arsenic	4	1,328	265
Mercury	23	28,367	208,024
Sulphur	7	49,856	11,862
Barytes	9	1,067	682
Zinc	80	119,708	161,164
Copper	216	2,672,365	1,830,236
Tin	5	115	2,018
Silicate of magnesia	7	4,880	5,812
Phosphates	9	4,220	3,376
Iron	536	7,906,517	1,633,295
„ (argentiferous)	13	27,726	15,193
„ (pyrites)	5	33,953	7,179
Coal	518	2,566,591	1,157,296
Lignite	57	95,867	20,265
Kaolin	4	2,220	341
Manganese	16	60,325	40,282
Ochre	3	164	105
Gold	2	1,595	1,914
Silver	7	391	11,831
Lead	412	174,326	549,026
„ (argentiferous)	206	207,188	1,343,102
Asphalt	6	3,956	1,627
Salt (common)	95	345,063	119,986
Tungsten	2	6	97

Details of the production of each province are also given.

Mercury.—The Almaden mines showed an increased production of 2,370 tons.

Manganese.—The Huelva mines are not what they were, and the mineral produced is not of the same quality.

Copper.—There was a small decrease of production in the Huelva district, due to some of the Tharsis mines being partially exhausted and the other mines not having been opened up.

Bauxite at Marseilles and Toulon.

Foreign Office Annual Series, No. 2855.

Trade developed considerably in 1901, and, in view of a trial shipment of 1,700 tons from Toulon, last Dec. to Boston, U.S.A., some 300,000 tons of spotted bauxite are likely to cross the Atlantic in 1902.

Germany has hitherto been the principal buyer of both red and white bauxites, the former containing a smaller proportion of aluminium. The advantage of the French over the American bauxite lies in the latter requiring to be quarried. The richest mines of bauxite are claimed to be in the south of France, between the town of Brignolles (Var), and the Department of the Hérault, the town of Baux, whence the name, having at one time been the centre of the industry. There are 31 mines in the Department of the Var alone, the most important of them being at Ampus, Barjols, Cabasse, Carcès, Le-Cannet-du-Luc, Le-Muy, Le-Thoronet, Lorgues, Mazaugues, Méounes, Puget-sur-Argens, Rougiers, Tourves, and Vins.

The south of France produces three kinds of bauxite: ferruginous, aluminous, and the spotted. The demand for the first is small, although it contains 60 per cent. of oxide of iron. Were the mines properly developed and the bauxite methodically treated, profits would be greater. Aluminous bauxite, which can be cut with a knife, is much sought after, especially when it contains a high percentage of aluminium, little iron, and no silica ; it is mined in the district of Baux, is said to contain a minimum of 60 per cent. of alumina, and a maximum of 3 per cent. of silica. It is delivered free on truck at Parabou-les-Baux station at 12*s.* per ton. Spotted bauxite (bauxite truitée, in French) is pink or violet in colour, and is largely mined at Brignolles and its vicinity. The chief deposits are those of Le-Val, Le-Vins, La Brasque St. Christophe. It contains 21·99 parts of sesquioxide of iron, 0·26 of silica, 63·15 of alumina, 2·60 of titanic acid, and 12 of water. If the silica be below 3 per cent., and the alumina above 60 per cent., the price free on truck at Brignolles Station is 9*s.* 7½*d.* per ton. Freight from Brignolles to Marseilles by rail is 3*s.* 5*d.* per ton. Putting on board 1*s.* 1*d.* per ton, making a total of 14*s.* 1½*d.* per French ton f.o.b. at Marseilles. Price f.o.b. at St. Raphael, 13*s.* 8½*d.*

The bauxite mining industry is not carried on with sufficient method as yet to be profitable. In order to do this it would be necessary to establish works equipped with the requisite modern appliances, and where aluminium, alkaline salts of aluminium, emery, and aluminous refractory compositions could be produced at considerable profit.

Of the bauxites of the Var, 43,052 tons (English) were exported from St. Raphael, as compared to 24,292 tons in 1900, and 23,862 tons during 1899. 1,700 tons were exported (for the first time) from Toulon. From Cette, 1,672 tons were exported last year, as against 353 tons for 1900, and 962 tons for 1899.

XII.—FATS, OILS, Etc.

Soap Industry of Marseilles.

Foreign Office Annual Series, No 2855.

The Marseilles soap industry has greatly suffered during 1901 in consequence of the lack of stability of the oil market during 1900. Few sales on fixed delivery have been made. Under the stress of competition, several Marseilles firms increased the varieties of their soaps. The result has been a slight increase in the quantities exported from Marseilles during 1901, 19,791 French tons, as compared to 18,895 French tons during 1900. But still the financial results have been most unsatisfactory so far. The soap industry at Marseilles is in the hands of men anxious above all things to maintain at a high level the reputation of their firms, and who are able to tide over evil times, and it is to their credit to have increased their export in so uncertain a year. Unfortunately 1902 promises to be no better than 1900 and 1901, and the losses will certainly not be made up, but rather increased during the present year.

Use of Copra in East Prussia.

Bd. of Trade J., July 31, 1902.

In a despatch from H.M. Embassy at Berlin, it is stated that there are no oil mills in the German Baltic ports which at present use copra. Copra, will, however, be tried this autumn in the oil mills in East Prussia as a substitute for linseed. A number of experts in the oil traffic will visit the Düsseldorf Exhibition, with a view to becoming acquainted with the latest efforts to manipulate copra to advantage, and the result of their investigations is anxiously awaited by the oil mill owners.

Fancy Soap Imports of Naples.

See under XX., *page* 1117.

Oil Seeds at Marseilles.

Foreign Office Annual Series, No. 2855.

The total imports of oil seeds during 1901 at Marseilles have been 357,962 tons ; during 1900, 339,970 tons ; and during 1899, 278,980 tons. Shelled earthnuts have given 51,000 tons, against 24,000 tons in 1900, and 9,600 tons in 1899. According to latest reports from the Coromandel

Coast, the last season's crops promised to be much larger, and estimates range from 90,000 to 100,000 tons for export. Of unshelled earthnuts, Marseilles has received 75,000 tons, against 82,000 tons in the previous year. For gingelly, linseed, rape, ravison, and poppy seed the total imports show little difference. Imports of copra have been 80,000 tons, against 102,000 in 1900.

Nearly the whole quantity imported has been crushed by local mills.

Imports of earthnuts from the Coromandel Coast have quickly risen from 9,579 tons in 1899 to 61,136 tons in 1901, and it is generally estimated that the present 1901-02 crop will attain 120,000 tons.

This rapid increase has been gained by better manuring of the soil, but more especially by the new sowings of Mozambique and Senegal earthnuts.

The larger part of these nuts are shipped from Pondicherry and Cuddalore, but are nearly all grown on British territory. The nuts yield about 40 per cent. of oil, which is consumed by the Marseilles soap mills. By reason of these larger imports of earthnuts, the local soap mills are much less dependent upon imports of cotton oil, and there is now a substantial falling off in exports of cotton oil from the United States to Marseilles.

Of the cotton-seed oil imported last year, 4,678 tons came from Mozambique and only 227 tons from Bombay.

It would be very beneficial to the Bombay Presidency if the Government encouraged the introduction and sowing of Senegal and Mozambique nuts similar to those imported to Pondicherry by the French authorities.

Of the earth nuts, unshelled, 21,650 tons came from the Gambia, and 48,747 tons from Rutfisque and Saloum.

Of gingelly, or sesame seed, from Bombay, Marseilles received last year 59,300 tons. These Bombay qualities are mostly of finer grades and yield edible oils.

Owing to the continued hostilities in the Philippines, there is a large deficit in imports of copra, which were only 80,468 tons, as against 102,551 tons in the previous year. Consequently the value of Manila copra, which was 14*l.* per ton in December, 1900, rose to 18*l.* in December, 1901.

Imports of refined cotton-seed oils have been about the same as last year, say, 191,956 barrels, as against 195,491 barrels in 1900, but for the present year prospects point to a very substantial reduction, owing to shorter crops in America, and much higher range of prices there as compared with earth-nut oil here.

Of the 191,956 barrels of cotton-seed oil imported last year 3,304 barrels came from the United Kingdom, about one-third of the number imported during 1900.

XIII. A.—PIGMENTS, PAINTS, Etc.

Painters' Colours in Russia.

Chamber of Com. J., Aug., 1902.

According to the German Consul at Odessa, the import of white lead from Great Britain, Germany, and other countries again decreased last year in consequence of the augmented production in Russia itself. As to zinc white, the Belgian product is valued most, and with its well-established brands cannot be ousted from the market. Recently, however, German manufacturers have succeeded in more freely disposing of this article by granting prolonged terms of payment. It attracts customers who hitherto bought only the Belgian article. From France, little zinc white is ordered, nor was Austria, which tried to come into the market, successful. Red lead is chiefly supplied by Germany; one-third comes from Great Britain, whose product is perhaps somewhat better as regards quality, but which is principally in a strong demand on account of well-introduced brands. The prices of the most important colours were:—English white lead, Rbls. 4.75 to 5.40; German, 4 to 4.80; French, 4 to 4.70; Russian, 3.60 to 4.60 per pood. Zinc white, Rbls. 12.25 to 18 per cask of 3 pood 2 lb. Red lead, foreign, in kegs of 7¾ pood net, Rbls. 3 to 4.75 per pood. Ultramarine, French, Rbls. 26.

XIII. C.—INDIA-RUBBER, Etc.

Export Duty on Rubber from British Central Africa and North-Eastern Rhodesia.

Bd. of Trade J., July 31, 1902.

The Foreign Office has sanctioned the imposition, as from Sept. 1 next, of a duty of 4*d.* per lb. on rubber exported from the British Central Africa Protectorate and North-Eastern Rhodesia.

XVI.—SUGAR, STARCH, Etc.

Sugar in Peru.

U.S. Cons. Reps., July 28, 1902.

Business conditions in Peru, to-day, are in unfavourable contrast with those of a year ago. The general prosperity of the country may be fairly said to vary with that of the sugar producer, and the bulk of the capital—certainly 40 per cent.—is invested in the plantations of cane which occupy the irrigated valleys of the coast. In consequence of the decline in the price of sugar during the last year, the industry has suffered most severely, and with it all the allied or dependent interests. On all plantations the number of laborers has been greatly reduced.

The annual export of sugar is approximately 120,000 tons. In 1899, sugar sold for 2·68 dols. per cwt. f.o.b.; to-day it sells for 1·40 dols. Prior to the fall in price, this exportation at the average price of 2·43 dols. per cwt. produced 5,844,000 dols.; to-day that income is reduced to 3,305,300 dols. A commission was appointed a few days ago "to investigate and report to the Executive on measures calculated to relieve the difficult situation of the sugar industry."

Sugar in West Africa.

Bd. of Trade J., Aug. 7, 1902.

That the West Indies might find a remunerative market for some of its sugar in West Africa has been mentioned by Sir Robert B. Llewelyn, Governor-in-Chief of the Windward Islands, when he was Administrator of the Gambia in 1899. The following extract is taken from the report on the Gambia Blue Book for the year 1898.*

"No muscovado sugar is imported, but it would be appreciated by the natives to mix with their 'pap'—a preparation of pounded corn—if it could be obtained in handy packages. Sugar packed in bagging gets moist in this damp climate in lightly-constructed native huts; but if it could be put up in tins or kegs, which could be retailed here at a dollar or two dollars a package, it would take."

Sugar Industry in Bohemia.

Foreign Office Annual Series, No. 2857.

The exports of refined and raw sugar during the last three years were:—

	Refined Sugar.	Raw Sugar.
	Tons.	Tons.
1899	505,500	150,531
1900	536,257	131,607
1901	635,455	85,731

The refineries in the north of Bohemia export largely to the United Kingdom, Canada, and the United States, whilst the trade with the Levant, *viâ* Trieste, and to British India is of increasing importance. The exports to Japan were only 18,919 tons in 1901, as against 31,896 tons in 1900, this being partly due to German competition, the trade in sugar from Hamburg to Japan rising from 18,495 tons in 1900 to 51,530 tons in 1901.

The sugar production in Austria-Hungary last year was greater than in any preceding, and the price fell to an unprecedented extent, and having regard to the enormous stocks, estimated at 2,160,000 tons, there will be on hand

* Colonial Report, Annual, 264, Sugar in West Africa, Bd. of Trade J., Aug. 7th.

in the markets of the world at the close of the present campaign on Aug. 31, 1902, some time must elapse, even though the production be decreased, before any marked rise will take place in the price of sugar. In the following table the statistics for Austria-Hungary up to March 31, 1902, are given :—

	Refined Sugar.	Raw Sugar.	Total Raw Sugar.
	Tons.	Tons.	Tons.
Stock on August 1, 1901	121,588	48,898	183,996
Nett produced to March 31, 1902	884,210	260,059	1,242,514
Total Resources	1,005,798	308,957	1,426,510
Export to March 31, 1902	517,016	23,258	597,700
Consumed	226,419	2,629	254,206
Total stocks, March 31, 1902.....	262,363	383,090	574,604
" " " 1901.....	263,804	216,613	509,728

—A. S.

XVII.—BREWING, WINES, SPIRITS, Etc.

Spirit, Malting, and Brewing Industries in Bohemia.

Foreign Office Annual Series, No. 2857.

The manufacture of spirit from grain, molasses, and potatoes is extensively carried on in Austria-Hungary, and the production has increased since the introduction of the Decree of 1888. With the increasing areas of beet and potatoes under cultivation during the latter part of the last century, many distilleries were erected on agricultural estates, as well as others on a purely industrial basis. Austrian distilleries at one time took the leading place in the world's market, but the export to Spain and Japan has ceased in consequence of prohibitive import duties, whilst the Levant trade suffers from the competition of Russia and Roumania, both of which countries grant high export premiums to their spirit industries. Moreover, the German spirit ring, in order to get rid of their enormous stocks, have flooded over-sea countries with their spirit, the consequence being that prices have fallen to such a low point that Austrian producers are unable to compete. The spirit market during the year 1901 was unsatisfactory because of German competition in spirit-importing countries; reduction in value of Austrian ex-contingent spirit, the rich potato crop causing increased production; and the addition to the spirit tax which came into operation on Sept. 1 last. The price at the close of the year had fallen 5*s.* per 22 galls.

Number of Distilleries.

Year.	Bohemia.		Austria.	
	Agricultural.	Industrial.	Agricultural.	Industrial.
1898	211	15	1,075	39
1899	215	15	1,130	39
1900	218	14	1,166	36
1901	220	14	1,180	36

Production of Spirit.

Year.	Bohemia.		Austria.	
	Hectols.	Galls.	Hectols.	Galls.
1899—1900	397,784	8,751,248	1,415,331	31,137,282
1900—1901	432,360	9,511,920	1,513,417	33,295,174

Export of Spirit.

Year.	Bohemia.		Austria.	
	Hectols.	Galls.	Hectols.	Galls.
1899—1900	142,626	3,137,772	238,051	5,237,122
1900—1901	113,651	2,500,322	204,354	4,495,788

The malting season of 1900—1901 was only fairly satisfactory, in consequence of the weakness of the harvest in 1900, and the fluctuating prices in the home markets for barley, together with higher wages and dearer coal. The new season of 1901—1902 opened with moderate barley prices, which remained steady up to the end of December. Over-production, the sharp competition of the maltsters on the one hand and the reluctance to buy on the part of the brewers on the other, reduced the selling price to the lowest margin of profit, but high prices were obtained for rye products, malt sprouts, &c. The Austrian malt industry depends largely on the exports, the greatest quantity of which go to Germany, and it is feared that this market may be lost if the proposed new import duty is enforced. The total export of malt was—

Year.	Quantity.	Value.
	Tons.	£
1899	182,324	2,104,101
1900	185,357	2,081,376
1901	168,210	1,909,253

of which—

To—	Quantitiy.		
	1901.	1900.	1899.
	Tons.	Tons.	Tons.
Germany	108,869	118,956	107,672
United Kingdom.....	131	165	30

Brewing during the past year has been less affected by the prevailing commercial depression than other industries, but the profits of the brewers, especially in Prague, have been affected by a competition war between the breweries themselves, whereby the smaller ones have been driven from the field. Endeavours have been made to form a cartel, but have failed up to the present. The production of beer in Bohemia during the past five years has been as follows :—

Year.	Hectolitres.	Gallons.
1896-97	8,475,308	186,456,776
1897-98	8,514,453	187,317,966
1898-99	8,991,328	197,809,216
1899—1900	9,228,362	203,023,964
1900-01	9,473,196	208,410,312

The export trade has been adversely influenced by the increased duty placed on beer entering Germany, this being raised, in 1900, from 3*s.* 4*d.* to 5*s.* per ton, the weight of the cask being also included. It has been urged that the railway freights in Bohemia for beer and for empty returns should be lowered so as to counteract to some extent this increased duty. Brewing is extensively carried on in Prague and its vicinity, but only for the local trade. The export of beer from Austria-Hungary was in—

	Tons.
1899	92,821
1900	91,610
1901	91,457

In 1901, Germany took 67,866 tons.

The imports, which consisted chiefly of Bavarian and beers from Germany, were—

	Tons.
1899	7,390
1900	7,351
1901	7,115

Germany, in 1901, sent 7,073 tons, and the United Kingdom 41 tons.—A. S.

Spirits in Belgium.

Bd. of Trade J., Aug. 7, 1902.

The *Moniteur Belge* for the 28th and 29th July contain the text of a new Law, modifying previous legislation concerning the manufacture and importation of alcohols. The following is a translation of Article 6 of this Law, which affects the treatment of alcohols imported into Belgium :—

"The Government is authorised—

"1. To grant total or partial exemption from impo duty to alcohols intended exclusively for industrial pu

poses, after previous denaturation; the regulations of Articles 14 and 16 of the Law of the 15th April 1896 are applicable to this exemption;

"2. To reduce the import duties leviable on spirits in casks to a point not lower than the Excise duties leviable on spirits of Belgian production. The duties thus lowered may be again raised, by Royal Decree, to the rate originally leviable."

XVIII. A.—FOODS.

Beet Leaves for Fodder in Germany.

U.S. Cons. Reps., July 25, 1902.

The Verein der Deutschen Zucker Industrie offers a prize of 10,000 marks for the best process for drying beet leaves and "heads." The abolition of export bounties compels every economy in each element in the raw material. The conditions, as officially announced, are as follows:—

(1) Leaves and heads dried by the competing apparatus or process shall not contain water in excess of 12 per cent.

(2) The prepared product must be of good form and condition, as free as possible from foreign substances and smell, and not scorched or burned.

(3) The loss of soluble nutritive elements in the dried leaves as compared with fresh leaves shall not exceed 15 per cent.

(4) The working cost of the process, including depreciation and wear and tear of plant, shall be in such relation to the fodder value of the product that it will be, when properly installed and managed, economically profitable.

The plant for working the process must do no injury to the neighbourhood; the competing plans, drawings, and descriptions must be filed before September 15, 1902, at the office of Privy Councillor Koenig, in Berlin, and the apparatus be ready for trial, at a place to be designated by the commission, during the period from October 15 to November 25 of the present year.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Industry of Bohemia (Austria-Hungary).

Foreign Office Annual Series, No. 2857.

The paper industry in Bohemia is of great importance. The value of the exports was:—

Year.	Value.	
	Currency.	Sterling.
	Kronen.	£
1900	48,917,432	2,038,226
1901	43,213,418	1,800,560

The quantity exported in 1901 was 108,525 tons, of which—

	Tons.
To Germany	19,115
„ Italy	18,229
„ France	10,625
„ United Kingdom	7,496

The import was—

Year.	Value.	
	Currency.	Sterling.
	Kronen.	£
1900	25,550,924	1,064,622
1901	27,138,953	1,130,789

The quantity imported in 1901 was 16,707 tons, of which—

	Tons.
From Germany	12,233
„ France	398
„ United Kingdom	297

Paper in Mexico.

Bd. of Trade J., Aug. 7, 1902.

There are several paper manufactories in Mexico, but they are unable to meet the demands of the public, either as regards quality or quantity. The industrial development of the country necessitates a considerable increase in the consumption of paper from year to year.

The import duties on this article are very high, but the prices paid for paper manufactured in the country are very slightly inferior to those for paper imported from foreign countries.

The finer kinds of paper are not manufactured in Mexico. The existing establishments employ the same apparatus to produce papers of different qualities, with the result that the articles thus produced are always inferior to the European make.

As regards cigarette paper, for which there is such a large demand in Mexico, it is not made in the country at all.

XX.—FINE CHEMICALS, Etc.

Essential Oils in Dalmatia (Austria-Hungary).

Chem. and Druggist, Aug. 2, 1902.

There were exported from Spalato and its vicinity in 1901 654,766 lb. of chrysanthemum essence, of which 127,867 lb. went to Germany and the rest to Trieste, Vienna, and France. The price of the inferior quality was from 6*l.* 15*s.* to 7*l.* 12*s.* per centner (220 lb.). The best quality brings 8*l.* 12*s.* to 9*l.* 5*s.* per centner. Rosemary essence is produced principally on the Island of Lesina. The export amounted to 266,313 lb. last year, of which 3,567 lb. were sent to Germany, the remainder being sold on the market at Trieste. The price of rosemary essence varied between 12*l.* 14*s.* and 15*l.* per centner. There were also exported 41,887 lb. of rosemary leaves, from which the essence is extracted, of which 19,841 lb. were sent to Germany and the rest sold at Trieste.

Perfumery and Fancy Soap Imports of Naples.

Foreign Office Annual Series, No. 2864.

The following table shows the perfumery and soap imported into Naples from abroad:—

——	From—	Quantity.
		Kilos.*
Perfumed soap, in pieces	United Kingdom	1,497
	France	1,287
	Germany	781
	Austria-Hungary	101
	Belgium	86
	Sundry	4
	Total	3,756
Glycerin soap, in pieces.	United Kingdom	540
	France	64
	Austria-Hungary	28
	Belgium	14
	Germany	7
	Total	653
Alcoholic perfumes	France	1,093
	United Kingdom	385
	Germany	201
	Austria-Hungary	130
	Belgium	32
	Sundry	5
	Total	1,846
Simple perfumes	France	851
	United Kingdom	680
	Germany	102
	Austria-Hungary	93
	Belgium	10
	Sundry	4
	Total	1,740

* 1 kilo. = 2⅛ lb.

If we group these totals, we shall find that France occupies the first place, with 3,295 kilos., against 3,102 kilos. from the United Kingdom. It is to be noted that some important

British firms make perfumery in France, and it is possible that some of their wares come direct from France to Italy and thus get credited to French origin.

It is a somewhat singular thing that whereas in other orange-growing countries the orange flowers, when they fall, are collected for purposes of making perfumery, they are nowhere collected in South Italy, but go to waste upon the ground.

Cinchona Bark and Quinine in Java.

Foreign Office Annual Series, No. 2863.

The exports of bark from Java during last year compared with those of the four previous years are as follows:—

	Lb.
1901	13,901,586
1900	12,068,718
1899	12,414,402
1898	12,123,310
1897	8,498,726

The quantity of sulphate of quinine produced by the Bandong Factory and sold at auction in Batavia during 1901 was 1,014,000 oz. (English). The average price paid was 1s. $0\frac{1}{10}d.$ per oz.

XXII.—EXPLOSIVES, Etc.

Dynamite in South Africa.

U.S. Cons. Reps., July 31, 1902.

The U.S. Consular Agent telegraphs from Johannesburg, July 26, 1902, that a majority of the Chamber of Mines there favours the imposition of a coast duty of 1.80 dols. per case on dynamite, to protect local factories. A strong minority desires free trade. The annual consumption is 300,000 cases. The Agent thinks United States factories should compete for this trade, and requests cable quotations from manufacturers for blasting gelatin and No. 1 dynamite, 30,000 cases yearly, five-year contract, delivered at an African port. These figures, he adds, apply to one group of mines only.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 17,183. McIntosh. Apparatus to heat, boil, or evaporate water. Aug. 5.

„ 17,228. Parker and Oliver Mill Co., Ltd. Crushing-mills and the like. Aug. 5.

„ 17,235. Boult (Broux and Grégoire). Apparatus for cleaning the interior of casks and like receptacles. Aug. 5.

„ 17,253. Eckert. Waterproof acid-resisting and electrically non-conducting glove.* Aug. 5.

„ 17,261. Sisson. Steam superheaters. Aug. 5.

„ 17,264. Condict. Refrigerating apparatus. Aug. 5.

„ 17,308. Mitton. Filter presses. Aug. 6.

„ 17,330. Pereira and Pereira. Method of rendering vessels or receptacles liquid-tight.* (Portuguese Application, March 8.) Aug. 6.

„ 17,374. Crocker. Capsule to hold compressed gas for use in aërating liquids. Aug. 7.

„ 17,428. Turner. Pumps and compressors for liquid air and gases. Aug. 8.

„ 17,491. Koštálek. Filters.* Aug. 8.

„ 17,517. Jorgensen. Colour scales.* Aug. 8.

[A.] 17,566. McNeil and McNeil. Vacuum drying ap paratus. Aug. 11.

„ 17,663. Huillard. Apparatus for drying humi material reduced to grains, shavings, or smal particles.* Aug. 12. (French Application, Feb. 10.

„ 17,669. Brewer (Wheeler Condensing and Engineer ing Co.). Cooling towers. Aug. 12.

„ 17,697. Boult (Rojat). Filters. Aug. 12.

„ 17,741. Wise (Washington). Apparatus for ind cating the levels or quantities of liquids in tank &c.* Aug. 12.

„ 17,801. Oster. Filters. Aug. 13.

„ 17,874. Melotte. Centrifugal separators for liquids. Aug. 14.

„ 17,892. Godfrey. Rapid filtering funnel. Aug. 14

„ 17,966. Pollard and Behrman. Machine for packe ing measured quantities of powdered or granul substances and the like. Aug. 15.

„ 17,980. Peters. Funnel. Aug. 15.

„ 18,000. Clarkson and Clarkson and Capel Steam C Syndicate, Ltd. Lubrication of moving parts machinery. Aug. 14.

„ 18,094. de Alzugaray. Filtering apparatus. Aug. 1

[C.S.] 16,230 (1901). Duckworth. Apparatus for mixi powdered, granulated, or similar substance Aug. 29.

„ 16,344 (1901). Pulbrook and Pulbrook. Vessels apparatus for making infusions or decoction Aug. 20.

„ 16,353 (1901). Hampson and Swales. Aëration liquids. Aug. 20.

„ 17,614 (1901). Muirhead. Method of heating fluic and apparatus therefor. Aug. 13.

„ 18,377 (1901). Howden. Steam superheate Aug. 20.

„ 13,661 (1901). Croizier and Thomine. Apparat for drying powders and the like. Aug. 13.

„ 25,441 (1901). Hoffmann. Automatic fire-exti guishers. Aug. 20.

„ 25,824 (1901). Clark. Filters. Aug. 20.

„ 1236 (1902). Pryce. Appliances for removing sca &c., from boiler tubes, &c. Aug. 20.

„ 6859 (1902). Pearce. Machines for mixing plas compositions. Aug. 13.

„ 8118 (1902). Mynders. Apparatus for drawing viscid substances. Aug. 20.

„ 13,271 (1902). Mendham. Method of and appliar for controlling the delivery of viscous liquids, measured or other quantities, chiefly designed use in filling jars, &c., with such liquids. Aug.

„ 14,128 (1902). Ström. Centrifugal separato Aug. 20.

„ 14,276 (1902). Sachsenröder. Wrapping or pack material. Aug. 20.

II.—FUEL, GAS, and LIGHT.

[A.] 17,201. Arnott and Arnott Light and Burner C. Hydrocarbon burners.* Aug. 5.

„ 17,262. Jones. Steam-boiler and other furnac Aug. 5.

„ 17,265. Herrick. Gas producers.* Aug. 5.

„ 17,297. Bauke and Fuchs. Gas generating apparat Aug. 6.

„ 17,299. Classen. Treatment of comminuted wo peat, and the like, to prepare it for consolidat Aug. 6.

„ 17,302. Thwaite. Method of utilising liquid fl for generating heat. Aug. 6.

„ 17,303. Bell. Gas-burners. Aug. 6.

„ 17,305. Albany Mfg. Co. and Lamplough. burner for heating steam-generators and oth apparatus. Aug. 6.

„ 17,310. Baumgarten. Automatic generator d lamp for acetylene. Aug. 6

[A.] 17,318. Adam. Manufacture of incandescent mantles. Aug. 6.
„ 17,323. Glaskin. Means for burning petroleum and other inflammable oils for use in the production of motive power, &c. Aug. 6.
„ 17,338. Mollart and Turner. Fluid composition for application to gas mantles and other articles exposed to heat from combustion. Aug. 7.
„ 17,343. Douglas. Safety-guard to prevent back-lighting in Bunsen burners and the like. Aug. 7.
„ 17,392. Hookham. Electric incandescent lamps. Aug. 7.
„ 17,400. Clément. Carburettors. Aug. 7.
„ 17,406. Bloudel. Carbons for electric-arc lamps. Aug. 7.
„ 17,463. Dargie. Acetylene gas generators and gasometers.* Aug. 8.
„ 17,490. Burgess. King of lights, applicable for oil, gas, electricity. Aug. 8.
„ 17,497. Hill. Acetylene gas generators and lamps. Aug. 8.
„ 17,576. Boult (Moreau). Acetylene lamps or generators.* Aug. 11.
„ 17,587. Bauer. Electrolytic incandescent bodies particularly applicable to Nernst lamps. Aug. 11.
„ 17,603. Bousfield (Finke). Manufacture of mantles for incandescent lighting.* Aug. 11.
„ 17,689. Lake (Gen. Electric Co.). Electric-arc lamps. Aug. 12.
„ 17,690. Lake (Gen. Electric Co.). Electric-arc lamps. Aug. 12.
„ 17,711. Bridson and Brough. Liquid-fuel burners for steam-propelled vehicles and other purposes. Aug. 12.
„ 17,764. Gilmore. Burners for incandescent gas lamps. Aug. 13.
„ 17,776. McBride and McBride. Composition for promoting the combustion of coals and preventing black smoke issuing therefrom.* Aug. 13.
„ 17,797. Ashworth. Retorts for the manufacture of gas, &c. Aug. 13.
„ 17,823. Canellopoulos. Manufacture of catalytic igniters. Aug. 13.
„ 17,832. Shaw and Gee. Incandescent gas mantles. Aug. 14.
„ 17,886. Bremer. Electric-arc lamps. Aug. 14.
„ 17,889. Thubron and Leading Light Syndicate, Ltd. Acetylene gas generators. Aug. 14.
„ 17,903. Vaurs. Apparatus for carburetting air in explosion motors.* Aug. 14.
„ 17,913. Green. Electric-arc lamps.* Aug. 14.
„ 17,923. Rignon. Electric-arc lamp.* Aug. 14.
„ 17,924. Luthy. Electric igniting caudle for explosion motors.* Aug. 14.
„ 17,959. Griffin. Liquid-fuel burners, furnaces, and stoves. Aug. 15.
„ 18,004. Femerling and Trossin. Furnaces.* Aug. 15.
„ 18,009. Pryce. Devices for electric ignition of flammable gases. Aug. 15.
„ 18,035. Demster. Lutes for the covers of gas purifiers and other receptacles for gaseous or vaporous substances. Aug. 16.
„ 18,051. Podmore and Thomas. Incandescent gas-lamp lighter. Aug. 16.
„ 18,053. Rheinwald. Torches. Aug. 16.
„ 18,083. British Thomson-Houston Co. (Steinmetz). Means for changing the colour of artificial light. Aug. 16.
„ 18,091. Spooner (Werner and Werner). Carburettors. Aug. 16.
[C.S.] 15,990 (1901). Lux. Incandescent vapour-lamps. Aug. 13.
„ 15,991 (1901). Lux. Incandescent vapour-lamps. Aug. 13.
[C.S.] 17,507 (1901). Scott-Snell. Pressure system for incandescent gas lighting. Aug. 13.
„ 17,665 (1901). Kitson. Vapour-burning apparatus. Aug. 20.
„ 19,898 (1901). Thompson (Darby). Utilisation of gas for industrial purposes. Aug. 20.
„ 20,152 (1901). Robt. Dempster and Sons, Ltd., and Broadhead. Conveyors for hot coke and other substances. Aug. 20.
„ 20,177 (1901). Rickard. Carburettors for internal combustion engines. Aug. 20.
„ 20,472 (1901). Evans (de Velna). Manufacture of coke. Aug. 20.
„ 20,476 (1901). Phelps. Electric incandescent lamps. Aug. 20.
„ 26,535 (1901). Hopfelt. Manufacture of electrodes for arc lamps. Aug. 13.
„ 2135 (1902). Eudelin. Carburettors for internal combustion engines. Aug. 13.
„ 2276 (1902). Seymour. Apparatus for mixing gas and air. Aug. 13.
„ 9598 (1902). Winand. Process and apparatus for rapidly producing a gas suitable for driving gas-engines, &c. Aug. 20.
„ 11,529 (1902). Griffin and Hogan. Smoke-condensers. Aug. 20.
„ 12,034 (1902). Ramsden and Smith. Arrangement for working gas purifiers. Aug. 20.
„ 12,360 (1902). Bray. Burners for acetylene gas. Aug. 20.
„ 14,287 (1902). Gilgan. Acetylene gas generator. Aug. 13.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 17,650. Naylor. Obtaining ammonia from towns' refuse or other nitrogenous organic matter by means of waste heat from refuse destructor furnaces. Aug. 12.
„ 17,731. Stewart-Wallace. Treatment of mineral oils. Aug. 12.
[C.S.] 12,565 (1902). Singer and Pauli. Manufacture of paraffin-wax and lubricating oil from mineral oil and other hydrocarbons. Aug. 13.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 18,096. Johnson (Bad. Anilin und Soda Fabr.). Manufacture of halogenised indigo and analogues and homologues of indigo. Aug. 16.
[C.S.] 15,924 (1901). Ransford (Cassella and Co.). Manufacture of dyestuffs. Aug. 13.
„ 18,389 (1901). Levinstein, Mensching, and Levinstein, Ltd. Manufacture of black sulphur colouring matters directly dyeing cotton. Aug. 13.
„ 19,267 (1901). Urquhart (Chem. Fabr. vorm. Weiler-ter Meer). Manufacture of cotton dyes containing sulphur. Aug. 13.
„ 19,486 (1901). Ransford (Cassella and Co.). Manufacture of dyestuffs of the acridine group. Aug. 13.
„ 20,552 (1901). Johnson (Bad. Anilin und Soda Fabr.). Manufacture of derivatives of indigo and of intermediate products relating thereto. Aug. 20.
„ 22,385 (1901). Abel (Akt.-Ges. f. Anilinfabr.). Manufacture of sulphurised colouring matters directly dyeing cotton. Aug. 13.
„ 22,734 (1901). Abel (Akt.-Ges. f. Anilinfabr.). Manufacture of sulphurised colouring matters. Aug. 13.
„ 12,680 (1902). Vidal. *See under* XIII. A.
„ 14,049 (1902). Ellis (Chem. Fabrik von Heyden, Akt.-Ges.). Manufacture of indoxyl or indigo, or indoxyl or indigo preparations. Aug. 13.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 17,291. Binnie and Lugo. Method of decolorising fibres and other substances. Aug. 6.

„ 17,397. Barbe. Methods of dry-cleaning, and apparatus therefor. Aug. 7.

„ 17,465. Lugo. Processes of extracting inorganic and organic foreign matter from vegetable fibres. Aug. 8.

„ 17,516. Dargue. Apparatus for dyeing or washing fibrous materials. Aug. 8.

„ 17,622. Bertin. Apparatus for removing the wood from green stalks containing textile fibres, especially ramie stalks.* Aug. 11.

„ 17,653. Bleachers' Assoc., Benjamin, and Hübner. Process for reduction of oxycellulose in textiles, and for the removal of stains therein caused by oxycellulose.* Aug. 12.

„ 18,002. Oram. Machines for treating fabrics. Aug. 15.

„ 18,022. Sackville. Manufacture of book-cloth, leather-cloth, &c. Aug. 16.

[C.S.] 18,728 (1901). Boult (Reichenbach). Process for the production of mercerised cotton yarn Aug. 13.

„ 19,144 (1901). Kooing. Process for washing wools and other textile materials which enables the substances used for such washing to be recovered, and also for manufacturing a homogeneous ammoniacal soap. Aug. 20.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 16,429 (1901). Cohn. Glossing leather, paper, textile fabrics, and the like. Aug. 20.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 17,253. Eckert. *See under* I.

„ 17,316. Evers. Denitrating plant. Aug. 6.

„ 17,609. Johnson (Bad. Anilin und Soda Fabr.). Manufacture of sodium oxide. Aug. 11.

„ 17,650. Naylor. *See under* III.

„ 17,760. Ellison. Apparatus for concentrating sulphuric acid. Aug. 13.

„ 17,976. Tchernine. Manufacture of cyanides from sulphocyanides, and apparatus therefor. Aug. 15.

[C.S.] 19,993 (1901). Talbot. Production of ammonia. Aug. 13.

„ 20,142 (1901). Winsloe and Hart. Apparatus for manufacture of sulphuric acid. Aug. 20.

„ 20,143 (1901). Winsloe and Hart. Apparatus for manufacture of sulphuric acid and for recovery of gaseous nitrous compounds. Aug. 20.

„ 13,339 (1902). Felt and Greene. Retorts applicable for generating oxygen, &c. Aug. 20.

„ 15,666 (1902). Carmichael. Apparatus for carbonating liquids. Aug. 20.

VIII.—POTTERY, GLASS, and ENAMELS.

[A.] 17,236. Sefton Jones (Arnold and Clarke). Glass-pressing machine.* Aug. 5.

„ 17,402. Rembaux. Glass smoothing and polishing machines. Aug. 7.

„ 17,739. Weber. *See under* XVII.

„ 17,888. Davis and Smith. Glass beadings, angles, cappings, or similar decorative constructions. Aug. 14.

[C.S.] 16,652 (1901). Leistner. Machines for making glass bottles. Aug. 13.

[C.S.] 15,230 (1902). MacIntire. Manufacture of hollow glass articles. Aug. 20.

„ 15,231 (1902). MacIntire. Apparatus for manufacturing hollow glass articles. Aug. 20.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, and CEMENTS.

[A.] 17,293. Heuvels. Stucco and plaster work. Aug. 6.

„ 17,369. Dhondy. Artificial stone. Aug. 7.

„ 17,535. Grocott. Brick, quarry, or tile for use in building kilns, &c. Aug. 11.

„ 17,567. Jones. Bricks. Aug. 11.

„ 17,579. Mills (Seigle). Artificial building materials. Aug. 11.

„ 17,580. Mills (Seigle). Manufacture of artificial building materials. Aug. 11.

„ 17,618. Rubitschung. Manufacture of artificial asphalt stone. Aug. 11.

„ 17,761. Ellison. Apparatus for manufacture of tar macadam. Aug. 13.

„ 17,836. Coulson. Method of making blocks suitable for structural purposes, out of waste materials from mines and the like. Aug. 14.

[C.S.] 17,886 (1901). Boult (Devise Frères). Pressing mould for the production of artificial stone blocks or the like. Aug. 13.

„ 22,601 (1901). Rigby. Maturing Portland cement. Aug. 13.

„ 15,318 (1902). Waxin. Cement or artificial stone Aug. 20.

X.—METALLURGY.

[A.] 17,213. Brookes (Deutsch. Luxembergische Berg werks- und Hütten-Akt.-Ges.). Apparatus for purifying blast-furnace gases.* Aug. 5.

„ 17,219. Fris and British and W. African Agency and Trading Co., Ltd. Treatment of earths containing gold or other precious metals or gems. Aug. 5

„ 17,240. Bleukinsop. Treatment of ores and product containing cupreous sulphide. Aug. 5.

„ 17,322. Mercer and de Alzugaray. Apparatus for extraction of precious metals from their ores Aug. 6.

„ 17,325. Boult (Ajax Metal Co.). Method of eliminating metals from mixtures of metals.* Aug. 6

„ 17,616. Mennicke. Treatment of stanniferous ores to facilitate extraction of tin and the accompanying metals. Aug 11.

„ 17,618. Mennicke. Process for recovering copper from residual products containing it. Aug. 11.

„ 17,644. Jackman and Webster. Furnaces for melting metals, particularly for the production of malleable iron. Aug. 12.

„ 17,709. de Alzugaray. Extraction of precious metals from their ores. Aug. 12.

„ 17,713. Clark (Metallurgische Ges. Akt.-Ges. Process and apparatus for washing and cooling gases produced by roasting pyrites. Aug. 12.

„ 18,019. Jarvis. Manufacture of iron and steel Aug. 16.

[C.S.] 18,772 (1901). Brown. Utilising waste heat in connection with smelting furnaces. Aug. 20.

„ 4081 (1902). Pearson. Manufacture of abrasive materials known as "chilled iron shot" for industrial purposes, also machinery, &c., therefor Aug. 20.

„ 10,315 (1902). Wakely. Metallurgical furnace Aug. 13.

„ 11,533 (1902). Klepetko and Evans. Roasting furnaces. Aug. 13.

„ 15,046 (1902). Mitchell. Method of reducing copper matte to refined copper. Aug. 13.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

A.] 17,253. Eckert. *See under* I.

„ 17,380. Leuschner. Electro-magnetic treatment of ores, slimes, and the like, for separating their constituents.* Aug. 7.

„ 17,744. Heany. Insulating compositions for metallic surfaces or wires.* Aug. 12.

„ 17,745. Heany. Water-, acid-, and fire-proof insulating compositions, and method of making the same.* Aug. 12. (French Application, June 24.)

„ 17,746. Heany. Insulating metallic surfaces or wires, and method of preparing asbestos therefor.* Aug. 12. (French Application, June 24.)

„ 17,747. Heany. Manufacture of insulated wire.* Aug. 12. (French Application, June 24.)

„ 17,748. Heany. Insulated wire.* Aug. 12. (French Application, June 24.)

„ 18,048. Fuller, Fuller, and Fuller. Storage or secondary batteries. Aug. 16.

„ 18,071. Brown. Ozonisers. Aug. 16.

[S.] 18,600 (1901). Tayler. Treatment or manufacture of paper applicable for use in electric insulation. Aug. 20.

„ 15,435 (1902). Lake (Consolidated Storage Batteries Co.). Secondary or storage batteries. Aug. 20.

XII.—FATS, OILS, AND SOAP.

A.] 17,290. Smith. Manufacture of an oil for use as a substitute for linseed oil.* Aug. 6.

„ 17,673. Meyer. *See under* XVIII. B.

„ 17,869. Wetter (Friesdorf). Oil-separators or appliances for separating oil and grease from water containing the same. Aug. 14.

„ 17,915. Ranoe. Oil-separators. Aug. 14.

„ 17,937. White. Filters for cleansing and purifying dirty or waste oil, &c. Aug. 15.

„ 18,000. Clarkson and Clarkson, and Capel Steam Car Syndicate, Ltd. *See under* I.

[S.] 19,144 (1901). Koning. *See under* V.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[.] 18,015. Thwaite and Denny. Methods and apparatus for producing zinc oxide. Aug. 16.

[S.] 16,486 (1901). Greenley and Day. Producing designs or surfaces for enamelling and other purposes. Aug. 20.

„ 21,526 (1901). Bertrand. Paint or protective composition. Aug. 13.

„ 12,680 (1902). Vidal. Manufacture of paints and dyes. Aug. 13.

„ 15,107 (1902). Bertrand. Paint or protective composition. Aug. 13.

C.—India-rubber, &c.

.] 17,253. Eckert. *See under* I.

„ 17,431. Blundell. Liquid cement for patching tyres, insulating electric wires, and the like.* Aug. 8.

„ 17,637. Cockburn. Vulcanising rubber boots and shoes. Aug. 12.

[S.] 18,528 (1901). Bertram and Milne. Manufacture of gutta-percha. Aug. 20.

„ 18,964 (1901). Blossur. Manufacture of sheet india-rubber. Aug. 13.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 17,585. Karle. Process and apparatus for the production of substances resembling leather.* Aug. 11.

„ 17,831. Fell. Method of treatment or finishing of hides or skins, especially for use as coverings for the rollers of spinning and like machinery. Aug. 14.

„ 18,026. Straiton. Machines for cleaning, unhairing, scudding, or burring skins or hides. Aug. 16.

„ 18,042. Hilbert. Manufacture of gelatin and glue from bones.* Aug. 16.

[C.S.] 15,856 (1901). Kelsey. Apparatus for making glue. Aug. 13.

„ 20,535 (1901). Köster. Production of chrome leather. Aug. 13.

„ 13,584 (1902). Caldwell. Art of preparing leather for belting. Aug. 20.

XV.—MANURES.

[A.] 17,507. Lake (Cyanid-Ges. m. b. H.). Manufacture of artificial manure.* Aug. 8.

XVI.—SUGAR, STARCH, GUM, ETC.

[A.] 17,506. Reynaud. Manufacture of dextrin (achroodextrin) and alcohol.* Aug. 8.

„ 17,912. Spreckels and Kern. Purification of sugar-crystals, and a product obtained thereby. Aug. 14.

[C.S.] 11,812 (1902). Lang, Blake, and Smart. Continuous liquor and syrup heating and feeding apparatus in conjunction with vacuum pans for producing sugar in crystals. Aug. 20.

„ 13,353 (1902). Thompson (Anderson). Treatment of starch and materials containing starch. Aug. 20.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 17,506. Reynaud. *See under* XVI.

„ 17,512. Schrottky. Malting of rice.* Aug. 8.

„ 17,659. Tschappe. Process for production of linseed liqueur. Aug. 12.

„ 17,694. House and Lancaster. Apparatus for cooling, carbonating, and filtering ales, beers, &c. Aug. 12.

„ 17,739. Weber. Glass tanks or vessels for fermenting and other purposes.* Aug. 12.

„ 17,951. West, Chew, and Rogerson. Production of non-deposit beer and the like, and apparatus therefor. Aug. 15.

[C.S.] 15,886 (1901). Norman. Manufacture of brewing syrup. Aug. 20.

„ 17,815 (1901). Earp. Kilns for drying malt and the like. Aug. 13.

„ 19,981 (1901). Blackie. Method of and apparatus for hop-drying. Aug. 20.

„ 1264 (1902). Dewar and Tripp. Treating beer for bottling. Aug. 20.

„ 15,252 (1902). Thompson (Pfaudler Vacuum Fermentation Co.). Mechanism to regulate the admission of air to liquids in a fermentation apparatus during the process of fermentation. Aug. 20.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 17,258. Spitteler. Separation of casein. Aug. 5.

„ 17,382. Edmouds (Galbraith). Treatment of milk, cream, and butter. Aug. 7.

„ 17,399. Tommasini and Ceschina. Manufacture of macaroni and the like, and apparatus therefor.* Aug. 7.

[A.] 17,478. Klett and Potel. Preservation of organic substances.* Aug. 8.

„ 17,486. Ekenberg. Manufacture of milk-powder.* Aug. 8.

„ 17,584. Laessig. Milk-albumen preparation, and method of preparing it.* Aug. 11.

„ 17,774. Harley. Hermetically sealing-up earthenware and the like jars and other kindred vessels for the preservation of alimentary and other substances. Aug. 13.

„ 17,870. Madsen. Food preparation for the public and animals. Aug. 14.

[C.S.] 16,691 (1901). Hatmaker (Just). Baking powders. Aug. 13.

„ 16,692 (1901). Hatmaker (Just). Baking powders. Aug. 13.

„ 17,671 (1901). Royle and Royles, Ltd. Sterilising apparatus. Aug. 20.

„ 13,825 (1902). Brodrick. Gravy salt compound. Aug. 13.

„ 14,865 (1902). Laessig. Manufacture of preservable milk. Aug. 13.

B.—Sanitation; Water Purification.

[A.] 17,456. Ralston. Apparatus for controlling the flow of sewage in septic and bacterial tank systems.* Aug. 8.

„ 17,540. McNamee. Method of utilising wastes. Aug. 11.

„ 17,635. Barker. Apparatus for softening and purifying water and other liquids. Aug. 12.

„ 17,672. Meyer. Apparatus for supplying purified and heated water from exhaust steam. Aug. 12.

„ 17,673. Meyer. Apparatus for separating grease from exhaust steam. Aug. 12.

„ 17,830. Carter and Carter. Apparatus for purifying, scenting, and medicating air. Aug. 14.

„ 17,846. Oram. Method of disposing of by-products or dangerous and other matter of a liquid nature, or the like. Aug. 14.

[C.S.] 19,143 (1901). Wakefield. Sewage carriers or troughs. Aug. 13.

„ 21,856 (1901). Thompson (Maschinenbau Akt.-Ges. vorm. Beck and Henkel). Process for treating the substances deposited from sewage and the like. Aug. 13.

„ 11,990 (1902). Boult (Kennicott). Water-purifying apparatus. Aug. 20.

C.—Disinfectants.

[A.] 17,729. Carpenter. Ointment for the cure of foot and mouth disease, wounds, cuts, &c., in cattle. Aug. 12.

[C.S.] 17,281 (1901). Robertson. Medicinal preparation. Aug. 20.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 17,434. Grimshaw. Fireproofing of paper and the like. Aug. 8.

„ 17,501. Thompson (Vereinigte Kunstseidefabr. Akt.-Ges.). Preparation of stable alkaline solutions of cellulose hydrate. Aug. 8.

„ 17,502. Thompson (Vereinigte Kunstseidefabr. Akt.-Ges.). Manufacture of alkaline solutions of viscose. Aug. 8.

[A.] 17,503. Thompson (Vereinigte Kunstseidefabr. Akt.-Ges.). Manufacture of colourless cellulose films and threads. Aug. 8.

„ 17,620. Rüdiger. Drying felt for pasteboard and paper machines.* Aug. 11.

„ 17,653. Bleachers' Assoc., Benjamin, and Hübner. *See under* V.

„ 17,827. Wise (Salubra Wall Cover Co.). Manufacture of wall-paper. Aug. 13.

[C.S.] 18,600 (1901). Tayler. *See under* XI.

„ 20,397 (1901). Fielding. Manufacture of viscose. Aug. 20.

„ 21,834 (1901). Bensinger. Process for manufacture of combs from celluloid. Aug. 20.

„ 445 (1902). Lake (Anthony). Apparatus for drying paper. Aug. 20.

„ 9683 (1902). Rogers and Allen. Revolving strainer for straining paper-pulp, &c. Aug. 13

„ 14,276 (1902). Sachsenröder. Wrapping or packing material. Aug. 20.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 17,695. Marckwald. Halogenising of organic substances, and apparatus therefor. Aug. 12.

[C.S.] 17,924 (1901). Smith. Manufacture of eucalyptol arseniate and eucalyptol from eucalyptus oil. Aug. 13.

„ 20,188 (1901). Wetter (F. Hoffmann-La Roche and Co.). Manufacture of salicylide or salicyl anhydride. Aug. 13.

„ 11,750 (1902). Wirth. Process for the reduction of aromatic nitro-compounds containing two or more nitro-groups. Aug. 13.

XXI.—PHOTOGRAPHY.

[A.] 17,311. Huck and Fischer. Process for producing metalline-foils to serve as a ground for photographic and other printings.* Aug. 6.

„ 17,313. Mercier. Photographic films. Aug. 6.

„ 17,485. Boult (Miley Colour Photograph Co.). Colour photographs, and the method of making the same.* Aug. 8.

„ 17,573. Craft. Apparatus for developing photographic plates and films. Aug. 11.

„ 17,911. Meek. Apparatus for developing photographic impressions. Aug. 14.

„ 18,047. Macaigne. Synthetical reproduction of coloured original to serve as guides for a three colour process. Aug. 16.

[C.S.] 23,299 (1901). Abel (Akt.-Ges. f. Anilinfabr.). Photographic roll-films. Aug. 13.

„ 10,948 (1902). Leuchter. Production of negative plates for bichromated gelatin processes. Aug. 13.

XXII.—EXPLOSIVES, MATCHES, Etc.

[C.S.] 10,776 (1901). Allen and Dolby. Explosive composite shell for use in warfare. Aug. 20.

„ 15,259 (1902). Scott. Explosive charges for guns. Aug. 20.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 52

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 17.—Vol. XXI. **SEPTEMBER 15, 1902.** No. 17.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Marston T. Bogert.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.
Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.
F. H. Tate. | Dr. T. Lewis Bailey.

LONDON.
Walter F. Reid. | A. R. Ling.

MANCHESTER.
Ivan Levinstein. | J. Carter Bell.

NEWCASTLE.
V. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Dr. V. Coblentz. | Dr. H. Schweitzer.

NOTTINGHAM.
. Archbutt. | J. T. Wood.

SCOTTISH.
. L. Patterson. | Dr. Thos. Gray.

YORKSHIRE.
as. E. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. J. J. Hummel.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams .....I., XV.
L. Archbutt, I., XII., XVIII.B.
J. L. Baker..... XVI., XVII.
H. Ballantyne .....II., XII.
D. Bendix .....III.
E. Bentz .....IV., V., VI.
J. O. Braithwaite .....XX.
J. F. Briggs .....XVI., XVII.
J. H. Collins .....X.
C. F. Cross .....V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks .....XIV., XIX.
M. C. Lamb .....VI., XIV.
T. A. Lawson, Ph.D...IV., XX.
F. H. Leeds..III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. .....IV.
G. W. MacDonald, M.Sc. .XXII.
W. G. McMillan X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. .....XV.
C. A. Mitchell, B.A..... XII., XXII.
A. More .....VII., XVIII.
G. T. Morgan, D.Sc. ...IV., V.
J. G. Parker, Ph.D. .....XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak ...,Patent List.
T. H. Pope...XVI., XX., XXI.
F. W. Renaut.....Index.
G. H. Robertson .....XI.
Chas. Salter ..... I., II., III., XV., XVI.
M. J. Salter.....XIII.
R. Sandon .....II.
J. Shields, D.Sc., Ph.D. .....XI.
A. Shonk .....Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt.....III., VII., X.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer .....XX.
L. J. de Whalley, B.Sc. .XVI.
A. Wingham .....X.
Joseph T. Wood .....XIV.
A. C. Wright, B.Sc., M.A. .. IV., XVIII., XX.

Notices.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of next year A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organisation Committee in Berlin may be sent to them.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit (alcohol) having been accepted by the Government, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufactures in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

The Council has appointed a Committee, consisting of the President, Hon. Treasurer, Dr. Squire, Mr. David Howard, Mr. A. G. Green, Mr. Walter F. Reid, Mr. A. Gordon Salamon, and Mr. Thos. Tyrer, to consider and report on this question.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Aspinwall, Capt. H. C., l/o Pompton Lakes ; Haskell, N.J., U.S.A.

Carter, W. Chas., l/o Montreal ; Hotel Alfonse, Sydney, Cape Breton, Nova Scotia.

Earp, Dr. F. S. ; Journals to Perseverance Gold Mining Co., Boulder City, Western Australia.

Fasnacht, E. A., l/o Newton Heath ; The Hollies, Clayton Bridge, Manchester.

Hall, F. W., l/o Harpurhey ; Holly Bank, Parsonage Road, Withington, Manchester.

Harris, D. ; Journals to 16, Merchiston Avenue, Edinburgh.

Lamb, M. C. ; Journals to 151, Westcombe Hill, Blackheath, S.E.

Meyer, Dr. F. ; Journals to Frankfurt a/Main, Germany, Junzhofstrasse 14A.

Page, R. H., l/o McDougall Avenue ; 217, Vinewood Avenue, Detroit, Mich., U.S.A.

Prentice, Dr. David, l/o Lambert Street ; 5, Vermont Street, Beverley Road, Hull.

Schlichting, Emil, l/o Milwaukee ; 61, Hicks Street, Brooklyn, N.Y., U.S.A.

Singer, L., l/o New Zealand ; c/o Whitaker Bros. and Co., Newlay, near Leeds.

Summerskill, Dr. W. ; Journals to 92, Harrow Road, Leytonstone, N.E.

Taverner, W., l/o Burton-on-Trent ; Jamaica, Vermont, U.S.A.

Whiteley, A. Lloyd, l/o Beeches Road ; 5, Bagnall Street, West Bromwich, Staff.

Wilson, Dr. W. H. ; Journals to Presidency College, Madras.

CHANGE OF ADDRESS REQUIRED.

Jansen, Dr. R., l/o 43, Plymouth Avenue, Longsight, Manchester.

Deaths.

Abel, Sir Frederick Augustus, K.C.B., G.C.V.O., D.Sc., D.C.L., F.R.S., Past President of the Society of Chemical Industry (1882-83), 2, Whitehall Court, S.W. Sept. 6.

Hasenclever, R., Chemische Fabrik Rhenania, Aachen, Germany. May 28.

Moss, Jno., 39, Tressillian Road, S.E. Sept. 2.

Pears, Andrew, jun., Mevagissey House, Isleworth. Aug. 30.

Richmond, E. W. T., 132, Queen Victoria Street, E.C. ; and Warrington. Sept. 5.

Obituary.

ROBERT HASENCLEVER,

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY ; MANAGING DIRECTOR OF THE CHEMISCHE FABRIK RHENANIA, AACHEN, PRUSSIA.

ROBERT HASENCLEVER, like many great German chemists, was the son of a German pharmaceutical chemist. In 1852, his father had commenced a chemical factory, which, in 1856, was transferred to a limited company, termed the Chemische Fabrik Rhenania. He studied at the Technical High School in Karlsruhe. After gathering experience in several factories, in 1864 he returned to Aachen and to the Rhenania Fabrik as acting manager. When his father died, in 1874, he became managing director, and he held this post up to the date of his death. To Hasenclever's skill and resource as a manager of works, the fact of the enormous growth in size and importance of the Rhenania Works bears ample testimony. Besides this, branch factories were also established in Rhineland, Westphalia, and Baden. During the 38 years of Hasenclever's management, the number of workmen employed, increased from 200 to nearly 1,200.

He improved the Deacon chlorine process by purifying and completely drying the hydrochloric acid gas used, by causing the crude acid to pass into sulphuric acid, which both washed and dried it, furnishing pure dry hydrogen chloride. He also made of his mechanical bleaching powder apparatus a complete economic success by the use of towers for final chlorine absorption, in which the gas is made to ascend and meet a falling stream of lime.

Perhaps his most important improvement and invention was one involving both industry and sanitation, and chiefly for this he received the medal of the *Verein zur Förderung des Gewerbefleisses*. This process determined the satisfactory solution of the great question of the destruction of vegetation and the pollution of the atmosphere by furnace gases evolved in the roasting of zinc ores, as hitherto pursued. Hasenclever's new zinc blende furnaces, first constructed and set up at Stollberg in 1869, were quickly adopted in many zinc works, both in Germany and elsewhere. The Berthelot medal of the French Chemical Faculty was also awarded him for his improvements in the chemical industries.

His great and successful effort to utilise the sulphurous gases hitherto lost in the roasting of zinc blende ores, awakened in Hasenclever the desire to study in some detail the injurious action of acid gases on vegetation, and in 1870 he published the results of his investigations in pamphlet form.

In recognition of his eminent services, and at the nomination of the Hochschule of Karlsruhe, the high and special honour was conferred upon him of the degree of Doctor of Engineering, *honoris causa*.

Dr. Hasenclever was an original member of our Society of Chemical Industry. His numerous contributions to the literature of chemical technology have invariably arrested attention, bearing, as they always do, the marks of authority. Perhaps the most important are the following, as given in *Die Chemische Industrie*, 25, [14], 342:—

1868. Prevention of Boiler Incrustations.
1870. The Roasting of Pyritic Ores, with a Description of a New Furnace, by R. Hasenclever and W. Helbig.
1872. On Hasenclever and Helbig's Furnace for the Desulphurising of Ores, with a view to Sulphuric Acid Manufacture.
1872. On the Concentration of Sulphuric Acid.
1873. On Deacon's Chlorine Process.
1874. On the Manufacture of Sulphuric Acid.
1875. Losses of Zinc in the Roasting of Blendes.
1876. On Deacon's Chlorine Process.
1876. A Modified Hasenclever and Helbig Furnace.
1878. The German Alkali Manufacture in 1878.
1878. The Alkali Manufacture in Germany and Thelen's Mechanical Evaporator for Lyes, Brines, &c.
1879. Injury to Vegetation by Acid Gases.
1880. Injury to Vegetation by Acid Gases.
1880. The German Alkali Manufacture in 1880.
1881. Practical Results of Trials of New Patents for Avoiding the Injurious Effects of Furnace Gases.
1884. On the Utilisation of Hydrochloric Acid.
1884. On the German Alkali Manufacture and Collateral Industries.
1886. On Zinc Blende Roasting Furnaces and the Utilisation of the total Sulphur contained in the Blendes.
1887. The Present Position of the Lehlanc Soda Industry in Competition with the Ammonia-Soda Industry.
1889. The Alkali Manufacture in 1889.
1891. The Alkali Manufacture in 1890.
1892. The Sulphuric Acid Manufacture in 1891.
1893. The Position of the Industry of Acids and Alkalis in 1893.
1895. Avoiding Losses of Gas in Charging Pyrites Ovens.
1895. Injury to Vegetation by Acid Gases.
1897. Development of the Alkali and Collateral Industries in the last 25 years. (Address to the Deutschen Chemischen Gesellschaft in 1895.)
1899. The Sulphuric Acid Manufacture in 1898.
1899. Investigations of the *Verein deutscher Sodafabrikanten* on the Injury to Vegetation by Acid Gases.
1901. Advance of Chemical Industry with reference to the Industrial International Exhibition of Paris in 1900. (Address before the Aachener Bezirksverein deutscher Ingenieure, Jan. 9, 1901.)
1901. Improvements in the Nitric Acid Manufacture.
1902. The German Alkali Manufacture in 1901.

Recently, Robert Hasenclever had suffered from heart disease. He was ordered to Meran to recruit his health, and about the end of May he returned apparently recovered. In commencing to work again he appears, however, to have over-estimated his strength, was again seized with heart failure, and on May 28 he died suddenly, being then just 60 years of age.

Journal and Patent Literature.

Class.	Page.
I.—Genera Plant, Apparatus, and Machinery	1125
II.—Fue Gas, and Light	1126
III.—Destructive Distillation, Tar Products, Petroleum	1129
IV.—Colouring Matters and Dyestuffs	1129
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1132
VI.—Colouring Wood, Paper, Leather, &c.	1135
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1135
VIII.—Glass, Pottery, and Enamels	1139
IX.—Building Materials, Clays, Mortars, and Cements	1139
X.—Metallurgy	1140
XI.—Electro-Chemistry and Electro-Metallurgy	1142
XII.—Fats, Fatty Oils, and Soap	1144
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1145
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1146
XV.—Manures, &c.	1146
XVI.—Sugar, Starch, Gum, &c.	1146
XVII.—Brewing, Wines, Spirits, &c.	1147
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1148
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1150
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1151
XXI.—Photography	1154
XXII.—Explosives, Matches, &c.	1155
XXIII.—Analytical Chemistry	1155
XXIV.—Scientific and Technical Notes	1157

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d*. each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Centrifugal Apparatus for Determining the Relative Proportions of the Components of Compound Liquids. J. A. Larsen, Copenhagen. Eng. Pat. 7167, March 24, 1902.

THE apparatus is of the kind described in Eng. Pat. 4409 of 1893, but the annular trays, which are chambered to receive the test-tubes, are each formed with an annular outwardly sloping collar surrounding the centre hole, to retain any overflow from the test-tubes within the tray.—R. A.

Powders and like Materials; Machines for Packeting and Filling ——. M. Lary, Syracuse, New York. Eng. Pat. 13,699, June 17, 1902.

A WRAPPER-FOLDING mechanism, and expansible spiral feeders for feeding the material from a hopper to the wrappers.—R. A.

Tanks for Liquids. O. Intze, Aix-la-Chapelle, Germany. Eng. Pat. 18,242, Sept. 12, 1901.

ACCORDING to this invention, the tanks, whether erected on brickwork or iron structures, are composed of a number

of frames and of depending corrugated or curved plates arranged in such a manner as to cover in the spaces between these frames. Thus, the tanks are composed of constructional elements, each comprising "a horizontal beam and vertical, inclined, or curved uprights, the intervening spaces being covered by corrugated or curved plates." Horizontal or diagonal stay-bars may also be employed, and the tanks may be divided into two or more compartments by division walls between the elements.—R. A.

Gaseous Mixture; Apparatus for Separating, Extracting, or Recovering the Constituent Elements of a ——. E. N. Mazza, Turin. Eng. Pat. 12,194, May 28, 1902.

A CENTRIFUGAL separator. The rotary separating drum is divided internally into compartments by radial diaphragms, to impart the same rotary movement to the whole gaseous mass without shock. The drum contains means for deflecting the mixture, on its admission, towards the periphery, so that it is at once subjected to the maximum action of centrifugal force, and its constituent elements separated in order of density into concentric zones. The heavier gases pass out through peripheral orifices, which are separated by a curtain from the outlets for the gases of less density. The latter gases may be extracted and expelled by a centrifugal exhauster.—R. A.

Volatile Inflammable Liquids; Vessels for Holding ——. O. Imray, London. From La Cie. des Récipients et Lampes Inexplosibles, Paris. Eng. Pat. 12,183, May 28, 1902.

THE entrance of flame into vessels containing volatile inflammable liquids is prevented by placing within the spout or opening to the external air, capillary channels allowing the passage of liquid for filling or emptying the vessel, but preventing the passage of flame. The capillary channels consist of a set of grouped passages, measuring not more than 1 mm. inside diameter or less than 5 mm. in length, the channels being cast in the passage, or made of flat or round tubes; or passages are formed between the folds of a strip bent to and fro. The screw cap or cover of the vessel is provided with one or more fusible plugs, to permit the escape of vapour in the event of the vessel being heated.—C. S.

Filling Casks, Barrels, Tanks, and other Receptacles for Holding Liquids; Apparatus for ——. T. E. Coupe, Manchester. Eng. Pat. 16,984, Aug. 24, 1901.

AN arrangement for cutting off the supply of liquid, and ringing a bell, when the receptacle is full.—R. A.

Compressing Air or Gas, Drying and Cooling it, and Utilising its Waste Heat. P. Naef, New York. Eng. Pat. 14,577B, July 17, 1901. (Under Internat. Conv., Dec. 18, 1900.)

IN apparatus for producing cold gaseous fluid by compression and expansion, vessels are employed containing perforated partitions of wire gauze, &c., for removing moisture or depositing snow, which can be melted and removed by periodically heating the partitions. To prevent the generation of excessive heat during the compression, as much water as will evaporate is introduced into the compressor, in the form of a spray, at each stroke. Further arrangements relate to the drying of the compressed gas, by hygroscopic substances and otherwise, and the utilisation of its heat for heating steam in compound steam engines, for heating or drying fuel, &c., for use in furnaces, and for heating, evaporating, or distilling liquor. When the compressed gas is to be used for power purposes, a small quantity is cooled by expansion, &c., and afterwards mixed with the compressed gas, to free the latter from moisture.
—R. A.

UNITED STATES PATENTS.

Refrigerating Apparatus; Still for Absorption ——. N. W. Condiet, Jersey City. U.S. Pat. 706,901, Aug. 12, 1902.

THE generating chamber and steam coils of the ammonia still are combined with valved headers at the inlet and outlet ends, for controlling the admission of steam to the different coils, and with means for supplying steam from different sources to the inlet headers. The coils may be arranged in horizontal serpentine layers, successive layers having their inlets at opposite ends.—R. A.

Refrigerating Apparatus; Absorption ——. N. W. Condiet, Jersey City. U.S. Pat. 706,902, Aug. 12, 1902.

THE still of the apparatus is combined with a heating cylinder containing two strong-liquor coils, a cylindrical shield between the coils, and a steam inlet and an outlet on opposite sides of the shield, so that the strong liquor enters the still in a highly heated state, thus facilitating the formation of the gas in the still.—R. A.

Filtering Apparatus. D. Rojat, Nimes, France. U.S. Pat. 703,833, July 1, 1902.

A CHAMBER divided into compartments containing a number of filtering elements, each of which consists of an inner perforated metal wall surrounded by a spirally disposed distancing grid, a gauze covering over the grid, and a fibrous filtering coating of cellulose and asbestos. Each element has an outlet at the bottom for the filtered liquid, and the apparatus is provided with pipes and cocks for conducting the liquid to be filtered from one compartment to another, and controlling its flow.—R. A.

Filter. F. S. Young, Norristown, and W. W. Ueberroth, South Bethlehem. U.S. Pat. 706,370, Aug. 5, 1902.

A PRESSURE filter comprising an internally corrugated cylindrical casing, the corrugations of which are covered with a filter-cloth and a perforated plate, a drum mounted to turn in the casing and having pockets in its periphery, filter-cloths in the pockets, means for conducting the material to, and the liquid from, the pockets, and means for ejecting from the pockets the solid material deposited therein.—R. A.

II.—FUEL, GAS, AND LIGHT.

ENGLISH PATENTS.

Fuel in Furnaces; Combustion of ——. J. G. L. Bormann, Berlin. Eng. Pat. 16,737, Aug. 20, 1901.

THE grate is arranged as low as possible, forming a combustion chamber and an underlying ash space. Two or three sets of fire-bars are provided, and next to the fire-door is a massive plate. The fuel is piled up to a maximum depth, in accordance with the quality, and is gasified by a jet of air saturated with spray or steam, introduced through a nozzle in the front plate. A fire-bridge is provided, and behind this is a special air conduit for conveying pre-heated air, in predetermined quantity, for consuming the gases (containing about 50 per cent. of hydrocarbons, and poor in nitrogen) formed above the fuel layer, the resulting high temperature being transmitted to a fire-brick chamber, wherein the remaining heavy hydrocarbons are consumed.—C. S.

Fuel; Manufacture of Artificial ——. M. Hecking, Dortmund, Germany. Eng. Pat. 14,054, June 20, 1902.

FINE coal and pulverised coal pitch are mixed in a revolving drum, and the mixture moved continuously forward and exposed to the direct action of gases of combustion flowing in the same direction, the supply of heat being so regulated that the heating gases or vapours, and the mixture, leave the drum at a temperature between 80° and 100° C., so that the product can be immediately made into briquettes.
—C. S.

Fuel and the like; Furnaces or Apparatus for Burning Pulverulent or Dust ——. A. G. Brookes, London. From P. B. Bradley, Hingham (Mass.), U.S.A. Eng. Pat. 26,577, Dec. 30, 1901.

FOR preserving the crown, arch, or other wall of a brick combustion chamber, the inventor claims the combination of such wall with means to supply a film of air through said wall, and adjacent and in contact with the inner face thereof; and means to heat said air (before it reaches the

wall) by arranging supply conduits in the boiler setting and adjacent to the side walls of the combustion chamber.

Furthermore, to promote combustion in the combustion chamber, he claims the use of a perforated steam pipe, leading from the boiler, and so arranged as to deliver fine jets of steam into the top part of the combustion chamber and beyond the arch or crown, so that the steam is in the line of flow of the products of combustion towards and from the bridge wall of the furnace; the whole in combination with a device for feeding powdered fuel.—C. S.

Oil or Liquid Combustibles for various Purposes; Vaporisation of ——. A. J. Riley, Smethwick, and F. R. L. Strathy, Birmingham. Eng. Pat. 15,411, July 30, 1901.

The apparatus comprises the combination of a vaporiser or gasifier, formed of coiled tubing and heated externally; means for freeing the resulting gas from such impurities as would interfere with its proper combustion; and a gas-holder, the rise and fall of the movable part of which automatically regulates the supply of liquid combustible to the vaporiser.—C. S.

Spirit and Liquid Hydrocarbons; Process and Apparatus for Vaporising ——. H. Schünemann, Berlin. Eng. Pat. 7285, March 25, 1902.

Apparatus in which the vaporisation of the fuel is stated to be confined to the vaporiser proper, without extending to the feed pipe. The liquid is evaporated at a temperature below its boiling point, and the use of any kind of throttle contrivances or cocks requiring attention is said to be avoided. The apparatus is said to work equally well whether a large or small flame is employed.—F. H. L.

Heating Purposes; Utilisation of Liquid Hydrocarbons for ——. H. Tapp and W. H. Akester, London. Eng. Pat. 17,789, Sept. 5, 1901.

The liquid is led into a chamber filled with bundles of fine wires, in the centre being a tube for steam. This steam serves to heat the oil, and also to eject the finely-divided hydrocarbon through a suitable adjustable nozzle into the furnace where it is to be burnt.—F. H. L.

Heating Boilers with Mazut or Oil converted into Spray by Means of an Air Current; Process and Apparatus for ——. A. Brunn, Hamburg. Eng. Pat. 5707, March 7, 1902.

The oil is sprayed into the furnace chamber by means of a current of air, instead of the steam usually adopted. Either the oil or air, or both, may be previously heated, while an air-carburetting apparatus is added to the plant, so that the operation may be started with the aid of air-gas.—F. H. L.

Coke Ovens, Retorts, and other Heating Appliances: Method of Preventing the Leakage of Gases through the Walls or Partitions of ——. H. Koppers, Carnap, Germany. Eng. Pat. 18,159, Sept. 11, 1901.

The pores in the walls or partitions of the apparatus are filled by blowing in mineral dust, under suitable pressure, into the heated chamber.—C. S.

Coking Peat or the like; Furnaces for ——. A. J. Boult, London. From M. Ziegler, Berlin. Eng. Pat. 19,241, Sept. 26, 1901.

The furnace is an upright retort composed of superimposed rings containing partitions separating the rings into inner and outer portions. In each ring the partitions are set nearer the walls of the ring than in the one above, the result being to form a series of louvre openings whereby the inner portion of each ring communicates with the outer portion of the ring next above. These openings are enlarged by sloping the lower ends of the partitions inwards.—C. S.

Gas; Process of Producing Illuminating or Heating ——. W. J. Dibdin and H. C. Woltereck, London. Eng. Pat. 19,152, Sept. 25, 1901.

A permanent illuminating or heating gas is produced by passing a mixture of superheated steam and hydrocarbons (preferably crude petroleum) over metal (*e.g.*, iron or copper), which is continuously heated to a high temperature. The metal acts as a carrier of oxygen from the steam to the carbon of the hydrocarbon, the gas produced containing hydrogen and carbon dioxide, while the excess of hydrocarbons present is reduced to less complex molecules, or reacts with the hydrogen to produce methane, ethylene, &c.—H. B.

Gases; Apparatus for Purifying ——. W. Doman, Ambleeote, and S. W. Bullas, Cradley Heath, Staffordshire. Eng. Pat. 22,648, Nov. 9, 1901.

An apparatus of the kind in which the gases are passed through porous material, contained in one or more receptacles enclosed in an outer vessel provided with a cover. To facilitate manipulating or charging the apparatus, the seal between the inner and outer vessels and the cover is formed by a liquid.—R. A.

Gases from Blast Furnaces and the like; Utilising the Heat contained in Waste ——. V. F. Feeny, London. From Abwärme-Kraftmaschinen-Gesellschaft, Berlin. Eng. Pat. 13,757, June 17, 1902.

A process of deriving motive-power from the heat of the waste gases from blast furnaces and the like, consisting in passing the hot gases through a tubular vaporiser, whereby vapours are generated from a liquid (SO_2, CO_2, NH_3) having a boiling point below 0° C. at atmospheric pressure, the vapours being allowed to expand and perform work in a cold-vapour engine.—H. B.

Retort Settings, combined with the Gas Producer and Regenerative Chambers for heating Secondary Air-Supply by means of the Waste Gases leaving the Setting of the Retort. W. R. Herring, Edinburgh. Eng. Pat. 15,397, July 30, 1901.

The combustible gases, rising from the producer, mingle with a heated secondary air-supply, and, after burning round the retorts, the waste gases are led down, through regenerative chambers, on both sides of chambers up which the secondary air-supply is flowing. The air is thus heated by the waste gases. The air-heating passages or chambers are constructed of superimposed blocks, having rectangular vertical perforations, each block having a projecting lip or flange at the top on either side, forming a socket for the base of the next upper block to rest in. The projecting flanges also serve to support bricks, the other ends of which rest upon the brickwork of the regenerative chambers, thus forming transverse struts for the chambers, and also acting as baffles to the flow of the waste gases.—H. B.

Acetylene Gas; Apparatus or Machines for Generating ——. J. W. Weeks, Providence, Rhode Island, U.S.A. Eng. Pat. 11,498, May 20, 1902.

A mechanically-fed, carbide-to-water generator of the hopper pattern, which is claimed to work with non-granular carbide. The feeding arrangement consists of a barrel turning on a horizontal axis, which is made to revolve periodically by means of an escapement actuated through a spring and a system of levers connected to the holder-bell. One wall of the hopper is curved at its base concentrically with the barrel aforesaid, and is provided with slits through which pins fixed in the rim of the barrel wheel extend upwards to draw lumps of carbide sideways and downwards out of the store. By this construction the weight of the solid in the hopper is kept off the moving parts of the apparatus, and the feed is claimed to be so rendered more regular. The hopper mouth is automatically closed when the charging aperture is opened.—F. H. L.

Incandescence Mantles; Process and Apparatus for Incinerating, Shaping, and Hardening ——. H. Wolf, Berlin. Eng. Pat. 17,637, Sept. 3, 1901.

The mantle is burned off over a conical form, made of sheet platinum or other suitable material, of the same shape as that to be given to the finished mantle, and is then pressed against the cone by the inwardly directed flames of a ring-shaped pressure-gas burner, which is moved up and down. The interior of the cone can be heated by means of a gas burner.—H. B.

United States Patents.

Fuel; Artificial ——. G. M. Dallas, Chicago, Ill. U.S. Pat. 706,533, Aug. 12, 1902.

Culm or coal-dust is heated to the point of ignition, and is then incorporated with a mixture of 50 galls. of paraffin residuum, 10 lb. of borax, 25 lb. of antimony, 3 lb. of acetic acid, 1 peck of oil-cake meal, 200 lb. of clay, 5 lb. of crude potash boiled in 30 galls. of water, and 25 lb. of salt, to 25 tons of the coal-dust, the whole being finally made into briquettes.—C. S.

Fuel-Burner. C. A. Dally, Carnot, Pa. U.S. Pat. 701,800, June 3, 1902.

A burner designed for the combustion of a mixture of coal-dust and oil-fuel. It comprises a burner pipe, fitted with a hopper and connected with an air chamber, through which passes a rotatable oil-spraying pipe leading into the burner pipe and carrying a bladed gear wheel; a perforated cup loosely fitted into the base of the hopper and carrying a gear wheel which engages with that on the spray pipe; a spiral-bladed shaft connected to the cup so as to extend into the hopper; means for rotating the spray pipe, and means for introducing air under pressure into the air chamber.
—C. S.

Gas-Producer. J. A. Herrick, Philadelphia, Pa. U.S. Pat. 706,939, Aug. 12, 1902.

The producer is open at the bottom, for the direct downward discharge of ashes, and is fitted in the lower portion with a series of blast-boxes, so arranged as to permit clinker and ashes to fall between their inner ends, and also between their outer ends and the sides of the producer. Each of the blast-boxes is provided with a central blast-pipe, projecting downwards from the centre of the box, and consisting of a vertical portion connected by an elbow-joint with a horizontal portion, which projects through the wall of the ash-hopper. Above, and vertically in line with this horizontal pipe, is an air-blast supply pipe, communicating with the vertical portion of the air-supply pipe at a point above the elbow-joint.—C. S.

Gas-Producer. J. A. Herrick, Philadelphia, Pa. U.S. Pat. 706,412, Aug. 5, 1902.

The apparatus comprises a central blast-pipe, for supplying air to the central portion of the fuel in the producer; independent inwardly-projecting tuyère boxes, with openings for supplying air to the fuel between the wall of the producer and the central blast-pipe; an ash-hopper, fitted with pipes arranged so as to supply water laterally into the mass of ashes below the air-blast openings and between the latter and the water seal; brackets attached to the ash-hopper and serving to support the tuyère boxes, which latter are capable of adjustment from and towards the centre of the producer, the brackets being provided with projecting portions, which engage in slots in the tuyère boxes and prevent their lateral displacement.—C. S.

Coke; Process of Making ——. P. Naef, New Brighton, N.Y. U.S. Pat. 706,443, Aug. 5, 1902.

See Eng. Pat. 7951 of 1898; this Journal, 1899, 570.
—C. S.

Gas; Apparatus for Generating ——. W. J. Faulkner, Chicago. U.S. Pat. 701,186, May 27, 1902.

Molten material, such as iron or glass, is led into a horizontal chamber, divided by means of depending partitions, which dip below the surface of the molten material, into a series of compartments constituting gas-generating chambers and combustion chambers alternately, through which the fluid flows in succession. Into the generating chambers finely-divided coal or a mixture of oil and water is introduced, and gives off combustible gas, which is led away through a main. The molten material, partially cooled by this process, is reheated in flowing through the adjoining combustion compartment, wherein fuel is strewn upon its surface and burned by means of an air-blast.—H. B.

Gas; Apparatus for Generating ——. W. J. Faulkner, Chicago. U.S. Pat. 701,806, June 3, 1902.

The apparatus consists of a circular chamber, forming the furnace of the apparatus, and also forming a well for molten iron, glass, or the like; inlets for oil and air; vertical tubular gas-generators, dipping into the molten substance and extending upwards outside the chamber; concentric pipes passing centrally down the generators and provided with radial outlets, oil or oil-gas, and water or steam, being led down said pipes; and outlets from the generators for the gas produced therein. The heat of the molten material is maintained by the combustion of the oil within the furnace; and within the generators gas is produced from the oil and water, or the mixture of oil-gas and steam is superheated.—H. B.

Gas; Apparatus for Making Oil- ——. R. Dempster, Marietta, Ohio, U.S.A. U.S. Pat. 703,901, July 1, 1902.

Liquid hydrocarbon is fed in minute streams into the inner of two concentric, horizontal pipes, perforated along their upper surfaces, the annular space between the pipes being filled loosely with asbestos fibre. The pipes are supported centrally in a horizontal rectangular retort, which is heated by a fire, and the space between the pipes and the walls of the retort is packed loosely with asbestos fibre, which is kept in position by sheets of wire gauze. The vaporised hydrocarbons rise from the retorts through a filtering bed of asbestos into a superheating chamber, and are drawn off by a main consisting of two perforated concentric pipes having the annular space packed with asbestos.—H. B.

[*Acetylene*] *Gas Purifier.* D. O. Freeman. Assignor of one-half to the Rex Acetylene Generator Co., Binghampton, N.Y. U.S. Pat. 701,704, June 3, 1902.

A closed cylinder has a screen of wire gauze, forming a false bottom on which the purifying material rests. The cylinder has a gas-inlet pipe at the top and an outlet pipe leading from the side, beneath the false bottom. A drip pipe depends from the bottom of the apparatus.—H. B.

Acetylene Gas [*Heating*] *Burner.* J. J. Graf. Assignor to Union Light and Heat Co., Cincinnati. U.S. Pat. 703,404, July 1, 1902.

An atmospheric burner of the usual horizontal ring shape, constructed to burn acetylene, which is claimed to work satisfactorily at any pressure between 1 and 3 ins. of water, giving a perfectly non-carbonaceous flame, and free from any liability to fire back to the jet. The essential features of the burner are (1) that the annular chamber underneath the wire gauze has twice the cubical capacity of the tube leading thereto from the injector, and (2) that the flame has a secondary air supply in its centre, which is derived from a pair of conduits leading from the base of the casting. This central air inlet passes through the gauze and terminates in a horizontal baffle plate, so that the air is forced to spread outwardly into the acetylene flame. The mesh of the gauze employed ranges between No. 24 and No. 36. The primary air supply can be regulated by a hit-and-miss arrangement.
—F. H. L.

Acetylene Gas Generator. A. Davis, Chicago, and P. L. Davis, Marquette, Mich. U.S. Pat. 705,739, July 29, 1902.

A mechanically-fed, carbide-to-water, side-shoot generator. The carbide store is a water-sealed, detachable vessel, with an ordinary clock train driving a central vertical spindle placed in its topmost compartment. The spindle passes downwards to the bottom of the vessel, terminating in a horizontal disc, which, by the agency of the clock spring and the releasing action of the falling holder-bell, is periodically caused to revolve. Assisted by fixed eccentric scrapers, the revolution of the disc sets up a "centrifugal action" among the carbide lumps, and causes them to drop from the upper part of the hopper into the water underneath. The feed is arranged to pass only small quantities of solid at a time, and it is claimed that dust or powdered carbide can be employed in this apparatus with success.—F. H. L.

Acetylene Gas Generator. S. W. Ray. Assignor to New Process Manufacturing Co., both of Texas. U.S. Pat. 705,788, July 29, 1902.

A MECHANICALLY-FED, carbide-to-water generator of the hopper type. The holder-bell is connected with the feed-valve by means of a horizontal lever fulcrumed in a part of the side wall of the carbide store, which behaves as a flexible diaphragm. The feed-valve is a vertical plunger, which is lifted off its seat by the fall of the bell, and restored to its normal position by the action of the diaphragm. —F. H. L.

Acetylene Gas Generator. H. D. Bugg, Arkansas. U.S. Pat. 705,902, July 29, 1902.

AN automatic, water-to-carbide generator working on the dipping principle, in which the decomposing vessel is a vertical, cylindrical, detachable vessel, placed centrally within the apparatus, and carried by the holder-bell.—F. H. L.

Acetylene Gas Generator. A. Karg, Paterson, New Jersey. U.S. Pat. 706,067, Aug. 5, 1902.

A MECHANICALLY-FED, carbide-to-water generator. The carbide is held in a number of boxes fixed radially round a vertical revolving shaft, which is actuated from the holder-bell. Each box has the vertical section of a right-angled triangle, with the most acute angle pointing downwards, and with the hypothenuse pointing outwards. Said hypothenuse is hinged at the top, so that when a catch at the base holding it shut is released, the side swings vertically, opens the box, and allows carbide to fall into the water of the decomposing chamber. Each catch in succession is released when the corresponding box arrives at a spot where there is a spring-closed door in the top of the generator, the door then opening by the weight of the carbide falling on it.—F. H. L.

Incandescent Gas Lights; Substance and Mantle for ——. L. Hicks, Englewood, N.J. U.S. Pat. 703,064, June 24, 1902.

A MANTLE consisting mainly of oxide of thorium (say 89 per cent.), with a comparatively large percentage (say 10 per cent.) of oxide of lanthanum or yttrium, or a mixture of these, and a comparatively small proportion (say 1 per cent.) of oxide of cerium, uranium, praseodymium, chromium, or manganese, or mixtures of these.—H. B.

Incandescent Gas Lamp. J. Lowy, New York. U.S. Pat. 703,070, June 24, 1902.

IN a suspended incandescent gas lamp, a pipe conveying air under pressure, and a gas-supply pipe, are led down in the neighbourhood of the flames of the burners to a mixing tube, wherein both pipes are bent upwards, the nozzles being brought together. The base of the mixing tube is open to the atmosphere, so that a large quantity of air may be drawn in. The top of the mixing tube opens into a horizontal chamber, on which are arranged the burners, each with a mantle suspended over it.—H. B.

Incandescent Lamp; Hydrocarbon ——. G. Washington, New Brighton, N.Y. U.S. Pat. 706,504, Aug. 5, 1902.

OIL is supplied up a vertical tube, serving as a vaporiser, to a conical nozzle, which is controlled by a needle-valve. The vapour issuing from the nozzle draws in air through tubes which pass laterally through the burner casing. Above the nozzle rises a mixing tube; this is surrounded by an intermediate tube, closed at the top and open at the bottom; and this again is surrounded by the outer burner tube, having a perforated top as usual. The mixed gases thus pursue a tortuous course on their way to the burner top, and part of them, on their downward passage between the mixing and intermediate tubes, escape through jet orifices in the base of the casing, burning against flanges arranged on the vaporising tube and supplying the heat necessary for vaporising the oil.—H. B.

Carbons for Arc Lamps [Metallic Salts]; Manufacture of ——. C. R. Boehm, Charlottenburg. U.S. Pat. 703,692, July 1, 1902.

THE metallic salts to be incorporated into the carbons, such as fluorides of calcium and sodium, are mixed with magnesium fluoride in molecular proportions.—H. B.

Electric Furnace [Calcium Carbide]. A. Parker, Chorley, England. U.S. Pat. 706,099, Aug. 5, 1902.

SEE Eng. Pat. 18,645, 1900; this Journal, 1901, 977.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum; New Method of Fractional Distillation of ——. B. Lach. J. du Pétrole, 2, [14], 359—361.

THE distillate is passed through a condenser fitted with Fischer hollow plates, whereby the vapours and the condensing water are brought into contact in thin layers. The apparatus being worked on the counter-current principle, the vapours, in passing from one hollow plate to another, encounter water at progressively higher temperatures, the result of which is to produce fractional condensation and what is claimed to be a perfect separation of the fractions, so that they can be drawn off through separate taps. In the case of the lighter grades of petroleum spirit (benzine), an extra condenser is employed for rectifying these products and separating them into fractions of sp. gr. 0·690, 0·660, 0·650, 0·640, &c. The apparatus is said to be equally applicable to distillates from the cracking process, and also for lubricating oils.—C. S.

ENGLISH PATENT.

Asphalt, Bitumen, Pitch, and other Substances; Boilers or Heating Apparatus for ——. A. J. Boult. From A. Baumann. Eng. Pat. 25,400, 1901.

See under IX., *page* 1139.

UNITED STATES PATENTS.

Retort for Wood Distillation. W. B. Chapman, Boyne City, Mich. U.S. Pat. 705,906, July 29, 1902.

IN order to overcome the difficulties arising from expansion and contraction, the retort is made of a series of separate plates, about one-eighth of an inch in thickness, riveted together. Each plate is bent transversely, so as to form corrugated walls for the retort. At each vertical line of joints the side plates are fixed to the brickwork so that the retort has no movement endwise.—D. B.

Furnace for Retorts [Wood Distillation]. W. B. Chapman, Boyne City, Mich. U.S. Pat. 705,907, July 29, 1902.

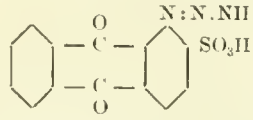
A FURNACE particularly for use in wood-distillation, so constructed that it is possible to use solid fuel, such as wood, sawdust, shavings, and the like, with the same results of uniform heating as are attained with natural gas. The main features of the furnace are a fire-box with top feed-hole, which is built out beyond the end of the retort, and fire flues, extending on a higher level than the fire-box, longitudinally beneath the retort, but separated therefrom by an arched partition with distributing openings terminating at a point near the centre of the retort. The heat flues from the furnace are parallel with the longitudinal axis of the retort and immediately under the retorts, and the hot currents from the furnace are made to go out through the bottom part of the longitudinal flue, to return again over the top of the retort at the front end, thus ensuring uniform heating.—D. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

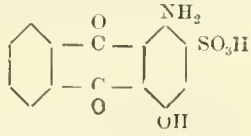
Diazo Group; Replacement of the ——, by the Amino Group. L. Wacker. Ber., 1902, 35, [14], 2593—2602.

THE author finds that in the anthraquinone series the diazo group is readily replaced by the amino group. In many cases intermediate products, derivatives of diazoanthraquinone amine, can be isolated, which decompose on gentle warming in acid, aqueous, or in concentrated sulphuric acid solution into the corresponding substituted amino derivatives,

their transformation or decomposition products. Thus 1.2-diazo-anthraquinone sulphonic acid anhydride readily gives with ammonium carbonate the ammonium salt of amino-anthraquinone sulphonic acid, whilst with aniline a diazo-amino compound is obtained which, on boiling with dilute acid or with concentrated sulphuric acid, is converted almost quantitatively into 1-amino-anthraquinone-2-sulphonic acid, phenol, and nitrogen. Methylamine yields amino-anthraquinone sulphonic acid, whilst dimethylamine gives an intermediate compound which decomposes with sulphuric acid, giving off nitrogen, into the corresponding hydroxyanthraquinone sulphonic acid and dimethylamine. Hydroxylamine forms with diazo-anthraquinone sulphonic acid a tolerably stable intermediate compound, which can be described as diazo-anthraquinone sulphonic acid hydroxylimine—



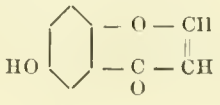
This, on treatment with concentrated sulphuric acid, is converted into 1-amino-4-hydroxyanthraquinone-2-sulphonic acid—



That the hydroxyl group enters para to the amino group is shown by the fact that on heating with *p*-toluidine in presence of boric acid and zinc chloride, Quinizarin Green sulphonic acid (Ger. Pat. 101,919) is formed. Hence a general method is thus given for hydroxylating amino anthraquinones by diazotising the amino group, combining with hydroxylamine, and treating the resulting product with concentrated sulphuric acid. In a similar manner diazo-anthraquinone sulphonic acid combines with hydrazine (diamine), and gives, on decomposition with concentrated sulphuric acid, 1·4·2-aminohydroxyanthraquinone sulphonic acid.—T. A. L.

2-Hydroxychromone. E. David and St. v. Kostanecki. Ber., 1902, **35**, [14], 2547—2549.

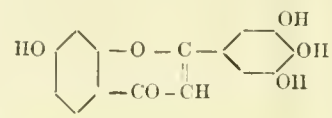
Quinacetophenone ethyl ether condenses in presence of metallic sodium with oxalic diethyl ester to form 2-hydroxy-5-ethoxy-benzoylpyruvic ethyl ester (needles from alcohol melting at 92° C.), which, on boiling with alcoholic hydrochloric acid, is converted first into 2-ethoxychromone-β-carboxylic ester, and finally, on hydrolysis, yields 2-ethoxychromone carboxylic acid (needles melting at 235° C., with evolution of carbon dioxide). The latter on distillation gives off carbon dioxide, forming 2-ethoxychromone (white powder melting at 90° C.), from which 2-hydroxychromone can be obtained by boiling with hydriodic acid. The last-mentioned substance, having the formula—



crystallises from dilute alcohol in white needles melting at 244° C., and dissolves in sulphuric acid to a colourless solution with green fluorescence. On boiling with acetic anhydride and fused sodium acetate, it yields the acetyl compound, which crystallises from dilute alcohol in irregular white needles melting at 127° C.—T. A. L.

Tetrahydroxyflavone; A Mordant-dyeing ——. St. v. Kostanecki and E. Plattner. Ber., 1902, **35**, [14], 2544—2546.

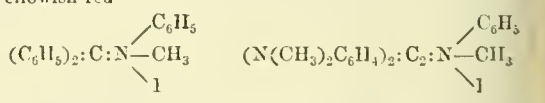
With the object of obtaining a hydroxyflavone with a gallic acid radicle, the authors have prepared 3.3′.4′.5′-tetrahydroxyflavone by the following process. Resacetophenone diethyl ether condenses in presence of metallic sodium with trimethyl gallic ethyl ester to form 2.4-diethoxy-3′.4′.5′-trimethoxybenzoylacetophenone (yellowish needles melting at 132°·5 C.), which, on boiling with concentrated hydriodic acid (sp. gr. 1·96), undergoes inner condensation and hydrolysis, yielding 3.3′.4′.5′-tetrahydroxyflavone—



The product crystallises from dilute alcohol in thin white needles, melting, with decomposition, at 340° C. It gives yellow shades on an alumina mordant similar to those from Luteolin.—T. A. L.

Auramine and the Salts of Phenyliminobenzophenone; Constitution of ——. C. Graebe. Ber., 1902, **35**, [14], 2615—2621.

In a previous paper (Ber., **32**, 1681; this Journal, 1899, 752), showing the analogy existing between the imines of benzophenone and Auramine, the author brings forward reasons for considering that Auramine, not only as a base, but also in the form of its salts, is to be regarded as an amine. Stock bases his view, which is opposed to that of Graebe, on the existence of a methylphenylauramine, and has since (Ber., **33**, 318; this Journal, 1900, 236) obtained a thiocyanate of this substance. The author now finds that both phenyliminobenzophenone and phenylauramine yield iodomethylates, the first being yellow and the second yellowish-red—



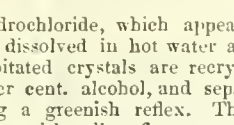
The two products show great analogy, both in the method of their formation and their behaviour. Both are decomposed by alkalis, giving methylaniline and benzophenone or its tetramethyldiamino derivative, and since the iodomethylate of phenyliminobenzophenone cannot have a quinoid formula, it is highly improbable that phenylauramine is so constituted. The author confirms the observation of Dimroth and Zoeppritz (Ber., **35**, 991; this Journal, 1902, 467) that the hydrochloride of phenyliminobenzophenone contains a molecule of water, but maintains that this is no proof in favour of the quinoid formula.

The salts of phenyliminobenzophenone (hydrochloride and hydriodide) are readily prepared by treating benzene solutions of the substance with dilute hydrochloric or hydriodic acid. The former salt melts at 190° and the latter at 185° C. The iodomethylates are obtained by heating with methyl iodide in benzene solution in a sealed tube. That from phenyliminobenzophenone melts at 202° C., whilst Auramine yields Auramine iodomethylate, $[(CH_3)_2N.C_6H_4]_2C:NH.CH_3I$, which melts at 235°—240° C., and, on heating with dilute soda lye, is converted into methylauramine, melting at 130° C. The hydriodide of phenylauramine, $[(CH_3)_2NC_6H_4]_2:CN.C_6H_5HI$, melting at 242° C., is obtained by precipitating the technical hydrochloride with potassium iodide. Phenylauramine iodomethylate, melting at 214° C., and having the formula $[(CH_3)_2NC_6H_4]_2C:N.C_6H_5CH_3I$, is formed when phenylauramine is heated with methyl iodide in benzene solution in a sealed tube in the water-bath. The product, on moderate warming with an alkali, gives off methylaniline, and yields tetramethyldiaminobenzophenone. The author still maintains that the balance of evidence is in favour of the imino as against the quinoid formula for Auramine, and is of opinion that the results of Hantzsch and Osswald (Ber., **33**, 297; this Journal, 1900, 236), on the conductivity of Auramine base, are not opposed to this view.—T. A. L.

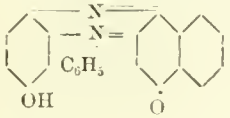
Dimethylnaphthosafranine. O. Fischer and E. Hepp. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [16], 437—439.

In the course of their work on the production from nitrosodimethylaniline and α-naphthylamine hydrochloride in

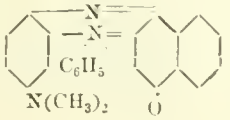
presence of aniline of the bluish-violet dyestuff, $C_{32}H_{29}N_5$ (Annalen, **272**, 323, and **286**, 221; this Journal, 1893, 669, and 1895, 797), the authors found small quantities of a safranine. This they have now further investigated, and characterise as B-Dimethylnaphthosafranine—



The crude hydrochloride, which appears as a shining greenish mass, is dissolved in hot water and treated with salt. The precipitated crystals are recrystallised several times from 70 per cent. alcohol, and separate in needles or prisms having a greenish reflex. The red alcoholic solution has a brownish-yellow fluorescence. The nitrate forms long green needles, whilst the bromide crystallises from dilute alcohol in greenish plates. The base obtained by decomposing the hydrochloride with soda lye forms short metallic prisms, which are red by transmitted light. It crystallises well from pyridine. On heating the hydrochloride in glacial acetic acid solution with concentrated hydrochloric acid under pressure for some hours to 160°—170° C., the chief product is oxyrosindone (naphthosafranol)—

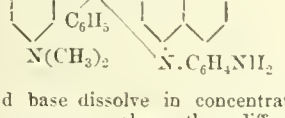


which crystallises from pyridine in the greenish red-brown needles characteristic of this compound. By heating dimethylnaphthosafranine with alcoholic potash under pressure at 140°—150° C., two products are obtained, one being the above naphthosafranol and the other dimethylnaphthosafraninone—



The product crystallises from boiling alcohol in greenish needles sparingly soluble in most solvents.

Dimethylnaphthosafranine behaves towards *p*-phenylene amine like other safranines of the naphthalene series, in that condensation only takes place with one phenylene amine radicle, the resulting product having the formula—



The salts and base dissolve in concentrated sulphuric acid with a grass-green colour, thus differing from dimethylnaphthosafranine, which gives a bluish-green reaction. The authors also state that dimethylnaphthosafranine can be readily diazotised in alcoholic or aqueous solution.

—T. A. L.

English Patents.

Indigo [*Indigo Dyestuffs*]; *Process for Purifying Raw* ——. O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. Eng. Pat. 19,663, Oct. 2, 1901.

See Fr. Pat. 314,681 and U.S. Pat. 702,730; this Journal, 1902, 401 and 967.—T. A. L.

Phenylamido-acetonitrile [*Indigo*], *and Homologues and Substitution Products thereof.* O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. Eng. Pat. 19,998, Oct. 7, 1901.

Phenylamido-acetonitrile, $CH_2(OH).CN$, combines with aniline and homologues and substitution products, slowly at the ordinary temperature, rapidly and completely on heating. Thus aniline yields phenylamino-acetonitrile, $C_6H_5.NH.CH_2.CN$, which on hydrolysis gives phenylglycocoll; sodium anthranilate by the same reactions yields phenylglycine-*o*-carboxylic acid.—A. C. W.

Orange-yellow to Red Mordant Dyestuffs [*Azo Dyestuffs*]; *Manufacture of* ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. Eng. Pat. 17,094, Aug. 26, 1901. Supplementary to Eng. Pat. 20,276 of 1900 (this Journal, 1901, 982).

See Fr. Pat. 305,491; this Journal, 1902, 169.—T. A. L.

Azo Colouring Matter [*Azo Dyestuffs*] *and of Intermediate Products relating thereto; Improvements in the Manufacture of* ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 20,200, Oct. 9, 1901.

See Fr. Pat. 314,135; this Journal, 1902, 402.—T. A. L.

Red Colouring Matters or Dyes [*Triphenylmethane Dyestuffs*]; *Manufacture of* ——. J. J. M. Ville, Montpellier, France. Eng. Pat. 19721, March 14, 1901. (Under Internat. Conv.)

See Fr. Pat. 308,968; this Journal, 1902, 39.—T. A. L.

Black Sulphur Colouring Matters [*Sulphide Dyestuffs*] *directly Dyeing Cotton; Manufacture of* ——. I. Levinstein, C. Mensching, and Levinstein, Ltd., Manchester. Eng. Pat. 18,912, Sept. 23, 1901.

See Fr. Pat. 316,576; this Journal, 1902, 911.—T. A. L.

Colouring Matter [*Sulphide Dyestuffs*], *and Material for Use therein; Manufacture and Production of* ——. G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine, Germany. Eng. Pat. 19,332, Sept. 27, 1901.

When *p*-nitro-*o*-amino-*p* hydroxydiphenylamine—

$$1.3.4.NO_2.NH_2.C_6H_3.NH.C_6H_4.OH.1.4$$

is boiled with carbon bisulphide, it yields a product having the character of a thiocarbamide. The substance is readily soluble in hot alcohol and acetone, but almost insoluble in petroleum, benzene, or chloroform; it melts above 280° C. On fusing this product with sulphur and sodium sulphide, preferably in presence of glycerin at 110°—115° C., and subsequently at 145° C., it yields a dyestuff giving greyish-blue shades on cotton from an alkaline bath containing sodium sulphide. By subsequent treatment with an oxidising agent (hydrogen peroxide), or on exposure to air, the shade becomes pure blue, and this can be intensified without any other alteration by treatment with a metallic salt, such as stannic chloride.—T. A. L.

United States Patents.

Bromindigo [*Indigo Dyestuffs*]; *Process of Making* ——. M. v. Gallois, Hochst. Assignor to the Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Main, Germany. U.S. Pat. 706,921, Aug. 12, 1902.

Indigo-white in paste form is treated with bromine, the product obtained on subsequent oxidation yielding bromindigo.—T. A. L.

Black Sulphur Dye [*Sulphide Dyestuffs*], *and Process of Making same.* I. Levinstein and C. Mensching, Manchester. Assignors to Levinstein, Ltd., Manchester. U.S. Pat. 702,369, June 10, 1902.

See Fr. Pat. 316,576; this Journal, 1902, 911. See also Eng. Pat. 18,912 of 1901 above.—T. A. L.

Black Sulphur Dye [*Sulphide Dyestuffs*], *and Process of Making same.* I. Levinstein and C. Mensching, Manchester. U.S. Pat. 706,969, Aug. 12, 1902.

Black dyestuffs for unmordanted cotton are obtained by boiling, in aqueous solution, sulphur, crystallised sodium

sulphide, and the disazo dyestuff from equimolecular proportions of diazobenzene, diazotised-*p*-nitraniline, and phenol. A bluer shade of black is produced when the above disazo compound is mixed with an equimolecular proportion of *p*-hydroxydinitrodiphenylamine.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mould in Sheep's Wool; Origin of ——. W. Kalmann. Färber-Zeit., 1902, **13**, [16], 245—248.

The disease in sheep's wool giving rise to the speckled appearance sometimes observed in the dyed fibre is due to a bacterium, which may be developed in a piece of healthy woollen cloth by wrapping this round a fragment of rotten wood and maintaining the whole in a damp chamber at 40° C.

The presence of organic or mineral acids reagents in the wool very materially hinders the growth of this mould. On the other hand, it thrives most readily on wool dyed in an alkaline indigo vat, destroying not only the fibre, but also the dyestuff: the freshly-dyed wool can, however, be preserved from mould by treatment with acid.

The bacterium slowly develops in wool dyed with Methyl Violet, but not on the fibre when dyed with Methylene Blue; both these dyestuffs have an alkaline reaction, but the latter behaves as an antiseptic towards the mould. Mouldy wool, when dyed with the mordant dyestuffs, does not at first present a spotted appearance, but the light specks appear on drying.—G. T. M.

Wool Mordanting. H. Alt. Färber-Zeit., 1902, **13**, [16], 248—249.

Three samples of wool dyed in the same indigo vat with a light shade of blue were each mordanted with one of the following mixtures: lignorosin, bichromate, and sulphuric acid; lactolin and bichromate; argol and bichromate; and then subsequently dyed with Alizarin Blue A. The sample mordanted with the first mixture gave the deepest and purest shade, this result being undoubtedly due to the rapid and complete reduction of the chromic acid by the lignorosin.

Hard water should be acidified before being employed in the chrome bath. The requisite amount of acid was ascertained by a comparative experiment, several hanks mordanted in baths containing different quantities of sulphuric acid being matched against a standard hank mordanted in distilled water with the appropriate proportion of bichromate and dilute sulphuric acid.—G. T. M.

Cotton Bleaching; Liquid for ——. H. Cuémod. Soc. Industrielle de Mulhouse. Procès-verbaux, July 9, 1902, 1.

A solution of sodium hypochlorite and sodium chloride, obtained by electrolysis, is extremely stable in the absence of chlorate and free alkalis, and may be kept unchanged for several months; it is recommended for use in cotton bleaching.—G. T. M.

Indigo Printing [*Kalle and Co.'s Process*]. E. Fischer and H. Alt. Färber-Zeit., 1902, **13**, [13], 197—198.

A mixture containing finely-ground Indigo and caustic soda lye (Eng. Pat. 9587 of 1900; this Journal, 1901, 577) is printed upon unprepared, glucose-prepared, or oil-prepared cotton tissues, which are thereupon dried and steamed with dry superheated steam, at a temperature of 104°—116° C., according to the depth of shade of the blue to be produced, for a length of time varying from a few minutes to 1½ hours, according to the nature of the colour mixtures, that is, tannic acid and basic dyestuff mixtures, Alizarin mixtures, &c., along with which the Indigo mixture is printed. Glycerin is added in some cases to the Alizarin printing mixtures to attract in the steaming the moisture necessary for the proper formation of the colour lakes. Suitable hygroscopic substances are also added to the basic dyestuff mixtures when these require moisture for the fixing of the colours. Darker shades of blue are obtained upon oil-prepared than upon unprepared tissues. The colour produced by this process by padding either on one or both sides of the tissue, resembles in appearance vat-dyed Indigo, but has the advantage over this of being considerably faster to rubbing and washing. By using the bromine derivative of Indigo in place of Indigo, brighter blues of reddish tone are obtained.—E. B.

English Patents.

Indigo Vat Dyeing; Improvements in and in the Preparation of Substances for ——. A. W. Playne, Stroud, and L. W. Macdonald, Isle of Skye. Eng. Pat. 19,312, Sept. 27, 1901.

In indigo vat-dyeing the employment of indigo or indigotine (whether natural or artificial) is claimed, which has been intimately ground up with glycerin to form a paste. As a practical working example the following proportions are given:—Indigo (or indigotine), 20 parts; glycerin, 10 parts; and water, 70 parts. These proportions are said to give the best economic results, providing the indigo or indigotine, has been ground to the highest degree of fineness.—G. T. M.

Dyeing Warps for Weaving. R. W. Goddard, Bradford. Eng. Pat. 15,038, July 24, 1901.

With the object of preventing warp yarns from becoming entangled when they are being dyed in the form of a "sheet," that is, a large number together, parallel to and a little distance apart from one another, they are passed continuously, in a horizontal or approximately horizontal direction, through a dye bath or a series of dyeing, washing and fixing baths, the rollers which support them being placed at intervals not exceeding 16 ins. from one another —E. B.

Textile Materials; Apparatus for Dyeing, Bleaching Treating with Mordants, Washing, and Otherwis Treating ——. P. Schirp, Barmen, Germany. Eng Pat. 12,510, June 2, 1902.

See Fr. Pat. 314,274, 1901; this Journal, 1902, 406. —E. B.

Warp Yarns [*for Carpet Weaving*]; *Printing* —— W. Schmidt, Hof, Germany. Eng. Pat. 11,184, May 1 1902.

A disc or roller is mounted in a small carriage containi the colour mixture to be applied. The yarn to be print is wound upon a drum. Printing is accomplished l passing the carriage first in one and then in the opposi direction along the same track underneath the drum, t printing disc coming into contact with the yarn as t carriage passes below this. After each printing operati the drum is moved forward a certain distance, to bring further portion of yarn into line with the disc, until t whole of the yarn has been printed in this manner. distribute the colour mixture upon the yarn, spreadi devices are arranged in front and at the back of t printing disc. These are stated to be more certain in th action and of a simpler character than those hitherto in for the purpose.—E. B.

Finishing Plain, Dyed, or Printed Cotton, Linen, and ot Fabrics. E. G. Ferreira, Rio de Janeiro. Eng. 19,532, Oct. 1, 1901.

A plain, dull figure on a lustred or silky ground is p duced on cotton cloths, linen, or other textile fibres y passing the woven material through a calender contain a roller engraved with a series of fine longitudinal par el lines (Schreiner's process) excepting on the parts occu d by the engraved design.

The alternative effect of a lustred figure on a dull gro d is attained by the use of a plain roller engraved with ne lines only on the parts containing the design.—G. T. M

Textile Fabrics; Improved Method of Water-proofing a Rot-proofing ——. J. Williams, London. Eng. at. 19,013, Sept. 24, 1901.

Textile fabrics are rendered water-proof and rot-pro by immersion in a solution prepared by digesting cocc turnings with an aqueous solution of ammonium carbate in the presence of air or oxygen.—G. T. M.

th, Canvas, Paper, and other Fabrics; A Process for Rendering Waterproof ——. J. Menzies, London. Eng. Pat. 12,807, June 5, 1902.

TH, canvas, paper, and other fabrics are rendered water-of by being first immersed in an emulsion containing parts of stearic acid, 6 parts of oleic acid, 18 parts of affin wax, 2·5 parts of caustic potash, 2 parts of sodium cate, and 400 parts of water, and subsequently passed ough a clear fixative solution of aluminum acetate.

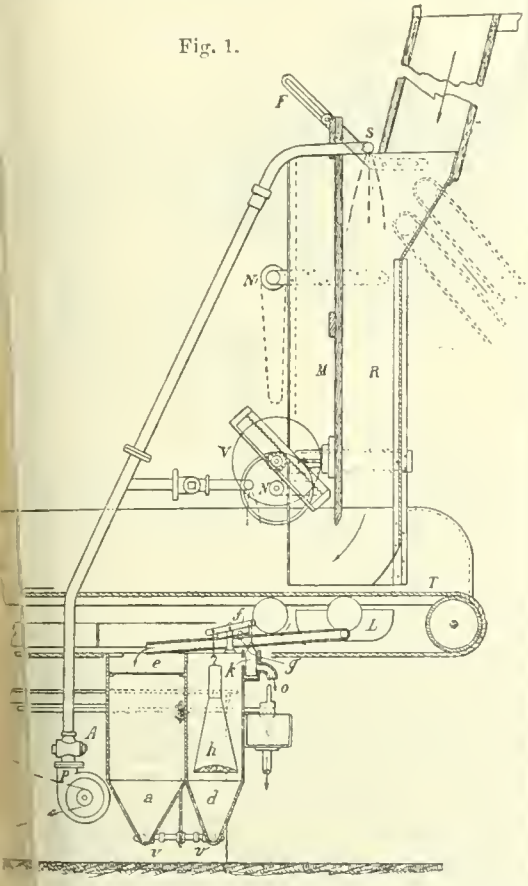
—G. T. M.

French Patents.

ol; Apparatus for Scouring and otherwise Treating——. G. Malard. Fr. Pat. 317,255, Dec. 31, 1901.

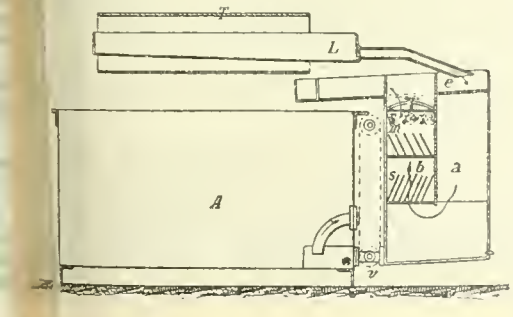
LAYER of wool of uniform height and width is automatically supplied to a continuous scouring machine by feeding

Fig. 1.



the ool through a vertical column on to an endless ra ing apron T (see Fig. 1 and also Fig. 2), which ar the wool through the first washing or scouring

Fig. 2.



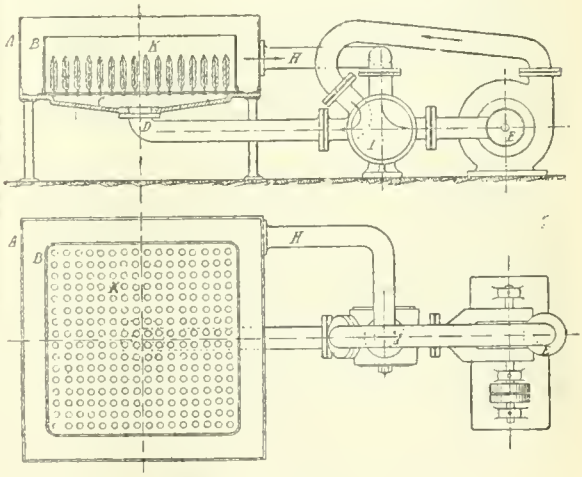
tank, A, of the machine. The height of the layer is varied, according to the nature and condition of the wool which is to be treated, by adjusting one or both of the movable panels, M, R, in the column. A preliminary wash or scour is also given to the wool while it is in the column by pumping the washing or scouring liquor from the tank through the pipe S upon it, the liquor flowing into the receptacle L, and thence through a series of filtering cones *a*, *b*, *c*, *d* and a side conduit back into the tank. The dirt and heavy insoluble matters collect at the bottom of the cones, and are drawn off from time to time through the valves *v* into the tank A. When the liquor becomes sufficiently concentrated, the cone-valve *h* in the chamber *d* rises and causes a gate, K, to descend and close the conduit. The liquor thereupon rises in this, and overflows into a channel *c*, whence it is taken to evaporating and calcining apparatus. The ash obtained in this manner is freer from insoluble matter than has hitherto been the case.—E. B.

Mercerising Tissues; Apparatus for——. P. Kahn. Fr. Pat. 316,963, Dec. 16, 1901.

Saturation of the tissue with the caustic soda-lye is accomplished upon a stentering machine, the tissue being taken in a stretched state through a tank filled with the lye. The excess of the latter is removed by passing the tissue between two or more sectional squeezing roller systems, which are so constructed that the roller segments of which they are composed are laterally adjustable, along with the rails upon which the stentering chains travel. It is advantageous to place the segments of one pair of squeezing rollers opposite the spaces intervening between the segments of another pair, so that the portions of the tissue which escape squeezing by the first shall be acted upon by the second pair. After leaving the squeezing rollers the tissue passes hot and cold water spray-pipes, the lye recovered from the tissue being collected in a trough.—E. B.

Dyeing Machine. E. Rolland. Fr. Pat. 316,512, Dec. 3, 1901.

Textile materials in an unmanufactured, or more or less completely manufactured condition, are put into a perforated vessel B (see figure), inside a second vessel A, where they are treated with dye-liquor, which is circulated through



them in opposite directions alternately, the reversal of the direction of its flow being effected by means of a four-way tap I, placed on the pipes, through which it is forced and drawn by a rotary pump E. When yarns are dyed in the form of cops, these are placed upon perforated tubes K in a plate C.—E. B.

Printing Machine [for Carpets and Linoleums]. W. P. Wrightson. Fr. Pat. 316,152, Nov. 22, 1901.

To facilitate access to the printing-rollers, to reduce the weight of the apparatus, and to enable at the same time a greater length of the material which is being printed, to be

placed upon the impression cylinder, the apparatus is suspended at a convenient height from the ground, the framework is constructed of steel, and a large impression cylinder is used, around which the material to be printed is passed. If desired, a side motion may be given to the apparatus by attaching wheels to the supporting framework in such a way that they do not interfere with the free operation of the apparatus, and running these upon overhead rails. With this arrangement, a roll of carpeting may be printed, and while it is being dried, the apparatus may be moved to one side and a second roll printed. The apparatus may then be moved back to its original position, and another roll, which in the meantime has been prepared, may be printed without any loss of time.—E. B.

Half Silk (Mixed Cotton and Silk), Tissues dyed in the Piece; Method of Producing Lustrous ——. Müller. Fr. Pat. 315,642, Nov. 5, 1901.

Raw silk yarns, after being submitted to the operation of weighting, are woven with undyed or dyed cotton yarns. The tissues thus produced are then dyed. It is stated that the silk in the tissues thus obtained is as supple and lustrous as when the tissues are woven with dyed silk yarns, and that they are manufactured in this manner at less expense than by the latter method.—E. B.

Steaming Tissues [*Woollen Slubbing Printed by the Vigoureux Machine*]; *Apparatus for* ——. Peltzer and Son. Fr. Pat. 317,366, Dec. 28, 1901.

An apparatus designed more especially for steaming wool in the form of slubbing, but applicable also to the steaming of woollen tissues and other materials. It consists of two cones placed vertically one inside the other, and surmounted by a revolving feeding apparatus, which delivers the hands of wool in coils into the apparatus directly from the printing machine. The inner cone is perforated, and is surrounded by a coiled pipe for the admission of steam, a perforated pipe in the centre of the apparatus serving to effect the removal of this after it has passed through the wool.—E. B.

United States Patents.

Yarn and Textile Fabric; Metallic ——. L. Harmel, Boulzicourt, France. U.S. Pat. 700,915, May 27, 1902.

A fabric adapted to produce a voltaic action by contact with the human body is formed of threads of textile material twisted with an electropositive metal, such as aluminium, and similar threads twisted with an electro-negative material, preferably copper, whilst pure textile threads are employed to isolate the electropositive material from the electro-negative.—G. H. R.

Dyeing [*Cotton Sliver*]; *Apparatus for* ——. D. Mattei, Genoa, Italy. U.S. Pat. 705,856, July 29, 1902.

Cotton sliver is conveyed in a continuous manner, between two endless belts, the lower one of which is perforated, through a series of scouring and dyeing, &c. baths. Before entering the first bath the sliver is passed upon the lower of the two belts, between two boxes from which, through jet openings, steam and water are directed upon it, to expel the air and thoroughly moisten it. On leaving each of the baths, it is allowed to fall upon an endless carrier passing through a chamber in which it is heated and drained. It is finally received upon a winding apparatus.—E. B.

Dyeing Machine. W. H. Fletcher, Paterson, N.J., U.S.A. U.S. Pat. 706,171, Aug. 5, 1902.

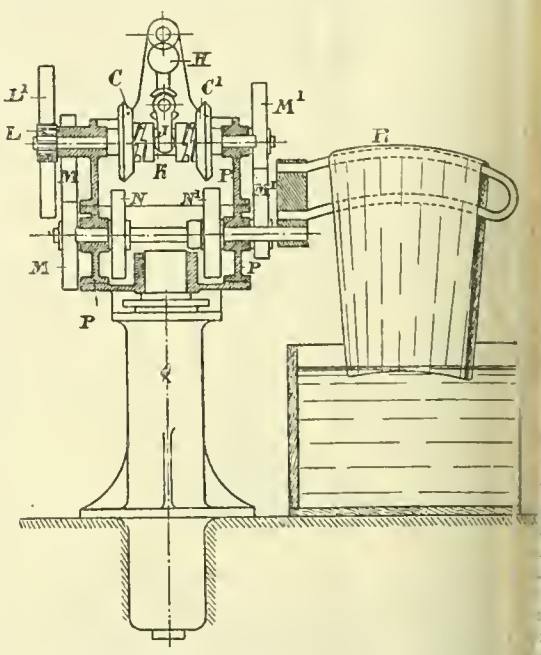
An apparatus designed for use in dyeing tissues. An elliptical reel delivers the latter, in full width, in folds upon an endless travelling apron, composed of staves, carried by chains. The tissues are carried in this manner downwards into a dyebath, horizontally through this, and then upwards out of it at the end opposite to that at which they entered. They are then taken from the apron and drawn over a number of rollers, back to the reel, which serves either to feed the apparatus with undyed or partially dyed tissues, or to plait the tissues down in trucks for their removal from it when they are sufficiently dyed.—E. B.

Dyeing, &c.; Apparatus for ——. E. Hindley, S. Walker and M. Rose, Stockport. U.S. Pat. 706,657, Aug. 12, 1902.

See Eng. Pats. 6666 and 26,115 of 1901; this Journal, 1902, 473 and 613.—E. B.

Dyeing, &c. [*Yarns*]; *Apparatus for* ——. C. Corro, Lyons, France. U.S. Pat. 706,801, Aug. 12, 1902.

An electromotor drives, through speed-reducing gearing, the mitre wheels C, C′ (see figure), by means of which the direction of rotation of the hank-carriers R is reversed. The wheels C, C′ are automatically actuated by means of a counterpoise H, which is moved by a tappet operated by suitable mechanism, the movement of the counterpoise causing a clutch K to move to opposite sides alternately



and thus to engage with each of the wheels in turn. The motion imparted to the latter is transmitted through the gearing L, L′ to double elliptic or eccentric gear-wheels M and M′, and from these to a series of circular gear-wheels N, keyed upon the spindles of the eccentric hank-carriers R. These are made curved, namely, convex, concave or undulated, in order better to displace and separate the threads of yarn during the dyeing, &c. operations. The whole apparatus is mounted upon a frame P, supported upon a hydraulic piston contained in a cylinder Q, to the end that it may be readily raised and lowered.

The object of this arrangement is to impart to the ma. R which carry the hanks of yarn to be dyed, successively varying speeds, instead of a uniform speed of motion a each rotation of the eccentric carriers, so as to obtain ; the period of greatest speed, *i.e.* when the hanks are ing raised from the dyebath, a "whip stroke"-like m ion which, it is declared, is indispensable for producing a pid absorption of the dyestuff by the yarn.—E. B.

Silk Fibre; Intensifying the Lustre of ——. C. Hart, Paterson, N.J., U.S.A. U.S. Pat. 705,715, July 29, 1902.

Skeins of silk yarn are hydro-extracted after dyeing and are placed in the damp state upon rods or other supports, and stretched, while they are subjected to a temperature of about 120° F., until they are completely dry. Shrinkage during drying is thus prevented, and a lustre obtained which, it is said, is more brilliant and permanent than that produced in the usual way.—E. B.

ustreing Silk; Machine for ——. C. Stuart, Paterson, N.J., U.S.A. U.S. Pat. 705,716, July 29, 1902.

COMBINATION of a frame with a series of horizontal rods itably connected and depending from said frame. The ls are adapted to hold skeins of wet silk stretched tween each pair, and flexible means are provided, con-cted to the lower portion of the frame and to the lowest l of each series, for stretching the wet skeins and for eventing the contraction of the same whilst drying (see eceding abstract).—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

mber; Dyeing of ——; Improvements in and relating to the ——. M. Grünhut, Vienna. Eng. Pat. 13,118, June 9, 1902.

MBER, in logs, is uniformly dyed by forcing the dyeing ution into the wood by means of a pressure chamber, ed to one end of the log, the liquor being extracted by uction chamber placed at the opposite extremity.

Uniformity in dyeing is ensured, firstly, by subjecting log to a preliminary treatment with soda-lye under ssure; and, secondly, by dissolving the dyestuffs in itious of alum, lactic acid, or lignorosin (the sodium of lignosulphonic acid).

he log may be caused to exhibit several colours in cross ion by covering the ends with stencilled plates during t dyeing operation, different stencils being employed for t various dyestuffs.—G. T. M.

United States Patent.

iographic Printing Plates; Process of Preparing ——. . C. Strecker, Darmstadt, Germany. U.S. Pat. 703,096, ne 24, 1902.

T well-ground plates, which are provided with a litho-g hic design or transfer, are exposed to the treatment of a lution which acts with, and is acted on by the metal o , which is composed from a salt or salts, the acids of w h form insoluble compounds with the metal applied, a in oxidising means, preferably nitrate of ammonium a in acid substance, which does not decompose the salts of he solution or set an acid free, thereby forming an in ble hygroscopic layer firmly adherent to the plate of m l or alloy.—G. H. R.

VII.—ACIDS, ALKALIS, AND SALTS.

Ali, &c., Works; Thirty-Eighth Annual Report on ——, by the Chief Inspector, Feb. 25, 1902.

T E has been depression in most of the industries o ed by the present report, during 1901, as shown by a re ion of two alkali and of 16 scheduled works, besides tha f two of the latter in Scotland. The escape of acid gas has, in most cases, been slightly less than in the pre-ed year, and it has not been found necessary to institute any prosecutions.

A Amending Bill was introduced in the House of Lords, the objects of which were:—"(1) to state, without the ssibility of doubt, what were the gases in which the am t of the acid gases of sulphur and nitrogen was to be ertained, and where the limit of acidity was to be fix ; and (2) to define equally explicitly, in regard to H drochloric acid and acid gases of sulphur and nitrogen, the provisos protecting the manufacturer from undue ass e by the inspector under the 'best practicable mea ' clause." Amendments, however, to increase the eff ncy of the Bill being proposed, after a second read in the House of Commons, by a private member, it could not be proceeded with by the House in Com-mit tee and was consequently withdrawn. A considerable opinion of the trade gave a hearty reception to the Amending Bill, in Scotland as well as in England. The bearings of the proposed measure on the industries concerned are very fully elucidated by the inspector. Taking, for instance, the Hargreaves process of salt-cake manufacture, in which the space available for chemical reaction is only one-twentieth of that in the lead-chamber process, the restriction of limit of escape should not be the same for the two processes. Hence it was proposed to make the use of the "best practicable means" clause the criterion to govern the industry. Again, the "limit" clauses should not apply to the new catalytic processes for the manufacture of sulphuric acid, beginning to get a foothold in the United Kingdom, with the capabilities and peculiarities of which we are as yet imperfectly acquainted. With time and experience, such limits of escape as may reasonably be demanded for such works will become known.

The demand for bleaching powder has been much curtailed during the year, necessitating stoppage of plant in several works. The Electrolytic Alkali Company, working the Hargreaves-Bird patents on a considerable scale, has adopted a special method of chamber draughting, reducing the time needed for removal of the residual chlorine before the doors are taken down for packing.

Only one sulphuric acid works in England has, as yet, carried out the catalytic process; but a plant, operating with other patents than those of the Badische Anilin und Soda Fabrik, has been started in Scotland. The same white acid fume in the escaping gases, familiar in the chamber process, occurs also in the new process, and has led to complaint; but the inspector is sanguine that this difficulty will ultimately be overcome. Researches made on the Continent show that, with platinum as contact substance, "while a rise of temperature from 400° to 500° C. decreases the yield of SO_3 from a figure which is almost quantitative to one of 85—90 per cent., and at 530° C. to 75—80 per cent. from the SO_2 employed, yet at 500° the velocity of reaction is almost 20 times that at 400°, and at higher temperatures it increases still more." From these facts it follows, that to obtain at once high reaction velocity with high percentage yield, a plurality of contact apparatus must be employed in one working process. Iron oxide as catalytic substance requires, for efficient conversion, a temperature closely approaching the dissociation point of SO_3. The demand in this country for acid of high strength being limited, it is not anticipated that the interesting catalytic process will have any rapid extension. In works where spent oxide is burnt as a source of sulphur for sulphuric acid manufacture, burners of the old type are stated to be objectionable, owing to local escape of fumes from their fronts; for the burnt oxide contains free sulphur, and if drawn hot from the front of the burners sulphurous acid is emitted. But in the new burners, which have been introduced at two works, the burnt oxide is pushed out to fall from the back into hoppers, having damper arrangements from which it may be drawn when cool. The extended return flues of the modern burners are also advantageous.

In respect to sulphuric acid concentration, the Kessler process receives continued extension; but although it is economical as to the quantity of fuel consumed, that fuel must be coke of very high quality, a necessity which in some localities is against its introduction. The acidity of the escaping gases is reduced to a minimum by the use of a specially devised hot scrubber. As to the system of concentration by surface-heat and hand-fired pans, it is described as being crude and unscientific; and, in the Widnes and Runcorn district, the average acid escape from such pans is more than double that in the Kessler process. A concentrating process of American origin has been adopted at a newly registered works. The rectifying vessels are of cast-iron, air being excluded above the liquid acid, and the process is continuous. It is claimed that very little sulphurous acid is formed by the action of the iron, and that the escaping gases, small in volume, are free from the acid in the vesicular condition, in which it is so difficult of condensation. In the same district, some alkali works' chimneys have the acidity of their gases increased by the acid steam from sulphuric acid concentration pans, and especially in the hot months some difficulty was experienced in keeping the escape within the permitted limits. An instance is given in which, to meet the "grainage" limit of HCl, air was admitted

at the bottom of the chimney, thus diluting the gases; an expedient stated to be "in no way precluded by the statute," "if no better means can be shown to be available."

Alkali waste works and dealings with sulphuretted hydrogen have received much attention. In the Chance-Claus process, the inspector states that no successful method of utilising the residual gases from the "flowers" chamber has as yet found a place in any works; and, as a consequence of experiments made in his laboratory, and already tested on a manufacturing scale, he suggests the use of Weldon mud as contact substance in the kiln, placed as a layer, some inches thick, on the top of the filling of iron ore usually provided. It is observed that manganese oxide is active at a lower temperature than ferric oxide in effecting the reaction $H_2S + O = H_2O + S$, and at that lower temperature there is less liability to the counter reaction. It is stated that the smoke from the Claus kiln of the alkali waste works has still a much greater acidity than that from any other process carried on in registered works. It is remarked, however, in regard to the "nuisance-creating power" of the Chance-Claus process, that the acidity of the escaping gases is chiefly, if not wholly, due to sulphurous acid, in which the vesicular condition common where sulphuric acid is emitted, being absent, quicker diffusion takes place. In Widnes, the presence of H_2S is still very perceptible in the atmosphere and in the streets, due to the drainage from many millions of tons of alkali waste investing the town; but great as the nuisance is, it is much less than it was formerly. From elaborate experiments made with a jacketed Claus kiln at Granton, N.B., by Mr. Linder, on the oxidation of H_2S, the conclusions are drawn, (1), "That the temperature of the contact material in the kiln, within the limits of efficient reaction, is determined by the energy of chemical reaction, rather than by the temperature of the furnace gases circulating in the surrounding jacket." (2), "That the efficiency of the kiln —as measured by the amount of H_2S oxidised, per cent. of the total entering—is, within the same limits, determined by the temperature of the contact material, rather than by the relative proportions of air and gas in the reacting mixture, or by its rate of flow through the kiln." Any increase in efficiency that might be looked for (*a*) from a large increase in the percentage of oxygen present in the reacting mixture, or (*b*) by prolongation of the time of passage of such mixture through the contact material, is far outweighed by the lowering of temperature induced in the latter by such alteration in the conditions of working.

Plant for the continuous distillation of gas liquor is now almost universally employed. Treatment of the foul saturator gases by iron oxide purification is most general. The use of automatic hydraulic valves for purifier regulation is insisted upon as a condition of fitness of any factory for registration. A large residuals factory has been started at Granton, where opportunity has been afforded for a careful study of the reactions on a large scale of working, of the jacketed Claus kiln, dealing with saturator gases, the results being tabulated. When the jacket of the kiln received the fuel gases leaving two steam boilers, the percentage decomposition of H_2S was at its best. The gases leaving the kiln pass to the "flowers" chamber, and thence to a limestone tower for absorption of sulphurous acid, and lastly to a combustion furnace to destroy residual H_2S. The reactions between sulphurous acid gas and calcium hydrate and carbonate in "convertor liquor," under varying conditions as to rate of flow of gases, time, temperature, &c., in forming differing proportions of bisulphite, sulphite, and sulphate, have been experimented upon, and the results are set forth in a table, the most striking feature in which is the relatively large amount of bisulphite formed in presence of calcium carbonate, at temperatures ranging from 52° to 66° C. The largest proportion of sulphate was formed at 15° C., when a doubled dose of calcium hydrate was present.

Experiments have been made on the reaction between ferrous thiosulphate and H_2S in aqueous solution, in stoppered bottles, leading to interesting and unexpected results, and having bearings on Hemingway's sulphite of iron process for removal of H_2S from the foul gases evolved in the manufacture of ammonium sulphate from gas liquor. The reaction that took place, instead of yielding ferrous sulphide and sulphur, according to the equation—

$$FeS_2O_3 + 3H_2S = FeS + 4S + 3H_2O,$$

as might have been anticipated, gave the bisulphide and sulphur, as shown by $FeS_2O_3 + 3H_2S = FeS_2 + 3S + 3H_2O$. The same reaction, in degree, takes place when less than three molecules are present to one molecule of the ferrous thiosulphate. The results of the experiments made under varying conditions are tabulated.

The amount of sulphate of ammonia produced in the United Kingdom is shown in the following table:—

	1901.	1900.	1899.
	Tons.	Tons.	Tons
Gas works	142,703	142,419	133,763
Iron works	16,353	16,939	17,963
Shale works	40,011	37,267	38,780
Coke oven works	12,255	10,393	7,814
Producer gas and carbonising works (bone and coal).	5,891	6,688	7,361
	217,213	213,726	205,721

Apart from Scotland, the ammonia production of gas works in England, Ireland, and Wales, reckoned as sulphate, is less by 100 tons than in 1900. The exports of sulphate of ammonia were 150,000 tons for 1901, with a home consumption of 68,000 tons; the corresponding figures for 1900 being 145,000 and 65,000 tons respectively. The depressed condition of the iron industry has prevented the anticipated increase from coke-oven recovery works being attained, notwithstanding that progress has been made in the conduct of the operations. "Increase in the recovery of ammonia from producer gas may be looked for with confidence in the early future, as in various parts of the country, and notably in North Staffordshire, the company formed to promote the erection of Mond producer gas plants has contracted to erect large installations with ammonia recovery." In a steel works, using coke ovens of the Semet-Solvay type, improvements have been effected in details of working giving considerable advantages. The washed fine coal, before being placed in the oven, is moulded into cakes, in a compressor worked from coke-oven gas through a Crossley-Otto gas engine with dynamo, which also supplies energy for general work. One-fourth more coal is got into the charge, with an ultimate gain of 10 per cent. in produce, and the time of charging is shortened. A needle bath, that can be moved from oven to oven is adapted for quenching the cake of incandescent coke, the use of which contributes to the brightness of the coke obtained. The oven flues are coupled up to a fan, controlling the draught, which renders the time of carbonising more regular.

In regard to dealing with the purification in the wet way of foul gases from the worm-ends of tar stills, and the vapours from melted pitch, the inspector directs attention to the paper by Craven and Coleman (this Journal, 01, 200), in which it was shown that 1 cwt. of lime and 1 cwt. of ferrous sulphate in from 200 to 300 galls. of water had purified the gases from the distillation of 300 tons of tar.

In chemical manure works, an additional process has been introduced, namely, the drying of the freshly made superphosphate after discharge from the den, involving the emission of some acid vapour, though not to such an extent as to call for additional condensing plant. J. Affleck has contributed to the report a paper "On the Composition of the Gases evolved in the Manufacture of Superphosphate Manures, and a more accurate Method of determining both SO_3 equivalents," in which it is shown that the ordinary methods of acidimetric analysis, as applied to chamber smoke and the residual gases from sulphuric acid chambers fail to give reliable results in the presence of fluorine compounds, such as occur in the case considered, and to find (as silicon fluoride) nearly all the acidity in the escaping gases is due. As silicon fluoride in presence of water forms silicofluoric acid, and since, if the water be alone fluorides are formed, hydrofluoric acid is made the sis of

comparison with SO_3, and not silicofluoric acid, which latter would give a very different comparative result. Pure water is used to absorb the acid constituent in the gases, and the portion taken for the test, after addition of H_2O_2, receives one drop of methyl orange and a few drops of phenolphthalein, and is titrated with caustic soda solution, partially while cold, and finally after heating. With phenolphthalein as indicator, the end point of the decomposition is sharp and distinct. It is noted that the decomposition of silicofluoride to fluoride by means of caustic soda is reversible on acidifying, and the change one way or the other may take place any number of times, according as the solution is made acid or alkaline. One result of Affleck's investigation is to show that the use of steam to promote condensation of fluoric gases is "worse than useless." The following table shows the amounts imported:—

——	1901.	1900.	1899.
	Tons.	Tons.	Tons.
Guano	13,000	30,000	27,000
Mineral phosphates	354,910	353,400	420,000
Nitrate of soda	107,600	135,000	136,000

In salt works, the principle of vacuum evaporation has not yet passed the experimental stage, the drawback being the liability to deposits of gypsum on the tubes of the apparatus; and it remains to be proved whether prior purification of the brine will give better commercial results.

Operations at copper works have been less active than usual, but steady improvement is remarked in the chimney gases, these containing less HCl. At a copper works in the South Midland (No. 5) District a large reduction in acidity in the chimney smoke has been effected by mixing more "green ore" with the furnace charges, "instead of employing the small special furnace for roasting pyrites to supply the necessary amount of sulphurous acid to mix with the furnace gases to prevent chlorine being in excess, which gas would pass through the condensers to the chimney, where, on mixing with the sulphurous acid in the smoke, hydrochloric acid is produced."

An experimental plant has been started at Neath for working H. K. Picard's process for treating complex zinc ores (Eng. Pat. 22,570, 1900; this Journal, 1902, 124). Another experimental plant has been worked at Barry, near Cardiff, in which the calcined ore is smelted in J. Armstrong's patent furnace (Eng. Pat. 3462, 1900; this Journal, 1901, 367). The Phœnix Process Trust are described as about to work, at Runcorn, Asheroft and Swinburne's process (Eng. Pat. 14,278, 1899; this Journal, 1902, 349).

Owing to the reduced value of white arsenic, the works engaged in its production have suffered severely, it being no longer profitable in some cases to extract the metal from the ores, and a large number of workers are correspondingly affected. This is especially the case at the Devon Great Consols mine, where mining operations have been suspended. At an arsenic work in District No. 6, a condensing flue of a novel description has been erected, containing rows of iron rods suspended with intervals of an inch or so, whereby 70 per cent. of the arsenious acid passing through the tower was removed. It is suggested that, could the rods be kept in vibration, still better results might be attained.

The cement industry is depressed, foreign competition being keen; but "American perseverance and industry" have effected developments in works on the Thames and Medway, in the direction of the production of cement clinker from the slurry by continuous rotating kilns. The escape from the chimneys is described as being only a "thin white vapour," different from ordinary cement fume, when the coal and air supply are duly adjusted, adequate means for which are provided.

In Venetian Red works, considerable difficulties are experienced in securing condensation of the acid gases evolved with the saggar kilns; but hopes are entertained that the desired shades of colour may ultimately be obtained in the closed furnace. A factory is mentioned, in which towers packed with scrap iron are used to arrest the deleterious gases, recovering as much as 35 per cent. of the copperas roasted by the action of the sulphur acids on the iron.

In reference to the future of electro-chemistry, the inspector quotes largely from Mr. Swan's Presidential Address to the Society of Chemical Industry (this Journal, 1901, 662), including the interesting table showing the "Total Power available in 50 works in Europe for Electro-chemical and Electro-metallurgical Industries." Some destructive fires have occurred in tar works, in one case attended with loss of life. The report contains 152 pages, of which 12 are devoted to Scotland.—E. S.

Sulphuric Acid Manufacture; Observations on the Contact Process of ——. G. Keppeler. Zeits. angew. Chem., 1902, **15**, [32], 809—811.

A PRELIMINARY communication of theoretical considerations, to be followed by the results of the author's experimental investigations. The reaction $2SO_2 + O_2 = 2SO_3$ proceeds extremely slowly, and the duty of a contact-substance is to quicken it, by means of intermediate reactions, which go on with greater rapidity. All such substances must be capable of existing in two conditions of oxidation, and must fulfil besides the condition that, at the same temperature at which the higher oxide is reduced by sulphur dioxide, the reduced substance must be capable of rapidly becoming oxidised by the aid of atmospheric oxygen. In some cases, as for instance with oxide of iron, there is the possibility of the formation of sulphate to be considered. Here the mechanism of dissociation comes in. If the formation of SO_3 takes place at a temperature at which iron sulphate is undissociated, sulphate will be formed until the whole of the oxide is converted into sulphate, and the contact action will cease. But if the temperature be raised above that at which dissociation of the sulphate begins, then to any given temperature there will correspond a maximum SO_3-pressure of dissociation, just as to any given temperature there corresponds a maximum vapour-pressure of water; and if the dilution of the entering SO_2 be so great that the pressure of the SO_3 formed cannot rise above this maximum, reaction will go on continuously, even though the iron oxide be partially converted into sulphate (or the sulphate be not completely dissociated). Thus if burner gases contain 8 per cent. of SO_2 (and thus can yield 8 per cent. of SO_3 by volume), reaction will proceed at any temperature above that at which the maximum pressure of dissociation of iron sulphate is 8/100 of an atmosphere—temperatures far below that at which it is completely dissociated. The temperature limits for the reaction of a given contact-substance which the above described conditions determine, are of course further restricted by the possible dissociation of the sulphuric anhydride formed, which Knietsch has shown to occur to an extent injurious to the process at temperatures above 500° C.

Platinum possesses in the highest degree the qualities necessary in a contact-substance. It is highly probable, especially from the results of Engler and Wöhler (Zeits. anorg. Chem., **29**, 1) that platinum acts by successive oxidation and reduction, and these reactions occur with enormous velocity at temperatures below 450° C. Moreover, platinum possesses the advantage of not being attacked by the sulphuric anhydride formed. The high reaction-velocity might be thought a disadvantage, as the resulting rise of temperature is so great; but dilution of the reacting gases and appropriate cooling have completely overcome this. The Mannheim works use ferric oxide, the reduction of which, and the oxidation of the lower oxide, occur readily at comparatively low temperatures; but the formation of ferric sulphate is here to be feared. The author's experiments have shown that the dissociation-pressure of ferric sulphate is imperceptible at 400° C., but very considerable at 500° C. The process must be worked below 500° C., but that is rendered quite practicable by the dilution of the burner-gases, which under the patent contain only 2—3 per cent. of sulphur dioxide, and hence will react at temperatures at which the dissociation-pressure of ferric sulphate is very low. The great excess of oxygen in the

gases, too, tends to prevent the dissociation of the sulphuric anhydride formed should the temperature rise, whilst the enormous mass over which the heat of reaction is spread tends to lessen the consequent rise of temperature. Theoretically, the conditions in this process are very favourable; technically, the construction and working of plant to deal with such huge volumes of gases constitute, perhaps, a disadvantage. Lead peroxide readily absorbs sulphur dioxide to form sulphate, but the great stability of this sulphate forms an effectual bar to the employment of lead peroxide as a contact-substance. Some of the oxides of the rare earth metals, as cerium and thorium, also possess some of the characteristics needed for a contact-substance, but, in those the author has examined, either the stability of the sulphate has been too great, or the velocity of oxidation much too low, for use.—J. T. D.

Nitric Acid from Atmospheric Nitrogen. Electrician, 1902, [1265], 684.

A DESCRIPTION of Bradley and Lovejoy's process of electrical fixation of atmospheric nitrogen in operation at Niagara Falls. In order to obtain the maximum chemical union of nitrogen and oxygen, it was found best to use a voltage of about 10,000, and allow it to jump electrostatically through the air a short distance, thereby forming the arc, and then to rapidly separate the contacts till the arc breaks. A large direct current series arc-machine was adapted for the purpose. The fields are separately excited, and the areas are connected in multiple with the terminals of the machine. In each arc circuit is placed an induction coil, which is carefully adjusted to obtain the best results. This prevents the arc forming a short circuit on the machine, and, as the motion of the arc drawing contact is exceedingly rapid, the load of an arc drawn in this way is very light. The machine is capable of operating a Bradley-Lovejoy device making 414,000 arcs per minute. The device itself consists of a metal box provided with openings to admit the air and containing rows of insulated fixed contacts. To each contact is connected a wire passing first to an induction coil and thence to the positive pole of the dynamo. The negative pole is a revolving cylinder provided with projections which come very near but do not touch the fixed contacts in the surrounding box. The cylinder makes 500 revolutions per minute and there are six sets of contacts in line with the fixed contact on the wall of the cylinder; each fixed contact, therefore, provides 3,000 arcs per minute. In the apparatus there are 138 contacts, six rows of 23 each. The air is driven through the apparatus at the rate of about 5 cb. ft. per arc contact per hour. It emerges laden with $2\frac{1}{2}$ per cent. of oxides of nitrogen, and these by simply leading through condensing towers form nitric and nitrous acids; the nitrous acid is also ultimately converted into nitric acid. It is claimed that the acid produced by the process is chemically pure, and that the cost of production will control the market.

—A. S.

Cuprous Oxide; The Yellow ——. M. Gröger. Chem.-Zeit., 1902, **26**, [64], Rep. 197.

THE yellow precipitate obtained by the action of caustic soda on cuprous chloride, is generally regarded as a true hydroxide of the formula $4Cu_2O.H_2O$. The author has obtained the compound as a brownish orange-yellow powder, which is colloidal in character, and is to be regarded, not as cuprous hydroxide, but as cuprous oxide containing water. It is unaltered in dry air, but oxidises when moist, although not readily. The red crystalline cuprous oxide, precipitated from Fehling's solution, by the simultaneous action of caustic soda and air also passes into the brownish-black cupric hydroxide, though more slowly than does the yellow amorphous oxide.—A. C. W.

Periodates; Preparation of ——. F. Roques and A. Gerngross. J. Pharm. Chim., 1902, **16**, [3], 120—121.

THE alkali iodides are transformed into periodates by the action of excess of sodium hypochlorite, after apparently passing through the intermediate stages of hypoiodite and iodate. This reaction affords the following simple method: A very large excess of sodium hypochlorite is added to a solution of 50 grms. of potassium iodide and 20 grms. of caustic soda. On heating the mixture on the water-bath, a large deposit of crystallised sodium paraperiodate, $Na_2H_3IO_6$, is formed. The yield is almost the theoretical.

—A. C. W.

English Patents.

Anhydrous Sulphuric Acid; Apparatus for Making ——. C. Daub, Antwerp, and J. C. Deuther, Detroit, U.S.A. Eng. Pat. 9536, April 24, 1902.

THE apparatus consists of a vertical column, into the top of which a mixture of sulphur dioxide and oxygen enters, and after traversing a series of reaction chambers, alternating with heating chambers, has outlet at the bottom. The reaction chambers contain several relatively small, perforated metallic boxes, containing the contact material, so disposed as to avoid overheating. The contact chambers are connected by pipes traversing the heating chambers, and are provided with means for circulating a heating or cooling medium. The heating chambers are in communication with a main vertical pipe leading gases from the heater.

—E. S.

Hydrochloric Acid; Manufacture of ——. A. M. Clark, London. From The General Chemical Co., New York. Eng. Pat. 9875, July 24, 1902. (Compare U.S. Pats. 698,704, 1902, and 702,877, 1902; this Journal, 1902, 971 and 772 respectively.)

SODIUM PYROSULPHATE, two equivalents, and sodium chloride and water, one equivalent each, are caused to react at a temperature below redness, in a retort so set that the temperature may gradually increase from one end to the other, thus causing the gas liberated to pass over the nearly finished salt cake resulting from the reaction, together with the HCl. Alternatively, a mixture of sodium chloride and sulphuric acid may be similarly heated in the presence of water or steam, to obtain HCl and salt cake.—E. S.

French Patent.

Saline Solutions; Apparatus for the Complete Crystallisation of Sugar and ——. A. Grantzdorfer. Fr. Pat. 127,493, June 22, 1901.

See under XVI., *page* 1147.

United States Patents.

Gas [CO_2]; Apparatus for Producing ——. T. H. Müller, New York. U.S. Pat. 702,580, June 17, 1902.

"CRUSHED rock" is supplied to the upper end of a vertical retort, situated within a furnace, and is discharged at the lower end into a closed chamber, from which the carbon dioxide gas produced is drawn off by an exhauster through an atmospheric cooler. A coiled steam-pipe surrounds the retort within the furnace, and the superheated steam is passed into the retort to prevent the fusion of the mineral. By means of a branch pipe from the exhauster, part of the gas produced is supplied both to the charging and discharging ends of the retort, the internal pressure thus maintained preventing access of air, which would cause difficulties in the subsequent liquefaction of the gas.

—H. I.

Carbonic Acid or other Gas; Apparatus for Making ——. Van V. W. Riesberg, Philadelphia, Pennsylvania. U.S. Pat. 704,272, July 8, 1902.

THE apparatus comprises a fixed tank with conical bottom, receiving the calcium carbonate, or the like, to be decomposed, with which tank a removable gasometer dome is adapted to telescope. A rotatable hollow shaft traverses the dome, and extending into the tank, carries agitating vanes, and is fitted internally with a pipe of incorrodible material, connected at the top to a reservoir for acid, and terminating below in a siphon-formed continuation, located without the shaft, whereby the acid is delivered on to the top of the calcium carbonate or other material. Reference

is made to an application, of which the present is a division, bearing the Serial No. 68,726, of July 18, 1901. —E. S.

Sulphides; Process of Treating Metallic ——. A. Germot, Asnières, and H. E. L. Fiévet, Paris. U.S. Pat. 697,138, April 8, 1902.

See Eng. Pat. 2407, 1901; this Journal, 1902, 176.—E. S.

Alumina; Process of Manufacturing ——. C. M. Hall, Niagara Falls, U.S.A. U.S. Pat. 706,553, Aug. 12, 1902.

See Eng. Pat. 2260, 1902; this Journal, 1902, 549.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Pottery]; *Old Egyptian Ware of Unusual Composition.* Berthelot. Sprechsaal, **35**, [31], 1177—1178.

A HEMISPHERICAL basin, 16 cm. in diameter, 6 cm. deep, and 4—5 mm. thick, was recently discovered at Abou-Roach, in the pyramid of King Didufri, and consisted of a dense, greyish shaly and foliaceous mass, which split up into several thick layers in the bottom, and easily reduced to powder. Examination with a low power showed the presence of white masses embedded at intervals between the grey strata. No trace of free metallic particles could be detected, though, from its external appearance, the basin was at first believed to be silver. Quantitative analysis gave the following composition:—Lead chloride, 20·370; lead oxide, 9·745; soda, 1·25; lime, 0·77; calcium carbonate, 8·975; water, 1·20; silica, 57·485; alumina, —.

The local conditions seeming to preclude the influence of mine water, the large proportion of chlorides is attributed to the employment of common salt in the making, the mass having probably been compounded of salt, litharge, and sand. There being no traces of fusion, the mixture seems to have served the double purpose of a glaze (since worn away) and a cementing medium, the method of manufacture being presumably a kind of fritting process, different from those now practised. A notable feature is the entire absence of alumina or clay; so that the basin consists solely of glaze, without any "body" in the ordinary sense.—C. S.

English Patents.

Kilns for Burning Ceramic Articles; Tunnel ——. A. Dufort, Vierzon, France. Eng. Pat. 18,345, Sept. 13, 1901.

The movable floors of these kilns are formed of a series of trolleys, the platforms of which carry refractory linings of slightly less width and length than the platforms. To both sides of the platforms, and for their entire length, plates or angle-irons are fastened and form, with the refractory linings, lateral troughs, into which angle-irons, fastened along the whole length of the kiln, dip, and are sealed with loose sand. The trolleys are connected together by filling with sand troughs formed by the ends of the refractory linings and suitable transverse plates.—W. C. H.

Enamelling Metal Articles. H. Oschatz, Erfurt, Germany. Eng. Pat. 11,991, May 26, 1902.

A PROCESS of protecting the outside of nickel sheet iron articles, during the process of enamelling them internally, by the application either of a thick nickel plating or of an electrolytic deposit formed on the article, which is removed after the enamelling operation.—W. C. H.

United States Patent.

Glass Furnace; Electric ——. A. Voelker, Cologne, Germany. Assignor to Compagnie L'Industrie Verrières et Produits Derivés, Brussels. U.S. Pat. 706,283, Aug. 5, 1902.

See Eng. Pat. 23,903, 1900; this Journal, 1901, 476. See also Eng. Pats. 12,672-3, 1900; this Journal, 1900, 1112—1113.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Mortars; Influence of the Chemical Composition and Granular Condition of the Sand on the Resistance to Crushing of Ordinary ——. E. Manzella. Gaz. chim. ital., **32**, [1], 474—484. Chem. Centr., 1902, **2**, [4], 308.

The author has arrived at the following conclusions:—(1) In the case of ordinary mortar, 1:3, with sand of uniform size, fine and medium sand is preferable to the coarse, provided one is dealing with silica sand or sand containing a preponderating proportion of silica; with dolomitic sand, better results are obtained with the medium sand. (2) In all cases, mortars prepared with sand composed of grains of different sizes (natural sand) possess, under similar conditions, a greater power of resistance than those prepared with sand of uniform size (sifted sand). (3) Dolomitic sand allied with ordinary mortar shows a resistance about twice as great as that of other mortars with quartz and calcareous sand, provided one excepts mortars prepared with fine sand. This greater strength imparted to ordinary mortars by dolomitic sand is not to be attributed to chemical action, but, according to the author, is due to the porosity and capacity of the dolomitic sand for water.—A. S.

English Patents.

Artificial Stones, Pavings, Slabs, Cements, and Plasters; Red Aggregates for the Manufacture of ——, *applicable also to Brick-making, for Decorative Sanded Surfaces, and for use in Hour-glasses, Toys, and the like.* H. W. C. K. Dyson, London. Eng. Pat. 17,540, Sept. 2, 1901.

Sand is wetted with solutions of ferrous or ferric salts, or both, which are then decomposed so that each grain is coated with red oxide of iron, which it is stated will not rub or wash off, and is unaffected by lime, acids, alkalis, the weather, alcohol, &c. The decomposition is produced either by an alkali, alkali carbonate, hydrogen peroxide, or by the action of heat, as in the case of iron nitrate, acetate, &c. In all cases the sand is raised to a red heat to complete the formation of the coat of red oxide on the grains. —W. C. H.

Asphalt, Bitumen, Pitch, and other Substances; Boilers or Heating Apparatus for ——. A. J. Boult, London. From A. Baumann, Paris. Eng. Pat. 25,400, Dec. 12, 1901.

A STATIONARY or movable apparatus, for the treatment of asphalt, bitumen, pitch, and other similar materials, consisting of a boiler, a fire-grate, a shield of refractory material to protect the boiler from the action of the fire immediately above the fire-place, and a central stationary or rotatory return tube for the flame and heated gases, mixing blades therein, stationary scrapers for the central tube, and means for rotating the latter.—C. S.

United States Patents.

Asphalt; Preparing ——. A. Wolskel, Kew, Australia. U.S. Pat. 697,307, April 8, 1902.

See Eng. Pat. 386, 1902; this Journal, 1902, 317. —W. C. H.

Asphaltic Paving Mixture or Composition. W. S. Wilkinson, Baltimore; and C. H. Burchinal, Pittsburg, U.S.A. U.S. Pat. 705,803, July 29, 1902.

The body material is crushed rock or sand and a bituminous cement with a small proportion of comminuted copper, not exceeding 3 per cent. A conglomerate rock, bearing from a half to 1½ per cent. of native copper (known as "copper sands"), is preferably used in the composition.—E. S.

Building Material. M. W. Marsden, Philadelphia, Penn., U.S.A. U.S. Pat. 704,066, July 8, 1902.

Fibrous material, such as cardboard, asbestos, &c., is impregnated with a solution of silicate of soda and sulphate

of magnesium. The 12 claims cover various devices for building up sheets of the material into walls, ceilings, and the like, and the application of plaster to them.—W. C. H.

Artificial Stone. V. Conti, G. De Geofroy, and G. Le Gall Du Tertre, Paris. U.S. Pat. 705,650, July 29, 1902.

The artificial stone or cement is prepared by mixing aluminium sulphate and kieselguhr, 15 parts each; magnesia, 50 parts; magnesium chloride, 25 parts; magnesium sulphate, 75 parts; and inert material, such as asbestos, sand, or the like, sufficient to give the required density. Compare Eng. Pat. 9892, 1901; this Journal, 1902, 708. —E. S.

Kiln [Bricks]; Continuous ——. W. A. Butler and A. Kunze, San Francisco (Cal.). U.S. Pat. 703,533, July 1, 1902.

The kiln has a series of combustion chambers extending crosswise below the kiln floor, in which chambers liquid or powdered fuel is burned in suspension; these chambers also communicate with the kiln direct by means of openings in the kiln floor, combined with horizontal, longitudinal flues or pipes running below the said floor and between the longitudinal walls of the kiln, for connecting the combustion chambers and joining damper-controlled draught flues; in combination with controlled fuel pipes or flues leading to the top and outside of the kiln, and between the kiln walls, for the purpose of supplying fuel to the combustion chambers.—C. S.

Kiln [Bricks, &c.]; Continuous ——. F. E. Swift, Washington, Iowa. U.S. Pat. 703,848, July 1, 1902.

The kiln comprises a series of chambers, each of which has a furnace, a smoke-stack, and a flue fitted with a controlling damper and leading to the smoke-stack; combined with upper and lower passages between the chambers, the upper passages being controlled by dampers, and the lower passages provided with vertical passages through which a combustible element, such as coal, may be introduced in order to close the lower passages.—C. S.

Mortar Composition. E. K. Welch, Philadelphia, Penn., U.S.A. U.S. Pat. 706,138, Aug. 5, 1902.

The following ingredients are mechanically mixed in a dry state:—25 per cent. of ground unslaked lime, 60 per cent. of ground cinder, 10 per cent. of jute, and 5 per cent. of litharge. Water is added to form the mixture into a plastering composition.—W. C. H.

Cement; Hydraulic Fireproof ——. W. R. Knox, Newark, New Jersey. U.S. Pat. 706,760, Aug. 12, 1902.

A mixture of silica, 24 parts; alumina, 6½ parts; magnesia, 5 parts; lime, 60 parts; hydrochloric acid, 3 parts; and iron oxide, 1½ parts, by weight.—E. S.

X.—METALLURGY.

Iron; Calcium and Magnesium in ——. A. Ledebur. Chem.-Zeit., 1902, **26**, [64], Rep. 207.

Gay-Lussac and Thénard unsuccessfully endeavoured to make iron containing calcium. Gray has now regularly found calcium and magnesium in a silicon iron prepared in the electric furnace. Fluid wrought-iron does not take up calcium or magnesium when treated with calcium carbide and magnalium, but the author has found 0·06 and 0·03 per cent. of magnesium and 0·16 and 0·59 per cent. of calcium in iron made in the electric furnace; the richer sample also contained the more silicon. The conclusion is that calcium silicide, which is soluble in iron rich in silicon, is formed in the electric furnace.—A. C. W.

Aluminium; The Pasty State of —— below its Melting Point, and the Utilisation of this Property in Sub-dividing the Metal. A. Granger. Bull. Soc. Chim., 1902, **27**, [15], 789.

It is known that aluminium assumes a brittle and then a pasty condition below its melting point when it is being heated. The author proposes making use of this property when small samples are required from large pieces of the metal. The ingot is heated in a gas-fired muffle to a dark red heat, and strips are then cut from it with a knife, gentle pressure being quite sufficient. If very small quantities are taken, the hot metal may be reduced to powder in a mortar, like zinc; but larger masses are apt to cohere under the pestle.—F. H. L.

Metals; Extraction of ——, by Means of Calcium Carbide. B. Neumann. Chem.-Zeit., 1902, **26**, [62], 716—719.

The author replies to v. Kügelgen and Frölich (this Journal, 1901, 126, 582, 719). In regard to the gas produced in the reductions, the operations have now been conducted in a crucible with an air-tight covering of fireclay mixture, through which passed two glass tubes. A current of air carried away the gaseous products of the reaction; in the case of a mixture of litharge, lead chloride, and calcium carbide in the proportions represented by the formula—

$$PbCl_2 + 4PbO + CaC_2,$$

55·5 per cent. of carbon dioxide and 44·5 per cent. of carbon monoxide were found; the latter must therefore be the primary product. The yield of lead was 82 per cent. instead of the 60 per cent. required by the equation—

$$2M_2O + 2MCl + CaC_2 = 3M_2 + CaCl_2 + 2CO,$$

which was previously given by the author. The excess is due to reduction by the carbon monoxide. Von Kügelgen's formula is thus incorrect, which is also shown by the yield he obtained.

Reduction by means of calcium carbide might find practical application in the preparation of alloys and the treatment of ores. In regard to the former use, it is necessary to use pure compounds, otherwise the alloys are impure, and in any case the composition of the alloy does not correspond to that which is theoretically to be expected. The author founded this conclusion on the preparation of certain bronze and brass alloys. The carbide process has, therefore, neither practical nor economic advantages.

Neumann gives in detail the cost of reducing 1 ton of copper from a rich ore by means of the carbide process, and shows that it is considerably greater than the present price of electrolytic copper. The process is also shown to be inapplicable to lead-zinc ores.—A. C. W.

Arsenic and Antimony in Ores; Determination of ——. L. B. Skinner and R. H. Hawley.

See under XXIII., *page* 1156.

English Patents.

Burnt Steel; The Restoration of ——. M. Hirschmann and V. Heilmeier, Nuremberg, Germany. Eng. Pat. 18,949, Sept. 23, 1901.

The burnt steel is heated to redness and sprinkled with a mixture of 90 to 110 parts of colophony, 28 to 32 parts of blue vitriol, 18 to 22 parts of bone dust, 13 to 18 parts of borax, and 8 to 12 parts of salt, "or their equivalents." The steel is then hardened in the usual manner.—E. S.

Steel and the like; Apparatus for the Manufacture of —, applicable also for Use in Melting Metals. E. C. Mills, Peru, Indiana, and H. Evans, Philadelphia, U.S.A. Eng. Pat. 9890, April 29, 1902.

See U.S. Pat. 698,610, April 29, 1902; this Journal, 1902, 977.—E. S.

Gold, Silver, and other Metals; Extracting ——, from their Ores. J. B. De Alzugaray, London. Eng. Pat. 15,541, July 31, 1901.

A dilute solution of sodium chloride, sodium carbonate, and potassium cyanide is added to the crushed ore, and a mixture of gaseous bromine and air is forced through the pulp. The use of a solution containing 1 per cent. of cyanide, followed by the air and bromine injection, is also claimed. The precious metals may be recovered from the solution by electrolysis or otherwise.—E. S.

Ores containing Noble Metals; Treatment of ——. F. W. Martino, Sheffield. Eng. Pat. 9501, April 24, 1902. (Under International Convention, Sept. 30, 1901.)

ORES containing tellurium, selenium, sulphur, arsenic, antimony, tin, phosphorus, or the like, with the noble metals, are heated with "barium-sulpho-carbide," and the product then treated with water to dissolve out the soluble sulphides, the noble metals being recovered from the residue by, for instance, the use of a gold solvent, and precipitation by the sulpho-carbide. The latter is obtained by fusing a mixture of barium sulphate and carbon in an electric furnace. See Eng. Pat. 12,500, 1901; this Journal, 1902, 776.—E. S.

...in from Tin Scrap or Cuttings; Separation of ——. T. Twynam, Moortown, near Leeds. Eng. Pat. 18,843, Sept. 21, 1901.

...E U.S. Pat. 703,165, 1902; this Journal, 1902, 978. —E. S.

...melting; Processes of and Apparatus for ——. C. A. Allison, London. From W. F. Hannes, Deming, U.S.A. Eng. Pat. 10,929, May 13, 1902.

...E furnace, of vertical type, is adapted to combine both ...ising and reducing processes, and is supplied with ...oasted ores. Fuel is admitted from the top into a side ...partment, formed by a partition extending from above ...t way toward the bottom, the ore entering the larger ...ly of the furnace on the other side, the separate compart...nts merging together below. Valve-controlled tuyères ...ply oxygen to the fuel immediately below the partition ..., an independent set of tuyères supplying the body of ... furnace. Thus, the carbon monoxide and other com...tible gases or vapours formed in the said body are ...lised on meeting the air injected from the upper set of ...ères. The ore, when roasted, is fed into the zone of fuel ...bustion, for reduction, and the fused metal is withdrawn ...n the furnace.—E. S.

United States Patents.

...n or Steel; Apparatus for making ——. E. Meining...aus, Düsseldorf, Germany. U.S. Pat. 697,213, April 8, ...02.

...S Eng. Pat. 21,481, 1901; this Journal, 1902, 617.—E. S.

...S' Furnace; Open Hearth ——. F. L. Saniter, of ...aton-Carew, and J. L. Smith, Eaglescliffe, England. ...S. Pat. 703,309, June 24, 1902.

...Eng. Pat. 12,823, 1900; this Journal, 1901, 903.—E. S.

...emer Steel; Method of Manufacturing Basic ——. ... McDonald, Youngstown, Ohio. U.S. Pat. 706,089, ...g. 5, 1902.

...CCESSIVE charges are subjected to basic Bessemer treat...ent each charge being tested in turn, and the duration of ...the eatment of succeeding charges varied according to the ...res s of the preceding tests; the charges so treated are ...poi into a receiving furnace of sufficient size to contain ...at time the charges from a number of converters, and ...the etal is brought to a casting temperature.—E. S.

...Tempering Bath. J. E. Lawrence, West Shefford, Canada. U.S. Pat. 706,966, Aug. 12, 1902.

...ATH is formed of two liquids, differing in specific gravity, ...uch s oil and mercury, one superposed on the other, and ...the icle to be tempered, requiring, for instance, a hard ...ened a softer back, is wholly immersed in the bath so as ...s the face to be hardened the required distance into ...the avier liquid. The vessel containing the bath may be ...set hin another vessel containing a cooling liquid.—E. S.

...Furnace; Hot Blast ——. E. T. Bradford, Denver, U.S.A. U.S. Pat. 705,640, July 29, 1902.

...E Eng. Pat. 18,028, 1900; this Journal, 1901, 1117. —E. S.

Amalgamating Machine. G. C. Scott, Columbus, Ohio. U.S. Pat. 697,175, April 8, 1902.

WITHIN a casing, having an inlet opening at one end and an outlet opening at the other end, is arranged a rotatably-mounted drum, having on its periphery spirally-arranged amalgamating copper blades, adapted to contact with a body of mercury contained within the casing, from which a valved pipe section leads outwards, flexibly connected to a mercury reservoir, capable of being lowered or depressed, as it may be needed to receive mercury from, or to supply it to, the interior of the casing. The drum with its blades serves the double purpose of amalgamation and of delivering the tailings outwards through an upwardly-inclined prolongation of the casing.—E. S.

Gold, Silver, or other Ores; Cyanide Process of Working ——. R. H. Officer, J. W. Neill, J. H. Burfeind, and F. H. Officer, Salt Lake City, Utah. U.S. Pat. 705,698, July 29, 1902.

THE ore, slime, or the like, is treated with a solution of a suitable cyanogen compound in a closed vat, so connected to a vessel containing a regenerating caustic solution that evolved hydrocyanic acid gas may pass into it, after subjection to pressure in an intervening vessel, provision being made for return to the vat of unabsorbed air or gases, and also, as required, for return of the regenerated cyanide. "Foul solutions," containing copper, are slightly acidulated in the vat with sulphur dioxide gas, and agitated with compressed air, the hydrocyanic gases being regenerated as before, with return of the air, &c., to the vat, the contents of which are ultimately passed through a filter press, for collection of the precipitated cuprous auro-cyanide, &c. Compare U.S. Pat. 696,374, 1902 (this Journal, 1902, 619). —E. S.

Ores; Extracting Precious Metals from ——. L. B. Darling, Providence, Rhode Island. U.S. Pats. 706,302 and 706,303, Aug. 5, 1902.

THE finely-divided ores containing the precious metals are first treated with a metal-dissolving solution in tanks, and are then spread in a comparatively thin layer (such as of three inches thick) over a substantially flat and large working surface, having drainage ducts or channels, covered by fixed screens or strainers; the layer of ore is flooded with a cyanide or other solution, and a mechanically-acting rolling device is passed to and fro, thus agitating and aerating the charge, and forcing some of the solution into the drainage ducts, whence it passes into sunken tanks for precipitation of the precious metals. The plant is provided with suitably arranged tanks, containing, respectively, water, and weak and strong solvent solution. Two working floors are arranged for alternate use.—E. S.

Gold and Silver Ores; Treatment of ——. S. Trivick, London. U.S. Pat. 706,365, Aug. 5, 1902.

THE ores are treated with a mixture of dilute solutions of calcium (or an alkali) hypochlorite free from the hydrate, and of a ferric salt, such as ferric chloride, the proportions used being such as to result in the formation of ferric hypochlorite leaving some excess of ferric chloride, in order to evolve nascent chlorine to act upon the ore. Reference is made to Eng. Pat. 12,641, 1890.—E. S.

Ores [Copper]; Apparatus for the Treatment of ——. E. L. Sharpneck, Chicago, U.S.A. U.S. Pat. 697,178, April 8, 1902.

IN combination with a leaching tank and a filtering tank is a valved conduit extending between them, a valved-branched pipe which extends from the conduit below the valve back to the leaching tank, and a jet pump for steam interposed between the leaching tank and the branch pipe, whereby the liquid contents of the leaching tank may be circulated through the conduit and the branch pipe; or transferred through the conduit to the filtering tank. The steam supply discharges through a jet nozzle directly into the conduit, whereby the liquid contents of the tank are agitated, circulated, and heated. The invention is especially applicable in the treatment of ores of copper with an acid

solution, but is also available in the treatment of gold and silver ores by the cyanide process, and generally in leaching ores. Reference is made to a concurrent application, Serial No. 57,446 of April 25, 1901, relating to the precipitating tank used in the present apparatus. —E. S.

Copper Ores; Apparatus for Treating ——. R. Seeman, London. U.S. Pat. 702,490, June 17, 1902.

See Eng. Pat. 18,864, 1900; this Journal, 1901, 1218. —E. S.

Retort [Zinc Distillation]. E. H. Hopkins, London. U.S. Pat. 701,885, June 10, 1902.

See Eng. Pat. 22,554, 1900; this Journal, 1902, 54. —E. S.

Zinc; Process of Extracting ——. J. L. Babé and A. Tricart, Paris. U.S. Pat. 702,764, June 17, 1902.

Ores poor in zinc are made into briquettes with sodium carbonate and carbon in stated proportion, and the briquettes are heated in a suitable vessel, the vapours being condensed. The impure zinc oxide thus obtained is mixed with the same reagents, and the mixture is heated to from 800° to 1,000° C., the metallic zinc volatilised being condensed.—E. S.

Ore Roaster. J. L. Hopper, Kirksville, Missouri. U.S. Pat. 702,004, June 10, 1902.

The furnace comprises front and rear walls, having feed and discharge openings, floors and partitions being arranged to form upper and lower ovens, or tiers of superposed ovens, and cooling chambers beneath. The heating is by fluid fuel, supplied through perforated pipes arranged directly within the ovens, near to the opposite side walls, auxiliary supply pipes being also used within the lower tier of ovens near to the roof. Passages or flues permit the escape of gases from the lower to the upper ovens, and thence outwards. The superposed ovens have inclined floors, and a removable discharge chute leads from the lowest oven, and the chute and flues are in vertical alignment to permit the independent discharge of the contents of either oven. Reference is made to U.S. Pat. 462,767, 1891, of which the present is an improvement.—E. S.

Ore-roasting Furnace. D. C. Jackling, Republic, Washington, U.S.A. U.S. Pat. 706,756, Aug. 12, 1902.

The furnace is of the "straight line" type, the ore being received at one end and dumped at the other end, and the supporting and operating mechanisms are independent of the ore-roasting hearth. A supplementary cooling hearth of corrugated sheet iron is arranged parallel with and above the roasting part of the furnace. The charge is stirred, and moved along both hearths by a plurality of rabble blades attached to supporting bars secured to rabble trucks running upon tracks parallel with, and outside the hearths, means for driving which are shown. Means for feeding material into the furnace are provided, and the discharge end is provided with swinging doors, opened by the rabble mechanism, and permitted to close as the material passes into a small chamber to be dumped into a pit or trough, whence, by an endless conveyor and suitable attached mechanism, it is passed on to the cooling hearth. —E. S.

Metals and Alloys; Treating Metallic Oxides in the Production of ——. F. C. Weber, Chicago, U.S.A. U.S. Pat. 705,727, July 29, 1902.

A small portion of the oxide to be reduced is placed as a layer at the bottom of a crucible with a small coil of aluminium wire, and the crucible is then charged with the oxide in a coarser condition, mingled with aluminium, with a helix of thicker wire, both coil and helix being connected, each to a source of electricity. The current is first sent through the helix "to dry and raise the temperature of the charge and add additional calories to the heat of the reaction"; next, a current is sent through the lower coil sufficient to melt it and react with the finely-powdered oxide, which reaction extends to the dried and prepared charge which is to be reduced. The crucible is provided with a lining of lime or graphite, which is again lined with asbestos or the like, which lining may be faced with a spun thimble of sheet aluminium.—E. S.

Impacting One Metal upon Another; Method of ——. S. H. Thurston, Longbranch, New Jersey. U.S. Pat. 706,701, Aug. 12, 1902.

A metal article is coated with another metal by impelling particles of the latter against the face of the former by a gas blast, with such force as to cause the particles to become so embedded as to form a permanent coating. Reference is made to U.S. Pat. 698,670, 1898; see Eng. Pat. 22,405, 1898; this Journal, 1899, 588.—E. S.

Coating One Metal with another Metal; Process of —— S. H. Thurston, Longbranch, New Jersey. U.S. Pat 706,702, Aug. 12, 1902.

The metal to be coated is heated to open up the pores, and is then beaten with beaters composed of the coating metal which first cleanses and then impregnates the surface o the metal to be coated, thus forming thereon an "amorphous inherent, adherent, coherent, permanent film." Reference i made to U.S. Pat. 661,650, 1900; see Eng. Pat. 100, 1899 this Journal, 1899, 588.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Periodic Acid; Preparation of free —— by Electrolysi E. Müller and O. Friedberger. Ber., **35**, [14], 2652-2659.

Some years ago one of the authors showed that by t electrolysis of iodates in alkaline solution, periodates cou be obtained, but he was unsuccessful in his endeavour obtain the same reaction with the free acid. Findin later, that with platinum plates there was always a low anodic potential (and hence a lower oxygen-pressu according to Nernst's theory) during the electrolysis of acid than during that of an alkali, the authors substitut an anode of lead peroxide, which has already been fou so powerful an agent in electrolytic oxidations. Worki in this way they have been able to convert iodic acid co pletely into periodic acid, and have shown that curre density, temperature, and concentration of the solution ha but little influence on the yield. In 4½ hours, usi a current of 2 ampères and 6 volts, 5 grms. of pu recrystallised periodic acid were obtained. Lead perox alone, without the aid of the current, produces traces periodic acid from iodic acid solution; and the same react can be proved to occur, though only to a slight exte during electrolysis between platinum plates. Bro acid yielded no perbromic acid when similarly treated.

The determination of periodic acid in presence of ic acid was carried out by exactly neutralising with sodi hydroxide, with the aid of phenolphthalein, then adde sodium bicarbonate and potassium iodide, and titrating e liberated iodine by means of standard arsenious oxide. Th corresponds to one-fourth of the total oxygen in e periodic acid ($KIO_4 + 2KI = KIO_3 + K_2O + I_2$). The total oxygen of the iodic and periodic acids was determi d by adding dilute sulphuric acid and potassium iodide, d titrating the iodine with sodium thiosulphate, and e amount of iodic acid was of course calculable from the two results.—J. T. D.

Chlorine and Alkali by the Solvay-Kellner Mercu Process; Electrolytic Production of ——. F. Glaser. Zeits. f. Elektrochem., 1902, **8**, [32], 552—563.

It is found that, in this process, diminutions in curr efficiency are chiefly attributable to the depolarising ac of chlorine upon the alkali-amalgam formed in the ll. and that the loss caused by the decomposition of wat is of minor importance. In the experiments described he highest efficiencies were obtained when the circulatic of

he mercury in the cell was fairly rapid, or when diahragms were used. Without diaphragms only high urrent-densities showed high current-efficiencies, but with iaphragms the yield was good even with low current-ensities. A current of 0·1 ampère per sq. cm. of cathode urface gave good results in some of the experiments ithout diaphragms.—W. G. M.

lloys; Potentials of ——, and the Formation of Covering Films (Deckschichten). F. Haber. Zeits. f. Elektrochem., 1902, **8**, [32], 541—552.

HIS is a continuation of the article by Haber and Sack on ie disintegration of cathodes (this Journal, 1902, 777). : is shown that in the series of alloys of tin and sodium, id of lead and sodium respectively, there are two haracteristic alterations in the curves of potentials obtained y plotting the percentage of heavy metal and the potentials bserved as co-ordinates. One of these alterations occurs at e point which marks the separation between the metals id or tin and the corresponding sodium compound of the etal, that causes gradual decomposition of water when mersed in it; the other separates this sodium alloy and e alloy richer in sodium, which is instantaneously broken into dust on immersion. The former of these points is easurable in caustic soda solutions at the temperature of e room, but vanishes, owing to the formation of covering ns, when the measurement is attempted in intensely cold ium chloride solutions. The latter of these points may observed in the cold lithium chloride solution, but not alkalis at the ordinary temperature, owing to the violence the action then occurring.—W. G. M.

Nitric Acid from Atmospheric Nitrogen. Electrician, 1902, [1265], 684.

See under VII., *page* 1138.

English Patents.

ctrolytic Apparatus. A. J. Boult, London. From The merican Alkali Co., Philadelphia, U.S.A. Eng. Pat. 5,579, Aug. 1, 1901.

external vessel provided with an off-take contains a r of mercury which acts as cathode, and within the el is mounted an electrolytic cell capable of being ted and provided with a plurality of flanges extending downwards, which form the walls of anode compartments anged in a ring, and with a cup placed in the centre. ns are provided at the centre of the cell for supplying electrolyte to ducts which radiate from it to the anode partments, and which have an outlet. A flange and ve interposed between the cell and the vessel form a The anode comprises a block of carbon having a inal flange, and carbon rods, provided with threads, nd through tapped holes formed in the block, and are stably and detachably connected to it by a screw-thread nection.—G. H. R.

stos Goods [Diaphragms], Improved Treatment of —, to enable them to Resist Liquids. J. Berufeld, rlin. Eng. Pat. 16,493, Aug. 16, 1901.

revent the disintegration, under the action of liquids, of bestos goods, made without the addition of any binding rial, the goods are heated to a temperature below that ich vitrification occurs, *e.g.*, by immersion in a bath of olten aluminium at 600°—700° C. Sheet asbestos ted in this manner forms an excellent material for diaragms in the electrolytic production of alkali.

—W. C. H.

United States Patents.

Generator (Single Fluid); Electrochemical ——. [*Baffle.*] S. Amwake, New Jersey. U.S. Pat. 12,019, Aug. 12, 2. (See U.S. Pat. 702,760, June 17, 1902.)

he present patent the baffle surrounds one of the electrodes and is open at the bottom.—G. H. R.

Secondary Batteries; Composition [Bitumen] for use in ——. C. T. J. Oppermann, London. U.S. Pat. 706,444, Aug. 5, 1902.

Lead oxide is mixed with a solution of bitumen in a light hydrocarbon, preferably benzine, with or without the addition of alcohol or of dilute sulphuric acid.—G. H. R.

Electrochemical Apparatus [Cooling Fluid]. C. C. Clark, Assignor of one-half to J. G. Carson, both of Philadelphia. U.S. Pat. 706,529, Aug. 12, 1902.

There are two closed cylinders, one within the other, with an intervening space between them, and a series of electrodes within the inner cylinder provided with electrical conductors which pass through tapered and screw-threaded stuffing-boxes screwed into the cylinders, which also prevent the outward flow of liquid from them. A chamber at each end of the cylinders, provides an inlet, and an outlet for fluid, and they communicate with the intervening space, and also with each other through the inner cylinder, which is provided with a series of tubes secured to tube sheets, for the circulation of cooling fluid which flows to the parts surrounding the cylinder diametrically, and at its ends, so as to enable a free and uninterrupted flow of the cooling liquid about and through the electrolyte to neutralise the heat generated by the electrodes.—G. H. R.

Electricity; Chemical Generator of ——. [*Aluminium Electrode.*] L. Anderson, St. Louis, Missouri. U.S. Pat. 706,631, Aug. 12, 1902.

The single-fluid cell contains a pair of electrodes, one of which is of aluminium, and an electrolyte in contact with both of them composed of a suitable halogen salt, preferably a fluoride or a chloride, or both, nitric acid, and a depolarising agent.—G. H. R.

Electric Furnace. [*Carbon Bisulphide.*] E. R. Taylor, New York. U.S. Pat. 706,128, Aug. 5, 1902.

The furnace, which is specially suitable for the production of bisulphide of carbon by a continuous process, comprises a working chamber, the heat zone of which is located at the bottom, and which has inlets at the top and through passages in its side walls adapted respectively for the introduction of carbon and sulphur. There are also inlets at an intermediate height for fragmentary conductive material which passes through conduits of conductive substance to the bottom of the furnace, and constitutes the self-renewing electrodes there. Means are provided for connecting the conduits with a suitable generator of electricity, and there is an outlet at the bottom of the working chamber for the residue of the carbon and sulphur in a fused state.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Electric Furnace for Iron; Stassano's ——. V. Lucchini. Chem.-Zeit., 1902, **26**, [64], Rep. 207.

The furnace constructed by Stassano, as described in the Italian Patent 47,476 of April, 1898, was a small blast-furnace heated by a powerful electric arc and lined with graphite, which dissolved in the molten metal. The graphite has now been replaced by magnesite, and the furnace is constructed on the model of a Martin's basic-hearth furnace, heated from above by three arcs, which are not in contact with the minerals. The charge consists of the roasted and (magnetically) concentrated ore, mixed with an amount of coal calculated according to the composition of the materials and the percentage of carbon desired in the iron, and kneaded with tar into balls of 5—6 cm. diameter. The product contains not less than 0·03 per cent. of sulphur, and frequently 0·06 per cent. It is, however, almost free from manganese, and has a very low coefficient of magnetic hysteresis; it is, therefore, very suitable for dynamos. Analyses of the wrought-iron have given the following figures: Fe, 99·6; Mn, 0·169; Si, 0·028; S, 0·046; P, 0·013; C, 0·113. For the production of one ton of iron, 700 H.P. are required.

—A. C. W.

Copper Plating; Dessolle's Process of ——. H. Fontaine. Bull. de la Soc. d'Encouragement pour l'Ind. Nat., 1902, 101, [1] 46—54.

After giving an outline of previous processes of plating metals with copper, the author describes the process of Dessolle, the novelty in which is that the electrolyte is projected under pressure against the metallic objects and the anodes. The metallic objects are first cleansed either in an acid bath or by means of a jet of sand driven by compressed air, which rapidly removes all impurities. They are next placed in a preparatory bath and subjected to the action of a current of 30 ampères per square metre. The composition of this "adhesion bath" is as follows:—Double cyanide of potassium and copper, 4 parts; potassium cyanide, 0·5 part; ammonia, 0·5 part; and water, 94 parts. On leaving this bath the objects are carefully examined and any trifling holes in the deposit stopped with solder, or if larger, with spongy tin obtained by electrolysis. They are next immersed in the principal bath, which has the following composition:—Crystalline copper sulphate, 12; free sulphuric acid (66°), 3; and water, 85 parts. Jets of this liquid are driven against their surface and that of the anodes. This effects a removal of gas and impurities from the bath and enables a strong current to be used, so that a perfectly smooth deposit of copper is obtained. In Dessolle's installation a current with an ampèrage of 750 is employed, and a deposit of 1/10 mm. obtained in 1½ hours, whilst this speed is stated not to have any prejudicial effect upon the quality of the deposit. The temperature is maintained at the required degree by means of steam jets, viz., at 50° C. in the adhesion bath, and at 35° C. in the final bath. The electrolyte projected by the jets falls into a central tank below, whence it is raised by means of wooden pumps to a reservoir fixed at a height of five metres above the level of the bath, and falls through the jets again under considerable pressure. Finally the plated articles are dried and polished in the usual manner.

The price of plating metals with a good deposit of copper does not exceed 2 francs per kilo. of deposit, but the economic advantage of the Dessolle process is that there is perfect adhesion of the deposit, which can be made thinner and yet be durable. A recent application of this process has been the plating of the interior of the tubes of marine boilers, thus preventing the dangers of steel tubes whilst retaining their power of resistance to pressure. It has also been used for ships' keels and for the interior of the cylinders of hydro-pneumatic guns.

—C. A. M.

Alloys; Electrolytic Production of New ——. A. Coehn. Zeits. f. Elektrochem., 1902, 8, [33], 591—595.

The formation of ammonium- or sodium-amalgam in aqueous solutions is due not merely to electrolytic deposition of the alkali-metal in the mercury, but to a property possessed by the mercury itself; since Wood's fusible metal, melting at 65° C., does not take up any ammonium or sodium under aqueous solutions at temperatures above the melting point of the alloy. Under suitable conditions, however, magnesium (up to 10 per cent.) passes into nickel when this metal is deposited from nickel sulphate solutions containing magnesium sulphate, the proportion of magnesium co-deposited increasing with the proportion of that metal added, and diminishing with a rise of temperature. The deposition of the magnesium is clearly not due to simultaneous electrolysis of the two metals, but to the formation, either of a definite compound, or of a solid solution of the metals. A study of the decomposition curve of a mixed solution will at once indicate whether an alloy can be formed electrolytically from it. Thus the addition of aluminium sulphate, which forms no such alloy, and that of magnesium sulphate, to a nickel sulphate solution, have very different effects; the addition of magnesium at once showing a new decomposition point corresponding to the new alloy. In this way the formation of new alloys of the light with the heavy metals may be accomplished. The magnesium alloy behaves better than the pure nickel deposit, for, under conditions in which the former yielded, on iron or polished copper, an adhesive and cohesive deposit, the latter failed to do so.

—W. G. M.

United States Patent.

Ores or Slimes; Apparatus for the Electrolytic Treatment of ——. F. T. Mumford, Kalgoorlie, Australia. U.S. Pat. 706,436, Aug. 5, 1902.

The apparatus consists of a rotatable, cylindrical, met drum with a copper lining which is kept continual amalgamated by a layer of mercury in the drum. plurality of conductive bars, connected by a metallic rin pass longitudinally through the drum and are insulate from it. A trailing electrical contact is provided for th ring, and there is also one for the drum, which is rotate by suitable means.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Hexabromides of Glycerides and Fatty Acids. J. Walk and G. Warburton. Analyst, 1902, 27, [317], 257—2

The following percentages of hexabromide were obtain by the method described by Hehner and Mitchell (J Journal, 1899, 77):—

Kind of Oil.	In Glyceride.	In Fatty Ac
Japan fish	21·14—22·07	23·04—23·2
Newfoundland cod	32·68—30·62	39·10—37·7
Shark liver	21·22—19·08	12·68—15·0
Genuine cod liver	35·33—33·76	29·86—30·3
Deodorised fish	49·01—52·28	38·42—39·3
Sperm	2·61— 2·42	2·05
"	3·72— 3·69 (stood 48 hours)	..
Whale	15·54—16·14	12·38—12·
Seal	27·54—27·92	19·83—19·9
Linseed (iodine value, 184)	..	31·31—30· — 30·80
Liquid acids (iodine value, 208)	..	31·9
Linseed (iodine value, 181)	23·14—23·52	29·06—29·
Candle nut	8·21— 7·28	11·53—11· —12·03
Chinese wood (1st sample)	0·38— 0·39	..
" (2nd sample)	None.	..
Safflower	..	1·65—0·6
Rape	..	2·44—3·3

—W. P.

Mineral Oil in Rosin Oil; Determination of ——. J. H. Walker and C. D. Robertshaw.

See under XXIII., *page* 1157.

Butter Fat; Relation between the various Constants of——. P. Behrend and H. Wolfs.

See under XVIII. A., *page* 1148.

English Patent.

Oil and other Liquids; Filtering and Cleansing ——. J. Smith and J. R. Smith, Bolton. Eng. Pat. 17,3, Aug. 28, 1901.

The apparatus consists essentially of three superpd vessels or compartments. The top one receives the o to be filtered, the lowest serves as a reservoir for the clared oil, and the middle one forms part of the filtering apparce, being constructed with a grid bottom supporting a pous vessel constructed of paper or other suitable filtng material and containing any granulated filtering medm. The filtration is, however, mainly performed by cylindal vessels, also of paper, which have their tops closed and are affixed to the base of the uppermost receiver, thn gh apertures in which their interiors communicate with he middle compartment. The outer surfaces of these cylin ers are cleansed by ring-shaped wire scrapers, which ca be worked up and down by a suitable frame and handle.

—M. J.

United States Patents.

Oil Filter. T. Neuray, Liege, Belgium. U.S. Pat. 702,814, June 17, 1902.

To clarify oils which have been used for lubricating purposes, they are caused to ascend through a series of cone-shaped strainers immersed in water at 60°—80° C. The cones fit closely into the interior of a cylindrical vessel, which contains the hot water, and the oil is delivered into the space below the bottom one by a central pipe from an upper reservoir, the flow being regulated by a spindle valve. Each successive filter is of more closely woven fabric than the one next below it. Near the upper part of the water cylinder, a side opening allows the filtered oil to flow over into a tank—M. J. S.

Fat; Apparatus for Washing ——. D. J. Davis, Kansas, U.S.A. U.S. Pat. 706,033, Aug. 5, 1902.

A rotating drum, with flanges or paddle-blades arranged on its periphery parallel to the axis of revolution, travels from one end of the cooling tank to the other, and is partly submerged therein. The congealing fat is caught by the blades and depressed below the water, being thus washed and chilled, and is then pushed bodily by the drum to the collecting end of the tank, where it is lifted on an endless band and passed to a receiver. Various mechanical details are claimed.—R. L. J.

Soap Press. J. J. Forster and R. L. Murdock, Avalon, Pennsylvania, U.S.A. U.S. Pat. 706,919, Aug. 12, 1902.

A soap-press provided with feed mechanism, whereby the cakes may be presented in proper position and at proper intervals to the feed-chute, and also with an arrangement for gripping the soap as the plungers, which carry the dies, separate, so as to prevent the adherence of the cakes to either of the die-faces. The whole apparatus is so arranged that the several parts will operate in due successive order without any delay in the operation of compressing and delivering the cakes.—M. J. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Lithopone. E. Kochs and F. Seyfert. Zeits. angew. Chem., 1902, **15**, [32], 802—808.

Lithopone, zinkolith, or Griffiths' white, consists essentially of a mixture of precipitated zinc sulphide and barium sulphate. It is sent out in various qualities under differently coloured seals, each seal corresponding to a certain content of zinc sulphide, though different makers do not agree in the order of their colours. The chief makers have formed a ring, and supply lithopone at prices varying from 23 marks per 100 kilos. for 30 per cent. of zinc sulphide to 16 marks for 15 per cent. The different qualities vary not only in their zinc-content, but also in their appearance, the best qualities being pure white, while the poorer sorts show slight grey or yellow tints, due to particles of carbon or of oxide of iron.

The usual process of manufacture of lithopone is as follows:—

Heavy spar is furnaced with carbon, and yields a barium sulphide of 80—85 per cent., which is almost completely soluble in water. Materials containing zinc are so treated as to yield zinc sulphate. The solutions of zinc sulphate and barium sulphide are mixed in appropriate proportions, when complete precipitation of a mixture of barium sulphate and zinc sulphide ensues. This mixture contains, theoretically, 29·4 per cent. of zinc sulphide. By using a larger proportion of barium sulphide, and precipitating the excess either by another zinc salt, such as the chloride, or by sodium sulphate, mixtures containing a higher or lower percentage of zinc sulphide are precipitated.

The precipitate is then washed and dried. In preparing the finer qualities, the precipitation is effected with warm, concentrated solutions, and to the precipitate is added from 0·5 to 1 per cent. of freshly precipitated magnesium hydroxide and a little common salt. The dried and ignited precipitate is ground, mixed with 2—3 per cent. of sal ammoniac, and again ignited. The still hot substance is thrown into water, dried, and finely ground.

According to a patent of Steinau, soluble calcium sulphide is made by heating together 50 parts of flowers of sulphur and 50 of lime in 1,000 of water, and with this zinc sulphate is precipitated. The mixed zinc sulphide, calcium sulphate, and free sulphur are dried and heated to 250°—300° C., when the sulphur volatilises. The hot product, quenched in water, dried, and ground, is known as "sulphopon," and is said to be softer and smoother than lithopone.

Lithopone nearly always contains zinc carbonate, and traces of soluble zinc salts (sulphate and chloride), whilst the poorer qualities contain iron (up to 0·3 per cent.) and alumina; calcium compounds are also frequently present. The valuable constituent of lithopone is of course the zinc sulphide, and a quick method of analysis, which will show the amount of this in a sample is necessary for commercial purposes. As zinc compounds other than sulphide are present, and sulphides other than zinc, neither a determination of the total zinc nor one of the total sulphur as sulphide is accurate, either method giving too high a figure. Drawe has lately published a method of analysis which is similar to that which the authors have long used, though many of the details differ. This Journal, 1902, 427. The authors' process is as follows:—

1. The lithopone is carefully sampled, and 5 grms. are dissolved in 100 c.c. of hydrochloric acid of sp. gr. 1·12 in a half-litre flask. After boiling to expel hydrogen sulphide, and cooling, the flask is filled to the mark, and filtered through a dry filter into another flask, which is rinsed with the first portions of the filtrate. To 100 c.c. of the clear filtrate 50 c.c. of water are added, then ammonium chloride and ammonia in excess; the liquid is heated on the water-bath to 60°—70° C., sodium or ammonium sulphide in slight excess added, and the precipitate, after standing some hours, filtered through an ashless filter, washed with warm dilute ammonium sulphide, dried, ignited, and weighed as zinc oxide. If on treatment with ammonia a precipitate of iron or alumina is observable, the zinc oxide is dissolved in hydrochloric acid, and the iron and alumina are determined by precipitation with ammonia in the usual way. The weight of oxides so obtained, deducted from the zinc oxide as weighed, gives the total zinc present.

2. To determine the zinc in forms other than sulphide, 5 grms. of the sample are treated at the ordinary temperature in a 250 c.c. flask with 100 c.c. of dilute acetic acid (50 grms. of glacial acid in a litre), by which the authors have shown zinc sulphide to be unaffected. After some hours standing and occasional shaking, the flask is filled to the mark, and filtered through a dry filter into a 200 c.c. flask, bringing the solid at once upon the filter, and returning the first filtrate till the liquid runs through clear. The zinc in the 200 c.c. of filtrate (4 grms. of substance) is determined as above. As a rule, not more than 0·5—2·0 per cent. of zinc is found, but in bad samples the authors have found as much as 12 per cent.

3. The sulphur as sulphides is determined by dissolving 1 grm. of the sample in 50—75 c.c. of dilute hydrochloric acid (1 vol. acid of sp. gr. 1·19, 9 vols. water) in a flask filled with carbonic anhydride, and through which a stream of carbonic anhydride is passed during the operation. The evolved gas is bubbled through bromine water (with a drop or two of bromine in excess) contained in two Peligot's tubes, a U-tube with glass beads and a three-bulbed U-tube, and at the end of the operation the liquid from the tubes (which are rinsed with a little caustic soda solution) is concentrated, filtered, and precipitated with barium chloride. The zinc sulphide calculated from (3) is usually 0·1—0·3 per cent. lower than that given by the difference of (1) and (2). The authors usually take the mean of these two results.

The presence of one or two per cent. of zinc in other forms than sulphide in itself affects the lithopone but little

but larger amounts are objectionable, for they indicate defective methods of manufacture. Only about 15 per cent. of the samples examined by the authors contained the amounts of zinc sulphide supposed to be guaranteed by their seals.—J. T. D.

Lithopone; Analysis of ——. G. Coffignier. Bull. Soc. Chim., 1902, **27**, [15], 829.

The author records a number of analyses of lithopones obtained from five different makers, the samples ranging in nominal composition between 15 and 34 per cent. of zinc sulphide. The figures show that lithopone contains a very variable (0·38 to 2·68 per cent.) amount of zinc oxide, whilst it is also apt to contain a portion soluble in water, the quantity of which may be from 0·12 to 5·14 per cent. Occasionally specimens are found in which the soluble matter includes zinc salts, which are of course useless as a constituent of the pigment. On the whole, therefore, Drawe's method of valuing the substance (this Journal, 1902, 427) is not satisfactory, and the actual amount of zinc oxide present must be determined directly.

The French customs authorities estimate the proportion of barium sulphate in lithopone and return all the residue as zinc sulphide; and thus their analyses frequently disagree with those of the makers of the pigment.—F. H. L.

Red Lead; Technical Analysis of ——. E. Szterkhers. *See under* XXIII., *page* 1156.

English Patents.

Paint; Distemper Wash or Water——. R. Cussen, Cork. Eng. Pat. 22,081, Nov. 2, 1901.

Two lb. of glue are dissolved by boiling in 2 galls. of water. When cool, 2 pints of paper varnish, 4 pints of boiled linseed oil, 2 pints of turpentine, and 1 pint of terebene are added, and the whole is boiled thoroughly. Twenty-eight lb. of whiting or any desired pigment are then added, the composition is cooled and thinned with water for use.—M. J. S.

Paint ["*Asol*"] *or Protective Composition.* E. G. Bertrand, Paris. Eng. Pat. 15,107, July 7, 1902.

This paint, known as "Asol" is designed mainly for painting glass houses and windows, with the object of excluding the heat rays of the sun. It is composed of whiting, blue colouring matter, oil, alum, potassium silicate, and water.—M. J. S.

United States Patent.

Paint-Oil, and Process of Making same. J. F. Krebs, Colorado, U.S.A. U.S. Pat. 706,961, Aug. 12, 1902.

Thirty-five galls. of acetic acid, 10 lb. of zinc sulphate, and 15 lb. of litharge are mixed with 5 lb. of manganese dioxide dissolved in 5 galls. of "benzin." Then 5 lb. of lead acetate are added, and the whole is left for a week in a closed tank, stirring it once a day; 2,000 lb. of ordinary whale or fish oil are now added, and then 10 galls. of linseed oil, 5 galls. of turpentine, and 100 lb. of chloride of lime. After the lapse of 48 hours the oil is ready for mixing with pigments.—M. J. S.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patent.

Tanning Extracts; Treatment of ——. A. J. Boult, London. From Fratelli Dufour, Genoa, Italy. Eng. Pat. 11,502, May 20, 1902.

Tanning extracts are heated with finely-divided metals such as tin, zinc, and aluminium, to improve their colour and solubility. Thus, quebracho extract (1,000 kilos.), finely-powdered tin (4 kilos.), and aluminium powder, (0·2 kilo.) are heated together at 100° C. for a sufficient time; the resulting extract has a good colour and is soluble in cold water.—R. L. J.

Dyeing and Tanning Baths; Improvements in Combined ——. Lepetit Dollfus and Gansser, Milan. Eng. Pat. 4,516, July 16, 1901. (Under Internat. Conv., Jan. 15, 1901.)

Skins prepared for tanning are treated with a one-bath chrome liquor to which is added one of the following dyestuffs:—Logwood lake, indigo substitute, Naphthol Black, Orange II B, Naphthol Yellow S. The dyeing may be commenced first, and a chrome salt solution which does not precipitate the dyestuff, is added gradually in the usual way until the skins are tanned. An example of a combined tanning and dyeing bath is as follows:—20 kilos. of chrome alum and 20 kilos. of hyposulphite of soda are dissolved in 100 litres of water and 300—500 grms. of hydrochloric acid, 20° B. added; after standing for 3—5 days, 50—80 litres of a solution of logwood (5°—6° B.) previously oxidised with biehromate and acid are added and the mixture is filtered. To make up the tanning and dyeing bath, one litre of this solution is diluted with 10 litres of water, further additions being made as the tanning proceeds until the bath reaches a constant strength of 4°—5° B. The leather is "fat liquored" and finished in the usual way, but care must be taken that the soap used be as neutral as possible.—J. T. W.

United States Patent.

Ellagic Acid; Extracting ——. A. Heinemann, Eberswalde, Germany. U.S. Pat. 706,411, Aug. 5, 1902.

See Fr. Pat. 314,375, Sept. 10, 1901; this Journal 1902 415.—R. L. J.

XV.—MANURES, Etc.

English Patents.

Natural Phosphates; Process for Rendering the Phosphoric Acid contained in ——, *Soluble in Citric Acid.* G. Hoyermann, Hanover. Eng. Pat. 11,873, May 24, 1902.

The natural phosphate is treated with such a proportion of an acid or mixture of acids as may be necessary for decomposing its foreign constituents, as calcium carbonate and the like, water being added to form a uniform mixture; the mass is then dried. A modification is also claimed consisting in mixing with the phosphate "a salt of the active acid," and setting that acid free by addition of another acid. In either case, ammonium and potassium salts, &c., may be added to the product.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

English Patents.

Filters for Sugar Juices and other Liquids; Improvements in ——, *and Means for Cleansing the Filtering Medium thereof.* J. Kostalek, Prague, Bohemia. Eng. Pat. 933, July 17, 1902.

A rectangular reservoir, with funnel-shaped bottom, is arranged, near its lower portion, a layer of parallel tubes split or perforated on their under sides, and all fed by an external main with juice to be filtered. The liquid flowing through these tubes is, therefore, distributed over the whole ground of the filter, and mounts through the medium (sand or other material that can be readily washed) to the top of the vessel, whence it overflows into a conduit and is conveyed to its destination. At the lowest part of the conical bottom are two openings (ordinarily closed) through which the sand can fall into injectors, from which it is forced with a jet of water through a vertical pipe over the top and back into the vessel, for washing purposes. The dirty water flows off over the rim. By this means the filtering material can be thoroughly washed without being removed from the apparatus.—H. T. P.

Sugar; Improvements in the Manufacture of Cube —— F. Scheibler, Aix-la-Chapelle. Eng. Pat. 24,847, Dec. 1901.

The sawn surfaces of the sugar are moistened with water or syrup to dissolve the sugar dust. On drying, the surface presents a crystalline appearance.—B. F. D.

French Patents.

[*Sugar*] *Diffusion Vessels; Improved* ——. E. Deltour and L. Mist, Huy, Belgium. Fr. Pat. 129,810, Feb. 5, 1901.

The object of this invention is to do away with the useless space found in the top of the ordinary diffusion cylinder. To this end, a perforated cylinder rather smaller than the diffusion vessel, and provided with perforated bottom and cover, is placed in the neck of the vessel in such fashion that the liquid is compelled to circulate evenly through it. —H. T. P.

Osmosis; Improved Apparatus for ——. L. Fuchs, Lundenburg, Germany. Fr. Pat. 130,328, March 17, 1901.

Two rectangular vessels, placed in juxtaposition, are used. Each vessel is double-bottomed, the upper one being horizontal, the lower one sloping down from the edges towards the centre, whilst the space between them is divided into two chambers by a central partition. These pockets are intended to retain the sludge which separates during osmosis. The upper portion of the vesssel is formed by horizontal and vertical partitions into two open tanks; and, in each vessel, one pocket and one tank communicate with the interior of the main vessel by canals and perforations. The inlet and outlet conduits of the pockets, as also the conduits for removing the sludge from them, are channelled in the lower bottom. In practice, the one vessel serves as the water container, the other for the osmosis proper. Water passes into the first vessel from the one tank above, emerges into the pocket, and from thence passes into the pocket of the second vessel, then into the interior of the same and out into the tank above.

By this disposition of the apparatus it is possible to use non-perforated sheets of paper.—H. T. P.

Osmosis; Improved Apparatus for ——. L. Fuchs, Lundenburg, Germany. Fr. Pat. 130,821, March 17, 1901.

An addendum to Fr. Pat. 130,328, 1902 (see preceding extract). The inlet and outlet conduits, as also the sludge outlet passages of the pockets, of the osmosis vessel previously described, being channelled in the outer bottom, tend to weaken the vessel, and are, therefore, replaced by pipes passing through the sides of the apparatus.—H. T. P.

Sugar and Saline Solutions; Apparatus for the Complete Crystallisation of ——. A. Grantzdorfer, Magdeburg, Germany. Fr. Pat 127,493, June 22, 1901.

The apparatus consists of a large vertical crystallising cylinder and two smaller cylindrical concentrating vessels connected with the first, but placed on a higher level. The juice, concentrated to the crystallising point in one of the boiling pans, enters the main cylinder near the top and is discharged over a large inverted cone of metal which serves to spread out the liquid in a thin layer. The lower segment of the cone forms a chamber through which cold water is kept circulating. The juice is thus chilled and caused to crystallise, and falls into a sieve-cylinder below, which retains the crystals. The mother-liquor is forced up again into the boiling vessel, concentrated, and again passed over the cone, and so on. After a time, the process is changed; the concentrated juice is caused to circulate through the main cylinder from below upwards to the level of the sieve vessel, whence aspirated into the second boiling vessel, again concentrated, and returned to the bottom of the main vessel. In this manner the operation is continued until all the crystallisable matter is extracted and collected in the sieve cylinder.—H. T. P.

United States Patent.

Diffusion [*Sugar*]; *Process of Continuous* ——. F. Kessler, Argentina. U.S. Pat. 706,669, Aug. 12, 1902.

The continuous diffusion is carried out in a single vessel containing no compartments unless different liquids are employed. The mass which is to be extracted is formed into a continuous compact column, travelling from the inlet to the outlet and being subjected to a gradually increasing pressure. The diffusion liquid is introduced at a point at a suitable distance from the delivery end, under a pressure smaller than that obtaining at the delivery end, and is caused to travel in a direction opposite to that in which the mass is being forced. The liquid is withdrawn by suction at a point situated at a distance from the inlet of the material so as to reduce the pressure at that point. The liquid is heated outside the diffusion vessel and may be withdrawn and returned at an intermediate point of its passage, for heating and purification out of contact with the material.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Alcoholic Fermentation; Action of ——, *on the Typhoid Bacillus and B. Coli Commune.* E. Bodin and F. Pailheret. Comptes Rend., 1902, **135**, [5], 299—301.

In connection with the possible presence of these bacteria in cider, the authors established in a previous investigation that the typhoid bacillus of Eberth is very unfavourably affected by the musts of sour apples. Experiments on the effect of pure alcoholic fermentation upon these bacteria, with neutral sugar and peptone media, showed that the act of alcoholic fermentation in itself did not destroy their vitality. But these bacteria themselves have a fermentative action on the media and the combined result of the activity of the bacteria and the yeast is a complex mixture in which the bacteria are considerably modified.

The result naturally varies with the composition of the saccharine medium fermented. In glucose media the acidity increases under the combined fermentative action, and the typhoid bacillus is rapidly modified, it loses most of its mobility, and its cultivation is subsequently difficult. The modified bacillus cannot be cultivated at 40° C., the usual temperature for the normal bacillus, but only at 36°—37° C. In the same media, in presence of chalk, these modifications do not occur. But the total acidity is not the only factor; the typhoid bacillus only remains alive in artificial cane sugar musts if chalk be present, but in glucose musts it retains its vitality after fermentation whether chalk be added or not. *Bact. coli*, on the other hand, develops in cane sugar musts with or without the addition of chalk; this fact might constitute a test for the differentiation of the two species.—J. F. B.

Brewing Water; Value of Analysis of ——. H. Zikes. La Bière, **10**, [7], 108—110.

The relative value of the chemical and biological analysis of brewing water depends on the uses for which the latter is destined. In water for steeping, the main point is to test for the presence of certain chemical constituents and micro-organisms, favourable or adverse to the processes of steeping and germination; whilst chemical analysis alone is important in the case of mashing liquor, no organisms except a few spores being able to survive the temperature employed. Conversely, greater prominence attaches to biological analysis in the case of water for washing yeast, cleaning utensils, &c.

So far as chemical analysis is concerned, the character of the water is indicated by the amounts of sulphuric acid, carbon dioxide, lime and magnesia present, together with the degree of hardness. Nitric acid points to completely oxidised nitrogenous matters; nitrous acid or ammonia to imperfect oxidation; and a high percentage of chlorine and ammonia to sewage contamination. However, both nitric acid and ammonia may have been dissolved by the water in its passage through the soil; and again, decomposed organic matter in solution may be derived from harmless humic acids and not from albuminoids. Thus, in such cases permanganate as a reagent fails accurately to indicate the amount of organic matters present, the quantity of the permanganate consumed depending merely on the substances oxidised. It should be borne in mind that water from shallow wells, being more subject to variation, requires analysing at shorter intervals than is the case with water from deep wells.

A defect in chemical analysis is the very slight difference in the numerical results obtained with pure and deeply

contaminated waters, the presence of millions of organisms being expressed by only a few units of oxygen consumed. Biological analysis, on the other hand, supplements chemical examination, by indicating the nature and quantity of the organic impurities in the water. Traces of substances too minute for detection by chemical reagents, are revealed by bacteria, putrefactive bacteria, *Bact. coli* or *Bact. acrogenes* indicating sewage contamination or the like; sulphur bacteria showing the presence of sulphuretted hydrogen; and river bacteria in well water showing the existence of communication with some stream. Moreover, a certain check on the purity as estimated by chemical analysis is afforded by the fact that some bacteria thrive in highly impure water, others in water that is only slightly defiled, whilst others, again, inhabit pure water alone. Finally, biological analysis is the sole means of detecting the presence, in brewing water, of organisms causing turbidity, bad flavour, and other maladies of beer.—C. S.

Wine modified by Mycoderma vini; Composition of a ——. X. Rocques. Ann. Chim. anal. appl., **7**, 220—221. Chem. Centr., 1902, **2**, [4], 309.

Of one and the same wine, one portion had suffered from the action of *Mycoderma vini*, whilst another portion remained untouched. Comparative analyses showed for the sound and the modified wine respectively: alcohol, 9·3 and 5·7 per cent. by volume; extract at 100° C., 1·845 and 1·657; sugar, 0·17 and 0·223; potassium sulphate, 0·110 and 0·107; tartar, 0·239 and 0·222; total acid as H_2SO_4, 0·518 and 0·480; volatile acid, 0·193 and 0·200; non-volatile acid, 0·325 and 0·280 grm. The aldehyde content had increased from 0·0108 to 0·0295 grm. Of the extractive matter, the colouring matter had chiefly suffered, being retained by the cells of the fungus in the form of a lake. The colour diminished to about one-tenth of the original. The tartaric acid was scarcely attacked. The experiments show that when a wine has suffered from any disease, the usual conclusions cannot be drawn from the analytical data.—A. S.

Wine; Analysis of Natural and Artificial ——. Cari-Mantraud. Monit. Scient., 1902, **16**, [728], 587—590.

The author endeavours to distinguish by results of analysis between wines made by fermentation, and those prepared from the fresh juice by addition of alcohol. The methods of analysis were those ordinarily used. The artificial wine showed a considerable decrease in total acidity, and in the weight of residue on evaporation. If the samples to be analysed were first distilled, and the residue, after making up to the original volume, submitted to yeast fermentation for 48 hours, the same results were obtained to a more marked degree.—B. F. D.

Oxalic Acid; Formation of ——, *by Bacteria.* F. Banning.
See under XX., *page* 1151.

English Patents.

Drying Apparatus [*Brewers' Grains*]; *Improvements in* ——. R. Simon, Basford, England. Eng. Pat. 17,432, Aug. 30, 1901.

This improvement consists in the introduction of separately heated air blasts into the interior or jacket of a suitable drying machine.—B. F. D.

Stills for the Distillation of Spirits; Improvement in the Construction of ——. F. Meyer, London. From J. W. Meyer and J. W. Arbuckle, Trinidad. Eng. Pat. 12,384, May 31, 1902.

The shelves slope downwards, alternately from opposite sides of the still, but not reaching quite across, so that a free passage is left for the wash to flow from top to bottom of the column. Steam, as usual, is introduced near the lower end. By this means the perforations, valves, dip pipes, and cups, as generally used in the construction of a still, are done away with.—H. T. P.

Spirit; Improvements in Treating or Ageing. R. C. Scott, Liverpool. Eng. Pat. 14,104, July 10, 1901.

See U.S. Pat. 704,389, 1902; this Journal, 1902, 1035.
—B. F. D.

United States Patents.

Grain; Apparatus for Malting, Drying, or otherwise Treating ——. J. Sleeman, Somerset, England. U.S. Pat. 706,462, Aug. 5, 1902.

A cylindrical vessel capable of being rotated is divided into a number of compartments for holding the grain by means of hollow partitions with perforated walls, with or without a solid dividing wall. The grain compartments and hollow partitions constitute a series of alternate supply and exhaust chambers for air or other fluid. The partitions are not carried up to the top of the cylinder, but a segment is missing from each, so that the space above forms a large intercommunicating chamber into which the grain falls and is thoroughly mixed when the cylinder is revolved. The supply of air or liquid cannot reach the exhaust by any other way than through the grain. In this drum the operations of steeping, germinating, and drying can be carried out as desired by supplying either water, air, or heated air to the compartments.—J. F. B.

Malt-Kilns. E. Haynes, jun., Radcliffe-upon-Trent. U.S. Pat. 702,552, June 17, 1902.

The fire basket is surrounded by a sheet-metal casing provided at the top with a long coiled flue, also of conducting material and disposed under the malting floor, but terminating above it so that the products of combustion are not discharged into the malt itself.—R. L. J.

Filtering Apparatus [*Brewers' Wort*]. E. De Meuelmeester, Brussels. Assignor to B. Müller-Rau, Frankfort-on-the-Main. U.S. Pat. 703,559, July 1, 1902.

An apparatus by means of which an extremely rapid separation of brewers' wort from the dregs, and a washing of the same is obtained.

A number of porous filter cells open at their lower ends where they are made of flexible or compressible material are arranged in a vat or tank, within which movable clamping-bars are arranged to engage the lower ends of the cells between them, to open or close the said ends as the bars are moved apart or together. The ends are closed by the bars during filtration, and are opened afterwards to discharge the dregs.—R. A.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Butter Fat; The Relation between the Various Constants of ——. P. Behrend and H. Wolfs. Zeits. Unters. Nahr.- u. Genussm., 1902, **5**, [15], 689—719.

Analyses were made of the butters obtained from different cows, each butter being examined separately. It was found that there was a certain amount of relation between the melting points and the Reichert-Meissl numbers of the fats, the latter decreasing as the melting point rose. The amount of insoluble fatty acids in the fats approximately increased in proportion to the melting point. There was little relation between the melting points and refractometer numbers, but the average values of the latter increased as the averages of the Reichert-Meissl numbers diminished. The iodine values showed an increase corresponding to increasing refractometer numbers and decreasing Köttstorfer values. As the Reichert-Meissl and Köttstorfer numbers increased, the iodine values and insoluble acids decreased.
—W. P.

Gelatin and Gelose in Preserves; Detection of ——. A. Desmoulière.
See under XXIII., *page* 1157.

Sandal-wood in Cocoa; Detection of ——. Riechelmann and Leuscher.

See under XXIII., *page* 1157.

United States Patents.

Heating Liquids [*Sterilising Milk*]; *Apparatus for* ——. J. Fliegel, Malmitz, Germany. U.S. Pat. 705,745, July 29, 1902.

A cylinder is provided with a stirrer composed of a series of concentric cylinders, thus dividing the outer portion of the main vessel into annular spaces, through which the milk flows in turn on its course to the centre of the apparatus, passing in the first two spaces over inserted chambers heated by the outgoing milk, and in the third space over a steam heater. It remains in the centre until sterilised, and then passes out, giving up much of its heat to the incoming milk.—A. C. W.

Centrifugal [*Cream*] *Separator.* H. McCormack, Westchester, Pennsylvania. U.S. Pat. 706,087, Aug. 5, 1902.

Two or more vertical-walled partitions are arranged concentrically within the separator, in contact with each other at intervals, to form a series of separating compartments between each of the said partitions and the contacting inner or outer one. Each compartment has skim-milk and cream openings, the openings jointly providing separate outward and inward flow passages through adjoining inner and outer compartments.—R. A.

Heating or Cooling Liquids [*Pasteurising Milk, &c.*]; *Apparatus for* ——. H. Feldmeier, New York. U.S. Pat. 706,170, Aug. 5, 1902.

A stationary closed vessel provided with a surrounding hollow jacket and a detachable hollow core, inlet and outlet pipes, &c., and means for supplying a heating or cooling medium to the jacket and core.—R. A.

Foods; Apparatus for Preserving ——. M. D. Ellis, Washington. U.S. Pat. 706,506, Aug. 5, 1902.

Food or liquids are preserved by placing them in a suitable chamber and there subjecting them to the action of an electric current of sufficient strength to sterilise them by killing all bacteria and germs with which they may be contaminated. A special form of contact-maker, which adapts itself to the shape of any article on which it is placed, consists of a series of interwoven metallic links.

—J. F. B.

Maize for the Production of Grits, Flakes, &c.; Treatment of ——. T. T. Gaff, Barnstaple, Massachusetts, and J. F. Gent, Indianapolis, Indiana, U.S.A. U.S. Pat. 707,059, Aug. 12, 1902.

Maize is coarsely ground and the starchy portion is separated by winnowing and sifting from the hulls and germs. The latter, still containing starchy material, are then freed from oil by extraction with naphtha. After removing all traces of the solvent, the extracted residue is further sifted and winnowed, whereby the starchy material is obtained. This is mixed with about 25 per cent. of its weight of the first separated starchy portion, the mixture being then moistened and rolled.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Water; Purification and Sterilisation of ——. S. Rideal. J. Soc. Arts, 1902, 50, [2591], 717—725; [2592], 729—737; [2593], 741—750; and [2594], 755—767.

The author, in a series of lectures, treats the subject under the following headings:—Purification by uncontrolled natural agencies; natural purification; natural purification of surface waters; protection of sources; reservoirs and filter-beds; sand filters; service reservoirs, open or covered; use of coagulants; softening; mechanical filters; sterilising filters; sterilisation by heat; chemical purification; and sterilisation by acids.—A. S.

Oxygen dissolved in Water; Titration of ——, *with Indigo and Hydrosulphite Solution.* A. Wangerin and D. Vorländer.

See under XXIII., *page* 1156.

English Patents.

Sewage and other Liquids; Automatic Distributing and Alternating Apparatus for use with Bacteria Beds for ——. W. L. Roach, Blaina. Eng. Pat. 10,571, May 8, 1901.

The liquid is distributed over bacteria beds, in regular quantities and at fixed periods, by means of apparatus consisting of a combination of compound levers, valves, floats, and siphons.

A second apparatus, composed of a compound lever, valve, and float, is employed to regulate the period of accumulation of the liquid, and to discharge it.

—N. H. J. M.

Sewage Purification; A New or Improved System of ——. E. Peake, Fenton. Eng. Pat. 18,405, Sept. 14, 1901.

The sewage passes through a grating into a precipitation tank, divided into compartments at different levels. From this it passes through a series of horizontal tanks, filled with coke or saggar, communicating at the top of one side and at the bottom of the other side.—N. H. J. M.

Sewage Treatment; Improvements in Apparatus for ——. W. J. Newton, Pendlehurst. Eng. Pat. 18,366, Sept. 14, 1901.

The apparatus consists of a tank provided with a siphon, by means of which the sewage is intermittently discharged from the tank into a space below, from which it passes into perforated tubes, which distribute it, in any desired direction, over the filter bed. The tank is preferably placed in the centre of the bed; the iron pipes then radiate from the tank so as to discharge in all directions.

—N. H. J. M.

Sewage Water and the like; Treating the Substances Deposited from ——. W. P. Thompson, London. From The Maschinenbau Actiengesellschaft vorm. Beck and Henkel, Cassel, Germany. Eng. Pat. 21,856, Oct. 30, 1901.

The sludge is mixed with sulphuric or hydrochloric acid (12—20 kilos. of sulphuric acid or an equivalent quantity of hydrochloric acid per cubic metre), the mass is heated to 80° or 90°, and is then freed from the greater part of its water by filter presses or a centrifugal. The residue, which contains about 50 per cent. of water, may at once be treated for the extraction of the grease, which contains about 70 per cent. of free fatty acids. The residue from which the grease has been removed contains 2·5—4·5 per cent. of nitrogen and 30—40 per cent. of ash. It may be utilised as manure or as a material for paper manufacture.

—M. J. S.

Filters for Sewage and Liquid, and Apparatus connected therewith. S. H. Adams, Harrogate. Eng. Pat. 9920, April 30, 1902.

The liquid is passed over sloping filter floors, so that it passes in a lateral sloping instead of a vertical direction. Two or more floors, parallel to each other, may be used in combination. Bacteria filters, formed by special tiles or otherwise for aeration, may be employed.

The arrangement includes an automatic intermittent supply apparatus; and when more than one filter floor is used the siphon is provided with a corresponding number of outlets.—N. H. J. M.

Antifouling and Preserving Composition for Bottoms of Ships. T. S. Mullay, Invercargill, New Zealand. Eng. Pat. 14,707, July 19, 1901.

Tannin, either in the form of extract or of pulverised tree-bark, is mixed with ordinary paint, and applied with a brush, or the pulverised bark may be mixed with appropriate materials for working up into a felt, which is then applied to the ships' bottoms. The use of tannin or a

decoction of the bark of trees is also claimed as a preservative of land structures, or of living plants against insect parasites.—M. J. S.

UNITED STATES PATENTS.

Furnace [Sterilising Air]. W. L. Ross, Omaha (Neb.). U.S. Pat. 703,474, July 1, 1902.

A FURNACE for sterilising air, consisting of a number of open-ended sterilising tubes passing through the combustion chamber, a return air-supply tube communicating with the intake openings of the tubes, one or more hot-air chambers receiving the exit ends of the sterilising tubes and communicating with the return air duct, into which latter extends a draught flue that empties into the smoke flue of the furnace. An evaporating tank is situated adjacent to the intake opening of the return air-supply duct. The above features are combined with a lower fresh-air pit, a fire-pot, an auxiliary combustion chamber situated above the latter and surmounted by a number of hot-air chambers, which are provided with openings leading into a smoke flue. Supply pipes leading from the hot-air chambers and communicating with a number of sterilising tubes that cross and recross within the auxiliary combustion chamber and finally empty into the hot-air chamber.—C. S.

Water-purifying Apparatus [Refrigerating and Ice-making, &c.]. J. Roan, Portsmouth, Virginia. U.S. Pat. 700,826, May 27, 1902.

THE purifying tank is divided lengthwise by partitions into a settling compartment, a filter compartment, and a purified water compartment, communicating with each other in the order named, suitable valves and inlet and exit pipes being provided for controlling and directing the flow. The settling compartment is provided with baffle-plates, which cause the water to travel the length of the compartment in a tortuous path, and with an overflow opening extending practically the length of the compartment above the normal level of the water therein.—R. A.

Filter [Water]. V. Oster, Missouri. U.S. Pat. 702,466, June 17, 1902.

CONSISTS of a muddy-water tank, containing a strainer, connected by a siphon with a clear-water tank, controlling valves, and sprinklers for washing the strainers. The strainers are made of ordinary yellow or red brick clay, potter's clay, and hard-wood charcoal, worked in the manner of pottery ware to any desired shape, and burnt in an unglazed-ware kiln.—R. A.

Water, &c.; Apparatus for Sterilising ——. D. Grove, Berlin. U.S. Pat. 705,751, July 29, 1902.

THE water is forced by a pump to the primary coil of a double range of coils, whence it passes, by gravitation, to the bottom of the boiler. A second pump is fed from the top of the boiler, and forces the hot water through the secondary coil, where it gives up most of its heat to the fresh water.—A. C. W.

(C.)—DISINFECTANTS.

ENGLISH PATENTS.

Disinfectant [Formaldehyde]; Manufacture of a ——. C. Spengler, Davos-Platz, Switzerland. Eng. Pat. 15,271, July 27, 1901.

ORGANIC acids, particularly nucleinic acid, in alcoholic solution are added to formaldehyde with or without the further addition of ether, chloroform, and similar volatile liquids. The following mixture, expressed in percentage composition, is used, in the form of a spray, for the treatment of phthisis: formaldehyde, 0·1—0·5; formic, nucleinic, citric, lactic, or other acid, in alcoholic solution, 0·0005—0·1; alcohol, 20; ether, 78.—R. L. J.

Ozonising Apparatus applicable for Inhaling and Disinfecting; Portable ——. E. Coustall, Paris. Eng. Pat. 13,177, June 10, 1902.

THE generator all the parts of which are contained in a small case, consists of a source of electricity, and an induction coil with a condenser, one of the electrodes of which is formed by two platinum conductors of the same pole, their ends being inserted in a closed glass vacuum tube, whilst the other electrode is composed of two silk-covered coils of copper wire wound over a second glass tube, open at the ends, and placed centrally over the closed tube which it surrounds. One of the open ends of the outer tube communicates with an air blower, and the other with the external air. An ozonising inhaler is formed by an external bell which communicates with the outlet tube attached to the outer and open glass tube.—G. H. R.

UNITED STATES PATENT.

Formaldehyde; Process of Solidifying ——. R. Groppler, Berlin. U.S. Pat. 705,667, July 29, 1902.

SEE Fr. Pat. 312,327; this Journal, 1902, 63.—A. C. W.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENT.

Paper; Process and Apparatus for Marbling ——. Herbert Anders and Hugo Anders, Hönnethal, Westphalia. Eng. Pat. 8390, April 10, 1902.

PAPER pulp of a different colour to the web in the paper machine, is placed in a receptacle and then by means of cups mounted on a revolving shaft, is thrown against an adjustable disintegrating screen, so that it flows from this on to a plate arranged on the receptacle, and thence, in a finely-divided condition on to the moist travelling web which is passing beneath the apparatus in a horizontal direction.—G. T. M.

UNITED STATES PATENTS.

Pulp-Separator. J. K. McLaughlin, New York. U.S. Pat. 706,441, Aug. 5, 1902.

THE pulp-separator consists of a revolving, funnel-shaped screen mounted in a tank upon a vertical shaft which also carries a series of successively smaller deflectors inside the screen revolving with it and having working surfaces inclined oppositely to the taper of the screen. The pulp from the digesters is fed in at the wide end of the funnel, and is thrown against the walls of the screen by the conical deflectors; at the same time jets of water, issuing from the hollow shaft, wash the acid through the screen. In this way the pulp travels down the funnel past the whole series of deflectors, and is drawn off at the apex, whilst the acid is run off from the tank: an inclined pipe outside the screen directs jets of water against the latter and prevents the meshes from being clogged by the pulp.—J. F. B.

Vegetable Parchment, free from Germs; Process of Producing ——. A. Mackensen, Düsseldorf, Germany. U.S. Pat. 705,687, July 29, 1902.

THE vegetable parchment is drawn through a bath prepared by dissolving boric acid in boiling glycerin, cooling the mixture to form a wax-like mass and dissolving the mass in glycerin. In this way the parchment may be softened to any desired extent and will always remain in an antiseptic condition.—J. F. B.

Cellulose Products; Manufacture of —— [*Washing Threads*]. M. Fremery and J. Urban, Aachen, Germany. U.S. Pat. 705,748, July 29, 1902.

SEE Eng. Pat. 24,101, 1899; this Journal, 1900, 1105. —J. F. B.

Machine Belting [Paper]. M. Gillet, Mass. U.S. Pat 706,044, Aug. 5, 1902.

WATERPROOF machine belting is manufactured by compressing together alternate layers of untreated textile fabri and of treated paper, the latter being situated on both th outer surfaces of the belting. The paper is prepared b passing it in the form of a web through a bath of sulphuri acid, until the fibres are sufficiently gelatinised, eliminatin the acid and compacting the mass by compression in bath of water, and then combining the layers of fabric and pape

by strong compression whilst the paper is still in a soft and plastic condition. The belting so produced is water- and oil-proof, it contains no glue or other adhesive, and it is kept pliable by incorporating a certain proportion of glycerin in the mass before the final drying.—J. F. B.

Collapsible Tubes [*Pyroxylin*]; *Process of Making* ——. L. Feval, Assignor to Transparent Cellulose Products Company, New Jersey. U.S. Pat. 706,541, Aug. 12, 1902.

Collapsible tubes and other hollow articles are made by dipping a non-collapsible former into a composition of pyroxylin, drying the coating of composition picked up by the former, removing the coating from the former by subjecting it to the action of boiling water or steam, and finally eliminating the last traces of solvent by boiling the product in water or otherwise heating it.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Bismuth Citrate. W. Duncan. Pharm. J., 1902, **69**, [1677], 135—137. Paper read before the Brit. Pharm. Conf., Dundee.

The author has previously pointed out that so-called bismuth citrate appears to be a dibasic acid of the formula $C_3H_4OH(COOH)_2COOBiO$ (this Journal, 1902, 871). He now gives the results of further experiments which confirm this view. He has prepared various salts of the bismuthyl citric acid, the ammonium and sodium compounds being obtained in a crystalline condition. The alkali salts are fairly soluble in water, especially the lithium and ammonium compounds. Bismuthyl-citrates of magnesium and of the alkaline earths are much less soluble. All are precipitated from aqueous solutions by alcohol, apparently in an anhydrous condition.—A. S.

Oxalic Acid; Formation of —— *by Bacteria.* Banning. Centralbl. Bakt. Parasitenk., II. Abt., 8, [13—19], 393. Zeits. ges. Brauw., **25**, [29], 442—443.

In addition to the seven species of oxalic-acid bacteria discovered by Zopf, the author finds this acid is produced by *Bact. industrium* Henneberg, *Bact. oxydans* Henneberg, *Termobacterium aceti* Zeidler, *Bact. acidi oxalici nov. spec.*, *Bact. monasteriense nov. spec.*, *Bact. diabeticum nov. spec.*, *Bact. Dortmundense nov. spec.*, and *Bact. parvulum nov. spec.* Grown in media containing lime, all these organisms produced considerable amounts of calcium oxalate, deposited in and around the mass of cells. The amount was smaller in liquid media, owing to the lack of oxygen below the surface.

Among the substances investigated as sources of material for the reaction were the following carbon compounds: carbohydrates, alcohols, fatty acids, urea, uric acid and its derivatives, and aromatic acids. No results were obtained in any case from starch, inulin, glycogen, or gum arabic; whereas all the organisms formed oxalic acid from dextrose, and 14 of them did so from arabinose, though only a few were capable of attacking lævulose, galactose, maltose, saccharose, lactose, raffinose, rhamnose, isolichenin, and dextrin so as to give the desired result.

The alcohols susceptible of conversion into oxalic acid by these bacteria include ethylene glycol, glycerin, erythritol, ethyl alcohol and mannitol; but not methyl alcohol, propyl alcohol, butyl alcohol, amyl alcohol, or dulcitol. Success was also obtained with the following acids: glycollic acid, pyrotartaric acid, malonic acid, lactic acid, acetic acid, and isobutyric acid. On the other hand, no results ensued with urea, uric acid, kreatine, kreatinine, benzoic acid, hippuric acid, salicylic acid, or tyrosine.—C. S.

Anæsthetics. C. Goldschmidt. Chem.-Zeit., 1902, **26**, [64], 743. See this Journal, 1901, 605.

By boiling *p*-aminobenzoic acid for 10 minutes on the water-bath with a slight excess of orthoformic ester, a compound, $CO_2H.C_6H_4.NH.CH:N.C_6H_4.CO_2H$, similar to those previously described, was obtained. It is a yellowish-white crystalline substance, which melts at 235° C. and is readily soluble in alkalis. The corresponding compounds from *m*- and *o*-aminobenzoic acids were also prepared; the former melts above 250° C., the latter is not as stable as the others and not as easily obtained, whilst *p*-aminobenzoic methyl ester at once combines with orthoformic ester in alcoholic solution. Two compounds are obtained: the first, soluble with difficulty and constituted as above, melts above 240° C., the second, $CH_3.CO_2.C_6H_4.NHCHOC_2H_5$, is precipitated by water from the alcoholic solution and melts at 209° C. Neither of these compounds has greater anæsthetic properties than anæsthesin, the ethyl ester.

By the action of formaldehyde and hydrochloric acid on *p*-aminobenzoic methyl ester, the chloride, $CH_3.CO_2.C_6H_4.NH.CH_2Cl$, was obtained. It is converted by alkali into the base $(CH_3.CO_2.C_6H_4.NH)_2.CH_2$, which melts at 220° C., and is obtained by the action of formaldehyde in the absence of condensing agents.—A. C. W.

Olive Oil: Its Commercial Varieties and the Pharmacopœial Tests. J. C. Umney and C. T. Bennett. Pharm. J., 1902, **69**, [1677], 144—146. Paper read before the Brit. Pharm. Conf., Dundee.

The authors have examined a large number of olive oils of different origin and from the results obtained conclude that failure to conform with the present official test does not of necessity imply that the oil is adulterated, whilst, on the other hand, certain oils unquestionably adulterated with cotton-seed oil may fail to produce the indications which would suggest impurity according to the British pharmacopœial test.

The following chart gives the physical constants and behaviour of type oils with the various reagents:—

——	Olive, Virgin.	Olive, Sublime.	Olive, Fine.	Sesamé.	Cotton seed.
ecific gravity	0·9167	0·9171	0·9164	0·9226	0·9230
dine value	81·73	82·15	80·06	100·91	103
ecchi	Slightly greenish	Yellowish-green	Brownish-green	Yellow, meniscus, golden.	Reddish-brown
alphen	Yellow	Yellow	Yellow	Yellowish white	Distinct red tinge with 1 per cent.; deep red with 10 per cent.
laidin	Solid white mass with green layer.	Nearly solid, yellowish; no marked green.	Nearly solid, yellowish.	Reddish-brown, semi-solid.	Reddish-brown, almost liquid.
cher	Slightly reddish-yellow.	Slightly reddish-yellow.	Slightly reddish-yellow.	Deep violet; distinct violet with 5 per cent.	Reddish-yellow.

They suggest that the official requirements should be follows:—Sp. gr., 0·915 to 0·918 at 60° F. The oil ould become pasty at 33° F. and form a nearly solid, anular mass. It should be readily soluble in ether, loroform, and carbon bisulphide, very sparingly soluble in ohol. Iodine number, 80—84. Five c.c. of the oil h 5 c.c. of amyl alcohol and 5 c.c. of a 1 per cent. solution of sulphur in carbon bisulphide, heated for one hour in a boiling saturated solution of sodium chloride, should develop no reddish tinge (absence of cotton-seed oil). On shaking the oil with pyrogallol in hydrochloric acid solution and then heating the separated acid liquid in the water-bath, no violet coloration should be produced (absence of sesamé oil).—A. S.

Terpenes and Essential Oils. 53rd Paper. Syntheses in the Terpene Series. O. Wallach. Annalen, **323**, [2], 135—160.

The cyclic ketones condense with bromo-acid esters in the presence of zinc (Annalen, **314**, 147). The first product is always (in the case of bromacetic ester) a hydroxy ester, thus : R : CO gives : R : C (OH)CH_2.CO_2R. The hydroxy ester then by loss of water forms an unsaturated ester, from the acid of which a hydrocarbon is produced by the separation of carbon dioxide. When the condensation is applied to ketones with an ethylene linkage in the nucleus, the hydroxy ester cannot be isolated, but the ester formed from it by loss of water appears as the product of the reaction. The hydrocarbon which is the final product of the series of reactions is then a dihydrobenzene derivative. The reaction with bromacetic ester may be used to decide whether an unsaturated hexacyclic ketone contains an ethylene linkage in the side chain or nucleus.

Methylhexenone (Annalen, **281**, 94) was condensed with bromacetic ester, the unsaturated ester could not be isolated pure, but the *dihydro-m-tolylacetic acid*, obtained by saponifying the ester with sodium methylate, was easily purified; it formed long needles melting at 170°—172° C. The acid was partially decomposed by heating in a sealed tube at 160° C., the *dihydroxylene* produced boiled at 133°—134° C. and was identical with the dihydroxylene formed from methylheptenone (Annalen, **285**, 336).

3.5-dimethylhexenone (Annalen, **281**, 104), treated in the same manner, gave symmetrical *dimethylbihydrophenylacetic acid*, which melts at 150°—152° C. and can be distilled without decomposition. The acid, when heated in a sealed tube at 200° C., gives *dihydromesitylene*, which boils at 147° C.

Methylethylhexenone, also prepared by Knoevenagel's method, boils undecomposed at 232° C.; when condensed with bromacetic ester and zinc, it forms the unsaturated ester, from which *dihydromethylethylphenylacetic acid* is obtained. This acid crystallises from alcohol in needles, which melt at 141°—143° C.; on heating, it yields a terpene and *dimethylethylbenzene*, among other products.

Methylisopropylhexenone (Annalen, **288**, 323) is best condensed with bromacetic ester in benzene solution, adding the zinc in small quantities at a time. The ester, $C_{14}H_{20}O_2$, boiled at 154°—158° C. under 16 mm. pressure; on saponification it yielded the acid, $C_{12}H_{16}O_2$, which was purified with some difficulty. The acid on heating at 200° C. gave a mixture which mainly consisted of *dimethylisopropylbenzene*.

Mentholacetic ester, $C_{14}H_{26}O_3$, which is best obtained from menthone by the method given in the last paragraph, boils at 150°—152° C. under 14 mm. pressure and has a cedar-like odour. The hydroxy acid, $C_{10}H_{18}(OH)CH_2.CO_2H$, was analysed as the silver salt. When the hydroxy ester is heated with potassium bisulphate at 140°—150° C., the unsaturated ester, $C_{14}H_{24}O_2$, is obtained, the free acid from which distils at 158°—163° C. under 10 mm. pressure. This acid, $C_{12}H_{20}O_2$, when heated at 270°—280° C. gives *homomenthene*, $C_{11}H_{20}$, which boils at 186°—187° C., $d = 0.8215$, $n_D = 1.4579$ at 23° C. Menthone could not be obtained from homomenthene by oxidation.

Carvomentholacetic ester, similarly obtained from tetrahydrocarvone, has an odour of cedar oil and boils at 162°—164° C. under 16 mm. pressure. The unsaturated ester, obtained from the hydroxy ester as above, boiled at 150°—152° C. under 13 mm. pressure; the free acid, $C_{12}H_{19}O_2$, boiled at 166°—172° C. under 11 mm. pressure. *Homocarvomenthene*, $C_{11}H_{20}$, boils at 194° — 196° C., $d = 0.8300$, $n_D = 1.46187$ at 20° C.

A hydroxy ester could not be found among the substances obtained from carvenone; the unsaturated ester, $C_{14}H_{22}O_2$, boiled at 135°—137° C. under 16 mm. pressure. The acid, $C_{12}H_{18}O_2$, boiled at 175°—180° C. under 17 mm. pressure, with partial decomposition; at 250°—260° C. it gave a hydrocarbon, $C_{11}H_{18}$, which boiled at 194°—197° C. and resembled homolimonene especially in odour, $d = 0.851$, $n_D = 1.4821$ at 22° C.

Bihydrocarveolacetic ester and the corresponding acid have recently been described (Annalen, **314**, 164). The acid on dry distillation gives an alcohol and a hydrocarbon, *homolimonene*, which boils at 191°—192° C., $d = 0.8465$, $n_D = 1.4771$ at 20° C.

In the condensation of pentanone with bromacetic ester, *cyclopentanolacetic ester*, $C_5H_8(OH).CH_2.CO_2C_2H_5$ is the main product. When heated with potassium bisulphate it yields the unsaturated ester, which boils at 82°—84° C. under 11 mm. pressure. The acid, $C_7H_{10}O_2$, obtained from the ester, after recrystallisation from methyl alcohol melts at 49°—50° C.; it readily yields a dibromide, $C_7H_{10}Br_2O_2$, which melts at 88° C. The acid gives only a very small quantity of pentanone on oxidation, its constitution is therefore still uncertain.—A. C. W.

Thujyl Series; Isomeric Transformations in the ——, and the Constitution of Thujone. J. Kondakow. Chem.-Zeit., 1902, **26**, [62], 720—724.

Thujone was converted into thujyl alcohol, and thence into thujyl chloride, which was found not to be of constant composition, or possess a constant boiling point, and also to be unstable, thus it possesses properties differing widely from the characteristics noted by Semmler. The following conclusions are drawn from the behaviour of the various compounds examined:—(1) the constitution generally assigned to thujone must be reconsidered, (2) the thujyl chloride, obtained by the action of phosphorus pentachloride, is a mixture of a tertiary chloride with a larger quantity of a secondary chloride, as is shown by the production of dipentene dihydrochloride from the thujene obtained by the action of alcoholic potash. (3) The thujyl chloride and bromide, obtained by the action of hydrochloric and hydrobromic acids, are also mixtures of secondary and tertiary products, but with the former preponderating. (4) The ready conversion of secondary thujyl alcohol into derivatives of the tertiary alcohol confirms the author's previous statements. (5) The diagonal linkage in the thujyl compounds is readily removed, thus close relationship with pinene or carvone is probable. Comparative experiments with fenchyl, bornyl and isobornyl chlorides show the diagonal linking is most stable in the bornyl compounds. Fenchyl chloride readily gives carvestrene dihydrochloride.—A. C. W.

Neroli Oil; Chinese ——. J. C. Umney and C. T. Bennett. Pharm. J., 1902, **69**, [1677], 146. Paper read before the Brit. Pharm. Conf., Dundee.

The authors have examined a sample of Chinese neroli oil imported from Foochow, China, and stated to be derived

	Neroli.			Petitgrain.
	Chinese.	French (Bigarade).	French (Portugal).	
Sp. gr.	0·860	0·870 — 0·880	0·860	0·885—0·900
Optical rotation	+35°	+ 1° to + 5°	about + 30°	− 2° to + 4°
Esters as linalyl acetate	4·79 per cent.	10—28 per cent.	about 6·5 per cent.	50—75 per cent.
Free alcohols as linalool	21·41 „	20—25 „	..	25—35 „
Appearance	Fluorescent	Fluorescent	Not fluorescent	Not fluorescent.
Known constituents	Methyl anthranilate, linalool, linalyl acetate, limonene, camphene (?).	Methyl anthranilate, linalool, linalyl acetate, limonene.	No Methyl anthranilate, linalool, solid hydrocarbon, dextro-limonene, dextro-camphene.	No Methyl anthranilate, linalool, linalyl acetate, limonene.

from *Citrus triptera* (Trifoliata). The oil is of a yellowish-brown colour, becoming paler on exposure to light; it has a very slight, almost imperceptible blue fluorescence, which, however, becomes very marked when the oil is largely diluted with alcohol. The oil has a peculiar sweet odour, recalling a mixture of neroli, lavender, and tarragon oils. The chief constituents are limonene, camphene (?), linalool, linalyl acetate (traces), methyl anthranilate, and a paraffin hydrocarbon. In the accompanying table, the oil is compared with French oils of neroli and with oil of petitgrain.

The authors consider that Chinese neroli oil cannot replace French neroli oil or any of the different varieties of oil of petitgrain, but it could be used with advantage both unmixed or blended, for toilet perfumery, or for perfuming soap.—A. S.

Oil of Lavender. E. J. Parry. Chem. and Druggist, 1902, **61**, [1174], 168.

The author discusses the question as to whether the ester-content is a satisfactory basis for the valuation of lavender oil. He gives the specific gravity, optical rotation and ester-value of 36 samples of pure lavender oils, of which the origin of growth was known in twelve cases. From the results and also from other considerations he concludes that no definite relation can be found between the ester-content and the perfume-value of French oil of lavender.—A. S.

Oil of the Atlas Cedar. Boisse. Bull. Comm., 1902, 291. Chem. and Druggist, 1902, **61**, [1176], 236.

The oil contains about 16 per cent. of a sesquiterpene alcohol. Ordinary cedar-wood oil only contains about 2 per cent. of such alcohols, whilst it is to the presence of a large amount of such bodies that sandalwood oil owes its efficacy.
—A. S.

Salicin and Salinigrin in different Willow and Poplar Barks; Variations in the Occurrence of ——. H. A. D. Jowett and C. E. Potter. Pharm. J., 1902, **69**, [1677], 157—159. Paper read before the Brit. Pharm. Conf., Dundee.

One of the authors has previously isolated a new glucoside, salinigrin, from an unknown species of *Salix* (see this Journal, 1900, 476). In order to determine the exact botanical source of salinigrin, a large number of different species of *Salix* and *Populus*, both European and American, were collected and examined. Of 33 specimens examined, salinigrin was only found in one, *Salix discolor*, Muhl, which may therefore be regarded as the source of salinigrin.

It was found, in the course of investigation, that the amount of salicin contained in the bark of a willow or poplar depends not only on the species, but on the season of the year at which it is collected, the sex of the tree, and possibly other factors. The quantity present tends to increase in the autumn, and whilst, in April, bark from female trees contains about three times as much as that from male trees, in July the latter yield the larger proportion, the bark of female trees in this month being almost destitute of the glucoside.—A. S.

Toxic Principles of the Coriariæ. C. R. Marshall. Pharm. J., 1902, **69**, [1677], 154. Paper read before the Brit. Pharm. Conf., Dundee.

The best-known species—*Coriaria myrtifolia*, L.—of the somewhat ill-defined order of Coriarieæ, is found abundantly in the countries bordering the Mediterranean. Other species occur in India (the Himalayas), the East Indies, China, Japan, the countries between the United States and Chili, and extensively in New Zealand. Riban, nearly 30 years ago, isolated the active principle of *C. myrtifolia*. He found it to be a crystalline glucoside melting at 220° C. (corr.), readily soluble in boiling alcohol, and in ether, chloroform and benzene, and soluble to the extent of 1·44 per cent. in water at 22° C. The author points out that the commercial coriamyrtin of to-day is not identical with that described by Riban. Merck gives the melting point as 228°—229° C., and Easterfield and Aston as 225° C. (uncorr.). The author's specimen has a similar physiological action to Riban's coriamyrtin, but it is not a glucoside; it melts at 224° C. (uncorr.), and its solubility in water is less than 1 in 1,000. The glucoside, tutin, isolated by Easterfield and Aston from New Zealand Coriariæ (this Journal, 1901, 67), possesses a similar pharmacological action to coriamyrtin.—A. S.

Solanum Dulcamara; Chemistry of ——. F. Davis. Pharm. J., 1902, **69**, [1677], 160. Paper read before the Brit. Pharm. Conf., Dundee.

The author has isolated from *Solanum dulcamara* two alkaloids, solanine and solanidine, and two glucosides, solanein and dulcamarin, the latter being also the bitter principle of the plant.

Solanine was obtained in four-sided prisms melting at 235° C. Solanidine occurs chiefly in the leaves and young shoots. It was separated from the alcoholic extract of the plant by means of chloroform. It forms acicular crystals, has a bitter, acrid taste, melts at 205° C., and is soluble in alcohol. Solanein occurs in the alcoholic extract with solanidine. It was obtained as a non-crystallisable, yellow, horny substance melting at 298° C. When boiled with very dilute sulphuric or hydrochloric acid, it breaks up into solanidine and grape sugar. Dulcamarin occurs throughout the plant. It has at first an intensely bitter taste, which gradually gives place to a sweet and not unpleasant flavour. On boiling with dilute sulphuric acid, it breaks up into dulcamaretin and glucose. The author finds that commercial solanine is a mixture of solanine and solanidine.
—A. S.

Rhubarb; Chinese ——. A. Tschirch and K. Heuberger. Chem.-Zeit., 1902, **26**, [64], Rep. 203.

By treatment in turn with dilute alcohol, strong alcohol, and ammonia, all the active constituents are dissolved. They comprise (1) tannoglucosides, which give, on hydrolysis, gallic and cinnamic acids, a lævorotatory sugar capable of fermentation, and a tannin: rheum-red; (2) anthraglucosides, which give on hydrolysis chrysophanic acid, emodin, rhein, and a dextrorotatory sugar.
—A. C. W.

Rhubarbs; European and Chinese ——. Jakabhazy. Apoth.-Zeit., 1902, 359. Chem. and Druggist, 1902, **61**, [1176], 236.

The author has examined a number of rhubarbs of Eastern and Western origins, and the results show that the Chinese root is decidedly richer in all principles than the European root:—

——	Chinese Rhubarb.	European Rhubarb.
	Per Cent.	Per Cent.
Extracted by alcohol (ammoniacal)	41—47	27—36
Chrysophanic acid	3·1—3·7	0·5—1·9
Emodin	1·3—1·7	0·4—0·6
Pseudo-emodin and pseudo-frangulin ..	2·2—2·6	0·7—1·4
Frangulic acid	2·9—3·9	1—2
Double glucosides	19—21	15—20

—A. S.

English Patents.

Pharmaceutical Compounds; Production of —— [*Salicylic Esters of Quinine Alkaloids*]. H. E. Newton, London. From the Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 16,968, Aug. 23, 1901.

Salicylic esters of the quinine alkaloids (see Eng. Pat. 8165, 1901) are produced by heating quinine alkaloids or their salts with (*a*) salicylide or the polysalicylides (see Ger. Pat. 68,960); (*b*) the chloroform addition product of the foregoing (see Ger. Pat. 62,708); or (*c*) the halogen derivatives of salicylic acid itself (see Fr. Pat. 304,117).—R. L. J.

Mercury; Organo-Metallic Compounds of ——*Antiseptics.* B. J. B. Mills, London. From A. & L. Lumière, Lyon-Monplaisir, France. Eng. Pat. 20,074, Oct. 8, 1901.

Freshly precipitated mercuric oxide is added in small portions to a boiling solution of sodium phenol sulphonate,

disulphonate, or polysulphonate. The solution is then filtered and evaporated. The product is stated to be highly antiseptic and soluble in water. The solutions are said not to precipitate albuminoid matters.—A. C. W.

Antiseptic Disinfectant and Purgative Preparations [of Phenolphthalein]. Z. von Vamosey, Budapest, Hungary. Eng. Pat. 2188, Jan. 28, 1902.

Phenolphthalein is the active ingredient of the various preparations described.—A. C. W.

Sweetening Substance [Ammonium "Saccharinate"], and Process of manufacturing the same. G. M. G. Partridge, Liscard, Cheshire. From The "Trust-Chimique" Société Anonyme, Lyons, France. Eng. Pat. 4455, Feb. 21, 1901.

The lead saccharin compound obtained by oxidising toluene sulphamide with lead dioxide, is treated with ammonium sulphite. Thus, lead sulphite is precipitated and a solution of an ammonium compound of saccharine is obtained. The solution is concentrated, when the compound crystallises out in hexagonal prisms which are very soluble in water. —A. C. W.

United States Patents.

Receptacle for Ethyl Chloride. L. Schwarz, New York. Assignor to Eagle Chemical Works, New Jersey. U.S. Pat. 701,274, May 27, 1902.

Mainly spray-nozzles and cap-fittings for the receptacles, and means for forming tight joints at the fittings, the receptacles being of the kind such as are used for producing local anæsthesia.—R. A.

Glycosuria Antidote and Process of producing ——. F. Blum, Frankfort-on-Main, Germany, Assignor to E. Merck and Co., Darmstadt, Germany. U.S. Pat. 705,638, July 29, 1902.

The suprarenal capsules contain a substance which, when subcutaneously injected, produces glycosuria of short duration. An animal is subjected to gradually increasing injections of the juice of suprarenal glands; finally, blood is drawn off and the serum obtained; it forms an antitoxin for the treatment of diseases (glycosuria) due to the faulty action of the suprarenal glands.—A. C. W.

Salicylic Acid; Alkyloxymethyl Ester of ——, *and Process of making same.* J. Callsen, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 706,018, Aug. 5, 1902.

Esters of salicylic acid of the general formula—

$$C_6H_4(OH).CO.O.CH_2.OR,$$

in which R represents an alkyl group, are obtained by treating salicylates with the halogen methylalkyl esters of the formula $XCH_2.OR$. The methylhydroxymethyl salicylate, which boils at 153° C. under 32 mm. pressure, and ethylhydroxymethyl salicylate, which boils at 168°—169° C. under 43 mm. pressure, are specially claimed.—A. C. W.

Methylenedisalicylic Acid, and Process of making same. S. L. Summers, Philadelphia, Pennsylvania, U.S.A. U.S. Pat. 706,354, Aug. 5, 1902.

Methylenedisalicylic acid, $CH_2[C_6H_3(OH).CO_2H]_2$, is obtained by boiling salicylic acid with strong hydrochloric acid and formaldehyde, and washing the precipitate with boiling water. The compound is very soluble in ether and alcohol; it melts at 245° C.—A. C. W.

Acetsalicylphenetidine, and Process of making same. S. L. Summers, Philadelphia, Pennsylvania, U.S.A. U.S. Pat. 706,355, Aug. 5, 1902.

Acetsalicylphenetidine, $C_2H_5O.C_6H_4.N(C_2H_3O).C_6H_3(OH).CO_2H$, is obtained by heating crude acet-*p*-phenetidine with crude bromosalicylic acid [1:2:5] at 140° C., and extracting by a suitable solvent. It forms white satin-like crystals, which melt at 92° C., and are soluble in ether, alcohol, and benzene.—A. C. W.

Acetsalicylphenetidine, and Process of making same. S. L. Summers, Philadelphia, Pennsylvania, U.S.A. U.S. Pat. 706,356, Aug. 5, 1902.

Pure salicyl-*p*-phenetidine is made by heating salicylic acid and *p*-phenetidine with phosphorus oxychloride, and recrystallising from hot alcohol. The product is then heated with acetic anhydride in xylene solution, and the compound recrystallised. It is stated to have the formula $C_{17}H_{17}NO_4$, and to form white needle-like crystals, which melt at 85° C. (compare preceding abstract).—A. C. W.

[Carbon Bisulphide] Electric Furnace. E. R. Taylor. U.S. Pat. 706,128, Aug. 5, 1902.

See under XI. A., *page* 1143.

XXI.—PHOTOGRAPHY.

Acetone Sulphite; The Use of ——, *in Photographic Laboratories.* N. Weintraub. Chem.-Zeit., 1902, **26**, [64], Rep. 208.

The use is proposed of a compound of acetone and potassium metabisulphite, both as a white crystalline powder and a 50 per cent. solution. In preparing the aromatic developers it is preferable to the sulphites; it is also cheaper: 1 grm. replaces 8 grms. of crystallised sodium sulphite. With developers of phenol character, it may be used in place of acetone and sodium sulphite; strong stock solutions can then be made and kept. "Acetone sulphite" is also useful for diluting the concentrated commercial solutions of developers; the dilute baths made with a 2 per cent. solution in place of water last much longer and are more active. —A. C. W.

Lead Thionates as Photographic Toning Agents. Lumière Bros. and Seyewetz. Bull. Soc. Chim., 1902, **27**, [15], 792.

Continuing their investigations already described (this Journal, 1902, 561), the authors find that a combined toning and fixing bath may be made from lead acetate, sodium thiosulphate, and pentathionic acid, which tones well and gives brighter pictures than a bath of lead salt, alum, and sodium thiosulphate; whilst identical results are obtained in the former case by replacing the lead acetate and pentathionic acid with an equivalent amount of lead pentathionate. By saturating a solution of pentathionic acid of 10° B. with lead carbonate, a 21° B. solution of normal lead pentathionate is produced; and, if 250 grms. of "hypo" are dissolved in 1 litre of it, after filtration, a bath is obtained which yields tones comparable with those of a combined bath containing gold. Quantities of gold, equal to those employed in the usual combined bath, may be added to the lead pentathionate bath, and the mixture gives distinctly blacker and brighter tones with citrate prints than do the ordinary combined baths; experiments show that far better results are obtained by the use of the pentathionate than by any other of the lead salts hitherto recommended.

On mixing solutions of sodium thiosulphate and normal lead pentathionate, a precipitate is formed consisting of lead sulphite and sulphur. If the acid pentathionate be employed, the precipitate is sulphur only, the by-product being sulphurous acid. A solution of lead pentathionate without sodium thiosulphate decomposes similarly, and a weak solution of the free acid slowly deposits sulphur and evolves SO_2. For this reason toning with lead pentathionate is of no practical utility.—F. H. L.

United States Patents.

Photographic Plate for Reproducing Ink Impressions L. C. Henriot, Rheims, France. U.S. Pat. 702,554 June 17, 1902.

A process for preparing glass plates with a sensitive emulsion, which is exposed under a negative, and then printed from in ordinary printers' ink. 80 grms. of gelatin

(two-thirds hard and one-third soft) are dissolved in 1 litre of water, the albumin of one egg is added, the mixture boiled for 75 minutes, filtered repeatedly, and left to cool. 500 grms. of the solution are raised to 40° C. in a water-bath, and 40 grms. of potassium bromide are dissolved in it. 50 grms. of mercuric nitrate are similarly dissolved in the remainder (600 grms.) of the gelatin solution; and at the same temperature the second mixture is poured into the first. Nitric acid is added till the whole becomes acid and milky, and it is finally decanted and filtered. The emulsion is cut up and washed free from soluble salts in running water. Glass plates provided with a substratum of albumin and potassium silicate are coated with the emulsion at 40° C., using about 5 c.c. per square decimetre. After drying they are sensitised by immersion for three minutes in a solution of 30 grms. of potassium bichromate in 1 litre of water and 50 c.c. of alcohol. The dry plates are exposed under a negative to daylight for a few minutes only, until a faint grey image is visible from the back; then the glass side of the film is rendered insoluble by insolation, as usual, and the picture is "developed" by treatment with cold running water for 5 or 10 minutes, till it appears bluish-grey. Before printing, the plate is soaked for five or six minutes in 40 parts of water and 60 parts of glycerin; the back is rubbed dry, the surface wiped with a sponge, and printers' ink is applied by means of the usual roller, copies being taken in succession in the press. The mercuric bromide in the emulsion is claimed to render the plates more sensitive than similar products, and also, by virtue of its antiseptic qualities, to make them keep considerably longer.

—F. H. L.

Casein Photographic Film, and Process of making same. O. Buss, Rüschlikon, Switzerland. U.S. Pat. 705,643, July 29, 1902.

In most processes where casein is employed, the latter exists in the form of a silver compound. This silver compound of casein, however, has the defect that it is not strong enough to resist the various photographic baths unless it is hardened. In the present process the casein is employed only in the free state, being rendered insoluble in water by treatment with saline solutions, and being kept smooth by the addition of glycerin, &c. For example, 500 to 700 grms. of dry milk casein are heated with 9 litres of water to 35° C. or 50° C., mixed with 250 grms. of citric acid dissolved in 1 litre of water, and the heating continued till the whole has dissolved. Then 100 or 200 c.c. of glycerin are added, and the liquid is filtered. It is applied by machine to plain or baryta paper, and allowed to dry. It is next rendered insoluble by being drawn through a 5 or 7 per cent. solution of ammonium or sodium chloride, and finally sensitised in a silver nitrate bath ranging between 4 and 12 per cent. in strength.—F. H. L.

Etching [Photo-]; Preparing Surfaces for ——, and Etching such Surfaces. F. H. Thibodo and S. S. Peckinpaugh; latter Assignor to R. B. H. Macrorie, all of Green Bay, Wisconsin. U.S. Pat. 706,280, Aug. 5, 1902.

A GLASS or metal plate is given a coating of "solution of albumin," 1 oz.; water, 3 oz.; ammonia, 10 drops; chrome alum, 3 drops of a solution containing 10 grs. per oz.; and ammonium bichromate, 20 grs. This is dried in subdued light, and rendered insoluble by insolation, through the glass if that material be employed. Ordinary "carbon tissue" is then exposed under a negative, made to adhere to the coated plate, developed with hot water, as usual, the backing stripped off, and the whole dried. It is then etched by means of the vapours of hydrofluoric acid, and finally the remaining portions of the coating are removed.

—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Explosives; Improvements in ——. E. Steele, C. J. Bower, and H. E. Poehlman, California. Eng. Pat. 14,676, July 18, 1901.

POWDERED nitrophthalic acid (one part) is moistened with alcohol, and incorporated with powdered potassium chlorate (two to four parts). The evaporation of the alcohol leaves a hard, moisture-resisting coating of nitrophthalic acid on the particles of potassium chlorate.—G. W. McD.

Smokeless Powder or Explosive Material; Improved Manufacture of ——. C. F. Hengst, London. Eng. Pat. 15,141, July 25, 1901.

VEGETABLE fibre, freed from resinous matter, is nitrated, then washed, and afterwards boiled in caustic soda solution. An aniline colour, such as Bismarck Brown, is added, and the nitro body treated with live steam at 120° C. to remove acid products. Nitro starch (93 per cent.) is incorporated under runners with potassium nitrate (3 per cent.), zinc sulphate (1 per cent.), and ground charcoal (3 per cent.). This composition, after drying, is mixed with nitroglycerin (5 per cent.), linseed oil (2 per cent.), and acetone (15 per cent.). The nitrated vegetable fibre is then incorporated with the foregoing, and the resulting paste converted into finished explosive in the ordinary way.—G. W. McD.

Powder-granulating Machine. P. A. Newton, London. From Laflin and Rand Powder Co., New York. Eng. Pat. 13,758, June 17, 1902

THE machine has a cutting wheel consisting of a pair of discs spaced apart, transverse cutting knives, grooves for directing rods or cords of powder towards the knives and feed rollers.

—G. W. McD.

Fuses for Armour-piercing Projectiles; Improvements relating to ——. H. S. Maxim, London. Eng. Pat. 16,694, Aug. 20, 1902.

THE fuse is of the delayed-action type, having its parts held by three retaining pins so arranged that on discharge of the gun one of them is bent and another sheared. On the impact of the projectile, the bent pin is sheared to permit the independent advance of the fuse, and on the sudden stoppage of the fuse, the third pin is sheared to liberate the striker, which detonates the primary charge. The fuse has three compartments, the first containing ballistite, the second a nitro or picrate explosive, the third picric acid, and these explode successively in the above order, the last finally igniting the main body of explosive in the projectile.

—G. W. McD.

United States Patent.

Matches; Process for Making ——. W. H. Parker, New York. U.S. Pat. 701,091, July 8, 1902.

THE usual carrier for the splints is dispensed with by rolling up a belt with a strip of veneer, thus keeping the edges separate. The separated edges are dipped into the firing composition. After the composition has set, and during the process of unrolling, the veneer is cut into matches, which are straightened out for boxing.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Filter-Paper a Cause of Error in Analysis. II. Irregular Spreading of Solutions, due to Capillary Action. Mansier. J. Pharm. Chim., 1902, **16**, [3], 116—120. (See this Journal, 1902, 1098.)

WHEN a drop of an aqueous solution is placed on filter-paper, the outer part of the wetted paper may be quite free from the dissolved substance. This is readily seen with solutions of dyestuffs. When drop reactions are executed on filter-paper by placing drops in juxtaposition, erroneous results may thus be readily obtained. Sulphuric acid, caustic soda, tannin, ferrous sulphate, and lead acetate solutions all give this zone free from the dissolved substance. Potassium ferrocyanide, ferricyanide and iodide do not form this neutral zone. In the case of very dilute solutions, one drop has even the power of taking the place occupied by another without the two substances coming into contact, the neutral zone of the second drop driving the first drop before it. Thus potassium iodide is driven away by lead acetate, ferric chloride expels potassium ferrocyanide and antipyrin;

but lead acetate is not expelled by potassium iodide, or ferric chloride by potassium ferrocyanide.

Apart from the formation of the neutral zone, when a band of paper is soaked in a solution and dried, the dissolved substance is very unevenly distributed. In the case of a 1 per cent. solution of morphine hydrochloride, the upper portion of the band contained three times as much as the lower. When, on the other hand, the paper was cut up before drying, the distribution was exactly the opposite. Glucose gave the same results. If the impregnating solution contains two substances in very different proportions, the one present in smaller quantity reaches the top of the band much more rapidly than the other. This may be well seen in the case of a solution of cobalt chloride and copper acetate.—A. C. W.

Lead Salts; Volumetric Determination of ——. R. C. Cowley and J. P. Catford. Pharm. J., 1902, **69**, [1677], 149. Paper read before the Brit. Pharm. Conf., Dundee.

For the determination of lead in lead salts, the authors find that direct titration of the precipitated lead oxalate gives satisfactory results. Precipitation is effected with excess of N/10 oxalic acid, and the lead oxalate is filtered off, washed, and titrated direct with permanganate and sulphuric acid. If the precipitation be effected in the cold, the acidic portion of the lead salt can be determined in the filtrate *plus* the washings, by titration with N/10 alkali.—A. S.

Sodium Phosphate and Sodium Arsenate; Volumetric Determination of ——. F. R. Dudderidge and J. S. Hill. Pharm. J., 1902, **69**, [1677]. 138. Paper read before the Brit. Pharm. Conf., Dundee.

The authors find that the U.S.P. method of determining phosphoric acid by titrating it with alkali in the presence of phenolphthalein gives satisfactory results, the end reaction occurring when two-thirds of the hydrogen has been displaced. They recommend the substitution of this process for the present official gravimetric method

It was also found that for the determination of sodium phosphate and sodium arsenate, accurate results are furnished by titration with N/1 sulphuric acid, with Methyl Orange as indicator, the reaction proceeding according to the equation (in the case of the phosphate) :—$2Na_2HPO_4.12H_2O + H_2SO_4 = 2NaH_2PO_4 + Na_2SO_4 + 24H_2O$. It is best to take at least 3 grms. of the salt, and to dissolve to a concentrated solution.—A. S.

Arsenic and Antimony in Ores; Determination of ——. L. B. Skinner and R. H. Hawley. Eng. and Mining J., 1902, **74**, [15], 148.

The method described is based on the fact that when a mixture of sulphides precipitated from an acid solution is heated with a hydrochloric acid solution of cupric chloride, any arsenic present readily distils over in the form of arsenious chloride. In the actual determination a mixture of cupric chloride and zinc chloride is used. 300 grms. of pure crystallised cupric chloride are dissolved in 1 litre of hydrochloric acid (sp. gr., 1·20) and the solution is mixed with an equal volume of one of zinc chloride prepared by dissolving 1 lb. of pure stick zinc in a mixture of 500 c.c. of water and 1,250 c.c. of hydrochloric acid (1·20 sp. gr.), and evaporating till the solution has a boiling point of 180° C. 1 grm. of the ore is heated with 10 c.c. of nitric acid (sp. gr. 1·42) till the evolution of red fumes has ceased, then 10 c.c. of sulphuric acid (sp. gr. 1·84) are added, and the heating is continued until fumes of sulphuric anhydride are copiously evolved. After cooling, 40 c.c. of water and 10 c.c. of hydrochloric acid are added, and, if antimony be present, some tartaric acid also. The mixture is boiled, filtered if necessary, and the filtrate reduced to a colourless solution by means of a mixture of one part of ammonium bisulphite and two parts of strong ammonia. Any hydrates which are precipitated are dissolved by the addition of hydrochloric acid, the solution is boiled to expel sulphur dioxide, and a current of sulphuretted hydrogen is passed in. The precipitated sulphides are filtered off, washed free from iron, and rinsed by means of hydrochloric acid (1 : 1) into a distillation flask provided with a thermometer reaching to within about $\frac{1}{4}$ in. from the bottom, and connected to a Liebig condenser held vertically downwards. The outlet of the condenser dips about $\frac{1}{2}$ in. below the surface of 40 c.c. of cold water in the receiver. 50 c.c. of the cupric chloride solution are added to the liquid in the distillation flask, and the latter is heated gradually until the thermometer marks about 115° C. The stopper is then removed 10—25 c.c. of strong hydrochloric acid added, and a second distillate collected in water as before. This second distillation is not necessary if only a small amount of arsenic be present. The united distillates are made alkaline with ammonia, just acidified with hydrochloric acid, about 2 grms of sodium bicarbonate and some starch solution added, and the arsenic determined by titration with standard iodine solution (1 c.c. = about 0·005 grm. of arsenic). A blank test should be made by precipitating with sulphuretted hydrogen the same amount of arsenic as that used for standardising the iodine solution, then filtering off the arsenic sulphide, and distilling as in a regular determination

For the determination of antimony, after the separation of the arsenic, the thermometer is removed and a glass tube connected with a hydrochloric acid gas generator, is inserted till it reaches nearly to the bottom of the flask. The condenser is sealed with cold water as before, and heat is applied to the flask till the contents become dry. The distillate is treated with a small quantity of tartaric acid nearly neutralised with ammonia, and sulphuretted hydrogen passed in. A second distillate is collected and treated in the same way, and this is repeated until no precipitate is obtained with the sulphuretted hydrogen. The antimony sulphide is filtered off into a tared Gooch crucible, dried in an air-bath for one hour at 255° C., and weighed. In presence of molybdenum, the results for antimony are a little too high.—A. S.

Red Lead; Technical Analysis of ——. *A New Volumetric Method.* E. Szterkhers. Ann. Chim. anal. appl. **7**, 214—217. Chem. Centr., 1902, **2**, [4], 305.

Minium is a mixture of Pb_3O_4 ($PbO_2 \cdot 2PbO$) with unchanged PbO, and as impurities, $PbSO_4$, SiO_2, unoxidised lead, etc. Its value depends on its content of PbO_2. For the determination of this constituent, 1 grm. of minium is boiled with water acidulated with 1 c.c. of pure nitric acid, the PbO_2 filtered off, dried at 110° C., and weighed. The method is not quite accurate, owing to the slight solubility of PbO_2 in nitric acid. For volumetric determinations, the oxalic acid and potassium iodide methods have up to the present been used. The author, however, employs sodium nitrite, which reacts with lead dioxide according to the equation—

$$PbO_2 + 2HNO_3 + NaNO_2 = Pb(NO_3)_2 + NaNO_3 + H_2O.$$

5 grms. of minium are heated on the water-bath with 100 c.c. of water and 5·7 c.c. of pure nitric acid, the mixture is allowed to cool to 50° C., and an excess of standardised sodium nitrite solution added gradually. The excess of sodium nitrite is then titrated back with potassium permanganate. The author recommends a 1 per cent sodium nitrite solution and a 0·8 per cent. solution of permanganate.—A. S.

Oxygen dissolved in Water; Titration of ——, *with Indigo and Hydrosulphite Solution.* A. Wangerin and L. Verländer. Zeits. f. Farben- u. Textil-Chem., 1902, 1, [16], 439—442.

For the determination of the oxygen dissolved in water by titration with Indigo and hydrosulphite, the authors have suitably modified the original method of Schützenberger and Risler (Bull. Soc. Chim., 1873, **19**, 152, and **20**, 145), and find that on titrating in acid solution, the number obtained represents half the amount of the oxygen dissolved in the water. For the titration are required, a 0·1 per cent. solution of pure Indigo and a hydrosulphite solution of known value (Zeits. f. Farben- u. Textil-Chem., **1**, 281). A measured volume of the 1/10 per cent. Indigo sulphate solution is titrated in an atmosphere of coal-gas with hydrosulphite until decolorised. Then 100—200 c.c. of the water under

examination are run in by means of a pipette, and the blue solution is again decolorised by a further addition of hydrosulphite. If f be the factor of the hydrosulphite solution, and x the number of cubic centimetres required, then $0{\cdot}016\ x\ f$ gives the number of grammes of oxygen contained in the water taken. The fact that only half the amount of oxygen present is found is due to the formation of hydrogen peroxide, which is one of the products formed when indigo-white sulphonic acid is oxidised in acid solution, whereas in alkaline solution hydrogen peroxide is decomposed. The presence of hydrogen peroxide in acid solution does not interfere with the titration, as shown by a series of control experiments.—T. A. L.

ORGANIC—QUALITATIVE.

α- and β-Naphthol; Distinction between ——. A. Jorissen. Ann. Chim. anal. appl., **7**, 217—219. Chem. Centr., 1902, **2**, [3], 281.

On treatment with 2 c.c. of a solution of iodine in potassium iodide, followed by the addition of excess of caustic soda, β-naphthol gives a clear colourless solution, whilst with α-naphthol, the liquid becomes turbid and is coloured. With a mixture of the two naphthols, the depth of colour produced is proportional to the amount of the α-compound present. —A. S.

Sandal-Wood in Cocoa; Detection of ——. Riechelmann and Lenscher. Zeits. öffentl. Chem., **8**, 203—204. Chem. Centr., 1902, **2**, [4], 303.

The presence of sandal-wood in chocolate powders, for the coloration of which it is frequently used, can easily be detected microscopically. For detection by chemical means, 2—3 grms. of the sample are shaken in a test-tube with 10 c.c. of absolute alcohol. With pure cocoa, the solution remains colourless, or at the most, has only a yellowish tinge; with caustic soda, a white precipitate is produced; alcoholic or aqueous ferric chloride solution gives no reaction. The filtered alcoholic extract of sandal-wood gives an intense violet coloration with caustic soda and with ferric chloride. Even a faint coloration of the alcoholic extract of a cocoa, therefore, renders the latter open to suspicion. The alcoholic extract is then treated with ferric chloride a violet coloration indicating the presence of sandal-wood.—A. S.

ORGANIC—QUANTITATIVE.

Rosin Oil; Determination of Mineral Oil in ——. J. H. Walker and C. D. Robertshaw. Analyst, 1902, **27**, [317], 238—239.

The authors obtained the best results by using Valenta's acetic acid method. The sp. gr. is useful as a preliminary test. McIlhiney's method (estimation of the bromine substitution figure) and Holde's method (solubility in 96 per cent. alcohol) yielded unsatisfactory results. —W. P. S.

Gelatin and Gelose in Preserves; Detection of ——. A. Desmoulière. Ann. Chim. anal. appl., **7**, 201—204. Chem. Centr., 1902, **2**, [3], 300.

For the detection of gelose, Ménier, in 1879, recommended microscopical examination for the presence of diatoms, *viz.*, *Grammatophora marina* and *Arachnoidiscus japonicus*, which are retained mechanically by the marine algæ used as raw material for the manufacture of gelose. These impurities are now, however, removed in the course of purification of the gelose, so that microscopical examination fails, and recourse must be had to a chemical process. The method of detection varies according to whether gelatin is present or absent. For the detection of gelatin, 20 grms. of the preserve are treated with 100 c.c. of 90 per cent. alcohol, added gradually, and the mixture allowed to stand for 2—3 hours. The liquid is carefully decanted, and the residue dissolved in hot water. In presence of gelatin, the solution gives precipitates with tannin and picric acid, whilst with quicklime, ammonia is evolved. If gelatin has been found to be present, 30 grms. of the substance are dissolved by heating on the water-bath with 10 c.c. of water, then 150 c.c. of 95 per cent. alcohol are added gradually with stirring, the mixture is allowed to stand for 12 hours, the liquid decanted and the residue dissolved in 50 c.c. of water. The solution is boiled, made alkaline with lime water, boiled for 2—3 minutes, and strained through linen to remove the calcium pectate. The clear liquid is neutralised with oxalic acid (or left very faintly alkaline), concentrated to 30 c.c., 2 c.c. of formol added, and then evaporated to dryness. The residue is boiled for some minutes with 50 c.c. of water, filtered through a hot-water funnel, and the filtrate evaporated to 7—8 c.c. If gelose be present, the solution on cooling solidifies to a jelly. If gelatin be absent, the precipitation with alcohol may be omitted, in other respects the above method is followed.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Rays; Becquerel ——, *and Radio-active Substances.* F. Giesel. Zeits. f. Elektrochem., 1902, **8**, [33], 579—585.

The author gives a summary of the work in this direction up to date, showing that, at the present time, radio-active substances may be classed in three groups, *viz.*:—(1) Those which are intensely and permanently active, such as radium, actinium, and an unknown substance found by the author to be associated with lead in the radium mother-liquors. (2) Those which are only slightly but yet permanently active, such as uranium and thorium; although it is possible that their apparent activity may be due to the presence of traces of substances belonging to the first group. (3) Those which are either strongly or slightly active, but which gradually lose their activity; such as polonium and certain rare earths from uranium minerals. These are probably converted into the active condition by "induction" by the influence of substances in groups (1) and (2).—W. G. M.

Nitrogen; Direct Reduction of the Oxides of ——, *by the Contact Process.* P. Sabatier and J. B. Senderens. Comptes Rend., 1902, **135**, [5], 278—281.

It is well known that platinum-black brings about the direct reduction of the oxides of nitrogen when mixed with excess of hydrogen; the authors have studied the action of reduced nickel and copper in the same direction.

Nitrous oxide.—In contact with reduced nickel the reduction of nitrous oxide by hydrogen starts immediately in the cold, with a great rise of temperature. With large excess of hydrogen, nitrogen is the sole product of the reduction. When the proportion of nitrous oxide is increased, incandescence occurs and complex decomposition products are formed, by the reduction of which a little ammonia is produced. In contact with reduced copper no reaction takes place in the cold, but if the metal be heated to 180° C., the reaction is the same as with nickel.

Nitric oxide in contact with reduced nickel or copper does not react with hydrogen in the cold; but if the metal be heated above 180° C. reduction occurs with the simultaneous production of nitrogen and ammonia. With higher proportions of nitric oxide, incandescence takes place with partial oxidation of the metal.

Nitrogen peroxide, mixed with hydrogen by passing a current of the latter through the liquid peroxide, only reacts in the cold with the metals, forming nickel or copper nitrate; but if the metal be heated to 180° C., reaction with the hydrogen sets in with a considerable production of ammonia. If the proportion of the peroxide be increased, fumes of ammonium nitrite and nitrate are observed, incandescence then ensues, followed generally by a violent explosion. The reaction in the case of *nitric acid* vapours is exactly similar, owing to the partial dissociation of these into the peroxide and oxygen, ammonium nitrate may condense on the cooler parts of the tube. When the metal is heated to 350° C., no nitrate is produced, but only ammonia and a certain quantity of nitrogen.

The contact properties of reduced nickel and copper in these reactions are very similar to those of platinum-black. —J. F. B.

Cupric-Ammonium Chlorides; Anhydrous ——. Cupric-Ammonium Radicles. Bonzat. Comptes Rend., 1902, **135**, [5], 292—295.

The author demonstrates the existence of a series of chlorides of the complex radicle cupric-ammonium. Three well defined members have been prepared, the constitution of which may be represented as follows:—

$$Cu\begin{cases}NH_2\\NH_2\end{cases}2\,HCl,\quad Cu\begin{cases}NH\,NH_4\\NH\,NH_4\end{cases}2\,HCl,\quad \text{and}$$

$$Cu\begin{cases}N(NH_4)_2\\N(NH_4)_2\end{cases}2\,HCl$$

The absorption of ammonia gas by anhydrous cupric chloride is at first very rapid, but prolonged treatment is required to obtain the saturated compound. The highest member of the series, $CuCl_2$, $6NH_3$, is only obtainable by using liquefied ammonia. After distilling the perfectly dry gas on to the anhydrous cupric chloride, the excess of ammonia is allowed to evaporate, whilst maintained at a temperature of $-30°$ C. The compound, $CuCl_2$, $6NH_3$, dissociates under atmospheric pressure at a temperature of about 90° C. to form $CuCl_2$, $4NH_3$, which latter dissociates at about 140° C., forming $CuCl_2$, $2NH_3$.

$CuCl_2$, $2\,NH_3$, is a green powder which gives with water a precipitate of oxychloride. $CuCl_2$, $4\,NH_3$, is a blue substance soluble in a small quantity of water; the solution deposits a precipitate of cupric hydrate on dilution. $CuCl_2$, $6NH_3$, is a blue substance, which when perfectly anhydrous has not a very deep colour. Its solutions when very dilute deposit cupric hydrate; it is insoluble in liquefied ammonia. The author has determined the thermochemical relations of this series of salts.—J. F. B.

Chromium produced by the Alumino-thermic Method; Chemical Properties of —— in regard to Hydrochloric Acid. T. Döring. J. für prakt. Chem., 1902, **66**, [14 & 15], 65—103.

Three specimens of chromium prepared by the alumino-thermic method were examined. These contained respectively per cent., 97·41, 97·95, and 93·67, Cr.; 1·38, 1·00, and 1·90, Fe; 0·16, 0·12, and 0·21, Al; with 0·73, 0·69, and 0·36, Si, and varying proportions of Mn, S, As, P, and Cr_2O_3. All were soluble with rapid evolution of hydrogen, in concentrated hydrochloric acid in the cold, and in very dilute acid on gently warming the mixture; but specimens 1 and 2 (above) were less readily acted upon than was specimen 3, which was more impure. The $CrCl_2$ first produced by treating small quantities of the chromium with HCl was, in course of solution (even when oxygen was excluded), converted into $CrCl_3$. This change was complete when the temperature of the solution was about 20° C., but, strange to say, not quite complete at 100° C., at the latter temperature suffering a decided falling-off. It was due to the catalytic action, in the presence of HCl, of SiO_2 produced by oxidation during solution of the Si contained in the Cr originally. Experiments with pure $CrCl_2$ solutions showed that, when free from acid, the solution exhibited no tendency to become converted into $CrCl_3$, either spontaneously or on the addition of catalytic agents; acid solutions, however, very slowly underwent this change, with evolution of hydrogen, whilst the addition of platinum black, finely divided gold, or even (but in this case more gradually) silica, increased the rapidity of the reaction. The reaction is due to the direct decomposition of HCl without the intermediate decomposition of water thus:—

$$2CrCl_3 + H_2 \rightleftarrows 2CrCl_2 + 2HCl;$$

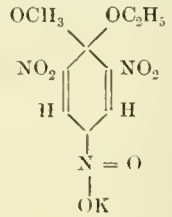
as may be shown by passing HCl gas over heated $CrCl_2$.
—W. G. M.

Aromatic Nitro-Compounds; Reactions of ——. J. Meisenheimer. Annalen, **323**, [2], 205—246. (See also this Journal, 1901, 396; 1902, 542.)

Nitro-anthracene is obtained by the action of alkalis on anthracene nitrate or nitrite (Liebermann and Lindemann), or on anthracene methylnitrate $C_{15}H_{13}NO_3$ (A. G. Perkin, J. Chem. Soc., 1891, 634). A compound soluble in water is produced at the same time, which the author shows to be identical with anthraquinone oxime, and to be formed by the action of the alkali on nitro-anthracene. The oxime readily yields an acetyl derivative when heated with acetyl chloride or acetic anhydride; this confirms Perkin's result, in opposition to Schunck and Marchlewski. The action of alkalis on nitro-anthracene is complicated: 5 per cent. methyl alcoholic potash at the ordinary temperature gives, by addition, the potassium salt of anthracene methylnitrate, $C_{14}H_9(NO_2K)(OCH_3)$, which is very unstable and readily passes back into nitro-anthracene; on keeping, it decomposes into anthraquinone, methyloxanthranol, and potassium nitrite. The solution of the salt, by the action of alkali hypobromite, gives quantitatively anthracene bromomethylnitrate, $C_{14}H_9Br(NO_2)(OCH_3)$, which, on boiling with alcohol, yields nitromethoxyanthracene.

When nitro-anthracene is boiled with 10 per cent. methyl alcoholic potash, and the solution is precipitated by acetic acid or by carbon dioxide, anthraquinone oxime dimethylacetal, $C_{14}H_8(OCH_3)_2(N.OH)$, is obtained. The same product is obtained from anthracene methyl nitrate; when oxidised by alkaline ferricyanide it yields anthraquinone dimethylacetal. The acetals are at once decomposed by dilute acids; thus anthraquinone dimethylacetal yields anthraquinone.

β-nitronaphthalene reacts with methyl alcoholic potash in the same manner as nitro-anthracene. The known combination of alcoholates with trinitrobenzene derivatives takes place in the same manner as the formation of the analogous compounds mentioned above: the nucleus assumes a quinoid structure. Trinitro-anisol and ethyl alcoholic potash give the same compound as trinitrophenetol and methyl alcoholic potash. The compounds obtained in each case is decomposed by acids into a mixture of methyl and ethyl alcohols, trinitrophenetol and trinitro-anisol. The same results were obtained with ethyl and *i*-butyl picrates. The constitution of the addition compound of trinitro-anisol and potassium ethylate must therefore be represented by



—A. C. W.

Casein; Formation of α-Pyrrolidinecarbonic Acid on the Hydrolysis of ——, by Alkali. E. Fischer. Zeits. physiol. Chem., **35**, 227—230. Chem. Centr., 1902, **2** [3], 284.

The author has previously (Zeits. physiol. Chem., **33**, 151) given cogent reasons for his contention that α-pyrrolidine carbonic acid is a direct product of the hydrolysis of casein by hydrochloric acid, and is not formed by a secondary reaction. He now shows that it is also formed on the hydrolysis of casein by alkali.—A. S.

Casein; Action of Dilute Nitric Acid on ——. J. Habermann and R. Ehrenfeld. Zeits. physiol. Chem. **35**, 231—239. Chem. Centr., 1902, **2**, [3], 285.

In studying the action of nitric acid on albuminoids, the aim is usually to isolate nitro-derivatives of the protein substances. The author sought, on the other hand, to completely break up the albumin molecule by the action of nitric acid, and to obtain crystalline decomposition products. The experiments show that besides the previously known decomposition products, oxalic acid and *p*-nitro benzoic acid, hydroxyglutaric acid is also formed by the action of nitric acid on casein. It is probably produced by the action of nitrous acid, the formation of which cannot be avoided, on the glutaminic acid portion of the casein molecule.—A. S.

Gentiobiose; Preparation and Properties of Crystallised ——. E. Bourquelot and H. Hérissey. Comptes Rend., 1902, **135**, [5], 290—292.

Gentianose (see this Journal, 1901, 76 and 386) is a trisaccharide which is split up on regulated hydrolysis into 1 molecule of fructose and 1 molecule of gentiobiose. The authors have made a further study of this latter sugar which they have prepared in the crystallised state.

The gentiobiose, when purified by means of alcohol from all admixture with fructose, may be crystallised either from methyl or ethyl alcohol, the product having a bitter taste. Gentiobiose crystallised from methyl alcohol is very hygroscopic; it is dextrorotatory and exhibits multirotation, the rotation of the freshly prepared solution decreasing on standing; the final rotatory power $[\alpha]_D = +8{\cdot}33°$. After drying *in vacuo* over sulphuric acid, the crystals contain 2 molecules of methyl alcohol; they melt in their methyl alcohol of crystallisation at a temperature of $85{\cdot}5° - 86°$ C. The alcohol is volatilised on further heating, and the sugar swells up and solidifies, melting again at $189° - 195°$ C. When crystallised from ethyl alcohol, gentiobiose occurs in the anhydrous form without alcohol of crystallisation, melting at $190° - 195°$ C. The sugar is dextrorotatory but, unlike the modification crystallised from methyl alcohol, the rotation of the freshly prepared solution increases on standing; in fact, the solution is laevorotatory at first. The final rotatory power is $[\alpha]_D = +9{\cdot}61°$, which is identical with that of the other modification after allowing for the methyl alcohol of crystallisation—J. F. B.

Araban; Behaviour of ——, *to Fehling's Solution.* E. Salkowski. Zeits. physiol. Chem., **35**, 240—245. Chem. Centr., 1902, **2**, [3], 264.

The author has previously shown (Zeits. physiol. Chem., **34**, 162) that xylan gives a precipitate with Fehling's solution, whilst araban extracted from beet-chips [or cherry gum ("Kirschgummi")] with alkali does not. Aqueous solutions of gum arabic, on the other hand, give, with Fehling's solution, a precipitate consisting of an araban-alkali-copper compound. The precipitate is produced even if the gum be first treated with alkali; excess of Fehling's solution hinders the precipitation. It appears, therefore, that the araban extracted by alkali from beet-chips, although it yields *l*-arabinose, is not identical with the araban of gum arabic.—A. S.

English Patent.

Absorbent Mineral Preparation, and Process for the Manufacture thereof. A. G. Saunders, Adelaide, Australia. Eng. Pat. 14,590, June 30, 1902.

Carbonaceous clay—such as that found near Lake Albert, South Australia—is ground to a fine powder and soaked in water to allow the impurities to settle; the clean clay is then boiled at a high temperature with caustic soda, and kept thoroughly agitated, and afterwards washed with dilute sulphuric acid, allowed to cool, washed with water, and dried.—W. C. H.

New Books.

Monographien über angewandte Elektrochemie. Bd. II. Die Gewinnung des Aluminiums und dessen Bedeutung für Handel und Industrie. Von Adolphe Minet; ins Deutsche übertragen von Dr. Emil Abel. Wilhelm Knapp, Halle a/S., Germany. 1902. Price M. 7.

Vol. I. of this series was notified in this Journal, 1902, page 729 (Die Elektrolyse des Wassers). The present volume, II., similar in style to the preceding, contains 126 pages of subject-matter, illustrated with 57 engravings and 15 tables, and followed by an alphabetical index of names of authors. The subject is treated under the following subdivisions:—I. Processes for the Preparation of Aluminium. A. Chemical Methods. B. Electro-chemical Methods. II. Aluminium and its Alloys. Methods of Preparation and Use.

Methods of Gas Analysis. By Dr. Walther Hempel Translated from the 3rd German Edition and considerably enlarged by L. M. Dennis, Professor of Analytical and Inorganic Chemistry in Cornell University. The Macmillan Company, New York, U.S.A. 1902. Macmillan and Co., Ltd., London. 1902. Price 10*s.* net.

8vo volume of 474 pages, illustrated with 136 engravings, eight tables, and alphabetical indexes of subjects and authors' names. The subject-matter is divided into three parts, and these are subdivided as follows: — Part I. General Methods. I. and II. Collecting, Keeping, and Measuring of Gas. III. Apparatus for Gas Analysis with Water as the Confining Liquid. IV. Ditto with Mercury as the Confining Liquid. V. Laboratory Arrangements and Fittings. VI. Purification of Mercury. VII. Analysis, using ordinary Absorption Apparatus. Part II. Special Methods. I. and II. Absorption Analysis, &c. III. Combustion of Gases. IV. Determining the Various Gases. Part III. Practical Applications of Gas Analysis. I. Furnace Gases. II. Illuminating Gas. III. Acetylene Gas. IV. Gases occurring in Sulphuric Acid Manufacture. V. Gases in the Electrolysis of Chlorides. VI. Gases in Bleaching Powder Making. VII. Atmospheric Air. VIII. Gases produced by Living Bacteria. IX. Fluorine as Silicon Tetrafluoride. X. Analysis of Saltpetre, Nitroglycerin, Guncotton, &c. XI. Elementary Analysis of Organic Substances, and determining the C, H, and N simultaneously. XII. and XIII. Calorimetric Method for Determining the Heating Power of Fuel, &c. XIV. Sulphur in Coal, &c. XV. Methane by Flame Test. XVI. The Gas Lantern. XVII. Carbon in Iron. XVIII. Determining Volumetrically the Strength of Chloride of Lime, Pyrolusite, Potassium Permanganate, and Hydrogen Peroxide, &c.

On Cane Sugar and the Process of its Manufacture in Java. By H. C. Prinsen Geerligs, Director of the "West-Java" Sugar Experiment Station, Kagok-Pekalonga. 2nd Edition. Revised and Enlarged. Office of the "Sugar Cane," Altrincham, Manchester. 1902. Price, post free, 5*s.* 3*d.*

8vo volume, containing preface to the first and present edition, table of contents, 106 pages of subject-matter, and the alphabetical index. The subject is subdivided into four parts: Part I. The Raw Material. (i.) The Sugar Cane and its Constituents. (ii.) Distribution of the Constituents in the Cane. Part II. Sugar Manufacture. (i.) Extraction of the Juice. (ii.) Composition of the Juice. (iii.) Clarification. (iv.) Concentration of the Juice. (v.) Curing of the First Sugar. (vi.) After-Products. (vii.) Exhausted Molasses. Part III. Chemicals used in Cane Sugar Manufacture. Part IV. Tables.

Utilisation of Waste Products. A Treatise on the Rational Utilisation, Recovery, and Treatment of Waste Products of all Kinds. By Dr. Theodor Koller. Translated from the German Second Edition by a Technical Chemist. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1902. Price 7*s.* 6*d.* net.

This work, an 8vo volume, contains preface, table of contents, subject-matter filling 276 pages, and the alphabetical index. It contains 22 illustrations, and deals with 59 waste products.

Text Book of Electro-Chemistry. By Svante Arrhenius. Translated by John McCrae, Ph.D. Longmans, Green, and Co., 39, Paternoster Row, London; New York, and Bombay. 1902. Price 9*s.* 6*d.* net.

Volume of large 8vo size, containing the preface, 312 pages of subject-matter, illustrated with 58 engravings, a copious series of references to literature, filling nine pages, and indexes of authors' names and subject-matter. The subdivisions under which the whole subject is treated are as follows:—I. Fundamental Physical and Chemical Conceptions. II. Older Electro-Chemical Views. III. The Laws of Avogadro and van't Hoff. IV. Vapour Pressure of Solutions. V. Boiling and Freezing Points of Solutions.

VI. General Conditions of Equilibrium. VII. Velocity of Reaction. VIII. Electrolytes. Electrolytic Dissociation. IX. Conductivity of Electrolytes. X. Degree of Dissociation and Dissociation Constant. XI. Additive Properties of Solutions. XII. Equilibrium between Several Electrolytes. XIII. Calculation of Electromotive Forces. XIV. Potential Difference between two Bodies. XV. Oxidation and Reduction Elements, Secondary Elements. XVI. Electro-Analysis. XVII. Development of Heat by the Electric Current.

Trade Report.

II.—FUEL, Etc.

Alcohol for Fire-Engines in Hanover.

U.S. Cons. Reps., Aug. 4, 1902.

The chief of the Fire Department at Hanover has constructed an alcohol-firing apparatus, in connection with an automobile fire engine, which is said to be satisfactory. The Fire Department of this city had been using the first automobile fire-engine in Germany, which does away with the disadvantages of smoke and noise during the trip, and it proposes to procure another alcohol automobile engine.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum in South Australia.

U.S. Cons. Reps., Aug. 7, 1902.

It is reported that an oil-spring of good quality has been discovered in the south-eastern district of South Australia. The spring is near the mouth of the Murray River and the little town of Meningie, on the eastern shore of Lake Albert. The oil exudes from the banks of Lake Coorong, and also from the more southern coast line.

Petroleum Production in Roumania.

Foreign Office Annual Series, No. 2874.

	Tons.
1862	3,013
1872	12,697
1892	56,170
1895	76,660
1898	140,700
1899	182,540
1900	224,760

In the 12 months, April, 1900 to March, 1901, the total export was 75,879 tons, *viz.*:—

	Tons
Crude petroleum	46,172
Refined petroleum	22,367
Benzine	4,145
Mineral oil	33
Petroleum residue	3,162

The petroleum industry is in a cramped state through want of capital. Railway charges are high and tank waggons scarce, though the railways do indirectly contribute to the development of the industry by employing petroleum as fuel. The various projects for the laying of a pipe line remain in abeyance. No concessions were granted during 1901. The production for 1901 is estimated at about 250,000 tons. Of this quantity, the "Steaua Romana" produces nearly 50 per cent., all from the Prahova district. The amount of oil coming from Moldavia has not increased.

The petroleum refineries have made some progress, and benzine is now exported to Germany. There are about 50 refineries, of which those of the "Steaua Romana" are the largest, and monopolise nearly two-thirds of the available amount of crude oil. These refineries treated, during the first nine months of 1901, about 140,970 tons of crude petroleum, and delivered some 37,787 tons of refined oil, besides grease and benzine, and 58,778 tons of residue, equivalent to 80,000 tons of imported coal.

It is estimated that Roumanian crude petroleum yields about 55 per cent. of benzine and kerosene. The flash point is high.

The home consumption of petroleum amounts to about 30,000 tons of refined oil, and 2,000 tons of benzine. Lubricating oils, which might be easily produced, are neglected, as is also the production of vaseline. Prices rule usually very low; they were unnaturally forced up during the winter of 1899—1900, but fell again. Refined kerosene fetched about 6*l.* per ton. For crude oil, 1*l.* 5*s.* per ton free to railway station may be considered as the average price during recent years.

Nearly all the sugar mills, distilleries, gasworks, hospitals, and manufactories in Roumania now use petroleum refuse as fuel, as well as the State railway, which employs it largely for its locomotives. During the last two years, the price of British coal has amounted to about 2*l.* per ton. Considering that the heating effect of petroleum residue is about one and a half times that of coal, and taking the prices of coal at 2*l.* per ton, the comparative value of petroleum residue is equivalent to 3*l.* a ton, but its average price is about 1*l.* 12*s.*, and crude, 1*l.* 8*s.* per ton.

Petroleum in Trinidad.

Bd. of Trade J., Aug. 21, 1902.

Oil-wells are being exploited, some a little to the north of the Pitch Lake, and others at Guayaguayare, in the extreme south-eastern corner of the island. These last are supposed to be the richest. No great quantity has as yet been brought to the surface, operations being in abeyance until ample storage is provided; but the experts in charge of the works believe that the supply is very large. Analytical reports speak most favourably of the oil, which is said to be rich in illuminating and lubricating constituents, and to lend itself readily to refining.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Blue Prints in Liberia.

Foreign Office Annual Series, No. 2875.

Among the cottons imported of German manufacture a favourite article is what is known as German "blaudrück" (blue print). Hitherto the British manufacturer has not succeeded in producing an exactly similar article. Several attempts have been made, but the difference has at once been detected, and the British-made print has become locally known as "imitation German." It is made in 12-yard pieces, 27 to 28 inches wide, and its selling price in Liberia is 8*s.* in cash, or 10*s.* in produce.

A sample of this material has been sent to the Association of Chambers of Commerce.

VII.—ACIDS, ALKALIS, SALTS, Etc.

Sulphur Trade of Sicily.

Eng. and Mining J., Aug. 2, 1902.

Since the organisation of the Anglo-Sicilian Sulphur Company, in which British and Italian capital is largely interested, the sulphur industry of Sicily has become more prosperous. The Anglo-Sicilian Company is in control of fully 85 per cent. of the sulphur production of Sicily, as a result of a long time agreement with the miners. The Company has a capital of less than 3,500,000 dols., upon which it has paid, in five years to 1901, dividends of 43¾ per cent. It is said that the profits from the sale of sulphur at ruling prices are large; but on the other hand, money is required to carry the heavy stocks now on hand. The financial standing of the syndicate is strong, and there seems little doubt that a change in the business policy will be made before the renewal agreement with producers comes up some time hence. In the meantime, there is competition with the outside operators, who produce about 15 per cent. of the sulphur. Occasionally the syndicate meets them with a small reduction in price.

The monthly exports from Sicilian ports, from Jan. to May inclusive, compare with last year as follows, in long tons :—

Month.	1901.	1902.
January	32,594	41,692
February	45,471	40,221
March	67,638	54,263
April	66,776	58,348
May	42,713	27,089
Total	255,192	231,611
U.S. imports	63,189	79,604

The decrease in this year's exports is equal to 9·3 per cent.; this is due chiefly to the curtailed consumption in France since the termination of the sulphur refiners' agreement with the Sicilian producers some months ago.

The imports into the United States this year have increased about 26 per cent. This is credited wholly to the paper-pulp manufacturers, as sulphuric acid makers are now using more pyrites owing to the high prices asked for sulphur.

Stocks at shipping ports in Sicily this year are considerably larger than in 1901. On Jan. 1, 1902, they were 310,123 tons, whilst a month later they were 315,634 tons, which is the largest in over two years. In March and April, heavy exports reduced the stock to 251,815 tons; on May 1 and on June 1, they were 262,292 tons, which compares with 172,509 tons, on June 1, 1901, and 186,290 tons, on June 1, 1900. The stocks show conclusively that the syndicate mines are producing a large quantity of sulphur, notwithstanding the curtailment in exports.

On the other hand prices continue to rule high. Below we give the average selling prices, f.o.b. shipping port in Sicily, in the five months ended May 31, as compared with the corresponding period last year :—

	1901.	1902.
	Dols.	Dols.
Best, unmixed, 2nds	18·72	20·21
„ „ 3rds	16·57	17·94
Current, 3rds	..	16·98
Refined block (100 %)	19·82	20·63
„ roll (casks)	21·57	22·86
Sublimed flowers, pure (bags)	23·59	24·60
„ „ current	22·56	22·67

There has been a marked increase in prices this year, and from present indications, the producing syndicate will not deviate from its policy.

Carbonic Acid Gas in the Bars of Passenger Steamers.

Bd. of Trade Notice, Aug. 1902.

The whole apparatus, including the cask containing the beer and the bottle containing the carbonic acid gas (CO_2), should be enclosed in a cupboard made of stout material and provided with a close-fitting door, well secured; the cupboard should be ventilated to the open air by means of a pipe of not less than 2½ inches diameter and the upper end protected by a goose-neck.

The pressure gauge, and the key for turning the valve of the bottle, to be outside the cupboard.

It is assumed that only one cylinder will be used at a time, that it does not contain more than 20 lb. of gas, and that it complies both as to materials and test with the specification of the Departmental Committee, a Summary of which will be found in the "Report of the Committee appointed to inquire into the Causes of the Explosion and the Precautions required to ensure the Safety of Cylinders of Compressed Gas" of 1896, pp. 22—24.

Potash Salts Industry in Germany.

Eng. and Mining J., Aug 2, 1902.

The production of potassium salts is steadily growing. Every effort is being made to induce agriculturists to use more potash salts, especially by the German Potash Syndicate. This syndicate includes about 20 of the best properties, fully one-half of which have already proved excellent investments, whilst the others, now in course of development, are yielding satisfactory profits. To show the magnitude of this business, the following are its shipments during 1900 and 1901, as officially reported, in metric tons :—

	1900.	1901.
Potassium chloride, 80 %	191,422	197,474
„ sulphate, 90 %	31,255	28,159
Sulph. pot.-magnesium, cryst., 40 %	882	751
„ „ calc., 48 %	12,150	11,750
Kieserite, calcined	358	361
„ blocks	28,508	26,727
Pot. manure salt, 20—40 %	125,089	140,683
Kainit and Sylvinit	1,099,631	1,347,323
Carnallite	58,358	85,245
Total tons	1,547,653	1,838,473

This table shows that there has been an increase of nearly 19 per cent. in the shipments in 1901, due chiefly to the heavy consumption of kainit and manure salt. Of the total shipped in 1901, the United States received 373,245 tons, or 20·3 per cent., as against 314,556 tons, or 20·3 per cent., in 1900. The heaviest buyers in the United States, the second largest consumers, are the Virginia-Carolina Chemical Co. and the American Agricultural Chemical Co. In order to obtain its supply of potash salts, the former recently sent experts to Germany to make proper arrangements, and after buying a promising independent property for a large sum, succeeded in inducing the German Potash Syndicate to make advantageous terms. Now the Virginia-Carolina Co. will receive its potash salts at lower prices than others, and it is likely that a similar arrangement will be made with the American Agricultural Chemical Co.

The consumption in Germany last year showed a substantial gain over 1900, owing to the heavy use by the beet-sugar growers. In 1901, the shipments of potash salts for German users aggregated 1,069,334 tons, equal to 58·2 per cent. of the total sold, as compared with 910,483 tons, or 58·8 per cent., in 1900.

Other large buyers, in 1901, were France, Great Britain, Norway and Sweden, Denmark, Belgium, and Holland. Russia is also consuming larger quantities than formerly, but the total is still too small to receive attention.

Mining is active in nearly every locality where indications warrant the expenditure. Renewed efforts are being made to sink deep shafts, as borings have shown an excellent quality of potash at 3,250 ft. The heavy flow of water at about 1,000 ft. and less has prevented the sinking of deep shafts. In fact, considerable money has already been spent in this direction without success. Three of the prominent companies—the Ronnenberg, the Benthe, and the Hansa-Silberberg — are sinking deeper shafts. The Benthe-Walmont Co. had a shaft down about 850 ft. when an inrush of water completely ruined the workings. Boring companies are busy proving ground, and in the Luneburger Heath field very satisfactory work is being done. The Einigkeit, also known as the trade union, near Ealiersleben, is drilling, and at a depth of 1,160 ft. has struck a layer of potash of first-class quality.

Fuller's Earth Production in the United States.

Eng. and Mining J., Aug. 2, 1902.

The reports made to the United States Geological Survey show that the production of fuller's earth, in 1901, was 14,112 short tons, an increase of 4,414 short tons, or 45 per cent. over the production of the previous year. This is the largest production since 1898. The greater part of last year's product was obtained from the vicinity of Quincy, Fla. Small quantities were contributed by three other States—Arkansas, Colorado, and New York.

Not only in the production, but also in the importation of fuller's earth into the United States, was there a noticeable

increase—of the unmanufactured materials, 2,918 long tons; of manufactured fuller's earth, 7,851 long tons; a total importation of 10,769 tons. During 1900, 8,173 long tons were imported.

Production of Salt in the United States.

Mineral Resources of U.S.A., 1901, *and Eng. and Mining J., Aug.* 9, 1902.

The production of salt in the United States, during 1900 and 1901, was the largest for any two individual years yet recorded.

The total production, in 1901, was 20,566,661 barrels of 280 lb. each, a decrease of 303,681 barrels, or 1·5 per cent. from the production of 20,869,342 barrels for 1900. The value of the salt produced, in 1901, was 6,617,449 dols., a decrease of 327,154 dols. from the value of 6,944,603 dols., in 1900. The corresponding figures for 1899 were 9,768,614 barrels, valued at 6,867,467 dols.

Under the production of salt is included salt in brine, which is used in very large quantities for the manufacture of soda-ash, sodium bicarbonate, caustic soda, and other sodium salts. During 1901, the United States manufactured 529,104 short tons of sodium salts of all varieties, and the quantity of salt, chiefly in the form of brine, required to make this product was in excess of 1,000,000 short tons, equivalent to more than 4,000,000 barrels.

Sulphuric Acid in Chile.

Bd. of Trade J., Aug. 28, 1902.

In the Chilean *Diario Oficial*, of 12th June last, was published the text of a law recently passed by the National Congress which reads as follows:—

Article I.—A bounty of 3 centavos will be given for each kilo. of sulphuric acid at 60° B. which is manufactured in the country, provided that the annual production of each factory is not less than 1,500 metric tons.

Article II.—In order to enjoy this bounty, those interested must commence the installation of their factories within a year of the promulgation of this law.

Article III.—The President of the Republic is authorised to expend 50,000 pesos annually for five years for the purpose of paying the bounties mentioned in Article I.

Article IV.—If the sum of 50,000 pesos be found insufficient to pay the bounty for the total production, it will be divided in the proportion of the production of each factory.

In connection with this subject, the *Bulletin Commercial* (Brussels) of 16th inst. points out that the necessary pyrites are very plentiful in Chile, and adds that sulphuric acid should find an important opening in the treatment by the wet process of poor copper ores, which are found abundantly in the Cordilleras.

Sulphate of Copper in Algeria.

Foreign Office Annual Series, No. 2881.

The British Vice-Consul at Bône reports that the demand for sulphate of copper increases, 190 tons being imported in 1901, of which 133 tons came from the United Kingdom.

IX.—BUILDING MATERIALS Etc.

Cement Imports of the United States.

Eng. and Mining J., Aug. 9, 1902.

Imports of cement of all kinds into the United States for the fiscal year ended June 30th are reported by the Bureau of Statistics as follows, in short tons:—

	1901.	1902.
Great Britain	30,212	9,716
Belgium	101,589	82,953
France	6,348	2,391
Germany	164,820	113,528
Other European countries	11,968	1,626
Canada	1,107	774
Other countries	3,341	934
Totals	319,385	211,922

A decrease was shown in every case. This illustrates the extent to which cement made in the United States is replacing the imported descriptions.

X.—METALLURGY.

Manganese Ore Production of the United States.

Eng. and Mining J., Aug. 2, 1902.

The total production of manganese ores in the United States, during 1901, as reported by the Geological Survey, amounted to 11,995 long tons, valued at 116,722 dols., as compared with 11,711 long tons, valued at 100,289 dols. in 1900, an increase of only 224 tons, or about 2 per cent. but the average value per ton increased from 8·52 dols., in 1900, to 9·73 dols., in 1901, or 1·21 dols. per ton.

In 1901, eight States contributed to the total, Alabama, Missouri and Utah being added to the 1900 list. Montana, a former producer, reported no ore mined. As in 1900, Virginia heads the list of production, Georgia being second and Utah ranking third; the combined product of these three States amounted to 10,849 tons, or 90 per cent. of the total for the United States. At no time since 1891 has the annual production of manganese ores exceeded 16,000 long tons, which suggests that the domestic manganese industry has not developed into one of importance so far as quantity is concerned. The bulk of the supply still comes from foreign countries.

The amount of manganese ores imported in the United States, during 1901, was 165,722 long tons, valued at 1,486,573 dols., or 8·97 dols. per ton, as compared with imports of 256,252 long tons, valued at 2,042,361 dols., or 7·97 dols. per ton, in 1900. In 1901, foreign ferro manganese and spiegeleisen were attractively low in price and a number of the largest companies preferred to import such manganese metal as might be required rather than to manufacture it.

The principal shippers to the United States, in 1901, were Brazil, Russia, Cuba, Turkey, Chile, and India, in the order named. The importation by customs districts shows that over half of the total foreign manganese ore was received at the port of Baltimore, and about one-seventh at Philadelphia. The average domestic production for 13 years was 13,949 long tons, valued at 125,773 dols., and the average imports in the same period amounted annually to 92,413 long tons, valued at 853,627 dols. Manganese ore to the amount of 21,627 long tons was imported into the United States from Cuba, in 1901, and it is probable that Cuba will continue to be an important source of supply of manganese ores for the United States. Russia is the largest contributor of manganese ores, nearly all the world's output being credited to that country. The greatest portion of this ore comes from the Caucasus district, followed in order by South Russia and the Ural districts. The imports into the United States from Russia, in 1901, amounted to 32,600 long tons. According to the latest obtainable figures, the production of manganese ore, for 1901, may be estimated for the most important producing countries, in long tons, as follows:—Russia, 646,582; India, 130,670; Brazil, 95,710; Spain, 90,224; Germany, 58,269; Turkey, 38,100; Chile, 31,477; and Cuba, 25,183.

Zinc Production of the United States.

Eng. and Mining J., Aug. 2, 1902.

The production and consumption of zinc in the United States, for 1901, as reported by the United States Geological Survey, is given, in short tons, in the subjoined table.

The increase in production, in 1901, was 13·7 per cent. The decrease in exports was 84·9 per cent. As heretofore the exports went chiefly to the United Kingdom, the quantity being 5,167,274 pounds for 1901, as compared with 33,378,240, in 1900.

The year 1901 was one of prosperity for the zinc mining industry of south-west Missouri and south-east Kansas, which district maintains its position. The production

inc ore in the Galena-Joplin district, in 1901, was 256,920 hort tons, valued at 6,318,249 dols., as compared with 44,629 short tons, valued at 6,583,944 dols., in 1900; an ncrease, for 1901, in quantity of 12,291 short tons, but a lecrease in value of 265,695 dols.

	1900.	1901.
roduction	123,886	140,822
xports	22,410	3,390
stimated consumption	99,445	141,697
Total	121,855	145,087
ecrease in stocks	..	4,265
ncrease in stocks	3,015	..

The imports of zinc, in 1901, amounted in value to 6,059 dols., as compared with 128,090 dols., in 1900, and ith 165,667 dols., in 1899.

The world's production of zinc, in 1901, is estimated at 01,494 long tons, as compared with 470,937 long tons, in 900, and with 481,854 long tons, in 1899. The United tates furnished, last year, 25·1 per cent. of the world's roduction. The largest producer in the world is the ieille Montagne Co. in Belgium, which has the record of 2,330 long tons, in 1901, as compared with 68,815, in 1900. he Lanyon Zinc Co. of Kansas would take rank as the econd largest producing company in the world, the next iree largest makers being in Silesia.

Zinc White.—The production of zinc white from ores, in 901, amounted to 38,889 short tons, as against 47,151 tons otal output in 1900. A new manufactory was started at Vest Plains, Mo., in December, by the Renfrew Zinc Oxide o., and the plant of the Ozark Zinc Oxide Co. at Joplin, lo., was building, though not completed at the close of the ear. Each of these is to have an estimated capacity of bout 2,000 tons of oxide per annum.

Copper Matte: Tariff Classification in Spain.

Bd. of Trade J., Aug. 14, 1902.

The *Gaceta de Madrid* for the 9th ult. contains a Royal ecree, dated the 28th June, according to which copper atte is to be classed on importation into Spain, under o. 72 of the Customs Tariff, dutiable at the rate of 0 pes.) cts. per 100 kilos. (2½*d.* per cwt.).

Mining in Norway.

Foreign Office Annual Series, No. 2873.

At the close of 1900, there were 14 groups of mines in orway embracing silver and silver ore, gold, copper ore, yrites (partly cupriferous), nickel ore, cobalt slick, iron re, zinc ore, chromium ore, manganese ore, molybdenite, atile, apatite, and felspar.

The most important copper mines are those at Röros, orked by the Bessemer process. Here, also, the most nportant chromium ores are found. The Rörus mines ffered from a strike last year, from March to the close of ie year, and only about 14,000 tons of ore were extracted, f which 8,000 tons were export pyrites, and 6,000 tons opper ore, yielding 341 tons copper. The Killingdale ines also turned out less, but the prices were good.

Next in importance are the Sulitelma mines in Salten, Nordland, employing about 700 men, and producing nnually about 30,000 tons of pyrites.

A copper mine has been started near Hammerfest on a nall scale, and the results so far appear good. It is in ontemplation to extend it considerably.

The apatite mines at Bamle, near Kragerö, have been malgamated; capital, 40,000*l.*

The Aamdal copper mines in Telemarken, which for a umber of years yielded between 5,000 and 6,000 tons of opper, have passed into the possession of a British firm, nd consequently increased export is looked for.

Mineral Production of British Columbia.

U.S. Cons. Reps., Aug. 12, 1902.

The following table shows the value of the mineral production of British Columbia, in 1901:—

	Dols.
Copper	4,446,963
Lead	2,002,733
Iron	17,238
Coal	4,880,993
Coke	635,405

Lead.—The production was 51,582,906 lb., worth 2,002,733 dols., a decrease in value of 689,154 dols., or about 25 per cent., as compared with the production of 1900, but in that year there was a phenomenal increase over 1899 of 206 per cent. The lead production of 1901 shows an increase over 1898 of 86 per cent., and over 1899, of 128 per cent.

Copper.—The production was 27,603,746 lb. of "fine copper," valued at 4,446,963 dols., an increase of 17,606,666 lb. and of 2,831,674 dols. in value over that of the previous year; it was derived from the following:—

	Lb.
Boundary district	14,511,787
Trail (Rossland) district	8,333,446
Coast district	3,115,872
Nelson district	1,599,449
Other districts	43,192
Total	27,603,746

Platinum.—A small quantity of platinum—about 457 dols. worth—was produced from the Similkameen district.

Ferro-Chrome: Customs Decision (United States).

Eng. and Mining J., Aug. 9, 1902.

Ferro-chrome is dutiable at the rate of 4 dols. per ton under the provisions of par. 122 of the Tariff, by similitude to ferro-manganese, and is not dutiable as a metal unwrought.

Tin Industry of Malay States.

Bd. of Trade J., Aug. 21, 1902.

In the report on the Federated Malay States, for 1901, it is stated that, whilst the average price of tin for the year was lower than in 1900—67·56 dols. per picul of 133⅓ lb. (108*l.* 15*s.* per ton) as against 74·15 dols. (132*l.* per ton)—the output was larger:—

	Quantity.		Value.	
	Piculs.	Tons.	Dols.	£
1900	713,000	42,449	52,800,000	5,500,000
1901	789,000	46,960	53,000,000	5,240,000

The output approximated to that of 1896, which ranks next to 1895, in which year the largest record for the Federated Malay States was obtained, *viz.*, 825,000 piculs, the sterling price being 62*l.* per ton only, or 32 dols. a picul.

The miners in Perak are reputed to have had, on the whole, a very good year, and their output increased; in Selangor there was an increased output also, but the miners are said not to have made much money, the latter remark applying to Negri Sembilan, where the output increased by some 3,000 piculs. Pahang, which produced 15,700 piculs in 1900, is credited with 26,300 piculs in 1901.

XII.—FATS, FATTY OILS, AND SOAP.

Cohune Palm-nut in British Honduras.

Bd. of Trade J., Aug. 14, 1902.

At Belize, British Honduras, a society has recently been formed, one of the objects of which is the utilisation of the nut of the Cohune palm, which grows in great abundance

over large portions of the Colony. If a machine for cracking the nuts and separating the kernels be procurable, a considerable trade in the kernels, which contain a large quantity of a superior quality of oil, is likely to arise. A recent report from the Imperial Institute places the value of these kernels at 15*l.* per ton.

Lamy (*Pendatesma Butyracea*) in French Guinea.

Foreign Office Annual Series, No. 2876.

With the view of inducing the natives to cultivate other things besides rubber, so as to render them less dependent upon that article, commencing from the year 1901, the head-tax will be payable, in all the rivers, in "Lamy," the native name for the fruit of *Pendatesma butyracea*, which is worth about 8*l.* per ton on the European market and is employed in candle and margarine manufacture. The cultivation of sesame and earthnuts is to be encouraged; 80 tons of picked seed of the latter have been obtained from Senegal and distributed.

Prepared Tallow—Alizarin Assistant: Customs Decision (United States).

Bd. of Trade J., Aug. 28, 1902.

Certain preparations of tallow for softening cloth were held to be dutiable as "non-enumerated manufactured articles" under section 6 of the Tariff, but the United States Treasury Department have now directed that prepared tallow of the above-mentioned descriptions is to be charged with duty as an "alizarin assistant," under par. 32 of the Tariff, at the rate of 30 per cent. *ad val.*

XIII. C.—INDIA-RUBBER, Etc.

Rubber in French Guinea.

Foreign Office Annual Series, No. 2876.

So as to improve the quality of Guinea rubber, a decree was issued, in May 1900, forbidding the sale of rubber in unopened bales. This has already had a good effect, as the natives, finding they were certain of detection, ceased adding foreign matter; but as the method of coagulating the rubber in calabashes ordinarily employed by the natives made it difficult to detect adulteration with resins, a further Decree was issued to the effect that, dating from the wet season of 1901, the only rubber allowed to be exported would be that prepared by the Foulah method, in red filaments, which was found to be the only one which permitted the detection of resinous adulteration.

Rubber Exports from Pará (Brazil).

U.S. Cons. Reps., Aug. 9, 1902.

According to the final returns, the shipments of rubber from the Amazon Valley this season amounted to 29,997 tons, or 2,317 tons more than in 1900—1901.

In the season just begun, it is believed that a record crop will be harvested. The rubber fields of the lower river, and especially on the islands, are failing, both in quantity and quality; but the decrease is made up by the development of new fields and the expansion of the old fields on the Upper Amazon.

Bolivia continues to offer inducements for the colonisation and development of her vast area of rubber territory.

The Government of the State of Amazonas has granted the privilege of receiving, cutting, and packing all the rubber produced in that State to one wharf company. The creation of this monopoly will injure the rubber trade of this region, but Peru, Bolivia, and Ecuador will be the beneficiaries, as rubber growers and gatherers here are seeking to escape the new restrictions, which entail considerable expense and trouble upon exporters.

Balata Gum in Brazil.

U.S. Cons. Rep., Aug. 14, 1902.

The balata, or bulle tree (*Minsaps balata*), known in the Brazilian language as the macaranduba, grows in great abundance throughout the Amazon Valley, but up to this time, no attempt has ever been made to introduce the gutta-percha trade into this country.

For more than 30 years, this trade has been carried on with profitable results in the Guianas and the Orinoco Valley, but those fields are now almost exhausted and very little gutta-percha has recently been shipped.

The balata trade can be made to rival the rubber trade in this country, as the balata can be produced here in unlimited quantities, and its quality is at least as good as the Guiana balata.

Balata trees have been found scattered and in groves sometimes amounting to forests many miles in extent, all over the States of Pará and Amazonas, and it is stated, on trustworthy authority, that vast areas of these trees are growing on the Purus and Acre rivers and other tributaries of the Upper Amazon River.

These trees yield many times as much sap as the rubber trees, and one man can easily produce as many kilos of gutta-percha in a day as 20 men can extract of rubber. The trees will average 3½ lb. of gutta-percha each, and a competent "bleeder" can prepare 40 to 50 lb. per day. The gum is first fermented and then dried in the sun, after which it is ready for shipment.

Concessions of balata fields of any extent can readily be secured from the Brazilian Government, and private balata lands can be purchased for a fair price. It only requires some capital and practical knowledge of the business to develop one of the greatest industries in Brazil.

XIV.—TANNING; LEATHER; GLUE, Etc.

Glove Industry in Germany.

J. Soc. Arts, August 1902.

Germany has of late years greatly increased her facilities in the glove making industry, and has overshadowed France in quantity of product at least. At the present time, 1,100 German concerns are engaged in this industry, the total output of 85 factories being for export alone. All but 10 of the factories are entirely occupied with the kid glove industry. Germany has also 100 tanneries for kid leather and over 40 for shoe leather. The glove industry is scattered all over the German empire, Thuringia and Saxony having most factories. Other European nations interested in the manufacture of gloves are Austria-Hungary, 350 factories, nearly all at Vienna and Prague; France, 225 factories, with trade headquarters at Paris, Grenoble, and Chaumont; England, about 190 factories situated in London and Worcester; Italy, 100 factories, at Naples, Milan, and Turin; Sweden, 60 concerns, mostly at Stockholm and Malmö; Norway, some 50 factories scattered over its land; Spain, about the same number; Russia, some 25 large concerns and about 10 smaller; and Belgium, with her only important makers (very few in number) at Brussels.

XV.—MANURES.

Phosphates in Porto Rico.

Eng. and Mining J., August 2, 1902.

Deposits of phosphate of lime are found at San Germán, Cabo Rojo, Lajas, Isabela, Manati, Ponce, and Pueblo Viejo. The largest deposits are on the islands of Caja de Muertos and Mona.

The island of Caja de Muertos is situated south of Porto Rico, about eight miles from Ponce harbour, and contains both phosphates and guano, analyses of which have shown satisfactory results.

The island of Mona is situated west of Porto Rico, about 34 miles from the city of Mayagnez, and is said to contain rich deposits.

XVI.—SUGAR, STARCH, Etc.

New Italian Sugar Law.

Bd. of Trade J., August 14, 1902.

An Italian law, dated the 2nd July, 1902, affects the classification for tariff purposes, of sugar imported into Italy, the method of assessing duties on sugar of home production, and other matters connected with legislation concerning sugar.

Art. 1 of this law enacts that the previously existing method of classifying imported sugars by the Dutch colour standards is to be substituted by the following:—"All sugar, the refined product of which is above 94 per cent.

classified as being of the first quality. The product is ained by deducting from the percentage of saccharose percentage of soluble ash multiplied by five. All ar combined with substances tending to diminish the duct is also classified as being of first quality." It is ther provided, by Art. 8, that the drawbacks of duties herto granted on products containing sugar when ex- ted abroad "will be modified by Royal Decree in such manner that the reimbursement of the home tax on nufacture fixed for sugars of the first quality shall l equivalent to the quantity of sugar added to the ducts."

Sugar Export Trade of Russia.

Bd. of Trade J., August 14, 1902.

n the *Journal de St. Pétersbourg*, of 25th June/8th July, ublished the text of a detailed note sent by the Russian vernment to the signatory powers of the sugar conference Brussels. The following figures, taken from this note, w the average annual export of Russian sugar to a:—

	Pouds.
1886—1889	1,053,000
1890—1893	1,477,000
1894—1897	1,905,000
1898—1901	2,665,000

The export of Russian sugar to Asia has increased from ,000 pouds, in 1886, to 2,926,000 pouds, in 1901. The ort to European countries represented, in 1901, only per cent. of the production of the country.

The following table shows the quantity of sugar exported Europe and Asia during each of the last seven years :—

——	Europe.	Asia.
	Pouds.	Pouds.
1895	3,876,776	1,771,251
1896	11,506,556	1,941,779
1897	4,558,304	2,372,914
1898	3,594,971	2,157,655
1899	3,405,295	2,527,763
1900	6,915,000	3,052,000
1901	2,874,000	2,926,000

ustoms Tariff on Sugar, Glucose, and the like in the United Kingdom.

Bd. of Trade J., Aug 21, 1902.

Articles.		Rates of Duty.
		£ s. d.
cose, solid	the cwt.	0 3 3
„ liquid	„	0 2 6
king, liquid, containing sugar or any ber sweetening matter. (Together with the duty on any proof spirit contained therein.)	„	0 1 0

accharin allowed to be imported only at Dover, Folke- ie, Goole, Grangemouth, Grimsby, Harwich, Hull, Leith, ndon, Newhaven, Southampton, and West Hartlepool. Not allowed to be imported through Foreign and Colonial rcel post.

Sugar Production in Germany.

Bd. of Trade J., Aug. 28, 1902.

The *Reichs-Anzeiger*, for the 13th inst., contains a statement of the production of sugar in Germany during the sugar campaign just ended (Aug. 1, 1901, to July 31, 1902). The quantity of raw beets used in the 1901–2 sugar campaign was 15,999,780 tons, as compared with 13,253,908 tons in the preceding campaign; in addition, certain quantities of sugar and of sugar refuse were also used as raw materials. The amount of raw and refined sugar produced in Germany during the 1900–1 and 1901–2 campaigns was as follows:—

——	August, 1900, to July, 1901.	August, 1901, to July, 1902.
	Metric Tons.	Metric Tons.
Raw sugar	1,740,451	2,030,982
Refined sugar	1,292,167	1,345,686

Sugar Bounties in France.

Bd. of Trade J., Aug. 28, 1902.

A Presidential Decree fixes the rates of the direct bounties to be allowed on sugar, the produce of France and the French Colonies, declared for exportation on and after Sept. 1 next. The following is a translation of the Decree, which bears date Aug. 14, 1902:—

Art. 1. The bounties which will be granted to French native or Colonial sugars, declared from Sept. 1, 1902, for exportation to foreign countries and to the French Colonies not subject to the Metropolitan Customs Tariff, are fixed as follows:—

Raw sugar in grains or small crystals testing at least 98 per cent. for beet sugar or 97 per cent. at least for Colonial sugar, the testing being made before allowance for waste in refining, per 100 kilos. of refined sugar, 1 fr. 27 c.

(Sugars of this class, liable to duty, and exported abroad directly by the manufacturer, when they polarise 92·75 per cent. at least, will be considered as refined sugar, without any deduction on account of drawback in favour of the manufacturer.)

Raw sugar testing from 65 to 97 per cent. for beetroot sugar, or from 65 to 97 per cent. for French Colonial sugar, per 100 kilos. of refined sugar, 1 fr. 11 c.

Sugar candies, calculated at their legal coefficient; refined sugar in loaves or pieces, perfectly pure, hard and dry, per 100 kilos., 1 fr. 43 c.

"Vergeoises," per 100 kilos. of refined sugar, 1 fr. 43 c.

Refined sugar in grains or crystals, testing at least 98 per cent., per 100 kilos. of refined sugar, 1 fr. 27 c.

(If the sugars of this last-named class polarise at least 99·75 per cent. they will be considered as pure refined sugars, and the export certificates therefor will be accepted in discharge of temporary admission bonds for their total weight, without any deduction.)

Sugar in Roumania.

Foreign Office Annual Series, No. 2874.

In view of a recent law passed, imposing a tax of 15 c. per kilo. on all sugar exported, it may be of interest to trace the development of this industry.

Name of Manufactory.	Year.	Amount of Sugar.			Home-made Sugar Consumed.	Total Home Consumption.
		Home Manufactured.	Imported.	Exported.		
		Tons.	Tons.	Tons.	Tons.	Tons.
ut	1896-97	1,708	15,015	..	2,816	17,831
ila, Sascut	1897-98	3,322	15,041	..	2,757	17,798
„ „ Mnrasesti	1898-99	10,576	15,535	..	5,429	20,964
„ „ „	1899—1900	8,353	7,948	..	8,355	16,303
ila, Sascut, Marasesti, Roman, rinceni.	1900-01	18,714	3,645	2,678	11,650	15,295
ila, Sascut, Marasesti, Roman, rinceni, and Ripiceni.	1901-02*	6,521	223	3,707	7,284	7,510

* Six months.

The law of May 14, 1896, gave a great impetus to the development of the sugar trade by granting a bounty of 16 c. per kilo. on all sugar manufactured in the country, as well as putting on a heavy duty of 35 c. per kilo. on all imported sugar. In the five years that have elapsed since the application of the law, not only has the supply of sugar been equal to the home demand, but a considerable export trade has grown up.

XVIII. B.—SANITATION.

Sewage Commission Report.

The Commissioners appointed, in 1898, to inquire and report as to what methods of treating and disposing of sewage may properly be adopted, have issued their second report as follows:—

We, the undersigned Commissioners appointed to inquire into the subject of the Treatment and Disposal of Sewage (including any liquid from any factory or manufacturing process), desire humbly to submit to Your Majesty the following reports, which have been made by the officers appointed by us for the purpose of our investigations:—

(1) The Oxidation of Sterile Sewage, by Mr. Colin C. Frye; (2) The Manchester Experiments, by Professor Boyce and Dr. G. McGowan; (3) Bacteriological Standards in relation to potable and non-potable streams, by Dr. A. C. Houston; (4) Anthrax in Yeovil Sewage, by Dr. A. C. Houston; (5) The Subcutaneous Injection of Animals, by Dr. A. C. Houston; (6) The Longevity of *B. Typhosus* in Sewage, by Dr. A. MacConkey; (7) Effect of Filtration in reducing the number of Bacteria in Sewage Effluents, by Professor Boyce and Drs. MacConkey, Grünbaum, and Hill; (9) The Self-purification of the River Severn, by Mr. Colin C. Frye; (10) Some of the chief methods used in the Bacteriological Examination of Sewage and Effluents, by Dr. A. C. Houston.

The report is signed by Lord Iddesleigh (chairman), Lieutenant-Colonel C. Phipps Carey, Sir Michael Foster, Lieutenant-Colonel T. Walter Harding, Professor Sir William Ramsay, Dr. J. B. Russell, and Mr. W. H. Power; and by Mr. F. J. Willis, as Secretary. The various reports alluded to are contained in the Blue-book.

XIX.—PAPER, PASTEBOARD, Etc.

Pulp and Cellulose in Norway.

Foreign Office Annual Series, No. 2873.

British paper manufacturers are the chief consumers of mechanical wood-pulp. Production in the autumn was restricted by the want of water, but the year 1901 was a better one than 1899. The quantity exported is given in the following table:—

Year.	From all Norway.		From Christiania.	
	Dry.	Wet.	Dry.	Wet.
	Tons.	Tons.	Tons.	Tons.
1901	18,839	294,932	6,695	35,977
	21,228	297,098	6,670	38,052

The total value exported, in 1901, was 762,159*l.*, as against 730,247*l.*, in 1900.

There were two new mills capable of producing jointly 17,000 tons during the year.

Of the total quantity of 421,006 tons of pulp and cellulose exported in 1900, the United Kingdom took 275,201 tons.

The production was about the same as in 1900, in some cases less, but prices were lower.

Cellulose was subject to the same influences as pulp. Less of this article was exported than in 1900, and the value was also less in proportion. The principal demand was for the better qualities, the lower descriptions fetching very low prices. For 1901, the total estimated quantity and value exported was 93,789 tons and 656,846*l.*, against 102,680 tons and 762,077*l.*, in 1900. As in t case of pulp the United Kingdom took the bulk of t exportation.

Paper Industry of Germany.

U.S. Cons. Reps., Aug. 12, 1902.

Owing to the favourable condition of the paper industr contracts for wood-pulp, for 1901, were readily closed; h the long drought caused a lack of water power, which turn decreased the production, and Canadian and Sca dinavian competition, as well as the general busine depression, caused a decrease of sales and demand for low prices towards the end of the year.

The price of pine wood, which had steadily increase seems to be at a standstill, as consumers have combined make purchases direct, instead of through middlemen.

Wood from Finland is able to compete, on account of quality, when the transportation charges are not too high

The printing-paper factories have formed a combinati to regulate sales, but their efforts are confined chiefly to t export trade. The production of these works has decreas some 15 to 20 per cent.

The home industry in wood-pulp desires that the prese duty on dry pulp, of 1 mark per 100 kilos., be raised 3 marks per 100 kilos., and that moist pulp pay 2 mar per 100 kilos.

The following table shows the trade in packing-paper i the years 1900 and 1901:—

Description.	Import.		Export.	
	1901.	1900.	1901.	190(
	Cwt.	Cwt.	Cwt.	Cwt
Ordinary	5,120	4,969	176,123	173,1
Smooth	32,591	33,037	255,392	285,2

XX.—FINE CHEMICALS, Etc.

Tung [Wood] Oil; its Sources, Character, and Uses.

Hankow, which is the chief centre of the wood-oil tra receives its main supply from Ch'en-chou in Hunan, wh the oil costs about 6 c. per picul. The oil is also produ at T'ung-jên-tu, in the Kwei-Chow province, and at Fuch Wanhien, and Chung-chow in the province of Szechu. The oil collected at Hankow is nearly all exported to ot Chinese ports; in 1901 the exports were 334,025 c. Wuchow, which is a minor centre of the trade, receives oil from various parts of its own province of Kwan throughout which the tree appears to be well distribut. From Wuchow the oil is carried to Hong Kong, and the distributed to the southern provinces or re-exported. 1901 the exports were 37,058 cwt.

In Japan the tree is known as Jamagiri; it is wid distributed. The small quantity of exported oil is ship at Hokkaido. There is little doubt that, with a grow demand in Europe and America, both China and Ja would soon be able largely to increase their exports. 1900 Shanghai imported 124,336 cwt., and re-expor 56,418 cwt. to other Chinese ports, and 24,924 cwt. foreign countries and Hong Kong. The total export fr China is a small fraction of the home consumption.

In China the best quality is used for varnishing furnitu a thicker and darker quality for making putty and varn ing shop fronts and junks. An enormous quantity is u for the last-named purpose; into Chinkiang alone 150,0 piculs are annually imported for native use. The oi applied hot to the bottoms of the boats; thin coats of c oil are used on the unsubmerged parts. Paints are made fr galena and other ores. The oil is also used for burn waterproofing umbrellas, in the manufacture of high-c silks, and in making ink and cement. (See also Journal, 1899, 283; 1900, 156, 359; 1901, 261, 485.)

—A. C. W

Saccharin Prohibition Law in Germany.

Bd. of Trade J., Aug. 14, 1902.

In the *Deutscher Reichs-Anzeiger* for the 21st ult. is published the text of a law prohibiting the production, importation, or sale in Germany of substances possessing a higher sweetening power than refined cane or beet sugar, and not possessing corresponding nutritive qualities. Exception is made in cases where such substances are intended for medicinal or scientific purposes.

This law came into force on April 1 last, and supersedes that of July 6, 1898.

Saccharin Prohibition Law in Italy.

Bd. of Trade J., Aug. 14, 1902.

Article 9 of the law of July 2, 1902, prescribes the penalties which will be incurred by anyone illegally importing, manufacturing, keeping, or selling saccharin or similar substances or goods containing such products.

Saccharin and Substances of a like Nature or Use.

British Customs Order.

A further General Order, dated Aug. 12, 1902, has been issued by the Commissioners of H.M. Customs, relative to the treatment, for Customs purposes, of saccharin and mixtures containing saccharin or similar substances. The following is the text of the Order:—

"Notice is hereby given that the Lords of the Treasury have directed that, on and after the 1st prox., the full rate of duty of 1*s.* 3*d.* an ounce be charged on all importations of saccharin, *and mixtures containing saccharin or other substances of like nature or use*, in accordance with the provisions of Sec. 7 of the Finance Act, 1901, and the Customs Tariff Act, 1876.

"Under this Order no questions will arise in respect of importations already assessed for duty which may be remaining in bond on and after the 1st prox. In all such cases the original assessment is to stand."

Perfumed Spirits, Ether, Chloroform, &c. Customs Treatment (United Kingdom).

Bd. of Trade J., Aug. 21, 1902.

Articles.		Rates of Duty.
IMPORT DUTIES.		£ *s.* *d.*
Perfumed spirits ..... per liquid gall. and so on in proportion for any less quantity. Any importations of naphtha or methylic alcohol purified so as to be potable are rated under the heading of unenumerated spirits.	0 18 1	0 19 1
Chloroform	the lb.	0 3 3
Chloral hydrate	„	0 1 4
Chlodion	the gall.	1 6 3
Ether, acetic	the lb.	0 1 11
„ butyric	the gall.	0 16 5
„ sulphuric	„	1 7 5
Ethyl bromide	the lb.	0 1 1
„ chloride	the gall.	0 16 5
„ iodide	„	0 14 3
Ether, transparent, in the manufacture of which spirit has been used.	the lb.	0 0 3

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 18,165. Prest and Rogers. Drums, tins, cans, &c., for oils, &c. Aug. 18.

„ 18,240. Nash. Abrading machines. Aug. 19.

„ 18,242. Winter. Devices for distinctly separating the different discharge of fluids within a centrifugal machine. Aug. 19.

„ 18,335. Albany Mfg. Co., Ltd., and Lamplough. Condenser. Aug. 20.

„ 18,383. Riley and Strathy. Blow-pipes. Aug. 21.

„ 18,502. Skaife. Manufacture of tanks, &c. Aug. 22.

„ 18,566. Baechler. Filtering apparatus.* Aug. 23.

„ 18,579. Müller. Process of and apparatus for fractional distillation.* Aug. 23.

„ 18,587. Jottrand. Oxyhydrogen blow-pipes. Aug. 23.

„ 18,594 Macfarlane. Centrifugal machines. Aug. 25.

„ 18,652. Kessler. Centrifugal machines. Aug. 25.

„ 18,779. Lake (Maschinenfabr. Buckau). Apparatus for purifying waste-liquors, &c., and dehydrating the residues contained therein.* Aug. 26.

„ 18,830. Reese. Extracting. Aug. 27.

„ 18,894. Pott and Williamson. Suspended self-balancing centrifugal machines. Aug. 28.

„ 19,002. Welch and Poole. Methods of heating drying, and subdividing materials.* Aug. 29.

„ 19,027. Gau. Filters. Aug. 29.

„ 19,034. Von Seemen. Evaporating apparatus.* Aug. 29.

„ 19,060. Macfarlane. Centrifugal machines. Aug. 30.

„ 19,069. Pott, Cassels, Cassels, Williamson, and Stuart. Centrifugal machines. Aug. 30.

[C.S.] 17,276 (1901). Wright. Better detection of the surreptitious abstraction of the contents of casks, barrels, drums, &c., containing fluids. Aug. 27.

„ 17,478 (1901). Macfarlane and Robertson. Centrifugal machines. Aug. 27.

„ 18,335 (1901). Naef. Treatment of liquids for the precipitation of solids for evaporating or distilling them. Aug. 27. (International Patent, April 18, 1901.)

„ 18,373 (1901). Wilson and Wilson Filter Syndicate, Ltd. Filter presses. Sept. 3.

„ 18,748 (1901). Naef. Treatment of materials with liquids and gases or vapours. (International Patent, April 18, 1901.)

„ 18,749 (1901). Naef. Treatment of solids, liquids, and gaseous fluids. Sept. 3. (International Patent.)

„ 20,489 (1901). Lever. Cooling towers. Aug. 27.

„ 21,142 (1901). Roberts. Means or apparatus for use in filling bottles, jars, cans, canisters, &c., with liquid or semi-liquid substances. Sept. 3.

„ 13,484 (1902). Scotch and Irish Oxygen Co., Ltd. and Carty. High-pressure stop-valves. Aug. 27.

II.—FUEL, GAS, AND LIGHT.

[A.] 18,130. Raynaud and Raynaud. Process and apparatus for carburetting air or gas for lighting or heating or actuation of internal-combustion motors. Aug. 18.

„ 18,131. Marshall. Apparatus for conveying or transporting incandescent coke from gas-works retorts. Aug. 18.

„ 18,133. Boult (New Process Lighting Co.). Gas-lamps.* Aug. 18.

„ 18,171. Johnson (Bullitt). Combustion of carbonaceous fuel in furnaces.* Aug. 18.

„ 18,206. Proctor. Automatic coal-feeding of gas-producers. Aug. 19.

„ 18,222. Sugg. Production of incandescence bodies for use in incandescent gas lighting. Aug. 19.

„ 18,233. Leask. Construction of furnaces and the supply and control of air to the same. Aug. 19.

„ 18,234. Stillman. Hydrocarbon lamps.* Aug. 19.

„ 18,238. Claydon. Apparatus for delivering steam and forced draught to the furnaces of boilers and the like.* Aug. 19.

„ 18,241. Castelnau. Process and apparatus for feeding boilers with instantaneous vaporisation. Aug. 19.

„ 18,310. Tresenreuter. Apparatus for mixing air and gas.* Aug. 20.

„ 18,317. British Thomson-Houston Co., Ltd. (Wood). Electric-arc lamps. Aug. 20.

„ 18,319. British Thomson-Houston Co., Ltd. (Fleming). Electric-arc lamps. Aug. 20.

„ 18,363. Meinhardt. Automatic acetylene safety-lamp. Aug. 21.

„ 18,396. Moeller. Apparatus for the automatic generation of acetylene gas. Aug. 21.

„ 18,401. Petitpierre. Acetylene burners. Aug. 21.

„ 18,461. Pearson. Portable incandescent electric lamps or torches. Aug. 21.

„ 18,499. McLean. Mode and means for treating peat. Aug. 22.

„ 18,501. Clarkson and Clarkson and Capel Steam Car Syndicate, Ltd. Oil-fuel burners. Aug. 22.

„ 18,510. Smith (Macklin). Hydrocarbon vapour-burning lamps or apparatus. Aug. 22.

„ 18,533. Ward, jun., and Weeks. Arc-lamps. Aug. 23.

„ 18,590. Soc. Houdaille et Triquet. Burner for use in incandescent gas lighting.* Aug. 23. (French Application.)

„ 18,599. Tee. Gas-lighting torches. Aug. 25.

„ 18,629. Johnson. Marine torches and marine torch-burners. Aug. 25.

„ 18,634. Hinckesman. Burners for incandescent gas lighting. Aug. 25.

„ 18,643. Lowen. Incandescent gas burners. Aug. 25.

„ 18,644. Lyman. Hydrocarbon generators and burners.* Aug. 25.

„ 18,648. Hurwitz and Schapiro. Petroleum Bunsen or blue burners. Aug. 25.

„ 18,649. Boult (Cie. pour la Fabrication des Compteurs et Matériel d'Usines à Gaz). Gas-purifiers. Aug. 25.

„ 18,658. Milne. Composite peat blocks.* Aug. 25.

„ 18,665. Abel (Watergas-Maatschappij Systeem Dr. Kramers and Aarts). Process and apparatus for the manufacture of combustible gas. Aug. 25.

„ 18,698. Platt. Incandescent gas burners. Aug. 26.

„ 18,730. Hunt. Safety tube lamp. Aug. 26.

„ 18,786. Bremer. Electric-arc lamps. Aug. 26.

[A.] 18,796. Crossley. Crossley's "perfect anti-vibrator" for factory, weaving-shed, and workshop lighting with incandescent gas. Aug. 27.

„ 18,798. Eccles and Standale-Haslolme. Manufacture of fire-lighters, briquettes, &c. Aug. 27.

„ 18,824. Horvath. Electric glow-lamps. Aug. 27.

„ 18,828. Baudoux and Plott-Keen. Economic burner. Aug. 27.

„ 18,844. Lucas and Allgemeinebeleuchtungs und Heiz-Industrie Akt.-Ges. Incandescent petroleum burners.* Aug. 27.

„ 18,867. Schill and Hills. Construction and working of producer-gas generators. Aug. 28.

„ 18,886. Gans. Means for regulating the electric current employed in joining the carbon filaments of electric incandescent lamps, mine-firers, &c., to the connecting wires by means of electrolysis. Aug. 28.

„ 18,892. Crossley and Rigby. Gas-producers. Aug. 2

„ 18,914. Hoyne. Burner for oil-vapours. Aug. 28

„ 18,938. Winter. Gas heating-appliances.* Aug. 2

„ 18,942. Imbert. Gas-lamps. Aug. 28.

„ 18,950. Winter. Mixed gas- and air-burners. Aug. 28.

„ 18,979. Old and Clough, as "Crown" Disinfect Fire-lighter Co. "Crown" disinfector fir lighter.* Aug. 29.

„ 18,981. Pease. Method of and apparatus for coo ing, for subsequent purification, by the extracti of dust, of the combustible hot gases exhaust from blast and other furnaces, whereby the h water derived from cooling the gas is utilised f various purposes, such as the treatment of brir Aug. 29.

„ 19,047. Nocolson and McLean. Combined liqui fuel pressure furnace and steam-generator. Aug. 3

„ 19,055. Cox. Safety lamp. Aug. 30.

[C.S.] 10,680 (1901). Blanchard. Hydrocarbon vapo burners. Sept. 3.

„ 14,536 (1901). Turner and Wood. Inclined ga retort coal-stops. Aug. 27.

„ 17,048 (1901). Lake (Boullet). Smoke-consumi apparatus. Sept. 3.

„ 17,282 (1901). Drake and Ram and Nernst Electr Light, Ltd. Incandescent electric lamps of t "Nernst" type. Sept. 3.

„ 17,286 (1901). Winn and Wilkes. Method deflecting heat and smoke from lamps and burne Aug. 27.

„ 19,444 (1901). Laxton. Acetylene gas generato Sept. 3.

„ 19,483 (1901). Christen and Aschner. Wick-burn for incandescent spirit light. Sept. 3.

„ 19,899 (1901). Thompson (Darby). Apparatus f compressing fuel for coke-ovens, &c. Sept. 3.

„ 20,302 (1901). Sugg. Burners for incandesce lighting. Sept. 3.

„ 20,361 (1901). de Thiersant. Apparatus for gen rating acetylene gas. Aug. 27.

„ 21,056 (1901). Jandus Arc Lamp and Electric C Ltd., and Jones. Electric-arc lamps. Aug. 27.

„ 21,089 (1901). James. Vaporisers for oil or hydr carbon engines. Aug. 27.

„ 21,720 (1901). Humphrey. Purification of gas Sept. 3.

„ 25,394 (1901). Imray (Coppée). Apparatus f regulating the pressure of gas. Sept. 3.

C.S.] 3852 (1902). Arnholt. Smoke-consuming apparatus for steam-boiler and other furnaces. Sept. 3. (International Patent.)

„ 4851 (1902). Mackie. Gas-detecting device for miners' safety lamps. Sept. 3.

„ 5193 (1902). Bleckly, Atherton, and Massey. Furnace charging and distributing apparatus. Sept. 3.

„ 12,063 (1902). Allison (Smoke Exterminator and Fume Condensers Co.). Means for condensing smoke, fumes, and gases. Sept. 3.

„ 12,559 (1902). Roberts and Roberts. Furnaces. Sept. 3.

„ 12,737 (1902). Swan. Blowing-off machines for electric lamp bulbs or other glass bodies. Sept. 3.

„ 12,738 (1902). Swan. Means or apparatus for effecting an all-glass seal between the stem which carries the filament of an incandescent electric lamp and the enclosing bulb. Sept. 3.

„ 12,739 (1902). Swan. Bases for incandescent electric lamps, and means or apparatus for manufacturing same. Sept. 3.

„ 13,611 (1902). Bergfleth. Furnaces. Sept. 3.

„ 13,772 (1902). Donohue and Moran. Devices for preventing the escape of smoke from chimneys and smoke stacks. Aug. 27.

„ 15,106 (1902). Boult (Hooley and Ford). Apparatus for automatically controlling an injection of steam and air into boiler furnaces for smoke-consuming purposes. Aug. 27.

„ 15,970 (1902). Mower. Apparatus for heating or cooling air or other gases. Sept. 3.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

A.] 18,579. Müller. *See under* I.

„ 18,728. Macalpine and Alcohol Syndicate, Ltd. Refining mineral or petroleum oils. Aug. 26.

IV.—COLOURING MATTERS AND DYESTUFFS.

A.] 18,127. Imray (Basle Chem. Works). Manufacture of indoxyl and its derivatives. Aug. 18.

„ 18,139. Newton (Farbenfabr. vorm. F. Bayer and Co.). Process for obtaining on wool fast black shades. Aug. 18.

„ 18,255. Lake (Chem. Works formerly Sandoz). Manufacture of sulpho-acids of aromatic aldehydes and the production of colouring matters therefrom. Aug. 19.

„ 18,569. Newton (Farbenfabr. vorm. F. Bayer and Co.). Manufacture and production of new azo-dyestuffs. Aug. 23.

„ 18,667. Abel (Akt.-Ges. f. Anilin Fabr.). Manufacture of new sulphurised colouring matters and of intermediate products for use therein. Aug. 25.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

A.] 18,277. Bakau Co., Ltd., and Meikle. Tanning, dyeing, and similarly treating nets, ropes, and textiles, and apparatus therefor. Aug. 20.

„ 18,596. Heaton (Rudolph and Kühne). Apparatus for finishing textile fabrics. Aug. 25.

„ 18,684. Leuscher and Leuscher. Thread or fabric with metallic or metallically glittering coating, and method of producing same.* Aug. 25.

[A.] 18,756. Wetter (Holle and Co.). Apparatus for treating textile material with liquids for dyeing, bleaching, and other purposes. Aug. 26.

„ 18,916. Krihbe and Burrows. Machinery for treating hemp and other fibrous stems or fibrous leaves, such as *phormium tenax* or agaves, &c., in the preparation of same for spinning. Aug. 28.

[C.S.] 20,281 (1901). Boult (Port). *See under* XIII. A.

„ 21,272 (1901). Newton (Farbenfabr. vorm. F. Bayer). Printing with the aid of dyestuffs containing sulphur. Sept. 3.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[A.] 18,593. Heys (Schreiber and Levinstein). Printing and reproduction of pictures and blocks, and printing surfaces therefor.* Aug. 25.

„ 18,696. Turner. Electric-chemico process of printing newspapers, posters, sheets, hooks, &c., without the use of ink. Aug. 26.

[C.S.] 20,281 (1901). Boult (Port). *See under* XIII. A.

„ 10,510 (1902). Sanderson and Humphrey. Means for rendering washable paper which has been printed or treated with water colours. Aug. 27.

„ 14,518 (1902). Pfister. Apparatus for impregnating and (or) dyeing timber. Sept. 3.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 18,202. Fletcher. Means to be employed for discharging and refilling metallic capsules or other vessels with compressed gases. Aug. 19.

„ 18,342. Rosenberg. Oxygen-generating apparatus. Aug. 20.

„ 18,427. Pauling. Process for the production of nitric acid, and apparatus therefor. Aug. 21.

„ 18,449. Tee. Manufacture of salt. Aug. 22.

„ 18,540. Carty. Apparatus for aërating or gasifying liquids. Aug. 23.

„ 18,581. Crocker. Capsule to hold compressed gas for use in aërating liquids. Aug. 23.

„ 18,622. Angel. Manufacture of caustic soda as a by-product from the reduction of refractory and other ores. Aug. 25.

„ 18,779. Lake (Maschinenfabr. Buckau). *See under* I.

„ 18,863. Smith. Means and material for absorbing ammonia from gaseous mixtures, with simple method of recovering the ammonia and also the absorbent for use over again. Aug. 27.

„ 18,930. Polzeninsy. Nitrogen compounds, and process for manufacturing same. Aug. 28.

„ 18,947. Conroy, Shores, and United Alkali Co., Ltd. Manufacture of sodium hypochlorite. Aug. 28.

[C.S.] 2144 (1902). Malmendier and Stühler. Apparatus for saturating liquids with gases. Sept. 3.

„ 15,667 (1902). Osenbrück. Absorber for ammonia absorption, refrigerating, and like machines. Sept. 3.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 18,494. Evans. Manufacture of glass mirrors.* Aug. 22.

„ 18,772. Adams. Apparatus for moulding hollow articles in clay or other plastic material.* Aug. 26.

„ 19,005. Doulton and Pleace. *See under* XVIII. B.

[C.S.] 17,920 (1901). Shore. Potters' jiggers for making dishes of circular, oval, or other forms. Sept. 3.

[C.S.] 8827 (1902). Aynsley and Illingworth. Pottery-ware cups, and beer, wine, spirit, &c. glasses. Aug. 27.

„ 12,737. (1902). Swan. *See under* II.

„ 14,441 (1902). Miller and Trades Progress Co., Ltd. Gathering or extraction of definite quantities of molten glass from tanks or pot-furnaces, and delivering the same to moulds or other receptacles. Sept. 3.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 18,123. Alker and Vinzelberg. Apparatus for impregnating roofing paste-board with tar, &c. Aug. 18.

„ 18,184. Sellars. Paving-tiles or slabs. Aug. 19.

„ 18,476. Beaumel. Manufacture of an improved composition forming an imitation of statuary marble, onyx stone, polychromatic materials, &c. Aug. 22. (French Application.)

„ 18,506. Lake (Gnissani). Apparatus for impregnating wood.* Aug. 22.

„ 18,583. Livingstone and Sanitary Block and Tile Pavement Co., Ltd. Manufacture of blocks and tiles for paving, &c. Aug. 23.

„ 18,617. Musker. Hydraulic machinery for making artificial paving-slabs and similar blocks.* Aug. 25.

„ 18,829. Salamon and Williams. Manufacture of artificial stone or other refractory material. Aug. 27.

„ 18,849. Bowley and Lea. Manufacture of fireproof material for covering walls, partitions, and other surfaces, also for use as advertising plates, &c. Aug. 27.

„ 18,876. Dunwoodie and Dunwoodie. Machines for making bricks, also applicable for making rivets, bolts, &c., from plastic or semi-dry materials or metal in a softened state. Aug. 28.

„ 18,884. Musker. Machinery for making artificial slabs and other blocks. Aug. 28.

„ 18,953. Passow. Process for producing cement. Aug. 28.

[C.S.] 18,207 (1901). Fletcher, Neil, and Fletcher, Russell, and Co., Ltd. Fire-brick back for iron-fret fires. Aug. 27.

„ 19,052 (1901). Foxworthy and Moore. Construction of boiler-flue arches. Sept. 3.

„ 26,437 (1901). Sellars. Manufacture of building blocks, or tiles, or artificial stone. Aug. 27.

„ 9332 (1902). Lake (Warren). Manufacture of and method of using asphalts, cements, and compositions. Aug. 27.

„ 16,259 (1902). Adams. Kilns for fire-clay and other goods. Sept. 3.

X.—METALLURGY.

[A.] 18,140 Shone. Tinning and soldering aluminium, and fluxes and solders therefor. Aug. 18.

„ 18,237. Jackson and Kiesel. Alloy capable of use without flux as solder or surface-coating for aluminium, &c.* Aug. 19.

„ 18,384. Dewhurst. Carriages for ladles used for carrying and tipping blast-furnace slag. Aug. 21.

„ 18,577. de Alzugaray. Extraction of metals from their ores. Aug. 23.

[A.] 18,584. Kohlmeyer and Edwardes. Treatment of tailings or slimes resulting from ore-stamping and similar operations. Aug. 23.

„ 18,613. Lennox. Method of refining metals, alloys and amalgams. Aug. 25.

„ 18,622. Angel. *See under* VII.

„ 18,660. Aston and Mullier. Manufacture of steel from scrap metal. Aug. 25.

„ 18,684. Leuscher and Leuscher. *See under* V.

„ 18,845. Gutensohn. Recovering metallic lead from lead ore (galena). Aug. 27.

„ 19,014. Gutensohn. Treatment of refractory ores containing zinc and lead. Aug. 29.

„ 19,035. Payne and Gillies. Treatment of ores containing copper.* Aug. 29.

„ 19,088. Séhillot. Apparatus for the treatment of gold ore.* Aug. 30.

„ 19,105. Coe. Machines for depositing metallic lea upon a surface to be ornamented.* Aug. 30.

[C.S.] 7037 (1902). Letson and Burpee. Solderin machines. Aug. 27.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 18,172. Schmidt-Altwegg. Proceeding to manufacture the active mass of electrodes for lead accumulators. Aug. 18.

„ 18,575. Feith. Electro-deposition of zinc. Aug. 2

„ 18,886. Gans. *See under* II.

XII.—FATS, OILS, AND SOAP.

[A.] 18,197. Pratt. Deodorising cotton-seed meal, &c and apparatus therefor.* Aug. 19.

„ 18,393. Pfestroff and Gillon. Oils. Aug. 21.

„ 18,741. Haddan (Edson). Rendering or reducin apparatus suitable for treatment of fish-waste an other oil-yieldable material.* Aug. 26.

„ 18,742. Haddan (Edson). Process of rendering o reducing fish-waste and other material capable o yielding grease, oil, or gelatin.* Aug. 26.

„ 18,743. Haddan (Edson). Apparatus for renderin or reducing fish-waste and other material capabl of yielding grease, oil, or gelatin.* Aug. 26.

„ 18,822. David. Soap. Aug. 27.

„ 18,932. Schnetzer. Machines for moulding soap. Aug. 28.

[C.S.] 20,454 (1901). Karntz. Mixing apparatus for th manufacture of soap. Sept. 3.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[C.S.] 20,281 (1901). Boult (Port). Compositions for th preservation of leather, fabrics, &c. Aug. 27.

B.—Resins, Varnishes.

[A.] 18,355. Zachow. Varnish-like substance applicabl as a vehicle for colours or as a coating substance. Aug. 20.

„ 19,074. Lynch. Substitute for turpentine. Aug. 3(

C.—India-rubber, &c.

[A.] 18,135. Gray and Sloper. Rubbered thread o cable. Aug. 18.

A.] 18,218. Gray and Sloper. Apparatus for the manufacture of rubbered thread. Aug. 19.

„ 18,673. Sefton Jones (Koch and Palm). Method and means for uniting india-rubber and leather. Aug. 25.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

A.] 18,277. Bakau Co., Ltd., and Meikle. *See under* V.

„ 18,477. De Pont and Ballardie. Material or composition adapted to be used as a substitute for ivory. Aug. 22.

„ 18,673. Sefton-Jones (Koch and Palm). *See under* XIII. C.

„ 18,742. Haddan (Edson). *See under* XII.

„ 18,743. Haddan (Edson). *See under* XII.

S.] 20,281 (1901). Boult (Port). *See under* XIII. A.

, 10,868 (1902). Perkins. Machine for treating hides, skins, and leather. Sept. 3. (International Patent.)

XV.—MANURES.

S.] 22,142 (1901). Day (Staubschutz Ges. m. b. H.). Treatment of offals. Aug. 27.

XVII.—BREWING, WINES, SPIRITS, ETC.

.] 18,579. Müller. *See under* I.

S.] 20,895 (1901). de Meulemeester. Process for the rapid separation of wort from dregs, and apparatus therefor. Aug. 27.

22,181 (1901). Wild. Manufacture of solidified spirit. Sept. 3.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

.] 18,137. Lake (Soc. franç. pour la Conservation des Beurres). Process for refining and preserving butter. Aug. 18.

18,138. Lake (Emmerichs Fleisch-Konservierungs-Ges. m. b. H.). Preservation of meat in a raw condition. Aug. 18.

18,150. Fraser. Manufacture of food for live stock. Aug. 18.

18,209. Rutherford. Medicated biscuit. Aug. 19.

18,247. Stahl. Preservation of meat, sausage, sausage skins, &c. Aug. 19.

18,249. Gaulin. Process and apparatus for intimately mixing milk and other fluids.* Aug. 19.

18,496. Geldard. Appliances for testing butter for water.* Aug. 22.

18,507. Marks (Pfaff). Method and process for preserving eggs. Aug. 22.

18,667. Barratb. Manufacturing artificial ice.* Aug. 25. (United States Application.)

18,910. Posternak. *See under* XX.

19,107. Bell. Alimentary preparation. Aug. 30.

[S.] 18,439 (1901). Lorne. Preserving compound. Aug. 27.

4329 (1902). Manasse. Process for preserving foods. Sept. 3.

B.—Sanitation; Water Purification.

] 18,186. Dawber, Liptrot, and Roby. Treatment or disposal of sewage and sewage-sludge and the manufacture of bricks. Aug. 19.

[A.] 18,498. Ham. Valves or gates for sewers, bacteria and filter beds, and other conduits or places.* Aug. 22.

„ 18,733. Bachman. Apparatus for purifying water or other liquid. Aug. 26.

„ 18,875. Enock and Coombs. Apparatus for raising or lifting sewage, &c. by compressed air. Aug. 28.

„ 18,888. Palmer. Means for automatically distributing sewage or flushing liquids. Aug. 28.

„ 19,005. Doulton and Pleace. Flushing-siphons for sewage, &c. Aug. 29.

„ 19,065. Mackey. Filters and apparatus for softening water. Aug. 30.

[C.S.] 17,397 (1901). Beissel. Water softening and purifying apparatus. Sept. 3.

„ 18,825 (1901). Doulton and Manger. Water-softening apparatus. Aug. 27.

„ 16,375 (1902). Prött. Apparatus for moistening air and saturating the same with vapours. Sept. 3.

C.—Disinfectants.

[A.] 18,706. Evans. Cementine sanitary fluid. Aug. 26.

„ 18,979. Old and Clough, as "Crown" Disinfectant Fire-lighter Co. *See under* II.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 18,417. Dietrich. Machine for comminuting broken paper, &c. Aug. 21.

„ 19,090. Dunham. Insoluble casein, and process of producing same.* Aug. 30. (United States Application.)

[C.S.] 16,685 (1901). Bertram and Milne. Machines used in the manufacture of paper, paper-pulp, &c. Aug. 27.

„ 20,396 (1901). Fielding. Manufacture of viscose (cellulose sulpho-carbonate) for certain purposes. Sept. 3.

„ 10,524 (1902). Lake (Bird). Manufacture of paper. Aug. 27.

„ 11,593 (1902). Walbinger. Impregnation of pasteboard and paper with tar, asphalt, &c. Aug. 27.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 18,108. Peter Spence and Sons, Ltd., and Spence. Manufacture or production of a new titanous compound. Aug. 18.

„ 18,215. Lang. Oxidising processes and manufacture of aldehydes, ketones, and quinones. Aug. 19.

„ 18,340. Imray (Farbwerke, Höchst). Process for removing albumin from bacterial and animal antitoxins and toxins. Aug. 20.

„ 18,628. Cadett and Tattam. Means for extracting naphthalene from coal-gas and oil-gas. Aug. 25.

„ 18,762. Imray (Farbwerke, Höchst). Process for oxidising organic compounds. Aug. 26.

„ 18,910. Posternak. Process for obtaining the organic assimilable phosphorous compound contained in vegetable foodstuffs.* Aug. 28. (French Application.)

„ 19,100. Peters and Waterhouse. Medical embrocation.* Aug. 30.

[C.S.] 14,921 (1902). Dreher. Manufacture of titanium lactate. Sept. 3.

XXI.—PHOTOGRAPHY.

[A.] 18,946. Barnard. Apparatus for use in the developing and fixing of photographic pictures. Aug. 28.

[C.S.] 16,134 (1902). Hoh and Hahne. Photographic developing bath. Aug. 27.

„ 16,318 (1902). Pifer. Photographic plates. Sept. 3.

„ 16,718 (1902). Crabtree and Mason. Vitrifiable photographic decoration. Sept. 3.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 18,806. Davies. Explosives. Aug. 27.

„ 19,017. Maxim. Fuses for explosive projectiles. Aug. 29.

[C.S.] 18,360 (1901). Wood and Mills. Fog-signalling apparatus for railways. Sept. 3.

„ 18,363 (1901). Allison. Railway fog-signalling apparatus. Sept. 3.

„ 23,889 (1901). Bielefeldt Priming compositions or charges for percussion caps and detonators. Sept. 3.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 5263.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 18.—Vol. XXI. SEPTEMBER 30, 1902. No. 18.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Marston T. Bogert.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

	CANADIAN.
of. W. R. Lang.	Alfred Burton.
	LIVERPOOL.
H. Tate.	Dr. T. Lewis Bailey.
	LONDON.
alter F. Reid.	A. R. Ling.
	MANCHESTER.
an Levinstein.	J. Carter Bell.
	NEWCASTLE.
. L. Rennoldson.	F. C. Garrett.
	NEW YORK.
. V. Coblentz.	Dr. H. Schweitzer.
	NOTTINGHAM.
Archbutt.	J. T. Wood.
	SCOTTISH.
L. Patterson.	Dr. Thos. Gray.
	YORKSHIRE.
s. E. Bedford.	Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I., XV.
L. Archbutt..I., XII., XVIII.B.
J. L. Baker..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. .. VII., X., XI.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley. I., X., XIII., XXI.
H. Ingle, Ph.D... V., VI., XII., XIII.
R. L. Jenks ..... XIV., XIX.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D... IV., XX.
F. H. Leeds.. III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. .. XXII.
W. G. McMillan X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ..... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak .... Patent List.
T. H. Pope... XVI., XX., XXI.
F. W. Renaut ..... Index.
G. H. Robertson ..... XI.
Chas. Salter ..... I., II., III., XV., XVI.
M. J. Salter ..... XIII.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley XII., XVIII., XX.
E. Sonstadt ..... III., VII., X.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. .. XVI.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. G. Ellis.
W. Hodgson Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: F. H. Tate.

Vice-Chairman: C. Longuet Higgins.

Committee:

Percy Bateson.
J. Campbell Brown.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Max Muspratt.
Julius Raschen.
Alf. Smetham.
H. B. Stocks.
J. W. Towers.

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Walter F. Reid.

Vice-Chairman:

Committee:

Julian L. Baker.
A. C. Chapman.
E. Divers.
M. O. Forster.
Oscar Guttmann.
Otto Hehner.
H. Hemingway.
W. Kellner.
J. Lewkowitsch.
A. Gordon Salamon.
W. S. Squire.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

J. Allan.
W. Brown.
R. Clayton.
J. Craven.
W. Heys.
J. Hübner.
H. Levinstein.
W. J. Pope.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.

Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.
P. P. Bedson.
H. S. Collins.
J. T. Dunn.
T. W. Hogg.
H. Louis.
J. Mather.
John Pattinson.
W. W. Proctor.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: V. Coblentz.

Vice-Chairman: Russell W. Moore.

Committee:

L. Baekeland.
G. Drobegg.
W. F. Fuerst.
A. P. Halloek.
E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schieffelin.
R. C. Schüpphaus.
G. C. Stone.
M. Toch.
D. Woodman.
F. G. Zinsser.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.

Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

Scottish Section.

Chairman: T. L. Patterson.

Vice-Chairman: D. J. Playfair.

Committee:

W. Carrick Anderson.
E. M. Bailey.
H. Bumby.
D. B. Dott.
C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgow

Yorkshire Section.

Chairman: Jas. E. Bedford.

Vice-Chairman: T. Fairley.

Committee:

C. S. Bedford.
E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

Notices.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the act that the International Congress of Applied Chemistry ill meet in Berlin, during Whitsuntide week of next year committee of this Society has been formed to co-operate ith the other British Chemical Societies in endeavouring secure an adequate representation of British Chemical ndustry, and it is requested that the names of those proosing to attend the Congress be forwarded to the General ecretary, in order that a formal invitation from the rganisation Committee in Berlin may be sent to them.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit lcohol) having been accepted by the Government, the ouncil would be obliged if those members who are interested in industries, in which partially or wholly duty-free irit would be of advantage, would inform the Secretary what way the power to use spirit duty-free for manucturing purposes would affect their industries, giving, as r as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).
2. As rendering possible the manufacture, in Great itain, of products which the duty has hitherto prevented.
3. As affecting the position of British manufactures in gard to foreign competition.
4. As to the branches of industry which the duty on ohol has crippled or destroyed.

The Council has appointed a Committee, consisting of President, Hon. Treasurer, Dr. W. S. Squire, Mr. David ward, Mr. A. G. Green, Mr. Walter F. Reid, Mr. A. rdon Salamon, and Mr. Thos. Tyrer, to consider and ort on this question.

Changes of Address.

When notifying new addresses, members are requested to te them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be ided as tending to create confusion. When sending scriptions, the use of the form attached to the application ks in the verification of addresses, on which the safe very of the Journal depends.

eman, Dr. Gellert; Journals to Swarthmore College, Swarthmore, Pa., U.S.A.
eman, G. F., l/o Cook Avenue; 940, Hamilton Avenue, St. Louis, Mo., U.S.A.
k, A. J., l/o Gravesend; 1, Manor Terrace, Halling, near Rochester.
is, Chas. B.; Journals to c/o Dr. Francis Wyatt, 39, South William Street, New York City, U.S.A.
y, W. C., l/o Norfolk; American Beet Sugar Co., Grand Island, Neb., U.S.A., Superintendent.
y, J. Campbell, l/o Stockport; c/o The Rossendale Printing Co., Loveclough, near Rawtenstall.
wade, W. R., l/o London; 342, Flinders Lane, Melbourne, Vic., Australia.
rie, Jno., l/o Hunslet Moor; Trentham Street, Dewsbury Road, Leeds.
, Clarence A., l/o Powelton Avenue; 517, North American Building, Philadelphia, Pa., U.S.A.
ley, Jos.; Journals to 43, High Road, Gorton, Manchester.
y, Elkanah, l/o Camden; Keystone Academy, Factoryville, Pa., U.S.A.
n, Dr. Robt., l/o Manchester; c/o Chemische Fabriken Weiler-ter Meer, Uerdingen a/Rhein, Germany.
rson, Jos., l/o Lisbon; 4, Whetley Grove, Bradford.
er, Dr. Carl; all communications to Laboratory, Vienna, IX/2, Borschkegasse, No. 8.
, W. P., l/o Paulison Avenue; 282, Lafayette Avenue, nd (Journals) c/o General Chemical Co., Dundee Works, Passaic, N.J., U.S.A.
Kirkland, R., l/o Newmains; Grand Junction Glue and Chemical Co., Ltd., Market Harborough.
Kohnstamm, E. H., l/o West Broadway; 87–89, Park Place, New York City, U.S.A.
Ling, A. R., l/o Wimbledon; Hazeldene, Kingston Road, New Malden.
Lynn, A. H., l/o Nottingham; 125, Alexandra Road, Wimbledon.
Nelson, E. K., l/o Ellis Avenue; c/o Swift and Co., Union Stock Yards, Chicago, Ill., U.S.A.
O'Shea, L. T., l/o Cosham; University College, Sheffield.
Palmer, F. G.; Journals to Mervyndene, Court Road, West Norwood, S.E.
Perkins, T. S., l/o San Francisco; c/o Union Sugar Co., Betteravia, Sta. Barbara, Cal., U.S.A., Chemist.
Pope, T. H., l/o Copenhagen; 59, Gillott Road, Edgbaston, Birmingham.
Robins, Walter, l/o Lee; Wanstead Cottage, New Wanstead, Essex.
Robinson, H. H., l/o 98; 75, Finborough Road, London, S.W.
Royal-Dawson, H., l/o Leeds; retain Journals.
Scott, Leonard C., l/o East Chicago; 1358, Wilton Avenue, Chicago, Ill., U.S.A.
Shonk, A., l/o Canning Town; 6, York Road, West Hendon.
Smith, Harry E., l/o Milwaukee; L. S. & M. S. Railway, Collinwood, Ohio, U.S.A.
Stansfield, Edgar, l/o Sunderland; Whalley, near Blackburn, Lancs.
Sutro, H. H.; Journals to 126, Liberty Street, New York City, U.S.A.
Townsend, Oliver C., l/o Leven; Ravenswood, Rugby.
Tribe, P. C. M., l/o Oswego; 46, Breakspear's Road, St. John's, S.E.
Van Zwaluwenberg, J. G., l/o Elizabeth; Box 69, Argentine, Kansas, U.S.A.
Wallace, E. C., l/o New York City; Cambridgeport, Mass., U.S.A.
Weeks, H. B., l/o Ainslie Street; 2, Infield Park Road, Barrow-in-Furness.
Wielandt, Dr. W., l/o Parkveien; Frognerveien 3, Christiania, Norway.
Winser, P. J., l/o Bebington; Moor House, Biddulph Moor, Congleton, Chesbire.
Woodrow, Jno.; Journals to Albyn Cottage, Broxburn, N.B.
Wright, A. C., l/o Bradford; c/o Turner, Morrison, and Co., 6, Lyons Range, Calcutta, India.

Deaths.

Hummel, Prof. J. J., 152, Woodsley Road, Leeds; at Glasgow. Sept. 13.
Wertheimer, Alf., Johannesburg, South Africa. Sept. 18.

Obituary.

SIR FREDERICK A. ABEL, Bart., D.C.L., F.R.S.

President of the Society of Chemical Industry (1883–84); First Chairman of the London Section of the Society of Chemical Industry (1882–83).

Frederick Augustus Abel, born in London on July 17th, 1827, was the eldest son of J. L. Abel, of Woolwich, and grandson of A. C. A. Abel, Court miniature painter to the Grand Duke of Mecklenburg-Schwerin. At the age of 14 he went to Hamburg to stay with his uncle, A. T. Abel, a mineralogist, and pupil of Berzelius. This seems to have been the beginning of his scientific career.

The British metropolis afforded few openings for a student of chemistry in those days, and young Abel did the best he could in joining the Royal Polytechnic in 1844, which was practically the only available place. Fortunately for him, however, a scheme for establishing in London a school of chemistry on the lines of Liebig's famous one at Giessen was now carried out, and thus

be became one of the 26 students of the Royal College of Chemistry when, in the autumn of 1845, its temporary laboratory in George Street, Hanover Square, was opened under the direction of A. W. Hofmann. Abel spent some six years at this college, during five of which he was one of Hofmann's assistants. With Hofmann he did good work in research on certain aniline derivatives. He was also demonstrator of chemistry under Dr. Stenhouse at St. Bartholomew's Hospital. In 1861 he succeeded Faraday as Professor of Chemistry at the Royal Military Academy, Woolwich, and in 1864 the office of Ordnance Chemist, known subsequently as Chemist to the War Office, was created, and Professor Abel was appointed to fill it. He held the position for 34 years. During that period our whole artillery and rifle system underwent a series of momentous changes. New guns, methods of rifling, and varieties of ammunition came into existence. With these changes Professor Abel had much to do. Guncotton, the invention of Schönbein, had not as yet been prepared so as to be uniform in composition, and consequently safe to use. Abel succeeded in devising improvements in manufacture, so that this explosive agent could be safely manipulated, and efficiently applied.

An experimental inquiry was instituted by Sir Frederick Abel at the request of the Secretary of State for the Home Department, dated November 4th, 1880, into the question of colliery explosions and the influence therein of coal-dust, and the results of this important inquiry, embodied in a most lucid report, alone deserve for Abel the gratitude of his country.

In 1882 a most instructive and suggestive discourse on "Dangerous Dusts" was given by him at the Royal Institution. In this he not only attacked the question of the influence of coal dust in coal mine explosions, but added the weight of his authority to causes already assigned to those disastrous flour mill explosions, which only a few years before could not be accounted for.

In 1885 an advance was made in France in smokeless powders, the explosive basis of which was guncotton or nitrocellulose. Meanwhile, the British Government also attacked the problem, and Sir Frederick Abel, who had been knighted in 1883, was appointed President of a committee which was for several years engaged in securing a safe smokeless powder of suitable character. Prof. Dewar and Sir F. A. Abel finally patented the substance known as "cordite," which was accepted by the Government as its smokeless powder. In conjunction with Sir Andrew Noble, Sir Frederick Abel also investigated the explosive effects of black powder, the results demonstrating that the size of the grains of powder had an enormous influence on the rate of combustion within the chamber. These discoveries extended the theoretical knowledge of explosives, and won for Sir Frederick the gold medal of the Royal Society. Not the least important of the late baronet's duties as adviser to the Government, and possibly the one subjected to the greatest amount of popular criticism, had reference to the regulations prescribed for the safe storage of petroleum. In the first instance, what was known as "an open test" was adopted, and restrictions were placed on petroleum which vaporised at a lower temperature than 100° F. Subsequently, a "close test," now known as Abel's, was adopted, and under this mode of examination 73° F. was adopted for the flash-point, instead of 100° F., the former reading under the latter test being considered equal to 100° with the test previously in use.

Sir Frederick Abel filled many offices. He was the second President of the Society of Chemical Industry from 1882—1883, President of the British Association, of the Chemical Society, of the Institute of Chemistry, and of the Institute of Electrical Engineers; he was also the first chairman of the London Section of this Society, chairman of the council of the Society of Arts, a warden of the Goldsmiths' Company, and chairman of the executive committee of the City and Guilds of London Institute for Technical Education; and in 1883, together with Lord Sudeley, Lord Kelvin, and the late Sir W. Siemens, was one of the English Commissioners at the Vienna Electrical Exhibition. On the founding of the Imperial Institute he became its organising secretary, and remained the general director up to the time of its transference to the Board of Trade. He took considerable interest in the subjects of technical education and original research, and was instrumental in establishing at the Imperial Institute well-equipped research laboratories in connection with its scientific and technical department. Elected a Fellow of the Royal Society in 1860, he was awarded a Royal medal by that body in 1887. In recognition of his contributions to the chemistry of iron, the Iron and Steel Institute, in 1897, awarded him its Bessemer medal. He was hon. D.Sc. of Cambridge and D.C.L. of Oxford. Sir Frederick was twice married, and leaves no heir to the baronetcy conferred upon him in 1893.

He died suddenly on the night of Sept. 6th, at his residence in Whitehall Court.

PROFESSOR J. J. HUMMEL.

Professor of Dyeing, and Head of the Dyeing Department of the Yorkshire College, Leeds. Original Member of the Society of Chemical Industry and of its Publication Committee.

John James Hummel was born in Clitheroe, in Lancashire, in 1850. His father was Swiss, his mother an English lady. After leaving school he went to Zürich and studied chemistry under Städeler, Bolley, and Wislicenus in the Polytechnikum. Returning to this country, Hummel obtained his first appointment in Scotland, being made chemist in the Dalmonach Works, Alexandria, Dumbartonshire, and, later on, in the Print Works, Milngavie. He gained further experience in a dyeworks at Auchterarder, and also in works in Lancashire. When, therefore, in 1879, instruction was undertaken in the chemical technology of dyeing and the allied branches in connection with the Yorkshire College, Leeds, Mr. Hummel was naturally marked out through his education, training, and proved ability as the man to be entrusted with the organisation and supervision of the department. His work in Leeds was begun in 1880 in a building little better than a shed, where he had, however, 18 students. Now, however, partly through his own persistent representations of the need of more suitable and scientific equipment, and very largely through the liberality of the Clothworkers' Company of London, the Yorkshire College, Leeds, possesses a magnificent dyeing department, furnished with research laboratories, experimental dyehouses, and every kind of apparatus for instruction and investigation in connection with this branch of textile industry. The Clothworkers' Company also founded a Chair of Dyeing, and to this Prof. Hummel was appointed. Anyone knowing the condition of technical training in this country 20 years ago will gain some idea of the work done by the man who designed and superintended most details of that building and its equipment, organised the courses of instruction, and was himself the chief teacher. A school of dyeing has thus been established in Leeds, the fame of which is acknowledged in Germany, and has attracted students from almost every country of Europe, from America and from Japan. In his own department of technical education, Prof. Hummel was the pioneer in this country. The value of a man with such practical experience and theoretical knowledge on the Publication Committee of the Journal of the Society of Chemical Industry, from the commencement of that Journal, has been highly appreciated.

Yet in his brief, laborious life, for he died in his 52nd year, he found time for considerable literary work. Besides numerous contributions to journals of science and

technology, he was the author of an article on "Dyeing" in the "Encyclopædia Britannica," and his text-book on the "Dyeing of Textile Fabrics" was translated into German, Italian, and Japanese, and forms a standard work on the subject. He also acted as collaborateur in Gustav Eger's "English-German Technological Dictionary."

Prof. Hummel was a member of the Senate of the Yorkshire College. In 1887, as a member of the Committee of the Department of Chemical and Allied Industries, of the Royal Jubilee Exhibition of Manchester, he made a collection of calico prints representing the advance of the industry of calico printing during the century. He also officiated as British juror in the Department of Textile Fabrics at the last Paris Exhibition. For the last two years Prof. Hummel had been suffering from diabetes. He had spent the month of August with his wife and family in Arran, and subsequently went to visit his brother-in-law, Mr. Jas. Muir Simpson, in Glasgow. Here he suffered a relapse and died on the 13th Sept. He leaves a widow and seven children.

ERRATUM.

This Journal, 1902, 1125 (Obituary of Robt. Hasenclever), col. 2, and 2 lines from end, for "May 28" read "June 23."

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1177
II.—Fuel, Gas, and Light	1178
III.—Destructive Distillation, Tar Products, Petroleum	1180
IV.—Colouring Matters and Dyestuffs	1181
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1182
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1183
VIII.—Glass, Pottery, and Enamels	1183
IX.—Building Materials, Clays, Mortars, and Cements	1183
X.—Metallurgy	1184
XI.—Electro-Chemistry and Electro-Metallurgy	1185
XII.—Fats, Fatty Oils, and Soap	1187
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1188
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1189
XV.—Manures, &c.	1189
XVI.—Sugar, Starch, Gum, &c.	1189
XVII.—Brewing, Wines, Spirits, &c.	1190
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1191
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1192
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1193
XXI.—Photography	1195
XXII.—Explosives, Matches, &c.	1195
XXIII.—Analytical Chemistry	1195
XXIV.—Scientific and Technical Notes	...

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

Magnesium Chloride; Behaviour of ——, in Steam Boilers. H. Ost. Chem.-Zeit., **26**, [71], 819—823.

SOLUTIONS of the chlorides and sulphates of the alkali metals, of calcium, and magnesium, were evaporated to half their bulk in a small iron boiler at 10 atm. pressure, so as to imitate the conditions of actual work in a high-pressure boiler. In all cases (and even with distilled water alone) hydrogen was given off, and magnetic oxide of iron found in the residue; but no iron was dissolved, except in the case of the magnesium salts. The author considers that the solution of hydrogen is in all cases due to decomposition of the water by the iron, and that the magnesium salts do not attack the metal, but react on the magnetic oxide (or ferrous oxide) according to the equation—

$$Fe(OH)_2 + MgCl_2 \rightleftarrows FeCl_2 + Mg(OH)_2.$$

This reaction is reversible, but the point of equilibrium is much nearer the state of things represented by the right-hand member than the left. The salts of stronger bases, as lime and the alkalis, are not decomposed by ferrous hydroxide.

Similar solutions were boiled with various specimens of iron at 100° C. The amounts of hydrogen evolved varied considerably, but on the whole increased with the amounts of carbon, &c., in the iron. Here, too, no iron was dissolved by the salts of calcium and the alkali-metals, but the magnesium salts (and to a still greater extent alum) always dissolved some.

The addition of calcium carbonate, either in solution as bicarbonate, or in the solid form, greatly diminished the amount of iron dissolved by the magnesium salts. Reaction occurs between the calcium carbonate and the magnesium salt, with production of calcium salt and magnesium carbonate and hydroxide, the last of which tends to prevent the reaction mentioned above from proceeding in the direction from left to right. An amount of calcium carbonate equivalent to not more than a quarter of the magnesium salts present suffices to prevent altogether the solution of iron.

—J. T. D.

Salt Solutions; Behaviour of ——, towards Copper, and towards Iron in presence of Copper. H. Ost. Chem.-Zeit., **26**, [73], 845—847.

A CONTINUATION of the former research (see preceding abstract). At 10 atmospheres pressure, in absence of air, a copper boiler was attacked, not only by magnesium chloride, but also by sodium chloride, while sodium sulphide was without action. But the attack seems to take place only in the presence of cuprous oxide (from which it was almost impossible completely to clean the boiler), for no evolution of hydrogen took place in any of the experiments, showing that no decomposition of water occurred.

The presence of iron, in surface approximately equal to that of the copper, completely protects the latter metal from the action of these salts, whilst the action on the iron is not more rapid than when the iron is exposed alone. But under these circumstances iron is attacked, not only by magnesium salts, but also by calcium chloride, and by potassium chloride and sulphate.—J. T. D.

ENGLISH PATENT.

Drying Powders [Sand] and the like; Apparatus for ——. H. Croizier and E. Thomine, Paris. Eng. Pat. 18,661, Sept. 18, 1901.

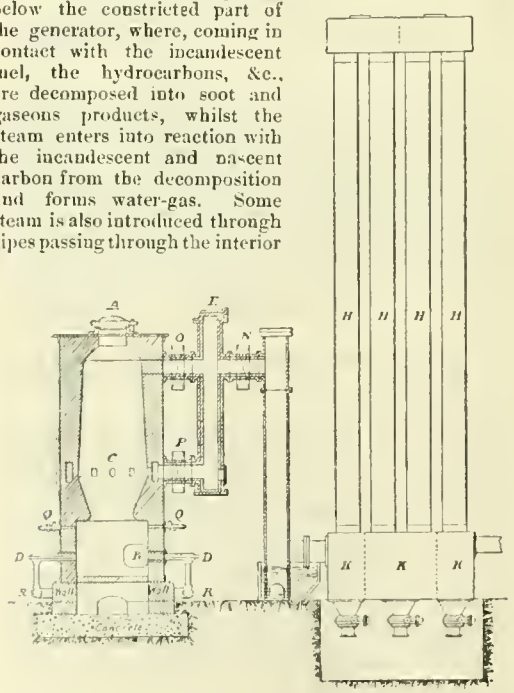
HEATED gases from a fire are conducted through a chimney, into which the powder is introduced, so that it falls in a shower down the chimney, baffles being employed for distributing the falling powder through the heated gases. A receptacle for the powder is arranged in the chimney, below the orifice at which the heated gases enter.—R. A.

II.—FUEL, GAS, AND LIGHT.

'Methane-Hydrogen Water-Gas Plant at Sligo, Ireland. C. B. Tully. J. Gas Lighting, 1902, **80**, [2049], 489—490.

THE plant described, is so arranged that the height of the bed of incandescent fuel is kept constant; the steam is injected through the same openings as the air-blast, so that the clinker is broken up and it is possible to work without fire-bars; a stack-pipe, valves, and connections are provided which allow of the removal of the gases from the generator either at the middle or top, and also allow of the soot (for lampblack) being brought away with the gas and recovered, or retained in the generator as fuel and burned at will.

The generator, which is lined with fire-brick and provided at the bottom with clinkering-doors, is filled with fuel (coke or anthracite, alone, or with a large proportion of bituminous coal) to the top, the fuel is ignited and raised to a high degree of incandescence by an air-blast through openings in the lower part of the generator. The products escape through a series of nozzles half-way up the generator into a flue bedded into the lining. The gases travel from this flue, which passes entirely round the generator, into a stack-pipe, and thence into the air through a snift-valve at the top. In this way the fuel is raised to a high degree of incandescence for a definite height; and with proper regulation of the air-blast, the escaping products will contain little unburned matter. When the necessary temperature has been attained, the snift-valve is closed, and the tar and heavy hydrocarbons are injected by steam into the annular space left by the falling fuel below the constricted part of the generator, where, coming in contact with the incandescent fuel, the hydrocarbons, &c., are decomposed into soot and gaseous products, whilst the steam enters into reaction with the incandescent and nascent carbon from the decomposition and forms water-gas. Some steam is also introduced through pipes passing through the interior of the air-blast tubes, and this, playing upon the clinker formed during the blow, breaks it up, the steam being converted into water-gas. The gases formed during this part of the process pass upwards together with some finely-divided carbon; the latter is retained by the comparatively cool carbon in the upper portion of the generator, whilst the gaseous mixture of hydrogen, carbon monoxide, and methane passes out through a pipe near the top into the stack-pipe, leaving the latter by a pipe which forms a cross-junction with the upper exit from the generator. If it be desired to produce lampblack, the gases laden with finely-divided carbon are led away through the nozzles into the stack-pipe, and then through the same pipe as before into a series of atmospheric condensers, in which strips of asbestos are suspended, on which the carbon deposits, and from which by a jigging arrangement, it can be shaken into sealed receptacles.



A, Charging door. B, Clinkering door. C, Nostrils. D, Steam supply. E, Snift valve. H, Air condensers. K, Soot pockets. N, O, P, Valves. Q, Hydrocarbon supply. R, Air supply.

The gas produced has an illuminating power of 10—1 candles and a calorific value of about 380 B.T.U., whilst is estimated that its cost will not much exceed that "straight" water-gas.—A. S.

Gas; Manufacture of ——, *from Waste Liquors fro Cellulose Factories.* E. R. Besemfelder.

See under XIX., *page* 1192.

ENGLISH PATENTS.

Coke; Manufacture of ——. W. E. Evans, Londo. From G. de Velna, Paris. Eng. Pat. 20,472, Oct. 1 1901.

PULVERISED waste coal, anthracite, &c., is mixed with 5 10 per cent. of tar and 10 to 20 per cent. of resin, bitume or other agglutinant, and the mixture is coked as usual. —H. B.

Gas for Industrial Purposes; Utilisation of ——. W. Thompson, London. From J. H. Darby, Penygart Wales. Eng. Pat. 19,898, Oct. 5, 1901.

To minimise the injury to the refractory linings of flue &c., in which gases of high flame temperature (such coke-oven gases) are burned, these gases are mixed regulated proportions with low-power gas, such as bla furnace or producer gas.—H. B.

Gas and Air; Machines or Apparatus for Mixing —— J. Seymour, Toronto. Eng. Pat. 2276, Jan. 28, 1902.

WITHIN an exterior cylindrical casing are arranged t concentric rotating cylindrical receptacles, one within t other, each provided with a series of helical measuri chambers, the inner receptacle for measuring gas and t outer for measuring air. Gas- and air-supply pipes en the receptacles axially, and both of the latter open into t exterior cylindrical casing from which the mixture of g and air is led off. The two cylinders are geared togeth and are caused to rotate simultaneously by the impingi of the gas on the helical blades or walls of the inn measuring chambers. The apparatus is filled with wa to a uniform level in each of the cylinders, the wa forcing the gases forward during the rotation of the parts —H. B

Gas suitable for Driving Gas Engines and other App ances; Process and Apparatus for Rapidly Produci a ——. P Winand, Charkow, Russia. Eng. Pat. 95 April 25, 1902.

A PROCESS for rapidly producing a gas, for gas engi usually driven by blast-furnace gases, in the event o t usual gas-supply failing; this process consisting in forci atomised oil into a fireproof chamber along with sufficie air for complete combustion, until the chamber wa become incandescent, and then reducing the air-supply cause only partial combustion of the oil, and thus produ a power-gas. To utilise the heat of the gases produc they may be passed through solid fuel contained in generator or through an economiser for heating t compressed-air supply.—H. B.

amps; Incandescent Vapour —— [*Means for Extinguishing*]. H. Lux, Berlin-Friedenau. Eng. Pat. 15,990, Aug. 8, 1901.

In incandescence vapour lamps (of the type in which vaporisation is effected by a heat conductor from the Bunsen flame), means are provided whereby the vapours can be withdrawn momentarily from the vaporisation chamber, so as to interrupt the supply to the flame.—H. B.

amps; Incandescent Vapour ——. H. Lux, Berlin-Friedenau. Eng. Pat. 15,991, Aug. 8, 1901.

In a Bunsen burner for liquid combustibles, having a vaporisation chamber below the burner, supplied by means of wicks, a spirally or similarly curved mixing tube is arranged with coils passing through or past each other, into which the vapour tube discharges laterally, said mixing tube being so placed that a portion of its wall forms the cover of the vaporisation chamber. The object is to provide a mixing tube which shall be long enough to ensure thorough mixing of the vapour and air and shall nevertheless be hot enough throughout to prevent condensation of the vapours.—H. B.

ncandescent Gas Lighting; Pressure System for ——. J. Scott-Snell, London. Eng. Pat. 17,507, Aug. 31, 1901.

A PRESSURE system for incandescent gas lighting, in which the burner having the usual air-inlet holes in the mixing tube is used. This burner has also a low-pressure gas supply tube surrounded by a number of jets for the supply of compressed air. The combined energy of the gas- and air-jets is employed to draw in the amount of atmospheric air required to give the maximum temperature. In this system, therefore, the gas is not compressed, but only a small proportion of the air supply, and it is claimed that with a burner consuming, say, 15 cb. ft. of gas per hour, the same effect is produced by compressing 3 cb. ft. of air per hour as would be obtained by compressing the 15 cb. ft. of gas per hour, the amount of air drawn in and caused to mingle with the gas being about 75 cb. ft. per hour in both systems.—H. B.

apour-burning Apparatus [*Incandescence Lamps*]. A. Kitson, Coventry. Eng. Pat. 17,665, Sept. 3, 1901.

A LAMP, having a horizontal vaporising tube situated over the incandescence burner, is provided with an auxiliary burner adapted to project a flame along the vaporising tube, to maintain the vaporisation, the mixture of vapour and air produced in the mixing tube being apportioned between the main and auxiliary burners by means of a valve. For the preliminary heating, the auxiliary burner is provided with a Bunsen burner, connected to a gas supply and allowing its air supply through the tube connecting the mixing tube and the auxiliary burner.—H. B.

cetylene Gas; Burners for ——. J. W. Bray, Leeds. Eng. Pat. 12,360, May 31, 1902.

A BURNER of the usual injector type in which the gas is caused to pass through filters of muslin, &c., in order to remove dust. The nipples are provided with male threads round which the material is wrapped; and they are then screwed and cemented into the arms of the burner proper.
—F. H. L.

cetylene Gas Generator. P. Gilgan, Sligo, Ireland. Eng. Pat. 14,287, June 24, 1902.

An automatic drip generator in which the water supply is governed by the gas pressure. The vessel is a vertical cylinder divided into two compartments by a horizontal partition, the water being at the top and the carbide at the bottom. If too much gas be evolved, it rises either into a bell holder or below a flexible diaphragm, and lifts a mushroom valve which closes the water-feed aperture.
—F. H. L.

ncandescence Lamps; Electric ——. W. J. Phelps, Detroit. Eng. Pat. 20,476, Oct. 12, 1901.

An incandescence lamp, comprising a vacuum bulb containing two or more filaments; a supporting sleeve, within which the base of the bulb is mounted so that it may rotate: pins projecting from the supporting sleeve, for engaging the slots of a bayonet-joint lamp-socket; and three or more contact terminals on the base of the bulb, by means of which, on rotating the bulb within its supporting sleeve, the flow of current from the socket terminals to the multiple filaments, may be modified.—H. B.

Electrodes for Arc Lamps. R. Hopfelt, Berlin. Eng. Pat. 26,535, Dec. 28, 1901.

In the manufacture of arc lamp electrodes from a carbide which is decomposable by water, the conductivity of the carbide is increased by incorporating with it fine metallic dust, or by providing it with a core of solid carbon, or by inserting a metal wire into it. The electrodes are coated with waterproof material. (See U.S. Pats. 700,495 and 700,649; this Journal, 1902, 964.)—H. B.

Ammonia; Production of —— [*Gas Producers*]. B. Talbot. Eng. Pat. 19,993, Oct. 7, 1901.

See under VII., *page* 1183.

United States Patents.

Fuel; Manufacturing Artificial ——. E. J. Hoffman. Assignor to C. W. Adams, Chicago. U.S. Pat. 707,231, Aug. 19, 1902.

Crude petroleum is incorporated with an "alkaline salt" (preferably caustic soda) and vegetable loam, as free as possible from silica and clay, the proportions recommended being 8 parts of oil, 1 part of caustic soda, and 250 parts of loam. The mixture is heated to between 180° and 212° F., being meanwhile stirred until it sets hard. The product may be used as fuel, either in the loose state or after compression into briquettes.—C. S.

Coke; Manufacturing ——. J. W. Seaver. Assignor to the Wellman-Seaver-Morgan Eng. Co., Ohio. U.S. Pat. 707,525, Aug. 19, 1902.

For charging coke ovens of the beehive type, the inventor provides a car running on a track between the ovens and the coal hoppers, and fitted with a movable bottom that can be raised so as to fit tightly under a ramming box, wherein the coal delivered from the hopper is rammed to form a compact mass or briquette. The car bottom is then lowered on to the car and conveyed opposite the oven to be charged, the dome of the latter being raised by a travelling crane and slung over the car track, ready for lowering on to the briquette. At the same time the car bottom is raised so as to be flush with the surface of the coking base, whereupon the dome (which just clears the base) is moved back again by the crane, and draws the briquette with it on to the base, where the charge is coked in the usual manner. In discharging the oven, this operation is reversed, to deliver the coke on to the car.—C. S.

Coke; Apparatus for Quenching or Cooling ——. L. Bertrand, Paris. U.S. Pat. 707,379, Aug. 19, 1902.

The coke drops from the retort through a hopper into a closed water-tank, whence it is removed by an endless elevator. A fan at the top of the elevator-casing carries off the steam produced, and a paddle-wheel beneath the hopper ensures the immersion of all the coke in the water. The elevator, fan, and paddle-wheel are driven electrically, and the whole apparatus is mounted on a carriage which runs on rails in front of the retorts.—H. B.

Coke-Oven. W. T. Gates, Simpson, W. Virginia. U.S. Pat. 707,914, Aug. 26, 1902.

Two beehive ovens are arranged back to back, with their floors on different planes, the upper oven being intended for the production of a higher grade of coke than the lower oven produces. A tortuous flue beneath the floor of the upper oven, and round the lower part of its walls, communicates with an opening in the lower oven at a point above its floor, so as to convey the products of combustion from the lower oven below and round the upper oven.
—H. B.

Fuel Compound. J. H. Ricker. Assignor to S. P. Greene and J. A. T. Evans, Texas. U.S. Pat. 707,722, Aug. 26, 1902.

An artificial fuel composed of crude petroleum, 18·75 per cent.; resin, 2·5 per cent.; sawdust, 12·5 per cent.; clay, 12·5 per cent.; "liquid glass," 2·5 per cent.; and lignite or coal dust, 51·25 per cent., all parts by volume. —H. B.

Burner, Liquid-Fuel —— [*for Rotary Furnaces*]. R. Helley. U.S. Pat. 707,510, Aug. 19, 1902.

The burner, which is adapted for burning heavy oils, is inserted centrally into the top of a rotary furnace, and throws a flame down into the cavity thereof. The burner remains stationary while the furnace revolves; it consists of a vertical cylindrical shell, to which air is supplied by a wide pipe connected with a blower; an oil-supply pipe passing centrally down the shell; and a second pipe, surrounding the oil pipe and conveying compressed air. The compressed air atomises the oil issuing from the inner pipe. A hollow block, fixed in the top of the furnace, surrounds the burner pipes and extends up into the shell, within which it rotates.—H. B.

Gas; Process of Manufacturing Illuminating —— [*Coke*]. C. W. Isbell, New York. U.S. Pat. 707,783, Aug. 26, 1902.

In the manufacture of illuminating gas, the residual coke in the retorts is loosened by the introduction into the retort, round the coke, of sufficient steam to cause the combustion and conversion into gas of that portion of the coke contiguous to the sides of the retort. See U.S. Pat. 693,137; this Journal, 1902, 334.—H. B.

Gas Producer. L. L. Merrifield. Assignor to E. J. Checkley and Econ. Gas App. Constr. Co., Ltd., Toronto. U.S. Pat. 707,146, Aug. 19, 1902.

See Eng. Pats. 12,958, 12,959, of 1901; this Journal, 1902, 1020—1021.—C. S.

[*Gas-*] *Burner.* M. S. Walker. U.S. Pat. 707,285, Aug. 19, 1902.

See Eng. Pat. 15,139 of 1901; this Journal, 1901, 1101. —H. B.

[*Gas-*] *Burner.* M. S. Walker, Chicago. U.S. Pat. 707,286, Aug. 19, 1902.

A Bunsen gas-burner, suitable for incandescence lighting, in which the mixing tube is provided with two series of air-inlet holes, the one series, which is surrounded by a regulating sleeve, being situated below the level of the tip of the gas-nipple; the other series, protected by a hood, being above the level of the tip. A diaphragm, extending across the tube above the upper air-holes, has a central tubular passage, through which the mixed gases flow into the upper part of the burner tube.—H. B.

Carburetter. W. F. Betzel, Portsmouth, Va. U.S. Pat. 707,897, Aug. 26, 1902.

An open-topped tank, containing a floating bell for the air to be carburetted, is divided in its lower portion by horizontal partitions into two or more carburetting chambers, containing gasolene and water. A pipe from the interior of the bell extends downwards to the lowest carburetting chamber, and supplies air to both ends of a spirally-coiled perforated pipe situated therein. The carburetted air produced, passes up to both ends of a similar coiled pipe in the upper chamber, where it is further enriched, and whence it flows to the point of consumption. A number of such tanks are connected together by means of pipes for the air and liquids, and their bells may be supplied with air by a somewhat similar tank, the bell of which is caused to rise and fall by a hydraulic piston fitted with tripping devices, the bell drawing in air through check-valves during its ascent, and forcing the air into the other bells during its descent.—H. B.

Burners; Vapour-generating Apparatus for [*Incandescence*] *Hydrocarbon* ——. T. J. Forde, Geneva, Ohio. U.S. Pat. 707,689, Aug. 26, 1902.

An apparatus for supplying a mixture of vaporised gasolene and air to the service-pipes of the building to be illuminated. Gasolene is fed to a vertical vaporiser which is surrounded by a vaporising burner, and the vapours produced, pass into a valved chamber at the top of the vaporiser. A part of the vapours is led down to feed the vaporising burner, while the main portion flows up through mixing tubes enclosed in an open-ended horizontal casing, to the service pipes. In starting the apparatus, the vaporising burner is supplied with carburetted air obtained by pumping air into the closed gasolene-reservoir, the supply of carburetted air being shut off when the vaporiser is hot enough to vaporise the gasolene freely.—H. B.

Burning Apparatus; Hydrocarbon-Vapour ——. [*Incandescence Burners.*] A. B. Macklin, Brooklyn. U.S. Pat. 707,517, Aug. 19, 1902.

Vapour burners are described, characterised by having vertically-arranged vaporiser and mixing chamber, with a free space between them; a needle, operating in the said free space, for cleaning the nozzle of the vaporiser, the needle being mounted on a horizontally rotating and vertically movable arm, so that it may be supported outside the hot zone when not in use; an inner bell shaped tube arranged in the vaporiser between the oil-inlet and the vapour nozzle, forming a cushioning chamber to equalise the flow of vapour through the nozzle; a vaporising burner adjacent to the vaporiser; and a shield surrounding the latter burner to prevent the products of combustion from being drawn into the mixing chamber above.—H. B.

Acetylene Gas Generators. D. W. Bishop, Lennox, Mass. U.S. Pats. 707,077 and 707,078, Aug. 19, 1902.

See Eng. Pats. 6826 and 6858, 1902; this Journal, 19, 762 and 763.—F. H. L.

Acetylene Gas Generator. S. L. Newlin and J. Mathis, Kingriver, Cal. U.S. Pat. 707,796, Aug. 26, 1902.

An automatic water-to-carbide generator of the contact pattern, in which the carbide store is carried by the rising bell. The carbide boxes hang from the top of the bell, and when the latter falls to a certain position, ball valves rise and open the gas outlet from the said boxes, thus permitting water to enter through constantly open pipes, which extend from the bottom of the boxes, downwards, into the bottom tank. These water tubes can be closed by means of a hand lever, so that only the contents of one box are decomposed at a time.—F. H. L.

Incandescent Electric Lamp. E. S. Gardner, Boston, Mass. U.S. Pat. 707,099, Aug. 19, 1902.

The lamp consists of an exhausted bulb, a glass tube extending into the bulb and sealed at the outer end to the neck of the bulb, leading-in wires and a filament sealed to its inner end, and a reflector (preferably a disc of polished aluminium) inserted into the bulb before the neck is sealed and secured to the inside of the bulb.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum; The Sulphur Content of Commercial Grades of ——. E. Lecocq and H. Vandervoort. Bull. Assoc. Belge des Chim., 16, [4—5], 181—184.

Having frequently observed the liberation of sulphur dioxide during fractional distillation of commercial petroleum, the authors passed the uncondensable gases from the distillation through ammoniacal hydrogen peroxide, and precipitated the sulphur as barium sulphate. In this manner, Standard White American oil was found to contain 0·0130—0·274 per cent. of sulphur; Water White oil merely traces; ordinary Russian oil 0·0042—0·0084 per cent.; similar oil, rectified in Belgium, traces. No sulphates or sulphur dioxide could be detected, as such in

e oil previous to distillation; and it is therefore assumed at the sulphur present is in the form of organic compounds. The authors consider that the method might be eful as a means for detecting the adulteration of burning ls, subsequent to distillation, with light or heavy oils ntaining sulphur compounds.—C. S.

English Patent.

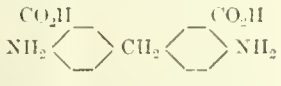
araffin Wax and Lubricating Oil from Mineral Oils and other Hydrocarbons; Manufacture or Production of ——. L. Singer, Mezötelegd, Hungary, and R. Pauli, Berlin. Eng. Pat. 12,565, June 2, 1902.

IE substance is treated with strong (preferably 98·5—·8 per cent.) ethyl alcohol, and heated—under ordinary or reased pressure—until the oil and paraffin scale are dis-ved. After separation from the resinous and tarry pre-ipitates (or before, if pressure has been employed), this lution is cooled to a temperature between 15° and 0° C. cording to the purification required), or diluted with ter, to solidify the paraffin scale, the solvent being after-rds recovered by distillation.—C. S.

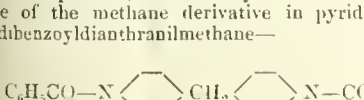
IV.—COLOURING MATTERS AND DYESTUFFS.

thranilic Acid; Action of Formaldehyde on ——. G. Heller and G. Fiesselmann. Annalen, 1902, **324**, [1], 118—137.

o molecules of anthranilic acid condense with one lecule of formaldehyde in alcoholic solution at the linary temperature giving a yield of methylene dianthra-ic acid amounting to 85 per cent. of the anthranilic d taken. The new product, $H_2C:(NHC_6H_4CO_2H)_2$, arates as a crystalline powder from acetone and melts 158° C. It apparently forms acid salts, and when heated h fused sodium acetate and acetic anhydride, yields a cetyl compound melting at 284° C. The action of benzoyl oride on methylene dianthranilic acid in pyridine solution ds to the formation of benzoylanthranil, whilst boiling h aqueous potassium cyanide gives anthranilinotonitrile, melting at 181° C. When heated with hydroric acid on the water-bath, the diphenamine base lergoes molecular transformation, and is converted into minodiphenylmethane dicarboxylic acid—



e base melts at 254° C., and the hydrochloride, which is ringly soluble in concentrated hydrochloric acid, at ° C. The product readily reacts with sodium nitrite in l solution, and the resulting compound combines with aline solutions of naphthol and naphthylamine sulphonic ls. The dyestuffs so obtained are usually bluer than corresponding ones from anthranilic acid. The ethyl ester melts at 147° C., and separates from methyl ohol in shining scales on adding water. The diacetyl ivative melts at 261° C., and the dibenzoyl compound ained by the Schotten-Baumann method crystallises n glacial acetic acid in tufts of needles melting at 268° C. action of a condensing agent (concentrated sulphuric l) on this product, or of benzoyl chloride on the hydroride of the methane derivative in pyridine solution, ds dibenzoyldianthranilmethane—



h crystallises in fine needles melting at 288° C. Applyi this latter reaction to anthranilic acid itself, the authors ained benzoylanthranil melting at 123° C. This fact lains the formation of benzoylanthranil by the action of zoyl chloride on methylenedianthranilic acid in pyridine tion.

When the hydrochloride of diaminodiphenylmethane dicarboxylic acid is heated in a sealed tube with water and hydrochloric acid to 200° C. for some hours, it gives off carbon dioxide, and yields *pp*-diaminodiphenylmethane melting at 88° C.—T. A. L.

Benzidine Blue and some Reactions of Benzidine. G. Saget. Monit. Scient., 1902, **16**, [729], 655—656.

Benzidine Hydrochloride and Potassium Permanganate.—On mixing cold aqueous solutions of these compounds, a bright blue precipitate is formed, the shade of which becomes darker as more permanganate is added, until at length it reaches the colour of Indigo. On further continuing the addition of permanganate, the blue precipitate is decomposed, and a brown precipitate of manganese dioxide is left, whilst the filtrate from this is colourless and contains manganous chloride. If the Indigo-coloured precipitate be filtered off, the filtrate has a crimson shade and contains manganous chloride, the excess of benzidine chloride, and an oxidation product of benzidine, to which the crimson colour is due. The precipitate, which is not quite insoluble in cold water, also contains a little benzidine hydrochloride. Hydrochloric acid prevents the action of permanganate on the benzidine salt, whilst sulphuric acid forms benzidine sulphate, which becomes yellow on the addition of permanganate. Acetic acid does not prevent the formation of the blue precipitate, but causes it to assume a greener shade.

Benzidine Hydrochloride and Manganese Dioxide.—On adding manganese dioxide to an excess of benzidine hydrochloride, a dark blue mass is obtained, which is only sparingly soluble in cold water. On now adding a large amount of water, allowing the precipitate to subside, and filtering, a Bordeaux-wine-red filtrate is obtained. This contains manganous chloride and a colouring matter which is not precipitated by common salt or destroyed by heat, and is insoluble in ether and benzene. The blue precipitate, when washed with cold water and dried at a very low temperature, forms a blue powder resembling Indigo. It is not stable. When suspended in water and heated, it is decomposed at about 65° C. It is also destroyed by hydrochloric acid, ammonia, and sodium carbonate. It is not changed by cold potassium bichromate, but becomes black when heated. Treatment with 10 per cent. acetic acid renders Benzidine Blue more stable, and it then only decomposes in water at 100° C.—C. A. M.

English Patents.

Aromatic Nitro-Compounds containing two or more Nitro-groups; Reduction of ——. Ernst Wirth, Dortmund, Germany. Eng. Pat. 11,750, Aug. 7, 1902.

Reduction is effected by heating the aromatic nitro-compounds with alkali sulphides containing water to temperatures above 110° C., reaction taking place best at between 150°—170° C. according to the equation—

$$R.NO_2 + Na_2S + H_2O = RNH_2 + Na_2SO_3$$

Crystallised sodium sulphide, $Na_2S + 9H_2O$, is most suitable for the purpose. Although the reaction takes place partially at lower temperatures, the best results are obtained between 160°—170° C.; for this, closed vessels are preferable, as preventing loss of water and the consequent drying up of the mass.—J. O. B.

Indoxyl or Indigo [Indigo Dyestuffs] or Indoxyl or Indigo Preparations; Manufacture of ——. R. E. Ellis, London. From the Chemische Fabrik von Heyden A. G., Dresden. Eng. Pat. 14,049, June 20, 1902.

By heating one molecular proportion of chloracetic acid with three molecular proportions of aniline, a yield of 36—38 parts of phenylglycin from 25 parts of aniline can be obtained, which is about three times as much as by the ordinary method of heating equimolecular proportions. The patentees further find that good yields of indoxyl and of Indigo are obtained by the action of caustic alkalis on phenylglycin in presence of an alkali metal, an alkali metal alloy or an alkali alcoholate. See also Fr. Pat. 317,121; this Journal, 1902, 967.—T. A. L.

Indigo and Intermediate Products relating thereto; Manufacture of Derivatives of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 20,552, Oct. 14, 1901.

See Fr. Pat. 315,180; this Journal, 1902, 401.—T. A. L.

Colouring Matters [*Sulphide Dyestuffs*] *directly Dyeing Cotton; Manufacture of Black Sulphur* ——. I. Levinstein, C. Mensching, and Levinstein, Ltd., Manchester. Eng. Pat. 18,389, Sept. 14, 1901.

The patentees heat together in enamelled or leaden vessels 1.3.4-dinitrophenol and hydroxyazobenzene or diphenyltetrazophenol with sulphur and sodium sulphide either in the dry state or in aqueous solution. The larger the proportion of hydroxyazo compound present, the bluer or greener the shade of black produced.—T. A. L.

Colouring Matters [*Sulphide Dyestuffs*] *directly Dyeing Cotton; Manufacture of Sulphurised* ——. C. D. Abel, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 22,385, Nov. 6, 1901.

See Fr. Pat. 315,669; this Journal, 1902, 543. See also Eng. Pat. 7349 of 1899; this Journal, 1900, 239.

—T. A. L.

Colouring Matters [*Sulphide Dyestuffs*] *directly Dyeing Cotton; Manufacture of Sulphurised* ——. C. D. Abel, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 22,734, Nov. 11, 1901.

See Fr. Pat. 315,669 (supplement); this Journal, 1902, 543. See also preceding specification.—T. A. L.

Cotton Dyes [*Sulphide Dyestuffs*] *containing Sulphur; Manufacture of* ——. R. J. Urquhart, Manchester. From Chemische Fabriken vorm. Weiler-ter Meer, Uerdingen-on-the-Rhine, Germany. Eng. Pat. 19,267, Sept. 27, 1901.

See Fr. Pat. 310,713; this Journal, 1902, 967.—T. A. L.

Dyestuffs [*Azo Dyestuffs*]; *Manufacture of* ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 15,924, Aug. 7, 1901.

See Fr. Pat. 313,119; this Journal, 1902, 112.—T. A. L.

Dyestuffs [*Acridine Dyestuffs*] *of the Acridine Group; Manufacture of* ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-the-Main, Germany. Eng. Pat. 19,486, Sept. 30, 1901.

See Fr. Pat. 314,266; this Journal, 1902, 402.—T. A. L.

Paints and Dyes; Manufacture of ——. R. Vidal. Eng. Pat. 12,680, June 3, 1902.

See under XIII. A., *page* 1188.

United States Patents.

Triphenylmethane Dye, and Process of Making Same. F. Ach, Mannheim, assignor to C. F. Boehringer, Mannheim, Germany. U.S. Pat. 707,813, Aug. 26, 1902.

Amino-phenyl-tartronic acid, its homologues, derivatives, and salts, yield triphenylmethane dyestuffs on oxidation with aromatic bases. The particular compound claimed is dimethyldiethyldibenzyltriaminotriphenylcarbinol, which is obtained by oxidising acid potassium dimethyl-aminophenyl tartronate and ethylbenzylaniline with nitrobenzene and ferrous chloride in presence of hydrochloric acid. See Eng. Pat. 23,687 of 1900; this Journal, 1901, 358.

—T. A. L.

Blue Dye [*Oxazine Dyestuffs*], *and Process of Making Same.* C. de la Harpe, Basle. Assignor to L. Durand, Huguenin, and Co., Basle, Switzerland. U.S. Pat. 707,832, Aug. 26, 1902.

The sulphonated gallocyanines obtained by reacting with nitrosoalkylbenzylaniline sulphonic acids on gallic acid or its derivatives are treated with sulphurous acid, yielding dyestuffs giving blue shades on chrome-mordanted fibres. See Eng. Pat. 4550 of 1902; this Journal, 1902, 769.

—T. A. L.

Blue Dye [*Oxazine Dyestuffs*], *and Process of Making Same.* C. de la Harpe, Basle. Assignor to Durand, Huguenin, and Co., Basle, Switzerland. U.S. Pat. 707,833, Aug. 26, 1902.

The gallocyanine obtained by reacting with nitroso-ethylbenzylaniline sulphonic acid on gallamic acid is condensed in aqueous solution with resorcinol in presence of hydrochloric acid. See Eng. Pat. 4552 of 1902; this Journal, 1902, 855.—T. A. L.

Anthrazene Dye, and Process of Making Same. O. Bally, Mannheim. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 707,374, Aug. 19, 1902.

Nitro-anthraquinone derivatives are condensed with sulphanilic acid. See Eng. Pat. 1358 of 1901; this Journal, 1902, 111.—T. A. L.

Anthracene Dye, and Process of Making Same. O. Bally, Mannheim. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 707,373, Aug. 19, 1902.

Halogen amino-anthraquinones, their derivatives, and sulphonic acids can be condensed with the sulphonic acids of primary aromatic amines. If necessary these products may be subsequently sulphonated. See Eng. Pat. 7194 of 1901; this Journal, 1902, 471.—T. A. L.

Note.—This Journal, 1902, 1073, col. 1: In the abstract of U.S. Pat. 704,301, reference should have been given to Eng. Pat. 4551 of 1902; this Journal, 1902, 609.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Resists under Azo Dyestuffs formed on the Fibre. A. Schoen and E. Schweitzer. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [7], 38—39.

β-naphthol is volatilised when tissues prepared with it are steamed. It deposits upon the steaming cloths which are employed as "back greys" in the steaming operation. The effect is sensible with steaming of even very short duration. A sufficient amount of the naphthol may be volatilised and collected in this manner upon a bleached tissue which is used as a back cloth, to furnish a red colour when the tissue is subsequently passed through a solution of diazotised *p*-nitraniline. A method of resisting azo dyestuffs has been based upon this discovery:—Resist mixtures containing tannic acid are printed upon a tissue prepared with Turkey-red oil, which is thereupon steamed in contact with a tissue prepared with sodium β-naphtholate. The printed tissue is then developed with, *e.g.*, diazotised *p*-nitranili. The red colour thus obtained is sufficiently regular to be produced on the large scale.—E. B.

Resists under Aniline Black with Stannous Sodium Citrate. F. Binder and J. Frossard. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [7], 38.

A grey resist under Aniline Black (Prud'homme's style) is obtained with stannous-sodium citrate; with the addition of an iron salt, which reacts with the ferrocyanide present in the black mixture, a Prussian Blue resist is produced, which may be shaded with Eosin for a violet; the addition of a lead salt leads to the formation of an olive resist on afterwards chroming the printed tissue.—E. B.

Black not liable to turn Greenish, from Amino- and Hydroxy-amino-diphenylamine Compounds. E. Ullrich and T. Fussgänger. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [7], 38.

A mixture of sodium chlorate, aluminium chloride, acetic acid, copper sulphide, and a base derived from diphenylamine (see Fr. Pat. 313,035 of 1901; this Journal, 1902,

4) gives, when printed and steamed for 1—3 minutes, a ack which is completely devoid of any tendency to come greenish. A similar mixture of one of the same inodiphenylamine bases with acetic acid, acetin, sodium lorate, and a small proportion of copper chloride, yields black when the tissue padded with it is merely dried on a am-heated cylinder.—E. B.

English Patents.

ool and other Textile Materials; Process for Washing ——, which enables the Substances used for such Washing o be Recovered; and also for Manufacturing a Homo-eneous Ammoniacal Soap. J. Koning, Nord, France. Eng. Pat. 19,144, Sept. 25, 1901.

E wool or other material is scoured in a tank containing um or potassium carbonate solution, and then pressed. s next sprinkled with olein or other fatty body and again ssed, after which it is passed through a second tank taining water charged with ammonia, which combines h the olein, forming a homogeneous soap. After leaving tank it is pressed, again sprinkled with olein so as to plete the amount required for perfect cleansing, ssed, passed through a third bath resembling the second , and finally rinsed. Special claims are made for the of an endless band of linen or felt sprinkled with olein passing through tanks of ammoniacal solution and veen rollers, a homogeneous solution of soap being thus tinuously manufactured; also for the recovery of the noniacal salts and fatty matter by the addition of sulphuric ther acid.—C. A. M.

ercerised Cotton Yarn; Process for Producing ——. . J. Boult, London. From C. O. Reichenbach, Dresden-lasewitz. Eng. Pat. 18,728, Sept. 19, 1901.

COTTON yarns, *i.e.*, rovings of Egyptian cotton sufficiently ted to withstand a considerable amount of tension, are ted with a mercerising solution while they are subjected , tension exceeding their limit of strength. They are caused to break or to become so much over-strained they can be easily broken afterwards. The mercerised rn thus produced are further torn or broken up, and the rated fibres are then spun into fine yarns. It is stated , by this process, a high degree of lustre is obtained n single yarns, which, as usually mercerised, do not e bit the "perfect polish common to double yarns."—E. B.

Leather, Paper, Textile Fabrics, and the like: Glossing ——. A. Cohn, Berlin. Eng. Pat. 16,429, 1901.

See under XIV., *page* 1189.

United States Patents.

Ramie or Similar Fibre; Method of Retting ——. Depetro, Paris. U.S. Pat. 707,907, Aug. 26, 1902.

A process for removing encrusting matters, such as gums, fr ramie, aloes, wood, and the like, consisting in steeping th atter in sea water or a solution of salts having approxi-m ly the same composition as sea water, at a temperature of C. for 12—15 days. Fermentation occurs and the en sting matters become decomposed and dissolved.—E. B.

ice; Electro-depositing Metal on ——. J. A. Daly. U.S. Pat. 707,306, 1902.

See under XI. B., *page* 1187.

VII.—ACIDS, ALKALIS, AND SALTS.

Sodium Hypochlorite; Instability of —— in Solution. Sünden. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 02, [7], 38.

The decomposition of sodium hypochlorite solutions (prepared from bleaching powder and sodium carbonate solution), is not induced by the lime or the small quantity of ammonium chloride present in them. It is due, the author finds, to the sodium bicarbonate contained in the soda ash (made by the ammonia-soda process) employed in their preparation.

The presence of caustic alkali in an alkali hypochlorite solution may be detected by means of mercuric chloride. This gives no precipitate with solutions containing bicarbonates, but yields a red precipitate when alkali hydroxides and carbonates are present.—E. B.

English Patents.

Sulphuric Acid; Apparatus for the Manufacture of ——. R. H. Winsloe, Salford; and B. Hart, Manchester. Eng. Pat. 20,142, Oct. 9, 1901.

VERTICAL cooling pipes, open at the top and bottom for passage of air, are set in connecting trunks between sulphuric acid chambers, and between the chambers and the towers. The gases pass downwards around the pipes, whilst the air current within them is upwards.—E. S.

Sulphuric Acid; Apparatus for the Manufacture of ——, and for Recovery of Gaseous Nitrous Compounds. R. H. Winsloe, Salford; and B. Hart, Manchester. Eng. Pat. 20,143, Oct. 9, 1901.

VERTICAL cooling pipes, such as described in the preceding abstract, are set in a trunk connecting the sulphuric acid chambers to the Gay Lussac tower; and also, a series of dams over which strong acid is run in cascade fashion, whereby the acid gases passing to the tower are cooled and dried.—E. S.

Ammonia; Production of —— [Gas Producers]. B. Talbot, Leeds. Eng. Pat. 19,993, Oct. 7, 1901.

THE temperature in a gas producer, and the admission of steam thereto, are so regulated that there may be no dissociation of ammonia, whilst the gas is maintained in a condition suitable for use in steel and other furnaces. To effect this, and to minimise the quantity of steam required, the fuel near the top of the producer is mechanically agitated, laterally and vertically (the rotating arms having a water-circulation through them), ensuring a practically even bed, with easier regulation of the temperature of the mass. Reference is made to Eng. Pat. 10,049, 1900; this Journal, 1900, 814.—E. S.

Oxygen and other Gases; Apparatus for Generating ——. F. B. Felt, Chicago; and M. Greene, Marshall Town, Iowa. Eng. Pat. 13,339, June 12, 1902.

SEE U.S. Pat. 702,855, June 17, 1902; this Journal, 1902, 971.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

English Patent.

Enamelling and other Purposes; Method of and Means for Producing Designs or Surfaces for ——. C. J. Greenley, Wolverhampton. Eng. Pat. 16,486, Aug. 16, 1901.

CELLULOID sheets or other flexible supports coated with gelatin are used for transferring designs to pottery, enamels, &c., in place of paper transfers. The "gelatin transfer" receives impressions in turn from lithographic stones or plates of the component shades of the design. Commencing with the darkest shade, by working chromatically, using the colours yellow, blue and red, the most complicated design may be reproduced in three firings, each firing consisting of any number of shades of the one colour.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Sand Bricks. Schwarz. Schweizerische Bauzeitung; through J. Gas Lighting, 1902, 80, [2049], 485.

LIME and sand are mixed in a paddle pug mill, heated by a steam-jacket, the inlet of water and air being so regulated that much less lime is required than is usually the case (2—6 instead of 6—10 per cent.), whilst less powerful presses are needed for moulding. The plant is very simple, owing to the reduced number of mixing machines (one

being sufficient), and to the absence of conveyors, hoists, &c. The moulding machines are each capable of producing from 800 to 1,100 bricks (10 in. × 5 in. × 2½ in.) per hour. The cost price per 1,000 bricks, including interest and repayment of capital, is 12*s.* 6*d.*—A. S.

ENGLISH PATENTS.

Stone (Artificial); An improved Cement or ——. C. Waxin, London. Eng. Pat. 15,318, July 9, 1902.

A suitable stone is pulverised and mixed with 15 per cent. of zinc oxide; the powder obtained is mixed in suitable proportion (about 7:3) with a liquid mass formed by adding zinc (8 per cent.), and borax (6 per cent.) to hydrochloric acid (86 per cent.). The proportions may be varied to some extent in order to produce a softer or harder mixture. The cement may be applied by means of a brush or may be poured into moulds to form blocks; colouring matter may be added.—J. W. H.

Portland Cement; Maturing ——. J. S. Rigby, Liverpool. Eng. Pat. 22,601, Nov. 9, 1901. (See Eng. Pat. 801, 1901; this Journal, 1902, 118.)

THE cement is cooled by passing it through a conveyor, jacketed for passage of water or air, and is then subjected to the action of moist carbon dioxide and air, or of the former only.—E. S.

X.—METALLURGY.

Ores; Magnetic Concentration of ——, *by the Mechernich System.* Hassreidter. Bull. Assoc. Belge des Chim., **16**, [4—5], 185—195.

In this system the ore is delivered by an adjustable shute, between two magnetic poles, the upper one of which (N. pole) is rotated. The ore arriving at the point of greatest magnetic intensity, the magnetic portions are attracted by the N. pole and are carried round by it into zones of progressively diminishing intensity, so that, as soon as the force of attraction is overcome by the centrifugal force, the particles are detached and fall into collecting shutes, thus undergoing classification according to their magnetic properties. The non-magnetic particles fall direct into a shute close against the lower magnetic pole and are discharged.

This arrangement is said to possess the advantage of dispensing with all belt carriers, which weaken the magnetic field; it also permits the use of small magnetic fields and very narrow air spaces, thus minimising the loss of energy, so that it becomes possible to magnetise bodies of low magnetic properties by a weak current. Thus, for example, finely-divided *siderose* can be separated by an apparatus with a polar surface of 60 sq. cm. and an expenditure of electric energy amounting to 3 watts. The direct contact between the ore and the poles increases the working capacity of the apparatus; and as the sole working piece consists of the rotating iron cylinder, there is practically no wear and tear.

Employed in the concentration of siderosiferous blende from the Upper Harz, reduced to grains of ½ mm. in diameter, the separator recovers 98·7 per cent. of the total zinc. With dolomitic Silesian blende, 91·8 per cent. of the zinc is recovered when the grains are 3—2 mm. in diameter, the yield being increased to 93·5 per cent. on reducing the grain to 2 mm.; and with mixed ore from Broken Hill, a yield of 81 per cent. of the lead, and 69 per cent. of the zinc is obtained. A Mechernich plant installed for the enrichment of "middlings" at Broken Hill (zinc 28 per cent., lead 10 per cent., silver 9 oz.) gives a product containing 44—45 per cent. of zinc, and 4·5 per cent. of lead, and from non-magnetic ore a product containing 37 per cent. of zinc and 17 per cent. of lead.—C. S.

Zinc Blende at Denver, Colorado; Magnetic Separation of ——. Eng. and Mining J., Aug. 16, 1902.

THE magnetic separation of zinc blende from mixed sulphide ores by means of the Wetherill machines, is now being carried on by the Colorado Zinc Company at Denver, Colorado. The ore comes from Leadville, Colorado. It is first broken by means of a Gates crusher, and then reduced by rolls to 30-mesh size. This product is distributed among eight Wilfley tables, which separate it into galena-pyrites and pyrites-blende classes. The latter is dried and then passed over the Wetherill magnetic machines, of which there are two, each having three magnets. These yield a blende product, containing about 50 per cent. of Zn, 10—12 of Fe, and 1 per cent. of Pb, which is sold to zinc smelters, and a pyrites product, containing some lead and about 5 to 7 per cent. of Zn, which is united with the galena-pyrites heads from the Wilfley tables, the mixture being sold to the lead smelters, who value it. The capacity of the zinc mill at Denver is about 40 to 45 tons of crude ore per day.—A. S.

[*Iron*] *Ore-Process in the Martin Furnace; Special Modification of the* ——. W. Schmidhammer. Stahl u. Eisen, 1902, **22**, 653. Chem.-Zeit., 1902, **26**, [Ch. Rep. 223.

THIS process is used where scrap is costly. In the Ural Messrs. Goriainoff Brothers, in 1894, worked an ore process, in which 25 kilos. of ore (containing 87·32 per cent. of Fe_2O_3) with 40 per cent. of limestone were used per 100 kilos. of pig-iron. In Nadiejdinski there are new works with five 13½-ton furnaces, lined with chrome ore, using charcoal pig-iron and producer-gas prepared from wood. The ore and lime of the charge are first fused together, requiring two hours, and producing according to Loisy a sufficiently fusible compound having the general formula Fe_2O_3R. The pig-iron is then added, cold, during the space of 30—50 minutes; the fusion and boiling require 2—2½ hours, and the finishing processes before tapping, 1—1½ hour, so that three heats may be worked off in 24 hours. The raw materials used per ton of iron are as follows:—1·35—1·7 cb. m. of wood (= about 2 kilos. of charcoal), 966·8 kilos. of pig-iron, 188·4 kilos. of ore, and 32·8 kilos. of dolomite. The yield from the ore is 41 per cent. A. Monell has used a somewhat similar process in Pittsburg in 40-ton furnaces; 3 tons of lime were charged on to the hearth, 10—12 tons of ore were then added, and when, after 1½ hour, the ore began to melt, the pig-iron was run in in the liquid state. The reaction is not very violent, as the ore is not completely melted. The slag is poor in lime but rich in iron. A similar process was in operation in Resieza in 1900.

—W. G. M.

Wires of Nickel and Iron; Effect of a Longitudinal Magnetic Field on the Internal Viscosity of ——, *as shown by the Change of Rate of Subsidence of Torsional Oscillation.* A. Gray and A. Wood. Proc. Roy. Soc., 1902, **70**, [463], 294—303.

A WIRE, one metre long, of the metal to be examined, was suspended vertically with a heavy weight at the bottom in such a way that it was surrounded with a coil of 3,080 turns of copper wire, so that the wire could thus be placed in a magnetic field of any desired strength. It was found that, when the wire was subjected to torsional oscillations by rotating the suspended weight on its axis through 90°, the rate of subsidence of the oscillations was affected by the strength of the magnetic field. In the case of annealed nickel, stated to be almost pure, the effect of small fields was to increase greatly the rate of subsidence, the maximum effect being observable at a field of about 160 C.G.S. Beyond this point an increase in the field caused a decrease again in the rate of subsidence. Drawn nickel wire (hard), however, showed a regular but slight increase in the rate of subsidence up to the maximum field (400 C.G.S.) available. Iron and steel, unlike nickel, showed a diminution in the rate of subsidence of the oscillations, the effect being greater in the iron than in the steel. The iron, however, reached a maximum at a field of about 160 or 170 C.G.S., but showed no reversal, while the steel showed no maximum. Hard drawn iron, like steel, did not show the tendency to reach constancy at any fields experimented with.—W. G. M.

English Patents.

tallurgical Furnaces. W. Wakely, Taunton, Mass., U.S.A. Eng. Pat. 10,315, May 5, 1902. (Under Internat. Conv., Dec. 7, 1901).

E U.S. Pat. 697,701, 1902; this Journal, 1902, 599.
—E. S.

asting Furnaces. F. Klepetko, Anaconda, and W. J. Evans, Great Falls, Montana, U.S.A. Eng. Pat. 11,533, May 20, 1902.

E furnace is built with superposed hearths, and a central olving vertical shaft carries arms with blades, which are pted to agitate, and move the charge towards the centre the periphery, on alternate hearths. The shaft and s are hollow, to admit of passage of an inner pipe ough which water circulates. The ore is fed through a per provided with a rotatory stirrer on to a plate beneath, which it is mechanically scattered on to the uppermost rth, from which, through several flues and passages, leaches in succession the lower hearths.—E. S.

lting Furnaces; Utilising Waste Heat in connection ith ——. R. Brown, Southampton. Eng. Pat. 18,772, ept. 20, 1901.

r slag is discharged from smelting furnaces into bogies, ch are run into flues beneath the floor of a covered shed, which floor is spread ore to be dried. The construction uch as to allow air, heated by contact with the hot slag, scend through the ore above.—E. S.

per; Improved Method of Reducing Copper Matte Refined ——. G. Mitchell, Naco, Arizona, U.S.A. ng. Pat. 15,046, July 5, 1902.

U.S. Pat. 705,109, 1902; this Journal, 1092, 1081.
—E. S.

United States Patents.

el; Producing ——, *direct from Oxide of Iron Ore.* . Reynolds, Albany, New York. U.S. Pat. 707,638, ug. 26, 1902.

ore is granulated, and mixed with sufficient granulated onaceous material to reduce it, and to carbonise the . The mixture is exposed in a suitable furnace to the rface action of a neutral flame" until the reduction and onisation of the ore are effected. Granulated fluxes then added, and the mass is subjected to the action of a tral heating flame (now changed to a "true blowpipe e") until the metal is fused, when the slag is rated, all the processes being carried out in the same ace.—E. S.

cious Metals; Treating Rebellious Ores of the ——. . F. Dowds, Jersey City, U.S.A. U.S. Pat. 707,214, ug. 19, 1902.

es containing gold and silver associated with arsenic, imony, sulphur, or similar impurities, are (usually after ior mild roasting) mixed with a sodium compound, such he carbonate, and with carbon, and, either in the form briquettes or otherwise, heated sufficiently to set free the ium, which is stated to so react as to render the said purities volatile, or removable on lixiviating the cooled s. The precious metals may then be recovered from residue.—E. S.

cious Metals; Extracting ——. W. Hilt, Coles, alifornia; and C. E. Lane, Ashland, Oregon. U.S. at. 707,926, Aug. 26, 1902.

c vapour is led to near the bottom of the cyanide or r solution of the precious metal, which is thus ipitated. In the apparatus shown, a covered crucible ged with zinc is heated in a closed chamber, and the zinc ur passes down a vertical tube, open above to the upper e in the crucible, and leading through the crucible om and chamber into the solution contained in a vessel eath. The zinc, condensing in a finely-divided con- n, is stated to effect the precipitation very rapidly.
—E. S.

Ores [*Cupreous Sulphide*]; *Process of Treating* ——. J. Herman, Colorado. U.S Pat. 707,107, Aug. 19, 1902.

Cupreous sulphide ores are roasted at a low temperature, and the mass is lixiviated to dissolve cuprie and ferrous sulphates, the latter being required to be present in large proportion, a condition secured, when necessary, by addition of iron pyrites to the ore to be roasted. Copper is precipitated from the solution by scrap iron, and sodium chloride is added to the liquor, either before or after separating the copper. The lixiviated mass may be mixed with salt and again roasted, the product being lixiviated with the saline liquor. This liquor is also used to dissolve copper and silver out of "carbonate and oxide" ores; and may be again similarly used after precipitation of the said metals.—E. S.

Sulphide Ores [*Zinc*]; *Treating Mixed* ——. E. Ferraris, Monteponi, Italy. U.S. Pat. 707,566, Aug. 19, 1902.

Mixed sulphide zinc ores are treated with concentrated sulphuric acid in the proportion of two molecules of the acid to each molecule of the metallic sulphides contained in the ore, no external heat being applied. "From the sulphated ore all of the zinc [as sulphate] can be leached by means of water, whilst lead, silver, gold, and antimony will remain in the insoluble residue." See Eng. Pat. 12,349, 1901; this Journal, 1901, 1117.—E. S.

Aluminium; Solder for Soldering ——. J. C. Webster, Philadelphia, U.S.A. U.S. Pat. 707,470, Aug. 19, 1902. (Compare Eng. Pats. 4713, 1901; and 6969, 1902; this Journal, 1902, 976 and 1081.)

The solder is formed by melting together from 5 to 6 parts of tin, 4 to 5 parts of lead, and 6 to 4 parts of aluminium, and then adding 1 part of zinc. No flux or scraping of the aluminium article to be soldered is stated to be necessary.
—E. S.

Metals; Eliminating ——, *from Mixtures of Metals.* G. H. Clamer, Philadelphia, U.S.A. U.S. Pat. 707,551, Aug. 26, 1902.

The scrap metal or alloy from which a constituent metal is to be eliminated, is melted with a suitable flux in contact with an oxide, sulphide, or chloride of a metal, the "heat of formation" of which is less than that of the constituent to be removed, whereby the metallic base of such oxide, &c., enters the alloy, displacing the other metal. For example, in case the scrap or alloy contains copper, tin, and zinc, which last it is desired to replace by lead; the alloy is heated with lead oxide and a flux (such as a mixture of silica and soda-ash), when a slag of zinc oxide is formed, the zinc being replaced by lead in the alloy, which alloy is stated to be thus rendered more suitable for application in making carriage-bearings. See Eng. Pat. 11,806, 1900; this Journal, 1900, 829.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Cathodic Polarisation in Dilute Sulphuric Acid. J. Tafel. Zeits. f. Elektrochem., 1902, 8, [34], 604—607.

An apparatus is described which is available for the measurement of polarisation values at comparatively high current-densities. It is based on the observation that a large polished platinum anode opposed, in dilute sulphuric acid, to a small platinised platinum cathode, very rapidly arrives at a P.D. which, for any given volume of current, remains constant for hours, and which is always again attained after a few minutes, even if the experiment be discontinued for a time. The apparatus consists of a polished platinum crucible, containing dilute sulphuric acid, in which is immersed, to an exact predetermined depth, the platinised platinum cathode, which is cylindrical in shape, but with a hemispherical bottom. The cathode may be replaced at will by a precisely similar cathode of any metal desired.—W. G. M.

(*B.*)—ELECTRO-METALLURGY.

Graphite Electrodes in Electro-Metallurgical Processes. C. L. Collins. Trans. Amer. Electrochem Soc., 1902, 1, [1], 53—60.

The author gives in the following table the results of some experiments with amorphous carbon and graphite electrodes in actual electro-metallurgical work. The amorphous c bon electrodes were of the best American manufacture a made of finely-ground petroleum coke with a pitch bindi The graphite electrodes were made by the Acheson proces they had a specific resistance of only 0·00032 ohm p cubic inch, or about one-fourth that of the amorpho carbon articles.

Series.	Number, Size, and Kind of Electrodes used in each Terminal.	Total Current in Ampères.	Current Density in Ampères per square inch.	Average Hours Run.	Average Length Consumed.	Number of Runs.	Relative Weight Consumed p Hour.
					Ins.		
A	Four—1″ × 1″ × 24″ amorphous carbon	4000	62·5	8	12—14	4	1·000
B	Four—1″ × 4″ × 24″ Acheson graphite.	4000	62·5	32	12—14	4	0·250
C	Four—2″ × 4″ × 24″ Acheson graphite.	4000	125·0	32	12—14	15	0·125
D	Four—2″ × 4″ × 30″ Acheson graphite.	4000	125·0	95	22—24	15	0·074

In all the experiments the electrodes projected into the mixture under treatment, and were not only exposed to its oxidising action, but were also exposed to some oxidation from the oxygen of the air above the surface of the mixture. All the runs were under as nearly as possible identical conditions. In series A, the amorphous carbons were slightly heated by the current density used, whereas in series C, with twice the current density, the graphite electrodes showed no signs of heating whatever. In the series D, the graphite electrodes were partially protected by a casing from the oxidising action of the air above the surface of the mixture. This means of protection was not possible with the amorphous carbons on account of the heating developed in the carbons themselves.—A. S.

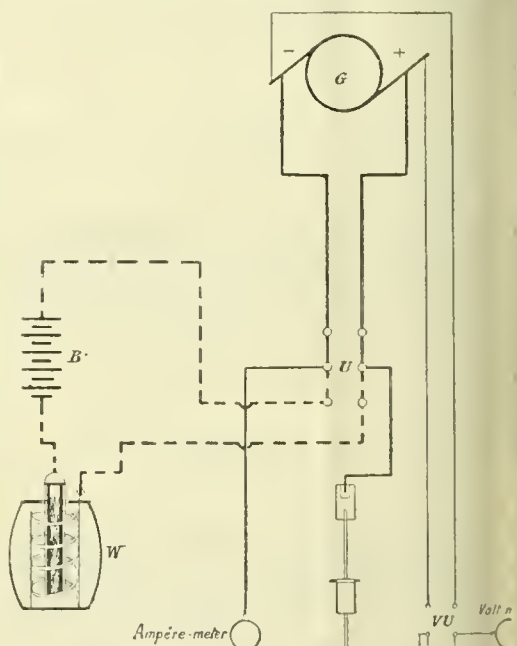
Aluminium: Extraction of ——. F. Haber. Zeits. f. Elektrochem., 1902, 8, [34], 607—616.

Contrary to some published statements, it is quite easy to reduce aluminium on the small scale from the same materials and by the same general method as are used on the large scale; and the author has studied the reactions and conditions of manufacture with the aid of a small furnace, described elsewhere by Haber and Geipert (see this Journal, 1902, 260), and figured in the accompanying illustration. The dynamo used (G) was one capable of giving 375 ampères at 15 volts. A battery of 120 volts (B) with a suitable resistance (W) was used to melt the raw materials at the outset, being cut in or out of the circuit by the switch U. The cathode consisted of a single block of carbon hollowed out to form a crucible. An ammeter is shown permanently in the main circuit, and a voltmeter, shown on the right-hand side of the figure, is arranged to indicate at will either the pressure between the terminals of the dynamo or that between the electrodes. The metal after reduction is ladled out of the crucible. The electrodes should be kept as close as possible together without risk of short-circuiting, and the anode is therefore provided with a fine, as well as with a coarse, adjustment to regulate the distance between them.

The anodes are rapidly destroyed and are subject to a softening action at the point at which they enter the liquid bath.

It is recommended to work with a small anode current density. The author has found it advantageous to reduce the current 10 to 5 ampères per square cm.

In the experiments tried, 1 kilo. of cryolite, and 150—200 grms. of alumina were used; these were melted in a few minutes. The anode was then lowered to within a space of at most 1 cm. from the bottom of the crucible. Electrolysis was conducted with 330—350 ampères at 8 volts; the average was $7\frac{1}{3}$ volts between the top of the immersed portion of the anode and the cathode. On a large scale 7 volts, or possibly 6 volts, could be used. The proportion of Al_2O_3 may vary from $\frac{1}{3}$rd to $\frac{1}{6}$th of the total bath without making any apparent difference in the current or pressure losses. But it is necessary that sufficient Al_2O_3 be present to provide all the Al for electrolysis, as the pressure required for electrolysis of the fluoride is found to be 12 volts under the same conditio as those which yielded the metal with 8 volts wh Al_2O_3 was added. On the other hand, an excess Al_2O_3 is to be avoided, especially if it be of the vari having a high specific gravity. The light porous Al_2O_3 always preferable, as it dissolves more quickly in the ba The Al_2O_3 was added at the rate of 130—160 grms. per ho thus allowing for a current efficiency of 60—75 per cent. one case where the temperature was unusually high, o 300 grms. of Al were obtained where 1,040 grms. sho theoretically have been produced. This abnormal loss



traceable to the passing over of finely-divided Al in bath from the cathode to the neighbourhood of the an and being there re-oxidised by the oxygen evolved.

The formation of this finely-divided Al occurs most readily at high temperatures. A reduction of temperature is therefore advisable, especially as it minimises the heat losses, and the vaporisation of fluoride, which is so detrimental to the neighbourhood of the works. It is often argued that at high temperatures the bath conducts better, and therefore works more economically; but this is incorrect. The anode carbons should be as free as possible from silicon, as it is usually from this source that the silicon in electrolytic aluminium is derived. There is no difficulty in obtaining cryolite and alumina practically free from silica.
—W. G. M.

Lead; Electrical Reduction of ——. P. G. Salom. Trans. Amer. Electrochem. Soc., 1902, **1**, [1], 87—89.

The author describes the process for the electrical reduction of lead now in operation on a considerable scale at Niagara Falls. The ore, after being carefully washed to remove as far as possible the dirt and loose gangue, is ground to a fine powder and placed in the cells, which have the shape of truncated cones of cast antimonial lead, about 2 feet in diameter at the top, and 15 inches at the bottom, and 6 inches high, with a flange on the outside so arranged as to fit on the top of another cell. Each cell is charged with about 12 lb. of ore, and filled to about two-thirds with dilute sulphuric acid. They are connected up in series of about 48 cells, and a current of about 1 ampère per lb. is used, requiring from 125 to 130 volts, or about 2·5 volts per cell. At this current density, complete reduction is effected in five days. After this time, the cells are disconnected, the acid is poured off, and the resulting mass of spongy lead scraped out. The sulphur usually contained in the ore passes off as sulphuretted hydrogen, and it is proposed to burn this to sulphurous acid, and convert the latter into sulphuric acid. The spongy lead is thoroughly washed to remove sulphuric acid, and can then be compressed into ingots, or converted into various lead compounds.—A. S.

United States Patents.

Lace; Method of Electro-Depositing Metal on ——. J. Daly, Washington, Columbia, U.S.A. U.S. Pat. 707,305, Aug. 19, 1902.

The lace is first coated with graphite or other conducting surface in the usual way; it is then placed in a wire-basket, which is next surrounded with a coil of fine wire and immersed as cathode in a plating-vat. The many points of contact between lace and wire ensure the deposit starting from many centres. As soon as the lace has become stiffened by a slight metal-coating all over, it is removed and suspended in a plating-vat in the usual way.
—W. G. M.

Galvanising Machine. R. Heathfield, London, England. U.S. Pat. 707,322, Aug. 19, 1902.

In galvanising sheet metals the rolls through which the plates are withdrawn from the zinc bath are placed so near the surface that the nip is only just submerged. Close below these exit-rolls a second pair is placed, with the object of removing as much as possible of the excess metal clinging to the plates. Between the two sets of rolls the sheets pass through guides, so hooked over tie-bars, that if a sheet becomes caught, it may be readily released by shaking the guides.—W. G. M.

XII.—FATS, OILS, & SOAP.

Fats and Oils; Free Fatty Acids in ——. P. Schestakoff. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [8], 180—182.

Tallow rendered over a naked flame is much less stable than that rendered by steam. On boiling crude fat with water, a good product is obtained, but its keeping properties are diminished by the process. The most rational method of separating the fat is Lidoff's process of rendering *in vacuo* at the lowest possible temperature.

The oil extracted from the powder that had been used to bleach cocoa-nut oil was examined by the author and found to contain 60 to 70 per cent. of free fatty acids and to be nearly free from glycerides. The acidity of pure cocoa-nut oil was found to vary from 2 to 5 per cent.

The following table shows the percentage of free fatty acids in different commercial samples of animal fats examined by the author:—

Fat.	No. of Samples.	Free Fatty Acids. Min.	Free Fatty Acids. Max.
		Per Cent.	Per Cent.
Bone fat	379	8·3	56·2
Mixed tallow	158	0·6	36·8
Ox tallow	65	0·1	27·0
Mutton tallow	54	0·33	10·7
Horse-bone fat	2	43·2	47·1
Fish oil	3	1·3	2·8

—C. A. M.

Fatty Acids, Insoluble; Mean Molecular Weight of ——. M. Tortelli and A. Pergami. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [8], 182—184.

It has been generally assumed that the acid value or neutralisation equivalent of the insoluble fatty acids

Oil or Fat.	Oil or Fat. Acid Value. I.	Oil or Fat. Saponification Value. II.	Insoluble Fatty Acids. Acid Value. III.	Insoluble Fatty Acids. Saponification Value. IV.	Molecular Weight of Insoluble Fatty Acids calculated from Acid Value. V.	Molecular Weight of Insoluble Fatty Acids calculated from Saponification Value. VI.	Difference. V.—VI.
Almond oil, 2½ years	1·50	193·6	196·0	202·2	286·2	277·3	8·7
Cotton-seed oil, 2½ years	0·19	195·2	194·3	204·5	288·7	274·3	14·4
Linseed oil, crude, recently pressed.	3·80	193·3	200·9	203·1	279·2	276·2	3·0
Palm-nut oil, 2½ years	1·29	191·0	195·5	200·0	286·9	280·5	6·4
Earth-nut oil, fresh ...	0·90	188·9	195·2	200·2	287·3	280·2	7·1
Sesame oil, 2½ years old	3·29	—	183·1	189·0	306·4	296·7	9·7
" fresh.....	1·90	181·3	187·0	191·0	300·0	294·3	5·7
Lard oil, 3 years old	2·70	192·6	191·5	205·4	292·8	273·2	19·6
" fresh cold-drawn.	0·30	189·8	194·6	201·8	288·2	277·9	10·3
Tallow, 2 years old .	4·30	199·6	205·4	207·1	273·1	270·8	2·3
" freshly rendered.	1·49	200·9	205·7	209·9	272·7	267·2	5·5

liberated from different fats and oils is identical with the molecular weight. The authors, however, find that this is not the case, and point to the fact of the recorded molecular weights of the mixed fatty acids of different oils being inconsistent with their known composition. They attribute this discrepancy to the presence of inner anhydrides or lactones, and illustrate their conclusion by a long table of determinations, typical examples of which are given in the accompanying table.

To obviate this error, the lactones must be hydrated by saponifying the fatty acids with an excess of alcoholic alkali and titrating the excess, just as in the determination of the saponification value of the fats themselves.

—C. A. M.

Sesamé Oil; Certain Tests for ——. Utz.

See under XXIII., *page* 1196.

Olives; Determination of Oil in ——. I. Pouget.

See under XXIII., *page* 1196.

ENGLISH PATENT.

Soap, Ammoniacal; Process for Washing Wool and other Textile Materials, which enables the Substances used for such Washing to be recovered; and also for Manufacturing a Homogeneous ——. J. Koning. Eng. Pat. 19,144, 1901.

See under V., *page* 1183.

UNITED STATES PATENT.

Deodorising [*Cornmeal, Cotton-seed meal, &c.*]; *Process of* ——. F. M. Pratt, Decatur, U.S.A. U.S. Pat. 707,354, Aug. 19, 1902.

THIS process is specially applicable to corn meal, cotton-seed meal, &c., from which the oil has been extracted by hydrocarbon solvents. The material is first heated in a chamber to a temperature sufficient to prevent the condensation of steam, and then subjected to the action of live steam, stirring being continued throughout the whole process.

—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

ENGLISH PATENT.

Paints and Dyes; Manufacture of ——. R. Vidal, Argenteuil, France. Eng. Pat. 12,680, June 3, 1902. Under Internat. Conv., Nov. 7, 1901.

REDUCIBLE substances such as nitrobenzene, hydroxybenzene, nitro- or dinitronaphthalenes, and the like, are treated with sulphate of iron solution and cast steel or iron borings or turnings. In addition to the product of reduction, there is obtained a polybasic iron sulphate either alone or mixed with oxide of iron. After separating by filtration this is heated in a closed furnace to 180°—250° C., when a sulphoxide of iron is obtained in impalpable powder, of a shade varying from reddish brown to dark brown according to the quantity of iron salt employed. The colours are employed in the manufacture of oil paints.—T. A. L.

UNITED STATES PATENTS.

Paint. F. H. Crass, Murfreesboro, Tennessee, U.S.A. U.S. Pat. 707,677, Aug. 26, 1902.

RAW cotton is "carbonised" at a suitable temperature, pulverised and incorporated with coal-tar in the proportion of 2 oz. to 1½ lb. to 1 gallon according to the purpose for which the paint is required.—R. L. J.

Pigments; Process of Making ——. J. Lones, Smethwick, England. U.S. Pat. 707,434, Aug. 19, 1902.

SEE Eng. Pat. 10,865, 1901; this Journal, 1902, 555.

—M. J.

(C.)—INDIA-RUBBER, &c.

Rubber-like Latexes from the Congo Region; New ——. E. Marckwald and F. Frank. Gummi-Zeit., 1902, 17, [48], 923—924.

THESE samples were preserved during transmission by the addition of ammonia at the time of collection. The following table shows the proximate composition of the coagulated products and their chief properties:—

Name of Latex.	Composition of Product after 14 Days. H_2O.	Ash.	Resin.	Rubber substance.	Condition of Latex, and sp. gr.	Mode of Coagulation.	Nature of Product, and Remarks.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.			
1. Bossenja (*a*) ..	17·94	3·96	71·22	6·88	Clear; 0·992	Salt solution and heat.	Softens when warmed and hardens when cooled.
1. Bossenja (*b*) ..	19·58	Trace	68·22	12·20	„ „	H_2SO_4	Sticky, and of small elasticity
2. Lôcûna	16·77	0·28	72·26	10·69	Coagulated; 1·007	H_2SO_4 and heat..	Very sticky, and of low elasticity
3. Lokomoû (tree)	0·9	16·87	62·40	20·73 abnormal.	Turbid; 1·0168 .. (*a*) (*b*)	(*a*) Salt and heat (*b*) H_2SO_4	Very difficult to coagulate. Product dried on water bath for analysis.
4. N'Tio (ereeper)	3·80	Trace	83·72	12·48	Turbid; 1·003 ...	H_2SO_4 and heat..	Brown coloured, and darkens rapidly in the air.
5. Manghay.....	5·34	—	84·44	Nil	Clear; 1·048	H_2SO_4 or alum...	A brittle mass with 15·08 per cent. of ash.

—R. L.

ENGLISH PATENTS.

India-rubber; Manufacture or Preparation of Sheet ——. A. C. Blossier, Paris. Eng. Pat. 18,964, Sept. 23, 1901.

ONE kilo. of cleaned and softened Pará rubber is mixed in a mill with about 800 grms. of zinc oxide, 400 grms. of magnesium oxide, and 60 grms. of litharge, and the whole is calendered until sufficiently thin. It is then vulcanised either in the cold with a liquid containing 2·5 lb. of sulphur chloride per 100 lb. or after heating to 130° or 140° C. In the latter case the litharge is replaced by about 70 grms. of flowers of sulphur. The process is said to give sheets thinner than have hitherto been capable of manufacture; and also to yield a vulcanised material having an almost white colour, or, if pigments be added, clear and transparent tints.—F. H. L.

Gutta-Percha; Manufacture of ——. D. N. Berrim and S. Milne, Edinburgh. Eng. Pat. 16,528, Sept. 7, 1901.

IN order to remove air and moisture which cause bubbles and holes in the finished material, gutta-percha is kneaded under diminished pressure in a steam-jacketed vessel.

—F. H.

Plastic Compositions; Machines for Mixing ——. H. Pearce, New Haven, Conn., U.S.A. Eng. Pat. 69, March 20, 1902. Under Internat. Conv., Oct. 10, 1901.

ABOVE the pair of horizontal revolving rollers of the usual type of mixing machine, a casing is erected containing two Archimedean screws working in opposite directions, and connected by gearing with the rest of the apparatus. Mechanically driven valves are also fitted at the bot-

t hopper so that the solid substances which have to be i rporated with the rubber, &c., that is travelling between t rollers, may be added thereto after a preliminary mixing, niformly all along the length of the said rollers, and in predetermined quantities.—F. H. L.

United States Patent.

Fiber; Treatment of Crude ——. J. Thame, Assignor o South Western Rubber Co., Ltd., both of London, ngland. U.S. Pat. 707,654, Aug. 26, 1902.

See Eng. Pat. 9920, 1901; this Journal, 1902, 188.

—F. H. L.

XV.—TANNING; LEATHER, GLUE, SIZE,

English Patents.

Leather for Belting; Preparing ——. J. Caldwell, Minneapolis, U.S.A. Eng. Pat. 13,584, June 16, 1902.

The leather is strained in such a way that every portion of it stretched to its utmost capacity before the hide is cut into strips for belting the process being assisted by saturation with grease and water and partial drying. In illustration of the principle various mechanical devices are described for gradually stretching in due order the softer portion beginning at the belly-part, and finally the hide as a whole.—R. L. J.

Leather, Paper, Textile Fabrics, and the like; Glossing —. A. Cohn, Berlin. Eng. Pat. 16,429, Aug. 15, 1901.

A durable glossy coating is produced on the above materials by painting them with a solution of celluloid of high density and syrupy consistency, whereas if a thin solution be employed, no glossy coating is obtained. The solution is advantageously composed of 100 parts by weight of amyl acetate (or the latter and acetone), 7 to 12 parts of celloid and 10 to 18 of castor oil.—J. F. B.

Leather; Production of Chrome ——. E. J. A. Köster, Münster, Germany. Eng. Pat. 20,535, Oct. 14, 1901.

In the production of chrome leather by the two-bath process the hide is removed from the second bath before reduction is complete, and immersed in a solution of sodium thiosulphate heated above 109° C. A hard and waterproof leather is said to be obtained. The thiosulphate completes the reduction of the chromium salts.—R. L. J.

Glue; Apparatus for making ——. L. L. Kelsey, Oldford, Connecticut, U.S.A. Eng. Pat. 15,856, Aug. 6, 1901.

The apparatus consists of a first compartment in which the liquid stock is reduced to a suitable density, and discharged through apertures or moulds into a second part where the viscid material is dried and finished for the market, the whole process being continuous. Various mechanical details are claimed.—R. L. J.

United States Patent.

Material which cannot be readily Punctured; Manufacture of Sheets of Flexible Elastic ——. V. E. Belledin, Paris. U.S. Pat. 707,752, Aug. 26, 1902.

This is a "puncture-proof" strip for insertion between the inner and outer tubes of a pneumatic tyre. The hide of any horned cattle is cleaned and unhaired, immersed for some hours in cold crude petroleum, then in a suitable mineral or fatty oil, and finally dried. It is next, if necessary, thickened by treatment for 20 minutes in a 33° B. solution of potassium silicate, and again dried. Strips of the desired width are then cut from it, curved to shape by means of iron rollers, and hardened in a bath of petroleum spirit. A bath of bleaching powder solution of 33° or 50° B. is next used so as to close the pores and sterilise the material, and the whole is ready for use.—F. H. L.

XV.—MANURES, Etc.

United States Patent.

Manure; Manufacturing ——, *from Apatite or similar Mineral Phosphate.* [*Electrical.*] J. G. Wiborgh and W. Palmaer, Stockholm. U.S. Pat. 707,886, Aug. 26, 1902.

An electric current is passed "through an electrolytic bath having an anode and cathode, and containing an electrolyte consisting of a solution of a salt disengaging at the anode an acid, forming a soluble salt with lime, while at the cathode a basic hydrate is formed; dissolving the mineral phosphate by the acid disengaged, and precipitating the same in the alkaline liquid of the cathode as phosphate of calcium, but in another more soluble form," *i.e.*, soluble in citric acid solution. The anode and cathode compartments are preferably separated by a porous diaphragm.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Diffusion Residues; Experiments on Compression of ——. A. Herzfeld. Zeits. des Vereins deutsch. Zuckerind., Aug. 1902, 701—715.

The author summarises the results of a long series of experiments on pressing diffusion residues, as follows:—

By working the diffusion at a low temperature, the loss of foodstuffs in the subsequent pressing of the residues is almost negligible, whereas extraction at higher temperatures gives rise to considerable losses in the press water.

Residues coming hot to the press are more easily compressible.

Partially extracted residues give rise to considerably greater losses in the press than those which have been completely extracted.

The compressibility of fresh chips is very much assisted by a short treatment with hot juice beforehand; continued soaking at a high temperature destroys this effect.

—B. F. D.

Molasses; Action of Potassium Lactate in forming ——. R. Ilmer. Zeits. Vereins deutsch. Zuckerind., Aug. 1902, 720—723.

Experiments were carried out to determine the solubility of sugar in water, containing varying amounts of potassium lactate, from 2—16 per cent., at temperatures of 30° and 50° C. Only in one instance, in the presence of 15 per cent. of the salt, was there any indication of an increase of solubility of the sugar. The author concludes that the small quantities of lactate found in molasses can have no appreciable effect in preventing the crystallisation of the sugar.—B. F. D.

English Patents.

Sugar in Crystals; Continuous Liquor and Syrup Heating and Feeding Apparatus in conjunction with Vacuum Pans for Producing ——. J. Lang, M. Blake, and R. H. Smart, Greenock. Eng. Pat. 11,812, May 24, 1902.

The heating and feeding apparatus consists of a vessel interposed between the liquor or syrup storage tank and the vacuum pan. The liquor on its way through the vessel passes through a series of tubes or coils surrounded by steam, in which it is heated to the desired degree; it is then sucked into the vacuum pan by way of a siphon in a continuous stream. The temperature and quantity of feed liquor are regulated by valves, and the speed may be increased by opening a supplementary direct connection between the vacuum pan and the vessel, above the levels of their contents.—J. F. B.

Starch and Materials containing Starch; Treatment of ——. W. P. Thompson, Liverpool. From A. P. Anderson, New York. Eng. Pat. 13,353, June 12, 1902.

Starch granules are swollen and caused to burst by heating the starchy material in the air-dried condition under pressure

at a temperature above the boiling point of water, and then suddenly releasing the pressure in such a way that the liquid present in the starch—usually considered to be hygroscopic moisture—is immediately volatilised. Starch treated in such a manner is more porous, and is said to be more easily digested than ordinary starch.—J. F. B.

United States Patents.

Sugar; Process of Extracting ——, from its Solutions. A. Wohl, Berlin. U.S. Pat. 707,889, Aug. 26, 1902.

This specification corresponds with that of Eng. Pat. 22,859, 1895. Sugar is extracted from molasses or impure afterproducts by converting it into lead sucrate. (See this Journal, 1896, 822.) The solution is treated with yellow lead protoxide and an alkali hydrate, the viscous semi-solid mass is separated and washed with water, first at 40°—50° C., and subsequently at 70°—75° C. The sucrate is then decomposed by carbonating, and the last traces of lead are removed from the filtrate by concentrating the liquor, treating it with a small proportion of calcium hydrate, and again carbonating at a temperature of 80°—90° C. (Compare Kassner's articles and patents, this Journal, 1895 and 1896.)—J. F. B.

Sugar; Process of Converting Wood into ——. A. Classen, Aachen, Germany. U.S. Pat. 707,903, Aug. 26, 1902.

See Eng. Pat. 12,588, 1901; this Journal, 1901, 1008. —J. F. B.

Starch Material; Art of Treating ——. A. P. Anderson, New York. U.S. Pat. 707,892, Aug. 26, 1902.

See Eng. Pat. 13,353, 1902; see last of preceding Eng. Pats.—J. F. B.

Starch; Process of making Laundry ——. C. H. Tolhurst and A. G. Goldthwaite, New York, Assignors to W. H. Tolhurst and Son, New York. U.S. Pat. 707,985, Aug. 26, 1902.

A mixture of starch and water is enclosed in a drum, protected from external contamination, and heated from the outside by steam with agitation, until the starch is swollen and dissolved. The solution, still in the drum, is further agitated and subdivided during the process of cooling, with the result that the cold starch paste remains in a fluid condition.—J. F. B.

Starch; Apparatus for Treating ——. C. H. Tolhurst and A. G. Goldthwaite, New York, Assignors to W. H. Tolhurst and Son, New York. U.S. Pat. 707,986, Aug. 26, 1902.

The apparatus for the preparation of laundry starch according to the process described in the preceding abstract, consists of an inner and outer drum mounted and rotatable horizontally. The space between the drums serves as a jacket for the reception of steam or cold water as desired. A valved opening leads from the outside to the interior of the inner drum. Inside the inner drum, radial screens of wire-gauze are fixed to the periphery and only extend a part of the way to the centre. The wire screens and the free space at the centre of the drum effect a thorough agitation of the mass when the apparatus is rotated. —J. F. B.

Cattle Food. G. H. Hughes. U.S. Pat. 707,113, 1902.

See under XVIII. A., *page* 1191.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt; Sulphuring of ——. W. Windisch. Woch. f. Bran., 1902, **19**, [36], 511—513.

Satava (Ber. Versuchsanst. Böhmen) describes experiments in which samples of green malts from various maltings were divided into three portions, one being then kilned plain, one moderately sulphured, and one strongly sulphured. Mashes were made, and the worts analysed and examined. Satava concludes that the yield of extract was increased by sulphuring, the time of saccharificati was not prolonged, and the worts were, as a rule, ligh coloured and more stable than those from the unsulphu malts. Windisch remarks, however, that the differences yield of extract were only small, and within the limits error, especially as the malts were kilned separately; l even if there were a slight increase in yield, it might obtained by other less objectionable methods. As rega the colour of the worts, it is not shown that the paler col was preserved after prolonged boiling with hops, and stability of the worts could be attained just as well by addition of sulphurous acid as a direct antiseptic. Sat admits that the malty aroma of the worts was destroyed a certain extent by sulphuring. He concludes that outward appearance of the malt is only improved by s phuring when it is naturally inferior from any cause; the case of normal malts, sulphuring decreases the la without improving the colour. From this, Windisch duces a confirmation of his previous standpoint: t sulphuring is technically useless, and in some cases amount to a deception. In the present state of the indus there is no necessity for any artificial means of obtain pale kilned malt, and brewers should combine to supp this practice.—J. F. B.

Hops; Contribution to the Chemistry of ——. M. B berger and A. Landsiedl. Zeits. ges. Brauw., **25**, [461—464.

α-Lupulinic Acid.—The lupulin obtained by rubbing cones through a coarse sieve was digested with petrol spirit (b.pt. under 50° C.) at the ordinary temperature. extract was shaken up with a 4 per cent. solution sodium bicarbonate, followed by acidification with di sulphuric acid, the soft yellow mass thereby separated b dissolved by ether. This solution was repeatedly agit with water, and then evaporated by gentle heat *in va* the residue being taken up with alcohol. The solution the characteristic reactions for α-lupulinic acid. The acid was obtained by precipitation with lead ace followed by extraction with ether and recrystallisation glacial acetic acid and acetone, or alcohol, the crysta lead salt being decomposed with dilute (1 : 10) sulp acid and ether. The ethereal solution was evaporate *in vacuo*, the residue taken up with alcohol and allow crystallise out, *in vacuo*, over sulphuric acid and cal chloride, the crystals being dried in the desiccator for se weeks. The dry acid forms a pale amber crystalline m easily reduced to a white powder; it melts at 5 C. (uncorr.) and is apparently soluble in nearly all solv without heating. When exposed to the air, it oxi rapidly, becoming a deeper yellow, soft and glutinous then furnishing, in alcoholic solution, a deep y coloration with ferric chloride, instead of the deep a obtained with the pure acid. The formula $C_{20}H_{28}O$ or $C_{20}H_{30}O_5$ corresponded with analytical figures obtain

The alcoholic solution filtered off from the lead precipitate gave, on treatment with lead acetate, a precipit of brownish-yellow flakes, which partly dissolved on e action with ether, after washing in alcohol and water drying in the desiccator. Evaporation *in vacuo* left a ea yellow brown, resinous, brittle residue, readily solu alcohol and ether, and containing about 30 per cc. of lead. The acid obtained on decomposing this salt with sulphuric acid, took the form of a clear, viscid, re brown residue, remaining unsolidified. Ultimate an revealed a probable formula $C_{27}H_{38}O_7$. The alc solution has a decided acid reaction and bitter flour. With ferric chloride it gives a deep yellow-brown c tion; with copper acetate a flocculent pale yellow e precipitate.—C. S.

Yeast; Special ——, common in High-Fermentation Beers. H. Van Laer. Bull. Assoc. Belge des Chim., **16**, [4—5], 177—181.

A new asporogenic yeast, occurring as pudding-shaped cells in arborescent aggregations—on which account has been named *Saccharomyces pastorianus arborescens*—has been discovered by the author in high-fermentation beers,

especially in the scum collecting round the bung-holes of casks during primary fermentation, and also attached to flocculating particles of finings.

In form, the arborescences are liable to be mistaken for those of *Mycoderma cerevisiæ* in commercial yeast; but the film developed on the surface of cultures in sterilised wort is pale and of a pale colour, and never exhibits the thick convolutions shown by Mycoderma. Except for the fact that numerous particles of finings are maintained in suspension by the cells of this yeast, during and after clarification, the organism seems to be innocuous, having no influence on the clarification or taste of the beer. When present in the sediment of bottled beers, it chiefly occurs as isolated narrow cells, similar to those often found in beer lees. When grown on plaster blocks, the cells become attenuated and stretch considerably, their arrangement recalling that of a typical mycelium.

The action on sugars is similar to that of *Sacch. apiculatus*, the di- and tri-saccharides being inacted upon, even when a fermentable mono-saccharide is present. Dextrose and levulose are decomposed, furnishing the same amount of alcohol as is produced by ordinary beer yeast; but galactose is not acted upon. Unlike Mycoderma, it does not consume alcohol more rapidly than ordinary beer yeast, though aerobic in habit; in fact, even 3 per cent. of alcohol seems to retard the formation of the film, in liquid cultures, such as yeast water, which forms an excellent nutrient medium for Mycoderma.—C. S.

ENGLISH PATENTS.

Malt and the like; Kilns for Drying ——. T. Earp, Newark. Eng. Pat. 17,815, Sept. 6, 1901.

Malt kilns with closed fire-grates to which air is admitted mainly from underneath, a series of baffle plates is arranged between the fire-grate and the perforated malt-floor so that the products of combustion are forced to travel a zig-zag direction from side to side in their passage across to the malt. In this way the greater portion of the arsenic and other deleterious constituents of the furnace gases is deposited on the plates, which are cleaned at intervals.—J. F. B.

Brewing Syrup; Manufacture of ——. L. I. N. Norman, London. Eng. Pat. 15,886, Aug. 7, 1901.

BREWING syrup, containing about 15 per cent. of dextrin and much larger proportion of fermentable sugar whilst practically free from the unfermentable product known as maltose, is prepared by boiling a liquid starch sugar of suitable composition for four hours in order to convert it into so-called "dextrin-maltose," and then mixing it with a suitable proportion of good raw cane sugar. The mixture is filtered, diluted with water, filtered through charcoal, and the sugar inverted by means of sulphuric acid, which at the same time decomposes the gallisin, neutralised, carefully with calcium carbonate, agitated with powdered animal charcoal and subsequently filtered through char.

—J. F. B.

Fermentation; Mechanism to Regulate the Admission of Air to Apparatus containing Liquids in ——. W. P. Thompson, Liverpool. From the Pfaudler Vacuum Fermentation Co., New York. Eng. Pat. 15,252, July 8, 1902.

AN automatic regulator to govern the supply of air to vacuum fermentation vessels is described, consisting a vacuum suction-pipe; a governing regulator, comprising a valve case, and a yielding diaphragm engaged with the valve controlled by the suction in the pipe; an expansion chamber in the suction pipe, and a vacuum gauge communicating with the regulator and serving for its adjustment. The quantity of air admitted to the vessel by this means is constant in spite of fluctuations in the vacuum.—J. F. B.

Beer; Bottling; Treating ——. J. L. Dewar and E. J. Tripp, Bristol. Eng. Pat. 1264, Jan. 17, 1902.

BEER is prepared for bottling by passing or forcing it through a refrigerator, then through a carbonating apparatus and finally through a filter, the two latter arrangements being preferably enclosed in a cold chamber at a temperature of about 35° F., and the beer not being exposed to the air at any point after entering the pump.—J. F. B.

Liquids; Apparatus for Carbonating ——. H. Carmichael, Boston, U.S.A. Eng. Pat. 15,666, July 14, 1902.

THE carbonator, constituting a gas and water chamber, has a bottom with packing material, removably secured to the shell by a locking ring and hooked bolts, capable of elongating under excessive pressure, thus affording an outlet between the shell and the bottom, closing automatically when the pressure is reduced. A gas inlet and a water outlet are provided at the bottom, the water inlet being at the top. There is a perforated grating immediately over the removable bottom, above which grating the gas discharges into the shell, containing a number of superposed horizontal perforated discs, spaced apart by flanges and connected to vertical bolts, the discs being removable. All the internal parts of the apparatus are made of, or coated with tin.—E. S.

Liquids; Aëration of ——. F. G. Hampson and H. Swales, London. Eng. Pat. 16,353, Aug. 14, 1901.

THE controlling mechanism is so arranged, that when a charge of aërated liquid is withdrawn, the charge is replaced by fresh supplies of gas and liquid, admitted from separate sources. The valves control successively the admission of gas and liquid to the receiver, the delivery of both to the aërating chamber, and the escape of the excess gas from the reservoir.—E. S.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

ENGLISH PATENTS.

Milk; Manufacture of Preserveable ——. H. Laessig, Berlin. Eng. Pat. 11,865, July 3, 1902.

MILK is heated nearly to boiling, cooled, and evaporated under reduced pressure at a temperature not exceeding 50° C. The essential feature of the patent is the introduction of carbon dioxide into the milk during the evaporation.—W. P. S.

Baking Powder. J. R. Hatmaker, London. From J. A. Just, New York, U.S.A. Eng. Pat. 19,691, Oct. 3, 1901.

SEE U.S. Pat. 692,454, 1902; this Journal, 1902, 361; and U.S. Pat. 11,981, 1902; this Journal, 1902, 787.—W. P. S.

Baking Powder. J. R. Hatmaker, London. From J. A. Just, New York, U.S.A. Eng. Pat. 19,692, Oct. 3, 1901.

SEE U.S. Pat. 692,451, 1902; this Journal, 1902, 360.

—W. P. S.

UNITED STATES PATENTS.

Cattle-Food. G. H. Hughes, London, England. U.S. Pat. 707,113, Aug. 19, 1902.

THE pith of sugar cane is mixed with from 20—80 per cent. of molasses, and dried at 212° F. The mixture may be powdered or pressed into cakes. Albuminous and other matters extracted from the juice can be added.

—W. P. S.

Albuminous Substances: Process of Obtaining [from Blood] ——. A. Jolles, Vienna. U.S. Pat. 707,423, Aug. 19, 1902.

BLOOD corpuscles are treated with sulphurous acid, and then rendered alkaline by the addition of ammonia. Hydrogen peroxide is now added and the mass is boiled. Sufficient ammonia must be present to prevent the precipitation of the albumin during the boiling. The albumin is then precipitated by neutralising the solution with dilute acid,

filtered and purified, the object being to obtain an article suitable for food preparation.—W. P. S.

Soup Material; Method of Making ——. W. T. Scheele, Maryland, U.S.A. U.S. Pat. 707,646, Aug. 26, 1902.

The food product claimed is prepared by mixing 100 lb. of finely chopped meat, 150 lb. of flour, 25 oz. of yeast, and sufficient water to form a pasty mass. The mixture is allowed to ferment for several hours at a temperature of 120° F., then spread out and dried at 140° F. and finally ground.—W. P. S.

(B.)—SANITATION; WATER PURIFICATION.

Sewage Purification in Belgium by the Chemico-Biological Method ——. Duyk. Annales Trav. Publ. Bull. Assoc. Belge des Chim., **16**, [4—5], 213—214.

In reporting on the method pursued at Wenduyne, the author expresses the opinion that, in view of the fact that only about 40 per cent. of the matters in suspension are converted into the soluble form in the septic tank, and that a large volume of malodorous gases is produced that must be eliminated before the sewage is submitted to the action of the oxidising bacteria, this preliminary fermentation is by no means indispensable, particularly where the main conduit is long enough and the rate of flow sufficiently slow for the nitrogenous matters to be already decomposed by the time they reach the tank where the chemical treatment is carried out.

To minimise the retarding influence of excessive movement on the activity of the nitrifying bacteria in the oxidising tank, the sewage is admitted by a number of distributing channels. With regard to the effect of temperature on the action of the bacteria, cold does not appear to retard this, and the only time when the activity is diminished is when the filter bed is idle and no reaction is occurring to generate heat.—C. S.

English Patents.

Filters; Improvements in ——. J. Clarke, Tynemouth. Eng. Pat. 25,824, Dec. 18, 1901.

The water after passing downwards though an upper filter is led, by means of a pipe outside the filter case, to a space at the bottom of the apparatus from which it passes upwards through the lower filter into an intermediate space provided with a tap.—N. H. J. M.

Water purifying Apparatus. A. J. Boult, London. From C. L. Kennicott, Chicago, U.S.A. Eng. Pat. 11,990, May 26, 1902.

An apparatus for softening water, consisting of an annular soft-water tank enclosing inter-communicating precipitating tanks, and tanks for preparing lime and soda solutions. The inflowing hard water passes over a water-wheel with which is connected a stirrer and, when required, a hoister for raising barrels of lime, &c., to the platform of the apparatus. The parts are so arranged as to prevent freezing.
—N. H. J. M.

Sterilising Apparatus. J. J. Royle, and Royles, Ltd., Manchester. Eng. Pat. 17,671, Sept. 4, 1901.

The object of the apparatus is to furnish a constant supply of sterilised softened water. By means of a valve and float, brought into action by the steam of the heated water, the rate of inflow and outflow is so regulated as to avoid, on the one hand, insufficient, and, on the other hand, unnecessarily prolonged heating.—N. H. J. M.

XIX.—PAPER, PASTEBOARD, Etc.

Paper; New Zealand Flax as Raw Material for ——. O. Winkler. Papier-Zeit., 1902, **27**, [71], 2555.

Samples of paper made from New Zealand flax (phormium) are condemned. Much of the fibre, which is very long, with thin, smooth walls, was still in the form of unresolved bundles, and the pulp contained much vascular and cuticular débris, giving the paper a very inferior appearance. This fibre has nothing in common with flax or linen, but is said to resemble more the bamboo and mitsumata fibres, in that it is very long, slender, and thin-walled, and from the fact that it will not stand severe or protracted beating and readily gelatinises; if the pulp were purified, for mixing with better class printing papers, a considerable loss of fibre would ensue.—J. F. B.

Waste Liquors from Cellulose Factories; Manufacture of Gas from ——. E. R. Besemfelder. Papier-Zeit., 1902, **27**, [67 and 68], 2402—2403 and 2442—2444.

Instead of burning off the organic matter in the recovery of soda from alkali sulphide cellulose liquors, the author proposes to prepare from it a gas for heating or mechanical purposes, incidentally recovering the whole of the sulphur, and has devised a continuous system of treatment. The principle consists in carbonising the concentrated liquor by means of hot gases, collecting and purifying the volatile gases and producing at the same time a combustible gas by blowing steam over the coke so produced. The separation of the silica by the method of Lunge and Lohöfer (this Journal, 1901, 1231) is adopted, with the modification that the silica is separated from the crude, dilute liquors instead of from the final products. The scheme proposed for a straw-cellulose factory, using the sulphate (sulphate) method is as follows:—Concentrated liquors, freed from silica, are mixed with a little lime and sufficient coke or carbonaceous matter to reduce the proportion of ash in the subsequently carbonised product to 25—30 per cent. The mixture is fed into a suitable, continuous, combined carboniser and gas producer, such as is used for making gas from wood, and is subjected to heat. In the carbonising process the sulphates, sulphites, &c., are reduced to sulphides; in the gas-producing process the sulphides are decomposed and oxides remain behind. The resulting gas is a mixture of products from both operations, and contains a considerable proportion of carbon dioxide and sulphuretted hydrogen. This mixture, in virtue of its carbon dioxide content, is utilised for the precipitation of the silica in fresh quantities of waste liquor. The precipitation takes place, not under pressure, in a scrubbing tower; the silica is then in the gelatinous form and cannot be filtered. For this reason the liquors discharged from the tower are filtered by means of the waste gases from the generator-furnace in a series of vessels under a pressure of 0·5 atmosphere, until the silica can be readily filtered. The pressure in the vessels is utilised to force the liquor through a filter into a collecting cistern for subsequent concentration.

The scrubbing tower discharges the combustible gas contaminated with sulphuretted hydrogen and some carbon dioxide. The latter is eliminated by passing the gas through a vessel containing boiling milk of lime, while the sulphuretted hydrogen is absorbed in a vessel containing caustic soda in which fresh boiling-liquor is prepared. The caustic soda and lime are obtained by the lixiviation of the oxides discharged from the gas generator. The purified gas is then ready for use for heating or motive power.

In the case of the waste liquors from the boiling of wood with calcium bisulphite, no precipitation of silica is required. The residual bisulphite in the crude liquors is precipitated as monosulphite, before concentration. The products of gas is carried out as above, but the sulphuretted hydrogen is absorbed by cold milk of lime instead of by soda, forming calcium sulphydrate. This is decomposed by heat, and the sulphuretted hydrogen set free is burnt to sulphuric acid according to Miller and Opl's process.—J. F. B.

English Patents.

Leather, Paper, Textile Fabrics, and the like; Gassing ——. A. Cohu. Eng. Pat. 16,429, 1901.

See under XIV., *page* 1189

Viscose; Manufacture of ——. A. Fielding, Salford. Eng. Pat. 20,397, Oct. 12, 1901.

A solution of a bisulphite is added to the viscose in order to decolorise it and make it suitable for the manufacture of white paper or textile materials.—J. F. B.

Paper; Apparatus for Drying ——. H. H. Lake, London. From E. Anthony, Mass., U.S.A. Eng. Pat. 5, Jan. 7, 1902.

Paper is dried in continuous webs by passing it alternately over and under two horizontal rows of rollers, the lower series constituting tension rollers and being adjustable automatically according to the shrinkage of the web. The paper thus travels in a zig-zag path in a vertical direction, and is dried by currents of clean, dry air directed from rows of nozzles against both sides of the web. The nozzles are situated between each pair of adjacent rollers, those between the upper series of rollers being directed downwards and those between the upper rollers being directed upwards.—J. F. B.

Paper Wrapping- or Packing Material. G. H. Sachsröller, Barmen Unterbarmen, Germany. Eng. Pat. 12,276, June 24, 1902.

Grease- and water-proof wrapping paper is prepared by passing two suitable rolls or sheets of paper and passing one of them through a parchmentising bath. The two sheets are then permanently united by bringing them into intimate contact and passing them through a squeezing device, directly into a bath of water, which stops the parchmentising and removes the acid. The unparchmentised paper is preferably coloured differently on its two surfaces, in order that the parchmentised side may be readily distinguished, or else the paper may be initially of uniform colour, and the unparchmentised surface of the finished paper may be stained afterwards.—J. F. B.

Paper, applicable for Electric Insulation; Treatment or Manufacture of ——. J. B. Taylor, Liverpool. Eng. Pat. 18,600, Sept. 17, 1901.

Flax or other pure vegetable paper is rendered suitable for use as an insulating material, by treating the paper after the boiling or the finished paper with dilute mineral acids. It is found that the residual alkaline products of the pulp-boiling are highly objectionable from an insulating point of view. The excess of acid is removed by washing.—J. F. B.

X.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Iodoform and Di-iododithymol; Examination of the Mother Liquors from the Preparation of ——, *by means of Hypochlorite.* F. Roques and A. Gerngross. J. Pharm. Chim., 1902, **16**, [5], 211—213.

The preparation of iodoform, or of di-iododithymol from acetone or thymol by means of sodium hypochlorite, the utilisation of the iodine employed is by no means quantitative. In the case of iodoform, from 0·3 to 4 per cent. of the iodine employed may be lost in the mother liquors, and in the case of iodothymol, this loss may amount to as much as 28 to 37 per cent. In the manufacture, crystallised thymol, dissolved in caustic soda, is mixed with the desired quantity of sodium iodide, and a large excess of sodium hypochlorite is added. It has been found that the iodothymol thus obtained may be contaminated by considerable quantities of the chloro-derivative. In fact, chlorothymol may be prepared by omitting the iodide and employing a large proportion of hypochlorite. The mother liquors in this case contain both chloride and chlorate. In the iodo-reaction, the chlorate reacts with some of the iodide to form iodate, and the reaction may proceed still further, some of the iodate being converted into periodate. The authors have isolated periodate in the form of the silver salt, from some of these mother liquors; they conclude, therefore, that the loss of iodine in the manufacture of iodothymol results from the formation of iodate and periodate, which are produced concurrently in greater or smaller quantities according to the excess of hypochlorite; a very large excess of this reagent may convert the whole of the iodate into periodate. (See this Journal, 1902, 1138.)—J. F. B.

Iodoform; Determination of ——. G. Meillère.

See under XXIII., *page* 1196.

Lupinine. R. Willstaetter and E. Fourneau. Archiv der Pharm., **240**, [5], 335—344.

The formula for lupinine is found to be $C_{10}H_{19}ON$, not $C_{21}H_{40}O_2N_2$ as stated by Baumert and confirmed by Berend. The alkaloid was isolated from an alcoholic extract of the seeds by several crystallisations from petroleum spirit, and was finally purified by re-crystallisation from acetone. It forms colourless tablets, melting at 68·5°—69·2° C. and boiling at 255°—257° C. It is odourless and does not possess a fruity odour, as stated by Baumert. The following compounds have been prepared:—*Anhydrolupinine*, $C_{10}H_{17}N$, boiling at 726 mm., at 216·5°—217·5° C., *lupinic acid methyl ester*, $C_9H_{16}N.COCH_3$, b. pt. 131° C. at 15 mm.; *methyl lupinine*, $C_{11}H_{21}ON$, b. pt. 145°—146° C. at 15 mm., and *dimethyl lupinine* $C_{12}H_{23}ON$, b. pt. 169° C. at 29 mm. The platinum salt $(C_{20}H_{40}N_2O_2Cl_6Pt)_2H_2O$ is stable, and contains $\frac{1}{2}$ molecule of water of crystallisation; it melts at 165° with decomposition. The benzoyl compound $C_{10}H_{18}N.O.COC_6H_5$ melts at 49—50° C., and is more active therapeutically than lupinine.—J. O. B.

Asarum Arifolium; Essential Oil of ——. Emerson R. Miller. Arch. der Pharm., **240**, [5], 371—383.

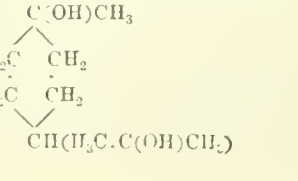
The dried herb was found to yield from 7 to 7·5 per cent. of oil by steam distillation, the specific gravity of which ranged from 1·0585 to 1·0613, and the optical rotation from −2°·55 to −3°·7. When shaken with alkali, about 0·5 per cent. of a phenolic constituent was removed. The oil was found to contain the undermentioned bodies. For comparison, the constituents of *Asarum canadensis* as found by Power, and of *Asarum europæum* are also given:—

Asarum europæum.	Asarum canadense.	Asarum arifolium.
1. Lævo-pinene	1. A phenol, $C_9H_{12}O_2$	1. Lævo-pinene
2. Methyl-eugenol	2. Pinene	2. Eugenol
3. Asarone	3. *d*-Linalol	3. A phenol (composition unknown).
4. A blue oil	4. Lævo-borneol	4. Methyl-eugenol
	5. Lævo-terpineol	5. Methyl-iso-eugenol.
	6. Geraniol	6. Safrol, the chief constituent.
	7. Methyl-eugenol	7. Asarone
	8. A blue oil	8. A sesqui-terpene
	9. A lactone, $C_{14}H_{20}O_2$	
	10. Palmitic acid	
	11. Acetic acid	
	12. A mixture of fatty acids $C_nH_{2n}O_2$ to $C_{12}H_{24}O_2$.	

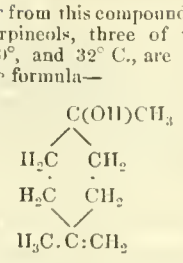
—J. O. B.

Terpineol. O. Wallach (O. Rahn). Annalen, 1902, **324**, [1], 79—97.

Previous researches by the author on the constitution of the terpineol $C_{10}H_{17}OH$, melting at 35° C., showed the close relationship existing in a whole series of similar compounds, one of these being terpine, having the formula—



The removal of water from this compound leads theoretically to four isomeric terpineols, three of which, melting respectively at 35°, 70°, and 32° C., are known. The last-mentioned having the formula—



has now been investigated. On treatment with bromine and hydrobromic acid, it yields 1:8:9 tri-bromoterpane $C_{10}H_{17}Br_3$, melting at 67° C., which by the further action of bromine yields dipentene tetrabromide (m. pt. 123° C.), affording a proof of the constitution of dipentenetetrabromide and of dipentene. When treated with sodium methylate, two bromine atoms are split off, and the resulting monobromide $C_{10}H_{15}Br$, which boils at 105°—110° C. under 10 m.m. pressure, gives by the action of bromine a pentabromide $C_{10}H_{15}Br_5$, melting at 137° C. On oxidising the terpineol melting at 32° C. with permanganate, it gives 1:8:9 trihydroxyterpane melting at 118° C. When further oxidised with chromic acid, and boiled with dilute sulphuric acid, this compound is converted into an unsaturated ketone, tetrahydroacetyltoluene $C_9H_{14}O$, isomeric with phorone. It gives a semicarbazone melting at 165° C., and an oxime melting at 51° C. The substance is a tetrahydromethyltolylketone and on heating with concentrated sulphuric acid is converted into *p*-acetyltoluene boiling at 222°—224° C., which gives an oxime melting at 89° C. The same series of compounds can be obtained from dihydrocarveol, which is isomeric with the terpineol melting at 32° C., differing only in the position of the hydroxyl group.

The action of reducing agents on the tetrahydroacetyltoluene $C_9H_{14}O$ yields a new alcohol $C_9H_{15}OH$, boiling at 213° C., which is a lower homologue of the terpineol melting at 35° C. This product, by successive treatment with phosphorus pentachloride, quinoline, and glacial acetic acid, gave, on distilling with steam, a hydrocarbon C_9H_{14}, having the constitution of a lower homologous dipentene or terpinolene.—T. A. L.

English Patents.

Eucalyptol Arseniate and Eucalyptol from Eucalyptus Oils. Watson Smith, London. Eng. Pat. 17,924, Aug. 7, 1902.

Eucalyptus oil, containing eucalyptol, is mixed with syrupy arsenic acid, sp. gr. 2·300 (75° B.), in sufficient quantity to precipitate the whole of the eucalyptol as the crystalline eucalyptol-arsenic-acid compound at once. This proportion is ascertained by a preliminary experiment, with small quantities of the materials. The degree of concentration of the arsenic acid is not material, but a syrupy acid of the concentration named affords the best results.

The non-eucalyptol portion of the oil is separated from the crystalline magma by centrifugating, pressure, or other suitable means, and the white crystalline arsenic-acid-compound thus obtained is treated with water or steam when the eucalyptol is liberated, and may be separated or distilled, and the residual solution of arsenic acid again employed, after concentration by evaporation, to separate a fresh quantity of eucalyptol from a further quantity of eucalyptus oil. (See also this Journal, 1902, 1096.)

—J. O. B.

Salicylide or Salicylic Aldehyde; Manufacture of ——. J. Wetter, London. From F. Hoffmann la Roche and Co., Bale, Switzerland. Eng. Pat. 20,188, Aug. 7, 1902.

Aceto-salicylic acid is slowly heated in an open vessel to 200°—210° C. for five or six hours. The cooled product is boiled with successive quantities of water, and the residue dissolved in four or five times its weight of acetone. The clear acetone solution is poured into 20—30 times its volume of water, when the salicylide separates in cheese-like flakes, which are subsequently dried.—J. O. B.

United States Patents.

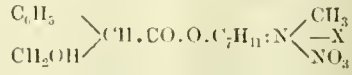
Alkoxy-Caffeine, and Process of Making same. F. [illegible], Mannheim, Germany. Assignor to C. F. Boehringer und Soehne, Mannheim, Germany. U.S. Pat. 707,2[illegible], Aug. 12, 1902.

See Eng. Pat. 16,231, 1899; this Journal, 1899, 1051.

—J. F. B.

Atropinium Alkyl Nitrate. H. Dreser and J. Call[illegible], Elberfeld, Germany. Assignors to Farbenfabriken[illegible] Elberfeld. U.S. Pat. 707,402, Aug. 19, 1902.

Atropinium alkyl nitrates, having the general formula



where X is an alkyl radicle, are obtained by the action of alkyl nitrates on atropine by heating in closed vessels or else by double decomposition of the atropinium alkyl iodides or sulphates with the nitrate of a suitable metal. They are readily soluble in water and in alcohol, but only sparingly in chloroform or ether.—J. F. B.

Camphene; Process of Making ——. K. Stephan, Assignor to Chem. Fab. vorm. E. Schering, Berlin. U.S. Pat. 707,270, Aug. 19, 1902.

By heating the hydrogen-haloid compounds of pinene with bases of the aliphatic series (including heterocyclic bases such as piperazine and piperidine) higher yields of camphene (up to 80 per cent. of the theoretical) are obtained than by any of the previously known methods. Examples are cited where the pinene hydrochloride is heated in alcoholic solution with the amine in closed vessels at 210° C. for several hours.—J. F. B.

Camphene; Process of Making ——. K. Stephan, Assignor to Chem. Fab. vorm. E. Schering, Berlin. U.S. Pat. 707,271, Aug. 19, 1902.

Camphene is prepared by causing ammonia to react on the hydrogen-haloid compounds of pinene for a long time at a high temperature.

The reaction is carried out in the autoclave at a temperature of about 210° C. for about 20 hours. Aqueous or alcoholic ammonia may be employed, or the pinene hydrochloride may be mixed with an inert substance and treated with gaseous ammonia; a yield of 90 per cent. of the theoretical is obtainable.—J. F. B.

Methylene Di-aceto Di-salicylic Acid and Process of Making same. S. L. Summers, Philadelphia. U.S. Pat. 707,178, Aug. 19, 1902.

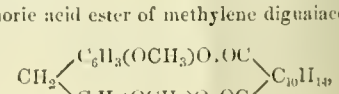
This substance, having the formula—

$$CH_2(C_6H_3OC_2H_3O.COOH)_2,$$

is prepared by acetylating methylene di-salicylic acid by heating with acetic anhydride under pressure. It occurs in the form of white microscopic crystals, melting at about 145° C., and is insoluble in water, but soluble in ether and alcohol.—J. F. B.

Methylene Diguaiacol; Camphoric-Acid Ester of ——. S. L. Summers, Philadelphia. U.S. Pat. 707,8[illegible], Aug. 19, 1902.

The camphoric acid ester of methylene diguaiacol,



is prepared by passing gaseous formaldehyde through a hot solution of camphoric acid, guaiacol and phosphorus oxychloride in a suitable solvent (*e.g.*, xylene), separating and purifying the product. It melts at about 130° C., and is insoluble in dilute alkaline solutions, and soluble in ether, benzene, and hot ethyl alcohol.—J. F. B.

lycollic Menthyl Ester. F. Hofmann and J. Callsen, Elberfeld, Germany, Assignors to Farbenfabriken of Elberfeld. U.S. Pat. 707,110, Aug. 19, 1902.

HE glycollic acid ester of menthol is produced by treating enthol or its derivatives with glycollic acid or its derivaes under conditions suitable for esterification. It occurs white lustrous needles, melting at 87° C., and is sparingly luble in water, but readily soluble in most organic solvents.
—J. F. B.

XXI.—PHOTOGRAPHY.

ning Bromide and Chloro-bromide Papers. T. T. Baker. Brit. Jour. Phot., **49**, 1902, [2208], 688, 689.

ARM tones may be produced on bromide paper in three ys; 1st, by a special emulsion; 2nd, by sulphur toning; d, by deposition of metallic salts on the reduced silver age. The first method is beyond the ordinary worker; e following bath used warm, provides a means of sulphur ning. Sodium thiosulphate, 150 grms.; alum, 15 grms.; t water, 1000 c.c.; toning takes up to half an hour.

Red tones may be produced by mixing together 25 c.c. a solution of:—lead nitrate, 1 grm.; potassium ferroanide, 3 grms.; water, 50 c.c.; with 100 c.c. of a 1 per nt. solution of uranium nitrate; 100 c.c. of a 20 per cent. ution of citric acid; and 20 c.c. of a 1 per cent. solution ammonium chloride. By omission of the ammonium loride, brown tones are obtained.

A copper bath for red and sepia tones consists of:—A ½ per cent. solution of copper sulphate to which has en added concentrated ammonium carbonate solution til the precipitate first formed redissolved; II. potassium ricyanide, 12 grms.; water, 700 c.c. II. is added to I. and n more ammonium carbonate, until the solution becomes ar. Blue tones may be obtained by the bath formed by ling two parts each of a 2 per cent. solution of ferric oride, and a 20 per cent. solution of citric acid to three rts of:—lead nitrate, 1 grm.; potassium ferricyanide, rms.; water, 50 c.c. For violet tones two baths may made up. A. Ferric oxalate, 1 grm.; potassium ferrianide, 1 grm.; water, 2000 c.c.; B. Copper chloride, grm.; water, 100 c.c. To both solutions ammonium bonate is added till the precipitates first formed, resolve. The print is immersed first in A until a blue e is obtained and then in B, to get the desired violet.
—J. W. H.

English Patent.

otographic Roll-films; Coverings for ——. C. D. Abel, London. From the Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 23,291, Nov. 18, 1901.

the production of coverings or wrappers for photophic roll-films, instead of using paper dyed with a ck dyestuff, which does not exclude the light to a icient extent, the patentee proposes to use paper d with two or more other suitable dyestuffs, of such haracter as to absorb by the combination of their cts upon light, all rays of the spectrum.—F. H. L.

United States Patent.

gative Plates for Bichromated Gelatin Processes; Production of ——. A. Leuchter, Brooklyn, U.S.A. Eng. Pat. 10,948, May 13, 1902.

OM a negative, a positive picture of the object to be otographed is produced in the usual manner. This itive is then tinted with various colours possessed of erent reflecting powers, arbitrarily using white, yellow, , blue, and black in the order quoted for application to se parts of the print which represent portions of the object ing diminishing luminosity. The treated, or "neutral," nt is next photographed in the camera on a gelatin te, and the latter is developed with water in the ordinary ion to obtain relief. By this correction of the interliate print, it is claimed that the final prints given by gelatin plate show in monochrome a more correct dering of the planes and colour values of the original ect.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

United States Patents.

Detonating Compound. U. Alvisi, Rome. U.S. Pat. 707,493, Aug. 19, 1902.

THE detonating compound contains fulminate of mercury and ammonium perchlorate, the proportions giving the maximum effect, being "83·8 per cent. of the former and 17·2 per cent." of the latter. The mixtures and detonators are prepared in the usual way, and may be fired either by means of a tape-primer, percussion fuse, or electric spark.
—W. G. M.

Match [Fire Prevention]. C. M. Bowman, Lebanon, Pa., U.S.A. U.S. Pat. 707,080, Aug. 19, 1902.

To prevent the gnawing of friction matches by rats and mice, and so to remove a known cause of fires, the paraffin, which is used to saturate the wood at the head-end, and which is the principal attraction to the rodents, is mixed either with oil of horse-mint, or with tannin or tannic acid, the deterrent being in the first named the smell, and in the others the taste. The substance to be added is dissolved in alcohol, and then incorporated with the paraffin. ½ oz. of the mint solution (about 1 : 1), or 3 oz. of tannin, is used per pound of paraffin.—W. G. M.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Selenium; Volumetric Method of Determining ——. K. Friedrich. Zeits. angew. Chem., **15**, [34], 852—856.

THE principle of the method consists in the reaction of finely-divided precipitated selenium on silver nitrate, according to the equation—

$$4AgNO_3 + 3Se + 3H_2O = 2Ag_2Se + H_2SeO_3 + 4HNO_3.$$

The selenium is precipitated as such from dilute solution, and thoroughly washed on a filter. The precipitate and filter are then returned to the beaker in which the precipitation was effected, 10 c.c. of ammonia are added, then a measured quantity (about 25 c.c.) of decinormal silver nitrate, and the liquid is boiled for two or three minutes, the beaker being covered with a clock-glass. The red colour of the selenium changes to the black of silver selenide, and silver selenite falls as a white precipitate which adheres to the glass. If this precipitate does not appear, either there is very little selenium, or there is insufficient excess of silver nitrate. A few cubic centimetres of the silver nitrate solution are added, and if a precipitate forms, more must be added (double the first amount?), so as to ensure considerable excess. After adding 10 c.c. more ammonia, the solution is boiled again (5 to 10 minutes in all), more ammonia being added if necessary. The liquid is now rapidly cooled, and made acid with nitric acid containing about 31·5 grms. of HNO_3 per litre; when the neutral point is nearly reached, silver selenite separates, but dissolves again when the acid is in excess. Not too much ammonia should be used in the process, so as to keep down the bulk of liquid. A 700-c.c. beaker should be large enough for the determination of 0·25 grm. of selenium. A few cubic centimetres of iron-alum solution are now added, and the excess of silver is determined by ammonium thiocyanate. The end-point is best seen if the precipitate be allowed to settle out after thorough stirring; 1 c.c. of decinormal silver nitrate is equivalent to 5·914 mgrms. of selenium. The method is far more accurate than weighing, for small quantities of selenium; but it is not so accurate for amounts over 0·05 grm., for then the precipitated selenium is not so finely divided, and does not so readily and completely react on the silver nitrate. Sulphur and tellurium interfere with the process.—J. T. D.

Arsenic; Determination of Small Quantities of ——. C. T. Mörner. Zeits. anal. Chem., 1902, **41**, [7], 397—413.

THE author titrates quantities of arsenious sulphide, of not more than 0·5 mgrm. in weight, with potassium perman-

ganate solution. The arsenious sulphide is dissolved in 0·5 per cent. potash solution in a small flask. 25 c.c. of N/100 permanganate solution, are then added and mixed. After running in 5 c.c. of sulphuric acid (5 per cent.) an amount of N/100 oxalic acid solution is added, sufficient to exactly balance the 25 c.c. of permanganate. The solution is warmed until it becomes colourless, and then titrated back with 1/100 permanganate solution. The number of c.c. required in this latter titration, multiplied by 0·0536, gives the quantity of arsenic (As) present.—W. P. S.

Thomas Slags; Determination of Total Phosphorus in ——. C. Aschman. Chem.-Zeit., **26**, [71], 823.

The following more rapid modification of the author's earlier process (Chem.-Zeit., **23**, 435) has been found sufficiently accurate for technical and commercial analysis. The solutions required are:—1. Nitro-sulphuric acid, 420 grms. of nitric acid of sp. gr. 1·2, and 50 grms. of strong sulphuric acid, made up to 10 litres. 2. Citric acid, 500 grms. of the crystallised acid in 1 litre. 3. Magnesia mixture, 100 grms. of crystallised magnesium chloride, 140 grms. of ammonium chloride, 700 grms. of ammonia, of sp. gr. 0·967, and 1,300 c.c. of distilled water; the mixture is filtered after standing some days. The process is as follows:—Place 5 grms. of the powdered substance in a 500 c.c. flask, wet it with a few cubic centimetres of alcohol, fill to the mark with nitro-sulphuric acid, close with a good rubber stopper, and rotate in a Wagner's shaking apparatus for 30—40 minutes, at a speed of not more than 40—45 revolutions per minute. Filter through a dry filter, and immediately afterwards measure off 50 c.c. of the filtrate and add to it 10 c.c. of the citric acid solution (without the citric acid the solution will often deposit calcium sulphate after a short time, but after the citric acid is added, it will remain clear for an indefinite period). Neutralise carefully with ammonia, using a fragment of litmus-paper in the liquid as an indicator, and after cooling add to the liquid (which must be perfectly clear) 20 c.c. of magnesia mixture, stir mechanically for 40 minutes, allow to stand for 1—2 hours, then filter and finish the analysis in the usual way. Sometimes the liquid blackens on adding the ammonia on beginning to stir, but the darkening disappears on more prolonged stirring. Occasionally, though very seldom, a flocculent precipitate of silica falls on neutralising; when this is the case, the method cannot be used.—J. T. D.

ORGANIC—QUALITATIVE.

Sesamé Oil; Certain Tests for ——. Utz. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [8], 177—178.

Ammonium Vanadate.—In every case the author obtained an olive-green coloration on treating sesamé oil with ammonium vanadate and sulphuric acid, whereas the reagent is stated to give a bright blue colour changing to black. Cotton-seed oil gave an orange colour changing to olive green of a lighter shade than in the case of sesamé oil. Since mixtures of sesamé oil and other oils also gave olive-green colorations, the test, in the author's opinion, is unreliable.

Resorcinol.—On treating 2 c.c. of sesamé oil with 2 c.c. of benzene saturated with resorcinol and 1 2 c.c. of colourless nitric acid (sp. gr. 1·38), the oil should become violet blue and the acid layer bluish green. In the author's hands, however, the test gave a coloration resembling that obtained in the Baudouin test. Resorcinol and hydrochloric acid gave no colour reaction, nor were the colours given by various phenols (hydroquinone, phloroglucinol) with nitric or hydrochloric acid sufficiently distinctive to serve as tests for sesamé oil.

Formaldehyde and Sulphuric Acid have been stated to yield a blue-black emulsion with sesamé oil; but the author has found the test unreliable in the case of mixtures.

Cavalli's Reagent.—Equal parts of sesamé oil and of a mixture of 3 parts of hydrochloric acid and 2 parts of nitric acid give a rose coloration. The author confirms this, but finds that the test is not sufficiently delicate. (See this Journal, 1899, 790, 1054, 1158; 1900, 914; 1901, 285.)—C. A. M.

ORGANIC—QUANTITATIVE.

Olives; Determination of Oil in ——. J. Pouget. Monit. Scient., 1902, **16**, [729], 651—655.

A rapid and approximate determination of the amount of oil in olives can be formed by treating 100 grms. of the sample with 100 c.c. of petroleum spirit and estimating the increase in the specific gravity of the solvent after the extraction. The author describes experiments which show that by using a petroleum spirit of about 0·700 sp. gr., the results deduced from the specific gravity of the solution of oil agree within about 1 per cent. of the theoretical quantities. In making a determination, 100 grms. of the olives are triturated in an iron mortar with 100 grms. of anhydrous sodium sulphate and 50 grms. of sand. The mass is then left for 20 minutes, after which it is treated with 200 c.c. of petroleum spirit of known density (0·700), in a stoppered flask, which is shaken from time to time during 16 to 18 hours. The specific gravity of the solution is then determined at the same temperature, and the weight of oil obtained by reference to the following abbreviated table constructed by the author.

Increase in Density.	Weight of Oil added to 100 c.c. of Solvent.	Increase in Density.	Weight of Oil added to 100 c.c. of Solvent.
	Grms.		Grms.
1	0·5	26	10·9
2	0·7	28	11·9
4	1·5	30	12·9
6	2·3	32	13·9
8	3·1	34	14·9
10	3·9	36	16·0
12	4·7	38	17·0
14	5·5	40	18·1
16	6·3	42	19·2
18	7·2	44	20·4
20	8·1	46	21·6
22	9·0	48	22·8
24	10·0	50	24·1

—C. A. M.

Iodoform; Determination of ——. G. Meillère. Ann Chim. anal. appl., **3**, 153; through Zeits. anal. Chem. 1902, **41**, [7], 445—446.

The iodoform is placed in a small flask and treated with 25 c.c. of nitric acid free from chlorine, and a slight excess of silver nitrate (1·7 grm. to 1 grm. of iodoform). The flask is connected to a Liebig bulb apparatus, containing a few cubic centimetres of silver nitrate solution. The contents of the flask are gently heated for 10 minutes, without boiling the nitric acid, and kept warm until the decomposition is completed. Should the silver nitrate in the bulb apparatus become turbid, which is not usually the case, it is mixed with the bulk of the silver solution in the flask, and the silver iodide filtered off and weighed as usual. The iodoform should not be mixed with dry silver nitrate, as the mixture explodes. The presence of nitric acid prevents this.

—W. P. S.

New Books.

Subject List of Works on Domestic Economy, Foods and Beverages, including the Culture of Cacao, Coffee Barley, Hops, Sugar, Tea, and the Grape. In the Library of the Patent Office. Darling and Son, Limited 34—40, Bacon Street, London, E. Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C 1902. Price 6*d*.

Jahrbuch der Chemie. Bericht über die wichtigsten Fortschritte der reinen und angewandten Chemie, unter Mitwirkung von den Herren H. Beckurts; C. A. Bischoff M. Delbrück; O. Doeltz; J. M. Eder; P. Friedländer C. Häussermann; A. Herzfeld; F.W. Küster; W. Küster J. Lewkowitsch; A. Morgen; W. Muthmann. Heraus gegeben von Richard Meyer. XI. Jahrgang. 1901 Verlag von Friedrich Vieweg und Sohn. Braunschweig 1902. Price, in parts, M. 14; bound, M. 15.

8vo volume, containing preface, list of contributors, table of contents, and subject-matter, filling 518 pages, and fol

owed by indexes of subject-matter and authors. The ubjects represented, with contributors, are as follows:— . Physical Chemistry, F. W. Küster. II. Inorganic Chemistry, W. Muthmann. III. Organic Chemistry, C. A. Bischoff. IV. Physiological Chemistry, W. Küster. V. Pharmaceutical Chemistry, H. Beckurts. VI. Chemistry f Foodstuffs, H. Beckurts. VII. Agricultural Chemistry, A. Morgen and W. Zielstorff. VIII. Metallurgy, O. Doeltz. X. Fuels and Explosives; Inorganic Chemical Technology, . Häussermann. X. Technology of the Carbohydrates, . Herzfeld and O. Schrefeld. XI. Fermentatiou Industry, I. Delbrück and O. Mohr. XII. Technology of the Fatty Compounds and Petroleums, J. Lewkowitsch. XIII. Chemistry of Coal Tar and Dyestuffs, R. Meyer. XIV. Chemical Technology of the Textile Fibres, P. Friedländer. Photography, J. M. Eder and E. Valenta.

Trade Report.

I.—GENERAL.

Chemical Goods, Import into Turkey.

London Chamber of Commerce Notice.

The attention of the chemical trade and of exporters of hemicals and medicines generally is called to further oppages at Constantinople of goods containing chemical ements, the Custom House there requiring exporters to rovide a detailed specification of all such articles, such as erapeutics and prophylactics, including patent medicines, aps, colours and dyestuffs, perfumery, coloured toys and ncy articles, coloured stationery, &c. The absence of this ecification renders the goods liable to confiscation, which now repeatedly being enforced by the Turkish Customs thorities, notwithstanding the fact that compliance with e order is often impossible.

Patents, Designs, and Trade Marks.

The following amendments to the International Convention rules came into force on Sept. 14:—

(*a*) The priority granted to applicants for patents, signs, or trade marks in any of the States of the Convention shall be 12 months for patents, and four months for signs or trade marks, reckoned from the date of the pplication, in the State in which the applicant is domiciled.

(*b*) The patents applied for in any of the States of the nvention by persons entitled to the privileges thereof all be independent in duration of patents obtained for the me invention in other States, whether parties to the nvention or not.

(*c*) No patent applied for under the Convention shall cur forfeiture for non-working until the expiration of a inimum period of three years from the date of application. The extended period of priority given to applicants under e Convention has been granted in Great Britain since n. 1, 1902, by the amending Act that came into force then. now, therefore, also applies to Belgium, Denmark, France, ly, Japan, Netherlands, Norway, Portugal, Sweden, itzerland, Tunis, and United States.

General Imports of Foreign and Colonial Merchandise into the United Kingdom for the Years 1900–1.

Annual Statement of Trade, Aug., 1902.

A.—Articles Free of Duty.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Ammunition: Gunpowder.....	Cwts. 1,895	Cwts. 1,965	£ 7,180	£ 3,701
Ammunition—*cont.* Rockets and other Combustibles for purposes of War, Explosives, Percussion Caps and Ammunition unenumerated: Foreign Countries ..	..	..	242,769	49,319
British Possessions .	..	..	14,569	8,734
Total	..	..	257,338	58,053
Cordite and other Smokeless Propellants.....	..	231	..	5,326
Dynamite and other High Explosives: Foreign Countries ..	..	14,136	..	78,627
British Possessions .	..	129	..	5,200
Total	..	14,265	..	83,827
Small Arms Ammunition: Foreign Countries.. No.	..	34,085,210	..	29,639
Cwts.	..	4,981		
British Possessions.... No.	..	8,288,990	..	3,143
Cwts.	..	601		
Total .... No.	..	42,374,200	..	32,782
Cwts.	..	5,582		
Fuses, Tubes, Pistons, &c. No.	..	1,381,677	..	9,921
Cwts.	..	2,225		
Percussion Caps	..	Thousand 5,030	..	939
Asbestos, Raw:		Cwts.		
Foreign Countries...	56,331	49,519	71,767	68,712
British Possessions .	35,560	40,707	18,551	34,913
Total	91,891	90,226	90,318	103,625
Asphalt or Bitumen (other than Painters' Colours or Drugs):	Tons.	Tons.		
Foreign Countries...	35,058	46,558	96,719	115,524
British Possessions .	17,150	26,960	48,952	74,237
Total	52,208	73,518	145,671	189,761
Blacking and Polishes:	Cwts.	Cwts.		
Foreign Countries ..	62,277	55,714	144,300	140,181
British Possessions .	32	12	56	66
Total	62,309	55,726	144,356	140,247
Bones (except Whalebone) whether burnt or not, or as Animal Charcoal (other than Manure):	Tons.	Tons.		
Foreign Countries...	10,249	8,880	42,825	50,160
British Possessions .	1,609	641	9,335	3,661
Total	11,858	9,521	52,160	53,821
Candles, of all Sorts, Total	Cwts. 11,555	Cwts, 10,394	23,182	21,347
Caoutchoue:				
Foreign Countries ..	436,030	426,294	6,106,234	5,410,649
British Possessions .	77,256	40,180	879,899	419,575
Total	513,286	466,474	6,986,133	5,830,224
Cement for Building and Engineering Purposes:	Tons.	Tons.		
Foreign Countries ..	104,768	220,922	211,524	377,624
British Possessions .	3	40	8	120
Total	104,771	220,962	211,532	377,744
Chemical Manufactures and Products (other than Drugs, Dyestuffs, and Manures):				
Alkali:	Cwts.	Cwts.		
Foreign Countries ..	316,740	..	162,339	..
British Possessions .	5,316	..	6,819	..
Total	322,056	..	169,158	..

A.—Articles Free of Duty—cont.

A.—Articles Free of Duty—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
	Cwts.	Cwts.	£	£
Chemical Manufactures —*cont.*				
Bleaching Materials:				
Bleaching Powder	..	248,356	..	82,939
Other Bleaching Materials:				
Foreign Countries ..	..	9,200	..	5,340
British Possessions .	..	65	..	65
Total	..	9,265	..	5,405
Borax, Total	308,407	309,253	155,409	153,718
Brimstone, Total	450,661	441,725	109,048	99,122
Carbide of Calcium, Total	18,885	9,612	15,801	8,359
Saltpetre (Nitrate of Potash):				
Foreign Countries ..	147,248	144,541	132,397	134,380
British Possessions..	104,773	95,914	82,668	72,224
Total	252,021	240,455	215,065	206,604
Soda Compounds:				
Soda Ash:				
Foreign Countries ..	..	38,349	..	10,035
British Possessions..	..	708	..	580
Total	..	39,057	..	10,615
Soda, Bicarbonate:				
Foreign Countries ..	..	24,075	..	6,161
British Possessions .	..	300	..	113
Total	..	24,375	..	6,274
Soda, Caustic, Total	..	7,796	..	4,211
Soda, Crystals, Total	..	119,280	..	17,243
Soda, Sulphate (Salt-cake), Total	..	2,207	..	447
Soda, other Sorts, Total	..	71,626	..	46,153
Chemicals, Other Sorts, Unenumerated:				
Foreign Countries ..	..	..	1,443,269	1,624,219
British Possessions..	..	..	40,229	60,540
Total	..	..	1,483,498	1,684,759
Chinaware or Porcelain, and Earthenware:				
Foreign Countries...	357,523	406,542	921,442	993,684
British Possessions .	3,161	1,993	8,036	5,288
Total	360,684	408,535	929,478	998,972
Coal, Culm, Cinders, and Shale:	Tons.	Tons.		
Foreign Countries ..	9,805	1,444	11,749	1,402
British Possessions .	144	6,120	405	20,821
Total	9,949	7,564	12,154	22,223
Drugs:	Cwts.	Cwts.		
Bark, Peruvian:				
Foreign Countries ..	8,826	20,736	28,991	72,460
British Possessions .	32,282	21,810	63,196	48,210
Total	41,108	42,546	92,187	120,670
Unenumerated, including Medicinal Preparations not liable to Duty:				
Foreign Countries ..	..	..	960,776	928,804
British Possessions .	..	..	238,178	193,951
Total	..	..	1,198,954	1,122,755
Dyestuffs (other than Dye-Woods) and Substances used in Tanning or Dyeing:				
Bark for Tanning:	Cwts.	Cwts.		
Foreign Countries ..	112,874	144,091	30,000	35,170
British Possessions .	186,541	297,377	82,015	137,429
Total	299,415	441,468	112,015	172,599

A.—Articles Free of Duty—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
	Cwts.	Cwts.	£	£
Dyestuffs —*cont.*				
Cochineal:				
Foreign Countries ..	2,997	1,896	14,638	7,958
British Possessions .	..	4	..	18
Total	2,997	1,900	14,638	7,976
Cutch and Gambier:	Tons	Tons		
Foreign Countries ..	360	117	5,120	2,851
British Possessions .	19,196	17,496	380,979	388,922
Total	19,496	17,613	386,099	391,773
Dyestuffs obtained from Coal Tar, Alizarin:				
Foreign Countries ..	..	..	186,246	201,872
British Possessions .	..	..	18	57
Total	..	..	186,264	201,929
Dyestuffs obtained from Coal Tar, Aniline:				
Foreign Countries ..	..	..	510,430	539,233
British Possessions .	..	..	..	5
Total.....	..	..	510,430	539,238
Dyestuffs obtained from Coal Tar, other Coal Tar Dyestuffs:				
Foreign Countries ..	..	..	23,117	36,349
British Possessions .	..	..	277	199
Total	..	..	23,394	36,548
Extracts:				
Foreign Countries ..	..	..	493,530	502,421
British Possessions .	..	..	18,650	19,974
Total	..	..	512,180	522,395
Indigo:	Cwts.	Cwts.		
Foreign Countries ..	5,556	7,317	82,425	117,90
British Possessions .	28,321	44,042	459,664	670,920
Total	33,877	51,359	542,089	788,820
Myrobalans:				
Foreign Countries ..	2,063	2,859	593	751
British Possessions .	629,196	479,777	191,266	145,179
Total	631,259	482,636	191,859	145,930
Sumach:	Tons	Tons		
Foreign Countries ..	10,281	11,214	109,714	105,310
British Possessions .	..	44	..	45
Total	10,281	11,258	109,714	105,75
Valonia, Total.....	32,668	30,533	313,656	324,08
Unenumerated	Cwts.	Cwts.		
Foreign Countries ..	171,461	154,375	222,920	183,20
British Possessions .	45,575	30,749	42,212	30,15
Total	217,036	185,124	265,132	213,35
Dye-Woods:	Tons	Tons		
Logwood:				
Foreign Countries ..	11,340	17,189	59,384	88,70
British Possessions .	8,467	12,165	55,820	73,85
Total	19,807	29,354	115,204	162,55
Unenumerated:				
Foreign Countries ..	11,380	10,580	43,130	40,61
British Possessions .	1,740	3,061	17,711	21,30
Total	13,120	13,641	60,841	61,9
Farinaceous Substances:				
Starch, Farina, and Dextrin:		Cwts.		
Foreign Countries ..	..	1,388,671	..	782,07
British Possessions .	..	28,453	..	11,3
Total	..	1,417,124	..	793,3
Floorcloth, Linoleum, and Kamptulicon:	Sq. Yds.	Sq. Yds.		
Foreign Countries ..	2,233,277	1,448,133	119,591	73,4
British Possessions .	2,520	160	70	
Total	2,235,797	1,448,293	119,661	73,4

A.—*Articles Free of Duty*—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Fruit Juice, not containing Spirit:	Galls.	Galls.	£	£
Foreign Countries ..	329,972	139,795	36,532	19,327
British Possessions .	689,888	440,641	46,523	23,336
Total	1,019,860	580,436	83,055	42,663
Galls:	Cwts.	Cwts.		
Foreign Countries ..	23,659	49,402	68,919	128,242
British Possessions .	102	318	380	493
Total	23,761	49,720	69,299	128,735
Glass:				
Window and German Sheet, including Shades and Cylinders:				
Foreign Countries ..	1,165,979	1,247,679	650,251	691,869
British Possessions .	..	2	..	2
Total	1,165,979	1,247,681	650,251	691,871
Plate:				
Foreign Countries ..	316,094	464,781	354,789	316,587
British Possessions .	..	32	..	62
Total	316,094	464,813	354,789	316,649
Flint, Plain, Cut, or Ornamented, and other Manufactures of Flint Glass:				
Foreign Countries ..	487,783	571,720	901,694	1,026,243
British Possessions .	2	3	13	4
Total	487,785	571,723	901,707	1,026,247
Manufactures, unenumerated:	Cwts.	Cwts.		
Foreign Countries ..	343,052	287,746	618,073	558,162
British Possessions .	13	13	106	49
Total	343,065	287,759	618,179	558,211
Glue, Size, and Gelatin:				
Foreign Countries ..	212,856	225,525	463,095	473,402
British Possessions .	307	732	733	1,536
Total	213,163	226,257	463,828	474,938
Glue Stock and Pieces for making Glue:				
Foreign Countries ..	61,582	33,335	54,545	26,371
British Possessions .	89,220	42,824	68,073	28,087
Total	150,802	78,159	122,618	54,458
Gum:				
Arabic:				
Foreign Countries ..	56,587	72,319	135,905	160,110
British Possessions .	26,408	26,030	41,168	51,811
Total	82,995	98,349	177,073	211,921
Kauri:				
Foreign Countries ..	250	238	880	520
British Possessions .	114,595	80,167	350,136	258,195
Total	114,845	80,405	351,016	258,715
Lac-dye, Seedlac, Shellac, and Stick-lac:				
Foreign Countries ..	506	4,726	1,342	15,584
British Possessions .	112,478	91,987	362,267	300,885
Total	113,074	96,713	363,609	314,469
Unenumerated:				
Foreign Countries ..	105,335	108,068	347,256	334,117
British Possessions .	78,674	76,567	161,287	177,085
Total	184,009	184,635	508,543	511,202
Gutta Percha:				
Foreign Countries ..	18,134	14,906	180,388	174,678
British Possessions .	107,925	74,432	1,495,180	1,207,968
Total	126,059	88,438	1,685,568	1,382,646

A.—*Articles Free of Duty*—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Hides, raw, and pieces thereof:	Cwts.	Cwts.	£	£
Dry:				
Foreign Countries...	145,092	132,113	419,982	387,873
British Possessions..	602,655	220,974	1,530,407	599,259
Total	747,747	353,087	1,950,389	987,132
Wet:				
Foreign Countries ..	547,831	718,867	1,273,470	1,701,451
British Possessions .	88,373	38,308	194,285	81,328
Total	636,204	757,175	1,467,755	1,782,779
Horns, tips and pieces of Horn and Hoofs:	Tons.	Tons.		
Foreign Countries ..	2,616	2,412	91,713	84,503
British Possessions .	3,625	2,578	121,383	80,070
Total	6,241	4,990	213,096	164,573
Isinglass:	Cwts.	Cwts.		
Foreign Countries ..	3,162	2,839	44,041	35,709
British Possessions .	5,749	5,039	84,673	65,997
Total	9,211	7,878	128,714	102,697
Ivory:				
Teeth, Elephants', Sea-cows', or Walrus':				
Foreign Countries...	6,174	5,527	236,031	197,727
British Possessions .	3,715	3,298	162,623	137,983
Total	9,889	8,825	398,654	335,710
Vegetable:				
Foreign Countries...	13,952	14,869	8,205	7,650
British Possessions .	20	1,342	6	593
Total	13,972	16,211	8,211	8,243
Lard:				
Foreign Countries...	1,809,957	1,873,223	3,063,023	3,800,364
British Possessions..	117,317	113,033	203,559	237,325
Total	1,927,274	1,986,256	3,266,582	4,037,689
Imitation Lard:				
Foreign Countries...	69,197	93,295	95,450	151,293
British Possessions..	2,135	1,851	3,179	2,946
Total	71,332	95,146	98,629	154,239
Leather:				
Undressed:				
Foreign Countries...	342,881	371,191	1,315,712	1,462,436
British Possessions..	636,441	531,940	3,670,414	3,095,632
Total.....	979,322	903,131	4,986,126	4,558,068
Dressed:				
Foreign Countries...	404,537	401,223	3,480,373	3,453,726
British Possessions..	18,367	11,655	119,291	71,579
Total	422,904	412,878	3,599,664	3,525,305
Varnished, Japanned, or Enamelled:				
Foreign Countries...	6,665	7,819	206,699	238,124
British Possessions .	30	5	463	180
Total	6,695	7,824	207,162	238,304
Malt, Total	Quarters. 928	Quarters. 796	2,044	1,578
Manures:				
Bones for Manure (whether burnt or not):	Tons.	Tons.		
Foreign Countries...	12,912	21,461	52,603	75,012
British Possessions .	55,225	36,287	249,200	145,012
Total	68,137	57,748	301,803	220,024
Guano:				
Foreign Countries...	32,051	22,181	172,099	104,057
British Possessions .	1,585	349	5,310	852
Total	33,636	22,530	177,409	104,909
Nitrate of Soda (cubic nitre).	141,155	107,108	1,155,462	910,067

A.—Articles Free of Duty—cont.

Articles, and Countries whence Imported.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
	Tons.	Tons.	£	£
Manures—*cont.* Phosphate of Lime, and Rock Phosphate:				
Foreign Countries...	354,886	354,115	586,952	549,967
British Possessions..	616	775	1,746	1,750
Total	355,502	354,890	588,698	551,717
Unenumerated:				
Foreign Countries...	99,074	97,816	204,055	178,195
British Possessions .	552	425	2,881	1,067
Total	99,626	98,241	206,936	179,262
	Cwts.	Cwts.		
Margarin (including all kinds of Artificial or Imitation Butter):				
Foreign Countries ..	920,328	962,122	2,464,630	2,556,665
British Possessions..	84	5	195	14
Total	920,412	962,127	2,464,825	2,556,679
	Gross of Boxes.	Gross of Boxes.		
Matches:				
Safety, Total.....	4,497,777	4,401,869	203,818	201,256
Other Sorts, Total.....	3,262,432	4,065,619	177,239	222,041
Metals and Ores:				
Brass, Bronze, and Metal Bronzed or Lacquered, Manufactures of:				
Foreign Countries...	Cwts. 44,645	Cwts. 47,828	208,742	233,202
British Possessions .	1,304	765	8,494	6,856
Total	45,949	48,593	217,236	240,058
	Tons.	Tons.		
Copper Ore:				
Foreign Countries...	73,900	58,187	773,503	737,631
British Possessions..	26,853	42,702	399,119	514,309
Total	100,753	100,889	1,172,622	1,251,940
Copper, Regulus and Precipitate:				
Foreign Countries...	78,431	81,358	3,204,008	3,323,554
British Possessions..	9,308	10,510	313,410	345,109
Total	87,739	91,868	3,517,508	3,668,663
Copper, Old, fit only to be Re-manufactured:				
Foreign Countries...	6,364	3,200	253,899	137,991
British Possessions..	1,193	754	75,571	47,311
Total	7,557	3,954	329,470	185,302
Copper, Unwrought, in Bars, Blocks, Slabs Cakes, and Ingots:				
Foreign Countries...	54,574	49,192	4,034,438	3,374,672
British Possessions..	16,311	18,489	1,227,508	1,355,908
Total	70,885	67,681	5,261,946	4,730,580
Iron Ore (including Chrome Ore):				
Foreign Countries...	6,279,246	5,503,729	5,606,271	4,491,820
British Possessions..	18,717	45,159	32,732	58,743
Total	6,297,963	5,548,888	5,639,003	4,550,563
Lead Ore:				
Foreign Countries...	6,023	5,745	59,819	47,594
British Possessions..	15,196	23,727	159,263	196,731
Total	21,219	29,472	219,082	244,325
Lead, Pig and Sheet:				
Foreign Countries...	138,755	157,407	2,354,080	2,058,461
British Possessions..	56,625	60,653	967,494	785,535
Total	195,380	218,060	3,321,574	2,843,996
Manganese Ore:				
Foreign Countries ..	229,460	150,502	504,837	346,192
British Possessions .	36,297	42,152	80,567	112,468
Total	265,757	192,654	684,404	458,660

A.—Articles Free of Duty—cont.

Articles, and Countries whence Imported.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
	Lb.	Lb.	£	£
Metals and Ores—*cont.* Mercury:				
Foreign Countries ..	2,454,438	2,642,622	297,243	322,316
British Possessions .	..	7,950	..	962
Total	2,454,438	2,650,572	297,243	323,278
	Oz. troy.	Oz. troy.		
Platinum, wrought or unwrought, Total..	160,860	158,109	227,854	228,152
	Tons.	Tons.		
Pyrites of Iron and Copper:				
Foreign Countries ..	710,470	617,366	1,175,013	1,050,370
British Possessions .	30,961	36,218	62,210	70,875
Total	741,431	653,584	1,237,223	1,121,245
Tin Ore:				
Foreign Countries ..	Tons. 7,101	Tons. 10,412	364,654	518,242
British Possessions .	228	110	11,256	5,643
Total	7,329	10,522	375,910	523,885
	Cwts.	Cwts.		
Tin, Blocks, Ingots, Bars, and Slabs:				
Foreign Countries ..	79,877	86,630	508,317	560,517
British Possessions .	582,482	621,309	3,850,816	3,715,121
Total	662,359	707,939	4,359,133	4,275,638
Zinc Ore:	Tons.	Tons.		
Foreign Countries ..	35,875	34,796	197,261	162,928
British Possessions .	6,193	302	38,589	2,270
Total	42,068	35,098	235,850	165,198
Zinc, Crude, in Cakes:				
Foreign Countries ..	69,123	67,069	1,136,130	1,171,227
British Possessions .	413	483	5,902	5,844
Total	69,536	67,552	1,142,032	1,177,071
Zinc, Manufactures of:	Cwts.	Cwts.		
Foreign Countries ..	434,760	426,724	558,713	489,354
British Possessions .	264	129	1,055	852
Total	435,024	426,853	559,768	490,206
Ores, Unenumerated:	Tons.	Tons.		
Foreign Countries ..	55,524	65,693	276,180	279,916
British Possessions .	6,826	10,284	56,521	52,470
Total	62,350	75,977	332,701	332,386
Metal, Unenumerated, Unwrought:				
Foreign Countries ..	2,358	3,517	173,089	227,409
British Possessions .	112	398	5,610	13,691
Total	2,470	3,915	178,699	241,100
Metal, Unenumerated, Old, fit only to be Re-manufactured:	Tons.	Tons.		
Foreign Countries ..	5,770	4,028	183,838	123,099
British Possessions .	1,912	1,109	55,977	32,978
Total	7,682	5,137	239,815	156,077
Methylic Alcohol, not Purified so as to be Potable:	Gallons.	Gallons.		
Foreign Countries ..	267,744	336,805	42,985	52,588
British Possessions .	3,100	27,620	470	3,778
Total	270,844	364,425	43,455	56,366
Mica, Talc, French Chalk, Steatite, Mineral White, Silica, and Soapstone:	Cwts.	Cwts.		
Foreign Countries ..	121,317	119,797	34,801	38,181
British Possessions .	35,159	20,307	181,275	103,354
Total	156,476	140,104	216,076	141,535
Nuts and Kernels: For expressing oil therefrom:	Tons.	Tons.		
Foreign Countries ..	19,765	15,695	258,796	191,340
British Possessions .	36,903	34,395	455,905	422,984
Total	56,668	50,090	714,701	614,324

A.—*Articles free of Duty*—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Oil:	Tuns.	Tuns.	£	£
Fish, Train, Blubber, Sperm, or Head Matter:				
Foreign Countries...	14,428	17,943	252,908	319,465
British Possessions..	6,895	6,441	136,804	134,344
Total	21,323	24,384	389,712	453,809
Animal:	Cwts.	Cwts.		
Foreign Countries...	85,478	78,210	94,221	103,757
British Possessions..	18,714	13,660	22,910	16,670
Total	103,892	91,870	117,131	120,427
Castor:				
Foreign Countries...	31,915	74,211	47,522	108,359
British Possessions..	21,420	33,086	31,325	47,222
Total	53,335	107,297	78,847	155,581
Coco-nut:				
Foreign Countries...	81,244	54,753	98,779	69,716
British Possessions..	471,499	423,390	568,425	524,438
Total	552,743	478,143	667,204	594,154
Olive:	Tuns.	Tuns.		
Foreign Countries ..	12,044	15,477	461,075	581,413
British Possessions .	..	11	9	489
Total	12,044	15,488	461,084	581,893
Palm:	Cwts.	Cwts.		
Foreign Countries...	187,534	294,133	217,015	344,205
British Possessions..	750,816	917,978	869,540	1,026,440
Total	938,350	1,212,111	1,086,555	1,370,645
Seed:	Tons.	Tons.		
Foreign Countries ..	40,576	48,427	1,027,077	1,184,119
British Possessions .	555	415	11,487	9,458
Total	41,131	48,842	1,038,564	1,193,577
Turpentine:	Cwts.	Cwts.		
Foreign Countries ..	595,489	643,846	978,943	842,742
Chemical, Essential or Perfumed:	Lb.	Lb.		
Foreign Countries ..	877,954	944,408	193,321	181,992
British Possessions .	880,377	996,799	52,784	61,661
Total	1,758,331	1,941,207	246,105	243,653
Unenumerated:				
Foreign Countries ..	..	..	101,488	90,090
British Possessions .	..	..	8,175	3,585
Total	..	..	109,663	93,684
Oil-seed Cake:				
Linseed Cake:	Tons.	Tons.		
Foreign Countries ..	178,089	162,891	1,325,722	1,190,837
British Possessions .	9,331	11,181	70,194	81,307
Total	187,420	174,072	1,395,916	1,272,144
Cotton-seed Cake:				
Foreign Countries ..	187,697	180,838	1,051,528	1,030,089
British Possessions .	..	1,486	..	6,220
Total	187,697	182,324	1,051,528	1,036,309
Other Sorts:				
Foreign Countries ..	15,862	19,312	73,717	82,535
British Possessions .	3,911	3,891	26,380	22,658
Total	19,773	23,203	100,097	105,193
Oleo-margarin, or Oleo-oil:	Cwts.	Cwts.		
Foreign Countries ..	172,892	154,867	285,219	276,094
British Possessions .	8,662	12,803	15,034	22,716
Total	181,554	167,670	300,253	298,810
Painters' Colours and Pigments, Unenumerated:				
Foreign Countries ..	..	..	1,343,055	1,293,361
British Possessions .	..	..	6,505	4,581
Total	..	..	1,349,560	1,297,942

A.—*Articles free of Duty*—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Paper:	Cwts.	Cwts.	£	£
Unprinted:				
Foreign Countries ..	3,636,674	3,469,684	3,011,943	2,869,394
British Possessions .	182,060	184,406	101,158	96,212
Total	3,818,734	3,654,090	3,113,101	2,965,606
Printed or Coated:				
Foreign Countries ..	122,681	136,027	408,673	420,746
British Possessions .	505	323	1,650	1,165
Total	123,186	136,350	410,323	421,911
Strawboard or Millboard:				
Foreign Countries ..	1,919,146	2,028,706	662,490	736,328
British Possessions .	3,440	1,256	1,568	529
Total	1,922,586	2,029,962	664,058	736,857
Wood-Pulp Board:				
Foreign Countries ..	393,936	421,921	190,746	198,421
British Possessions .	73,990	38,984	34,212	19,439
Total	467,926	460,905	224,958	217,860
Paper making Materials:				
Linen and Cotton Rags	Tons.	Tons.		
Foreign Countries ..	16,189	15,554	158,061	143,472
British Possessions .	423	368	3,806	3,231
Total	16,612	15,922	161,867	146,703
Esparto and other Vegetable Fibres for making Paper:				
Foreign Countries ..	200,280	193,937	800,498	802,463
Pulp of Wood:				
Foreign Countries ..	431,725	..	2,367,491	..
British Possessions .	56,017	..	250,298	..
Total	487,742	..	2,617,789	..
Chemical, Dry:				
Foreign Countries ..	..	155,094	..	1,363,300
British Possessions .	..	18,707	..	154,742
Total	..	173,801	..	1,518,042
Chemical, Wet:				
Foreign Countries ..	..	14,372	..	82,508
British Possessions .	..	774	..	5,322
Total	..	15,146	..	87,830
Mechanical, Dry:				
Foreign Countries ..	..	11,231	..	82,314
British Possessions .	..	2,078	..	14,503
Total	..	13,309	..	96,817
Mechanical, Wet:				
Foreign Countries ..	..	196,320	..	561,166
British Possessions .	..	49,879	..	142,229
Total	..	246,199	..	703,395
Other Paper-making Materials:				
Foreign Countries ..	19,411	16,055	108,835	95,976
British Possessions .	702	391	3,885	2,080
Total	20,113	16,446	112,720	98,056
Paraffin and Paraffin-Wax:	Cwts.	Cwts.		
Foreign Countries ..	927,374	799,762	1,249,140	949,597
British Possessions .	57,197	39,675	88,131	56,777
Total	984,571	839,437	1,337,271	1,006,374
Perfumery, and Articles used in the Manufacture thereof, except Perfumed Spirits:	Lb.	Lb.		
Foreign Countries ..	871,952	644,518	89,567	61,556
British Possessions .	19,897	17,421	7,022	9,389
Total	891,849	662,019	96,589	70,945

A.—Articles Free of Duty—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Petroleum:	Galls.	Galls.	£	£
Illuminating:				
Foreign Countries ..	214,645,210	217,209,601	4,359,092	3,938,320
British Possessions .	623,270	..	6,678	..
Total	215,268,480	217,209,601	4,365,770	3,938,320
Lubricating:				
Foreign Countries ..	39,167,072	36,458,558	1,186,065	1,129,775
British Possessions .	542,491	116,587	7,424	2,607
Total	39,709,563	36,575,145	1,193,489	1,132,382
Pitch:	Cwts.	Cwts.		
Foreign Countries ..	129,713	130,350	44,405	40,929
British Possessions .	10,289	750	3,434	264
Total	139,993	131,100	47,839	41,193
Plumbago:	Tons.	Tons.		
Foreign Countries ..	5,789	6,302	111,507	109,767
British Possessions .	8,933	11,901	235,254	192,272
Total	14,722	18,203	346,761	302,039
Rosin, Total.....	Cwts. 1,801,571	Cwts. 1,812,478	461,064	429,302
Seeds:				
Cotton:	Tons.	Tons.		
Foreign Countries ..	406,130	392,708	2,622,366	2,511,638
British Possessions .	348	11,441	2,084	193,959
Total	406,478	437,149	2,624,450	2,705,597
Flax or Linseed:	Quarters.	Quarters.		
Foreign Countries ..	891,422	926,069	2,173,677	2,235,489
British Possessions .	774,609	758,753	1,988,469	2,028,442
Total	1,666,031	1,684,822	4,162,146	4,263,931
Rape:				
Foreign Countries ..	74,744	51,665	126,625	89,445
British Possessions .	59,499	111,664	119,995	208,981
Total	134,243	163,329	246,620	298,426
Unenumerated, for expressing oil therefrom:				
Foreign Countries ..	92,486	63,949	185,567	138,233
British Possessions .	98,139	205,137	201,571	407,899
Total	190,625	269,086	387,138	546,132
Skins and Furs:				
Skins, goat, undressed:	No.	No.		
Foreign Countries ..	6,024,957	6,112,038	647,764	613,271
British Possessions .	8,850,833	13,489,398	765,210	1,203,325
Total.....	14,875,790	19,601,436	1,412,974	1,816,596
Skins, sheep, undressed:				
Foreign Countries ..	4,535,810	3,686,815	535,017	406,834
British Possessions .	10,522,185	11,422,584	1,064,559	1,065,838
Total.....	15,057,995	15,109,399	1,599,576	1,472,672
Skins, Unenumerated, dressed or undressed (not Leather):				
Foreign Countries ..	247,421	131,112	26,617	23,206
British Possessions .	68,209	22,359	7,746	2,895
Total.....	315,630	153,471	34,363	26,101
Soap and Soap Powder:	Cwts.	Cwts.		
Foreign Countries ..	190,694	301,227	243,771	313,574
British Possessions .	539	1,328	574	1,452
Total.....	191,233	302,555	244,345	315,026
Tallow and Stearin:				
Foreign Countries ..	928,413	782,472	1,204,713	992,604
British Possessions .	1,249,578	1,002,847	1,630,504	1,340,642
Total.....	2,177,991	1,785,319	2,835,217	2,333,246
Tar:				
Foreign Countries ..	334,456	329,111	96,144	90,964
British Possessions .	20,960	21,817	2,031	1,766
Total.....	355,416	350,928	98,175	92,730

A.—Articles Free of Duty—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Varnish, not containing Spirits:	Cwts.	Cwts.	£	£
Foreign Countries ..	..	..	56,149	47,492
British Possessions .	..	..	248	145
Total	..	..	56,397	47,637
Vinegar, Total	Galls. 193,354	Galls. 229,369	12,958	15,278
Wax (including Ozokerite and Earth Wax):	Cwts.	Cwts.		
Foreign Countries ..	45,223	34,545	162,134	125,394
British Possessions .	6,393	5,569	40,120	33,354
Total.....	51,616	40,114	202,254	158,748
Yeast:				
Foreign Countries ..	138,186	130,511	339,026	277,893
British Possessions .	553	25	1,650	97
Total	138,739	130,536	340,676	277,990

Trade of Dantzig (Germany).

Foreign Office Annual Series, No. 2892.

Salt.—The larger portion of the salt sent on, either by river craft or rail, to Poland, is Russian, brought to Dantzig by sea from Eupatoria in the Crimea. The trade in coarse salt from the Black Sea only began in 1898, and steadily increases. None came either from Spain or Portugal, in 1901 or 1900. The finer qualities of salt come principally from the United Kingdom, and are for use in this part of Germany. This branch of the trade was favoured by the extremely low freights ruling in 1901. The German salt from the springs at Inowrazlaw was sold in the places near the springs at prices at which the British article could not compete, but this cutting down of prices has brought the German producers to financial straits. The average price of the British salt, during 1901, was 1*s.* 9*d.* per sack of 125 lb. delivered here in bond.

Total Import of Salt at Dantzig during 1899–1901.

From	Quantity.		
	1899.	1900.	1901.
	Tons.	Tons.	Tons.
United Kingdom	6,670	6,744	5,737
Russia.....	9,945	11,822	13,047
Spain.....	282	..	..
German ports.....	125	113	335
Total	17,022	18,679	19,119

Tar and Pitch.—In 1901, out of 3,804 tons of tar imported by sea, 3,413 tons came from the United Kingdom. The figures for pitch were 875 tons out of 1,021 tons. Business in these articles is more profitable at Königsberg, as the railway rates are less and the facilities greater at that port for dealing with building materials. The freight from the United Kingdom to Dantzig is the same as to Königsberg.

Tallow.—The supply of tallow from Australia decreased considerably, particularly in the second half of 1901. Of the total import of 2,270 tons, in 1901, 790 tons were of British origin, as against 2,012 tons out of 2,262 tons, in 1900. The United States furnished 1,320 tons, in 1901, as against 72 tons, in 1898. The best tallow is now so largely used for cooking purposes, that the price is now much higher than for mutton fat.

Table of the Stocks of Tallow in London at the end of 1899—1901.

	Casks.
1899	17,401
1900.....	23,025
1901	6,489

Sugar.—The crisis, in 1901, in nearly every branch of rade and industry, was also severely felt by the beet-sugar ills. The unusually low quotations at the beginning of he year fell further, until they reached a level at which sugar could only be produced at a loss. The fall in price during 1901, was as much as 1*l.* 10*s.* a ton, or 33 per cent In 1901, 159,281 tons of beet-sugar were shipped, of which 98,719 tons went to the United Kingdom.

MINERAL PRODUCTS OF THE UNITED STATES.

U.S. Geol. Survey, 1901.

		1900.		1901.	
		Quantity.	Value.	Quantity.	Value.
METALLIC.			Dols.		Dols.
Copper, value at New York City	Lb.	606,117,166	98,494,639	597,443,212	86,629,266
Lead, " " "	Short Tons	270,824	23,561,688	270,700	23,280,200
Zinc, " " "	"	123,886	10,654,196	140,822	11,265,760
Mercury, value at San Francisco	Flasks	28,317	1,302,586	29,727	1,382,305
Aluminium, value at Pittsburg	Lb.	7,150,000	1,920,000	7,150,000	2,238,000
Antimony, value at San Francisco	Short Tons	1,226	837,896	2,649	542,020
Nickel, value at Philadelphia	Lb.	9,715	3,886	6,700	3,551
Platinum, value (crude) at San Francisco	Troy oz.	400	2,500	1,827	13,009
NON-METALLIC (Spot Values).					
Fuels:					
Bituminous coal	Short Tons	212,513,912	221,133,513	225,607,649	236,201,899
Pennsylvania anthracite	Long Tons	51,221,353	85,757,851	69,242,560	112,504,020
Natural gas	..	..	23,698,674	..	27,067,500
Petroleum	Barrels	63,362,704	75,752,691	69,383,194	66,417,335
Building materials:					
Brick-clay	..	..	12,000,000	..	13,800,000
Cement	Barrels	17,231,150	13,283,581	20,068,737	15,786,789
Abrasive materials:					
Corundum and Emery	Short Tons	4,305	102,715	4,305	146,040
Infusorial earth and Tripoli	"	3,615	24,207	4,020	52,950
Chemical materials:					
Borax	Lb.	Refined, tons 1,602 Crude, tons 24,235	173,036	Refined, tons 5,344 Crude, tons 17,887	697,307 314,811
Bromine	"	521,444	848,215 140,790	352,043	154,572
Fluorspar	Short Tons	18,450	94,500	19,586	113,803
Gypsum	"	594,462	1,627,203	659,059	1,577,493
Marls	"	60,000	30,000	60,000	30,000
Phosphate rock	Long Tons	1,491,216	5,359,248	1,483,783	5,316,403
Pyrites	"	204,615	749,991	234,825	1,024,449
Salt	Barrels	20,869,342	6,944,603	20,566,661	6,617,449
Sulphur	Short Tons	3,525	88,100	7,690	223,430
Pigments:					
Barytes, crude	"	67,680	188,089	49,070	157,344
Cobalt oxide	Lb.	6,471	11,648	13,360	24,048
Mineral paints	Short Tons	72,222	881,363	61,480	789,962
Zinc-white	"	48,840	3,667,210	38,889	3,111,120
Miscellaneous:					
Asbestos	"	1,054	16,310	747	13,498
Asphaltum	..	54,389	415,958	63,134	555,335
Bauxite	Long Tons	23,184	89,676	18,205	79,914
Chromic iron ore	"	140	7,400	368	5,790
Clay, all other than brick	..	..	1,840,377	..	2,591,332
Felspar	Short Tons	21,353	173,059	34,741	220,422
Fibrous talc	"	63,509	499,500	69,200	483,600
Flint	"	32,495	84,352	31,420	142,297
Fuller's earth	"	9,698	67,535	10,967	80,697
Graphite	..	Crystalline, lb. 5,507,855 Amorphous, tons 614	197,579	Amorphous, tons 3,967,612 Crystalline, lb. 809	167,714
Limestone for iron flux	Long Tons	7,495,435	4,500,000	8,540,268	4,639,836
Magnesite	Short Tons	2,252	19,333	13,172	43,057
Manganese ore	Long Tons	11,771	100,289	11,995	116,722
Mica	Lb.	Sheet, lb. 456,283 Scrap, tons 5,453	92,758 54,302	Sheet lb. 360,060 Scrap, tons 2,165	98,859 19,719
Mineral waters	Gallons sold	47,558,784	6,245,172	55,771,188	7,586,962
Monazite	Lb.	908,000	48,805	748,736	59,262
Rutile	"	300	1,300	44,275	5,710
Soapstone	Short Tons	27,943	383,541	28,643	424,888

II.—FUEL, GAS, AND LIGHT.

BY-PRODUCT COKE-MAKING IN THE UNITED STATES.

Eng. and Mining J., Aug. 23, 1902.

The number of by-product ovens in use in the United States was less than 2 per cent. of the total. The average yield per oven, last year, from by-product ovens was 1,000 tons, as compared with 343 tons average yield from beehive and other kinds. Some of the by-product ovens made as much as 1,200 tons of coke during the year, the average above including a number of ovens which were not in operation throughout the entire year. The by-products included 12,695,190 galls. of tar, 12,927,627 lb. of sulphate of ammonia, and 2,537,510 galls. of ammonia liquor, the aggregate value of which was 1,029,876 dols. At most of the works, the gas produced is not measured or valued, but the product is estimated at 12,000,000 cb. ft., worth 3,000,000 dols. The value of the coke produced in these ovens is stated at 2,894,077 dols., showing the value of all the by-products to have exceeded the value of the coke produced by over 1,100,000 dols.

There is a remunerative market in the United States for the chemical products derivable from the supply of coal-tar obtained, and which is now consumed principally in the

manufacture of roofing-paper, for creosoting timber, and for street-paving. Statistics of imports are given which show that the coal-tar products brought into the United States last year, with duty added, were worth nearly 7,500,000 dols., and exceeded 8,300,000 dols., in 1900. These values are (exclusive of duty) for the products at point of shipment, and do not include freight, insurance, and profits. (See also this J., 1902, 1110.)

Briquettes in Germany.

U.S. Cons. Reps., Aug. 16, 1902.

The briquette manufacture is controlled by a syndicate, which includes more than nine-tenths of all the producers in Germany, and regulates the out-put and prices for each year. According to the official report of the syndicate, for 1901, which has recently appeared, the total output during last year was 1,566,385 tons, to which is to be added the product of makers outside the syndicate, consumed at works, small retail sales, &c., making a grand total of 1,643,416 tons.

The average selling price in large quantities was 13·33 marks per ton, as against 12·27 marks, for 1900, so that, notwithstanding the general relaxation of industrial activity and the diminished pressure upon the coal supply, the ruling price was the highest that had been realised since 1891. Of the quantity sold by the syndicate, last year, 749,208 tons were taken by the German railways, 124,380 tons were sold to retailers, 497,136 tons, to factories and works of various kinds, and 149,089 tons, or 9·8 per cent., were used by German merchant steamers and the navy or exported to the German colonies or neighbouring European countries.

The following tabulated statement shows the production, the sales of the syndicate, and the mean price per ton for several years:—

Year.	Production.	Sales of Syndicate.	Price per Ton.
	Tons.	Tons.	Marks.
1891	482,495	202,780	12·67
1895	796,363	780,185	9·07
1899	1,530,816	1,485,139	10·66
1900	1,563,928	1,519,811	12·27
1901	1,566,385	1,560,230	13·33

The syndicate produces to a large extent briquettes made from coal screenings, which require a matrix or binder of some plastic inflammable material, and for this purpose 116,956 tons of mineral pitch were used, which cost on an average about 2*l.* per ton delivered.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Production of Asphaltum in the United States.

Mineral Resources of the United States, 1901, *and Eng. and Mining J., Aug.* 23, 1902.

The production of asphaltum and bituminous rock amounted to 63,134 short tons, valued at 555,335 dols., as compared with 54,389 short tons, valued at 415,958 dols., in 1900, and with 75,085 short tons, valued at 553,904 dols., in 1899. The production, in 1901, increased 8,745 tons in quantity, and 139,377 dols. in value, over the production of 1900, but the production, in 1900 and 1901, both in quantity and in value, has been the smallest in the last seven years.

The production of bituminous sandstone decreased from 38,334 short tons, valued at 119,779 dols., in 1900, to 34,248 tons, valued at 138,602 dols., in 1901. The production of bituminous limestone increased from 2,434 short tons, valued at 11,322 dols., in 1900, to 6,970 short tons, valued at 33,375 dols., in 1901.

The production of hard and refined asphaltum, which includes gilsonite and other pure varieties, increased from 12,367 tons, valued at 256,793 dols., in 1900, to 19,316 tons, valued at 333,509 dols., in 1901.

The production of liquid asphaltum, or maltha, all of which was derived from California, increased from 1,251 short tons, valued at 28,064 dols., in 1900, to 2,600 tons, valued at 49,850 dols., in 1901. No sales of mastic were reported during 1899, 1900, or 1901, the crude material from which it was previously made being now included in the output of bituminous sandstone and bituminous limestone.

Asphalt Export of Sicily.

Foreign Office Annual Series, No. 2887.

The shipments of asphalt made from the whole of Sicily, during 1901, were as follows:—

	Tons.
United States	11,870
Austria-Hungary	4,310
United Kingdom	7,630
France	5,910
Germany	29,300
Holland	3,750
Total exports	62,770

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Crop in India.

Chem. Trade J., Aug. 30, 1902.

The first Indian official forecast of the indigo crop in the United Provinces of Agra and Oude reports a continued decline in the cultivation of the plant, which is attributed to the fall of prices. The total area sown, to the middle of April this year, according to the preliminary local estimates, appears as 71,609 acres, as compared with 119,31[illegible] acres last year. The area for indigo which was irrigated from the canals, up to May 31, was only 38,215 acres as against 78,894 acres last year. The decrease in the first-stated area was 40 per cent., and in the latter, 5 per cent., following decreases of 37 and 50 per cent., respectively, last year. In the Doab, where the supply of water for irrigation was not deficient, the prospects are good and the crop comparatively better; elsewhere injury has been caused by hot winds and insufficient supply of water. Taking 100 to denote a normal crop, the estimates of the condition of the crop, in the last week of June, varied from 60 to 90. The character of the monsoon has not yet been declared, and it is too early at present to say what the final yield will be.

VII.—ACIDS, ALKALIS, Etc.

Sulphur and Pyrites in the United States.

Mineral Resources of the United States, 1901, *and Eng. and Mining J., Aug.* 23, 1902.

The production of sulphur in the United States, during 1901, was 7,690 short tons, valued at 223,430 dols., which was derived from Nevada, Idaho, Utah and Louisiana in the order of production. A comparison with the production, during 1900, of 3,525 short tons, valued at 88,10[illegible] dols., shows an increase, during 1901, of 4,165 tons, or over 118 per cent in quantity, and of 135,330 dols., or over 152 per cent., in value. The production of sulphur in the United States, during 1901, is the largest annual record ever made, yet the domestic production has always been of insignificant proportions as compared with the total consumption of the country. The quantity of sulphur consumed in the United States from foreign and domestic sources, in 1901, including the sulphur content of iron pyrites, which is used in the manufacture of sulphuric acid, amounted to 525,745 short tons.

The use of iron pyrites in the manufacture of sulphuric acid has shown a remarkable increase since 1891. The sulphur content of the iron pyrites used in that year was 93,233 long tons. In 1901, the sulphur content of the imported pyrites amounted to 181,668 long tons, and that from

the domestic production of pyrites was 105,671 long tons, a total of 287,339 long tons, or more than three times the quantity consumed in 1891. This use is increasing steadily. By far the greater part of the sulphur consumed in the United States is used in the manufacture of paper-stock by the sulphite process.

The import of sulphur into the United States, in 1901, was 175,210 long tons, valued at 3,287,906 dols., as compared with 167,696 long tons, valued at 2,941,888 dols., in 1900, and with 140,701 long tons, valued at 2,523,203 dols., in 1899. The estimated total domestic consumption of sulphur was 469,415 long tons, in 1901, as compared with 408,038 long tons, in 1900, with 345,904 tons, in 1899, and with 211,491 tons, in 1891.

The world's production of sulphur, in 1900, was 577,420 metric tons, valued at 10,698,494 dols., as compared with 586,122 metric tons, valued at 10,844,688 dols., in 1899.

The production of pyrites, in 1901, was the largest yearly quantity yet recorded, amounting to 234,825 long tons, valued at 1,024,449 dols. A comparison with the production, during 1900, of 204,615 long tons, valued at 749,991 dols., shows an increase in quantity of 30,210 long tons, or 14·8 per cent., and in value of 274,458 dols., or 36·6 per cent. The greater part of the output was derived from Virginia, Colorado, Massachusetts and New York in the order of production. Ohio contributed 7,585 long tons of pyrites, obtained from the coal mined in that State.

In addition to the large increase in the production of pyrites in the United States, during 1901, there was a very large increase in the quantity of pyrites imported, the imports, for 1901, being 403,706 long tons, valued at 1,415,149 dols., as compared with 322,484 long tons, valued at 1,055,121 dols., in 1900, an increase of over 24 per cent. in quantity, and over 34 per cent. in value. The consumption of iron pyrites in the United States, in 1901, was 338,531 as compared with 527,099 long tons, in 1900, with 340,602 tons, in 1899, and with 207,184 tons, in 1891.

The quantity of sulphur displaced by pyrites for acid making is estimated at over 200 per cent., in the 11 years from 1891 to 1901, inclusive.

According to the latest available figures, the world's production of pyrites, in 1900, was 1,640,979 long tons, as compared with 1,552,039 tons, in 1899, and with 1,082,808 tons, in 1892. The corresponding displacement of sulphur was 738,440 long tons, in 1900; 648,418 long tons, in 1899, and 487,263 long tons, in 1892.

Fire-extinguishing Apparatus: Tariff Alterations (Finland).

Bd. of Trade J., Sept. 11, 1902.

The Board of Customs for Finland have decreed the following alteration in the Finnish Customs Tariff:—

Fire-extinguishing apparatus, consisting of a thin brass jacket containing chloride of ammonium and alum, is to be liable at the rate of 14 mks. 70 p. per 100 kilos. (6*s.* per cwt.).

Caustic Potash and Soda, Sulphate of Copper, and Carbonate of Soda Imports of Messina (Sicily).

Foreign Office Annual Series, No. 2887.

The total amount of caustic potash and soda imported, in 1901, was 8,307 cwts., of which 7,009 cwts. were imported from the United Kingdom.

The quantity of sulphate of copper imported, the whole of which came from the United Kingdom, was 2,710 cwts.

The following table shows the quantity imported during the years 1899—1901:—

	Cwts.
1899	2,124
1900	2,639
1901	2,710

The amount of carbonate of soda imported was 731 cwts., against 293 cwts., in 1900.

Nitrate at Junin (Chile).

Foreign Office Annual Series, No. 2885.

The exports of nitrate were as follows:—

	Tons.
1899	118,330
1900	69,545
1901	68,018

Of this quantity, 45,169 tons were exported to the United Kingdom or the Continent, 20,090 tons, to the United States of America, and the balance to various foreign countries.

Nitrate at Taltal (Chile).

Foreign Office Annual Series, No. 2885.

The duties collected by the customs on nitrate of soda exported during the year amounted to 197,119*l.* 6*s.* 9*d.*

The manufacture of nitrate of soda has shown much better results than during the previous year. The manufacture of soda is, with the exception of a small private concern producing about 14,000 tons annually, British enterprise, namely, the Lautaro Nitrate Co., Ltd., and the Esperanza Nitrate Co., Ltd. The Nitrate Combination, formed with the object of restricting the output of nitrate of soda, and put in force from April 1st last, has realised the anticipated improvement in the price of the article, the manufacturers obtaining greater profits than for several years past.

From experiments made in sinking wells near Aqua Verde railway station, distant 38 miles from this port, and also another well near the works of the Esperanza Nitrate Co., situated 59 miles from this port, and to which a branch line of the railway is extended, it is now proved that there exists a much larger underground watercourse near the nitrate fields than was hitherto supposed. This discovery will be the means of further development in the nitrate trade by capitalists acquiring properties, which, for many years, have not been worked for want of the necessary supply of water, as well as fields not yet fully explored.

The Lautaro Nitrate Co. continue operating with their two nitrate works, returning nitrate up to the "quota" allowed them by the Nitrate Committee. Their largest works have produced 18,555·35 British tons of nitrate of soda, and the one of smaller capacity, 19,584·86 tons, in all, 68,140·21 tons of nitrate of soda during the year under review.

The Esperanza Nitrate Co. purchased the property of the New Julia Nitrate Co., Ltd., in liquidation, and reconstructed, during 1901, with a board of directors in London. It is due to the discovery of a larger water supply from the new well that this property is now being worked. Operations were commenced early in December, and 362·2 British tons were manufactured up to the end of the year.

VIII.—GLASS, POTTERY, Etc.

Leadless Glaze in the United Kingdom.

Chem. Trade J., Aug. 30, 1902.

In his annual report on the work of the Government Laboratory, the Principal Chemist, referring to the employment of leadless glaze in pottery, says:—There has been a considerable reduction in the number of samples examined for the Home Office in the course of the year, largely in consequence of the adjournment of the arbitration on the question of the proposed limitation of the quantity of soluble lead to be permitted in pottery glazes. This arbitration was commenced in November last, but it having been shown that the statistics established the fact that, mainly in consequence of improved working conditions brought about by the later Home Office rules, there has been a considerable diminution in the number of cases of plumbism, the arbitrator adjourned the proceedings for a period of 18 months, that it might be seen in the interval whether or not it was after all necessary to impose a limitation on the quantity of soluble lead to be permitted in pottery glaze. In the meantime, a number of samples of glaze, frit, and colours have

been analysed in preparation for the arbitration proceedings, and a Parliamentary paper on the subject was issued by the Home Office, giving the further results obtained to that date and the conclusions reached. A number of manufacturers had also taken advantage of the Treasury permission to obtain from the Government Laboratory an analysis of their frits and glazes, showing the readily soluble lead compounds. Altogether, in the year under review, 55 such samples were submitted, as against 91 similar samples in the previous year. A number of samples of a varied kind were submitted for analysis by the Medical Officer of the Factory Department of the Home Office, to ascertain whether poisonous compounds, especially lead and arsenic, were present. These samples included various enamel powders, colouring substances, ores, dust from the neighbourhood of furnaces, brassworks, shops, &c. Under the existing regulations, which require that glazed articles supplied to the public departments shall be leadless, glazed bricks, pottery, and electrical insulating substances were received for examination, and it is satisfactory to record that in each instance the glaze has been found to be substantially free from lead.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Mica Production in the United States.

Eng. and Mining J., Sept. 23, 1902.

The total amount of plate or sheet mica produced in the United States, during 1901, as reported to the Geological Survey, was 360,060 lb., valued at 98,859 dols., as compared with 456,283 lb., valued at 92,758 dols., in 1900. There was a large falling-off in the amount of scrap mica produced, in 1901, estimated at 2,165 short tons, valued at 19,719 dols., as compared with 5,497 tons, valued at 55,502 dols., in 1900. The importation of mica from Canada and India tends to curtail the production in the United States, especially the Indian mica, which can be imported at a cost lower than that for which it can be mined in this country. There was an increase in the production of plate mica in North Carolina, but a large falling-off in the production of scrap mica.

The imports of mica, in 1901, were valued at 335,054 dols., as compared with 319,560 dols., in 1900, and with 275,984 dols., in 1899.

Clay-Working Industries in the United States.

Eng and Mining J., Aug. 16, 1902.

The total value of the clay-products in the United States was 110,211,587 dols., in 1901, as compared with 96,212,345 dols., in 1900, a gain of 13,999,242 dols., or 14·55 per cent. This is one of the largest gains in the industry recorded. Of this total of 110,211,587 dols., 87,747,727 dols., or 79·62 per cent., represent the value of the products classified as brick and tile, but really embracing all structural clay-products, together with paving bricks and products used in drainage, and other clay-products which it is impracticable to classify separately; and 22,463,860 dols., or 20·38 per cent., was the value of the pottery products.

The year 1901 was one of unprecedented activity in the building-brick industry, the total value of the brick used for this purpose being 51,048,653 dols., as compared with 43,099,512 dols., in 1900, an increase of 18·44 per cent., with 45,461,025 dols., in 1899, and with 35,191,454 dols., in 1898. The common-brick production increased in value from 38,621,514 dols., in 1900, to 45,503,076 dols., in 1901, a gain of 6,881,562 dols., or 17·82 per cent. Front-brick increased in production 21·87 per cent., from 3,864,670 dols., in 1900, to 4,709,737 dols. in 1901. Vitrified paving-brick gained 15·11 per cent., reaching a value of 5,484,134 dols., in 1901. Fire-brick gained less than one-half of 1 per cent., the total being 9,870,421 dols. The stove-lining industry alone decreased, the loss being 39,170 dols., or 8·47 per cent., from 462,541 dols., in 1900, to 423,371 dols., in 1901. The sewer-pipe production increased 15·31 per cent; terra-cotta gained 41·95 per cent., and the fire-proofing industry made a slight gain of 2·20 per cent., as compared with 1900. Pottery increased in value from 19,798,570 dols., in 1900, to 22,463,860 dols., in 1901, a gain of 2,665,290 dols., or 13·46 per cent.

Production of Gypsum in the United States.

Mineral Resources of the United States, 1901, *and Eng. and Mining J., Aug.* 23, 1902.

The production of gypsum in the United States, during 1901, was 659,659 short tons, valued at 1,577,493 dols., as compared with 594,462 short tons, valued at 1,627,203 dols. in 1900, an increase of 65,197 short tons in quantity and a decrease of 45,710 dols. in value. For the 10 years prior to 1899, the annual output averaged 269,712 short tons. During 1900, the production rose to 594,462 short tons, and in 1901, to the maximum output of 659,659 short tons. The rapid development of the gypsum industry has risen mainly from two causes: the increased use of plaster of Paris in the manufacture of wall-plaster in modern buildings, because of its superiority in hardness and durability to lime-plaster and the large quantities consumed in the manufacture of "stuff" for the construction of temporary buildings, particularly exhibition buildings.

The quantity of crude gypsum sold, in 1901, was 72,66 short tons, valued at 76,773 dols., as compared with 35,47 short tons, valued at 44,127 dols, in 1900, an increase of approximately, 105 per cent. over the production of 190 The value per ton of the product, however, decreased fro 1·24 dol., in 1900, to 1·06 dol., in 1901, the lowest pric reported since 1890. Most of the gypsum sold in the crud state is used for land-plaster, being ground for this purpos by Custom mills.

The quantity so ground, during 1901, was 65,698 ton valued at 123,153 dols., as compared with 45,682 ton valued at 82,806 dols., in 1900, an increased production 43·5 per cent. over the figures for 1900. The value p ton was about the same for the two years, averaging, 1900, 1·81 dols., and in 1901, 1·87 dols.

The quantity of gypsum calcined into plaster of Paris, 1901, was 421,292 tons, valued at 1,377,570 dols., as com pared with 513,301 tons, valued at 1,500,270 dols., in 190 The value per ton decreased from 3·79 dols., in 1900, 3·34 dols., in 1901. The value assigned to calcined plast is for the quantity of plaster produced after calcination, n for the raw material.

Brick Manufacture in Quilimane (Portuguese East Africa).

Foreign Office Annual Series, No. 2880.

The brick-making industry is one of the industr introduced by the Companhia da Zambezia. It is in flourishing condition, and, though subject to fluctuatio varying with the local demand, tends to a steady increa This industry has already considerably encroached on t trade previously done here in bricks and tiles from Ma seilles. The locally-made bricks, though wanting in the fin of the European-made article, are nevertheless in great a increasing demand, from their comparative cheapness (7 as against 8*l.* or 9*l.*), and they are now generally used ordinary purposes, the French bricks being employed work requiring those of specially good quality.

Cement Testing in Germany.

Eng. and Mining J., Aug. 30, 1902.

With a view to further elucidate the effect of sea-wa on Portland cement concrete, a series of experiments, on very large scale, are about to be undertaken by the Prussi Government, in conjunction with several cement manufacturers. A number of large concrete blocks, made f cements of different compositions, are to be sunk in the s off the coast of Sylt Island, and will be examined perio cally. At the same time, briquettes of the mortar used, a blocks of the concrete, will be immersed in tanks on

and. Some of these tanks will contain fresh, and the others salt, water. Both tensile and compressive tests of these briquettes and blocks will be made from time to time. The mortars used will be compounded so as to determine whether an addition of slags or trass improves the resistance of a cement to sea water. Both high-limed and low-limed cements are being tried. The experiments are expected to extend over a period of 30 years.

X.—METALLURGY.

Cobalt Ore in New Caledonia.

Foreign Office Annual Series, No. 2891.

The demand for cobalt ore is on the increase, and many new mines are being opened. Cobalt ore, containing 4 per cent. of protoxide of cobalt, was sold last year at the rate of 5*l.* 4*s.* per ton, and is now quoted locally at 13*l.* 4*s.* per ton, a rise of 8*l.* per ton.

XII.—FATS, OILS, Etc.

Cotton-seed in Egypt.

Bd. of Trade J., Sept. 4, 1902.

The total exports of cotton-seed, for 1901, were 393,804 tons, as against 378,702 tons, in 1900, and 379,285 tons, in 1899.

The present crop is much larger than the preceding one, and has been rapidly exported, thus enabling the exports of 1901 to equal those of previous years.

The seed-crushing industry in Egypt has continued active, and a new mill of 32 presses has been erected at Kafr Zayat. The output of oil being greater than local necessities, some of it is exported to Mediterranean ports. The cakes, of which there is no consumption in Egypt, continue to be shipped to British ports.

Olive Husks for Soap-making from Syracuse (Sicily).

Foreign Office Annual Series, No. 2887.

There is a great demand for the husks of olives, from which is extracted about 10 per cent. of a very inferior quality of oil, which is used for the manufacture of soap. The quantity exported, in 1901, from Syracuse was 7,090 tons, most of which went to Pirano (Hungary) and several Italian ports, where there are soap factories.

Linseed for the Manufacture of Linseed-Oil: Duty-Free in Australia.

Bd. of Trade J., Sept. 4, 1901.

The *Official Gazette* of the Commonwealth of Australia of July 11, 1902, contains a Customs by-law, which provides that linseed for the manufacture of linseed-oil shall be admitted into the States of the Australian Commonwealth free of import duty. The by-law further provides that the Collector of Customs is to be first satisfied that such linseed is intended to be forthwith used for the manufacture of linseed-oil, and security is also to be furnished by the importer that the linseed shall be so used, and within six months of the date of importation, proof shall be given to the satisfaction of the Collector that the linseed has been used by the importer.

Carbon Bisulphide and Sulphide Oil at Catania (Sicily).

Foreign Office Annual Series, No. 2887.

There is an important factory (L'Insulare) established at Catania for the production of carbon bisulphide, which is used on a large scale in Sicily and on the Continent for the extraction of the oil remaining in the olive refuse (after the commercial olive-oil is extracted), which is called "olio al solfuro," and is largely employed in soap-making.

Two companies are engaged here for the extraction of sulphide oil (olio al sulfuro) from the olive refuse, one, "L'Insulare," works on the latest system and employs some 60 hands; the capital is principally British.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Sumach in Sicily.

Foreign Office Annual Series, No. 2887.

The sumach grinders and merchants of Palermo endeavoured some two years ago to form a combination for their mutual benefit in the disposal of this product. Those who remained outside got the advantage of the better prices resulting from the combination. Since then, considerable quantities of sumach have been dealt in by outside dealers, and renewed efforts, which have so far failed, were made to endeavour to bring about a complete combination.

The total exports of sumach, during the last two years, were as follow:—

Year.	Quantity.		
	Ordinary.	Ground.	Total.
	Tons.	Tons.	Tons.
1900	9,611	20,543	30,155
1901	11,977	22,206	34,183

The countries to which the sumach was exported, with the quantity for each, are as follow:—

To	Quantity.	
	1900.	1901.
	Tons.	Tons.
United Kingdom	9,356	12,655
France	6,752	9,450
Germany	4,745	1,696
United States	2,820	5,401
Belgium	2,564	1,506
Holland	1,123	1,222
Austria-Hungary	812	984
Russia	728	1,138
Other Countries	189	148

XV.—MANURES, Etc.

Phosphate Industry in Algeria.

Foreign Office Annual Series, No. 2881.

The following figures indicate the quantity of phosphates extracted in the Department of Constantine, during the years 1899—1900:—

	Tons.
1899	324,983
1900	321,422

The restrictive clauses and conditions of tendering for the phosphate beds near Toequeville, in November, 1901, excluded all competitors. The beds were adjudicated to the discoverer of them.

Some 160 tons of phosphate were shipped from Oran, in 1901. Several deposits have been discovered, and only require capital to develop them. These phosphates are of the crystalline quality, not amorphous, as in the province of Constantine. They are especially adapted for the manufacture of superphosphate.

The quantities of phosphates exported from Bône, in 1901, were as follow:

	Tons.
United Kingdom	78,290
France	66,140
Germany	35,515
Italy	29,530
Holland	10,150
Other Countries	29,988
Total	249,613

XVI—SUGAR, STARCH, Etc.

Sugar Campaign in Austria-Hungary.

Bd. of Trade J., Sept. 4, 1902.

In a preliminary report on the Austro-Hungarian sugar campaign of 1901-2 (1st Aug., 1901, to 31st July, 1902), the results of the campaign are given as follows:—

	Refined Sugar.	Raw Sugar.	Total expressed in Raw Sugar.	Increase as compared with previous Year.
	Metric Centners.	Metric Centners.	Metric Centners.	Metric Centners.
Stock in hand	1,176,000	449,000	1,756,000	84,000
Net output	10,529,000	1,181,000	12,880,000	2,072,000
Total	11,705,000	1,630,000	14,636,000	2,156,000
Export	7,046,000	323,000	8,153,000	1,223,000
Consumption	3,453,000	37,000	3,874,000	91,000
Stock in hand	1,206,000	1,270,000	2,609,000	842,000

Note.—The figures for July are only provisional, but it is unlikely that they will undergo any material modification.

The sugar factories began the campaign with somewhat larger stocks than in the previous year, but the output was enormously increased, 12,800,000 metric centners* in raw sugar value being produced, or fully 2,000,000 metric centners more than in the previous year. These figures, which give the net output after deduction of the amount necessary for the manufacture of the refined sugar, are the highest which have been reached in Austria. Of this output, 8,150,000 metric centners, or more than 60 per cent. went abroad, 3,870,000 metric centners, or about 30 per cent. were consumed in the country, and the remaining 10 per cent. was again placed to the stock in hand, so that the stock at the end of the year stands at 2,600,000 metric centners. The internal consumption, amounting to 3,800,000 metric centners, or 4·8 kilos. (10½ lb.) per head of the population, has not substantially increased, but the export has been considerably augmented—by 1,200,000 metric centners—since the sugar factories forced their exports under the pressure of the Brussels conference. The exportation is confined almost exclusively to white sugar, and the export of raw sugar, which was formerly very considerable, has fallen to 323,000 metric centners.

Gum and Gum Tragacanth in Baghdad (Turkey).

Foreign Office Annual Series, No. 2884.

The prices of gum varied from 1*l.* 12*s.* to 2*l.* 18*s.* per maund of 34·375 lb. What little came to Baghdad was eagerly bought at high prices, and shipped principally to London and Marseilles, where the demand was great.

Large quantities of gum tragacanth arrived in Baghdad from Persia and the Suleimanieh district, and were shipped to London, where large stocks were still on hand from the previous season. This had the effect of bringing down prices, and in spite of a fairly good demand, some of the gum was left unsold at the end of the year.

* Metric centner = 220·4 lb.

XVII.—BREWING, Etc.

Alcohol in Quilimane (Portuguese East Africa).

Foreign Office Annual Series, No. 2880.

The distillation of alcohol from sugar cane was first tried by the Companhia do Boror, in 1901, buildings having been erected and machinery purchased from Germany, in 1900. The alcohol produced was sent to Lourenço Marques, and was sold at too low a price to prove remunerative, on account of the heavy excise duty levied in Portuguese East Africa. The native demand in the Transvaal was reckoned on to recoup the outlay. As the war prevented the entrance of the alcohol into the Transvaal, and the annexation will doubtless permanently stop its sale to the native population, this anticipated market is lost; and since it would not prove remunerative to sell it in Europe at European prices, the venture will have to be given up and the company will have to find some other means of utilising their valuable concessions.

XVIII. A.—FOODS.

Vinegar and Acetic Acid Duty-Free for Certain Purposes in the Netherlands.

Bd. of Trade J., Sept. 4, 1902.

A Dutch Royal Decree, dated the 6th ult., grants freedom from taxation for vinegar and acetic acid for use in the preparation of wires for electric glow-lamps.

XIX.—PAPER, PASTEBOARD, Etc.

Bamboo for Pulp in Trinidad.

Bd. of Trade J., Oct. 4, 1902.

Enquiries have been made of the Government of Trinidad respecting the possibility of obtaining bamboo in quantities large enough to warrant the establishment of a factory in the colony for the production of pulp. At present, immense areas in Trinidad are occupied by the bamboo, and these could be almost indefinitely increased if the plant were in demand. If a factory were established in or near Port of Spain a practically unlimited supply could be obtained within a radius of five or six miles.

Paper Industry in Spain.

Handels Museum and Chamber of Com. J., Sept. 1902.

In spite of the further development of the paper industry in Spain, the importation of paper into that country has remained practically unchanged. Under the style of "Papelera Española, there exists at Bilbao a syndicate, with a capital of 20,000,000 pesetas, for making paper, which already supplies 90 per cent. of the Spanish production. At Madrid, there are four paper factories, as well as the Papelera del Tajuña, which carries on a paper factory situated on the Tajuña with a capital of 600,000 pesetas. The esparto grass, which grows abundantly in Spain, particularly in the Sierra Morena, is, as far as is known, scarcely made use of. Moreover, there is a good sale in Spain of white ("Carton") pasteboard as used by printers, lithographers, &c., for visiting cards, invitation cards, &c. The demand for roof pasteboard at Madrid is insignificant, and it was supplied by factories at Barcelona and Bilbao.

Wood-Pulp from Gothenburg (Sweden).

Foreign Office Annual Series, No. 2879.

Chemical wood-pulp, especially sulphite, seriously affected by increased production and the depressed condition of the paper market, has been placed in an unfavourable position with declining prices, during 1901. In October this falling tendency seems to have reached its limits, and during December, an improved tone predominated. In order to ameliorate the condition of the market, representatives of cellulose manufacturers in Scandinavia, Germany, and Austria-Hungary have met at Gothenburg and Berlin,

where it has been decided to endeavour to limit the production, and so effect a balance between supply and demand.

The prices of sulphite and sulphate, of good brands, which, during the earlier part of the year were 8*l.* 6*s.* 8*d.* to 8*l.* 16*s.* 9*d.*, did not exceed at the close of the year, 6*l.* 11*s.* 4*d.* to 7*l.* 2*s.* 1*d.* per ton, f.o.b. Swedish port.

Mechanical wood-pulp was in great demand during the early part of the year, and maintained its position through the winter and spring; later, prices became weaker, in consequence of the unfavourable state of the paper market. During the summer, the severe drought caused a change in the market, owing to diminished production, which raised a brisk demand, and suddenly sent prices to a maximum, the year closing with a steady market, and a large portion of this year's production has already been disposed of at very favourable prices. The intense dryness of the summer and autumn had a detrimental influence on the working of the mills, and some factories were even compelled to suspend work altogether. An improved market has been generally obtained, and prices will probably make good the loss due to the decrease in production.

The prices of mechanical wood-pulp were, at the commencement of the year, 5*l.* 10*s.* 1*d.* to 6*l.* 13*s.* 4*d.* per ton for dry, and 2*l.* 10*s.* to 3*l.* 6*s.* 8*d.*, for wet, but at the close of the year they did not exceed 4*l.* 3*s.* 4*d.* to 4*l.* 14*s.* 6*d.* for dry, and 2*l.* 2*s.* 3*d.* to 2*l.* 4*s.* 6*d.*, for wet, f.o.b. Swedish port.

XX.—*FINE CHEMICALS, Etc.*

Saccharin and Substances of a like Nature in Use in the United Kingdom.

Bd. of Trade J., Sept. 4, 1902.

A General Order (No. 69 of 1902) issued by the Commissioners of H.M. Customs, relative to the regulations governing the importation of saccharin and similar substances has been issued. The following is the text of the order:—

"Notice is hereby given that, under the regulations made by the Commissioners of Customs and the Commissioners of Inland Revenue in pursuance of Section 8 of the Finance Act, 1901, the importation into the United Kingdom of saccharin is prohibited, except in packages containing not less than 1 lb. net weight, and into the ports of London, Harwich, Dover, Folkestone, Newhaven, Southampton, Hull, Leith, Goole, Grimsby, West Hartlepool, and Grangemouth.

"The term saccharin includes substances of a like nature in use, or any goods containing saccharin or any substance of a like nature or use as a substantial part or ingredient thereof, and such goods when imported must be warehoused.

"Saccharin must be specially described in the report of the importing vessel, and must not be packed with or included in any parcel or package containing goods of any other description.

"Any saccharin imported in contravention of these regulations will be forfeited, and the importer of the goods will render himself liable to a penalty of 50*l.* in respect of each offence committed."

Galls at Baghdad (Turkey).

Foreign Office Annual Series, No. 2884.

The gall crop in Mosul and its neighbourhood was slightly below the average, as was also the quality. Prices varied from 11*l.* 16*s.* to 15*l.* 18*s.* per cantar of 640½ lb. Speculative purchasers, both in Baghdad and Mosul, bought large quantities at high prices, thinking that the comparatively small crop would send up prices in London, but there were large surplus stocks in the London market from 1900, which were only increased by the shipments of 1901. There was little demand, and consequently prices fell from 9*l.* 13*s.* to 13*l.* 1*s.* per cantar, nearly all the principal holders being compelled to dispose of their stock at heavy losses.

Essences and Volatile Oils, Wine Lees, Lemon Juice, Citric Acid, and Citrate of Lime from Messina (Sicily).

Foreign Office Annual Series, No. 2887.

The quantity of essential oils of lemon, orange, and bergamot, shipped to all countries, in 1901, was 6039 cwts., as against 5,979 cwts., in 1900.

The total amount of wine lees shipped was 93,993 cwts., in 1901, as against 112,103 cwts., in 1900. Of the former quantity, 41,375 cwts. were shipped to the United Kingdom.

The exports of concentrated lemon juice were 34,815 cwts., or a decrease of 566 cwts. from the amount exported in 1900.

The total production of citric acid, in 1901, amounted to 2,406 cwts. The quantity shipped was 1,572 cwts., of which 693 cwts. went to the United Kingdom and 879 cwts. to foreign countries.

The exportation of citrate of lime was 17,394 cwts., of which 3,928 cwts. were shipped to the United Kingdom.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 19,122. Baxter. Hygroscopes. Sept. 1.

" 19,146. Tynan and Duntley. Annealing apparatus. Sept. 1.

" 19,149. Smith. Centrifugal separators. Sept. 1.

" 19,231. Butler. Construction of casks or barrels. Sept. 2.

" 19,247. Carlson. Coating machine.* Sept. 2.

" 19,290. Edson. Condensing apparatus.* Sept. 2. United States Application, Jan. 13, 1902.

" 19,465. Blair. Appliances for drying materials under vacuum or otherwise. Sept. 5.

" 19,569. Lake (Gen. Elec. Co.). Manufacture of tubes, &c., from refractory materials. Sept. 6.

" 19,570. Lake (Gen. Elec. Co.). Foundry ladles. Sept. 6.

" 19,619. Kolb. Discharging-filter without inner partitions alongside the filtering cloth.* Sept. 8.

" 19,644. Elstner. Filter with uniformly compact filtering material at different levels.* Sept. 8.

" 19,814. Skoglund. Refrigerating apparatus.* Sept. 10.

" 20,002. Chapman. Apparatus for the evaporation of liquids. Sept. 12.

[C.S.] 17,291 (1901). Smith. Apparatus for the delivery or supply of regulated or measured quantities of liquid. Sept. 10.

" 17,797 (1901). Kelsey (Pelzer and Co.). Apparatus for measuring aërated and other liquids. Sept. 17.

" 18,417 (1901). Abrey. Plastic compositions applicable as electric insulating and acid-proof materials, and for manufacturing various articles. Sept. 17.

[C.S.] 18,436 (1901). Lake (Le Carbone). Means for replenishing or emptying receptacles for liquid. Sept. 17.

„ 18,974 (1201). Crossmann. Apparatus for measuring and filling liquids. Sept. 10.

„ 19,349 (1901). Butt. Collecting solids deposited in liquid-purifying apparatus. Sept. 10.

„ 20,253 (1901). Gray. Manufacture of articles formed from plastic, &c., substances. Sept. 10.

„ 21,282 (1901). Morison. Evaporating and condensing apparatus. Sept. 17.

„ 22,124 (1901). Björnstad. Apparatus for superheating steam. Sept. 10.

„ 22,299 (1901). Cowey. Apparatus for delivering measured quantities of liquids from bottles and similar liquid-containing vessels. Sept. 17.

„ 23,312 (1901). Heyl-Dia. Insulating gloves for use in electrical or chemical operations. Sept. 17.

„ 12,407 (1902). Büttner. Construction of vessel by means of which liquid substances, thin and thick, can be drawn off by air pressure. Sept. 17.

„ 13,116 (1902). Feeny (Abwärme Kraftmaschinen Ges. m. b. H.). Evaporator heated by steam, hot vapours, or gases. Sept. 10.

„ 13,512 (1902). Feeny (Abwärme Kraftmaschinen Ges. m. b. H.). Heating of liquids of low boiling points. Sept. 10.

„ 13,788 (1902). Stute. Centrifugal drying apparatus. Sept. 10.

„ 16,958 (1902). Van Haelen. Flask or bottle containing compressed air. Sept. 10.

„ 17,491 (1902). Kostálek. Filters. Sept. 17.

II.—FUEL, GAS, AND LIGHT.

[A.] 19,110. Green. Electric-arc lamps. Sept. 1.

„ 19,135. Bailly and Chauvin. Acetylene generator.* Sept. 1.

„ 19,145. Boult (Massie). Compound to be employed as an illuminant and as a source of motive power.* Sept. 1.

„ 19,202. Warner. "Refuse" furnace. Sept. 2.

„ 19,246. Bacher. Acetylene gas-generator. Sept. 2.

„ 19,255. Lake (Railroad Gas Lighting Co.). Acetylene gas-generators for railway carriages.* Sept. 2.

„ 19,272. Miller. Incandescent electric-lamps. Sept. 2.

„ 19,332. Page (J. B. Colt Co.). Portable apparatus for acetylene illumination. Sept. 3.

„ 19,380. Parker. *See under* III.

„ 19,406. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and Orde. Apparatus for burning liquid fuel. Sept. 4.

„ 19,479. Eschè. Slow-burning wicks.* Sept 5.

„ 19,489. Legge. Carburettors, and lamps to be used therewith. Sept. 5.

„ 19,526. Parkinson and W. B. Cowan, Ltd., and Parkinson. Atmospheric burners for use in connection with gas fires and other gas-stoves. Sept. 6.

„ 19,592. Thézard. Acetylene gas-generators.* Sept. 6. French Application, Dec. 5, 1901.

„ 19,597. Jeffery and Gibbons. Furnaces of gas-retort settings. Sept. 17.

„ 19,651. Ingalls. Method of producing and consuming a hydrogenic fuel. Sept. 8.

„ 19,657. Rosenthal. Vaporisers for liquid fuel. Sept. 8.

[A.] 19,706. Hughes. Oil- or spirit-vapour stoves. Sept. 9.

„ 19,707. Woodruff. Smoke-consumers for steam-generators. Sept. 9.

„ 19,719. Bessey. Process for the manufacture of peat-fuel, peat-charcoal, and fibrous peat. Sept. 9.

„ 19,753. Haddan (Fairbanks, Morse, and Co.). Gas-generators.* Sept. 9.

„ 19,812. Casper (Hopkins). Fuel. Sept. 10.

„ 19,828. Wise (Eiffe). Vapour-burning apparatus suitable for firing steam-generator furnaces. Sept. 10.

„ 19,836. Schwab and Green and Sons, Ltd. Incandescent gas-lighting. Sept. 10.

„ 19,864. Docherty and Craig. Burners for gas heating-apparatus. Sept. 11.

„ 19,895. Pfoser. Calcining or smelting furnaces.* Sept. 11.

„ 19,902. Darby. Stamping machine for compressing fuel, &c. Sept. 12.

„ 19,929. Miller and Miller. Acetylene-gas generators for motor-car lamps, &c. Sept. 12.

„ 19,935. Webb and Webb. Combustion of solid fuel such as coal, in domestic fire-places, steam-boilers and generators, furnaces, &c. Sept. 12.

„ 19,963. Allen (Allen). Burner for marine, stationary or locomotive boilers, fired with liquid fuel Sept. 12.

„ 20,003. Boult (Kunze). Electric-arc lamps.* Sept. 12

„ 20,004. Terrell. Manufacture of incandescent mantles. Sept. 12.

„ 20,005. Terrell. Apparatus for incinerating incandescent mantles. Sept. 12.

„ 20,052. Bray. Method of packing double-jet acetylene gas-burners.* Sept. 13.

„ 20,056. Lees. Furnace for the destruction of the refuse of towns.* Sept. 13.

„ 20,074. Wirtz and Hamilton-Adams. Electric-arc lamps. Sept. 13.

[C.S.] 17,434 (1901). Fenner. Burning of fuel, and furnaces and like apparatus therefor. Sept. 10.

„ 17,458 (1901). Ross. Gas-generators particularly applicable to those used for the production of acetylene. Sept. 10.

„ 18,093 (1901). De Thiersant (Soc. Radiguet et Massiot). Electric gas-lighters. Sept. 10.

„ 20,716 (1901). Rigby. Treatment of furnace-gases or producer-gases, and the recovery of ammonia and tar from the same, and apparatus therefor. Sept. 10.

„ 21,356 (1901). Hughes. Production of gas. Sept.

„ 22,614 (1901). Renny. Apparatus for burning oil fuel. Sept. 10.

„ 23,069 (1901). Wigham. Lights for buoys, beacons, lighthouses, &c. Sept. 17.

„ 23,561 (1901). Bonneart. Carburettors for explosive engines. Sept. 17.

„ 26,487 (1901). Hopfelt. Carbide electrodes for arc-lamps, and process for manufacturing the same. Sept. 17.

„ 3373 (1902). Monteith. Furnaces. Sept. 10.

„ 4091 (1902). Heany. Electric-arc lamps. Sept.

„ 7151 (1902). British Thomson-Houston Co., Ltd. (Fish). Electric-arc lamps and induction coils. Sept 17.

„ 8369 (1902). Keith. Apparatus for generating acetylene and other gases. Sept. 17.

[C.S.] 11,044 (1902). Girdlestone and Thorkelin. Electric-arc lamps. Sept. 10

„ 11,078 (1902). British Thomson-Houston Co., Ltd. (Fish). Electric-arc lamps. Sept. 17.

„ 12,086 (1902). Worms. Incandescent vapour lamps. Sept. 17.

„ 12,278 (1902). Koch and Rothenberg. Incandescent gas lamps. Sept. 17.

„ 12,409 (1902). Wiederhold. Gas-burners especially adapted for use with incandescent mantles. Sept. 10. International Patent, Nov. 4, 1901.

„ 13,208 (1902). Harris and Vogel. Gas heating-burners. Sept. 10.

„ 14,321 (1902). Goard and Morgan. Ignition devices for lamp and lantern burners. Sept. 17.

„ 14,517 (1902). Albreebt. Method of promoting combustion in furnaces. Sept. 10.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 19,380. Parker. Retorts used in the production of gas from petroleum or shale oils; and method of treating such oils and the residues from the production of gas therefrom, and the residues from the production of gas from coal, with a view to facilitate their distillation. Sept. 4.

[C.S.] 20,716 (1901). Rigby. *See under* II.

V.—COLOURING MATTERS AND DYESTUFFS.

[A.] 19,341. Read Holiday and Sons, Ltd., Dean, and Turner. Production and manufacture of intermediate products and colouring matters. Sept. 3.

„ 19,440. Johnson (Badische Anilin und Soda Fabrik). Manufacture and production of blue colouring matters containing sulphur. Sept. 4.

„ 19,551. Read Holliday and Co., Turner, Dean, and Turner. Production of dyestuffs containing sulphur. Sept. 6.

„ 19,609. Tootal. Preparation and make-up of mordants, dyes, and fixing agents ready for use. Sept. 6.

„ 19,894. Imray (Farbwerke, Höchst). Process for the manufacture of dialkylanthrachrysone-ethers, their nitro- and amidosulphonic acids. Sept. 11.

„ 19,983. Ransford (Cassella). Manufacture of staple diazo solutions. Sept. 12.

20,000. Johnson (Badische Anilin und Soda Fabrik). Manufacture of colouring matters suitable for dyeing wool. Sept. 12.

[C.S.] 20,553 (1901). Johnson (Badische Anilin und Soda Fabrik). Manufacture of a new colouring matter, of lakes therefrom, and of an intermediate product relating thereto. Sept. 17.

20,741 (1901). Ransford (Cassella and Co.). Manufacture of purified sulphur dyestuffs from dialkylamido-oxydiphenylamines and new intermediate products. Sept. 10.

21,077 (1901). Imray (Farbwerke, Höchst). Manufacture of phenylamido-acetonitrile and homologues thereof. Sept. 10.

13,778 (1902). Imray (Soc. of Chem. Ind. in Basle). Manufacture of new nitroalphylacidylamidonaphtholsulphonic acids, nitroalphylamidoacidylamidonaphtholsulphonic acids, amidoalphylacidylamidonaphtholsulphonic acids, or amidoalphylamidoacidylamidonaphtholsulphonic acids, and new azo-colouring matters derived therefrom. Sept 10.

15,355 (1902). Kessler. *See under* XVI.

V.—TEXTILES: COTTON, WOOL, SILK, ETC.

[A.] 19,108. Kleinertz. Colouring apparatus with, by a proper medium by means of a slight over-pressure, proved dye-fluid. Sept. 1.

„ 19,167. McKee. Keir and apparatus for bleaching fabrics. Sept. 1.

„ 19,174. Whitney. Wool and fibre scouring machinery.* Sept. 1.

„ 19,207. Calico Printers' Assoc., Ltd., and Wilson. Calico-printing machines. Sept. 2.

„ 19,222. Longley and Longley. Complete manufacture of dyed wadding in one continual process. Sept. 2.

„ 19,319. Goddard. Method of and apparatus for dyeing warps for weaving. Sept. 3.

„ 19,357. Haas. Apparatus for treating textile fabrics. Sept. 3.

„ 19,549. Ranpach. *See under* VI.

„ 19,609. Tootal. *See under* IV.

„ 19,634. Newton (Farbenfabr. vorm. F. Bayer and Co.). Dyeing. Sept. 8.

„ 19,701. Justice (Hanson). Apparatus for dyeing slivers, wound into tops or cheeses.* Sept. 9.

„ 19,734. Scott. Mercerising of cotton goods. Sept. 9.

„ 19,807. Harvey and Sureties. *See under* XIX.

[C.S.] 17,308 (1901). Montgomery. *See under* XIII. C.

„ 19,656 (1901). Rushworth. *See under* XIII. C.

„ 20,398 (1901). Fielding. Process of mordanting and dyeing textile fabrics or yarns. Sept. 10.

„ 22,516 (1901). Fry, Binns and Co., Ltd., and Hartley. Manufacture of union cloth. Sept. 17.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[A.] 19,549. Ranpach. Decorations upon wood, leather, tissue, &c. Sept. 6.

[C.S.] 22,461 (1901). Völker. Manufacture of washable embossed wall-papers. Sept. 17.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 19,234. Price. Processes for manufacturing nitrate of lime, soda, or potash, or sulphonitrate of lime, soda, or potash. Sept. 2.

„ 19,601. Rahtjen. Method of preparing sub-oxide of copper. Sept. 8.

„ 19,774. Ferraud. *See under* XI.

„ 19,805. Woltereck. *See under* XX.

„ 19,979. Hyde (Union Lead and Oil Co.). Method of and means for manufacturing lead carbonate.* Sept. 12.

„ 19,980. Hyde (Union Lead and Oil Co.). Method of and means for producing lead carbonate.* Sept. 12.

„ 19,986. Hansen. Method for producing carbonate of soda. Sept. 12.

„ 20,053. Lévy and Hellbronner. Separation of gases from their mixtures, especially oxygen and nitrogen from atmospheric air, and apparatus therefor. Sept. 13.

[C.S.] 20,716 (1901). Rigby. *See under* II.

„ 21,314 (1901). Mason. Use and utilisation of carbonate of lime obtained in the recovery of sulphur from alkali waste, and commonly called "Chance" mud. Sept. 10.

[C.S.] 2456 (1902). Godwin and Keil. Method of treating or dealing with the spent gases resulting from the manufacture of sulphate of ammonia for the recovery of the cyanogen group contained therein. Sept. 17.

„ 5637 (1902). Charlier. *See under* XIII. A.

„ 16,272 (1902). Brünjes. *See under* X.

„ 16,338 (1902). Ramage. Process of treating ferrous liquors. Sept. 17.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 19,146. Tynan and Duntley. *See under* I.

„ 19,474. Stanley. *See under* IX.

„ 19,769. Bernasconi and Baker. Manufacture of leaded glazing lights. Sept. 10.

„ 19,829. Heal. Manufacture of sheet or plate glass. Sept. 10.

[C.S.] 20,253 (1901). Gray. *See under* I.

„ 24,927 (1901). Boucher. Machines for making bottles and other articles from blown glass. Sept. 10.

„ 7682 (1902). Keyes. Manufacture of plate-glass. Sept. 17.

„ 14,791 (1902). Marks (Warren). Lamp, &c., chimneys. Sept. 17.

„ 16,009 (1902). Sepulchre. Reflecting chimneys for lamps. Sept. 17.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A]. 19,267. Dymond (Thompson). Mastic or other cement compositions, concrete, artificial asphalt, waterproofing material, &c., and process for manufacturing the same, and articles manufactured therefrom or therewith. Sept. 2.

„ 19,435. Broadbent and Holliday. Machine for moulding, pressing, or repressing tiles, bricks, &c., from plastic or powdered substances. Sept. 4.

„ 19,474. Stanley. Manufacture of earthenware sanitary pipes, cable conduits, ridge-tiles, roofing-tiles, &c. Sept. 5.

„ 19,493. Imray (Carborundum Co.). Manufacture of refractory bricks, &c.* Sept. 5.

„ 19,802. Duckering and Spink. Composition of millstones. Sept. 10.

„ 19,895. Pfoser. *See under* II.

„ 19,915. Brown. Drying chambers or drying floors, &c., for drying bricks, tiles, &c. Sept. 11.

[C.S.] 18,417 (1901). Abrey. *See under* I.

„ 20,253 (1901). Gray. *See under* I.

„ 22,144 (1901). Jelinek. Method of producing relief etchings on wood, metal, marble, &c. Sept. 10.

„ 10,083 (1902). Haddan ("Pyrisolith" Isolating Material Mfg. Co., Ltd.). Method of producing electric insulating bodies. Sept. 10.

X.—METALLURGY.

[A.] 19,146. Tynan and Duntley. *See under* I.

„ 19,195. Price. Aero-hydro-metallurgy. Sept. 2.

„ 19,351. Malden and Malden. Process of agglomerating finely-divided ore. Sept. 3.

„ 19,375. Sharp. Machinery or apparatus employed in the manufacture of steel, copper, &c., metallic tubes. Sept. 4.

„ 19,680. Henderson. Admission and regulation of fluids to regenerative steel furnaces, &c. Sept. 9.

[A.] 19,872. Boor and Muir. Method of precipitating gold from solutions containing it. Sept. 11.

„ 19,895. Pfoser. *See under* II.

„ 19,914. Haas. Process for melting nickel.* Sept. 11.

„ 19,967. Thoms and Green. *See under* XI.

„ 19,981. Hyde (Union Lead and Oil Co.). Method of and apparatus for pulverising metallic lead.* Sept. 12.

„ 20,050. Brown and Griffiths. Apparatus for use in tinning or terne-coating iron or steel sheets. Sept. 13.

„ 20,084. Evans (Elektrochemische Werke G.m.b.H.). Process for the production of metallic calcium.* Sept. 13.

[C.S.] 11,339 (1901). Armstrong. Smelting or refining zinc, cadmium, or antimony. Sept. 10.

„ 16,131 (1901). Hadfield. Method of annealing steel. Sept. 17.

„ 16,132 (1901). Hadfield. Manufacture of steel. Sept. 17.

„ 17,415 (1901). Braunfels. Method for the reduction of zinc ores. Sept. 10.

„ 22,144 (1901). Jelinek. *See under* IX.

„ 22,549 (1901). Wise (McNight). Extraction of gold and other precious metals from refractory ores. Sept. 10.

„ 15,358 (1902). Girardot. Metallic body for motor road vehicles. Sept. 10.

„ 16,272 (1902). Brünjes. Process for obtaining sulphide of zinc from copper slag containing zinc and barium. Sept. 17.

„ 17,325 (1902). Boult (Ajax Metal Co.). Method of eliminating metals from mixtures of metals. Sept. 17.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 19,180. Zwiebel. Electric baths.* Sept. 1.

„ 19,225. Fairweather (International Battery Co.). Storage batteries. Sept. 2.

„ 19,368. Hargreaves. Electrodes. Sept. 4.

„ 19,713. Sandhagen and Lürgen. Composition for electrolytes for the formation of accumulator plates.* Sept. 9.

„ 19,774. Ferrand. Production of caustic soda and sodium hypochlorite by electrolysis. Sept. 10.

„ 19,860. Clapham and Clapham. Primary batteries. Sept. 11.

„ 19,967. Thoms and Green. Electro-deposit of zinc. Sept. 12.

„ 19,999. Fiedler and Puchmüller. Secondary battery elements, and process of producing same. Sept. 12.

[C.S.] 19,468 (1901). Von Welsbach. Manufacture of carbon anodes. Sept. 10.

„ 21,362 (1901). Oppermann. Secondary batteries. Sept. 17.

„ 8288 (1902). Stassano. Electrical smelting of ores, and refining of metals, and furnaces therefor. Sept. 10.

„ 11,509 (1902). Thompson (Akkumulatoren und Elektricitätswerke vorm. W. A. Boese and Co.). Process for the production of electrodes for secondary batteries. Sept. 10.

„ 14,781 (1902). Mills (Atmospheric Products Co.). Process and apparatus for subjecting gases to high-tension electrical discharges. Sept. 17.

„ 16,556 (1902). Brewer (Taylor). Electric furnaces, and production of chemicals in such furnaces. Sept. 10.

XII.—FATS, OILS, AND SOAP.

[A.] 19,171. Fresenius. Purification of fats and oils, particularly of cocoanut oil.* Sept. 1.

„ 19,426. Hulburd. Lubricators. Sept. 4.

„ 19,599. Onions. Process and apparatus for extracting oils, fats, &c., from fish, fish livers, and fish offal. Sept. 8.

„ 19,642. King (National Enamelling and Stamping Co.). Oil-drums.* Sept. 8.

„ 19,733. Scott. Distillation of oils, fatty acids, and other greases. Sept. 9.

„ 19,918. Brown (Warder.). Oil filters.* Sept. 12.

„ 19,960. Antonadès (Pittaki). "Stickless candle." Sept. 12.

„ 20,027. Hull. Oil-skin dressing. Sept. 13.

[C.S.] 21,270 (1901). Brown and Martineau. Lubricators. Sept. 17.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[C.S.] 20,889 (1901). Grote. Process of manufacture of a non hygroscopic adhesive medium or cement for binding pigments or other pliant or mouldable substances. Sept. 17.

„ 24,370 (1901). Allen and Brooke. Anti-corrosion paint. Sept. 10.

„ 5637 (1902). Charlier. Manufacture of lead pigments and lead or other metallic compounds, and apparatus therefor, also suitable for aërating or saturating liquids with gases. Sept. 17.

„ 14,690 (1902). Thompson (Carryl). Apparatus for painting or cleansing surfaces. Sept. 17.

„ 16,337 (1902). Ramage. Manufacture of pigments. Sept. 17.

B.—Resins, Varnishes.

[A.] 19,626. Fry. Production of substances constituting varnish or for use in its manufacture. Sept. 8.

„ 19,861. Dalgety. Machine for mixing varnishes, &c. Sept. 11.

C.—India-rubber, &c.

[A.] 20,081. Theelgaard. Process of devulcanising caoutchouc, india-rubber, gum-elastic, &c.* Sept. 13.

[C.S.] 17,308 (1901). Montgomery. Washable and water proof carpet. Sept. 10.

„ 19,656 (1901). Rushworth. Method of and apparatus for waterproofing textile fabrics. Sept. 10.

„ 19,883 (1901). Panzetta and Childs. Hot plates for separating rubber from canvas, &c. Sept. 10.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 19,196. Keats. Machinery or apparatus for skiving leather, leather boards, and paper. Sept. 2.

„ 19,661. Dymond (Macmillan). Method of making leather. Sept. 8.

[C.S.] 11,092 (1901). Lamb and Peter Spence and Sons, Ltd. Manufacture of leather and the preservation and curing of skins. Sept. 10.

„ 16,088 (1901). Brown. Machines for preparing or working leather. Sept. 17.

„ 20,889 (1901). Grote. *See under* XIII. A.

„ 22,062 (1901). Philippi. Tanning of hides and skins. Sept. 10.

XV.—MANURES.

[A.] 19,513. Crooke and Crooke. Fertilisers, and process of making the same.* Sept. 5.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 19,354. Effront. *See under* XVII.

[C.S.] 19,720 (1901). Ashworth. Method of producing soluble products from amylaceous bodies. Sept. 27.

„ 15,355 (1902). Kessler. Treatment of sugar-cane, sugar-beets, bagasse, dye-woods, &c., and apparatus therefor. Sept. 17.

„ 17,506 (1902). Reynaud. Manufacture of dextrin (Achroo-dextrin) and alcohol. Sept. 17.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 19,354. Effront. Process for the fermentation of beet residues (molasses), beetroots, and other amylaceous materials, in the same manner as the preparation of pressed yeast. Sept. 3.

„ 19,586. Oger. Process for making wines sparkling, and apparatus therefor. Sept. 6.

„ 19,761. Nicholls and Goff. Apparatus for bottling and unbottling of ales, wines, stout, &c. Sept. 10.

„ 20,007. Ruckdeschel. Method of evaporating, caramelising, and colouring beer wort.* Sept. 12.

„ 20,079. Lapp. Process of and apparatus for decomposing brewers' mash, &c., into liquid and solid ingredients.* Sept. 13.

[C.S.] 14,852 (1902). Stang. Method for the utilisation of certain materials in the manufacture of yeast and spirit. Sept. 10.

„ 17,506 (1902). Reynaud. *See under* XVI.

XVIII.—FOODS, SANITATION, Etc., AND DISINFECTANTS.

A.—Foods.

[A.] 19,183. Hult and Hult. Method of and means for separating milk and other liquids in centrifugal separators.* Sept. 1.

„ 19,602. Mills and Conner. Nutritive tea. Sept. 8.

[C.S.] 15,725 (1901). White and White. Beverages, and apparatus for the manufacture thereof. Sept. 17.

„ 18,269 (1901). Hooker. Manufacture of alimentary products. Sept. 17.

B.—Sanitation; Water Purification.

[A.] 19,532. Smith. Filtering or straining devices for use in connection with taps, on domestic water-pipes, and for taps employed for other purposes. Sept. 6.

„ 19,862. Fisher. Contrivance for the ventilation of unhealthful works, mills, and manufactories. Sept. 11.

[C.S.] 11,366 (1901). Waite. Apparatus for softening, filtering, and purifying water. Sept. 10.

„ 17,805 (1901). Harris. Purification of air. Sept. 10.

„ 21,231 (1901). Bell and Bell. Mechanism for adding chemicals used in connection with mechanical or other filters for the purification or sterilisation of water. Sept. 10.

„ 12,303 (1902). Osbourn. Feed-water heaters, filters, and purifiers. Sept. 17.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 19,196. Keats. *See under* XIV.

„ 19,360. Gilbert, Gilbert, and Nash. Wire or felt guides for paper-making machines.* Sept. 3. United States Patent, Feb. 4, 1902.

[A.] 19,807. Harvey and Sureties. Fibrous composition for manufacturing papier maché moulds to be called "Harvey's Fibrine." Sept. 10.

[C.S.] 11,040 (1901). Maginn. Machines for coating paper, &c., with paste, &c. Sept. 10.

„ 21,628 (1901). Newton (Farbenfabr. vorm. F. Bayer and Co.). Manufacture or production of derivatives of cellulose. Sept. 10.

„ 22,662 (1901). Goldsmith and British Xylonite Co., Ltd. Manufacture of celluloid. Sept. 17.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 19,178. Imray (Farbwerke, Höchst). Process for oxidising organic compounds. Sept. 1.

[A.] 19,804. Woltereck. Process for producing hydrocyanic acid. Sept. 10.

„ 19,805. Woltereck. Process of producing cyanides and ferrous cyanides. Sept. 10.

[C.S.] 15,517 (1902). Ellis (Chem. Fabr. von Heyden Akt.-Ges.). Manufacture of salts of acetyl salicylic acid. Sept. 10.

„ 2456 (1902). Godwin and Keil. *See under* VII.

XXI.—PHOTOGRAPHY.

[A.] 19,437. Edwards. Manufacture of flexible films, &c., for photographic purposes. Sept. 4.

„ 20,069. Cobenzl. Processes for making sensitive emulsions for photographic purposes. Sept. 13.

Printed and Published by EYRE and SPOTTISWOODE, East Harding Street, London, E.C., for the Society of Chemical Industry.—F 3333.

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 19.—Vol. XXI. **OCTOBER 15, 1902.** No. 19.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Harston T. Bogert.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.

Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.

H. Tate. | Dr. T. Lewis Bailey.

LONDON.

Walter F. Reid. | A. R. Ling.

MANCHESTER.

Ivan Levinstein. | J. Carter Bell.

NEWCASTLE.

L. Rennoldson. | F. C. Garrett.

NEW YORK.

V. Coblentz. | Dr. H. Schweitzer.

NOTTINGHAM.

Archbutt. | J. T. Wood.

SCOTTISH.

L. Patterson. | Dr. Thos. Gray.

YORKSHIRE.

E. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
E. Grant Hooper.
David Howard.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I.
L. Archbutt ..... I., XII.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. ..... VII., X.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley ..... I., VIII., IX., X., XXI.
H. Ingle, Ph.D. ..... V., VI., XII., XIII.
R. L. Jenks ..... XIII. C., XIV., XIX.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. ..... IV., XX.
F. H. Leeds ..... II., III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV. V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. ..... XXII.
W. G. McMillan ..... X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ..... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak ..... Patent List.
T. H. Pope ..... XVI., XX., XXI.
F. W. Renaut ..... Index.
G. H. Robertson ..... XI.
Chas. Salter ..... II., III., XVI., XVII.
M. J. Salter ..... XIII.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley ..... XII., XVIII.
E. Sonstadt ..... III., VII., X., XV.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. ..... XVI.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.

Notices.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of next year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organisation Committee in Berlin may be sent to them.

SPIRIT (ALCOHOL), DUTY-FREE.

The principle of concessions in regard to the use of spirit (alcohol) having been accepted by the Government, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures:—

1. As facilitating present processes (crystallising, &c.).
2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.
3. As affecting the position of British manufactures in regard to foreign competition.
4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

The Council has appointed a Committee, consisting of the President, Hon. Treasurer, Dr. W. S. Squire, Mr. David Howard, Mr. A. G. Green, Mr. Walter F. Reid, Mr. A. Gordon Salamon, Mr. Thos. Tyrer, and Mr. J. C. Umney, to consider and report on this question.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Clark, Jno., l/o Hampstead; Broadway Works, Millwall Dock, E.

Crosby, Thos., l/o Briton Ferry; Llanelly Steelworks, Llanelly, South Wales.

Denison, J. R., l/o Duckworth Grove; 18, Duckworth Lane, Bradford, Yorks.

Dick, John; Journals to c/o John Dick, Ltd., 77, York Street, Toronto, Canada.

Goyder, G. A., l/o School of Mines; Journals to 12, Pirie Street, Adelaide, S. Australia, Assayer and Analyst.

Hall, Arch. D., l/o Bishopsgate Street; 7, Fenchurch Avenue, London, E.C.

Hall, Wm. F., l/o Transvaal; c/o Wanderer G. M. Co., Selukwe, Rhodesia.

Haworth, Dr. E., l/o Stanley Villas; Sunnyside, Norman Road, Runcorn.

Hunt, Charles, l/o Birmingham; 15, Victoria Street, Westminster, S.W.

Jackson, Saml., l/o London; c/o Binny and Co., Madras, India.

Kay, Wm. E., l/o Sale; Marple Lodge, Marple, Cheshire.

Lazell, E. W.; Journals to 1416, South Penn Square, Philadelphia, Pa., U.S.A.

North, E. Gordon N., l/o Bella Vista; Peña de Hierro, por Rio Tinto, Huelva, Spain.

Pilgrim, J. A., l/o Seacombe; c/o S. McArthur and Co., 7, The Temple, Dale Street, Liverpool.

Pringsheim, Dr. H. H., l/o New York City; 909, Harrison Street, Syracuse, N.Y., U.S.A.

Pullman, E. E., l/o Surbiton; Alverstoke, Clandon Road Guildford.

Ritson, T. N., l/o Kendal; 1, West Cliff Villas, West Cliff Road, Ramsgate.

Townsend, C. F., l/o Swanley; 1, Morgan Road, Bromley Kent.

Williams, Rowland, l/o Aldcliffe Road; Hale Cote, Haverbreaks, Lancaster.

CHANGES OF ADDRESS REQUIRED.

Crawford, Alex., l/o 113, Fenchurch Street, E.C.

Eckel, E. C., l/o State Museum, Albany, N.Y., U.S.A.

Hawliczek, Jos., l/o 2, Princes Avenue, Liverpool, S.

Jones, C. H., l/o Minas de Rio Tinto, Huelva, Spain.

Deaths.

Booth, Geo., Irk Vale Dyeworks, Middleton, Manchester.

Fulton, H. B., 120, Sinclair Road, Kensington, W. Sept. 15

Gladstone, Dr. J. H., F.R.S., 17, Pembridge Square, London W. Oct. 6.

Liverpool Section.

SESSION 1902—1903.

Wednesday, Oct. 29th, 1902.—Address by the Chairman Mr. F. H. Tate.

New York Section.

Meeting held at the Chemists' Club on Friday, May 23rd, 1902.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE PROPOSED STANDARDISATION OF CEMENT ANALYSIS.

BY W. HARRY STANGER AND BERTRAM BLOUNT.

It may be accepted that the rapid increase of what essentially a chemical industry has involved the attenti and activity of more and of abler chemists than had befc concerned themselves with the study of the chemistry cement. As a natural consequence, results and metho which were at one time thought adequate are now und going criticism and revision. It is not so long ago that t average English cement maker scarcely realised that he w essentially a chemical manufacturer, and he was apt overlook the fact that a properly-equipped laboratory und the control of a competent works chemist was the kern and hfaia of his undertaking. It is peculiarly gratifying learn that already, in one of the great cement-produci countries of the world, the chemist has so complete established himself that he feels the time for self-critici has come, and is prepared to subject his convention methods to a rigorous scrutiny.

We conceive that this aim is prominent in the mir of your Committee. With it we are in hearty agreeme. But from the proposition that a standard method of cem

alysis should be formulated and enjoined with the great ight of authority, which it must have, as originating m your Committee, we must, most respectfully but very tinctly, dissent. We would urge our objection with the re vigour in that we are entirely at one with the main ject of your Committee, which is the attainment of uracy in analytical results; accuracy of results neces- ily means uniformity of results, but it is independent uniformity of method.

It may be admitted that in certain branches of chemical rk, such as the examination of manures, of soils, asphalts, l the like, a standard method of testing is defensible on score of convenience.* With our present knowledge it mpossible usefully to report upon these materials without ring recourse to arbitrary procedures. But all this is not alysis. In a given sample of steel there is a definite centage of sulphur; it is the business of the chemist to ermine that percentage accurately; his method of doing is not to be dictated. The erection of a standard method which every chemist shall be required to conform is, our judgment, a false step, and will result in grave onvenience.

mpressed by the great pains which have been taken by ir Committee in collecting the experiences of many emists expert in the analysis of cement, we have ventured cut before you a description of our own method, hoping t it may serve to illustrate the general tendency of glish practice. Although freely communicated at all es to those interested in the subject, it has never been olished. We are glad to submit it to the New York tion of the Society of Chemical Industry.

Now, a perfect method of cement analysis must be ximate. We must determine every definite constituent, it tricalcium silicate or uncombined lime. No such thod of analysis is known. Therefore it is necessary to ise the second best. The total quantity of each active terial must be determined with accuracy, and from ex- ience of the behaviour of cements of similar composition, ded by theoretical consideration of what that composition uld be, the quality of the material must be appraised. In ming a judgment on this point, properly contrived hanical tests for soundness are, in our opinion, in- ensable.

t is clear that a cement made from chalk and clay, or n calcareous rock and limestone, should be free from uxed material; *i.e.*, the whole of the silicates should have n so fully acted on by the lime as to form basic silicates ly decomposable by acids. In the laboratory this may done, and this condition is approached by well-made ker prepared by the rotatory process, but is never ined; there is always a certain quantity of unattacked eous material. The amount may be 1 per cent. or less, , if regarded merely as a diluent—for it is completely t—may appear unimportant. But its importance omes manifest when its genesis is considered. It has lted from the imperfection of the combination of the f base, lime, with the acid oxides constituting the rest he cement, and is therefore a criterion of the success ch has attended the processes of mixing and burning. method of analysis which fails to take account of this or can be satisfactory, and this is a ground for objection he process proposed by your Committee.

he amount of insoluble residue usually present may be n from the accompanying tables of analyses, selected to er a fairly wide range of manufacture. (See Appendix.) may be said that, in general, a cement containing sub- tially more than 1 per cent. of insoluble residue is ty in one respect or another.

ur own method stated in detail is as follows:—

n the first place, considerable precautions are taken in pling, which, if carelessly conducted, is productive of ay errors. According to the usual Government require- its, the cement, when ground, is filled into bins of about to 250 tons capacity, and of such area that the average th does not exceed 5 ft. With this depth it is prac- ticable to dig down into the heap, and obtain a sample at any required point. Four or more samples are taken at different places on the heap; each sample weighs about 100 lb., and represents, as nearly as possible, the whole of the cement at that point from surface to base. The joint samples are well mixed on a clean floor, and from 25—40 lb. are taken from this heap. It may be accepted that the resulting sample fairly represents the average of the cement in that particular delivery. In addition, a check sample is taken during the operation of loading, in which case it is possible to draw a small portion from each barrel as it is filled. This highly representative sample, when examined, is found to be substantially identical in quality with the original sample drawn from the heap. It must be concluded that the method is satisfactory, and adequate for the purpose in view.

The cement sampled in the way described is too well mixed to need auxiliary sampling, and, in modern manufacturing practice, too well ground to need grinding in the laboratory.

Its analysis is conducted in the following manner:—

(1) *For Silica and Chief Bases.* 0·5 grm. is placed in a shallow dish about 6 ins. in diameter, swirled round with a few c.c. of water until thoroughly mixed. About 20 c.c. of hydrochloric acid of sp. gr. 1·15 are then added, and the swirling continued for a few minutes. The cement is thus dissolved almost completely, and no silica is precipitated. The dish with its contents is placed on a hot plate, taken to dryness, covered with a clock glass, and baked on a triangle at a temperature of at least 200° C. for an hour. This part of the procedure is essential. Silica can be completely dehydrated and rendered insoluble when it is spread out in a thin even film and heated in this manner. A lower temperature in a great bulk of material in which part of the silica is enclosed and isolated from the heating surface means loss of silica. Want of appreciation of this necessity has been the cause of all the elaborate processes of heating in air ovens, repeated evaporations, and the like which have been devised from time to time. For cement handled in the way described these proceedings are wholly unnecessary. We have examined the filtrates from silica thus separated for dissolved silica, and found them substantially free therefrom. The belief that there is some special difficulty in separating the whole of the silica of cement by a single evaporation probably arises from a false analogy with the case of more acid silicates. These need to be fused with comparatively large quantities of sodium carbonate, and, in consequence, the silica is ultimately obtained in the midst of a mass of sodium chloride. Consider a small particle of silica perched by chance on the crest of a good-sized crystal of sodium chloride; consider a similar particle enclosed in a group of such crystals; satisfactory dehydration by heating the dish from below must evidently be nearly impossible. In analysis of acid silicates which need fusion with sodium carbonate, it is our practice to evaporate the filtrate from the bulk of the silicate, and to recover any which may have escaped in this manner, but, according to our experience, a second evaporation is unnecessary for cement; being unnecessary, it is undesirable, as increasing the number of manipulations and chances of error.

The residue obtained on evaporation in the manner described is digested with about 30 c.c. of hydrochloric acid of sp. gr. 1·15, and the silica, together with the insoluble residue, is filtered off. The filtrate is returned to the dish in which the cement was dissolved, and an excess of ammonia is added. It will be observed that no addition of ammonium chloride, as such, is made. Most commercial samples obtainable from the dealers, and labelled "chemically pure," "Puriss," and the like, are grievously impure; pure hydrochloric acid and pure ammonia can, in general, be more readily obtained; therefore we prefer to make the ammonium chloride *in situ*. The solution in the dish is gently heated until nearly all the excess of ammonia has been driven off. This stage is one of some delicacy. The removal of the excess of ammonia is necessary to ensure the precipitation of the whole of the alumina; also the evaporation must not be pushed too far, else some alumina will re-dissolve. No guide is so reliable as a well-trained nose. When properly conducted the separation is exact;

* Even in the cases cited, the standards are in constant need of sion, and would be swept away at once by the device of a rational ess of proximate analysis.

the whole of the alumina and ferric oxide is precipitated, and the precipitate is free from lime. The precipitate is filtered off and well washed, without the use of the filter-pump; in our opinion, much mischief has been wrought by its indiscriminate employment. In all filtrations we have, after manifold trials, discarded the use of the filter-pump.

The filtrate from the alumina and ferric oxide is collected into a beaker, and to it about 25 c.c. of ammonia (containing half its volume of solution of 0·880 sp. gr.) is added. The mixture is brought to its boiling point, and 25 c.c. of a 4 per cent. solution of ammonium oxalate is poured in. It is proper to remark that we in no way attach importance to the use of the exact quantities named; the process can be equally well performed by a skilled chemist who uses just what his experience suggests; the figures are merely set down to complete the description of our scheme, and for the convenience of our critics. The precipitated calcium oxalate is boiled for two or three minutes, allowed to settle for about an hour, and then filtered. The operation, if properly conducted, will separate all but a very trifling proportion of the lime, and the precipitate will be free from magnesia. The possible remnant of lime is recovered at the next operation. It will be seen that, in our opinion, double precipitations are unnecessary; in general, with such straightforward separations as that of alumina and ferric oxide from lime, and of lime from magnesia, a clean precipitation can be obtained by a single operation conducted with skill and knowledge. Such double precipitations are properly confined to the separation of less well defined bodies, with which the process is one of fractionation rather than scission.

The filtrate from the calcium oxalate is evaporated in a porcelain dish until a pasty residue is obtained. 40—50 c.c. of nitric acid (sp. gr. 1·4) is added, and the heating continued until the ammonium salts have been broken up and their products volatilised.

This excellent process, due, we believe, to Lawrence Smith, is essential in the conduct of all analyses where large quantities of ammonium salts accumulate. We would draw your Committee's attention to this point; in their suggested scheme it appears to have been overlooked. This may have arisen from the fact that most of the cements made in the United States contain at least 2 or 3 per cent. of magnesia, and thus the need for destroying ammonium salts is less pressing. It happens that in the Thames and Medway district in England, which is the largest of the centres of the industry, the usual amount of magnesia is not greater than 1 per cent. This small quantity is not easy to precipitate completely in a large volume of liquid loaded with salts of ammonium. But there is another reason for obtaining a clean and concentrated solution. However carefully any analysis may be conducted, however well purified may be the reagents, and however refractory the vessels used, it is certain that as it proceeds impurities will accumulate. These may be removed, and small quantities of the substances to be determined may be recovered, if all extraneous matter be got rid of and the solution be reduced to its primitive concentration.

To revert to the description of our process. The residue, after the destruction of ammonium salts, is dissolved in a few c.c. of water and about six drops of hydrochloric acid of sp. gr. 1·15. Excess of ammonia and two drops of ammonium oxalate solution (4 per cent.) are added, and the mixture is heated. A small precipitate is obtained, which is filtered off. In ordinary routine work it usually weighs about 0·0015 grm., and consists of about 0·0010 grm. of silica, and the balance of alumina, ferric oxide, and lime. The two latter belong to the cement, and in specially close work must be separated and added to the values for the main precipitates. Under ordinary conditions this is scarcely necessary. The silica is most probably derived from the glass and porcelain vessels which have been used, and partly, perhaps, from the dust inevitable in a city atmosphere. It is better neglected. The filtrate from this small precipitate contains the whole of the magnesia in concentrated solution, free from excess of ammonium salts and easy to precipitate cleanly and completely. To obtain it, 10 c.c. of ammonia (50 per cent. of 0·880 solution) and 2 c.c. of a 10 per cent. solution of sodium phosphate are added. On shaking and standing for two hours a well-crystallised precipitate is obtained, which is filtered and washed with ammonia (10 per cent. of 0·880 solution). The various precipitates are dealt with as follows:—

The silica and insoluble residue, the alumina and ferric oxide, and the lime as calcium oxalate, are dried and placed, together with their filter-papers, in platinum crucibles and burnt off gently at the mouth of a gas muffle; when the paper is consumed and the calcium oxalate is decomposed to carbonate or thereabouts, the three crucibles are placed inside the muffle and ignited at the full temperature attainable (about 1,050° C.) for one hour. Two sets of precipitates are commonly worked off in a single muffle.

By this means all are brought to the state of anhydrous oxides and, except in rare cases, need no re-ignition. The magnesium ammonium phosphate is burnt off moist in its filter-paper in porcelain at the mouth of the muffle, brushed out, and weighed as pyrophosphate.

(2) *For Insoluble Residue and Sulphuric Anhydride.*—A second portion of 0·5 grm. of cement is decomposed as before, and evaporated to dryness in the same way. As it is not intended for the determination of silica, there is no need to bake the residue. The contents of the dish are taken up in 10—15 c.c. of hydrochloric acid of sp. gr. 1·1, and filtered, leaving as much as possible of the residue in the dish. The silica on the filter is washed back into the dish and digested with a saturated solution of sodium carbonate (not caustic soda). The whole of the silica active and useful in the cement is dissolved, and the inert acid silicates are left.

This insoluble residue is most thoroughly washed, ignited at the mouth of a gas muffle, and weighed, and the weight is deducted from that of the silica *plus* insoluble residue obtained from the previous portion, thus giving the quantity of combined effective silica.

This method by difference is, in our opinion, preferable to the direct determination of the silica in the sodium carbonate solution. The principal reasons are, that the method is more accurate, because it is easier to render the whole of the silica insoluble by evaporating the solution of the cement itself than it is to recover the silica from a considerable bulk of sodium carbonate solution; also, that no special purity of the sodium carbonate is necessary, and silica originally present in it, or extracted from the vessels used, has no influence on the results; further, that there is a considerable saving of time both in evaporating and filtering.

The original acid solution from this second portion of 0·5 grm. is precipitated with 5 c.c. of a saturated solution of barium chloride at the boiling temperature. The boiling is continued for about three minutes, and, after standing for one to two hours, the solution is filtered and the barium sulphate, moist, together with the filter-paper, is ignited at the mouth of a gas muffle and weighed. We have found that this proceeding is admissible with quantities of barium sulphate not exceeding 2 or 3 centigrms. When larger amounts are weighed, as in the analysis of gypsum, plaster, pyrites, and the like, it is essential to dry, separate, and ignite the filter-paper first, then adding the bulk and re-igniting. With cements of ordinary composition no such precautions are requisite.

(3) *For Loss on Ignition; Carbonic Anhydride and Water.*—0·5 grm. of the cement is ignited in platinum for half an hour in a gas muffle at a temperature well below the maximum obtainable, *e.g.*, about 800° C. This precaution is necessary, inasmuch as fierce ignition may drive off sulphuric anhydride (SO_3) and give too high a result. This point appears to have been overlooked by your Committee.

(4) *For CO_2.*—2 to 5 grms., according to the character of the cement, are decomposed with hydrochloric acid in the ordinary manner, and the CO_2, after purification through a silver sulphate tube and drying, as usual, is collected in a weighed potash bulb.

(5) *For Alkalis.*—1 grm. of the cement is decomposed in the way already described, and the silica and chief bases got out as usual. The ammonium salts are destroyed with nitric acid, and the final residue, containing magnesia and

lkalis, is treated with baryta and afterwards with ammonium carbonate, and the alkalis are converted into chlorides, weighed as such, and separated by the use of platinum chloride.

The determination of CO_2, and of alkalis, is not usually necessary where the analysis is directed merely to the valuation of the cement. A knowledge of the percentages of silica, insoluble siliceous matter, alumina and ferric oxide jointly, of lime, magnesia, sulphuric anhydride, and combined water *plus* carbonic anhydride, generally suffices.

(6) *Separation of Alumina and Ferric Oxide.*—This may be carried out on the mixed precipitate after ignition, or on a separate portion of cement. In the former case the precipitate is fused with potassium bisulphate and the melt dissolved in hydrochloric acid. The solution is precipitated with ammonia, dissolved in hydrochloric acid, the solution concentrated, and poured into excess of caustic soda prepared from the metal. The alkaline solution is heated to near boiling, to ensure the dissolution of the alumina. The operation is best conducted in platinum. The solution is diluted so as to allow it to be filtered through paper, and the ferric oxide collected, dissolved in hydrochloric acid, and precipitated with ammonia, filtered, ignited, and weighed. The ignition may be performed over a Bunsen, as there is not the same difficulty in completely dehydrating ferric oxide as there is with alumina. If desired, and as a check, the alumina is recovered from the caustic soda solution.

It is generally more convenient to obtain the joint ammonia precipitate from another portion of the cement, and to separate the ferric oxide and alumina in this by the caustic soda process; the bisulphate fusion and recovery of the oxides from the melt are thus avoided. In the event of manganese being present in sensible amount, as it is in Roman and Medina cements, and in cements made from blast furnace slag or adulterated with the same material, the ammonia precipitation must be carried out in the presence of bromine. Using a little bromine throughout, the manganese finally appears with the iron, and can be satisfactorily separated by a basic acetate precipitation.

(7) *For Sulphides.*—In general, these are present in such small quantity that they may be ignored. They are, however, of more importance when slag products are treated. The best process is to dissolve the cement in hydrochloric acid in an atmosphere of coal-gas, and collect the H_2S in lead acetate solution, finally weighing the precipitated sulphide as lead sulphate.

Various minor constituents might be spoken of, but enough has been said to indicate the general methods which we have found accurate and reliable.

Analysis of Cement Raw Materials.—When a mixture ready for burning to cement is to be analysed, the simplest and most satisfactory method, in the majority of cases, is to ignite 1 grm. in platinum at the highest attainable temperature of a blast lamp. The product is not cement in the proper sense of the term, inasmuch as it has never reached a clinkering temperature, but it has been so far caused to combine that in almost all instances the silicates are thoroughly attacked, and the mass is almost completely soluble in hydrochloric acid; it is then analysed as for a cement. The only objection to this process is that some SO_3, properly belonging to the cement as made under manufacturing conditions, is expelled. But, in practice, the amount of SO_3 left in the cement, whether made by the rotatory process or by older methods using fixed kilns, depends on so many conditions, not excluding those determined by the composition of the fuel and the manner in which it is burned, that any attempt to reproduce these conditions precisely in a laboratory, and to secure the appearance in the ignited material of the same quantity of SO_3 as that present in clinker made on a large scale, are likely to be nugatory. Using this process, a product is obtained so nearly fluxed that the insoluble siliceous material is very small. If, through coarseness of grain of the raw materials or imperfect heating, the amount be sensible, this residue must be separated and analysed like any other insoluble silicate.

The analysis of each of the unmixed raw materials hardly comes within the scope of this paper; they may be treated according to the usual principles of mineral analysis. A single word of warning will suffice. The insoluble residue from a moderately siliceous limestone (one containing 2—4 per cent. of such material) may, and often does, contain so much alumina as to influence substantially the composition of cement prepared from it. This alumina will often turn the scale of opinion in considering the value of the raw material. It is well known that the commonest fault with raw materials from a given site is that they are too poor in alumina and too rich in silica. If the insoluble siliceous residue from the larger constituent (the limestone) be reckoned, as it often is, as being substantially silica, whereas it contains a tangible amount of alumina, an error will arise, and the materials receive less than their due.

Before passing from this description of our method, we would draw attention to certain details of working which are of sufficient practical importance to merit consideration. The first is the purity of the chemicals used. Such essential reagents as hydrochloric and nitric acids, according to our experience, cannot be procured, in England, of sufficient purity for general analytical use. Redistillation in the laboratory is necessary to obtain a satisfactory quality.

Most of the remaining reagents can be bought either sufficiently pure or containing only such impurities as do not interfere with the work of analysis. The water must be distilled in the laboratory.

The filter papers must all be extracted with hydrochloric and hydrofluoric acids, and most thoroughly washed with water. The ordinary extracted filter-paper sold by the dealers is not good enough for accurate work. There are a few to be obtained which are excellently free from ash, but these are usually special filter-papers of close texture intended for certain troublesome precipitates. Now, for silica or alumina and ferric oxide such a filter-paper is far too slow; the ordinary loose-textured quick filters are far too impure. In consequence of this we extract the whole of our filter-papers, buying ordinary English and Swedish unextracted filters fitted for rapid and for difficult filtrations respectively, and purifying them to a point as good as, or better than, that reached by the best filters procurable in the market.*

We would review, very briefly, the chief points in the scheme of analysis formulated by your Chairman, and modified in accordance with the suggestions of Mr. Hillebraud, which appears on page 30 of the Journal of the Society of Chemical Industry for January 15th, 1902. It is there proposed to determine silica by two evaporations on the water-bath. We think that a single evaporation, conducted in the manner described above, is at least equally accurate, and is certainly more rapid. In the next place, the insoluble inert silicates are reckoned as silica, or, alternatively, the silica which they contain is regarded in the same light as the silica active and useful as a constituent of the cement. We submit that this is an error. If this process be accepted, a grain of quartz or a piece of flint ranks equally with the silica of the cement proper.

As to the determination of alumina and ferric oxide, we believe a second precipitation to be unnecessary if the first be skilfully conducted; the same holds for the precipitation of the lime as calcium oxalate. The ignition of this lime over the blowpipe is so tedious and uncertain (as must be obvious when one considers the atmosphere surrounding the precipitate) that the use of a good muffle is almost indispensable to secure an accurate and constant weight. We do not think that any cement chemist of experience is likely to adopt so cumbrous a process as that of titration by permanganate, if he have means to convert the calcium oxalate into lime by suitable ignition. The precipitation of magnesia in a solution loaded with ammonium salts seems to us likely to lead to error; destruction of the ammonium salts by nitric acid is, in our belief,

* The quantity of ash of a 3-in. filter is 0·00002 grm.; of a 5-in., 0·00008 grm.

preferable. The determination of loss on ignition is difficult to make with the blowpipe; a muffle is preferable, and the temperature must not be so high as to cause SO_3 to be driven off.

It will be seen that a scheme most carefully contrived and thought out by skilful and experienced workers still exhibits features to which exception may be, not unreasonably, taken. No better example could be found of the impracticability of arriving at a standard scheme of analysis which will commend itself to all specialists entitled to be heard in the matter. It is certain that there will always be differences of view and differences of method among chemists. It is well that it should be so.

We have set down everything in detail, hoping to gain a little from the friendly criticisms of chemists who may have studied this question from points of view which have not presented themselves to our consideration. But whilst welcoming such criticism, we would ask that it should be divided into two parts. The first and easier is the discussion of the methods which we ourselves have found effective; the second is a larger matter. Is it desirable that chemists should use and enjoin standard methods for determining chemical entities? We unhesitatingly say "No." Such demand as there is for standard methods has, in our opinion, a foundation of fallacy. The manufacturer wants a uniform method, correct or not; he would prefer that the buyer's chemist and the seller's chemist should agree, than that either should be right. This wish proceeds from ignorance, and must be suppressed. No permanently useful results can be obtained by a false concord. It is the business of the chemist, trained to disregard advantages and to think wholly of the truth, to guide the manufacturer to a better goal. The adoption of routine, the formulation of a standard, can but lead to stagnation, and ultimately to disaster. Let there be free play, and if uniformity is to be attained, let it come when perfection is reached; short of that, it is at once a chimera and an incubus.

Appendix.

	Silica (SiO_2).	Insoluble Residue.	Alumina (Al_2O_3).	Ferric Oxide (Fe_2O_3).	Lime (CaO).	Magnesia (MgO).	Sulphuric Anhydride (SO_3).	Carbonic Anhydride (CO_2).	Water (H_2O).	Alkalis (K_2O, Na_2O).	Specific Gravity
English	21·34	0·88	10·70		62·40	1·09	1·36	1·46		0·77	3·150
	22·36	0·90	11·42		62·12	1·01	1·39	0·54		0·26	3·185
	22·46	1·08	10·62		61·84	0·98	1·28	0·96		0·78	3·145
	21·60	1·00	12·12		61·56	1·00	1·53	0·62		0·57	3·175
	20·56	1·26	10·50		63·60	1·02	1·42	1·08		0·56	3·155
	20·80	1·48	11·84		62·16	1·02	1·22	0·56		0·92	3·175
	22·36	0·82	12·50		61·18	1·02	1·28	0·44		0·40	3·175
	21·96	1·08	12·16		60·76	1·01	1·47	0·86		0·70	3·165
	22·44	1·66	12·30		59·32	0·96	1·60	0·92		0·80	3·155
	22·08	1·04	11·92		61·84	1·02	1·10	0·84		0·66	3·175
	20·36	1·20	11·96		62·52	1·08	1·06	0·76		1·06	3·140
	21·04	4·60	12·36		58·12	1·02	1·30	0·56		0·70	3·155
	21·58	4·32	12·10		58·06	1·02	1·37	0·58		0·97	3·150
	21·56	5·28	12·54		56·86	1·02	1·32	0·40		1·02	3·150
	21·38	5·50	12·20		57·10	1·02	1·34	0·40		1·06	3·150
	21·46	0·96	10·80		63·36	0·98	1·54	0·60		0·30	3·180
	21·78	1·38	10·90		62·66	0·97	1·37	0·44		0·50	3·175
	22·26	0·98	10·92		61·46	1·00	1·44	1·54		0·40	3·125
	23·34	1·28	10·54		61·20	1·00	1·14	1·14		0·36	3·155
	23·42	0·88	10·52		61·32	0·99	1·22	0·80		0·85	3·160
	21·98	0·80	11·50		61·56	1·02	1·63	0·50		1·01	3·175
	22·06	0·70	11·50		61·44	1·01	1·58	0·68		1·03	3·165
	22·12	1·22	11·88		60·92	0·99	1·48	0·82		0·57	3·165
	21·70	1·32	11·24		61·44	0·99	1·37	1·12		0·82	3·145
	20·74	0·92	11·36		63·08	1·00	1·32	0·78		0·80	3·165
	22·94	1·90	11·70		57·90	0·99	1·46	2·04		1·07	3·115
	22·76	0·84	11·58		60·72	1·01	1·58	0·64		0·87	3·165
	22·76	2·40	11·12		57·96	0·96	1·60	2·50		0·70	3·075
	20·44	0·60	9·92		64·04	0·99	1·81	1·22		0·98	3·140
	21·92	0·88	7·50	4·20	61·42	1·02	1·60	0·15	0·29	0·78	3·180
Irish	19·98	1·56	10·20		60·52	1·16	1·82	4·20		0·56	3·080
	23·24	1·70	9·72		59·06	1·42	1·60	2·00		1·26	3·105
	16·96	8·96	5·94		54·44	1·27	1·69	9·80		0·94	2·976
	23·68	2·04	10·66		59·36	1·01	1·60	1·26		0·39	3·135
	16·04	15·82	8·30		50·58	0·69	2·40	5·76		0·41	3·075

	Silica (SiO_2).	Insoluble Residue.	Alumina (Al_2O_3).	Ferric Oxide (Fe_2O_3).	Lime (CaO).	Magnesia (MgO).	Sulphuric Anhydride (SO_3).	Carbonic Anhydride (CO_2).	Water (H_2O).	Potash (K_2O).	Soda (Na_2O).	Specific Gravity.
German	22·02	0·60	6·36	4·06	62·16	1·33	1·35	0·75	0·69	Nil	0·62	3·145
	19·30	0·90	5·82	2·68	62·84	0·81	1·16	1·72	2·80	Trace	1·82	3·020
	20·50	0·94	7·10	3·48	61·02	1·92	2·07	0·90	1·14	0·93		3·120
	20·18	0·76	10·62		62·48	1·12	1·52	2·76		0·56		3·085
	22·12	0·80	10·86		60·86	1·12	1·45	2·00		0·79		3·125
	20·40	0·64	7·50	3·34	63·32	1·24	1·72	0·67	0·63	Nil	0·47	3·140
	21·46	0·92	6·82	3·18	60·46	1·62	2·02	1·38	0·98	Nil	1·18	3·075
	22·00	0·92	7·02	2·84	63·08	1·13	0·31	1·03		0·62		3·135
Belgian	22·40	1·00	8·28		64·10	0·95	1·37	1·30		0·60		3·138
	24·06	0·58	8·02		64·08	0·94	0·36	1·18		0·78		3·148
	19·76	1·16	4·60	3·50	63·16	1·55	1·11	1·43	2·77	Trace	0·96	3·067
French	21·68	0·92	10·66		60·10	1·01	0·91	0·96		0·76		3·150
	22·20	1·20	10·76		61·04	1·02	0·99	1·60		1·19		3·125
Rotatory: American	20·36	0·44	7·26	3·24	61·90	3·10	1·36	0·33	1·97	0·04		3·093
German	23·16	0·44	9·18	3·06	62·96	0·80	0·11	0·06		0·42	Nil	..
English	23·88	0·24	7·54	3·70	61·40	1·02	0·70	1·36		0·16		..
	21·14	0·34	11·06		64·02	1·08	1·02	0·76		0·58		..

Discussion.

Dr. W. F. Hillebrand said that the authors claimed that it was a confession of lack of skill, or of ignorance, when a chemist could not effect a clean separation at one trial of such bodies as iron and aluminium from calcium and magnesium, and of calcium, in its turn, from magnesium. Even 30 years ago such a bold charge would not have passed unchallenged, for even Bunsen never professed to be able to accomplish such results, as not only his writings but his instructions to his students showed. That was long ago, when the mechanism of chemical reactions was less understood than it was to-day, and when the demands for accuracy were, in general, less rigid than at the present time. If, during the interval, any one thing more than another had been made clear, it was the insufficiency in their original form of many methods of separation that were once regarded as good. The authors seemed to ignore entirely the advances in analytical and physical chemistry which had thrown so much light on the supposed mechanism of chemical reactions, and the causes that interfered with complete separations, even in those cases which were cited as affording clean "scissions" at one operation. The comments of Messrs. Stanger and Blount on the uselessness of double precipitations, and of duplicate determinations, would hardly receive the approval of any chemist who knew what a serious reality had to be contended with in concomitant precipitation, occlusion, solid solution, or whatever one might choose to call it.

Silica.—It was true that, as claimed, the exposure over a large surface in a thin film of the evaporated hydrochloric solution of a cement free from admixture with introduced salt gave a more perfect separation of silica than when those conditions were not fulfilled (see also "Common Errors in the Determination of Silica," J. Amer. Chem. Soc., 24, 367). Messrs. Stanger and Blount claimed that, by heating such a film at 200° for at least an hour, a separation of silica fully equal to that resulting from two evaporations at steam-bath temperature resulted. The experience of Cameron and others seemed to contradict this, but, never having himself operated at the temperature designated, it seemed worth while to put the matter to further test.

A portion of the cement analysed a year ago and reported upon by himself to the Committee was at hand. It had since that time increased in weight by absorption of more moisture and carbon dioxide, and hence showed a lower silica content than when first analysed. One half-grm. of this was evaporated with hydrochloric acid in a broad (6 in.) dish as directed by Messrs. Stanger and Blount. A thermometer resting on the bottom of the covered platinum dish registered for an hour and a half about 177° C. The silica obtained was 20·40 per cent., and from the filtrate, by a second evaporation on the steam-bath, was recovered 0·34 per cent.; a total of 20·74 per cent. But, the temperature of the plate not being quite up to that designated by the authors, a second determination was made, with the thermometer at 205°—210° C. for one hour and a quarter. In this case only 20·07 per cent. was obtained at first, and from the filtrate an additional 0·66 per cent., giving a total of 20·73 per cent., practically identical with that obtained in the first case. The claim of the authors did not seem to be well founded.

If so low an error as 0·34 per cent. could be counted on in every case, which was quite impossible, in his opinion, this might possibly be regarded as a sufficient approach to the truth by the cement maker, and it might not be worth while to dispute the claim of Messrs. Stanger and Blount, that their method was to be preferred on the score of rapidity. But, as shown in his own report, the error did not stop there. It reappeared with an opposite sign in the alumina, where, because of the much smaller percentage of that ingredient, the relative error might be several times as great as with the larger percentage of silica. Was this a matter of no consequence?

The method of drying, however, had the merit of great rapidity, and, if coupled with a second evaporation, could very well be substituted by the Committee for continuous drying on the water- or steam-bath, though the silica would be less pure.

Alumina, Iron, Lime, Magnesia.—If the authors were able at a single operation to separate 10 per cent. or thereabouts of alumina and ferric oxide from 60 or more per cent. of lime and some magnesia, by the use of ammonia, they were singularly skilful or fortunate, but at the same time they offered the strongest possible argument for uniformity in methods, since, as shown by the report of the Committee, others, when employing variations of the method, could not furnish agreeing results.

If the authors had consulted the paper by Richards, McCaffrey, and Bisbee (Proc. Amer. Acad., 36, 377, and Zeits. anorg. Chem., 28, 71), referred to in his report to the Committee, they would hardly have ventured the statement, that by their method of procedure the lime precipitated as oxalate would be wholly free from magnesia. Doubtless, with the low magnesia contents of the cements of Great Britain, as shown by their paper, the error was less than with American cements, and Messrs. Stanger and Blount might be quite justified, from a technical point of view, in deprecating a second precipitation of lime. In this case, too, their treatment of the filtrate from the calcium oxalate was, undoubtedly, to be preferred, *viz.*, removal of ammoniacal salts by evaporation with nitric acid. It might be at once admitted that, from an analytical viewpoint, this procedure is, theoretically, preferable in any case, given pure nitric acid, for it admitted of much readier separation of invariable contaminations before finally precipitating the magnesia.

The objection urged by the authors against the permanganate titration method for calcium oxalate on the score of cumbersomeness was difficult to understand, for it was many times quicker than ignition and weighing of the resulting oxide.

Quite as hard to understand was the statement as to the difficulty of securing constant weight for lime by ignition over the blast lamp. Evidently their blast must be very ineffective; or did they base their objection on experience with oxalate which had been precipitated in presence of considerable alkali salt? Here was a most pronounced instance of occlusion in what the authors would doubtless consider a straightforward separation, where one precipitation with care should suffice. Yet it was known to most chemists of to-day, presumably, that a single precipitation did not free from alkali, and when such a contaminated calcium oxalate was blasted no constant weight could result till the included alkali had been volatilised. This doubtless accounted for a statement he had seen to the effect that an hour and a half's blasting was necessary to bring lime to constant weight. His own experience of 20 years was that 10 minutes is sufficient time to secure practically constant weight with as much as half a grm. of lime. The ordinary Bunsen flame sufficed for the ignition of very small amounts of lime, and in a recent analysis 0·12 grm. of lime was brought to such a condition in 10 minutes by the burner that subsequent blasting reduced its weight only 1 mgrm.

Again, the authors were in error in claiming that it was difficult to precipitate small amounts of magnesia in presence of much ammoniacal salts. Neubauer and Gooch independently had sufficiently shown the contrary. The ammoniacal salts simply retarded the formation and influence the composition of the precipitate.

Loss on Ignition.—The authors condemned the use of the blast for determining loss on ignition ($CO_2 + H_2O$) because of volatilisation of SO_3, and called attention to the omission of this point by the Committee. To test this point, which it seemed might be well taken (for pure calcium sulphate when blasted did lose weight and become caustic), 1 grm. of the above mentioned cement was blasted for 15 minutes (more than ample to expel the CO_2 and H_2O), the crucible being set in a hole in an asbestos board so as to prevent access of the flame gases to the cement. The loss was 3·08 per cent., whence it might be surmised that the 1·34 per cent. of SO_3 had all been expelled by the heat, since the cement when first analysed contained but 0·76 per cent. H_2O and 0·63 per cent. CO_2, a total of 1·39. But this strongly blasted cement was found to yield to hydrochloric acid 1·47 per cent. SO_3, appreciably more than it held originally, the excess doubtless being due to oxidation of

the sulphide in the cement to sulphate, either by slow oxidation during the past year or by rapid conversion during ignition. This objection of Messrs. Stanger and Blount is therefore not sustained, though it may very well be that too prolonged blasting might introduce an appreciable error. Blast ignition seems quite as rational as to follow the somewhat indefinite instruction of Messrs. Stanger and Blount to utilise the heat of the front of the muffle.

Insoluble Matter.—Another point the authors made, which on its face seemed well taken. It was that the committee made no provision for determining the matter not attacked by hydrochloric acid. The method of Messrs. Stranger and Blount for determining this insoluble matter, however, seemed to him to be faulty. In the first place evaporation to dryness with acid would decompose some of the inert matter of which it was desired to get the correct weight.

The second objection would be made clear by the following consideration. When silica separated from bases by evaporation was treated with hydrofluoric and sulphuric acids a varying amount of residue was invariably found. Now when the silica of the cement was treated with sodium carbonate, as the authors directed, this contamination presumably remained, and would be weighed with the inert silicates, where it did not belong. The error, it was true, tended to counterbalance that due to undue solvent action of the acid on the silicates.

A sounder procedure he believed to be the following: Dissolve as quickly as may be in dilute hydrochloric acid, without undue heating, filter at once, and treat the residue, if need be, with sodium carbonate, for gelatinous and granular silica that may have separated in small amount. In the filtrate the SO_3 could be determined as in Messrs. Stanger and Blount's scheme, but it was not necessary to remove the silica before precipitating the sulphuric ion.

It was singular that with the wide range of texture in the washed paper of Schleicher and Schüll, all with negligible ash, the authors should still feel it necessary to go to all the trouble and expense of preparing their own filter papers.

The recommendation of the authors to avoid the use of solid ammonium chloride, and to prepare it *in situ* as wanted, was quite justified. This, he was inclined to think, was the altogether prevalent practice in the United States.

As to the claim that the chemist should be untrammelled in his choice of methods that may be admitted in the case of the umpire to whom disputes are referred, but the experience of the Committee in the matter of cement analysis, and of others in different lines of analysis, showed the utter futility of such a claim when applied to the great majority of works chemists. Uniformity in analytical results was needed in many of the great manufacturing industries more than the extreme of exactness, so that comparisons might be possible, but history had shown clearly enough that in the rush of factory work such uniformity was impossible without uniformity in methods.

Mr. Clifford Richardson was somewhat surprised at some of the statements which the paper contained, and it would hardly seem that the writer could have read the report of the Committee, especially Dr. Hillebrand's discussion of the various determinations, very attentively. He could see no reason why a uniform method (the Committee had in no place used the word standard) should not be applied to the analysis of Portland cement materials as well as to other industrial products, such as fertilisers. Analyses of Portland cements had been no more concordant up to the present time than those of fertilisers were in 1880 to 1885. Because a method had been generally accepted in the past, it was not necessarily correct to-day, especially if it could be shown to contain striking defects.

The preliminary results on the samples distributed by the Committee showed that some steps were necessary to bring about uniformity or accuracy. The descriptions of the method of analyses employed by the analysts returning these results, pointed without question to the causes of the divergencies, and the "uniform" method of the Committee suggested merely how to avoid these errors in future careful work. Each chemist could modify the details of manipulation according to his own ideas, or pay no attention to them at all in his own private work, but the main principles, double evaporation for silica, reprecipitation for the other constituents, where accuracy was required in work to come before the public, or to be checked by other chemists, seemed too well fixed at the present day, from the papers of Hillebrand, Bulletin No. 176, U.S. Geological Survey, J. Amer. Chem. Soc., 24, 362 (1902), and others, to be open to argument. This was certainly the case with the precautions necessary in determining silica, as could be seen in Hillebrand's paper on this subject. The method proposed by Messrs. Stanger and Blount could not, in his opinion, give accurate results for the reason given in Hillebrand's "Discussion of the Technical Analyses" in the Committee's Report in the Journal, January 15, 1902, under the heading "Silica." If the method proposed by the writers was what they consider good practice, there was nothing for them to do but disagree.

The authors could hardly obtain a satisfactory precipitation of iron and alumina by the method described, and the same might be said in regard to the calcium and magnesium. The reasons were printed at length on pages 26, 27, and 28 of the Journal for January 15, 1902.

It would have been very interesting if Messrs. Stanger and Blount had been able to insert in their paper the results of the analysis of the materials distributed by the Committee, but, he understood the samples sent them miscarried. It was to be hoped that they would do this work later, and join in the examination of another series of samples to be sent out shortly.

The authors stated that Portland cement consisted of tricalcium silicate and tricalcium aluminate. It has been shown by the Newberry's that if aluminates were present, it must be in the dicalcic form, whilst more recent investigations, confirmed by his own experiments, proved that in all probability no aluminates are to be found as such in well-burned cement, but that alumina entered into combination with both silica and lime in the form of double silicates, SiO_2, Al_2O_3, CaO, and that, in fact, Portland cement resembled a crystalline rock of igneous origin where the tricalcic silicate had separated on cooling from a magma consisting of a double silicate not rich enough in lime to permit the further crystallisation of the tricalcic or dicalcic silicate. Some English cements did, no doubt, carry aluminates.

In regard to the insoluble residue and its determination in the best American cement, he found nothing insoluble in strong hydrochloric acid, that was to say, they contained no siliceous raw material or ash not in combination with lime.

The suggestion of the authors for the removal of ammonia salts before the precipitation of magnesia was probably a good one, and would be given a trial.

In response to a recent circular sent out by the Committee, inviting criticism of the method, a number of replies had been received, which were all favourable to it, with one exception. Slight modifications were, of course, proposed. It was hoped to present these criticisms to the Section at another time, and after the distribution of a further series of samples of slurry and cement from the marl regions.

The Authors, in reply to the discussion, stated that they were much obliged to Dr. Hillebrand for his criticisms and for the pains he had taken to deal with the various points which they had raised. He had in some degree misunderstood their position with regard to the need for double precipitations for the separation of iron and aluminium from calcium, and calcium in its turn from magnesium. They did not suggest that such double precipitations were not desirable and necessary in certain cases, but they knew from experience and direct experiment that a second

	First Analysis.	Second Analysis.
	Per Cent.	Per Cent.
Silica and insoluble residue	22·68	22·60
Silica obtained by second evaporation and baking.	..	0·18
		22·78

ecipitation was not requisite in the analysis of cement the first were properly conducted. The foregoing results, tained in the course of ordinary daily work, without ecial treatment or precaution, would prove this point.

The amount of silica left in solution (0·0009 grm. on the 5 grm. taken) was altogether inconsiderable, and was leed scarcely more than the difference to be expected in plicate determinations. The silica also had been analysed d found to be free from all impurity. There was really difficulty in separating silica certainly and accurately in ment by a single evaporation, and the authors felt no ubt that if Dr. Hillebrand would experiment further he uld obtain equally satisfactory results.

As regards the purity of the precipitate of ferric oxide d alumina obtained by a single precipitation in the course ordinary routine work, the following figures were structive. Two such precipitates were analysed and und to contain:—

	I.	II.
	Per Cent.	Per Cent.
O_3	0·11	0·22
O	Nil.	Nil.

The silica (amounting in weight to 0·0005 grm. and 0011 grm. respectively) was more likely to be due to st and outside impurities than to residual silica in the ment itself. Lime was absent, probably because an ple quantity of ammonium chloride was used.

The authors were well acquainted with what had been itten on the separation of lime from magnesia, and reed that in highly magnesian cements a double pre- itation might be advisable. But with Portland cements ntaining up to 3 per cent. of magnesia (which covered least 90 per cent. of the world's output) there was no ch necessity. Their own analyses showed that in the esence of a sufficiency of ammonium chloride a clean aration could be effected by a single precipitation. The monium salt should be removed before precipitating the gnesia, for although, as stated by Dr. Hillebrand, magnesia uld eventually be precipitated in the presence of a good al of ammonium chloride, yet it was obtained more ickly, cleanly, and certainly when only a moderate antity was present.

The objection felt by the authors to the permanganate ethod for determining lime was based, as they had stated, its cumbersomeness. When the lime had been obtained oxalate, and washed, nothing remained but to put it, t as it was, filter-paper and all, in a crucible, and ignite s in the muffle; with the permangate process, the pre- itate had to be washed off, dissolved, heated, and titrated. hen the result was obtained it was usually erroneous, and any case failed to measure the lime directly, but only by ference. The blast lamp was ineffective, not because of temperature, but on account of its atmosphere; their perience was based not on the precipitation of lime in e presence of salts of the alkalis, but when these were sent. A good muffle should be used.

The authors were much interested in Dr. Hillebrand's periments on the determination of "loss on ignition" of sample of cement, and would be glad of his opinion as to e cause of the abnormal results which he had obtained. it the experiment, though interesting, hardly touched the estion at issue, which was, that cement, if ignited at a gh temperature, was apt to lose, not only CO_2 and H_2O, t also SO_3. Of this they had ample analytical proof, d any scheme for analysis which would avoid this error ust take account of this fact. In their own case, they had deavoured to define the temperature roughly as that at e mouth of the muffle. This corresponded with 800° C., cording to actual measurement. A higher temperature, ., 1,000°—1,100° C., would cause loss of SO_3.

The necessity for determining the insoluble residue and turning it distinct from active and useful silica had been erlooked by the Committee, and Dr. Hillebrand now ggested methods by which this omission might be medied. The authors ventured to think that on trial would find their own method preferable. That portion of the siliceous matter which could fairly be reckoned as inert and useless was resistant to the action of acid even on evaporation, and repeated determinations showed its percentage to be constant in a given sample of cement. The belief that silica, separated from the bases by the action of hydrochloric acid on cement, contained impurities, was directly contradicted by their own experiments; the two counterbalancing errors thought by Dr. Hillebrand to occur therefore disappeared. Filter-papers of loose texture, such as were known as "English" filter-paper, were extremely useful for rapid filtration of silica and alumina, and could not be bought free from ash. The ordinary "ashless filters" were not good enough for exact work, and with a proper system of extraction a far better filter-paper could be readily prepared.

The authors were glad to know that Dr. Hillebrand considered that chemists acting as referees in disputed cases should be untrammelled by "standard" methods. If a similar liberty could not be accorded to works chemists (which they ventured to doubt), it would appear that the training of the works chemist rather than the codification of methods was a matter for attention. But if a standard were to be erected it was evidently necessary that it should be accepted by consulting chemists at large. In this respect the method devised by Dr. Hillebrand and endorsed by the Committee was somewhat unfortunate. A process which confused quartz and insoluble silicates with the active silica of cement could not receive the suffrages of cement experts, and unless these were obtained its claim to be considered a standard was untenable.

In reply to Mr. Clifford Richardson the authors were glad to be able to assure him that they had studied with much care the whole of the documents to which he referred. His comparison between the analysis of fertilisers and of cement and its materials was not exact. In the former, certain arbitrary figures had to be obtained, and needed arbitrary methods for their determination; in the latter, plain analytical separations sufficed, and could be accomplished by any competent chemist in any way he thought proper. From their own experience they were compelled to contradict his statement that in the best American cement there was no insoluble residue. The remainder of Mr. Richardson's observations had been sufficiently dealt with in their reply to Dr. Hillebrand.

REPORT OF THE SUB-COMMITTEE ON UNIFORMITY IN ANALYSIS OF MATERIALS FOR THE PORTLAND CEMENT INDUSTRY.

(This Journal, Jan. 15, 1902, 12—30.)

ERRATA.

Page 14, foot of second column, analysis 62·67 should read "62·87."

Page 15, top of first column, last two lines of analysis should read—

SO_3.....	1·34 +	1·34	1·34 +
S	0·09 +		0·09 +

not—

SO_3.....	1·34 +	1·34	1·34 +
S	0·09 +		0·09 +

Page 26, last number, under column headed 4, should be "100·08," not "108·08."

Page 26, in second column, last two lines in paragraph headed "Modes of Attack," omit commas after "case" and "latter."

Page 26, in second column, fourth line of paragraph headed "Silica," omit comma after "substantially."

Page 27, first column, seventeen lines from bottom, omit final *s* in "results."

Page 28, second column, under paragraph "Loss on Ignition," sentence six lines from bottom of paragraph should begin, "It is important, therefore."

Page 29, first column, under paragraph "Conclusions," sixth line, omit comma after "washing" and change "of" to "or."

Page 29, first column, last line, add au *s* to "manipulation."

Page 29, second column, fourth line above paragraph beginning MgO, change "the" before "CaO" to "to."

Page 30, second column, last line of paragraph beginning with MgO, before "cooled" insert "ignited."

Through an oversight, the description of the method of solution was incorrectly given. The second sentence in the paragraph entitled "Solution" should read, "It is th transferred to an evaporating dish, preferably of platin for the sake of celerity in evaporation, *moistened wi enough water to prevent lumping*, covered with a wa glass, *and ten c.c. of strong hydrochloric acid added a digested until solution is completed.* It is then diluted wi about fifty c.c. of water and digestion allowed to go on r fifteen minutes."

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1224
II.—Fuel, Gas, and Light	1225
III.—Destructive Distillation, Tar Products, Petroleum	1228
IV.—Colouring Matters and Dyestuffs	1229
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1229
VI.—Colouring Wood, Paper, Leather, &c.	1261
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1231
VIII.—Glass, Pottery, and Enamels	1232
IX.—Building Materials, Clays, Mortars, and Cements	1233
X.—Metallurgy	1233
XI.—Electro-Chemistry and Electro-Metallurgy	1235
XII.—Fats, Fatty Oils, and Soap	1238
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	12
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	12
XV.—Manures, &c.	..
XVI.—Sugar, Starch, Gum, &c.	12
XVII.—Brewing, Wines, Spirits, &c.	12
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	12
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	12
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	12
XXI.—Photography	12
XXII.—Explosives, Matches, &c.	12
XXIII.—Analytical Chemistry	12
XXIV.—Scientific and Technical Notes	12

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, post a included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Mixing Powdered, Granulated, or Similar Substances; Apparatus for ——. C. Duckworth, Colne, Lancashire. Eng. Pat. 16,230, Aug. 13, 1901.

PURELY mechanical.—R. A.

Casks, Barrels, Drums, or any other Receptacles containing Fluids; Better Detection of the Surreptitious Abstraction of the Contents of ——. J. Wright, Salford, Lancashire. Eng. Pat. 17,276, Aug. 29, 1901.

THE tap or cock of the cask or other receptacle is enclosed in a casing provided with electric contacts, which close the circuit of an alarm when the tap or the casing is opened.

—R. A.

Centrifugal Machines. J. W. Macfarlane and A. R. Robertson, both of Glasgow. Eng. Pat. 17,478, Aug. 31, 1901.

"IN centrifugal machines having fluid pressure bearings, a fluid pressure" is employed "in excess of that necessary to support the revolving parts, and suitable bearings are provided to oppose the upward tendency thus developed." In machines driven by fluid pressure, two or more motor wheels are employed, which may be used separately for getting up and maintaining speed, or for obtaining different rates of speed. The discharge opening in the bottom of the revolving basket is provided with a valve, which can be lifted or lowered by hand, and placed in a given position, while the machine is in motion.—R. A.

Filter Presses; Improvements in ——. J. Wilson and The Wilson Filter Syndicate, Ltd., Glasgow. Eng. Pat. 18,373, Sept. 14, 1901.

To facilitate the removal of the cake, links are connected to the plates and frames, so that on drawing back the shifting head, the frames are tilted.—J. W. H.

Towers; Cooling ——. J. Lever, Manchester. Eng. Pat. 20,489, Oct. 14, 1901.

HIGHLY porous drain tiles, which are formed from a mixture of sandy clay and sawdust, the latter being bu t out in firing, are employed in the towers. The towers e constructed and arranged in successive stages, so that r may circulate freely throughout the structure.—R. A.

Liquids with Gases; Apparatus for Saturating ——. . Malmendier and M. Stühler, Cologne, Germany. E Pat. 2144, Jan. 27, 1902.

THE invention relates to aërating apparatus. A ve l communicating with the gas supply receives from a t near its base a spray of the liquid to be saturated with g ; this jet, being below its level, circulates the whole of e liquid in the vessel. Means are described for keeping e level of the liquid constant, &c.—J. W. H.

Ammonia-absorption Refrigerating and like Machi ; Absorber for ——. A. Osenbrück, Bremen, Germ . Eng. Pat. 15,667, July 14, 1902.

"INNER and outer cooling jackets are provided at the lo r part of the absorber, through which jackets the whol f the cooling water is supplied from the top to the botto" or reversely, "through spiral windings, in order finall o enter the top of a serpentine cooling coil arranged in e gas and fluid space of the absorber, which coil is prefer y provided externally, or externally and internally, th spiral sheet-metal strips enlarged conically downwards."

—E. S

Abrasive Materials, known as "Chilled-iron-shot," r Industrial Purposes [Sand-blast, Stone-working, &c ; Manufacture of ——; *also Machinery, Appara , and Plant therefor.* J. T. Pearson, Burnley, Lancash e. Eng. Pat. 4081, Feb. 18, 1902.

REFERENCE is made to U.S. Pats. 7499 of 1877 d 446,986-7-8 of 1891, and Eng. Pats. 9617 of 1887 d

18 of 1891, the objects of the present patent being to viate oxidation and the formation of irregular, stalked, hollow shot, &c. The liquid metal is blown direct into mall covered receiver, containing a comparatively small antity of water, through a truncated cone-shaped tube. ich surrounds or encloses the jet of steam and spray of mised metal, to within a short distance of the surface of water, the air between the tube and the water being pelled by the volume of steam. The water is circulated ough the receiver and two tanks, and serves to carry ay slag or other waste from the receiver. The atomised ticles are dried by means of the heated gases of a cupola, l are afterwards passed to a screening mechanism. A table mixture of metallic substances for forming the hot" consists of cast and scrap iron, pulverised alu inium, and a small percentage of spiegeleisen.—R. A.

scid Substances [Blacking, Cream, Lanoline, Ointments, &c.]; Apparatus for Drawing off ——. A. P. Mynders, Holland. Eng. Pat. 8118, April 7, 1902.

E apparatus is for drawing off viscid substances into ces, tins, tubes, &c. The discharge valve is opened wly by cam action, and closed suddenly by a spring en released by the cam.—R. A.

scous Liquids [Syrups, Tar, Paint, Bird-Lime, Pitch, &c.] n Measured or other Quantities; Method of and Apparatus for Controlling the Delivery of ——, *chiefly designed for use in Filling Jars, Tins, and other Receptacles with such Liquids.* C. F. Mendham, London. Eng. Pat. 13,271, June 11, 1902.

E flow of liquid is cut off at the delivery orifice by means a jet of air, which is caused to impinge on the liquid ing the closing of the orifice.—R. A.

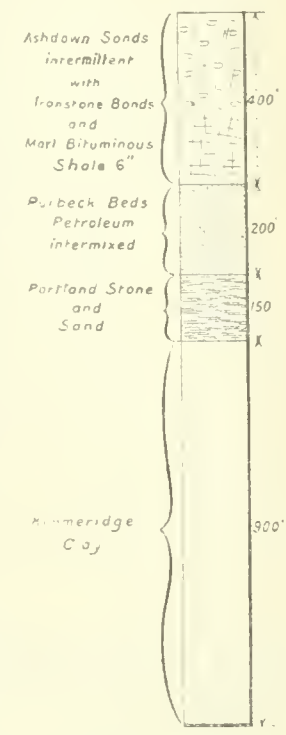
rnishing of Metallic Articles; Wrappers, Receptacle, r Packing Materials for Preventing the ——. F. Flor nd E. Murmann, Vienna. Eng. Pat. 14,184, June 23, 902.

prevent the tarnishing action of sulphide of hydrogen, rehurous or sulphuric acid, &c., the wrappers, recep- es, or packing materials employed, are impregnated with monia ted cupric hydroxide, or other suitable ammoniated per salt. In the case of packing paper, the impregnating ition may be added to the paper pulp.—R. A.

II.—FUEL, GAS, AND LIGHT.

tural Gas in Sussex. The Times, Sept. 10, 1902, and Engineer, Sept. 26, 1902, 312. (See also C. Dawson, Quarterly J. of the Royal Geol. Soc., Aug. 5, 1898.)

BOUT six years ago, the London, Brighton, and South ast Railway Company, in searching for an underground er-supply, discovered the presence of natural gas at Uthfield, Sussex, about 46 miles from London. About a r ago a company was formed for the exploration and elopment of this occurrence of gas, and rights were ired for sinking boreholes over an area of 300 square es; at the present time, the company has half a dozen ings, one of which is completed and reaches to a depth 00 ft. In the deepest hole there is a pressure of 200 lb. the square inch, and it is found that the pressure eases steadily as the holes pierce deeper into the bed of ous sandstone that covers the gas-bearing strata. The ont of the deepest boring is about 15 million cb. ft. per . The gas comes from the Kimmeridge clays, and, ing regard to the area over which these are known to end (from Dorset to the Pas de Calais), it appears pable that the East Sussex gas-field is larger than any wn to exist in America. The gas, which has a distinct or of petroleum, contains 72·5 per cent. of methane, 5·5 cent. of higher hydrocarbons, 4 per cent. of carbon oxide, and 18 per cent. of oxygen; it is free from on dioxide, ammonia, and sulphuretted hydrogen. The position of the gas from different boreholes appears to practically the same. The proportion of methane is less is found in many natural gases from American sources, the amount of higher hydrocarbons is greater, and equently whilst the American gas, burned in an Argand or ordinary fish-tail burner, is practically devoid of illuminating power, the English gas, without any previous enrichment, gives a light of 12—14 candle-power. The gas possesses a high calorific value, a smaller volume being consumed for equal light, with incandescent mantles, than of coal-gas. It is also well adapted for power purposes, no preliminary scrubbing or cleaning of any kind being required. At the present time the gas is being used for lighting several dwelling-houses and for driving gas-engines employed in pumping and well-sinking. All the water obtained for the railway company is pumped by means of a small gas-engine of 1½ h.p., using the gas, with a consumption of 15 cb. ft. per h.p.-hour, or about half the quantity of ordinary London coal-gas often required; it is stated that practically no deposit is formed in the cylinder or in the valve-chamber of the engine.



The following plan has been devised by I. Watts for storing the gas underground:—A well is sunk, say 12 ft. in diameter and 75 ft. deep. This is lined with boiler plates so that it will stand a high pressure, and from the bottom a borehole descends into the gas-bearing strata, whilst from the top a main is led away to any desired point.

The foregoing diagram shows a section of a boring.

—A. S.

Naphthalene; Solubility of ——. J. F. Smith. J. Gas Lighting, **79**, [2035], 1270—1271.

SATURATED solutions of naphthalene were prepared at 60° F. with each of the under-mentioned solvents, and the amount of naphthalene in solution was determined, by Kuster's method, with standard picric acid solution. The following figures show the parts by weight of naphthalene dissolved by 100 parts of the respective solvents:—Benzene, 45·80; toluene, 32·0; xylene, 31·50; cumenes, 30·10; 90 per cent. commercial benzol, 43·20; solvent naphtha, 31·72; 50 per cent. benzol + 50 per cent. toluol, 39·80; 30 per cent. benzol + 70 per cent. toluol, 37·20; 50 per cent. commercial benzol, 31·80; "carburine," sp. gr. 0·672, 16·90; creosote, sp. gr. 1·030, containing 8 per cent. of tar acids, 9·65; Scotch blast-furnace oil, sp. gr. 0·985, containing 31 per cent. by volume of phenic acids, 17·64; heavy tar oils, 8·90.

From these results, pure benzene would appear to be the best solvent to use in removing naphthalene from gas-mains, were it not that such a volatile solvent is readily taken up by the gas. To determine how much naphthalene would be taken up along with the solvent on evaporation, air was led through naphthalene solutions, of known

Solvent.	Naphthalene in Solution.		Parts of Solvent evaporated at 60° F. for 1 part Naphthalene evaporated.
	At Start.	At End.	
	Per Cent.	Per Cent.	
Benzene	6·37	10·78	1,168
30 per cent. benzol and 70 per cent. toluol.	5·65	8·15	1,681
Solvent naphtha	6·42	7·62	645
90 per cent. benzol	6·00	9·00	1,588

strength, contained in a flask having inlet and outlet tubes, the latter being connected to the absorption bottles of the modified Küster's test for naphthalene devised by H. G. Colman and the author (see this Journal, 1900, 128—130). From the weights of the solutions before and after passing the air, and the weight of naphthalene carried over, the tabulated results were calculated.

The amount of naphthalene which would be carried forward to the burners through the evaporation of the solvent in the gas mains is therefore small. A saturated solution of naphthalene in pure benzene lost 160 parts of solvent for 1 part of naphthalene carried with it.—H. B.

Carbon Dioxide in Furnace Gases; Determination of ——. Garnier.

See under XXIII., *page* 1246.

Gas-purifying Material; Determination of Prussian Blue in Spent ——. R. Schwartz.

See under XXIII., *page* 1249.

English Patents.

Solidified Spirit. R. C. Wild, New Eltham. Eng. Pat. 22,181, Nov. 4, 1901.

Solidified spirit is produced by the combination of alcohol, or other spirit, paraffin wax or ceresin, and soap or stearate or palmitate of soda or potash.—H. B.

Fuel for Coke Ovens and other Purposes; Apparatus for Compressing ——. W. P. Thompson, Liverpool and London. From J. H. Darby, Wales. Eng. Pat. 19,899, Oct. 5, 1901.

The box, in which the fuel is compressed before it is charged into the coke ovens, gas retorts, &c., is fitted with any known device for causing both the sides throughout their whole length and depth to spring outwards simultaneously, and thereby release the formed cake of compressed fuel.—R. S.

Furnace Charging and Distributing Apparatus. H. S. Bleckly, Altrincham, T. Atherton, Warrington, and E. Massey, Poulton. Eng. Pat. 5193, March 1, 1902.

The apparatus is constructed for conveying iron ore, coke, and the like to the top of a furnace, for charging these materials into the furnace when required, for indicating the depth of materials in the furnace, for regulating the discharge of the materials, for preventing the charging of the hopper unless the main charging bell is closed, and for preventing the lowering of the bell when the sleeve of the inlet hopper is closed, and unless the gauging or plug rods in the furnace have been previously raised.—R. S.

Furnaces. C. P. Roberts and G. P. Roberts, both of Toledo, Ohio, U.S.A. Eng. Pat. 12,559, June 2, 1902.

The grate of steam generator furnaces and the like, is formed of a series of tubes, coated with asbestos, cement, or other refractory material, each tube being open to the air at the front, while the rear leads to a chamber formed in the bridge. A damper regulates the supply of air to the tubes. The heated air from the tubes meets the products of combustion at the bridge. A secondary grate formed of ordinary firebars is arranged below the tubular grate.

—R. S.

Furnaces. H. Bergfleth, New York, U.S.A. Eng. Pat. 13,611, June 16, 1902.

The ashes forming at the bottom of the fire are clinkered by a mixture of steam and air. The grate bars are rather far apart, and immediately beneath them is a water pan, which has an overflow and waste pipes, and a water-supply pipe fitted with a valve.—R. S.

Smoke, Fumes, and Gases; Means for Condensing ——. C. A Allison, London. From The Smoke Exterminator and Fume Condenser Co., Pueblo, Col., U.S.A. Eng. Pat. 12,063, May 27, 1902.

The products of combustion are led to the lower part of a condensing chamber, provided with two wire-netting diaphragms. Within this chamber the gases, &c., are subjected to the action of jets of hot and cold water and of steam. The uncondensed gases pass out through the upper narrowed end of the condensing chamber to the chimney, while the condensed products are carried off with the water through a trapped outlet.—R. S.

Gases; Purification of ——. H. A. Humphrey, Northwich. Eng. Pat. 21,720, Oct. 29, 1901.

The purifying device consists of a series of centrifugal apparatus, each delivering into the succeeding one. Pipes provided with valves, connect the delivery and suction sides of the apparatus. Pipes also connect the drained sump of each apparatus with the intake of the apparatus next preceding it.—R. S.

Acetylene Gas Generators. J. Laxton, St. Albans. Eng. Pat. 19,444, Sept. 30, 1901.

An automatic carbide-feed apparatus of the hopper type. The carbide container is polygonal, being subdivided into as many compartments as the polygon has sides. Each compartment is triangular in vertical section, and has its outside hinged at the top, so as to swing open when a catch at the base is released by studs projecting from a revolving wheel. The operating rod attached to the holder bell is fitted with several pins, each of which in succession comes in contact with the teeth of the first star wheel of the feed gear. By this device, should the first pawl fail to open the carbide box, the second or the third will do so; and thus the action of the generator is rendered more certain.

—F. H. L.

Acetylene Gas; Apparatus for Generating ——. H. Thiersant, London. Eng. Pat. 20,361, Oct. 11, 1901.

An automatic drip generator intended for portable work. On its way from the reservoir to the decomposing chamber, the water is made to travel through a tube of considerable length, an arrangement which is claimed to control the supply more accurately than heretofore possible. A siphon pipe extending upwards from the carbide vessel through the reservoir acts as a safety tube, and is fitted with a small non-return valve at its bend.—F. H. L.

Incandescent Electric Lamps of the Nernst Type. B. A. Drake, G. S. Ram, and Nernst Electric Light, L., London. Eng. Pat. 17,282, Aug. 29, 1901.

To compensate for the gradual increase in the resistance of the glower, when the lamp is run at constant voltage an adjustable steadying resistance, adapted to be reduced gradually by hand, is arranged in series with the glower. The resistance is composed of two parts, the one permanent, the other adjustable; and in adjusting the resistance care is to let the desired current pass, the adjustable portion is altered till the permanent part just begins to show red in the dark. Various forms of adjustable resistance are described.—H. B.

Burner for Incandescent Spirit Light; Wick ——. F. Christen and F. H. Aschner, Berlin. Eng. Pat. 19,461, Sept. 30, 1901.

A circular-wick burner for an incandescence spirit lamp, in which the tubular shaft of the flame-spreader extends centrally downwards into the inner wick tube. The slit is closed at its lower end, and has two series of lateral slit-holes for admitting a supply of air to the interior of the flame-spreader.—H. B.

Lamps; Electric Arc ——. Jandus Arc Lamp and Electric Co., Ltd., and A. D. Jones, London. Eng. Pat. 21,165, Oct. 21, 1901.

An insulating composition, to be applied to the coil or solenoids of arc lamps, consisting of a solution of silicate of potash or soda, mixed to a paste with a metallic oxide or oxides (*e.g.*, oxides of zinc and manganese).—H. B.

urners; Hydrocarbon Vapour ——. A. Blanchard, London. Eng. Pat. 10,680, May 23, 1901.

order to prevent the deposition of carbon deposits within t jet orifice, the hydrocarbon is forced up an annular tube, ound which, when the vapour is burning, the flame is ated. The vapour arrives at the top of this tube in a y hot condition, and then passes downwards through a ll central tube to a jet orifice situated below the flame. om this the vapour, along with air, passes by side sages to a space beneath a gauze or perforated burner . The vaporising tube and the central cooler tube ich it encloses are each packed with porous or finely-ided heat-conducting material, such, for instance, as fine - or steel-wire gauze. The burner is intended for use h an incandescent mantle for lighting purposes.—R. S.

mps; Gas-detecting Device for Miners' Safety ——. M. D. Mackie, Scranton, Penn., U.S.A. Eng. Pat. 4851, Feb. 26, 1902.

e U.S. Pat. 692,885; this Journal, 1902, 603.—R. S.

United States Patents.

Peat-Press. W. A. Milne, Brown's Corners, Canada. U.S. Pat. 708,574, Sept. 9, 1902.

o vertical wheels are mounted in the same plane on posite shafts, so as to almost touch one another at their ipheries, and are driven simultaneously in opposite ections by gear wheels, mounted on the same shafts, ich engage each other. The wheels are provided with ernate arc-shaped and angular recesses in the peripheries, angular recesses on one of the wheels being designed to ne opposite to the arc-shaped recesses on the other, and *e versâ*, to mould the briquettes. The sides of the cells are enclosed, opposite the compressing-point, by lless steel bands, supported closely to the wheels, so as form ends for the compressing recesses. Ground peat is to the wheels from above, and is compressed into quettes as the corresponding recesses approach each ier, the briquettes dropping out below the wheels as the esses move away from each other.—H. B.

mposition of Matter [*Liquid for Sprinkling over Fuel*]. E. L. Livingstone and W. A. Vandercook, New York. U.S. Pat. 708,774, Sept. 9, 1902.

RMANGANATE of potash, soda, or zinc (3 lb.), chloride of lium (72 lb.), peroxide of hydrogen (1 lb.), and manga-se dioxide (1 lb.), are mixed together. The powder is ded to water in the proportion of 1 oz. per gallon, and rinkled over the coal to be consumed. The hydrogen roxide and manganese dioxide may be omitted.—H. B.

urning Liquid Hydrocarbons [*Incandescence Burner*]; *Apparatus for* ——. W. H. and G. E. Russell, Jersey City. U.S. Pat. 708,258, Sept. 2, 1902.

L flows up a vertical tube, the upper part of which consti-es a vaporising chamber and is surmounted by a nozzle ected upwards into a mixing-tube. Air reaches the xing-tube through tubes extending laterally through the rner casing. By means of a concentric intermediate tube ich surrounds the mixing-tube, and is enclosed in the rner tube, part of the combustible mixture of vapour and is deflected down through tubes to an auxiliary burner ich surrounds the vaporising chamber. The burner is rted by burning alcohol in a cup beneath the vaporising amber.—H. B.

ydrocarbon Burner [*for Boilers, &c.*]. W. N. Best, Assignor to W. A. Cooper, Los Angeles, Cal. U.S. Pat. 708,453, Sept. 2, 1902.

BURNER, for use on locomotives, &c., in which the oil is omised by means of steam or air. To prevent the ogging of the orifice of the steam (or air) chamber by eaus of scale or carbonaceous deposits, the orifice is rmed of a movable nozzle-piece, hinged to the body of e burner and attached to operating arms. On throwing back the nozzle-piece, any obstruction which may form is blown out by the steam or air, whereupon the orifice is again closed.—H. B.

Oil-Burner. G. W. Arper, Oakland, Cal. U.S. Pat. 708,691, Sept. 9, 1902.

OIL is burned within a casing, the bottom of which is closed, and a jet of steam is directed across the casing through the flame. The steam is generated in a coiled water-pipe within the casing. The casing is open at the top when the burner is for use in an oil-burning stove; but when it is to be used for directing a blast-flame some distance outward, the casing is closed with a cover and an outlet-pipe passes through the wall of the casing at a point directly opposite to the steam jet.—H. B.

Oil [*Petroleum*] *Heater, Strainer, and Separator.* E. A. Burrow, Hico, Texas, U.S.A. U.S. Pat. 707,760, Aug. 26, 1902.

AN apparatus specially intended for use in connection with oil-burning plant. The impure oil is pumped into a lower chamber, where it is heated in contact with water, and after depositing much of the grit contained in it, then rises through a strainer into an upper storage chamber, operating so as to compress the air contained there. The air-pressure will act upon the needle of the pressure gauge, indicating when the proper pressure is secured for feeding the oil to the burners.—C. A. M.

Gas-Tar Residuum; Process of Treating ——. J. T. Lowe, Boston, U.S.A., Assignor to M. P. McLaughlin, Somerville, and J. N. Smith, Wollaston, Mass. U.S. Pat. 708,510, Jan. 21, 1901.

THE gas-residuum obtained in making Pintsch gas is liable to harden on cooling slightly, and so will not flow. To obviate this, it is agitated with water, to reduce it to a liquid mass of uniform consistency, and the free water is separated from the mass so as to produce a liquid product of uniform and predetermined consistency.—C. S.

Calcium Carbide; Process of Manufacturing ——. I. L. Roberts, New York. U.S. Pat. 708,921, Sept. 9, 1902.

FINELY-POWDERED anthracite is used, in place of the coke generally employed, in the manufacture of calcium carbide. Having a higher specific gravity than coke, the anthracite is said not to separate from the lime of the furnace charge, while it does not produce so much dust in the neighbourhood of the pots. The anthracite is also cheaper than coke, and yields a carbide which is stated to be less porous, and consequently more permanent, than the ordinary material. —F. H. L.

Acetylene Gas Generator. C. W. Caldwell, Iowa, Assignor to the Railroad Gas Lighting Co., Chicago. U.S. Pat. 708,021, Sept. 2, 1902.

AN automatic carbide-to-water generator of the central-hopper type, specially designed for railway-carriage lighting. The outer casing is made tall and narrow, so that it fits conveniently into one corner of the coach, and while the top with the carbide-charging aperture projects above the roof, the sludge cock and blow-off pipe extend below the floor, thus enabling the apparatus to be manipulated wholly from the outside. The feed mechanism consists of a hollow plunger working at the mouth of the hopper cone, and opening or closing a connection between the storage vessel and the decomposing chamber, according to the position of the holder bell. The latter is claimed to be so arranged that, in the event of the carriage becoming derailed, the gas is liberated, and danger of explosion thus prevented.—F. H. L.

Acetylene Gas; Apparatus for Generating ——. E. R. Cook, Sacramento, Cal., Assignor to G. F. Heusner, Portland, Oreg. U.S. Pat. 708,956, Sept. 9, 1902.

A MODIFICATION of the generator described in U.S. Pat. 670,196, March 19, 1901, specially designed for the service of locomotive headlights. The apparatus is an automatic

drip generator, having two carbide vessels lying within the main water receptacle. The supply of water is governed by the pressure, while a seven-way hand-operated valve is provided, by means of which either of the carbide containers, or both, can be brought into action or isolated for recharging. In order to prevent freezing, this valve, a purifier, and a governor are all situated within the main casing, and the water space contains a steam coil connected with the locomotive boiler. The surplus water in the apparatus is employed to wash the gas.—F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Wood Tar from the Douglas Fir "Pseudotsuga Taxifolia"; Examination of ——. H. G. Byers and P. Hopkins. J. Amer. Chem. Soc., 1902, **24**, [8], 764—771.

The authors give the results of two distillation trials with the wood of the Douglas fir or Oregon pine, a "low run," in which the temperature did not rise above 420° C., and a "high run," in which the temperature did not rise above 700° C. The figures obtained were—

	Low Run.	High Run.
	Per Cent.	Per Cent.
Pyroligneous acid	47·5	34·0
Tar	7·5	17·7
Charcoal	30·0	29·0
Gas (by diff.)	15·0	19·3
	100·0	100·0

The high percentage of tar in the high run was due to the fact that it contained an abnormal amount of water, which settled out gradually in the course of several weeks. Referring the weight of water-free tar to that of wood, the amounts were 6·37 per cent. for the high run and 6·00 per cent. for the low run.

Pyroligneous Acid.—In the high run the acid had a specific gravity of 1·020, and contained 2·95 per cent. (by vol.) of methyl alcohol and 2·90 per cent. of acetic acid. In the low run it had a specific gravity of 1·025, and contained 4·16 per cent. (by vol.) of methyl alcohol and 3·47 per cent. of acetic acid.

Tar.—In the high run the specific gravity was 1·060, and in the low run, 1·075. The results of fractionation expressed on the water-free tar were—

	High Run.	Low Run.
	Per Cent.	Per Cent.
Light oil (below 150° C.)	22·2	22·5
Creosote oil (150°—250° C.)	27·8	28·7
Pitch	50·0	48·8
	100·0	100·0

The light oil has not yet been thoroughly investigated, but was found to contain ketones, aldehydes, mesityl oxide (?), and esters (methyl acetate, propionate, butyrate). The creosote oil contained 17 per cent. of creosote. The latter had a specific gravity of 1·065, was almost colourless, of a smoky aromatic odour, contained about 9·5 per cent. of guaiacol, and seemed almost identical with the product of beech-wood tar. The pitch was black or very dark brown, and resembled in appearance coal-tar pitch, but had not the same odour or taste. By removing the water and a portion of the light oil from the tar, a product was obtained which, except that the colour suffered somewhat in the redistillation, could not be otherwise distinguished from Stockholm tar, even by the tests usually given for the latter.

Charcoal.—This was soft, and retained the porous structure of the wood; it was remarkably free from ash.

—A. S.

Petroleum, Japanese, Industry in 1902. A. Ragosin Petroleum Ind. and Tech. Rev., 1902, **7**, [180], 17 [181], 186.

The information given is based on data supplied to th author by B. van Walkenburg, who recently visited th Japanese oil fields. The Japanese oil industry is confine almost exclusively to the province of Echigo, the dai production outside this province being only 600 poods Shinano, 500 in Udo, and 900 poods in Totomi. In Echig the daily production is 48,000 poods, practically the whe of which is obtained by pumping. The total annual pr duction of petroleum in Japan has increased from 500,0 poods in 1890 to 18,250,000 poods at the present time.

The quality of the crude oils obtained from the vario fields in Echigo varies greatly, as is shown in the followi table :—

Field.	Specific Gravity at 15° C.	Products Obtainable.		
		Benzine.	Kerosene.	Residua
		Per Cent.	Per Cent.	Per Cen
Mitsu	0·921	..	20·0	72·0
Nagaok	0·866	21·8	30·8	37·9
Gendoi	0·825	20·8	51·0	27·0
Amaze	0·818	25·0	53·0	21·0
Kitano	0·884	16·0	37·0	45·0
Nagamine	0·899	10·0	36·0	52·0
Kurakava	0·927	..	20·0	70·0
Miagava	0·891	15·0	36·7	42·2

Petroleum has recently been discovered at Nagano, the province of Shinano, and a sample of the crude oil h been examined by P. G. Stephanoff. It had the sp. g 0·950 at 15° C.; flash-point, open test, 96° C.; it did n congeal at 2° C., and contained no paraffin. On distillatio the following fractions were obtained :—240°—250° 2·5 per cent., sp. gr. 0·844; 250°—270° C., 6·0 per cen sp. gr. 0·860; 270°—290° C., 6·5 per cent., sp. gr. 0·87 290°—310° C., 6·5 per cent., sp. gr. 0·890. A mixture these fractions had a specific gravity of 0·873, and a flas point (Martens Pensky) of 65° C., and, on refining wit 3 per cent. sulphuric acid, gave a burning oil with sp. g 0·872; and colour, 2 marks by Wilson's test. The residu left in the retorts had the sp. gr. 0·974; flash-poin (Martens-Pensky), 151° C.; viscosity (Engler-Ragosine) at 50° C., 15 minutes.

In Japan, boring is still mostly carried on by primitiv methods, although in some fields the American system being introduced. Only one refinery in Japan, that of th International Oil Company at Naoetsu, can be regarded a being properly equipped. This factory has been built an is managed by Americans; it is capable of dealing wit 30,000 poods of crude oil per day, but, owing to th difficulty of obtaining the oil, has never yet been supplie with more than 9,000 to 10,000 poods.—A. S.

Petroleum Oil Field (Texas); The Beaumont ——. R. T. Hill. J. Franklin Inst., **154**, [3], 225—238.

Although traces of petroleum have long been known t exist in West Louisiana and Texas, it was not until 189 that A. F. Lucas began drilling at Beaumont, and h second well—the Lucas Gusher, which began to yield o Jan. 19, 1901—was the first to produce oil in commercia quantities.

Analyses by Thiele show the composition of the oil t be :—I. Burning oil, 36 per cent.; light lubricating oi 21·05; medium, 31·05; heavy, 10·52, asphalt, 6·34; los and gas, including sulphur, 5·04 per cent.; colour of crud oil, brown, opaque; sp. gr. at 62·57° F., 0·9206. II. Petro leum spirit, 6·45; burning oil, 35·00; lubricating oi 43·90; residue and gasca, 14·65 per cent. The burnin oil is prime white in colour; sp. gr. 0·872 at 65·5° F. flashing-point, 120° F. (test unspecified); fire test, 150° F. —C. S.

Petroleum Oil-raising; Improved Appliance for ——. R. Stirling. Pet. Indust. Techn. Rev., 7, [183], 241.

The oil is raised by air pressure through a central risin pipe A (Fig. 1), surrounded by the air-pipe B, the two bein

d at the lower end to a screw socket piece D. Within
th latter is a brass ring *d* (Fig. 2), provided on the upper
fa with a groove or channel d^1, which receives the base *a*
o he rising pipe, and thus places it in direct communication

Fig. 1.

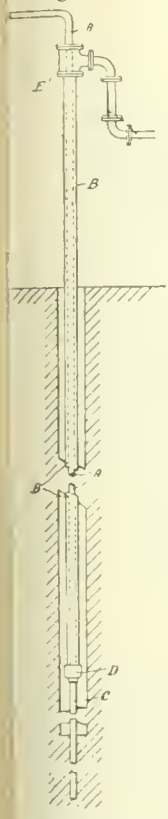
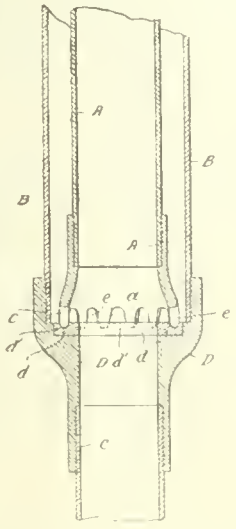


Fig. 2.



va a lower pipe C, extending into the oil supply. The
le l of the oil in the well, &c. is always above the junction
o he pipes A and C. On air being forced from a com-
p sor into the pipe B, it passes through the gaps *e* (Fig. 2)
i the rising pipe A, and carries up with it the oil entering
f n the pipe C.—C. S.

Ita ian Petroleum; Examination of ——. L. Balbiano. Gaz. chim. ital., **32**, [1], 437—447. Chem. Centr., 1902, I, [5], 402.

The author, in conjunction with M. Palladini, has examined the petroleum from Valleia, near Piacenza. It is particularly rich in light oils boiling below 150° C., containing 54·4 per cent. of the same, whilst the oils from Salsomaggiore and Fornovo Ozzano contain only 27·5 and 38·8 per cent. respectively. In the fractions of the oil from Valleia, boiling between 57° and 87° C., no olefines were present. On oxidation with nitric acid, succinic and adipic acids were found among the products, showing the presence in the petroleum of methylcyclopentane and cyclohexane. The formation of small quantities of nitrobenzene is, however, not regarded sufficient proof of the presence of benzene.
—A. S.

Asphalt Cements and Compositions; Manufacture of and Method of Using ——. H. H. Lake. Eng. Pat. 9332, 1902.

See under IX., *page* 1233.

Naphthalene; Solubility of ——. J. F. Smith.

See under II., *page* 1225.

Naphthalene; Electrolytic Oxidation of ——. A. Panchaud de Bottens.

See under XI. A., *page* 1237.

Anthracene; Detection of the Chief Impurities of ——. H. Behrens.

See under XXIII., *page* 1250.

IV.—COLOURING MATTERS AND DYESTUFFS.

United States Patent.

Blue Sulphur Dye [*Sulphide Dyestuffs*], *and Process of making same.* A. F. Poirrier, Assignor to Soc. Anon. des Mat. Col. de St. Denis, Paris. U.S. Pat. 708,662, Sept. 9, 1902.

The indophenol obtained by oxidising equimolecular quantities of *p*-phenylene diamine and a phenol is dissolved in sodium sulphide, and treated with the product resulting from the action of sulphur chloride on phenol or commercial cresol. The product formed dissolves to a blue solution in water, and gives fast blue shades on unmordanted cotton. (See Fr. Pat. 292,400 and Eng. Pat. 2839 of 1901; this Journal, 1902, 40 and 111.)—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Indigo Dyeing; Theory of ——. A. Bing and F. Rung. Zeits. angew. Chem., 1902, **15**, [25], 616—629. (See also Divers, this Journal, 1899, 451.)

An investigation of the circumstances which prevent the hydrosulphite Indigo vat from attaining in wool-dyeing the importance it has in cotton-dyeing.

The reduction in this vat is effected with sodium hydrosulphite, $Na_2S_2O_4$, the reduced dyestuff being dissolved with caustic soda or lime. Although the proportions of the components of the vat can be adjusted with great accuracy, and the vat can be consequently prepared with ease, yet a difficulty is met with in maintaining the vat, arising from the oxidising influence of the air upon it. The first effect of this is, as Bernthsen has shown, to transform the sodium hydrosulphite into sodium pyrosulphite, $Na_2S_2O_5$, which absorbs alkali (2 mols. of NaOH) and changes into sodium sulphite. As a result of this, the alkalinity of the vat is gradually diminished. A further loss of reducing agent is occasioned by its intramolecular decomposition into sodium thiosulphate and pyrosulphite—

$$2Na_2S_2O_4 = Na_2S_2O_3 + Na_2S_2O_5$$

(Bernthsen). As these changes are constantly occurring, the caustic alkali and sodium hydrosulphite in the vat are by degrees converted into sodium pyrosulphate, thiosulphate, sulphite, and, finally, sulphate. To maintain a vat in proper working condition, therefore, it is necessary from time to time to make additions to it of caustic soda and sodium hydrosulphite besides the solution of Indigo white. A vat which has been in use for some time contains an accumulation of the salts named, since they are not absorbed by the textile fibres which are dyed in it. The present research relates to the influence of these salts upon dyeing. The conclusions deduced are as follows:—

1. An increase in the alkali content of the vat results in a decrease in the intensity of the shade dyed. This effect is more pronounced in wool than in cotton dyeing.

2. Additions of salts, namely, common salt, sodium sulphate, and sodium thiosulphate, are without influence upon the dyeing when the vat contains only the quantity of caustic alkali, *i.e.*, 2 mols. of NaOH to 1 mol. of Indigo White, necessary to combine with the latter. In the presence of a slight excess over this amount, such additions have a very marked action in increasing the affinity of the dyestuff for wool; thus, the addition of 1·8 per cent. of common salt to a vat containing such an excess causes the amount of dyestuff taken up to be doubled.

3. With a further increase in the proportion of free alkali, namely, up to about 0·3 per cent. of NaOH, the vat becomes

more exhausted in dyeing, when salts are present in it, than it does in their absence. The proportion of dyestuff withdrawn does not, however, correspondingly increase. The influence of the salts is, therefore, much less in this case than it is when the amount of free alkali present is small.

Generally, it may be stated that the salts present in a hydrosulphite vat are without influence so long as the vat is free from excess of alkali. When free alkali is also present their influence is very considerable, and is exerted until the alkali is neutralised by the pyrosulphate which becomes formed. The intensity of the shade produced in dyeing being thus dependent upon the state of alkalinity of the vat, and this being variable, it follows that the results obtained in wool dyeing with the hydrosulphite vat must be irregular. Hence the employment still of the woad vat with its disadvantages, but with its one great advantage of enabling dyeings of the same intensity to be obtained through a lengthened period of time.

The authors find that common salt, under the conditions obtaining in Indigo dyeing, is not attractively absorbed, even in traces, by wool.—E. B.

Acid Dyestuffs; Dyeing of Animal Fibres with ——. P. Sisley. Bull. Soc. Chim., 1902, **27**, [16—17], 901—914.

The author's previous work, confirmed by Prud'homme and Gillet (see this Journal, 1900, 734 *et seq.*), on the action of dyestuffs on amyl alcohol, has removed the only solid ground for the "salification" theory of dyeing, which supposes a chemical combination of the dyestuff with a basic or acid group in the fibre. The author adopts the solution theory of Witt, modified by the belief that chemical action comes into play in dyeing, in the same manner that it does, in the author's opinion, in ordinary cases of solution. He now describes a number of experiments on the solubilities of the free acids of several dyestuffs, and on their partition between two neutral immiscible solvents under various conditions. As dyestuffs he used Picric acid and the free acids of Chrysoin, Orange II., Crystal Ponceau, and Carmine Blue. The following pairs of solvents were used:—Water and ether, water and toluene, water and amyl alcohol. In each experiment the dyestuff was shaken with a pair of solvents, at about 20° C., and, after settling, the quantities dissolved by each were determined colorimetrically and by evaporation of the solvent. The results are given in several tables. In all cases it was found that the laws of solution, as laid down by Berthelot and Nernst, were more or less departed from. The relative masses of the two solvents greatly influence the partition coefficient. The coefficient by no means agrees with the ratio of the solubilities of the substance in the separate solvents. Lastly, if the aqueous solution be sufficiently dilute, it is impossible to extract any of the dyestuff from it by means of an organic solvent, no matter how much of this is used, or how soluble the dyestuff may be in it in the absence of water. If the concentration of the aqueous solution be gradually increased, the proportion of dyestuff extracted increases, until a limit is reached, considerably below its maximum solubility in the organic solvent. For example, toluene, in which Picric acid is $8\frac{1}{2}$ times as soluble as in water, when the volumes of the two solvents are equal, extracts a continually smaller proportion of the acid as the aqueous solution is more and more diluted, until, when the water contains 0·1 grm. of Picric acid per litre, toluene, in whatever quantity, can remove no trace of it. These phenomena seem at first sight the reverse of those observed in dyeing, for in the dyebath there is a point of dilution at which, in contradiction to Witt's solution theory, the whole of the dyestuff is taken up by the fibre. This, however, only happens in presence of an acid, and of this there must be a considerable excess, in order to produce the effect (Knecht, this Journal, 1888, 819; H. W. Hallit, this Journal, 1899, 368). The author therefore tried the effect of the presence of a mineral acid in the extraction of dyestuff from aqueous solution by the immiscible solvents toluene and amyl alcohol, in comparison with silk under identical conditions, using 40 c.c. of water, 2 grms. of silk or solvent, and shaking in a well-closed flask for about eight hours in the cold. The results, with Picric acid as dyestuff, are given in the following table.

	Strength of Solution in Grms. per 100 c.c.	Percentage Amount remaining in the Bath.		
		Silk.	Amyl Alcohol.	Toluene
Neutral solution.....	0·001	100·0	100·0	100·0
	0·01	83·6	98·4	100·0
	0·1	50·0	92·5	89·5
	0·5	67·2	86·9	88·1
	1·0	82·0	85·7	85·2
Solution made acid with 5 grms. of sulphuric acid per litre	0·001	nil	nil	3·0
	0·01	5·9	57·8	71·1
	0·1	12·8	71·3	67·4
	0·5	52·7	78·4	66·1

Similar experiments were tried with the free acids of t other dyestuffs named above, using amyl alcohol and wat with and without sulphuric acid. In all cases there is close resemblance between the action of the silk and that the neutral or organic solvent in the presence of sulphu acid; there is always a degree of dilution which determin the total absorption of the dyestuff by the silk and by t immiscible solvent. Moreover, in the absence of miner acid the phenomenon is always reversed. Silk, howeve differs from the liquid organic solvents in extracting, n only the dyestuff, but also a considerable proportion of t mineral acid. Instead of the free acids of the dyestuffs, th salts may be used with the same results. Certain neutr salts exert the same action favourable to dyeing as do t mineral acids. This action cannot be attributed entirely the diminished solubility of the dyestuff, but is probab due to molecular combinations between the dyestuff a the silk or solvent, these combinations being favoured the mineral acid opposing the dissociating influence of t water.—T. A. L.

English Patents.

Designs, Patterns, and Devices on Textile Fabrics; Pr cess of producing [*Resists under Indigo*]. H. Whi London. Eng. Pat. 2660, Feb. 1, 1902.

As a resist, the use is proposed of a mixture of China cl verdigris, gum-senegal, bluestone, acetate of lead, saltpet and water, to textile fabrics, which are then dyed wi Indigo "or other blue dye."—E. B.

Printing with Dyestuffs containing Sulphur. H. E. Ne ton, London. From The Farbenfabr. vorm. F. Bayer a Co., Elberfeld, Germany. Eng. Pat. 21,272, Oct. 23, 19

See Fr. Pat. 315,230 of 1901; this Journal, 1902, 406. —E. B.

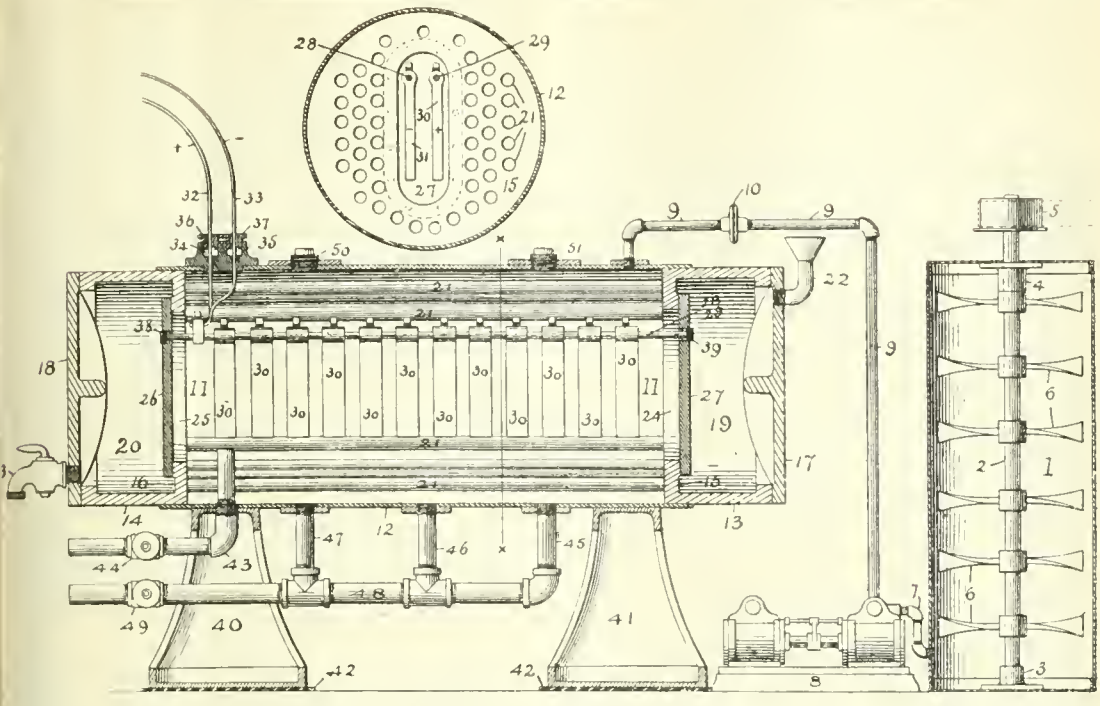
United States Patents.

Viscose on Textiles; Fixing ——. A. Fielding, Salfo U.S. Pat. 708,761, Sept. 9, 1902.

Textile materials are saturated with a solution of visco (U.S. Pat. 520,770 of 1894; Eng. Pat. 8700 of 1892; t Journal, 1893, 517), dried and steamed for 1—3 minute they are then washed and dried.—E. B.

Bleaching [*Electrolysis of Brine*] *Apparatus.* C. Clark, Assignor to J. G. Carson, Philadelphia, I U.S. Pat. 708,796, Sept. 9, 1902.

The construction and operation of the apparatus are follows:—Brine mixed in a vessel such as a cylinder 1 (figure) is pumped through a pipe 9, provided with insulating joint 10, into a decomposing vessel 11, containi platinum (anode) and zinc (cathode) electrodes 30 and : in the form of bars depending from two platinum-coat rods 28 and 29, connected by wires 32 and 33 with dynamo. Here the brine is decomposed, while it is coo by a current of water which is passed through tubes from a chamber 13 at one end of the decomposing ves to a second chamber 14 at the other end of this. T electrolysed solution is withdrawn through the pipe the residue of salt and impurities being removed by mea of the pipes 45, 46, and 47.



Apparatus for the Electrolysis of Brine.

—E. B.

Dyeing Slivers; Apparatus for ——. C. M. Hanson, Peacedale, R.I. U.S. Pat. 708,808, Sept. 9, 1902.

Apparatus for dyeing (woollen) sliver in the form of tops cheeses, consisting of a combination of a tank, a wheel thin and near the bottom of the tank with an opening in centre, and with pockets extending outwardly from the en centre, upon which hollow perforated tubes are rtically mounted, a series of perforated cans surrounding tubes serving as receptacles for the sliver to be dyed, ans for rotating the cans and tubes upon their axes, and ans for returning the dye liquor, which is thrown out m the perforated tubes, when the apparatus is in use, to centre of the wheel, whence it is driven by centrifugal ion through the pockets, tubes and cans, passing, in its rse, through the textile materials contained in the s.—E. B.

Sulphur Dyes [Sulphide Dyestuffs]; Process of Printing with ——. E. Voetter, Uerdingen, Germany. U.S. Pat. 708,429, Sept. 2, 1902.

Sulphide dyestuff free from any alkali sulphide is xed at a low temperature with a solution of potassium bonate, a thickening agent, and precipitated sulphur, the xture being employed for printing in the usual manner. ter drying, the goods are steamed for half an hour at lb. pressure, well washed, and treated in a boiling soap h.—T. A. L.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patents.

Paper which has been Printed or Treated with Water Colours; Means for rendering Washable ——. H. W. Sanderson and E. E. Humphrey, London. Eng. Pat. 10,510, May 7, 1902.

Paper is exposed for 12 to 72 hours at atmospheric peratures, or for half an hour at 70° to 80° C., to the our of formaldehyde; or it is immersed in a 3 to 10 per t. solution of formaldehyde, tannin, or chromic acid, or a 10 to 20 per cent. solution of the chromates or bichromates of potassium or sodium.—F. H. L.

Timber; Apparatus for Impregnating or Dyeing ——. J. Pfister, Vienna. Eng. Pat. 14,518, June 30, 1902.

An apparatus for staining wood, in which dye liquors are forced under pressure into one end of a balk of timber and flow through the balk and out of it at the opposite end. A tight packing or seal for the liquors is formed in the vessel containing the end of the balk into which the liquors are forced, by surrounding the timber with a sleeve or collar of material such as leather, extending inwardly into the vessel, so as to grip the timber when pressure is applied to the liquors.—E. B.

United States Patent.

Wood; Process of Staining —— [*in Pattern*]. J. Pfister, Vienna, Assignor to J. von Brenner, Schloss Gaidford, Austria-Hungary. U.S. Pat. 708,069, Sept. 2, 1902.

In the process of staining wood, in the form of logs or tree trunks, which consists in enclosing the latter, at one end, in a suitable receptacle and forcing dye liquors into them through the enclosed ends, it is found that the liquors permeate the texture of the wood at first in an axial direction solely, penetrating radially only under continued pressure. Based on this discovery, coloured patterns are obtained in wood by affixing leather or caoutchouc forms to the enclosed ends of the logs and forcing dye liquors through the uncovered parts of these as usual, but for a relatively short time only. After thus imparting to the wood a pattern in a certain colour, other colours may be similarly produced in it, with the aid of forms of different shapes from those first employed, by exposing to the action of the liquors the parts previously protected from such action. The pressure may be continued, to force the liquors radially through the wood after they have passed axially through it.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Hypochlorous Acid and its Salts; Behaviour of —— during Electrolysis. F. Foerster and E. Müller.

See under XI. A., *page* 1235.

ENGLISH PATENTS.

Liquids; Treatment of ——, for the Precipitation of Solids, for Evaporating, or for Distilling them. [*Alkali Products.*] P. Naef, New York. Eng. Pat. 18,335, Sept. 13, 1901. (Under Internat. Conv., Feb. 13, 1901.)

APPLICABLE especially in the manufacture of alkali products by the ammonia-soda process. Reference is made to Eng. Pats. 13,771 and 23,404 of 1899 (this Journal, 1901, 28). The claims relate mainly to arrangements and combinations of apparatus for treating the liquid with solids, liquids, and gases, removing precipitate, heating, cooling, and equalising or adjusting temperature, &c.—R. A.

Solids, Liquids, and Gaseous Fluids; Treatment of ——. [*Precipitation of Sodium Bicarbonate from Ammoniated Brine.*] P. Naef, New York. Eng. Pat. 18,749, Sept. 19, 1901. (Under Internat. Conv., May 1, 1901.)

THE invention relates to the treatment of liquids with carbon dioxide, as in the precipitation of sodium bicarbonate from ammoniated brine, &c. There are 52 claims, relating to conduct of the process, withdrawal of the gas, distilling ammonium chloride solution by passing into it hot carbon dioxide in the presence of an alkaline earth oxide, construction of the apparatus, &c.—J. W. H.

UNITED STATES PATENTS.

Alumina; Separating ——, from Silica. A. Kayser, Buffalo, New York. U.S. Pat. 708,561, Sept. 9, 1902.

MARL, containing approximately 18 per cent. of alumina, 28 per cent. of silica, and 54 per cent. of calcium oxide, is mixed with about one-third of its weight of sodium carbonate, and the mixture is calcined. The solution of sodium aluminate obtained on lixiviation is purified by addition of a small proportion of milk of lime, and the alumina is then precipitated by the usual process.—E. S.

Sodium Cyanide; Making ——. F. Roessler, Frankfort-on-the-Main, Germany, Assignor to The Roessler and Hasslacher Chemical Company, New York, U.S.A. U.S. Pat. 708,079, Sept. 2, 1902.

THE process "consists in treating a mixture of sodium cyanide and sodium carbonate with insufficient water to dissolve the cyanide completely, forming a lye, separating the lye from the mixture, again treating the remaining mixture with such a quantity of water as is necessary to dissolve all the cyanide left in the mass after the first treatment, forming a second lye, lixiviating a fresh quantity of the mixture of sodium cyanide and sodium carbonate with the second lye, whereby the sodium carbonate in the solution is displaced by sodium cyanide, depositing crystals of sodium cyanide by cooling, and fusing the crystals" "in their water of crystallisation at about 33° C., whereby the cyanide is separated in a state free from water."—E. S.

Cyanide Compound, and Process of Making same. G. Erlwein and A. Frank, Berlin. U.S. Pat. 708,333, Sept. 2, 1902.

CALCIUM cyanamide, made in the usual way, or by passing nitrogen over calcium carbide at a high temperature, is mixed with carbon, in the proportions indicated by the equation, $CNNCa + C = Ca(CN)_2$. This mixture is heated together with a metal chloride, preferably sodium chloride, added to avoid frothing, and to facilitate the reaction. The calcium cyanide produced is intended to be used as a substitute for alkali cyanides in lixiviating ores of the precious metals, and may also be used for preparing hydrocyanic acid.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Lead Glazes (Pottery) with Golden-Yellow Sheen. L. Thiriot. Sprechsaal, **35**, [32], 1210—1211.

LEAD glazes frequently exhibit, after firing, the presence of small lustrous-yellow crystalline flakes of various dimensions, and appearing in both ordinary and fine ware. Whether these flakes are due to lead oxide *per se*, or in combination with silica, cannot be definitely stated, though it would appear that the oxide itself plays the most important part. The conditions favouring the deposition of the flakes seem to be, primarily, a high proportion of lead oxide to silica in the glaze (about 1 : 1), and when the quartz sand used contains a good deal of such materials as felspar or mica, since, in such event, there is an insufficiency of silica to combine with the lead unless allowance is made in compounding the glaze. A certain thickness of glaze over and above the amount absorbed into the pores of the ware, is also necessary for the deposition of the microscopic crystals in question, as will be evident from the fact that such deposition is never found on highly porous ware owing to the absorption of the glaze, and the greater tendency on the part of the latter to extract silica from the body. A low temperature in the glazing kiln also favours crystallisation, since the greater the fluidity of the glaze the greater the ease with which it penetrates the pores and extracts silica. The main factor, however, is sufficiently gradual cooling, no sheen being produced when the ware is cooled rapidly, notwithstanding the presence of all other favourable conditions.

A similar tendency is observed in the case of copper oxide, especially in highly basic glazes; and the oxides of iron, chromium, manganese, and zinc are all employed for producing similar effects; but, on the other hand, no crystals are furnished by cobalt oxide under parallel conditions.—C. S.

ENGLISH PATENTS.

Glass; Gathering or Extraction of Definite Quantities of Molten ——, from Tanks or Pot Furnaces, and Delivering the same to Moulds or other Receptacles. L. Miller, Hendon, and The Trades Progress Co., Ltd., London. Eng. Pat. 14,441, June 25, 1902.

THE invention consists of a machine, worked both by "vacuum" and compressed air, by which molten glass may be removed from the glass furnace to the moulds.—J. W. H.

Photographic Decoration [*China, Glass, &c.*]; *Improvements in Vitrifiable ——.* L. Crabtree. Eng. Pat. 16,718, July 28, 1902.

See under XXI., *page* 1245.

UNITED STATES PATENTS.

Glass; Manufacture of ——, by means of Electricity. J. Brown, Assignor to Becker and Co., Cologne-on-the-Rhine, Germany. U.S. Pat. 708,309, Sept. 2, 1902.

THE component materials are mixed with a binding material, and compressed into solid pieces, or rods, before being conducted between the poles of an electric arc.—J. W. H.

Enamel-sifting Apparatus. C. H. Zwermann, Baltimore, Maryland. U.S. Pat. 707,490, Aug. 19, 1902.

AN apparatus for enamelling bath tubs or other metal articles. The article to be enamelled is supported on a table which can be tilted and revolved, and above which a number of sifting boxes adapted to contain enamel are mounted. Each box is provided with independent jarring arrangements, and is free from direct connection with the other boxes.—R. A.

Enamelling Metal Ware; Art of ——. G. W. Ketchan, Newark, New Jersey, U.S.A. U.S. Pat. 708,363, Sept. 1902.

THE article, made of sheet metal (steel or iron in particular) first receives a deposit or layer of copper, nickel, or other "non-corrosive" metal, and is then coated with an enamel of the following composition:—Felspar, 500 lb.; borax, 300 lb.; soda-ash, 15 lb.; nitrate of potash, 50 lb.; fluorspar, 25 lb.; cryolite, 50 lb.; colouring material, such as cobalt or manganese, being also added. The amount of borax used should be sufficient to act on the coating metal, but not sufficient to penetrate it.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Hydration [Portland Cement, &c.]; Influence of Positive and Negative Catalytic Agents on the Velocity of ——. P. Rohland. Zeits. anorg. Chem., **31**, 437—444. Chem. Centr., 1902, **2**, [7], 495.

After referring to earlier work on the hydration of calcium oxide, calcium sulphate, and Portland cement (this Journal, 1899, 1123; 1900, 1114), the author deals with the causes for the dissimilar effects on the speed of hydration of catalytic agents. He concludes that this is due to differences in the solution pressure of the substance undergoing hydration in the different saline solutions, or to the formation of complex ions. Substances which increase the solubility of the substance undergoing hydration accelerate the velocity of hydration, but substances which diminish the solubility have a retarding influence. It must of course be taken into consideration that the solubility is influenced not only by the nature, but also by the concentration of the catalytic agents. —A. S.

English Patents.

Building Blocks or Tiles, or Artificial Stone; Manufacture of ——. J. C. Sellars, Birkenhead. Eng. Pat. 26,437, Dec. 27, 1901.

The invention has reference to material and moulds for the production of building blocks, especially such as key into each other.

Clay in the form of nodules or "slurry" is added to ashes or "towns' refuse" and heated until "clinkered"; the mass is ground, the carbonaceous matter being blown off, before, during, or after grinding, mixed with cementing material, and moulded; the blocks, after drying, are indurated by means of flannel or other wrappings, and again dried. —J. W. H.

Kilns for Fireclay and other Goods. M. J. Adams, Leeds. Eng. Pat. 16,259, July 22, 1902.

Two kilns are built together, their flues being arranged so that the products of combustion from the fires in one, circulate round the second.—J. W. H.

Asphalt Cements and Compositions; Manufacture of and Method of Using ——. H. H. Lake, London. From W. J. Warren, Newton (Mass.), U.S.A. Eng. Pat. 9332, April 22, 1902.

Commercial asphalt is incorporated with heavy petroleum distillate (from oils with an asphalt base) at a temperature not exceeding 300°, the whole being thoroughly intermingled—when the formation of a pavement is in question—with the earthy or stony ingredients forming the base of the pavement. The proportions of asphalt and oil may be varied according to the class of product in view.—C. S.

United States Patents.

Wood; Process of Preserving ——. T. Giussani, Milan. U.S. Pat. 707,224, Aug. 19, 1902.

The wood is first immersed in a mixture of anthracene and pitch, heated to a temperature above 100° C., so that the water contained in the pores is vaporised and a layer of the mixture is deposited on the surface. The wood is then immersed in a cold bath, whereby the surface layer from the first bath is made to penetrate the wood and form a dense protecting layer. In an alternative process, the second bath consists of two liquids of different densities, and incapable of being mixed mechanically, *e.g.*, zinc chloride and creosote, which penetrate the wood and become mixed with the material of the first bath within the pores.—R. A.

Composition of Matter. J. Murphy, Columbus, Ohio, U.S.A. U.S. Pat. 707,788, Aug. 26, 1902.

The composition of matter is said to be useful for railway ties, building material, pipes, fence posts, &c., and consists of blast-furnace slag, 50 parts; furnace cinders (containing 48 to 52 per cent. of lime), 30 parts; Portland cement, 14 parts; soluble silicate (sodium silicate), 2 parts; water, 4 parts; all by volume. The ingredients are thoroughly mixed, and moulded to the form desired.—J. W. H.

Stones or Mortar; Composition for Making ——. J. Loewenthal, Magdeburg, Assignor to the Quarzitol Co., New York. U.S. Pat. 707,129, Aug. 19, 1902.

The composition consists of clean quartz sand, pulverised quartz, alunite, magnesia, borax, graphite, mineral oil poor in carburetted hydrogen, and water, the quartz sand being the principal component. Mineral colours may be added. —R. A.

Stone; Artificial ——. F. Boas, St. Hyacinth, Canada. U.S. Pat. 707,898, Aug. 26, 1902.

Silicate of magnesium, or sand mixed with magnesia rock or magnesia, is treated with a small amount of lime, made into a plastic mass with water, moulded, and finally hardened by the direct action of steam.—J. W. H.

Bricks; Treatment of Refractory ——. S. Zuckschwerdt, Stassfurt, Germany. U.S. Pat. 707,670, Aug. 26, 1902.

Suitable bricks are soaked in a solution of magnesium or aluminium chloride, and heated, to decompose the salt taken up, expelling the hydrogen chloride. In this way magnesia or alumina is deposited in the pores of the bricks, which diminishes their porosity, and increases their refractory character.—J. W. H.

Roofing Compound. F. A. Mitchell, Washington, Columbia, U.S.A. U.S. Pat. 707,710, Aug. 26, 1902.

A pasty mass which may be applied to roofs in the usual way, and is said to form "a more durable and advantageous roofing composition," is made by adding 300 lb. of bolted slate powder and 200 lb. of powdered soapstone to 50 galls. of heated coal-tar. 1 gall. of sour milk and 1 quart of creosotine are finally stirred in.—J. W. H.

Plaster; Composition of Fireproof Wall- ——. C. R. Harris and C. C. Barrick, Los Angeles, Cal. U.S. Pat. 708,353, Sept. 2, 1902.

The composition differs from that claimed in U.S. Pat. 708,354 (see next abstract) by the omission of the sand. The proportions given are: ordinary plastic clay, 500 lb.; fireclay, 400 lb.; calcined "plaster," 800 lb.; hydraulic cement, 250 lb.; asbestos pulp, 40 lb.; powdered glue, 10 lb —J. W. H.

Plaster; Fireproof Wall- ——. C. R. Harris and C. C. Barrick, Los Angeles, Cal. U.S. Pat. 708,354, Sept. 2, 1902.

The composition consists of a mixture of clay (one-half plastic, one-half fireclay), 500 lb.; calcined "plaster" (powdered burnt gypsum), 700 lb.; sand, 400 lb.; hydraulic cement, 350 lb.; asbestos, 40 lb.; glue (in powder), 10 lb. The plaster may be shipped in the dry state, colouring matter being added if desired.—J. W. H.

X.—METALLURGY.

Phosphorus; Separation of ——, *in the Martin Furnace* Ramorino. Stahl u. Eisen, 1902, **22**, 912.

Experiments were made with two kinds of lime, one containing 96·5 CaO, 0·5—1 MgO, and 0·5 SiO_2 per cent., and the other 55—57 CaO, 38—38·8 MgO, and 1·76—2 SiO_2 per cent. With the former the dephosphorisation was nearly complete, and the ease was the same also with the latter when the charge was properly worked.—W. G. M.

Copper; New Process for the Extraction of ——, *by the Wet Method.* G. Kroupa. Oesterr. Zeits. Berg.-Hütt. **50**, 387—389. Chem. Centr., 1902, **2**, [7], 549.

Neill has worked out a method based on the following principle:—Copper oxide and carbonate are converted by an aqueous solution of sulphurous acid into cuprous sulphite ($Cu_2SO_3 + H_2O$), which is insoluble in water, but soluble in

excess of sulphurous acid. The clear solution is boiled to expel excess of sulphur dioxide, when the copper is precipitated as cupro-cupric sulphite (a dark-red, crystalline precipitate containing 49·1 per cent. of copper) in a very pure condition. This can at once be smelted to copper without the addition of any flux. On boiling the solution, about one-fifth of the copper goes into solution as cupric sulphate, and must be precipitated therefrom by iron; only the theoretical amount of iron is required, because that already present in the solution is in the ferrous condition. An advantage of the process is that, sulphurous acid being a weak acid, foreign oxides are dissolved to only a limited extent. Sulphide copper ores must first be roasted.—A. S.

Lead; Effects of Strain on the Crystalline Structure of ——. J. C. W. Humfrey. Proc. Roy. Soc., 1902, **70**, [465], 462.

Test-pieces were made from a pure variety of lead, in which the part under observation (which extended right across the centre of the specimen, as well as through from front to back) was a single crystal uniformly oriented throughout. The object of the investigation was to ascertain the behaviour of such uniformly oriented parts under the influence of strain. The specimens were first strained in simple tension, when the slip lines formed occurred in such a manner that the plane of slip was parallel to an octahedral face of the etched pits. As the specimen was strained, the surface, originally plane, became slightly undulated, the undulations running diagonally across it at an angle of about 45° to the direction of pull. When the specimen was re-etched, these undulations, which appear to be due to the strain not being uniform throughout the specimen, were still visible as slight changes of orientation.

When a single uniformly oriented isolated crystal of lead is in any way severely strained, then, upon re-etching, the orientation no longer remains uniform, but the crystal has become broken up into numerous small patches of various new orientations, many of which patches consist of two or more parts, which bear a twin relation to one another. Change of this kind is more readily produced by compression than by tension.

On heating large strained crystals to moderate temperatures (up to 100° C.), further changes are produced. If the originally uniformly oriented crystal exhibits any sign of recrystallisation upon etching immediately after straining, heating will produce a far greater amount of change, the recrystallised areas extending outwards into the parts of the crystal, which, before heating, had retained their original orientation. Heating also produces a recrystallisation in specimens which show no change immediately after straining, but a certain amount of straining is always necessary before any change can be produced.

Experiments were also made in order to decide the question whether the recrystallisation which is apparent immediately after re-etching a severely strained crystal is a direct and instantaneous effect of the strain, or is a growth which occurs during the interval between the straining and the examination. The author is of the opinion that the latter is the case, and that the structural rearrangement does not occur during the act of straining, like the rearrangement (by twinning) which can be produced by straining a crystal of calcite.

The author also concludes that there is no broad distinction between the change which is visible (on etching) almost immediately after straining, and that which is observed to go on after any considerable lapse of time or when the specimen is slightly warmed. (See also this Journal, 1899, 834; 1900, 1115.)—A. S.

Alloys; Determination of Platinum, Gold, and Silver in ——. P. A. E. Richards.

See under XXIII., *page* 1249.

Arsenic-, Iron-, and Lead-containing Substances; Decomposition with Sulphuric Acid for the purpose of Analysing ——. H. Nissenson and F. Victoglou.

See under XXIII., *page* 1248.

English Patent.

Materials [*Gold Ores, &c.*]; *Treatment of* ——, *with Liquids and Gases or Vapours.* P. Naef, New York. Eng. Pat. 18,748, Sept. 19, 1901. (Under International Conv., April 18, 1901.)

Applicable especially for the extraction of gold by cyanide or chlorine, but also for the extraction of glue from bones, and the manufacture of bicarbonate of soda &c. The material is moved through a liquid while the latter passes preferably in the opposite direction, the material and liquid being brought into most intimate contact with each other, and also, if required, with a gas or vapour. Rotary apparatus is employed, in connection with which provision is made for agitating the material, separating heavy particles and particles of various specific gravities, circulating the liquid and gaseous fluid through the apparatus and a temperature adjuster, &c. Loose or stationary bodies are employed in the apparatus for keeping the surfaces clean, and to facilitate agitation, &c.—R. A.

United States Patents.

Iron and Steel; Manufacture of ——. F. J. Tone. Assignor to the Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 708,941, Sept. 9, 1902.

Silicon is added to molten iron or steel, preferably to the former in the proportion of from one-half to one per cent. and to the latter, of about one-fourth of one per cent. Better castings, and other advantages, are stated to be thus obtained.—E. S.

Centrifugal Machine [*Extraction of Precious Metals, &c.*]. H. de Raasloff, New York. U.S. Pat. 707,52[illegible] Aug. 19, 1902.

The machine is especially intended for use in connection with the continuous process of centrifugal separation, described in U.S. Pat. 685,793, for the treatment of cyanide solutions of the precious metals, &c., the solid or heavier matters being continuously separated from the liquid and lighter matters, and formed into a mass, which is discharged from the separator at the same rate as that at which it is formed. The discharge outlet of the rotary separating chamber is provided with a continuously-operated rotary valve, which is chambered and adapted to transfer the separated material.—R. A.

Slimes; Treatment of Ore ——. H. L. Sulman and H. Kirkpatrick-Picard, London. U.S. Pat. 708,504, Sept. 1902.

See Eng. Pat. 7157, 1901; this Journal, 1902, 1081.—E.

Antifriction Metal Alloy. H. Pearse and E. F. Ieve[illegible] Buenos Ayres. U.S. Pat. 708,580, Sept. 9, 1902.

The alloy, for use in lining bearings, is composed of lead 75 parts; antimony, 15 parts; tin, 6 parts; copper, 3 parts and wrought and cast iron, ½ part each; but the proportions may be modified according to the application intended. The iron and copper are first fused together, and then the molten tin, lead, and antimony are successively added.—E. S.

Melting Furnace, and Melting and Treating Metals. E. Schwartz, Assignor of two-thirds to the Hawley Down Draft Furnace Co., Chicago, Ill. U.S. Pats. 708,782 and 708,783, Sept. 9, 1902.

The furnace is hemispherical in its lower part, and tapering or conical above, the charging door being at the apex, and an upwardly-inclined passage slightly above the hearth is available for exit of the products of combustion, as well as for discharging molten metal. The lower portion of the hemisphere, constituting the hearth, is detachable, and may be tilted or oscillated. The fuel (oil or gas) is mixed with air in chambers within the trunnions, and the mixture fed to a number of burners within the upper part of the furnace. These burners are so directed downwards, and converging, each towards the opposite wall, as to focus their jets at a point near the central vertical axis of the furnace, when the jets separate, and are "finally deflected

erally and downwardly with a whirling movement, and en forwardly, so that the flame, at the time of its complete mbustion and greatest heat, will be in direct and intimate ntact with the metal." The flame may be changed from oxidising to a neutral or reducing flame. In melting ass, a reducing flame is used.—E. S.

etals; Coating ——, *preparatory to being Heated.* H. Wachwitz, Hersbruck, Assignor to M. Dünkelsbühler, Nuremberg, Germany. U.S. Pat. 708,788, Sept. 9, 1902.

E Eng. Pat. 20,657, 1901; this Journal, 1902, 176.—E. S.

luminium; Process of Rendering ——, *capable of being Welded or Soldered.* C. P. Sörensen, Copenhagen. U.S. Pat. 708,840, Sept. 9, 1902.

E Eng. Pat. 16,864, 1901; this Journal, 1901, 1119.—E. S.

rrous Liquors [*Waste Pickling*]; *Treating* ——. A. S. Ramage, Cleveland, Ohio. U.S. Pat. 708,585, Sept. 9, 1902.

PROCESS of treating ferrous liquors, such as those sulting from the pickling of iron, which consists in pre- itating therefrom a yellow, hydrated, basic ferric oxide e Eng. Pat. 23,858, 1900; this Journal, 1901, 910), overing the acid radicle as a solution of a salt of an tali or alkaline-earth, placing said oxide and solution in oximity, and heating said oxide to a temperature sufficient cause its occluded oxygen to react on the oxide with olution of heat, thereby simultaneously calcining the ide and supplying heat to evaporate the solution. The cined oxide is converted into a red pigment. (See also g. Pat. 23,859, 1900; this Journal, 1901, 809.)—E. S.

ckling and Swilling Apparatus. J. R. Phillips, Assignor to the American Tin Plate Co., Pittsburg, Penn., U.S.A. U.S. Pat. 708,660, Sept. 9, 1902.

E invention relates to the pickling and swilling of plates eparatory to tinning, and includes a pickling trough ving a swilling trough in tandem therewith, acid-proof lers to feed the sheets successively through both troughs, l brush rollers rotated at higher speed than the feed lers, having on them projecting rubber plugs, set in ggered form, the plugs of the upper roller intermeshing ghtly with those of the lower, somewhat like gear teeth. —E. S.

ates; Apparatus for Treating and Tinning ——. J. R. Phillips, Assignor to the American Tin Plate Co., Pittsburg, Penn. U.S. Pat. 708,970, Sept. 9, 1902.

E pickling and swilling apparatus described in the pre- ling abstract is combined with tinning pots arranged at ferent points along the swilling tank, switch devices to gage successive sheets and transfer them to the pots, and icating mechanism to show the transfer mechanism ich will act upon any particular sheet. There are also nning and dusting devices to which the switches lead, i a common feed table to which the sheets are fed from dusting apparatus.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

pochlorous Acid and its Salts; Behaviour of ——, *during Electrolysis.* F. Foerster and E. Müller. Zeits. f. Elektrochem., 1902, **8**, [35], 633—638; and [36], 665—672.

E conclusions arrived at are as follows:—If equimolecular utions of alkali-metal hydroxide, hypochlorite, and oride be electrolysed with increasing E.M.F., the passage a given volume of current takes place at the lowest ode-potential in the hydroxide, and at the highest in the oride solution. Chlorine ions are discharged at intermediate values of anode-potential in the electrolysis of hypochlorite. At the moment of discharge, ClO' ions are formed, probably reacting in accordance with the following equation, oxygen escaping at the anode:—

$$6ClO + 3H_2O = 2HClO_3 + 4HCl + 3O.$$

This formation of anode chlorate occurs in the electrolysis alike of free hypochlorous acid and of neutral or alkaline hypochlorite solutions. At the same time, but only to a small extent, unaltered ClO' ions, meeting with anode-oxygen at potentials exceeding 1·1 volt, may unite according to the equation $ClO' + 2O = ClO_3'$, producing chlorate by a primary reaction. A secondary formation of chlorate may occur during the electrolysis of hypochlorites if not too small a portion of the hypochlorite oxygen remain as free hypochlorous acid in any considerable part of the electrolyte. Hence it is a result of acidification.—W. G. M.

Caustic Soda and Potash; Electrolysis of Molten ——. M. le Blanc and J. Brode. Zeits. f. Elektrochem., 1902, **8**, [37], 697—707; and [38], 717—729.

THE authors, in summarising their work, point out that fused caustic soda containing water has two decomposition-values, 1·3 and 2·2 volts, whilst, when the sodium hydrate is free from extraneous water, only the higher value is obtained. By quantitative measurement of the gases evolved at different voltages, it is proved that both of these values have special significance. There is a separation of H and O at 1·3 volt, and of Na and O at 2·2 volts. The yield of oxygen is never strictly quantitative, but increases with the current density; the hydrogen yield, on the contrary, provided there is no sodium deposited, is quantitative at pressures below 2·2 volts. In soda free from water, sodium alone (not Na + H) is deposited at pressures above 2·2 volts. Hence it is certain that pure molten caustic soda contains no H', and therefore no O'' ions, but only Na' and OH' ions. Caustic soda, when melted, is very hygroscopic, and usually therefore contains an appreciable quantity of water. Fused soda, to which free sodium has been added, yields hydrogen as well as oxygen at the anode at high current densities, which is a direct proof that water is formed at the anode by the discharge of the hydroxyl ions.

Since an equivalent of water is obtained for every two equivalents of sodium, the theoretical maximum yield of the Castner process represents 50 per cent. current efficiency. In practice it is usually not more than 40 per cent. Unnecessarily high temperatures are to be avoided in the Castner process, as under these conditions the sodium tends to dissolve in the molten bath, and to attack the water formed at the anode, forming detonating gas, which produces a series of slight explosions. In the same way that sodium in excess acts as a depolariser at the anode, peroxide in excess is a depolarising agent at the cathode. These two products tend to react in the liquid, reproducing sodium monoxide, which re-forms caustic soda with the water formed at the anode. The current efficiency of the process would be markedly improved if a suitable diaphragm could be found to prevent the anode water from gaining access to the cathode. If the conductivity of solid caustic soda were sufficiently high, this material might be used as a diaphragm in the form of a solidified film.—W. G. M.

Electrolysis, especially of Alkali-metal Chlorides, with Platinised Electrodes. F. Foerster and E. Müller. Zeits. f. Elektrochem., 1902, **8**, [31], 515—540

EXPERIMENTS with neutral alkali-metal chloride solutions with or without the addition of chromate, disprove Lorenz and Wehrlin's statement as to the effect of platinising the electrode upon the formation of chlorates (Zeits. f. Elektrochem., **6**, 389, &c.), by showing that, although the platinising of the anode causes a reduction of P.D. of more than 0·5 volt, the formation of chlorate is about the same as in the case of electrolysis with polished anodes. Further experiments indicate that, in the electrolysis of the neutral chlorides with platinised anodes, the generation of oxygen and formation of chlorate can only be ascribed in the

minutest degree to the catalytic action of the platinum black. When electrolysis takes place between polished electrodes, the P.D. gradually increases until it becomes nearly constant, and with a high current density (0·067 amp. per sq. cm.) a similar increase is observed if a platinised anode be used, although with weaker currents (0·017 amp. per sq. cm.) the P.D. is practically constant from the first. But the P.D., when, under otherwise identical conditions, a platinised anode was substituted for a polished anode, was reduced by from 0·75 to 0·92 volt in the experiments described. Coating with spongy platinum, instead of merely platinising, did not increase this difference of 0·9 volt appreciably, and the use of grey platinising distinctly lessened it. The effects of electrolysing sulphuric acid, caustic soda, and alkaline potassium iodide solutions are then described, and it is shown that there is a similar lowering of the P.D. when platinised anodes are used instead of bright platinum. In the experiments described, this decrease, after from 8 to 10 ampère-hours, was as follows :—

	Current Density per Sq. Cm.	
	0·067 Amp.	0·017 Amp.
	Volt.	Volt.
In the case of H_2SO_4 solution...	0·46	0·308
„ „ NaOH „ ...	0·755	0·665
„ „ NaCl „ ...	0·82	0·75

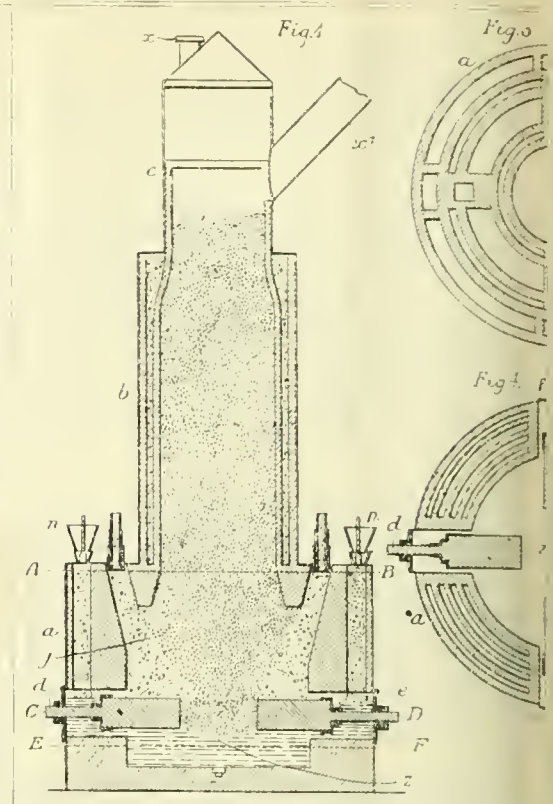
The difference, in the case of sulphuric acid, did not vary greatly with the time, but with 2N. caustic soda solution, it ranged from 0·72 volt after 1 min. to 0·92 after 20 mins., 0·86 after 1 hr., 0·76 after 4 hrs., and 0·67 volt after 11 hrs. The reduction in P.D. is only to a very small extent due to an alteration in concentration at the anode, but is to be chiefly connected with the evolution of gas at the electrode, as it is first observed at the moment when the current suffices for such evolution.—W. G. M.

Salts; Electrolysis of Mixtures of ——. A. Leduc. Comptes Rend., 1902, **135**, [9], 395—396.

In an investigation on the electrolysis of silver nitrate, the question arose as to the effect of the presence of small quantities of impurities in the bath on the weight of silver deposited. Two baths of silver nitrate were electrolysed in series, one being as pure as possible, whilst the other received additions of various quantities of impurities (potassium nitrate and copper nitrate), the equivalent concentration being kept constant. The results showed that very little account need be taken of the presence of a few parts per thousand of such impurities as are likely to be found in commercially pure silver, when they consist of metals occupying a lower place than silver in Dumas' list. The presence of metals above silver in this classification would be more troublesome, but the proportions of these are never considerable, and their electro-chemical equivalents are generally not far different from that of silver; moreover, these metals would be eliminated from the bath in the first experiments performed.—J. F. B.

Carbon Bisulphide; Manufacture of ——, *in the Electric Furnace.* E. R. Taylor. Trans. Amer. Electrochem. Soc., 1902, **1**, [1], 115—117.

In the most recent form of the author's electric furnace (see Eng. Pat. 25,182, 1901, and U.S. Pat. 702,117, 1902; this Journal, 1902, 353 and 979), of which illustrations are here given, the inner metal shell is surrounded by brick walls instead of by an outer shell of iron, as was formerly the case. The sulphur is fed directly to the furnace in the cold state, and surrounds the interior so completely as practically to make a blanket of sulphur, which in melting carries the heat absorbed, back into the furnace. It is stated that this arrangement is so effective that the larger the production of bisulphide, the cooler is the outside of the furnace and the more complete the utilisation of the heat generated in the interior during the process. The sulphur rises in the bottom of the furnace, and its height is



Figs. 1 and 2 = Sectional elevations of furnace.
Fig. 3 = Horizontal section through one side of furnace on line A B.
Fig. 4 = Horizontal section through same side of furnace on line C D.
Fig. 5 = Horizontal section on line E F.
a, b, c = Base, body, and dome of furnace respectively.
d & *e* and *f* & *g* = Electrodes in pairs.
j = Broken or scrap conducting material.
n. p. q = Feed-hoppers for sulphur.
x = Feed-inlet for carbon.
x' = Outlet for gases and vapours.
z = Working chamber.

gulated by feeding cold sulphur into the surrounding nambers. It is claimed that with regular supplies of ectricity and materials, the process gives excellent results. In the discussion following the reading of this paper, the thor stated that the waste of the carbon electrodes is ry small. These carbons are 48 ins. long, and each presents a surface of 20 sq. ins.—A. S.

Naphthalene; Electrolytic Oxidation of ——. A. Panchaud de Bottens. Zeits. f. Elektrochem., 1902, **8**, [36], 673—675.

EXPERIMENTS were made on the electrolytic oxidation of naphthalene, using either acetone, glacial acetic acid (with sulphuric acid), or sulphuric acid as solvent, and employing either lead or platinum electrodes. Naphthoquinone and phthalic acid were the principal products obtained in appreciable quantities, together with a brown substance not yet identified. The naphthoquinone was obtained only from the acetone-sulphuric acid electrolyte in the cold, but the quantity was exceedingly small, since a further oxidation of the α-naphthoquinone immediately occurred. Phthalic acid was formed, either in the cold or when warmed, in the oxidation of naphthalene in the form of its α-monosulphonic acid (free acid or sodium salt) or aminonaphthol sulphonic acid (1 : 2 : 4), or in the heat by the oxidation of naphthalene in glacial acetic acid and sulphuric acid; the yield is, however, very small, the chief reaction being the decomposition of H_2SO_4.—W. G. M.

Alcohols; Formation of ——, *by the Electrolysis of Salts of Fatty Acids.* H. Hofer and M. Moest. Annalen, 1902, **323**, [3], 284—323.

AFTER a short review of previous work on the subject, the authors deal with it under the following headings:—A. Electrolysis of salts of fatty acids in presence of sodium perchlorate: (1) sodium acetate, (2) sodium propionate, (3) sodium butyrate, (4) sodium isobutyrate, (5) sodium succinate. B. Systematic examination of the reactions: (1) methods, (2) apparatus. C. Influence of different electrolytes and different proportions of the components of the mixtures: (1) sodium acetate and sodium perchlorate, (2) sodium acetate and sodium sulphate, (3) potassium acetate and potassium carbonate. Eleven tables, three curve diagrams, and one plate are given in the original.—A. S.

United States Patents.

Cell; Electrolytic ——. A. Sommer, Cambridge, Mass., U.S.A. U.S. Pat. 707,804, Aug. 26, 1902.

THIS cell is devised to keep the anode products from mingling with those formed at the cathode. The outer cell, which may be of iron, is itself the cathode. Near the bottom is a vent, communicating with an elbow, and a vertical tube outside, which may be turned about the elbow as an axis. The vertical tube is provided with a T-connection near the upper end: both may be closed. Within the outer cell, and at no great distance from it, is an earthenware (or similar) tube resting in porous material. The upper end of this inner tube is enlarged and flanged at the top, to support a thrice-perforated plate, which serves as a cover to the inner compartment. Through the central perforation in the cover is passed the support of the anode, which consists of a horizontal disc, carrying blocks of carbon below. Through one of the other perforations is passed a tube dipping beneath the surface of the electrolyte, and closed at will. Through this tube, salt is charged as required, falling upon the anode disc, where it dissolves rapidly. The other perforation carries a water-seal for the removal of chlorine.—W. G. M.

Battery; Electric ——. E. A. G. Street, Paris. U.S. Pat. 707,731, Aug. 26, 1902.

THE flat carbon electrode of a battery is attached, by bands of india-rubber bands, a flat box of porous carbon, filled with the solid depolarising material. Between the carbon plate and the inner wall of the box is a short space. In this arrangement a good supply of depolariser may be readily kept up.—W. G. M.

Counter Electro-Motive Force [Battery, Voltaic]; Means for Generating ——. H. H. Dow, Midland, Michigan, U.S.A. U.S. Pat. 707,835, Aug. 26, 1902.

THIS is a battery for the production of counter E.M.F. in an electric circuit, and consists of a series of layers in "pile" form, in the following order:—Carbon plate, granular carbon, sheet of bibulous material wetted with a suitable solution (as, for example, $CaCl_2$), granular carbon, carbon plate, and so on. Thus a series of cells is produced, each having a large electrode surface, owing to the granulation of a portion of the carbon.—W. G. M.

Secondary-Battery Plates; Method of Manufacturing —— [*Spongy Lead*]. G. H. Christian, Assignor to C. H. Taylor, Cleveland, Ohio. U.S. Pat. 708,694, Sept. 9, 1902.

OXIDE or peroxide of lead is converted into spongy lead by reducing it at the cathode of an electrolytic cell containing a solution of a compound of an organic acid, such as oxalic acid, and an alkaline earth, and strengthening the electrolyte periodically by the addition of the compound as the reduction progresses.—G. H. R.

Plates for Secondary Batteries; Method of Manufacturing ——. G. H. Christian, Assignor to C. H. Taylor, Cleveland, Ohio. U.S. Pat. 708,695, Sept. 9, 1902.

THIS process is similar to that described in the preceding patent, but an aqueous solution is preferred.—G. H. R.

Electrode Separator for Batteries. A. W. Harrison, Assignor to F. A. Marcher, Los Angeles, Cal. U.S. Pat. 708,708, Sept. 9, 1902.

THE separator is made of the fibrous portions of yucca (preferably *yucca brevifolia*), from which the starch and other non-fibrous materials have been extracted.—G. H. R.

Bleaching [Electrolysis of Brine] Apparatus. C. C. Clark. U.S. Pat. 708,796, Sept. 9, 1902.

See under V., *page* 1230.

(*B.*)—ELECTRO-METALLURGY.

Antimony; Production of ——, *Electrolytically.* I. Izart. L'Électricien, 1902, **22**, [I.] 307, [II.] 33.

THE antimony ore is treated with sodium sulphide to dissolve the antimony sulphide. The electrolytic vessel is divided by a diaphragm, and the cathode compartment contains the antimony solution, whilst the anode division is supplied with caustic soda solution, to which is added some ammonium chloride, to bring up its specific gravity to that of the antimony solution, and so to obviate diffusion through the diaphragm. In an experimental plant in Cassagnas (Lozere), the author obtained a scaly, lustrous deposit with a current density of 0·8 ampère per sq. dcm. at a pressure of 1·6 volt, and with a current efficiency of 76 per cent.—W. G. M.

United States Patent.

Furnace; Oscillating Electric ——. P. L. T. Héroult, La Praz, France. U.S. Pat. 707,776, Aug. 26, 1902.

THE furnace is approximately rectangular in plan, the lower part, or crucible, having a spout on one side and a charging hole at each end. The cover has a small chimney or vent on the side nearest the spout of the crucible, and two other perforations to take the carbons through which the current is supplied. Each carbon is supported by a collar, into which it is fixed by means of copper wedges, which also make the necessary electrical connections with the supply cables. The whole is mounted on a toothed rocker, gearing into a horizontal rack, so that the furnace may be tilted at will. The electrodes may be removed or may be oscillated with the furnace, the movements of the furnace and of the electrodes being under hydraulic control. The spout may be used as a ladle, if desired. Tuyères may be fitted above the normal level of the fluid charge on the side opposite the spout, so that, by tilting the whole to the proper angle, air may be blown in for Bessemerising purposes.—W. G. M.

XII.—FATS, OILS, AND SOAP.

Oil of the Red Elderberry, "Sambucus Racemosa Arborescens"; Examination of the ——. H. G. Byers and P. Hopkins. J. Amer. Chem. Soc., 1902, **24**, [8], 771—774.

The red elderberry grows on the western slopes of the Cascade Mountains and on the lowlands about Puget Sound. From 10 galls. of the berries, about 500 c.c. of a yellow oil were obtained by pressing out the juice and extracting with ether the layer of crude oil which rose to the surface of the liquid. The oil darkens markedly on standing, or when the ether is evaporated from the solution on the water-bath. It decomposes when distilled even at a pressure of 20 mm. It consists of a mixture of glycerides, with 6·65 per cent. of free acid calculated as oleic acid. It is stated that "an acid, probably linoleïc acid, having an iodine absorption greater than that of oleïc acid, is present to the extent of about 7·8 per cent." The oil bears a very close resemblance to olive oil, as is shown in the following table:—

——	Elderberry Oil.	Olive Oil.
Palmitin	22·0 per cent.	28·0 per cent.
Olein and linolein	73·6 { 92·2 " / 7·8 "	72·0 { 93 " / 7 "
Caprin, caproin, and caprylin	3·0 per cent.	..
Unsaponifiable matter	0·66 "	..
Specific gravity	0·907	0·914—0·917
Solidifying point	− 8° C.	2° C.
Melting point of fatty acids	38° C.	26° C.
Saponification value	209·3	191·7
Iodine value	81·44	80—82
Hehner value	91·75	94·03
Reichert-Meissl value	1·54	1·50
Free acid	6·65 per cent.	8·07 per cent.

—A. S.

Oils; Refractive Indices of Certain Vegetable ——. *Correction for Temperature.* L. M. Tolman and L. S. Munson. J. Amer. Chem. Soc., 1902, **24**, [8], 754—758.

In correcting for temperature the readings of refractive indices, two factors are ordinarily used, *viz.*, 0·000176 for 1° C. for instruments giving the index of refraction directly, and 0·55 scale division for 1° C. for the Zeiss butyro-refractometer. The authors find that the former is considerably too small, whilst with the latter, corrections for temperature are not accurate unless the scale reading is calculated to refractive index, the correction factor applied to that, and then the corrected refractive index recalculated to scale division. From the results of a number of experiments, the following table of temperature corrections has been calculated, and it appears that, for the ordinary fats and oils, the correction for change in refractive index is very uniform, being about 0·000365 for 1° C.

Oil.	Correction for 1° C. in Refractive Index.
Linseed	0·00037
Cottonseed	0·00037
Peanut	0·00037
Corn	0·00036
Sesamé	0·00037
Olive	0·00037
Rape	0·00036

—A. S.

English Patent.

Soap; Mixing Apparatus for the Manufacture of ——. P. Karutz, Hamburg. Eng. Pat. 20,454, Oct. 12, 1901.

The fat, lye, &c. are introduced into a round-bottomed kettle, provided with a false bottom with a central opening. The materials are forced downwards through this opening by means of a revolving screw, and, rising through the perforations of the false bottom in a state of intimate admixture, fall over the edge of a mantle surrounding the screw worm, so that a continual circulation takes place.

—C. A. M.

United States Patents.

Rendering Apparatus. E. R. Edson, Cleveland, Ohio U.S.A. U.S. Pat. 707,565, Aug. 26, 1902.

This consists of a closed vessel surrounded by a heating chamber, and provided inside with a revolving shaft with perforated lateral arms, through which gaseous heating material or air under pressure can be introduced. Means are also provided for creating a partial vacuum, prior to the introduction of air under pressure, and for recovering the evaporated solvent (see this Journal, 1902, 263).

—C. A. M.

Fish or other Material; Process of Reducing or Rendering ——. E. R. Edson, Cleveland, Ohio, U.S.A. U.S. Pat. 707,566, Aug. 26, 1902.

The material is heated in a closed vessel under pneumatic pressure greater than that caused by the heating, so as to prevent boiling. When the liberation of oil, &c. is interfered with by the substance caking, air under still greater pressure is introduced below the mass to effect disintegration.—C. A. M.

Rendering Apparatus. E. R. Edson, Cleveland, Ohio, U.S.A. U.S. Pat. 707,567, Aug. 26, 1902.

Apparatus for carrying out the process claimed in the preceding patent.—C. A. M.

Rendering Apparatus. C. Turner, Chicago, U.S.A. U.S. Pat. 708,845, Sept. 9, 1902.

An apparatus for extracting oil from fatty animal matter and more particularly for the extraction of oils from garbage and other refuse. It consists essentially of a rotatable tank heated by means of a steam jacket, and provided with a steam-supply pipe entering the tank axially, and an outlet pipe for drawing off the oil, both pipes being closed by valves.—C. A. M.

Oils; Process of Extracting ——. A. F. Lundeberg, Stockholm. U.S. Pat. 707,854, Aug. 26, 1902.

The seed is first crushed cold, then heated, again crushed and finally pressed.—C. A. M.

Oils; Apparatus for Refining ——. E. Douillet. L. Garenne-Colombes, France. U.S. Pat. 707,960, Aug. 26, 1902.

See this Journal, 1902, 864, and also Eng. Pat. 14,329, 1901; this Journal, 1902, 711.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

United States Patents.

Pigment [*Ferric Oxide stained with various Dyestuffs*]. J. S. Ramage, Cleveland, Ohio, U.S.A. U.S. Pat. 708,58[illegible] Sept. 9, 1902.

The hydrated ferric oxide claimed in U.S. Pat. 691,3[illegible] (this Journal, 1902, 263) is impregnated with an independent colouring matter.—M. J. S.

Ferrous Liquors; Treating —— [*Pigment*]. A. S. Ramage U.S. Pat. 708,585, Sept. 9, 1902.

See under X., page 1235.

(B.)—RESINS, VARNISHES.

United States Patents.

Varnish Oils; Method of Producing ——. W. A. Smith Cleveland, Ohio, U.S.A. U.S. Pat. 708,178, Sept. 2, 1902.

Rosin is boiled with concentrated sulphuric acid until foaming ceases, at which stage the sulphonated rosin acids are capable of forming lead salts, which are not curd-like. Finally, the product is thinned by the addition of refined petroleum oil.—C. A. M.

arnishes; Manufacture of ——. E. H. Strange, London, and E. Graham, Tilehurst, Berks, Assignors to E. R. Burrell, London. U.S. Pat. 708,935, Sept. 9, 1902.

ARD gums or resins are dissolved in an excess of turpentine, in a closed vessel at about 300°—350° C.; a small portion of the turpentine is distilled off to remove water, and the solution of the gum is clarified either by filtering or by subsidence. The excess of turpentine is then distilled off. The remaining solution, after sufficient cooling, is mixed with linseed oil previously heated to a temperature not exceeding 100° C. Pale, clear varnishes, ready for immediate use, are obtained.—M. J. S.

(C.)—INDIA-RUBBER.

United States Patents.

ubber Substitute; Producing a Composition of Matter to be used as a ——. O. A. Bailer, Philadelphia. U.S. Pat. 708,003, Sept. 2, 1902.

WENTY parts of crude rubber, dissolved in a volatile solvent to the consistency of syrup, are incorporated with 5 parts of "melted or liquid" gum arabic, 25 parts of whiting, and 45 parts of sulphur. The whole is strained, diluted, if necessary, to a syrup with petroleum spirit, and mixed with three times its weight of whole or chopped fibres, which have been previously freed from grease. The composition is moulded into the desired shapes under slight pressure, and finally vulcanised in the usual manner. —F. H. L.

ubber-coated Materials; Process of Preparing and Treating ——. J. Minder, Assignor to Oxylin-Werke Actien-Ges., Piesteritz, Germany. U.S. Pat. 708,823, Sept. 9, 1902.

E Eng. Pat. 24,467, 1899; this Journal, 1900, 360. —F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

anning; Researches on Chrome ——. J. Krutwig. Collegium, 1902, **1**, [20], 161—166, and [21] 167—169.

In support of his previous results (see this Journal, 1900, 58—59), the author has examined the process of tanning by the single-bath method, in a liquor containing a basic chromium sulphate of the composition $Cr_2O_3{,}2Cr_2(SO_4)_3$ + H_2O, using solutions of 10, 5, $2\frac{1}{2}$, and 1 per cent. strength, and at a temperature of about 15° C. The hide used was dehaired by sweating, so as to avoid the presence of lime salts. Careful analysis of the liquor from day to day failed to detect any decomposition of the salt, the ratio Cr_2O_3 to SO_3 remaining constant; so the author considers it beyond doubt that the basic salt like the neutral salt (*loc. cit.*), combines with the hide substance as such, the process being, not one of chemical decomposition, but physical in its nature, and now recognised by the term *adsorption*. Experiments with chrome alum led to the same result. The leather thus tanned in a weak chrome liquor, in the course of 15 days, gave satisfactory mechanical tests, the breaking load being from 3·6 to 4·7 kilos. per sq. mm. A number of theoretical considerations, especially as to the tanning of chrome tanning phenomena on the still more complex question of vegetable tanning, conclude the paper. —R. L. J.

Tannin; Determination of ——. G. Schweitzer.

See under XXIII., *page* 1250.

English Patent.

ather, Fabrics or other Materials; Compositions for the Preservation of ——. A. J. Boult, London. From J. M. Port, Boston, U.S.A. Eng. Pat. 20,281, Oct. 10, 1901.

METALLIC palmitate, and, in particular, zinco-aluminium palmitate, is dissolved in a drying oil (*e.g.*, linseed or Chinese wood oil) and a mineral resin, such as gilsonite, added to the solution to give consistency. If desired, a hard fossil resin, such as gum kauri, may also be added. The zinco-aluminium palmitate is prepared by adding an excess of zinc-alum to the solution of an alkali palmitate. —C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Juices: Concentration of ——, *in presence of Aluminium and its Alloys.* Besson. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [2], 131—135.

THE author has previously described the advantages to be gained by effecting the concentration of sugar juices in presence of powdered aluminium. He now finds that the presence of a foreign metal alloyed with the aluminium intensifies the action, and produces a specific effect. The nature of the alloy used is not stated. Comparative experiments have been made in the laboratory on the evaporation of carbonated juices and carbonated and sulphured juices, in the ordinary form, and with the addition of the alloy to the extent of 0·1 grm. per kilo. of juice. It was found that the presence of the alloy brought about a strong decolorisation of the juices; the quotients of purity were raised by 0·8 to 0·9, and the increased evaporation in a given time amounted to 11—23 per cent.

Beet Juice; Defecation of ——, *with a Minimum of Lime* J. Zamaron. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [2], 145—152.

As the result of the work of the last two years, the author finds that the proportion of lime employed may be largely reduced with very considerable advantage to the quality and yield. The summary of the process is as follows:—Maximum temperature of diffusion, 90° C.; exhaustion of the slices, 0·16; liming of the juice in the first carbonation, 9—12 grms. of CaO per litre; temperature during carbonation, 75°—80° C.; degree of first saturation, 0·9—1·25; temperature after saturation, 85° C.; rapid decantation of the juice into special tanks; liming in the second carbonation, 3·0—4·0 grms. of CaO per litre; temperature, 80° C.; degree of second saturation, 0·25—0·33; temperature after saturation, 98°—100° C.; rapid decantation and mechanical filtration of the juice; filtration of the first and second carbonation mud in filter presses.—J. F. B.

United States Patents.

Bone-Black Kiln [*Spent Material from Sugar Purification*]. W. T. Mohr, Gladerun, Penn. U.S. Pat. 708,898, Sept. 9, 1902.

A KILN for revivifying spent bone-black, &c., the construction of which is described in 17 claims. There is a heating chamber, an upright retort extending through it, and through this the material treated, falls. A vertical flue extends through the retort and opens at its lower end into the heating chamber to form an escape for the heat from the latter.—E. S.

Agitator [*Starch-making*]. H. M. Martinson. U.S. Pat. 708,858, 1902.

See under XIX., *page* 1243.

XVII.—BREWING, WINES, SPIRITS, Etc.

Fermentation; Theory of ——. *I.* A. Richter. Centr.-Bl. f. Bakter. u. Parasitenk., **8**, [2], 787—796. Chem. Centr., 1902, **2**, [5], 391.

THE author shows that the presence of nitrogenous substances (peptones) influences the fermenting power of the yeast fungus only when the quantity of sugar present is inappreciable. The peptones present, whilst favouring the development and propagation of the cells, have no influence on the fermenting power of the yeast fungus. If the sugar be exhausted, or if it be present only in very small quantity, however, the yeast begins to assimilate other substances, as for example, alcohol, peptone, &c. These facts may be explained by Buchner's enzyme theory. If an old culture be sown in a fresh nutrient solution, the cells begin to grow and to propagate, and contain at first little or no zymase.

Fermentation only commences when the enzyme has developed. The zymase decomposes the sugar present, and this is so whether peptone be present or not. When, however, the whole of the sugar is decomposed, a new process of assimilation sets in, which has nothing in common with the act of fermentation.—A. S.

Ferments and Fermentations; Testing ——. Sorel. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [2], 139—144.

In addition to a full and careful microscopic examination of yeast, the author recommends a direct determination of fermentative power. In the case of brewery or distillery yeast, a 10 per cent. solution of sugar and a 10 per cent. suspension of yeast are prepared; 5 c.c. of each are placed in a flask with 0·5 grm. of sawdust. The flask communicates by means of a tube with a bottle filled with acidulated water. The flask is placed in a water-bath and kept at a constant temperature of 29°—30° C. The gas evolved during fermentation displaces from the bottle an equal volume of water, which is conducted through a second tube into a graduated measuring cylinder. Readings are taken every 15 minutes, and curves are plotted; the fermentative power of the yeast is represented by the total volume after two hours. In the case of bakery yeasts, the flask is replaced by a wide tube of at least 80 c.c. capacity. A suspension of the yeast, at 10 grms. per litre, is prepared, and 20 c.c. of this are mixed in the tube with 20 grms. of flour by means of a glass rod, care being taken to keep the paste at the bottom of the tube. The test is made in the same way as before, the total volume of gas after three hours being taken as the fermentative power of the yeast; the rising qualities can also be noted. In order to determine the acidity produced, a parallel fermentation is made with 100 grms. of flour and 100 c.c. of yeast suspension in a plugged tube; after three hours the volume is made up to 200 c.c. and the mixture is filtered. An aliquot portion of the filtrate is then boiled under a reflux condenser, and the acidity is titrated. Generally speaking, the acidity produced varies inversely as the fermentative power. Just as the relative values of different yeasts may be determined in this apparatus with the same flour, so also may the values of different flours be determined towards the same yeast. The volume of gas evolved in three hours may vary from 80 c.c. with the best quality flours down to 25 c.c. with inferior or damaged samples.

In examining the activity of fermentation in worts at various stages of the process, 25 to 50 c.c. of the wort, according to the activity, are introduced into the fermentation flask together with 1 grm. of sawdust, and the quantity of gas evolved is determined as described above. Results of such experiments should be tabulated from readings taken every 15 minutes for worts of different densities, together with records of the number of cells present in unit volume of wort, and the number of cells required to maintain good activity in fermentations at different attenuations should be determined. The practice of using fresh yeast stock for pitching each vat is greatly to be commended, but many still adhere to the practice of pitching new vats with a portion of the contents of the preceding one. After operating thus for two or three times, the number of cells transferred in a given volume becomes less, even though the proportion of foreign organisms may not be excessive. Tests on the lines indicated will often reveal this cause of sluggish fermentation; the proportion is stated to be sufficient when there are not less than 30 millions of cells per litre of pitching yeast, and not less than three millions of active cells per litre in the vat. Only when the wort has been completely sterilised is a smaller proportion safe, and then only at the expense of longer duration.—J. F. B.

Malt Analysis. Windisch. Woch. f. Brau., 1902, **19**, [38], 545—546.

The author, in giving a *résumé* of a paper by A. R. Ling (see this Journal, 1902, 983), points out that the results confirm the opinion already largely held in Germany, that the determination of the diastatic power of a malt is of very doubtful value in determining its quality.—B. F. D.

Malt Analysis; Limitations of the Applicability of t Results of ——, for the Valuation of Large Bulks Malt. O. G. Woch. für Brau., 1902, **19**, [37], 52 527.

The experiments of the author tend to show that, owing the inherent nature of malt as a product manufactured fr the produce of an enormous number of separate plants, conceivable care in sampling can possibly give an accur representation of such factors as the extract-content, wh are liable to variations, *ab initio*. As might be expect factors such as moisture, which are determined by kilning and storage, and as time of saccharification, colo aroma, clearness and taste of wort, which are determi by the treatment during manufacture, may, under g conditions, be fairly represented in a small sample. even the mean of four analyses of extract was found only give an approximate valuation of a 2-kilo. sample, and errors must increase the greater the quantity of the malt be valued. Analysis may afford valuable information as the general condition of the malt as well as an idea of extract-content, but the percentage of extract found never afford a satisfactory measure of the money value o large consignment, since an absolutely true average sam cannot be obtained. An equalisation of all the variatic from corn to corn, unavoidable even with the most unifo manufacture, can only occur when the malt is worked the large scale.—J. F. B.

Mashing Operations; Modern ——. L. Briant. J. Fed. Inst. of Brewing, **8**, [5], 611—625.

After a short account of the several methods recen adopted with a view to obtaining increased extraction in t mash tun, the author gives the results of a series experiments in mashing various malts at a low initial heat t 15 to 30 minutes, and subsequently raising the temperatu by introducing from below water at a temperature of fr 165°—170° F., so as to bring the temperature of the mixtu to 155° or 158° F. In the whole of the experiments made, t soluble albuminoids both in the wort and finished beer w lowered by this treatment, whilst the beers carried a tou head, brightened very rapidly, and were less liable to ca fermentation. With ordinary malts, 20 minutes at the l initial temperature is sufficient, malts of low diastatic pow may be treated for 30 minutes; the second temperatu being brought to 155° or 158° F.

The following method is recommended as being success in practice. Half of the grist is mashed as thick possible at a mixing heat of about 115° F., allowed to sta 45 minutes, and then rapidly raised to 150° F.; when t temperature is reached, the second half of the grist is mash in, and the whole allowed to stand for two hours. T beer is of good character and satisfactory stability.

—B. F. D.

Saccharomyces, and a New Application of this Prope in the Distillery; New Proof of the Cellular Resistan of ——. H. Alliot. Bull. de l'Assoc. des Chim., 2 [2], 162—166.

It is well known that distillery molasses containing notat proportions of nitrates have to undergo a denitrifyi treatment before they can be successfully fermented. Th treatment consists in adding sulphuric acid to the molas and blowing air through them at a boiling temperatu The nitrates are decomposed and reduced to nitrog peroxide under the action of the sugar, and this gas eliminated, together with the volatile fatty acids, which a also inimical to yeast, being carried off with the stea The author's endeavours have been to dispense with t treatment by acclimatising yeast to the antiseptic co stituents of industrial molasses.

For this purpose a certain quantity of molasses i diluted with an equal weight of water and 4 grms. sulphuric acid are added per litre. The mixture is distill in a retort, and a volume of distillate, equal to about one-fi of the original bulk, is collected. This liquid is added small portions at intervals of a few hours to a vigoro culture of wine yeast in a nutritive saccharine medium a incubated at 20°—25° C. The acclimatisation takes pla

thout difficulty, and need only be carried to a degree ghtly exceeding the proportion of volatile products esent in industrial molasses, *i.e.*, a quantity of molasses ould be distilled equivalent to that which would be present the culture medium were composed of ordinary distillery ish. A litre of acclimatised yeast culture would suffice r a large distillery fermenting 1,000 hectolitres of wash r day, and this quantity would receive the products of stillation of about 250—300 grms. of molasses. The itial acclimatised yeast, when subsequently developed in yeast-propagation apparatus, will retain its acquired operties for a sufficient time to complete the industrial rmentation. Results of experimental fermentations in e laboratory have shown such favourable results, as mpared with unacclimatised yeast of the same kind, that may reasonably be hoped that under the more favourable aditions of practice, the process will be a complete success. —J. F. B.

Wine; Concentration of ——. F. Garrigou. Comptes Rend., 1902, **135**, [9], 407–408.

the concentration of wines it is important to start from solutely natural products; doctoring in any form is liable lead to disastrous results. Such treatment is easily detected a preliminary experiment on about 10 litres of wine.

Fortification.—When inferior spirits have been employed, greater yield of heavy alcohols is obtained than from a rfectly natural wine.

Tartaric Acid.—When the concentration exceeds 50 per nt., added tartaric acid begins to deposit, and the deposit comes very great on further concentration. The tartaric id and tartrates do not re-dissolve when the original wine re-constituted by the addition of water and alcohol.

Plastering.—If the addition has been considerable, the ncentrated wine becomes strongly acid, and copious posits of calcium and potassium sulphates are formed, cognisable by microscopic examination.

Sulphuric Acid.—A small quantity of natural wine of the me origin and known purity should be evaporated in a psule side by side with some of the wine to be treated e extracts are dried *in vacuo* at about 150° C., and then refully incinerated. The extract of the pure wine will be utly acid, no white fumes will be evolved on incineration, d the vapours condensed on a cold surface will yield only aintly acid liquid. If sulphuric acid has been added to e wine to be concentrated, the extract will be strongly d, the liquid condensed from the white fumes on a cold rface on incineration will be strongly acid, and will give e reactions of sulphuric acid. Perfectly natural wines en subjected to concentration will yield sterile products a condensed form, suitable for blending and for exportan, and crops will be saved which ordinarily would give ses of little stability owing to deficiency of protective nstituents.—J. F. B.

ntiobiose; Action of Soluble Ferments and Top-fermentation Beer Yeast on ——, *&c.* E. Bourquelot and H. Herissey.

See under XXIV., *page* 1251.

ulphurous Acid in Fermented Liquids; Determination of Free ——. Mathieu and Billon.

See under XXIII., *page* 1247.

English Patent.

ort from Dregs; Process and Apparatus for the Rapid Separation of ——. E. de Meulemeester, Brussels. Eng. Pat. 20,895, Oct. 18, 1901.

E mash is allowed to flow under moderate pressure into a ntral pipe, and thence through a series of small tubes into umber of porous filter cells (cloth tubes in wire cases) anged at short distances from one another inside a vat tank under atmospheric pressure. The lower ends of filter-tubes are clipped between bars adapted to open or se all together. During the filtration of the mash, the ver ends of the filters are closed and the wort filters into vat. When all the wort has run off, the clipping-bars are rapidly opened and the dregs are discharged into a mashing tank below, where they are washed and mashed before returning to the clarifier.—J. F. B.

United States Patent.

Agitator. [*Mash mixing.*] H. M. Martinson. U.S. Pat. 708,858, 1902.

See under XIX., *page* 1243.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Oleomargarine and Butter; Influence of the Growth of Mould upon the Chemical Composition of ——. C. A. Crampton. J. Amer. Chem. Soc., 1902, **24**, [8], 711—719.

On keeping a number of samples of oleomargarine in glass-stoppered bottles for about two years, many of them became permeated with a growth of dark green mould, a species of *Coniothecium*. The refractive indices varied greatly, being so low with some specimens, that judged by this test alone, they would have been classed as butter; the differences in the results were due to the growth mentioned, the greatest divergence being between the samples showing a strong growth of the mould, and those showing little or none. An examination of some of the original material which had no outward appearance of change, except that it had developed the tallowy smell incident to oleomargarine on long keeping, showed that the figures obtained from the mouldy samples differed widely from those given by specimens which had presumably only been affected by the action of the atmosphere. With the mouldy samples, the Reichert-Meissl value was much less, approaching the value ordinarily obtained from fresh oleomargarine, whilst the refractive index and the Valenta value were about normal for butter; the specific gravity was very low and the iodine value showed a great variation.

An examination by the author, of a sample of butter which contained mould, confirmed the observations of Hanus and Stocky that the growth of mould in butter produces a slight but distinct decrease in the Reichert-Meissl value.

The author concludes from his experiments that it may safely be asserted, at all events for the edible fats, that where the presence of nitrogenous and other non-fatty matter affords a nutritive medium for such growth, the greater part of the changes embraced under the general term "rancidity" is due to the action of micro-organisms, or to the enzymes resulting from their development. The results obtained with the samples of oleomargarine mentioned above, are explained as follows:—The glycerides, exposed to the cool damp air of the refrigerator, and in contact with the nitrogenous matter derived from the milk used in the process of manufacture, undergo a gradual decomposition, probably induced and promoted by bacterial growth, with the formation of the lower fatty acids; this leads ultimately to the high results obtained for volatile acids and specific gravity with the samples which showed no mould. The germs of the *Coniothecium* fungus having gained access to the fat, and their growth being started by the favourable conditions resulting from the splitting-up of the glycerides, attack the liberated fatty acids and glycerides and consume them in proportion as they grow. The growth of the fungus produces further decomposition and a further consumption of fatty acids, with a preference for those of lower molecular weight, until the remaining mixture of fat and free acids gives the low values for volatile acids and specific gravity obtained from the samples containing mould.—A. S.

Beet Slices; Acid Fermentation of ——. S. Epstein. Centr.-Bl. f. Bakter. u. Parasitenk., **8**, [2], 796—797 Chem. Centr., 1902, **2**, [5], 393.

The experiments were carried out, as far as possible, in a manner similar to that obtaining in practice. The slices were pressed as tightly as possible into a glass vessel up to

the rim and a stopper inserted. The micro-organisms isolated from the beet slices belonged to the lactic acid bacteria and to the so-called earth—or potato—bacilli species. With extracted and sterilised slices, the former caused a pure, almost odourless fermentation, whilst the latter produced substances varying with the kind of bacteria, having an odour of butyric or valeric acid. In some experiments a strong cellulose fermentation was also observed. After diffusion, the beet slices, in consequence of the warming to 65°—70° C., contain no lactic acid bacteria, because these are non-sporulating, but they contain the species forming endospores. If the raw slices be allowed to undergo autofermentation, or if the extracted slices be inoculated with a pure culture of the lactic acid bacteria, the desired acidification is always produced. The lactic acid bacteria thus play an important part in the acid fermentation of fodder material; they injure by means of the acid formed, the development of the earth and butyric bacteria, so that the latter are unable to exercise their prejudicial influence. This explains why the method now followed frequently fails; the extracted slices, after the diffusion at 65° C., usually no longer contain lactic acid bacteria, and the lactic acid which causes the suppression of the earth bacilli is, therefore, not produced. If, however, the extracted slices be sprinkled with sour milk, or infected with a pure culture of lactic acid forming bacteria, then the desired acidification is produced.—A. S.

Foodstuffs; Electrolytic Determination of Traces of Metals in ——. L. Medicus (and C. Mebold).

See under XXIII., *page* 1248.

ENGLISH PATENT.

Preserving Compound [for Eggs]. C. E. Lorne, Upsala, Sweden. Eng. Pat. 18,439, Sept. 14, 1901.

THE composition consists of a mixture of linseed oil, 25 parts; stearic or palmitic acid, 25 parts; paraffin wax, 46·5 parts; tallow, 25 parts; and turpentine, 35 parts; all by weight.—W. P. S.

UNITED STATES PATENT.

Food Extracts; Process of Obtaining ——. G. Eichelbaum, Berlin. U.S. Pat. 708,330, Sept. 2, 1902.

MILK, skimmed milk, or whey is peptonised by adding 0·1 grm. of pancreatine and 3 grms. of soda per litre and heating the mixture for from 10 to 15 hours at a temperature of 37° C. The lactose in the solution is then inverted by adding about 1 per cent. of hydrochloric acid and increasing the temperature to 100° C. The acid is then neutralised with sodium carbonate and the liquid is fermented for two days with good common yeast at a temperature of 30°—32° C. The cloudy liquor thus obtained is heated to 100° C. to kill the yeast, filtered, and concentrated.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Natural Waters; Significance of Phosphates in ——. A. G. Woodman. J. Amer. Chem. Soc., 1902, **24**, [8], 735—743.

AS the result of the examination of a large number of waters, the author states that there can be no question that the presence of phosphates in water in any appreciable quantity is an indication of pollution. It was found that the amount of phosphate and its variation seem to follow the same general line as in the case of other mineral constituents which either accompany the polluting material or are produced by its decay; the amount of phosphates is, however, not so delicate an indicator as that of the nitrates and chlorides. The limit of 0·5 part of phosphorus pentoxide per million given by Hehner for unpolluted waters appears to the author to be rather low; he states that a safer amount would be 1·0 part, although the average would doubtless be rather less.—A. S.

ENGLISH PATENTS.

Water Softening and Purifying Apparatus [for Settling and Decantation]. C. W. Beissel, London. Eng. Pat. 17,396, Aug. 30, 1901.

THE settling and decanting apparatus consists of a cylindrical casing having within it a conical bottom with valved aperture for discharge of the deposit formed, and a central vertical tube, open at both ends, into which the liquid to be cleared flows, terminating at a certain height above the bottom, and, in one form of the apparatus, attached to the sides by a sieve false bottom. Above the sieve are settling partitions constructed as polygonal-shaped hoppers arranged in steps, converging towards the top, and so formed that the liquid may flow upwards uniformly and permit of deposition upon the steps. In another form of the apparatus, instead of a sieve or false bottom, as described, a series of inverted cups are so arranged as to divide and equalise the upward flow.—E. S.

Water-softening Apparatus. H. L. Doulton and A. Wesley Manger, London. Eng. Pat. 18,825, Sept. 20, 1901.

THE plant consists of a hard-water tank, a mixing tank, a vessel for holding the softening solutions, a settling tank and a filter. Sufficient softening solution, say for a day's supply, is placed in the above mentioned vessel and is kept agitated by a stirrer actuated by a motor driven by the hard water running into the hard water tank. The flow of the hard water into the mixing chamber regulates the admission of the softening solution by means of a float connected to a valve on the inlet pipe of the said solution. The latter is thoroughly mixed with the inflowing hard water, which then passes into the settling tank, and may be drawn off through a filter connected with the same.—W. P. S.

UNITED STATES PATENT.

Rendering Apparatus [Oil from Garbage]. C. Turner. U.S. Pat. 708,845, Sept. 9, 1902.

See under XII., *page* 1238.

(*C.*)—DISINFECTANTS.

Creolin; Ordinary and Solid ——. E. Baroni. Giorn. Farm. Chim., **51**, 289—295. Chem. Centr., 1902, [7], 531.

A GOOD creolin forms a brownish red, clear liquid of an unpleasant, coal-tar odour, sp. gr. 1·03—1·08, and gives on mixing with water (25:1000), a milky emulsion of alkaline reaction which remains permanent for several weeks, but which, on the addition of excess of acid becomes brown owing to the separation of coal-tar. For the determination of the free alkali, 10 c.c. of the creolin are diluted with 200 c.c. of distilled water and titrated with N/1 sulphuric acid. A further 10 c.c. of N/1 sulphuric acid are then added, the mixture heated for about half an hour to 70°—80° C., filtered and titrated with N/1 caustic soda. The difference between the two titrations gives the amount of combined alkali. The total alkali in a good creolin amounts to from 2·5 to 4·5 per cent. For the determination of the coal-tar, 50 c.c. of the creolin are mixed with 50 c.c. of distilled water at 60° C., and after cooling, the liquid is extracted with about 250 c.c. of ether in small portions at a time. The coal-tar is left as residue on evaporating the ethereal solution; it should amount to 70—80 per cent. Ten c.c. of the extracted tar are shaken with 10 c.c. of caustic soda solution (sp. gr. 1·115), then treated in a glass cylinder graduated into tenths of a c.c. with 3 c.c. of hydrochloric acid (sp. gr. 1·18) and, after shaking, the mixture allowed to stand in a warm place. The amount of phenols is read off at 15° C. In the aqueous solution, after extraction with ether, the soap is decomposed by excess of sulphuric acid and the resin filtered off, washed, dried, and weighed. The proportions for the preparation of different creolins are shown in the accompanying table.

The rosin is saponified at 100° C., with the caustic soda which is preferably first freed from contaminating salts. The resin soap is then treated with the coal tar heated

	1. Italian Creolin.	2. Ordinary Creolin.	3. Solid Creolin, m. pt. 55°—58° C.
	Grms.	Grms.	Grms.
Venetian turpentine ..	250	..	70
Caustic soda solution, sp. gr. 1·332.	70	90	90
Oil tar, sp. gr. 1·03—1·05.	775	780	750
Colophony	..	200	60
Palm fat.....	..	..	80

...—80° C., thoroughly mixed with the latter at 100 C., ... filtered. The process takes about 30—40 minutes.

...n the following table are given the results of the ...mination of two trade samples of good creolin and of a ...ple of Italian creolin :—

	Creolin, A.	Creolin, B.	Italian Creolin.
...OH :—			
...nsaponified.....	1·76	2·96	1·84
...aponified	0·96	0·32	0·76
...otal	2·72	3·28	2·60
Oil tar.....	77·00	66·00	76·00
...ct. of the tar.....	180°—270°	170°—260°	160°—270°
...nols (cresols)	12·00	16·00	16·00
...in.....	17·50	27·30	19·00

—A. S.

United States Patent.

...ect-Repellent. J. C. Kessler, Milwaukee, Wis., U.S.A. U.S. Pat. 708,649, Sept. 9 1902.

...olution of the fatty acids of cocoa-nut oil in a suitable ...vent (*e.g.*, amyl acetate and alcohol), mixed with ...safras oil. The composition is applied to the skin or ...r of animals.—C. A. M.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

...scose [*Cellulose Sulpho-Carbonate*] ; *Manufacture of* ——, *for certain Purposes.* A. Fielding, Salford. Eng. Pat. 20,396, Oct. 11, 1901.

...loured viscose is made from any form of cellulose ...ich has been previously dyed, and is employed for the ...oaring or finishing of goods which are substantially of ... same colour.—J. F. B.

...per ; Manufacture of ——. H. H. Lake, London. From ...C. S. Bird, Mass., U.S.A. Eng. Pat. 10,524, May 7, 1902.

...per made in the web and intended to be finished in the ...m of continuous strips, is cut whilst still in the moist ...finished state, after it leaves the last squeeze-rolls, and ...fore it comes in contact with the drying cylinders. A ...ies of circular cutters working in relation to a roll cuts ... web longitudinally. The strips then pass on to the ...ying cylinders, where each contracts independently, and ... state of unequal tension, frequently observed when the ...b is cut after drying, is avoided ; this is specially ...vantageous when the substance of the strips is made of ...eater thickness than the intervening portions of the web. —J. F. B.

...steboard and Paper ; Impregnation of ——, *with Tar, Asphalt and other Substances.* M. Walbinger, Bischweiler, Germany. Eng. Pat. 11,593, May 21, 1902.

...e pasteboard or paper after impregnation is freed from ...e surplus impregnating substance adhering to its surface ... exposing it, in the form of vertical rolls or packets or ...parately hanging or rolled sheets, to a temperature higher ...an the melting point of the impregnating substance (at ...st 70° C.) and allowing the excess of the latter to drop ... If desired, the process may be aided by exposing the boards or paper to a steam or air pressure during the dropping off, and any volatile matters may be distilled off and collected.—J. F. B.

Paper which has been Printed or Treated with Water Colours ; Means for Rendering Washable ——. H. W. Sanderson and G. E. Humphrey. Eng. Pat. 10,510 1902.

See under VI., *page* 1231.

Wrappers, Receptacles or Packing Materials for Preventing the Tarnishing of Metallic Articles. F. Flor and F. Murmann. Eng. Pat. 14,184, 1902.

See under I., *page* 1225.

United States Patents.

Agitator [*Wood Pulp, &c.*]. H. M. Martinson, Maine. U.S. Pat. 708,058, Sept. 2, 1902.

The apparatus consists of a reservoir, which may be cylindrical with conical lower part, in the middle of which is placed a mixing chamber which may take the form of an inverted cone. A pipe connected with a source of steam or compressed air is conducted to the apex of the mixing chamber at the bottom of the apparatus, and when the valve is opened, the upward force sucks the liquid in at the bottom and discharges it through the wide end of the cone, which is near the top of the reservoir. A more perfect mixing is obtained by causing the liquid material to pass through one or more perforated plates before it enters the mixing chamber, and by making the discharge from the same with notched edges.—J. F. B.

Cellulose Esters ; Process of Purifying ——. B. W. Boeseh, Boston. U.S. Pat. 708,457, Sept. 2, 1902.

In the preparation of cellulose esters, the compound is usually purified by pouring the products of the reaction, still containing an unavoidable excess of organic anhydride and acid, into water or alcohol.

According to this invention, the loss so caused is avoided and the excess of the reagents is recovered by extracting them from the products of reaction by means of naphtha and recovering them by fractional distillation.—J. F. B.

Cellulose Acetate ; Process of Making ——. B. W. Boesch, Boston. U.S. Pat. 708,456, Sept. 2, 1902.

Dried viscose is treated with a mixture of acetyl chloride and acetic anhydride ; the alkali of the viscose is thus converted into chloride and the organic acid radicle enters into combination with the cellulose ; 25 parts of dry viscose, 16 parts of acetyl chloride, and 20 parts of acetic anhydride are specified as convenient proportions.—J. F. B.

Viscose ; Manufacture of ——. A. Fielding, Salford. U.S. Pat. 708,760, Sept. 9, 1902.

See Eng. Pat. 20,397, 1901 ; this Journal, 1902, 1193. —J. F. B.

Viscose on Textiles ; Fixing ——. A. Fielding. U.S. Pat. 708,761, Sept. 9, 1902.

See under V., *page* 1230.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Thoria in Minerals ; Occurrence of ——. J. Sehilling. Zeits. angew. Chem., 1902, **15**, [35], 869—882.

This paper consists mainly of a compilation of tables relating to the mineralogical occurrence of thoria. In the first table are enumerated the 50—60 minerals in which thoria has been found, the following details being given :—specific gravity and name of mineral, year of its discovery, name of discoverer, locality, composition, dates of analyses quoted, names of analysts, and references to literature. The second table gives similar details regarding monazite, 57 analyses being quoted ; and the third table quotes 15

analyses of monazite sand, giving also the source of the sample, date of the analysis, name of the analyst, and references to literature.

The Scandinavian sources of thoria are now exhausted, but it is obtainable in large quantities from monazite (in the form of monazite sand). This mineral is found very widely distributed in the United States, Canada, South America, England (Cornwall), Sweden, Norway, Finland, Russia, Belgium, France, Switzerland, Germany, Austria, and New Zealand, the deposits of commercial importance being found in Brazil and North and South Carolina.

—H. B.

Carbon Bisulphide; Manufacture of ——, *in the Electric Furnace.* E. R. Taylor.

See under XI. A., *page* 1236.

Bismuthose [*Bismuth-Albumin Compound*]. H. Reinhardt. Pharm. Zeit., 1902, **47**, 637. Chem.-Zeit., 1902, **26**, [70], Rep., 232.

Bismuthose is a dust-free, yellowish-white, odourless, and tasteless powder containing 21·7 per cent. of bismuth. The patented method of preparation consists essentially in coagulating a solution of pure egg albumin with a saturated solution of common salt containing dissolved bismuth nitrate. The precipitate is washed till it has a perfectly neutral reaction, then dried at a moderate temperature and ground to a fine powder. In pure water and in aqueous liquids, bismuthose swells enormously, and then when stirred with more water, forms a milky emulsion.—A. S.

Bismuth Oxyiodogallate; The so-called ——. P. Thibault. J. Pharm. Chim., 1902, **16**, [4], 145—151.

Under the name of "airol," Lüdy (see this Journal, 1895, 184) claims to have prepared an oxyiodogallate of bismuth. Frizzi has prepared a body containing the same elements, but considers it to be an iodogallate of bismuth. The author has examined these two bodies and the methods of preparing them, and finds that both compositions really consist of a mixture of bismuthogallic acid and bismuth tri-iodide, the proportions of the two components varying according to the mode of preparation.

—A. S.

Terpenes and Essential Oils. O. Wallach. 54th and 55th Papers. Annalen, 1902, **323**, [3], 323—373.

The first paper deals with the isoxime of tetrahydrocarvone and is divided under the following headings:—the hydrochloride of tetrahydrocarvoneisoxime; esters of the amino acid (obtained from the isoxime); betaine from the aminodecylic acid; reaction of the amino-acid with nitrous acid; hydroxy acid and ketone acid (from amino-acid and nitrous acid); lactone (from amino-acid and nitrous acid); decylenic acid; nitrile, $C_9H_{17}CN$.

The second paper refers to compounds of the thujone series and comprises the following divisions and subdivisions:—

1. Isothujone:—(*a*) oxidation of isothujone with potassium permanganate; (*b*) keto-lactone from isothujone, and its semi-carbazone and oxime; (*c*) acids from isothujone, ketone acid, $C_9H_{16}O_3$, and its semi-carbazone, oxime-acid, $C_9H_{16}O_2{:}NOH$, ketone acid, $C_8H_{14}O_3$ (isopropyllevulinic acid); (*d*) oxidation of the free keto-lactone, $C_{10}H_{16}O_3$, from isothujone; (*e*) constitution of the acid, $C_9H_{14}O_4$ (from the keto-lactone); (*f*) benzylidene-isothujone.

2. Thujamenthone:—(*a*) conversion of isothujone into thujamenthol and thujamenthone; (*b*) thujamenthone; (*c*) oxime of thujamenthone; (*d*) thujamenthylamine; (*e*) thujamenthoneisoxime; (*f*) benzylidenethujamenthone; (*g*) oxidation of thujamenthone with chromic acid; (*h*) thujamenthoketone acid, $C_{10}H_{18}O_3$; (*i*) keto-lactone, $C_{10}H_{16}O_3$, from thujamenthone; (*k*) oxidation of the keto-lactone to the acid, $C_9H_{14}O_4$; (*l*) oxidation of the acid, $C_9H_{14}O_4$; (*m*) comparison of the keto-lactones from isothujone and thujamenthone.

3. Thujone (tanacetone).—A. S.

Essential Oils; Commercial ——. E. Dowzard. Chem. and Druggist, 1902, **61**, [1182], 520.

Camphor Oil.—Owing to the more complete extracti of the camphor and the removal of the safrol, the co mercial camphor oils of the present day consist principa of terpenes. The author gives the results of the examin tion of five oils, of which Nos. 1 and 2 are typical light oi No 3 is a fairly good oil, No. 4 a very good oil, and No a first-class oil, but of a quality seldom met with:—

——	Sp. Gr.	Rotation (100 mm.
No. 1	0·8895	+ 23° 38′
„ 2	0·9124	+ 18° 0′
„ 3	0·9230	+ 13° 0′
„ 4	0·9817	+ 18° 52′
„ 5	0·9980	+ 9° 10′

Eucalyptus Oil.—In eight samples examined, the gr. varied between 0·9205 and 0·9260; the optical rotati (100 mm.) between − 3° 0′ and + 3° 30′; and the cine content between 68 and 80 per cent.

Rosemary Oil.—The maximum sp. gr. and optic rotation allowed by the B.P. are too low, a few genui oils being occasionally met with, which give figures outsi the official limits. Parry gives the figures for genuine o as sp. gr. 0·900—0·918, and optical rotation (100 mm from + 1° to + 12°. The author has obtained the follow figures:—

——	Sp. gr.	Optical Rotation (100 mm.).
B.P.	0·900—0·915	Not more than + 10°
No. 1	0·915	+11°
„ 2	0·917	+ 9°
„ 3	0·917	+10° 20′

—A. S.

Camphor Oil as an Adulterant. E. J. Parry. Chem. an Druggist, 1902, **61**, [1182], 520.

Light oil of camphor is used to a considerable extent f the adulteration of the more valuable essential oils, pa ticularly peppermint and eucalyptus oils, and more rare wintergreen oil. Peppermint oil should always be careful examined for this form of adulteration. In some case where the oil is exceptionally insoluble, the menth content will be found to be much below normal, and th fractions obtained, on distillation, below 200°—205° much larger than is the case with pure oils, which on yield small amounts at this temperature.—A. S.

Odours of Flowers; Dual ——. Pharm. J., 1902, **69**, [1678], 211.

J. O'Brien has observed that the odour of *Odontoglossu hebraicum* differs at various periods. When first flowere by him, the blooms had a marked cinnamon odour, qui distinct from the hawthorn fragrance of other members the group. On passing into other hands, the plant whe it first flowered gave off the hawthorn odour, but on th next occasion of its blooming, the smell was again that cinnamon. It is not stated whether these differences odour have been traced to diverse periods of the bloomin In the case of the common jasmine, it has been observe that the flowers when first expanded possess in a marke degree the delicious fresh odour which is characteristic them, but as flowering progresses, the perfume become less delicate. This has probably some connection with th recorded formation of indole in the jasmine bloom as th process of flowering approaches completion.—A. S.

Oil of Lavender; Adulteration of ——, *with Salicylic Acid.* J. E. Weber. Chem.-Zeit., **26**, [75], 875.

As adulterations of oil of lavender, there are alread enumerated succinyl-ethyl ether, resin, and benzoic acid all substances tending to raise the ester value. The autho found salicylic acid in a sample which, judged by th

specific gravity, rotatory power, acid value, and ester value, appeared to be genuine. The oil turned red after some time, and it was found to contain about 1 per cent. of salicylic acid. This amount is so small that it had no doubt been added as an experiment; but it is curious that the acid should have been added and not one of its esters; probably the adulterator supposed that in routine analyses the whole of saponification would be calculated as esters. Salicylic acid can be readily titrated in alcoholic solution, using phenolphthalein as indicator.—J. T. D.

Perfumes. J. Dupont. Bull. Soc. Chim., 1902, **27**, [15], 1—23.

A LECTURE divided into sections relating to (1) The relation between chemical properties and constitution of compounds and their odour; (2) and (3) The manufacture and methods of extracting natural perfumes; (4) The preparation of artificial perfumes (artificial musk, ionone, violin, heliotropin, coumarin, terpineol, aromatic aldehydes, phenols, ethers, esters, &c.).—A. S.

Caffeine; Determination of ——. André.

See under XXIII., *page* 1250.

ENGLISH PATENT.

Titanium Lactate; Manufacture of ——. C. Dreber, Freiburg, Germany. Eng. Pat. 14,921, July 4, 1902.

COMBINATIONS of one molecule of titanic acid with four molecules of lactic acid are prepared by treating titanic acid anhydride with dilute sulphuric acid, which is subsequently concentrated by boiling until solution is complete; then adding a lactate of an alkali or alkaline earth, and crystallising if desired.—J. F. B.

UNITED STATES PATENTS.

Dimethyl-aminophenyl-glyoxylic Acid, and Process of making same. F. Ach, Assignor to C. F. Boehringer and Soehne, Mannheim, Germany. U.S. Pat. 708,511, Sept. 9, 1902.

THIS compound, $CH_3.NH.C_6H_4.CO.COOH$, crystallises in orange-coloured prisms which soften at 140° C., and are decomposed with frothing at 155°—157° C. It is readily soluble in boiling water, cold alcohol, acetone, &c., but only with difficulty in chloroform, ether, and benzene. It is prepared by the oxidation of an aminophenyl-tartronyl-ureid or methyl-anil-alloxan by mercuric oxide or manganese dioxide peroxide in presence of an alkali, boiling until all the ammonia is driven off, filtering, evaporating, and acidifying.
—J. F. B.

Acetyl-diamine, and Process of making same. F. Ach, Assignor to C. F. Boehringer and Soehne, Mannheim, Germany. U.S. Pat. 708,512, Sept. 9, 1902.

See Eng. Pat. 12,985, 1901; this Journal, 1901, 931.
—J. F. B.

Thioxanthine, and Process of making same. F. Ach, Assignor to C. F. Boehringer and Soehne, Mannheim, Germany. U.S. Pat. 708,513, Sept. 9, 1902.

THIOXANTHINES are prepared by heating uric acid or an alkyl derivative of uric acid, or their salts, with carbon bisulphide in a closed vessel, in presence of water to a temperature of about 150° C.; 3-methyl-8-thioxanthine is specially mentioned.—J. F. B.

XXI.—PHOTOGRAPHY.

Ortol Sulphite: a New Photographic Preparation. J. Precht. Phot. Centr., 1902, **8**, 301.

THIS compound (see this Journal, 1902, 1154) dissolves in water to form a 50 per cent. solution, and may therefore be used in the preparation of highly concentrated developing solutions. As a preservative against spontaneous oxidation of the developer, it is nearly as good as potassium pyrosulphite, and much better than sodium sulphite. It is inferior to the potassium salt in that it does not retard development, when added in some excess, whilst it affects the colour of the silver precipitate, especially in the presence of alkalis, by which it is decomposed into free acetone (which improves the colour of the silver) and bisulphite. It may be advantageously employed with all developers, and may be used in developing bromide paper. According to Lumière, sodium sulphite must always be added to acetone developers; in many cases, however, a corresponding quantity of acetone sulphite may be substituted for the sodium salt. It is possible, with the aid of acetone sulphite, to correct over-exposures, even up to the point of solarisation. The acetone sulphite may be used in the preparation of weak acid fixing baths, for the blackening process in mercury intensification, and for reduction of density by potassium permanganate.
—W. G. M.

Gelatino-Bromide Plates Sensitive to Red; Preparation of ——. W. H. Burbank. Phot. Rundschau, 1902, **16**, 177; through Chem.-Zeit., 1902, **26**, Rep., [26], 260.

ONE grm. of cyanine is warmed for 30 or 40 minutes on the water-bath with 30 grms. of chloral hydrate and 120 c.c. of water; the solution is well shaken and 30 c.c. of the strongest ammonia are added. When the precipitated cyanine has settled upon the sides of the vessel, the liquid is poured away, and the residue is dissolved in 100 c.c. of alcohol. A solution of 8 grms. of quinine sulphate in 60 c.c. of alcohol (prepared by heat) is added to the solution, and the whole is diluted to 250 c.c. with spirit. The sensitising bath for the bromide plate consists of water, 160 c.c.; cyanine solution, 1 c.c.; ammonia, 1 c.c.; 1:40 silver nitrate solution, 5 drops. This is thoroughly agitated before use, and the plate is allowed to rest in it for 4 or 5 minutes, finally rinsing the film and drying it in an oven in presence of strong sulphuric acid. The stock cyanine solution must be carefully protected from the red light of the dark-room.
—F. H. L.

ENGLISH PATENT.

Photographic Decoration [*China, Glass, &c.*]; *Improvements in Vitrifiable* ——. L. Crabtree, Newark, New Jersey, and H. Mason, New York City, U.S.A. Eng. Pat. 16,718, July 28, 1902.

THE mineral colouring matter to be used is mixed with glycerin, and gelatin added to form an emulsion, with which paper or other suitable base may be coated; this coating is sensitised with bichromate of potash and exposed under a negative; by moistening the film, the layer of pigmented gelatin is transferred to the article to be decorated and developed with water until all soluble parts are removed; the image is then "burnt in" in the usual way.—J. W. H.

UNITED STATES PATENTS.

Flash-Light Apparatus [*Photography*]. C. H. Nichols, St. Louis, Miss. U.S. Pat. 708,909, Sept. 9, 1902.

THIS apparatus comprises a flat table to carry the explosive powder, a spirit lamp, and the usual rubber ball blowing arrangement. The air-leading pipe is bent U-fashion, the curve lying within the lamp reservoir, and a hole in the pipe is provided below the level of the spirit. Thus the tube fills with liquid, and when pressure is applied to the ball the spirit is forced out at the end of the pipe, passes through the flame, catches fire, and finally sets light to the flash powder lying on the table. A screen is fitted between the lamp and the table, a hole opposite the jet of vapour permitting its passage. On the table are certain deflectors which cause the flame to yield a large illuminating surface.
—F. H. L.

Polychrome Photographs; Process of Producing Enamelled ——. H. Perrin, Sérézin du Rhône, France. U.S. Pat. 708,918, Sept. 9, 1902.

A BICHROMATED gelatin film is exposed under a positive, as usual in the preparation of photographic enamels, and then "developed" by means of a brush charged with a vitrifiable colour of a neutral (gray or brown) tint, until the details

are visible. Next vitrifiable powders of the proper colours are applied in succession, beginning with the darkest, until the tinting is finished, when the chromium salts are removed in the ordinary manner, and the plaque is burnt. The process is claimed to be simpler than those formerly adopted in the production of polychrome enamels, inasmuch as only one furnacing is required to burn in all the colours; and this not only saves time, but reduces the liability to breakage.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENTS.

Percussion Caps and Detonators; Priming Compositions or Charges for ——. M. Bielefeldt, Berlin. Eng. Pat. 23,889, Nov. 25, 1901.

FINELY pulverised trinitronaphthalene (70 per cent. to 85 per cent.) is mixed with finely pulverised potassium chlorate (15 per cent. to 30 per cent.) and sufficient gum solution to form a paste of the desired consistency.

—G. W. McD.

Charges for Guns; Explosive ——. R. W. Scott, Philadelphia, Pa., U.S.A. Eng. Pat. 15,259, July 8, 1902.

WITH the object of developing pressure more gradually in the gun and obtaining higher velocities of projectile with the same charge, and without increase in pressure, the grains or pellets of the (nitro- or other) powder are made with hermetically sealed internal cavities or fissures. In firing such a charge, the surface of ignition is at first the same as though the pellets were solid, but as soon as the envelope has been burnt through, the internal surfaces are exposed and become effective. This may be effected by cutting the cords of explosive nearly through at very short intervals (say 75 cuts to the inch), but leaving a connecting piece from end to end, either in the form of a central core or otherwise, and then immersing the whole for a short time in a solution of the explosive, or in a solvent, so that on withdrawal, the outside of the rod is covered with a uniform layer and the edges of the cuts are sealed. The cuts may be longitudinal, transverse, or spiral. A refinement of the process is to give two or three sets of cuts, alternately and successively, with a dipping operation after each cut, so that, on firing, two or three sets of new surfaces are opened in succession. Alternative methods are also given.—W. G. M.

Ignition Strips, especially intended for use with Miners' Safety Lamps. J. Hübner, Breslau, Prussia. Eng. Pat. 16,668, Aug. 19, 1901.

PRIMING ribbons or strips are prepared by dissolving camphor, naphthalene, nitrobenzene, and musk in a mixture of ether and alcohol, saturating trinitrocellulose with this mixture, and allowing it to soak in a closed vessel. The resulting pasty mass is then rolled into strips, which are dried, and then furnished with pellets of a priming substance consisting of a mixture of red phosphorus, "potassium chloride," and powdered glass, igniting by friction and protected by a coating of collodion. If preferred, the ether-alcohol nitrocellulose solvent may contain, instead of the above substances, a mixture of resins, such as amber, benzoin, colophony, and shellac.—J. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Iodo-eosin as Indicator in Volumetric Analysis. C. Glücksmann. Zeits. Oesterr. Apoth.-V., **40**, 773—774: 793—795. Chem. Centr., 1902, **2**, [6], 476; [7], 538. (See this Journal, 1902, 793.)

IODO-EOSIN, like Methyl Orange, is indifferent to carbonic acid, and can thus be used for the direct titration of carbonates. Pyrophosphoric acid behaves as a dibasic acid towards Iodo-eosin. Metaphosphates react neutral. Pure aqueous solutions of arsenious acid react neutral to Methyl Orange and to Iodo-eosin. The combined alkali in alkali arsenites can therefore be determined by direct titration with standardised hydrochloric acid. Also the alkali content of Fowler's solution which contains both potassium arsenite and potassium carbonate can be determined by direct titration with hydrochloric acid with Iodo-eosin as indicator. Silicic acid is indifferent to litmus, Methyl Orange, and Iodo-eosin, so that the alkali content of water glass can be directly titrated. It should be noted, also, that in the titration of waters, the bases combined with silicic acid are determined simultaneously with those present as carbonates.—A. S.

INORGANIC—QUALITATIVE.

Sulphuretted Hydrogen; New Reaction for the Detection of ——. D. Ganassini. Boll. Chim. Farm., **41**, 417—421. Chem. Centr. 1902, **2**, [6], 476.

A KNOWN method for the detection of molybdenum consists in converting it into an alkali molybdate, adding some potassium thiocyanate, acidifying with hydrochloric or sulphuric acid and adding some pieces of zinc; by the action of the hydrogen, a transient blood-red coloration is produced owing to the formation of molybdenum thiocyanate. The coloration is more permanent and can be used for the detection of the smallest traces of molybdenum if to a small quantity of solid ammonium molybdate (ca. 0·02 mgrm.) 1—2 drops of potassium thiocyanate solution (containing potassium thiocyanate equal to at least twice the amount of molybdenum present) be added, the mixture acidified with hydrochloric acid and the liquid, distributed over as wide a surface as possible, exposed for an instant to sulphuretted hydrogen gas. The liquid is immediately coloured a more or less intense violet, which, on evaporation of the solution, becomes blue. The reaction can be used for the detection of small quantities of thiocyanates, the alkali thiocyanate, preferably in the solid form, being treated with ammonium molybdate and hydrochloric acid, and exposed to sulphuretted hydrogen.

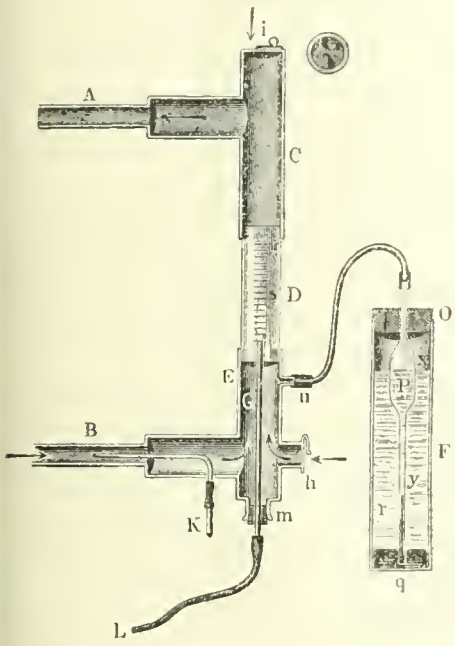
The reaction is most useful, however, for the detection of sulphuretted hydrogen. The reagent is prepared by mixing together two solutions prepared separately: (*a*) 1·25 grms. of ammonium molybdate in 50 c.c. of distilled water, and (*b*) 2·5 grms. of potassium thiocyanate in 45 c.c. of distilled water; and then acidifying with 5 c.c. of concentrated hydrochloric acid. The golden-yellow solution thus obtained, if placed in a closed bottle and protected from light, will keep unchanged for several days. The test is made by introducing into the gas, &c. under examination a strip of filter paper which has been dipped into the reagent or the bottom of a crucible or test-tube moistened with the same. In the examination of drinking and mineral waters, 20 c.c. of the sample are treated with 1—2 c.c. of a 20 per cent. solution of potassium thiocyanate, the liquid acidified with hydrochloric or sulphuric acid, a small quantity of a 5 per cent. ammonium molybdate solution added and the whole mixed. The liquid is immediately coloured violet to red according to the amount of sulphuretted hydrogen present; if the latter be absent only a yellow colour is produced. On shaking with ether in the latter case, the ether is only momentarily coloured yellow, whilst the lower layer is colourless; but with a red-coloured liquid, both the ether and the acid solution are coloured yellowish-red. The presence of iron has little disturbing effect on the reaction, as in presence of sulphuretted hydrogen, the iron in mineral waters always occurs in the ferrous condition, whilst the coloration produced by ferric salts disappears on the addition of oxalic acid. If, therefore, before the addition of the ammonium molybdate, the liquid becomes coloured red, a small quantity of oxalic acid is added.—A. S.

INORGANIC—QUANTITATIVE.

Carbon Dioxide; Determination of ——, *in Furnace Gases.* Garnier. Woch. f. Brau., 1902, **19**, [38], 552—553.

THE apparatus described was devised by Hempel, to facilitate the control of furnace firing by a quick estimation of the carbon dioxide in the products of combustion.

Two right-angled iron tubes AC and BE of equal mensions are connected by a graduated glass tube D. he tube B is connected with the fire-box of the furnace, hilst the tube A leads to the chimney above the dampers; this way a current of the furnace gases passes through e apparatus. A metal tube G passing through the rk (*m*) serves as a burner and is connected with a gas pply. The two rosette dampers at (*h*) and (*i*) are for e regulation of the air supply to the burner. For



asuring the gas current through the apparatus, the tube s connected by a lead tube (*n*) with the pipette P; this fastened by a two-holed cork in the glass cylinder F, ch contains a mixture of paraffin oil and carbon lphide (*q*) under water (*r*). The pipette dips under liquid layer (*q*). When the dampers (*h*) and (*i*) are n, the levels of the liquids in P and F must be adjusted correspond.

To graduate the instrument, the dampers (*h*) and (*i*) are ly opened, the burner G lighted, and the gas supply ulated to bring the flame to a convenient height. The ace to which the apparatus is attached is now fired so : a maximum of carbon dioxide is produced, the damper is shut and (*h*) gradually closed till the flame of the burner s just extinguished, the position of (*h*) is then marked, a determination made of the carbon dioxide in the gas sing through B. For this purpose a small tube K is rted in the tube B as shown. The furnace is now ught to its normal condition. The burner G is lighted, damper (*i*) closed, and (*h*) adjusted to the former k, the percentage of carbon dioxide in the gases being reduced, the flame is not extinguished, but assumes a ain length which can be measured on the graduated e. By making determinations of the carbon dioxide in furnace gases for different heights of flame measured, apparatus can be readily graduated. In making surements, the level of the liquids in F and P must be ays adjusted to the same point by opening or closing damper (*i*).—B. F. D.

Sulphuric Acid in Soluble Sulphates; Volumetric Method for the Determination of ——. Y. Nikaido. J. Amer. Chem. Soc., 1902, **24**, [8], 774—778.

The author finds that under suitable conditions in alcoholic solutions, lead salts will not react with iodides in the presence of sulphates until all the sulphuric acid has been precipitated by the lead, whereupon the yellow colour of the lead iodide becomes visible. It is, therefore, possible to use potassium iodide as an indicator for the end reaction between lead and sulphuric acid.

The conditions requisite for obtaining satisfactory results are:—

(1) The operation should be carried out in a solution containing 50—70 per cent. of alcohol for N/10 solutions of lead salts and 50—60 per cent. of alcohol for semi-normal solutions.

(2) Nitric acid, hydrochloric acid, sodium acetate and substances which form insoluble compounds with lead must be avoided.

(3) With coloured sulphates, the base which gives colour to the compound is removed by precipitation, *e.g.*, in the case of copper sulphate, the copper is precipitated by zinc or aluminium.

(4) With sulphates of the heavy metals, a few drops of acetic acid are added to prevent the formation of basic sulphates.

(5) The titration is made in a small volume of cold solution, using about 0·2 grm. of potassium iodide to each 25 c.c. of solution.

The method, which may also be used for the determination of lead in soluble compounds, is claimed to be rapid, accurate, easily carried out, and capable of wide application. —A. S.

Sulphurous Acid in Fermented Liquids; Determination of Free ——. Mathieu and Billon. Ann. Chim. anal. appl., **7**, 252—256. Chem. Centr., 1902, **2**, [7], 546.

As free sulphurous acid is designated that which can be titrated in the cold with iodine, whilst the combined sulphurous acid is of the type of aldehyde-sulphurous acid and cannot be directly titrated with iodine in acid solution in the cold. The total sulphurous acid can readily be accurately determined, but the usual methods for the determination of the free sulphurous acid are wholly unreliable. The author has worked out the following process, in which an about N/50 iodine solution (2·5—2·6 grms. of I and 3·5 grms. of KI per litre), and an alkaline solution of arsenious acid (1 grm. of As_2O_3 and 3 grms. of Na_2CO_3 per litre) exactly adjusted to the iodine solution are used. The apparatus is the same as that employed in Haas' method. As a preliminary test, 10 c.c. of the wine are treated with the iodine solution, till a drop of the liquid turns starch solution distinctly blue. 100 c.c. of the wine are then introduced into the distillation flask of the apparatus, the air in which has been replaced by carbon dioxide, 2 c.c. of hydrochloric acid and 10 times the quantity of iodine used in the preliminary test are added, then, after about 10 minutes, an equivalent quantity of the arsenite solution is introduced, and half of the liquid is distilled over in a current of carbon dioxide. In the distillate, the sulphurous acid originally present as combined sulphurous acid is determined gravimetrically as barium sulphate. The difference between the combined sulphurous acid and the total amount as determined by Haas' method gives the free sulphurous acid.—A. S.

Copper; Determination of ——, *with Potassium Permanganate.* H. A. Guess. J. Amer. Chem. Soc., 1902, **24**, [8], 708—711.

For the determination of copper in ores, tailings and concentrates, the author employs a modification of the method based upon the precipitation of the copper with an alkali thiocyanate. From 1 to 5 grms. of the sample are digested with nitro-hydrochloric acid together with a few drops of sulphuric acid to remove any lead present, the excess of acid is boiled off, the acid solution diluted and filtered, and the residue well washed. The filtrate is neutralised with ammonia, a few drops of dilute hydrochloric acid added, the solution reduced with excess of sodium sulphite, and the copper precipitated with a slight excess of potassium or ammonium thiocyanate. After heating to boiling, the cuprous thiocyanate is washed first by decantation and then on the filter with hot water. The funnel with filter and precipitate is placed in the original precipitation flask and a boiling 10 per cent.

solution of caustic soda poured through. This operation is repeated with a further amount of the caustic soda, the filter being filled each time to ensure complete contact with all of the precipitate. The cuprous thiocyanate is in this way decomposed with the formation of cuprous hydroxide and sodium thiocyanate, the latter passing into the filtrate. After washing with hot water, the filtrate and washings are made acid with sulphuric acid and the liberated thiocyanic acid titrated warm with potassium permanganate.—A. S.

Foodstuffs; Electrolytic Determination of Traces of Metals in ——. L. Medicus (and C. Mehold). Zeits. f. Elektrochem., 1902, **8**, [36], 690—694.

For the oxidation of the organic matters, Mehold prefers a modification of the Kjeldahl method. For each 1 grm. of substance, from 4 to 8 grms. of H_2SO_4 are used, and the heating process is continued for from 8 to 24 hours. For example: 100 grms. of meat are mixed (in successive portions) with 400 grms. of sulphuric acid. The mixture is then heated in a litre flask of hard glass placed on wire gauze over a Bunsen burner, the flame being kept low for 2—3 hours, until the mixture is fluid, and then turned on to the full, so that the acid is kept thoroughly boiling until the liquid is perfectly clear. A platinum spiral is used to prevent bumping. Fluids and moist substances should be evaporated or dried before treatment; and large fragments should be reduced in size. The use of mercuric oxide is to be avoided because, although it reduces the time of solution, the mercury has afterwards to be separated before electrolysis.

Determination of Zinc.—The sulphuric acid solution is evaporated to dryness in a platinum dish, the residue taken up with water, if necessary with the addition of a few drops of sulphuric acid, and it is then rendered slightly alkaline with caustic soda. The liquid is now washed into the platinum electrolytic vessel, and should measure about 100 c.c. A slight excess of KCN is added (until the solution has cleared), then an excess of soda is used, to convert all the iron present into ferrocyanide. The electrolysis of the resulting 150 c.c. of solution requires a current density of 0·3—0·6 ampère at 5·8—6 volts. The precipitation should be complete in $2\frac{1}{2}$ hours, and then the zinc deposit is dried at 100—110° C. and weighed.

Determination of Copper.—The solution after evaporation and filtration, as in the case of zinc, is electrolysed at once, with a current density of 1 ampère at 2·5—3 volts. The deposition is complete in $1\frac{1}{2}$—2 hours, and the results should be good.

Determination of Tin.—Instead of evaporating dry, the acid is only evaporated down to 10 c.c. It is then made up to 250 c.c. with water, warmed to 70° C. and the tin precipitated with H_2S. The tin sulphide is dissolved in ammonium polysulphide solution and electrolysed with a current of 1 ampère at 3·5—4 volts at a temperature of 50°—60° C.

Determination of Lead.—Comparatively large quantities of lead cannot be estimated in this way, owing to the low solubility of lead sulphate in hot sulphuric acid. But with small quantities, the clear solution is evaporated as before; the residue is then taken up in about 30 c.c. of a $33\frac{1}{3}$ per cent. ammonium acetate solution containing a slight excess of ammonia and filtered. The filtrate is acidified with acetic acid and precipitated with H_2S; and the resulting PbS is dissolved in 20—30 c.c. of 20 per cent. nitric acid. A further 20 c.c. of nitric acid are added and the liquid is diluted to 150 c.c. and electrolysed at 0·2—0·6 ampère and 2—2·4 volts. After 2—$2\frac{1}{2}$ hours, precipitation should be complete, and the anode with its yellow or reddish deposit is dried at 180°—200° C. and weighed as PbO_2.

Determination of Mercury.—The clear sulphuric acid solution is evaporated down to 3—5 c.c., cooled, diluted with water, filtered into the electrolytic vessel, and made up to 150 c.c. A current of 0·6—1 ampère at 3·5—5 volts is used, and in 2—$2\frac{1}{2}$ hours the precipitation should be complete. With the small quantities of metal in question, the deposit should adhere perfectly to the platinum dish, which, after washing, is dried over sulphuric acid and weighed.

—W. G. M.

Arsenic, Iron, and Lead; Decomposition with Sulphuric Acid for the purpose of Analysis of Substances containing ——. H. Nissenson and F. Crotogino. Chem. Zeit., **26**, [73], 847—849.

The authors recommend the use of pure strong sulphuric acid for the decomposition and solution of ores containing arsenic, as there is then no danger of loss of volatile arsenious chloride, nor is there the difficulty of precipitating arsenic as sulphide from a pentoxide derivative. Moreover any lead present is by this process separated at once from the other metals precipitated by hydrogen sulphide. The following detailed applications of the method to typical ores are given:—*Speiss and Arsenic Ores:* Treat 5 grms. of finely powdered ore with 15 c.c. of strong sulphuric acid in a small Erlenmeyer flask with a funnel in the neck; heat till complete decomposition is effected ($\frac{1}{2}$—3 hours). Cool, add hot water, allow to settle and filter. Heat the filtrate to boiling, pass a rapid stream of hydrogen sulphide till the precipitate clots (10 minutes), filter into a 500-c.c. flask and wash. Boil the filtrate to expel hydrogen sulphide, add ammonium persulphate or hydrogen peroxide to oxidise the iron, add 200 c.c. of ammonia, heat, allow to cool, and make up to the mark. Filter through a dry filter and in 100 c.c. of the filtrate determine the nickel and cobalt electrolytically. Dissolve the hydrogen sulphide precipitate in hydrochloric acid and potassium chlorate, expel chlorine, make up to 500 c.c., and filter through a dry filter. To 100 c.c. of the filtrate add tartaric acid, neutralise with ammonia and precipitate the arsenic with magnesia mixture. In the filtrate from this, determine the copper either colorimetrically or by thiosulphate. The whole analysis, save the separation of cobalt from nickel, can be easily done in a day. *Galena and Blende:* Treat 1 grm. with 7 c.c. of strong sulphuric acid and proceed as above. Heat the filtrate from the silica and lead sulphate to boiling, pass hydrogen sulphide, filter, boil off the hydrogen sulphide from the filtrate, peroxidise the iron, precipitate the iron, aluminium and manganese with ammonia, and determine the zinc in the filtrate. Digest the well-washed hydrogen sulphide precipitate with ammonium carbonate and determine the arsenic thus dissolved. Dissolve out the antimony with 20 c.c. of strong sodium sulphide solution and oxidise the remaining sulphides with nitric acid, for the determination of copper, bismuth, and cadmium. (Should the ore contain but little arsenic and antimony, 5 grms. should be taken and 15 c.c. of sulphuric acid; the whole of the hydrogen sulphide precipitate is treated, but only an aliquot portion of the filtrate.) Treat the residue of gangue and lead sulphate with tartaric acid and ammonia, filter and precipitate the lead in the filtrate with sulphuric acid. Through the filtrate from the lead sulphate, pass hydrogen sulphide to precipitate any antimony; dissolve the antimony sulphide in the same sodium sulphide used for the main portion and determine the antimony electrolytically. If the lead is to be determined in the dry way, extract the antimony from the residue insoluble in sulphuric acid by direct treatment with tartaric and sulphuric acids; or, if zinc, iron, &c. are not to be determined, treat the contents of the decomposition flask, after addition of water, but before filtration, with tartaric acid. In most cases, by keeping the temperature of reaction of the sulphuric acid as low as possible, and cooling as quickly as possible after solution, the amount of antimony retained by the lead sulphate can be kept down to a negligible amount. (The antimony oxidises at the expense of the sulphuric acid, and is retained in the form of lead antimonate.) Calcium, iron, aluminium, and manganese are best determined in a separate portion—that which is treated with hydrochloric acid for the determination of the silica. If only zinc is to be determined, in an ore almost free from arsenic, antimony, bismuth, and cadmium the analysis can be shortened by adding to the mixture in the decomposition flask, after dilution with water and heating to boiling, some sodium thiosulphate; the sulphides of copper and silver which fall can be filtered off with the lead sulphate and gangue.

The method is especially convenient for the determination of small amounts of arsenic and antimony in ores rich in lead or iron; the precipitate of arsenic and antimony sulphides is so readily and quickly obtained. In such cases

ie washed precipitate is digested with ammonium carbonate, id the arsenic sulphide, after reprecipitation, boiled with ater till completely decomposed (½—1 hour with these nall amounts), and the solution (filtered if necessary) trated with hydrochloric acid and potassium bromate, or mmonium carbonate and iodine. For the determination of ydrogen sulphide metals in ores containing large amounts iron, the method is also very convenient, as a very short eating with sulphuric acid is enough for the decomposition this class of ores, no reduction of the iron is necessary, id there is no troublesome separation of sulphur on passing hydrogen sulphide.—J. T. D.

in; Determination of ——, *and its Separation from Antimony.* C. Ratner. Chem.-Zeit., **26**, [75], 873—874. (See this Journal, 1892, 461.)

CLARK'S method of separating tin from antimony gives astworthy results. Rössing has proposed to redissolve e precipitated antimony sulphide, and precipitate again th hydrogen sulphide in presence of oxalic acid, so as to move traces of tin carried down with the antimony; but e author finds that if the solution is sufficiently dilute 00—700 c.c. for 0·5 grm. of tin and antimony), and if ark's directions are faithfully carried out, the antimony ecipitate is quite free from tin.

But Clark's treatment of the filtrate (expulsion of drogen sulphide, and destruction of the whole 20 or 30 ms. of oxalic acid by permanganate, precipitation of the as sulphide, and conversion into dioxide) is very tedious; d Rössing's proposal (neutralisation of the oxalic acid th ammonia, addition of ammonium sulphide, precipitation the tin as sulphide by acetic acid, and conversion into oxide) scarcely less so. The author precipitates the tin zinc, as follows:—Boil off the hydrogen sulphide, place the liquid a compact fragment of pure zinc, and heat on uze over a small flame, not to boiling. After 20 minutes, t a few drops of the liquid for tin, and, if necessary, heat ger, till no tin remains in solution. Decant the liquid ough a small filter, on to which bring the zinc and hering deposited tin, then wash the contents of the filter into a small beaker (into which rinse also any metallic rticles from the large beaker), so that the total volume of uid is about 15 c.c. Add 10 c.c. of nitric acid, cover, and ow the reaction to proceed (accelerating or retarding by it or by dilution with cold water as may be necessary) the zinc is dissolved and the tin completely oxidised. ute with water to 40—50 c.c., heat cautiously, with ring, to boiling, allow to settle, and filter through the ne filter on which the metals were collected. Wash, dry, ite, and weigh. The metastannic acid is liable to pass ough the filter; the addition of ammonium nitrate to liquid lessens this tendency. Sometimes the zinc becomes ered with a glassy crust; but this seems to occur only er the tin is all precipitated, and does not affect the ults.—J. T. D.

oys; Determination of Platinum, Gold, and Silver n ——. P. A. E. Richards. Analyst, 1902, **27**, [318], 265—268.

s following methods were found to give the best ults:—

. Alloys containing Platinum and Silver only.—About grm. of the alloy was heated for about 15 minutes with c.c. of concentrated sulphuric acid, until the action had parently ceased. After thoroughly cooling, the acid was ured off from the platinum into a beaker containing er. The residue of metal was then treated with sulphuric d (5 c.c.) again and the acid poured off. The metal was ce washed with water, the washings being added to the er sulphate solution, and next with successive quantities water until free from acid. The platinum was then nsferred to a crucible, dried in the air-bath, and weighed. e silver was estimated by the sulphocyanide method.

Alloys containing Gold, Platinum, and Silver.—The y was treated with boiling sulphuric acid as above cribed, the residue of gold and platinum being washed, d, and weighed as a check. This residue was then lved in nitro-hydrochloric acid, concentrated to a small , and the platinum separated as ammonium platinum chloride. The gold in the filtrate was precipitated by ferrous sulphate, washed, dried, and weighed.

c. Alloys containing Gold, Platinum, Silver, and Tin.—The method used was that described under *b*, the silver in the acid solution being titrated, and the tin taken by difference. Heating the alloy in a current of chlorine also gave fair results, the tin chloride being volatilised and estimated by difference, as it was not found possible to collect it.—W. P. S.

Vanadium; Determination of ——. H. Cormimbœuf. Ann. Chim. anal. appl., **7**, 258—260. Chem. Centr., 1902, **2**, [7], 539.

THE publication of Truchot's method for the determination of vanadium (see this Journal, 1902, 991) has led the author to make known the process, an improvement of that of Roscoe, used by himself for many years. The vanadium is converted into an alkali vanadate, the aqueous solution of the latter filtered, the filtrate acidified with acetic acid and treated with lead acetate, whereby the vanadic acid is completely precipitated. The precipitate of lead vanadate is not of constant composition; it is filtered off through a weighed filter, washed well with water acidulated with acetic acid, dried at 100° C., and weighed. It is then detached from the paper, well pulverised, and an aliquot part dissolved in dilute nitric acid. The lead is precipitated as sulphate with sulphuric acid, filtered off, the filtrate evaporated to dryness, and the residue ignited in a weighed porcelain crucible, till all the sulphuric acid is expelled. Pure vanadic acid remains behind. The method is stated to be rapid, accurate, and comparatively simple.

The separation of ammonium vanadate from an ammonium chloride solution is very uncertain, unless certain definite limits of concentration are adhered to.—A. S.

Prussian Blue; Determination of ——, *in spent Gas-purifying Materials.* R. Schwartz. Chem.-Zeit., **26** [75], 874—875.

THE usual plan is to act on 50 grms. of the substance with caustic soda in a flask marked at 1,030 c.c., and to assume 30 c.c. as the volume of the undissolved residue; then to determine by appropriate methods the sodium ferrocyanide in an aliquot portion of the liquid. The author has modified the mode of extraction as follows, so that an ordinary litre flask can be used:—A wide-mouthed bottle of 100—150 c.c. capacity is fitted with a rubber stopper carrying two glass tubes; one, passing just through the stopper, is connected by a longer straight tube carrying rubber connections and screw pinchcocks at both ends, with a reservoir of water on a shelf above; the other, bent at right angles, reaches to the bottom of the bottle, and is expanded at the end, which is covered with fine brass or phosphor-bronze gauze, while the horizontal limb is connected, through a short rubber connection furnished with a screw pinchcock, with another right-angled piece, which enters the neck of a litre flask. The bottle is filled to a depth of 2 cm. with fine washed sand, to act as a filter; the weighed material is poured in a layer on the sand, the extracting liquid added, the cork tied down, the exit-tube closed by its pinchcock, and the liquid allowed to act for 1—2 hours at the room temperature, or for half an hour in the water-bath, under the pressure of the water column. Then the exit clamp is opened and the liquid allowed to filter slowly through into the litre flask, followed by wash-water to make up the litre. The flask is now removed and a portion of the succeeding wash-water tested for alkalinity and for ferrocyanides. Should it be necessary to continue the washing, a two-litre flask is used, and the contents of the litre flask are transferred to it. Should the wash-water not be alkaline, and should any doubt exist as to complete extraction, a bottle of soda-solution is substituted for the water-reservoir, and the process is carried on further.

The author prefers to determine the Prussian blue gravimetrically; the liquid is acidified, precipitated by ferric chloride, the precipitate allowed to settle, washed well with hot water, first by decantation and then on the filter, dried, ignited (the filter being separately incinerated), and the amount of Prussian blue calculated from the ferric oxide obtained (56 parts of ferric oxide = 86 of Prussian blue).—J. T. D.

ORGANIC—QUALITATIVE.

Anthracene; Detection of the Chief Impurities of ——. H. Behrens. Rec. trav. chim. Pays-Bas, **21**, 252—253. Chem. Centr., 1902, **2**, [7], 540.

For the detection of carbazole, the sample is extracted in the cold with acetic ester, the solution allowed to evaporate, and the residue transferred by the aid of a few drops of the same solvent to a watch-glass. On evaporation, the carbazole is left behind; when treated with a drop of nitrobenzene and phenanthraquinone, it yields characteristic, small, copper-coloured plates. Phenanthrene is detected by extracting with benzene and treating the evaporation residue of the extract with *a*-dinitrophenanthraquinone dissolved in nitrobenzene.—A. S.

ORGANIC—QUANTITATIVE.

Tannin; Determination of ——. G. Schweitzer. Collegium, 1902, **1**, [14], 114—116.

The author finds that in the analysis of quebracho extracts by the Vienna shake-method, using chromed hide-powder, 1 to 3 units per cent. more of soluble non-tannin are obtained than is the case if Freiburg hide-powder and the filter method are employed, the amount returnable as tannin being correspondingly low. The accuracy of his results was checked by duplicate analyses made in Vienna and in Freiburg by the two methods respectively. The apparent inference is that chromed hide-powder has a lower power of absorption, the alternative view held by Eitner that unchromed hide-powder absorbs a portion of non-tannin (*i.e.*, some of the tannin returned as such is in reality non-tannin) being too serious to entertain without strong proof.—R. L. J.

Caffeine; Determination of ——. André. Rep. de Pharm., 1902, 356. Chem. and Druggist, 1902, **61**, [1179], 388.

For the determination of caffeine in tea, &c., 10 grms. of the powdered sample are mixed with 10 grms. of magnesia and 10 c.c. of water; 100 c.c. of alcohol are then added, the mixture heated to boiling for a few minutes, allowed to stand and the clear liquid decanted. The process is repeated four times with 50 c.c. of alcohol. The mixed liquids are evaporated to 60 c.c., filtered and the filter washed with a little alcohol. The filtrate is evaporated to a syrup, the caffeine extracted with dilute hydrobromic acid, the acid solution filtered and heated with 50 c.c. of 10 per cent. solution of potassium bromide containing 5 per cent. of bromine. The precipitate produced has the composition $C_8H_{10}N_4O_2.HBr.Br_3$; it is redissolved in a large quantity of water, and the bromine set free and determined. From the amount of bromine found, the percentage of caffeine can be calculated.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Solutions: Colloidal ——. R. Zsigmondy. Zeits. f. Elektrochem., 1902, **8**, [36], 684—687.

The author has studied colloidal solutions with the aid of a microscopic method, not yet described, worked out by H. Siedentopf and himself. First examining gold glasses, he found that a colourless glass, showing only a slight cloudiness, contained all its gold in grains of which the diameter was about the wave-length of light. In a glass somewhat more cloudy, but still almost colourless, the gold particles were about one-fifth of the diameter of those previously mentioned. In other samples with red colour, the diameter of the gold particles was 20 $\mu\mu$ (1 $\mu\mu$ = 0·000001 mm.) and in others of deep red and violet colour it was 10 $\mu\mu$. But the colour is not a safe indication of the diameter of the gold particles. In liquids the existence of the suspended particles is similar to that in the glass, but in the former whilst the larger particles remain simply in suspension, the smaller particles are in active motion, of which the activity increases as the size diminishes. For instance, in the case of gold, the smallest particles partook of two motions, one of translation, by which they travelled through a space of from 100 to 1,000 times their own diameter in from $\frac{1}{6}$th to $\frac{1}{2}$th of a second, and one of vibration, of shorter period. Hence such a solution remains thoroughly mixed for weeks or, it may be, even for years. In other colloidal solutions there may be a similar variation in the sizes of the particles.

The use of deep red gold solution as a reagent for colloids (see this Journal, 1902, 192) has been extended, and it is found to be applicable to the examination of different substances obtained by the fractional precipitation of white of egg. For example, out of three similar samples of egg-albumin, two hindered the precipitation of gold, but in very different degrees, whilst the third actually precipitated the colloidal gold.—W. G. M.

Gold; The Liquid Hydrosol of —— [*Collodial Gold Solution*]. A. Gubier. Zeits. anorg. Chem., **31**, 448—450. Chem. Centr., 1902, **2**, [7], 502.

Zsigmondy (this Journal, 1898, 669, 767), by the reduction of dilute solutions of gold salts with formaldehyde, has obtained permanent collodial gold solutions of a deep purple-red colour, and has stated that by altering the experimental conditions, violet to blue solutions, which rapidly decompose, may form. Bredig has obtained, by an electrical method, stable solutions of collodial gold of both a ruby red and a blue colour. The author found that by the addition of hydrazine hydrate solution (1 : 2,000) to a perfectly neutral solution of gold chloride (1 : 1,000), pseudo solutions of gold can be obtained that are always coloured blue, and are characterised by great stability. An excess of the reducing agent must be avoided. The reduction is complete when the solution appears deep blue both in reflected and in transmitted light. Hydrazine hydrate acts in the manner described only in the cold and in extremely dilute solution. In concentrated solutions, and in the warm, gold separates immediately.—A. S

Arsenic Acid; Action of Boiling Hydrochloric Acid upon ——. O. Hehner. Analyst, 1902, **27**, [318], 268—271.

By distilling pure concentrated hydrochloric acid after adding 0·3 per cent. of arsenic acid, strong yellow colorations were obtained in all fractions of the distillate on the addition of hydrogen sulphide, even when potassium permanganate had been added before the commencement of the distillation. Boiling hydrochloric acid was also found to reduce ferric chloride. In these experiments the distillation flask was connected to the fractionating column and condenser by cork joints. When ground-glass connections were used, no formation of ferrous salt could be detected, nor could arsenic be found in the distillate by the hydrogen sulphide test. But plain indications of the presence of arsenic could be detected by the Marsh-Berzelius test. The author considers that this reduction was brought about by the atmospheric dust present, although every precaution had been taken to cleanse the flask, &c., and that in preparing acid free from arsenic, it is better to add a powerful reducing agent to drive off any arsenic present, and then to collect the distillate after thus removing the arsenic.

—W. P. S.

Acetic Acid with Nitric Acid; Compound of ——. A. Pictet and P. Genequand. Bull. Soc. Chim., **27**, [16], 863—867.

When nitric acid of sp. gr. 1·4 is added to acetic anhydride, or when fuming nitric acid of sp. gr. 1·52 is added to glacial acetic acid, a vigorous reaction occurs, with considerable evolution of heat. On fractionally distilling the product nearly the whole (if the proportions used are $2C_2H_4O_2$: HNO_3) comes over at 127·5—128° C., at 730 mm. pressure. The liquid so obtained has the composition $C_4H_9NO_7$, and its molecular weight determined cryoscopically in bromoform shows that this is its molecular formula, and that it is not a mixture of acetic and nitric acids. It is colourless, boils at 127·7° C. at 730 mm., or 45° C. at 17 mm. At 23° C. its density is 1·189, and its refractive index μ_D 1·38432. It mixes in all proportions with water, but in so doing is completely dissociated into nitric and acetic acids. The

me dissociation is produced by a temperature (138° C.) ry little above its boiling point. No salts derived from it ve yet been obtained; but the authors regard it as *acetyl nitric acid* $(CH_3CO)_2O_2N(OH)_3$, a derivative of tho-nitric acid $N(OH)_5$. It reacts on many organic mpounds, producing in some cases nitro or acetyl deriva-es, in others oxidation products. These products are ually different from those produced by nitric acid alone, d the frequently occurring difference between the results acting with nitric acid on a substance directly and in etic-acid solution are possibly explained by the preliminary rmation of diacetyl nitric acid.

Of the other acids of the acetic series, propionic seems to the only one which forms a corresponding derivative th nitric acid.—J. T. D.

etramethyl Ammonium; Electrolytic Production of ——. W. Palmaer. Zeits. f. Elektrochem., 1902, **8**, [38], 729—731.

XPERIMENTS in the direction of isolating ammonium by the ctrolysis of solutions of ammonium salts in liquid mmonia at low temperatures have failed, owing to the ontaneous decomposition of the NH_4 into ammonia and drogen. The author has tried to isolate tetramethyl mmonium by an analogous method, and has obtained a nsient blue colour at the cathode, exactly similar in pearance to the solution of sodium in fluid ammonia. It assumed that this blue liquid contains tetramethyl-mmonium dissolved in ammonia, and that it is rapidly acked by oxygen. All attempts to separate it from the ution have failed. The substance used was either the droxide (which could not be obtained quite free from loride) or the chloride; this was dissolved in pure mmonia and electrolysed with platinum electrodes in a war's double-walled vessel with the space between the lls exhausted. The temperature was −41° C. A pressure 30 volts yielded a current of 0·6 ampère when the ution was saturated. The blue colour was formed mediately, but its formation ceased when ammonium oride was formed by the agency of anode chlorine, this t being then electrolysed instead of the tetramethyl mmonium compound.—W. G. M.

ntiobiose; Action of Soluble Ferments and Top-fermentation Beer Yeast on ——. *Remarks on the Constitution of Gentianose.* E. Bourquelot and H. Herissey. Comptes Rend., 1902, **135**, [9], 399—401.

E action of soluble ferments upon gentianose having been died (this Journal, 1898, 592, and 1901, 386), the hors have now turned their attention to the hydrolysis gentiobiose (this Journal, 1902, 1159).

The liquid obtained from cultures of *Aspergillus* hydro-es gentiobiose completely, two molecules of glucose being med. Invertase has no action on gentiobiose. Emulsin lrolyses gentiobiose completely, but not gentianose. The ion of emulsin on gentianose has been further studied; er a long time the liquid develops slight cupric reducing perties and the dextro-rotation is slightly increased. nce the emulsin of almonds probably contains traces of enzyme capable of splitting gentianose into glucose and ugar of the nature of cane sugar.

Top-fermentation beer yeast neither hydrolyses nor fer-nts gentiobiose, and constitutes a convenient means for oving fructose from the impure hydrolytic products taining gentiobiose.

Constitution of Gentianose.—There are four polysac-rides known which are attacked by invertase: cane ar, raffinose, gentianose, and manneotetrose. In all se cases one molecule of fructose is split off. It is gested that only those polysaccharides, which contain a lecule of fructose united to a molecule of glucose in the ne way as in cane sugar, are attacked by invertase in s way, and that gentianose therefore contains the cane gar linkage. To hydrolyse gentianose completely (and bably all polysaccharides), several enzymes are necessary, this case, invertase and emulsin. The action of the two is not simultaneous, the emulsin cannot act until the invertase has split up the trisaccharide into fructose and gentiobiose.—J. F. B.

New Books.

The Electro-plating and Electro-refining of Metals. Being a New Edition of Alexander Watt's "Electro-deposition." Revised and largely re-written by Arnold Philip, A.R.S.M., &c. Crosby Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London, E.C. 1902. Price 12*s.* 6*d.*

8vo volume, containing frontispiece, prefaces, tables of contents, 660 pages of subject-matter, illustrated with 160 engravings, and indexes of subject-matter and authors. The work is divided into two parts: I. Electro-plating; II. Electro-Metallurgy. These are again subdivided under the following headings:—(i.) Primary and Secondary Batteries. (ii.) Thermopiles, Dynamos, &c. (iii.) History of Electro-deposition. (iv. to viii.) Electro-deposition of Copper. (ix. to xi.) Deposition of Gold by Simple Immersion. (xii.) Various Gilding Operations. (xiii.) Mercury Gilding. (xiv. to xvi.) Electro-deposition of Silver. (xvii.) Imitation Antique Silver. (xviii. to xx.) Electro-deposition of Nickel. (xxi.) Deposition and Electro-deposition of Tin. (xxii.) Electro-deposition of Iron and Zinc. (xxiii.) Electro-deposition of Various Metals. (xxiv. and xxv.) Electro-deposition of Alloys. (xxvi.) Recovery of Gold and Silver from Waste Solutions, &c. (xxvii.) Mechanical Operations connected with Electro-deposition. (xxviii.) Materials used in Electro-deposition. Two Appendixes on Electro-plating.

II. Electro-Metallurgy. (i.) Electro-metallurgy of Copper. (ii.) Cost of Electrolytic Copper Refining, &c. (iii.) Electrolytic Copper Refineries. (iv.) Electrolytic Gold and Silver Bullion Refining. (v.) Electrolytic Treatment of Tin. (vi.) Electrolytic Treatment of Lead. (vii.) Electrolytic Production of Aluminium and the Electrolytic Refining of Nickel. (viii.) Electro-galvanising.

The Chemistry of the Terpenes. By F. Heusler, Ph.D. Authorised Translation by Francis J. Pond, M.A., Ph.D., Assistant Professor in the Pennsylvania State College. J. and A. Churchill, 7, Great Marlborough Street, London. 1902. Price 17*s.*

8vo volume, containing dedication (to Prof. O. Wallach), prefaces, tables of contents, 435 pages of subject-matter, and the alphabetical index. The subject-matter is sub-divided as follows: — Introduction. Special Part. Hemiterpenes. Terpenes Proper. Hydrocarbons. I. Oxidised Compounds related to the Terpenes, $C_{10}H_{16}$. II. Compounds regarded as Derivatives of the Hydrocymenes. Amido-derivatives of the Terpenes. I. Bases regarded as Derivatives of the Hydrocymenes. II. Bases which may be regarded as Derivatives of the Hydrocymenes. Amido-derivatives of Phellandrene. Olefinic Members of the Terpene Series. Sesquiterpenes and Polyterpenes. Diterpenes. Triterpenes and Tetraterpenes.

The Analysis of Steel-Works Materials. By H. Brearley and F. Ibbotson. Longmans, Green, and Co., 39, Paternoster Row, London, E.C.; also New York and Bombay. 1902. Price 14*s.* nett.

This work, of 8vo size, contains dedication (to Dr. H. C. Sorby, F.R.S., &c.), preface, table of contents, and subject-matter filling 351 pages, an appendix giving a Bibliography of Steel-Works Analyses by N. Brearley, with preface, table of contents, and text extending from page 359 to 495. A general alphabetical index concludes the work. With regard to the contents of the body of this work, the sub-division is as follows:—I. Analysis of Steel. II. Analysis of Pig Iron. III. Analysis of Steel-making Alloys. IV. Rapid Analysis at the Furnace. V. Analysis of Ores. VI. Analysis of Refractory Materials (Acid Materials, Neutral

Materials, and Basic Materials). VII. Analysis of Slags. VIII. Analysis of Fuel. IX. Boiler Water, Boiler Scales, &c. X. Analysis of Engineering Alloys. XI. Micrographic Analysis of Steel. XII. Pyrometry. XIII. Miscellaneous Notes. There are 85 illustrations. With regard to the contents of the Bibliography of Steel-Works Analysis, these are subdivided as follows:—Carbon. Silicon. Manganese. Sulphur. Phosphorus. Chromium. Nickel. Cobalt. Tungsten. Molybdenum. Vanadium. Titanium. Aluminium. Copper. Iron.

Die Chemische Industrie des deutschen Reiches im Beginne des zwanzigsten Jahrhunderts. Eine Festschrift zum fünfundzwanzigjährigen Jubiläum der Begründung des Vereins zur Wahrung der Interessen der Chemischen Industrie Deutschlands. Von Dr. Otto N. Witt, Prof. der techn. Chemie an der königl. technischen Hochschule zu Berlin. 1877—1902. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schoenebergerstr. 26, Berlin, S.W. 1902. Price M. 10.

4to volume containing table of contents and introduction; with text, filling 229 pages. The subject-matter is treated under the following headings:—I. The Chemical Industry of Germany as a whole, its field of Operations and its Present Extent: A. Conditions of Existence and Extent. B. The German Chemical Industry and the World's Exhibitions. II. The German Chemical Industry in its Individual Sections: A. The Acids, Alkalis, and Salts, as also the Artificial Manures. B. The Industry of Chemical Preparations:—Inorganic: (1) Bromine and Bromine Compounds. (2) Iodine. (3) Sulphites, Thiosulphates, Hydrosulphites, and Sulphides; also Persulphates. (4) Phosphorus, Arsenic, and Antimony Compounds. (5) Boric Acid and Borax. (6) Water-glass. (7) Cyanogen Compounds and Derivatives. (8) Metallic Salts. Carbon Compounds: (1) Alcohol Preparations. (2) Preparations from the Aromatic Series. (3) Medicinal and Pharmaceutical Preparations, Alkaloids, and Drugs. (4) Photographic Preparations. The German Industry (Chemical Preparations) in the Paris Exhibition of 1900. C. The Glue and Gelatin Industry, also that of the Mineral and Pigment Colours. D. The Destructive Distillation Industry: (1) Distillation of Wood. (2) Distillation of Brown Coal. (3) Distillation of Coal. Statistical. E. Dyestuff Industry: (1) Present Condition. (2) Dyestuffs in the Collective Exhibition of German Chemical Industry in Paris, 1900. F. Perfumery Industry. Conclusion.

Die Chemische Industrie in der deutschen Zoll- und Handelsgesetzgebung des neunzehnten Jahrhunderts. Ein Beitrag zum Studium des deutschen Wirtschaftsgeschichte. Von Gustav Müller; Kaiserl. Geh. Regierungsrat und vortragender Rat im Reichsamt des Innern. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schönebergerstr. 26, Berlin, S.W. 1902. Price M. 24.

4to volume, with preface, table of contents, and subject-matter filling 422 pages, followed by an alphabetical index. The division of subjects is as follows:—I. Up to the Foundation of the Zollverein. (i.) Prussian Laws. (ii.) Bavarian Law. (iii.) Saxon Law. (iv.) Würtemberg Law. (v.) Bavarian-Würtemberg Law. (vi.) Baden Law. II. From the Foundation of the Zollverein to that of the German Empire. (i.) From 1834 to 1842. (ii.) From 1843 to 1853. (iii.) From 1853 to 1865. (iv.) From 1865 to 1870. (v.) Statistics of the Years 1832 to 1871. III. Since the Foundation of the German Empire. (i.) From 1871 to 1879. (ii.) From 1880 to 1891. (iii.) From 1891 to the Present Day. (iv.) Statistics from 1872 to the Present Day. An Appendix follows. The work closes with an alphabetical index.

Trade Report.

I.—GENERAL.

General Imports of the United Kingdom for the Years 1900–1.

Annual Statement of Trade, Aug. 1902.

B—Articles subject to Duty.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Beer and Ale: Mum, Spruce, or Black Beer, Berlin White Beer, and other similar preparations, Total..	Barrels. 1,416	Barrels. 1,424	£ 8,849	£ 8,90
Of other Sorts: Foreign Countries ..	51,546	54,662	144,524	154,78
British Possessions .	258	41	697	6
Total.....	51,804	54,703	145,221	154,85
Chloral Hydrate, Total .	Lb. 25,035	Lb. 35,972	5,658	3,99
Chloroform, Total	1,454	1,635	108	14
Cocoa or Chocolate, in the Manufacture of which Spirit has been used, Total	106,087	60,712	9,412	4,54
Collodion, Total	Galls. 1,203	Galls. 1,059	395	31
Ether: Acetic, Total.....	Lb. 5,294	Lb. 2,362	244	13
Butyric, Total	Galls. 1,354	Galls. 141	898	89
Sulphuric, Total	3,107	3,390	663	68
Ethyl: Bromide, Total	Lb. 43	Lb. 86	7	1
Chloride, Total	Galls. 449	Galls. 396	2 458	2,30
Iodide, Total	2	4	15	1
Soap, Transparent, in the Manufacture of which Spirit has been used, Total	Lb. 11,364	Lb. 9,404	511	5
Spirits: Rum:	Proof Galls.	Proof Galls.		
Foreign Countries ..	1,434,247	1,323,845	116,077	83,4
British Possessions .	4,762,300	5,368,756	366,451	424,5
Total	6,196,547	6,692,601	482,528	507,9
Rum, Imitation: Foreign Countries...	42,616	26,739	3,460	2,0
British Possessions..	18	112	10	
Total	42,634	26,851	3,470	2,0
Brandy: Foreign Countries ..	2,566,139	3,067,018	1,195,771	1,384,4
British Possessions .	30,126	14,507	10,036	4,1
Total	2,596,265	3,081,525	1,205,807	1,388,6
Geneva: Foreign Countries ..	413,023	431,317	66,331	65,7
British Possessions .	19	28	4	
Total	413,042	431,345	66,335	65,7
Unenumerated, not Sweetened: Foreign Countries ..	1,426,075	2,001,070	79,008	87,4
British Possessions .	3,835	924	808	5
Total	1,429,910	2,001,994	79,816	88,0

B.—Articles subject to Duty—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Spirits—*cont.*	Proof Galls.	Proof Galls.	£	£
Unenumerated, Sweetened or Mixed, Tested:				
Foreign Countries ..	94,875	103,892	191,391	203,142
British Possessions .	7,061	8,032	11,879	15,089
Total	101,936	111,924	203,270	218,231
Liqueurs, Cordials, &c., not Tested for ascertaining the Strength:	Galls.	Galls.		
Foreign Countries...	14,074	16,489	22,055	24,807
British Possessions .	1,136	126	1,318	162
Total	15,210	16,615	23,373	24,969
Perfumed:				
Foreign Countries ..	52,889	54,626	128,303	138,376
British Possessions .	701	586	1,123	973
Total	53,590	55,212	129,426	139,349
Sugar:				
Refined, or rendered by any Process equal thereto:				
In Lumps and Loaves:	Cwts.	Cwts.		
Foreign Countries ..	2,878,877	3,143,134	1,985,437	2,111,212
British Possessions .	..	21	..	16
Total	2,878,877	3,143,155	1,985,437	2,111,228
Other Sorts, including Sugar Candy:				
Foreign Countries ..	16,369,148	18,113,498	10,353,254	10,837,444
British Possessions .	162	193	310	162
Total.....	16,369,310	18,113,691	10,353,564	10,837,606
Refined:				
Foreign Countries ..	19,248,025	21,256,632	12,338,691	12,948,656
British Possessions .	162	214	310	178
Total	19,248,187	21,256,846	12,339,001	12,948,834
Unrefined, Beet:				
Foreign Countries ..	10,239,556	10,009,412	5,120,821	4,532,998
British Possessions .	..	26	..	10
Total	10,239,556	10,009,438	5,120,821	4,533,008
Unrefined, Cane, and other Sorts:				
Foreign Countries ..	1,617,517	1,833,101	907,706	881,031
British Possessions .	1,377,859	1,544,604	888,911	963,985
Total.....	2,995,376	3,377,705	1,796,617	1,845,016
Unrefined, Total:				
Foreign Countries ..	11,857,073	11,842,513	6,028,527	5,414,029
British Possessions .	1,377,859	1,544,630	888,911	963,995
Total	13,234,932	13,387,143	6,917,438	6,378,024
Molasses for Distillers' use in the Manufacture of Spirits, and other Molasses not distinguished as to Sweetening Matter:				
Foreign Countries ..	..	454,358	..	77,125
British Possessions .	..	1,567	..	293
Total	..	455,925	..	77,418
Molasses containing 70 % or more of Sweetening Matter:				
Foreign Countries ..	..	6,182	..	1,951
British Possessions .	..	193	..	43
Total	..	6,375	..	1,994
Molasses containing from 50 % to 70 % of Sweetening Matter:				
Foreign Countries ..	..	231,423	..	62,018
British Possessions .	..	66	..	45
Total	..	231,489	..	62,063

B.—Articles subject to Duty—cont.

Articles, and Countries whence Imported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Sugar—*cont.*	Cwts.	Cwts.	£	£
Molasses containing not more than 50 % of Sweetening Matter:				
Foreign Countries ..	..	387,936	..	71,513
British Possessions .	..	65	..	13
Total	..	388,001	..	71,526
Molasses, Total:				
Foreign Countries ..	1,335,418	1,706,403	343,373	364,376
British Possessions .	12,513	3,275	4,957	953
Total.....	1,347,931	1,709,674	348,130	365,329
Glucose, not distinguished as to Solid or Liquid, Total ..	..	154,040	..	66,538
Glucose, Solid:				
Foreign Countries ..	..	298,650	..	143,905
British Possessions .	..	23,912	..	12,120
Total	..	322,562	..	156,025
Glucose, Liquid:				
Foreign Countries ..	..	341,215	..	153,866
British Possessions .	..	8,473	..	3,806
Total.....	..	349,688	..	157,672
Glucose, Total of:				
Foreign Countries ..	1,774,432	1,449,208	718,868	629,828
British Possessions .	68,070	48,096	26,710	22,122
Total	1,842,502	1,497,304	745,578	651,950
Saccharin (including Substances of a like Nature or Use, Total.....	..	Oz. 514,822	..	24,770
Articles containing Sugar or other Sweetening Matter:				
Blacking, containing Sugar or other Sweetening Matter, not distinguished as to Solid or Liquid, Total ..	..	Cwts. 2	..	3
Blacking, Solid, containing Sugar or other Sweetening Matter, Total.....	..	215	..	572
Blacking, Liquid, containing Sugar or other Sweetening Matter, Total.	..	107	..	226
Caramel, Solid, Total	..	2	..	7
Caramel, Liquid, Total	..	13,591	..	10,605
Cattle Foods, containing Molasses or other Sweetening Matter, Total.	..	2,510	..	733
Tea, for the Manufacture of Caffeine, Total .	Lb. 714,991	Lb. 728,903	4,987	6,232
Wine:				
Total of all Kinds:	Galls.	Galls.		
Foreign Countries ..	15,966,278	15,790,952	5,039,170	4,799,988
British Possessions .	837,551	755,254	153,739	131,347
Total.....	16,803,829	16,546,206	5,192,909	4,931,335

B.—Articles subject to Duty—cont.

Degrees of Polarisation of Sugar Imported liable to Duty.		Quantities.		Quantities.	
		1900.	1901.	1900.	1901.
Sugar, Refined:		Lumps and Loaves.		Other Sorts.	
Exceeding	and not exceeding	Cwts.		Cwts.	
77°	98°	..	185	..	7,509
98°	..	..	1,951,968	..	10,944,184
Total, Refined ..		..	1,952,153	..	10,951,693
Sugar, Unrefined:		Beetroot.		Cane and other Sorts.	
Not exceeding	76°	..	Cwts. 199	..	Cwts. 219,629
Exceeding	and not exceeding				
76°	77°	..	3	..	3,068
77°	78°	..	3	..	4,865
78°	79°	..	12	..	13,086
79°	80°	..	13	..	204,195
80°	81°	..	49	..	27,155
81°	82°	..	174	..	22,934
82°	83°	..	60	..	65,777
83°	84°	..	72	..	43,787
84°	85°	..	140	..	234,314
85°	86°	..	147	..	80,542
86°	87°	..	6,925	..	31,720
87°	88°	..	6,694	..	59,436
88°	89°	..	16,924	..	41,061
89°	90°	..	40,403	..	49,835
90°	91°	..	313,311	..	90,836
91°	92°	..	568,882	..	49,220
92°	93°	..	307,650	..	83,790
93°	94°	..	872,669	..	93,579
94°	95°	..	1,041,843	..	45,769
95°	96°	..	636,199	..	108,796
96°	97°	..	155,015	..	221,106
97°	98°	..	141,101	..	220,398
98°	..	..	212,582	..	128,208
Not tested.....		..	20,567	..	2,746
Total, Unrefined		..	4,141,637	..	2,145,942

Articles subject to Duty upon Importation. Quantities Entered for Home Consumption in 1900–1, and Rates of Duty.

Article.	Year.	Quantity Entered for Home Consumption.	Duty. Gross Amount Received.	Duty. Rate, and when Imposed.
Beer and Ale:		Barrels.	£	
Mum and Spruce.....	1900	1,442	2,636	1*l.* 12*s.* and 1*l.* 17*s.* 6*d.* per barrel of 36 gallons, according to the specific gravity of the worts. 6th March 1900.
	1901	1,121	2,665	
Other Sorts..	1900	50,405	19,881	2*s.* per barrel of 36 gallons, and so on in proportion to the specific gravity of the worts from 1.055°. 6th March 1900.
	1901	53,168	21,280	
		Lb.		
Chloral Hydrate..	1900	22,218	1,456	1*s.* 4*d.* per lb. 6th March 1900.
	1901	23,961	1,597	
Chloroform	1900	4	1	3*s.* 3*d.* per lb. 6th March 1900.
	1901	235	38	
		Galls.		
Collodion	1900	3	4	1*l.* 6*s.* 3*d.* per gall. 6th March 1900.
	1901	3	4	
Confectionery, in the Manufacture of which Spirit has been used.....		Lb.		
	1900	235,396	490	½*d.* per lb. 26th Feb. 1893.
	1901	83,035	173	Ditto to 18th April 1901.

B.—Articles subject to Duty—cont.

Article.	Year.	Quantity Entered for Home Consumption.	Duty. Gross Amount Received.	Duty. Rate, and when Imposed.
Ether:		Lb.	£	
Acetic	1900	3,998	380	1*s.* 11*d.* per lb. 6th March 1900.
	1901	1,967	188	
		Galls.		
Butyric.....	1900	885	716	16*s.* 5*d.* per gall. 6th March 1900.
	1901	450	570	
Sulphuric....	1900	101	137	1*l.* 7*s.* 5*d.* per gall. 6th March 1900.
	1901	124	170	
Ethyl:		Lb.		
Bromide	1900	43	2	1*s.* 1*d.* per lb. 6th March 1900.
	1901	79	4	
		Galls.		
Chloride	1900	427	344	16*s.* 5*d.* per gall. 6th March 1900.
	1901	375	307	
Iodide	1900	2	2	14*s.* 3*d.* per gall. 6th March 1900.
	1901	4	3	
Soap, Transparent, in the Manufacture of which Spirit has been used..	1900	9,747	122	3*d.* per lb. 8th March 1880.
	1901	8,451	106	
Spirits:		Proof Galls.		
Rum.....	1900	4,416,555	2,468,035	11*s.* 4*d.* per proof gall. 6th March 1900. 1*s.* additional when imported in bottle. 13th May 1899.
	1901	4,356,227	2,468,478	
Rum, Imitation.....	1900	44,216	24,670	11*s.* 4*d.* per proof gall. 6th March 1900. 1*s.* additional when imported in bottle. 13th May 1899.
	1901	29,959	16,984	
Brandy	1900	2,623,357	1,495,633	11*s.* 4*d.* per proof gall. 6th March 1900. 1*s.* additional when imported in bottle. 13th May 1899.
	1901	2,514,139	1,449,041	
Geneva	1900	360,044	212,304	11*s.* 4*d.* per proof gall. 6th March 1900. 1*s.* additional when imported in bottle. 13th May 1899.
	1901	379,968	225,755	
Unenumerated, not Sweetened.	1900	1,225,613	687,669	11*s.* 1*d.* per proof gall. 6th March 1900.
	1901	1,456,184	825,211	
Methylated in Bond	1900	61,708	1,028	4*d.* per gall. Differential duty. 5th April 1881.
	1901	380,555	6,342	
Unenumerated, Sweetened (Tested)...	1900	94,713	56,960	11*s.* 4*d.* per proof gall. 6th March 1900. 1*s.* additional when imported in bottle. 13th May 1899.
	1901	101,284	61,890	2*d.* additional to the above duty in respect of the sugar used therein. 19th Aug. 1901.
Liqueurs, Cordials, &c., not tested for ascertaining the strength	1900	Galls. 3,787	3,058	16*s.* 4*d.* per gall. 6th March 1900.
	1901	4,118	3,352	
Perfumed....	1900	40,956	38,541	18*s.* 1*d.* per gall. 6th March 1900. 1*s.* additional when imported in bottle. 13th May 1899.
	1901	40,837	38,674	

Articles subject to duty upon Importation. Quantities Entered for Home Consumption in 1900–1, *and Rates of Duty*—continued.

Article.	Year.	Quantity Entered for Home Consumption.		Duty. Gross Amount Received.		Duty. Rate, and when Imposed.
		Lumps and Loaves. Cwts.	Other Sorts and Candy. Cwts.	Lumps and Loaves. £	Other Sorts and Candy. £	
Sugar:						
Refined:						
Of a polarisation exceeding 98°	1901	1,883,331	10,705,100	392,369	2,230,221	4s. 2d. the cwt. 19th April 1901.
Other degrees.....		..	4,366	..	751	
		Beetroot. Cwts.	Cane and other Sorts. Cwts.	Beetroot. £	Cane and other Sorts. £	
Unrefined:						
Of a polarisation not exceeding 76°		74	122,101	7	12,207	2s. the cwt. 19th April 1901.
Exceeding 76° and not exceeding 77°		..	2,129	..	220	2s. 0·8d. the cwt. 19th April 1901.
„ 77° „ „ 78°		..	1,771	..	189	2s. 1·6d. „ „ „
„ 78° „ „ 79°		12	11,775	2	1,295	2s. 2·4d. „ „ „
„ 79° „ „ 80°		13	149,204	2	16,910	2s. 3·2d. „ „ „
„ 80° „ „ 81°		19	12,511	2	1,450	2s. 4d. „ „ „
„ 81° „ „ 82°		174	18,252	21	2,199	2s. 4·8d. „ „ „
„ 82° „ „ 83°		60	40,804	7	5,045	2s. 5·6d. „ „ „
„ 83° „ „ 84°		71	29,691	9	3,773	2s. 6·5d. „ „ „
„ 84° „ „ 85°		140	188,463	18	24,657	2s. 7·4d. „ „ „
„ 85° „ „ 86°		147	72,683	20	9,782	2s. 8·3d. „ „ „
„ 86° „ „ 87°		6,925	28,100	956	3,195	2s. 9·2d. „ „ „
„ 87° „ „ 88°		6,228	55,427	887	7,898	2s. 10·2d. „ „ „
„ 88° „ „ 89°		15,320	31,060	2,230	4,555	2s. 11·2d. „ „ „
„ 89° „ „ 90°		39,462	40,433	5,985	6,132	3s. 0·1d. „ „ „
„ 90° „ „ 91°		307,230	58,473	48,185	9,162	3s. 1·6d. „ „ „
„ 91° „ „ 92°		353,253	36,607	57,091	5,918	3s. 2·8d. „ „ „
„ 92° „ „ 93°		294,869	14,346	49,130	2,391	3s. 4d. „ „ „
„ 93° „ „ 94°		849,810	50,177	145,877	8,614	3s. 5·2d. „ „ „
„ 94° „ „ 95°		1,002,734	32,193	177,088	5,688	3s. 6·4d. „ „ „
„ 95° „ „ 96°		607,534	58,080	110,334	10,551	3s. 7·6d. „ „ „
„ 96° „ „ 97°		141,157	103,926	26,348	19,399	3s. 8·8d. „ „ „
„ 97° „ „ 98°		105,001	116,612	20,118	22,344	3s. 10d. „ „ „
„ 98°		231,418	80,058	48,140	16,640	4s. 2d. „ „ „
		3,961,651	1,349,976	692,457	200,214	
Total Unrefined		5,311,627		892,671		
Deduct exported on drawback		473,187		82,431		
Retained for H.C.		4,838,440		810,240		

Article.	Year.	Quantity Entered for Home Consumption.	Gross Amount Received.	Duty. Rate, and when Imposed.
Sugar:		Cwts.	£	2s. per cwt. 19th April 1901. 2s. 9d. per cwt. If containing 70 per cent. or more of sweetening matter. 11th June 1901.
Molasses.....	1901	660,979	50,877	2s. per cwt. If containing less than 70 per cent. and more than 50 per cent. of sweetening matter. 11th June 1901. 1s. per cwt. If containing not more than 50 per cent. of sweetening matter. 11th June 1901.
Glucose.....	1901	802,290	89,994	1s. 8d. per cwt. 19th April 1901. 2s. 9d. per cwt. Solid. 11th June 1901. 2s. per cwt. Liquid. 11th June 1901.
Saccharin.....	1901	Oz. 356,717	22,295	1s. 3d. per oz. 19th April 1901.
Packing, containing Sugar or any other Sweetening Matter	1901	Cwts. 342	17	2s. per cwt. 31st May 1901. 1s. per cwt. Liquid (together with the duty on any spirit contained therein). 2nd Aug. 1901. 1s. per cwt. Solid. 2nd Aug. 1901.
Caramel	1901	13,294	2,003	4s. 2d. per cwt. Solid. 4th July 1901. 3s. per cwt. Liquid. 4th July 1901.
Cattle Foods, containing Molasses or other Sweetening Matter	1901	2,155	109	1s. per cwt. 4th July 1901.
Tax of Wine of all Kinds...	1900	15,880,382	1,594,140	s. d. Not exceeding 30° of proof spirit ..... 1 0 per gall. 15 Aug. 1886. „ „ „ „ ..... 1 3 „ 14 April 1899. Exceeding 30° but not exceeding 42° of proof spirit ..... 2 6 „ 15 Aug. 1886. „ „ „ „ ..... 3 0 „ 14 April 1899. And for every degree or part of a degree beyond the highest above charged, an additional duty of ..... 0 3 „ 15 Aug. 1886.
	1901	15,280,578	1,430,520	In addition to the duty in respect of alcoholic strength :— s. d. Still wine imported in bottle 1 0 per gall. 14 April 1899. Sparkling wine in bottle ... 2 0 „ 12 „ 1892. „ „ „ „ ... 2 6 „ 14 „ 1899.

Import Trade of the Transvaal.

Transvaal Government Gazette, Aug. 15. 1902.

Articles.	Six Months ended June 1901.	Six Months ended June 1902.
	£	£
Metals and manufactures	52,000	948,000
Leather and manufactures	87,000	206,000
Drugs and chemicals	26,000	159,000
Beverages	46,000	165,000
Groceries and oilmen's stores (including paints).	58,000	113,000
Soap and candles	39,000	70,000

The above figures do not include free importations for the use of the Government or military and public stores.

Chemical Imports of the United States.

Foreign Office Annual Series, No. 2890.

The value of the imports of chemicals, in 1901, amounted to 57,723,336 dols., being an increase of 7¾ per cent. over 1900. The most important increases were—

	Quantity.	
	1900.	1901.
	Lb.	Lb.
Glycerin	20,369,712	28,576,400
Bleaching powder	110,960,523	130,251,696
Potassium chloride	135,956,222	136,893,771
Ground sumach	7,339,606	9,182,917

II.—FUEL, GAS, AND LIGHT.

Coal and Coalfields of South Africa.

Bd. of Trade J., Sept. 11, 1902.

In Cape Colony there are numerous coal-mines, the largest being the Indwe Mine, which furnishes about half the total output of the Colony. In Natal, the coalfields are situated north of a line drawn east and west, about 12 miles north of Ladysmith, the principal producing mines being the Dundee Collieries, Natal Navigation Collieries, those of the St. George's Colliery Co., the Elandslaagte Collieries, and the Natal Marine Collieries. The following are some analyses of Natal coals :—

	Fixed Carbon.	Volatile Matter.	Sulphur.	Ash.	Moisture.
Dundee coal, No. 1	70·53	16·63	4·18	12·41	0·44
„ No. 2	71·85	9·37	3·83	12·09	1·56
Newcastle	60·94	31·20	0·74	6·23	1·63
Navigation Collieries :					
No. 1 top seam	80·98	8·44	1·64	8·38	0·56
No. 1 bottom seam.	80·37	9·59	1·72	7·70	0·52
No. 2 top seam	76·37	14·67	1·37	8·30	0·66
No. 2 bottom seam.	71·59	15·17	1·30	12·71	0·53

Official trials, communicated to the Cape Government Commission on Railway Coal, show that the following are the amounts (in tons) of the South African coals required to do the same work as 1 ton of Welsh coal (Ocean Merthyr) :—Viljoen's Drift (Vereeniging), 1·562 ; Indwe, 1·634 ; Cyphergat, 1·729 ; Wallsend (Cape Colony), 1·502 ; and Molteno, 1·706 ; and on the same basis, Natal coal has been estimated at 1·102 tons. Welsh coal and Viljoen's Drift coal are those principally used for locomotive purposes, but in some parts of the Colony an admixture of colonial coal, or colonial coal alone, is used with economical advantage.

In Rhodesia, extensive coal deposits have been found, and, as the coal lies within 40 ft. of the surface, it will be worked by means of inclines instead of shafts.

The output of the Cape collieries, in 1898, was 191,8 tons ; that of Natal, for 1898, was 387,811 tons, and for 19 569,200 tons. The largest markets for coal in South Afr are furnished by the Rand goldfields, the bunkering tr of Durban, and the Government railways.—H. B.

III.—TAR PRODUCTS, PETROLEUM, Etc

Petroleum in Germany.

Chem.-Ind. ; through Petroleum Review, Sept. 20, 190

The consumption of petroleum during the last few ye has considerably increased. Germany imported 9,227,0 metric centners of lamp oil, in 1900, paying a tax f 2,700,000*l.* sterling, and valued at about 4,500,000*l.* Te price has risen by about 50 per cent. in Germany, and i makes it desirable that Germany should depend, if possi , on home supplies, and refine her own crude oil. Ts refining would supply oils for lubrication and pow production, as well as illuminating-oil. The new Gerı tariff does not offer any encouragement of the developm t of German petroleum.

Russia competes with the United States on the Gerı market. The following table shows the changes in e American and Russian production of crude petroleum the last decade :—

	Metric Centners.	
	United States.	Russia.
189	60,485,930	39,795,100
1895	69,817,800	70,565,370
1896	80,467,680	71,062,200
1897	79,827,080	78,316,360
1898	73,080,790	82,264,380
1899	75,549,280	89,610,670
1900	83,292,790	98,338,200

Galicia and Roumania also produce increasing quant s of petroleum.

The German production of petroleum is very small. n 1900, Alsace produced 225,960 metric centners (147,88 of them at Pechelbronn). The above table shows that ıe Russian production has overtaken that of the States, it crude American oil yields about 75 per cent. of lamp l, as against 35 per cent. from Russian, so that America ll far surpasses Russia in the amount of lamp-oil produd. On the other hand, exactly the reverse is the case as reg ls petroleum for lubricating and other non-illumina g purposes.

Petroleum has been found in the Rhine Valley, ch ly on the left bank of the stream, and along the slope of ıe Vosges Mountains. The chief place of productio is Pechelbronn, in Alsace. The oil has been traced to ıe neighbourhood of Altkirch, in Upper Alsace.

Recently, explorations have been made for petrol m in the alluvial flats of the Rhine Valley, near Kandel n the Landau-Lauterburg Railway. Two borings have en put down near Buchelburg, and have yielded petrol n vapour and traces of the liquid product. In one bo g the gas burst out in the night of Dec. 11, 1900, at a d h of 300 yards, and with such force that there was no ıe to remove any lights. In consequence the gas was id, and the boring plant was reduced to ashes and scrap. ıe flame from the opening was several yards high, an it was two days before it could be put out. Some of ıe gas was then collected and analysed, with the follo g results :—

	Percentages per Volum	
	I.	II.
Marsh gas	79·6	79·3
Ethylene	3·7	2·9
Oxygen	2·3	2·7
Nitrogen	14·4	14·6

The gases obtained at Pechelbronn have practically the ne constitution, and borings are being proceeded with. The sources of petroleum, so far known, show signs that y may become exhausted before the coalfields.

Petroleum Deposits of Mexico.

Bd. of Trade J., Sept. 25, 1902.

In a report recently made to the Mexican Government, s stated that there is a larger extension of paying oil-ings in Mexico than in any other part of the world. The o oil-currents which flow through the Republic, one down Pacific coast and the other down the Atlantic coast, ne together below the Isthmus of Tehuantepec and form ubterranean deposit, with a much larger extension than oilfields of Pennsylvania, whilst there are more oil eepages" to be found in this section than in any other own part of the world, and more subterranean deposits n even those in the Caspian Sea in Russia.

IX.—*BUILDING MATERIALS, Etc.*

Mine-Timber Preservation in Germany.

U.S. Cons. Reps., Sept. 17, 1902.

A series of experiments was recently carried out at the tenburg Colliery, near Saarbrücken, Germany, with lime, , and carbolineum, to determine the respective value reof as preservatives of mine-timber against rot. Lime s found to be of the least value, whilst coal-tar, although uring perfect preservation of the surface of the timber, led to protect the interior. Carbolineum, however, gave cellent results, provided the timber coated had been viously barked and well dried.

X.—*METALLURGY.*

Mineral Production of Western Australia.

Bd. of Trade J., Sept 18, 1902.

The following table shows the quantity and value of erals produced in Western Australia in the years 1900 1901 :—

	1900.		1901.	
	Quantity.	Value at the Mines.	Quantity.	Value at the Mines.
	Statute Tons.	£	Statute Tons.	£
k tin	823	56,702	734	40,000
	118,410	54,835	117,836	68,561
per ore	6,185	43,673	10,157	75,246
stone	12,251	9,258	20,569	13,246
d ore	268	533	9	109
estone	15,927	3,594	18,210	4,348
a (exported)	..	3	..	..

Mercury Production in the United States.

Eng. and Mining J., Sept 19, 1902.

The production of mercury in the United States, during 1, is reported, by the Geological Survey, as amounting 9,727 flasks of 76½ lb., valued at 1,382,305 dols., as com-ed with 28,317 flasks, valued at 1,302,586 dols., in 1900; increase in quantity of 1,410 flasks, and in value of 719 dols. To the total production, during 1901, Cali-nia contributed 26,720 flasks, Texas, 2,932 flasks, and gon, 75 flasks; and of the 26,720 flasks of mercury duced in California, 20,950 flasks were received at San ncisco, the remainder being shipped East.

There was very little variation at San Francisco, during 1, in the price of mercury, which ranged from 46 dols. to dols. per flask, for home consumption, and from 44 dols. 5 dols. per flask, for export.

XVI.—*SUGAR, STARCH, Etc.*

Sugar Exports of Belgium.

Foreign Office Annual Series, No. 2901.

The most noticeable decrease is that in the exportation of raw sugar from Belgium to the United Kingdom. It is partly accounted for by the alteration of official values, which alone produced a diminution of 155,800*l.*, but the quantity exported actually fell from 109,635 tons, in 1900, to 95,818 tons, in 1901. The large exports, in 1899 and 1900, shown in the next table, may, however, have been in anticipation of the abolition of bounties.

Exports of Raw Sugar from Belgium to the United Kingdom.

Year.	Quantity.	Value.
	Tons.	£
1899	100,305	978,360
1900	109,635	1,069,360
1901	95,818	778,800

XIX.—*PAPER, PASTEBOARD, Etc.*

Paper and Pulp Exports of Finland (Russia).

Foreign Office Annual Series, No. 2897.

The following figures show a satisfactory increase of paper and pulp exported, as of the articles made therefrom :—

Articles.	Value in 1,000 Marks = 40*l.*	
	1900.	1901.
Pulp articles	500	1,118
„ and paper articles	225	238
Pulp	1,107	1,196
Paper	647	1,386

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 20,102. Mac Farlane. Centrifugal machines. Sept. 15.

„ 20,108. Forsyth. Automatic apparatus for counting and registering casks or barrels. Sept. 15.

„ 20,147. Ordway. Vacuum evaporating-apparatus.* Sept. 15.

„ 20,223. Winter. Devices for distinctly separating the different discharges of fluids in centrifugal apparatus. Sept. 16.

„ 20,303. Lewicki. Method or process for the revivification of filtering materials. Sept. 17.

„ 20,356. Calmant. Process and apparatus for distilling.* Sept. 18.

[A.] 20,480. Jenkins. Melting-apparatus for easily fusible substances. Sept. 19.

„ 20,507. Lenhardtson. Refrigerating-apparatus.* Sept. 19.

„ 20,626. Niethammer. Pulp-beating machines. Sept. 22.

„ 20,853. McPhail. Apparatus for superheating or drying steam. Sept. 24.

„ 20,968. Lindberg. Centrifugal separators. Sept. 26.

„ 21,053. MacFarlane. Self-balancing centrifugal machines. Sept. 27.

[C.S.] 18,874 (1901). Berry and A. Boake, Roberts, and Co., Ltd. Finings. Sept. 24.

„ 642 (1902). Newcomb. Method and means for generating superheated steam or vapour. Oct. 1. Rights under Patents Act, 1901, not granted.

„ 5015 (1902). Untiedt. Boiling-, evaporating-, and distilling-apparatus. Sept. 24.

„ 6096 (1902). Freeman and Freeman. Apparatus for separating substances of different size or specific gravity. Sept. 24.

„ 13,150 (1902). Heiliger. Means or appliance for starting crystallisation in thermophores. Sept. 24.

„ 15,348 (1902). Bergner. Cans for containing inflammable liquids. Oct. 1.

„ 15,401 (1902). Lichtenberg. Spouts for vessels containing explosive liquids. Oct. 1.

„ 17,253 (1902). Eckert. Water-proof acid-resisting and electrically non-conducting glove. Sept. 24.

II.—FUEL, GAS, AND LIGHT.

[A.] 20,152. Evans (Johnstone). Liquid-fuel burners. Sept. 15.

„ 20,199. Brockie. Construction of electric-arc lamps. Sept. 16.

„ 20,212. Holmes (Guldlin). Method of treating coal-gas to prevent loss of illuminants. Sept. 16.

„ 20,215. Thwaite. Utilisation of the volatile effluent gases from coke-ovens. Sept. 16.

„ 20,234. Cotton. Utilisation of carbonaceous liquids as fuel.* Sept. 16.

„ 20,242. Offenberg. Incandescent mantles.* Sept. 16.

„ 20,281. Beard and Mackie. Gas-detecting attachment for miners' safety lamps.* Sept. 17.

„ 20,422. Lässoe and Lovekin. Apparatus for supplying oil and air in condition to be burned for heating purposes.* Sept. 18.

„ 20,554. Ducellier. Acetylene gas-generators. Sept. 20.

„ 20,582. Chubb. Apparatus for the generation, condensation, and storage of acetylene, &c. Sept. 20.

„ 20,619. O'Brien. Composition for improving the illuminating power, and destroying the smell and smoke of burning oils or gas. Sept. 22.

„ 20,669. Boult. (Köneman). Artificial fuel briquettes, and method of manufacturing the same.* Sept. 22.

„ 20,670. Boult (Köneman). Manufacture of artificial fuel.* Sept. 22.

„ 20,688. Russell. Carburettor for petrol- or spirit-engines, &c. Sept. 23.

„ 20,718. Johnson. Gas-machines.* Sept. 23.

„ 20,761. Stocss. Chimneys for incandescent gas-burners. Sept. 23.

„ 20,804. Herriot. Furnaces for the combustion of pulverulent fuels. Sept. 24.

[A.] 20,810. Groves. Automatic cone-syphon acetyle gas-generator. Sept. 24.

„ 20,826. McNally. Material for use in purifyi acetylene gas. Sept. 24.

„ 20,839. Schlickeysen. Process for the manufacti of peat-fuel.* Sept. 24.

„ 20,893. MacCallum. Producing high-pressure co bustion gases, and apparatus therefor. Sept. 25

„ 20,895. Anderson. Acetylene gas-generator Sept. 25.

„ 20,919. Hatfield and Lewis. Composition for he ing, &c., purposes, a method of preparing t same and one of its ingredients, and appara for the utilisation of the said composition. Sept. 2

„ 20,939. Quartermaine and Knight. Incandesc glow-lamp. Sept. 26.

„ 20,972. Gell. Regenerative incandescent-mar burners. Sept. 26.

„ 20,984. Little and Little. Coke-conveyers. Sept.

„ 21,012. Haddan (Wolff and Co.). Incandesc gas-burners. Sept. 26.

„ 21,014. Dougall and Godwin. Manufacture of g Sept. 26.

„ 21,054. Bartlett. Acetylene gas-generators, plicable as lamps.* Sept. 27.

„ 21,194. Elb. Process of manufacturing porous cok charcoal bricks.* Sept. 27.

[C.S.] 12,432 (1901). Hooker. Apparatus for regulati the supply of combustible vapour or gas burners. Sept. 24.

„ 18,502 (1901). Froment. Electric-arc lam Sept. 24. International Application, Feb. 1901.

„ 19,230 (1901). British Thomson-Houston Co., L (Fish). Electric-arc lamps. Sept. 24.

„ 20,278 (1901). Suggate. Incandescent gas-burne and fittings for the same. Sept. 24.

„ 20,998 (1901). Geille. Muffle-furnaces. Sept. 2

„ 21,615 (1901). Koblenzer. Manufacture of inc descent gas-mantles. Sept. 24.

„ 21,665 (1901). Hopkins. Construction and p duction of the terminals of electric glow-la sockets, and their fitting to and insulation fr the casing of the said sockets. Sept. 24.

„ 21,936 (1901). Goulden and Johnson. Gas-ret drawing machinery. Oct. 1.

„ 22,102 (1901). Hislop. Regenerative settings gas-, &c., retorts. Oct. 1.

„ 22,131 (1901). Humphrey. Centrifugal-appara for purifying gases. Sept. 24.

„ 22,349 (1901). Schill. Manufacture of gas, a apparatus employed in such manufacture. Sept.

„ 23,260 (1901). Schild. Process of manufactur coal or the like fuel-cakes. Sept. 24.

„ 23,945 (1901). Star Patent Fuel Co., Ltd., a Heath. Apparatus for use in the manufacture artificial fuel. Oct. 1.

„ 25,265 (1901). British Thomson-Houston Co., L (Fish). Electric-arc lamps. Sept. 24.

„ 8779 (1902). Guigue (Borrelly). Acetylene g producing apparatus. Oct. 1.

„ 12,878 (1902). Haddan (Akt.-Ges. f. Fabrikat von Broncewaaren and Zinkguss vorm. J. C. Sp und Sohn). Incandescent gas-burners. Sept.

„ 12,091 (1902). Rankin, Betts, Carsley, and Lon dorf. Furnaces and combustion-enhancing devi for steam-generators, wherein the furnace is c posed in a flue in the boiler. Sept. 24.

[C.] 13,541 (1902). Bracklow, Timm, and Bünz. Smoke-consuming-apparatus for boilers or furnaces. Sept. 24.

14,560 (1902). Francisco and Eden. Smoke-consuming and fuel-saving in furnaces. Sept. 24.

15,243 (1902). Gröuberg. Furnaces. Sept. 24.

17,006 (1902). Schwab and H. Greene and Sons, Ltd. Apparatus for lighting gas-burners. Sept. 24.

17,145 (1902). Jeavons. Vaporising trough for vapour-burners. Sept. 24.

17,776 (1902). McBride and McBride. Composition for promoting the combustion of coals and preventing black smoke issuing therefrom. Sept. 24.

17,903 (1902). Vaurs. Apparatus for carburetting air in explosion motors. Sept. 24.

17,913 (1902). Green. Arc electric-lamps. Sept. 24.

18,658 (1902). Milne. Composite peat-blocks. Oct. 1.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[. 20,356. Calmant. *See under* I.

C] 10,423 (1902). Hermes. Process for the production of artificial asphalt. Sept. 24.

I —COLOURING MATTERS AND DYESTUFFS.

[. 20,125. Read Holliday and Sons, Ltd., Dean, and Turner. Manufacture of colours containing sulphur. Sept. 15.

. 20,185. Johnson (Badische Anilin und Soda Fabrik). Manufacture and production of halogen substituted leuco-compounds, and colouring matters of the indigo series. Sept. 16.

, 20,375. Abel (Act. Ges. f. Anilinfabr.). Manufacture of new polyazo dyestuffs. Sept. 18.

, 20,577. Imray (Farbenfabr., Höchst). Manufacture of amidophenol derivatives, and azo-dyestuffs therefrom. Sept. 20.

. 21,040. Rahtgen. Method of preparing monobrom- and dibromindigo, as well as sulphurated monobromindigo.* Sept. 27.

[C.S 21,773 (1901). Ransford (Cassella and Co.). Manufacture of acridine dyestuffs. Oct. 1.

, 23,944 (1901). Johnson (Badische Anilin und Soda Fabrik). Manufacture and production of new colouring-matter, of colouring-matter lakes, and of intermediate products for use therein. Sept. 24.

, 24,400 (1901). Imray (Farbwerke, Höchst). Manufacture of new acridinium compounds. Oct. 1.

„ 25,650 (1901). Johnson (Badische Anilin und Soda Fabrik). Manufacture and production of sulphur colouring-matters, and material for use therein. Oct. 1.

'.—PREPARING, BLEACHING, DYEING, PR TING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

A 20,284. Bindschädler and Hemingway. Apparatus for circulating liquids through textile fibres to be dyed, scoured, bleached, &c. Sept. 17.

„ 20,672. Boult (Chevolleau). Mercerising machines. Sept. 22.

[C.S 22,688 (1901). Rodger. Method of producing variegated or parti-coloured effects upon yarns, &c. Oct. 1.

[C.S.] 23,695 (1901). Urquhart (Chemische Fabr. vorm. Weiler-ter Meer). Process of dyeing piece-goods with sulphur dyes. Oct. 1.

„ 13,121 (1902). Boult (Vogelsang). Method of bleaching linen, &c. Oct. 1.

„ 17,653 (1902). Bleachers' Assoc., Ltd., Benjamin, and Hübner. Process and means for the reduction of oxycellulose in textile fabrics and materials, and for the removal of stains therein caused by oxycellulose. Oct. 1.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 20,220. Packard. Process of separating alumina from silica.* Sept. 16.

„ 20,241. Pryor (Soc. Anon. d'Escaut et Meuse). Receptacles for compressed gases or liquids to prevent explosion thereof. Sept. 16.

„ 20,369. Standfast. New form of saturator for the manufacture of sulphate of ammonia, &c. Sept. 18.

„ 20,511. Sanders. Substitute for black-lead. Sept. 20.

„ 20,657. Casper (Comba). *See under* X.

„ 20,668. Crocker. Capsules for holding compressed gas. Sept. 22.

„ 20,857. Tedesco. Manufacture of sulphate of alumina. Sept. 24.

„ 20,915. Johnson (Badische Anilin und Soda Fabrik). Means for effecting the revivification of contact substances employed in the manufacture of sulphuric anhydride and sulphuric acid. Sept. 25.

„ 20,929. Lyle. Process and apparatus for separating and recovering oxygen and nitrogen from air. Sept. 25.

[C.S.] 19,527 (1901). Hargreaves. Manufacture of borax. Oct. 1.

„ 14,387 (1902). Lederlin. *See under* XI.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 20,148. Lake (Toledo Glass Co.). Production of articles of glass, and apparatus therefor. Sept 15.

„ 20,495. Courmont. Imitation ceramic-ware. Sept. 19.

„ 20,565. Shufflebotham. Manufacture of glass bottles, &c., and apparatus therefor. Sept. 20.

„ 20,586. Goebel. Firing-kilns for porcelain, &c.* Sept. 20.

„ 20,627. Goebel. Kiln for porcelain, &c.* Sept. 22.

„ 20,628. Goebel. Kiln for porcelain, &c.* Sept. 22.

[C.S.] 21,158 (1901). Simpson. Machines for manufacturing glass bottles, &c. Oct. 1.

„ 21,521 (1901). Simpson and Bradshaw. Machines for manufacturing glass bottles, &c. Sept. 24.

„ 22,577 (1901). Mills (Bocuze). Mould for glass works. Oct. 1.

„ 10,777 (1902). Claus. Enamelling machines. Oct. 1.

„ 13,211 (1902). Kyle. Process of decorating glass, &c. Oct. 1.

„ 18,636 (1902). Struchey. Process for the decoration of pottery, &c. Oct. 1.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 20,150. Schwanenberg. Process for the manufacture of artificial stone, particularly lithographic stone.* Sept. 15.

„ 20,188. Kieselstein and Czermak. Manufacture of artificial stone and marble.* Sept. 16.

„ 20,423. Brücker. Machines for the manufacture of artificial stones, tiles, &c.* Sept. 18.

[A.] 20,442. Ryan. Economisers for lime-kilns. Sept. 19.

„ 20,492. Birkbeck (Mielck's Stone and Terra-Cotta Co.). Artificial stone, and process of making same.* Sept. 19.

„ 20,534. Rigby. Manufacture of bricks or artificial stone. Sept. 20.

„ 20,550. Kruskopf. Apparatus for impregnating logs or timber.* Sept. 20.

„ 20,588. Poulsom and Williams. Manufacture of mortar. Sept. 20.

„ 20,592. Baxter. Fireproofing of combustible materials. Sept. 22.

„ 20,730. Mackenzie and Cheffins. Kilns. Sept. 23.

„ 20,841. Ibotson and Meldrum. Process for the manufacture or production of asbestos millboards, slates, plates, or tiles. Sept. 24.

„ 20,874. Ryan. Economisers for lime-kilns. Sept. 25.

„ 20,878. Quinn. Manufacture and moulding of artificial stone, &c. Sept. 25.

„ 20,879. Gray. Drying timber. Sept. 25.

„ 21,060. Willis (Bedell). Manufacture of building-blocks. Sept. 27.

[C.S.] 19,045 (1901). de Leuchères. Compositions applicable as mortar, concrete, artificial stone, &c. Sept. 24.

„ 21,616 (1901). Lake (Portland Cement Fabrik Hemmoor and Valeur). Fireproof lining- or facing-material for kilns, &c. Sept. 24.

„ 22,990 (1901). Sankey. Insulating composition for electrical purposes, and method of applying the same. Sept. 24.

„ 17,012 (1902). Angus. Means for impregnating wood. Oct. 1.

„ 17,744 (1902). Heany. Insulating compositions for metallic surfaces or wires. Sept. 24.

X.—METALLURGY.

[A.] 20,095. Williams and Williams. Method of puddling iron. Sept. 15.

„ 20,155. Thallner. Process of hardening steel. Sept. 15.

„ 20,225. Mitchell and Copeland. Process and apparatus for utilising the heat of hot slag for generating steam.* Sept. 16.

„ 20,245. Carson, Miller, and Hurst. Method or process of treating or refining molten metals, and apparatus employed therein.* Sept. 16.

„ 20,427. Bennett. Manufacture of iron, steel, &c. Sept. 19.

„ 20,465. Miller. Method for the treatment of refractory ores. Sept. 19.

„ 20,496. Wirtz. Recovery of tin and zinc from tinned and galvanised scrap-metal. Sept. 19.

„ 20,621. Chenhall. Manufacture of alloys of iron or steel with other metals. Sept. 22.

„ 20,657. Casper (Comba). Recovery of copper from solutions containing it. Sept. 22.

„ 20,922. Lake (Fabr. Chem. Präparate von Dr. R. Sthamer, vorm. Sthamer, Noack, and Co.). Production of radio-active metallic coatings. Sept. 25.

„ 20,930. Servais. Process for the smelting of iron ores.* Sept. 25.

„ 20,981. Cookson (Sanderson). Smelting antimony ores.* Sept. 26.

[A.] 21,078. Reynolds. Production of steel direct fro the ore in furnaces of blast-furnace type, ar apparatus therefor. Sept. 27.

[C.S.] 12,950 (1901). Snelus. Manufacture of iron ar and steel and alloys thereof. Oct. 1.

„ 14,363 (1901). Fyfe. Furnaces for convertin metallic oxides into metal. Sept. 24.

„ 21,410 (1901). Heys (Boyer). Process for the co centration or enrichment of ores. Sept. 24.

„ 9670 (1902). Sharp. Apparatus for compressin scrap-metal into blocks or slabs. Oct. 1.

„ 14,949 (1902). Neuhaus. Device for applying sm. quantities of acid liquid to metallic surfaces as preparation for soldering, and generally applicat for moistening surfaces. Sept. 24.

„ 14,970 (1902). Renard and Becker. Process for t treatment of iron ore. Sept. 24.

„ 16,993 (1902). Vanstone. Manufacture of st ingots plated with copper. Sept. 24.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 20,097. Rooper. Storage-batteries. Sept. 15.

„ 20,651. Hardy (Warner). *See under* XVIII. B.

„ 20,871. Sutherland and Marenson. Electric storag batteries, &c. Sept. 25.

„ 21,005. Hardy. *See under* XVIII. B.

„ 21,021. Atkins. Poles or electrodes of electroly apparatus, &c. Sept. 26.

[C.S.] 18,256 (1901). Colletas. Electrical batteri Sept. 24. International Application, Feb. 1901.

„ 22,303 (1901). Marino and Marino. Elect batteries and electrolytic apparatus. Oct. 1.

„ 14,387 (1902). Lederlin. Electrolytical manufact of chlorates and perchlorates. Sept. 24. Int national Application, Jan. 8, 1902.

XII.—FATS, OILS, AND SOAP.

[A.] 20,218. Adams. Oleaginous compound, and proc for producing same.* Sept. 16.

„ 20,477. Stirton and Sturton. Treatment of su Sept. 19.

„ 20,801. Cormack and Lowson. *See under* XIV.

„ 20,998. Wilkens. Method of and apparatus determining the lubricating properties of liqui Sept. 26.

„ 21,107. Matthew. Compound for removing s phurous and carbon deposits from, and cleansi painted, varnished, and polished wood-surface Sept. 27.

[C.S.] 15,531 (1901). Arledter and Whitney (Arledte *See under* XIII. B.

„ 19,494 (1901). Koens. Saponaceous product horticultural, &c., purposes. Sept. 24.

„ 20,026 (1901). Blaubach. Process and appara for producing linoleum. Oct. 1.

„ 20,429 (1901). Rübsam. Candle-moulding machi Sept. 24.

„ 21,456 (1901). Templer and Ranoe, Ltd., and Ran Oil- and grease-separators for steam-pipes, & Sept. 24.

„ 16,618 (1902) Barratt and United Asbestos C Ltd. Waste oil purifier. Sept. 24.

II.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[.] 20,120. Akester. Obtainment of white pigment. Sept. 15.

20,413. Jamieson, Nicholson, and Nicholson. Manufacture and preparation of paints and colours, &c. Sept. 18.

20,448. Crocker and Lougher. Anti-fouling paint for the protection of ships' bottoms and submarine structures. Sept. 19.

B.—Resins, Varnishes.

[.] 20,933. Tüschel. Varnishes.* Sept. 25.

[C.] 15,531 (1901). Arledter and Whitney (Arledter). Purifying and decolorising resins, oils, and fats. Sept. 24.

C.—India-rubber, &c.

[] 20,910. Prampolini. Composition or substance suitable as a substitute for india-rubber, and method of preparing the same.* Sept. 25. United States Application, Feb. 6, 1902.

V.—TANNING, LEATHER, GLUE, and SIZE.

[] 20,318. Bierich. Manufacture of meal from raw horn, &c., suitable for the production of a homogeneous horn substance. Sept. 17.

20,564. Greaves. Process and apparatus for tanning hides or skins. Sept. 20.

20,800. Cormack and Lowson. Manufacture and treatment of gelatin. Sept. 24.

20,801. Cormack and Lowson. Method of treating gelatin solutions to eliminate fatty matters. Sept. 24.

XV.—MANURES.

[] 20,679. Metcalfe. Manufacture of manures from waste animal materials.* Sept. 22.

C] 15,976 (1902). Lake (Cyanid-Ges. m. b. H.). Manufacture of artificial manures. Oct. 1.

XVI.—SUGAR, STARCH, GUM, Etc.

[A 20,575. de la Cámara and Egaña. *See under* XIX.

20,851. Schrader. Process for obtaining and utilising the organic acids contained in the residuary liquors of molasses. Sept. 24.

21,102. Winter. Stirring devices, more especially mixers for sugar massecuite. Sept. 27.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A 20,160. Stanley and Broadhead. Patent beer-cask curer. Sept. 16.

, 20,228. Sefton-Jones (Highton). Purifying raw or immature alcoholic liquors. Sept. 16.

, 20,356. Calmant. *See under* I.

„ 20,365. Wrede and Jeffersen. Process and apparatus for removing bitterness from, regenerating, and imparting an aroma to, brewers' yeast, with the object of converting the same into baking yeast. Sept. 18.

„ 21,006. Jänicke. Apparatus for malting purposes. Sept. 26.

[S 21,824 (1901). Boult (Dornig). Manufacture of alcohol. Sept. 24.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 20,249. Waite. Utensils for the sterilising of milk. Sept. 17.

„ 20,365. Wrede and Jeffersen. *See under* XVII.

„ 20,477. Sturton and Sturton. *See under* XII.

[C.S.] 21,768 (1901). Reichert and Heydemann. Method of and apparatus for the preparation of an extract of coffee. Oct. 1.

„ 22,875 (1901). Pakes and Barnes. Apparatus for sterilising milk, &c. Oct. 1.

„ 25,599 (1901). Meiul. Process of manufacturing cocoa substitutes. Oct. 1.

„ 10,348 (1902). Fournier. *See under* XVIII. C.

B.—Sanitation; Water Purification.

[A.] 20,386. Lewicki. Process for purifying drainage-water. Sept. 18.

„ 20,532. Hocking. "Feed-water," &c., filters or purifying apparatus. Sept. 20.

„ 20,651. Hardy (Warner). Purifying, &c., of water, &c., by electrolysis. Sept. 22.

„ 20,732. Cannon. Sterilising and cooling water. Sept. 23.

„ 20,791. Crocker and Lougher. *See under* XVIII. C.

„ 20,847. Wilkinson. Method of and apparatus for purifying or softening water. Sept. 24.

„ 21,005. Hardy. Purifying or other treatment of water, &c., by electrolysis. Sept. 25.

„ 21,015. Howard. Apparatus for use in the filtration of water. Sept. 25.

[C.S.] 23,469 (1901). Haller and Machell. Treatment of sewage, and apparatus therefor. Sept. 24.

„ 14,644 (1902). Clark, Bleakly, and Carson. Liquid-purifier. Oct. 1.

C.—Disinfectants.

[A.] 20,216. Wickham. Construction of machine for washing or sterilising pulp, &c. Sept. 16.

„ 20,791. Crocker and Lougher. Disinfectant water-softeners for toilet, &c. purposes. Sept. 24.

[C.S.] 10,348 (1902). Fournier. Disinfecting and preserving process. Sept. 24.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 20,575. de la Cámara and Egaña. Process of extracting cellulose from sugar-cane trash, pulp, or residues, and similar products for making pulp for paper, pasteboard, &c. Sept. 20.

„ 20,626. Niethammer. *See under* I.

„ 20,660. Little, Walker, and Mork. Manufacture of cellulose esters. Sept. 22.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 20,851. Schrader. *See under* XVI.

„ 21,017. Feld. Production of hydrocyanic acid Sept. 26.

[C.S.] 18,333 (1901). Lake (Chuit, Naef, et Cie.). Process for the preparation of alpha-ionone. Sept. 24.

XXI.—PHOTOGRAPHY.

[A.] 20,141. Coberzl and Mies, jun. Mediums for use in producing photographic pictures on fabrics or the like, and processes for making the same. Sept. 15.

„ 20,377. Imray (Farbwerke, Höchst). Photographic developers. Sept. 18.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 20,214. Denton and Preas. Smokeless powder, an method of compounding same.* Sept. 16. Unite States Applicatiou, Mar. 8, 1902.

„ 20,439. Robinson aud Peters. Detonator signallic apparatus for railways, &c. Sept. 19.

„ 20,735. Lake (Parker Match Co.). Machines fc the manufacturc of matches.* Sept. 23.

„ 21,080. von Schaller, Pfestroff, and Gillon. E: plosives. Sept. 27.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 541

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 20.—Vol. XXI. **OCTOBER 31, 1902.** No. 20.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Prof. Marston T. Bogert, A.B., Ph.B.	J. M. C. Paton.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	Dr. P. B. Power.
Dr. John Clark.	Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Prof. G. G. Henderson, D.Sc.	Dr. Boverton Redwood.
E. Grant Hooper.	Dr. Jos. W. Swan, F.R.S.
Dr. R. Messel.	Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.	David Howard.
Eustace Carey.	Dr. J. Lewkowitsch.
Dr. Edw. Divers, F.R.S.	N. H. Martin.
Thos. Fairley.	Prof. E. J. Mills, D.Sc., F.R.S.
Dr. J. Grossmann.	Max Muspratt.
Prof. W. R. E. Hodgkinson, Ph.D.	Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.	
C. W. R. Lang.	Alfred Burton.
LIVERPOOL.	
H. Tate.	Dr. T. Lewis Bailey.
LONDON.	
Walter P. Reid.	A. R. Ling.
MANCHESTER.	
Ivan Levinstein.	J. Carter Bell.
NEWCASTLE.	
L. Rennoldson.	F. C. Garrett.
NEW YORK.	
V. Coblentz.	Dr. H. Schweitzer.
NOTTINGHAM.	
Archbutt.	J. T. Wood.
SCOTTISH.	
L. Patterson.	Dr. Thos. Gray.
YORKSHIRE.	
E. E. Bedford.	Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.	Charles A. Kohn, M.Sc., Ph.D.
G. Beilby.	J. Lewkowitsch, Ph.D.
J. Carter Bell.	A. R. Ling.
Joseph Bernays, M.I.C.E.	W. Macnab.
H. Brunner.	N. H. Martin.
Edw. Divers, M.D., D.Sc., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
Sir John Evans, K.C.B., F.R.S.	B. E. R. Newlands.
A. G. Green.	John Pattinson.
Samuel Hall.	F. B. Power, Ph.D.
Otto Hehner.	Prof. H. R. Procter.
John Heron.	Boverton Redwood, D.Sc.
D. B. Hewitt, M.D.	Walter F. Reid.
E. Grant Hooper.	John Spiller.
David Howard.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.
Wm. Kellner, Ph.D.	

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I.	N. H. J. Miller, Ph.D. .... XV.
L. Archbutt ..... I., XII.	C. A. Mitchell, B.A. ..... XII., XXII.
J. L. Baker ..... XVI., XVII.	A. More ..... VII., XVIII.
H. Ballantyne ..... II., XII.	G. T. Morgan, D.Sc. ... IV., V.
D. Bendix ..... III.	J. G. Parker, Ph.D. ..... XIV.
E. Bentz ..... IV., V., VI.	H. T. Pentermann ..... XVI., XVII.
J. O. Braithwaite ..... XX.	H. S. L. Polak .... Patent List.
J. F. Briggs .... XVI., XVII., XIX., XX.	T. H. Pope ... XVI., XX., XXI.
J. H. Collins ..... X.	F. W. Renaut ..... Index.
C. F. Cross ..... V., XII., XIX.	G. H. Robertson ..... XI.
B. F. Davis .... X., XI., XVI., XVII.	Chas. Salter .. II., III., XVI., XVII.
J. T. Dunn, D.Sc. .... VII., X.	M. J. Salter ..... XIII.
Walter C. Hancock, B.A. ..... VIII., IX.	R. Sandon ..... II.
J. W. Hinchley. I., VIII., IX., X., XXI.	J. Shields, D.Sc., Ph.D. ... XI.
R. L. Jenks ..... XIII. C., XIV., XIX.	A. Shonk ..... Gen. Chem.
M. C. Lamb ..... VI., XIV.	W. P. Skertchley .... XII., XVIII.
T. A. Lawson, Ph.D. ... IV., XX.	E. Sonstadt, III., VII., X., XV.
F. H. Leeds ..... II., III., XIII., XXI.	E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.	Charles T. Tyrer ..... XX.
J. McCrae, Ph.D. ..... IV.	L. J. de Whalley, B.Sc. .XVI.
G. W. MacDonald, M.Sc. .XXII.	A. Wingham ..... X.
W. G. McMillan X., XI., XIV., XXII.	Joseph T. Wood ..... XIV.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. G. Ellis.
W. Hodgson Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: F. H. Tate.

Vice-Chairman: C. Longuet Higgins.

Committee:

Percy Bateson.
J. Campbell Brown.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
Max Muspratt.
Julius Raschen.
Alf. Smetham.
H. B. Stocks.
J. W. Towers.

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

SESSION 1902—1903.

Wednesday, Nov. 26th, 1902:—H. B. Stocks, F.I.C., and H. Graham White. "Sizing and Sizing Materials."

London Section.

Chairman: Walter F. Reid.

Vice-Chairman:

Committee:

Julian L. Baker.
A. C. Chapman.
E. Divers.
M. O. Forster.
Oscar Guttmann.
Otto Helmer.
H. Hemingway.
W. Kellner.
J. Lewkowitsch.
A. Gordon Salamon.
W. S. Squire.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

SESSION 1902—1903.

Monday, Nov. 3rd, 1902:—
Sir Wm. Ramsay, K.C.B., F.R.S. "Chemical Changes produced by Various Reagents on Gutta-Percha."
Dr. G. T. Morgan. "Reduction of Ammoniacal Silver Solutions by Organic Substances."
Dr. F. Mollwo Perkin. "Simple Qualitative Test for Bromides and Iodides."
Mr. Arthur Marshall. "Influence of Impurities on the Specific Gravity of Sulphuric Acid."

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

J. Allan.
W. Brown.
R. Clayton.
J. Craven.
W. Heys.
J. Hübner.
H. Levinstein.
W. J. Pope.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.

Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.
P. P. Bedson.
H. S. Collins.
J. T. Dunn.
T. W. Hogg.
H. Louis.
J. Mather.
John Pattinson.
W. W. Proctor.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: V. Coblentz.

Vice-Chairman: Russell W. Moore.

Committee:

L. Baekeland.
G. Drobegg.
W. F. Fuerst.
A. P. Hallock.
E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schieffelin.
R. C. Schupphaus.
G. C. Stone.
M. Toch.
D. Woodman.
F. G. Zunsser.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.

Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

Scottish Section.

Chairman: T. L. Patterson.

Vice-Chairman: D. J. Playfair.

Committee:

W. Carrick Anderson.
E. M. Bailey.
H. Bumby.
D. B. Dott.
C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasg.

Yorkshire Section.

Chairman: Jas. E. Bedford.

Vice-Chairman: T. Fairley.

Committee:

E. S. Bedford.
E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

Notices.

SUBSCRIPTIONS FOR 1903.

oreign and Colonial Members are reminded that the scription of 25s. for 1903, payable on January 1st next, ld be sent in good time to the Hon. Treasurer (Mr. Saael Hall), in order to ensure continuity in the receipt of Society's Journal. Any changes of address to appear he new List of Members now in course of preparation ld reach the General Secretary not later than January 1, 1903.

COMMUNICATIONS.

nthors of communications read before the Society, or of its Local Sections, are requested to take notice that er Rule 43 of the Bye-laws the Society has the right of prity of publication for three months of all such papers. Ingement of this Bye-law renders papers liable to be cted by the Publication Committee, or ordered to be racted for the Journal, in which case no reprints can rnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

he attention of Members of the Society is called to the that the International Congress of Applied Chemistry meet in Berlin, during Whitsuntide week of next year. ommittee of this Society has been formed to co-operate the other British Chemical Societies in endeavouring ecure an adequate representation of British Chemical istry, and it is requested that the names of those proing to attend the Congress be forwarded to the General etary, in order that a formal invitation from the anisation Committee in Berlin may be sent to them.

INTERNATIONAL FIRE EXHIBITION.

he President, Mr. Ivan Levinstein, has been offered and accepted a seat on the Advisory Council of the International Fire Exhibition.

TECHNOLEXICON.

he *Verein Deutscher Ingenieure* has undertaken to uce a reliable technical dictionary in three languages — glish, French, and German—and has asked this Society to rnish the names of such scientific and industrial men e willing to supply the technical expressions of their special branches of industry. The assistance to be ered must be gratuitous, as otherwise the expense d be prohibitive; but no money is asked for by the aan Society, though it has already spent considerable upon the work, and has provided an editor, Dr. Hubert len, of Berlin, with a staff, to collate the materials lied.

he Council of this Society agreed to co-operate in work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, n, Mcssel, Redwood, and Squire, and Messrs. Beilby, ner, Newlands, Reid, and Watson Smith to decide the form of co-operation. It has been determined to t one or more representatives for each class of the nal and Patent Literature; and the committee now for volunteers to undertake a class or division of a . To those who intimate their wish to help, full culars of the plan of the work, with instructions how oceed, will be sent. Offers of co-operation should be essed to the General Secretary.

List of Members Elected

23rd OCTOBER 1902.

Baillie, Dr. Thos. B., 60, Rockfield Road, Liverpool, Chemist.

Bemeut, Alburto, 218, La Salle Street, Chicago, Ill., U.S.A., Chemical Engineer.

Bird, Wm. Robt., 217, Newport Road, Cardiff, Oil Merchant.

Blakemore, Geo. Hy., Great Cobar Copper Mine, Cobar, N.S.W., Australia, Metallurgist.

Brownsdon, Dr. Henry W., 62, Wellington Road, Charlton, London, S.E., Works Chemist.

Cerasoli, Alberto, 29, West Kensington Mansions, London, W., Engineer.

Corse, Wm. Malcolm. Detroit Lead Works, 560, East Milwaukee Avenue, Detroit, Mich., U.S.A., Chemist.

Crossley-Holland, F. W., 68, Parade, Leamington, Chemist and Druggist.

Dixon, Wm. A., 97, Pitt Street, Sydney, N.S.W., Australia, Public Analyst and Assayer.

Doveton, Godfrey D., Cyanide Works, Camp Bird Mills, Ouray, Col., U.S.A., Metallurgist.

Dunning, D. M., jun., Auburn, N.Y., U.S.A., Gas Engineer.

Elliott, Victor Geo., Elliott Bros. Chemical Works, Rozelle, Sydney, N.S.W., Australia, Manufacturing Chemist.

Emery, Arthur Lowell, Palo Alto, Cal., U.S.A., Chemical Engineer.

Fahrig, Dr. Ernst, Commercial Museum, 233, South 4th Street, Philadelphia, Pa., U.S.A., Chief of Laboratories.

Finch, Chas. Allt, 130, King Street, Sydney, N.S.W., Australia, Analytical and Pharmaceutical Chemist.

Gibbon, Edw., Ynys House, Clydach, R.S.O., Glam., Works Chemist.

Griffiths, Manfred E., Fernside, Childer Road, Stowmarket, Explosives Works Chemist.

Guthrie, Fredk. B., Chemical Laboratory, Department of Agriculture, Sydney, N.S.W., Australia, Chemist.

Haas, Herbert, Torreon, Coahuila, Mexico, Chemist and Metallurgist.

Hall, Hy., Messrs. Booth and Co., Irk Vale Works, Middleton, Lancs., Yarn Dyer and Polisher.

Hawkins, Clement C., c/o The Chatfield Mfg. Co., Carthage, Ohio, U.S.A., Chemist.

Holdsworth, Ernest T., Westholme, Great Horton, Bradford, Dyer.

Humphrey, Richard L., 1001, Harrison Building, Philadelphia, Pa., U.S.A., Civil Engineer.

Jackson, Samuel, Wm. Metcalf, Ltd., Church, near Accrington, Managing Director.

Jonker Czn., Hendrik, H. Jonker Czn., c/o J. C. P. Hotz and Son, Ispahan, Persia, Chemical Engineer.

Loomis, Henry M., 261, Third Street, Niagara Falls, N.Y., U.S.A., Chemist.

Marriott, F. Grant, 14, Selby Street, Toronto, Ont., Canada, Student of Chemistry.

Mitchell, John, c/o Messrs. W. Mitchell and Sons, Ayr, N.B., Provision Curer.

Moore, Fredk., Victoria Chemical Co., Ltd., Victoria, B.C., Canada, Manufacturing Chemist.

Mosbaugh, Francis R., Damascus, Va., U.S.A., Chemist.

Patterson, Wm. Hamilton, Fernlea, Danes Road, Rusholme, Manchester, Student.

Pollitt, Jas. C. T., Wheatsheaf Works, Alexandria, Sydney, N.S.W., Australia, Managing Chemist.

Potts, Cuthbert, Hawkesbury Agricultural College, Richmond, N.S.W., Australia, Lecturer in Chemistry.

Potts, Hy. Wm., Hawkesbury Agricultural College, Richmond, N.S.W., Australia, Chemist and Principal.

Puntan, H. H. C., 10, London Chambers, Durban, Natal, Public Analyst.

Ramsay, A. Alexander, Laboratory, Department of Agriculture, 136, George Street, Sydney, N.S.W., Australia, Assistant Chemist.

Robitschek, Carl, 200, Worth Street, New York City, U.S.A., Scientific Brewer.

Rogers, Wm. E., 18, Durand Gardens, Clapham, London, S.W., Chemist.

Schofield, Jas. A., The University, Sydney, N.S.W., Australia, Lecturer in Chemistry.

Smith, Hy. Geo., Technological Museum, Harris Street, Ultimo, Sydney, N.S.W., Australia, Assistant Curator and Chemist.

Thomas, Jas. E., Box 192, Germiston, Transvaal, South Africa, Cyanide Manager.

Thorburn, Jas., Holmwood, Rectory Road, Stanford-le-Hope, Essex, Analytical Chemist.

Turner, Basil, 14, Castlereagh Street, Sydney, N.S.W., Australia, Metallurgist.

Turner, Jos., Read Holliday and Sons, Ltd., Huddersfield, Chemist.

Wethered, Wm. P., Redcourt, Carnatic Road, Mossley Hill, Liverpool, Manager.

Wheeler, Frank G., New York Mills, Oneida Co., N.Y., U.S.A., Chemist.

White, Geo. Arthur, P.O. Box 70, Vandergrift, Pa., U.S.A., Chemist.

Woodside, F. Frank, Chesco Chemical Co., Uwchland, Pa., U.S.A., General Manager.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Bramham, Wm., l/o 115; 86, Bow Road, E., and (communications) 115, Broadhurst Gardens, W. Hampstead, London, N.W.

Brown, S. B., l/o Whaley Bridge; Lovecough, Rawtenstall, Lancs.

Cates, W. A., l/o Wapella; retain Journals.

Dakin, H. D., l/o Leeds; Jenner Institute of Prevent Medicine, Chelsea, S.W., Chemist.

Ekenberg, Dr. M., l/o Gothenburg; V. Hamngatan Stockholm, Swedeu.

Escher, Paul, l/o St. Louis; c/o Swift and Co., Natio Stock Yards, St. Clair Co., Ill., U.S.A.

Forbes, Paul R., l/o Yokohama; 614, Sears Buildi Boston, Mass., U.S.A.

Halliwell, Edw., l/o Wakefield; c/o Ribble Joint Committ 16, Walton's Parade, Preston, Chief Inspector.

Hibbard, P. L., l/o Waukegan; 2291, North 41st Co Chicago, Ill., U.S.A.

Hodges, And., l/o Hawthorne Grove; 28, Grosvenor Ro Heaton Moor, near Stockport.

Hopkins, Erastus, l/o Worcester, Mass.; Lake Hel Fla., U.S.A.

Hunt, E.; all communications to Myvod House, W Green, Wednesbury.

Kibble, W. Oakes, l/o California; G.P.O., Denver, C U.S.A.

Knight, Henry, l/o Faraday Street; Stanley House, Anfield Road, Liverpool.

Mathews, Dr. Jno. A., l/o Brooklyn; c/o Crucible St Co. of America, Syracuse, N.Y., U.S.A.

Naylor, Wm., l/o Walton's Parade; 3, Garstang Ro Fulwood Park, Preston, Chemist.

Nelson, E. K., l/o Chicago; Paris, Ill., U.S.A.

Ormerod, Ernest, l/o Rochdale; 34, Harold Road, E Ibaston, Birmingham.

Revue Générale des Matières Colorantes, l/o 23; Chaussée d'Antin, Paris.

Sawyer, Harris E., l/o Boston; 27, Bellevue Street, W chester, Mass., U.S.A.

Takamine, Dr. J., l/o Central Park; 1611, Amster Avenue, New York City, U.S.A.

Takayama, J.; Journals to Nando Machi, 26, Ushigo Tokio, Japan, Director, Imperial Industrial Experim Statiou.

Taylor, Jno., l/o Chester; Crawford Municipal Techn School, Cork, Irelaud.

Wakefield, Wm., l/o St. Mary's Place; c/o Savile To Chemical Co., Ltd., Savile Town, Dewsbury.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1267
II.—Fuel, Gas, and Light	1267
III.—Destructive Distillation, Tar Products, Petroleum	1271
IV.—Colouring Matters and Dyestuffs	1272
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1275
VI.—Colouring Wood, Paper, Leather, &c.	1276
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1277
VIII.—Glass, Pottery, and Enamels	1278
IX.—Building Materials, Clays, Mortars, and Cements	1279
X.—Metallurgy	1279
XI.—Electro-Chemistry and Electro-Metallurgy	1281
XII.—Fats, Fatty Oils, and Soap	1285
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1[illegible]
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1[illegible]
XV.—Manures, &c.	1[illegible]
XVI.—Sugar, Starch, Gum, &c.	1[illegible]
XVII.—Brewing, Wines, Spirits, &c.	1[illegible]
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1[illegible]
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1[illegible]
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1[illegible]
XXI.—Photography	1[illegible]
XXII.—Explosives, Matches, &c.	1[illegible]
XXIII.—Analytical Chemistry	1[illegible]
XXIV.—Scientific and Technical Notes	1[illegible]

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, po[illegible] included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I-PLANT, APPARATUS, AND MACHINERY.

English Patents.

quid Substances, Thin or Thick; Construction of a Vessel by Means of which ——, can be drawn off by Air Pressure. A. Büttner, Breslau, Germany. Eng. Pat. 12,407, May 31, 1902.

The vessel is provided with a cylindrical cover containing a piston actuated by pressing a knob on the top of the hollow piston rod which passes outside; a spring normally retains the piston at the highest point; on pressing the knob, the air pressure produced in the vessel, forces the liquid out of a nozzle or tube leading to the bottom of the vessel. A hole may be made in the knob, which is closed by the finger on pressing, but admits air to the vessel on the release of the piston.—J. W. H.

Solids Deposited in Liquid-purifying Apparatus; Collecting ——. T. H. Butt, Bradford. Eng. Pat. 19,349, Sept. 28, 1901.

The apparatus is intended to deal with the semi-liquid sludge collected by the filtering apparatus described in Eng. Pat. 20,205, 1900 (this Journal, 1901, 233), and consists of a tank placed at a lower level than the discharge valve of the stated apparatus, within which tank are placed two or more horizontal grids, the space between these being filled with breeze or other filtering material. Space is left for the filtered liquid in the lower part of the tank; and in the angle of the bottom, a grid is formed connected to a suction pipe. A steam-pipe coil is adjusted within the tank. Another form of tank is shown, in which the grids are arranged vertically.—E. S.

Drying Apparatus; Centrifugal ——. C. Stute, Rieklingen, Germany. Eng. Pat. 13,788, June 17, 1902.

The invention relates to the ordinary centrifugal hydro-extractor; the sides of the cage may be removed by a crane. The action of lifting releasing the sides from the bottom. The washed clothes or other contents do not fall out until shed—into a convenient receptacle.—J. W. H.

Evaporating and Condensing Apparatus. D. B. Morison, Hartlepool. Eng. Pat. 21,282, Oct. 23, 1901.

The apparatus, to be used either as an evaporator or condenser, consists of a vessel having a horizontal coil-containing lower portion and a vertical upper portion containing horizontally disposed coils, the ends of which are connected to opposite sides of vertical hollow standards constituting the inlet and outlet of the coils. The upper and lower portions of the vessel can be disconnected, each being provided with a door to afford access to the coils, that of the upper portion being narrow and situated near the standards. The coils of the upper portion may be supported on the side remote from the standards by means of lamps on a vertical stay or bracket secured to the base.
—J. F. B.

Evaporator Heated by Steam, Hot Vapours, or Gases. V. F. Feeny, London. From Abwärme-Kraftmaschinen-Gesellschaft, Berlin. Eng. Pat. 13,116, June 9, 1902.

An EVAPORISER, suitable for cold-vapour engines, comprising a vertical boiler having vertical pipes, down which hot vapours or gases flow, and several horizontal partitions through which the pipes pass, a certain amount of free space being left round each pipe in the holes in the partitions. The liquid to be vaporised is supplied to the boiler above the uppermost partition, and flows in a thin film down the pipes, the vapours produced passing into a vapour-collecting pipe which rises centrally through the partitions. (See Eng. Pat. 13,757 of 1902; this Journal, 1902, 1127.)—H. B.

Heating of Liquids of Low Boiling Points. V. F. Feeny, London. From The Abwärme-Kraftmaschinen-Gesellschaft, Berlin. Eng. Pat. 13,512, June 14, 1902.

A METHOD, applicable to cold-vapour engines, of heating liquids of low boiling points by means of exhaust gases, in which the said gases, on their way to the liquid-vaporiser, are passed through a closed vessel and brought into contact with water flowing over coke or the like, so that they are mixed with the steam which is generated, and reach the vaporiser in a purified condition. (See preceding abstract, and Eng. Pat. 13,757 of 1902; this Journal, 1902, 1127.)
—H. B.

Feed-Water Heaters, Filters, and Purifiers. M. P. Osbourn, Camden, N.J., U.S.A. Eng. Pat. 12,303, May 29, 1902.

In the combined feed-water heater and purifier, means for regulating the supply of purifying agent in proportion to the water supply are provided, consisting of valves on the two supplies so connected that they are operated together by the action of a float in the heater; a yielding connection, such as a spring, may be provided between the two valves so as to permit of a slight further movement of one of them, after the other has been closed. After treatment with chemicals and steam in the heater, the water passes through a series of purifying chambers, which may be arranged one above the other, and which contain in their lower portions a series of inclined obstructions or barriers, forming pockets in which the precipitated sediment may collect whilst the water finds a free passage above them.
—J. F. B.

Filters; Improvements in ——. J. Kostalek, Prague, Bohemia. Eng. Pat. 17,491, Aug. 8, 1902.

In sand or similar filters arranged with parallel flow, the delivery and inlet tubes are made readily removable for cleansing, by the use of rubber flange packings and rubber stoppers.—J. W. H.

United States Patents.

Evaporating Apparatus; Vacuum ——. C. Ordway, Brooklyn, New York. U.S. Pat. 709,172, Sept. 16, 1902.

The apparatus consists of a series of sections, each section comprising an upper vapour chamber connected with the exhausting apparatus and a lower liquor chamber; these chambers are connected together by means of two "uptakes" and one "downtake"; the uptakes consist of a number of tubes in a common jacket by which heat is applied; the downtake is a single-jacketed tube. The incoming liquid is circulated through the downtake jacket before entering the apparatus; it thus determines the downward circulation of the liquid in the downtake and becomes heated itself. A "vacuum leg" extends below from each section, and is provided at its base with a screw conveyor for the removal of precipitated material.
—J. W. H.

Evaporator. W. Bender, Assignor to the Zellstoff-fabrik Düren Hermann Maria Schoeller and Co., Düren, Germany. U.S. Pat. 709,297, Sept. 16, 1902.

The evaporator is especially intended for thick liquids, such as pitch, molten resin, &c., and consists of a series of inclined tubes provided with a steam jacket; the tubes communicate, by means of two "headers," with the main reservoir for the liquid, from which the gases make their exit. The heated inclined tubes cause a circulation of the whole liquid. A U-shaped trough connects the two headers together inside the main reservoir.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Coal; Calorific Power of ——. M. Goutal. Comptes Rend., **135**, [12], 477—479.

The calorific power calculated from the results of analysis by any of the formulæ suggested by Dulong, Scheurer-Kestner, Cornut, Ser, Gmelin, &c., often differs considerably from the value obtained by experiment in the Mahler bomb or other form of calorimeter. From calorific determinations of some 600 coals of different kinds, the author has deduced a formula, the results of calculating by which agree within 1 per cent. in nearly all cases with those of experiment. The fixed carbon (C), volatile matters (V), ash and

moisture, are determined; the calorific value is then given by the formula $P = 82C + aV$, where a is a coefficient which is a function of V', the percentage of volatile matters in the coal taken as free from ash and moisture (so that $V' = \frac{100\,V}{C+V}$). The values of a corresponding to different values of V' are plotted in a curve which differs but little from a straight line. When $V' = 5$, 10, 15, 20, 25, 30, 35, 40 per cent., $a = 145$, 130, 117, 109, 103, 98, 94, 80 respectively.

In the case of anthracites, $a = 100$. The average value of the calorific power of anthracite is 8,250 cal., and it rises with the content of volatile matter to a maximum of about 8,700, when V is between 10 and 30 per cent., falling again as the percentage of volatile matter increases further.

—J. T. D.

Coal; Determination of Sulphur in ——. C. W. Stoddart.

See under XXIII., *page* 1298.

Sulphur in Coal and Pyrites; Determination of ——. A. Reitlinger.

See under XXIII., *page* 1298.

Smoke; Prevention of ——. J. S. Raworth. Paper read before Section G of the British Association, Belfast, 1902. Electrician, 1902, **49**, [1271], 911.

For the prevention of smoke, the author recommends the Wilson process of squirting a mixture of air and nitrate of soda solution on the fire. This he has found to give very satisfactory results. In order to ascertain how the process affected the output of the boiler and its evaporative efficiency, H. W. Wilkinson made a series of tests with a Babcock and Wilcox water-tube boiler fitted with a Wilson apparatus. The results are given in the following table, and show that, assuming existing conditions, (*a*) = 100; then (*b*), air injected, = 108; and (*c*), Wilson process, = 122.

	With Air and Nitrate of Soda.	With Air only.	Ordinary Conditions.	With Air and Nitrate of Soda
Duration of test	7·08 hours	7 hours	7·42 hours	7 hours
Average pressure of steam	113·3 lb.	115 lb.	117·7 lb.	115·3 lb.
Average temperature of steam (superheated)	469° F.	473° F.	459° F.	466° F.
Average temperature of steam feed	143° F.	140° F.	146° F.	150° F.
Factor of evaporation	1·228	1·235	1·22	1·219
Total coal	2,856 lb.	3,416 lb.	3,248 lb.	2,744 lb.
Total coal per hour	403 lb.	488 lb.	438 lb.	392 lb.
Total coal per hour per square foot of grate	15 lb.	18 lb.	16·2 lb.	14·5 lb.
Total water	19,520 lb.	19,485 lb.	17,680 lb.	17,886 lb.
Total water per hour	2,755 lb.	2,784 lb.	2,334 lb.	2,555 lb.
Water evaporated per pound of coal (actual conditions).	6·83	5·7	5·32	6·52
Water evaporated per pound of coal from and at 212° F..	8·38	7·01	6·5	7·95

—A. S.

Water-Gas in the London Gas Supply. Report by the Chemist to the London County Council.

The gas supplied to London by the South Metropolitan, Gas Light and Coke, and Commercial Gas Companies has been continuously examined during the period June 1, 1901, to May 17, 1902, as to its content in carbonic oxide, with a view to ascertaining the proportion of water-gas present. The results obtained were as follows:—

(1) Fifty-seven per cent. of the samples taken in the district supplied by the Gas Light and Coke Company contained under 12 per cent., and 94 per cent., under 16 per cent. of carbonic oxide.

(2) This amount of carbonic oxide varied little day or night.

(3) Of the samples collected in the area supplied by the Commercial Gas Company, 19 per cent. contained less than 12 per cent., and 76 per cent. less than 16 per cent. of carbonic oxide.

(4) This percentage of carbonic oxide was higher during the hours of lighting.

The gas supplied by the South Metropolitan Gas Company was not found to contain carbonic oxide in sufficient quantity to indicate the presence of water gas. The results show that the gas companies are able to supply gas of the statutory illuminating power, even when the amount of carbonic oxide present does not exceed 12 per cent. It is recommended that when the Board of Trade introduces a measure limiting the extent of enrichment of coal-gas by means of carburetted water-gas, the Council should seek to inserted a clause stating that the whole amount of carbonic oxide present, as supplied to London, shall not exceed 14 per cent. by volume.—A. S.

Alcohol as an Illuminant. L. Denayrouze. Bull. French Phys. Soc.; through Pharm. J., 1902, **69**, [1682], 295.

The author compares the cost of alcohol and petroleum as illuminants in the Denayrouze lamp. The latter consists essentially of a wick, conducting the liquid by capillarity into a chamber where it is vaporised, the necessary heat being produced by a copper bar, which derives it from the lamp itself. The vapour passes through a small channel into a kind of Bunsen burner, above which the mantle is fixed.

With a consumption of 1·08 grm. of pure alcohol or 0·64 grm. of "carburetted alcohol" (this Journal, 1901, 960) per candle-hour, the cost is estimated at 0·00478*d.* and 0·00298*d.* per candle-hour respectively, as compared with 0·01428*d.* for petroleum. (See also this Journal, 1901, 959—960.)—A. S.

Ferrocyanide Manufacture at the Hague Gas Works. J. Rutten.

See under VII., *page* 1277.

English Patents.

Furnaces and like Apparatus for Burning of Fuel. W. Fenner, New York, U.S.A. Eng. Pat. 17,434, Aug. 9, 1901.

See U.S. Pat. 698,190; this Journal, 1902, 962.—R. S.

Furnaces. F. W. Monteith, Toronto. Eng. Pat. 3373, Feb. 10, 1902.

To prevent smoke and economise fuel in furnaces, carburetted air is fed through perforated pipes into the fire-box, and the gases formed are carried off at the moment of their creation by means of perforated pipes leading to the smoke stack. The carburetted air used, is obtained by spraying, by means of an atomiser, an oil into a reservoir containing air under pressure.—R. S.

Furnaces; Method of Promoting Combustion in ——. K. Albrecht, Madrid. Eng. Pat. 14,517, June 30, 1902.

This method consists "in returning the furnace fumes or gases from the back of the boiler or flue to the furnace to be burned."—R. S.

Ammonia and Tar from Furnace Gases or Producer Gases, and Apparatus therefor. T. Rigby, St. Helens. Eng. Pat. 20,716, Oct. 16, 1901.

The hot gases are passed through a long tank, through which cool water is flowing in the opposite direction, the tank being divided transversely into compartments provided with spraying devices, whereby the gases are cooled to 30°—70° C. The hot water flowing from the tank is used for heating and saturating with moisture the air required

fr[om] the producer, and the water, cooled by this operation, is returned to the gas-cooling tank. The cooled gases are passed into a tower provided with horizontal perforated partitions over which "acidified ammonia liquor" flows, for the recovery of the ammonia, and to prevent the dilution of the liquor by cooling and condensation of the water-saturated gases, steam is passed through a heating coil situated within the receptacle from which the liquor flows over the perforated partitions.—H. B.

[Oil] Fuel; Apparatus for Burning ——. A. Renny, Singapore. Eng. Pat. 22,614, Nov. 9, 1901.

The liquid-fuel burner consists of an outer casing within which two concentric tubes are fitted by screwing, these forming nozzles at their outlet ends. The three passages formed by means of this construction are connected up as follows: the outer one to the oil supply, the middle one to the open air or to a supply of air under pressure, and the innermost one to a steam supply. The burner is used for steam generators, for smelting, &c.—R. S.

[Acetylene] Gas; Production of ——. G. H. Hughes, London. Eng. Pat. 21,356, Oct. 24, 1901.

The cylindrical retort in which the oil is vaporised is provided internally with a removable rotating shaft, to which are fixed baffles formed of eccentrically-mounted discs, &c., as figured.—H. B.

Carbide Holders. G. G. Smith, Florence. Eng. Pat. 16,701, Aug. 20, 1901.

The holder is a metal cylinder open at both ends, and closed by means of two flat plates tightened against rubber washers by rings fitted with bayonet catches. The device is intended for use in generators such as are described in Eng. Pats. 23,309, 1899, and 12,240, 1900 (this Journal, 1900, 137 and 1001); and has the advantage that after the cartridges have been punctured and the carbide decomposed, the cartridge can be recharged, only the ends having to be renewed. Concentrically within the cylinder is an empty tube of coarse gauze, which provides space for the expansion of the carbide by allowing the lime to pass through its meshes; and within that tube, extending half way along the cylinder from one end, is a full tube, which prevents water from reaching the carbide when the cartridge stands upright with the lower end has been punctured, until the outer cylinder is more than half submerged in the water.

—F. H. L.

Acetylene Gas Generators. G. G. Smith, Florence, Italy. Eng. Pat. 16,702, Aug. 20, 1901.

This patent refers to modifications in the generators described in Eng. Pats. 23,309, 1899, and 12,240, 1900 (this Journal, 1900, 137 and 1001), in which moving punches make holes in carbide cartridges. Having found that special weights are not required to operate the punches, the inventor now makes the falling holder bell lift a stirrup surrounding the cartridge, which first punches a hole in the bottom, and then raises the cartridge till a second fixed punch pierces the top, the punches being either hollow, or provided with longitudinal channels so as not to interfere with the entry of water. Immediately after the cartridge is perforated, the same mechanism upsets an intermediate reservoir of water, and allows its contents to attack the solid. Other mechanism causes the holder to punch a number of cartridges in succession. It is stated that the action of [the] cing does not affect the gas pressure appreciably.

—F. H. L.

Acetylene; Gas Generators particularly applicable for the Production of ——. J. H. Ross, Birmingham. Eng. Pat. 17,456, Aug. 31, 1901.

An automatic carbide-feed apparatus of the central hopper type, essentially a modification of the generator described in Eng. Pat. 9537, 1900 (this Journal, 1901, 564). The holder bell is made to move smoothly by having a vertical rod attached somewhat loosely to its crown, which rod passes easily in a fixed vertical tube fastened to a fixed part of the generator. The inverted cone at the base of the hopper is formed obliquely, so that its apex lies on one side of the central rod. In small generators the detachable carbide vessel is inside the holder bell, though not carried by it; but in large apparatus, the holder is an annulus, and does not require removal from its seal each time the carbide has to be renewed.—F. H. L.

Acetylene and other Gases; Apparatus for Generating ——. D. S. Keith, Toronto, Canada. Eng. Pat. 8369, April 10, 1902.

A CARBIDE-feed apparatus of the central hopper type, requiring granulated carbide. The rising holder is arranged as an annulus round the carbide hopper, and from the former, an upright lever extends which operates a rod bearing two cone-shaped valves at its base, that open or close the hopper mouth. The rod carries a depending cap which works in a water-seal so as to keep the hopper air-tight. The acetylene is made to travel through pipes and then to bubble through the water contained in the holder tank, which stands above the generating chamber.—F. H. L.

[Acetylene] Gas Heating-Burners. J. Harris and L. H. Vogel, Cleveland, U.S.A. Eng. Pat. 13,208, June 10, 1902.

A CIRCULAR atmospheric burner for acetylene in which means are provided to keep the gas cool, thus avoiding, so it is claimed, polymerisation, and the consequent deficiency of air. Over the usual circular mixing chamber are arranged (radially) slotted covers, rectangular in horizontal section but semicircular in vertical section; and above these are perforated caps at the orifices of which the acetylene finally burns. Thus the actual place of combustion is considerably above the top of the mixing chamber. The proportion between gas and air can be regulated by a screwed sleeve travelling over the inlet to the burner casing.—F. H. L.

Incandescent Vapour Lamp. R. Worms, Berlin. Eng. Pat. 12,086, May 27, 1902.

WITHIN the upper metallic casing of a suspended lamp is situated a vaporiser consisting of two long, concentric, hollow cylinders or truncated cones, up the annular passage between which the combustible liquid is fed. The vaporiser is placed vertically over the lamp chimney, and extends so far downwards below the top of the chimney that only its upper portion is heated by the waste gases, and metallic ribs or the like are attached externally to its lower portion to assist in keeping it cool. The combustible liquid is contained in a reservoir surrounding the upper metallic casing of the lamp.—H. B.

Incandescent Gas Lamps. R. Koch and L. Rothenberg, Berlin. Eng. Pat. 12,278, May 29, 1902.

IN incandescent gas lamps burning at ordinary gas pressure, an intense light is obtained, by supplying the air requisite for forming a suitable "gaseous air mixture" exclusively by a mixing tube prolonged below the gas-nozzle, and is open at the lower end. It is surrounded by the burner-tube, which extends downwards to the same point, and is provided with air-inlet holes at its lower end; the secondary supply of air, flowing up the annular channel between the two tubes, mingles with the combustible mixture just below the burner top.—H. B.

Gas Burners especially adapted for use with Incandescence Mantles. O. Wiederhold, Bloomfield, New Jersey. Eng. Pat. 12,409, May 31, 1902. (Under Internat. Conv., Nov. 4, 1901.)

THE base of the mixing-tube is screw-threaded upon a gas-inlet nipple, which has lateral passages for admission of the gas to the mixing-tube, and has its top formed conically to act as a needle valve. A diaphragm having a central perforation stretches across the tube immediately above the point of the needle, so that the gas supply may be regulated by screwing the tube up or down upon the nipple. The top of the mixing tube has lateral perforations, is closed by an inverted conical body, which deflects the mixture of gas and air through the perforations, and is surrounded by a perforated cylindrical casing which is in

turn enclosed in the outer casing of the burner top. The tubular socket for the base of the mantle-support is slotted, to facilitate the removal of the stump, should the support get broken.—H. B.

Arc Lamps; Carbide Electrodes for ——, and Process of Manufacturing the same. R. Hopfelt, Berlin. Eng. Pat. 26,487, Dec. 27, 1901.

Electrodes composed of a carbide which is decomposable by water, are provided with a waterproof coating in one of the following ways:—(1) A sheathing of tin, zinc, or other metal having its point of fusion or volatilisation below 1,050° C., is slipped over the electrode. (2) The electrode is dipped into "an alcohol or alcoholoid," such as glycerin, which produces an external protective layer of lime; or it may be coated with a pasty mass, composed of glycerin, a metallic oxide, such as lead oxide, and a small quantity of carbon. (3) A varnish, such as tar, is applied.—H. B.

United States Patents.

Bog Peat for Fuel Purposes; Process of Preparing ——. A. Charon, Assignor to A. Duclos, Montreal. U.S. Pat. 709,664, Sept. 23, 1902.

The peat is dried and then ground in a disintegrator, through which an electric current of from 110 to 220 volts is passing, so as to carbonise the peat. The carbonised product is mixed with slightly less than 1 per cent. of petroleum, and is compressed into briquettes.—H. B.

Fuel; Artificial ——. C. B. Harris, Assignor to S. I. Atwater, Trustee, New York. U.S. Pat. 709,851, Sept. 23, 1902.

Petroleum coke, 5 lb.; Texas asphalt, or resin, 3·5 lb.; "gluttinous matter," 1·5 lb.; water, 10 lb.; and coal dust, 80 lb., are incorporated together, moulded into briquettes, and dried.—H. B.

Fuel; Apparatus for Spraying and Burning Liquid ——. A. Köhler, Hamburg. U.S. Pat. 709,579, Sept. 23, 1902.

An apparatus for use with boilers and the like, in which the burners consist of concentric tubes, through which air and liquid fuel are forced, to form a spray. Pivotally mounted between the air- and oil-supply pipes respectively is a distributing box from which issue the pipes leading to the burners. Each of the latter pipes has a pivotal joint between the distributing box and the burner. By turning the pipes and the distributing box on their pivots, the burners can be swung aside from beneath the boiler.—H. B.

Burner; Hydrocarbon ——. Mary A. Hodge, Assignor to W. P. Holmes and L. M. Hodge, San Jose, Cal., U.S.A. U.S. Pat. 709,443, Sept. 16, 1902.

Oil and steam are forced through adjustable concentric annular passages and through a conical nozzle into a spherical atomising chamber, in which they impinge upon a deflecting block, to complete the atomisation. The mixture is carried forward through a vaporising chamber packed with wire-cloth or the like, and flows thence to the burner, a drip-chamber being provided to trap any oil which may escape vaporisation.—H. B.

Burner; Hydrocarbon —— [for Boilers, &c.]. L. K. Leahy, Los Angeles, Cal. U.S. Pat. 709,782, Sept. 23, 1902.

A burner designed for use with crude petroleum and steam, in which the supplies of fuel and steam are regulated simultaneously and automatically by the steam pressure within the boiler.—H. B.

Furnace Gases; Process of Desulphurising ——. E. Pollaczek, Budapest. U.S. Pat. 709,358, Sept. 16, 1902.

The gases are passed through a sponge-like material, arranged in layers, alternating with the fuel, or arranged behind the fuel, and formed by the action of the gases upon a mass consisting of 10 to 15 parts of sawdust, 30 to 35 parts of non-caking coal, 20 to 25 parts of caking coal, 3 to 35 parts of peat, and 6 to 20 parts of caustic lime.—H. B.

Gas Generator. C. J. Luther, Redbank, N.J. U.S. Pa 709,788, Sept. 23, 1902.

The apparatus comprises a generator, a vaporising chamb above the generator, pipes for feeding oil into the vapori ing chamber, a series of vertical retorts surrounding t chamber and enclosed within gas passages which commun cate with the generator, and sliding valves which normall close the lower ends of the retorts, and are adapted to clo the gas passages. Coal is fed into the vertical retort where it is carbonised by the hot gases from the generato which flow round the gas passages and are burned there with additional air supplies. The coal-gas is led off to gas-holder, and the coke is dropped into the generato where it is treated with steam to produce water-gas; oi gas is produced simultaneously in the vaporising chambe and mixes with the water-gas. The mixed gases are supe heated on flowing through the gas passages, and are led o to the gas-holder, to mingle with the coal-gas. Air is the blown through the coke in the generator to produ generator-gas for the carbonisation of the next charge coal, and so on.—H. B.

Carbide Holder. F. Simonson, Stirling, Ill. U.S. Pat. 707,027, Aug. 12, 1902.

A cylinder, open at one end and closed at the other, fitted with a lead weight resting on the bottom, so th when dropped into water, it always maintains a vertic position. The vessel is greater in length than in diamete the dimensions being so selected that, according to t inventor, the current of acetylene rushing out of th cartridge when immersed in water, carries with it the lim sludge, and leaves the rest of the carbide fit for furth attack.—F. H. L.

Acetylene Gas Generator. A. C. Einstein, St. Louis, Mis U.S. Pat. 706,810, Aug. 12, 1902.

An automatic water-to-carbide generator working on t contact principle, in which the supply of water is governe by the gas pressure. The upper part of the gas space the apparatus contains a collapsible bag having a fixe bottom but a movable top. When the pressure in t decomposing vessel falls, the top of the bag drops, pressin downwards a spring-supported rod, which is the stem of t water valve.—F. H. L.

Acetylene Gas Generator. C. W. Metcalf, Tucson, Arizon U.S. Pat. 709,344, Sept. 16, 1902.

An automatic water-to-carbide generator of the floodin type, with the water-supply governed by the movements the bell and the liquid coming from the holder tank. Th water pipe has two mouths, of different sizes; the large on is ordinarily used, but the small one comes into operatio first when the apparatus is charged, so that gas productio may not begin too suddenly. The carbide is held in a pa of two-storey water-sealed vessels standing on a subdivide water tank, and at their side are purifiers filled with tub containing sand held in position by means of plugs of fel Inside each carbide vessel the water-supply pipe terminate in a detachable ball-valve.—F. H. L.

Acetylene Gas Generator. J. C. Charbeneau, Mour Clemens, Mich. U.S. Pat. 709,470, Sept. 23, 1902.

An automatic water-to-carbide apparatus working on th flooded compartment system, in which the water supply governed by the bell movements. The carbide is held in horizontal rectangular tray divided into a number of cham bers, which is put into a water-jacketed portion of th generator through a manhole at one end. The water fal into one of the compartments, and when the carbide there is decomposed it runs over a partition into the next cham ber. The act of opening the manhole shuts off the wate supply, disconnects the generating chamber from th holder, and puts it into communication with the atmospher through a vent-pipe.—F. H. L.

urner; Petroleum Incandescent-Light ——. M. Bramson, Warsaw, Assignor to H. F. Vogel, St. Louis, Miss., U.S.A. U.S. Pat. 709,198, Sept. 16, 1902.

LAMP of the circular-wick type, in which the outer wick-be is higher than the inner wick-tube, and a flange pro-cting iawards over the wick deflects the vapour towards e central air-distributor. Two superimposed conical per-rated caps surround the outer wick-tubes, and from the ace between them a mixture of hot and cold currents of r flows up into the interior of the mantle, impinging ainst the flame.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

cetone Oil; Manufacture of —— [*from Wash Water of Wool Combings*], *with a View to its Adoption for Denaturing Alcohol.* P. Baechlin. Rev. Chim. Ind., **15**, [133], 240—242.

IE author describes the apparatus erected by Buisine for taining the ammonia, fatty acids, and potash from the ish-water of wool-combings. After being allowed to ment for six days, the wash-water is concentrated by aporation; during this process, ammonia is given off hich is absorbed by sulphuric acid. The concentrated uor is decomposed in large vats by sulphuric acid, and e fatty matter separated from the potassium sulphate in e filter-press. The expressed liquid is distilled and the id vapours are passed into milk of lime. The calcium ts formed are dried, and on distillation yield acetone oil, per cent. of which distils between 70° and 99°, and is itable for denaturing alcohol, since it contains a large antity of methyl ethyl ketone (b. pt. 81°).—J. McC.

Aromatic Hydrocarbons. E. Lippmann and J. Pollak. Monatsh., 1902, **23**, [6], 670—671.

E colour reactions given in the following table are served by suspending the hydrocarbon in concentrated phuric acid, and adding in the cold a few drops of benzal loride (benzyldichloride), $C_6H_5CHCl_2$:—

Hydrocarbon.	Colour.
nthracene	Malachite green.
aphthalene	Magenta.
nzene	Light yellow.
oluene	"
ylene	Orange.
henanthrene	Carmine.
iphenylmethane	Faint yellow.
cene	Olive-green after a short time.
iphenylmethane	Brick-red.
ilbene	Bluish green.
eudecumene	Orange-red.
ymene	Orange.
rene	Emerald-green becoming deep blue.
enaphthene	Dark blue.
benzylanthracene	Yellowish-green.
rysene	Light yellow, then light green, and finally dark olive-green.

The hydrocarbons marked with an asterisk give the same our with sulphuric acid alone, no alteration taking place the addition of benzal chloride.—T. A. L.

troleum; Composition of ——. C. F. Mabery. Amer. Chem. J., **28**, [3], 165—198.

E hydrocarbons with boiling points above 216° C., given in accompanying table, were isolated from Pennsylvania troleum.

The last two liquid hydrocarbons belong to the series C_nH_{2n-2}, members of which also occur in the less volatile rtions of Canadian, Californian, and Texan oils, and ir presence is considered to reveal a closer relationship an was hitherto suspected between Pennsylvania oil and heavier oils from the other fields mentioned. By owing 3 kilos. of the same Pennsylvania oil to evaporate ntaneously at ordinary temperature for 30 days, the hor obtained 1 kilo. of an oil nearly corresponding in gr. with $C_{28}H_{54}$, and having the percentage composition the C_nH_{2n-2} series.

——	—	Boiling Point.	Melting Point.
		°C.	°C.
Tridecane	$C_{13}H_{28}$	226	..
Tetradecane	$C_{14}H_{30}$	236—238	..
Pentadecane	$C_{15}H_{32}$	256—257	..
Hexadecane	$C_{16}H_{34}$	274—275	..
Heptadecane	$C_{17}H_{36}$	288—289	10
Octodecane	$C_{18}H_{38}$	300—301	20
Nonodecane	$C_{19}H_{40}$	210—212 (50 mm.)	33—34
Hydrocarbon, liquid at − 10°.	$C_{21}H_{42}$	230—231 "	40—41
Henicosane	$C_{21}H_{44}$	.. ..	..
Hydrocarbon, liquid at − 10°.	$C_{22}H_{44}$	240—242 (50 mm.)	..
Docosane	$C_{22}H_{46}$	.. ..	44
Hydrocarbon, liquid at − 10°.	$C_{23}H_{46}$	258—260 (50 mm.)	..
Tricosane	$C_{23}H_{48}$	.. ..	45
Hydrocarbon, liquid at − 10°.	$C_{24}H_{48}$	272—274 (50 mm.)	..
Tetracosane	$C_{24}H_{50}$	.. ..	48
Hydrocarbon, liquid at − 10°.	$C_{26}H_{52}$	280—282 (50 mm.)	..
Pentacosane	$C_{25}H_{52}$	.. ..	53—54
Hydrocarbon, liquid at − 10°.	$C_{27}H_{52}$	292—294 (50 mm.)	..
Hexacosane	$C_{26}H_{54}$	.. ..	58
Hydrocarbon, liquid at − 10°.	$C_{28}H_{54}$	310—312 (50 mm.)	..
Octocosane	$C_{28}H_{58}$	.. ..	60

—C. S.

Petroleum from Beaumont; Free Sulphur in ——. F. C. Thiele. Chem.-Zeit., **26**, [77], 896—897.

A SAMPLE of sediment from a tank car, furnished the author, on analysis, the following composition:—Amorphous grey sulphur, 63·63; crystalline sulphur (m. pt. 132° C.), 6·81; crude petroleum, 29·56 per cent. Phosphorus compounds and arsenic sulphides were also present; and a terpene was isolated from the alcoholic solution of the substance. The crystalline sulphur was entirely soluble in caustic potash, and the cold solution evolved a fishy smell, due to nitrogen compounds. The formation of the sediment is ascribed to pressure in the tank car, whereby the solvent power of the crude oil suffered diminution. This circumstance forms the best proof of the presence of free sulphur in Beaumont oil. The cap rock overlying the oil deposit consists chiefly of calcium carbonate, but contains 1·58 per cent. of sulphur (free and in organic combination), and 0·21 per cent. in the form of sulphates, the amount being too large to regard as an accidental impurity.

The fact that Beaumont oil yields better distillates after storage, is due to the deposition of sulphur, which is then unable to influence the terpenes and resins during distillation. The dissolved sulphuretted hydrogen is harmless, and can readily be removed by blowing steam into the oil.

—C. S.

Benzene; Action of Sulphur Chloride on ——. E. Lippmann and J. Pollak. Monatsh., 1902, **23**, [6], 669.

COMMERCIAL benzene is heated for 192 hours with 15 per. cent. of sulphur chloride, until no further evolution of hydrochloric acid takes place. The benzene is distilled off with steam, washed, dried over calcium chloride, and rectified. It boils constantly at 81° C., and is found to be free from thiophene, giving no indophenine reaction with isatin and sulphuric acid. Benzene free from thiophene is not acted on by sulphur chloride, even after heating for 10 hours to 100° C. Probably a halogen derivative of thiophene is formed.—T. A. L.

Diphenyl; Pyrogenetic Production of ——, *by means of the Electric Current.* W. Löb. Zeits. f. Elektrochem., 1902, **8**, [40], 777—778.

BENZENE (say 50 grms.) is heated in a round flask over a water-bath, and the vapours are condensed in a vertical condenser with return flow, after passing over a carbon filament heated to a clear red-heat, care being taken that all air is expelled from the apparatus before switching on the current to the filament. After four hours of such treatment, about 11 grms. of white crystalline material, containing 7·5—8 grms. of pure diphenyl may be obtained by

distilling off the unaltered benzene in the flask. Beyond this period (of four hours), the boiling-point of the benzene is raised beyond that which renders the water-bath serviceable, and an oil-bath or sand-bath would have to be substituted. If the temperature of the carbon filament be too high, carbonisation occurs, and the deposited carbon thickens the filament, so that its resistance is less, and the temperature is reduced below that at which flashing occurs. There is provided in this way an automatic method of controlling the temperature. Platinum or nickel wires may be substituted for the filaments, but the temperature used should at first be unnecessarily high, so as to yield a slight deposit of carbon, which will assist the automatic temperature regulation.—W. G. M.

IV.—COLOURING MATTERS AND DYESTUFFS.

o-Hydroxycarboxylic Acids; Action of Sulphites on Aromatic ——. H. Bucherer. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [18], 477—480.

1-HYDROXY-2-NAPHTHOIC, 2-hydroxy-1-naphthoic, and 2-hydroxy-3-naphthoic acids lose their carboxyl groups and become converted into naphthols when they are heated with a solution of sodium bisulphite and caustic soda.

When an ammoniacal solution of ammonium sulphite is employed, the elimination of the carboxyl group again occurs, but the product in this case is the corresponding naphthylamine.

Salicylic acid, on the other hand, is not affected by these reagents.—G. T. M.

Halogen Dinitronaphthalenes. F. Ullmann and F. Consonno. Ber., 1902, **35**, [15], 2802—2811.

WHEN α-chloronaphthalene is nitrated, it yields 1.4-chloronitronaphthalene, together with the 1.1′- and 1.4′-derivatives according to Ger. Pat. 120,585. Further nitration is said to yield a mixture of two chloro-dinitronaphthalenes melting at 180° and 106° C. Similarly, α-bromonaphthalene yields a nitro derivative melting at 85° C., and subsequently two bromodinitronaphthalenes, whilst the bromination of α-nitronaphthalene gives 1.4′-bromonitronaphthalene melting at 122°·5 C. Both the bromodinitro derivatives on reduction give 1.1′-diaminonaphthalene melting at 66°·5 C. Chlorination of α-nitronaphthalene yields 1.1′-chloronitronaphthalene melting at 94° C., which on nitration forms 1.4.1′-chlorodinitronaphthalene (m. pt. 138° C.), since on reduction it is converted into 1.4′-naphthylene diamine. The authors also find that the halogen atom in the 1.4.4′- or 1.4.1′-chloro- or bromo-dinitronaphthalene is readily replaceable. On heating with ammonia or substituted amines, the corresponding dinitronaphthylamines are formed, and with sodium carbonate or sodium ethylate the corresponding naphthols or naphthol ethers.—T. A. L.

Naphthoquinone; Hydroxy Derivatives of ——. P. Friedländer and L. Silberstern. Monatsh. für Chem., 1902, **23**, [6], 513—533.

OF the nine possible monohydroxy derivatives of naphthoquinone, only β-hydroxy-α-naphthoquinone (O:O:OH = 1:4:2) and Juglone (1:4:1′) are known, whilst the 23 possible dihydroxy derivatives are represented by Naphthazarin (O:O:OH:OH = 1:4:1′:2′) and Isonaphthazarin (1:4:2:3). They are obtained by combining dihydroxynaphthalenes or aminonaphthols with diazo compounds, reducing the *p*- or *o*-azo derivatives, and reacting with acid oxidising agents on the aminodihydroxynaphthalenes or diaminonaphthols formed. The authors by this method have synthesised Juglone, Naphthazarin, and Isonaphthazarin, and have also obtained from trihydroxynaphthalene a new isomeric naphthazarin (O:O:OH:OH = 1:4:2′:3′).

Juglone is obtained from 1.1′-aminonaphthol (Ger. Pat. 55,404). This product, melting at 94°—97° C., and giving a monacetyl derivative melting at 138° C., soluble in alkalis, gives, with an equimolecular proportion of diazotised sulphanilic acid, a garnet-red azo dyestuff. This, on reduction with zinc dust and hydrochloric acid, yields a reduction product, which is oxidised by ferric chloride to Juglone. By combining 1.1′-aminonaphthol or 1.1′-diamino- or dihydroxynaphthalene with two molecular proportions of diazotised sulphanilic acid and reducing, the resulting solution yields Naphthazarin on air-oxidation alone.

The starting point for Isonaphthazarin is from 2.3-dihydroxynaphthalene, which the authors have further characterised by preparing, by means of dimethyl sulphate and ethyl iodide, the methyl and ethyl ethers, the mono derivatives melting at 108° and 103° C. respectively, and the di-derivatives at 116° and 97° C. The aminodihydroxynaphthalene obtained by combining the above dihydroxynaphthalene with one molecular proportion of sulphanilic acid, and reducing with stannous chloride and hydrochloric acid, does not yield β-hydroxy-β-naphthoquinone on oxidation, but a product, $C_{20}H_{10}O_7$, melting at about 250° C. With two molecular proportions of diazotised sulphanilic acid and subsequent reduction, there results 1.4.2.3-diaminodihydroxynaphthalene, which, on oxidation with ferric chloride, yields Isonaphthazarin.

In order to obtain 2.3.1′.4′-dihydroxynaphthoquinone, the authors start from 2.3.1′.3′-naphtholtrisulphonic acid. When fused with caustic soda, the first product is a mixture of two dihydroxynaphthalene disulphonic acids, one of which, probably the 2.1′.3.3′-dihydroxynaphthalene disulphonic acid, is separated by formaldehyde and hydrochloric acid as a dark blue precipitate, whilst the other, probably the 2.3.1′.3′, is not altered. By prolonging the soda fusion, a second sulphonic acid group is replaced, yielding a uniform product, 2.3.1′.3′-trihydroxynaphthalene sulphonic acid. By heating this substance with dilute sulphuric acid in an autoclave, it gives 2.3.1-trihydroxynaphthalene, which crystallises from xylene in yellowish needles melting at 175° C. The product gives a triacetyl derivative melting at 144° C., and a trimethyl ether melting at 128° C., and smelling, on warming, of cloves and thymol. The azo dyestuff obtained by combination with diazotised sulphanilic acid in weak acetic acid solution gives a reduction product with stannous chloride which, on oxidation, yields 2.3.1′.4′-dihydroxynaphthoquinone analogous to Hystazarin. The substance has scarcely any affinity for mordants, and gives, with acetic anhydride, a diacetyl compound melting at 67° C.—T. A. L.

Anthranilic Acid; Electro-Thermal Formation of —— *from o-Nitrotoluene.* W. Löb. Zeits. f. Elektrochem. 1902, **8**, [40], 775—777.

CONTINUING previous experiments in the same direction (see this Journal, 1901, 588 and 1119), the author has experimented as to the action of heat upon *o*-nitrotoluene. If passed alone over a wire heated to dull redness, the vapour undergoes violent, almost explosive decomposition accompanied by separation of nitric oxide and by carbonisation. But if the vapour be diluted with water-vapour anthranilic acid and other bodies are produced in fair quantity when the temperature of the wire is between 500° and 1,000° C. The wire or ignited material used, may be of platinum, platiniridium, nickel, iron, or carbon, without affecting the result qualitatively. Copper, however, behaves differently. The addition of volatile acid vapours (such as HCl) to the mixture of gases, does not affect the production of anthranilic acid. Among other constituents of the product are a large quantity of resin containing many complex (azo- and azoxy-?) acids with a little *o*-eresol and some salicylic acid. In a typical example quoted, 20 grms. of *o*-nitrotoluene and 100 grms. of water were boiled briskly in a round flask provided with an inverted condenser with return flow, so that the vapours, after expelling the air in the apparatus, passed over a platinum wire, 0·25 mm. in diameter, and 20 cm. long, heated to about 1,000° C. by a current of 3·5 ampère at 5·32 volts. The aqueous solution at once became yellow, then the nitrotoluene became darker in colour, and subsequently viscid, and subject to "bumping." After treatment for four hours, the liquid was freed from nitrotoluene, eresol, and salicylic acid by means of steam. The distillat

elded 0·2—0·3 grm. of salicylic acid and 0·1 to 0·2 grm. cresol. The residue from the distillation yielded 1·5—·6 grm. of crude anthranilic acid, from which the pure acid as readily obtained. Copper wire cannot be used for the urpose, as when heated to redness it acts upon the mixture, nd, in the presence of the water vapour, produces toluidine. is probable that the main reaction may be explained by ne separation of the elements of water from the *o*-nitro-luene, with the production of anthranil, which, by boiling ith alkalis, or by the action of heated water-vapour, is nverted into anthranilic acid, thus—

$$C_6H_4.NO_2.CH_3 \rightarrow C_6H_4.N.CH.O + H_2O.$$

he formation of salicylic acid, is due to the action of eam on anthranilic acid at a high temperature. Small uantities of ammonia were detected amongst the products the reaction.—W. G. M.

minohydroxydiphenylamines and Analogous Substances. R. Gnehm. Ber., 1902, **35**, [15], 3085—3088.

ERTAIN of the aminohydroxydiphenylamines which are f value for the production of sulphide dyestuffs are naracterised by the author.

Dimethyl-p-amino-p-hydroxydiphenylamine is obtained y condensing dimethyl-*p*-phenylene diamine with hydro-uinone, or in better yield by reducing so-called Phenol lue. The product crystallises in white needles melting 161° C., gives a diacetyl compound melting at 131° C., dibenzoyl derivative melting at 210° C., a tetranitro ompound melting at 228° C., and addition products with ethyl and ethyl iodide melting respectively at 218 and 06° C.

Dimethyl-p-amino-m-hydroxydiphenylamine, obtained by ondensing resorcinol with dimethyl-*p*-phenylene diamine, eparates from water in greyish plates melting at 99° C. ; gives a diacetyl compound melting at 101° C., a dibenzoyl ompound melting at 112° C., and a nitrosamine melting at 25°·5 C.

Dimethyl-p-diamino-diphenylamine, which is formed by educing the indamine obtained from dimethylaniline and niline, crystallises from water in long white needles elting at 116° C.

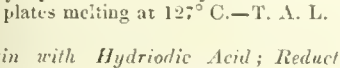
2-p-Dimethylanilino-2′-hydroxynaphthalene is obtained y condensing dimethyl-*p*-phenylene diamine with 2,2′-hydroxynaphthalene. It crystallises from dilute alcohol white plates melting at 127° C.—T. A. L.

hrysazin with Hydriodic Acid; Reduction of ——. H. Schrobsdorff. Ber., 1902, **35**, [15], 2930—2931.

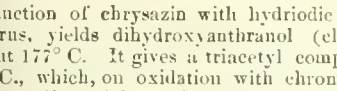
HE reduction of chrysazin with hydriodic acid and red hosphorus, yields dihydroxyanthranol (chrysanthranol) elting at 177° C. It gives a triacetyl compound melting 210° C., which, on oxidation with chromic and acetic ids, forms diacetylchrysazin, separating in yellow needles elting at 227°—232° C.—T. A. L.

uinizarin and Anthrarufin with Hydriodic Acid; Reduction of ——. B. Pleus. Ber., 1902, **35**, [15], 2923—2930.

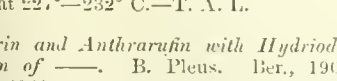
HE author has obtained from quinizarin and from anthrafin a number of reduction products by the action of ydriodic acid and red phosphorus. From the former he as prepared hydroquinizarol—



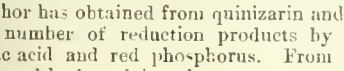
1.4-dihydroxyanthranol—



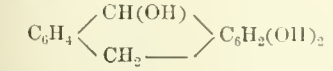
ydroxyhydroanthranol and hydro-α-anthranol—



which have been further characterised by their acetyl compounds. From anthrarufin he has obtained 1.5-dihydroxy-hydroanthranol—



(golden yellow needles melting at 241° C.) and 1.5-dihydroxyanthranol—



These two compounds give triacetyl derivatives melting respectively at 163° C. and 185° C., which, on oxidation with chromic acid and acetic acid, yield diacetyl compounds. Moreover, dihydroxyanthranol can be converted into dihydroxyhydroanthranol by reduction with hydriodic acid and red phosphorus. The author has also prepared anthrarufin ethyl ether (yellow needles melting at 164° C.), its acetyl compound (yellow plates melting at 173° C.), and anthrarufin diethyl ether (long silky needles melting at 178° C.).—T. A. L.

Nitrosophenols and o-Nitrosophenol; Methyl Esters of the True ——. A. Baeyer and E. Knorr. Ber., 1902, **35**, [15], 3034—3037.

THE action of Caro's acid on *p*- and *o*-anisidine yields the corresponding nitroso-anisols, although the *p*-compound was not obtained free from nitro-anisol. The product melts at about 33° C., is soluble in all organic solvents with the exception of light petroleum spirit, and is very volatile with steam. It is hydrolysed by dilute sulphuric acid, soda, or alcoholic potash lye to *p*-nitrosophenol. Similarly *o*-anisidine is oxidised in cold aqueous solution by a weak acetic acid solution of Caro's acid. The *o*-nitroso-anisol is blown off with steam, and crystallises from acetone-petroleum spirit in colourless plates melting at 103° C. It is very stable towards alkalis, and yields tarry matters with acids. By dropping its aqueous solution into boiling potassium bisulphate solution and passing the vapours into soda lye, the sodium salt of o-nitrosophenol is obtained, the yield being 20 per cent. of the theoretical. Free *o*-nitrosophenol (*o*-quinone oxime) has only been obtained as an oil. It gives a sparingly soluble barium salt and an explosive silver salt.—T. A. L.

Indigo Blue from o-Nitro-acetophenone. R. Camps. Arch. der Pharm., **240**, [6], 423—437.

EMMERLING and Engler (Ber., **3**, 855) found that *o*-nitro-acetophenone could be converted into Indigo by heating with zinc dust and soda-lime. The author has reinvestigated the subject, and finds that the reaction proceeds in two stages, the first product being an oil of characteristic odour, which by further heating yields Indigo. Further experiments showed that the oil could be obtained by reducing o-nitro-acetophenone in acid, alkaline, or neutral solution. The oil boils at 121°—127° C. at 17 mm. and is colourless and strongly refractive. Analyses gave figures which agree with those calculated for diacetohydrazobenzene. On heating the oil in a test tube it boils and then becomes coloured ; finally dark violet vapours of Indigo are produced. Water condenses on the cool portion of the tube, and an odour of HCN is noticeable. The oil forms a platinum salt, and, by action of sodium nitrite and HCl, crystals melting at 101°—102° C. are obtainable, the composition of which is uncertain, but they yield Indigo on heating with water.—J. O. B.

Indigo Reduction with Zinc Dust and Ammonia. A. Kufferath. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [18], 481. (Compare this Journal, 1901, 802.)

Two experimental vats were prepared with Indigo powder, B.A.S.F., zinc dust, and ammonia—one at 0° and the other at 50° C. Both vats gave good dark shades of blue on satin. An estimation of the Indigo white in the clear liquor of each vat showed that the warm solution contained less than half as much of this substance as the cold solution ; but, on

the other hand, the precipitated Indigo from the hot vat contained 78·3 per cent. of Indigotin, whilst that from the cold vat only contained 50 per cent. of this compound.

The probable explanation of these facts is that Indigo white and its decomposition products, being only weak acids, form ammonium salts, which are hydrolysed in the warm solution, and consequently the substances themselves are precipitated. A large excess of ammonia is required to keep Indigo white in solution in the form of its ammonium derivative.—G. T. M.

Indulines of the Aminoazobenzene Melt. O. Fischer and E. Hepp. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [17], 457—459.

The authors first refer to previous work by themselves and by Nietzki and Kehrmann (see this Journal, 1891, 457; 1893, 669—671; 1896, 192, 536; 1900, 653, 654; and 1902, 35, 767).

It has already been shown (this Journal, 1900, 654) that safranine derivatives react sometimes as *o*-quinoid, sometimes as *p*-quinoid compounds. Kehrmann has tried the reaction between Aposafranone and hydroxylamine, described by the authors, but without success. He concludes from this, that impure Aposafranone was used by them. Kehrmann's want of success is probably to be ascribed to the decomposing action of the strongly alkaline solution employed upon the hydroxylamine, an excess of which is required on this account. The Aposafranone used by the authors was prepared as follows:—

Preparation of Pure Aposafranone.—3 grms. of Aposafranine hydrochloride, dissolved in 1,200 grms. of 20 per cent. alcohol, containing 6 grms. of caustic potash, are boiled for about an hour under an inverted condenser. The solution is filtered while boiling, the residue being boiled with 500 grms. of 20 per cent. alcohol. The orange-red coloured filtrate deposits, partly on cooling, partly on evaporation, brown needles, which are dissolved in a boiling 10 per cent. solution of hydrochloric acid, the hydrochloride of the base separating in green prisms from this solution on prolonged standing. The base is isolated by decomposing the hydrochloride with sodium acetate; it crystallises from dilute alcohol or light petroleum in lustrous green prisms, m. pt. 249° C. In a mol. wt. determination, 264 was found (calculated, 272). With this preparation the oxime is readily obtained.

The following compounds have been isolated from the aminoazobenzene melt:—1. Azophenine. 2. Anilino-aposafranine. 3. Anilinomauveine. 4. Phenylanilinomauveine. 5. Paraphenylenediamine. 6. Di-*p*-aminodiphenylamine. 7. Diphenylfluorindine (in small quantity). As yet, it is interesting to observe, no derivatives of Aposafranine have been found in it.—E. B.

Nitrosophenol Dyestuffs. H. Decker and B. Solonina. Ber., 1902, **35**, [15], 3217—3225.

Although Liebermann's reaction (the colour produced by the action of nitrous acid on phenols) has long been known, it has not been possible to isolate the simplest nitrosophenol dyestuffs. The authors have investigated the product obtained by the action of red fuming nitric acid (sp. gr. 1·47) on thymol ethyl ether, which they find to be the nitrate of thymoquinonium ethylnitrate-thymolethyletherimine oxide. The base of this salt, on reduction, gives a colourless diphenylamine derivative, dithymolylamine diethyl ether, thymolyl being the radicle—

$$-C_6H_2(CH_3)C_3H_7(OH)1.2.5.4-$$

This product, on successive oxidation and reduction with hydriodic acid, gives dithymolylamine, which is the leuco derivative of the red quinoid substance thymoquinonethymolimine. The alkali salt of this is blue, and identical with the dyestuff obtained according to Liebermann's method after the purification of the latter by reduction and oxidation. Most probably, therefore, the nitrosophenol dyestuffs are indophenols containing an indophenol oxide formed simultaneously. These stand in the relation of Nietzki's resorufin to resazurin, which are secondary products of dihydroxyindophenol and its oxide. The colourless reduction product of the nitroso dyestuffs is nothing else than a derivative of *p* dihydroxydiphenylamine, which is immediately converted on air-oxidation into the dyestuff. —T. A. L.

Dyestuffs of the Aesculetin Series. II. C. Liebermann and S. Lindenbaum. Ber., 1902, **35**, [15], 2919—2923. (See this Journal, 1901, 1104.)

By treating aesculetin in small quantities, suspended in water, with sodium amalgam, it is converted into aesculetin dihydride and hydro-aesculetin, $C_{18}H_{14}O_8$. The former compound, $C_9H_8O_4$, crystallises in white plates, melting at 200° C. and gives a characteristic reaction when cautiously treated with ammonia, yielding a dyestuff dissolving in water with an eosine colour and a fluorescence similar to that of the aescorceïn sulphonic acid salts. The product, Aesculameïn, dyes wool a faint red, the ordinary mordants only slightly but the reverse with some of Scheurer's mordants. The brominated dyestuff gives bluish-violet shades on wool. —T. A. L.

Aromatic Nitro-Compounds; Influence of the Cathode Material on the Electrolytic Reduction of ——. W. Löb.

See under XI. A., *page* 1282.

Monohydroxybenzophenones. F. Ullmann and J. Goldberg

See under XX., *page* 1293.

Dyestuffs; New Method for the Qualitative Analysis of Artificial ——. J. Pokorny.

See under XXIII., *page* 1299.

English Patents.

Phenylamidoacetonitrile [Indigo Dyestuffs] and Homologues thereof; Manufacture of ——. O. Imray. From Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 21,077, Oct. 21, 1901.

See Fr. Pat. 315,940; this Journal, 1902, 543.—T. A. L.

Sulphur Dyestuffs from Dialkylamido-oxydiphenylamine and New Intermediate Products; Manufacture of Purified ——. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Main. Eng. Pat. 20,741, Oct. 16, 1901.

A method for purifying the dyestuffs obtained according to Eng. Pat. 16,247 of 1900 (this Journal, 1901, 889). See Fr. Pat. 303,524 (suppl.); this Journal, 1902, 402. —T. A. L.

Colouring Matter [Azo Dyestuffs], of Lakes therefrom and of an Intermediate Product relating thereto; Manufacture of a New ——. J. Y. Johnson. From the Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 20,553, Oct. 14, 1901.

See Fr. Pat. 315,573; this Journal, 1902, 544.—T. A. L.

Nitroalphylacidylamidonaphtholsulphonic Acids, Nitroalphylamidoacidylamidonaphtholsulphonic Acids, Amidoalphylacidylamidonaphtholsulphonic Acids, or Amidoalphylamidoacidylamidonaphtholsulphonic Acids, and New Azo Colouring Matters derived therefrom; Manufacture of New ——. O. Imray. From Soc. Chem. Ind. in Basle. Eng. Pat. 13,778, June 17, 1902.

Nitroalphylacidylaminonaphtholsulphonic acids or nitroalphylaminoacidylaminonaphthol sulphonic acids are obtained by reacting with acid chlorides of nitroalphyl (*e.g.*, *m*-nitrobenzoyl chloride), nitroalphylisocyanates and nitroalphylisothiocyanates on aminonaphtholsulphonic acid. These compounds, on reduction, yield new aminoalphylacidyl and aminoalphylaminoacidyl-aminonaphtholsulphonic acids. The latter can also be obtained by hydrolysing the acetyl aminoalphylacidylaminonaphthol-sulphonic acids formed by reacting with the acid chlorides of acetylaminoalphyl (*e.g.*, acetaminobenzoyl chloride) on aminonaphtholsulphonic acids. The new aminoalphylacidyl- or aminoalphylaminoacidyl-aminonaphtholsulphonic acids are useful as primary components for the preparation, by combination with diaz

mpounds, of azo dyestuffs which can be diazotised and veloped in bulk or on the fibre with amines and phenols, d differ from the original aminonaphtholsulphonic acids in ving diazo compounds, which, on treatment with alkalis, eld reddish-yellow to reddish-blue dyestuffs, and not violet black dyestuffs. The nitro derivatives above mentioned mbine in alkaline solution with diazo compounds to form o dyestuffs suitable for the manufacture of lakes. Similar estuffs can be obtained by treating with nitro alphyl lorides the azo dyestuffs resulting from the combination diazo compounds and aminonaphtholsulphonic acids. yestuffs containing an aminoalphylacidyl or an amino-phylaminoacidyl radicle are also formed by hydrolysing e azo dyestuffs obtained from aromatic diazo compounds id acetylaminoalphylacidylaminonaphtholsulphonic acids. urther, the diazotised aminoalphylacidyl- or amino-alphyl-minoacidyl-aminonaphtholsulphonic acids combine with nines or phenols, the resulting azo dyestuffs combining in alkaline medium with diazo compounds. The shades tained, which are said to be very fast to washing, are also stinguished by their intensity and brilliance.—T. A. L.

yewoods, Sugar-Cane, Beets, Bagasse, and other Materials; Treatment of ——, and Apparatus therefor. F. Kessler. Eng. Pat. 15,355, July 9, 1902.

See under XVI., *page* 1288.

United States Patents.

olour Scale. C. J. Jorgensen, Milwaukee, Wis., U.S.A. U.S. Pat. 709,328, Sept. 16, 1902.

HE patentee claims the construction of a colour chart conining a series of coloured figures arranged in a rational quence. This is effected by taking the three primary olours, yellow, red, and blue, mixing them in pairs to form econdary colours, and mixing each of these with the rimary colour which it does not contain or with any other econdary colour containing the omitted primary colour.
—T. A. L.

oluylic Aldehyde, and Process of Making same; Ortho-sulphonated ——. J. Koetschet, St. Fons. Assignor to Soc. Chim. des Usines du Rhône anc. Gilliard, P. Monnet et Cartier, Lyons. U.S. Pat. 709,159, Sept. 16, 1902.

y sulphonating *m*-toluic aldehyde with 60 per cent. oleum t a low temperature, the chief product is the o-mono-ulphonic acid $C_8H_8SO_4$. Its sodium salt reacts with hosphorus pentachloride, giving a chloride melting at bout 109° C. See Eng. Pat. 21,365 of 1900; this Journal, 901, 1205.—T. A. L.

reen Dye [*Triphenylmethane Dyestuffs*], *and Process of Making same.* J. Koetschet, St. Fons. Assignor to the Soc. Chim. des Usines du Rhône, anc. Gilliard, P. Monnet, et Cartier, Lyons. U.S. Pat. 709,160, Sept. 16, 1902.

HE sulphonated *m*-toluic aldehyde described in the preeding specification is condensed with dimethylaniline to a euco compound which on oxidation yields a bluish-green yestuff fast to alkalis. In place of dimethylaniline may e employed diethylaniline, ethylbenzylaniline, methyl- or thyltoluidine, or their substitution products, such as ethyl-enzylaniline sulphonic acid, dibenzylsulphonic acid, toluine-*p*-sulphonic acid, or naphthylamine sulphonic acid. ee Eng. Pat. 21,365 of 1900; this Journal, 1901, 1205.
—T. A. L.

Blue Sulphur Dye [*Sulphide Dyestuffs*], *and Process of Making same.* R. Herz, Assignor to L. Cassella and Co., Frankfort-on-the-Maine. U.S. Pat. 709,151, Sept. 16, 1902.

Para-amino-tolyl *p*-hydroxyphenylamine, obtained by the imultaneous oxidation of *p*-aminophenol and *o*-toluidine, s heated with sulphur and sodium sulphide to 80°—120° C. The crude melt containing the leuco compound is dissolved n water, and the dyestuff is precipitated by a current of ir. It dissolves in water in presence of sodium sulphide, nd gives indigo-blue shades on unmordanted cotton. See Fr. Pat. 317,219; this Journal, 1902, 967.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

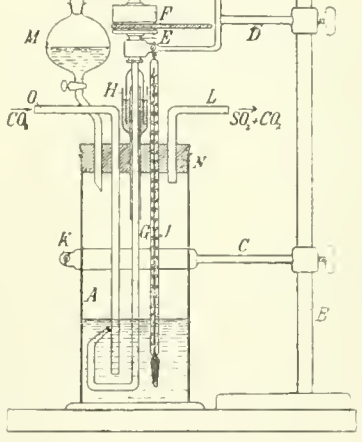
Silk; Weighting ——, with Tin Compounds. H. Silbermann. Zeits. Farben- u. Textil-Chem., 1902, **1**, [17], 464—465.

Silk weighted with stannic hydrate by the method formerly in common use is destructively affected by exposure to direct sunlight. When the weighting is accomplished by the Neuhaus method now generally practised, which consists in treating silk, in the form of yarn, successively with a solution of stannic chloride at 25°—30° B., water, and phosphate and silicate of soda, the fibre is much less readily injured by light, provided that stannous salts are absent from the stannic solution employed. When such salts have been present in this, the weighted silk suffers a deterioration in tenacity, slowly in the dark, more rapidly in the light. To detect the compound, resulting from the application of stannous salts, a sample of the yarn is heated with an acidified solution of mercuric chloride, when, if stannous tin be present, mercurous chloride deposits upon the yarn and, after washing, may be converted into a more or less dark grey coloured compound by treatment with hydrogen sulphide.

A similar destructive action upon the fibre is caused by ferrous salts present in the ferric mordant employed in dyeing black upon silk.—E. B.

Turkey-red Oil, [*Non-oxidising Action of Sulphuric Acid on Olive Oil*]. W. Herbig. Färber-Zeit., 1902, **13**, [18], 277—282.

With a view to determining the action of sulphuric acid upon olive oil, in the manufacture of Turkey-red oil, the sulphur dioxide generated during the treatment of olive oil with sulphuric acid was measured. The apparatus employed for this purpose consisted of a glass cylinder A (see figure) with an india-rubber stopper N, containing holes for a gas-inlet tube O for a current of carbon dioxide, a gas-exit tube L for the removal of this gas and the sulphur dioxide produced, a tap funnel M, thermometer J, and a stirring rod G driven by a turbine and working in



a mercury seal H. The oil experimented upon, namely pure olive oil, was placed in the cylinder and mixed with the acid which was allowed to drop into it, at various rates of speed, from the funnel. The results show:—

1. Little or no sulphur dioxide is evolved when the acid is added slowly and the mixture is cooled.

2. The rapid addition of acid causes sulphur dioxide to be disengaged. In an experiment in which the temperature of the acid-oil mixture rose from 17° to 41° C., 0·113 grm.

of sulphur dioxide was produced from 26·9 grms. (3 mols.) of acid and 100 grms. (1 mol.) of oil.

3. Sulphur dioxide is formed when the acid-oil mixture is allowed to stand for a long time.

4. As the quantity of sulphur dioxide produced, even under the unfavourable conditions mentioned above (2 and 3), is very small, the oxidising action of sulphuric acid on olive oil may be neglected when formulating the reactions which occur in the preparation of Turkey-red oil from this oil.—E. B.

Indigo Discharge Process; Function of Oxalic Acid in the Chromic Acid ——. W. G. Schaposchnikoff and W. Michireff. Zeits. Farben- u. Textil-Chem., 1902, **1**, [17], 459—464.

In the mixed sulphuric and oxalic acid discharging bath employed in calico printing, the first phase of the action which occurs is between the potassium chromate, printed upon the indigo-dyed tissue, and the sulphuric acid in the bath, resulting in the formation of potassium sulphate and chromic acid. The next phase is the reaction between the latter of these and the oxalic acid, giving carbon dioxide, which escapes, chromic hydrate, which is dissolved by the excess of sulphuric acid, and active oxygen; thus—

$$2CrO_3 + 2H_2O + C_2H_2O_4 = 2CO_2 + 2Cr(OH)_3 + O_2$$

the oxygen at the moment of its formation oxidising the indigo to isatin. The function of the oxalic acid is not, therefore, as is still, it would seem, generally assumed, a reducing one upon the chromic acid which is supposed to be dissolved from the tissue, but it is an oxidising one, and is much more important.

The authors have undertaken an exact experimental research upon the chromic acid discharge process with the object of elucidating:—

1. The effect upon the tenacity of the cotton fibre of the several operations of dyeing with indigo, treating with acid after dyeing, and treating with acid after printing.

2. The question whether the presence of oxalic acid in the discharging bath is essential.

3. Whether the oxalic acid reduces the destructive action upon the tissue which takes place.

4. Whether the reaction which occurs is correctly expressed by the above equation.

The present article deals with the first of these subjects.

Diminution in the Tenacity of Cotton Fibre caused by dyeing with Indigo.—Dynamometric tests show that the loss in tenacity suffered by cotton tissues in the operation of dyeing with indigo in a vat set with indigo pure (3 grms. per litre), powdered zinc (3·5 grms.), and lime (7·5 grms. of CaO), amounts to 9 per cent. A solution containing 10·7 grms. per litre of caustic soda, *i.e.*, an amount equivalent to the lime present in the vat, caused under the same conditions of immersion and exposure to air, the treated tissue being finally dried without washing, a loss of 3·4 per cent. A blank experiment made with a solution of lime, containing lime in suspension, as in the vat, gave a loss of 5·7 per cent. Although alkalis thus reduce the tenacity of the tissue, an important factor in such action is obviously to be sought elsewhere.

In the souring operation following the dyeing with indigo, the diminution in tenacity caused by an immersion for ½—1 minute in a solution containing 35 grms. of sulphuric acid per litre, amounted in one experiment to 9·5 per cent.; in another experiment, in which the tissue was afterwards washed with water until Congo Red was no longer reddened, and was then rinsed in dilute ammonia, and again in water, before being dried, the loss was 10·7 per cent.—E. B.

Calico Printing; Method of Producing Naphthylamine Bordeaux in ——. E. C. Kayser. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [17], 466—467.

A solution of tannic acid, thickened with gum tragacanth, is printed upon an unprepared cotton tissue, along with the ordinary Alizarin and pigment colour mixtures, with the exception of those containing Ultramarine Blue. The tissue is steamed for an hour, or longer if necessary. It is then treated with tartar emetic, rinsed, soaped, and dyed in a cold dilute solution of diazotised α-naphthylamine, until the yellow or yellow-brown tannic acid compound which is formed no longer darkens in shade. After being well rinsed in water, the tissue is treated with a cold solution of sodium β-naphtholate. A claret colour is thus obtained in the parts of the tissue where the tannic acid has been printed. Instead of naphthylamine and β-naphthol, certain other similar compounds may be employed, *e.g.* benzidine, tolidine, dianisidine, aminoazobenzene. The red colour produced with *p*-nitraniline and β-naphthol is too dull to be of technical value.—E. B.

English Patents.

Carpet; Washable and Waterproof ——. W. Montgomery, Addlestone. Eng. Pat. 17,308, Aug. 29, 1901.

Waterproof fabrics for covering floors are manufactured by spreading upon felt, jute, canvas, &c., a mixture of boiled linseed oil, wood flour, "benzine," paint, and driers. To produce a smooth surface upon them, the fabrics are pressed between rollers. If a rough surface be desired, this operation is omitted, and flocks or similar materials are added to the waterproofing mixture. The fabrics may be printed upon in the usual manner.—E. B.

Textile Fabrics; Method of and Apparatus for Waterproofing ——. F. Rushworth, Bradford. Eng. Pat. 19,656, Oct. 2, 1901.

Textile fabrics are first "mordanted in the usual way, and are then passed over a supporting bed beneath and in contact with a rotating brush, to which the waterproofing agent, which is liquid when hot and solid when cold, is supplied in the former state, being evenly brushed into the prepared fabrics, while these are being drawn over the supporting bed. The fabrics are then shrunk by being placed in a moist and warm condition between layers of wet cloths, or by any other known method.—E. B.

Textile Fabrics or Yarns; Mordanting and Dyeing —— [*by Means of Viscose*]. A. Fieldhug, Salford. Eng. Pat. 20,398, Oct. 12, 1901.

See U.S. Pat. 708,761; this Journal, 1902, 1230.—E. B.

United States Patent.

Silk; Process of Intensifying the Lustre of ——. C. Stuart Paterson, N.J. U.S. Pat. 709,524, Sept. 23, 1902.

Skeins of silk are taken in a damp state after dyeing and directly after treatment in a hydro-extractor, and are stretched and, at the same time turned, or turned and calendered, while they are subjected, in a closed chamber, to dry air at a temperature of about 120° F. The lustre of the fibre is thus enhanced, while its shrinkage is prevented.—E. B.

Errata.

This Journal, 1902, 1229, col. 2, l. 25 from bottom; also *ibid.*, 1230, col. 1, l. 10 from top, *for* "pyrosulphate" *read* "pyrosulphite."

This Journal, 1902, 1230, col. 2, l. 31 from bottom, *for* "to textile fabrics" *read* "for textile fabrics."

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Mill Boards; Colouring ——, *Black.* Papier-Zeit., 1902, **27**, [77], 2777.

Method A.—Four kilos. of logwood extract and 2 kilos. of quercitron extract are dissolved with gentle boiling in 30 litres of water; 1—2 kilos. of good starch, suspended in 2·5—5 litres of cold water, are boiled to paste in the above mixture, 1 kilo. of glycerin and 8—10 kilos. of casein solution (1:6) being then added. A first coating is given to the board with this solution. For the second coating, 7 kilos. of casein are dissolved in 42 litres of water with 700—800 grms. of ammonia (casein solution

:6); to this are then added, in the following order:—
)0 grms. of potassium bichromate, boiled in 3—4 litres of
ater; 150 grms. of copper sulphate, dissolved in 2 litres
water, with the addition of 1·5 litres of ammonia and,
necessary, 2 litres of glycerin. On the application of
is, the dull first coat acquires a deep black, washable
stre.

Method B.—Sodium silicate, logwood paste, and shellac
olution, with a little Marseilles soap, when mixed in
uitable proportions give with one coating a black, which
ay be rendered more lustrous and washable by polishing,
ter drying, with a brush rubbed in paraffin wax.

Method C.—2 kilos. of shellac and 1 kilo. of logwood
xtract are steeped, in a closed vessel, with 2 litres of
mmonia and 10 litres of water for 24 hours, and then dis-
olved at a moderate heat. Marseilles soap, 0·25—0·5
lo., dissolved in water, is then added, together with
fficient potassium chromate solution to give the paste the
roper shade of black (too much chromate decreases the
stre). The presence of shellac ensures the washing
ualities of the colour.—J. F. B.

ENGLISH PATENT.

Wall Coverings; Washable, Embossed ——. R. Völker, Buda Pesth. Eng. Pat. 22,461, Nov. 7, 1901.

MOULD composed of, *e.g.*, glue, plaster of Paris, or sul-
ur, and prepared from a model of the design to be
produced, is filled with a plastic mixture of magnesium
loride, gypsum or chalk, asbestos, magnesite, and dextrin,
which pigments may be added if desired. A backing
paper, textile tissue, sheet zinc, or wood, is pressed upon
e plastic mass, which is then allowed to harden. When
e mass is completely set, the fabric produced is withdrawn
om the mould, and is ready for use.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Oceanic Salt Deposits; Formation of Langbeinite. J. H. van't Hoff, W. Meyerhoffer, and F. G. Cottrell. Preuss. Akad. Wiss. Berlin, Sitz. Ber., 1902, **15**, 276—282.

KAINITE, $K_2Mg(SO_4)_2.6H_2O$, is converted into *leonite*, $K_2Mg(SO_4)_2.4H_2O$, at 47·5° C. or 41° C., according as K_2SO_4 or $MgSO_4$ is present in excess. Further dehydration occurs at 72·5° C.; the product, however, is not *langbeinite*, $K_2Mg_2(SO_4)_3$, but a complex of the formula, $K_2Mg_4(SO_4)_5.H_2O$. The conversion of *leonite* into *langbeinite*, which latter occurs in the Stassfurt salt-beds, takes place, according to the equation:—

$$2K_2Mg(SO_4)_2.4H_2O = K_2Mg_2(SO_4)_3 + K_2SO_4 + 8H_2O.$$

On heating in a sealed tube, the transition temperature being about 89° C. The formation of *langbeinite* from *leonite* and magnesium sulphate,—

$$K_2Mg(SO_4)_2.4H_2O + MgSO_4.6H_2O = K_2Mg_2(SO_4)_3 + 10H_2O,$$

takes place above 61° C. *Langbeinite* can be obtained from a solution saturated with K_2SO_4 and $MgSO_4$ at 85° C. or above, but a better method consists in adding magnesium chloride as a dehydrating agent, and subsequently extracting with alcohol. The temperature of formation of *langbeinite* from *leonite*, which is lowered from 89° to 61° C. by the presence of magnesium sulphate, falls to 37° C. in a solution saturated with common salt, and this is probably the lowest temperature at which it can have been deposited in the Stassfurt beds.—A. S.

Ferrocyanide Manufacture at the Hague Gas-Works. J. Rutten. Het Gas; through J. Gas Lighting, 1902, **80**, [2055], 879—882.

As the Bueb process for the recovery of cyanogen from coal-gas (see Eng. Pat. 9075, 1898; this Journal, 1899, 570; also this Journal, 1900, 999; 1902, 1026), the final products are a pressed cake containing the cyanogen in the form of insoluble ammonium ferrocyanide (this Journal, 1900, 999), and a lye containing ammonium sulphate. The application of this process is not feasible in works in which concentrated "ammoniacal liquor" is produced, since all the ammonia combined as sulphate would have to be liberated by means of alkali, and the cost of producing the concentrated liquor would be greatly increased; also, great care is required in the working up of liquors containing high and varying proportions of ammonia.

In the author's process, which is in practical operation at the Hague Gas Works, the final products are concentrated "ammoniacal liquor," containing 15—20 per cent. of ammonia, chiefly combined as carbonate and sulphide; liquor ammoniæ containing about 25 per cent. of ammonia; and potassium ferrocyanide (99 per cent.). In carrying out the process, basic ferrous carbonate is prepared by mixing hot solutions of ferrous sulphate (1,320 lb.) and sodium carbonate (606 lb.), allowing to stand, and washing the precipitate with water, in the mixing vessel, till free from sulphates. The precipitate is then agitated with from 660 to 1,320 galls. of water, and from 660 to 1,320 lb. of potassium carbonate, and the mixture run into the cyanogen extraction apparatus. After the extraction of the cyanogen, the liquor is run into a settling vessel, the precipitate of iron sulphide, ammonium ferrocyanide, and Prussian blue allowed to deposit, and the clear lye containing 4—5 per cent. of ammonia, chiefly as sulphate and carbonate, treated in a special Feldmann ammonia extraction apparatus. The condensed vapours produce a concentrated ammoniacal liquor containing 15—20 per cent. of ammonia. In the residual liquor in the still, a small quantity of a precipitate containing cyanide is formed. This is separated by filtration, and the liquid is then concentrated and the potassium ferrocyanide crystallised out.

The precipitate containing iron sulphide, ammonium ferrocyanide, &c., after the clear liquid has been separated, is filter-pressed and distilled with caustic potash, the ammonia evolved being collected in distilled water for the production of liquor ammoniæ. The residue in the still is filter-pressed, potassium ferrocyanide recovered from the lye by crystallisation, and the press-cake, if the mass has not been too strongly oxidised, used over again for cyanogen extraction.—A. S.

Foul Gases evolved in the Sulphate of Ammonia Manufacture; Removal of Sulphuretted Hydrogen from ——. [*Hemingway's Process.*] Chief Alkali Inspector's Thirty-eighth Annual Report, 1902. (See also this Journal, 1902, 1136.)

FURTHER experiments have been carried out in the Chief Inspector's laboratory on the reactions occurring in Hemingway's process for the removal of sulphuretted hydrogen from the foul gases evolved in the sulphate of ammonia manufacture by the use of sulphite of iron (see Thirty-seventh Annual Report, 1901, 20—21, and also this Journal, 1900, 442, Hemingway, Eng. Pat. 9432, 1899). Mr. Hemingway has more recently pointed out to the Chief Inspector that a statement (p. 21 of Thirty-seventh Annual Report) of what occurs in the laboratory experiments, indicating that "a material loss of sulphur takes place through formation of thiosulphate, the sulphur in which is lost as far as the process is concerned," is not applicable to what takes place on the working scale, where he has found that ferrous thiosulphate is quite as efficient as sulphite in absorbing sulphuretted hydrogen from the gaseous mixture ascending his purifying column. Experiments made by Mr. Linder in the Chief Inspector's laboratory proved the correctness of Hemingway's view. In the experiments, two theoretical hypotheses were followed and examined, broadly represented by the two equations given in this Journal, 1902, 1136. This resulted in the rejection of the first, *viz.*, $FeS_2O_3 + 3H_2S = FeS + 4S + 3H_2O$, since the black precipitate produced by the action of sulphuretted hydrogen on ferrous thiosulphate solution, was quite insoluble in dilute hydrochloric acid, and yielded no H_2S with excess of the acid. The second equation, *viz.*, $FeS_2O_3 + 3H_2S = FeS_2 + 3H_2O + 3S$, however, affords a full and adequate explanation, quantitative and qualitative, of the reactions taking place. It is pointed out that, "taking the sum of the reactions, starting with sulphite of iron and sulphuretted hydrogen, in such a tower as

Hemingway describes (*loc. cit.*), a mixture of ferrous sulphide and bisulphide with free sulphur might be expected as the insoluble products at the foot of the tower. These, if collected on a filter-bed of pyrites smalls, would give a mass rich in sulphur and therefore of use to the sulphuric acid maker, and the calcined ferric oxide in a state of fine division suitable for manipulation by the colour maker."—A. S.

Sulphur in Coal and Pyrites; Determination of ——. A. Reitlinger.

See under XXIII., *page* 1298.

Ozone; Reactions and Preparation of ——. C. Arnold and C. Mentzel.

See under XXIII., *page* 1297.

English Patents.

Carbonate of Lime obtained in the Recovery of Sulphur from Alkali Waste, and commonly called "Chance Mud"; Utilisation of ——. A. Mason, Chester. Eng. Pat. 21,314, Oct. 24, 1901.

The waste carbonate of lime is pressed and moulded into blocks, which are ground with salt cake and coal, with water or milk of lime, and then formed into bricks, or dried in heaps, for making black ash.—E. S.

Cyanogen Group; Treating the Spent Gases resulting from the Manufacture of Sulphate of Ammonia, for the Recovery of the ——. A. H. Godwin and F. A. Keil, Margate. Eng. Pat. 2456, Jan. 30, 1902.

The gases are passed through a solution of an iron salt, such as iron chloride or sulphate, to which "a percentage of sodium or potassium hydrate or carbonate" has been added; the alkali ferrocyanide formed may be crystallised out, or Prussian blue may be produced by addition of a suitable ferric salt.—E. S.

Chlorates and Perchlorates; Electrolytical Manufacture of ——. P. L. E. Lederlin. Eng. Pat. 14,387, June 25, 1902.

See under XI. A., *page* 1282.

United States Patents.

Ammonia Generator. J. A. Young, Assignor to C. Doersch, Trustee, Nyack, New York. U.S. Pat. 709,846, Sept. 23, 1902.

The generator, intended for the production of ammonia water for laundry purposes, &c., consists of a solid inner core of caustic soda or lime, contained loosely within an outer enveloping sphere of, preferably, ammonium carbonate, through which are channels to the inner space, nearly tangential to the spherical core, so that when the generator is placed in the water to be ammoniated, the rush outwards of the gas generated by the percolation of the water within may cause a rolling motion of the sphere. The apertures to the channels are covered by caps, which may be perforated as required. The generator receives two coats, "relatively insoluble," the inner of paraffin, and the outer coat of a preparation of gelatin and chromic acid, for instance.—E. S.

Magnesium Peroxide; Process of Making ——. F. Elias, Berlin. U.S. Pat. 709,086, Sept. 16, 1902.

Barium peroxide, previously hydrated by prolonged trituration in water, is brought into a very fine state of division, then suspended in water, and treated with a magnesium salt, such as the chloride, the presence of a little hydrochloric acid being desirable. The magnesium peroxide is then filtered off, washed, and dried.—J. F. B.

Sodium Peroxide; Process of Compressing ——. G. F. Jaubert, Paris. U.S. Pat. 709,490, Sept. 23, 1902.

See Eng. Pat. 17,461, 1900; this Journal, 1901, 43.
—J. F. B.

Cyanate of Potassium; Producing ——. S. Zuel schwerdt, Leopoldshall, Germany. U.S. Pat. 709,57 Sept. 23, 1902.

The mixture of salts (potassium cyanate, cyanide, ar carbonate) obtained from the synthetic cyanogen processe is made into a mash with sufficient water to dissolve tl potassium carbonate, at a temperature not exceeding 66° (and the residual salts are treated with sufficient water dissolve the cyanide, at a temperature between −18° ar +5° C., potassium cyanate remaining practically undi solved.—E. S.

Chlorine Gas; Generator for ——. T. Edwards, Sebastopol, Australia. U.S. Pat. 709,004, Sept. 16, 1902

The generator is a semi-cylindrical iron, lead-lined vess adapted to sustain considerable pressure, and mounted c trunnions, so as to be free to oscillate. The cover has central opening surmounted by a dome, for admission acid, and for the chlorine exit pipe, and other openings f charging and discharging, lead washers extending arour their edges, with devices for closing.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Stoneware [Pottery] Glaze; Formation of Sediment in —— M. Ilcim. Sprechsaal, **35**, [35], 1337—1338.

The frequent tendency to deposit sediment, exhibited stoneware glaze, may occasionally be remedied by addi crude plastic clay, kaolin, white lead, or chalk to the ma previous to the final grinding, or by increasing the densi or viscosity of the liquid portion of the glaze with gu dextrin, syrup, milk, blood, borax, boric acid, or acetic ac Cases are, however, known where the sediment becom hard and cannot be redistributed without regrinding, t result of which treatment is to increase the tendency harden. This effect of excessive grinding would seem to due to a partial dissociation of the glaze constituents, wi formation of basic silicates that are more or less soluble water, and capable of setting hard in conjunction with oth siliceous materials. That this is actually the case has be demonstrated by the author with a glaze fritt, which, aft grinding with water for 10 days, gave a decided alkali reaction to test paper, whereas neither the original fritt n any of the materials, such as chalk, white lead, or miniu added in grinding, gave any such reaction. A volumet determination of the alkalinity, performed with acid presence of phenolphthalein as indicator, revealed t presence of 4·8 grms. of free alkali in 25 c.c. of gla (fritt : water = 1 : 1½); and this ground glaze set so hard the mortar, within a short time, that the porcelain ba were fixed as though embedded in cement. On stirring a portion of the sediment with water, it proved difficult moisten, drawing out in long ropy threads; but on gradua neutralising the alkali with a free acid, the viscosity w proportionally reduced and finally disappeared.

This experiment indicates the remedy for the fault question; namely, that the frit should not be grou longer than is necessary to obtain the proper degree of fi ness. In regrinding the solidified deposit, a little hyd chloric or nitric acid (free from iron) should be added to t solid glaze, the proportion not exceeding half a litre of 30 acid per 100 kilos. The excess of acid is afterwards wash out by decantation, and the glaze will be fit for use. simpler remedy for practical use, however, is to neutral the alkali with a soluble salt of an alkaline earth, e barium nitrate, which at the same time precipitates insoluble silicate. On stirring up such a salt with the gla the sediment is quickly and completely dissipated.—C. S

United States Patent.

Silvering Glass; Trough for ——. C. Laval, Pittsbu Penn. U.S. Pat. 709,336, Sept. 16, 1902.

The trough, for use in the silvering of sheet glass, has inclined bottom, and is provided with an impervious lining and a contracted outlet.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

...mp Walls; Tar Coating for ——. Moorman. Centr.-Bl. der Bauverwaltung; through the J. Gas Lighting, 1902, **80**, [2053], 739.

...E wall is first scraped and brushed clean, and the joints ...ared to a depth of about 0·4 in. Large-headed nails, ...out 2·3 ins. long, are then driven into the joints of the ...rses at intervals of about 4 ins., the head of the nail ...ng 0·3 in. from the masonry. Two coats of hot tar ...e next applied, and finally, a coat of cement is laid on ... tar in the ordinary manner, care being taken that the ...ls are covered well, to prevent them from rusting. The ...erage cost is about 3*s.* 8*d.* per square yard.—A. S.

...ime Sandstone; Artificial ——. J. Gas Lighting, 1902, **80**, [2051], 622.

...T sand is mixed with powdered quicklime, and a certain ...antity of water added at a temperature a little below ...ling point. The mixture is spread out in a closed vessel ...il the lime is completely slaked, and is then heated with ...erheated steam. The pulverulent mass obtained is, ...ore moulding, treated with steam in a mixer, and then ...mitted to the action of gaseous hydrofluoric acid in the ...dening apparatus. It is claimed that the artificial stone ...duced will withstand the effects of water, air, and fire. —A. S.

...ments; Inspection and Testing of ——. R. L. Humphrey. J. Franklin Inst., 1902, **43**, [1], 23—42; [2], 93—99.

...the conclusions drawn by the author from the results of ... investigations, it is pointed out that the cement made in ...ary kilns is a comparatively new article, the properties ... which are not yet completely known. This cement ...dens very rapidly, and develops great strength in a very ...rt time, but it has been observed that there is a period ...he hardening when the tensile strength falls off con...erably, both in the case of neat cement and of sand ...tures, though to a lesser degree with the latter. The ...e falling-off does not occur in compression tests. The ...at strength quickly attained by cements made in rotary ...ns is further increased during the early stages by the ...ition of sulphate of lime, and it is claimed that the ...iod of apparent retrogression occurs when the effect of ...sulphate is neutralised, and that the real strength, due ... the formation of the silicates, still continues. The ...quettes which show a loss of strength are perfectly ...nd and hard, and present no evidences of unsoundness ... disintegration. The loss of tensile strength during ...ening is probably due to crystallisation, and the reason ...t loss is greater with neat cement than with sand mixtures, ...hat the voids in sand mixtures enable the expansion, ...duced by the process of crystallisation, to take place ...n less injury to the adhesive qualities of the cement. ...he author considers that the proper method for ascer...ing the real strength of cement, especially at the end ... long period of time, is by compression tests. Tension ...s should be used for the purpose of determining the ...tive value of shipments of cement, and should be ...fined to tests not extending over more than 28 days (... also this Journal, 1902, 831).—A. S.

Cement Analysis: Note on ——. R. F. Young and B. F. Baker.

See under XXIII., *page* 1298.

English Patents.

...ing Bricks, Pottery, Malt, Cores for Foundry Work, ...d the like; Floors for ——. J. A. Mobberley, Stourbridge. Eng. Pat. 18,154, Sept. 11, 1901.

...T drying floor consists of a layer of steam pipes with ...t and cast cheek bars.—J. W. H.

Mortar, Concrete, Artificial Stone, and the like; Compositions applicable as ——. G. le Roy de Lenchères, Vierzon, France. Eng. Pat. 19,045, Sept. 24, 1901.

See U.S. Pat. 702,140, 1902; this Journal, 1902, 973.

—W. C. H.

Cement for Binding Pigments or other Pliant or Mouldable Substances; Manufacture of a Non-Hygroscopic Cohesive Medium or ——. L. Grote, London. Eng. Pat. 20,889, Oct. 18, 1901.

THE precipitate obtained by adding a concentrated solution of zinc chloride to a solution of an alkali silicate of 40° B. is washed free from alkali salts, to render it non-hygroscopic, and is pressed. The mass is then stirred in a nearly boiling alkali silicate solution of 40° B., to which an equal volume of water has been added. The product is evaporated to expel the greater part of the water present, and is then available for the purposes of the invention.—E. S.

Kilns; Fireproof Lining or Facing Material for ——; *also applicable for other Purposes.* H. H. Lake, London. From Portland Cement Fabrik Hemmoor and P. F. Valeur, both of Hemmoor, Germany. Eng. Pat. 21,616, Oct. 28, 1901.

PORTLAND cement clinkers, in place of broken stones, gravel, or coarse sand, are mixed with ground Portland cement, moistened with water, and stamped down in the interior of the kiln or the like, which is immediately heated or fired. The claims also include the manufacture of retorts, muffles, crucibles, and the like from this fireproof material.—W. C. H.

United States Patents.

Wall Finish, and Process of Making same. G. W. Wodicka, St. Louis, Miss., U.S.A. U.S. Pat. 709,188, Sept. 16, 1902.

A LUSTRELESS non-peeling wall finish is claimed. 2,000 lb. of powdered marble are added to a solution of 4 lb. of gum tragacanth in 42 galls. of water. The mixture is dried and reduced to an impalpable powder. Finally, 20 lb. of alum and 80 lb. of glue are added.—J. W. H.

Carborundum Articles [Refractory Bricks, &c.], and Process of Making same. F. J. Tone, Assignor to the Carborundum Co., both of Niagara Falls, Pa. U.S. Pat. 709,808, Sept. 23, 1902.

AMORPHOUS boron carbide, or a mixture of it and the crude materials of which the carbide is made, is compressed into a coherent form and crystallised by subjection to intense heat, which converts it into a crystalline and porous carborundum.—G. H. R.

X.—METALLURGY.

Moisture in Lake Superior Iron Ores. N. P. Hulst. Eng. and Mining J., 1902, **74**, [10], 302.

THE author points out that of the 20,589,393 tons of iron ore shipped from the Lake Superior region in 1901, 88 per cent. consisted of soft hematites, whilst about 46 per cent. contained 10 per cent. or more of moisture. A considerable saving of freight would be effected by drying ores containing such large proportions of moisture, and although it has been found not to be advantageous to remove all the moisture from soft hematite ores, prior to shipment, owing to the dust losses and inconveniences which would ensue in handling, yet 6 per cent. of moisture may be removed without detriment from all soft hematites containing 10 per cent. or more of moisture, where the physical structure of the ore shows a more or less coarse grain. The total cost, including interest and cost of installation, of removing such a proportion of the moisture is estimated at about 6 cents per ton, whilst the saving of freight with the ores in question would vary from 10·5 to 11·1 cents per ton. —A. S.

Gold Precipitation by Zinc Dust. G. A. Packard. J. Chem. and Metall. Soc. of S. Africa, 1902, **3**, [4], 34—35.

In reply to the discussion on his paper (see this Journal, 1899, 922 and 1022), the author states that the zinc dust used contains about 90 per cent. of Zn and costs at present 5 dols. per cwt.; samples of American manufacture containing only 60 per cent. of Zn were not sufficiently pure. The amount used depends upon the ore, and is not proportionate to the amount of gold and silver present, but averages about 1½ lb. per ounce of gold recovered. It is usual, after a clean-up, to add a quantity of zinc dust to the first tank-charge to be precipitated. At the Mercur mill, 30 lb. are thus used for a 30-ton charge, 20 lb. are added on the second, and from 5 to 10 lb. on each subsequent charge. The solutions are always drawn off about 8 ins. above the bottom of the tank, and a portion of the zinc remains therefore at the bottom; thus there is always an excess of zinc in subsequent charges, although less is then actually added. This practice leads to economy in zinc consumption. The cubic contents of the vats used are probably six times as great as those of the zinc boxes used in the other (shavings) process to treat the same quantity of material. The dust process ensures a more complete precipitation in less time than is customary with the shavings process in the case of dilute solutions, but is not necessarily in all cases preferable.—W. G. M.

Gold Industry; Value of the Residual Products of the Dynamite Factory for the ——. W. Cullen.

See under XXII., *page* 1296.

Aluminium; Alloys of ——. L. Guillet. Bull. Soc. d'Encour. pour L'Ind. Nat., 1902, **101**, [2], 221—273.

The author's experiments were made with a view to isolate the compounds of various metals with aluminium, to study their properties and to ascertain what rôle they play in the constitution of the alloys. The results obtained are summarised as follows:—

The compounds isolated were:—

(1) With tungsten, Al_3W and Al_5W in the form of crystals, and AlW_2 in the form of a crystalline powder insoluble in *aqua regia*.

(2) With molybdenum, Al_3Mo, $AlMo$, and Al_7Mo in the form of crystals, and $AlMo_4$ as a crystalline powder.

(3) With copper, the three compounds described by Le Chatelier, Al_2Cu, $AlCu$, and $AlCu_3$, the first-named in the form of prismatic crystals.

(4) With tin, the two compounds, $AlSn$ (maximum of the fusibility curve) and Al_4Sn, both in the form of crystals.

(5) With titanium, the two compounds, Al_3Ti_3 or $AlTi$, and Al_4Ti, the first in the form of lamellæ, the second as a crystalline powder.

(6) With iron, the two compounds Fe_2Al_3 and $FeAl_3$ in the form of crystals.

(7) With manganese, two compounds analogous to those of iron, Mn_2Al_3 and $MnAl_3$.

(8) With uranium, the two compounds, U_2Al_3 and UAl_3.

(9) With chromium, Cr_4Al and $CrAl$.

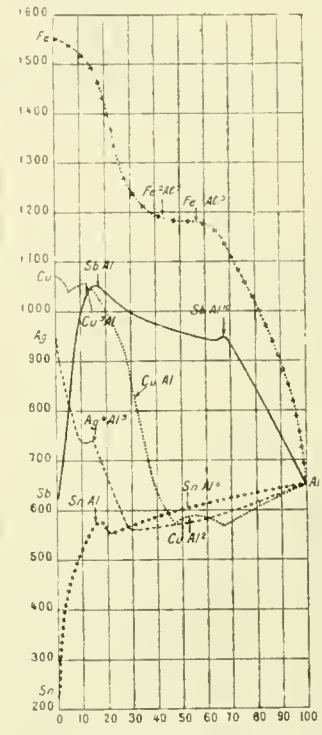
(10) With antimony, the compound $SbAl_{10}$ (one of the two maxima of the fusibility curve), which is interesting on account of its high melting point (about 950° C.), its specific gravity (2·7 at 20° C.), and its action on water (liberation of hydrogen and sometimes even formation of antimony hydride).

(11) With nickel, the compounds Ni_3Al, Ni_4Al (?), Ni_2Al, and $NiAl_2$.

(12) With cobalt, the compounds Co_3Al, Co_4Al (?), Co_2Al, and $CoAl_2$.

The author has also prepared $NiAl_3$ and $CoAl_6$ by fusing aluminium with nickel and cobalt respectively; other experiments appear to establish the existence of $FeAl$ and $MnAl$.

The accompanying diagram represents the fusibility curves determined by Le Chatelier, Roberts-Austen, Gauthier, Rolland-Gosselin, &c., and the author has indicated on them the various compounds isolated.



The mechanical properties of the alloys examined are given briefly as follows:—

(1) The aluminium tungsten alloys containing more than 58 per cent. of tungsten are very hard, but extremely brittle.

(2) Alloys of aluminium and molybdenum are very similar to the above; those containing the compound Al_7Mo rapidly disintegrate, owing to allotropic transformation.

(3) Aluminium-iron alloys are malleable.

(4) Aluminium-uranium alloys, within the limits examined, are hard and brittle.

(5) Alloys containing more than 65 per cent. of iron and those containing 67 per cent. of manganese are malleable.

(6) Aluminium-chromium alloys containing more than 1 or less than 45 per cent. of chromium are hard and brittle.

(7) Aluminium-nickel alloys containing between 50 and 2 per cent. of nickel are very brittle and slowly disintegrate; those containing between 80 and 95 per cent. of nickel are extremely hard, the maximum degree of hardness being attained with 83 per cent. of nickel.

(8) Aluminium-cobalt alloys containing between 42 and 83 per cent. of cobalt are brittle; those containing between 83 and 98 per cent. are remarkably hard, the maximum degree of hardness being obtained with 87 per cent. of cobalt.—A. S.

Iron; Analysis of ——. F. Bischoff.

See under XXIII., *page* 1299.

English Patents.

Steel; Improved Method of Annealing ——. R. A. Hadfield, Sheffield. Eng. Pat. 16,131, Aug. 10, 1901.

The steel articles are heated to an appropriate temperature, then allowed to cool considerably, and afterwards raised to a suitable, but lower, temperature than at first; and, having the furnace is allowed to cool down slowly until the articles are cool enough to admit of handling. In the case of steel articles containing about 0·80 per cent. of carbon, these are first heated to between 850° and 1100° C.; allowed to cool to between 400° and 500° C.; then heated to from 760° to 820° C.; when the furnace is allowed to cool slowly as described.—E. S.

Steel; Manufacture of ——. R. A. Hadfield, Sheffield. Eng. Pat. 16,132, Aug. 10, 1901.

An improvement on Eng. Pat. 27,753, 1897 (this Journal, 1899, 49), in which the manufacture of a chromium-steel, free from or low in manganese, is described. According to the present invention, the proportion of carbon may vary from 0·2 per cent. upwards, but must be always kept below 0·6 per cent.—E. S.

old and Precious Metals; Extraction of ——, *from Refractory Ores.* W. L. Wise, London. From R. McKnight, Philadelphia, U.S.A. Eng. Pat. 22,549, Nov. 8, 1901.

SEE U.S. Pat. 696,469, 1902; this Journal, 1902, 614. —E. S.

inc, Cadmium, or Antimony; Smelting or Refining ——. J. Armstrong, London. Eng. Pat. 11,339, June 3, 1901.

AN improvement on Eng. Pat. 3462, 1900 (this Journal, 1901, 367), chiefly in respect to the collection of the zinc fumes, which, instead of being passed into a bath of molten lead, are collected as dust in an atmosphere of carbon monoxide proceeding from the furnace. The gases carrying the metal vapour (zinc, cadmium, or antimony), after passing through a column of incandescent fuel, are conveyed through cooled pipes to a closed condenser, a heavy fall, or the like, being employed to trap any metallic dust, as the gases (chiefly CO) leave the condenser to be stored for further use. The metallic dust is compressed into blocks, which, mixed with carbon, are subjected to distillation, the vapour being received in a bath of the liquid metal in the manner prescribed in the previously-named invention. —E. S.

Zinc Ores; Reduction of ——. L. Braunfels, Frankfort-on-the-Maine, Germany. Eng. Pat. 17,115, Aug. 30, 1901.

THE ores, after previous roasting if containing sulphides, are powdered, mixed with coal dust, and formed into briquettes, which are heated sufficiently to expel tarry matters. They are then heated in an iron reduction vessel, having a condenser and suitable connections, to a sufficiently high temperature to distil the zinc, a vacuum being induced; and finally a current of an inert gas, such as carbon monoxide, is passed through to lead the zinc vapour to the condenser.—E. S.

Drying Bricks, Pottery, Malt, Cores for Foundry Work, and the like; Floors for ——. J. A. Mobberley, Stourbridge. Eng. Pat. 18,154, Sept. 11, 1901.

See under IX., *page* 1279.

Metals; Improved Method of Eliminating —— *from Mixtures of Metals.* A. J. Boult, London. From the Ajax Metal Company, Philadelphia, U.S.A. Eng. Pat. 17,325, Aug. 6, 1902.

SEE U.S. Pat. 707,551, 1902; this Journal, 1902, 1185. —E. S.

UNITED STATES PATENTS.

Iron; Process of Producing ——. O. Thiel, Kaiserslautern, Germany. U.S. Pat. 709,563, Sept. 23, 1902.

THE process consists in "heating a regenerative furnace by the introduction of heated reducing gas; adding part of the mix to be employed and heating same; shutting off the gas supply and adding the charge of ore, carbon, and the remainder of the flux; readmitting the gas and then cutting off to allow of an equalisation of the temperature of the apparatus; then readmitting the gas until the desired degree of reduction is obtained; and afterwards adding molten iron to take up the reduced iron."—E. S.

Ores and By-Products containing Sulphur and Iron; Process of Treating ——. A. W. Chase, Avoca, Iowa. U.S. Pat. 709,745, Sept. 23, 1902.

THE process relates mainly to the treatment of sulphide iron ores, containing earthy ingredients, with copper and other metals; and also to the ashes of sulphide ores occurring as a by-product of the sulphuric acid manufacture. The ore is first roasted for the production of sulphuric acid, and the powdered ash is mixed with a small proportion of carbonaceous material; the mixture is then roasted at a dull-red heat, with mechanical stirring and free access of air. To the mass, after powdering, if necessary, sodium chloride is added, in proportion "chemically equivalent to the copper present," and the mixture is roasted at a dull-red heat. The product is lixiviated by hot water and steam under pressure, and the liquor and residue are respectively treated for their valuable constituents, the iron contained in the latter being one of these.—E. S.

Telluride Gold Ores; Treatment of ——. W. Pethybridge, London. U.S. Pat. 709,037, Sept. 16, 1902.

SEE Eng. Pat. 1738, 1901; this Journal, 1902, 123.—E. S.

Telluride Gold Ores; Process of Treating ——. W. Pethybridge, London. U.S. Pat. 709,038, Sept. 16, 1902.

SEE Eng. Pat. 4375, 1901; this Journal, 1902, 350.—E. S.

Nickel; Process of Melting ——. H. L. Haas, Assignor to Zucker and Levett and Loeb Company, both of New York. U.S. Pat. 709,218, Sept. 16, 1902.

THE nickel to be melted and refined is mixed with "fuel," and charged in successive portions into a cupola furnace already containing strongly ignited "fuel," through which, and through the entire column of nickel and "fuel," air in large quantity and under "excessive pressure" is passed upwardly, so as to melt the nickel and oxidise any carbon it may contain or take up. The mixture of "fuel" and granular nickel is so fed in as to give practically a continuity of melted nickel flowing from the bottom of the column. The nickel thus melted and refined is stated to be especially suitable for anodes.—E. S.

Nickel and Copper-Nickel Ores; Treatment of ——. C. Perron, Rome. U.S. Pat. 709,277, Sept. 16, 1902.

POOR nickel or copper-nickel ores, such as occur in serpentine in the Italian Alps, are finely powdered, and stirred with a solution of an alkali sulphide, or ammonium sulphide, with or without free ammonia. The liquor is collected, the residue washed with cold water, and the nickel reduced "by means of hydrogen sulphide."—E. S.

Alloy. D. P. James, Eureka, Ill., U.S.A. U.S. Pat. 709,268, Sept. 16, 1902.

THE alloy, intended to serve as a substitute for gold, is formed by fusing together approximately 72 parts of copper, 9 parts of tin, 4 parts of nickel, 2 parts of silver, and 1 part of aluminium, all by weight.—E. S.

Alloys of the Alkali Metals; Manufacture of ——. G. F. Jaubert, Paris. U.S. Pat. 709,489, Sept. 23, 1902.

A MIXTURE of 4 parts of potassium with 1 part of sodium hydroxide is heated to between 200° and 300° C. on an oil-bath *in vacuo*; on cooling, a liquid alloy, having approximately the composition NaK_2, is found floating on the top of the melt. According to a second example, 5 parts of sodium may be similarly heated with 8 parts of potassium hydroxide, the fluid alloy obtained being approximately NaK. The invention is not confined to the use of the described proportions. The alloys are stated to react in many cases in which sodium is inert.—E. S.

Sulphide Ores; Eliminating the Sulphur from ——. A. Gutensohn, Assignor to Sulphur Elimination Syndicate, Limited, London. U.S. Pat. 709,482, Sept. 23, 1902.

SEE Eng. Pat. 13,263, 1900; this Journal, 1901, 722.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Lead; Behaviour of —— *as Anode in Sodium Hydroxide Solutions; and the Electrolysis of Sodium Hydroxide Solutions containing Lead.* K. Elbs and J. Forssell. Zeits. f. Elektrochem., 1902, 8, [40], 760—772.

THE following are the principal conclusions arrived at. A lead anode under all conditions dissolves in caustic soda

solutions as a di-valent metal. When solutions of caustic soda containing lead are electrolysed with insoluble anodes, lead oxide and oxygen are primarily deposited at the anode, but the peroxide is formed by secondary action. The yield of peroxide in relation to the current increases with the temperature and the rapidity of formation of the peroxide is dependent upon the material of the anode. The discharged anions have for the most part the formula $HPbO_2'$. Lead peroxide is formed on a platinum anode at 20° C. at a P.D. which is 0·23 volt lower than that necessary for the formation of lead oxide and oxygen; and the latter kind of discharge takes place at the same P.D. as that of another oxygen acid ($HPbO_2'$) on platinum. Lead peroxide has, like platinum and some other metals, the property of occluding oxygen, and it is probable that, at a given potential, the pressure of the occluded oxygen is the same as it is on platinum. The potential of the system Pt, PbO_2 | normal NaOH, PbO is about 0·3 volt lower than that corresponding to the formation of PbO_2. Consequently the formation of lead peroxide and the re-formation of di-valent lead ions in alkaline solution is not a reversible process.—W. G. M.

Cuprous and Cupric Ions. G. Bodländer and O. Storbeck. Zeits. anorg. Chem., 1902, **31**, 1—42.

When cuprous chloride is exposed to the action of water, two reactions occur; the prevailing one results in the production of cupric chloride and metallic copper, whilst in the other, cuprous hydroxide and free hydrochloric acid are formed. The former reaction is retarded by the addition of increasing amounts of chlorides, so that in solutions, in which the concentration with regard to potassium chloride is more than 0·05 normal, cuprous chloride will dissolve without decomposition. In aqueous solutions, cuprous chloride is present partly ionised. Solutions containing potassium chloride at concentrations of 0·05 to 0·4 normal, dissolve cuprous chloride with formation of the compound $KCuCl_2$; in more concentrated chloride solutions, the compound K_2CuCl_3 is formed.—A. S.

Aromatic Nitro-Compounds; Influence of the Cathode Material on the Electrolytic Reduction of ——. W. Löb. Zeits. f. Elektrochem., 1902, **8**, [40], 778—779.

This is chiefly a summary of work that has been done by various workers in the field under review.—W. G. M.

English Patents.

Insulating (Electric) and Acid-Proof Materials and for Manufacturing various Articles; Plastic Compositions applicable as ——. R. Ahrey, Tooting. Eng. Pat. 18,417, Sept. 11, 1901.

One-half part of molten manilla copal is added to 7 parts of molten asphalt; to this mixture in a closed vessel a mixture consisting of 5 parts of carnauba wax, 1 part of paraffin wax, and ½ part of ceresin wax is added and thoroughly incorporated under a pressure of a pound or two to the square inch; the temperature is then allowed to fall to 300° F. and 1 part of stearic acid stirred in; 4 to 6 parts of loading material (asbestos, wood pulp, or peat fibre) are finally added, when the mixture becomes ready for moulding to shape to produce articles, such as battery cells, &c.
—J. W. H.

Insulating Composition for Electrical Purposes, and a Method of Applying the same. J. W. Sankey, Bilston, Staffordshire. Eng. Pat. 22,990, Nov. 14, 1901.

This consists of a mixture of powdered chalk, steatite, or whiting, with flour paste, or other adhesive liquid, of such a consistency that it can be sprayed on the surface to be insulated.—W. C. H.

Insulating Bodies; Electric ——. H. J. Haddon, London. From the "Pyrisolith" Insulating Material Manufacturing Co., Ltd., Budapest. Eng. Pat. 10,083, May 1, 1902.

Powdered brittle insulating material such as gypsum, lime, clay, mica, &c., is heated to 70°—100° C. and bituminous material stirred in, in the proportion of 11—7 parts to 89—93 parts by weight of powdered brittle material. The dry and loose powder formed is freed from lumps, heated to 140°—180° C., and compressed in suitable moulds.
—J. W. H.

Insulating Compositions for Metallic Surfaces or Wire. J. A. Heany, Philadelphia, U.S.A. Eng. Pat. 17,774, Aug. 12, 1902.

Fibrous or flakey asbestos is united to the surface to be insulated by a paste of lime or its equivalent combined with a gelatinous or gummy solution. See U.S. Pats. 703,199, 703,200, and 703,201, 1902; this Journal, 1902, 979.
—W. C. H.

Electrical Batteries (Electrodes). [*Hydride of Copper.*] M. J. B. A. Colletas, Paris. Eng. Pat. 18,256, Sept. 1, 1901. (Under Internat. Conv., Feb. 12, 1901.)

For employment in primary or secondary batteries, the basis of which is a combination of hydride of copper, lead and sulphuric acid, the electrode holders are formed of agglomerated retort carbon, or of any porous material which is electrically conductive, but is not attacked by sulphuric acid. The carbon for the cathode is preferably associated with arsenic, and the paste for the anode is formed by mixing red lead, or the like, with water containing gelatin, white of egg, dextrin, starch or vegetable gums. The electrodes are placed in an aqueous solution of copper strongly acidulated with sulphuric acid, and on the passage of a current the copper is deposited on the cathode in the form of copper hydride. When the accumulator is charged and the circuit closed, the sulphuric acid attacks the copper hydride, forms sulphate of copper, and liberates the hydrogen.—G. H. R.

Anodes; New Manufacture of Carbon ——. [*Solid Carbon.*] C. F. Auer von Welsbach, Vienna. Eng. Pat. 19,468, Sept. 30, 1901.

Flame soot in a finely porous condition is strongly compressed and rendered conductive by heating to incandescence, and it is stated that anodes, wherein the parts that are directly subjected to the action of the current are formed of this substance, are capable of resisting the action of chemical reagents, and of offering a large amount of surface to the exciter. They are specially suited for employment in the cerium accumulator described in Eng. Pat. 21,566, 1900; this Journal, 1902, 124.—G. H. R.

Secondary Batteries. [*Active Material.*] C. T. J. Oppermann, London. Eng. Pat. 21,362, Oct. 24, 1901.

Lead oxide is mixed with Trinidad bitumen in solution in a hydrocarbon and formed into a workable paste by the addition of sufficient dilute sulphuric acid. It is claimed that the bitumen renders the material harder or more coherent, and also more permanently conductive.—G. H. R.

Chlorates and Perchlorates; Electrolytical Manufacture of ——. [*Hydrochloric Acid.*] P. L. E. Leder, Chedde, France. Eng. Pat. 14,387, June 25, 1901. (Under Internat. Conv., Jan. 8, 1902.)

This method differs from those described in Eng. Pat. 17,320, 1901, and 14,386, 1902, and consists in the electrolysis of a solution of a corresponding chlorate whilst maintaining the electrolyte during the whole time of the electrolysis in a non-alkaline state by means of dilute hydrochloric acid, the latter being added either periodically or preferably continuously, so that the liquid may never contain free alkali.—G. H. R.

Gases (NO_2 and NO_3, &c.); Process and Apparatus for Subjecting —— *to High Tension Electrical Discharges. [Electric Arc.]* B. J. B. Mills, London. From the Atmospheric Products Co., New York. Eng. Pat. 14,571, July 2, 1902.

This patent relates to improvements in the process and apparatus described in Eng. Pat. 8230, 1901 (this Journal,

1, 726), in which direct currents were used, whereas in ease uni-directional or alternating currents of any evenient frequency may be employed. Two sets of atively fixed and movable electrodes enclosed in a mber are used, the movable ones being mounted on a ft connected with a driving device by an insulating pling consisting of two discs of insulating material ened respectively to the shaft and driving device and each other, and an interposed insulating disc. The trodes are provided with fine wire tips, those of the vable ones being finer than the others, and the fixed trodes, which are adjustably mounted on insulating ports in the walls of the chamber, are normal to the ne of rotation of the movable ones, which are radially posed. Gas inlets are arranged at the ends of the mber near the shaft to direct the entering gas against and gas outlet ducts, placed in the periphery of the mber, and extend throughout its length. The combination of gases to form oxides of nitrogen and their mpounds is effected by separately charging their molecules trostatically and leading them into a common chamber, ere they are maintained at higher than atmospheric ssure and subjected to the action of the electric arc. mospheric air can be enriched by adding oxygen to it, hydrogen in such proportions as to form a mixture taining less than 10 per cent. of hydrogen. The mbined and uncombined gases are led away after tment; the former are separated out, and the latter r having been restored to the original proportion by the dition of sufficient nitrogen and oxygen are again jected to the electric arc.—G. H. R.

ctric Furnaces and the Production of Chemicals [Carbon Bisulphide] in such Furnaces. [*Self-renewing Electrodes.*] G. Brewer, London. From E. R. Taylor, New York. Eng. Pat. 16,556, July 25, 1902. (See also this Journal, 1902, 1236.)

E furnaces and the process of producing chemicals in m are very similar to those described in Eng. Pat. 182, 1901; U.S. Pats. 702,117 and 706,128, 1902; s Journal, 1902, 353, 979, and 1143. Conduits formed conductive material, and connected with a suitable erator of electricity, are arranged to discharge into the working chamber of the furnace, and streams of fragmentary conductive material, adapted to constitute self-renewing electrodes, are fed into and through them to the bottom of the working chamber, and towards each other by gravity. Protective walls are arranged between the conduits respectively and the middle wall of the chamber. In the continuous production of carbon bisulphide, the sulphur or similar fusible material is introduced into the concentric spaces within the walls at the top, and fed from them respectively into the heat zone and at one or more levels above it. The bisulphide vapour is continuously discharged, and the residue from the carbon and sulphur is fused within the furnace, and periodically discharged from it in a fused condition.—G. H. R.

United States Patent.

Ozonising Apparatus. A. Vosmaer, Haarlem, Assignor to Company Ozon Maatschappy Systeem A. Vosmaer, Amsterdam. U.S. Pat. 709,427, Sept. 16, 1902.

See Eng. Pat. 5826, 1901; this Journal, 1902, 353.

—E. S.

(*B.*)—ELECTRO-METALLURGY.

Aluminium Alloys, Electrical Conductivity of certain ——, as affected by Exposure to London Atmosphere. E. Wilson. Paper read at the British Association, Section G, Belfast. Electrician, 1902, [1273], 868.

In a previous communication (see this Journal, 1902, 175) the physical properties of certain light aluminium alloys have been described. A specimen of each alloy in the form of wire, 0·126 in. (3·2 mm.) diameter, supported on a wooden frame, was placed on the roof of King's College, London, on June 11, 1901. These specimens were tested after about 13 months' exposure, and the results, with regard to electrical conductivity, are shown in the accompanying table.

The position of aluminium in the electro-chemical series with respect to the other constituents of the alloys is as follows:—Al, Mn, Zn, Fe, Ni, Cu, Si. It was thus to be expected that copper, widely separated from aluminium, would be effective in the production of corrosion, and this

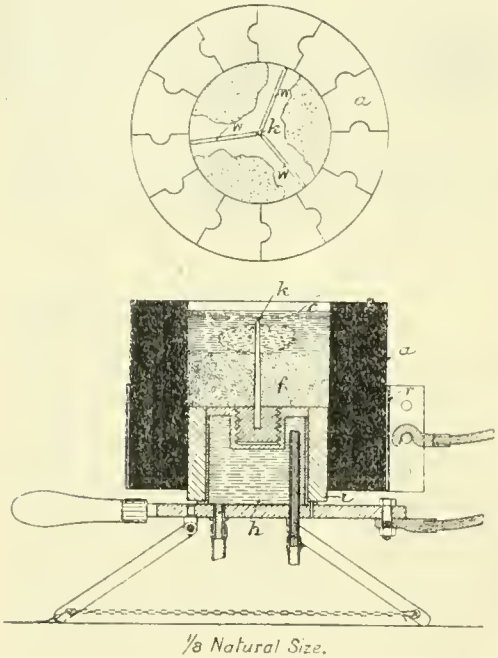
Specimen.	Analysis.						Specific Resistance in 10^{-6} ohms before Exposure on June 11, 1901.	Percentage Variation of Resistance as found on July 23, 1902.
	Si.	Fe.	Cu.	Ni.	Mn.	Zn.		
5	0·31	0·37	0·11	..	..	..	2·92	1·81
4	0·38	0·25	0·16	..	..	..	2·88	1·83
6	0·38	0·25	1·58	..	..	..	3·34	4·50
9	0·40	0·31	1·86	..	..	..	3·25	6·18
7	0·49	0·40	2·61	..	..	..	3·31	8·07
1	0·38	0·22	0·17	..	..	0·62	2·86	1·98
2	0·43	0·28	0·30	..	..	1·20	2·94	1·30
3	0·43	0·39	0·69	..	..	2·04	3·07	2·39
7	0·37	0·25	0·05	0·75	..	..	3·05	1·21
8	0·35	0·29	0·09	1·19	..	..	3·24	2·07
9	0·37	1·10	0·06	2·25	..	..	3·18	1·64
4	0·35	1·16	0·09	..	..	..	2·97	0·69
3	0·37	0·28	0·50	..	..	0·59	3·06	2·49
5	0·39	0·31	0·63	..	..	1·20	3·12	2·00
7	0·35	0·53	0·10	0·83	..	0·90	3·03	0·99
2	0·31	0·59	0·19	1·09	..	0·73	3·33	1·21
8	0·43	0·40	0·21	1·13	..	1·94	3·24	2·59
1	0·35	0·29	0·11	2·01	..	1·77	3·26	3·21
1	0·39	0·56	0·24	2·31	..	0·38	3·48	1·93
2	0·37	0·43	1·08	1·29	..	..	3·41	-1·41
1	0·39	2·57	0·10	1·39	..	..	3·24	-0·80
0	0·32	0·54	0·02	..	0·05	..	3·09	0·62
9	0·31	0·35	0·03	..	0·35	..	3·30	1·92
3	0·44	0·56	0·09	..	1·78	..	3·49	2·20

was found to be the case (specimens 16, 4, 13, 14, 15), the effect increasing with the percentage of copper. Nickel, which is well separated from aluminium in the series, had considerable effect alone (specimen 20), but when alloyed with copper (specimen 22), the conductivity increased slightly during exposure. This alloy (22) has a breaking load of 45,900 lb.; limit of elasticity, 36,600 lb. per square inch; percentage extension, 0·146 with 16,250 lb. per square inch; coefficient of expansion, 0·0000252; and temperature coefficient for electrical resistance, 0·00178 per 1° C. between 0° and 100° C. An alloy containing iron and nickel (21) had also a slightly increased conductivity; this specimen had a breaking load of 42,200 lb. per square inch, and a slightly higher conductivity than No. 22.

From the results it appears that in the preparation of light aluminium alloys which are to be exposed to the air, copper alone should not be used; with equal amounts (about 1 per cent.) of nickel and copper, the conductivity is reduced to a slight extent, but the gain in mechanical and corrosive properties is great.—A. S.

Calcium; Process for the Production of Metallic ——. W. Borchers and L. Stockem. Zeits. f. Elektrochem., 1902, **8**, [40], 757—758.

A CIRCULAR vessel, consisting of a number of vertical carbon blocks shaped and keyed into one another, and held together by an iron band like the staves of a cask, is used to contain the charge, and also to act as anode. The bottom of the vessel is closed with a water-cooled box (see accompanying figure) separated from contact with the



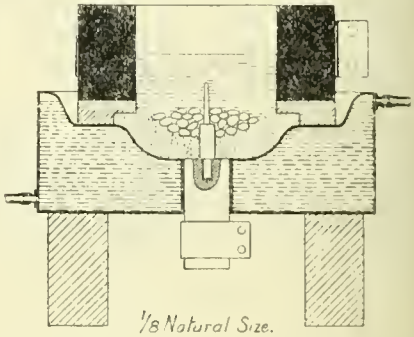
⅛ Natural Size.

carbon by a refractory non-conducting material, such as clay. From this box a needle-shaped iron cathode projects upwards, to which connection is made through the supporting box. A layer of fluorspar is packed on the top of the cooled box to protect it from contact with the fluid charge. Calcium chloride is then placed on the working bottom of fluorspar, and is employed as electrolyte. The fusion of the charge may be started by connecting the top of the cathode with the anode by thin radial carbon rods (as shown in the "plan" of the furnace), which may be removed as soon as the upper portion is melted. A temperature at which the charge shows a red glow should be used, which is below the fusing point of calcium but above that of the chloride. With this arrangement, using a relatively very small cathode surface, the calcium comes down in the form of a sponge-like mass, which can be removed by the aid of an iron spatula, and plunged into petroleum or other liquid free from oxygen. This sponge contains 50—60 per cent. of metallic calcium, and encloses much calcium chloride. By pressing the sponge together before removing it from the electrolytic vessel, it may be welded to a mass containing about 90 per cent. of calcium. Such a material may find many uses; but the remaining 10 per cent. of foreign substance may be removed by fusion with exclusion of air. After fusion of the calcium, a residual reddish salt has been observed crystallising in the monoclinic or triclinic system, and evolving hydrogen, with formation of CaO and CaCl$_2$ on exposure to moist air. It is evidently a subchloride of calcium, and contains chlorine in the proportion demanded by the formula CaCl. Calcium fluoride might be used as electrolyte, but the chloride is preferred. The apparatus is suitable for use on a large scale or for lecture purposes.

—W. G. M.

Strontium: Electrolytic Separation of Pure ——. W. Borchers and L. Stockem. Zeits. f. Elektrochem., 1902, **8**, [40], 759.

THE apparatus employed by the authors for the production of calcium (see preceding abstract) could also be used to produce strontium; but this metal fused into shot, which sometimes rose to the top and sometimes sank (being evidently of nearly the same specific gravity as the electrolyte), and so gave rise to loss. The apparatus was therefore modified as shown in the annexed sketch. The water-cooled box was made much wider, and was shaped so that the point of the cathode was only just above the bottom of the anode. The carbons were insulated from the box by fireclay ring. The layer of solid salt stamped into the bottom was thinner than before, with the result that the deposit solidified almost as soon as it formed. The pure strontium was therefore obtained in the form of shot measuring about 10 mm. in diameter. It is, like calcium, a white metal, and is as soft as lead.—W. G. M.



⅛ Natural Size.

ENGLISH PATENT.

Ores and Refining of Metals, and Furnaces therefor Electrical Smelting of ——. [*Revolving Furnace.*] L. Stassano, Rome. Eng. Pat. 8288, April 9, 1902.

IRON, chrome, manganese, or tin ores to be reduced are pulverised and mixed with pulverised reducing material (carbon) in the necessary chemical proportions to extract the oxygen or sulphur contained in them, and formed into a paste which is moulded into a block under pressure. The blocks are then reduced to small fragments and fused in a revolving electric furnace closed against the access of air and "consisting of a cylinder surmounted by a cap revolving round an inclined axis, and resting by means of rollers on an inclined rail." The furnace is provided with carbon electrodes and holders with water circulation, hydraulic cylinders for the working of the carbons, brackets, tapping holes for the metal and slags, a charging hopper with

uble closing device, and cables for the transmission of the tric current, as well as means for the conduction of the er into the casings of the carbon holders and the raulic cylinders. Arms provided with metallic brushes fixed on the top of the cap for the circuit of the electric rent, and conducting cables communicate with the trodes. A tube, not subject to the rotation of the nace, is immersed in a trough filled with sand, and is plied with metallic discs (insulated from the tube, and mmunicating with the poles of the current) on which the shes are allowed to slide. A disc is fixed on the bottom the furnace, and has fixed annular grooves with a disc, ich hermetically closes it, and is fixed to the pivot of the nace. The grooves communicate with the main water e, and the covering disc is provided with six water pipes, of which communicate with the outside groove of the tom disc and with the casings of the carbon holders, and other four with the ends of the chambers of the raulic cylinders. Raw metals are refined by introducing h them into the furnace a certain quantity of the oxide the same metal, so that the oxygen in the oxide may n out the impurities of the metallic mass; or, in the e of other metals than those of the iron group, an excess he same oxide is employed, and at the end of the re- ion the quantity of carbon requisite to reduce any solved oxide in the liquid mass is added.—G. H. R.

United States Patent.

s; Electrolytically treating ——. [*Wet Method.*] C. E. Dolbear, Assignor to American Mining and Metal Extraction Co., both of Boston, Mass. U.S. Pat. 709,817, Sept. 23, 1902.

TALLIC copper or other metals are produced from raw s by crushing and dissolving the latter in a solution of itrate of a suitable metal, or of a compound containing a ic acid radicle, adding sulphuric acid to the mixture, l subjecting the solution to the action of the electric rent.—G. H. R.

XII.—FATS, OILS, & SOAP.

tty Oils; The Recognition and the Formation of ——, *specially in the Olive.* C. Hartwich and W. Uhlmann. Arch. der Pharm., **240**, [6], 450—470.

E authors review the various reagents used for identifying in microscopic sections and recommend for this purpose aturated solution of caustic potash mixed with an equal ume of ammonia solution. A drop of this solution is ced upon the section and then a cover glass is placed in ition. After a time, the potassium salts of the fatty ds present, crystallise out. The authors claim their lity to distinguish between drying and non-drying oils the shape of the crystals obtained.

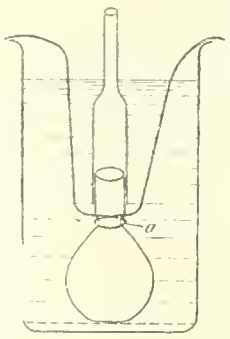
Gentian root has been said to contain 6 per cent of ty oil. The authors obtained 5·67 per cent. of a dark low sticky body which was not saponified by aqueous ali, and which Hesse's, Liebermann's, and Salkowski's ts indicate to be a cholesterin-like fat. The authors ve carefully examined the development of the oil in the ve; oil is present in a very early stage and gradually reases, until a maximum is obtained in January; after t the amount somewhat diminishes. The oil is not reted in special oil cells, but occurs as drops in the otoplasm. It has been stated that the oil is formed from nnitol, but the authors were unable to find any mannitol olives; they, however, found an abundance of glucose ich they consider to be the source of the oil, since in the ly stages an abundance is present, but later, when much has been formed, the quantity is small.—J. O. B.

Linseed Oil. S. Fokin. J. russ. phys.-chem. Ges., **34**, 501—503. Chem. Centr., 1902, **2**, [8], 601.

CORDING to the author, linseed oil contains linolic acid, —25 per cent. of linolenic acid and 5 per cent. of solid ty acids. Hazura has stated that it contains only olenic and isolinolenic acids, whilst A. Reformatski could only detect linolic acid. The linolic acid from linseed oil appears to be isomeric with the analogous acid from cotton-seed and sunflower oils. The tetrabromostearic acid obtained on brominating linseed oil forms an amorphous mass melting at 98°—101° C.; that from cotton-seed and sunflower oils is distinctly crystalline and melts at 114°—115° C. —A. S.

Wax; Determination of the Specific Gravity of ——. H. Mastbaum. Zeits. angew. Chem., 1902, **15**, [37], 929—931.

To determine the specific gravity of a wax at 100° C., the modified specific gravity bottle shown in the illustration is used. The bottle has its neck contracted at *a*, so that it may be readily suspended by a wire loop, and is fitted with the covering-tube to prevent any drops of the boiling water from falling into the wax. A piece of wire gauze, placed on the bottom of the beaker, protects the latter from shocks. After the bottle, filled with molten wax, has remained 15 or 30 minutes in the boiling water, it is raised so that its neck is just out of the water, the covering-tube is removed, and the previously warmed capillary stopper is inserted.—H. B.



English Patent.

Yeast and Spirit; Utilisation of certain Materials [Oil-cake and Leguminous Seeds] in the Manufacture of ——. C. Stang. Eng. Pat. 14,852, July 3, 1902.

See under XVII., *page* 1290.

United States Patent.

Garbage [for Oil]; Apparatus for Cooking ——. C. S. Wheelwright, Bristol, Rhode Island, U.S.A. U.S. Pat. 709,836, Sept. 23, 1902.

THIS apparatus, which is intended for removal of oil or grease from garbage, consists of a digester heated by means of a central steam-tight cylinder, and provided with pipes for the introduction of live steam and of a current of hot water to convey the oil to separating tanks.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

English Patents.

Anticorrosion Paint; An Improved ——. J. F. Allen, Manchester, and R. G. Brooke, Upton, Chester. Eng. Pat. 24,370, Nov. 30, 1901.

A MIXTURE of sulphur, linseed oil, and turpentine, with or without terebene or other suitable ingredient for promoting the drying.—M. J. S.

Lead Pigments and Lead or other Metallic Compounds; Manufacture of ——, *and Apparatus therefor; also suitable for Aërating or Saturating Liquids with Gases.* A. C. J. Charlier, Glasgow. Eng. Pat. 5637, March 7, 1902.

THE process, patented in 1896 (Eng. Pat. 19,788; see this Journal, 1897, 312), is improved by admitting the gas at a pressure of 200 lb. per square inch. The claim embraces the vessel for the reaction, this being capable of rotation or oscillation, and being mounted with hollow journals for the admission of the gas.—M. J. S.

Sulphide of Zinc; Obtaining ——, *from Copper Slag containing Zinc and Barium.* F. Brünjes, of the Chemische Fabrik Innerste-Thal, Langelsheim, Germany. Eng. Pat. 16,272, July 22, 1902.

The powdered slag is treated with sufficient diluted hydrochloric acid to dissolve as chlorides the barium, calcium, and iron present. The zinc is obtained as sulphide, which is separated by filtration. The lye is treated for recovery of the barium chloride, &c. In the case of slag containing zinc as oxide with iron oxide, but free from barium and calcium sulphides, a sufficient addition of these is made to secure the formation of zinc sulphide.—E. S.

Pigments; Manufacture of —— [*Ferric Oxide stained with various Dyestuffs*]. A. S. Ramage, Cleveland, Ohio, U.S.A. Eng. Pat. 16,337, July 22, 1902.

See U.S. Pat. 708,584, 1902; this Journal, 1902, 1238.
—M. J. S.

Ferrous Liquors; Process of Treating —— [*Pigment*]. A. S. Ramage, Cleveland, Ohio, U.S.A. Eng. Pat. 16,338, July 22, 1902.

See U.S. Pat. 708,585, 1902; this Journal, 1902, 1235.
—E. S.

(*B.*)—RESINS, VARNISHES.

English Patent.

Floor Coverings, Wall Decorations, and the like; Waterproof Composition for the Manufacture of ——. J. Thame, Hounslow. Eng. Pat. 15,621, Aug. 1, 1901.

The material is composed of gum of the *Dyera Costulata* (vulg. fluvia, pontianak, Borneo-mort, or jelutong), 25 to 35 per cent.; soft cotton fibre waste, 10 to 15 per cent.; hardening substance, such as zinc oxide, 65 to 50 per cent. To increase the elasticity of the product, 1 to 10 per cent. of Accra flake or manga boria gum may be added, or alternatively, 5 to 50 per cent. of an oxidised or sulphurised oil, *e.g.*, cotton-seed, linseed, nut, or China wood oil. It is claimed for the composition that all waste, trimmings, &c., can be worked up with fresh material, thus avoiding loss.
—F. H. L.

United States Patent.

Turpentine Still. J. T. Gilmer, Mobile, Ala., U.S.A. U.S. Pat. 709,315, Sept. 16, 1902.

The apparatus claimed consists of a combination of a still with a gum-vat, the latter being a covered kettle in which the crude turpentine is submitted to a preliminary fusion and filtration before admitting it to the still. Both the gum-vat and still are surrounded with corrugated steam jackets, which being bolted to the walls of the vessels at all the points of contact, add materially to their rigidity. Each vessel is also heated internally by a special horizontal heater-rack or blanket. This is constructed of two parallel metal plates, having indentations which meet one another, and are connected by hollow bolts or thimbles which permit the passage of the melted gum. The space between the plates is supplied with steam. The gum is charged into a wire basket resting on the heater-rack in the gum-vat. Below this rack there is a filter formed of cotton-batting, or other porous material, sandwiched between wire screens.—M. J. S.

(*C.*)—INDIA-RUBBER, &c.

India-Rubber; Species of Landolphia yielding ——, *in the French Congo.* A. Chevalier. Comptes Rend., **135**, [13], 512—515.

The "vegeto-lianas" of the dry plains of interior Africa, the vegetation on which is periodically burnt, are quite different from the lianas of the forests; their aërial stems and twigs become annual or biennial, whilst their subterranean growth is enormously developed. Accordingly, caoutchouc is obtained, from those species which yield it, not from the upper portions, but from the roots. Three species are mentioned by the author, *Carpodinus lanceolatus*, *Landolphia Thollonì*, and *L. humilis*. The first has been described as a rubber-yielding plant, but erroneously, since it gives only resin. The other two yield caoutchouc, the second in greater quantity than the third.—J. T. D.

English Patent.

Vulcanising Rubber, Articles of Soft and Hard India Rubber, or of Rubber Substitutes in any Combination with Fibres, Spinnings, Cloth and other Materials, Metal, Asbestos, Minerals, Wood, Cork, and the like; Process and Apparatus for ——. W. W. Wittenberg, E. Brod and E. Koch, Riga, Russia. Eng. Pat. 9625, April 2[illegible] 1902.

The articles are subjected to heat and pressure in a vessel in which the vulcanising medium is continually circulated the pressure giving rise to the formation of pores in the material.—F. H. L.

United States Patent.

Hydraulic Presses; Swinging Table for ——. M. Wilkes, deceased. Administrators, A. Wilkes and S. E. Gallagher Trenton, New Jersey, U.S.A. U.S. Pat. 709,285, Sept. 16 1902.

The columns of presses used for vulcanising rubber, &c form axes on which the platens for supporting the mould may be swung.—J. W. H.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patents.

Leather Manufacture and the Preservation and Curing of Skins; [Use of Titanium Salts in ——]. M. C. Lamb London, and P. Spence and Sons, Ltd., Manchester. Eng. Pat. 11,092, May 30, 1901.

Hides, prepared as for ordinary tanning, are treated in the drum or paddle for 3—15 hours, with a solution of titanium salt or compound, either alone, or in conjunction with preserving, tanning, or colouring substances. The goods are then washed, free acid is neutralised with a weak alkali, such as borax, and fat-liquoring, mordanting, and dyeing may be proceeded with.

Tanned or partially tanned hides may be similarly treated, grease, and in the former case a portion of the tanning agent, being first removed by washing in a weak alkali solution (washing soda).

Borax, glucose, dextrin, or sugar may also be added to the titanium bath, or again, chromium, aluminium, or iron salts, by which means a combination tannage is effected. In order to cure or preserve the hides, it is sufficient to merely brush the flesh side with the titanium liquor.—R. L. J.

Tanning of Hides and Skins. W. H. Philippi, Burgel Offenbach o/M., Germany. Eng. Pat. 22,062, Nov. 1901.

A tanning liquor is prepared by dissolving wood-, lignite or coal-tar or a mixture of these tars (160 parts) in turpentine oil (72 parts), pine oil, phenol or its homologues (30 parts), or a mixture of such solvents. The hides are prepared as if for vegetable tanning, but the lime must be completely removed.—R. L. J.

United States Patent.

Cement; Adhesive —— [*Casein-Glue*]. J. T. Slough Woodstock, Canada. U.S. Pat. 709,651, Sept. 23, 1902.

An adhesive cement is prepared by warming together casein 16 parts, alkali (preferably pure caustic soda) 0·5—1·5 parts, an infusible oxide free from acidity or alkalinity (preferably magnesium oxide) 2 parts, and water substantially 36 parts.—J. F. B.

XV.—MANURES, Etc.

Molasses; Manufacture of Spirit from —— [*Spent Residue as Fertiliser*]. A. Wenck.

See under XVII., page 1289.

United States Patent.

rtilisers; Process of Making ——. B. Terne, Philadelphia, Penn. U.S. Pat. 709,185, Sept. 16, 1902.

PHOSPHATE-CONTAINING substance is treated with sulnuric acid, and to the product a concentrated ammoniacal quor is slowly added, the resulting fumes being drawn f; a current of dry heated air is then forced through, th agitation in both cases, and the mass is finally owdered.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

w Sugar; Alkalinity of ——. Zeits. Vereins deutsch. Zuckerind., 1902, **52**, [558], 601—636.

a discussion on the Herzfeld official method of deteroining alkalinity (see Herzfeld, Zeits. Ver. deutsch. uckerind., Sept. 1902), Stutzer proposes the use of mus as the best indicator.

Köhler also mentioned the contradictory results obtained testing sugars for alkalinity. He was of opinion that e determination of alkalinity should be given up.

Herberger regards the testing for invert sugar as prefere to determining the alkalinity. Phenolphthalein being indicator which, on Glaser's classification, is sensitive to ids is unsuitable for the determination of alkalinity. It es not react with feeble bases; with dilute strong bases is of low sensibility, so that on adding well-boiled water eo, the red colour may be made to disappear. Moreover, alkalinity in sugar products is not due to alkalis or lime their carbonates, but to carbonates and bicarbonates of ak organic bases. The loss of alkalinity of stored sugar in all probability due to the formation of bicarbonates to nich phenolphthalein is not sensitive when the quantities e small.

The proposal of Lauterbach to boil the solution before ting is not to be recommended for fear of dissolving cali from the dish.

The requisites in an indicator for sugar are: pronounced nsitiveness to even weak bases, sufficient sensitiveness to e acids, a relatively slight sensibility towards carbonic hydride, sensibility in the presence of small quantities of utral bodies, as ammonium salts, caramel, sugar, dextrin. ., and a restricted tendency to hydrolytic changes.

Rosolic acid, neutralised with potash, in his opinion, swers these requirements best. One grm. of commercial solic acid is dissolved in 90 per cent. alcohol in a 500-c.c. sk, neutralised with decinormal potash to a faint purple, l made up to the mark with alcohol. One c.c. of the ution must turn yellow with a drop of $\frac{1}{2\frac{1}{2}}$ normal acid. e reagent shows bicarbonate alkalinity with great sharpss qualitatively, as well as free acidity, and is applicable h dark sugars and syrups.

Pollak gave examples showing that sugars acid to enolphthalein but alkaline to litmus formed invert sugar. concludes that the determination of alkalinity is a cessity, and that phenolphthalein is the only suitable icator; also that the different results are no reason for ndoning the conditions of sale which include this test.

Herzfeld pointed out the subtle nature of the test with enolphthalein, and that the conditions must be strictly served to obtain uniform results. The minimum quantity reagent only is to be used; a continued fresh addition of drops to a dark solution will ultimately give a pink our and a misleading result.—L. J. de W.

annulated Sugar; Theory of the Production of ——, *by he Steffen Process.* K. Cerny. Zeits. Zuckerind. Böhmen, **26**, [11], 681—693.

SUMING the Steffen separation station to be properly nned, and a sufficiency of dry lime and of cold water ilable, the regular working of the factory lies within tain definite limits dependent on local conditions. These its form the constants and determine the rational oduction of granulated sugar.

As a basis of calculation, take 100 kilos. of massecuite of following composition:—Pol., 88·5; water, 4·0; nonar, 7·5; quotient, 92·18. The yield of first product will be 75 per cent., leaving 25 per cent. of mother syrup. The composition of the first product being, pol., 95·5; water, 1·7; non-sugar, 2·8; the syrup will contain sugar, 16·88; water, 2·73; non-sugar, 5·40; and its quotient will be 75·7.

In practice, 50 to 55 of granulated sugar will be recovered from 100 of massecuite, and therefore from the 75 of raw sugar. For the sake of brevity in the calculations, 50 of granulated, polarising 100, is assumed, and its moisture and non-sugar are left out of account as negligible. Deducting 50 of sugar from the first product, a syrup is left containing sugar, 21·62; moisture, 1·27; non-sugar, 2·10; quotient, 91·14. The 25 kilos. of syrup are a mixture of grain and mother syrup, and calculation gives 14·62 of grain, pol. 1·90, and 10·38 of mother syrup; quotient, 75·7.

From this the system follows, for properly working for the granulated product; any mixing of the chief product, grain, must be most carefully avoided. The adhering syrup, which is only separated with difficulty from the crystals by centrifugalising, and must be dissolved away by the aid of steam, is of better quality and must be kept separate; every drop which reaches the lower product is a loss in yield. The moment must be seized when the richer syrup, quotient 90, begins to flow from the centrifugal; this is determined by analysis, by the time and the colour; under otherwise uniform conditions these data remain approximately constant. The arrangement of the centrifugal must be such that the separation of the syrups may proceed smoothly and with certainty.

The 25 of syrup from the first product is separated into a medium syrup and final runnings. Steam is admitted to the centrifugal at the moment when the first product is ready, the steam acting so as to produce a running syrup of gradually increasing purity from 75·7 to 98. This running syrup is so distributed by judicious admixture, &c., that as large a volume as possible of final runnings, of an average quotient of purity of 93·0, is obtained. The general aim is to obtain as nearly as possible 17 of medium and 8 of final runnings.

The 25 of mother syrup from the original massecuite and the 17 of medium syrup are mixed, giving a quotient of 81·8. This is boiled for 36 hours in a Grosse vacuum pan to 5 per cent. of water, and yields 18·18 kilos. of a second product of quotient 94·4 and a syrup quotient 70·8. The latter passes to the separation process, and produces 14·80 of dry solids of quotient 94, and final runnings, 8 kilos., quotient 93. The sum of the three last yields is the constant on which the regulation of the manufacture depends. The quantity of the massecuite, increased by the addition of these three items, gives 71·35 of granulated product in the first complete cycle, and this increases each cycle until it becomes constant at the eighth cycle of operations, when it reaches 87·21 of granulated from 100 of original massecuite containing 88·5 of sugar.—L. J. de W.

[*Sugar*] *Beetroot Chips; Pressing* ——, *before Drying.* Herzfeld. Zeits. Vereins deutsch. Zuckerind., 1902, **52**, [558], 599—601.

WHEN exhausted beetroot pulp from the diffusers is pressed till it contains 16 or 20 per cent. of dry solids by removing moisture before drying, it is a question whether the advantage gained is not more than compensated by the loss of nutritive matters in the press water.

Heitsch, in 1892, by pressing to 11 per cent. of dry substance, found that 10 to 11 per cent. of the solids were lost. Köhler, in 1902, gives results showing a loss of 4·5 per cent. on pressing to 10 per cent. The differences may be ascribed to imperfect exhaustion of the pulp in the diffusers, any residual juice being readily pressed out. Max Müller also found great losses.

The pulp was wrapped in sail-cloth to avoid mechanical losses, and treated in a hydraulic press. The chips were exhausted both with hot and cold water, and it was found that at whatever temperature they were pressed, the chips exhausted in cold water gave the better results. With exhaustion in the battery at a normal temperature, the pulp was found to press best at about 60° C.; if however, the chips had been over-heated in the battery, they invariably gave bad results on pressing. After pressing for ten

minutes at 100 atmospheres, a much smaller amount of dry solids was obtained than with eight minutes at 20 atmospheres, because in the former case the pulp was swollen by working hot. Working hot in the battery influences the loss in pressing more than the pressure used. Thus at the abnormal temperature of 95° to 100° C. and hot exhaustion, there was a loss of 11 per cent. of albumin; at the normal temperature of 65° to 80° C., and pressing to 14·9 per cent. of dry solids, the loss was only 2·9 per cent. Bearing these conditions in mind, it is advisable to press the pulp as strongly as possible, as any excessive loss in the press water need not be feared.—L. J. de W.

New Disaccharides; Synthesis of some ——. E. Fischer and E. F. Armstrong.

See under XXIV., *page* 1302.

Sugars; Isomers of β-Naphthyl Hydrazones of the ——. W. A. v. Ekenstein and C. A. Lobry de Bruyn.

See under XXIV., *page* 1302.

Sugars; Preparation of Osones from the Osazones of ——. E. Fischer and E. F. Armstrong.

See under XXIV., *page* 1302.

Sugars; Isomeric Acetohalogen Derivatives of ——, *and the Synthesis of Glucosides.* E. Fischer and E. F. Armstrong.

See under XXIV., *page* 1302.

Molasses; Manufacture of Spirit from ——. A. Wenck.

See under XVII., *page* 1289.

Alcohol from Molasses; Manufacture of ——. E. Bauer.

See under XVII., *page* 1290.

Soluble Starch by Means of Persulphates; Manufacture of ——. Soc. Anon. "Trust Chimique," Lyons. Ger. Pat. 134,301, May 30, 1901. Zeits. angew. Chem., 1902, **15**, [39], 1019.

100 KILOS. of starch are mixed with 3—5 kilos. of ammonium persulphate and 150 litres of cold water are added. The mixture is stirred and the nascent oxygen converts the starch entirely into the soluble modification after about 10 hours' treatment.—J. F. B.

ENGLISH PATENTS.

Sugar Juice; Purification of ——. A. Nodon and J. Piettre, both of Paris. Eng. Pat. 1792, Jan. 22, 1902. (Under Internat. Conv., Aug. 7, 1901.)

AN electrolytic process for the defecation of sugar juice. Shallow tanks are used, arranged in series of five or six, and stepwise to facilitate circulation of the sugar juice. The electrodes are composed of an alloy of lead and antimony (Pb 80, Sb 20), and a number of them are suspended vertically in each tank. The sugar-juice is treated with milk of lime and manganese dioxide, circulated through the vats and electrolysed under a pressure of 5 volts per vat, and a current density of 1 ampère per sq. decim., the liquid being continuously agitated by a rotating paddle at the bottom of each vat. The total energy required is about 6 kilowatts per 10 hectolitres of juice. The juice is then carbonated twice, filtered, and evaporated as usual.
—H. T. P.

Sugar; Separation of ——, *from Syrup or Molasses of Massecuite, and especially of After-Product Massecuite.* H. Claassen, Dormagen, Germany. Eng. Pat. 14,108, June 21, 1902.

THE process consists in delivering into the centrifugal along with the massecuite, a saturated or slightly undersaturated sugar solution, used either warm or cold, the "purity" of such solution being not higher than that of the mother syrup from the massecuite. That is, the mother syrup from previous operations may be employed.
—H. T. P.

Sugar Cane, Beets, Bagasse, Dye Woods, and other Materials; Treatment of ——, *and Apparatus therefor.* F. Kessler, Berlin. Eng. Pat. 15,355, July 9, 1902.

SEE U.S. Pat., 706,669; this Journal, 1902, 1147.
—J. F. B.

Amylaceous Bodies; Method of Producing Soluble Products from ——. A. Ashworth, Bury. Eng. Pat. 19,720, Oct. 3, 1901.

STARCH is converted into a soluble modification by the oxidising action of chlorates in presence of a mineral acid at a temperature of about 30° C., with or without the presence of a catalytic agent such as a vanadium or cupric salt.—J. F. B.

Dextrin [*Achroo-dextrin*] *and Alcohol; Manufacture of* ——. G. Reynaud. Eng. Pat. 17,506, Aug. 8, 1902.

See under XVII., *page* 1290.

UNITED STATES PATENTS.

Sugar-refining Apparatus. J. Robin-Langlois, Paris. U.S. Pat. 705,869, July 29, 1902.

THE apparatus consists of a series of batteries, each comprising a melting pan, cooler, and centrifugal, the whole so located that the raw sugar in passing from first to last is dissolved, crystallised, and centrifugalised successively in each battery, leaving the last one as pure white sugar. The dissolving liquid (plain water in the last battery) travels in the reverse direction.—H. T. P.

Liquids [*Sugar*]: *Apparatus for Defecating.* J. Hatton, Santo Domingo. U.S. Pat. 705,921, July 29, 1902.

A COMBINATION apparatus for defecating sugar juice in a continuous and automatic manner. It comprises one or more open heating pans, all fed with sugar juice from a common supply tank, where the juice is previously saturated with milk of lime. Each heater is steam jacketed below, and fitted with a temperature regulator which governs the steam supply to the jacket. The heated defecated juice is drawn off automatically by a siphon controlled by a valve and float inside the pan, and an outside tap which regulates the rate of flow. The end of the siphon dips into a conical cylinder resting on the bottom of the pan, and in such fashion as to separate, as much as possible, the sludge, a distinct outlet being provided for the latter. The sugar juice, collected in the first place in two reservoirs (used alternately), flows through a small measuring vessel into the supply tank before referred to, where it encounters and is mixed with milk of lime coming from a small tank, the supply being regulated by a gate valve controlled by a float in the measuring vessel. The same float also actuates an automatic volume-registering apparatus. Constant level is maintained in the mixing vessel by a float and valve regulating the juice flow. The milk of lime is kept in agitation by an air blast, and is drawn from a larger vessel provided with a rotating stirrer.
—H. T. P.

Adhesive [*Wheat-Gluten Washings from Starch Manufacture*]. A. S. Hoyt, New York. U.S. Pat. 709,5- Sept. 23, 1902.

THE waters, resulting from the washing of wheat-gluten in the manufacture of starch and from which the commercial starch has been separated, are concentrated, cooked, and reduced to dryness, yielding a product soluble in cold water and consisting of a mixture of converted starch and albumen suitable for an adhesive.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Prickly Pear [*Opuntia vulgaris*]; *Alcoholic Fermentation of the Juice of* ——. C. Ulpiani and L. Sarcoli. J. des Dist. Franc., 1902, **932**, 180; through Zeits. Spiritusin., 1902, **25**, [36], 391.

THE expressed juice of the prickly pear contains 12·8 per cent. of sugar, which consists of a mixture of glucose and

ctose. The authors have found in the fermenting juice atural yeast, which occurs on the fruit, and to which y have given the name *S. opuntiæ*. This yeast does ferment cane-sugar, maltose, raffinose, milk-sugar, or actose, but only glucose and fructose. It only ferments y slowly, and even after a long time the proportion of hol is smaller than the theoretical quantity. For this son the spontaneous fermentation of prickly pear juice not practicable industrially, and a special yeast would be essary. For sterilised juice this would present no iculty, but in the ordinary juice, added yeast is speedily pressed by *S. opuntiæ*. On account of the expense of ilisation, it would be desirable to find a yeast which ld be capable of producing alcohol rapidly in the sence of the natural yeast.—J. F. B.

nsu. B. T. P. Barker. Paper read before the Botanical ection of the British Association, Belfast. Chem. and Druggist, 1902, **61**, [1183], 550.

the preparation of samsu—a fermented drink of Eastern a—which is a variety of arrack, rice is boiled in water, after cooling, a powdered substance, obtained in the n of small, round, greyish cakes, the composition of ch is kept secret, is added. When the fermentation uced by this addition has subsided, the liquor is distilled e times, the final product containing a high percentage alcohol. In the greyish cakes, the author has identified ecies of *Monascus* and a bacterium capable of fermenting cose. The genus *Monascus* has hitherto been placed in hemiasci on account of a supposed formation of spores sporangium, surrounded by an investment of hyphæ; t isolated by the author is, however, stated to be a true omycete.—A. S.

ycogen in Distillery Yeasts, Pressed Yeasts and Top-Fermentation Brewery Yeasts; The Occurrence of ——. V. Henneberg. Zeits. Spiritusind., 1902, **25**, [35—39], 78—379, 388—389, 398—399, 410—411, and 420—421.

e author finds that only very dilute solutions of iodine s than 0·1 per cent.) are desirable for the detection of ycogen in yeast, as in this case the protoplasm remains coloured. In the same culture some cells and many ding branches may be free from glycogen, whilst others e a strong reaction, this being an individual and heredi- y peculiarity. The glycogen first appears in the form a number of sharply separated points, which increase in e and gradually fill up the whole protoplasm or only a nite portion of it. Rarely, the glycogen can be observed hout staining; it has been seen with a strongly refractive e appearance. "Reserve" cells containing glycogen are er met with: cells containing glycogen in old cultures always dead ones. In dead cells the glycogen remains olved in the aqueous cell-contents, and it only escapes ough the cell walls very gradually.

Quiescent Yeast: (*a*) *Freshly-pressed.*—Distillery yeast, e 2, is very rich in glycogen; Races 7 and 9 are generally r. The secretion of glycogen appears to be a racial aracteristic.

(*b*) *Stored Yeast.*—At low temperatures the glycogen creases constantly, and disappears in from two to four ks. It disappears first at the surface and later in the rior of the mass of yeast, the process depending on the ss of air. The working power of the yeast does not crease, and is quite independent of the presence of gly- gen. The number of living cells, *i.e.*, the permanence of yeast, is also independent of the glycogen. At ler temperatures the disappearance of the glycogen is more rapid (maximum rate at 37° C.); at 50° C. the st is soon killed, and the glycogen then persists for a ger time. Fresh yeast freely exposed to the air loses glycogen in three hours at 22° C.; at all temperatures disappearance is far more rapid than in the mass. ler water the disappearance of the glycogen is slow hout aëration, but rapid with aëration, a corresponding ntity of carbon dioxide being produced.

Fermenting Yeast.—Glycogen is formed in notable antities only when plenty of sugar is present; it dis- ears as soon as the sugar is reduced by attenuation, and reappears when more sugar is added. The glycogen content is influenced by factors which influence the fermentation, such as temperature, aëration, concentration of the wort. In concentrated worts it appears later and disappears more slowly on aëration than in dilute worts; in pure sugar it appears earlier and lasts longer than when peptone is added; the presence of lactic acid restricts the formation of glycogen. The best way to obtain the maximum content of glycogen is to keep the yeast for 24 hours in a 20 per cent. solution of cane-sugar, maltose, or glucose; starch and dextrin give no glycogen. Potato mashes never give very much glycogen, but grain, maize and molasses mashes, and malt worts generally afford large quantities.

Some races of yeast, *e.g.*, a milk-sugar yeast, never form any glycogen. Logos yeast, on the other hand, is extraordinarily rich. The re-formation of glycogen on fresh additions of sugar to exhausted worts only takes place up to a certain point, depending on the race. The influence of the alcohol upon the yeast is probably the cause of this. On the other hand, the addition of alcohol to the culture liquid before fermentation does not hinder the formation of glycogen.

Dead Cells.—Cells which die whilst glycogen is present retain the latter much longer than living cells. Chloroform and alcohol delay its disappearance. The disappearance of the glycogen is favoured by aëration and delayed by the presence of sugar; it disappears much more slowly at 50° C. than at 37° C. The glycogen in dead cells disappears more rapidly in distillery mashes than in worts, owing to the presence of diastase in the former.

In conclusion, it may be stated that glycogen is an indication of the presence of plenty of sugar; it appears to be of no special advantage to the yeast, and therefore hardly deserves the name of a reserve material.—J. F. B.

Molasses: Manufacture of Spirit from ——. A. Wenck. Zeits. Spiritusind., 1902, **25**, [40], 430—431.

In the more important molasses distilleries of France, Belgium, and Austria, the employment of malt and grain has long been successfully practised, and the use of hydrofluoric acid has been discarded. The good results are based on the use of pure-cultivated wine yeast, acclimatised to molasses and continuously propagated in the distillery in pure yeast apparatus. As a yeast nutrient an extract of yeast as proposed by Bauer should give good results, but nutrient salts, such as potassium phosphate and ammonium phosphate, are cheaper and better. The cost of the yeast, including these salts, is estimated at about 4 Pfennige per 100 litres of alcohol.

Utilisation of the Spent Residues.—Incineration in the direct-fire furnaces is attended by many drawbacks, and owing to the increasing competition of the electrolytic process of manufacturing caustic potash, it more often shows a loss than a profit. In all new plants for the concentration of spent wash, triple or quadruple effects take the first place, and if all the parts be constructed of copper or cast-iron, no excessive depreciation occurs. The author gives tables showing the composition of molasses spent-wash in the dilute state and after concentration to 71 per cent. of solids, together with analyses of the ash and the organic matter. In burning the concentrated residues for black ash without recovery of nitrogen, good practical results have been obtained by steam-raising in low-pressure boilers. In Garner's furnace 25 per cent. of black ash is thus obtained, containing 45—46 per cent. of K_2CO_3. Besemfelder's process for the production of black ash, with recovery of about 70 per cent. of the total nitrogen as ammonia, by destructive distillation has not been widely adopted owing to the complexity of the treatment. In the process of Buch and Reichardt, at the Dessau refinery, about 70—75 per cent. of the nitrogen is recovered, partly in the form of cyanogen compounds and partly as ammonium sulphate. These processes, however, are not on a very satisfactory basis. The most hopeful utilisation of molasses residues appears to be as a fertiliser, without incineration. The Chilinite syndicate's process consists in treating the concentrated residues with crude sulphuric acid and neutralising with chalk. The fertiliser produced contains 3·8 per cent. of nitrogen, 12·8 per cent. of potash as K_2O, 27 per cent. of gypsum, 3 or 4 per cent. of moisture, and the rest

organic matter. In this way the whole of the nitrogen and potash are retained, mostly in the form of valuable potash salts of amino acids, and the process is simple and odourless.—J. F. B.

Molasses; Manufacture of Alcohol from ——. E. Bauer. Zeits. Spiritusind., 1902, **25**, [34], 368.

The deficiency of molasses in yeast nutrients, renders necessary the use of more nitrogenous adjuncts, in the shape of raw grain or malt, from which a wort is prepared by acid or diastatic conversion. This wort is mixed in with the molasses; or the yeast is grown up separately in the wort, and afterwards added to the molasses solution. Apart from the extra plant and expenditure so introduced, these methods suffer from the radical defect that the yeast is cultivated in a medium (dextrose or maltose) differing from that obtaining in the principal fermentation (saccharose).

The author's process, patented in 1896, and since then adopted by a number of leading molasses distilleries, is free from these objections. It consists in the use of a yeast-food prepared from enzymatically liquefied brewers' yeast. This yeast-food is commercially obtainable ("Hefe-Extrakt") in Austro-Hungary, and forms a paste which remains sound for a long time. About 200 grms. of it are added to 1,000 litres of sterilised and slightly acidified molasses solution, which is then "pitched" as usual. It is claimed that good, healthy fermentations are so obtained, yielding a yeast crop of vigorous cells, rich in invertase, and free from bacteria.

For two years the yeast extract has been employed in a number of maize and potato distilleries with marked benefit, enabling a reduction to be made in the proportion of malted grain required in mashing. The process is the subject of Ger. Pat. 130,072, 1900.—H. T. P.

English Patents.

Drying Bricks, Pottery, Malt, Cores for Foundry Work, and the like; Floors for ——. J. A. Mobberley. Eng. Pat. 18,154, Sept. 11, 1901.

See under IX., *page* 1279.

Measuring and Filling Liquids [Bottling of Beer] into Jars or other Vessels; Apparatus for ——. J. G. Crossman, Watford. Eng. Pat. 18,974, Sept. 23, 1901.

The apparatus consists of two vessels mounted with their mouths on a central hub, upon which the two may be rotated; passages are provided so that while the lower vessel is being filled, the upper one is discharging its contents into the vessel placed to receive it.—J. W. H.

Yeast and Spirit; Utilisation of certain Materials [Oil Cake and Leguminous Seeds] in the Manufacture of ——. C. Stang, Berlin. Eng. Pat. 11,852, July 3, 1902.

The utilisation of highly albuminous materials, such as oil-cake and leguminous seeds, in the manufacture of yeast and spirits is rendered possible by digesting the malted nitrogenous raw materials, or the unmalted materials mixed with malt or malt-extract, in a slightly alkaline condition at a temperature of 50°—60° C. for four or five hours, to permit of the activity of the proteolytic enzyme. The product is then acidified and added to the ordinary mashes as a yeast-nutrient.—J. F. B.

Dextrin [Achroodextrin] and Alcohol; Manufacture of ——. G. Reynaud, Paris. Eng. Pat. 17,506, Aug. 8, 1902.

Peat, lichens, and mosses are mixed with twice their weight of water, and heated under pressure in an autoclave to a temperature of from 160° C. to 220° C. for about an hour and a half; the cellulose and starchy matters are thus converted into achroodextrin. If desirable, the water used may be slightly acidulated (2—3 per cent. of acid). The solution obtained may be treated for the manufacture of achroodextrin, or it may be saccharified and fermented for the production of alcohol. An autoclave provided with an agitator is described, having several nozzles at different levels for the introduction of superheated steam.—J. F. B.

United States Patents.

Malt Liquors; Manufacture of ——. J. Schneible, New York. U.S. Pat. 694,671, March 4, 1902.

In the cellar treatment of beers in process of manufacture, the beer, after primary fermentation is complete, is cooled, saturated with carbon dioxide, and the liquid, so charged under pressure, stored (in clarifying or chip casks) until clarification is effected. It is claimed that clarification takes place far more rapidly (five days or more) than under ordinary conditions of storage, and that the beer, being charged with gas, is in an immediately marketable condition.—H. T. P.

Beer; Process of Manufacturing Non-Alcoholic —— V. Lapp, Lindenau, Germany. U.S. Pat. 709,713, Sept. 23, 1902.

Wort is heated, aërated with pure air, saturated with ozone and then with carbon dioxide at a pressure of about 10 atmospheres. The wort is then cooled, still under that pressure, and filtered, relieving at the same time part of the pressure; it is then saturated with carbon dioxide and filtered again, and stored under a pressure of carbon dioxide of 10 atmospheres until bottled or racked off.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Macaroni, Spaghetti, Vermicelli, and Noodles. A. L. Winton and A. W. Ogden. Twenty-fifth Report of the Connecticut Agric. Exp. Station for 1901, 196—202.

Macaroni, spaghetti, and vermicelli are prepared by moistening wheat-flour, rich in gluten, with hot water, kneading into a dough, and forcing the latter through a perforated plate. "Noodles" are prepared by making a dough from flour mixed with a certain amount of eggs and salt, rolling into sheets, and cutting into strips or fanciful shapes. Most commercial "noodles," however, are not made with eggs, but have about the same composition as macaroni, the golden-yellow colour being produced by the addition of turmeric or a coal tar dyestuff (Tropeolins, Dinitrocresol, Martius Yellow, Naphthol Yellow S, &c.).

All the samples (37) of macaroni examined, appeared to have been made from wheat flour without the addition of any considerable amount of salt, eggs, or colouring matter. The amount of ash ranged from 0·38 to 0·96 per cent., protein, 11·94—20·69; nitrogen-free extract (including fibre), 64·82—75·60; and fat, 0·15—1·11 per cent.

In 18 samples of spaghetti and vermicelli, the amount of ash ranged from 0·46 to 0·97 per cent.; protein, 11·94—15·31; nitrogen-free extract (including fibre), 71·52—74·33; and fat, 0·19—0·63 per cent.—A. S.

Cheese; Salts formed by Casein and Paracasein with Acids, and their Relations to American Cheddar —— L. L. Van Slyke and E. B. Hart. New York Agric. Exp. Station. Bull. No. 214, July 1902.

In examining cheese for hetero-caseose by extraction with dilute solution of common salt, a substance other than hetero-caseose was detected. This compound, soluble in salt solution, is present in large quantities only when lactic acid is used in the manufacture of the cheese, being practically absent, or present in very small proportions, when rennet is used. In normal cheese the compound is always found, but in varying amounts, the proportion usually being largest in new cheese, and diminishing as the age of the cheese increases.

Paracasein, when treated with dilute lactic acid, furnishes a product resembling, in both physical and chemical properties, the substances, soluble in salt solution, extracted from cheese.

Both paracasein and casein combine with lactic, acetic, drochloric, and sulphuric acids in at least two different oportions, forming an unsaturated or mono-acid salt and saturated or di-acid salt. The unsaturated salts are luble in dilute solutions of sodium chloride and in 50 per nt. hot alcohol, but insoluble in water. The saturated lts are practically insoluble in all of the three solvents entioned. Both forms are sparingly soluble in dilute lutions of calcium lactate and calcium carbonate. The anges taking place in cheese-curd during the process cheddar cheese making, are due to the formation the unsaturated paracasein lactate. According to the thors, the ripening process in normal cheddar cheese, which the insoluble nitrogen compounds change into luble forms, begins, not with paracasein, as has been nerally held, but with unsaturated paracasein lactate. ie water-soluble nitrogen in cheese generally increases as e unsaturated paracasein lactate decreases, and it is proble that the first step in the normal ripening process of merican cheddar cheese is a peptic digestion of unsaturated racasein lactate.—A. S.

oods; Use of Coal-Tar Dyestuffs in ——. A. L. Winton. Twenty-fifth Report of the Connecticut Agric. Exp. Station for 1901, 179—182.

, showing the extent to which the use of dyestuffs in foods e been carried, it is reported that, during 1901, 21 out of samples of jellies and jams, and 86 out of 106 samples catsup and other sauces, as well as most of the cheap rdials and lemon extracts examined at the station contined coal-tar dyestuffs. Among other articles in which ese colours have frequently been detected, are milk, tter, cheese, ice cream, confectionery, pastries, flavouring tracts, mustard, cayenne pepper, sausages, "noodles," oes, and liquors.

Experiments on dogs and other animals by Cazeneuve d Lépine, Weyl, and others have proved, beyond doubt, poisonous nature of Picric Acid, Dinitrocresol, and rtius' Yellow among the nitro colours, and of Orange II. d Metanil Yellow among the azo colours. Magenta, lphonated nitro colours, and most of the azo colours do t act as poisons, but some of them produce vomiting, hers diarrhœa, and others albuminuria. The author ints out that, although there is evidence that most of the al-tar dyestuffs are not injurious to some of the lower imals, it is not safe to assume that they are entirely rmless to human beings.

Weber found that even at a dilution of 1 in 1,600, Oroline llow (Acid Yellow) retarded the action of pepsin in the ificial digestion of fibrin, and Methyl Orange, Saffoline cridine Red), and Magenta seriously interfered with the ncreatic digestion.—A. S.

affeine [in Tea, &c.]; Determination of ——. J. Katz

See under XXIII., *page* 1300.

United States Patents.

ising or Lowering the Temperature of Liquids [Milk]; Machine or Apparatus for ——. F. H. Floyd, Quincy, Mass., U.S.A. U.S. Pat. 708,703, Sept. 9, 1902.

ie liquid, such as milk, to be cooled is circulated in the ices formed between a series of double convex hollow ambers and a similar series of double concave chambers. ie cooling medium flows through the concave chambers, hich are superimposed on each other to form a column. —W. P. S.

Pasteurising Apparatus. B. F. Schirmer, Indianapolis, U.S.A. U.S. Pat. 708,738, Sept. 9, 1902.

E apparatus consists of a tank containing water, which is ated to the desired temperature. The bottles containing liquid to be pasteurised are placed in receptacles fixed a travelling belt, and are thus carried into the tank, first ssing through the heated atmosphere at the top of the k, then through the hot water, and finally being autotically delivered from the tank at the opposite end to at which they entered. The entrance and exit are sed by automatically shutting doors. On leaving the k the bottles are sprayed with cold water.—W. P. S.

Cream Separator. C. B. Phillips, Blissfield, Mich., U.S.A. U.S. Pat. 708,730, Sept. 9, 1902.

The drum of the separator contains a number of vertical partitions or wings, connected together by cone-shaped rings. The rings are hollow down the centre, and are in close contact at their outer and lower edge with the sides of the drum. A space is left between the edge of the lower cone and the side of the separator, through which the milk passes, after being run into the bottom of the drum through a hollow shaft entering at the top and passing down the centre of the separator.—W. P. S.

Centrifugal [Cream] Separator. J. P. Hultgren, Assignor to F. H. Getzmann, both of Stockholm. U.S. Pat. 708,643, Sept. 9, 1902.

Inside the separator drum is placed a vertical series of rings, each elliptical in cross-section and held together by vertical strips or ribs. Narrow slits are left between the rings, through which the separated milk passes.—W. P. S.

Milk Albumin; Process for producing Soluble ——. H. V. Dunham, New York, U.S.A. U.S. Pat. 709,003, Sept. 16, 1902.

Whey is concentrated, after the addition of 1 per cent. of ammonia (26°), to a thick syrup, the temperature being kept below the coagulating point of albumin during the evaporation. The milk-sugar is then allowed to crystallise out, and is removed. On adding 1 per cent. of hydrochloric acid to the syrup, the albumin is precipitated and is strained off, washed in a little water, and dried.—W. P. S.

Oleaginous Compound [Lard Substitute]. C. Adams, Bellows Falls, Ver., U.S.A. U.S. Pat. 709,291, Sept. 16, 1902.

A vegetable oil, preferably cotton seed oil, is thoroughly incorporated with a solution of casein in approximately the proportion of 60 parts of oil to 7 parts of solution. The resulting semi-solid product is stated to be a good substitute for lard, which it resembles in appearance.—C. A. M.

Food Products; Process of Preserving ——. W. D. Baker, Rogers, Ark., U.S.A., Assignor to E. B. Harrington, Kansas City, U.S.A. U.S. Pat. 709,431, Sept. 16, 1902.

The articles to be preserved are placed in a chamber built of non-conducting walls, so that the temperature shall not vary. On shelves round the sides are placed open vessels containing charcoal, potassium carbonate, and a mixture of iron and sulphur. The charcoal is placed on the bottom shelf, the potassium carbonate on the next, then another shelf of charcoal, and on the uppermost are the vessels containing a moist mixture of iron (filings) and sulphur, and others holding a dry mixture of iron, sulphur, and potassium carbonate.—W. P. S.

Food Products; Process of Preserving ——. W. D. Baker, Rogers, Ark., U.S.A., Assignor to E. B. Harrington, Kansas City, U.S.A. U.S. Pat. 709,432, Sept. 16, 1902.

The food products are subjected to the action of the fumes arising from smouldering paper which has been steeped in a solution of potassium nitrate. The fumes are forced into the chamber by a fan. In the chamber are placed pans of potassium carbonate (for drying the fumes) and of charcoal. —W. P. S.

Eggs; Process of Preserving ——. W. Shöning, Christiania. U.S. Pat. 709,583, Sept. 23, 1902.

The eggs are dipped in hot water (not boiling) for a few seconds, and are then placed in a solution of cold salt water containing 10 per cent. each of ammonium chloride and sodium silicate.—W. P. S.

(B.)—SANITATION; WATER PURIFICATION.

Sewage Purification by the Bacterial System. A. D. Greatorex. Public Health Eng., Oct. 1, 1902, 316—322.

The sewage in question is free from factory refuse, except that of breweries.

In view of the unsatisfactory results of irrigation and of complaints of nuisance arising therefrom, the local authority resolved to try two methods of bacterial treatment, *viz.*:—

High Level.—Preliminary passage through a "detritus" tank followed by bacterial treatment in one coarse bed, and finally by filtration through prepared land;

Low Level.—A coarse and a fine bacteria bed, 3½ ft. and 3 ft. deep respectively.

The beds were filled with engine ashes, which, for the coarse bed, were screened as between a ½ in. and a 2 in. mesh, and, for the fine, as between a ¼ in. and a ½ in. mesh.

The object of the experiment was to prove whether sewage could be purified without supplemental land filtration.

Samples taken for analysis gave the following results:—

Low Level:	Grains per Gall.
Suspended matter in crude sewage.....	54·17
,, in final filtrate.....	0·68
	Parts per 100,000.
Dissolved oxidisable matter in crude sewage....	3·251
,, ,, in final filtrate.....	0·457

The oxygen test showed a total purification by the combined beds of 85·9 per cent., which, after land treatment, was increased to 88·9 per cent. The albuminoid ammonia test showed a total purification by the combined beds of 78·6 per cent., increased after land treatment to 82·4 per cent. These figures were subsequently confirmed by the "incubator test."

High Level.—The final filtrate from the one bacteria bed, combined with land treatment, showed a reduction of oxidisable matters in solution of 92·6 per cent. With supplemental land treatment, nitrification showed an increase of from 0·447 to 1·239 parts per 100,000 of nitric nitrogen.

In both cases the beds, after 12 months' continuous working, were as free from nuisance as when first filled, and the effluent was throughout superior to the water of the river into which it flowed.

English Patents.

Water; Apparatus for Softening, Filtering and Purifying ——. T. Waite, Bradford. Eng. Pat. 11,366, June 4, 1901.

The apparatus includes two cylindrical vessels, on the same level and of similar height, but differing in size. Above the larger vessel, the water to be purified is run on to an overshot wheel or turbine, buckets connected to which discharge into hoppers communicating with a shute leading to a second wheel over the smaller vessel. The water passes from near the top of the smaller vessel downwards by a pipe leading to near the bottom of the larger vessel, then flows upwards through the latter through filtering beds alternated with chambers, wherein it is agitated by vanes worked by the flow, and finally passes outwards from the uppermost chamber. Lime or other purifying agent is supplied from above to the larger vessel, which, as well as the smaller vessel, has a settling bottom inclined in all directions to a side discharge valve.—E. S.

Water; The Purification or Sterilisation of ——; *Mechanism for adding Chemicals used in connection with Mechanical and other Filters.* A. J. Bell and P. A. G. Bell, Manchester. Eng. Pat. 21,231, Oct. 23, 1901.

In combination with a cylinder or tank containing the chemical solution to be used, and in which is a float, is a water-supply pipe in connection with a mixing chamber, fitted with valves controlled by the float in the cylinder, according to the density of the chemical solution therein, so that, if the solution become reduced in density, the float sinks, and thereby the valve admitting it to the mixing vessel is opened, so that more of the said solution is added to the water passing through the mixer, and *vice versâ*, the mixture being always made proportionately to the strength of the solution. In a modified form of apparatus, the flow of the chemical solution into the water is adjusted without the use of a float.—E. S.

United States Patents.

Water-purifying Apparatus. C. L. Kennicott, Assig to Kennicott Water Softener Company, both of Chica U.S. Pat. 708,717, Sept. 9, 1902.

See Eng. Pat. 11,990; 1902; this Journal, 1902, 1192. —E. S

Liquids with Gases [*Water with Ozone*] *or Gases w Liquids; Apparatus for Treating* ——. A. Vosma Watergraafsmeer, and A. Lebret, Utrecht, Assignors the Ozon Maat-schappy Systeem A. Vosmaer, Amsterda U.S. Pat. 709,379 Sept., 16, 1902.

An apparatus for treating water with ozone, and for simi purposes, in which the gas may be passed in fine bubb through the liquid, without being carried away by the lat An upright cylindrical vessel is provided at the bottom w an inlet-pipe for the gas; at the top, with an outlet for gas and an inlet-pipe for the liquid to be treated; and at side, with an outlet-pipe for the treated liquid. A horizon diaphragm having very fine perforations (say 0·05 m diameter) is arranged above the gas-inlet pipe and j below the level of the liquid outlet-pipe. A perfora screen, in the form of an annular chamber extend round the cylinder, is interposed before the liquid-out pipe, the perforations having a diameter of about 0·25 m A tubular projection extends upwards from the diaphragm above the screen. The gas is forced up through the p forated diaphragm into the liquid, which cannot wo through the perforations, and any bubbles which do not once rise through the liquid are caught by the annu screen, through which only the treated liquid can pass. —H. B

Garbage; Method of and Apparatus for Treating — S. E. Wilson, Frenchlanding, Mich., U.S.A. U.S. P 709,384 and 709,450, Sept. 16, 1902.

Garbage, distillery slops and the like, and especia matters from which it may be desired to extract grea are treated in a series of digesting and compression tan in which the cooking and compressing "fluid" used may steam, hot air, or vapours from naphtha, &c. The proc consists in dividing the mass into a number of comparativ small portions, and cooking these within a closed tank, t latter being connected with a separate tank wherein equal pressure is maintained; "applying fluid under pr sure simultaneously to all the surfaces of the mass un treatment," and allowing the contained liquid therein to p through to the pressure tank. Communication with t high-pressure tank is shut off, that with a low-pressure ta being opened. The mass upon that side opposite the co nection with the low-pressure tank is now compressed, flu under pressure being passed through the mass into the lo pressure tank. It is stated that a relatively dry mass is th obtained. Provision for deodorising the escaping gases made. Reference is made to U.S. Pat. 567,210, Sept., 1896.—E.S.

Garbage; Apparatus for Cooking ——. C. S. Wheel wright. U.S. Pat. 709,836, Sept. 23, 1902.

See under XII., *page* 1285.

XIX.—PAPER, PASTEBOARD, Etc.

Sulphite Lyes containing Soda; Determination of Alkali in ——. R. Schwartz.

See under XXIII., *page* 1298.

Benzene and Cellulose; Reaction between ——. A. M. Nastjakow.

See under XXIV., *page* 1302.

English Patent.

Textile Fabrics or Yarns; Mordanting or Dyeing by Means of Viscose] ——. A. Fielding. Eng. P 20,398, Oct. 12, 1901.

See under V., *page* 1276.

lulose: Manufacture of Derivatives (Acetates) of ——. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer, Elberfeld, Germany. Eng. Pat. 21,628, Oct. 28, 1901.

E Fr. Pat. 317,007; this Journal, 1902, 870.—J. F. B.

lluloid: Manufacture of ——. J. N. Goldsmith and the British Xylonite Company, both of Braintham, Suffolk. Eng. Pat. 22,662, Nov. 9, 1901.

KYL esters of the acid or acids obtained by the action of powerful oxidising agent (*e.g.*, nitric acid) on fats, oils, or ips are claimed as camphor substitutes in the manufacture celluloid.—J. F. B.

UNITED STATES PATENT.

per-making Machines: Paper-making Wire for ——. H. Parker, Verm. U.S. Pat. 709,934, Sept. 16, 1902.

E ordinary making-wire of the Fourdrinier paper-making chine is supported underneath by a perforated belt, which ieves the wire of the wear and tear experienced at the tion boxes. This belt consists of perforated metal such aluminium-bronze, electro-plated with lead, the surfaces ing coated with sheet rubber, which also extends through perforations in the metal, and which is united to the tal by the affinity induced by the action of the process of lcanisation on the lead coating.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

iorite and Orangite. J. Schilling. Zeits. angew. Chem., 1902, **15**, [37], 921—929.

résumé of the literature relating to thorite and orangite, which the subject is dealt with under the following adings:—I. Historical. The Discovery, Occurrence and vestigation of the Mineral. II. The Mineralogical Form, acture, &c. III. Chemical Composition (including recent lyses by the author).—H. B.

ercuric Acetate; Oxidations with ——. L. Balbiano and V. Paolini. Ber., 1902, **35**, [15], 2994—2998.

E authors have found that olefines are oxidised by ercuric acetate, mercurous acetate being precipitated, etic acid liberated and oxygen or hydroxyl becoming ached to the two carbon atoms at the double linkage. the reaction takes place very gradually at ordinary mperatures, it affords a means of gently oxidising com- cated molecules. The following results are here corded:—

Lævo-pinene.—Three mols. of mercuric acetate were owed to act upon 1 mol. of pinene in presence of water. perceptible rise of temperature took place and the action was complete after 7—8 days. The main pro- ct, a new *dioxypinene*, $C_{10}H_{16}O_2$, is a nearly colourless oil th an odour of camphor; its density at 0° C. = 1·069 d it boils under 5 m.m. pressure at 145° C.; its benzene lution is optically inactive. This body is a keto-alcohol d the usual ketone and alcohol derivatives have been epared. It yields, on oxidation by permanganate, etone and terpenylic acid.

Anethol on oxidation with mercuric acetate for 12 days lds as a main product the *glycol*, $CH_3O.C_6H_4.C_3H_5(OH)_2$, ystallising in warty needles, m. pt. 98° C. It yields anisic id on oxidation with chromic acid mixture and its diacetyl rivative boils at 210° C. under 11 m.m. pressure.

Safrol and Isosafrol.—Whilst isosafrol, like anethol, ntains the propenyl, $CH_3.CH:CH$, group, safrol contains e isomeric allyl, $CH_2:CH.CH_2$, grouping. Mercuric etate oxidises isosafrol, but the resulting glycol has not t been purified. With safrol, on the other hand, the ercuric salt is not reduced even after several months, but crystalline compound with mercuric acetate is produced, $(H_2O_2.C_6H_3.C_3H_5(OH)(HgC_2H_3O_2)$. If the reaction be owed to proceed for 8—10 days only, a syrupy compound the same composition is obtained; this result may be due to isomerism or polymerism. Both compounds yield safrol on hydrolysis with acids. Terpinene and camphene also yield metallic compounds with mercuric acetate.

—J. F. B.

Terpineol and Dimethylheptenol: Mercuric Compounds from ——. J. Sand and F. Singer. Ber., 1902, **35**, [15], 3170—3187.

IN a previous paper (this Journal, 1900, 1034), derivatives were described resulting from the combination of mercuric salts with ethylene compounds, characterised by having mercury in direct combination with carbon and by a tendency for two molecules to condense to form ether-oxide types.

It is now found that terpineol and dimethylheptenol also react with mercuric salts in an analogous manner, yielding mercurised alcohols and mercury compounds with oxygen linkage, with the difference that the latter condensation occurs inside the molecule itself.

Terpineol.—Satisfactory reaction only occurs under special conditions: mercuric oxide is dissolved in nitric acid and terpineol is dissolved in ether; 10 per cent. potash lye is then added to the mercuric nitrate solution until a precipitate of basic nitrate appears; this is caused to redissolve by shaking it with some of the terpineol solution. This procedure is repeated until the further addition of potash turns the liquid black; the aqueous portion is then filtered, and nearly all the mercury is obtained in the aqueous filtrate. A considerable further quantity of caustic potash is then added and the calculated quantity of potassium iodide. A crystalline derivative is precipitated at once, insoluble in alkali, and two other products are obtained from the liquors, one after standing and the other after saturation with carbon dioxide. These three products have been identified as follows: The compound insoluble in alkali is the oxide-like condensation product, *viz.*, mercury cineol iodide, $C_{10}H_{17}OHgI$, it yields cineol on reduction; the less soluble, glycol-like compound is stable (α)-mercury-*trans*-terpin iodide, $C_{10}H_{19}O_2HgI$; the more soluble product is an isomeride of this and is regarded as labile (β)-mercury-*trans*-terpin iodide.

Dimethylheptenol, obtained by the action of magnesium methyl iodide upon methylheptenone, has a structure very similar to that of terpineol, but acyclic; the action of mercuric salts is just the same. Reaction takes place quite easily in this case; the product insoluble in alkali, formed with internal condensation, is an oil, and has the constitution—

$$(CH_3)_2.C.CH(HgI).CH_2$$
$$O.C.(CH_3)_2.CH_2$$

and the glycol derivative, soluble in alkali, is crystalline, melting at 124°—125° C., and having the formula—

$$(CH_3)_2.C(OH).CH(HgI).CH_2.CH_2.C(OH)(CH_3)_2.$$

—J. F. B.

Monohydroxybenzophenones. F. Ullmann and J. Goldberg. Ber., 1902, **35**, [15], 2811—2814.

GRAEBE and Ullmann have shewn that the condensation of methylether salicylic chloride with benzene and aluminium chloride yields *o*-hydroxybenzophenone. The authors now further study this reaction, and have obtained 2-hydroxyphenyl-4′-tolylketone from methylether salicylic chloride, toluene and aluminium chloride. They have also converted the chlorides of the *m*- and *p*-methoxybenzoic acids into the corresponding methoxybenzophenones, and find that, unlike *o*-hydroxybenzophenone, the methoxy group is not split off in the reaction, but may be removed on subsequent hydrolysis.—T. A. L.

Iodoform; Preparation of ——, *by means of Acetylene.* O. Le Comte. J. Pharm. Chim., **16**, [7], 297—300.

100 GRMS. of corrosive sublimate are dissolved in 2,000 c.c. of warm water, and after cooling, a current of purified acetylene is passed through. A white precipitate containing chlorine, mercury, and acetylene results; it is washed with distilled water until the washings cease to blacken with sulphuretted hydrogen, and dried at 100° *in vacuo*. The dry compound is mixed with 50 parts of cold water, 2 parts of iodine added, then slowly and with constant agitation a

1:20 solution of caustic soda, until the iodine has almost disappeared. If excess of alkali be added, the mixture rapidly blackens. The mixture becomes yellow, and acquires the characteristic odour of iodoform. The product is placed on a filter and washed :—

1st, with alkali (1:100) to remove any iodine remaining; 2nd, with distilled water; 3rd, with water acidulated (1:100) with hydrochloric acid, which prevents oxide of mercury forming; 4th, with distilled water, until the washings give no reaction with silver nitrate solution. Finally, the precipitate is dried *in vacuo*, and purified by crystallisation from boiling alcohol.—C. T. T.

Morphigenine and Episine. E. Vahlen. Ber., 1902, **35**, [15], 3044—3047.

The author replies to criticisms by Pschorr (this Journal, 1902, 1094) upon his investigations on these substances. Pschorr stated that episine and the products of the sulphonation of morphigenine (aminopheuanthrol) hydrochloride are not nitrogenous bodies. The author, however, re-affirms that his preparations do contain nitrogen. Pschorr also contended that "morphigenine sulphonic acid" and episine are not nerve poisons like morphine, but blood poisons, which convert the blood into methæmoglobin. The author replies that morphigenine sulphonic acid is a mixture which does indeed contain blood poisons, but only in a minor degree, and that its narcotic effect has nothing to do with any action on the blood, but is a true nerve effect like that of morphine. Moreover, although episine will convert blood into methæmoglobin in a test-tube, it does not do so in the body. The author adheres to his view that the physiological action of episine is similar to that of morphine.—J. F. B.

Digitalis Leaves; Valuation of ——. H. Ziegenbein. Arch. der Pharm., **240**, [6], 455.

Doubt having been thrown on the value of digitoxin determinations as furnishing data on which to base the therapeutic value of digitalis leaves, the author has made comparative experiments, determining both the digitoxin content and the actual lethal dose for frogs, with a large number of leaves from different sources. He finds that there is no connection between the figures; thus the lethal dose is the same, with leaves containing respectively 0·33 and 0·125 per cent of digitoxin. It is further found that the extract of the leaves is from 2·5 to 6·5 times more toxic than corresponding amounts of pure digitoxin.—J. O. B.

Calumba Root [*Jateorhiza Calumba*]; *Alkaloids of* ——. J. Gadamer. Arch. der Pharm., **240**, [6], 450—453.

Calumba root contains at least two alkaloids, similar to, but not identical with, berberine. The latter alkaloid does not occur in the root. Like berberine, Calumba alkaloids are quaternary bases, yellow in colour, and are converted by reduction into colourless tertiary hydro-compounds, which may be separated by shaking out with ether.—J. O. B.

Ipecacuanha; Indian ——. B. H. Paul and A. J. Cownley. Pharm. J., 1902, **69**, [1680], 256.

The authors have previously pointed out (see this Journal, 1901, 500) that the relative proportions of emetine and cephaeline in Brazilian and Columbian ipecacuanha are so different that the two kinds cannot be regarded as interchangeable. They have recently examined a sample of Indian ipecacuanha and find that the latter resembles the Brazilian variety in that the proportion of emetine is greater than that of cephaeline. The results obtained are shown in the accompanying table, together with the figures obtained from samples of Brazilian and Columbian ipecacuanha.—A. S.

——	Indian.	Rio.		Columbian (two kinds).	
		Root.	Stem.		
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Emetine	1·39	1·45	1·18	0·89	0·89
Cephaeline	0·50	0·52	0·59	1·25	0·95
Psychotrine	0·09	0·04	0·03	0·05	0·14
Total alkaloids	1·98	2·01	1·80	2·19	1·98

Ipecacuanha; Valuation of ——, *and Determination of Different Alkaloids.* B. H. Paul and A. J. Cownley.

See under XXIII., *page* 1299.

Ipecacuanha Root; Determination of the Alkaloidal Constituents of ——. G. Frerichs and N. de Fuentes Tapia.

See under XXIII., *page* 1299.

"Quinine-tree"; South African ——. Guritz. Chem. & Druggist, 1902, **61**, [1181], 482.

The author, in his report as Cape Government Analyst, gives the results of an investigation of the bark of the so-called "quinine tree," or "Unijela" of the Transvaal (*Tabernæmontana ventricosa*, Hochst), which grows in the Gxwaleni forest, in the Nyanduli district. From a chloroform extract of the bark, which has a bitter taste and is said to possess the therapeutic properties of quinine, the author obtained needle-shaped crystals of an alkaloid, the yield being nearly 0·2 per cent. of the weight of the bark. The alkaloid melts at about 200 °C., has a bitter taste, is not fluoreseent in acid solution, and is very soluble in chloroform, alcohol, benzene, and very dilute sulphuric and hydrochloric acids.—A. S.

Di-Cinchona Alkaloid Carbonic Acid Esters; Manufacture of ——. Vereinigte Chininfabriken Zimmer and Co. Frankfort-on-Maine. Ger. Pat. 134,308. Supplement to Ger. Pat. 117,095. Feb. 28, 1899. Zeits. angew. Chem. 1902, **15**, [39], 1017.

If, instead of an excess of phenyl carbonate as specified in the original patent, only one molecule of neutral phenyl carbonate be caused to react upon two molecules of cinchona alkaloid at elevated temperatures, di-alkaloid carbonates are obtained in a simple manner without the formation of mixed carbonates.—J. F. B.

Di-Cinchona Alkaloid Carbonic Acid Esters; Manufacture of ——. Vereinigte Chininfabriken Zimmer and Co., Frankfort-on-Maine. Ger. Pat. 134,307. Supplement to Ger. Pat. 117,095, Feb 28, 1899. Zeits. angew. Chem., 1902, **15**, [39], 1018.

It has been found that the reaction between the cinchona alkaloids and phenyl carbonate ($C_6H_5O.CO.OC_6H_5$) takes place at lower temperatures than 150° C., as specified in Ger. Pat. 134,308 (see preceding abstract).—J. F. B.

Acetyl-quinine; Manufacture of ——. Chem. Fabr. v. Heyden, Radebeul, Dresden. Ger. Pat. 134,37[illegible] Aug. 24, 1901. Zeits. angew. Chem., 1902, **15**, [39], 1017.

Acetylquinine prepared in the usual way possesses an intensely bitter taste, owing to partial saponification with production of quinine during the process of purification. A product with only a slightly bitter taste is obtained by avoiding, at all events in the last recrystallisation, the use of water or alcohol. Pure acetylquinine, crystallised from anhydrous solvents, such as ether or hydrocarbons, melts at 116°—117° C.—J. F. B.

Strychnine and Brucine; Separation of ——. Lyons.

See under XXIII., *page* 1300.

Strychnine; Determination of ——. H. M. Gordin.

See under XXIII., *page* 1300.

Caffeine; Determination of ——. J. Katz.

See under XXIII., *page* 1300.

Cantharides; Japanese ——. Puran Sing. J. Pharm. Soc. of Japan, June 1902. Chem. and Druggist, 1902, **61**, [1181], 482.

It has been stated that the Japanese flies contain as much as 2 per cent. of cantharidin, but the author has never met with samples containing more than 2 per cent. For the determination of the cantharidin, 25 grms. of the powdered sample were treated with 200 c.c. of dilute nitric acid (1 in 2). After adding a little gypsum, the mixture was evaporated to dryness and extracted with chloroform. The chloroform solution yielded on evaporation a mixture of crystals and a heavy yellow oil; the latter was washed with the minimum quantity of ether. The cantharidin was finally dried and weighed; it melted at 207 —210° C.

—A. S.

Calamus Oil; Constituents of ——. H. Thoms and R. Beckstroem. Ber., 1902, **35**, 3187—3195.

The calamus oil investigated by the authors had a specific gravity of 1·0254 at 20° and an optical rotation of −0·68° in a 2-cm. tube at 26° C.; at the ordinary pressure the greater portion of it distilled between 272° and 340° C.. The following compounds were found to be present in it: Heptylic and palmitic acids; eugenol; asarylaldehyde; palmitic and oleic acids in the form of esters; a compound, $C_{15}H_{26}O_2$, to which the name calameon is given, and which is described in the following paper; asaron, the presence of which explains the high methyl number obtained for the oil; and two hydrocarbons of the formula $C_{15}H_{22}$, one boiling at 140° under 22 mm. pressure and having an $[\alpha]_D$ −13·38° at 20°, and the other boiling at 146° under 19 mm. pressure and having an $[\alpha]_D$ + 34·83° at 18° C..

When asaron is treated with a concentrated solution of phosphoric or arsenic acid, it undergoes polymerisation into a compound, $(C_{12}H_{16}O_3)_3$, which is termed parasaron. This body is soluble in alcohol, acetone, chloroform, and acetic acid, from which liquids it cannot be crystallised out, but on evaporation of the solvent it remains as a glassy, crystalline mass. On oxidation with potassium permanganate, it yields neither asaraldehyde nor asaric acid.—T. H. P.

Calamus Oil; The Calameon of ——. H. Thoms and R. Beckstroem. Ber., 1902, **35**, 3195—3200. (Compare preceding abstract.)

Calameon, $C_{15}H_{26}O_2$, forms shining crystals which belong to the hemihedral group of the rhombic system, and melt at 111° C. It is soluble in acetic acid, alcohol, and chloroform, to a less extent in ether or carbon bisulphide, but only very slightly so in light petroleum. Its optical rotation in alcoholic solution at 26° has the value $[\alpha]_D = -8·94°$. As regards its chemical nature, it is analogous to cineol, which it closely resembles, the oxygen in the molecule being combined with two different carbon atoms to form a cyclic ring.

When oxidised with potassium permanganate, calameon yields a monobasic acid, $C_{15}H_{24}O_4$, to which the name calameonic acid has been given; this acid melts at 136° C., and is soluble in chloroform, acetic acid, and alcohol.

Calameon (1 mol.) absorbs bromine (2 atoms), yielding a compound which is very unstable and decomposes in the same way as the corresponding derivative of cineol:—

$$C_{15}H_{26}O_2, 2Br = C_{15}H_{22} + 2H_2O + 2Br$$
$$C_{15}H_{22} + 2Br = C_{15}H_{21}Br + HBr.$$

Calameon also forms an unstable additive compound with hydrogen chloride.

When heated with dilute sulphuric acid, calameon is converted almost quantitatively into a hydrocarbon, $C_{15}H_{22}$, which has been named calamene. This compound is a light, strongly refracting liquid, which boils at 144° under 15 mm. pressure, and has the sp. gr. 0·9324 at 23°; it has the rotation $[\alpha]_D = -11·31°$ at 26° C. Calamene yields a bromo-derivative, $C_{15}H_{21}Br$, and a crystalline hydrochloride melting at 108°, and on oxidation it is converted into acetic and oxalic acids, together with a very small proportion of an acid melting at 196°.—T. H. P.

Gardenia Oil; Properties and Chemical Composition of Essential ——. E. Parone. Boll. Chim. Farm., **41**, 489—498. Chem. Centr., 1902, **2**, [10], 703.

For the preparation of pure gardenia oil, freshly gathered gardenias (5 kilos.) were macerated for 24 hours in 3 litres of vaseline oil, the turbid aqueous liquid separated, the vaseline extracted for several hours with small quantities of absolute alcohol, filtered, treated in the cold with six times its volume of a 16 per cent. solution of sodium sulphate, and the last traces of the gardenia oil separated by means of ether. The oil (yield, 176 grms. from 250 kilos. of flowers), after being dehydrated by means of calcium chloride, rapidly filtered, and dried by means of a current of carbon dioxide, formed a clear yellowish liquid, sp. gr. at 20·5° C., 1·009; b. pt. at 755 mm., 204° C., with partial decomposition; easily soluble in alcohol and ether; $[\alpha]_D$ = + 1·47° (at 20° C., 50 mm. tube). On distillation under reduced pressure (12—15 mm.), 170 grms. of the oil yielded the following fractions: 84° — 91° C., 25 grms.; 91°—104° C., 114 grms.; 104°—150° C., 12 grms. In these fractions the following compounds were detected:—benzyl acetate, styrolyl acetate, linalool, linalyl acetate, terpineol, and methyl anthranilate. The oil probably also contains small quantities of benzoic acid in the form of an ester, and some other substances not identified. The principal constituent of the gardenia oil is benzyl acetate, but its peculiar scent is chiefly due to the styrolyl acetate, $C_6H_5CH(OC_2H_3O)CH_3$.—A. S.

Eucalyptus Macarthuri; Oil of ——. H. G. Smith. Proc. Roy. Soc. of New South Wales; through Pharm. J., 1902, **69**, [1682], 295.

The author finds that the amount of the ester (geranyl acetate) contained in the oil of *Eucalyptus macarthuri*, does not fall at any time of the year below 60 per cent., and that the amount of free alcohol, considered as geraniol, diminishes as that of the ester increases. The greatest amount of naturally formed ester occurring at any time of the year was 74·9 per cent., in September, but the free alcohol was only 6 per cent. at that time. The oil does not contain phellandrene or eucalyptol at any time of the year. Eudesmol is always present, the amount varying with the specific gravity of the oil. The crude oil appears to be always slightly dextro-rotatory.—A. S.

Vanilla Extract. A. L. Winton and L. Silverman.

See under XXIII., *page* 1300.

Lemon Extract. A. L. Winton and A. W. Ogden. Twenty-fifth Report of the Connecticut Agric. Exp. Station for 1901, 163—174.

Lemon extract, U.S.P., is a 5 per cent. (by volume) solution of lemon oil in strong alcohol, coloured with lemon peel. Imitation extracts are generally made either by shaking a small proportion of lemon oil with weak alcohol and filtering through magnesia to remove the excess of oil, or by dissolving citral in dilute alcohol. The bogus extracts are coloured golden-yellow with turmeric or, more commonly, with a coal-tar dyestuff. A reliable test for lemon extract is based upon the insolubility of lemon oil in weak alcohol. If a good lemon extract be diluted with half its bulk of water, the liquid becomes cloudy, and finally the oil rises to the surface; if no separation occurs, the amount of lemon oil in the extract is deficient.

With the exception of the tests for dyestuffs, the authors examined lemon extracts according to the methods described by A. S. Mitchell (see this Journal, 1900, 179).

For the detection of dyestuffs, a portion of the liquid remaining in the distilling flask after the determination of the alcohol, is examined according to Arata's method (see abstract on Vanilla Extract, page 1300). Turmeric is tested for by the boric acid method.—A. S.

Orange Extract. A. L. Winton and A. W. Ogden. Twenty-fifth Report of the Connecticut Agric. Exp. Station for 1901, 175—176.

Orange extract is a solution of orange oil in strong alcohol. The methods of analysis employed are the same as those for

lemon extract (see preceding abstract), except that the factor 5·2 instead of 3·4 is used for calculating the percentage of oil from the degrees of rotation on the sugar scale.—A. S.

Terpenes and Essential Oils. O. Wallach. Fifty-ninth and Sixtieth Papers. Annalen, 1902, **324**, [2 and 3], 269—280; 281—309.

The fifty-ninth paper refers to investigations on phellandrene, and is divided under the following headings and subheadings:—(1) Phellandrene-diamine from eucalyptus phellandrene: (*a*) monohydrochloride and its platinum salt; (*b*) benzoyl compound; (*c*) methylation of the phellandrene-diamine; (*d*) hydrochloride of the methyl derivative; (*e*) dry distillation of the phellandrene-diamine monohydrochloride; (*f*) reaction of phellandrene-diamine with sodium nitrite. (2) Phellandrene-diamine from the phellandrene of water-fennel oil.

The sixtieth paper bears the title: "Conversion of Cyclic Ketones into Alkamines and into Cyclic Nitrogenous Bases free from Oxygen." The subject is treated under the following headings:—(1) Conversion of cyclopentanone, $(CH_2)_4CO$, into piperidine, $(CH_2)_5NH$. (2) Conversion of methyl cyclopentanone into methyl piperidine. (3) Base, $C_{10}H_{20}NH$, from thujamenthoneisoxime. (4) Reduction of cyclohexanoneisoxime (α-ketohexamethyleneimine). (5) Bases from the isoximes of β-methylcyclohexanone: (*a*) bases from α-isoxime; (*b*) bases from β-isoxime. (6) Bases from menthone-isoxime: (*a*) base free from oxygen; (*b*) oxy-base; (*c*) reduction of the base, $C_{20}H_{35}ClN$; (*d*) base, $C_{20}H_{40}N_2$ (?). (7) Bases from suberone-isoxime (α-ketoheptamethyleneimine: (*a*) base, $C_{14}H_{21}N_2O$; (*b*) reduction of suberone-isoxime.—A. S.

English Patents.

Acetyl-Salicylic Acid; Manufacture of Salts of ——. G. B. Ellis, London. From Chem. Fab. von Heyden, Radebeul, Saxony. Eng. Pat. 15,517, July 11, 1902.

Acetylsalicylic acid, and especially its salts, are hydrolysed during the process of concentrating their aqueous solutions, and are not obtainable in the solid form in a state of purity in this way. If, however, acetylsalicylic acid be suspended in an alcohol, ester, ether, acetone, hydrocarbon, carbon bisulphide, carbon tetrachloride, or chloroform, or a mixture of any of them, and a solution of caustic alkali or alkali-alcoholate in a similar medium be added to neutralisation, the salt separates in the solid state, a sufficient quantity of ether being added, if necessary, to complete the precipitation. —J. F. B.

Electric Furnaces and the Production of Chemicals [Carbon Bisulphide] in such Furnaces. G. Brewer. From E. R. Taylor. Eng. Pat. 16,556, July 25, 1902.

See under XI. A., *page* 1283.

United States Patent.

Sulphonic Acids; Process of Separating ——. L. O. Helmers, Hamburg, Assignor to the Ichthyol-Gesell.-Cordes, Hermanni and Co., Hamburg. U.S. Pat. 709,321, Sept. 16, 1902.

Certain compounds, such as ichthyol sulphonic acid or the product obtained by the action of sulphuric acid on Seefeld oil are treated with an organic base such as aniline, piperazine, or dimethylphenylpyrazolone, effecting a separation, by reason of their solubilities in water, into compounds rich and poor in sulphur. The products formed are subsequently decomposed by mineral acids.—T. A. L.

XXI.—PHOTOGRAPHY.

English Patents.

Photographic Paper. La Société Derepas Frères, Paris. Eng. Pat. 17,471, Aug. 31, 190.. (Under Internat. Conv., March 20, 1901.)

The lack of any description of paper which has to be given a coat of positive photographic emulsion is treated with a solution of gum lac in alcohol or in aqueous borax solution, so as to form a layer that is adhesive when t. After the usual photographic operations have been finish the paper is fastened upon its final mount by being me y pressed down with a hot iron. This process has e advantage of protecting the image from any impurities n the card mount, and of eliminating distortion, inasmuch s the paper is both exposed and mounted in the dry state. —F. H. L

Photographic Half-Tones in Printing and Lithograp ; Producing ——. J. Vilim, Prague, Bohemia, d F. Hauser, Naefels, Switzerland. Eng. Pat. 14,5 , June 21, 1902.

A process is described for obtaining an asphaltum p e suitable for ordinary or lithographic printing in mono or polychrome, which gives half-tones without the use o a screen or the employment of any intermediate manipulat n. The asphaltum is first partially extracted with ether, d then dissolved in a mixture of chloroform, ether, alco l, and benzene, in proportions varying according to e coarseness of the grain desired. The film so prepare is exposed under a half-tone negative, developed in a sin le operation with a suitable mixture of turpentine, petrol n spirit, and benzene, then etched, and finally printed f n as usual.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

Dynamite Factory; Residual Products of the ——, *a their Value to the Gold Industry.* W. Cullen. J. Ch and Metall. Soc. of S. Africa, 1902, **3**, [4], 37—40.

Nitre-cake (acid sulphate of soda) is already used Caldecott's process, and it is suggested that it migh e employed economically in lieu of sulphuric acid for it solution of zinc-slimes, one part of the salt in three of w r giving a solution of suitable strength. Mixed with a lit le sulphuric acid to increase its fluidity, the compound mat also be applied to the generation of chlorine; and to a solution of scrap iron for the production of ferrous sulp te as a precipitant.—W. G. M.

United States Patent.

Projectiles; Process of Hardening ——. R. A. Hadfi d. Sheffield. U.S. Pat. 709,631, Sept. 23, 1902.

The projectile, having its point protected by a cast- el pot, is suspended and rotated point downward in a furn e the point being heated to a very dull red, and the shou er to a black heat. After this preliminary heating, the il protected point and shoulder of the projectile are heate in like manner, but to bright redness or a low yellow it, and after withdrawal from the furnace, a cooling liqui at about 60° F., is circulated under pressure through he chamber of the projectile, beginning before and contin ng through the immersion of the latter in a cooling liqui at about 80° F., until the projectile is quite cool. Refer ce is made to Eng. Pat. 3237, 1892; and to U.S. Pat. 522 2. See also Eng. Pats. 6089 and 6091, 1901; this Journal, 12, 410.—E. S.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Hydroxylamine and Hydrazine Salts in Qualit ve Analysis; Use of ——. E. Knoevenagel and E. Ber., **35**, [15], 3055—3067.

The authors have studied the a tion of hydroxylamine n hydrazine salts and hydrogen peroxide, in acid and alk ne solutions, on the metals precipitated in acid solution by sulphuretted hydrogen, and as the result of these inv ti-gations, give two methods of separation.

In the first method the well-washed metallic sulph es are dissolved in *aqua regia*, the solution evaporated to e the excess of acid, and the residue poured into a mi re of 40 c.c. of 20 per cent. sodium hydrate and 20 c.c. f cold saturated solution of hydrazine sulphate. The sol on is boiled, diluted with an equal volume of water, co d.

tered, and washed with hot water till the precipitate is ee from alkali.

The precipitate (X′) contains metallic mercury, copper, id a trace of silver, with the hydrates of cadmium and smuth.

The filtrate (F′) contains tin, arsenic, antimony, and id, as sodium salts, and traces of bismuth.

The precipitate (X′) is dissolved in nitric acid, diluted, id the bismuth thrown down with ammonia. By boiling e ammoniacal filtrate and warming for half an hour on e water-bath, metallic mercury is separated. The filtrate om this precipitate, containing copper and cadmium, is idified with hydrochloric acid and the copper precipitated th potassium sulphocyanide; this precipitate can be tered after warming for half an hour on the water-bath. idmium is then precipitated with ammonium sulphide om the filtrate.

The filtrate (F′) is saturated with sulphuretted hydrogen. ad and bismuth are precipitated as sulphides, and can be tected by the usual methods. The tin, arsenic, and anti- ony remain in solution as sulpho salts, and can be precipi- ed as sulphides by sulphuric acid, and separated in the linary way.

Gold and platinum, if present, are precipitated with the pper in the metallic state, and remain as a residue on iling the precipitate (X′) with nitric acid. This residue dissolved in *aqua regia*, the excess of acid evaporated, d the gold precipitated with sodium hydrate and hydroxyl- ine hydrochloride. Platinum remains in solution, and is ecipitated by warming with hydrazine chloride.

In the second method of separation, the solution of the phides in *aqua regia*, is evaporated, and the residue taken with 3—4 c.c. of warm concentrated nitric acid; this ution, with any remaining residue, is poured into 20 c.c. of ncentrated ammonia, containing 5—10 c.c. of 1 per cent. drogen peroxide. By warming to about 80° C. for 5—10 nutes, a precipitate (X′) is obtained, consisting of lead oxide, bismuth hydrate, and stannic acid. The copper, lmium, mercury, arsenic, and antimony remain in the moniacal solution (F′).

The precipitate (X′) is warmed in a porcelain dish with lium hydrate and ammonium sulphide. Lead and bismuth obtained as sulphides, and tin remains in solution, and y be readily precipitated as sulphide by the addition of d.

The filtrate (F′) is boiled to decompose excess of hydro- peroxide, and warmed for five minutes on the water- h with 0·5—1 grm. of hydroxylamine hydrochloride or lrazine sulphate. Mercury is precipitated in the metallic te, and can be filtered through a double filter paper. The rate is allowed to stand for 12 hours with magnesium oride, whereby any arsenic present is precipitated. After aration of the arsenic, copper is precipitated in the utralised filtrate by warming for 10—15 minutes with assium sulphocyanide, and, in the filtrate from this pre- itate, antimony and cadmium are separated by ammonium phide.

The great advantages of these methods are that mercury be readily and completely separated from tin, arsenic, antimony, and that the use of ammonium sulphide is gely avoided. The first method is most suitable when d and platinum are present, as it effects a ready separa- of these metals from tin, arsenic, and antimony.

—B. F. D.

Ozone; Reactions and Preparation of ——. C. Arnold and C. Mentzel. Ber., **35**, [15]. 2902—2907.

a previous paper (this Journal, 1902, 640), tetramethyl- ′-diaminophenylmethane was recommended as a reagent the detection of ozone. It is best dissolved in methyl hol, whereby the colours produced are more intensified.

n former experiments the ozone prepared from barium oxide by the action of concentrated sulphuric acid gave luish-green coloration with the tetra base; this was nd to be due to the nitrous acid evolved from barium ite existing as an impurity. By using the pure peroxide ed-violet colour is produced, which assumes a blue tint from the action of the acid vapours evolved, especially on warming the solution. This test can therefore be used to detect admixture of nitric oxide, chlorine, or bromine with ozone, the colour reactions in each case being distinctive. The cause of these variations is found in the fact that salts of the tetra base give a blue colour with ozone, whilst the base itself gives a red-violet.

Percarbonates and persulphates treated with concentrated sulphuric acid in the cold give the violet reaction, the former readily, the latter more slowly.

The action of the acid vapours may be hindered or completely counteracted by the addition of pyridine or some other weak base to the alcoholic solution of the reagent. A solution of the tetra base with three or four drops of ammonia to every 10 c.c. keeps well, and is especially useful in detecting ozone in the presence of chlorine, the effect of the chlorine on the reagent being completely destroyed by the ammonia.

Ozone in water gives a blue coloration with the tetra base, which is considerably increased by the presence of silver nitrate, cupric sulphate, or manganous sulphate. The following method gives good results:—

To 1—2 c.c. of a 2 per cent. solution of silver nitrate, or a 10 per cent. solution of manganous sulphate, one or two drops of the reagent are added, and subsequently 25—35 c.c. of the water to be tested; a blue coloration indicates the presence of ozone. Hydrogen peroxide under these conditions gives no colour. Nitrous acid and its salts give a greenish-yellow, and bromine and chlorine a red solution.

When hydrogen peroxide is present with ozone, it can be detected by the blue precipitate produced with benzidine and copper sulphate, ozone producing only a reddish colour. To detect traces of hydrogen peroxide in water, two or three drops of a 10 per cent. solution of copper sulphate are added, and the solution shaken for a few minutes with two or three drops of the benzidine solution. A blue precipitate indicates the presence of the peroxide.

Ozone was also readily formed by the action of clean phosphorus on moist air in diffused daylight. The following method works with perfect safety and better results, at the ordinary temperature. In a 1—2 litre flask, 15—20 c.c. of sulphuric acid are shaken with 3—6 grms. of the oxygen-carrying body previously ground with 3 parts of sand. (1—2 c.c. of a 10—30 per cent. solution of hydrogen peroxide may be mixed with 5—10 grms. of sand.)

Chlopin has recommended Ursol D as a reagent for detecting ozone. The authors have found very various colorations to be produced with ozone prepared by different methods, the dark blue colour not being produced with pure ozone prepared by the silent electric discharge. Neither was the reagent so sensitive as the alcoholic solution of the tetra base.—B. F. D.

Hydrocyanic Acid; Detection of ——, *in presence of Sulphocyanic, Hydroferrocyanic, and Hydroferricyanic Acids and their Salts.* L. E. Preiss. Amer. Chem. J., **28**, [3], 240—241.

The solution is freed from heavy metals and alkaline earths, and 25—50 c.c. are then treated for about 15 minutes with caustic potash and 0·5 grm. of aluminium filings, to reduce the ferricyanide to ferrocyanide, the completeness of the reduction being tested with ferrous sulphate in a small sample. After acidification with HCl, the hydroferrocyanic acid is precipitated by agitating with excess of mercuric chloride in the cold, filtering until clear. The precipitate is washed with dilute mercuric chloride solution, and the clear washings added to the filtrate, the whole being then made alkaline with caustic potash. The mercuric oxide precipitate is removed, and the filtrate boiled with ferrous sulphate, converting the potassium cyanide into ferrocyanide. After filtering and washing, the washings and filtrate are acidified with HCl, and treated with ferric chloride. The resulting thiocyanate is decolorised by mercuric chloride, and the Prussian blue precipitate can then be seen. If the solution be quite acid, and originally contained only a small amount of hydrocyanic acid, no precipitate will form until the green liquid has stood some time.—C. S.

INORGANIC—QUANTITATIVE.

Phenolphthaleïn in Alcoholic Solution : Titrations with ——. R. Hirsch. Ber., 1902, **35**, [14], 2874—2877.

The author shows that the assumption that no dissociation of soaps, &c., takes place in alcoholic solution is not correct. In the first place, the sensitiveness of phenolphthalein in alcoholic solution is much less than in aqueous solution, several drops of normal alkali being required in the former to produce the same colour as is given by 0·1 c.c. in the latter. The relative colour-intensities may be estimated as 100 for water, 10 for ethyl alcohol, and only 1 for methyl alcohol. The intensity in alcoholic solutions may be increased by increasing the proportion of phenolphthaleïn. If a coloured aqueous solution be heated, the colour decreases considerably and may even disappear, but if an alcoholic solution be heated, the colour increases; both, however, recover their original colour on cooling. If 1 per cent. of pure sodium acetate be added to a faintly coloured aqueous solution, an intense coloration ensues on boiling, indicating hydrolysis of the salt, but the same thing also occurs in the case of an alcoholic solution, the increase of colour being far greater than that produced on boiling a pure alcoholic solution. The following experiment shows that hydrolysis occurs also in the case of alcoholic soap solutions. An alcoholic solution of phenolphthaleïn was coloured with alkali, and then treated with sufficient acid so that no coloration was observable even at the boiling point. An alcoholic solution of sodium stearate was treated in the same way, and the two colourless solutions mixed together. An immediate red coloration was produced. This was caused, on the one hand, by the increased hydrolysis of the soap consequent on dilution, and, on the other, by the more vivid reaction of the free alkali with the larger quantity of indicator.

The red coloration of an alcoholic soap solution in presence of phenolphthaleïn is no indication of the presence of free alkali; the error may, however, be diminished by comparing the solution under titration with a boiling solution containing 5 mgrms. of phenolphthalein and 0·1 c.c. of normal soda in 100 c.c. of alcohol. When the colour-intensities of the two solutions are equal, free alkali is present.—J. F. B.

Sulphur in Coal ; Determination of ——. C. W. Stoddart. J. Amer. Chem. Soc., 1902, **24**, [9], 852—864.

The author has made comparative determinations of the sulphur in different kinds of coal with the object of determining which method is the most generally applicable for rapid work. From the results thus obtained, he concludes that the standard method of combustion in oxygen in a bomb calorimeter under pressure is accurate with the most varying types of coal. Of the more practical methods, that of Eschka was found the best, provided the silica was dehydrated and separated. The other methods tried (Stolba's, Antony and Lucchesi's, and Thomson's) gave good results with certain coals, but were less reliable than the two preceding methods. Hodgson's method (fusion with sodium peroxide) was found unsatisfactory, the results being too low.—C. A. M.

Sulphur in Coal and Pyrites ; Determination of ——. A. Reitlinger. J. russ. phys.-chem. Ges., **34**, 457—461. Chem. Centr., 1902, **2**, [8], 610.

The usual methods for the determination of sulphur in the above-named products, those of Eschka and von Hundeshagen, take a considerable amount of time. The author has simplified the method of Antony and Lucchesi so that it can be rapidly carried out. 0·5 grm. of the coal in a finely-powdered condition is carefully mixed with 1 grm. of manganese dioxide, 0·5 grm. of potassium carbonate, and 0·5 grm. of magnesia. The mixture is ignited in a platinum crucible, the temperature being increased gradually. After cooling, the crucible is immersed in hot water, 10 c.c. of concentrated hydrochloric acid added, the liquid boiled till the mass has dissolved, the iron precipitated by ammonia, and the liquid filtered. The author finds that with this mode of working, the silica separates completely, and the tedious evaporation with hydrochloric acid is avoided. The process may be further simplified by burning the co (0·5 grm.) with a mixture of 1·5 grms. of magnesia a 1½ grms. of manganese dioxide. The ignition takes abo half an hour.

Sulphur in pyrites is determined in a similar manner, this case 0·5 grm. of the ore being mixed with 2 grms. manganese dioxide, 1 grm. of potassium carbonate, a 1 grm. of magnesia.—A. S.

Sulphite Lyes containing Soda ; Determination of Alk in ——. R. Schwartz. Chem.-Zeit., **26**, [77], 897.

The alkali present in a sulphite lye in combination wi sulphurous and sulphuric acids, and as excess of sodi carbonate, was determined as follows : that in the state sulphite, by titration with iodine solution in presence starch, each c.c. of decinormal iodine solution corresponds to 0·0031 grm. of Na_2O. After decolorising the liq with one drop of dilute thiosulphate solution, the alk present as sodium carbonate was titrated with N/5 s phuric acid and methyl orange, each c.c. of acid be equal to 0·0062 grm. of Na_2O. The alkali combined w sulphuric acid was determined in a fresh portion of t sample by acidifying with an excess of sulphuric ac evaporating to dryness in a platinum basin, incinerati and weighing as sodium sulphate, deducting from the res the figures obtained in the two preceding operations.—C.

Thiocyanates ; Iodometric Determination of ——. A. Th Ber., **35**, [15], 2766—2768.

Rupp and Schied recently put forward a method for t determination of thiocyanates (this Journal, 1902, 99 The objection to this method is the formation of cyanog iodide, which necessitates the use of small quantities thiocyanate, and renders the starch iodine reaction, as indication of the end stage, useless. The reaction is a not complete in less than four hours at the ordin temperature.

Cyanogen iodide is rapidly decomposed in an a solution, and this reaction is made use of in the follow modified method.

10 c.c. of a N/10 potassium thiocyanate solution 2 grms. of sodium bicarbonate, with sufficient water to eff complete solution, are placed in a loosely-stoppered fl with 50 c.c. of N/5 iodine solution, and allowed to stand the room temperature for four hours. 20 c.c. of 2N hyd chloric acid are then added, and the excess of iodine at o titrated with N/10 thiosulphate solution, starch being u as an indicator. The following equation represents reaction :—

$$CNS' + 3I_2 + 4H_2O \rightarrow SO_4'' + 6I' + 8H' + CN'.$$

The results are very accurate.—B. F. D.

Cement Analysis ; Note on ——. R. F. Young and B. F. Baker. Chem. News, 1902, **86**, [2234], 148.

The usual method of determining lime in cement dissolving in dilute hydrochloric acid, separating sil alumina, and iron by means of ammonia, and then p cipitating the lime as oxalate and weighing as CaO stated to be unreliable, the range of error being as mu as ± 1·5 per cent. The authors state that the follow two methods give very satisfactory results :—

(1) One grm. of the cement is treated with a sm quantity of concentrated hydrochloric acid, a little nitric added, the mixture evaporated to dryness, and the resi heated to redness. After cooling, the material is extrac with dilute hydrochloric acid, and excess of ammo added. The precipitated silica, alumina, and iron c filtered off, and the calcium separated as oxalate ignited to calcium oxide in the usual way.

(2) One grm. of cement is dissolved in dilute hydrochlo acid, excess of ammonia added, the precipitated iro alumina, and silica filtered off, redissolved in concentra hydrochloric acid, and reprecipitated with ammonia. In the united filtrates and washings, the calcium is determi as above.

The authors have found that the volumetric method determining calcium by titrating the excess of a know quantity of standard oxalic acid left after precipitation ammoniacal solution, invariably gives low results.—A. S.

on : Analysis of ——. F. Bischoff. Stahl u. Eisen, 22, 19—727 and 754—759. Chem. Centr., 1902. 2, [8], 611.

is generally known that, only exceptionally, do analyses of e and the same iron, if carried out by different analysts, e results that are sufficiently in accord. The author es not consider that the desired agreement in results n be attained by the demand that only certain well-fined methods should be employed. On the contrary, e causes of such great differences which obtain in iron alyses, as distinct from other chemical analyses, should sought for, and the conditions necessary for their avoi-ce determined. The chief difficulty, according to the thor, is the fact that iron is not of uniform composition roughout, and thus it is not easy to get representative mples. In distributing the samples among the different oratories, the relative amounts of coarse and fine shavings d of powder should remain the same. The author de-ribes the conditions which a laboratory for iron analyses ould fulfil with regard to its arrangement, and then scusses the actual methods of analysis. He puts forward e figures in accurate analytical work :—

Highest Permissible Variation in the Analytical Results.

Amount found per Cent.	C.	As, Cu, P, S, Si.	Al, Cr, Mn, Mo, Ni, W.
0·000—0·008	0·002	0·001	0·002
0·008—0·015		0·002	0·003
0·015—0·025		0·002	0·003
0·025—0·050	0·003	0·003	0·004
0·050—0·075	0·003	0·004	0·006
0·075—0·100	0·004	0·004	0·006
0·100—0·125	0·004	0·005	0·007
0·125—0·150	0·005	0·006	0·007
0·150—0·175	0·005	0·005	0·008
0·175—0·200	0·006	0·007	0·009
0·200—0·250	0·007	0·008	0·011
0·250—0·300	0·008	0·009	0·013
0·300—0·350	0·009	0·010	0·015
0·350—0·400	0·010	0·012	0·017
0·400—0·450	0·011	0·014	0·019
0·450—0·500	0·012	0·016	0·021
0·500—0·600	0·013	0·019	0·025
0·600—0·700	0·015	0·022	0·029
0·700—0·800	0·017	0·025	0·033
0·800—0·900	0·019	0·028	0·037
0·900—1·000	0·020	0·030	0·040
Over 1·000	2 per cent.	3 per cent.	4 per cent.

of the amount found.

For weighing out the samples of iron for the different terminations, the author uses special weights of aluminium, which are imprinted the form in which the element is eighed, and the factor for the conversion of the weight to percentage.

The author gives details of the C, P, Mn, Cu, As, and determinations, and also in a table the results of complete analyses of different kinds of iron.—A. S.

Tellurium ; Determination of ——. G. Frerichs. J. prakt. Chem., 66, [17], 261—262.

HE usual statement in the text-books is that tellurium oxide and tellurous acid are reduced by sulphur dioxide metallic tellurium. The author finds that this reduction ly occurs when the tellurous solution is mixed with from alf its bulk to an equal bulk of strong hydrochloric acid, d then only after several hours' heating and passage of e sulphur dioxide. Nor does hydriodic acid, as stated Peirce, effect the reduction. But in the simultaneous resence of sulphur dioxide and hydriodic acid, the eduction is immediate and complete, even in the cold. ydrobromic acid can be substituted for the hydriodic acid, ough the action is not so energetic. To the solution sulphuric or hydrochloric acid of about 0·3 grm. of llurium dioxide diluted to 100 c.c. with water, add —2 grms. of potassium iodide, heat to boiling (as the eparated tellurium filters more easily when precipitated ot), and add about 50 c.c. of sulphurous acid solution ; ass through a weighed filter, wash with water containing lphurous acid, finally with alcohol and ether, dry at 00°—105° C., and weigh.—J. T. D.

ORGANIC—QUALITATIVE.

Dyestuffs ; New Method for the Qualitative Analysis of the Artificial ——. J. Pokorný. Rev. Gén. des Mat. Col., 1902, 6, [70]. 247—251.

In the author's opinion, of all the methods proposed for the qualitative analysis of artificial dyestuffs, that of Formánek is the simplest and most accurate (see this Journal, 1900, 788).—A. S.

ORGANIC—QUANTITATIVE.

Ipecacuanha Root ; Determination of the Alkaloidal Constituents of ——. G. Frerichs and N. de Fuentes Tapis. Archiv der Pharm., 240, [5], 390—400 ; [6], 401—425.

Of the three alkaloids in ipecacuanha, cephaeline and emetine are alone important, the third, psychotrine, having probably very little therapeutic action, and occurring in very small quantity. After numerous experiments, the authors recommend the following modification of Keller's process, in which the psychotrine, being insoluble in ether, is not determined. Six grms. of the root in fine powder are shaken in a bottle with 60 grms. of ether, 5 c.c. of solution of NH_4HO or of Na_2CO_3 solution (1 : 3) are added, and the mixture allowed to stand one hour, with repeated shaking ; 10 c.c. of water are then added, and, after vigorous shaking and separation, 50 grms. of the ethereal solution are filtered into a flask. The ether is evaporated to half its volume, and the residue shaken in a separating funnel with 10 c.c. of N 10 HCl solution. The acid is separated, filtered into a flask, and the ether twice washed with 10 c.c. of water, the washings being filtered through the same filter as the acid, into the flask. The acid liquid is then made up to about 100 c.c., enough ether added to make a layer 1 mm. deep after shaking, and five drops of Iodeosine solution (1:250) ; the mixture is then titrated with N 10 NaOH solution. By multiplying the number of c.c. of N 10 NaOH used by 0·0241 (the mean of the molecular weights of cephaeline and emetine), the alkaloidal content of the 50 c.c. of ether (= 5 grms. of root) is obtained. If a determination of the alkaloids by weight is desired, which the authors recommend, the following procedure is convenient :—50 grms. of the ethereal solution are shaken with 50 c.c. of dilute HCl, and twice washed with 10 c.c. of water, acid and washings being run into a second separator. To the acid liquid, 5 c.c. of dilute NH_4OH and 50 grms. of ether are added, and the mixture shaken. After separation, 40 grms. of the ether (= 4 grms. of root) are filtered into a tared flask, the ether evaporated, the residue dried at 100° C., and weighed. The residue may be treated after weighing, although owing to slight decomposition during drying, the end point is not easy to determine, but the results should agree fairly well. In order to ascertain if the residue consists of ipecacuanha alkaloids and not of substitutes, the authors recommend the following colour test :—The residue is dissolved in Froehde's reagent, and a crystal of NaCl is added ; if cephaeline be present, a dark blue colour is formed. Emetine does not give any coloration. To determine cephaeline and emetine separately, the authors proceed as follows :—50 grms. of the ethereal solution, obtained as above, are shaken thrice with 10 c.c. of NaOH solution, which removes the cephaeline, and leaves the emetine in the ethereal solution ; it is then determined. The difference between the total alkaloid and the emetine found gives the cephaeline.—J. O. B.

Ipecacuanha : Valuation and Determination of its Different Alkaloids. B. H. Paul and A. J. Cownley. Pharm. J., 1902, 69, [1683], 317.

The authors state that in the valuation of ipecacuanha, it is not sufficient to ascertain the total amount of alkaloids in the root, but the relative proportions of at least two of them, emetine and cephaeline, should be determined. In the separation of the different alkaloids, so much of the drug should be taken that a sufficient weight—say 1 grm.—of the mixed alkaloids is obtained. It is pointed out that methods in which an aliquot portion of the alkaloid solution is taken as representing a definite corresponding fraction of the root operated upon, give inaccurate results. Linde

has explained this as being due to the fact that when the alkaloid is liberated, a concentrated solution is formed, which is more or less immiscible with the solvent, so that when the latter is decanted off, it does not fully represent the total alkaloids. Furthermore, the fraction decanted is different in weight and in volume from that originally added, and cannot be regarded as an exactly aliquot part of the original solvent.

Another source of error lies in the fact that the alkaloids are frequently titrated whilst dissolved in the solvent which has been used for extraction in presence of ammonia. The titration should always be carried out on the evaporation residue of the extract; in the case of ipecacuanha alkaloids, on the residue of the ethereal extract, dried at a low temperature.

The authors consider that many of the statements which have been published as to the relatively large amount of alkaloids in ipecacuanha root are owing to errors such as those mentioned. (See also this Journal, 1901, 500.)

—A. S.

Strychnine and Brucine: Separation of ——. Lyons. Chem. and Druggist, 1902, **61**, [1183], 550.

The author claims that the following method gives accurate results in the separation of strychnine and brucine in preparations of nux vomica. The alkaloids are extracted by one of the usual methods, dried, and weighed. They are then stirred in a beaker with sulphuric acid (1 c.c. of dilute acid to every 15 mgrms. of alkaloids) till the mass is completely disintegrated; the stirring is continued at frequent intervals for an hour. The residue is collected on a small filter, and the beaker rinsed out with 1 c.c. of dilute sulphuric acid, this being afterwards poured on to the filter above the insoluble residue as far as possible. The filter and residue are treated with 10 c.c. of chloroform and 3 c.c. of 10 per cent. ammonia solution till the residue has dissolved, and the solution then transferred to a separator by means of two washings of 5 c.c. each of chloroform. The separated chloroform is evaporated nearly to dryness in a tared dish, 2 c.c. of alcohol added, and the nearly pure strychnine dried and weighed. As a correction, 1·75 mgrm. is added for every c.c. of dilute acid used.

The amount of brucine is obtained by difference.—A. S.

Strychnine: Determination of —— [*Separation from Brucine*]. H. M. Gordin. Paper read before the Amer. Pharm. Assoc., Philadelphia. Pharm. J., 1902, **69**, [1683], 383.

The mixed alkaloids from 8 or 10 grms. of nux vomica are dissolved on the water-bath in 15 c.c. of 3 per cent. sulphuric acid, the solution cooled, and 3 c.c. of cold nitric acid (1:1) added. The liquid is allowed to stand, with occasional gentle shaking, for exactly 10 minutes, and is then transferred to a separator containing 20 or 25 c.c. of 10 per cent. sodium hydroxide solution, the containing vessel being rinsed three or four times with very small amounts of water. The mixture in the separator should be very turbid, owing to the separation of strychnine. If this is not the case, a further addition of 1 or 2 c.c. of alkali must be made. The mixture is then extracted three times with chloroform, 20 c.c. the first and 10 c.c. each the second and third times. The chloroform solution is filtered into a tared flask through a small plain double filter, arranged so that there are four folds of paper on each side; the stem of the separator is rinsed with chloroform. The filter and funnel are now washed a few times with small amounts of chloroform, and to the perfectly colourless solution of strychnine obtained, 2 or 3 c.c. of pure amyl alcohol, distilling between 128° and 132° C., and leaving no residue on evaporation, are added. The amyl alcohol is stated to prevent the decrepitation of strychnine on the removal of the last traces of chloroform by heat. The chloroform is then distilled off from the solution, the amyl alcohol expelled by keeping the flask on the water-bath and blowing air over its mouth, and the flask finally dried for about two hours at 135°—140° C., and weighed. The method is said to give very accurate results, whilst the strychnine obtained is quite pure.—A. S.

Caffeine; Quantitative Determination of ——. J. Katz. Zeits. angew. Chem., 1902, **15**, [39], 1013—1014.

Since the present methods for the estimation of caffeine are not quite satisfactory, the author proposes to modify Beitter's method, which seems the most convenient, in the following manner:—10 grms. of the substance are shaken for half an hour with 200 grms. of chloroform and 0·5 grm. of ammonia. After the liquid has settled, the chloroform solution is filtered through a Sanders' "cigarette" filter, whereby 150 grms. of a perfectly clear filtrate free from water are obtained. The chloroform is distilled off from the filtrate, and the residue is dissolved in 5 c.c. of ether, if necessary with gentle warming under a reflux condenser. 20 c.c. of a 0·5 per cent. solution of hydrochloric acid are added, the ether is driven off, and the aqueous solution is cooled and filtered.

The flask and filter are washed a few times with 0·5 per cent. hydrochloric acid, and the acid liquid is exhausted with chloroform in a "perforator" (an apparatus devised by the author) or else by shaking four times with quantities of 20 c.c. of chloroform in a separating funnel. The chloroform extract is filtered, if necessary, and distilled. Results are given for raw coffee beans, black tea, guarana bread, and kola nuts. For Paraguay tea a special procedure is advocated. The ammonia-chloroform residue is dissolved in ether, water is added, and the ether is driven off. The aqueous solution is then heated on the water-bath for 10 minutes with 2 c.c. of a suspension of lead hydrate in water (1 : 20); 0·1 grm. of calcined magnesia is then added, and the mixture is cooled and filtered. The clear, faintly coloured filtrate is then exhausted with chloroform in the perforator.—J. F. B.

Vanilla Extract. A. L. Winton and M. Silverman. Twenty-fifth Report of the Connecticut Agric. Exp. Station for 1901, 149—162.

In commercial vanilla extracts, the amount of sugar and alcohol is not always the same as in the U.S.P. tincture, and in some cases a certain proportion of glycerin or glucose is present. In six extracts prepared from different grades of beans according to the U.S.P. formula (100 grms. of beans per litre of extract), the sp. gr. varied between 1·0104 and 1·0166; vanillin, 0·065—0·215 per cent.; alcohol, 37·96—39·92; total residue, 21·75—23·13; cane sugar, 19·00—20·40; and residue other than cane sugar, 1·75—3·90 per cent. Of imitation extracts the best are those prepared from 3 parts of vanilla beans and 1 part of tonka beans; most of them, however, contain no genuine extract of vanilla beans, but are preparations of artificial vanillin, artificial coumarin, tonka beans, or a mixture of two or more of these materials, coloured with caramel. The chief adulterant is coumarin, added in the form of either artificial coumarin or extract of tonka beans.

The examination of vanilla extracts is carried out in the following manner:—

Total Residue.—5 grms. of the extract are mixed with previously ignited sand, and dried, first on the water-bath and then on the air-bath at 100° C.

Sugar.—13·024 grms. (one-half the normal weight) are dissolved in about 80 c.c. of water, 3 c.c. of basic lead acetate solution, and 2 c.c. of alumina cream added, the whole made up to 100 c.c., filtered through a dry filter, and the rotatory power determined.

Vanillin and Coumarin.—A slight modification of the method of Hess and Prescott (this Journal, 1899, 525) is used, the differences between the authors' process and the original being: (1) 2 per cent. instead of 10 per cent. ammonia is used; (2) a somewhat greater volume of ammonia is used; and (3) the vanillin and coumarin are weighed after evaporation of the ether solutions, before dissolving in petroleum spirit.

Alcohol.—25 grms. are diluted to 150 c.c., distilled, and the sp. gr. of the distillate determined.

Caramel, Coal-Tar Dyestuffs, &c.—A portion of the brown solution, after the vanillin and coumarin have been extracted with ether, is shaken with fuller's earth and filtered. With a suitable grade of fuller's earth, the filtrate is yellow or colourless, and the fuller's earth a brownish colour, if

el be present. Another portion of the solution is
ed according to Arata's method : 25—50 c.c. are diluted
00 c.c., boiled for 10 minutes with 10 c.c. of a 10 per
. solution of potassium bisulphate and a piece of white
l or woollen cloth, which has been previously heated
oiling in 0·1 per cent. solution of sodium hydrate, and
oughly washed with water. The wool is removed
m the solution, washed in boiling water, dried between
e paper, and examined as to the colouring matter, &c.
—A. S.

XIV.—SCIENTIFIC & TECHNICAL NOTES.

Bismuth : Radio-active —— [Polonium]. W. Marckwald. Chem.-Zeit., **26**, [77], 895—896.

By means of the usual chemical reactions, the author
ated from the residue from Joachimsthal pitch blende, a
ple of radio-active bismuth differing considerably
m radium and more closely resembling the "Polonium"
earlier workers. Attempts to separate the active
stituent from the bismuth showed that the portion of
al first deposited on electrolysis is far more active than
original material, the difference of potential enabling
separation to be effected with ease. On immersing a
n bismuth rod in a hydrochloric acid solution of the
uth oxychloride employed, the active metal gradually
osited on the rod, in the form of a black film, about
grm. being obtained from 850 grms. of oxychloride.
deposit was not of uniform character, but contained
uth, lead, antimony, vanadium, and traces of tellurium.
A probable method of purification is indicated by the
that the metal can be precipitated by antimony as
l as by bismuth, and that during reduction experiments
ydrogen, the bulk of the radio-active oxide sublimes,
ving a less active residue behind.
The rays from this metal differ from those of radium
being readily absorbed by thin satin paper, aluminium
, or even varnish. A powerful fluorescence is imparted
zinc, and especially to the diamond, but not to glass,
x crystal, or other precious stones. Finally the radio-
vity is superficial, the effect being independent of the
kness of the metallic stratum.—C. S.

Colloidal Silver : Experiments on the Formation of ——. F. Küspert. Ber., **35**, [15], 2815—2816.

The addition of a small quantity of silver nitrate solution
thick, colourless water-glass, containing as much for-
in as can be added without giving a precipitate, gives
yellow cloudiness, which rapidly gives place to a dark
en coloration ; with large quantities of the silver salt,
colorations pass through reddish brown to dark red.
ese preparations of colloidal silver are very stable, and
be diluted to any extent, but are decomposed by
assium chloride or hydrate and sulphuretted hydrogen.
presence of iron in the water-glass gives solutions of
ch less stability.—B. F. D.

Colloidal, and Cane Sugar Solutions of Insoluble Inorganic Bodies. C. A. Lobry de Bruyn. Ber., **35**, [15], 3079—3082.

The author's experiments show that cane sugar acts in the
ne manner as gelatin in holding inorganic bodies in
loid solution.
c.c. of N/10 potassium chromate and 1 c.c. of N/10
er nitrate, were mixed with 10 c.c. of sugar solutions
varying strength.
With a 65 per cent. sugar solution, a transparent red
ution was obtained, which very slowly clouded on
nding. With 50 per cent. and 25 per cent. sugar
utions, the clouding was more rapid.
Silver chloride formed in the same way, with the con-
trated sugar solution, a colourless solution, which
dually appeared opalescent, especially on warming ;
h the weaker solutions of sugar, only a slight retardation
precipitation was observed, a flocculent precipitate of
ver chloride soon being formed.
The precipitation of sulphur from a solution of sodium
osulphate in water, by the action of acids, as is well known, requires a certain time interval ; a 65 per cent. sugar solution retards the precipitation considerably, giving solutions with a reddish-brown opalescence.—B. F. D.

Colloidal Hollow Bodies from Heptylamine Soaps and Water : Formation of ——. F. Krafft and R. Funcke. Zeits. physiol. Chem., **35**, 364—385.

The so-called "myelin forms" produced when drops of soap solution are introduced into water have, up to the present, been regarded as products of incomplete emulsification. The authors consider that they are due to the swelling of colloidal hollow bodies ; the conditions which are favourable for the formation of a permanent foam and therefore of a colloidal membrane, also favour the production of "myelin forms."

In series of compounds a gradual change from the crystalloidal to the colloidal form can be recognised ; in the case of sodium soaps, the colloidal character increases with the molecular weight of the fatty acid, whilst with alkylammonium salts, it increases with the molecular weight of the alkyl residue. According to the above the heptylamine salts of the higher fatty acids should have a decided colloidal character, and should consequently have the power of forming a membrane. This was found to be the case ; the colloidal hollow bodies from heptylamine soaps have a considerable power of swelling and give excellent "myelin forms." Heptylamine carbonate gives "myelin forms" with water, but the heptylamine salts of low melting acids of the oleic series are much better in this respect. For the formation of colloidal hollow bodies capable of swelling, heptylamine erucate is specially suited ; the higher melting soaps (elaidate, brassidate) give "myelin forms" only with warm water. On cooling, the colloidal forms shrink and are converted into crystals. The colloidal hollow bodies exhibit osmose phenomena, whilst with Methylene Blue, Malachite Green, and Magenta they become intensely coloured. They effect polarisation and double refraction of light, but these optical properties disappear when the hollow bodies are solidified to crystals (by cooling).—A. S.

Ozonic Acid. A. Baeyer and V. Villiger. Ber., 1902, **35**, [15], 2038—3039.

Ozone acts on dry powdered caustic potash, forming a dark orange-brown mass, which is stable in the absence of moisture, but decomposes with evolution of gas on adding water. The product, *potassium ozonate*, can also exist in aqueous solution, since, when ozonised oxygen is passed into 40 per cent. potash lye cooled in a freezing mixture, the liquid becomes dark orange-brown ; the colour, however, quickly disappears when the temperature is allowed to rise. Rubidium hydroxide behaves similarly, whilst soda lye is only coloured a faint yellow. With regard to the constitution of the potassium salt, it is most probably identical with potassium tetroxide. If this should prove to be the case, ozonic acid must be regarded as the hydrate of ozone, $O_3 + H_2O = O_4H_2$.—T. A. L.

Cobalt : Compounds of Silicon with ——. A New Cobalt Silicide. P. Lebeau. Comptes Rend., **135**, [12], 475—477.

By heating in the electric furnace a mixture of cobalt and fused silicon, or, better, of copper silicide (200 parts), cobalt (20 parts), and crystallised silicon (30 parts), a compound Si_2Co is obtained. It forms dark-coloured crystals with a bluish sheen, has a sp. gr. of 5·3, and is very resistant to the action of reagents, with the exception of hydrofluoric acid, which decomposes it readily.

Thus three compounds of cobalt and silicon exist—$SiCo_2$, $SiCo$, and Si_2Co ; these are completely analogous to the corresponding compounds of iron.—J. T. D.

Vanadium Silicide ; New ——. H. Moissan and Holt. Comptes Rend., **135**, [13], 493—497.

The compound V_2Si is obtained by heating in the electric furnace a mixture of (1) silicon with a large excess of vanadium trioxide ; (2) silicon, carbon, and vanadium trioxide ; or (3) silicon, copper, and vanadium trioxide.

In cases 2 and 3 vanadium carbide and copper silicide are formed as intermediate products. Brilliant silver-white metallic-looking prisms, attacked readily by fluorine when warmed, and by chlorine, bromine, or hydrochloric acid gas at a red heat, and readily converted by excess of silicon in the electric furnace into the silicide formerly described by the authors, VSi_2. The experiments involved in the preparation of this substance prove that the laws governing equilibrium in solutions at the ordinary temperature also hold for the reactions between silicon and vanadium carbide, or vanadium and copper silicide, in the electric furnace at their boiling-points.—J. T. D.

Calcium Carbide; Equation representing the Reaction during Reduction by ——. B. Neumann. Zeits. f. Elektrochem., 1902, **8**, [40], 772—774.

Experiments show that v. Kügelgen's equations—

$$5M_2O + CaC_2 = 5M_2 + CaO + CO_2, \text{ and}$$
$$4M_2O + 2MCl + CaC_2 = 5M_2 + CaCl_2 + 2CO_2$$

are incorrect, and that carbonic oxide is produced (see this Journal, 1901, 126 and 582). The equations previously given by the author, and called in question by v. Kügelgen were—

$$3M_2O + CaC_2 = 3M_2 + CaO + 2CO$$
$$2M_2O + 2MCl + CaC_2 = 3M_2 + CaCl_2 + 2CO.$$

—W. G. M.

Tartar Emetic, Crystallised; A Stable Form of ——. F. E. Hale. J. Amer. Chem. Soc., 1902, **24**, [9], 828—847.

In a previous communication (Amer. J. Sci., **46**, 206) the author showed that a standard solution of tartar emetic (16 grms. per litre) required somewhat more than the theoretical amount of N/10 iodine solution for oxidation. He now finds that this is due to the readiness with which tartar emetic loses its water of crystallisation. In order to obtain a compound corresponding with the formula, $KSbOC_4H_4O_6.\frac{1}{2}H_2O$, on titration with iodine solution, the tartar emetic should be recrystallised in medium-sized crystals, and the latter washed with water two or three times, drained with the aid of a suction pump for 5 to 10 minutes, and exposed to a dry atmosphere for 3 to 4 hours at a temperature not exceeding 25° C.—C. A. M.

Benzene and Cellulose; Reaction between ——. A. M. Nastjukow. J. russ. phys.-chem. Ges., **34**, 231—235; 505—508. Chem. Centr., 1902, **1**, [22], 1277; **2**, [8], 576.

If benzene be added to a solution of cellulose in strong sulphuric acid, heat is developed and a distinct reaction takes place. After treatment with ice, the reaction product forms a dark-brown, amorphous, infusible precipitate, insoluble in the ordinary solvents. The compound is not tetraphenylcellulose. When dried in the exsiccator, its composition is $C_{18}H_{14}O_{23}S_2$, whilst that of the product dried at 105°—110° C., is $C_{180}H_{128}O_{22}S_2$. The author considers the two preparations as aggregates of six mols. of tetraphenylcellulose + $2SO_2$ − 9 and 12 mols. of H_2O respectively. This tetraphenylcellulose derivative gives on dry distillation toluene as the chief product, and on oxidation with permanganate, benzoic acid. It appears, therefore, that the phenyl groups are united directly to a carbon atom.—A. S.

Osones; Preparation of ——, *from the Osazones of Sugars.* E. Fischer and E. F. Armstrong. Ber., 1902, **35**, 3141—3144.

The authors have introduced a new method for converting the osazones of sugars into osones, consisting in boiling the aqueous solution of the osazone for a short time with benzaldehyde. The method works well with the osazones of the disaccharides, but cannot in general be applied to the monosaccharides, owing to the very slight solubility in water of their osazones; it can, however, be used with the osazones of arabinose and xylose, which are soluble in hot water.

Experiments have also been made on the behaviour of the osones of the disaccharides towards enzymes, and it has been found that this corresponds with that of the sugars themselves. Thus, maltosone is resolved by yeast-maltase into dextrose and glucosone, and melibiosone is hydrolysed by emulsin, or by the enzymes of bottom yeast, into galactose and glucosone.—T. H. P.

New Disaccharides; Synthesis of some ——. E. Fischer and E. F. Armstrong. Ber., 1902, **35**, 3144—3153.

For the synthesis of disaccharides the authors have made use of the action taking place between an acetochlorose hexose and the sodium derivative of a hexose, and in this way they have succeeded in preparing three different disaccharides. These compounds, which are regarded as being of the nature of glucosides, and are hence named glucosidogalactose, galactosidoglucose, and galactosidogalactose, form osazones fairly readily soluble in hot water; they can, therefore, be easily separated from the monosaccharides and their composition determined. The compound galactosidoglucose very closely resembles melibiose in its structure, its behaviour towards enzymes, and in the properties of its phenylosazone and bromophenylosazone, and is almost certainly identical with it.

Another new disaccharide, which is, however, not identical with either lactose or melibiose, has been obtained by the synthetic action of the lactase found in kephir grain on a mixture of glucose and galactose. This sugar, to which the name isolactose has been given, occupies in its behaviour towards enzymes an intermediate position between lactose and melibiose. Kephir lactase also produces a disaccharide from dextrose alone, and the same is the case with emulsin and a mixture of dextrose and galactose.

The behaviour of these various sugars towards yeast, emulsin, and kephir lactase is shown in the following table:—

——	Top Yeast.	Bottom Yeast.	Emulsin.	Kephir Lactase.
Lactose	Unchanged	Unchanged	Hydrolysed	Hydrolysed.
Isolactose	..	Fermented	..	Hydrolysed.
Melibiose	Unchanged	Fermented	Hydrolysed	..
Galactosidoglucose	..	Fermented	Hydrolysed	..
Glucosidogalactose	..	Fermented	Hydrolysed	..
Galactosidogalactose	..	..	Hydrolysed	..

—T. H. P.

Sugars; Isomeric Acetchalogen Derivatives of ——, *and the Synthesis of Glucosides. III.* E. Fischer and E. F. Armstrong. Ber., 1902, **35**, 3153—3155. (See this Journal, 1901, 1151.)

This communication, which is a completion of the two previous papers by the authors on this subject, gives descriptions of the preparation and properties of β-acetobromomaltose, heptacetylphenolmaltoside, β-phenolmaltoside, and β-ethylgalactoside. The last-named compound, like β-methyl- and β-phenol-galactosides, is hydrolysed by emulsin, and all three of these galactosides are hydrolysed by kephir lactase.—T. H. P.

β-Naphthyl Hydrazones of the Sugars; Isomers of —— W. A. v. Eckenstein and C. A. Lobry de Bruyn. Ber. **35**, [15], 3082—3085.

The authors compare the properties of the β-naphthyl hydrazones of the sugars prepared in weak alkalin

oholic solutions, according to the method used by lger and Rothenfusser, with those prepared by the lowing method. The hydrochloride of β-naphthylhydra- e is mixed with the equivalent of sodium acetate, and a ncentrated solution of the sugar in water. The hydrazone parates out on standing.

Galactose-β-naphthylhydrazone prepared by this method s a m. pt. 167°, and a rotation of + 24°. That epared by the alkaline method gives a rotation of 10°.

From glucose, two hydrazones were prepared of m. pt. 5° and 158°—159°, the latter with a rotation of [α] = 22° (Auer). Hilger and Rothenfusser's method gave a drazone with m. pt. 178° and [α] = + 11°.

In general, the hydrazones prepared in slightly acid ution have a lower melting point, and are less stable to e action of light and boiling alcohol.

These differences the authors consider to be due to the t that the different methods of preparation give rise to e formation of isomeric hydrazones.—B. F. D.

Nitric Esters; Saponification of ——. L. Vignon and I. Bay. Comptes Rend., **135**, [13], 507—509.

IE reducing action on Fehling's solution shown by the ric esters of erythritol, mannitol, dulcitol, penta- rthritol, &c., is accompanied by, and is, no doubt, rrelated with, the saponification of the esters by the tali of the Fehling's solution. The authors have investi- ted the conditions of saponification by water, by acid, d by alkali of the nitric esters of the alcohols named, gether with those of methyl alcohol, ethyl alcohol, and rceriu. In the case of water, there is no saponification any instance, either on heating on the water-bath, or on iling at atmospheric pressure; but in a sealed tube at 0°—120° C., the esters of the 4-, 5-, and 6-carbon ohols are completely saponified. In the case of acid and alkali, saponification occurs at the boiling point under nospheric pressure; but the laws governing the rate and e equilibrium limit of this saponification are complex, and e affected both by the oxidisability of the alcohol oduced, and by the easy reducibility of nitric acid to trous acid, nitrogen, or ammonia.—J. T. D.

New Books.

IRTY-EIGHTH ANNUAL REPORT ON ALKALI, &c., WORKS. By the CHIEF INSPECTOR. Proceedings during the year 1901. Presented to the Local Government Board and to the Secretary for Scotland. Ordered, by the House of Commons, to be printed, 21 July 1902. Messrs. Eyre and Spottiswoode, East Harding Street, Fleet Street, London, E.C.; 32, Abingdon Street, Westminster, S.W. Oliver and Boyd, Edinburgh, Scotland. E. Ponsonby, 116, Grafton Street, Dublin. 1902. Price 9*d*.

IIS, the Government Alkali Inspector's Report for 1902, rms an 8vo volume, containing table of contents and 152 ges of subject-matter, 49 pages of which are occupied by e Chief Inspector's Special Report to the Local Govern- nt Board. The arrangement of matter and items dealt th are as follows:—I. Report to the Local Government ard. II. Number of Registered Works. III. Separate ocesses of Manufacture under Inspection. Number of sits to Works and of Tests made. IV. Average Amount Acid Gases escaping in each District. V. Prosecutions der the Alkali Acts. VI. The Amending Bill of 1901. II. Alkali and Wet Copper Works. VIII. Chlorine. . Alkali Waste Works. X. Sulphuric Acid Works. . Concentration and Rectifying of Sulphuric Acid. I. Chemical Manure Works. XIII. Sulphate and uriate of Ammonia. XIV. Experiments on Methods of eatment of Foul Gases evolved in Sulphate of Ammonia anufacture from Gas Liquor. XV. Reaction of Sulphu- ted Hydrogen upon Sulphite and Thiosulphate of Iron. VI. Recovery and Production of Ammonia. XVII. Salt orks. XVIII. Cement Works. XIX. Arsenic Works. X. Venetian-Red Works. XXI. Tar Works. XXII. Zinc orks. XXIII. Future of Electro-Chemistry. XXIV. Reports from Ireland, North of England, Cheshire, North Wales and part of Lancashire, Widnes and Runcorn, North and East Lancashire and part of Yorkshire, East and South Midland, South-West of England and South Wales, Eastern and South-Eastern Counties. Report to H.M. Secretary for Scotland. Works under Inspection. Mr. Curphey's Report. Raw Materials and Products. Alkali, &c. Works Amending Bill of 1901. New Processes of Manufacturing Sulphuric Acid. Sulphate of Ammonia Works. Recovery of Ammonia in Shale Works, in Iron Works, and in Gas Works. The Claus Sulphur-Recovery Method modified for treating Gases containing small percentage of Sulphuretted Hydrogen. Use of Blast-Furnace Gases in Gas Engines.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF FACTORIES AND WORKSHOPS FOR THE YEAR 1901. PART II. TABLES. Presented to both Houses of Parliament by Command of His Majesty. Eyre and Spottiswoode, East Harding Street, Fleet Street, London, E.C.; and 32, Abingdon Street, Westminster, S.W. Darling and Son, Ltd., 34–40, Bacon Street, E.C. Oliver and Boyd, Edinburgh, Scotland. E. Ponsonby, 116, Grafton Street, Dublin. 1902. Price 10*d*.

GOVERNMENT Blue Book, containing title page, table of contents, and 59 pages of subject-matter, mostly tables, *i.e.*, tabulated statistics. These refer to the following items:—(1) Inspectors and Assistants. (2) Districts and Staff. (3) District totals. (4) Factories and Workshops under Special Rules. (5) Notices received by H.M. Inspectors. (6) Overtime Reports. (7) Ditto, Wearing Apparel. (8) Representations to Local Authorities. (9) Certifying Surgeons' Annual Report. (10) Accidents: *Degree of Injury, Age*; (11) *Industry, Age, Sex*; (12) *Industry, Causation*; (13) *Industry, Degree of Injury*; (14) *District, Causation*; (15) *District, Causation*. (16) Lead, Mercury, Phosphorus, and Arsenic Poisoning, and Anthrax. (17) Prosecutions: *Offence, Number, Penalty*: (18) *District, Offence*; (19) *Industry, Offence*: (20) *Under Special Rules*; (21) *Penal Compensation Cases*. (22) Fatal Accidents in Docks, &c., reported by Certifying Surgeons, July—December 1901. (23) Non-fatal Accidents in Docks, &c., reported by Certifying Surgeons, July—December 1901. (24) County of London, 1898: Factories (or Departments) employing more than 100 persons. (25) Administration of the Factory Acts, 1891—1901.

AIDS TO THE ANALYSIS AND ASSAY OF ORES, METALS, AND FUELS, &c. By J. JAMES MORGAN. Baillière, Tindall, and Cox, 8, Henrietta Street, Covent Garden, London, W.C.; 16, Lincoln Place, Dublin. Thin, Livingstone, Edinburgh and Glasgow. 1902. Price 2*s*. 6*d*., cloth; paper cover, 2*s*.

THIS little work, of foolscap 8vo size, contains preface, table of contents, and subject-matter filling 98 pages, followed by the alphabetical index. There are eight illustrations.

The ores, metals, and fuels, the analyses and valuations of which are given, are as follows:—Copper Pyrites; Galena; Zinc Blende; Tin Ores; Iron Ores; Manganese Ores; Chrome-Iron Ores; Dry Assay of Copper Ores; Lead Ores; Tin Ores, Silver Ores, and Gold Ores. Zinc. Lead. Tin. Copper. Iron and Steel. Nickel. Aluminium. Spiegeleisen. Silico-Spiegel and Ferro-Manganese. Ferro-Chrome. Ferro-Tungsten. Ferro-Aluminium. Ferro-Nickel. Ferro-Silicon. Coal, Coke, Patent Fuel (Charcoal). Liquid Fuels, Gaseous Fuels. Flue Gases, &c. Limestone, Lime, Magnesite, and Dolomite. Fireclay, Firebricks, Silica Bricks, Ganister, Sand, Fuel-Ash, and Boiler Incrustations. Slags. Alloys. White Alloys. Water for Technical Purposes, &c.

Trade Report.

I.—GENERAL.

General Exports of the United Kingdom for the Years 1900–1.

Articles, and Countries to which Exported.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
Aerated Waters:			£	£
Foreign Countries ..	845,195	646,410	130,735	101,332
British Possessions .	260,169	261,043	41,985	43,526
Total	1,105,364	907,453	172,720	144,858
Arms, Ammunition, &c.:				
Gunpowder:	Lb.	Cwts.		
Foreign Countries ..	1,770,700	11,171	45,181	45,520
British Possessions..	5,276,500	50,130	112,692	125,979
Total	7,047,200	61,301	157,873	171,599
Percussion Caps:	Thousand	Thousand		
Foreign Countries ..	193,595	330,757	15,756	17,882
British Possessions..	95,110	83,896	7,829	7,643
Total	288,615	414,653	23,585	25,525
Unenumerated:				
Foreign Countries ..	..	..	393,211	..
British Possessions .	..	..	634,918	..
Total	..	..	1,028,129	..
Arms, Ammunition, Military and Naval Stores:				
Cordite and other Smokeless Propellants:		Cwts.		
Foreign Countries ..	..	11,488	..	216,351
British Possessions..	..	2,567	..	23,882
Total	..	14,055	..	240,233
Dynamite and other High Explosives:				
Foreign Countries ..	..	12,986	..	76,749
British Possessions .	..	67,693	..	366,071
Total	..	80,679	.	442,820
Small Arms Ammunition:				
Foreign Countries ..	..	8,634	..	56,474
British Possessions .	..	39,200	..	198,394
Total	..	47,834	..	254,868
Fuses, Tubes, Primers, &c.:				
Foreign Countries ..	..	863	..	22,606
British Possessions .	..	944	..	16,970
Total	..	1,807	..	39,576
Rockets and other Combustibles for Warlike Purposes, Explosives and Ammunition, Unenumerated:				
Foreign Countries ..	..	..	..	38,843
British Possessions .	..	..	..	143,180
Total	..	..	..	182,023
Beer and Ale:	Barrels.	Barrels.		
Foreign Countries ..	150,564	141,312	544,171	521,275
British Possessions .	360,279	381,577	1,216,381	1,261,623
Total	510,843	522,889	1,760,552	1,782,898
Blacking and Polishes:	Cwts.	Cwts.		
Foreign Countries ..	117,001	131,666	63,267	78,809
British Possessions .	45,248	65,892	66,071	95,229
Total	162,249	197,558	129,338	174,038

General Exports—cont.

Articles, and Countries to which Exported.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
Candles:	Lb.	Lb.	£	£
Foreign Countries ..	11,090,400	11,090,500	195,256	196,32
British Possessions .	11,495,100	13,496,000	202,882	236,39
Total	22,585,500	24,586,500	398,138	432,71
Caoutchouc, Manufactures of:				
Foreign Countries ..	..	..	1,109,416	856,81
British Possessions .	..	..	314,048	375,59
Total	..	..	1,423,464	1,262,41
Cement for Building and Engineering Purposes:	Tons	Tons		
Foreign Countries ..	147,573	95,276	276,354	187,64
British Possessions .	212,371	210,055	396,808	396,32
Total	359,944	305,331	673,162	583,97
Chemicals and Chemical Preparations:				
Alkali:	Cwts.			
Foreign Countries ..	2,905,300	..	884,562	..
British Possessions .	750,400	..	234,857	..
Total	3,655,700	..	1,119,419	..
Aluminous Sulphates (including Alum):		Cwts.		
Foreign Countries ..	..	55,826	..	13,27
British Possessions .	..	103,901	..	22,36
Total	..	159,727	..	35,63
Bleaching Materials:	Cwts.			
Foreign Countries ..	1,204,700	..	343,052	..
British Possessions .	62,700	..	26,138	..
Total	1,267,400	..	369,190	..
Bleaching Powder:		Cwts.		
Foreign Countries ..	..	974,000	..	318,66
British Possessions .	..	57,100	..	22,12
Total	..	1,031,100	..	340,78
Other Bleaching Materials:				
Foreign Countries ..	..	100	..	2
British Possessions .	..	3,200	..	1,72
Total	..	3,300	..	1,74
Calcium Carbide:	Cwts.	Cwts.		
Foreign Countries ..	31	..	57	..
British Possessions .	66	7	132	1
Total	97	7	189	1
Copper Sulphate:	Tons.	Tons.		
Foreign Countries ..	42,186	35,458	996,383	833,67
British Possessions .	714	567	16,817	12,64
Total	42,900	36,025	1,013,200	846,31
Dyestuffs:				
Products of Coal Tar:				
Foreign Countries...	..	..	197,297	195,52
British Possessions..	..	..	13,157	14,82
Total	..	..	210,454	210,34
Other Sorts, Unenumerated:				
Foreign Countries...	..	..	96,577	98,12
British Possessions..	..	..	30,064	31,58
Total	..	..	126,641	129,70
Saltpetre, British Prepared:	Cwts.	Cwts.		
Foreign Countries...	18,177	19,260	19,260	20,45
British Possessions..	6,501	6,535	6,976	6,90
Total	24,678	25,795	26,236	27,33

General Exports—cont.

Articles, and Countries to which Exported.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
Chemicals—*cont.*				
Soda Compounds:				
Soda Ash:		Cwts.	£	£
Foreign Countries...	..	1,060,120	..	235,110
British Possessions..	..	227,880	..	46,932
Total	..	1,288,000	..	282,042
Soda, Caustic:				
Foreign Countries ..	..	914,303	..	449,661
British Possessions .	..	201,962	..	102,517
Total	..	1,116,265	..	552,178
Soda, Bicarbonate:				
Foreign Countries...	..	140,597	..	48,144
British Possessions..	..	152,917	..	53,765
Total	..	293,514	..	101,909
Soda, Crystals:				
Foreign Countries ..	..	128,850	..	22,043
British Possessions .	..	66,295	..	11,362
Total	..	195,145	..	32,405
Soda, Sulphate (Salt-cake):				
Foreign Countries ..	..	570,596	..	43,094
British Possessions .	..	3,970	..	539
Total	..	574,566	..	43,633
Soda, other Sorts:				
Foreign Countries ..	..	219,619	..	97,076
British Possessions .	..	39,344	..	16,318
Total	..	258,963	..	113,394
otherwise Enumerated:				
Foreign Countries ..	..	..	1,806,033	1,514,520
British Possessions .	..	..	946,388	986,084
Total	..	..	2,752,421	2,500,604
Coke, &c.:				
Coke, &c.:				
Foreign Countries ..	Tons. 41,373,996	Tons. 39,350,557	33,761,785	26,578,607
British Possessions .	2,725,201	2,526,524	2,647,829	2,166,377
Total	11,089,197	41,877,081	36,409,614	28,744,984
Slack and Cinders				
Foreign Countries ..	910,625	750,018	1,096,004	631,708
British Possessions .	74,740	57,653	119,732	69,078
Total	985,365	807,671	1,215,736	700,786
Coal, Manufactured:				
Foreign Countries ..	994,140	1,005,717	960,331	813,669
British Possessions .	32,526	75,443	34,175	75,309
Total	1,023,666	1,081,160	994,506	888,978
Products of Coal:				
Foreign Countries ..	..	..	1,653,735	1,073,714
British Possessions .	..	..	157,880	77,539
Total	..	..	1,811,644	1,151,253
Corn, Grain, Meal and Flour:				
Wheat:	Quarters.	Quarters.		
Foreign Countries ..	37,428	18,695	64,730	87,722
British Possessions .	91,592	111,920	177,032	219,206
Total	129,020	160,615	241,762	306,928
Graphite, Plumbago:	Cwts.	Cwts.		
Foreign Countries ..	54,334	41,791	97,781	78,098
British Possessions .	4,629	4,261	9,460	8,765
Total	58,963	46,052	107,241	86,863
Earthen and China Ware: Pottery and Brown Stone Ware, and Clay Manufactures (except Bricks):				
Foreign Countries ..	..	..	121,366	118,174
British Possessions .	..	..	62,017	60,404
Total	..	..	186,383	178,578

General Exports—cont.

Articles, and Countries to which Exported.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
Earthen and China Ware —*cont.*				
Earthenware, China-ware, Parian, and Porcelain:			£	£
Foreign Countries ..	..	..	1,193,898	1,050,270
British Possessions .	..	..	657,728	763,949
Total	..	..	1,851,626	1,814,219
Glass:				
Plate, Rough, or Silvered:	Sq. Ft.	Cwts.		
Foreign Countries ..	597,800	17,058	44,823	27,075
British Possessions .	1,566,000	49,777	90,595	88,242
Total	2,163,800	66,835	135,418	115,317
Flint, Plain, Cut, or Ornamented (including Bottles, and other Manufactures of Flint Glass):	Cwts.	Cwts.		
Foreign Countries ..	32,859	32,392	102,904	100,676
British Possessions .	65,116	71,109	141,736	149,899
Total	97,975	103,501	244,640	250,575
Bottles and Manufactures of Green or Common Glass:				
Foreign Countries ..	235,324	221,616	116,182	111,855
British Possessions .	627,860	659,889	305,025	326,962
Total	863,184	881,505	421,207	438,817
Other Manufactures, Unenumerated:				
Foreign Countries ..	118,247	116,714	126,814	136,187
British Possessions .	106,572	114,360	105,526	116,259
Total	224,819	231,074	232,340	252,446
Glue, Size, and Gelatine:				
Foreign Countries ..	98,085	103,486	95,501	102,306
British Possessions .	30,198	16,846	32,383	30,206
Total	128,283	120,332	127,884	132,512
Grease, Tallow, and Animal Fat:				
Foreign Countries ..	568,002	606,969	720,601	763,432
British Possessions .	39,777	60,469	37,962	57,346
Total	607,779	667,438	758,563	820,778
Hides, Raw:				
Foreign Countries ..	128,137	124,200	229,070	217,805
British Possessions .	33,015	45,897	81,418	112,556
Total	161,152	170,097	310,488	330,361
Hops:				
Foreign Countries ..	5,186	4,995	16,553	15,124
British Possessions .	9,813	13,197	46,973	64,451
Total	14,999	18,192	63,526	79,575
Instruments and Apparatus, Surgical, Anatomical, and Scientific:				
Foreign Countries ..	..	..	247,733	258,584
British Possessions .	..	..	200,788	244,207
Total	..	..	448,521	502,791
Leather:				
Foreign Countries ..	..	..	1,743,096	1,586,877
British Possessions .	..	..	1,655,164	1,919,731
Total	..	..	3,398,260	3,506,608
Manure:				
Sulphate of Ammonia:	Tons.	Tons.		
Foreign Countries ..	128,582	132,353	1,450,655	1,419,775
British Possessions .	16,575	17,531	186,023	187,401
Total	145,157	149,884	1,636,678	1,607,176

General Exports—cont.

Articles, and Countries to which Exported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Manures—*cont.*				
Other Descriptions:	Tons.	Tons.	£	£
Foreign Countries ..	191,218	212,742	527,848	547,607
British Possessions .	63,638	64,448	243,764	242,728
Total	254,856	277,238	771,612	790,335
Margarin and all Artificial Butters:	Cwts	Cwts.		
Foreign Countries ..	1,442	2,887	3,232	6,199
British Possessions .	1,591	1,535	3,879	3,858
Total.....	3,033	4,422	7,111	10,057
Matches:	Gross	Gross		
Safety:	Boxes.	Boxes.		
Foreign Countries ..	8,800	7,100	1,175	1,033
British Possessions .	87,400	59,600	7,728	6,290
Total	96,909	66,700	8,903	7,323
Other Descriptions:				
Foreign Countries ..	37,900	53,300	8,677	9,201
British Possessions .	654,200	732,800	81,288	91,251
Total.....	692,100	786,100	89,965	100,452
Medicines, comprising Drugs and Medicinal Preparations:				
Foreign Countries...	..	..	408,569	425,917
British Possessions .	..	..	854,116	914,053
Total	..	..	1,262,685	1,339,970
Metals, and Manufactures thereof:				
Brass, and Manufactures of, not being Ordnance:	Cwts.	Cwts.		
Foreign Countries...	73,887	66,858	303,794	212,221
British Possessions .	46,901	49,381	267,221	280,780
Total	120,788	116,239	631,015	593,001
Copper:	Tons.	Tons.		
Ore, Total.....	11	114	70	910
Unwrought, in Ingots, Cakes, or Slabs, and Precipitate:	Cwts.	Cwts.		
Foreign Countries ..	354,271	522,804	1,372,538	1,921,940
British Possessions .	6 455	8,405	24,957	30,404
Total	360,726	531,209	1,397,495	1,952,344
Wrought, Mixed or Yellow Metal:				
Foreign Countries...	47,903	42,196	168,857	142,690
British Possessions .	127,506	139,914	416,273	447,145
Total	175,409	182,110	585,136	589,835
Wrought, Unenumerated:				
Foreign Countries ..	143,319	142 732	637,906	615,454
British Possessions .	68,596	76,810	304,313	332,120
Total	211,915	219,602	942,219	947,574
Lead:				
Ore:	Tons.	Tons.		
Foreign Countries ..	1,482	2,278	14,046	18,220
British Possessions .	..	41	..	628
Total.....	1,482	2,319	14,046	18,848
Pig:				
Foreign Countries ..	16,802	15,217	295,252	201,889
British Possessions .	677	2,929	12,012	38,487
Total	17,479	18,146	307,264	240,376
Manufactures:				
Foreign Countries ..	6,587	5,896	128,146	96,522
British Possessions .	11,923	13,533	254,350	248,647
Total	18,510	19,429	382,496	345,169
Tin, Unwrought:	Cwts.	Cwts.		
Foreign Countries ..	103,147	101,514	700,045	627,131
British Possessions .	9,242	8,405	62,719	52,333
Total	112,389	109,919	762,764	679,464

General Exports—cont.

Articles, and Countries to which Exported.	Quantities.		Value.	
	1900.	1901.	1900.	1901
Metals—*cont.*				
Zinc or Spelter:	Tons.	Tons.	£	£
Ore, Total	13,689	13,761	41,554	35,3
Crude, in Cakes:	Cwts.	Cwts.		
Foreign Countries ..	89,459	90,813	85,402	70,0
British Possessions .	50,953	57,262	44,722	38,3
Total	140,412	148,075	130,124	108,4
Manufactures of:				
Foreign Countries ..	5,513	5,245	9,195	8,6
British Possessions .	17,295	19,481	27,526	27,9
Total	22,808	24,726	36,721	36,5
Unenumerated:				
Foreign Countries ..	..	..	625,863	660,6
British Possessions .	..	..	213,325	237,8
Total	..	..	839,188	898,4
Methylic Alcohol, not purified so as to be potable:	Gallons	Gallons.		
Foreign Countries ..	3,902	1,304	493	2
British Possessions .	12,750	4,799	1,583	7
Total	16,652	6,103	2076	9
Mica and Talc:	Cwts.	Cwts.		
Foreign Countries ..	1,384	1,848	9,068	9,0
British Possessions .	10	19	202	1
Total	1,394	1,867	9270	9,1
Milk, Condensed:				
Foreign Countries ..	38,082	23,398	70,354	42,5
British Possessions .	171,365	183,732	320,205	341,9
Total	209,447	207,130	390,559	384,4
Oil, other than Essential, or Medicinal:				
Seed, Linseed:	Tons.	Tons.		
Foreign Countries ..	9,742	9,551	290,333	293,0
British Possessions .	9,952	11,473	298,533	368,4
Total	19,694	21,024	588,866	661,4
Cotton:				
Foreign Countries ..	19,197	17,640	418,348	380,2
British Possessions .	128	256	10,056	6,1
Total	19,325	17,896	428,404	386,4
Other Seed Oils:				
Foreign Countries ..	2,931	3,243	81,141	90,3
British Possessions .	687	703	16,873	19,5
Total	3,618	3,946	98,014	109,8
Other Sorts, Unenumerated:				
Foreign Countries...	..	..	363,921	653,3
British Possessions..	..	..	111,467	183,2
Total	..	..	475,388	836,5
Oil- and Floor-Cloth:	Sq. Yds.	Sq. Yds.		
Foreign Countries ..	16,729,100	16,562,700	783,766	777,1
British Possessions .	11,117,300	10,195,200	529,067	520,8
Total	27,846,400	26,757,900	1,312,833	1,298,0
Oil Seed Cake and other Animal Foods, Unenumerated:	Tons.	Tons.		
Foreign Countries ..	45,096	54,086	192,067	215,8
British Possessions .	1,034	4,178	8,269	21,2
Total	46,130	54,264	200,336	237,1
Oleo-margarin:	Cwts.	Cwts.		
Foreign Countries ..	9,482	9,003	16,803	16,8
British Possessions .	..	20	..	
Total	9,482	9,023	16,803	16,8

General Exports—cont.

Articles, and Countries to which Exported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Painters' Colours and Materials, Unenumerated:	Cwts.	Cwts.	£	£
Foreign Countries...	..	..	1,104,456	1,029,438
British Possessions .	..	..	949,509	978,545
Total	..	..	2,053,945	2,007,983
Paper:				
Writing or Printing, and Envelopes:				
Foreign Countries...	219,312	182,411	365,118	325,147
British Possessions .	537,634	534,446	758,637	770,131
Total	756,976	716,857	1,123,755	1,095,278
Hangings:				
Foreign Countries...	24,704	23,286	83,249	83,186
British Possessions..	39,530	46,051	87,127	111,615
Total	64,234	69,337	170,376	194,801
Pasteboard, Millboard, Cardboard, and Cards:				
Foreign Countries...	7,630	6,844	13,637	17,204
British Possessions..	30,576	35,041	47,674	57,879
Total	38,206	41,885	61,311	75,083
Paraffin-Wax:				
Foreign Countries...	..	220,357	..	288,952
British Possessions..	..	5,904	..	7,235
Total.....	..	226,261	..	296,187
Perfumery (except Spirits Perfumed in Bond):				
Foreign Countries...	..	..	45,396	43,658
British Possessions..	..	..	84,704	87,949
Total	..	..	130,100	131,607
Plated and Gilt Wares:				
Foreign Countries...	..	..	138,518	130,676
British Possessions .	..	..	266,515	310,364
Total	..	..	405,033	441,040
Rags (except Woollen) and other Materials for making Paper:	Tons.	Tons.		
Foreign Countries...	60,080	63,615	363,333	372,811
British Possessions .	2,178	1,543	11,942	9,859
Total	62,258	65,158	375,275	382,670
Salt, Rock and White:				
Foreign Countries...	228,471	230,915	189,426	199,546
British Possessions .	318,924	386,288	267,914	309,594
Total	547,395	617,203	457,340	509,140
Soap:	Cwts.	Cwts.		
Foreign Countries ..	315,034	360,318	345,385	370,820
British Possessions .	559,180	587,167	594,125	628,704
Total	874,214	947,485	939,510	999,524
Spirits:	Proof Gallons.	Proof Gallons.		
British and Irish, Methylated:				
Foreign Countries ..	282	873	43	117
British Possessions .	11,111	13,427	1,054	1,374
Total	11,393	14,300	1,097	1,491
Foreign, Methylated in the United Kingdom, Total..	1,871	20	191	4
Perfumed in Bond:	Gallons.	Gallons.		
Foreign Countries ..	10,450	10,110	38,004	38,995
British Possessions .	11,081	12,565	31,760	32,749
Total	21,531	22,675	69,764	71,744
Starch and Blue:	Cwts.	Cwts.		
Foreign Countries ..	41,737	40,634	57,662	60,916
British Possessions .	66,965	63,324	101,048	96,662
Total	108,702	103,958	158,710	157,578

General Exports—cont.

Articles, and Countries to which Exported.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Sugar:				
Refined and Candy:	Cwts.	Cwts.	£	£
Foreign Countries ..	396,836	259,871	246,032	161,479
British Possessions .	209,517	296,438	135,701	189,282
Total	606,353	556,309	381,733	350,761
Molasses, Treacle, Syrup and Glucose:				
Foreign Countries ..	198,164	171,544	79,262	78,969
British Possessions .	40,808	57,207	39,575	56,585
Total	238,972	228,551	118,837	135,554

Patent Law Amendment Bill.

The following are the clauses of the Patent Law Amendment Bill (1902) as amended by the Standing Committee on Trade, &c.

Below will be found a further clause added at the third reading of the Bill.

"Be it enacted by the King's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

1.—(1) Where an application for a patent has been made and a complete specification has been deposited by the applicant, the examiner shall forthwith, in addition to the inquiries which he is directed to make by the Patents, Designs, and Trade Marks Act, 1883 (in this Act referred to as the principal Act), make a further investigation for the purpose of ascertaining whether the invention claimed has been wholly or in part claimed or described in any specification (other than a provisional specification not followed by a complete specification) published before the date of the application, and deposited in the Patent Office pursuant to any application for a patent made in the United Kingdom within fifty years next before the date of the application.

(2) If on investigation it appears that the invention has been wholly or in part claimed or described in any such specification, the applicant shall be informed thereof, and the applicant may, within such time as may be prescribed, amend his specification, and the amended specification shall be investigated in like manner as the original specification.

(3) The examiner shall report to the comptroller the result of his investigations in such manner as the Board of Trade may direct.

(4) The provisions of sub-section five of section nine of the principal Act, as amended by any subsequent enactment, shall apply to reports under this section.

(5) If the comptroller is satisfied that no objection exists to the specification on the ground that the invention claimed thereby has been wholly or in part claimed or described in a previous specification as before mentioned, he shall, in the absence of any other lawful ground of objection, accept the specification.

(6) If the comptroller is not so satisfied, he shall, after hearing the applicant, and unless the objection be removed by amending the specification to the satisfaction of the comptroller, determine whether a reference to any, and, if so, what, prior specification ought to be made in the specification by way of notice to the public.

(7) An appeal shall lie from the decision of the comptroller under this section to the law officer.

(8) Section eight of the principal Act and section three of the Patents, Designs, and Trade Marks (Amendment) Act, 1885 (which regulate the time for depositing a complete specification), shall have effect as if references therein to the period of nine months were references to the period of six months.

(9) The investigations and reports required by this section shall not be held in any way to guarantee the validity of any patent, and no liability shall be incurred by

the Board of Trade or any officer thereof by reason of, or in connection with, any such investigation or report, or any proceeding consequent thereon.

(10) An invention shall not be deemed to have been anticipated by reason only of its publication in a specification deposited in the Patent Office pursuant to an application made not less than 50 years before the date of the application for a patent therefor, or of its publication in a provisional specification of any date not followed by a complete specification.

(11) The Board of Trade, with the sanction of the Treasury, may prescribe an additional fee not exceeding one pound in respect of the investigation mentioned in this section, which shall be payable on the sealing of the patent.

(12) This section shall come into operation at such date as the Board of Trade may by order direct, and shall apply only to applications made after that date and to the inventions in respect of which such applications are made, and the order shall be laid before both Houses of Parliament.

2. Section twenty-two of the principal Act (relating to the grant of compulsory licences by the Board of Trade) is hereby repealed, and the following provisions shall be substituted therefor:—

(1) Any person interested may present a petition to the Board of Trade alleging that the reasonable requirements of the public with respect to a patented invention have not been satisfied, and praying for the grant of a compulsory licence, or, in the alternative, for the revocation of the patent:

(2) The Board of Trade shall consider the petition, and if the parties do not come to an arrangement between themselves, the Board of Trade, if satisfied that a primâ facie case has been made out, shall refer the petition to the Judicial Committee of the Privy Council, and if the Board are not so satisfied, they may dismiss the petition;

(3) Where any such petition is referred by the Board of Trade to the Judicial Committee, and it is proved to the satisfaction of the Judicial Committee that the reasonable requirements of the public with reference to the patented invention have not been satisfied, the Judicial Committee may order the patentee to grant licences on such terms as they may think just, or if the Judicial Committee are of opinion that the reasonable requirements of the public will not be satisfied by the grant of licences, they may, by order, revoke the patent;

Provided that no order of revocation shall be made before the expiration of three years from the date of the patent, or if the patentee gives satisfactory reasons for his default;

(4) On the hearing of any petition under this section, the patentee, and any person claiming an interest in the patent as exclusive licencee or otherwise, shall be made parties to the proceeding, and the law officer, or such other counsel as he may appoint, shall be entitled to appear and be heard;

(5) If it is proved to the satisfaction of the Judicial Committee that the patent is worked or that the patented article is manufactured exclusively or mainly outside the United Kingdom, then, unless the patentee can show that the reasonable requirements of the public have been satisfied, the petitioner shall be entitled either to an order for a compulsory licence or, subject to the above proviso, to an order for the revocation of the patent;

(6) For the purposes of this section, the reasonable requirements of the public shall not be deemed to have been satisfied if, by reason of the default of the patentee to work his patent or to manufacture the patented article in the United Kingdom to an adequate extent, or to grant licences on reasonable terms, (*a*) any existing industry or the establishment of any new industry is unfairly prejudiced, or (*b*) the demand for the patented article is not reasonably met;

(7) An order of the Judicial Committee granting any licence under this section shall, without prejudice to any other method of enforcement, operate as if it were embodied in a deed made between the parties to the proceeding;

(8) The Judicial Committee may make rules of procedure and practice for regulating proceedings under this section, and subject thereto, such proceedings shall be regulated according to the existing procedure and practice in patent matters. Any order made by the Judicial Committee may be enforced as if it were an order of the High Court.

(9) The costs of and incidental to all proceedings under this section shall be in the discretion of the Judicial Committee, but in awarding costs on any application for the grant of a licence the Judicial Committee may have regard to any previous request for, or offer of, licence made either before or after the application to the Committee;

(10) This section shall apply to patents granted before as well as after the commencement of this Act.

3. In subsection four of section eighty-two of the principal Act (which relates to the performance of the duties of the comptroller by other officers under the direction of the Board of Trade) the words "in his absence" shall be repealed.

4.—(1) This Act may be cited as the Patents Act, 190 and may be cited and shall be construed as one with the Patents, Designs, and Trade Marks Acts, 1883 to 1901.

(2) It shall, except as otherwise provided therein, come into operation on the first day of January one thousand nine hundred and three."

Patent Law Amendment Bill.

Times, *Oct.* 22, 1902.

On consideration of this Bill as amended by the standing committee,

Mr. Caldwell (Lanark, Mid) moved the following new clause:—"An invention covered by any patent granted on an application to which section one of this Act applies shall not be deemed to have been anticipated by reason only of its publication in a specification deposited in the Patent Office pursuant to an application made not less than 50 years before the date of the application for a patent therefor, or of its publication in a provisional specification of any date not followed by a complete specification."

Mr. Gerald Balfour (Leeds, Central) accepted the clause, which was agreed to.

On clause 2,

Mr. Cawley (Lancashire, Prestwich) moved an amendment, the effect of which, he said, would be to enable the Board of Trade not only to dismiss petitions for patents or to refer them to the Judicial Committee of the Privy Council, but to grant them outright, a course, which under the present law they were not empowered to take. His amendment was designed in the interests especially of the small manufacturers in the aniline-colour trade. That trade had been largely transferred to Germany mainly, he contended owing to the operation of the Patent Laws of this country.

Mr. Brigg supported the amendment on the ground that anything that could be done to help the small inventor so that the industry of the country might be promoted deserved the consideration of the Board of Trade.

Mr. Gerald Balfour said that the particular modification desired by the hon. member for Prestwich was very fully discussed in the committee upstairs and rejected, as he thought, for excellent reasons. What the Bill proposed was that applications should, in the first instance, be made to the Board of Trade, who could then act the part of conciliator between the patentee and those who were seeking for a licence. If the parties were unable to come to an agreement with the assistance of the Board of Trade, the Board of Trade might, if in its opinion there was a *primâ facie* case, refer the petition to the Privy Council, and the Privy Council decided at once and for all. Until the petition was referred to the Privy Council no expense of any kind was involved upon either of the parties, but he imagined that, in the case of the small manufacturers of whom the hon. member spoke, it would be possible for the Board of Trade to bring the parties together in the majority

f instances at all events. The effect of the hon. member's cheme, if it were carried, would be this. The Board of Trade would not accept the task of deciding upon matters in which very great pecuniary interests were constantly involved without referring them to a tribunal constituted *ad hoc*. There would be an abitration, whose expenses would have to be paid, and there would be the expenses of counsel, and the result would be that, where a case was carried from the decision of the Board of Trade to the Privy Council, so far from the expenses being diminished, they would be doubled. The object of the amendments which the Government introduced into the Bill in committee was to diminish the expenses as far as possible, and with that view they had arranged that there should be only one trial of these matters before a Court, and that from that Court there should be no appeal. He believed they could not get a better Court for the purpose than the Privy Council, and it was for that reason the Government substituted the Privy Council for the High Court. His own belief was that under the procedure which the Bill now contemplated they would get at once the cheapest and most satisfactory procedure available.

Mr. CALDWELL thought the Board of Trade should take upon itself the responsibility of giving a decision when there would be, if the necessity arose, an appeal to the Privy Council. The probability, however, was that the parties would come to an agreement before the Board of Trade.

The amendment was negatived without a division.

The Bill was then read a third time.

DUTY-FREE SPIRIT FOR INDUSTRIAL PURPOSES.

The following is the clause in the Finance Act of 1902 which gives power to authorise the use of spirits, without payment of duty, in arts or manufactures:—

Clause 8.—(1) Where, in the case of any art or manufacture carried on by any person in which the use of spirits is required, it shall be proved to the satisfaction of the Commissioners of Inland Revenue that the use of methylated spirits is unsuitable or detrimental, they may, if they think fit, authorise that person to receive spirits without payment of duty for use in the art or manufacture upon giving security to their satisfaction that he will use the spirits in the art or manufacture, and for no other purposes, and the spirits so used shall be exempt from duty:

Provided that foreign spirits may not be so received or used until the difference between the duty of customs chargeable thereon and the duty of excise chargeable on British spirits has been paid.

(2) The authority shall only be granted subject to a compliance with such regulations as the Commissioners may require the applicant to observe for the security of the revenue, and upon condition that he will, to the satisfaction of the Commissioners if so required by them, render the spirits unpotable before and during use, and will from time to time pay any expenses that may be incurred in placing an officer in charge of his premises.

(3) If any person so authorised shall not comply with any regulation which he is required to observe, he shall, in addition to any other fine or liability, incur a fine of fifty pounds.

IMPORTS OF JAPAN IN 1901.

U.S. Cons. Reps., Sept. 9, 1902.

Steel, Iron, &c.—In brass and copper tubes, mercury and nickel, Great Britain has the bulk of the trade, and the United States is losing ground in all except mercury. The imports of lead have steadily increased for several years, and the proportion of the United States has grown, until last year it amounted to five-eighths of the whole.

Oil.—Nearly all the kerosene oil, lubricating oil, and paraffin-wax imported comes from America, whilst Great Britain furnishes most of the linseed oil. The importation of kerosene oil continues to increase, although it is believed that good petroleum veins exist in some parts of this and the northern island, and the Japanese are making constant efforts to extend the domestic production. Since 1899, there has been a gradual absorption of the smaller companies by the Takarada Oil Co., which now claims to have the greatest and richest area of oil fields, although the International surpasses it in thoroughness of equipment and in command of capital. The Takarada, which operates chiefly in Echigo Province, commands oil-fields covering an area of 27,000 acres, in which are over 200 wells and boring machines, with a daily output of 52,000 galls. There are now only three important oil companies in Japan.

Sugar.—Hong Kong and Germany together furnish nearly half the sugar imported, and the other half is brought from many countries, among which Austria-Hungary, China, the Dutch Indies, and the Philippine Islands are the most important. The Philippines increased their shipments by about 50 per cent., as compared with 1900. This market for sugar is growing, and with the establishment of more settled conditions in the Philippines, the industry should be so developed as to supply half the demand here. The islands now supply about one-ninth, none of which is refined.

Paper.—More than half the fancy glazed paper, match-paper, and packing-paper imported into Japan comes from Germany, the United States doing very little in these lines. Great Britain leads in printing paper, with the United States and Austria-Hungary not far behind, the three together furnishing more than than three-fourths of the entire importation. There are 11 paper factories in Japan, which are steadily increasing their output, amounting this year to 103,926,000 lb.; whilst the total importation, which was less than half as much as last year, was 17,359,000 lb. The native factories have formed an alliance to control prices, with a view to check sharp fluctuations. They do not produce ornamental paper, but manufacture printing-paper, board-paper, and wrapping-paper, and the exportations of these almost equal in value the importations of paper of all kinds.

Alcohol.—About four-fifths of the alcohol imported last year came from America, this being the first year that she has been in the lead in this article.

Leather.—The United States still keeps the lead in sole-leather, of which it furnishes about three-fourths, but in sales of other leather it is falling back. The total import of sole leather, for 1900, decreased by 800,000 lb., and that of hides and skins increased an equal amount, whilst other leather gained a very little.

II.—FUEL, GAS, AND LIGHT.

PEAT DEVELOPMENT IN ONTARIO.

U.S. Cons. Rep., Sept. 22, 1902.

Large sums have been expended during the past few years in experiments for the perfection of machinery to turn out a fuel that will compete with coal. The Victoria Road peat plant, near Lindsay, Ontario, has alone spent 60,000 dols. during the past year in completing its machinery, but the result is not yet satisfactory.

The Ellice Peat Co. have added a new machine known as an artificial drier. Under the old process, the bog was cut and sun-dried. With the new machine, the crude peat is run through the apparatus as fast as dug from the bog. Part of the moisture is evaporated by the heat of the process, and the balance removed by the immense pressure the material undergoes, until it drops from the machine in cubes, ready for the market. This process of converting the raw material into marketable fuel is a great improvement over the old method, but further improvements are expected.

The whole question of making the inexhaustible beds of bog commercially valuable lies in the drying process.

Thus far, the nearest solution to the problem lies probably in the machine invented by Mr. Dobson, now in use at his peat works at Beaverton, near Lake Simcoe, in northern Ontario. This machine cuts, pulverises, and spreads the material at the same time. This reduces the moisture 50 per cent., and the balance is taken out by the drying process. The machinery in operation at this plant has a capacity of 20 tons a day. The bogs are three miles from a railroad, and yet the demand for the fuel is such that it brings 3·25 dols. a ton at the plant and is retailed at Toronto at

4·25 dols. The plant near Stratford now has a daily capacity of 25 tons, and a ready sale for all the fuel it can produce. It is run night and day, with a view to supply the demand caused by the scarcity of hard coal.

Canada annually consumes nearly 3,000,000 tons of anthracite coal, all of which comes from Pennsylvania. The prolonged strike has changed the situation to such an extent that this summer no coal was delivered, and a serious fuel famine confronts the people of this latitude. This condition of affairs has given a tremendous impetus to the manufacturing of peat for fuel all over the province, and will probably lead to the perfection of inventions.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Coal Tar Production in the United States.*

Eng. and Mining J., Sept. 20, 1902.

The recovery of coal-tar as a by-product in the manufacture of illuminating gas and coke in the United States has assumed very large proportions, and a large proportion of the total is furnished by the by-product coke ovens, the output of which, in 1899, amounted to 52,344 short tons. The recovery of tar in illuminating-gas manufacture, in 1900, is computed as follows:—The total production of gas was 67,093,553,471 cb. ft., of which upwards of 75 per cent. was water-gas. Reckoning the make of coal-gas at 20 per cent. of the total, its quantity was 13,418,710,694 cb. ft. The average yield per ton of coal being 10,000 cb. ft., there must have been consumed for this purpose 1,341,871 tons of coal. The yield of tar per ton of coal is, approximately, 5 per cent. by weight, which would indicate a recovery of 67,094 tons of tar. The quantity of water-gas tar is computed from the quantity of oil consumed, which was 194,857,296 galls. About 25 per cent. of the oil consumed is recovered as tar, corresponding to 48,714,324 galls., which is equivalent to 222,868 tons, a gallon of this weighing 9·15 lb. (sp. gr. 1·1). The total production of coal tar and water-gas tar in 1900 was therefore 342,306 tons. The quantity of coal tar reported as consumed in the United States, in 1900, was 22,004,650 galls., which, at 10 lb. per gallon, gives 110,023 tons.

Petroleum Industry of New Brunswick.

Ed. of Trade J., Oct. 2, 1902.

According to *The B.C. Review* of 27th ult., the petroleum industry in New Brunswick is likely to assume considerable importance in the near future. The New Brunswick Petroleum Co. has already sunk 14 wells, the majority of which have been sunk to a distance of between 400 ft. and 500 ft., but two have been pushed through the first oil sands, and have reached a depth of 1,450 ft. The company is prepared to erect a refinery which will have a capacity of 400 barrels a day. For the present, the company will confine its operations to extracting the naphtha and benzoline, and making burning- and lubricating- oils. The residuum, being more costly to treat, will not be dealt with for the present. The charter of this company gives it practically the control of all the oil-bearing territory in the province, but in return for these powers the company has to spend 20,000*l.* in development during the first five years.

VII.—ACIDS, ALKALIS, Etc.

Potash Industry in Germany.

U.S. Cons. Reps., Sept. 25, 1902.

The potash industry has suddenly lapsed into a critical condition. Several of the more important mining companies have reduced the wages of their working people from 10 to 30 per cent. The Prussian Fiskus, which controls an important group of mines in Prussian Saxony, has discharged 350 to 400 workmen, and the Solvay works at Bernburg have done the same, until a mass meeting of working people was called to solicit the intervention of the local government against further dismissals. When it is remembered that, down to the end of April last, all the producing potash mines were running up to their full capacity, many even employing Sunday and night shifts, in order to keep pace with the demand, this sudden depression would seem to be due to some special cause.

The effect of the recent negotiations (see this Journal, Sept. 15, 1161) has been to make the syndicate unstable; its productive capacity now exceeds the requirements of the market at syndicate prices. This has not only disappointed the hopes of the newly-admitted members of the syndicate, but has compelled some of the old ones to restrict their output, discharge some of their workmen, and, in some cases at least, to reduce the wages of those who are retained.

Bromine Production in the United States.

Eng. and Mining J., Sept. 27, 1902.

The production of bromine in the United States, during 1901, amounted to 552,043 lb., valued at 154,572 dols., as compared with 521,444 lb., in 1900, valued at 140,790 dols., an increase of 30,599 lb., in quantity, and 13,782 dols., in value, for the year. The price per lb., during 1901 averaged 28 cents, as compared with 27 cents, in 1900, and 29 cents, in 1899. The production of bromine in the world continues to be controlled by the Associated American Producers and by the Leopoldshall-Stassfurt Convention, which is operative for several years to come.

Chemical Industries of Lyons (France).

Foreign Office Miscellaneous Series, No. 582.

The chemical industry was especially affected by the high price of native coal in 1901. The fall in the price of British coal, which took place in 1901, had no effect on the price of native coal until towards the end of 1901; this, taken in conjunction with the general industrial crisis and the decrease of demand from the United Kingdom, explains the poverty of the situation.

Soda.—The consumption of soda for the department of the Rhône, which had fallen away in 1900, went back to the figure reached in 1899, namely, 13,000 tons.

The sale of carbonate of soda (Solvay), coming from the East, appears to be increasing to the detriment of the soda factories of St. Fons, which follow the Leblanc system.

Sulphuric Acid.—The production of sulphuric acid has decreased throughout the whole of France. This is evident proof of the general decrease of chemicals in which sulphuric acid largely figures.

The extraction of pyrites at Sain-Bel, which, in 1899, amounted to 317,000 tons, fell, in 1900, to 304,000 tons; of this quantity, 52,000 tons were for export.

The import has increased from 4,253 tons in 1900, to 5,385 tons in 1901. This amount is insignificant, considering that the total French production is 500,000 tons, and probably is, in most part, composed of concentrated acids.

Chemical Manures.—The extreme cheapness of wine in the South of France has had the effect of almost suspending the purchase of manure in the wine-growing districts. At the same time, the fall in the price of sugar has diminished beetroot cultivation. The manufacturers of chemical manures have therefore suffered to some extent. The excess of importation over exportation of natural phosphates varied from 194,800 tons, in 1900, to 154,900 tons, in 1901. The importation of nitrate of soda fell from 285,612 tons, in 1900, to 229,834 tons, in 1901. The exportation of superphosphates increased from 72,000 tons, in 1900, to 94,000 tons, in 1901, whilst manufactured manures fell from 127,000 tons, in 1900, to 94,000 tons. The industry has accordingly limited its production, and by this precaution, prices have been maintained, and, indeed, slightly increased. The bone-manure industry, which is an important one in this district, but which produces a far smaller quantity than the mineral manure factories, was easily able to get rid of its production owing to the high prices asked for mineral manures. But at the same time, the production of bone-manure is on the decrease, if not, perhaps, at Lyons itself, in the rest of France. The import of bones dropped from

* Note.—In the above article, the United States gallon (equal to of a British gallon) and the ton of 2,000 lb. must be understood.

39,000 tons. in 1900, to 19,000 tons, in 1901. It is to be remarked, however, that the figures of 1900 were abnormal, the average import of bones being 30,000 to 35,000 tons.

Glue and Gelatin. — The glue and gelatin industry suffered severely. Exports fell from 7,814 tons, in 1900, to 7,689 tons, in 1901, whilst the import rose from 1,766 tons, in 1900, to 1,867 tons, in 1901. This result caused some alarm in Paris, manufacturers there calling out for the imposition of protective duties. This measure was opposed by the Lyons producers, backed by the Lyons Chamber of Commerce.

Phosphorus.—The production of phosphorus again diminished. The exportation of white phosphorus fell from 243 tons, in 1900, to 135 tons, in 1901. Red phosphorus did better, the export increasing from 53 tons, in 1900, to 58 tons, in 1901.

Citric Acid.—The citric acid trade suffered with the others. Export fell from 165 tons, in 1900, to 132 tons, in 1901. The trade claims freedom from custom duties for raw citrate of lime, which tends to replace, as raw material, lemon juice, raw and concentrated.

Stearine and Soap.—The increase of 732 tons in the consumption of candles in France, in 1900, seems to have been quite exceptional. In 1901, there was a decrease amounting to 2,223 tons. In competition with gas, electricity, and spirits of wine, candles, which now pay duty, cannot compete; the sale must necessarily gradually decrease. The export of stearine must be limited to countries that have not the facilities offered by gas or electric light, such as Algeria and the East. The export has increased from 4,326 tons, in 1900, to 4,402 tons, in 1901. In this amount candles account for 2,955 tons.

In the custom-house tariff, stearic acid is taxed 8 fr. per 100 kilos. lower than candles, and this has caused the French market to be flooded with Belgian and Dutch raw stearic acid. The importation has increased from 123 tons, in 1899, to 3,149 tons, in 1901.

Dyestuffs.—The trade in dyestuffs, which started in Lyons upon the invention of Magenta, is becoming more and more dependent on Germany. With rare exceptions, all the Lyons factories are merely branches of German houses.

If treatment by electrolysis were to become general, it would cause a revolution in many of the chemical industries, and Lyons, on account of its reserve of hydraulic force from the Alps, should become the centre of the new industry.

X.—METALLURGY.

Mining in British Columbia.

U.S. Cons. Reps., Oct. 2, 1902.

A few years ago the mines around Rossland could not afford to ship ore valued at less than 16 dols. per ton. The charges for freight and smelter treatment amounted to 14 dols. Later, these charges were decreased to 11 dols. per ton, and about a year ago the smelters reduced the rate for freight and smelting to 6·50 dols. per ton. A recent contract made by certain mines with the smelter enables them to ship ore valued at 5 dols. per ton, although they ship a quantity of high-grade ore with the low-grade. The terms of the contract between these mines and the smelter are 4·50 dols. per ton for freight and treatment. This is most important for the future prosperity of Rossland, the majority of the ore mined around the city being of low grade. With these cheap rates for freight and smelting, there are hundreds of mines in the vicinity of Rossland which will become shippers almost immediately.

Every effort is being made by the managers of the mines to reduce the cost of concentration and refining of the ores. The Elmore process (this Journal, 1900, 251) is being introduced, and great hopes are entertained of the ultimate success of this system. It is understood that the owners of the Elmore patents have expressed their willingness to erect a plant, or to sell one of their plants to the mine owners.

A new smelter is being erected near Grand Forks, which is expected to handle 1,000 tons of ore per day. It is said that several improvements in smelting will be introduced.

Manufacturers of giant powder, dynamite, hardware, sanitary supplies, and all productions connected with smelters or mines should be represented.

There is also a market for hardware, crockery, glass, plumbers' supplies, machinery, printers' goods, stationery, drugs, leather goods, and harness.

XII.—FATS, OILS, Etc.

Candles and Soap in Cyprus, Diarbekir, and Persia.

Chamber of Com. J., Oct. 1902.

England and France share in the import of candles into Cyprus. France supplies it mostly with perfumery, England sends exclusively soaps of luxury, whilst ordinary soap is mostly imported from Greece. About 200,000 frs. worth is imported annually. The vilayet of Diarbekir imported, in 1900, stearine candles of the value of 18,000 frs., three-fourths of which were supplied by France, and one-fourth by Belgium. A cheap Antwerp brand threatens to gradually oust the French article entirely from the market. Attempts to cover the requirements by the importation of a bad quality from Constantinople have failed. Persia is a remunerative country for selling candles, especially in the interior of the country, where the consumption of petroleum is not yet as general as in the north. According to Persian statistics for 1900–1, candles of the value of 961,755 krâns (5 krâns = 2*s.*) were imported, the greatest portion of which was sent from Russia, England, and Belgium, whilst Austria's share in the importation was only trifling. The Russian candles are sold in packets containing six candles, 27 cm. long, the packet weighing 400 grms., for something less than 1 fr. The Belgium candles are only 20 cm. long, and somewhat cheaper. It is of importance to send candles to Persia in the autumn exclusively, as otherwise the heat melts stearine candles of every sort.

XIII. C.—INDIA-RUBBER, Etc.

Rubber and Mangrove Bark in East Africa.

Foreign Office Annual Series, No. 2903.

Rubber.—The value of rubber exported has fallen, in East Africa, to one-half that of last year, which is due to the fall in price as well as to the Somali rising. Uganda has exported rubber this year for the first time.

Mangrove Bark.—Mangrove bark has been shipped from the Lamu and Malindi districts for the past two years, and has been used in the preparation of a rich purple dye, which has been able to compete with chemical dyes.

XV.—MANURES, Etc.

Phosphates and Fertilisers in South Russia.

Foreign Office Annual Series, No. 2904.

An establishment for the manufacture of superphosphates from coprolites is being built at Schmerinka. The requisite sulphuric acid will have to be brought from Poland. Thomas phosphates are made at Sardana, Mariupol, and Kertch. Next year it is proposed to raise the annual output to 50,000 tons.

The Imperial Minister of Agriculture is taking advice from experts as to the best means of bringing fertilisers into general use, especially in South Russia and the Caucasus.

XVI.—SUGAR, STARCH, Etc.

Maize Starch of British Manufacture; Drawback on Exports of ——.

Customs Gen. Order (*No.* 76 *of* 1902).

Collectors and other officers concerned are informed for guidance that the Board have directed that drawback be

allowed on exported maize starch of British manufacture at the rate of 2¾*d.* per cwt.

"All duly substantiated claims in respect of British manufactured maize starch exported since the 7th May last inclusive will be settled in the usual manner by the Collector, London, at that rate accordingly."

BEET SUGAR PRODUCTION OF EUROPE.

Foreign Office Annual Series, No. 2904.

The following table gives the number of factories in Europe, their production, area under cultivation, yield of roots per acre, &c., for the season of 1901–2.

Country.	Number of Factories.	Area under Cultivation.	Quantity of Roots used.	Quantity of Sugar produced.	Yield of Roots per Acre.	Yield of Sugar per Acre.	Percentage of Sugar to Weight of Beet.
		Acres.	Tons.	Tons.	Cwts.	Cwts.	
Germany	395	1,188,088	15,378,307	1,966,518	258½	33	12·8
France	383	709,302	9,128,748	956,591	257¼	27	11·0
Russia	278	1,394,643	8,170,600	955,930	117	13½	11·5
Austria-Hungary	216	913,390	8,800,431	1,157,328	192¼	25½	12·2
Belgium	107	173,668	2,408,532	287,778	281½	33	12·0
Holland	32	122,139	1,459,081	177,097	239	29¾	12·4
Sweden	17	71,539	861,871	107,491	241½	30	11·7
Denmark	7	37,774	435,855	50,915	230½	27¾	11·0
Total	1,385	4,610,543	46,703,425	5,659,648	..	..	..
„ 1900-1	1,377	4,383,640¾	39,485,477	4,923,360	..	..	..

From the above, it will be seen that, whilst Russia has the largest area under cultivation, she shows the lowest yield of roots per acre, and stands sixth in the percentage of sugar to weight of beet.

The consumption of sugar in Russia keeps steadily increasing, last year showing an increase of 56,451 tons. It now equals 11¼ lb. per head of the population.

XX.—FINE CHEMICALS, Etc.

MORPHIA IMPORT DUTY: PROPOSED PROHIBITION OF IMPORTATION INTO CHINA.

Bd. of Trade J., Oct. 2, 1902.

A duty of three taels (about 7*s.* 9*d.*) per oz. will be levied on morphia from the 31st October next, when the new specific Tariff comes into force, and forward contracts will not be exempted. The treaty recently negotiated contains a clause prohibiting the importation of morphia except for medicinal purposes. This clause will not, however, become operative until the provisions of the Treaty have been agreed to by the other Treaty Powers, and morphia actually shipped before such date will not be affected.

MEDICINES AND THE TAX ON ALCOHOL IN GERMANY.

U.S. Cons. Reps., Sept. 27, 1902.

On October 1, 1902, the law exempting alcohol for medicinal purposes from taxation will be supplemented by an amendment, which requires alcohol for all purposes to pay the same tax. As this law will necessarily tend to make medicines, &c., in the preparation of which a large percentage of alcohol is used, more expensive, and as the different German States have a fixed drug tariff, the German Pharmacist Association is petitioning them to raise the price of all preparations in which alcohol is used, accordingly.

XXII.—EXPLOSIVES, MATCHES, Etc.

EXPLOSIVES IN FRENCH MINES (LOIRE DISTRICT).

Foreign Office Miscellaneous Series, No. 582.

The following table shows the explosives used in French mines:—

Explosive.	St. Etienne Group.		Rive de Gier Group.	
	1900.	1901.	1900.	1901.
	Lb.	Lb.	Lb.	Lb.
Dynamite	63,628	67,654	15,413	4,521
Grisounite and favier powder	49,836	65,301	19,250	11,715
Grisoutine	125,749	131,610	26,422	37,455
Black powder	56,806	42,033	2,695	2,552

The use of black blasting powder is gradually dying out whilst, amongst safety powders, grisoutine is the most favoured. The amount of dynamite employed has also considerably decreased.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journal in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 21,118. Patterson. Pyrometer. Sept. 29.

„ 21,181. Sewell. Evaporating-apparatus. Sept. 29.

„ 21,243. Berry and Smith. Heating- and cooling apparatus. Sept. 30.

„ 21,484. Darling. Calorimeters. Oct. 3.

„ 21,543. Martins. Method for ascertaining the quantity of solid and liquid admixtures of gases and apparatus used for carrying out this method. Oct. 3.

„ 21,642. Boult (Ziegler). Cooling-chambers, &c. Oct. 4.

„ 21,650. Field. Manufacture of acid-proof vessels &c. Oct. 4.

„ 21,718. Boult (Kessler). Centrifugal apparatus Oct. 6.

„ 21,729. Burton. Construction of blow-pipe. Oct. 6

„ 21,782. James. Filter-press.* Oct. 7.

„ 21,986. Mauser. Packing-cases for glass carboys earthenware jars, &c., used for conveying acids volatile liquids, &c.* Oct. 9.

„ 22,016. Reif and Von Reibnitz. Process and apparatus for the manufacture of plastic objects from peat, &c.* Oct. 9.

„ 22,213. Adams. Filter construction, and apparatus connected therewith. Oct. 13.

„ 22,221. Johnson. Heads of casks, vats, &c., for liquids, &c. Oct. 13.

„ 22,226. Saenger. Apparatus for impregnating air with medicinal vapours, &c.* Oct. 13.

[A.] 22,256. Kiefer. Filters.* Oct. 13.
„ 22,323. Griffin. Chemical and physical balances. Oct. 14.
„ 22,362. Gebauer, Gebauer, and Haring. Receptacles for containing or administering volatile liquids.* Oct. 14.
„ 22,363. Garde. Apparatus for measuring the density or specific gravity of gases or vapours. Oct. 14.
„ 22,381. Zechmeister. Process for heating solid bodies for the purpose of drying, distilling, &c. Oct. 14.
„ 22,382. Strehli. Process of producing moulded articles from fibrous material.* Oct. 14.
„ 22,571. Guttmann. Heat-exchanging apparatus.* Oct. 16.
„ 22,664. Laidlaw and Macfarlane. Collapsible screens for separation of centrifugal machine effluents. Oct. 18.

[S.] 22,301 (1901). Schwerin. Apparatus for the extraction of water, &c. from mineral, vegetal, and animal substances. Oct. 8.
„ 9884 (1902). Smith. Filter-presses. Oct. 22.
„ 11,035 (1902). Torkington (Knight). Apparatus for, and method of treating and working, bituminous and other compounds, and articles made therefrom. Oct. 22.
„ 15,783 (1902). Postranecky. Stirring- and mixing-apparatus. Oct. 22.
„ 17,663 (1902). Huillard. Apparatus for drying humid material reduced to grains, &c. Oct. 15. International Application, Feb. 10, 1902.
„ 17,874 (1902). Melotte. Centrifugal separators for liquids. Oct. 15.
„ 18,566 (1902). Baechler. Filtering apparatus. Oct. 15.
„ 19,034 (1902). Von Seemen. Evaporating-apparatus. Oct. 22.

II.—FUEL, GAS, AND LIGHT.

[A.] 21,132. Doman and Streeten. Acetylene generating-apparatus. Sept. 29.
„ 21,133. Doman and Streeten. Acetylene generating-apparatus. Sept. 29.
„ 21,134. Lauder. Burners for acetylene and other illuminating gas. Sept. 29.
„ 21,153. Poetter. Means or apparatus for reversing regenerative furnaces.* Sept. 29.
„ 21,175. Applegarth. Apparatus for assisting combustion and preventing smoke in boiler, &c., furnaces.* Sept. 29.
„ 21,197. Spiel. Burners for liquid fuel. Sept. 29.
„ 21,240. Howorth (Beleuchtungs-Industrie Paul Flor). Incandescence gas-burners. Sept. 29.
„ 21,226. Clark. Acetylene gas-generators. Sept. 30.
„ 21,274. Adam and Adam. Manufacture of incandescent mantles, and burners therefor. Sept. 30.
„ 21,279. Lowden. Manufacture of incandescing electric lamps. Sept. 30.
„ 21,284. Goulton. Economic manufacture of anthracite duff or dust briquettes or the like fuel blocks. Sept. 30
„ 21,322. Herriot. Furnaces for the combustion of pulverulent fuels. Oct. 1.
„ 21,346. Jandus Arc Lamp and Electric Light Co., Ltd., and Jones. Electric-arc lamps. Oct. 1.
„ 21,465. Proskey. Hydrocarbon incandescent lamps.* Oct. 2.

[A.] 21,586. Backeljau. Apparatus for purifying smoke and gas charged with dust, &c.* Oct. 3.
„ 21,587. Ledermüller. Apparatus for carbonising peat.* Oct. 3.
„ 21,611. Garrett (Garrett-Cromwell Eng. Co.). Heating-furnaces. Oct. 4.
„ 21,615. Mitchell. Incandescent smokeless fuel. Oct. 4.
„ 21,631. Longuemare and Longuemare. Carburettors for explosive motors, &c.* Oct. 4.
„ 21,654. Imbert. Heating- and lighting-apparatus. Oct. 4.
„ 21,735. Mackenzie (Eagle Oil-Burner Co.). Oil-burners.* Oct. 6.
„ 21,742. Arter. Electric-arc lamps. Oct. 6.
„ 21,746. Schroeder. Automatic gas-igniters.* Oct. 6.
„ 21,748. Worsley. Arc electric-lamps.* Oct. 6.
„ 21,769. Hookham. Electric incandescent lamps. Oct. 7.
„ 21,778. Paranjape. Means for the consumption of smoke in steam-boiler, &c., furnaces. Oct. 7.
„ 21,815. Stanley. Carburettors for making mixtures of hydrocarbon-vapour and air. Oct. 7.
„ 21,831. Davy. Electric-arc lamps. Oct. 7.
„ 21,861. Worsnop. Mantles for incandescent gas-lighting. Oct. 8.
„ 21,929. Marshall and Kilby. Method of and means for increasing the illuminosity of gas, &c. Oct. 9.
„ 21,964. Walker. Acetylene-generators. Oct. 9.
„ 21,973. Richardson. Means for reducing smoke and economising fuel in steam-boiler, &c., furnaces. Oct. 9.
„ 22,001. Faure. Carburettor for hydrocarbon motors.* Oct. 9.
„ 22,002. West Driving gear of charging and drawing machines for gas-retorts. Oct. 9.
„ 22,040. Chiverton. "Atmospheric" and gas accumulator. Oct. 10.
„ 22,049. O'Sullivan-Beare and Haslam. Process and apparatus for drying and preparing peat for use as fuel, &c. Oct. 10.
„ 22,064. Moir. Arrangement for the application of liquid fuel to furnaces, kilns, &c. Oct. 10.
„ 22,082. Berry. Furnaces and flues of steam-boilers, by which the production of smoke is prevented or reduced. Oct. 10.
„ 20,092. Tully. Apparatus for the manufacture or production of gas for heating and illuminating purposes. Oct. 10.
„ 22,180. Soc. Radignet and Massiot. Electric ignition-devices for gas-burners.* Oct. 11. French Application, Apr. 9, 1902.
„ 22,205. Eccles. Machines for use in the manufacture of fire-lighters, briquettes, &c. Oct. 13.
„ 22,211. Lee and Parkin. Benzolene lamps. Oct. 13.
„ 22,215. Slading. Acetylene gas appliances for illuminating and igniting purposes. Oct. 13.
„ 22,224. Boult (Flora). Incandescent burners for oil-burning lamps.* Oct. 13.
„ 22,228. Hawes and Farrington. Device for intensifying the light of incandescent vapour or gas illumination. Oct. 13.
„ 22,241. Reynolds (Hofmann). Means or apparatus for automatically preventing the escape of gases when stoking gas-producers. Oct. 13.
„ 22,242. Trasenster. Gas-valves for regenerative furnaces, &c.* Oct. 13.
„ 22,282. Fowler and Medley. Apparatus for cleansing gas from gas-producers, blast-furnaces, and coke-ovens. Oct. 14.
„ 22,325. Davison. Acetylene-generators for motor, &c. lamps. Oct. 14.

[A.] 22,364. Garde. Apparatus for carburetting air. Oct. 14.

„ 22,388. Clay (Holbrook). Manufacture of briquettes of fuel. Oct. 14.

„ 22,425. Sutton. Apparatus for carburetting in gas or explosive vapour engines. Oct. 15.

„ 22,457. Belin. Flame-burners. Oct. 15.

„ 22,509. Heenan and Leask. Destructors or furnaces for burning refuse, &c. Oct. 16.

„ 22,517. Wallis and Leading Light Syndicate, Ltd. Means for regulating the supply of water to carbide chambers of acetylene gas-generators. Oct. 16.

„ 22,520. Kent. Apparatus for the direct conversion of hydrocarbon vapours and combustible gases mixed with air into heat. Oct. 16.

„ 22,524. Duclos. Charon's carbonising process.* Oct. 16.

„ 22,532. Rooney. Incandescent electric-lamps.* Oct. 16.

„ 22,538. Meeker. Eureka blast oil-burner.* Oct. 16.

„ 22,561. Orvis. Means for consuming smoke in steam-generator furnaces.* Oct. 16.

„ 22,593. Wild and Wild. Steam-generator furnaces. Oct. 17.

„ 22,648. Von Anrep. Process and apparatus for disintegrating peat.* Oct. 17.

„ 22,679. Huppenbauer. Process and apparatus for manufacturing combustibles. Oct. 18.

„ 22,690. The Fietz (Preliminary) Syndicate, Ltd., and Grist. Mixtures and apparatus for carburetting air for lighting, heating, motive, &c., purposes. Oct. 18.

„ 22,698. Watson. Acetylene-generators. Oct. 18.

„ 22,699. Lessing and Wolff. Process for spraying glowing liquid blast-furnace cinder, and apparatus to be used in connection therewith. Oct. 18.

„ 22,701. Guldlin. Devices for feeding air and steam to furnaces. Oct. 18.

„ 22,704. Hellmann. Bunsen-burners with mantles hanging downwards. Oct. 18.

[C.S.] 13,736. (1901). Watson. Furnaces for the destruction of town refuse. Oct. 15.

„ 20,063 (1901). Locke. Construction of high-power oxyhydrogen mixed gas-jets. Oct. 15.

„ 20,747 (1901). Boult (Plaissetty). Manufacture of incandescent filaments and mantles. Oct. 22.

„ 21,685 (1901). Gearing. Manufacture of steam-boiler furnaces, &c. Oct. 22.

„ 21,151 (1901). Lake and Elliott. Self-generating vapour-burners or lamps. Oct. 8.

„ 21,472 (1901). Kitson. Vapour-burning apparatus. Oct. 22.

„ 21,764 (1901). Kitson. Vapour-burning apparatus. Oct. 15.

„ 22,016 (1901). Crossley and Atkinson. Gas-producers. Oct. 15.

„ 22,595 (1901). Edmondson. Apparatus for testing the quality of gases as fuel in internal combustion engines. Oct. 15.

„ 22,891 (1901). Drake. Regenerative and other furnaces and kilns. Oct. 15.

„ 23,038 (1901). Branson. Electric-arc lamps. Oct. 8.

„ 23,214 (1901). Siemens Bros. and Co., Ltd. (Siemens and Halske Akt.-Ges.) Manufacture of a material for incandescent electric-lamp filaments. Oct. 22.

„ 23,459 (1901). Kitson. Vapour-burning apparatus. Oct. 22.

„ 23,816 (1901). Graetz. Oil-burners for lighting and heating purposes. Oct. 8.

„ 24,023 (1901). Cousin. Smoke-consuming furnaces. Oct. 15

[C.S.] 24,247 (1901). Clifford. Kilns, furnaces, &c., for firing, burning, and drying various goods. Oct. 15.

„ 24,276 (1901). Jandus Arc Lamp and Electric Co., Ltd., and Jones. Electric-arc lamps. Oct. 8.

„ 24,532 (1901). Dunne. Method for the manufacture of fire-lighters from peat. Oct. 15.

„ 24,986 (1901). Blake (Hardt). Incandescent gas-burner. Oct. 15.

„ 25,519 (1901). Faller. Methods for consuming smoke, and apparatus therefor. Oct. 15.

„ 25,616 (1901). Helbing. Process of manufacture of peat briquettes. Oct. 8.

„ 2001 (1902). McNally. Appliances or chambers for purifying acetylene or other gas. Oct. 22.

„ 5084 (1902). Meenen. Incandescent lamp for use with vaporised or gasified liquid fuel. Oct. 8.

„ 7471 (1902). Watson and Watson. Furnaces for forced draught, and ventilating apparatus to be used in connection therewith. Oct. 22.

„ 7884 (1902). Coulson. Manufacture of artificial fuel. Oct. 22.

„ 11,059 (1902). Lake (Rheinisch-Westfälische Maschinenbau-Anstalt and Eisengieserei G. m. b. H. Abteilung Metallwarenfabr. Buchum). Miners' lamps. Oct. 8.

„ 11,076 (1902). British Thomson-Houston Co., Ltd. (Rice). Electric-arc lamps. Oct. 8.

„ 11,705 (1902). Wilson and Heist. Vapour-burners for heating purposes. Oct. 22.

„ 13,086 (1902). Russell and Clausen. Gas arc-lamps. Oct. 8. International Application, June 28, 1901.

„ 14,527 (1902). Trautmann. Smoke-consuming devices for furnaces, &c. Oct. 8.

„ 15,261 (1902). Bullier and Maquenne. *See under* VII.

„ 15,262 (1902). Bullier and Maquenne. System of apparatus for the purification of acetylene and other gases containing solid or vesicular particles in suspension. Oct. 22. International Application, July 12, 1901.

„ 15,528 (1902). Montupet. Furnaces for heating asphalt, &c. Oct. 8.

„ 15,691 (1902). Laurenius. Charcoal retorts and furnaces. Oct. 15.

„ 15,731 (1902). Stefan and Schönfelder. Gas-burner Oct. 15.

„ 16,027 (1902). Stoelet. Manufacture of block-fuel Oct. 15.

„ 16,613 (1902). Bottomley. Means for consuming smoke in furnaces. Oct. 22.

„ 17,201 (1902). Arnott and Arnott Light and Burner Co. Hydrocarbon vapour-burners. Oct. 15.

„ 17,213 (1902). Brookes (Deutsche-Luxemburgische Bergwerks and Hütten Akt.-Ges.). Means or apparatus for purifying blast-furnace gases. Oct. 8

„ 17,603 (1902). Bousfield (Finke). Manufacture o mantles for incandescence lighting. Oct. 15.

„ 18,234 (1902). Stillman. Hydrocarbon lamp. Oct. 8

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 21,145. Wetter (Rütgerswerk-Akt.-Ges.). Deodorisation of tar- and mineral-oils. Sept. 29.

„ 21,546. Curric. *See under* XXII.

„ 21,548. Wetter (Rütgerswerk-Akt.-Ges.). Process for deodorising tars and mineral oils. Oct. 3.

[C.S.] 11,035 (1902). Torkington (Knight). *See under* I.

„ 15,528 (1902). Montupet. *See under* II.

V.—COLOURING MATTERS AND DYESTUFFS.

[A.] 21,193. Ellis (Soc. Chim. des Usines du Rhône, anciennement Gilliard, P. Monnet, and Cartier). Treatment of indigo. Sept. 29.

„ 22,078. Read Holliday and Sons, Ltd., Turner, Dean, and Turner. Manufacture of yellow to orange nitro-colouring matters. Oct. 10.

„ 22,534. Read Holliday and Sons, Ltd., Turner, Dean, and Turner. Manufacture of intermediate compounds, and colouring matters therefrom containing sulphur. Oct. 16.

[S.] 20,201 (1901). Wise (Iljinskij and R. Wedekind und Co.). Manufacture of flavo-purpurine. Oct. 15

„ 21,879 (1901). Johnson (Kalle and Co.). Manufacture and production of black colouring matters containing sulphur. Oct. 8.

„ 22,128 (1901). Newton (Farbenfabr. vorm. F. Bayer und Co.). Manufacture and production of new derivatives of the anthraquinone series. Oct. 8.

„ 22,222 (1901). Johnson (Kalle and Co.). Manufacture and production of brown dyes containing sulphur. Oct. 8.

„ 22,306 (1901). Ransford (Cassella and Co.). Manufacture of dyestuffs. Oct. 8.

„ 22,583 (1901). Newton (Farbenfabr. vorm. F. Bayer und Co.). Manufacture or production of anthraquinone derivatives. Oct. 8.

„ 22,733 (1901). Imray (Farbwerke, Höchst). Manufacture of phenylglycine, its homologues, and salts thereof. Oct. 8.

„ 22,762 (1901). Johnson (Bad. Anilin und Soda Fabr.). Manufacture of colouring matters of the anthracene series. Oct. 15.

„ 22,838 (1901). Newton (Farbenfabr. vorm. F. Bayer und Co.). Manufacture or production of derivatives of the anthracene series. Oct. 22.

„ 25,697 (1901). Johnson (Bad. Anilin und Soda Fabr.). Manufacture of new substantive colouring matter containing sulphur, and material for use therein. Oct. 15.

25,809 (1901). Johnson (Bad. Anilin und Soda Fabr.). Manufacture and production of new colouring matters containing sulphur. Oct. 8.

26,058 (1901). Imray (Farbwerke, Höchst). Manufacture of indoxyl. Oct. 22.

26,448 (1901). Shillito (Aniline Colour and Extract Works, formerly J. R. Geigy and Co.). Sulphur dyestuff. Oct. 22.

V.—TEXTILES: COTTON, WOOL, SILK, ETC.

.] 21,440. Southwood. Manufacture of surfaces for, and apparatus used in, cylinder-printing on textile and like fabrics. Oct. 2.

21,847. Downham. Mercerising cloth. Oct. 8.

21,848. Burghardt and Reid. Process or processes for decreasing the inflammability of cotton fibres and fabrics. Oct. 8.

„ 21,915. Ellis (Kron). Manufacture from short-fibre asbestos, cellulose, &c., of rolls capable of being drawn off in strips suitable for spinning, twisting, &c. Oct. 8.

22,000. Rolland. Dyeing, washing, and bleaching of textile materials. Oct. 9.

22,095. Carmichael, Carmichael, and Carmichael. Processes for dyeing and finishing.* Oct. 10.

22,235. Hahn. Machine for mercerising yarn in the form of skeins.* Oct. 13.

[A.] 22,285. Brandwood. Perforated skewers for use in dyeing. Oct. 14.

„ 22,382. Strehli. *See under* I.

„ 22,468. Walker. Apparatus for treating flax, &c.* Oct. 15.

„ 22,605. Sutherland. Method of degumming or cleansing stalk and leaf fibres. Oct. 17.

„ 22,682. Markus and Barnwell Machine Co., Ltd. Manufacture of fabrics faced or coated with finely comminuted materials. Oct. 18.

[C.S.] 19,912 (1901). Ashwell. Treatmeat or finishing of yarn. Oct. 8.

„ 6664 (1902). Lake (Fries). Machines for steaming, oxidising, drying, or otherwise treating yarns, fabrics, &c., specially applicable for use in connection with dyeing apparatus. Oct. 15.

„ 11,878 (1902). Fredenburgh. Machines for dyeing, sizing, &c., thread. Oct. 22.

„ 12,042 (1902). Woodhead and Orr. Treatment of ramie and other fibrous substances. Oct. 15.

„ 12,603 (1902). Behnisch. Process and machine for shrinking woven fabrics. Oct. 8.

„ 14,675 (1902). Klauder. Apparatus for mercerising and treating fibres, &c. Oct. 22.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[C.S.] 14,685 (1902). Pfister. Staining of wood. Oct. 15.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 21,120. Pictet and Pictet Syndicate, Ltd. Method of and apparatus for the production of liquid air. Sept. 29.

„ 21,218. Hargreaves. Storing and transporting chlorine. Sept. 30.

„ 21,242. Hughes. Apparatus for producing oxygen gas.* Sept. 30.

„ 21,828. Pauling. Process for the manufacture of nitric dioxide and nitric acid.* Oct. 7.

„ 21,832. Marsball. Apparatus for producing ozone. Oct. 7.

„ 22,099. Stanley. Apparatus for the preparation of nitrates, &c. Oct. 10.

„ 22,100. Stanley. Crystallisation of nitrates, &c. Oct. 10.

„ 22,135. Gilmour. *See under* XI.

„ 22,527. Brindley. Manufacture of oxide of iron. Oct. 16.

[C.S.] 19,374 (1901). Hartridge. Chemical fire-engines, and analogous fire-extinguishing appliances. Oct. 8.

„ 19,902 (1901). Wenmaekers. Manufacture of sulphuric acid. Oct. 15.

„ 19,919 (1901). Lange. Receptacles for compressed or liquid gases. Oct. 8.

„ 14,386 (1902). Lederlin. *See under* XI.

„ 15,261 (1902). Bullier and Maquenne. Solid compound containing alkaline hypochlorite, and the various applications thereof, particularly for the purification of acetylene and other gases. Oct. 15. International Application. July 9, 1901.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 21,272. Moore. Manufacture of glass receptacles. Sept. 30.

„ 22,243. Newton (Sievert). Glass vessels.* Oct. 13.

„ 22,500. Mellowes. Roof-glazing. Oct. 16.

„ 22,650. Degeus. Process for or method of embossing glass. Oct. 17.

[C.S.] 21,331 (1901). Pfister. Manufacture of cloisonné mosaics and windows. Oct. 15.
„ 24,247 (1901). Clifford. *See under* II.
„ 16,675 (1902). Haley. Moulds for manufacturing glassware. Oct. 22.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 21,283. Goulton. Economic manufacture of bricks, &c. Sept. 30.
„ 21,386. Michell. Manufacture of non-conducting coverings, blocks, &c., suitable for covering steam-pipes, &c., and for other purposes. Oct. 1.
„ 21,387. Michell. Manufacture of non-conducting coverings, blocks, &c., suitable for covering steam-pipes, &c., and for other purposes. Oct. 1.
„ 21,446. Harnett. Manufacture of artificial grinding stones. Oct. 2.
„ 21,480. Alexander. Kilns or ovens for burning cement, &c. Oct. 2.
„ 21,540. Silley. Renewable fire-clay bridge-block. Oct. 3.
„ 21,606. Brooke. Damp-proof blocks, &c. Oct. 4.
„ 21,646. Ringel. Manufacture of embossed material, applicable for decorating walls, &c.* Oct. 4.
„ 21,795. Wallis. Machinery for the manufacture of artificial stone goods, such as flags, paving-stones, &c. Oct. 7.
„ 21,915. Ellis (Kron). *See under* V.
„ 22,005. Curry. Manufacture of refractory bricks. Oct. 9.
„ 22,291. Vaesen. Production of refractory materials, artificial stone, &c. Oct. 14.
„ 22,480. Kalweit. Building blocks.* Oct. 15.
„ 22,555. McDougall. Electric insulating material. Oct. 16.
„ 22,556. McDougall. Electric insulating fabrics. Oct. 16.
„ 22,625. Collinson. Building-bricks. Oct. 17.
„ 22,717. Putnam. Admixture or composition to be mixed with or applied to cements, &c. Oct. 18.
„ 22,723. Belt. Machine for fire-proofing paper, &c. Oct. 18.
„ 22,734. Bamber. Manufacture of Portland cement, and apparatus therefor. Oct. 18.
„ 22,735. Bamber. Manufacture of Portland cement. Oct. 18.
„ 22,736. Bamber. Manufacture of Portland cement, and apparatus therefor. Oct. 18.

[C.S.] 19,474 (1901). Croizier and Thomine. Compounding of artificial stone. Oct. 8.
„ 20,447 (1901). Thompson (Croizier et Cie.). Apparatus for hardening bricks, tiles, &c. Oct. 22.
„ 22,796 (1901). Jackson. Rotary kilns. Oct. 22.
„ 23,962 (1901). Burghardt, Hall, and Jones. Tiles, &c. for walls, &c., for use in the construction or decoration of buildings generally. Oct. 8.
„ 24,247 (1901). Clifford. *See under* II.
„ 24,393 (1901). Sangwin. Manufacture of artificial stone. Oct. 22.
„ 24,580 (1901). Wilkinson. Manufacture of materials for pavements. Oct. 15.
„ 25,118 (1901). Aslatt. Compositions or covering material for steam-generators, boilers, &c., to prevent or reduce radiation of heat. Oct. 15.

X.—METALLURGY.

[A.] 21,323. Moorhouse. Gold extractor and concentrator. Oct. 1.
„ 21,334. Boor and Muir. Precipitating gold from solutions containing it. Oct. 1.
[A.] 21,391. Conein. Process of treating mattes and raw metals in reverberatory furnaces. Oct. 1.
„ 21,449. Riemer. Process and apparatus for preventing the formation of blow-holes or cavities in steel and other metal castings.* Oct. 2.
„ 21,552. Lennox. Method for the preparation of copper and its alloys for casting. Oct. 3.
„ 21,621. Schürmann. Figured bar-iron. Oct. 4.
„ 21,693. Bradley and Mone. Process for the manufacture of all kinds of steel from cast pig or ferro ore. Oct. 6.
„ 21,750. Knoth. Manufacture of steel.* Oct. 6.
„ 21,807. Westinghouse (Knox). Linings of vessels for metallurgical work. Oct. 7.
„ 21,829. Surzycki. Smelting furnaces for the continuous production of steel. Oct. 7.
„ 21,880. Rouse. Method of consolidating iron-sand into lumps for reduction in furnaces. Oct. 8.
„ 22,004. Willans and Robinson, Ltd., and Eaton Shore. Method of casting metals. Oct. 9.
„ 22,225. Burton and Hartley. Manufacture of steel. Oct. 13.
„ 22,294. Jensen (Goldschmidt and Mathesius). Process of manufacturing homogeneous metal castings. Oct. 14.
„ 22,302. Mayer. Grinding mill or machinery apparatus for crushing, grinding, or washing brass foundry ashes, slag, &c., metal dross, metal ores, &c., also applicable as a mortar for crushing, &c., other suitable materials. Oct. 14.
„ 22,392. Martino. *See under* XX.
„ 22,594. Wimbury. Process of and means for easing ingots of steel, &c. Oct. 17.
„ 22,752. Kjarsgaard and Pedersen. Tinning of cast iron. Oct. 18.

[C.S.] 13,115 (1901). Fyfe. Apparatus for producing and depositing fumes from ores. Oct. 8.
„ 20,077 (1901). Sebillot. Process for the treatment of copper ores for the recovery of the metal. Oct. 15.
„ 22,387 (1901). Rey and Gregory (Wessell). Refining of spelter. Oct. 15.
„ 22,554 (1901). Lorrain (Thomson). Process of making alloys. Oct. 15.
„ 23,790 (1901). Lamberton. Crushing and amalgamating machinery for the reduction of quartz, and the recovery therefrom of the precious metals, and the grinding or pulverising of other materials. Oct. 22.
„ 24,026 (1901). Mumford. Method of and apparatus for the recovery of precious metals from ores and slimes. Oct. 8.
„ 5796 (1902). White. Manufacture of steel. Oct. 22.
„ 12,516 (1902). Huxley. Furnaces for annealing metal, &c. Oct. 8.
„ 16,274 (1902). Shadforth. Furnace for use in fusing or otherwise treating metals, minerals, &c., where high temperatures are required. Oct. 15.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 21,201. Adam (Engelmann). Process and apparatus for the manufacture of accumulator-plates. Sept. 29.
„ 21,846. Bate. Apparatus for electro-deposition of metals on small articles. Oct. 8.
„ 21,901. Schmitt and Fabre. Electric-accumulators. Oct. 8.
„ 22,057. Marsden. Wind or water motors, and accumulators for use therewith. Oct. 10.

[A.] 22,135. Gilmour. Electrolytic decomposition of alkaline chlorides. Oct. 11.
" 22,426. Bley. Galvanic double battery. Oct 15.
[C.S.] 26,237 (1901). Blanc. Accumulators or secondary batteries. Oct. 22.
" 5209 (1902). King. Magnetic ore separators. Oct. 15.
" 14,386 (1902). Lederlin. Electrolytic manufacture of chlorates and perchlorates. Oct. 15. International Application, Jan. 8, 1902.

XII.—FATS, OILS, AND SOAP.

[A.] 21,162. Nairn. Apparatus for the manufacture of mosaic linoleum floor-cloth, &c. Sept. 29.
" 21,190. Peryer. Composition for cleaning smooth surfaces and such as are varnished.* Sept. 29.
" 21,408. Wilding and Stott. Product for cleansing or renovating the polished or varnished surfaces of wood, &c. Oct. 2.
" 21,546. Currie. *See under* XXII.
" 21,662. Baleke. *See under* XVIII. B.
" 21,678. Greer. Filters or strainers of petrol, oil, &c. Oct. 6.
" 21,899. Heitz and Hazard. Method of and apparatus for storing toilet-soap. Oct. 8.
22,111. Counstein. *See under* XX.
" 22,118. Blake. Soap. Oct. 10.
22,427. Gill. Emulsion for softening paints or varnishes, &c., prior to their removal from woodwork, &c. Oct. 15.
" 22,576. Wirt. *See under* XVIII. B.
[C.S.] 14,098 (1901). Lilley and Bentote. Night-lights, &c. Oct. 22.
17,988 (1901). Weygang. Treatment of oils, fats, and other saponaceous materials. Oct. 15.
20,976 (1901). Yates and Yates. Pumps for lubricants and other liquids. Oct. 15.
22,315 (1901). Pepler. Candle-moulding machines. Oct. 22.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 21,441. Heatley. Coating of metal and other surfaces to protect them from atmospheric and other influences, and apparatus therefor. Oct. 2.
21,692. Hatmaker (Ruston). Casein coating and paint compositions. Oct. 6.
22,663. Oliphant and Elworthy. Process and apparatus for the manufacture of white lead. Oct. 18.
[C.] 24,815 (1901). Cranstone. Mill for grinding paint, &c. Oct. 22.

B.—Resins, Varnishes.

[A.] 21,546. Currie. *See under* XXII.

C.—India-rubber, &c.

[A.] 22,618. Raper. Method of impressing designs on india-rubber.* Oct. 17.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 22,729. Marter, Hanbury, and Gardner. Manufacture of improved products for use in lieu of leather, raw hide, ivory, &c., in the manufacture of various articles. Oct. 18.
22,738. Chemische Dungerfabr. Vogtmann und Cie., G. m. b. H., and Weiss. Process for the manufacture of glue and gelatin from leather and leather waste.* Oct. 18.
[C.S.] 19,249 (1901). Gautier. Manufacture of artificial leather. Oct. 8.
[C.S.] 16,710 (1902). Schmalfuss. Process of manufacturing adhesive mediums. Oct. 15.
" 18,042 (1902). Hilbert. Manufacture of gelatine and glue from bones. Oct. 15.

XV.—MANURES.

[A.] 22,101. Mülertz. *See under* XVIII. B.
[C.S.] 63. (1902). Schulte-Steinberg. Manufacture of Thomas powder from Thomas slag. Oct. 8.

XVI.—SUGAR, STARCH, GUM, ETC.

[A.] 21,146. Wetter (Weinrich). Purification and preservation of raw sugar. Sept. 29.
" 21,454. Lagrange. Process for the extraction and instantaneous crystallisation of sugar from any syrup, in free air and by refrigeration, in sugar factories and refineries.* Oct. 2.
" 22,537. Duryea. Process of producing maltose syrups and sugars.* Oct. 16.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 21,271. Ramsey. Distillation and purification of alcoholic liquids. Sept. 30.
" 21,351. Sleeman. Treatment of grain for the production of malt. Oct. 1.
" 21,479. Adam (Broux and Godin). Decantation, aëration, and refrigeration of beer, &c. Oct. 2.
" 21,643. Lapp. Fermentation of beer.* Oct. 4.
" 21,721. Lapp. Process for manufacturing mash from malt.* Oct. 6.
" 21,731. Lapp. Brewing.* Oct. 6.
" 21,749. Lapp. Malting.* Oct. 6.
" 21,839. Meacock. Means for discharging the contents of mash-tubs, &c. Oct. 7.
" 22,307. Haskin. Method of ageing or maturing spirits and wine. Oct. 14.
[C.S.] 16,523 (1902). Nicholas and Evans. Preparation of bottled malt liquors, cyder, perry, and wines and spirits. Oct. 15.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 21,194. Hudson. Reduction of grain products. Sept. 29.
" 21,230. Allison (Trescott). Curing food products.* Sept. 30.
" 21,293. Davidson. Fish-food preparation. Sept. 30.
" 21,294. Sandmann and Eichelbaum. Preservation of fruit juices, &c. Sept. 30.
" 21,383. Potter. Animal food, and process or method of preparing the same. Oct. 1.
" 21,416. Mullins. Process for rendering more digestible cereals and leguminous substances for feeding horses, &c. Oct. 2.
" 21,510. Vogtherr. Process of and apparatus for testing butter. Oct. 3.
" 21,617. Hatmaker (Just). Drying and preserving milk. Oct. 4.
" 21,770. Pedersen. Cream-separators. Oct. 7.
" 21,804. Smith. Means for packing and preserving eggs. Oct. 7.
" 21,877. Barrath. Manufacture of plate- or block-ice.* Oct. 8.

[A.] 21,878. Hatmaker. Process of making macaroni and other foods containing casein. Oct. 8.

„ 22,162. Shouten and Spencer. Process for preserving milk, cream, &c., and means and appliances therefor. Oct. 11.

[C.S.] 14,340 (1902). Baker. Processes for preserving food. Oct. 22.

„ 14,341 (1902). Baker. Processes for preserving food. Oct. 22.

„ 15,640 (1902). Davidson, Rowley, and Runwick. Apparatus applicable for separating and treating grain products, and for scouring grain. Oct. 15.

B.—Sanitation; Water Purification.

[A.] 21,297. Crosfield and Markel. Treating sewage and manufacturing refuse-liquor containing organic matter. Sept. 30.

„ 21,662. Balcke. Apparatus for separating oil and other constituents from waste steam. Oct. 4.

„ 22,094. Loock. Process for the sterilisation of fluids.* Oct. 10.

„ 22,101. Mülertz. Manufacture of meal or powder for use as sewage, manure, &c. Oct. 10.

„ 22,389. Maignen. Water-purifying apparatus. Oct. 14.

„ 22,390. Lowe. Composition for removing or preventing incrustations in steam-generators, and for cleaning liquor-pumps and connections, &c. Oct. 14.

„ 22,416. Watson and Billetop. Filters, especially low-pressure feed-water filters, &c. Oct. 15.

„ 22,576. Wirt. Feed-water heaters, purifiers, condensers, and oil-separators. Oct. 16.

[C.S.] 17,581 (1901). Lowe. Sewage, &c., filters. Oct. 8.

„ 21,316 (1901). Malabar. Purification of sewage, &c. Oct. 22.

„ 21,746 (1901). Putzeys. Means of and apparatus for purifying water. Oct. 8.

„ 23,907 (1901). Macauley. Method of forming combined wood and metal channels for the distribution of sewage or sewage-effluents over the surface of filter-beds, and regulating the levels of the same. Oct. 8.

„ 12,788 (1902). Kaysser. Method for sterilising and maintaining sterilised drinking-water. Oct. 8.

„ 12,635 (1902). Mountaoy and Farnsworth. Apparatus or means for distributing sewage. Oct. 15.

„ 18,948 (1902). Ham. Valves or gates for sewers, bacteria or filter-beds, &c. Oct. 22.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 21,306. Walmsley and Co., Ltd., and Walmsley. "Strainers" of paper-making machines. Oct. 1.

„ 21,582. Lake (Marshall). Pulp-beating machines.* Oct. 3.

„ 21,915. Ellis (Kron). *See under* V.

„ 22,089. Pope and Mullen. Beating-engines for use in the manufacture of paper.* Oct. 10.

„ 22,478. Balston and Briggs. Treatment of cellulose material, and the manufacture of articles therefrom. Oct. 15.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 21,904. Dunbar. Serum, and the method of preparing the same. Oct. 8.

„ 21,985. Tallqvist. Means for determining the proportion of hæmoglobin in blood.* Oct. 9.

„ 22,096. Behrens, jun. Manufacture of concentrate acetic acid.* Oct. 10.

„ 22,111. Connstein. Process for the decomposition of esters of fatty acids. Oct. 10.

„ 22,254. Finkler. Extraction of albumin from substances containing the same. Oct. 13.

„ 22,353. Lake (Kämpff). Serum, and method producing the same. Oct. 14.

„ 22,392. Martino. Treatment of metallic compound of cyanogen. Oct. 14.

„ 22,710. Carpenter. Manufacture of sulphocyanide of calcium.* Oct. 18.

[C.S.] 25,706 (1901). Newton (Farbenfabr. vorm. F. Bayer und Co.). Manufacture and production of pharmaceutical compounds. Oct. 22.

„ 16,855 (1902). Hanssen. Process for producing medicinal preparations of hæmoglobin. Oct. 22.

XXI.—PHOTOGRAPHY.

[A.] 21,512. Grün. Method of taking three-colour photographic negatives without the use of extraneous colour-screens. Oct. 3.

„ 21,537. Archer. Surfaces for receiving photographic prints.* Oct. 3.

[C.S.] 20,164 (1901). Askham. Printing photographs by artificial light. Oct. 15.

„ 22,727 (1901). Newton (Farbenfabr. vorm. F. Bayer und Co.). Manufacture or production of photographic plates and papers. Oct. 22.

„ 17,485 (1902). Boult (Miley Colour Photograph Co.). Colour photographs, and method of making the same. Oct. 15.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 21,171. Hough. Explosives.* Sept. 29.

„ 21,189. Poetter. Manufacture of a safety explosive or blasting substance.* Sept. 29.

„ 21,546. Currie. Manufacture of matches and tapers covered with wax, paraffin, stearin, resinous gums, &c. Oct. 3.

„ 22,540. Weston. Explosive or blasting-powder. Oct. 16.

„ 22,645. Schachtebeck. Manufacture of safety-explosives.* Oct. 17.

„ 22,665. Walker. Appliances for extracting matches from dipping-frames. Oct. 18.

[C.S.] 21,621 (1901). Safety Explosives, Ltd., and Thiem. Explosives. Oct. 8.

„ 22,965 (1901). Cocking and Kynoch, Ltd. Explosives. Oct. 22.

„ 24,917 (1901). Greenwood and Breakspear. Machinery for loading cartridge-cases with cordite or other stranded explosive compound. Oct. 15.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 12.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 21.—Vol. XXI. NOVEMBER 15, 1902. No. 21.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D, LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Prof. Marston T. Bogert, A.B., Ph.B.	J. M. C. Paton.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	Dr. F. B. Power.
Dr. John Clark.	Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Prof. G. G. Henderson, D.Sc.	Dr. Boverton Redwood.
E. Grant Hooper.	Dr. Jos. W. Swan, F.R.S.
Dr. R. Messel.	Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.	David Howard.
Eustace Carey.	Dr. J. Lewkowitsch.
Dr. Edw. Divers, F.R.S.	N. H. Martin.
Thos. Fairley.	Prof. E. J. Mills, D.Sc., F.R.S.
Dr. J. Grossmann.	Max Muspratt.
Prof. W. R. E. Hodgkinson, Ph.D.	Frank Scudder.

Sectional Chairmen and Secretaries.

	CANADIAN.
W. W. R. Lang.	Alfred Burton.
	LIVERPOOL.
H. Tate.	Dr. T. Lewis Bailey.
	LONDON.
Walter F. Reid.	A. R. Ling.
	MANCHESTER.
Ivan Levinstein.	J. Carter Bell.
	NEWCASTLE.
W. L. Rennoldson.	F. C. Garrett.
	NEW YORK.
H. V. Coblentz.	Dr. H. Schweitzer.
	NOTTINGHAM.
Arthur Scholefield.	J. T. Wood.
	SCOTTISH.
T. Patterson.	Dr. Thos. Gray.
	YORKSHIRE.
J. E. Bedford.	Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.	Charles A. Kohn, M.Sc., Ph.D.
G. Beilby.	J. Lewkowitsch, Ph.D.
J. Carter Bell.	A. R. Ling.
Joseph Bernays, M.I.C.E.	W. Macnab.
H. Brunner.	N. H. Martin.
Edw. Divers, M.D., D.Sc., F.R.S.	Ludwig Mond, Ph.D., F.R.S.
Sir John Evans, K.C.B., F.R.S.	B. E. R. Newlands.
A. G. Green.	John Pattinson.
Samuel Hall.	F. B. Power, Ph.D.
Otto Hehner.	Prof. H. R. Procter.
John Heron.	Boverton Redwood, D.Sc.
D. B. Hewitt, M.D.	Walter F. Reid.
E. Grant Hooper.	John Spiller.
David Howard.	W. S. Squire, Ph.D.
Prof. A. K. Huntington.	Thomas Tyrer.
Wm. Kellner, Ph.D.	

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I.	N. H. J. Miller, Ph.D. .... XV.
L. Archbutt ..... I., XII.	C. A. Mitchell, B.A. ..... XII., XXII.
J. L. Baker ..... XVI., XVII.	A. More ..... VII., XVIII.
H. Ballantyne ..... II., XII.	G. T. Morgan, D.Sc. ... IV., V.
D. Bendix ..... III.	J. G. Parker, Ph.D. ..... XIV.
E. Bentz ..... IV., V., VI.	H. T. Pentermann ..... XVI., XVII.
J. O. Braithwaite ..... XX.	H. S. L. Polak .... Patent List.
J. F. Briggs .... XVI., XVII., XIX., XX.	T. H. Pope ... XVI., XX., XXI.
J. H. Collins ..... X.	F. W. Renaut ..... Index.
C. F. Cross ..... V., XII., XIX.	G. H. Robertson ..... XI.
B. F. Davis .... X., XI., XVI., XVII.	Chas. Salter .. II., III., XVI., XVII.
J. T. Dunn, D.Sc. .... VII., X.	M. J. Salter ..... XIII.
Walter C. Hancock, B.A. ..... VIII., IX.	R. Sandon ..... II.
J. W. Hinchley. I., VIII., IX., X., XXI.	J. Shields, D.Sc., Ph.D. ... XI.
R. L. Jenks ..... XIII. C., XIV., XIX.	A. Shonk ..... Gen. Chem.
M. C. Lamb ..... VI., XIV.	W. P. Skertchley .... XII., XVIII.
T. A. Lawson, Ph.D. .. IV., XX.	E. Sonstadt, III., VII., X., XV.
F. H. Leeds ..... II., III., XIII., XXI.	E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.	Charles T. Tyrer ..... XX.
J. McCrae, Ph.D. ..... IV.	L. J. de Whalley, B.Sc. .XVI.
G. W. MacDonald, M.Sc. . XXII.	A. Wingham ..... X.
W. G. McMillan X., XI., XIV., XXII.	Joseph T. Wood ..... XIV.

Notices.

SUBSCRIPTIONS FOR 1903.

Foreign and Colonial Members are reminded that the subscription of 25*s.* for 1903, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1903.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of next year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows:—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products:—
Subsection A.—Organic Preparations, including Tar Products.
Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsengesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hold their respective annual meetings for 1903 in connection with the Congress.

An executive local committee will make arrangements for the entertainment of visitors during their stay.

As formal invitations should go out, at the latest, this autumn, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

All communications and questions, so far as they cannot be answered by the various organising committees, should be addressed to the Secretary of the Congress, Dr. G. Pulvermacher, Charlottenburg, Marchstrasse No. 21. The formation of organising committees is already in progress in England, Belgium, France, Italy, Portugal, Switzerland, Servia, and Turkey.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to produce a reliable technical dictionary in three languages —English, French, and German—and has asked this Society to furnish the names of such scientific and industrial men as are willing to supply the technical expressions of their own special branches of industry. The assistance to be rendered must be gratuitous, as otherwise the expense would be prohibitive; but no money is asked for by the German Society, though it has already spent considerable sums upon the work, and has provided an editor, Dr. Hubert Jansen, of Berlin, with a staff, to collate the materials supplied.

The Council of this Society agreed to co-operate in the work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, Kohn, Messel, Redwood, and Squire, and Messrs. Beilby, Hehner, Newlands, Reid, and Watson Smith to decide upon the form of co-operation. It has been determined to select one or more representatives for each class of the Journal and Patent Literature; and the committee now asks for volunteers to undertake a class or division of a class. To those who intimate their wish to help, full particulars of the plan of the work, with instructions how to proceed, will be sent. Offers of co-operation should be addressed to the General Secretary.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Ablett, A. W., l/o Salvador; Box 1180, Johannesburg Transvaal.

Ashley, Harrison E., l/o West Wareham; Box 291 Leetonia, Ohio, U.S.A., Metallurgical Chemist.

Brown, Wm., l/o Urmston; 293, Great Clowes Street Higher Broughton, Manchester.

Colquhoun, W., l/o Grove Road; Plas Penyddol, Bersham near Wrexham.

Eckel, E. C., l/o Albany; U.S. Geological Survey, Washington, D.C., U.S.A.

Ekenberg, Dr. M., l/o Göthenburg; Stockholm, Sweden.

Gill, J. Arthur, l/o Stratford; Glencoe, Meadow Road Rusthall, Tunbridge Wells.

Hambuechen, Carl, l/o Lake Street; 113, West Gorham Street, Madison, Wis., U.S.A.

Holden, G. H., l/o Chorlton; Manchester Oxide Co., Ltd. Canal Street, Miles Platting, Manchester.

Huffmann, L., l/o King Street West; 46–48, Adelaide Street West, Toronto, Canada.

Jones, Chas. H.; communications, as before, to Minas de Rio Tinto, Spain.

Laing, Wm., l/o The Exchange; 22, Edmund Street, Bradford, Yorks.

Lecomber, W. G., l/o Brooklands; Beech House, Ashton Grove, Ashton-on-Mersey, Cheshire.

Lee, Waldemar, l/o Passaic; Palmerton, Pa., U.S.A.

McCrae, Dr. J., l/o Glasgow; East London Technical College, People's Palace, Mile End Road, London, E.

McMurtrie, Dr. Wm., l/o West 81st Street; 440, West End Avenue, New York City, U.S.A.

Meldrum, And. N.; l/o Liverpool; 92, Bonnymuir Place Aberdeen.

Mürch, D. Wilshin, l/o Lostock Gralam; 6, Victoria Road Wednesbury, Staffs.

ilhashy, Benj. M., l/o Sycamore Street; 1325, Lincoln Avenue, Walnut Hills, Cincinnati, Ohio, U.S.A., Chemist (Pure Culture Yeast Co.).

orter, A. F., l/o Pompton Lakes; Haskell, N.J., U.S.A.

ratt, W. E., l/o Regent Street; 17, East Road, Lancaster.

nders, Warren W., l/o Greenwood Avenue; Victor Chemical Works, Chicago Heights, Ill., U.S.A.

ales, F. Shillington, l/o Sunderland; "Jersey," St. Barnabas Road, Cambridge.

hwarz, Dr. H. P., l/o New York City; c/o Western Sugar Refining Co., Potrero, San Francisco, Cal., U.S.A.

ead, J. C.; all communications to 42, Grove Green Road, Leytonstone, London, N.E.

eel, Thos., l/o Greenock; c/o Colonial Sugar Refining Co., O'Connell Street, Sydney, N.S.W.

abbs, A. J., l/o Calle de Carranza; 50, Calle de Ferraz, Madrid, Spain.

omson, Allen B., l/o Ealing Dean; c/o Spencer, Chapman, and Messel, Ltd., Silvertown, London, E.

rieg, Wm. C., l/o California; 154, Charles Street, Boston, Mass., U.S.A.

allerstein, Dr. M., l/o Worth Street; 105, East 91st Street, New York City, U.S.A.

ebb, Jno. F., l/o Queen Victoria Street; 20, Lonvaine Road, St. John's Hill, Clapham Junction, S.W.

illcox, F. A., l/o The Oaks West; 18, Holmlands Park, Sunderland.

tton, T., l/o Bethnal Green; Fen Villa, Queen's Road, Loughton, Essex.

ung, A. H. I. (of Chester); Journals to Kapaunenstrasse 24, Greifswald, Pomerania, Germany.

ung, Jas. S., l/o Nicaragua; Capellitas Copper Co., Pilciao, Prov. de Catamarca, Argentine Republic.

Deaths.

ys, Z. J., Stonehouse, Barrhead, N.B.

lar, W. Cross, l/o Tarkwa, Gold Coast, West Africa.

Newcastle Section.

Session 1902—1903.

r. 27, 1902.—Mr. S. Hoare Collins. "Sugar in Turnips." Part II.

Nottingham Section.

Session 1902—1903.

. 26, 1902.—Mr. H. S. Garry. "Factory Costs" (illustrated by diagrams).

Obituary.

JOHN HALL GLADSTONE, D.Sc., Ph.D., F.R.S.

Member of the Society of Chemical Industry.

John Hall Gladstone was born in London in the year 1827. He studied chemistry under Thos. Graham at University College, London, and under Liebig at Giessen, and soon began to distinguish himself by his investigations in the borderland between physics and chemistry. His first paper was published in 1845, and was entitled "Contributions to the Chemical History of Gun-Cotton and Xyloidine." How early Gladstone made his mark may be inferred from the fact that he became a Fellow of the Royal Society in 1853. He served on the Council of this Society in the years 1863—1864, and again in 1866—1868. He was an original member of the Society of Chemical Industry.

Gladstone became a Fellow of the Chemical Society in 1848, and was elected a member of Council four years later. From 1850 to 1852 he was Lecturer in Chemistry at St. Thomas's Hospital, and in 1874 he was appointed Fullerian Professor of Chemistry at the Royal Institution.

Dr. Gladstone made an early and suggestive investigation of the solar spectrum, demonstrating the fact that the spectra of the Fraunhofer lines varied at sunset and at sunrise from those observed at midday, and showed that a large number of the absorption lines must originate in the earth's atmosphere. But his greatest merit undoubtedly lies in his optical researches on the atomic refractions and dispersions of the elements. He was one of the founders of Physical Chemistry; indeed, it is to him that we owe our conception of molecular refraction. For his optical and electrical researches, &c., he received, in 1897, the Davy medal of the Royal Society. Amongst his less known work, his investigations in connection with early metallurgical history offer much interest. For example, he showed that the use of bronze in Egypt dated as far back as 3700 B.C., and that not only was this alloy used, but that it was of a type common to much later periods, the ratio of copper to tin being as 9 to 1. His scientific knowledge was on several occasions placed at the disposal of the country, *e.g.*, when he was a member of the Royal Commission on Lights, Buoys, and Beacons (1859 to 1862), and, a little later, of the Gun-Cotton Committee, appointed by the War Office (1864—1868). Dr. Gladstone was the first President of the Physical Society, in 1874, President of the Chemical Society from 1877 to 1879, and he was one of the six past Presidents of the Chemical Society, with a membership of over 50 years, in whose honour a banquet was given in 1898. He took a keen interest in philanthropic and educational movements, and for the long period of 21 years, beginning in 1873, he rendered good service to the ratepayers of London as a member of the London School Board. His death took place on October 6.

The following is the high testimony of a contemporary:—"Few men have been so faithful throughout a long life to high ideals, and have at the same time so effectively promoted the welfare of humanity."

Journal and Patent Literature.

ass.	Page.
I.—General Plant, Apparatus, and Machinery	1322
II.—Fuel, Gas, and Light	1322
II.—Destructive Distillation, Tar Products, Petroleum	1326
IV.—Colouring Matters and Dyestuffs	1326
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1328
VI.—Colouring Wood, Paper, Leather, &c.	1329
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1329
VIII.—Glass, Pottery, and Enamels	1330
IX.—Building Materials, Clays, Mortars, and Cements	1331
X.—Metallurgy	1331

Class.	Page.
XI.—Electro-Chemistry and Electro-Metallurgy	1334
XII.—Fats, Fatty Oils, and Soap	1336
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1337
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1338
XV.—Manures, &c.	1338
XVI.—Sugar, Starch, Gum, &c.	1339
XVII.—Brewing, Wines, Spirits, &c.	1340
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1344
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1345
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1345
XXI.—Photography	1348
XXII.—Explosives, Matches, &c.	1349
XXIII.—Analytical Chemistry	1349
XXIV.—Scientific and Technical Notes	1352

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Gases; Receptacles for Compressed or Liquefied ——. A. Lange, Berlin, Germany. Eng. Pat. 19,919, Oct. 5, 1901.

THE receptacles are provided with safety devices, wherein the inner orifice of a passage leading from the interior of the receptacle to the open air is closed by a capsule, which, when the pressure in the receptacle becomes excessive, will collapse and rupture, and thus provide an exit for the gas. A resisting part having a sharp edge may be provided to facilitate the rupture of the capsule.—R. A.

Gases; Centrifugal Apparatus for Purifying ——. H. A. Humphrey, Northwich. Eng. Pat. 22,131, Nov. 2, 1901.

A CENTRIFUGAL apparatus in which water and the gases to be purified are brought into repeated or prolonged contact. A casing is divided into two chambers, one of which contains a centrifugal fan, while the other contains guide blades forming channels between the periphery and the intake of the fan chamber. The gas enters the fan along with a water-spray, and is hurled against the interior of the casing, whereupon much of both water and gas are led back to the intake of the fan, some of the washed gas always passing forward out of the apparatus. If it be desired not to deliver the washed gas under pressure, a turbine is arranged on the shaft that carries the fan, and the pressure of the gas passing through the turbine is utilised to assist in driving the fan. To purify the gas systematically, it is passed through a series of fans, each delivering into the next, while water passes through the series in the opposite direction.—H. B.

Aërating Liquids; Means for ——. J. Gwynne and E. W. Sargeant, London. Eng. Pat. 22,666, Nov. 9, 1901.

"THE combination of a centrifugal pump, a tank containing liquid, a perforated delivery pipe arranged below the level of the liquid in the tank, a suction pipe connected to the bottom of the tank, and a device fitted in the suction pipe and comprising a liquid-inlet nozzle and a surrounding combining nozzle, both nozzles being separated by an intervening air-inlet passage communicating with the atmosphere through a cock," by which arrangement the liquid is maintained in continuous flow from the bottom of the tank, through the aërating device and pump, to the perforated horizontal tube immersed in the upper portion of the liquid.—E. S.

Purifier; Liquid ——. C. C. Clark, H. G. Bleakly, and J. G. Carson, Philadelphia, Penn. Eng. Pat. 14,644, July 1, 1902.

THE invention consists of a horizontal cylindrical vessel provided with tubes and arrangements for removing impurities in suspension in the liquid, for electrolysing the liquid, for getting rid of floating matter, &c.; the arrangement may be used as a feed-water heater, when the internal tubes are supplied with exhaust steam and the feed-water circulates outside.—J. W. H.

Boiling, Evaporating, and Distilling Apparatus. H. Untiedt, Bavaria. Eng. Pat. 5015, Feb. 27, 1902.

THE apparatus consists of a horizontal cylinder with two steam jackets, one for the vapour space and one for the liquid, each having separate regulating valves. An agitator revolves on a horizontal axis and facilitates the evolution of gas; the agitator may be a pipe worm supplied with steam from the hollow rotating shaft.—J. W. H.

UNITED STATES PATENTS.

Washing Gases; Apparatus for ——. E. Theisen, Baden, Germany. U.S. Pat. 704,593, July 15, 1902.

A HORIZONTALLY-arranged stationary casing, having openings in its lower part, dips into a liquid-container. Within the casing is a rotary horizontally-arranged cylinder furnished with blades on its exterior. The gases to be washed are passed between the casing and the cylinder and meet with the washing liquid, which is discharged by spraying devices located at different points lengthwise of the cylinder.—R. S.

Vapour Generation; Process of ——. A. Scharffe, Tientsin, China. U.S. Pat. 705,306, July 22, 1902.

A HIGH-boiling liquid is heated to a temperature somewhat below its boiling point, and then mixed with a small quantity of another liquid having a boiling point below the temperature to which the first has been raised. The mixing takes place immediately before the liquids enter a motor. The low-boiling liquid is vaporised, and operates the motor by the pressure generated. The high-boiling liquid is then returned and reheated for use again.—R. S.

Liquefying Air or other Gases; Process of ——, *and Cooling by Means thereof.* J. F. Place, Glenridge, N.J. U.S. Pat. 707,633, Aug. 26, 1902.

A SUPPLY of dry, cold gas, evaporating from an initial charge of liquid air or other liquefied gas, is delivered to the space to be cooled, and, on being allowed to escape therefrom, is employed in successive counter-currents to cool compressed air or gas, which is successively liquefied and delivered to the liquid charge, thus continuously replenishing the latter and continuously supplying dry, cold evaporated gas to the counter-currents and the space to be cooled. A hygroscopic substance, preferably calcium chloride, is employed to absorb the moisture from the compressed air or gas during the process of cooling it.—R. A.

Liquid Air or other Liquid Gases; Vessel for Holding and Shipping ——. J. F. Place, Glenridge, N.J., U.S. U.S. Pat. 707,634, Aug. 26, 1902.

THE bottle or vessel is provided with an impervious casing and lining, and a vacuum chamber or space is formed between the casing (of material of low heat-conductivity) and the bottle, or between the casing and lining.—R. A.

II.—FUEL, GAS, AND LIGHT.

Alcohol denatured with Benzene; Colouring of ——. Zeits. f. Spiritusind., 1902, **25**, [42], 450.

IN 1899 the German Government allowed alcohol to be denatured with a mixture of 2 per cent. of benzene and $1\frac{1}{4}$ per cent. of the ordinary denaturing agent instead of $2\frac{1}{2}$ per cent. of the latter. As spirit thus denatured is only suitable for motors, and not for domestic purposes, it was found advisable to distinguish it from the ordinary denatured product by giving it a bluish tint. It has therefore been enacted (Sept. 1902) that there shall also be an addition of 0·25 litre of a solution of Crystal Violet

00 litres of the alcohol. This Crystal Violet solution is to onsist of 0·4 grm. of Hexamethylpararosaniline dissolved a litre of spirit containing at least 85·6 per cent. of cohol by weight. On evaporating 100 c.c. of the solution 100° C. the residue should not be more than 45 mgrms. or less than 40 mgrms. The solution must also remain ear on dilution with water to 400 times its volume. he dyestuff is stated to impart a pronounced bluish tint solutions containing only 1 part in 1,000,000.—C. A. M.

English Patents.

oal- or the like Fuel-Cakes; Manufacturing ——. H. Schild, Rendsburg, Germany. Eng. Pat. 23,260, Nov. 18, 1901.

ROUND coal or the like is mixed with the viscous liquid btained by introducing oxygen or air into the lye from e sulphite cellulose manufacture, and the mixture is oulded into briquettes, which are heated gradually to 0°—450° C.—H. B.

uel, Artificial; Apparatus for Use in the Manufacture of ——. The Star Patent Fuel Co., Ltd., and T. E. Heath, Cardiff. Eng. Pat. 23,945, Nov. 25, 1901.

MALL coal of different kinds, contained in separate hoppers, ch of which can be independently controlled by means of sliding door, is discharged in the desired proportions into receptacle, from which an elevator conveys the mixture a disintegrator. Into the same disintegrator crushed ch is delivered in the desired proportion by an elevator om a separate hopper, the discharge of which can be ntrolled by a sliding door. The mixture is then conveyed a series of closed horizontal cylinders, within which are volving stirrers; hot gases from a furnace are fed, or ced by steam injectors, through the cylinders, and any latilised matters are caught by the cold mixture entering upper cylinders. The heated mixture drops down a osed shoot from the lower cylinders into an elevator, ich conveys it to the fuel press.—H. B.

ineral, Vegetal, and Animal Substances [Peat, &c.]; Apparatus for the Extraction of Water and other Fluid from ——. G. B. Schwerin. Eng. Pat. 22,301, Nov. 5, 1901.

See under XI. A., *page* 1335.

Peat Briquettes; Manufacture of ——. E. Helbing, Hamburg. Eng. Pat. 25,616, Dec. 14, 1901.

E U.S. Pat. 700,421; this Journal, 1902, 851.—H. B.

mbustion of Coals and Preventing Black Smoke Issuing therefrom; Composition for Promoting the ——. H. J. nd H. W. McBride, Belfast. Eng. Pat. 17,776, Aug. 13, 1902.

MMON salt, 14 cwt.; hydrated sulphate of lime, 2½ cwt.; l ground coke or coal, 3½ cwt., are mixed together. out 28 lb. of this composition are sprinkled over each of coal, which is then douched with water and allowed staud for at least two hours before being burned.—H. B.

s; Manufacture of ——, *and Apparatus employed in uch Manufacture.* C. H. Schill, Hyde. Eng. Pat. 2,349, Nov. 6, 1901.

PROVEMENTS on Lane's Eng. Pat. 17,762 of 1900 (this rnal, 1901, 1101). The gas leaving the generating ut is led into a gas-holder large enough to contain the gas produced in one cycle of operations, and the end of the "make," it is forced back through the ndescent fuel in the generator, and thence to the main -holder. In this way condensable hydrocarbon vapours ich may be present in the gas are converted into manent gases.—H. B.

etylene Gas-producing Apparatus. B. Guigue, Storrington, Sussex. From A. Borrelly, Tarascon-sur-Rhône, France. Eng. Pat. 8779, April 15, 1902.

automatic carbide-feed apparatus of the central hopper e, in which the hopper is carried by the rising holder bell. The charging aperture of the hopper is closed by means of a cock having a large plug in which several cavities are provided, these cavities being in such positions that small portions of carbide can be introduced from an open funnel on the top, into the hopper, by revolving the plug, without setting up any communication between the hopper and the outer air. The feed is effected by a movable mushroom-valve of the usual pattern. The water of the holder seal is separate from that used for decomposition —F. H. L.

Incandescent Lamp for Use with Vaporised or Gasified Liquid Fuel. A. Meenen, Berlin. Eng. Pat. 5084, Feb. 28, 1902.

A SUSPENDED lamp for use, preferably, with spirit, having a horizontal vaporising tube, provided with perforated metal wings, arranged in the lower part of a draught chimney of comparatively large dimensions.—H. B.

United States Patents.

Fuel, Artificial; Process of Manufacturing ——. [*Firelighters.*] C. J. Holmes, San Francisco. U.S. Pat. 710,580, Oct. 7, 1902.

DRIED, granulated, combustible substances, such as coal, wood, &c., are saturated in the cold with a liquid hydrocarbon. A fusible, combustible substance, such as resin, is melted and added to the mixture, contained in a closed vessel, and, after thorough mixing, the product is cast or pressed into blocks, briquettes, &c.—H. B.

Fuel Briquette; Artificial ——. W. A. Könemau, Assignor to International Fuel Co., Chicago. U.S. Pat. 711,166, Oct. 14, 1902.

BONES and cartilaginous butchers'-waste are treated with steam under pressure, and the crude glutinous extract, after separation of the grease, is mixed with finely-divided carbonaceous material. The mixture is then moulded into briquettes, and dried. The agglutinating material may be rendered insoluble by treating it with chlorine gas and sulphate of iron.—H. B.

Fuel; Artificial ——. W. A. Köneman, Assignor to International Fuel Co., Chicago. U.S. Pat. 711,167, Oct. 14, 1902.

NON-COKING coal, such as anthracite, and coking coal are ground together, mixed with an agglutinating material, and formed into briquettes. The agglutinating material serves to bind the particles together until they are entangled and held together by the coke formed from the coking coal during the initial combustion. As a binding material, the insoluble glutinous substance mentioned in the preceding abstract is preferred.—H. B.

Combustible from Petroleum, Sulphuric Acid, and Lime; Process of Manufacturing a Solid ——. J. C. Berntrop and M. L. Q. van L. Hulsebosch, Amsterdam. U.S. Pat. 711,380, Oct. 14, 1902.

ROSIN is dissolved in warmed crude petroleum, "enough sulphuric acid to decompose the rosin" is added, and the whole is heated to boiling. The blackened plastic mass is then mixed vigorously with moist slaked lime, and is made into briquettes, either with or without the addition of peat or coal.—H. B.

Coke Oven; Retort ——. J. F. Wilcox and D. E. Wagener Assignors to Retort Coke Oven Co., Cleveland, Ohio. U.S. Pat. 711,268, Oct. 14, 1902.

A RETORT coke oven, heated by gas in the presence of heated air, in which the flues for the intake of the hot air and for leading off the products of combustion are arranged across the top of the oven, and the combustion chambers are placed near the upper part of the oven, so that the expansion due to heat in the flues and chambers may take place without injury to the retorts or their substructure.—H. B.

Retort Gas-Furnace. F. Bredel, Milwaukee, Wis. U.S. Pat. 704,504, July 15, 1902.

The furnace is flanked on each side with a regenerator or recuperator, while above it are arranged nine retorts in three vertical sets of three each. On the under side of the outer two of the lowest retorts are fitted protecting blocks. There are three supplies of air: the primary air supply is delivered to the space below the fire grate, the secondary air supply is delivered to ducts opposite to the gas outlets from the furnace, so as to complete the combustion of these gases, and the third or auxiliary supply enters through ducts situated beneath the blocks supporting the retorts, and is intended to keep these blocks cool.—R. S.

Bunsen Burner. W. Kappel, Berlin. U.S. Pat. 706,830, Aug. 12, 1902.

See Eng. Pat. 18,260; this Journal, 1902, 331.—R. S.

Furnace. J. Reagan, Philadelphia. U.S. Pat. 707,157, Aug. 19, 1902.

To take air from the ash-pit or the outside of the furnace to any desired part, and to enable the air passages to be kept clear, hollow blocks are provided which may be removed and replaced either singly or in quantity without interfering with the operation of the furnace. Each block has a vertically-disposed tapering passage extending through its body, with an opening at the upper end, and an inclined outlet to deliver air into the combustion space above the fire.—R. S.

Furnace. J. Reagan, Philadelphia. U.S. Pat. 707,158, Aug. 19, 1902.

Blocks similar to those described in the preceding abstract are employed for introducing superheated steam and highly-heated air to furnaces.—R. S.

Oven or Furnace. J. W. Lewellen, Philadelphia. U.S. Pat. 710,284, Sept. 30, 1902.

A furnace having a combustion chamber divided in two by a wedge-shaped partition, a receptacle in which to burn oil at the bottom of the chamber, and lateral passages in the walls of the combustion chamber to admit air by natural draught to the flame.—H. B.

Burner; Bunsen ——. W. Kappel, Berlin. U.S. Pat. 706,830, Aug. 12, 1902.

See Eng. Pat. 18,260; this Journal, 1902, 331.—R. S.

Burner; Oil ——. S. M. Trapp, San Diego, Cal. U.S. Pat. 709,941, Sept. 30, 1902.

Two branches of an air- and steam-supply pipe are bent so as to discharge directly towards each other. In the mouths of the branches are arranged shelves, over which oil flows. The two currents of mixed steam, air, and oil are ignited, and are driven against each other so as to produce an intense heat at a point midway between the mouths of the two branches.—H. B.

Burner; [Oil-] ——. J. L. Jones, jun., Dallas, Texas. U.S. Pat. 710,276, Sept. 30, 1902.

An atomising burner for use in boilers, &c., comprising a conical funnel directed horizontally into the combustion chamber; a steam-nozzle projecting into the small end of the funnel; an air-inlet in the wall of the funnel; an oil-nozzle projecting through the wall of the funnel from above; a steam-jacketed oil-supply pipe, having a small hole for the admission of steam to the interior of the pipe; and pipes connecting the steam-jacket with the steam-nozzle and with the steam space of the boiler.—H. B.

Burner; Crude-Oil ——. J. B. Seeger, Dallas, Texas. U.S. Pat. 710,718, Oct. 7, 1902.

Crude oil is fed into a chamber, whence it is carried forward by a blast of steam through a revolving fan-wheel into a spherical atomising chamber. A narrow neck, containing a ball-shaped spreader, connects the atomising chamber with a crescent-shaped mixing chamber, having converging outlet-jets for the mixture of oil and steam. An air-box extends transversely through the mixing chamber, its mouth opening in the same direction as the outlet jets, and the suction caused by the steam and oil, issuing from the latter, draws in air to be mingled with the mixture.—H. B.

Gas-Filter. B. W. Harris, Waveland, Ind. U.S. Pat. 707,774, Aug. 26, 1902.

The filter consists of two short pipes arranged in the pipe-line of the gas, with a central plug cutting off direct communication between the two portions. Surrounding these pipes is a casing having a number of horizontal annular partitions carrying the filtering material, such as cotton. The gas enters one pipe, passes through perforations to the outer casing, and, after passing upwards through the filtering material, re-enters the pipe line through perforations in the other pipe.—R. S.

Gas and Air Mixer. S. Broiehgans, Assignor to the Perfect Gas Machine Co., Milwaukee, Wis. U.S. Pat. 708,308, Sept. 2, 1902.

An apparatus for mixing air with the gas or vapour from gasolene, for the production of gas of uniform candle-power. Within a casing provided with inlet pipes for air and for gasolene vapour, and an outlet pipe for the gaseous mixture, is a suspended float, pivotally attached to a lever the free end of which is connected to a valve on the air-inlet pipe. While vapour of the "desired richness" is passing through the apparatus, the air valve remains closed but if the density increases, the float rises, causing the lever to rise and lift the air-valve, admitting sufficient air to reduce the density of the gaseous mixture to the extent required.—H. B.

Carburetter. E. Bouchaud-Praceiq, Angoulême, France. U.S. 709,866, Sept. 30, 1902.

A carburetting vessel is filled with absorbent material saturated with hydrocarbon, but pervious to air. Down the centre of the vessel passes a very long outlet-cock consisting of two concentric tubes, the outer one being stationary and having a slot throughout its length in the form of a helix of one turn, and the inner one, which forms the rotating plug, having a vertical slot. The crossing of the helicoidal slot with the straight slot determines the level of the opening between the interior of the carburetter and the hollow rotatable plug, and by turning the latter, the height of the opening can be varied. Air entering the carburetter flows down through the absorbent material, and the carburetted air leaves the apparatus through the hollow plug, the depth of absorbent material through which the air passes being determined by the position of the plug.—H. B.

Acetylene Gas Generator. G. G. Smith, Florence, Italy. U.S. Pat. reissue No. 12,041, Sept. 30, 1902; original No. 660,169, Oct. 23, 1900.

See Eng. Pats. 23,309, 1899, and 12,240, 1900; this Journal, 1900, 137 and 1001.—F. H. L.

Acetylene Gas Generator. J. Ledru, Basècles, Belgium. U.S. Pat. 710,159, Sept. 30, 1902.

An automatic water-to-carbide apparatus working on the flooded-compartment system. The water used for decomposition is stored in a vessel bolted to the side of the holder tank and immediately over the carbide container. When the bell falls to a certain position, a needle-valve in the pipe communicating with the carbide container is opened, and water flows into the bottom of the container in quantity sufficient to attack the carbide held in two or three of the superposed trays. Automatic clutch gear is fitted to the lever rising from the bell, so that while the holder is free to rise or fall to its full extent, the valve is only moved sufficient distance to open or close the water inlet.—F. H.

Acetylene Gas Lamp. A. K. Miller, New York. U.S. Pat. 710,203, Sept. 30, 1902.

An automatic water-to-carbide apparatus intended primarily for vehicular purposes. The generator consists of a pair of tall cylindrical vessels, one containing a cartridge of carbide, and the other water. They are connected at the top and bottom, the lower connection serving to lead water to the carbide, and the upper to introduce gas into the upper part of the water store, which acts as a holder. The cock on the water-inlet and a gas cock on the tube leading to the burner are joined together so that one movement operates both. The water is made to saturate an annular jacket of porous fibrous material, from the inner wet surface of which it penetrates to the carbide. Traps are fitted in the water cylinder to prevent trouble if the apparatus is accidentally inverted.—F. H. L.

Acetylene Gas Lamp. A. K. Miller, Waterbury, Conn. U.S. Pat. 710,204, Sept. 30, 1902.

An automatic two-cylinder apparatus for portable work, generally resembling that described in the previous specification. The same cock which governs the water supply and regulates the consumption of gas has a long tapering plug held against its seat by means of a spring. The thin end of the plug extends into the gas leading tube so that the acetylene presses against it; if, then, the pressure in the apparatus rises undesirably, the plug is forced away from its seat, and gas escapes into the air.—F. H. L.

Acetylene Gas Generator. C. W. Beck, New York, and W. G. Homan, Meriden, Conn., Assignors to E. Miller and Co., Meriden, and The Acetylene Generator Manufacturing Co. of West Virginia, New York. U.S. Pat. 710,559, Oct. 7, 1902.

A carbide-feed table lamp, in which the feed is governed by the gas pressure. The lamp is outwardly the same in shape as a petroleum lamp, the stand being the carbide holder, and the upper hemispherical portion the water reservoir. Concentrically within the latter is a horizontally disposed collapsible chamber, which is contracted in size by the action of a coiled spring, but expanded by the gas rising from the decomposing vessel. The movable part of the chamber carries a vertical rod with a conical valve at its lower extremity, and this, descending as the chamber collapses, opens the carbide feed. The chamber communicates with the burner through a flexible pipe and a needle valve, which is operated by hand through a horizontal spindle. This latter carries a cam and lever, so that when gas is shut off, the movable side of the collapsible chamber is held up, and the carbide feed valve is kept shut.—F. H. L.

Acetylene Gas Generator. W. J. Loyer, San Marcos, Texas. U.S. Pat. 710,874, Oct. 7, 1902.

A carbide-feed apparatus of the central hopper type, with the hopper carried by the bell. Below the mouth of the hopper is a hanging open-ended conical tube, which dips below the water in the generator. This is connected with the rest of the storage space by means of a pipe bearing a cock, so that, on closing the cock, gas cannot escape when the hopper is being refilled. The feed is effected by a mushroom valve supported on a vertical stem, which is arrested in its downward motion by touching a carbide distributing plate when the bell descends. The distributing plate can be given a lateral movement by a hand-worked lever in order to agitate the decomposing carbide.—F. H. L.

Acetylene Gas Generator. P. P. and J. J. Reynolds, Laporte, Texas. U.S. Pat. 711,346, Oct. 14, 1902.

A carbide-feed apparatus of the central hopper type, in which the carbide container is carried by the rising bell. The mouth of the hopper is closed by a cylindrical plunger, which is lifted off its seat as the bell falls. The water used for decomposition is distinct from that employed for sealing the bell, a float working in a lateral tube serving to show the quantity of liquid in the apparatus.—F. H. L.

Lamp; Carburetting [Incandescence] ——. G. Wedderburn, Dunn Loring, Va. U.S. Pat. 707,190, Aug. 19, 1902.

An incandescence lamp (*e.g.*, for street lighting) wherein air is drawn, by the draught, over gasolene contained in the lamp-base, and the combustible mixture rises, without further access of air, through a tube to the burner top, the latter being enclosed in a globe which is closed at all points except the outlet end of the chimney.—H. B.

Lamp; Incandescent Oil ——. E. E. Flora, Assignor to T. J. Lovett, Chicago. U.S. Pat. 711,153, Oct. 14, 1902.

An incandescence oil lamp of the circular-wick type, in which the central air current issues through perforations in a tubular extension of the inner wick tube, which rises above the top of the wick; and the air, mingled with the vapour distilled from the wick, passes through a perforated tubular burner-top surrounding the wick tubes, and burns beneath a mantle. Additional air supplies enter the burner tube through perforations in its lower part, and an upward current of air is directed into the mantle by means of a conical hood loosely surrounding the burner-top.—H. B.

Lamp; Mercury-Vapour ——. [*Vacuum Jacket.*] H. N. Potter, Assignor to G. Westinghouse, both of Pittsburg, Pa. U.S. Pat. 707,975, Aug. 26, 1902.

All the luminous effects of a gas or vapour rendered and maintained incandescent by the electric current, may be utilised by shutting off the current from the central portion of the gas or vapour, and confining its action to a path in the form of an annulus surrounding it. The apparatus is described in the patent, the abstract of which follows; this patent forms a division of the present one.—G. H. R.

Lamp; Mercury-Vapour ——. [*Vacuum Jacket.*] H. N. Potter, Assignor to G. Westinghouse, both of Pittsburg, Pa. U.S. Pat. 707,976, Aug. 26, 1902.

The gas or vapour electric lamp consists of a tube containing a material or materials (mercury vapour) to be rendered incandescent, and at one end of it is a cooling chamber which has a narrowed extension, at the mouth of which one of the electrodes is located. The tube is surrounded for the remainder of its length by a vacuum chamber, in which is a heater, the operation of which is automatically interrupted by the lighting current. It is stated that "experience has shown that the efficiency of lamps of this class depends largely on the ratio of the cross sectional area of the path of the electric current to the surface of the tube in which the mercury vapour is hermetically enclosed."—G. H. R.

Incandescent Electric Lamps of Relatively Low Voltage; Method of Exhausting ——. S. E. Doane, Marlboro, Mass., Assignor to the Bryan-Marsh Co., New York. U.S. Pat. 710,099, Sept. 30, 1902.

The process consists in first exhausting the lamp by a vacuum pump; second, generating a gas within the bulb (*e.g.*, by means of amorphous phosphorus); third, passing an electric current through the filament to heat it to incandescence; and finally, passing an additional current of higher voltage directly through the gases in the vacuous space (by means of a third leading-in wire), so as to effect an electro-chemical action for the dissipation of the gas. —H. B.

Incandescent Electric Lamps; Method of Exhausting ——. S. E. Doane, Marlboro, Mass., Assignor to the Bryan-Marsh Co., New York. U.S. Pat. 710,186, Sept. 30, 1902.

An electric lamp of relatively low voltage is exhausted by first withdrawing the air through a tube common to it and to a lamp of high voltage; second, forcing a gas into both lamps for the purpose of further perfecting the vacuum by electro-chemical means; and third, heating the filaments of both lamps by currents of low and high voltage respectively, until the required degree of exhaustion is attained. Though the voltage in the first lamp is insufficient to effect the electro-chemical change, the reaction takes place, producing

a vacuum in the high-voltage lamp, whereby the gas is withdrawn from the low-voltage lamp through the tube connecting the two bulbs.—H. B.

Mantle for Incandescent Gas Lamps. O. Kaufmann, Assignor to D. Ottensoser, New York. U.S. Pat. 708,812, Sept. 9, 1902.

A DOUBLE mantle, consisting of one mantle inserted within another.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum Oil Field; The Beaumont (Texas) ——. R. T. Hill. J. Franklin Inst., **154**, [4], 263—281. (See this Journal, 1902, 1228.)

THE oil is closely associated with certain anticlinal or quaquaversal mounds, and hot water and beds of sulphur are said to underlie the oil in places. From these considerations and the fact that the temperature of 110° C. was exhibited by the oil in the original Lucas well, the author considers it probable that the oil was not formed *in situ*, but has been transported by hydrostatic pressure, along lines of structural weakness, from greater depths, until it encountered the impenetrable strata now capping the oil pools at Spindle Top Hill and other oil centres in this district, the underlying deposits of salt and dolomite having been crystallised from saturated solution in the said water.—C. S.

ENGLISH PATENT.

Asphalt: Production of Artificial ——. R. Hermes, Guben, Germany. Eng. Pat. 10,423, May 6, 1902.

A MIXTURE of 11 parts, by weight, of tar and two parts of resin, is melted, and, after the addition of one part of sulphur, is heated beyond the melting point of the latter ingredient. Combination occurs, and when the mass has become thick and brown, 11 parts of powdered lime are added. The resulting product forms a brown transparent resinous mass, insoluble in water, and suitable for replacing asphalt.—C. S.

UNITED STATES PATENT.

Ammonia Still. G. Stroh, Assignor to G. Osius, Detroit, Mich. U.S. Pat. 710,221, Sept. 30, 1902.

THE still-column, adapted for continuous working, contains a number of superimposed circular pans, of which the upper portions are so constructed that ascending gases are forced to traverse the liquor in each; and the lower portions so as to form the sides of the upper part of a well containing milk of lime, with which the descending liquor, deprived above of free ammonia, mingles. Steam is injected into the well, liberating ammonia from the liquor and heating the column, which remains comparatively cool at the top, into which a continuous stream of fresh liquor flows as the spent liquor is discharged. The ammoniacal vapours pass from the top of the column into a condenser, about midway in the coil of which communication is made with a pipe, passing downwards and then upwards to form a water seal, and entering the column at a certain distance from the top, discharging into it the cool liquid (containing ammonia) from the condenser. Thus, the discharge from the bottom of the condenser is obtained of high strength.—E. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Dibenzylideneacetone and Triphenylmethane. A. Baeyer and V. Villiger. Ber., 1902, **35**, 3013—3033.

TRIPHENYLMETHANE and tri-*p*-anisylmethane, when pure, do not exhibit the phenomenon of haloehromism, the colorations produced by dissolving these compounds in concentrated sulphuric acid being due to the presence of small quantities of the corresponding carbinol derivative. Triphenylcarbinol, when dissolved in glacial acetic acid, forms coloured salts with the strong mineral acids, and this basic character is considerably enhanced by introducing methoxyl (OCH_3) radicles into the phenyl nuclei. The salts of triphenylcarbinol and its methoxyl derivatives, however, readily undergo hydrolytic dissociation, and are decomposed even in glacial acetic acid when these solutions are treated with dilute alcohol. The relative strengths of the carbinol bases were determined by measuring the amount of 75 per cent. alcohol required to destroy the colour of their sulphates in glacial acetic acid solutions of equivalent concentrations. The relative avidities of triphenylcarbinol, *p*-anisyldiphenylcarbinol, di-*p*-anisylphenylcarbinol, tri-*p*-anisylcarbinol, tri-*o*-anisylcarbinol, *p*-anisyldi-*o*-anisylcarbinol, and tri-*m*-anisylcarbinol are expressed by the following ratio:—1 : 6.3 : 34.0 : 286 : 7.6 : 27.3 : 1.7. The introduction of three methoxyl radicles into para-positions with respect to the carbinol group, produces the maximum effect, the product being 286 times as basic as the parent substance. The presence of methoxyl radicles in the ortho-positions with respect to the methane carbon atom produces a smaller but well-marked increase in the basicity, whilst the effect of these substituent groups in meta-positions is scarcely appreciable.

Similar results attend the introduction of methoxyl into the two aromatic nuclei of dibenzylideneacetone, $CO(CH:CHC_6H_5)_2$; this substance, and its methoxyl derivatives also form sulphates when concentrated sulphuric acid is added to their glacial acetic acid solutions. The relative avidities, determined by the colorimetric method, showed that di-*p*-anisylideneacetone, $CO(CH:CHC_6H_4.OCH_3)_2$, is 13·5 times as basic as the unsubstituted ketone, *p*-anisylidenebenzylideneacetone, $OCH_3.C_6H_4.CH:CH.CO.CH:CHC_6H_5$, and di-*o*-anisylideneacetone have practically the same strength, whilst the avidity of di-*m*-anisylideneacetone is scarcely greater than that of the parent compound.

The property of forming coloured salts possessed by tri-*p*-anisylcarbinol can scarcely be due to the development of a quinone structure in one of the aromatic nuclei, inasmuch as these residues contain methoxyl in the reactive para-position, and the transformation of the benzenoid ring would involve the removal of methyl alcohol; this elimination, however, does not take place.—G. T. M.

α-Cyanobenzylanilines and μ-Cyanazomethines; Substituted ——. F. Sachs and M. Goldmann. Ber., 1902, **35**, 3319—3361.

THE colour of azomethine derivatives, R.CH:NX, is enhanced by substituting cyanogen or hydrosulphyl (SH) radicles for the methine hydrogen atom; thus, benzylideneaniline, $C_6H_5CH:NC_6H_5$, is pale yellow, whilst phenyl-μ-cyanoazomethinephenyl, $C_6H_5C(CN):NC_6H_5$, and thiobenzanilide are lemon-yellow. On the other hand, the imino-chlorides, amidines, and imino-ethers produced by replacing this hydrogen atom by chlorine, amidogen, and alkoxyl radicles respectively are colourless substances.

α-Cyanobenzylaniline, $C_6H_5CH(CN).NHC_6H_5$, and its homologues are prepared by a fairly general method; this consists in heating an alcoholic solution of the primary aromatic amine with benzaldehydecyanohydrin (mandelonitrile). This process was successfully applied to aniline and its homologues, *p*- and *m*-nitranilines, the naphthylamines, and anthranilic acid; it fails, however, in the case of *o*-nitraniline, 2:4-dinitro-aniline, 2:4:6-tribromo-aniline, diphenylamine, phthalimide, phenylhydrazine, phenylhydrazone, and the acid amides. Sulphanilic acid itself does not interact, but its potassium salt readily yields potassium α cyanobenzylsulphanilate.

Benzidine and *m*- and *p*-phenylenediamines condense with two molecular proportions of the cyanohydrin and yield di-α-cyanobenzyl derivatives. The mono-α cyanobenzyl derivatives are prepared from the monoacyl diamines, the acyl group being subsequently removed by hydrolysis. *p*-Aminophenol gives rise to a very labile α cyanobenzyl-*p*-hydroxyaniline, $C_6H_5CH(CN).NHC_6H_4.OH$ its ethoxy-derivative is, however, relatively stable.

The *p*-aminoazo compounds form α-cyanobenzyl derivatives with the cyanohydrin; the *o*-aminoazo-derivatives behave exceptionally, benzene-1-azo-β-naphthylamine, for example, yielding a triazine.

The α-cyanobenzyl derivatives of the primary aromatic amines all undergo oxidation to the corresponding phenyl-α-cyanoazomethine derivatives when treated with a hot acetone solution of potassium permanganate :—

$$C_6H_5CH(CN).NHC_6H_5 + O = H_2O + C_6H_5C(CN):NC_6H_5.$$

The secondary aromatic amines also condense with the cyanohydrin, and the products, although not oxidisable to azomethine derivatives, are nevertheless very reactive, and give rise to dyestuffs. For example, methyl-α-cyanobenzylaniline, $C_6H_5N(CH_3).CH(CN)C_6H_5$, when condensed with benzaldehyde, benzotrichloride, and zinc chloride, yields a blue dyestuff; this base also gives a nitroso-derivative which, when treated with amines and phenols, furnishes safrhodines and phenoxazines respectively.

The alkyl cyanobenzylanilines and their homologues yield amides which are not saponifiable, thus differing from the amides derived from aniline and other primary bases which are readily affected by hydrolytic agents.—G. T. M

Alkanet-Root : The Colouring Matters of ——. Gawalowski. Zeits. Apoth. Verein, 1902, 1001.

THE two chief colouring matters of alkanet-root are *anchusic acid*, $C_{30}H_{39}O_7$, which is soluble in petroleum spirit, and gives green alkali salts; and *alkannic acid*, $C_{30}H_{38}O_8$, which is soluble in alcohol-ether, and gives blue alkali salts.—A. S.

Fluorescence ; Influence of Substituting Groups on ——. L. Francesconi and G. Bargellini. Gaz. chim. ital., **32**, [2], 73—96. Chem. Centr., 1902, **2**, [14], 898—901.

THE authors first discuss the two theories of R. Meyer (his Journal, 1898, 448) and Hewitt (Zeits. physik. Chem., **4**, 1) as to the relation between fluorescence and chemical constitution. According to Meyer, the fluorescence of a substance is caused by the presence of certain "fluorophor" groups (the pyrone and azine rings) united to benzene nuclei, xanthine groups, &c. Hewitt, on the other hand, considers fluorescence to be connected with tautomeric processes. The authors find that the fluorescence of naphthalic anhydride and of naphthalimide cannot be satisfactorily explained by Hewitt's theory, but, on the contrary, is in complete accord with the views of Meyer. The manner in which the "fluorophor" ring is joined to the benzene nuclei, and in which the members of the "fluorophor" ring are united to one another are of no importance. In order to ascertain the influence of substituting groups on the fluorescence, the authors prepared various halogen and nitro derivatives of naphthalic anhydride. The introduction of chlorine changed the blue fluorescence of naphthalic anhydride in concentrated sulphuric acid to green, whilst the intensity of the fluorescence decreased as the number of chlorine atoms introduced increased; tetrachlornaphthalic anhydride was non-fluorescent. The introduction of one atom of bromine caused a slight diminution of the fluorescence, which, however, maintained its blue shade, whilst the introduction of iodine or a nitro group completely destroyed the fluorescence. The fluorescence of naphthalimide is also destroyed by the introduction of a halogen into the molecule. In the fluoresceins prepared from resorcinol and the halogen and nitro derivatives of naphthalic anhydride, the fluorescence also decreased as the number of substituting groups increased. The substituting groups can be arranged in the following series with regard to their power of causing a diminution of fluorescence—

$$NO_2 > I > Br > Cl.$$

—A. S.

Nitro-Compounds ; Reduction of Aromatic ——, *to Amino-Compounds.* K. Elbs and K. Brand.

See under XI. A., *page* 1334.

p-Nitrophenol in Alkaline and Acid Solution ; Electro-Chemical Reduction of ——. E. Klappert.

See under XI. A., *page* 1334.

o- and p-Nitrobenzene Sulphonic Acids in Alkaline Solution ; Electro-Chemical Reduction of ——. K. Elbs and Th. Wohlfahrt.

See under XI. A., *page* 1335.

Colourless Organic Compounds ; Sensibility to Light of ——. J. Pinnow.

See under XXIV., *page* 1353.

English Patents.

Phenylglycine [*Indigo Dyestuffs*], *its Homologues and Salts thereof ; Manufacture of* ——. O. Imray. From The Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. Eng. Pat. 22,733, Nov. 11, 1901.

See Fr. Pat. 315,940 ; this Journal, 1902, 543.—T. A. L.

Acridinium [*Acridine*] *Dyestuffs ; Manufacture of New* ——. O. Imray. From The Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. Eng. Pat. 24,400, Nov. 30, 1901.

See Fr. Pat. 316,467 ; this Journal, 1902, 701.—T. A. L.

Acridine Dyestuffs ; Manufacture of ——. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Main. Eng. Pat. 24,773, Oct. 29, 1901.

See Fr. Pat. 312,771 ; this Journal, 1902, 544.—T. A. L.

Dyestuffs [*Azo Dyestuffs*] ; *Manufacture of* ——. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Main. Eng. Pat. 22,306, Nov. 5, 1901.

SUPPLEMENTARY to Eng. Pat. 14,735 of 1901 (this Journal, 1902, 910). See Fr. Pat. 312,388 (suppl.) ; this Journal, 1902, 544.—T. A. L.

Black Colouring Matters [*Sulphide Dyestuffs*] *containing Sulphur ; Manufacture of* ——. G. W. Johnson. From Kalle and Co., Biebrich-on-Rhine. Eng. Pat. 21,879, Oct. 30, 1901.

See Fr. Pat. 315,458 ; this Journal, 1902, 543.—T. A. L.

Brown Dyes [*Sulphide Dyestuffs*] *containing Sulphur ; Manufacture of* ——. G. W. Johnson. From Kalle and Co., Biebrich-on-Rhine. Eng. Pat. 22,222, Nov. 4, 1901.

See Fr. Pat. 315,648 ; this Journal, 1902, 543.—T. A. L.

Anthraquinone Series [*Anthracene Dyestuffs*] ; *Manufacture of New Derivatives of the* ——. H. E. Newton. From The Farbenfabr. vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 22,128, Nov. 2, 1901.

See Fr. Pat. 315,416 ; this Journal, 1902, 609.—T. A. L.

Anthraquinone Derivatives [*Anthracene Dyestuffs*] ; *Manufacture of* ——. H. E. Newton. From The Farbenfabr. vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 22,583, Nov. 8, 1901.

See Fr. Pat. 315,575 ; this Journal, 1902, 544.—T. A. L.

Colouring Matter [*Azo Dyestuffs*], *Colouring Matter Lakes, and Intermediate Products ; Manufacture and Production of* ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 23,944, Nov. 25, 1901.

See Fr. Pat. 316,587 ; this Journal, 1902, 911.—T. A. L.

Sulphur Colouring Matters, and Materials for Use therein ; Manufacture and Production of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 25,650, Dec. 16, 1901.

THE action of nitro-sulphuric acid on *m*-dichloro- or on *m*-dinitro-*m*-dichlorobenzene yields a new trinitro-dichloro-

benzene, which, on condensation with two molecular proportions of *p*-aminophenol, its sulphonic or carboxylic acids, gives trinitro-di-*p*-hydroxy-diphenyl-*m*-phenylenediamine, its sulphonic or carboxylic acid. The action of sulphur and sodium sulphide on this condensation product at about 160°—180° C., forms a blackish mass soluble in water. The new product dyes cotton greenish-black shades, which become bluer on treatment with alkaline oxidising agents, such as hydrogen peroxide and ammonia.—T. A. L.

Colouring Matter [Sulphide Dyestuffs] containing Sulphur; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 25,809, Dec. 17, 1901.

See Fr. Pat. 317,063; this Journal, 1902, 967.—T. A. L.

United States Patents.

Brown-Violet Azo-Dye. P. Julius, Assignor to Badische Anilin und Soda Fabrik, both of Ludwigshafen, Germany. U.S. Pat. 710,059, Sept. 30, 1902.

The diazo compound from 1.2.4'-chloronaphthylamine sulphonic acid is treated with an excess of sodium carbonate yielding a new diazo compound, which only combines with β-naphthol at a temperature of about 50° C. The resulting compound gives brownish-violet shades on wool, which, on treatment with potassium bichromate and acetic acid, become blue to black, and with copper sulphate, violet. The new product, on reduction with stannous chloride, yields 1.2-aminonaphthol and an aminonaphthol sulphonic acid. Its sodium salt dissolves in water to a blue solution, turning violet on addition of sufficient caustic soda. The solution of the free acid in concentrated sulphuric acid is also violet.—T. A. L.

Blue Sulphur Dye [Sulphide Dyestuffs], and Process of Making same. W. Dollfus, Hoechst, Assignor to Meister, Lucius und Brüning, Hoechst a/Main. U.S. Pat. 710,766, Oct. 7, 1902.

The action of sulphur and an alkali sulphide on *p*-amino-*p*-hydroxydiphenylamine at 100°—130° C. gives a bluish black powder soluble in sodium sulphide or hydrosulphite, dyeing a bright indigo-blue shade, which becomes absolutely fast to washing on subsequent treatment with copper salts.
—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk Fabrics; Spontaneously-developed Stains on ——. P. Sisley. Rev. Gén. des Mat. Col., 1902, **6**, [70], 239—246.

A detailed study of the stains developed in dyed silk fabrics revealed the fact that this soiling of the goods is often due to contamination of the material with perspiration. Further examination showed that the active agent of the exudation of the sweat glands is sodium chloride, the other constituents having no injurious action on the dyed tissues.

In some cases the discoloration is brought about by sodium chloride introduced in the scouring and degreasing agents.

The stains may be developed simply by moistening the dyed silk with a sodium chloride solution of 15 per cent. strength, and allowing the material to dry in the dark.

The phenomenon is certainly not due to bacterial action, but is a purely chemical change, the exact nature of which is not fully understood. It is extremely probable, however, that the destructive action is due to a slow elimination of chlorine. This takes place to a less extent when the sodium chloride is replaced by other metallic chlorides; and the discoloration proceeds more rapidly on weighted silk than on the unweighted material.—G. T. M.

Alizarin Dyestuffs; New Method of Dyeing with ——. C. Knapstein. Färber-Zeit., 1902, **13**, [19], 300—303.

Compounds suitable for use in mordanting textile fibres generally, but more particularly cotton and silk fibres, are obtained by adding tartaric and lactic acids to solutions of aluminate and chromite of soda. With these the mordanting and dyeing can be accomplished simultaneously. An Alizarin Red, for instance, is economically produced upon cotton yarns by oiling these as usual and dyeing with Alizarin, with the addition to the bath of a small quantity of the aluminium mordanting compound, the dyed yarns being afterwards steamed and soaped. The fibre has a great affinity for the mordant and dyestuff, when they are thus applied together, as is shown by the fact that, at a temperature of 35° C., unoiled cotton is capable of withdrawing the whole of the Alizarin from a bath containing a mixture of this dyestuff and the aluminium compound.

The mixtures of mordanting compounds and dyestuffs may be conveniently prepared in the dry state in the form of powders.—E. B.

English Patents.

Oxycellulose in Textile Fabrics, and Removing Stains therein caused by Oxycellulose; Process and Means for Reducing ——. The Bleachers' Association, Ltd., Manchester, and A. A. Benjamin and R. Hübner, Bolton. Eng. Pat. 17,653, Aug. 12, 1902.

Textile fabrics composed of vegetable fibres are boiled for about 20 minutes in a solution prepared by mixing 20 litres of a solution containing about 17 per cent. of titanous chloride with 1,000 litres of water. They are then washed and, if desired, soured with hydrochloric acid at ½°—1° Tw or other suitable acid, after which they are again washed. Upon dyeing the fabrics thus treated with, for example, direct cotton dyestuffs, even dyeings are obtained, while spots on parts which, before the treatment with the titanous salt, were "tender" owing to the presence of oxycellulose in them, are, it is stated, very much stronger. Instead of titanous chloride, other titanous salts may be employed, but this is the only one at present commercially available.
—E. B.

Bleaching Linen Yarn or Thread. A. J. Boult, London. From A. Vogelsang, Dresden, Germany. Eng. Pat. 13,121, June 9, 1902.

A method of bleaching linen yarn which consists in packing it tightly in a closed receptacle, and, after boiling it with caustic potash solution and washing, treating it with an aqueous solution of sulphurous acid, and then in succession with a solution of bleaching powder, water, dilute sulphuric or hydrochloric acid, and, lastly, water.—E. B.

Dyeing Piece Goods [Tissues] with Sulphur Dyestuffs. R. J. Urquhart, Manchester. From The Chemische Fabriken vorm. Weiler-ter Meer, Uerdingen-on-Rhine, Germany. Eng. Pat. 23,695, Nov. 22, 1901.

To secure even dyeing, the edges of tissues which are being dyed with sulphur dyestuffs in a dye-jigger, are kept constantly wet by the application, by means of suitable apparatus, of cold water or a solution of sodium sulphide or of the sulphur dyestuffs, or diluted dye-liquor. The employment of these liquids may be combined with a reduction in the temperature of the dye-bath or with an increase in the quantity of alkali contained in this. Turkey red oil may be added to the dye-bath to facilitate the penetration of the tissue by the dyestuff.—E. B.

Yarns or Fabrics; Producing Variegated or Parti-coloured Effects upon ——. W. Rodger, Walkerburn. Eng. Pat. 22,688, Nov. 11, 1901.

Liquid colour-mixtures are caused by means of suitable mechanism to drop, at regular or irregular intervals, upon yarns or tissues. A revolving or moving horizontal disc or plate may be interposed between the dropping apparatus and the fabrics. Yarns are placed upon a revolving reel, tissues upon carriers to which a traversing or other motion may be given.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Titanium Mordanting Compounds [*Leather Dyeing*]. C. Dreher. Färber-Zeit., 1902, 13, [19], 293—300.

In disagreement with Barnes (Eng. Pats. 5712 and 27,742 of 1896; this Journal, 1897, 238, and 1898, 44), the author finds that of the oxides of tetravalent titanium, the fully hydrated oxide $Ti(OH)_4$ is alone capable of acting as a mordant for Alizarin and similar dyestuffs. This can be shown by mordanting wool or silk with solutions of meta-titanic acid, $TiO(OH)_2$, in hydrochloric, sulphuric, or lactic acid, with the last of which the acid in question forms the compound $TiO(C_3H_6O_3)_2$ when a solution of the lactate of titanic acid is treated with a dehydrating agent such as alcohol. On dyeing the fibre so mordanted, very pale shades of colour are produced. Similarly, when fibres mordanted with titanium are dried at a high temperature, dehydration of the mordant occurs, with consequent diminution of the dyeing power.

Of the compounds of titanic acid available for employment in dyeing, *viz.*, the sulphate, chloride, double alkali chlorides, fluoride, double alkali fluorides, oxalate, double alkali oxalates, tartrate, and the double lactates of the general formula $TiO_2(C_3H_6O_3)_4$, (in which three-fourths of the hydrogen of the COOH groups may be replaced by alkali or alkaline earth metals), only the last are suitable for application to leather. The rest of the compounds mentioned not only injure this material, rendering it hard and tough, but also act less efficiently in yielding the mordant, titanic acid, to it. While, for example, with the oxalates and fluorides, as much as 30 per cent. of the titanium applied to the leather remains in the bath, with the lactates only 8—9 per cent. is left unabsorbed. The mordant fixes dyestuffs readily either in the cold or at a low temperature, and the leather is not injured. The lactates are conveniently prepared by dissolving titanic acid in hydrochloric acid, and pouring the solution obtained into a warm solution of a lactate of an alkali or alkaline earth. It is not practicable to prepare them by dissolving titanic acid in lactic acid, owing to the sparing solubility of the former in the latter acid.

—E. B.

Leather Dyeing; Application of Salts of Heavy Metals in ——. E. Stiasny. Der Gerber, 1902, 28, [674], 277—278.

The action of titanium salts in developing fast shades on tanned leather, and in economising aniline or natural dyestuffs in the dye-bath (see Dreher, Ger. Pat. 126,598, Oct. 23, 1900, and Lamb, Eng. Pat. 11,092, May 30, 1901, this Journal, 1902, 1286), appears to be connected with the presence of hydroxyl groups in the tanning agents (vegetable) employed. Molybdenum, vanadium, and tungsten also exert a similar influence. The following table shows the results of test-tube experiments with salts of the foregoing metals and organic compounds of simpler structure than tannic acids, but characterised by the presence of hydroxyl groups. In the second part of the table, the results obtained with various tannin materials are given. The actual salts used (in 4 per cent. solution) were, potassium-titanium-oxalate, ammonium molybdate, uranium acetate, sodium tungstate, and ammonium vanadate:—

Substance containing OH Groups.	Titanium.	Molybdenum.	Uranium.	Tungsten.	Vanadium.
Phenol	Weak yellow	..	Yellow-brown	..	Yellow.
Salicylic Acid	Yellow	..	Yellow-red	..	Deep yellow.
Hydroquinone	Yellow-red	Weak yellow	Deep red	Yellow	Dark red-brown.
Pyrogallol	,,	Yellow-brown	Dark brown	,,	Blue-black.
Gallic Acid	,,	Yellow-red	,,	,,	Olive-brown.
Tannin	Yellow red	Yellow-red	Yellow brown	Light yellow	Blue.
Sumach	,,	,,	,,	Olive-yellow	Blue-green.
Oak	,,	,,	,,	Olive-brown	Green.
Chestnut	,,	,,	,,	,,	Dirty green.
Pine	Yellow-brown	Yellow-brown	,,	Red-brown	Olive.
Quebracho	,,	,,	,,	,,	Dirty green.

—R. L. J.

VII.—ACIDS, ALKALIS, AND SALTS.

ulphur Trioxide; Production of ——, *by the Contact Action of Ferric Oxide.* G. Lunge and G. P. Pollitt. Zeits. angew. Chem., 15, [43], 1105—1113.

. series of laboratory experiments carried out in a heated ombustion-tube containing a layer of the ferric oxide contact-substance (60 grms. spread over 60 cm.), through hich the sulphur dioxide and air were passed. The remaining sulphur dioxide and the total sulphur in the exit-ases were determined, and thus the percentage of sulphur oxide converted into trioxide was obtained. The following sults were ascertained:—1. The percentage conversion not affected by rise in the SO_2 concentration from 2 to per cent., but diminishes when the latter proportion is ceeded; higher concentration also diminishes the efficiency the contact-substance for lower concentrations, *i.e.*, more lute mixtures. 2. The reacting gases must be dried by assage through strong sulphuric acid; if moister than this, e percentage conversion is lessened, and the contact-substance "poisoned" for the drier mixture. From this poisoning" it only gradually recovers as the drier mixture passed over it. 3. Exposure of the contact-substance to dinary air, even for a short period if cold, produces the me effect as the passage over it of moist gases. 4. No provement was effected by treating the ferric oxide in ch ways as would loosen its surface and make it more rous. Oxide produced by igniting ferrous or ferric sulate was not so efficient as that made by igniting the droxide, or as burnt pyrites. No doubt, however, the ysical condition of the surface does affect the efficiency. 5. Mixture of the ferric oxide with cupric oxide (as in burnt cupriferous pyrites) increases the efficiency. 6. Arsenic pentoxide is absorbed, at and above 700° C., by ferric oxide. Ferric oxide containing $2\frac{3}{4}$ per cent. of arsenic as pentoxide is more efficient than the pure oxide in the proportion of 5 to 3. (Thus, instead of a conversion of about 46 per cent. under the previous conditions, a degree of conversion is now acquired of 75 per cent., the comparative ratio being 100:163.) If a layer of such arsenical oxide is followed in the reaction-tube by a layer of pure oxide, the ultimate efficiency is only that of the pure oxide. 7. Copper-containing ferric oxide is similarly improved by taking up arsenic. 8. The best temperature for the reaction is 600°—620° C. Below 600° it does not occur; above 620° the percentage conversion sinks somewhat, then remains nearly constant to 750°, above which it rapidly falls. That the fall does not proceed continuously from 620° onward, through the displacement of the position of equilibrium in the reaction $2SO_2 + O_2 \rightleftarrows 2SO_3$ continuously towards the left, is probably due to intermediate or bye-reactions—the formation and dissociation of ferric sulphate, and the reduction of Fe_2O_3 by SO_2 and reoxidation of Fe_3O_4 by air—which have different temperature-optima, between 620° and 750° C.—J. T. D.

English Patent.

Borax; Manufacture of ——. J. Hargreaves, Widnes. Eng. Pat. 19,527, Oct. 1, 1901.

Calcium borate is placed in any one of a series of vessels, together with a solution of sodium sesquicarbonate, or a mixture of the same and borax, drawn from another vessel

of the series in which a previous charge of the borate has been treated, the contents of both vessels being heated and agitated. After the reaction and settling, the strong liquor is run from the first vessel into a crystalliser; the residue of previous charges in other vessels of the series is washed, and the liquors passed forward, finally to the reacting vessels. After crystallisation of the strong liquor, the mother-liquor is refrigerated to obtain a second crop, and the residual solution may be treated with lime to precipitate any remaining boric acid.

According to a second process (to which most of the claims relate), a mixture is made of calcium borate with a suitable sodium carbonate (containing more CO_2 than the monocarbonate) and so much water or steam as, at the temperature produced by the mixing, may give a semi-fluid magma, which, on cooling, becomes solid. It is stated that "although the reactions may be only partially completed when the mass becomes solid, such reactions still continue in the solid mass until they become practically complete." The mass is then broken, and washed systematically.—E. S.

United States Patents.

Carbonic Acid Gas; Apparatus for Generating ——. F. A. Feldkamp, Newark, N.J. U.S. Pat. 705,570, July 29, 1902.

A cylinder containing acid with removable dome, through the top of which a graduated rod passes, supporting, from a lower slotted tube continuation, a perforated cylindrical receptacle for a suitable carbonate, such receptacle being free to move up and down automatically and continuously, according to the gas pressure, within a casing supported immediately below the dome.—E. S.

Carbonic Acid Gas from Carbonates; Apparatus for the Production of Pure ——, *in a Continuous Manner.* E. Luhmann, Münster, Germany. U.S. Pat. 706,972, Aug. 12, 1902.

The apparatus includes a close shaft furnace for "carbonates" (limestone), provided at its lower part with a jacket, connected with a system of pipes communicating with a fan, a portion of which pipes consists of a coil set in an auxiliary furnace, discharging the gas (CO_2) thus highly heated, with or without the addition of steam, into the midst of the charge in the shaft, which latter is not otherwise heated. The pipes are so arranged that a continuous circulation of the gas, or gas and steam, may be maintained, provision being made for cooling and withdrawing to a gasometer the excess of gas as it is produced.—E. S.

Nitrogen Compounds [*Nitric Acid*] *from Atmospheric Nitrogen; Manufacturing* ——. C. S. Bradley and D. R. Lovejoy. U.S. Pat. 709,867, Sept. 30, 1902.

See under XI. A., *page* 1335.

Alkaline Salts; Electrolytic Decomposition of ——. E. Edser and M. Wildermann. U.S. Pat. 709,971, Sept. 30, 1902.

See under XI. A., *page* 1336.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

Muffle Furnaces [*for Glass*]. E. Geille, Brussels. Eng. Pat. 20,998, Oct. 19, 1901.

Over a central fireplace is arranged a furnace consisting of a circular series of pillars joined at their upper ends by a dome of refractory material. In the spaces between the pillars, muffles are so situated as to form a radial arrangement, up the centre of which the flames rise from the fireplace. The flames, after striking against the dome, play downwards round the muffles, being drawn down by flues opening under the muffles and connected with vertical passages in the pillars. The vertical passages deliver the waste furnace-gases into a space above the dome, connected with the chimney. Dampers in the various flues permit of the regulation of the temperature of each muffle independently.—H. B.

Mould for Glass Works. B. J. B. Mills, London. From A. Bocuze, Lyons. Eng. Pat. 22,577, Nov. 8, 1901.

The moulds are either made completely of nickel, or have an inner working face of nickel and an exterior of other metal. Nickel is said to resist the action of molten glass more completely than other metals.—W. C. H.

United States Patents.

Glass or other Materials; Process of Framing ——. [*Electro-Deposition.*] H. W. Scattergood, Philadelphia, Pa. U.S. Pat. 709,513, Sept. 23, 1902.

The glass or other material is secured by an adhesive to the paper carrying the design, the spaces, which become ultimately filled with metal, being filled with soluble material, and strips of wax being laid round the design. A "curb" or frame is then attached to the design, and the whole filled with sand and reversed. The paper is then removed, and metal powder dusted on between the pieces of material; another curb is now secured to the former one, and filled in with molten wax. Again, the mould is reversed, the sand and soluble material removed, and the remainder placed, with suitable conducting wires, into a bath for electro-deposition.—J. W. H.

Glassware; Apparatus for the Manufacture of ——. D. C. Ripley, Assignor to the United States Glass Co., both of Pittsburg, Pa. U.S. Pat. 709,797, Sept. 23, 1902.

A machine intended to perform in turn all the finishing operations on blown glassware: cracking off, grinding, fire finishing, &c. The spindles carrying the blown article are carried round a vertical column in stages, and at each stage a special operation is performed.—J. W. H.

Glass Plates; Machine for Making ——. L. Appert, Paris, Assignor to the Appert Glass Co., New Jersey, U.S.A. U.S. Pat. 710,032, Sept. 30, 1902.

The combination of one or more rolls, mounted on stationary bearings, with a table capable of being moved longitudinally, this table, on which the molten glass is poured, having, near its centre line or section, inlets for the admission of a cooling fluid, such as water, which circulates through passages in the bed of the table, and is withdrawn at the sides, the inlets having flexible connections with the source of water supply.—W. C. H.

Glass; Manufacture of Window and Plate ——. W. E. Heal, Assignor to J. H. Forrest, both of Marion, Ind., U.S.A. U.S. Pat. 710,357, Sept. 30, 1902.

Continuous sheets or plates are made by melting glass in a suitable tank, and allowing the melted glass to flow over on to the surface of melted metal, of higher specific gravity than glass, and contained in a suitable forming tank, on the surface of which the glass flows into a sheet of uniform thickness under the combined action of heat and gravitation; the glass is cooled to a proper consistency, and the sheet drawn off regularly by drawing rolls, and passed over rollers in an annealing chamber. The level of the glass in the melting tank is maintained constant by the addition of fresh raw material, and the metal suggested for use in the forming tank is tin or an alloy of tin and copper.—W. C. H.

Filter-Press [*Porcelain "Slip"*]. F. M. Locke, Victor, New York. U.S. Pat. 707,245, Aug. 19, 1902.

A yielding disc or a layer of absorbent material is interposed between the corrugated surface of each filter-press plate and the sack or bag which confines the clay, &c., for the purpose of preventing injury to the sacks and permitting the escape of the water.—R. A.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Wood; Preserving and Colouring ——. G. Feyerabendt. Ger. Pat. 134,939, June 16, 1901. Zeits. angew. Chem., 1902, **15**, [41], 1077.

The wood is heated under pressure to 130°—150° C. with a solution of sodium aluminate to which has been added excess of aluminium hydroxide. It is stated that in a comparatively short time, all resinous constituents are converted into resin soap, and all reserve substances for the production of starch into soluble compounds (not dextrin). The soluble matters are removed by thorough washing, and the wood remains impregnated with alumina, which renders it hard and uninflammable. The alumina is also available as a mordant, so that the wood, after treatment, can be coloured uniformly throughout by means of suitable dyestuffs. Light woods, when treated by this process without any addition of dyestuff, acquire throughout a brown colour resembling that of walnut.—A. S.

English Patent.

Wood; Means of Impregnating ——. W. Angus, London. Eng. Pat. 17,012, Aug. 1, 1902.

The freshly-cut surface of a slab sawn off the end of a block of timber is coated with an impermeable material; out of the slab slots are cut, the walls of which are similarly coated. The slab is replaced on the end of the block and firmly held against it by a metal plate. If the pressure on the plate is sufficient to make a tight joint, it is said that the block can be impregnated by liquid forced through a nozzle in the plate into the grooves or channels cut out of the slab.—W. C. H.

United States Patents.

Lumber (From Wood-Pulp), Artificial; Process of Making ——. W. S. Huntington, Assignor to the Composite Board Company, New York. U.S. Pat. 709,488, Sept. 23, 1902.

Ground wood is beaten in a rag-engine with a proportion of "sulphite" (long-fibred pulp digested with bisulphite liquor), alum, and size; other materials, such as litharge, white lead, and casein, are added to give solidity, hardness, and finish. Finally, the product is made into boards on a paper machine and dried in a chamber in which air circulation is prevented, and fumes are produced to harden the material; the fumes are made by placing litharge and bicarbonate of soda in layers separated by a layer of casein, covering the whole with wood-dust saturated with sulphuric acid, and adding further sulphuric acid. It is proposed to make thus a substitute for the finer kinds of wood used for cabinet making, &c.—J. W. H.

Wood, Impregnating; Method of ——. M. Rüping, Charlottenburg, Germany. U.S. Pat. 709,799, Sept. 23, 1901.

The material is first subjected to an air pressure of about five atmospheres for half an hour, the impregnating liquid being then introduced; the pressure is raised to, say, 15 atmospheres for one or more hours; the pressure is then cut off and the impregnating liquid discharged. It is claimed that no more impregnating liquid than is necessary for coating the walls of the cells is used, the cells themselves remaining filled with air.—J. W. H.

X.—METALLURGY.

Iron and Steel; Influence of Heating and Quenching on the Tensile Strength of ——. J. A. Brinell. Stahl u. Eisen, **22**, 881—886. Chem. Centr., 1902, **2**, [12], 830.

The author has subjected various kinds of iron and steel to 11 different methods of treatment, *viz.*, hot rolling without any special after-treatment; slow cooling after heating to temperatures of 350°, 750°, 850°, 1,000°, 1,190°, and 1,200° C.; quenching in water (at 20° C.) after heating at 750°, 850°, and 1,000° C., in one set of experiments without leaving the samples in the water, and in others, allowing them to cool in the water to 350°, 550° and 650° C. respectively; quenching in oil (at 80° C.) after heating at 750°, 850°, and 1,000° C.; also in one case without leaving the samples in the oil, and in others leaving them in to temperatures of 350° and 550° C. respectively; and quenching in molten lead (at 550° C.) after heating at 750°, 850°, and 1,000° C. In the cases where the samples were allowed to cool to a certain extent in the quenching liquid, they were subsequently allowed to cool slowly in the air.

From the results of the experiments, the author draws the following conclusions:—By allowing the heated metal to cool in the quenching liquid till it shows a blue tint, the breaking strain and limit of elasticity (especially in the case of cold-worked iron and steel) are increased. In some cases the tenacity is also increased. The experiments on hardening in water after previous heating to 750° C. showed that at this temperature, carbide is scarcely converted into "hardening carbon" at all. By letting the samples cool in the water to 350° C., not only is the degree of ductility lost on quenching regained, but the ductility is even improved. Allowing samples heated at 750° C. to cool in water to 550° and 650° C. appears to have the same effect as the heating to redness of unhardened samples. Quenching at so low a temperature as 750° C. is not to be recommended, either with or without subsequent cooling in the quenching liquid. Quenching at 850° C. causes a strong diminution of the limit of elasticity. Although so far as strength is concerned, the best hardening temperature for steel appears to be 850° C., yet there is no great difference if the quenching be effected at 1,000° C. Quenching in oil produces a smaller degree of hardening than quenching in water. Quenching in lead is much less effective than quenching in water followed by cooling in the water to 550° C.

The increase in the degree of hardness caused by the presence of manganese, when determined by Brinell's method (Stahl u. Eisen, **21**, 382), is, with unhardened samples, 9 units, and with hardened samples, 43 units for each 0·1 per cent. of manganese. The tensile tests show, however, that manganese has not the same influence on the strength. The samples which had either not been subjected to any preliminary treatment, or had been heated and then cooled slowly, showed on the average a difference in the breaking strength of three units for 0·1 per cent. of manganese. On the other hand, with hardened samples, the breaking strength after quenching at 750°, 850°, and 1,000° C. was increased, on the average, by 2·3, 4, and 4·5 units respectively for 0·1 per cent. of manganese. With an increase of the breaking strength of 2·3, 3, and 4·5 units for 0·1 per cent. of manganese, there was found a decrease of the ductility of 0·4 per cent. for the unhardened material and 0·6—0·8 per cent. for the hardened.

It was also found that a fairly high percentage of silicon can be introduced without injury into a sample which is only hardened once, yet which might lead to deterioration on repeated hardening, owing to the easy oxidisability of the silicon.—A. S.

Rails [Railway]; Recent Studies made in the United States in the Manufacture of ——. H. Le Chatelier. Bull. de la Soc. d'Encouragement pour l'Ind. Nat., 1902, **103**, [3], 392—401.

Martin calls in question the efficacy of the Kennedy-Morrison process, as used at the Carnegie Works, whereby the rail is left to cool, during two minutes, to a point near the critical temperature before passing it for the last time through the rolls. The metal recrystallises at the relatively high temperature at which it is during this time, and the slight amount of mechanical work involved in a 5 per cent. reduction only suffices to restore the grain to a depth of from 4—8 mm. below the surface. A better method would be to roll the rail completely at one heat, allowing it to cool somewhat, if necessary, after passing the roughing rolls and before passing the finishing rolls. In rails rolled in this way, the grain is uniform throughout. Martin also contends that Webster's test for finished rails (comparing the length of the rail when it is cut hot, with its length after complete cooling) is inaccurate, as there is no evidence

that the rail has received normal treatment, and been subjected to no delays; and again, the contraction varies somewhat with different steels.

Job has examined 200 rails that have given bad results in use. He finds that the older rails, rolled, say, in 1864, were of better quality than those manufactured now. Comparing good with bad rails, the difference may not appear in the chemical composition, but in the structure. Out of 50 bad rails, broken after five years' service, 47 had a large-grained structure, and only two had a normal grain, and both of these showed flaws or slag. The wear of the rail is in inverse proportion to the size of the grain. The flow of the rail under compression is mainly attributable to defective welds due to the presence of foreign substances. The shock (falling weight) test is, by itself, insufficient to indicate the serviceability of a rail. Large-grained metal, provided it is fairly free from foreign matter, withstands this test as well as a fine-grained, but impure, metal; whereas the durability of the rail depends chiefly upon the size of its grain. Job would therefore take the results of this test in conjunction with those of Webster's test.

Martin has remarked that rolling at temperatures below the recalescence point does not alter the size of the grain, and Sauveur has pointed out that it reduces the ductility of the metal. But it must be remembered that the grains are drawn out into fibres which increase the resistance to rupture across the direction of rolling. But the power required for rolling at the lower temperature is relatively high.

The author points out that the possibility of rolling the metal at the actual temperature of transformation appears to have been overlooked. Yet there is a margin of 20° C. to work on, and the conditions of recalescence would make it comparatively easy to treat the steel at the critical point during the last passes through the rolls.—W. G. M.

Platinum Group; Disintegration and Recrystallisation of the Metals of the ——. L. Holborn and F. Henning. Sitzungsber, Kgl. pr. Akad. Wiss. Berlin, 1902, 936—943. Chem. Centr., 1902, 2, [13], 840.

In order to ascertain whether the changes occurring in thermo-elements in which a platinum-iridium alloy is used, are due to the disintegration of this alloy, the authors have studied the behaviour at high temperatures of the pure metals, platinum, rhodium, iridium, and palladium, and of some alloys, as for example:— 90 Pt with 10 Rh; 90 Pt with 10 Ir; 80 Pt with 20 Ir; 70 Pt with 30 Ir; 60 Pt with 40 Ir; 90 Ir with 10 Ru). Thin strips of plate 5 mm. wide were heated to redness by means of the electric current; the temperature (determined by means of an optical pyrometer) was near the melting point of platinum (about 1,500° C.), except in the case of the palladium, which, on account of its lower melting point, could not be heated so strongly. Most of the metals of the platinum group showed only a small loss of weight after being heated for several hours. Iridium and its alloys, however, suffered a strong disintegration, shown by the appearance of a "fog"; with the gradual decrease of the iridium-content on the surface, the disintegration diminished. In accordance with these observations, two thermo-elements of Pt and Pt-Ir, after being heated to whiteness for eight hours by means of the electric current, showed a decrease of "thermo-power" of 6 and 14 per cent. respectively, whilst an element with a Pt-Rh alloy showed an increase of 0·5 per cent. The heating of the platinum metals causes an increase of pliancy (with the exception of the Ir-Ru alloy) and the appearance of a crystalline structure, which is disclosed in a network of fine lines, and shows distinctly after etching with hot *aqua regia*. With the platinum-iridium alloys, the lines of the network are broader, the further the disintegration has proceeded.

Plates of gold and silver, after heating for a long time (at 100° below the melting point), also distinctly show a crystalline structure.—A. S.

Titanium; Metallurgy of ——. A. J. Rossi. J. Franklin Inst., **154**, [4], 241—261.

With regard to the objection that small quantities of titanic acid in iron ores produce deposits in the boshes of blast furnaces, the author is convinced that this defect is non-existent, provided the furnace be worked in a normal manner, and especially if the flux be so selected as to furnish a silico-titanate of lime which is perfectly fusible. The presence of titanic acid in large quantity, as in Norwegian ilmenite, may entail a large consumption of fuel, but not more so than the presence of an equal amount of silica; at least that is the experience gained in the author's own furnace, using dolomite as flux.

The pig iron made from titaniferous ores forms an excellent chilling iron for car-wheel mixtures, the addition of 5 per cent. of such iron increasing the chill from 1·062 to 1·375 inches and the transverse strength from 3,250 to 3,775 lb. per sq. in.; 10 per cent. brought the chill up to 1·562 inches and the transverse strength to 3,600 lb.; and 25 per cent. raised the depth of chill to 1·75 inches. Since the titanium present ranges from a few hundredths to a few tenths of 1 per cent., its influence would seem to be generally one of purification rather than direct; and as a matter of fact, the acid being irreducible in the blast furnace, its presence at all in pig iron is due to conversion into carbide and cyano-nitride.

By the aid of an electric furnace the author has produced ferro-titanium alloys, containing from 10 to 75 per cent. of the latter metal in the free state, the only carbon present being in the graphitic condition. The fusion temperature of these alloys rises with the percentage of titanium; and when added to molten steel or cast iron, the 10 per cent. alloys pass into solution, without fusing, like platinum under similar circumstances. The higher alloys are prepared by a process of igneous concentration, in which titaniferous iron ore is smelted, at a temperature slightly exceeding that of the blast furnace, along with sufficient carbon to reduce the contained iron oxides but not the titanic oxides, a small quantity of lime being added so as to form a titanate of lime, this passing into the slag along with the small amount of magnesia and alumina (or silica) present in the ore. The products obtained are a titaniferous pig iron and a slag concentrate containing 31 per cent. of titanium and only about 2 per cent. of iron. By a modification of the Goldschmidt thermite process, this concentrate can be converted into alloys free from carbon, for which purpose the concentrate is introduced into a bath of aluminium, maintained at a suitable temperature in the electric furnace, and when reduction is complete, the alloy is purified from any contained aluminium by an addition of iron oxide. The high alloy may be lowered to any desired extent by dilution in a bath of iron.

Tests made with these alloys as an adjunct to cast-iron, show that about 3 per cent. of a 10 per cent. titanium alloy will increase the tensile strength of the cast iron by 20—30 per cent., and the transverse strength to a proportionate degree. Added to coke-iron, the strength was raised to equal that of excellent Scotch charcoal iron costing double the price. With steel the influence of the titanium alloys is to considerably increase the ductility, the effect of even 0·10 per cent. of titanium (in the steel) being very marked.

A point tentatively raised by the author is whether titanium may not act as a more powerful deoxidiser than manganese, and also as a denitrogeniser (on account of its combustibility in nitrogen at 800° C.), and thus raise open-hearth and converter steel to approach the strength of crucible steel.—C. S.

Reduction with Calcium Carbide: Equation of Reaction in ——. Fr. von Kügelgen. Zeits. f. Elektrochem., 8 781—785.

The author replies to Neumann's criticism (this Journal 1902, 1140) of his theory of reduction by calcium carbide (this Journal, 1901, 126, 582). The presence of carbon monoxide in the gaseous products of the reduction does not prove that this is a primary product of the reaction especially as Neumann worked with fireclay crucibles which are quite porous for gases, and consequently the gas obtained by Neumann contained much of the furnace gas

The author upholds the view that the reduction takes place according to the equations—

$$5M_2O + CaC_2 = 5M_2 + CaO + 2CO_2 \text{ and}$$
$$4M_2O + 2MCl + CaC_2 = 5M_2 + CaCl_2 + 2CO_2,$$

where M is a monovalent metal.—J. McC.

Tin Alloys; Concentrated Sulphuric Acid as a Solvent for ——. H. Nissenson and F. Crotogino.

See under XXIII., *page* 1350.

Cadmium and Zinc; Detection of ——, *in the Dry Way.* R. Biewend.

See under XXIII., *page* 1349.

Lead in Ores; Determination of ——. I. C. Bull.

See under XXIII., *page* 1350.

English Patents.

Iron and Steel; Manufacture of ——, *and Alloys thereof.* G. J. Snelus, Frizington, Cumberland. Eng. Pat. 12,950, June 25, 1901.

"Molten pig iron is run from the blast furnace into a "rotator," which is a cylindrical iron vessel, two or more diameters in length, supported on anti-friction rollers, and lined with basic material coated with iron oxide; the ends are partially opened, and one end is provided with a tap hole, the opposite end being adjusted to a blowpipe, comprising a chamber containing porcelain pipes or tubes with which the blast furnace gases and hot blast pipes communicate. Iron oxide and lime, with or without ferro-silicon or "Saniter mixture," are added to the molten charge in the production of malleable iron castings, a basic slag thus also resulting. In case it is required to form an alloy, as with manganese, chromium, or nickel, the necessary oxide is added. For steel, the final refining is effected in a finishing furnace. Reference is made to Eng. Pat. 908, 1872.—E. S.

Iron Ore; Improved Process for the Treatment of ——. R. Renard and A. Becker, Lipetsk, Russia. Eng. Pat. 14,970, July 4, 1902.

Poor and silicious iron ores are rendered friable and magnetic by exposure first to oxidising and then to reducing gases from blast furnaces or other generators, and are then subjected to electro-magnetic sorting. The ore thus enriched may be treated by ordinary metallurgical processes.—E. S.

Metallic Oxides into Metal; Furnaces for Converting ——. W. W. Fyfe, London. Eng. Pat. 14,363, July 15, 1901.

The oxide container or basin of the furnace is built of fire-clay with "seating blocks" for the ends and sides, and is of large area relatively to the height, in order that the flames may impinge closely on the charge. The roof is formed of curvilinear blocks based on the side walls, independent of the sides of the hearth. The flames pass over the charge, then through channels under the basin, and lastly around an iron pot, set in a wing of the furnace at a suitable level to receive, through an inclined passage, the molten metal as it flows from the basin. An example is given of the treatment of antimony oxide, which is heated in the described furnace with sodium and potassium carbonates and carbon, to obtain the metal in one operation. —E. S.

Ores; Concentration or Enrichment of ——. W. E. Heys, Manchester. From E. Boyer, Paris. Eng. Pat. 20,410, Oct. 12, 1901.

The finely-divided ore is treated with such a solvent as may dissolve the mineral constituent without dissolving the gangue, in a "diffusion battery" similar to that used in the manufacture of beet-sugar. The solution is treated to precipitate the ore, which is filter-pressed. As an example, the treatment of calamine ore is given, in which an ammoniacal solution is used as the solvent, and precipitation is effected by expelling the ammonia, practically pure zinc carbonate being thus obtained.—E. S.

Blast-Furnace Gases; Means or Apparatus for Purifying ——. A. G. Brookes, London. From Deutsch-Luxemburgische Bergwerks- und Hutten Aktien-Ges., Differdingen, Luxemburg. Eng. Pat. 17,213, Aug. 5, 1902.

Improvements on Eng. Pat. 6141 of 1901. When the gases are to be passed through a number of fans in succession, the latter are so connected to the supply and discharge pipes, and to the mains for the washed and unwashed gases—each pipe being provided with shut-off devices—that one or more of the fans may, at will, be disconnected from the series.—H. B.

United States Patents.

Sulphide Ores; Desulphurising ——, *Preparatory to Smelting.* A. D. Carmichael, Broken Hill, Australia. U.S. Pat. 705,904, July 29, 1902.

See Eng. Pat. 17,580, 1901; this Journal, 1902, 349. —E. S.

Ores [Gold and Silver]; Process of Treating ——. S. T. Muffly, Bowdre, Georgia, Assignor to R. Pyatt, New York. U.S. Pat. 710,496, Oct. 7, 1902.

Gold and silver ores or concentrates are treated in a revolving cylinder fitted with baffle plates, with a spray of cyanide (or other solvent) solution, injected by hot air under pressure, the spray being circulated through the charge axially of the cylinder's revolution and agitation, the gases set free being carried off at a point opposite to that of the injection. Reference is made to U.S. Pat. Serial No. 75,799, of Sept. 20, 1901.—E. S.

Zinc from Ores; Furnace for Separating ——. A. M. G. Sébillot, Paris. U.S. Pat. 710,217, Sept. 30, 1902.

The combustion chamber is divided into a front compartment for the ore, and a rear compartment having a separate grate charged with charcoal, the wall to which has a lower and an upper passage; the former, for passage of the zinc vapours traversing the incandescent charcoal, and issuing into a series of condensing chambers, with baffle plates and depressions in the floors to receive the metal; whilst the upper passage leads to other independent chambers, for collection of dust from the lighter fumes which reach that passage.—E. S.

Mattes; Method of Treating ——. J. A. Potter and W. C. Harvie, Monterey, Mexico. U.S. Pat. 710,300, Sept. 30, 1902.

The molten matte is exposed to the action of an air-blast, with rabbling, and after the sulphur is practically burned away, the matte is balled for smelting. Chambers containing the molten matte are successively treated, the heat from one chamber being made serviceable in completing the operation in that previously exposed to the blast. —E. S.

[Alkali Metals] Metals of the Alkalis; Production of the ——. L. T. Moeser and W. E. Eidmann, Giessen, Germany, Assignors to Chemische Fabrik Griesheim Electron, Frankfort-on-the-Maine. U.S. Pat. 710,493, Oct. 7, 1902.

A mixture of calcium carbide and an alkali fluoride is heated in a vessel attached to a condenser, oxygen being excluded, when the alkali metal distils over, leaving a cyanide as a by-product, in case air has been expelled from the apparatus by nitrogen or ammonia gas. The alkali fluoride may be replaced by an alkali-silico-fluoride or cryolite, &c.; the residue then contains silicon carbide or aluminium carbide.—E. S.

Gas-producer and Recuperative Furnace combined [for Tin and Sheet-Mills]. A. J. Maskrey, Martins Ferry, Ohio. U.S. Pat. 706,579, Aug. 12, 1902.

This invention is especially applied to a combined gas-producer and a double recuperative finishing-furnace for

tin and sheet mills. Recuperative furnaces are arranged at each side of the rear end of the producer. Separate passages lead from the producer to the combustion chamber of each furnace for conveying the gases generated in the producer. Intake flues admit heated air to the combustion chambers at substantially the same points at which the gases are admitted.—R. S.

Smelting Furnace. C. Laughlin, St. Louis, Miss. U.S. Pats. 707,601 and 707,602, Aug. 26, 1902.

In a water-jacketed smelting furnace, the jacket is connected at the top and at the bottom to a water tank, the upper connecting pipe having a high vertical branch open to the atmosphere. The water supply to the tank is maintained at such a level that there may be continuous flow into it through the upper pipe leading from the jacket, with flow the reverse way through the lower pipe. Referring to No. 707,602, a tube extending through the double walls of the furnace is grooved on each side of the wall plates. The lower side of the tuyère, just outside the furnace, has an opening to allow discharge of any molten slag gaining entrance, which opening is closed by a sheet of paper and a plate, clamped by an automatic device in such manner that if the paper be burned away by intrusion of slag, way is made for passage outwards of the same. The sheet of mica clamped over the inspection hole is fitted with a device enabling it to be readily withdrawn or changed.
—E. S.

Fume-Arrester [*Smelting Furnaces*]. A. W. Gilliland, St. Louis, Miss. U.S. Pat. 709,896, Sept. 30, 1902.

The fume-house is a rectangular structure, divided by transverse brick partitions into a series of compartments traversed by the fumes from adjoining furnaces, the partitions having openings at alternately opposite ends near the floor level, so that the path of the fumes is zig-zag. In each chamber formed by the partitions is a low sheet metal frame extending to the side walls, having a door at each end and open to the air, and a shelving roof, so that the dust there collecting slides downward to the sides, means for withdrawing which are provided. The last chamber of the series communicates with the bottom of a vertical cooling tower, preferably of sheet iron, having two parallel passages, that into which the fumes enter having a vertical series of horizontal screens; from the top of this passage the fumes pass into and down the second passage, water being showered into both passages. The cooling tower has at its base a water-tank through which the purified gases pass, and the escape of which is regulated. A filter is connected to the water-tank.—E. S.

Plating Metal. W. Griffith, Pittsburg, Pa. U.S. Pat. 704,793, July 15, 1902.

Iron, steel, or the like, is coated with a more fusible metal, such as copper, by covering the surface of the steel (for instance) with a layer of pulverulent copper, then with a plate of the same, and heating them below the fusing point of the more fusible metal; a cold cap of brick or metal is then placed on the covering plate, and the ingot raised to a higher temperature.—E. S.

Amalgamator, and Method of Amalgamating Metals. P. A. Knappe, Grantville, Georgia, Assignor to American Amalgamating Co., Georgia. U.S. Pats. 705,095 and 705,096, July 22, 1902.

The ore pulp is delivered under pressure into one end of the smaller of two communicating horizontal stationary cylinders, of which the first constitutes the mixing, and the second the settling chamber, both being charged with mercury, and the latter having a settling space out of the path of travel of the intermingled pulp and mercury. The outlet for the pulp is near the extremity of the larger cylinder, and it is so arranged as to facilitate separation by gravity of the amalgam and tailings, which separation is further aided by admission of water to that cylinder. Both the cylinders are traversed by a rotating shaft carrying radial mixing arms. An electric current, preferably alternating, is passed through to obviate "sickening" of the mercury.—E. S.

Metals; Method of Amalgamating ——, *and Amalgamator.* P. A. Knappe, Grantville, Georgia, Assignor to American Amalgamating Co., Georgia. U.S. Pats. 707,971 and 707,972, Aug. 26, 1902.

The ore pulp is passed from a series of concentrating vessels, at an elevated position to obtain pressure, into a horizontal cylinder charged with mercury, and fitted with means for mixing, and an electric current is caused to act on the contents. The outflowing pulp is also subjected to concentration in another series of vessels, to extract the heavier particles, means for returning which to near the initial end of the amalgamator are provided. The circulation of unamalgamated metal is thus continued, and "those particles which are unsusceptible to amalgamation" are withdrawn.—E. S.

Metals; Method of Producing ——, *in a Finely-divided State.* E. Pohl, Weisswasser, Germany. U.S. Pat. 706,475, Aug. 5, 1902.

The molten metal is sprayed through a pipe provided with a nozzle into a retort heated sufficiently to distil the metal into a suitably attached condenser, which, when tin is being treated, may contain water.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Ketones; Electro-chemical Reduction of ——. K. Elbs and K. Brand. Zeits. f. Elektrochem., **8**, 783—788.

In alkaline solution ketones are reduced when electrolysed with a lead plate cathode in precisely the same way as by the chemical reduction with sodium amalgam, or zinc dust and alkali, that is to say, the carbonyl group is reduced to CHOH, and in many cases, this is a convenient method for preparing diphenylcarbinols.

The electrolytic reduction of ketones in acid solution (dilute sulphuric or phosphoric acid), at a lead cathode, yields pinacones, but if these primarily-formed pinacones are affected by acids, the corresponding α- or β-pinacolines are obtained. This reduction is much more violent than reduction with zinc dust and acetic acid, and is not so generally applicable for the preparation of pinacones. The conditions observed as necessary for the purely chemical reduction do not fully apply in the case of the electrolytic reduction; the aliphatic and mixed aliphatic and aromatic ketones give secondary alcohols as well as pinacones, but purely aromatic ketones yield only pinacones.—J. McC.

Nitro-compounds; Reduction of Aromatic ——, *to Amino compounds.* K. Elbs and K. Brand. Zeits. f. Elektrochem. **8**, 788—789.

m-Nitraniline when reduced at a nickel cathode gives *m*-diaminoazobenzene, but with a copper cathode, *m*-phenylene diamine is produced. The statement in Ger. Pat. No. 130,742 of Boehringer und Söhne that the reduction product is independent of whether nickel or copper is used as cathode is incorrect, because the presence of copper is essential for the production of *m*-phenylene diamine.
—J. McC.

m-Nitrophenol in Alkaline and Acid Solution; Electro chemical Reduction of ——. E. Klappert. Zeits. f. Elektrochem., **8**, 791—792.

m-Nitrophenol is reduced electrolytically in alkaline solution according to the rule which is found to apply to other *m*-nitro compounds. Provided that the electrolysis be carried out quickly in the heat, that a nickel cathode be used, that only the requisite amount of current be passed through, and that the solution be acidified with acetic acid immediately after electrolysis, a good yield of *m*-azophenol is obtained. In sulphuric acid solution, *m*-aminophenol sulphonic acid is produced.—J. McC.

and p-Nitro-benzene Sulphonic Acids in Alkaline Solution; Electro-chemical Reduction of ——. K. Elbs and Th. Wohlfahrt. Zeits. f. Elektrochem., 8, 789—791.

With a nickel cathode, potassium *p*-nitrobenzene sulphonate is reduced in the first place to potassium azobenzene-4-disulphonate, according to the equation—

$$2C_6H_4(NO_2)SO_3K + 8H = 4H_2O + SO_3K.C_6H_4.N:N.C_6H_4.SO_3K.$$

This azo-compound is obtained in yellowish-red prisms with $2\frac{1}{4}$ molecules of water of crystallisation. In very concentrated solution further reduction takes place, and potassium hydrazobenzene disulphonate is formed—

$$KSO_3.C_6H_4.N:N.C_6H_4.SO_3K + 2H = KSO_3.C_6H_4.NH.NH.C_6H_4.SO_3K.$$

This crystallises in fine colourless needles which are easily soluble in water, but insoluble in alcohol.

Potassium *o*-nitrobenzene sulphonate is reduced in quite a different way from the para-compound. In this case a mixture of potassium *o*-aminobenzene sulphonate and potassium benzidine-*o*-disulphonate is obtained; when the ammonium salt is used, and the anode liquid is sodium carbonate solution, a good yield of *o*-aminobenzene sulphonate is obtained and very little benzidine-o-disulphonate.

—J. McC.

English Patents.

Water and other Fluid from Mineral, Vegetal, and Animal Substances; Apparatus for the [*Electro-endosmotic*] *Extraction of* ——. G. B. Schwerin, Berlin. Eng. Pat. 22,301, Nov. 5, 1901.

The apparatus, which is of the type described in Eng. Pat. 12,431 of 1900 (this Journal, 1901, 726), comprises a stationary series of superposed floors, preferably corrugated, a series of removable open boxes, supported by the floors and provided with permeable bottoms forming negative electrodes, and a series of positive electrodes, located in the intervals between the floors, and arranged to be movable up and down in entirety. Each member of the positive electrodes is also capable of individually following the material as it contracts under the action of the electric current. The floors for supporting the boxes may be arranged to establish electrical connection between the bottoms of the boxes and the source of electricity.

—R. A.

Electric Batteries and Electrolytical Apparatus. [*Porous Wood Vessels.*] P. Marino and G. Marino, Paris. Eng. Pat. 22,303, Nov. 5, 1901.

By employing porous wood receptacles for the electrodes of a secondary battery, it is stated that a solid wall constituting no obstacle to the fall or displacement of the active material, is provided, whilst at the same time affording free passage to the electric current, to the electrolyte, and to the gases formed.

The wood is rendered porous and permeable to the current by treating it successively with a cuprammonium solution (Schweitzer's liquid) to dissolve the cellulose, an alkaline solution, to which chloride of lime has been added, to remove the incrusting matter, and with hydrochloric acid, in order to dissolve the xylose and paraxylose. The wood is then washed in a bath to which charcoal is added, to eliminate the hydrochloric acid, and finally the resinous matter is removed by hot alcohol. In a modification of the above method for the removal of the incrusting matter and the xylose and paraxylose, nitric and sulphuric acids are substituted for the alkaline solution and the hydrochloric acid. The wood may also be rendered porous by torrifying it in a receptacle heated to a uniform and suitable temperature. The porous wood may also be employed for primary batteries, and for electrolytic diaphragms.—G. H. R.

United States Patents.

Thermo-Electric Element. C. B. Thwing, Galesberg, Ill., Assignor to L. S. Langville, New York. U.S. Pat. 704,595, July 15, 1902.

The positive element of the thermo-electric couple is iron, and the negative element consists of an alloy of nickel and copper of the composition Ni_3Cu_2.—G. H. R.

Generator; Thermo-Electric ——. C. B. Thwing, Syracuse, N.Y., Assignor to L. S. Langville, New York. U.S. Pat. 704,596, July 15, 1902.

The generator is enclosed in a casing, open top and bottom, which contains a longitudinal burner with a chimney. A longitudinal series of thermo-electric couples is arranged on each side of the burner, their minor portions projecting into the path of the products of combustion from it, and their major portions extending outwards from and below the former. A second series of couples, similarly constructed, is arranged above the first, but in reverse position, so as to form small, compact heating-, and wide extended cooling-surfaces. The sets of couples have insulating strips between their members and between each other, the strips, chimney, and sides of the casing forming a heating chamber above the burner, lined with asbestos. The metallic positive and negative elements differ in composition, and fit into each other with a slot, the joint being riveted and brazed to a connecting piece.—G. H. R.

Generator (*Single Fluid*), *Electrochemical* ——. [*Baffles.*] H. S. Amwake, Camden, N.J., Assignor to C. H. Graham and G. D. Bouton, Philadelphia, Pa. U.S. Pat 707,372, Aug. 19, 1902.

According to this patent, which is an improvement on previous ones (see U.S. Pats. 702,760 and 12,019, 1902; this Journal, 1902, 1143), each electrode is surrounded by a current-conducting baffle, normally insulated from and means are provided for placing each electrode and its surrounding baffle in parallel circuit.—G. H. R.

Glass or other Materials; Process of Framing —— [*Electro-deposition*]. H. W. Scattergood. U.S. Pat. 709,513, Sept. 23, 1902.

See under VIII., *page* 1330.

Nitrogen Compounds [*Nitric Acid*] *from Atmospheric Nitrogen: Manufacturing* ——. C. S. Bradley and D. R. Lovejoy, New York, Assignors to Atmospheric Products Co., of Niagara Falls, N.Y. U.S. Pat. 709,867, Sept. 30, 1902. (See also this Journal, 1902, 1138.)

Air (or a mixture of nitrogen and oxygen), previously dried by cooling, is passed through an apparatus in which it is exposed to the action of a number of rapidly formed and interrupted electric arcs, maintained at the minimum thickness or volume consistent with avoidance of degeneration into sparks. The air traverses the apparatus at such a rate as to carry away the nitrous oxides formed from the arcs, so as substantially to prevent dissociation.—E. S.

Gases; Apparatus for subjecting ——, *to High-tension Discharges.* [*Electric Arc.*] C. S. Bradley, New York, and D. R. Lovejoy, Niagara Falls, Assignors to the Atmospheric Products Co., Niagara Falls. U.S. Pat. 709,868, Sept. 30, 1902.

The object of this patent, which is a division of a former one (Serial No. 8,008, 1901), is to enable the subdivision of the high-tension discharges so as to obtain a large number of arcs from the same circuit. A plurality of discharge devices, or fixed terminals, connected in parallel with a high tension supply circuit, is arranged in the containing vessel, and a shaft, carrying movable terminals, is mounted on it so that it can rotate. Means are provided for passing gases through the vessel, and subjecting them to the action of the discharge devices, and induction devices, supported on it, are connected in circuit with the fixed terminals. Means are also provided for supplying high-tension current to the induction devices and to the shaft. (See preceding abstract.)—G. H. R.

Alkali Salts; Electrolytic Decomposition of ——. E. Edser and M. Wildermann, London. U.S. Pat. 709,971, Sept. 30, 1902.

See Eng. Pat. 22,902, 1901; this Journal, 1902, 125. —G. H. R.

Graphite; Process of making ——. E. G. Acheson, Niagara Falls, N.Y. U.S. Pat. 711,031, Oct. 14, 1902.

A mass of carbon, preferably "petroleum-coke," is introduced into an electric furnace in lumps imbedded in powdered carbon, and with it is mixed a volatile material capable of forming carbide. The mass is then heated to a high temperature sufficient to vaporise the substance, causing the vapour to permeate the charge and graphitise it. —G. H. R.

(*B.*)—ELECTRO-METALLURGY.

English Patent.

Ores and Slimes; Method of, and Apparatus for, the Recovery of Precious Metals [Gold] from ——. F. T. Mumford, Kalgoorlie, Western Australia. Eng. Pat. 24,026, Nov. 26, 1901.

See U.S. Pat. 706,436, 1902; this Journal, 1902, 1144. —G. H. R.

United States Patent.

Copper or other Metals; Electrometallurgical Treatment of Ores of ——, [*Sulphurous Acid*]. C. J. Tossizza, Paris. U.S. Pat. 710,346, Sept. 30, 1902.

Copper or other metals may be recovered electrolytically from impure or ferruginous solutions of sulphate of copper, or of sulphide ores, those of the latter obtained by roasting the ores and treating with sulphuric acid. Sulphurous acid from the roasting operation is introduced into the electrolytic bath, whilst the voltage is simultaneously adjusted between about two-tenths and eight-tenths of a volt in such a way as to effect the decomposition of the salts of the metal to be recovered, whilst those of the other metals present in the solution remain intact. The insoluble anodes must be maintained in contact with the sulphurous acid.—G. H. R.

XII.—FATS, FATTY OILS, AND SOAP.

Rosin Oil: its Uses and a New Method of Producing it. P. Huth and W. Lippert. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [10], 226—228.

The authors tried decomposing ordinary colophony in an iron autoclave at a temperature of 250—260° C., under pressure of 12—15 atmos. The rosin was thus transformed into a viscid oil, which on distillation yielded a clear product.

Instead of the autoclave, a sealed glass tube was now used, the necessary safety valves affixed, and the glass tube was again heated to 300°—350° C. in an upright position, whereby the upper part remained cool, acting in some measure like a reversed condenser. A similar decomposition product was formed to that obtained in the iron autoclave, also a little more water, but no gas pressure was observed.

The process is considered suitable for the production of crude rosin oil, if a sufficiently strong apparatus can be constructed to withstand a temperature of over 300° C. and pressure of 12—15 atmos.

Experiments, at present in progress, on the distillation of rosin lime soaps, so far show that excess of lime hinders distillation; the mass also froths strongly, does not melt easily, and thus decomposition becomes difficult.—S. I. K.

Kapok Oil: Variation of the Mean Molecular Weight of the Fixed Fatty Acids. L. Philippe. Monit. Scient., 1902, **16**, [730], 728—736. (See this Journal, 1893, 923; 1894, 258.)

Kapok seeds contain 24·2 per cent. of oil. The oil examined by the author was obtained by cold-pressing; it gave the following figures:—specific gravity at 15° C., 0·9237: iodine value, 75·5; free acid, 5·2 per cent.; saponification value (Koettstorfer), 196·5: soluble acids or Planchon value, 0·37; Reichert value, 3·3; and Hehner value, 95·4. The insoluble fatty acids prepared in the usual manner and washed by boiling several times with water, gave the following figures:—Melting point, 35·5°—36° C.; solidifying point, 31·5° C.; saturation value (c.c. of N/1 potash required to saturate 5 grms. of the fatty acids), 12·0; acetyl value, 86·0. The fatty acids contained 30 per cent. of solid and 70 per cent. of liquid acids. The mean molecular weight of the fatty acids shows a great variation when calculated from the saponification value of the oil, and from the saturation value of the fatty acids; in the former case it is 272, and in the latter 416·7. The variation of the molecular weight is, according to the author, due to the formation of acid anhydrides, and it is probable that the great variation observed with kapok oil is due to the existence in this oil of a fatty acid capable of being easily transformed into an anhydride. Kapok oil is edible; it consists of a mixture of the glycerides of palmitic acid, oleic acid, and a liquid acid which has not been identified. The residual oil-cake is rich in nitrogenous matters. A sample completely freed from oil and dried yielded, on analysis, 4·25 per cent. of nitrogen. This oil cake is stated to form a very nutritive cattle-food.—A. S.

Fat of the Californian Bay Tree; Fatty Acids of ——. J. M. Stillman and E. C. O'Neill. Amer. Chem. J., 1902, **28**, [4], 327.

In 1882 (this Journal, 1882, 370) the authors believed that they had discovered an acid of formula $C_{11}H_{22}O_2$ in the fat of the seeds of the Californian bay tree (*Umbellularia Californica*). From their more recent work they have come to the conclusion that they were formerly dealing with a mixture of fatty acids (one of which was lauric acid) and not with a homogeneous acid.—C. A. M.

Cotton-Seed Oil in Butter; Halphen's Test for the Detection of ——. B. Sjollema and J. E. Tulleken.

See under XVIII. A., *page* 1344.

English Patents.

Cotton Seeds; Removing Fibre from ——. J. J. Green, Shreveport, Louisiana, U.S.A. Eng. Pat. 12,539, June 2, 1902. (Under Internat. Conv., Dec. 2, 1901.)

To remove fibres and gums from cotton seeds, the latter are heated and sprayed with concentrated sulphuric acid while being submitted to a rubbing action for the purpose of removing the portions of the fibres which have been carbonised, and of exposing fresh portions; the seeds are finally washed free from acid with water, and are dried. —F. B.

Saponaceous Product for Horticultural, Sanitary, and other Purposes. J. H. Koens. Eng. Pat. 19,494, Sept. 30, 1901.

See under XVIII. C., *page* 1345.

Resins, Fats, and Oils; Purifying and Decolorising ——. H. Arledter and R. J. Whitney. Eng. Pat. 15,531, Oct. 24, 1901.

See under XIII. B., *page* 1338.

Purifier for Waste Oil. S. H. H. Barratt and the United Asbestos Co., Ltd., both of London. Eng. Pat. 16,618, July 26, 1902.

The apparatus consists of a double casing with an intermediate heating coil, or with a heating jacket. The inner casing is secured to the bottom of the outer one by means of a central tube with a tap below, for drawing off the filtered oil. The impure oil is introduced into the space between the casings, where it deposits much of the impurities, which separate under the influence of the heat. It then rises through holes protected by strainers, at the lower part of the inner casing, and passing upwards through filtering material, preferably asbestos, is drawn off through the central tube.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Lithopone: Analysis of ——. Coffignier. Bull. Soc. Chim., 1902, **27**, [18], 943—947.

The author has extended his series of analyses of various samples of lithopone, some of the results of which were recorded in a previous paper (this Journal, 1902, 1146). In addition to the ordinary types of lithopone, some samples very rich in zinc sulphide (from 40 to 50 per cent.) have now been analysed. In the great majority of cases the results confirm the validity of the author's method of analysis. Some samples, however, all made at the same factory, afforded anomalous results, which gave totals falling very far short of 100. The fact is, when solutions of zinc sulphate and barium sulphide are caused to react, the precipitate contains oxysulphydrate of zinc, zinc hydrate and barium sulphate. On subsequent calcination, the oxysulphydrate is converted into sulphide and the hydrate into oxide. If the zinc soluble in 1 per cent. acetic acid, in the case of the anomalous analyses, be calculated as oxysulphydrate, ZnOH.SH, instead of as oxide, the results appear far more correct. They are, however, slightly high because some oxide is undoubtedly present. In the examination of lithopone therefore, the possible presence of oxysulphydrate of zinc, which is soluble in dilute acetic acid, has to be taken into account in the case of samples which have been insufficiently calcined. Samples of lithopone which had merely been dried without calcination showed the presence of this body very distinctly.—J. F. B.

Prussian Blue; Solubility of ——. Wyroubotf. Bull. Soc. Chim., 1902, **27**, [18], 940—941.

Referring to the note by Coffignier (this Journal, 1902, 1032) with regard to the solubility of Prussian blue in hydrochloric acid, the author remarks that he had recorded this fact in 1876. Coffignier's observation as to the great increase in the solubility of the blue in presence of fatty alcohols is new and important. The question now arises whether this is a phenomenon of true solution or whether the alcohols bring about a secondary decomposition of the blue with formation of alcoholic cyanides and ferric chloride. Coffignier misses this important point in that he does not state whether ferric chloride is present or not in the aqueous liquors after the reprecipitation of the blue by water. The nature of the change which occurs when Prussian blue dissolves in hydrochloric acid, with loss of its blue colour, is not elucidated; it is suggested that a combination may be formed with the acid, as a sort of hydrochloride of ferric ferrocyanide, similar to the hydrochlorides of chlorides studied by Engel. The increased solubility of the blue in presence of alcohols, provided no secondary decomposition occurs, ought to help to clear up this point.—J. F. B.

United States Patents.

Lampblack Apparatus. J. L. Maun, Smithton, West Virginia, Assignor to the Castle Brook Carbon Black Co., Williamsport, Pa. U.S. Pat. 706,429, Aug. 5, 1902.

Purely mechanical device for collecting and discharging lampblack.

Reference is made to U.S. Pat. 706,430, abstracted below. —E. S.

Carbon-Black; Apparatus for Making ——. J. H. Mann, Meadville, Pa., Assignor to the Castle Brook Carbon Black Co., Williamsport, Pa. U.S. Pat. 706,430, Aug. 5, 1902.

The main features of the apparatus are, "the combination of a casing, a horizontal shaft mounted therein, a series of carbon collecting wheels mounted thereon and spaced apart to permit the passage of air between the same, carbon burners arranged beneath each carbon-collecting wheel, and perforated plates located between the burners" and the wheels, to separate them, and direct the flame thereto. Transversely and above the primary collecting wheels a second series of wheels is arranged, and so on in succession. —E. S.

White Lead; Apparatus and Method for Producing ——. J. W. Bailey, Jersey City, U.S.A., Assignor to the Union Lead and Oil Co., New Jersey. U.S. Pats. 709,954 and 709,955, Sept. 30, 1902.

Molten lead, allowed to flow through orifices in a perforated plate, solidifies in the form of threads, or "lead fibre." This falls into a chute, which by a rocking motion deposits it in a series of wave-shaped ridges on a travelling belt, 8 or 9 feet wide and several hundred feet in length. The belt is constructed of wood slats, covered with wire cloth or other suitable porous material. The belt with its charge of lead passes first through a tank containing dilute acetic acid, and thence travels to the corroding chamber, the lead becoming superficially oxidised by the action of the air in the course of its traverse. The corroding chamber is 100—300 feet long and is supplied with carbon dioxide and steam. The belt enters near the roof and passes through the whole length of the chamber. At the extremity of its course it delivers its charge to a second belt running in the opposite direction, and this again to a third, and so on. The lead thus reaches the bottom of the chamber after a total course of about 5,000 feet, and by allowing the process to occupy about four days, only 8 per cent. of the metal remains uncarbonated.

In patent 709,555 the essential features of the claim are that the lead fibre is maintained throughout the process in an uncompacted condition so as to facilitate the access of the corroding gases, and is moistened with dilute acid during its passage through the corroding chamber.—M. J. S.

White Lead; Apparatus and Method for Producing ——. J. W. Bailey, Jersey City, U.S.A., Assignor to the Union Lead and Oil Co., New Jersey. U.S. Pats. 709,956 and 709,957, Sept. 30, 1902.

Metallic lead is reduced to a fine powder by a disintegrator or other form of mill. The lead dust is conveyed by a current of air to a vertical cylindrical chamber, meeting on its way with a supply of carbon dioxide and acetic acid vapour, driven in the same direction by a steam blast. The dust-laden gases enter the chamber tangentially, and the whirling motion thus imparted to them maintains the dust in suspension sufficiently long to ensure its conversion into lead carbonate.

An alternative method consists in sifting the lead powder into the top of the chamber, and allowing it, as it falls, to encounter a rising current of the gases.—M. J. S.

Printing Colour for Lithographic or Metallographic Printing. J. Adelsberger and H. Friedmann, Assignors to S. Wechsler, all of Vienna. U.S. Pat. 710,283, Sept. 30, 1902.

Substantially identical with Eng. Pat. 12,806, 1901 (this Journal, 1902, 782), except that the claim includes the use of a volatile resinous oil, which serves to bind the glycerin to the varnish.—M. J. S.

(B.)—RESINS, VARNISHES.

Gums [Gum Resins] of German East Africa. F. Mannich. Tropenpflanzer, 1902, 201; through J. Pharm. Chim., **16**, [5], 214.

The gums examined were those brought back by the exploration expedition of W. Busse. In each case the optical rotation given below refers to a 10 per cent. solution in a 100 mm. tube.

Acacia verek.—In pieces of various size and colour. The amount of ash appears to correspond with the depth of colour. Colourless tears give 2·622 per cent. of ash, brown particles 3·22 per cent. Optical rotation is feebly lævo-rotatory, *viz.*, − 1·1°. It contains no bassorin.

Acacia kirkii.—In grains and fragments often colourless; without bassorin. Ash 2·56 per cent. Rotation + 2·6°. Solution of good adhesive power, slightly acid in reaction.

Acacia Seyal.—Varying in size and colour. Contains but little bassorin; ash 1·70 per cent. Rotation + 5·1°. Mucilage is not precipitated by basic lead acetate.

Acacia spirocarpa.—The transparency, ash, and rotation of this gum vary with the age of the trees yielding it. Adult trees give a translucent gum with 1·8 per cent. of ash, and a rotation of − 2·6°. Younger trees yield it in the form of small opaque tears, with 3·022 per cent. of ash, and a rotation of + 1·4°.

Acacia arabica.—In pale pieces the size of a nut, traversed with numerous fissures. It contains a little bassorin. Ash 1·55 per cent. Rotation + 7·9°. Its solution is not precipitated by basic lead acetate nor by ferric chloride.

Acacia stenocarpa.—This gum is confounded with commercial Senaar or Suakim gum. It contains bassorin. Ash, 3·76 per cent. Rotation + 4·75°.

Acacia usambarensis.—In large brown masses of agglomerated tears, with a vitreous fracture. It swells with 10 times its weight of water, forming a thick mucilage. It contains much bassorin together with arabin. Ash, 1·93 per cent.

Berlinia emini.—This gum resembles tragacanth. It occurs in horny brown opaque pieces, with a slight but peculiar odour. It forms a jelly with 10 times its weight of water; with 50 parts of water it gives a slightly acid mucilage which is precipitated by neutral lead acetate. Ash, 5·78 per cent. It contains no starch.

Gum of unknown Botanical Origin.—This gum, distinguished by a greenish reflection when seen in large masses, is of good quality; it furnishes a colourless thick mucilage of great adhesive power. Ash, 3·692 per cent. optical rotation = − 0·78.—J. O. B.

English Patent.

Resins, Fats, and Oils; Purifying and Decolorising ——. H. Arledter and R. J. Whitney, both of Liverpool. From F. Arledter, Harburg, Germany. Eng. Pat. 15,531, Oct. 24, 1901.

Impure, coloured resins, fats, and oils are heated in a boiler with a dilute solution of an alkali or alkali carbonate to a temperature of about 150° C. whilst stirring continuously. The pressure rises to about 10 atmospheres, and a sudden cessation of the rise in pressure is evidence of the completion of the reaction. Carbon dioxide is then admitted until it is in excess, as is shown by the pressure again rising. The whole is cooled, whilst the atmosphere of carbon dioxide is maintained. The aqueous liquid, containing the impurities, is run off, and the resin again melted.—M. J. S.

(*C.*)—INDIA-RUBBER.

India-Rubber and Gutta-Percha in New Guinea. Imp. Inst. J., Oct. 1902, 268.

Schlechter, in "*Der Tropenpflanzer*" for August 1902, gives the following results of the examination of some specimens of rubber collected in New Guinea:—

Source of Specimen.	Age of Tree.	Yield.	Quality.	Content of true Caoutchouc.	Value.
	Years.	Oz.		Per Cent.	Per lb.
Ficus elastica	8	8	"middling"	80·7	2*s.* 2*d.*–2*s.* 9*d.*
Castilloa species..	6	12	"similar to Peruvian scrap"	84·0	2*s.* 4*d.*
Castilloa species..	3	¼	"resinous"	58·6	1*s.* 8*d.*
Hevea brasiliensis	4	2	"good"	90·2	3*s.* 2*d.*

A sample of gutta-percha also collected in New Guinea gave the following results:—Content of true gutta-percha, 56—74·8 per cent.; content of resin, 25—35 per cent.; value per lb., 2*s.* 8*d.* to 4*s.*—A. S.

Gutta-Percha; Methods for Determining ——. E. Marckwald and F. Frank.

See under XXIII., *page* 1351.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Gelatin; Action of Chromium Compounds on ——. R. Namias. Boll. Chim. Farm., **41**, 525—528. Chem. Centr., 1902, **2**, [13], 864.

Compounds of chromium are known to be more active than those of other metals in rendering gelatin insoluble. Contrary to the view generally held, however, ordinary chrome alum and ammonium chrome alum are not very active in this respect, chromous chloride and chromium acetate and tartrate have also only a slight action. The effect of chromium compounds in rendering gelatin insoluble is due to the power of the latter of combining with chromium oxide with the formation of insoluble compounds, and according to the author, the superiority of chromium sulphate over all other chromium salts in causing the change, is due to the greater tendency of this salt in solution to dissociate into chromium oxide and sulphuric acid. The presence of free acid hinders the separation of chromium oxide from the liquid and its combination with the gelatin. Gelatin which has been treated with a basic or neutral chrome alum solution, maintains its greenish colour even after repeated washing. A film of gelatin dipped in a 5 per cent. solution of potassium or ammonium bichromate, and then dried and kept in the dark, required several months before it became completely insoluble; in the light, the change proceeded more rapidly, but the gelatin acquired a brown colour. Gelatin which has been rendered insoluble by means of a bichromate and then washed till quite colourless, still contains chromium. Aluminium salts are less active than chromium salts, but the author obtained a liquid which was very active and coloured gelatin to only a slight extent, by adding 10 per cent. of common alum to a 10 per cent. solution of chrome alum containing in suspension a small amount of chromium hydrate, and boiling for some time. Chromium salts act upon albumin, casein, and gum in the same way as upon gelatin, neutral or basic chromium sulphate solution having the greatest effect. The results of the experiments appear to be of practical value for the tanning industry, the preparation of waterproof fabrics, and for photographic purposes. By the action of basic chrome alum solution on a mixture of gelatin and casein, the author has obtained very hard masses of different colours. —A. S.

United States Patent.

Plastic Articles [Leather Substitute]; Production of ——. E. Lottier, New Jersey, U.S.A. U.S. Pat. 710,287, Sept. 30, 1902.

A composition consisting of equal parts of waste silk fibre, shellac, and alcohol, and having the consistence of molasses, can be readily shaped when pressed in a heated mould. —G. T. M.

XV.—MANURES, Etc.

Phosphoric Acid; Determination of ——, *by means of Ammonium Phosphomolybdate.* G. P. Baxter.

See under XXIII., *page* 1351.

English Patents.

Thomas Powder; Manufacture of ——, *from Thomas Slag.* H. Schulte-Steinberg, Düren, Germany. Eng. Pat. 63, Jan. 1, 1902.

The slag is placed over a series of sieves in trucks and disintegrated by the action of steam. Sifting is effected during the heating with steam, by imparting a shaking movement to the trucks, and the finely powdered slag is dried.—N. H. J. M.

Manures, Artificial; Manufacture of ——. H. H. Lake, London. From The Cyanide Co., Ltd., Berlin. Eng. Pat. 15,976, July 17, 1902.

The manure is obtained by the action of atmospheric nitrogen on carbides, especially calcium carbide, or on mixtures which yield carbides. The product contains

substantially the metallic salts of amides or carbodiimides and their derivatives. It is lixiviated with hot water, whereby the metal is removed and the nitrogenous compounds (to be subsequently employed as manures) left behind in the free state.—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Inversion; Studies on ——. C. Kullgren. Zeits. physik. Chem., **41**, 407—426. Chem. Centr., 1902, **2**, [11], 726.

Cane sugar is inverted by merely boiling with water, also by boiling with saline solutions. The progress of the inversion cannot be expressed by a constant of the usual equation; on the contrary the coefficient of inversion calculated in the ordinary manner increases greatly with the time. The acidity of the cane sugar and of the invert sugar is not sufficient to account for this increase. In the course of inversion by heating to 100° C., however, an acid is formed in such quantity that it can be determined acidimetrically, and the concentration of this acid is nearly proportional to that of the invert sugar. A new inversion-formula can be based on this formation, which will satisfactorily represent the later and greater portion of the process of inversion. The inversion is started by the hydrogen ions of the water, and of the cane sugar, and is accelerated by those of the acid formed. According to Madsen (see this Journal, 1901, 512), the dissociation of cane sugar increases about sixfold between 10·5° and 39·8° C., whilst that of water in the same interval is stated by Kohlrausch and Heydweiller (Wied. Ann., **53**, 209), to increase tenfold. Probably at 100° C., the dissociation of water is equal to that of cane sugar, although at 20° C., it is less than the latter. At the beginning of the inversion, the concentration of the hydrogen ions of the cane sugar solution is 8×10^{-7} which does not greatly differ from the value, $8{\cdot}5 \times 10^{-7}$ directly determined for water by Kohlrausch and Heydweiller. On heating with saline solutions, the increase of the coefficient of inversion is smaller, the greater is the degree of hydrolysis of the salt.

—A. S.

Third Carbonating [*Sugar-juice*]. G. Collignon. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., **20**, [3], 1902, 310—313.

By the introduction of a third carbonating, good results have been obtained. The installation for triple carbonating in a factory working up 550,000 kilos. of beetroots in the 24 hours, consists of four "blow-ups," two for the first carbonating and one each for the others, all of the same size, 4 × 1·4 metres and 5·7 metres deep, the height of the juice being 3 metres. All these work continuously. Milk of lime equivalent to 2·3 kilos. of anhydrous lime per hectolitre of juice, is added to the diffusion juice, which enters the first "blow-up" after being heated to 55° C. by a condenser heater supplied with steam from the third body of the triple effect. The juice is then carbonated so as to leave in it 1 grm. of lime per litre. The carbonated juice next passes through a heater of 92 sq. m. of heating surface, where it is raised to 90° C. before being run off to the filter presses. To the juice from the presses, milk of lime equal to 0·5 kilo. of lime per hectolitre is added, and the alkalinity is reduced by carbonating, to 0·55, when it (the juice) is again filtered. It now passes a heater of 150 sq. m., which raises its temperature to 92° C. before entering the last "blow-up," where the carbonating commenced in the second stage, is now carried almost to neutrality. The juice is again passed through a filter press, then to the Philippe filters, and finally to the triple effect.

The results of five previous seasons of double carbonating are given for comparison. The third carbonating showed an increase of 1·5 of apparent purity, whilst the non-sugar was reduced from 0·98 to 0·80. In consequence of an extra filtration, the triple effect had less incrustation than usual. Improvement was even more marked in the lower products, the massecuites of the third jet being very fluid and easily grained, and a greater yield being obtained, thus sensibly lessening the amount of molasses, which, moreover, had a higher degree of purity.—L. J. de W.

Molasses; Amine-Ammonia Liquor from Distillation of the Waste Lyes of Desugarised ——. K. Andrlik. Zeits. f. Zuckerind. in Böhmen, 1902, **27**, [1], 1—15.

The ammonia liquor obtained from the distillation of the lyes of desugarised molasses should be properly termed amine-ammonia liquor. It contains a quantity of nitrogen varying from 2·7 to 5·6 per cent. according to the amount of water used for condensing the volatile products. Only one-fourth to one-third of this nitrogen is in the form of ammonia, the other nitrogenous components present being various amines, some pyrrol, and a little pyridine. The ammonia and amines are chiefly combined with carbonic acid. Besides these substances, methyl alcohol is present in quantity—a fact of some technical importance. It passes over almost completely on distilling off 30 per cent. of the amine-ammonia liquor.

It was not found possible to separate the ammonia and various amines by fractional distillation with lime. The distillate from lime, when passed into sulphuric acid, yielded ammonium sulphate. After crystallising out a portion of this, a syrupy uncrystallisable mother-lye remained, particularly rich in amine-nitrogen. The amine lye contains 10 to 13 per cent. of total nitrogen, 20 to 30 per cent. of which is due to ammonia, 5 to 10 per cent. to monomethylamine, and about 20 per cent. to trimethylamine and other amines, pyrrol, pyridine, &c.

By receiving the distillate in phosphoric acid, ammonium phosphate crystallises out more completely than the sulphate, only about 0·5 per cent. of ammonia remaining in the amine lye. This lye also crystallises with difficulty, but, on boiling, it froths, and the amines gradually volatilise, leaving free phosphoric acid. The determination of the nitrogenous constituents was made by Bresler's method, an exact separation of the ammonia and an almost exact separation of monomethylamine being obtained. The quantitative separation of di- and trimethylamine as chloroplatinate was not possible even with the aid of absolute alcohol.—L. J. de W.

Waste-Liquors from the Desaccharification of Molasses; Transformation of Nitrogen into Ammonia in the ——. K. Andrlik. Chem.-Zeit., 1902, **26**, [27], Rep., 274.

The author has made experiments on the conversion into some useful form, preferably ammonia, of the nitrogen in the waste liquors from molasses. Previous attempts have been in the direction of distilling the liquors in retorts, almost the whole of the nitrogen then being found in the distillate in the form of amines. In the author's investigations, however, the actions of the following bacteria have been studied:—(1) *Bac. proteus vulg.*; (2) *Bac. megatherium*; (3) *Bac. rhamnosus*; (4) *Bac. mycoïdes*; (5) *Bac. subtilis*; (6) A mixture of the four organisms (2)—(5). The results obtained were as follows:—Under the conditions employed, the conversion into ammonia was too slow to be employed in practice. The most favourable behaviour was exhibited by *Bac. megatherium*, which transformed 62 per cent. of the nitrogen present into a volatile form. The formation of amines depends on the decomposition of betaine, of which 72 per cent. disappeared. The quantity of acids, especially of those extracted by ether, was increased to as much as 300 per cent. of the original quantity.—T. H. P.

Saccharine Solutions; Behaviour of Ammonium Salts of some Amino Acids in hot Aqueous and ——. K. Andrlik. Chem.-Zeit., 1902, **26**, [27], Rep. 274.

The fact that, when boiled, some sugar juices lose their alkalinity and become acid, has been explained as due to a decomposition of sugar with formation of acid. This explanation is, however, insufficient, as the formation of acid from sugar is accompanied by intense caramelisation or oxidation, neither of which phenomena is observed. The author has previously observed that syrups which thus lose their alkalinity contain a quantity of non-volatile bases insufficient to saturate the acids (especially aspargic acid) present, so that these acids combine with ammonia. But the ammonium salts of the amino-acids readily lose their ammonia on heating, and become acid, this being the case

e.g., with aspargic and glutaminic acids, tyrosine and leucine, which are found in beet juices. The author has carried out experiments, from the results of which he concludes that: (1) Both aqueous and saccharine solutions of the ammonium salts of the acids named, lose ammonia when boiled. (2) Such solutions, having a distinctly alkaline reaction towards phenolphthalein, become acid on boiling. (3) The acid-reacting ammonium salts of aspargic and glutaminic acids cause the inversion of the saccharose in sugar juices. (4) When the evaporation takes place in a vacuum, although ammonia is expelled from these salts, the inversion is but slight. (5) The ammonium salts of tyrosine and leucine, when boiled in saccharine solutions, cause but a slight inversion, although they lose all their ammonia.—T. H. P.

Starch; Soluble Form of ——. (Ger. Pat. 134,301, May 30, 1901.) Zeits. Spiritusind., **25**, [41], 443.

100 KILOS. of starch are mixed with 3—5 kilos. of ammonium persulphate and 150 litres of water. On shaking, oxygen is liberated, and acts on the starch, producing a soluble form. The mixture is allowed to stand 10 hours, the water poured off, and the residue washed and dried.

The resulting product possesses the physical properties of gelatin, and dissolves in warm water to a clear solution.

—B. F. D.

Maltose and Glucose; The Equilibrium between ——. C. Pomeranz.

See under XXIV., *page* 1353.

Rhodeose; Oxidation Products of ——. E. Votoček.

See under XXIV., *page* 1353.

UNITED STATES PATENT.

Liquids [*Gum Solutions*]; *Process of Clarifying* ——. H. Lubberger, Assignor to L. W. Gans, Frankfort-on-the-Maine, Germany. U.S. Pat. 706,075, Aug. 5, 1902.

THE use of a solution of gelatin in clarifying solutions is supplemented by the addition of an oxidising agent, such as bleaching powder, hydrogen peroxide, or potassium permanganate, which are stated to have, in certain cases, advantages over the addition of tannic acid to the gelatin for similar purposes. In the refining of gum arabic, given as an example, gelatin and permanganate are used.—E. S.

XVII.—BREWING, WINES, SPIRITS, Etc.

Invertase of Yeast. G. Holzmann. Zeits. Spiritusind., **25**, [41], 443.

BOKORNY (this Journal, 1901, 824) has shown that the invertase of yeast is much more resistant to antiseptics than the maltase. In his experiments he used live yeast instead of extracting the enzymes, and on this account obtained results at variance with those of earlier experimenters. The same author (this Journal, 1902, 1086) showed that the degree of inversion of a sugar solution by yeast was the same whether the solutions were of 5 or 20 per cent. concentration.

In the following experiments a 20 per cent. solution of cane sugar was acted on for 15 minutes at 45° C. by different yeasts. A yeast dried at 25° C. gave a higher inversion than fresh yeast. A yeast which had stood for three days under absolute alcohol was only slightly weakened, but after three days' treatment with alcohol at 45° C., the invertase was destroyed. Dry yeast left for two days in 5 per cent. oxalic acid solution was not weakened; 2 per cent. acetic acid, 2 per cent. lactic acid, 5 per cent. sulphuric acid, and even 5 per cent. hydrofluoric acid were also without appreciable effect on the inverting power of the yeast.—B. F. D.

Yeast Gum and Invertase. K. Oshima. Zeits. physiol. Chem., **36**, 42—48. Chem. Centr., 1902, **2**, [14], 906.

THE author's experiments were made with a view to obtain an invertase free from yeast-gum (see Salkowski, this Journal, 1901, 489), and to study the chemical nature of yeast-gum. The yeast-gum was prepared by Salkowski's method (this Journal, 1894, 411). The results of distillation with hydrochloric acid and hydrolysis with sulphuric acid led to the conclusion that yeast-gum consists of a substance which on hydrolysis yields chiefly *d*-mannose, with probably *d*-glucose: it also contains a methyl pentosan forming fucose on hydrolysis.

Crude invertase was prepared from yeast by Osborne's method (this Journal, 1899, 777). The author observed that by increasing the time of extraction with chloroform-water, the yield was increased, but the preparation was less active. Attempts to obtain an invertase free from carbohydrates by means of fractional precipitation with alcohol, led to the discovery that a 1 per cent. solution of yeast-gum is not precipitated by 1½ times to twice its volume of 93 per cent. alcohol. In presence of invertase or of an aqueous extract of yeast, the gum, however, is precipitated even by an equal volume of alcohol and in solutions of less than 1 per cent. strength. In view of these facts it would be very tedious to attain the desired object by fractional precipitation, whilst by the repeated treatment with alcohol, a decrease of the activity of the invertase is to be feared. Precipitation with copper acetate gave an active preparation free from albumin and gum, but the yield was very small and the activity had frequently been reduced. A combination of the precipitation by alcohol and that by copper acetate would probably answer best.—A. S.

Malting: Studies on ——. W. Windisch and R. Hasse. Woch. für Brau., 1902, **19**, [40], 583—585.

THE attention of the authors is being devoted to the question of how far the steeping process in the cistern may be replaced by steeping in the pneumatic drum. The present paper deals with the distribution of the water and the diastase in the corn, with comparative methods of steeping, and with germination in the drum.

Distribution of the Water: (*a*) *Steeping in Cistern.*—The barley was given a full steep of 72 hours in the cistern according to the old system, changing the water twice daily. Samples were taken every 24 hours, and the corns were cut into halves, the moisture being determined in the two halves separately. The steeped grain was germinated in the drum with rather wet working. It was found that right through the whole process, from the first day of steeping to the last day of germination, the germ-halves contained considerably more water than the awn-halves of the corns. Since the water is the medium by which the modifying enzymes are conveyed to the different parts of the corn, the deficiency of the awn-halves in water would account for their lower degree of modification.

(*b*) *Steeping in Drum.*—The barley was steeped for 24 hours in the cistern, then charged into the drum, and submitted to an after-steep for two days by spraying very freely and rotating the drum, with aëration. After the third day the ordinary course of drum-germination was followed, except that no sprinkling was done after the fifth day, meaning a somewhat drier treatment. In this experiment the distribution of the water was also extremely uneven, just as in the other case, but the drier treatment towards the end effected a slight improvement in the equalisation of the moisture. Complete equalisation is hindered by the powerful attraction of the growing embryo for moisture, influencing that part of the endosperm which is in immediate contact with it.

Distribution of the Diastase.—In the same malting experiments the distribution of the diastase in the two halves of the corns was also studied. As might be expected, the proportion of diastase through the germination was very much greater in the germ-halves than in the awn-halves. But the extent of the difference was surprising; it was especially large in the drum-steeped malt. The difference would first ensue because the diastase is elaborated at the embryo end of the corn, and would be accentuated by the deficiency of moisture, as the transporting medium, in the awn-halves; the temperature of the two halves of the corn may also be different, owing to the activity of the embryo. The only remedy which at present suggests itself is cool, slow, and dry malting, with

judicious aëration. It cannot be denied that floor germination is better adapted to obtain this result than drum germination, since the latter is by necessity a much wetter process, and prevents equalisation of moisture by maintaining the saturation of the growing embryo. The main difficulty is the hygroscopic nature of the embryo; if vital activity could be checked when the embryo has attained a sufficient length, and when sufficient diastase has been elaborated, and if the enzyme could be left to complete the work of modification by itself without other activity going on, the ideal malting conditions would be realised.—J. F. B.

Starch; Action of Formaldehyde on ——, and an Iodine Compound of Amylodextrin. V. Syniewski. Annalen, 1902, **324**, [2 and 3], 201—212.

The relatively small amounts of formaldehyde (0·1 per cent. solution) used in the author's experiments on the hydrolysis of starch (as per next abstract) have no influence on the action of diastase or starch paste beyond slackening the reaction.

When potato starch is allowed to remain for two months in presence of a 40 per cent. solution of formaldehyde, a mobile opalescent fluid results, which gives no coloration with iodine, and is to be regarded as a definite compound. This compound has not been isolated in the pure solid state; on evaporation and heating, the whole of the formaldehyde is volatilised, and the residue again yields a blue reaction with iodine. If the solution of the formaldehyde compound be largely diluted with water, the formaldehyde is gradually separated, and the iodine reaction of the solution passes through the usual scale of colours from brown, through red and violet, to pure blue. This hydrolytic cleavage is brought about with greater rapidity in presence of acids. The product which remains in solution when the blue iodine reaction has been reached can be precipitated by alcohol; it is undoubtedly a product of the hydrolysis of starch, and, since it does not reduce Fehling's solution, it is concluded that formaldehyde in concentrated solution brings about a "carbinol" hydrolysis of starch, the product being amylodextrin or something very closely resembling it. Amylodextrin itself, when introduced into concentrated formaldehyde solution, dissolves at once, and the iodine reaction, blue at first, passes gradually through violet, red, and brown, and is finally colourless when combination is complete, returning again in the reverse order when the solution is diluted. If the formaldehyde-amylodextrin solution be evaporated, a crystalline residue remains, which has an appearance, under the microscope, exactly similar to that of starch granules; no blue coloration, however, is produced with iodine in the absence of acids.

Action of Iodine on Amylodextrin.—The dark blue precipitate obtained by the action of iodine on solutions of amylodextrin possesses a constant composition when a certain excess of iodine is employed; this precipitate then contains about 20 per cent. of iodine. It may be assumed that each amylogen (C_{54}) complex combines with three atoms of iodine, or one atom of iodine to each sub-complex of C_{18}. The iodine most probably attaches itself to the terminal CH_2OH groups. When all three of these primary alcoholic groups are combined with formaldehyde, no coloration with iodine can take place: as the splitting off of the formaldehyde occurs, the brown coloration with iodine would correspond with the liberation of one CH_2OH group, the carmine-red with the liberation of two, and the blue coloration with the liberation of all three terminal groups of the amylogen complex.—J. F. B.

Starch; Constitution of ——. V. Syniewski. Annalen, 1902, **324**, [2 and 3], 212—268.

Action of Heated Malt Extract on Starch.—A solution of starch, prepared by heating potato-starch paste in the autoclave at 140° C., was subjected to the action of malt extract which had previously been heated at 78° C. in presence of 0·1 per cent. of formaldehyde. Reaction was conducted at the ordinary temperature; at the end of 216 hours, the starch was completely converted into a product identical with the maltodextrin of Brown and Morris, the achroodextrin II. of Lintner and the maltodextrin of Ling and Baker. To this substance the author gives the name of "Grenzdextrin II.," since the hydrolysis proceeds very slowly after the stage at which it is produced. Grenzdextrin II. has the molecular formula $C_{36}H_{62}O_{31}$; $[\alpha]_D^{20°} = 179° 36'$, and R (maltose) = 30 per cent. This substance is rapidly hydrolysed by unheated malt extract; from a partially converted solution, maltose and a dextrin termed γ-maltodextrin $[\alpha]_D^{20°} = 172° 17'$, R = 42·7 per cent., were obtained, the latter corresponding to Prior's achroodextrin III. and Ling and Baker's maltodextrin-β. Complete hydrolysis of Grenzdextrin II. at the ordinary temperatures, yields a mixture of two parts of maltose and one part of "isomaltose" (Lintner's); hydrolysis of γ-maltodextrin yields a mixture of equal parts of maltose and "isomaltose." The production of "isomaltose" is now definitely established, the author having prepared it in the pure state. It has the characters $[\alpha]_D^{20°} = 141° 40'$, R = 84·5 per cent. of that of maltose, osazone m. pt., 152°—153° C.; it is, however, fermentable by yeast, and is not identical with the isomaltose of Fischer; the author prefers to distinguish it by the name of dextrinose. This body is also obtainable from Grenzdextrin I. (ordinary "stable" dextrin) by three weeks' hydrolysis with malt extract.

The Carbinol Hydrolysis of Starch.—On heating starch paste in the autoclave at 140° C., a clear solution of amylodextrin, soluble in cold water, not reducing Fehling's solution, and giving a blue iodine reaction, is obtained. The analysis of this body and the production of its acetyl derivative indicated that its amylogen complex contains three free hydroxyls more than that of starch. On standing for some days, solutions of amylodextrin deposit a precipitate of a reversion product insoluble in cold water.

The starch molecule, the amylogen complex of which contains 27 free hydroxyls, is not hydrolysed by malt extract in the cold; it must first undergo carbinol hydrolysis, being split up into amylodextrin. The amylogen complex of amylodextrin contains 30 free hydroxyls, and this dextrin is readily hydrolysed by cold malt extract, yielding the whole of the maltose it contains. The product of the reversion of amylodextrin has an amylogen complex with 29 free hydroxyls; this body is hydrolysed by malt extract in the cold, but only yields two-thirds of the total maltose contained in it.

Constitution of Starch.—The author assumes that the nine glucose residues which make up the amylogen complex, $C_{54}H_{90}O_{45}$, of starch, are connected together by nine carbonyl linkages of three different kinds, *viz.*, three α-linkages connecting the three maltose residues to a central Grenzdextrin I. (C_{18}) residue, three β-linkages which connect the three glucose components of this Grenzdextrin I. residue, and three γ-linkages which connect the glucose components of the three maltose residues.

The potato-starch molecule is regarded as being made up of four amylogen complexes, and its formula is $C_{216}H_{360}O_{180}$. In this molecule each amylogen complex is connected with the others by six carbinol anhydride linkages, three operating between Grenzdextrin I. residues (*d*-carbinol bonds), and three between maltose residues (*m*-carbinol bonds). The malto-carbinol bonds are hydrolysed by heating with water at 140° C.; all other hydrolyses, with malt extracts in different ways, act upon the various carbonyl linkages. The two (C_{18}) components of Grenzdextrin II. and the two glucose components of dextrinose are united by the *d*-carbinol bonds, and these resist to the end.

The author proposes to define a sugar as a complex in which the glucose residues are united only by carbonyl linkages, the highest member of the series being amylogen and the lowest glucose. A dextrin complex, on the other hand, contains at least one carbinol linkage, the highest dextrin being amylodextrin and the lowest dextrinose.

—J. F. B.

Hops; Aroma and Bitter Principles of ——. Th. Remy. Woch. f. Brau., **19**, [41], 614—618.

Hayduck has shown that of the two bitter principles of hops, the α-resin is stronger than the β-resin. As, however, the former is precipitated to a considerable extent

during fermentation, it may not be the essential bitter principle of the finished beer.

The experiments described, go to show that the variation in the degree of bitterness imparted to beer by hops from different localities, depends upon the relative proportions of α- and β-resin present.

5—10 grms. of the finely ground hops were extracted with light petroleum spirit. From this extract 50 c.c. were taken for the estimation of the total resin with N/10 potash. Six 25-c.c. portions of the extract were heated in a water-bath to expel the petroleum spirit, and the volumes again made up to 25 c.c. A saturated and standardised alcoholic solution of lead acetate was added to each, in amounts increasing from 0·15 c.c., by increments of 0·15 cc. Each solution was then shaken and filtered, and the filtrate tested for resin by the addition of more acetate. In one of the samples, complete precipitation was obtained, and from the volume of acetate solution added, the quantity of α-resin was calculated. 1 c.c. of the solution represents 16·5 mgrms. of the α-resin.

A number of results, obtained with hops from many districts and of many varieties, are tabulated, the percentage of the α-resin to the total resin being calculated. Those hops which are valued for their high bitter properties show a larger percentage of the α-resin than those which are characterised as mild. Hops of different varieties grown under the same conditions also show marked differences. Some experiments made by the author with hops grown under similar conditions, but with different manures, seemed to show no striking variation in the quantity of α-resin obtained.—B. F. D.

Hops; Heating Tendency of ——. M. Delbrück. Woch. für Brau., 1902, **19**, [40], 582—583.

Observations have shown, both in the case of barley and yeast, that a high proportion of nitrogen is accompanied by high enzymic activity. It would seem that all through nature an active "hot" temperament and a quiet temperament are observable. The author has studied these two distinctions in the case of potatoes, and their tendency to rot or to be preserved during winter storage. A "hot" organism tends to destroy itself through the activity of the enzyme present in it, and only then does it fall an easy prey to bacteria.

It is well known that hops, if they are not thoroughly dried, and in some cases treated with sulphurous acid, readily undergo changes which render them valueless. The author contends that the preservative effect of drying on the hop cells is due to the stoppage of enzyme activity in the cells themselves, and that sulphurous acid, owing to its avidity for oxygen, would retard respiratory activity. The effect of these treatments is on the hops themselves in the first place, and only secondarily on any micro-organisms which may be present. The question then arises:—Are there hops which have a "hot" tendency as a specific characteristic, quite apart from unfavourable conditions of storage? Practical experience indicates that there are. With barley and yeast the "hot" active tendency is determined by two factors; first, the race, one cell-organism being more adapted and provided for enzymic activity than another; and, secondly, the cultivation, *e.g.*, soil, nutrition, climate, and period of ripening.

Baden hops show a great tendency to lose their value on keeping. Fine hops preserve their aroma, whilst inferior qualities show their inferiority frequently only after storage. The activity of the enzymes is the first cause of this deterioration. The origin of hops is not a meaningless method of classification; it implies certain species and conditions of growth. Care should be devoted to obtaining a product poor in nitrogen; the nitrogenous fertilisation should be moderate, and the crop should be harvested only after full maturity, *i.e.*, a period when the enzyme-contents begin to diminish.—J. F. B.

Beer; Influence of Different Malting Methods on the Character of the ——. K. Winter. Woch. für Brau., 1902, **19**, [42], 639—640.

Various types of beer require various types of malt, and the experienced maltster is in a position to adapt his malt to the particular type of beer by developing acrospire and rootlet longer or shorter independently of each other, provided the weather remains within certain limits. Photographs are given showing typical green malt plants developed in accordance with this plan. In the Bohemian series, three types of green malt are shown, all grown in the same way on the floor for nine days, but with steeping of 65, 80, and 100 hours, and with acrospires equal to half, three-quarters, and full length of the corn respectively, with stout, curly rootlets. The shortest steep gives the palest product, but with steely points; this malt is most suitable for pithy beers with good permanent head of the Pilsener type, but these qualities are obtained at the expense of its keeping properties. The beer from the long-steeped malt, on the other hand, will be milder and more attenuated, and will keep well; the modification and yield of extract from coarse grist follows the order of steeping. For pale beers with body, profound modification of the endosperm is a disadvantage, since this leads to lack of body; Pilsener breweries would use the short-steeped malt in spite of its unmodified points.

Beers of the Dortmund type require a greater modification of the endosperm than Pilsener beers, and the long-steeped malt would be the variety desired for this type after suitable kilning. Dortmund beer has a softer, sweeter taste than Pilsener; it is desirable, however, to grow a malt specially for this type of beer, and to obtain the greater modification by developing the rootlets and keeping the acrospires short, which is done by shorter steeping and longer "felting." In this way a stable beer is obtained, with a comparatively full-bodied, sweet flavour. Munich beer requires malt with long acrospires and long, stout rootlets, such as are obtained by a wetter treatment on the floor; a sweet-tasting green malt is the result, which by high kilning acquires the proper colour and aroma, whilst the profound modification gives a soft, smooth flavour. The more rapidly a malt is dried off on the upper floor of the kiln, the more it tends to give hard, pithy beers like the Pilsener, and the slower the drying, the softer and sweeter is the beer; *e.g.*, Dortmund and Munich types. A malt grown after the Bohemian method, and high kilned as for Munich beer, gives a dark-coloured, hard beer lacking sweetness and smoothness, and a malt grown by the Munich method, but kilned at a low temperature, gives an insipid product, useless for Pilsener beer. All malts which are suitable for sweet beers fail to acquire a pleasant bitterness when strongly hopped; the two flavours are not compatible. Bohemian malt should be turned frequently on the couches, thus hindering the growth of the rootlets and causing them to become curly. The very low weight per hectolitre demanded by Bavarian breweries involves a long growth, and in this lies the soft character of the beer. Malt for beer which has to keep well in hot climates requires long, cool treatment on the floor; the beer must be highly attenuated, the factor of stability being of greater importance than that of "head" which is somewhat impaired by profound modification. A long acrospire does not necessarily indicate long growth. A photograph is shown of a green malt only eight days old, which has an acrospire the full length of the corn, but the rootlet is hardly developed at all. A proper opinion can only be formed by an examination of acrospire and rootlet together.

—J. F. B.

Lager Beer; Rodlet Bacterium causing Cloudiness in ——. [*Bacillus faciformis*]. F. Schönfeld and W. Rommel. Woch. für Brau., 1902, **19**, [40], 585—588.

The authors have studied a bacterium which causes a slight, somewhat opalescent, cloudiness, especially in pale lager beers, sometimes after 12—16 days, but frequently only after 4—12 weeks in bottle.

In wheat-malt mashes this bacterium produces a slight attenuation of the sugar, and forms a considerable proportion of acid (0·93 per cent. in three weeks). In beer, however, it only produces about 0·45 per cent. of acid under favourable conditions. An alcoholic extract of hop resins has a powerful retarding influence on the growth of this organism in beer. Pale beer with 5·7 per cent. of total alcohol and the addition of 0·17 per cent. of hop resin

showed no growth after infection. The addition of only 0·6 per cent. of tartaric acid is sufficient to kill the bacteria.

Hopped and unhopped worts, cane-sugar solutions, peptone solutions, and dextrin solutions are favourable media for cultivation; the organism does not grow, however, in a 0·5 per cent. solution of asparagine. This bacterium is not of so much importance in the brewery as *sarcina* and some other forms of rodlet bacteria; it occurs rather in the lager cellar and bottles than in the fermentation room. The low temperature of the lager cellar is the chief means of prevention. The beer is not absolutely spoiled by the development of this cloudiness, but its quality and appearance are considerably impaired.—J. F. B.

"Weissbier"; Causes of Red Discoloration of ——. Schönfeld and Dennhardt. Woch. für Brau., 1902, **19**, [42], 637.

The authors have investigated the causes of the discoloration of Berlin "Weissbier," by which it acquires a reddish-brown tint. The discoloration of "Weissbier" worts and beer only occurs in unboiled products. "Weissbier" worts which have not been boiled, gradually acquire a blood-red colour, and in some cases a deep violet; the depth of colour increases with time. A temperature of 40° C. gives rise to the most intense coloration, whilst the palest worts are obtained by mashing for a very short time at very elevated temperatures. It is not yet determined whether the colour is due to the direct action of an enzyme or to the atmospheric oxidation, or exposure of an aromatic residue split off from a glucoside by an enzyme. The latter explanation is supported by the fact that worts heated at boiling temperature in a digester subsequently develop a strong red coloration, whilst those boiled for a long time on an open fire are paler coloured. A brewing water containing gypsum has a favourable influence on the permanence of "Weissbier" and the colour of the wheat-malt worts remains pale. Water containing nitrates or nitrites causes a red-brown coloration, and renders the beer susceptible to the attacks of *Pediococcus Sarcina*. In order to prevent the discoloration of "Weissbier," it is advisable not to mash too long, nor maintain medium temperatures for too long a time. The brewing water should be selected as indicated above, the worts should be pitched without delay, fermentation should be conducted warm, and the beer should not be stored cold after the addition of "Kräusen."—J. F. B.

Spirit from Wood Fibre; Manufacture of ——. Zeits. für Spiritusind., 1902, **25**, [42], 453—454.

According to a Russian patent of Hiller-Bombin, substances containing woody fibre are heated at 125°—160° C. for 30 minutes to one hour with dilute mineral acid (0·2 to 2·0 per cent. strength). From 15 to 25 per cent. of the material is brought into solution, but since from 4 to 6 parts of dilute acid are required for each part of woody fibre, the resulting fermentable solution is weak. It is therefore used a second and a third time for treating a fresh quantity of wood, until the required concentration is obtained, the proportion of mineral acid being adjusted each time. (See this Journal, 1898, 365, 481, 1164.)

—C. A. M.

Alcoholic Liquids; New Process and Apparatus for the Purification of ——. E. Guillaume. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [3], 250—270.

This process for the purification of all dilute alcoholic liquids, either for rectifying them or for making whisky, &c., consists in:—(1) Diluting the alcoholic liquids if they are too strong, so that the amyl alcohol and other products usually found in the strong feints may be removed in the subsequent distillation at the same time as the weak feints. (2) In partially distilling this diluted liquid in a distilling column containing a sufficiency of plates to allow of the strong and weak feints being removed at the same time by evaporation, so that at the bottom of the column there is obtained only a mixture of ethyl alcohol and water. (3) In concentrating the strong feints in a special cylinder, generally superposed to the distilling column itself. The alcohol content of the liquid on all the plates of this cylinder is kept moderately low by delivering at the top a sufficient quantity of wine, fermented must, or warm water. (4) In concentrating the weak feints in a third column, which is generally superposed on the preceding, and from the lower part of which the strong feints at their maximum possible concentration are removed, whilst the weak feints are extracted from the head of the column, as usual.

—T. H. P.

English Patents.

Hops and Hop Seeds; New or Improved Products [Cattle-Food] from ——. E. Makin. Eng. Pat. 21,909, Oct. 31, 1901.

See under XVIII. A., *page* 1344.

Glass Tanks or Vessels for Fermenting and other Purposes. A. Weber, Fischern, Austria. Eng. Pat. 17,739, Aug. 12, 1902.

A tank is built up of sheets of glass containing wire fabric embedded in them, the bottom being introduced at its edges into grooves in a metal frame held between metal posts or standards, and resting on ribs on the frame members, between which ribs grooves are formed beneath the joints, where the several glass bottom-plates abut against each other. The plates of wire-glass forming the side walls are jointed together at their edges, forming the vertical edges of the vessel, by shaped connecting pieces introduced between them, made of heavily tinned copper or brass. All the joints, grooves, and hollow spaces are completely filled or run in with cement. The abutting edges of the plates making up each of the side walls are supported by intermediate vertical posts with specially constructed bolts.

—J. F. B.

Finings; Improvement in ——. A. E. Berry and A. B. Roberts, Stratford. Eng. Pat. 18,874, Sept. 21, 1901.

The invention relates to the production of a concentrated extract consisting of isinglass in a form in which it may be exposed to warm climates without gelatinising, and may be readily re-emulsified. The acid emulsion prepared in the ordinary way is mixed with 5—10 per cent. of its weight of a salt, such as sodium chloride or sulphate, the precipitated isinglass separated from the liquid, and pressed into cakes until it is of the desired degree of dryness. It is advantageous to add a solid acid, such as boric acid, which acts also as an antiseptic, to the precipitate before pressing. To use these cakes as fining material, they are steeped for a few hours in cold water, sufficient of the latter being then added to bring the mixture to the desired density.—T. H. P.

United States Patents.

Beer; Continuous Production of ——. C. Schmitz, Godesberg, Germany. U.S. Pat. 710,396, Sept. 30, 1902.

The combination of apparatus consists of a mash tun, a drainage vat at a lower level, a brewing copper below this, an open cooler at a level between the drainage vat and the brewing copper, a pump connected with the cooler, mash tun, and drainage vat, two connected infusion wort vessels, one being in connection with the mash tun and the other with the brewing copper and the mash tun, all the various parts being connected with each other, when required, by means of valved discharge pipes. A diagram shows the scheme by which the above plant is kept in operation for continuous production.—J. F. B.

Racking Apparatus. D. Beebe, N.J. U.S. Pat. 704,292, July 8, 1902.

The racking apparatus comprises a suitable main liquid-supply pipe and branch tubes, a back-pressure tank, a main back-pressure pipe leading from the tank and having a number of branch tubes adapted so as to be connected to "packages" (casks), and an auxiliary back-pressure duct leading from the tank at a higher point than the main pipe, connecting with the main pipe at a number of points adjacent to the branch tubes, both the main pipe and auxiliary duct affording simultaneously open communication with the back-pressure tank.—J. F. B.

Sterilising Machine [for Bottled Beer]. C. A. King, Mattapoisett, Mass., U.S.A. U.S. Pat. 710,784, Oct. 7, 1902.

The bottles, after being filled and corked, are placed in carriers on a travelling band and conveyed into a chamber containing water heated to about 160°. The bottles first pass through the warm vapour in the upper part of the chamber, then dip down into the water, and finally rise into the upper part of the chamber before leaving it. The bottles travel at the rate of about 1 ft. per minute, and take an hour to pass through the chamber.—W. P. S.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Caseïnogen of Asses' Milk. C. Storch. Monatsh. für Chem., 1902, **23**, [7] 712—730.

Asses' milk contains less protein, fat, and salts, and more water and sugar, than cows' milk. It shows also a strong alkaline reaction towards litmus, due to the presence of secondary phosphates, and does not readily undergo spontaneous coagulation. Rennet brings about coagulation in the form of an extremely fine flocculent precipitate (paracasein), the fineness of which may account for the ready digestibility of this milk. The caseïnogen of asses' milk is best coagulated by first dialysing the milk to a slight extent, and then adding acetic acid. The coagulation is sharp, and the product easily separated. The free caseïnogen has acid properties, but combines with a smaller proportion of alkali than does the caseïnogen of cow's milk; it is soluble in the same media as the latter.

The caseïnogen of asses' milk behaves in a peculiar manner as regards salting out. The milk remains apparently unaltered on saturation with a single neutral salt (NaCl), but if saturated with two salts (*e.g.*, NaCl and $MgSO_4$), coagulation takes place after long stirring, and the filtrate contains only lactalbumin. If the precipitate be then dissolved in water, sodium chloride alone will salt out a proteid (*a*), and the addition of magnesium sulphate to the clear filtrate will precipitate a second proteid (*b*). Ammonium sulphate coagulates the fresh milk so completely that no proteid remains in solution.

By no means was the author able to impart the above properties to cows' milk, and he concludes that the difference between the two depends on a specific difference of the caseïnogens. The caseïnogen of asses' milk contains more phosphorus and sulphur than that of cow's milk; it yields on peptic digestion a solid residue of pseudo-nuclein, smaller in quantity than in the case of cows' milk.

The two proteids *a* and *b* have been submitted to a further examination. Proteid *a*, insoluble in water and salt solutions, but soluble in alkalis to neutral solutions, is a nucleoalbumin very similar in properties to caseïnogen. Proteid *b* is soluble in water, and solutions of single salts, also in alkalis. It is insoluble in solutions of two neutral salts (NaCl and $MgSO_4$), and its aqueous solutions are coagulated at a temperature of 80° C.

The author concludes that the precipitate obtained from the fresh milk by the addition of two salts, consists of a single proteid, caseïnogen, the latter being split up into these two proteids by the subsequent action of a single salt. —J. F. B.

Butter; Halphen's Test for the Detection of Cotton-seed Oil in ——. B. Sjollema and J. E. Tulleken. Zeits. Unters. Nahr.- u. Genussm., 1902, **5**, [19], 914—916.

The colour obtained when butter, yielded by cows which have been fed on cotton-seed meal, is tested by Halphen's method is of the same tint as that given by cotton-seed oil itself. By heating cotton-seed oil at a temperature of 55° C. for four hours, and examining spectroscopically the colour this oil gave, an absorption band was noticed in the yellow part of the spectrum (maximum at λ-550); on employing a thicker layer of the oil, the band moved to the left (maximum at λ-570). By heating the oil for a long time at higher temperatures (up to 110° C.), a second darker band was noticed (maximum at λ-490); but on examining a thicker layer without dilution, the right half of the spectrum became so dark as to prevent observations being taken. On diluting with much amyl alcohol, the band showed a maximum at λ-490. The band in the yellow had then decreased in intensity.—W. P. S.

Butter; Separation of Margarine from ——. C. Degnide.

See under XXIII., *page* 1352.

Formaldehyde in Foods; New Reaction for the Detection of ——. Manget and Marion.

See under XXIII., *page* 1351.

English Patents.

Coffee Extract; Method and Apparatus for the Preparation of ——. F. J. Reichert and C. L. J. J. Heydemann, London. Eng. Pat. 21,768, Oct. 29, 1901.

Coffee berries are heated, but not roasted, until they assume a light-brown colour, and are then ground. The powder is extracted several times with hot water under pressure, at a temperature of 220° F.; the extract is allowed to settle, decanted and evaporated under reduced pressure. The distillates are collected and the aroma they contain extracted with chloroform. The concentrated extract is then dried, mixed with the chloroform extract after evaporating off the chloroform at a low temperature, and roasted in a special apparatus. The latter is provided with a stirrer and a retort-shaped neck. Any volatile matter which escapes is extracted with chloroform, and the residue returned to the bulk after the latter is roasted. When roasting is complete, the roaster is rapidly cooled by jets of water, its contents are broken up by the stirrer, and finally ground and filled into bottles by means of an air-tight hopper.—W. P. S.

Milk and other Liquids; Apparatus for Sterilising ——. W. C. C. Pakes and W. H. Barnes, London. Eng. Pat. 22,875, Nov. 12, 1901.

The milk is allowed to flow by gravity, firstly, through a series of steam-heated coils, and then through coils surrounded by cold water or brine. For sterilising water, or other liquids which may give a deposit, a settling chamber is provided between the heating and cooling chambers. —W. P. S.

Cocoa Substitutes; Process for Manufacturing ——. J. Meinl, Vienna. Eng. Pat. 25,599, Dec. 14, 1901.

Cocoa is roasted, hulled, crushed and cleaned, and is mixed with malt of any suitable grain. The mixture is then ground. The malt may be dextrinised and roasted at a temperature exceeding 75° C.—W. P. S.

Hops and Hop Seeds; New or Improved Products [Cattle-Food] from ——. E. Makin, Manchester. Eng. Pat. 21,909, Oct. 31, 1901.

After separating the seeds from the spent hops, oil is extracted from the seeds, or they are used before or after extraction for the preparation of a flour or meal, which is stated to be useful as a cattle-food. The leafy portions are used for stuffing or bedding.—B. F. D.

United States Patent.

Albumin; Process of Extracting Vegetable ——. F. W. Gaertner, Saginaw, Mich. U.S. Pat. 710,190, Sept. 30, 1902.

The vegetable matter, *e.g.*, rapeseed cake, is reduced to powder and treated with water at a temperature below that at which the albumin would be coagulated. The albumin

is then precipitated in the filtered extract by the addition of an equal volume of alcohol, and the precipitate is separated and dried by treatment in a centrifugal machine.
—J. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

ENGLISH PATENT.

Sewage; Treatment of ——, *and Apparatus therefor.* J. C. Haller and R. H. Machell, Dewsbury. Eng. Pat. 23,469, Nov. 20, 1901.

CLAIMS are made with regard to detritus tanks for the treatment of sewage, for—

(1) "The combination therewith of scum boards, troughs, and baffle boards for assisting to arrest the passage of solid particles contained in the sewage."

(2) Also of a pipe for drawing the sludge from the bottom of the tank, the outlet of such pipe being above the normal flow level of the sewage in the tank, and a valve for closing its outlet.

(3) and (4) The method of utilising the pressure of liquid due to the fall in and from the main sewer for delivering the sludge from the bottom of tanks such as the above, as also for raising the scum on the top of such tanks.
—T. H. P.

UNITED STATES PATENT.

Filter [*Water*]. A. Bommarius, New Orleans. U.S. Pat. 707,899, Aug. 26, 1902.

THE filter casing has an inlet at its upper end and an outlet at its lower end, and is provided below the inlet with a perforated diaphragm, in which the upper ends of a series of slit tubes are fitted. The tubes are closed at their lower ends, and a similar series of tubes, closed at their upper ends, project upwardly from a collecting chamber connected with the outlet. The filtering-beds may consist of iron filings and sand, and are arranged respectively above and below the diaphragm in the upper portion of the casing. Stirring arrangements and means for reversing the flow of the water through the filter are provided.
—R. A.

(*C.*)—DISINFECTANTS.

ENGLISH PATENTS.

Saponaceous Product for Horticultural, Sanitary, and other Purposes. J. H. Koens, Gravesend. Eng. Pat. 19,494, Sept. 30, 1901.

ACID tars (refuse from refining oils with sulphuric acid), or similar waste products, are washed with water and treated with an alkali, and the resulting crude soap mixed, if desired, with an antiseptic agent, such as creosote or carbolic acid. The soap may be employed in solution as a spray for plants, disinfecting streets, &c., and can also be used as fuel.—C. A. M.

Disinfecting and Preserving Process; Improved —— E. Fournier, Paris. Eng. Pat. 10,348, May 5, 1902. (See also this Journal, 1902, 147 and 718.)

THE process described is for the disinfection of buildings, clothing, bedding, &c., and also for the sterilisation, preservation, and disinfection of dead bodies. The objects are arranged in a closed chamber, to the door of which is attached an injector, and an outlet tube for the injected vapours. A first injection then takes place of acetonised water, containing a quantity of ammonia, varying with the number and nature of the objects, the area of the chamber, &c. Later is made a second similar injection, or one of "formacetone" (acetonised formaldehyde), with the addition of 40 per cent. of formaldehyde, the amount of the injection being just sufficient to saturate the ammonia employed in the first injection. A small quantity of steam is next injected, and finally sufficient ammonia to saturate all the injected "formacetone." After a rest, the door of the room is opened and air let in. If the room is previously heated to 35°—40°, the time required for disinfection is shortened from 24 to 4—6 hours, and any slight oxidation of iron and copper is avoided.—T. H. P.

XIX.—PAPER, PASTEBOARD, Etc.

UNITED STATES PATENTS.

Paper; Method of Waterproofing ——. C. S. Bird and J. B. Hanscom, Mass., Assignors to F. W. Bird and Son. U.S. Pat. 708,454, Sept. 2, 1902.

A WATERPROOF paper fabric is made by feeding two sheets or webs of paper between pressure plates, simultaneously feeding waterproofing material between them, cooling and compressing the compound fabric, subjecting its surfaces to a liquid waterproofing agent, and then cooling the fabric.
—J. F. B.

Beating Engine. E. L. Savage, Lancaster, N. Hampshire. U.S. Pat. 710,014, Sept. 30, 1902.

IN this beating engine the tub for the circulation of the pulp has a crooked portion in the sides, whereby eddy currents are set up in the pulp. In the straight part at each extremity of the crooked portion are ordinary beating rolls, bed-plates, and back-falls, and the relative speeds of the two beating rolls are arranged so as to cause the stock to flow rapidly through the intervening crooked section of the channel, and slowly through the remainder of the channel.—J. F. B.

Lumber [*from Wood-Pulp*], *Artificial; Process of Making* ——. W. C. Huntington. U.S. Pat. 709,488, Sept. 23, 1902.

See under IX., *page* 1331.

Cellulose Esters; Process of Making ——. H. S. Mork, A. D. Little, and W. H. Walker, Mass., Assignors to Chemical Products Co., Boston. U.S. Pat. 709,922, Sept. 30, 1902.

CELLULOSE esters are prepared by treating cellulose with an acid anhydride, in the presence of an aromatic sulphonic acid, with or without the addition of a salt of that acid. For cellulose acetate, 100 parts of cellulose are treated with 350 parts of acetic anhydride, 5 parts of phenol sulphonic acid, and 5 parts of the sodium salt of phenol sulphonic acid, and reaction is effected at a temperature of about 80° C.; if desired, naphthol sulphonic acid may be used. The object of the salt is to ensure the absence of any free sulphuric acid.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Mercury Oxybromide. T. Fischer and H. von Wartenberg. Chem.-Zeit., 1902, **26**, [83], 983—984.

THE authors have carried out a number of experiments to prepare mercury oxybromides, both by heating mercuric oxide and mercuric bromide in sealed tubes in presence of water, and by the interaction of the two constituents in alkaline solutions. According to their results, mercury is capable of forming five oxybromides, two of the composition $4HgO.HgBr_2$, two $7HgO.2HgBr_2$ and one $3HgO.HgBr_2$. The first four of these are insoluble in all indifferent solvents, but they are decomposed completely by acids and partially by caustic alkalis. Dry ammonia gas has no action on these compounds, but its solution converts them into a yellow substance, oxydimercurammonium bromide. When these four oxybromides are heated with potassium bromide, they are converted into mercuric bromide, while the supernatant liquid becomes strongly alkaline. When heated to 230° C. all four decompose into their constituents, which sublime. The specific gravity of the two compounds, $4HgO.HgBr_2$ is 8·73, but those of the formula, $7HgO.2HgBr_2$, have different specific gravities; that of the finely powdered modification obtained by the interaction of solutions of potassium bicarbonate and mercuric bromide being 8·25 and that of the form yielded by the direct union of the constituents, 9·13. The other mercury oxybromide, $3HgO.HgBr_2$, differs considerably from the above four.

It decomposes at a much higher temperature than 230° C., and gives mercury, oxygen, and mercuric bromide. It is unchanged by heating with caustic alkali solution, but it is converted into oxydimercurammonium bromide by ammonia, either in the gaseous state or in solution.

—T. H. P.

Ferric Oxide in Alcoholic Solution. A. Minet. J. Pharm. Chim., **16**, [5], 269.

A QUANTITY of alcohol which had been kept for approximately 19 years in iron vessels, in certain French military stores, was found to contain a considerable amount of iron in solution, amounting in some instances to 1·1 grm. or 1·25 grm. per litre. These solutions were deep red brown in colour, and had a characteristic dichroic appearance, as though containing much suspended matter, yet giving no residue on standing or on filtration. Specimens less strongly contaminated were tinted to the colour of rum. The iron proved to be in solution in the form of the colloidal hydrate $Fe_2O_3H_2O$. It was precipitated at once by the addition of a little sodium bicarbonate, or by a trace of tannin, and the alcohol, after decantation, was fit for use.—J. O. B.

Formaldehyde from Methyl Alcohol; Formation of ——, under the Influence of Colloidal Metal Solutions. A. Glaessner. Oesterr. Chem.-Zeit., **5**, 337—338. Chem. Centr., 1902, **2**, [11], 731.

BREDIG, by the electrical disintegration of platinum wire under water, has prepared a colloidal platinum solution, which exerts distinct catalytic action (see this Journal, 1899, 281; 1900, 1155; 1901, 376). The author has allowed such a solution to act on methyl alcohol in presence of a current of air. He finds that a small quantity of formaldehyde is formed, the amount being greater than that produced by a colloidal copper solution prepared in a similar manner.—A. S.

Aristol; Preparation and Derivatives of ——. H. Cousin. J. Pharm. Chim., 1902, **16**, [7], 378—382.

ARISTOL (di-thymol di-iodide), $C_{20}H_{24}I_2O_2$, may be prepared by the action of a solution of iodine in potassium iodide upon an alkaline solution of thymol, but on a manufacturing scale the iodine is usually replaced by a mixture of potassium iodide and alkali hypochlorite. The author has found more or less chlorine in various samples of aristol, and he has found that the iodine of that body can readily be replaced by Cl or by Br. 50 grms. of thymol were dissolved in 150 c.c. of caustic soda solution and 200 c.c. of water. This mixture was slowly added, with constant stirring, to a litre of concentrated sodium hypochlorite solution. The brown precipitate which formed was collected, washed, dried, dissolved in 200 c.c. of ether, and then poured, a little at a time, into a litre of alcohol containing a small quantity of sulphuric acid. A yellow precipitate was obtained, amounting to about 50 per cent. of the original weight of the thymol used. It was insoluble in water, very slightly soluble in absolute alcohol, easily soluble in ether, chloroform, benzene, and carbon bisulphide, and slightly in acetone. Most commercial samples of aristol contain the chlorine compound.—W. P. S.

Guaiacol Ether; A New ——. J. Pharm. d'Anvers, 1902, 338.

THE mono-glyceric ether of guaiacol has been introduced under the name of *oresol*. It is soluble in 40 volumes of water and readily soluble in alcohol.—A. S.

Opium; Persian ——. P. Siedler. 74th Meeting of Ges. deut. Naturfors. und Aerzte. Chem.-Zeit., 1902, **26**, [79], 920—921.

PERSIAN opium is somewhat dearer than the Levantine, but when calculated on the morphine content, the price is cheaper. The poppy is sown in the early part of the year under somewhat primitive agricultural conditions. The tapping of the fruit and collection of the juice take place from April to June, incisions being made in the juicy parts of the heads. After collection the product undergoes the operation of massage, a complicated treatment extending over some weeks, it is then wrapped in paper and packed in tins; the annual production amounts to about 3,000 chests of 60 kilos. each. A very large proportion of the yield is not exported but is consumed in Persia, where it is taken by nearly everyone; the opium of Meched is in great demand on account of its high proportion of morphine. Cylindrical opium appears in the form of light-brown sticks of 7—10 mm. in thickness, with a smooth, lustrous surface and smooth fracture showing no structure; some of the sticks are coated with poppy-seeds. Other qualities appear as irregular, brown lumps or sticks with rough surface and irregular fracture. All these products are very homogeneous, they do not present a granular appearance like the Turkish opium, and the author has not found starch in any of them. Morphine estimations showed from 15·0 to 15·8 per cent.; dry extracts contained 18·65 per cent. Larger lumps of opium weighing about 1 lb. were obtained from a different source, only containing 11·3—11·8 per cent. of morphine. The author prefers to determine the morphine by preparing the crystals according to Pharm. Ger. III., weighing them and subsequently controlling the results by titration according to Pharm. Ger. IV.; the latter results are lower than the former owing to the crystals not being perfectly pure. Owing to difficulties in obtaining Levantine opium of the morphine standard prescribed in Pharm. Ger. IV., Persian opium should come more widely into use, the morphine content being reduced to the proper standard by mixing the powder with an indifferent substance or with poorer opium.—J. F. B.

Cocaïne Hydrochloride; Rotatory Power of ——. Imbert. Bull. Soc. Chim., 1902, **27**, [18], 985—987.

THE author's observations were made with a commercial salt, powdered and dried over sulphuric acid and completely soluble in water. Under certain conditions the rotatory power decreases considerably as the concentration increases.

In aqueous solutions at 17° C., for concentrations from 2 grms. to 20 grms. per 100 c.c., the rotatory power is—

$$[\alpha]_D = -(71{\cdot}5776 - 0{\cdot}3788c)^\circ.$$

For concentrations from 2 grms. to 8 grms. per 100 c.c., in 40 per cent. alcohol at 15° C., the rotatory power is: $[\alpha]_D = -(68{\cdot}77 - 0{\cdot}225c)^\circ$.

In alcohol of from 65 to 80 per cent., however, the rotatory power does not change with the concentration within the limits studied (2 grms. to 8 grms. per 100 c.c.) and the value is constant:—

$$[\alpha]_D = -67{\cdot}5^\circ.$$

This constant value is the same as that of an aqueous solution at a concentration of 10 grms. per 100 c.c. and of a solution in 40 per cent. alcohol at 6 grms.—J. F. B.

Adlumia Cirrhosa; Alkaloids of ——. J. O. Schlotterbeck and H. C. Watkins. Proc. Amer. Pharm. Assoc. Pharm. J., 1902, **69**, [1684], 335.

ONE of the authors has previously examined the root of the first year's plant (see this Journal, 1900, 1036). The entire plant of second year's growth has now been examined. The dry, ground drug was moistened with water containing a small amount of ammonia, and after drying in the air, exhausted with chloroform, the chloroform extract evaporated and the residue extracted with warm, very dilute acetic acid. The acid solutions were concentrated, precipitated with ammonia, and extracted with ether. By repeated fractional crystallisation, five bases were separated, viz., protopine, $C_{20}H_{19}NO_5$; β-homochelidonine, $C_{21}H_{23}NO_5$; adlumine, $C_{39}H_{41}NO_{12}$; adlumidine, $C_{30}H_{29}NO_9$; and another one, in very small quantity, melting at 176°—177° C. Citric and tartaric acids were also present.—A. S.

Badiana; Japanese Oil of ——. E. Tardy. Bull. Soc. Chim., 1902, **27**, [18], 987—990.

JAPANESE oil of badiana (Shikimi-no-ki), obtained from *Illicium religiosum*, was studied in 1885 by Eykmann, who described eugenol, a hydrocarbon boiling at 170° C., which he termed shikimene, and shikimol (safrol).

The author has prepared this oil by exhausting the dried fruits with light petroleum, and distilling the essential oil from the fatty bodies extracted with it. The odour of the oil has no resemblance to that of Chinese oil of badiana. Aldehydes and esters were not found in this oil; the presence of eugenol was confirmed. In the fractions boiling between 170° C. and 177° C., a little cineol was identified. The author has re-investigated the hydrocarbon portion of the oil, described by Eykmann as shikimene; the fractions boiling between 150° C. and 170° C. yielded a mono-hydrochloride melting at 125° C., and a di-hydrochloride melting at 49° C. Two bodies are definitely characterised, a hydrocarbon of the turpentine group and a terpane. A terpilenic hydrocarbon may also be present, or the di-hydrochloride may equally be derived from the terpane; the quantity of oil was not sufficient to decide this point. These hydrocarbons have very feeble rotatory powers; the optical rotations of the fractions increase as the boiling point rises, and a body of high optical rotation may possibly be present in the fractions of higher boiling point, perhaps a borneol. The author has confirmed the presence of safrol, and the formation of anisic acid on oxidation with permanganate would suggest the presence of anethol, or estragol, or other body of this group; a sesquiterpene may also be present.—J. F. B.

Badiana; Chinese Oil of ——. E. Tardy. Bull. Soc. Chim., 1902, **27**, [18], 990—994.

The principles hitherto identified in Chinese oil of badiana include dextro-pinene, lævo-phellandrene, anethol, estragol, safrol, anisic acid, and the ethylic ether of hydroquinone. To this list the author now adds anisic aldehyde, anisic acetone (*p*-methoxyphenylacetone), a lævo-rotatory sesquiterpene $\alpha_D = -5°$, a small quantity of a crystalline body having the formula $C_{20}H_{22}O_3$, and dextro-terpilenol, with an odour of white lilac and lily of the valley. The author could not, however, detect the presence of any safrol.

The separation of the terpilenol was not effected, owing to the extreme difficulty of crystallising this body in presence of anethol, which occurs in the same fractions. Its odour, however, in these fractions was characteristic, and its presence, even in small proportions, is important, since it is doubtless to this constituent, the delicacy of whose perfume increases with dilution, that the Chinese oil of badiana owes its peculiar sweetness.—J. F. B.

Bitter Fennel; Oil of ——. E. Tardy. Bull. Soc. Chim., 1902. **27**, [18], 994—997.

The author has examined oils of bitter fennel obtained from Algeria and Galicia, comparing them with the oil from the South of France previously studied (this Journal, 1897, 757).

The *Algerian oil* was amber-coloured, with an odour of turpentine and camphor; $d_0 = 0{\cdot}991$; $\alpha_D = +62{\cdot}16°$. The following constituents have been isolated:—Dextro-pinene $\alpha_D = +28°$; phellandrene; 9·5 per cent. of fenchone; 10 per cent. of estragol; a little anethol; a lævo-rotatory sesquiterpene $\alpha_D = -2° 40'$ and a dextro-rotatory diterpene $\alpha_D = +10° 20'$, boiling respectively at 175—180° C. and 215° C. under a pressure of 30 mm. Cymene and aldehydes were absent, but a small quantity of a crystalline body melting at 140° C., probably thymohydroquinone, was obtained.

The *Galician oil* was nearly colourless, with an odour of camphor; it deposited crystals at −18° C., and had an optical rotation $\alpha_D = +39° 52'$. The following constituents were characterised: a dextro-rotatory hydrocarbon of the turpentine group, $\alpha_D = +38° 20'$; a dextro-rotatory terpilenic hydrocarbon (phellandrene) $\alpha_D = +31° 20'$. The rotatory power of this portion of the oil was much lower than that of the corresponding portion of the Algerian oil. Very large proportions of fenchone were found, over 34 per cent. of the pure compound being isolated. The proportion of estragol was very small, and that of anethol also relatively small. The poverty of the oil in anethol is explained by the fact that oils of this origin are generally deprived of their stearoptene, which serves for the adulteration of oil of aniseed. The richness in fenchone is not due solely to this circumstance, but also to natural causes, as the relative proportions of fenchone, hydrocarbons, and estragol indicate. Comparing these oils with that of the South of France, it is noted that the proportion of the principal constituent, fenchone, is by far the greatest in the Galician oil. The proportion of estragol is most considerable in the Algerian oil, less in the French oil and very small in the Galician. The proportions of the hydrocarbons follow those of the estragol. This is the result of climatic influences.—J. F. B.

Kino, Eucalyptus: New —— [*from Eucalyptus Drepanophylla*]. C. Mannich. Notizblat. d. botan. Gartens zu Berlin, 1902, 171; through J. Pharm. Chim., **16**, [5], 216.

The kino furnished by *Eucalyptus drepanophylla* is distinguished from that of *Pterocarpus* by the size of the pieces and their brighter colour. Its taste is astringent; it is fairly soluble in water, more easily in alkaline solutions. Its aqueous solution is coloured violet by iron salts. It contains a considerable proportion of gum, which diminishes its solubility in alcohol. It yields 0·09 per cent. of ash.—J. O. B.

Oil of Cedrus Atlantica. E. Grimal. Comptes Rend., **135**, [15], 582—583.

The essence was prepared by distilling the wood of *Cedrus Atlantica* with water. By fractional distillation under reduced pressure, and subsequent further fractionation of the fractions at the atmospheric pressure, the author isolated cadinene, $C_{15}H_{24}$, a ketone, $C_9H_{14}O$, which gives its odour to the essence, and traces of acetone.

—J. T. D.

Marjoram Oil. Genvresse and Chablay. Pharm. Centralh., **43**, 419. Pharm. J., 1902, **69**, [1684], 335.

The authors have isolated from marjoram oil, lævo-pinene, a new ketone, boiling at 208°—209° C. under 740 mm. pressure, and having a mint-like odour, and pulegone.

—A. S.

Bromelin from Pineapple. J. Franklin Inst., **154**, [4], 262.

Bromelin, the digestive principle in pineapple juice, is similar to pepsin, and is very powerful in its action, being able to digest as much as one thousand times its own weight of proteids in a few hours. Under its influence, fibrin disappears entirely after a time, coagulated egg albumin is slowly digested, whilst meat albumin is converted into a pulpy gelatinous mass, which soon passes into solution. Heat destroys this active principle. Bromelin may be precipitated from the juice by a large addition of common salt; it will operate in an acid, alkaline, or neutral medium, and therefore probably continues to act in the intestinal tract as well as in the stomach.—C. S.

Civet; Notes on ——. A. Hebert. Bull. Soc. Chim., 1902, **27**, [18], 997—1000.

Two classes of civet are met with in commerce: that obtained from the wild animal, and that from the domesticated animal, the latter being most highly prized. Civet has a soft consistency, and is of a dirty yellowish-brown or brown colour; it has a repulsive odour, which becomes less disagreeable when highly diluted. It has a greasy feel, and leaves a grease spot on paper. Civet melts at 36°—37° C. in the uncertain manner characteristic of fats of low melting point. The main product dissolves in cold ether, benzene, chloroform, and light petroleum, more readily on heating. It is sparingly soluble in ethyl and methyl alcohols and acetone at the ordinary temperature, but solution is more easily effected by heating. In all solvents there is an insoluble residue of accidental impurities, hairs, dust, &c. Civet is insoluble in water, acids, and alkalis, and, in short, it presents the same solubilities as a fat. The insoluble matter in three samples of genuine civet of high quality examined ranged from 3·69 to 5·30 per cent. In two of the samples the proportion of ash was 0·60 and 0·80 respectively, and consisted of sulphates in large quantities, carbonates, phosphates in traces, and salts of iron, alumina, lime, magnesia, potash, and soda. A sample of slightly lower quality contained 1·20 per cent. of ash

with only traces of sulphates, but considerable quantities of phosphates. None of the samples which were sufficiently pale to be examined had any action on polarised light when dissolved in ether-alcohol mixture. When civet is suspended in water and submitted to prolonged distillation with steam, practically the whole of the fæcal odour passes over with the distillate; the residue consists of the fatty substance with an odour of musk. The distillate is found to contain scatol. Some samples, however, do not admit of this complete separation, even after very prolonged treatment with steam; the odours of the distillates and residues also vary largely in different samples.

Saponification by means of alcoholic potash takes place very slowly, the aqueous solution of the products is opalescent; the fatty acids melt at 39° C. and present the appearance of a mixture of solid and liquid acids. The two best samples yielded 51 and 55 per cent. of fatty acids, the other gave 70 per cent.

Apart from specific differences due to individual animals, civet may show differences due to the method of extraction. The instrument employed for this purpose may be lubricated either with oil or with honey, and in the latter case this would account for slight optical and cuprie reducing properties, where such have been observed.—J. F. B.

Ionone; Preparation of ——. Haarmann and Reimer. Ger. Pat. 134,672, suppl. to 73,089, April 25, 1893; through Zeits. angew. Chem., 1902, **15**, [40], 1045.

Citral (60 parts), or a corresponding amount of an oil which contains it, and acetone (50 parts) are heated together under pressure for 5—10 hours at 165°—175° C. The excess of acetone is distilled off, any uncombined citral is removed by known methods, and the pseudionone resulting from the synthesis is obtained by distillation *in vacuo*.—R. L. J.

Tobacco-Camphor. Gawalowski. Zeits. Apoth. Verein., 1902, 1002.

The author finds that the so-called tobacco-camphor or *nicotianin* is a mixture of the nicotine salts of valeric, camphoric, oxy-camphoric, and pyridyl-carbonic acids. Nicotine pyridyl-carbonate is the chief toxic principle of tobacco, whilst the aroma is due to the other three salts named.—A. S.

Methyl Methylanthranilate in the Vegetable Organism. E. Charabot. Comptes Rend., **135**, [15], 580—582.

The essence obtained by distilling with water the leaves of the mandarine orange (*Citrus madurensis*) was treated with 25 per cent. sulphuric acid, the filtered acid solution rendered alkaline with soda, and then extracted with ether. The ethereal solution yielded crystals which, when purified by recrystallisation, proved to be methyl methylanthranilate. The ester forms about 50 per cent. of the essence.

—J. T. D.

Kola Preparations; Determination of the Alkaloids in ——. Warin.

See under XXIII., *page* 1352.

Podophyllum Resin; Determination of ——. H. M. Gordin and C. G. Merrell.

See under XXIII., *page* 1352.

English Patents.

Ionone; Process for Preparation of ——. H. H. Lake, London. From Chuit, Naef, et Cie., Geneva. Eng. Pat. 18,333, Sept. 13, 1901.

See Fr. Pat. 312,790; this Journal, 1902, 137.—J. F. B.

United States Patent.

Organic Peroxides; Process of Making ——. R. H. Page Detroit, Mich. U.S. Pat. 710,005, Sept. 30, 1902.

Strips of absorbent material, such as cloth or paper, are soaked in a mixture of an aromatic aldehyde and an anhydride of a fatty acid, *e.g.*, benzaldehyde and acetic anhydride, and exposed to the air in such a way that the oxidation set up can be controlled and retarded. For this purpose the strips are hung in a closed chamber with inlet and outlet through which air is drawn at a definite slow speed. After 48 hours' treatment, crystals of benzoyl-acetic peroxide appear on the strips and are removed therefrom; by limiting the rate of oxidation, the formation of by-products such as benzoic acid is considerably reduced.—J. F. B.

XXI.—PHOTOGRAPHY.

Photographic Chemicals; Progress and Improvements in the Preparation and Use of ——. J. M. Eder and E. Valenta. Chem. Ind., 1902, **25**, [19], 446—450.

Uranium Salts.—In the usual process of intensifying with uranium, a solution of uranium nitrate and potassium ferricyanide is used. This solution, however, is not very stable, and also produces yellow stains in the light parts of the print. According to L. Bunc this objection is overcome by proceeding as follows:—The print is immersed in a 2—5 per cent. solution of potassium ferricyanide, then well washed in water, and the desired sepia tone produced by immersion in a 1 per cent. solution of uranium chloride.

Uranium phosphate is not sensitive to light, but its solution in tartaric acid is. Dry uranium ferricyanide suffers a loss of weight on exposure to light.

Images can be produced on paper sensitised with a 5 per cent. solution of uranium bromide, and can be developed by means of potassium ferrocyanide.

Cellulose Tetracetate.—Valenta proposes to use this substance in place of nitrocellulose in the preparation of emulsion printing-out papers. It is dissolved in chloroform and the solution diluted with acetone, a collodion being thus obtained which is suitable for the preparation of an emulsion. Its chief advantage lies in the fact that it yields very firm films, which can be readily washed, whilst a disadvantage is that it is not soluble in alcohol or acetone-alcohol, and thus the collodion prepared from it will not bear any large addition of alcohol.—A. S.

Phototropy; New Investigations in ——. H. Biltz. Chem.-Zeit., 1902, **26**, [27], Rep. 276.

The author has previously found that some of the derivatives of benzylosazone—

$$C_6H_5NH.N:C(C_6H_5).C(C_6H_5):N.NHC_6H_5,$$

are distinctly phototropic, that is, they possess the property of changing their colour in the light, whilst they resume their original colour when placed in the dark, or more quickly when heated to 80° C. This is the case with cuminyl-β-osazone, the two anisylosazones, and the two piperylosazones; but others, such as the stereochemically isomeric benzylosazones, the two salicylosazones, and the two vanillylosazones, do not possess this property. In conjunction with O. Amme, the author has recently prepared some other osazones and tested them with regard to their sensitiveness to light. The compounds examined—which all contain two hydroxyl groups, one in each of the two benzene nuclei in the para-position, while in the ortho-positions to these hydroxyl-groups are either one or two halogen atoms or a nitro-residue—were the two tetrabromo- and the two tetraiodo-dihydroxybenzylosazones, dibromodihydroxybenzylosazone, and dinitrodihydroxybenzylosazone. All these bodies are perfectly stable to light, from which it is concluded that the presence of hydroxyl in a compound makes it unfitted to show the phenomenon of phototropy.

—T. H. P.

Gelatin; Action of Chromium Compounds on ——. R. Namias.

See under XIV., *page* 1338.

English Patent.

Flash-Light Cartridge for Photographic and other Purposes. G. Krebs, of the firm "Photochemische Fabrik Helios," Offenbach, Germany. Eng. Pat. 20,117, Oct. 8, 1901.

The cylindrical case of the cartridge is made of combustible material, such as celluloid; cork plugs are placed in each

end, and sealed at the ignition end by means of magnesium emulsion, and at the other end by collodion emulsion. A fuse is also attached.—J. W. H.

United States Patents.

Blue-Printing Apparatus. S. B. Whinery, Pittsburg. Assignor to the Pittsburgh Blue-Print Co., Penn., U.S.A. U.S. Pat. 704,415, July 8, 1902.

The design to be copied is wrapped round a tall, upright cylindrical glass vessel; over it is applied the sensitive paper, and over all is put an opaque backing. By suitable clock mechanism, governed by a pendulum, but also capable of hand operation, an electric arc light is allowed to descend centrally within the cylinder, details being so arranged that the exposure is completed by the time the light arrives at its lowest position.—F. H. L.

Photographic Developer. A. Eichengrün, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 707,403, Aug. 19, 1902.

Instead of using ordinary metallic sulphites as preservatives for photographic developers, the compounds prepared from acetone and potassium or sodium bisulphite, known as "acetone alkali bisulphites," are employed. Such substances are very soluble in water and very powerful in their protective power. A suitable formula is: Pyrogallol, 1 part; acetone alkali bisulphite, 2·5 parts; potassium carbonate, 6 parts; water, 100 parts.—F. H. L.

Negative Plates for Bichromated Gelatin Processes; Producing ——. A. Leuchter, Brooklyn. U.S. Pat. 710,106, Sept. 30, 1902.

See Eng. Pat., 10,948, 1902; this Journal, 1902, 1195.
—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patent.

Explosives: Improvements in ——. Safety Explosives, Ltd., and H. A. Thiersch, London. Eng. Pat. 21,621, Oct. 28, 1901.

Picric acid (5 per cent. to 20 per cent.) is mixed with ordinary gunpowder (95 per cent. to 80 per cent.). With the lower percentages of picric acid, an explosive of greater power than ordinary gunpowder is obtained, whilst with the higher percentages, an explosive is produced resembling in its properties those of the nitroglycerin group. To cheapen manufacture and reduce the speed of combustion, 4 to 12 per cent. of the gunpowder constituents may be replaced by cannel coal or other suitable carbonaceous material.
—G. W. McD.

United States Patent.

Pyrotechnic Compound. A. Eichengrün, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co. of New York. U.S. Pat. 710,047, Sept. 30, 1902.

The compound is a mixture of finely-divided magnesium with manganese peroxide, or with a peroxide of calcium or of magnesium.—E. S.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Iodine and Bromine in presence of Thiosulphates; Detection of ——. A. F. Leuba. Ann. Chim. anal. appl., **7**, 298. Chem. Centr., 1902, **2**, [11], 770.

The thiosulphate is precipitated with an excess of lead nitrate, and after boiling a few minutes, filtered off. The halogen is determined in the filtrate, lead iodide, if formed, being sufficiently soluble in boiling water to allow of this.
—A. S.

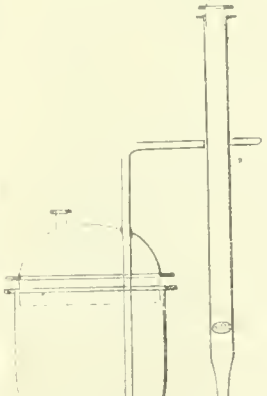
Cadmium and Zinc; Detection of ——, *in the Dry Way.* R. Biewend. Berg.-Hüttenm.-Zeit., **61**, 401—403; 413—416; 425—428. Chem. Centr., 1902, **2**, [12], 822.

The author has discovered that metallic cadmium and cadmium alloys, when heated in a glass tube closed at one end, yield a cadmium-mirror, accompanied by a sublimate of cadmium oxide, dark grey when hot, and brown when cold. In the case of zinc ores containing cadmium, potassium oxalate is added as a reducing agent; with calamine, an addition of spathic iron ore is preferable. From the more volatile sublimates and distillates, that of cadmium can be separated by igniting in a current of air, when the former are volatilised, whilst the latter is converted into cadmium oxide, which is not readily volatile. Aluminium has a strong reducing action on zinc ores: in a small glass tube, deposits are obtained which can be recognised by their yellow colour on heating. The cadmium-mirror is usually produced further away than the zinc-deposit, and the two metals can thus be detected in the presence of one another. The glass tube should be perfectly dry, and not more than 0·4 cm. wide. The author covers the sample with a layer of dust-free, granulated, freshly-ignited wood-charcoal as a reducing agent. The heating should be strong and uniform. Of alloys, not more than 0·5 grm. (exclusive of flux), should be taken, and of other materials, not more than 0·1 grm. If a slight cadmium-mirror is obtained, not sufficient for conversion into the brown oxide, a single grain of flowers of sulphur is introduced into the tube, and the latter heated gently with the blow-pipe. The cadmium-sublimate, whether it be metal or oxide, is converted by the sulphur vapour into the sulphide, which is of a bright vermilion colour when hot, and orange to lemon-yellow when cold. The smallest proportion of cadmium detected by the author in ores was 0·001 per cent., and the smallest amount, 0·00025 mgrm. In alloys, of which a larger weight can be tested, the smallest proportion detected was 0·0095—0·0001 per cent.
—A. S.

INORGANIC—QUANTITATIVE.

Fluorine; Determination of ——. Conot Leiningen-Westerburg. Chem.-Zeit., 1902, **26**, [81], 967—968.

The author finds that the present methods for the estimation of fluorine are unsatisfactory, especially when the element is present in small quantity or in mixtures, and he has devised a new method, which is based on the reaction $CaF_2 + H_2SO_4 = CaSO_4 + 2HF$, and on the loss in weight of silicious material when acted upon by the hydrofluoric acid thus set free. The apparatus employed (see figure) is constructed of platinum wherever it comes into contact with hydrofluoric acid, and consists of a crucible 4½ cm. high and of about 50 c.c. capacity, to which is fitted an arched lid about 2 cm. high and having its lower part ground into the upper part of the crucible. Both crucible and lid, where they fit together, are provided with strengthening rings. Through the top of the lid passes a platinum tube of 1½ mm. internal diameter, which reaches to the bottom of the crucible, and is bent rectangularly in its upper part. The lid is also provided with a flange, ground inside, into which fits a removable platinum tube, 14 cm. long and 6 mm. bore, drawn out into a conical form at the bottom. This tube is filled with beads of Jena borosilicate glass, 2 mm. in diameter, held in position by a piece of fine platinum gauze. At the top the tube is closed by a removable ground cap, which allows of the beads being changed and the tube rinsed out. This cap terminates at the top in a tube of 3 mm. bore to which is attached a piece of black, seamless rubber tubing, connected with one side of a U-tube filled with pieces of glass moistened with sulphuric acid; the other side of the U-tube is connected with an aspirator. The other platinum tube is also fitted



with a U-tube containing glass moistened with sulphuric acid, so that only dry air passes into the crucible. A slow current of air is aspirated through the apparatus during the whole course of the analysis. By this means the hydrogen fluoride is drawn into the wider platinum tube, where it attacks the glass beads, forming silicon fluoride and boron fluoride, which are both carried away by the air. The procedure is as follows:—The fluorine-containing matter, free from silicic acid (removable by means of ammonium carbonate and ammoniacal zinc solution), is placed in the crucible, the lid put on, the weighed platinum tube with the glass beads fixed in position, and the apparatus then tested to see if it is air-tight. 5—10 c.c. of concentrated sulphuric acid are then aspirated into the crucible, the sulphuric acid U-tube put in place and connected with a small washing flask containing sulphuric acid to show the rate of the air current. The crucible is then heated in a bath of high-melting paraffin to 180°—200° C. for several hours, the end of the operation being indicated by the formation of no further deposit at the top of the aspirator, and by the absence of the odour of the fluorides of boron and silicon. The platinum tube is then removed, washed through with 200 c.c. of boiling 25 per cent. potassium hydroxide solution, then with water, alcohol, and ether, being finally dried and weighed. The loss in weight, multiplied by 1·313229, gives the quantity of fluorine. Figures are given showing that the method yields good results.—T. H. P.

Tin Alloys; Concentrated Sulphuric Acid as a Solvent for ——. H. Nissenson and F. Crotogino. Chem.-Zeit., 1902, **26**, [83], 984—985.

In view of the unsatisfactory condition of the methods for analysing white metals—that is, alloys of tin, antimony, lead, and copper—the authors bring forward a new method, which has been in use for some time and is found to yield good results. The method is based on the fact that tin is readily soluble in hot, concentrated sulphuric acid, giving a liquid from which the tin is quantitatively precipitated as stannic acid on dilution with water. The process is carried out as follows:—

(1) *For Lead-free Alloys.*—0·5 grm. of the alloy, powdered as finely as possible, is mixed with about 7 c.c. of concentrated sulphuric acid in a small Erlenmeyer flask (200—300 c.c. capacity), and the mixture heated for a few minutes until evolution of gas ceases and the alloy dissolves. The absence of an insoluble residue of lead sulphate shows that lead is not present. After cooling the solution, hot water is cautiously added, and the yellow precipitate formed, which contains all the tin and antimony (in the antimonious condition), allowed to settle. The precipitate may be made more easy to filter by oxidation, best by means of ammonium persulphate, but even without being oxidised it is easier to handle than the precipitate formed by nitric acid. After washing, which, in the absence of metals other than these two, may be omitted, the filter and precipitate are burnt, strongly ignited, and weighed as $SnO_2 + SbO_2$. The filtrate is boiled, and the copper present precipitated by the addition of sodium thiosulphate; the precipitate is coagulated by boiling, filtered off, strongly ignited, and weighed as cupric oxide. The filtrate is tested for iron, cadmium, &c. To a second 0·5 grm. of the alloy, dissolved in sulphuric acid, a little hot water and 15 c.c. of dilute hydrochloric acid are added, and afterwards iron wire to precipitate the antimony. The separated antimony and copper are dissolved in hydrochloric acid containing a few drops of nitric acid, the antimony being then precipitated by means of hydrogen sulphide, the antimony sulphide dissolved in sodium sulphide, and the solution electrolysed. The insoluble sulphides can then be dissolved in nitric acid and tested for copper, bismuth, &c. In cases where but little copper and no iron are present, the antimony may be determined either by adding hydrochloric and tartaric acids to the solution and titrating with iodine, or by titrating direct with potassium bromate; in the latter case, the sulphuric or hydrochloric acid solution is heated, and the approximate quantity of N/10 potassium bromate solution added; a drop of Methyl Orange solution is then added and potassium bromate run in until the liquid is decolorised. If this method is employed, the original sulphuric acid solution must be cooled as soon as the alloy is dissolved, since the antimony oxide is gradually oxidised by hot concentrated sulphuric acid.

(2) *For Alloys containing Lead*—If only lead is to be determined, or if only lead and tin are present, as in soft solder, the procedure is very simple. After the alloy is dissolved in sulphuric acid, hot water and a large quantity of ammonium oxalate are added, the liquid being then allowed to slowly cool, and the lead sulphate removed by filtration. The tin is then determined directly in the filtrate by diluting the latter to 180 c.c. and electrolysing the hot liquid with a current density of 1—1·5 ampères per sq. cm. If, however, other metals are present, hot water is added to the sulphuric acid solution, the precipitate being filtered off as soon as it has settled and washed with dilute sulphuric acid; the filter and precipitate are then burnt, ignited, and weighed as $PbSO_4 + SnO_2 + SbO_2$. In the filtrate, copper, iron, cadmium, zinc, &c. are determined as usual. A second quantity of the alloy is treated in the same way, except that the lead, tin, and antimony precipitate is dissolved in hot dilute hydrochloric acid, the cooled solution, to which a couple of drops of sulphuric acid have been added, being freed from the lead sulphate by filtration. In the filtrate the antimony is precipitated by means of iron wire just as with lead-free alloys. The tin is obtained by difference, or it may be precipitated with hydrogen sulphide. The tin cannot be determined by merely removing the hydrochloric acid from the solution by evaporation and then diluting with water, since, in the presence of such large quantities of iron as the solution now contains, the tin will not be completely thrown down, besides which the precipitate will contain a considerable proportion of iron.

The methods given above cannot be advantageously employed with alloys containing large proportions of copper, such as bronzes, brass-bronzes, &c., since such are not attacked sufficiently rapidly by sulphuric acid.—T. H. P.

Zirconium from Iron; Quantitative Separation of ——. A. Gutbier and G. Hüller. Zeits. anorg. Chem., **32**, 92—95. Chem. Centr., 1902, **2**, [14], 913.

The method is based on the fact that, when heated in a current of hydrogen, iron oxide is reduced to metallic iron, whilst zirconium oxide remains unaltered. The solution containing the iron and zirconium is heated, the two metals precipitated as hydroxides by a slight excess of ammonia, the mixture heated to expel the excess of ammonia, and the precipitate filtered off, washed, and dried at 105° C. The filtrate and wash-water are evaporated to dryness, the residue dissolved in hydrochloric acid, and the solution again precipitated as before. The precipitate is filtered off on to small filter, washed, and dried at 105° C. The united precipitates are ignited to constant weight in a porcelain crucible. The weight represents $Fe_2O_3 + ZrO_2$. The oxides are ground as finely as possible in an agate mortar, weighed into a small platinum crucible, and ignited to constant weight in a current of hydrogen.—A. S.

Lead in Ores; Determination of ——. I. C. Bull. School of Mines Quarterly, 1902, **23**, [4], 348—365.

The author has examined and compared with the gravimetric determination as sulphate and chromate, various methods for the volumetric determination of lead; *viz.*, (1) *Alexander's method* (this Journal, 1893, 376); (2) *Koenig's method*, which consists in dissolving lead carbonate in excess of standard nitric acid and titrating the excess of acid with N/10 caustic soda solution and Methyl Orange; (3) *The oxalate or permanganate method* (this Journal, 1894, 280); (4) *The bichromate method*, consisting in adding excess of standard potassium bichromate solution to an ammonium acetate solution of lead sulphate, and determining the excess of bichromate by means of either ferrous ammonium sulphate or potassium iodide and sodium thiosulphate; (5) *The ferrocyanide method*, in which the lead is precipitated as sulphate, the latter converted into carbonate by digesting with ammonium carbonate solution, the lead carbonate dissolved in acetic acid and titrated with a standard solution of potassium ferrocyanide till a drop of the liquid gives a brown colour with uranium acetate solution. The results obtained show that the ferrocyanide and Alexander's

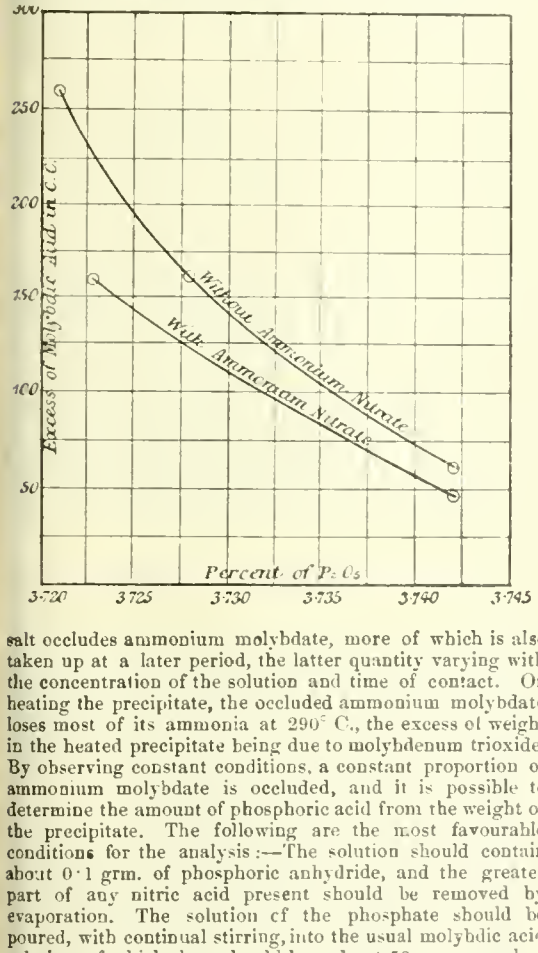
methods are the quickest and most accurate, especially in the presence of impurities. The author prefers the ferrocyanide method, and states that the conditions best adapted for the titration are as follows:—A 1 per cent. solution of potassium ferrocyanide was used. The volume of solution to be titrated should be about 100 c.c., containing about 10 c.c. of 50 per cent. acetic acid; temperature, about 60°C.; correction for indicator, about 0·8 c.c.—A. S.

Zinc and Cobalt; Quantitative Separation of ——. A. Rosenhain and E. Huldschinsky. Zeits. anorg. Chem., **32**, 84—89. Chem. Centr., 1902, **2**, [14], 913.

For the separation of zinc and cobalt, the authors tried the following methods:—(1) Precipitation of zinc as sulphide from faintly acid solution: results, accurate to within 0·5—1 per cent. (2) Precipitation of potassium cobaltinitrite; best results, about 1 per cent. from the theoretical. (3) Precipitation of zinc sulphide from an acetic acid solution of potassium cobalticyanide: very accurate results.—A. S.

Phosphoric Acid; Determination of ——, *by means of Ammonium Phosphomolybdate.* G. P. Baxter. Amer. Chem. J., 1902, **28**, [4], 298—315.

The author finds that on adding a solution of a phosphate to molybdic acid in excess, the precipitate has the formula $(NH_4)_3PO_4.12MoO$. At the moment of precipitation, this



salt occludes ammonium molybdate, more of which is also taken up at a later period, the latter quantity varying with the concentration of the solution and time of contact. On heating the precipitate, the occluded ammonium molybdate loses most of its ammonia at 290° C., the excess of weight in the heated precipitate being due to molybdenum trioxide. By observing constant conditions, a constant proportion of ammonium molybdate is occluded, and it is possible to determine the amount of phosphoric acid from the weight of the precipitate. The following are the most favourable conditions for the analysis:—The solution should contain about 0·1 grm. of phosphoric anhydride, and the greater part of any nitric acid present should be removed by evaporation. The solution of the phosphate should be poured, with continual stirring, into the usual molybdic acid solution, of which there should be at least 50 c.c. more than the theoretical quantity for complete precipitation. After 16 hours the precipitate is collected, washed with 10 per cent. ammonium nitrate solution, and heated for at least two hours at 300° C., in a Gooch's crucible. The excess of molybdic acid is calculated from the results of an approximate determination of the phosphoric anhydride, and the exact amount of the latter is then obtained by reference to the curve shown in the figure.

The precipitation may be accelerated by the addition of ammonium nitrate, and is complete in one hour after the addition of 10 grms. of the salt to 100 c.c. of the molybdic acid solution. As shown in the curve the results differ slightly from those obtained without the use of ammonium nitrate.—C. A. M.

Iodine; Standardising ——, *by means of Hydrazine Sulphate.* R. Stollé.

See under Org. Quantit., *below.*

ORGANIC—QUALITATIVE.

Formaldehyde in Foods [Milk, &c.]; New Reaction for the Detection of ——. Manget and Marion. Comptes Rend., **135**, [15], 584.

The surface of milk is lightly dusted with amidol or aminophenol. After a few minutes, pure milk develops a salmon tint, while if formalin be present, the colour produced is canary-yellow. One part in fifty thousand shows the reaction. In the case of meat jellies, a little is melted in a test-tube and shaken with a few crystals of amidol; if formalin be present, a yellow colour is produced, turning dirty-yellow when a drop of ammonia is added, while without formalin the colour is a reddish-brown, turned blue by ammonia.—J. T. D.

ORGANIC—QUANTITATIVE.

Hydrazine; Volumetric Determination of ——, *and the use of Hydrazine Sulphate for Standardising Iodine.* R. Stollé. J. prakt. Chem., 1902, **66**, [18 and 19], 332—338.

Hydrazine as hydrate or in the form of its salts can be readily titrated with iodine solution in presence of sodium bicarbonate and starch according to the equation, $NH_2.NH_2 + 2I_2 = N_2 + 4HI$. Moreover, hydrazine sulphate can be titrated with caustic potash using Methyl Orange as an indicator. Propylhydrazine when treated with iodine in bicarbonate solution gives dipropylhydrazine, two molecular proportions requiring four atoms of iodine. Benzyl-hydrazine under similar conditions gives benzyl iodide, whilst phenylhydrazine yields diazobenzenephenylhydrazide, $C_6H_5N{:}N.N(NH_2)C_6H_5$, which melts at 71° C. About two atoms of iodine are required for each molecule of base, and the same is also the case with the homologous diazotoluenctolylhydrazide which melts at 95° C.

—T. A. L.

Gutta-percha; Methods for Determining ——. E. Marckwald and F. Frank. Zeits. angew. Chem., 1902, **15**, [40], 1029—1032.

After citing the somewhat conflicting statements on record as to the action of various solvents on gutta-percha, the authors describe four methods for analysing this substance, of which three give fairly concordant results.

Method I. Dried gutta (2 grms.) was dissolved in chloroform (15 c.c.), and gradually added to acetone (75 c.c.). The voluminous and porous cake so obtained was washed with acetone, pressed, and dried. The mother-liquors gave the dirt, &c. by filtration, and the soluble resin by evaporation of the solvents. If small fragments of the gutta-percha are found on the filter, they are best re-dissolved by the help of hot toluene.

Method II., in which alcohol was used instead of acetone to precipitate the dissolved gutta, gave results in which the resin was constantly too low.

Method III. Dried gutta (2 grms.) was dissolved in chloroform (10 c.c.) and treated with ether (100 c.c.). Separation began to take place in one hour and required 24 hours to become complete. The resin, dirt and gutta were separately weighed as in Method I.

Method IV. Dried gutta (1 grm.) was boiled for one hour under a reflux condenser with light petroleum spirit (100 c.c.), which boiled at 35°—50° C.

When cold the gutta begins to separate and requires 24 hours to become completely precipitated.

Results.

Constituents.	Method I.	Method II.	Method III.	Method IV.
Gutta A.:—				
Real gutta.....	80·21	85·90	79·23	78·55
Resin, &c.	19·79	14·10	20·77	21·45
Gutta B.:—				
Real gutta.....	46·41	48·61	45·82	46·10
Resin, &c.	53·59	51·39	54·18	53·90

Method I. (chloroform and acetone) appears to be the best.—R. L. J.

Butter; Separation of Margarine from ——. C. Deguide. J. Pharm. Chim., 1902, **16**, [7], 372—377.

The apparatus employed consists of a vessel holding about 1100 c.c. This vessel is open at the top, and in it, suspended at three points, is placed another vessel of about half the capacity of the first and having a perforated bottom, the holes forming spaces of about 80 μ. 1000 c.c. of fresh, skimmed milk are placed in the apparatus and 10 grms of the unmelted fat to be examined are put into the inner vessel. The whole apparatus is then heated on a water-bath to 37·5° C, and the contents of the inner vessel are stirred with a thermometer. The temperature is then slowly raised until the fat melts, stirring meanwhile. The contents are then allowed to rest for half a minute, the inner vessel being raised to promote diffusion. Pure butter completely emulsifies, whilst margarine remains on the surface of the milk in large globules. The process is repeated ten times, and the interior vessel then taken out and placed in cold water. If butter has been used, only a trace of fat remains behind, but the whole of the margarine (or other foreign fat or oil) is obtained. The latter is dissolved in carbon tetrachloride, dried and weighed, and may afterwards be examined chemically.—W. P. S.

Alcohol; Determination of ——, *in very Dilute Solutions.* G. Argenson. Bull. Soc. Chim., 1902, **27**, [18], 1000—1003.

Twenty c.c. of a solution of alcohol of known strength *e.g.*, one in 500,000, are placed in a flask, and five c.c. of a saturated solution of potassium bichromate and one c.c. of concentrated sulphuric acid are added. The mixture is then distilled with precautions to avoid the projection of particles of the liquid. The first 5 c.c. of distillate are collected and treated in a test-tube with 0·5 c.c. of a solution of Magenta in sulphurous acid. This reagent must be very carefully prepared by dissolving 0·25 grm. of Magenta in 500 c.c. of water freed from air, and passing a stream of sulphur dioxide through the solution until decolorisation is nearly complete. After standing for several hours, a few more bubbles of gas are passed through until the solution has a faint pink colour. The sensitiveness of the reagent depends entirely on avoiding an excess of sulphurous acid. The distillate in the tube treated with this reagent develops a colour, constant after about one hour, due to the presence of aldehyde. This colour is then imitated by means of a standardised centinormal solution of permanganate in a similar tube. The estimation proper is then conducted on a sample of the alcoholic solution to be analysed in exactly the same way, the coloration being practically proportional to the permanganate required. If the solution contain more than one part of alcohol in 200,000, it will have to be diluted.

If aldehyde be already present, a distillation should be made without the chromic acid mixture, and the result subtracted from the main result. It is practically impossible to obtain alcohol free from aldehyde, but at these dilutions the quantity is so small that it can generally be neglected. —J. F. B.

Podophyllum Resin; Determination of ——. H. M. Gordin and C. G. Merrell. Proc. Amer. Pharm. Assoc. Pharm. J., 1902, **69**, [1684], 335.

Five grms. of the resin and 10 grms. of freshly prepared calcium hydroxide are placed in a strong, well-corked bottle of about 200 c.c. capacity, and the whole weighed. The bottle is then uncorked, heated for a few minutes on the water bath at 60°—65° C., 15 c.c. of alcohol added, the whole well shaken and the closed bottle kept on the water-bath for eight hours, shaking at first every few minutes to prevent formation of a hard lump. The bottle is then cooled, about 7 c.c. of chloroform added, then enough of a mixture of two parts of alcohol and one part of chloroform (by vol.) to make the whole liquid weigh 130 grms. After shaking for a few minutes, the bottle is allowed to stand for 24—48 hours, 65 grms. of the clear liquid drawn off into a tared vessel, the solvent distilled off, and the residue dried and weighed.—A. S.

Kola Preparations; Determination of the Alkaloids in ——. Warin. J. de Pharm., 1902, 373.

Fifteen c.c. of the liquid extract or similar preparation are heated on the water-bath to expel the alcohol, the residue triturated with 10 grms. of calcined magnesia and about 2 c.c. of water, and the mass boiled with 150 c.c. of chloroform in a wide-mouthed flask, under a reflux condenser for 45 minutes. Sufficient chloroform is then added to make up for loss during the boiling, and the whole well shaken, and filtered rapidly. 100 c.c. of the filtrate are evaporated till the residue is of constant weight. This residue represents the crude alkaloids in 10 c.c. of the sample. It is warmed with 10 c.c. of dilute hydrochloric acid, filtered and the undissolved matter washed. The filtrate is rendered alkaline with ammonia, extracted with three quantities of 20 c.c. of chloroform, the extract evaporated and the residue weighed.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Hydrogen Peroxide; Lowering of the Freezing Point of Aqueous Solution of ——, *by certain Salts and Acids.* H. C. Jones and C. G. Carroll. Amer. Chem. J., 1902, **28**, [4], 284—291.

The results of comparative experiments with solutions of potassium chloride, potassium nitrate, and ammonium sulphate in water and dilute solutions (3·2 to 5·5 per cent.) of hydrogen peroxide, showed in each instance that the molecular lowering of the freezing point under the same conditions was considerably lower in the case of hydrogen peroxide. In the author's opinion this is most probably due to a combination between the mols. of the salts and of the hydrogen peroxide. In similar experiments in which acids were added to the liquids instead of salts, the lowering of the freezing point of aqueous hydrogen peroxide was much greater than that of water, apparently indicating a greater dissociation of the acids in the former case (this Journal, 1902, 645).—C. A. M.

Perchloric and Periodic Acids [*Acidimetry*]. A. Astruc and H. Murco. Bull. Soc. Chim., 1902, **27**, [18], 929—930.

The thermo-chemical phenomena of the neutralisation of perchloric and periodic acids bring out considerable differences between the two: whilst perchloric acid is a strong, distinctly monobasic acid, periodic acid gives variable results according to the proportion of alkali employed. The authors find that similar differences are exhibited towards most indicators. The hydrates of the acids, $HClO_4$, $2H_2O$ and HIO_4, $2H_2O$, were employed.

Perchloric Acid.—This acid behaves like an exactly monobasic acid, comparable with HCl or HNO_3, towards all the indicators tested; the changes of colour are sharp.

Periodic Acid.—In presence of Methyl Orange (Helianthine A), this acid is saturated by exactly one molecule of potash, soda, or ammonia, and by half a molecule of lime, baryta, or strontia. The colour changes are rapid and very sharp. Very different results are obtained with phenolphthalein; in this case the colour changes are gradual and most frequently uncertain, and vary with the alkali employed. Whilst 1 mol. of the acid gives the pink coloration with 1·5—1·7 mols. of potash, soda or ammonia, 2 mols. of the acid, under the same conditions, require 1·9—2 mols. of baryta and 2·0—2·3 mols. of strontia and

lime. Litmus tincture and Rosolic acid give results of the same order, but the changes in colour are still less sharp. Poirrier's Blue also gives results approaching those of phenolphthalein. Periodic acid is therefore a complex acid possessing different acid functions: one strong, acting on Methyl Orange, and the others weaker, only influencing the other indicators. Methyl Orange is the only satisfactory indicator for the titration of this acid.—J. F. B.

Iodine Pentafluoride. H. Moissan. Comptes Rend., **135**, [15], 563—567.

Fluorine, passed over thoroughly dried iodine at the ordinary temperature, reacts on it with great elevation of temperature, forming the compound IF_5. A dense, colourless liquid, freezing at 8° C., boiling at 97°, and decomposing between 400° and 500° C., whether into iodine and fluorine or into iodine and a higher fluoride is not yet established. It has a very great chemical activity; most of the elements decompose it, and it enters into reaction with a great number of compound substances.—J. T. D.

Colourless Organic Compounds; Sensibility to Light of ——. J. Pinnow. J. prakt. Chem., 1902, **66**, [18 and 19], 265—320.

Investigating the diminution of the fluorescence of substances like fluorescein, quinine bisulphate and acridine hydrochloride by the addition of another substance (*e.g.*, hydric ferrocyanide), the author finds that this is due, not to change of electrolytic dissociation, nor to alteration of the absorption spectrum of the fluorescent substance, but to the absorption of light by the substance added, the fluorescent agent acting as a sensitiser. He has applied this method for the examination of a number of organic substances employing as fluorescing agents β-naphthylamine, anthracene, sodium naphthionate, and the three above mentioned.

The following conclusions are arrived at:—

1. The property of diminishing the fluorescence of a solution depends, apart from a few exceptional cases, on the absorption of the admixture.

2. This de-fluorescing property is a preponderating constitutional characteristic of chemical compounds.

3. The relationship existing between the constitution and the defluorescing property of colourless substances is dependent upon the influence of the corresponding characteristic groups in substances containing chromophors, especially dyestuffs.

4. Groups which limit the absorption of certain rays can also lessen the decomposition caused by the same rays.

—T. A. L.

Maltose and Glucose; The Equilibrium between ——. C. Pomeranz. Monatsh. für Chem., 1902, **23**, [7], 750—753.

Some time ago Croft Hill (this Journal, 1898, 684) recorded the fact that the maltase of yeast brought about the condensation of glucose, especially in concentrated solutions, and demonstrated that the action of this enzyme is of a reversible nature. He treated 40 per cent. solutions of maltose and glucose respectively with the enzyme, and found, when the reaction was complete, that both solutions had come to an equilibrium at practically the same composition, *viz.*, maltose: glucose = 15:85 approximately. The author finds a further proof of the correctness of Hill's conclusions by calculating from his analytical data the concentration, C_2, of glucose and that, C, of maltose hydrate (grm.-mols. per litre) after equilibrium had been established, with different initial concentrations of sugar. If the hydrolysis of maltose is a reversible action it should take place according to the scheme: Maltose hydrate $\rightleftarrows$ 2 glucose and by the law of mass action the ratio $\frac{C_2}{C}$ at the point of equilibrium should be a constant. The author has calculated this ratio for initial concentrations of 39·23, 20·0, 10·0, 4·0, and 2·0 grms. of maltose per 100 c.c. respectively in Hill's experiments and finds that it varies from 18·4 to 21·3, which, considering the nature of the case, is sufficiently constant to prove the validity of the theoretical conclusions from the experimental facts.—J. F. B.

Rhodeose; Oxidation Products of ——. E. Votoček. Zeits. f. Zuckerind. in Böhmen, 1902, **27**, [1], 15—27.

It has already been shown that rhodeose has a twofold rotation; in the syrupy condition $[\alpha]_D = +36°$ (calculated on the dry reducing substance of the syrup), while crystalline rhodeose obtained from the syrup through methylphenylhydrazone has $[\alpha]_D = +75{\cdot}2°$. This result is due to the presence in the syrup of a second sugar, named provisionally isorhodeose.

Isorhodeose differs from rhodeose in being oxidised with bromine to an acid which forms a lactone with difficulty, and the barium salt of which is extremely soluble in water. It gives an osazone different from rhodeosazone, and, with hydrazines or substituted hydrazines, no insoluble hydrazone.

From a comparison of crystalline rhodeose with the fucose of Tollens, it appears very probable that these are optical isomers, the first instance of the kind among methylpentoses.—L. J. de W.

Pectic Fermentation. Gayand. Comptes Rend., **135**, [14], 537—538.

The author has made a series of experiments on the action of pectase on clover juice, in which the lime had been replaced by potash; the results indicate that pectase forms pectic acid at the expense of the pectin, and that the action is not qualitatively influenced by the presence or absence of calcium salts.—T. H. P.

Lipase in Animal Organs, and the Reversibility of its Oleolytic Action. O. Mohr. Woch. f. Brau., 1902, **19**, [40], 588—589.

Kastle and Loewenhart (J. Amer. Chem. Soc., 1900, **24**, 491) described some very important experiments on the oleolytic enzyme lipase, obtained from various animal organs. They studied the action of the extracts upon esters, principally ethyl butyrate, and established the rapid saponifying effect of the enzyme. They also found that these extracts had a marked influence in the reverse direction, and brought about the esterification of butyric acid and ethyl alcohol to a considerable extent; in a large experiment 1 c.c. of ethyl butyrate was thus produced. It was found that pig's liver was the best material for the preparation of the enzyme, and that the extracts must only be filtered through cloth, as filtration through paper held back the active enzyme. The author has re-investigated the subject, and finds that Kastle and Loewenhart's observations are substantially confirmed. In order to study the reversion of the action, the author prepared two mixtures, each containing 16·7 grms. of butyric acid, 100 grms. of 95 per cent. alcohol, 1,900 grms. of water, and 3 grms. of toluene. To these were added 1,000 c.c. of a fresh 15 per cent. extract of pig's liver on the one hand, and an equal quantity of the same extract, boiled, on the other. After 48 hours, about 50 c.c. were distilled off from each with the aid of a current of air. The distillates were shaken with sodium carbonate solution to remove butyric acid, and then extracted by shaking with ether. The residue from the active solution consisted of a small quantity of oil with an odour of ethyl butyrate, identified by saponification and preparation of barium butyrate. The residue from the solution treated with the boiled extract, consisted of mere traces of the ester. Thus there remained no doubt that the action of the enzyme enormously increased the esterification.—J. F. B.

Eurotium Oryzæ; Diastatic Ferments in ——. E. Pozzi-Escot. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [3], 282—285.

The author has examined cultivations of *Eurotium Oryzæ* for the presence of enzymes, those found being diastase, invertase, the reducing enzyme "jacquemase," previously described by the author, and a de-coagulating enzyme which liquefies gelatin and behaves similarly to casease.

—T. H. P.

New Books.

THE MINERAL INDUSTRY: ITS STATISTICS, TECHNOLOGY, AND TRADE IN THE UNITED STATES AND OTHER COUNTRIES TO THE END OF 1901. Founded by the late RICHARD P. ROTHWELL. Edited by JOSEPH STRUTHERS, Ph.D. Vol. X., supplementing Vols. I. to IX. The Engineering and Mining Journal, New York, 261, Broadway; London, 20, Bucklersbury. 1902. Price 1*l.* 0*s.* 10*d.*

LARGE 8vo volume containing table of contents, preface with brief biographies of contributors, introduction, 884 pages of subject-matter, and alphabetical indexes of subjects and authors. The following subjects are treated of:—I. Aluminium and Alum. II. Ammonia and Ammonium Sulphate. III. Antimony. IV. Arsenic. V. Asbestos. VI. Asphaltum. VII. Barytes. VIII. Bismuth. IX. Borax. X. Bromine. XI. Calcium Carbide and Acetylene. XII. Carborundum. XIII. Cement. XIV. Chromium and Chrome Ore. XV. Clay. XVI. Coal and Coke. XVII. Copper. XVIII. Copperas. XIX. Electro-chemistry and Electro-metallurgy in 1901. XX. Felspar. XXI. Fluorspar. XXII. Fuller's Earth. XXIII. Garnet. XXIV. Gems and Precious Stones. XXV. Glass. XXVI. Gold and Silver. XXVII. Graphite. XXVIII. Gypsum. XXIX. Iron and Steel. XXX. Lead. XXXI. Magnesite. XXXII. Manganese. XXXIII. Mica. XXXIV. Molybdenum. XXXV. Monazite. XXXVI. Natural Gas. XXXVII. Nickel and Cobalt. XXXVIII. Ochre and Iron Oxide Pigments. XXXIX. Petroleum. XL. Phosphate Rock. XLI. Platinum and Iridium. XLII. Potassium and Potash. XLIII. Mercury. XLIV. Rare Elements. XLV. Salt. XLVI. Silica. XLVII. Slate. L. Soda and Sodium. LI. Stone. LII. Sulphur and Pyrites. LIII. Talc and Soap Stone. LIV. Tin. LV. Tungsten. LVI. Zinc and Cadmium. LVII. Pyritic Smelting. LVIII. Progress of Metallography in 1901, &c. LIX. Alloys as Solutions. LX. Literature of Ore Dressing in 1901, Review. LXI. Liquefied Carbonic Acid. LXII. Wetherill System of Magnetic Ore Dressing, Recent Progress.

DIE DARSTELLUNG DES CHROMS UND SEINER VERBINDUNGEN MIT HILFE DES ELEKTRISCHEN STROMES. Von Dr. MAX LE BLANC. Druck und Verlag von Wilhelm Knapp, Halle a. S. 1902. Price M. 6.

8vo volume, containing preface, table of contents, and 108 pages of subject-matter, with an alphabetical list of names of authors and inventors, &c. The subjects treated of are arranged under the following heads:—I. Obtaining Metallic Chromium. II. Compounds of Chromium with Metals. III. Compounds of Chromium with Non-Metals.

FORTY-SIXTH REPORT OF THE COMMISSIONERS OF H.M. CUSTOMS (FOR THE YEAR ENDED 31ST MARCH 1902). [Cd. 1226.] Price 3*d.*

THE gross Imperial Customs revenue collected in the year 1901–2 amounted to 32,250,948*l.*, or, after deduction of drawbacks and repayments, to 31,046,560*l.* This is 4,775,601*l.* more than the produce of 1900—1901, and 1,046,560*l.* more than the budget estimate for the year. The Customs revenue has thus brought in 3·49 per cent. more than it was expected to produce, and 18·18 per cent. more than it produced in 1900—1901.

Cocoa, cocoa husks, chocolate, and cocoa butter contributed in duties, 255,301*l.*; coffee, 174,342*l.*; dried fruit, 379,889*l.*; spirits, 4,581,520*l.*; tea, 5,792 967*l.*; tobacco and snuff, 10,567,705*l.*; and wine, 1,449,687*l.*

FACTORIES AND WORKSHOPS. ANNUAL REPORT OF THE CHIEF INSPECTOR FOR THE YEAR 1901. PART II. TABLES. [Cd. 1309.] Price 10*d.*

THIS report, which is issued annually by the Home Office, contains statistics as to accidents, cases of anthrax, and of poisoning by lead, mercury, phosphorus, and arsenic, prosecutions, &c., in connection with factories and workshops during the year 1901. Detailed statistics as to dock accidents are separately shown in this report. The total number of accidents in the United Kingdom reported to the inspectors in 1901, was 83,760, as compared with 79,020 in 1900. Of this total, 1,035 were fatal, as compared with 1,045 in the preceding year.

The number of reported cases of lead, mercury, phosphorus, and arsenic poisoning, and anthrax, in 1901, was 936, as against 1,129 in 1900. These figures do not include 169 cases of lead poisoning reported among house painters and plumbers in 1901.

Trade Report.

II.—FUEL, GAS, AND LIGHT.

PRODUCTION OF NATURAL GAS IN THE UNITED STATES.

Bd. of Trade J., Oct. 16, 1902.

The natural gas production of the United States, in 1901, according to a report by the United States Geological Survey, was equivalent to 8,458,600 tons of coal, at 20,000 cb. ft. of gas equal to one ton of coal. The value of this gas production was 5,639,000*l.*, an increase in value of 14 per cent. over that of 1900. At the close of 1901, there were 10,297 wells producing natural gas, and in 1901, 2,088 producing wells were drilled. Nearly 800 miles of pipe were laid in the year, making a total of 21,848 miles of natural gas mains in use, varying from 2 to 36 ins. in diameter. In the gas-belt, natural gas has been lately extensively applied in creating the power by which the natural gas itself is compressed, when the original pressure has failed, and the pipes are insufficient to deliver the necessary quantity of gas at the well pressure. A number of these compressors work at nearly 1,000 h.p., with an economy that enables 8 to 10 cb. ft. of natural gas to develop 1 h.p. for 1 hour; this is a saving of 40 to 50 per cent. over high-duty steam-engines. In manufacturing establishments, 1,545 report the use of natural gas; these include 102 iron and steel works and 219 glass works.

VII.—ACIDS, ALKALIS, SALTS, Etc.

SULPHURIC ACID IN CHILE.

Chem. and Druggist, Oct. 18, 1902.

The Chilean *Diario Oficial* publishes the text of a law, recently passed by the National Congress, which states that a bounty of three centavos will be given for each kilo. of sulphuric acid, at 60° B., which is manufactured in the country, provided that the annual production of each factory is not less than 1,500 metric tons. The President of the Republic is authorised to expend 50,000 pesos annually for five years for the purpose of paying the bounties. It is pointed out that the necessary pyrites are very plentiful in Chile, and that sulphuric acid should find an important opening in the treatment by the wet process of poor copper ores, which are found abundantly in the Cordilleras.

X.—METALLURGY.

SLAG PRODUCTION OF THE UNITED STATES.

Bd. of Trade J., Oct. 16, 1902.

The production of the six or eight slag-cement establishments in the United States, in 1901, amounted to 272,689 barrels; and two plants are making Portland cement from slag and limestone. Owing to the slight development of the basic Bessemer steel industry, only about 1,000 tons of American phosphatic slag were sold for fertilisers, in 1901. In the same year, 3,500 tons of mineral wool were made from slag in the United States, and about 5,000 tons of slag were used in constructing macadam highways, with entirely satisfactory results.

Mineral Production of India.

Bd. of Trade J., Oct. 23, 1902.

The following table shows the quantity and value of the principal minerals produced in India, in 1901, as compared with the figures for the preceding year :—

	Quantity.		Value.	
	1900.	1901.	1900.	1901.
			Rs.	Rs.
Salt..... Tons	1,005,022	1,102,546	45,78,295	56,22,728
Coal..... „	6,118,692	6,635,727	2,01,46,222	1,98,50,582
Petroleum..... Galls.	37,729,211	50,075,117	22,31,325	30,65,131
Manganese ore .. Tons	130,670*	133,170*	12,51,639*	14,37,858*
Mica..... ..... „	435½	1,138	4,17,212	9,95,892
Tin ore..... „	104	70	1,28,009	1,16,595

* Exports from India in the financial year ended 31st March, the figures of production not being available.

Bismuth in Arizona.

Eng. and Mining J., Oct. 4, 1902.

A mining property in Arizona, lately examined, contained ore which resembled horn silver, but which turned out to be a carbonate of bismuth, unusually pure. The property is situated on the Salt River, near its junction with the Verde, and between Fort McDowell and Superstitious Mountain.

XIV.—TANNING; LEATHER; GLUE, Etc.

Tanning Materials in India.

Chem. and Druggist, Oct. 18, 1902.

A recent issue of the *Agricultural Ledger* discusses the source and character of tanning materials available in India. It is almost entirely devoted to a list of the raw stuffs in India which contain tannin, with notes on their composition and the preparation of extracts. It also points out that the forests of India abound in products capable of being used for tanning-purposes. At present the chief tanning-stuffs of India are myrobalans, cutch, Tarwar bark or tanner's cassia, and Babul bark. Of these materials, on an average, myrobalans to the value of 34 lakhs are annually exported, principally from Bombay; and cutch, valued at 14 lakhs, is annually exported from Burma. Babul bark and tanner's cassia are extensively employed, the former in Northern India and the latter in Central and Southern India.

XVIII. B.—SANITATION.

River Pollution in Coal Districts in the United States.

Eng. and Mining J., Oct. 4, 1902.

An investigation is about to be begun by the Division of Hydrography, of the United States Geological Survey, into the effects of coal-mine refuse upon rivers. The streams running close to anthracite mines are heavily charged with sulphur, and their waters often have a slightly acid reaction; the beds of the streams are also often overlain by heavy deposits of sulphur precipitated from the water.

It is the purpose of the investigation to discover the effects upon the rivers which receive the polluted streams. One result is the driving away of all varieties of fish, but a more important consideration is the influence of the sulphur-charged streams on the decomposition of organic matter going on in rivers into which they flow. It is a question whether a stream polluted by some sewage is assisted or retarded in its self-purification by the sulphur-polluted tributaries; but there is a possibility that the discharge of mine waste into sewage pollution may have an important chemical influence upon sedimentation, if not an appreciable effect upon the oxidation of organic matter.

On the other hand, the mine refuse, especially such as comes from culm-pile washery, is a troublesome source of pollution. The separation of the coal from the waste is accomplished through the use of very large quantities of water, which are hence returned to the streams laden with fine coal-dust. For some distance below the outlets of these washeries the streams indicate this, and the coal-dust, extending for many miles down-stream, is gradually deposited, in places even filling the channels. Such water is unfit for household or even for many manufacturing uses.

XX.—FINE CHEMICALS, Etc.

Citric Acid, Essential Oils, &c., in Sicily.

Chem. and Druggist, Oct. 18, 1902.

The total production of citric acid in Messina, in 1901, was 2,406 cwts. The quantity shipped was 1,572 cwts., of which 693 cwts. went to the United Kingdom, and 879 cwts. to foreign countries. Of citrate of lime, 17,394 cwts. were exported, of which 3,928 cwts. were shipped to the United Kingdom. Concentrated lemon-juice was shipped to the extent of 34,815 cwts., being a decrease of 566 cwts. The quantity of essential oils of lemon, orange, and bergamot, shipped to all countries, was 6,039 cwts., as against 5,979 cwts., in the previous year; of this quantity, the United Kingdom received about 3,000 tons. The total amount of wine-lees shipped was somewhat less than in the previous year—*viz.*, 93,993 cwts., in 1901, as against 112,103 cwts., in 1900. Of the 93,993 cwts., 41,375 cwts. were shipped to the United Kingdom. From Palermo, the following were among the articles exported, the figures in parentheses being those for 1900 :—Olive oil, 2,174 tons (745 tons); essential oils, 72 tons (58 tons); tartar, 1,538 tons; citrate of lime, 446 tons (540 tons); manna, 86 tons (109 tons); dried orange-peel, 69 tons; lemon-juice, 498 tons (757 tons); liquorice-juice, 34 tons (38 tons); and sulphur, 13,803 tons (13,616 tons).

Ether in Holland.

Bd. of Trade J., Oct. 23, 1902.

A Decree, dated the 13th June last, provides for the exemption from import duty of ether used in the manufacture of cocaine, provided that the requisite formalities are complied with.

New Pepper from West Africa.

U.S. Cons. Reps., Oct. 10, 1902.

A new pepper has been recently imported from Kissi, on the Liberian frontier of Guinea. It is not akin to any known species, and is very rich in piperine and volatile oil. Its grains, generally very small, are characterised by a pedicule at their base. They give a reddish-brown powder, highly perfumed, and of a peculiar aromatic savour.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 22,831. Johnson. Casks, &c. Oct. 20.

„ 22,850. Ueberroth and Young. Filters. Oct. 21.

„ 22,852. Lynes. Appliances for abstracting or carrying off the fumes and gases evolved from vessels employed in metallurgical, chemical, &c., operations. Oct. 21.

[A.] 22,948. Johnson. Casks, barrels, &c. Oct. 21.

„ 23,266. Sugden. Superheaters for steam-generators. Oct. 24.

„ 23,271. Johnson. Repairing, cleaning, or inspection of casks, barrels, &c. Oct. 24.

„ 23,272. Johnson. Casks, barrels, &c. Oct. 24.

„ 23,467. Anderson, jun. Chemical substance, and method of producing the same. Oct. 28.

„ 23,468. Bagnall. Device for stoppering barrels containing fermented, &c., liquors. Oct. 28.

„ 23,548. Oster. Filters.* Oct. 28. United States Application, Oct. 28, 1901.

„ 23,646. Knudsen. Apparatus for liquefying air and other gaseous fluids. Oct. 29.

„ 23,764. Springborn. Method of and apparatus for filtering fluids. Oct. 30.

„ 23,770. Ekenberg. Rotary drums for evaporation apparatus.* Oct. 30.

„ 23,901. Wood. Cover for hydro-extractors, &c. Nov. 1.

[C.S.] 21,999 (1901). Keay. Safety reservoirs for containing inflammable, &c., liquids. Nov. 5.

„ 24,132 (1901). Schreiber. Process for the manufacture of printing-plates from elastic material for autotype-tone printing. Nov. 5.

„ 2124 (1902). Garson. Iron drums or receptacles for oils, varnishes, &c. Nov. 5.

II.—FUEL, GAS, AND LIGHT.

[A.] 22,765. Hollis. Coal-stopper for inclined gas-retorts. Oct. 20.

„ 22,767. Smith and Mollart. Liquid or solution for strengthening mantles used in incandescent gas-lighting. Oct. 20.

„ 22,785. Creighton. Acetylene lamps. Oct. 20.

„ 22,827. Soc. Anon. la Lampe "Hollub." Incandescent electric lamps.* Oct. 20. French Application, Nov. 30, 1901.

„ 22,843. Snell. Incandescent gas-lamps. Oct. 20.

„ 22,844. Jones. Manufacture of gas. Oct. 20.

„ 22,861. Ridgway, Willway, and Willway. Burner for oxyhydrogen light. Oct. 21.

„ 22,873. Grafton. No. 1 London Argand burner for gas-testing.* Oct. 21.

„ 22,887. Cole. Apparatus for "trimming" incandescent mantles. Oct. 21.

„ 22,906. Simon-Carves Bye-Product Coke Oven Construction and Working Co., Ltd. (Cie. des Mines d'Auzin). Means or devices for the transference of coke, &c., from coke-ovens or furnaces. Oct. 21.

„ 22,937. Brockmann. Method and means for the production of carbide of calcium. Oct. 21.

„ 22,967. Ludwig. Gas-generators for street lamps.* Oct. 21.

„ 22,978. Cherry. Oil-, &c., lamps, for the purpose of preventing explosions. Oct. 22.

„ 23,010. Moss. Generation or production of gas for use as a motive power for propelling motor-cars, &c. Oct. 22.

„ 23,019. Hodgkinson. Means of producing coloured flames for illuminations, &c. Oct. 22.

„ 23,045. Gerard. Electrical arc-light. Oct. 22.

„ 23,090. Crossley and Rigby. Apparatus for the regulation of the production of gases from gas-producer plants. Oct. 23.

[A.] 23,262. Blondel. Manufacture of carbons for arc-lamps, &c. Oct. 24.

„ 23,267. Rózsa and Pikál. Automatic gas-igniter. Oct. 24.

„ 23,291. Helps. Gas-burners and mantles. Oct. 27.

„ 23,332. Grice and Dewey. Incandescent mantles. Oct. 27.

„ 23,337. Fowler and Medley. Combined heat-interchanger and water-vaporiser for use in connection with gas-producers. Oct. 27.

„ 23,338. Hopwood and Clegg. Method of and apparatus for the prevention of smoke in the furnaces of steam-boilers, &c. Oct. 27.

„ 23,378. Edwards. Magnesium lamps. Oct. 27.

„ 23,407. Lefèvre. Artificial fuel.* Oct. 27. French Application, Mar. 12, 1902.

„ 23,413. Dempster. Apparatus for making oil-gas.* Oct. 27. United States Application, Nov. 5, 1901.

„ 23,428. Schattner. Incandescing bodies for electric lighting purposes. Oct. 27.

„ 23,438. Abel (Gebr. Siemens and Co.). Electrodes for arc-lamps. Oct. 27.

„ 23,442. Snell. Gas-burners. Oct. 27.

„ 23,450. Calentine and Ward. Smoke-consuming furnaces.* Oct. 27.

„ 23,503. Loewenthal. Compositions for making coal-dust bricks.* Oct. 28.

„ 23,511. Bartlett and Thomas. Waterproof artificial fuel. Oct. 28.

„ 23,544. Coppée. Coke-ovens. Oct. 28.

„ 23,592. Statter. Apparatus for the manufacture of acetylene gas. Oct. 29.

„ 23,606. Högner. Electric-arc lamps.* Oct. 29.

„ 23,695. Hookham. Incandescent electric lamps. Oct. 30.

„ 23,705. Allen, jun. Acetylene Bunsen-burners. Oct. 30.

„ 23,714. Evans and Spaull. Gas-economiser and mantle-preserver. Oct 30.

„ 23,849. Masters. Liquid-fuel lamps. Oct. 31.

„ 23,892. Herring. Method of manipulating the slide-valves of coal-storage hoppers or measuring chambers in connection with inclined gas-retorts, and gas-producers, &c.* Nov. 1.

[C.S.] 21,646 (1901). Viertel and Pueschel. Carbons for arc-lights. Nov. 5.

„ 22,334 (1901). Stubblebine. Furnaces. Oct. 29.

„ 22,786 (1901). Irving, Gibbons, and Gibbons. Gas producers or generators for use in heating gas retorts. Oct. 29.

„ 24,691 (1901). Kemp-Welch. Producer-gas apparatus. Nov. 5.

„ 25,139 (1901). Hills. Combined gas-generating plant and gas-engine. Nov. 5.

„ 25,281 (1901). Passmore. Atmospheric gas-burners. Oct. 29.

„ 25,578 (1901). Darby and Stevens. Machinery applicable for forming stamped or compressed charges of fuel for coke-ovens and for similar operations. Nov. 5.

„ 25,590 (1901). Boult (Braunstein). Incandescent gas-burners. Oct. 29.

„ 26,142 (1901). Chenhalls. Means for utilising exhaust steam in connection with liquid fuel. Oct. 29.

„ 26,198 (1901). Keith and Keith. High-pressure burners for incandescent lamps. Oct. 29.

[C.S.] 26,411 (1901). Nicholson and Brown. Coke-ovens. Nov. 5.

„ 6937 (1902). Taylor. Fire-bars and smoke-consuming devices for furnaces. Oct. 29.

„ 16,683 (1902). Brookes (Bradley). Pulverulent or dust fuel-feeding devices. Nov. 5.

„ 16,726 (1902). Dobson. Method of pressing peat-blocks. Nov. 5.

„ 17,265 (1902). Herrick. Gas-producers. Oct. 29.

„ 17,297 (1902). Bauke and Fuchs. Apparatus for use in connection with generating gas. Nov. 5.

„ 17,463 (1902). Dargie. Acetylene gas-generators and gasometers. Nov. 5.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 23,395. Scott and Hinchley. *See under* XX.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 22,823. Imray (Farbwerke, Höchst). Process for the manufacture of sulphurised dyestuffs. Oct. 20.

„ 22,824. Imray (Farbwerke, Höchst). Manufacture of a new sulphurised dyestuff. Oct. 20.

„ 23,058. Lesser. Manufacture of nitro and halogen substitution products of aromatic amines. Oct. 22.

„ 23,418. Ransford (Cassella and Co.). Manufacture of oxychlorphenyl amidotolylamine, and sulphur colours therefrom. Oct. 27.

„ 23,437. Abel (Akt.-Ges. f. Anilinfabr.). Manufacture of a sulphurised colouring matter directly dyeing cotton. Oct. 27.

„ 23,514. Read Holliday and Sons, Ltd., Turner, Dean, and Turner. Manufacture of colouring matters. Oct. 28.

„ 23,830. Imray (Farbwerke, Höchst). Manufacture of new colour lakes. Oct. 31.

„ 23,831. Imray (Farbwerke, Höchst). Manufacture of a red azo-dyestuff and of a material therefor. Oct. 31.

[C.S.] 25,780 (1901). Ransford (Cassella and Co.). Dyestuffs. Nov. 5.

„ 25,781 (1901). Ransford (Cassella and Co.). Manufacture of dyestuffs. Nov. 5.

„ 26,060 (1901). Imray (Farbwerke, Hochst). Manufacture of indoxyl from methylanthranilic acid or certain derivatives thereof. Nov. 5.

„ 26,147 (1901). Ransford (Cassella and Co.). Manufacture of dyestuffs. Nov. 5.

„ 26,465 (1901). Lake (Chem. Works, formerly Sandoz). Manufacture of black sulphur-dyes for cotton. Oct. 29.

„ 26,520 (1901). Read Holliday and Sons, Ltd., Turner, Turner, and Dean. Production of intermediate products, and colouring matters therefrom. Oct. 29.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[C.S.] 21,830 (1901). Lister. Apparatus for the steaming or finishing of textile fabrics. Nov. 5.

„ 24,697 (1901). Ransford (Cassella and Co.). Dyeing and printing with sulphur colours. Nov. 5.

„ 7716 (1902). Cohnen. Process of and apparatus for treating textile and other materials with liquids, and subsequently drying the same. Oct. 29.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[A.] 23,393. Fritsh. Manufacture or production of paper with both its faces of the same or different colours and patterns.* Oct. 27.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 22,799. Mook, Chambers, and Chambers. Apparatus for the generation of carbonic acid gas, &c. Oct. 20.

„ 22,804. Wetter (Continentale Ges. f. Chemisches Feuerlöschwesen G. m. b. H.). Chemical fire-extinguishers. Oct. 20.

„ 22,860. Thomas and Co., Ltd., Thomas, and Lones. Mode of and means for treating pickling water. Oct. 21.

„ 23,642. Trantom. Treatment for complete purification of brine or other saline solutions. Oct. 29.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 22,766. Capper. Method of decorating ceramic-ware. Oct. 20.

„ 22,840. Dressler. Manufacture of glazed tiles, bricks, &c., and apparatus therefor. Oct. 20.

„ 22,923. Shuman and Shuman. Manufacture of glass.* Oct. 21.

„ 23,494. Laybourn. *See under* XI.

[C.S.] 18,494 (1902). Evans. Manufacture of glass mirrors. Nov. 5.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 22,805. Heise. Impregnation of wood. Oct. 20.

„ 22,898. Hollings and Hollings, jun. Refractory material. Oct. 21.

„ 22,936. Brockmann. Method and means for the reduction by heat of refractory substances. Oct. 21.

„ 22,981. Ward and Bateson. Bateson's sanitary washable stucco. Oct. 22.

„ 23,026. Myzoule. Method of stuccoing. Oct. 22.

„ 23,061. Lonsdale. Compositions for covering steam-boilers, &c. Oct. 23.

„ 23,168. Sulman. Refractory materials. Oct. 23.

„ 23,243. Sefton-Jones (Isola Werke A.-G.). Insulating material for electrical purposes, and process for manufacturing the same. Oct. 24.

„ 23,422. Nathan. Bricks for building, &c. Oct. 27.

„ 23,558. van der Ven and Dreessen. Production of artificial marble.* Oct. 28.

„ 23,559. Thompson (Enamel Steel Tile Co.). Metallic tiling.* Oct. 38.

„ 23,663. Gaspary. Manufacture of artificial stones, &c., with an outer layer or facing of coloured, &c., material.* Oct. 29.

„ 23,664. Chappell. Manufacture of tiles, slabs, &c. Oct. 29.

„ 23,665. Ingham, Laogton, and Ingham. Continuous kiln. Oct. 29.

„ 23,680. Rigby. Manufacture of concrete flags, blocks, &c. Oct. 30.

[C.S.] 18,716 (1901). Whitham. Machinery or apparatus for grinding or reducing lime, ashes, sandstone, limestone, fireclay, &c. Oct. 29.

[C.S.] 24,072 (1901). Burn. Treatment of impure clay for use in the manufacture of bricks and articles of a like nature made or manufactured from clay. Nov. 5.

„ 3402 (1902). Newton. Imitation or artificial marble, stone, &c. Nov. 5.

„ 18,123 (1902). Alker and Vinzelberg. Apparatus for impregnating roofing-pasteboard with tar, &c. Nov. 5.

„ 20,188 (1902). Kieselstein and Czermak. Manufacture of artificial stone or marble. Nov. 5.

X.—METALLURGY.

[A.] 22,812. Starkey. Brass and other metal melting-pots or crucibles. Oct. 20.

„ 22,915. Häusermann. Process of ornamenting surfaces of metal.* Oct. 21.

„ 22,958. Simpson. Method of purifying and separating metals. Oct. 21.

„ 23,042. Stevenson, jun., and Marquard. Alloy for use in the manufacture of steel, and in the production of tin-plate and sheets.* Oct. 22.

„ 23,046. Thomas and Co., Ltd., Thomas, and Lewis. Apparatus for pickling and swilling iron and steel plates and sheets to be afterwards coated with tin or other metals, &c. Oct. 22.

„ 23,068. Shanks. Furnaces for melting metals. Oct. 23.

„ 23,425. Thompson (Süddeutsche Patentmetall-Papierfabr. A.-G.). Metallic paper, which is air-, water-, and grease-proof, and process for making same.* Oct. 27.

„ 23,559. Thompson (Enamel Steel Tile Co.). *See under* IX.

„ 23,644. Just, Jenkins, and Frith. Manufacture of a metallic alloy or metal. Oct. 29.

„ 23,756. Howorth (Trollhättans Elektriska Kraftaktiebolag). Distillation of zinc or other volatile metals from materials containing the same. Oct. 30.

[C.S.] 21,017 (1901). Cranston (American Copper Mining and Extraction Co.). Method or process for obtaining copper metal from copper-bearing ores. Oct. 29.

„ 21,738 (1901). Duke. Alloys. Nov. 5.

„ 24,524 (1901). Billington, Newton, and Billington, jun. Metallic alloys. Oct. 29.

„ 24,864 (1901). Bayliss, Jones, and Bayliss, Ltd., and Howarth. Furnaces for heating short pieces of metal. Oct. 29.

„ 20,981 (1902). Cookson (Sanderson). Smelting antimony ores. Nov. 5.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 22,942. Wass. Electrical cells or batteries. Oct. 21.

„ 23,114. Niblett. Storage, &c., batteries. Oct. 23.

„ 23,389. Schauli and Loewenstein. Galvanic dry cell. Oct. 27.

„ 23,426. Garcin. Electric accumulators. Oct. 27.

„ 23,494. Laybourn. Electro-deposition of metals upon china, earthenware, &c. Oct. 28.

„ 23,619. Sandhugen and Lürgen. Secondary batteries. Oct. 29.

„ 23,754. Pearson and Fiedler. Galvanic batteries. Oct. 30.

[A.] 23,858. Johnson (A. Wolf, jun., and Co.). Thermo-electric batteries. Oct. 31.

[C.S.] 24,992 (1901). Tully. Electric primary cells or batteries. Oct. 29.

„ 11,508 (1902). Thompson (Akkumulatoren und Elektricitätswerke Akt.-Ges. vorm. W. A. Boese and Co.). Process for the preparation of electrodes for secondary batteries. Nov. 5.

XII.—FATS, OILS, AND SOAP.

[A.] 22,864. Hargreaves. *See under* XVIII. B.

„ 23,044. Baker. Oil-separators or filters. Oct. 22.

„ 23,200. Schilling and Kremer. *See under* XVIII. B.

„ 23,561. Brown. Soap-blocks or tablets. Oct. 28.

[C.S.] 21,229 (1901). Scammell and Muskett. Process for solidifying and toughening oils. Oct. 29.

„ 2124 (1902). Garson. *See under* I.

„ 5716 (1902). Dahlqvist and Holm. Separation of fatty substances from emulsions. Oct. 29.

„ 11,619 (1902). Flynn and Siegener. Machines for manufacturing linoleum. Nov. 5.

„ 12,742 (1902). Oelbermann. Process and contrivance for attaining a coloured flame with candles &c. Oct. 29.

„ 17,290 (1902). Smith. Manufacture of an improved oil chiefly designed for use as a substitute for linseed-oil. Nov. 5.

„ 18,197 (1902). Pratt. Deodorising cotton-seed meal &c., and apparatus therefor. Nov. 5.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 22,820. Newton (Scott). Wall-distemper. Oct. 2(

[C.S.] 12,450 (1902). Efrem. Production of a supple protective coating. Oct. 29.

B.—Resins, Varnishes.

[A.] 23,207. Smith and Taylor. Manufacture of varnish Oct. 24.

[C.S.] 2124 (1902). Garson. *See under* I.

C.—India-rubber, &c.

[A.] 23,550. Germain. Treatment of waste gutta-percha &c. Oct. 28.

„ 23,655. Neighbour. Waterproof material, and manufacture thereof. Oct. 29.

[C.S.] 20,081 (1902). Theilgaard. Process of devulcanising caoutchouc, india-rubber, gum-elastic, &c. Nov.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 23,210. Staines. Machinery for the manufacture leather-board, &c. Oct. 24.

„ 23,392. Schmalfeldt. Process for the production tannin from vegetable tanning materials.* Oct. 2

„ 23,896. Erfurt. Process for manufacturing size Nov. 1.

[C.S.] 25,063 (1901). Klenk. Manufacture or treatment of tanning extracts to increase their utility for tanning leather. Oct. 29.

XV.—MANURES.

[C.S.] 17,507 (1901). Lake (Cyanid-Ges. m.b.H.). Manufacture of artificial manure. Oct. 29.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 23,779. McGlashan. Manufacture of sugar.* Oct. 31.

[C.S.] 21,985 (1901). Hlavati. Process of extracting sugar from beetroot and sugar-cane juices, and other fluids containing sugar. Nov. 5.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 22,866. Hollings and Guest, Ltd., and Guest. Hops, grain, &c., drying machines. Oct. 21.

„ 23,212. Rollinson, Rollinson, and Rollinson. Malting kilns. Oct. 24.

„ 23,456. Macardle. Brewing. Oct. 27.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 22,833. Macardle. *See under* XVIII. B.

„ 23,256. Bauermeister. Manufacture of bread poor in carbohydrates. Oct. 24.

„ 23,479. Bradley. Fruit-steriliser. Oct. 28.

„ 23,523. Cook. Manufacture of bread, &c.* Oct. 28.

„ 23,603. Aikman. *See under* XX.

„ 23,770. Ekenberg. *See under* I.

„ 23,789. Bibby. Manufacture of cattle-feeding cake. Oct. 31.

[C.S.] 22,116 (1901). Brunt. Manufacture of yeast. Nov. 5.

„ 16,560 (1902). Boult (Gaff). Degerming maize or Indian corn, and apparatus therefor. Oct. 29.

„ 17,478 (1902). Klett and Potel. Preservation of organic substances. Oct. 29.

„ 17,584 (1902). Laessig. Milk-albumen preparation, and process of preparing same. Oct. 29.

„ 18,496 (1902). Geldard. Appliances for testing butter for water. Nov. 5.

B.—Sanitation; Water Purification.

[A.] 22,822. Moffat. Feed-water purifiers.* Oct. 20.

„ 22,833. Macardle. Apparatus for purifying casks, milk-churns, &c. Oct. 20.

„ 22,864. Hargreaves. Appliances for separating or extracting oil and air from steam. Oct. 21.

„ 23,200. Schilling and Kremer. Apparatus for separating oil from water.* Oct. 24.

„ 23,750. Parker. Distribution of liquids, as sewage, on filter-beds.* Oct. 30.

„ 23,763. Springborn. Utilisation of sewage, &c. Oct. 30.

„ 23,764. Springborn. *See under* I.

„ 23,805. Springborn. Utilisation of sewage, &c. Oct. 31.

[C.S.] 15,137 (1901). Gamlen. Method of or means for the prevention or removal of incrustation in steam and other boilers. Nov. 5.

[C.S.] 21,882 (1901). Scott-Moncrieff. Apparatus for distributing liquids over large areas, such as the surfaces of bacterial filter-beds. Nov. 5.

„ 23,553 (1901). Ransom and Manlove, Alliott, and Co., Ltd. Apparatus for discharging liquids over bacteria-beds, filter-beds, &c. Oct. 29.

„ 25,893 (1901). Graham. Apparatus for automatically controlling the discharge or feed of sewage or other liquid into bacteria-beds or filters, tanks, &c. Nov. 5.

C.—Disinfectants.

[A.] 22,820. Newton (Scott). *See under* XIII. C.

„ 23,460. Mills. (Soc. Anon. des Produits Chimiques Spéciaux). Solid soluble antiseptic. Oct. 27.

„ 23,681. Walker, Walker, Walker, and Freestone. Disinfecting and deodorising gullys, traps, and sewage chambers, and disinfectants and deodorants. Oct. 30.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 23,174. Lebateux. *See under* XXI.

„ 23,393. Fritsh. *See under* VI.

„ 23,425. Thompson (Süddeutsche Patentmetall-Papierfabr. A.-G.). *See under* X.

„ 23,445. Zühl. Process for the manufacture of a celluloid-like substance.* Oct. 27.

[C.S.] 26,075 (1901). Newton (Farbenfabr. vorm. F. Bayer and Co.). Manufacture and production of celluloid-like substances and their use in industry. Nov. 5.

„ 26,234 (1901). Reinicke. Knot-catchers or strainers for paper-pulp. Oct. 29.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 23,395. Scott and Hinchley. Method of and apparatus for the manufacture of acetone. Oct. 27.

„ 23,603. Aikman. Preparation of extract of maté. Oct. 29.

[C.S.] 21,874 (1901). Nikiforoff. Manufacture of aromatic hydrocarbons, and apparatus therefor. Nov. 5.

„ 24,321 (1901). Newton (Farbenfabr. vorm. F. Bayer and Co.). Manufacture or production of pharmaceutical compounds. Oct. 29.

„ 25,688 (1901). Combes. Process and apparatus for the manufacture of carbon tetrachloride. Nov. 5.

„ 25,804 (1901). Newton (Farbenfabr. vorm. F. Bayer and Co.). Manufacture or production of pharmaceutical compounds. Oct. 29.

„ 286 (1902). Wetter (Rütgers). Paracresol, oxalic acid, ester, and the separation of paracresol from metacresol. Nov. 5.

XXI.—PHOTOGRAPHY.

[A.] 23,174. Lebateux. Treated or coated papers.* Oct. 23. French Application, Nov. 28, 1901.

„ 23,250. Clarke. Development of photographic pictures.* Oct. 24.

„ 23,466. Archer. Photographic films. Oct. 28.

[A.] 23,809. Brombead (Chem. Fabr. Helfenberg Akt.-Ges., formerly Eugen Dietrich). Photographic toning and fixing sheets of absorbent material.* Oct. 31.

[C.S.] 5381 (1902). Baese. Photographic process and apparatus for the reproduction of plastic subjects. Oct. 29.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 22,895. Markl. Safety-match, &c., ignition-composition. Oct. 21.

[A.] 22,945. Wright. Match-making machines.* Oct 21.

„ 23,019. Hodgkinson. *See under* II.

„ 23,632. Czerweny. Match-making machines.* Oct. 29.

„ 23,846. Bichel. Manufacture of explosives.* Oct. 31.

[C.S.] 21,517 (1901). Frost. Machines for dipping and heading matches. Oct. 29.

„ 13,266 (1902). Underwood. Combined marine torch and rocket. Nov. 5.

„ 20,214 (1902). Denton and Preas. Smokeless powder, and method of compounding same. Nov. 5. International Application, Mar. 8, 1902.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 5839.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 22.—Vol. XXI. **NOVEMBER 29, 1902.** No. 22.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Prof. Marston T. Bogert, A.B., Ph.B.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.
Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.
F. H. Tate. | Dr. T. Lewis Bailey.

LONDON.
Walter F. Reid. | A. R. Ling.

MANCHESTER.
Ivan Levinstein. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Dr. V. Coblentz. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
T. L. Patterson. | Dr. Thos. Gray.

YORKSHIRE.
Jas. E. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Helmer.
John Heron.
D. B. Hewitt, M.D.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. A. K. Huntington.
Wm. Kellner Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Sir Wm. Ramsay, K.C.B., LL.D., F.R.S.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I.
L. Archbutt ..... I., XII.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII., XIX., XX.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
B. F. Davis ..... X., XI., XVI., XVII.
J. T. Dunn, D.Sc. ..... VII., X.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley ..... I., VIII., IX., X., XXI.
R. L. Jenks ..... XIII. C., XIV., XIX.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. ..... IV., XX.
F. H. Leeds ..... II., III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. ..... XXII.
W. G. McMillan ..... X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ..... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak ..... Patent List.
T. H. Pope ..... XVI., XX., XXI.
F. W. Renaut ..... Index.
G. H. Robertson ..... XI.
Chas. Salter ..... II., III., XVI., XVII.
M. J. Salter ..... XIII.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley ..... XII., XVIII.
E. Sonstadt ..... III., VII., X., XV.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. ..... XVI.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. G. Ellis.
W. Hodgson Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: F. H. Tate.

Vice-Chairman: C. Longuet Higgins.

Committee:

Percy Bateson.
J. Campbell Brown.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
G. Watson Gray.
Max Muspratt.
Julius Raschen.
Alf. Smetham.
H. B. Stocks.
J. W. Towers.

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Walter F. Reid.

Vice-Chairman: A. Gordon Salamon.

Committee:

Julian L. Baker.
A. C. Chapman.
E. Divers.
M. O. Forster.
Oscar Guttmann.
Otto Hehner.
H. Hemingway.
W. Kellner.
J. Lewkowitsch.
A. Gordon Salamon.
W. S. Squire.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

J. Allan.
W. Brown.
R. Clayton.
J. Craven.
W. Heys.
J. Hübner.
H. Levinstein.
W. J. Pope.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.

Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.
P. P. Bedson.
H. S. Collins.
J. T. Dunn.
T. W. Hogg.
H. Louis.
J. Mather.
John Pattinson.
W. W. Proctor.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: V. Coblentz.

Vice-Chairman: Russell W. Moore.

Committee:

L. Baekeland.
G. Drobegg.
W. F. Fuerst.
A. P. Hallock.
E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schieffelin.
R. C. Schüpphaus.
G. C. Stone.
M. Toch.
D. Woodman.
F. G. Zinsser.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.

Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

Scottish Section.

Chairman: T. L. Patterson.

Vice-Chairman: D. J. Playfair.

Committee:

W. Carrick Anderson.
E. M. Bailey.
H. Bumby.
D. B. Dott.
C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgow.

Yorkshire Section.

Chairman: Jas. E. Bedford.

Vice-Chairman: T. Fairley.

Committee:

C. S. Bedford.
E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

Notices.

SUBSCRIPTIONS FOR 1903.

Foreign and Colonial Members are reminded that the subscription of 25*s.* for 1903, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1903.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of next year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows :—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products :—
Subsection A.—Organic Preparations, including Tar Products.
Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsengesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hold their respective annual meetings for 1903 in connection with the Congress.

An executive local committee will make arrangements for the entertainment of visitors during their stay.

As formal invitations should go out, at the latest, this autumn, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

All communications and questions, so far as they cannot be answered by the various organising committees, should be addressed to the Secretary of the Congress, Dr. G. Pulvermacher, Charlottenburg, Marchstrasse No. 21. The formation of organising committees is already in progress in England, Belgium, France, Italy, Portugal, Switzerland, Servia, and Turkey.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to produce a reliable technical dictionary in three languages —English, French, and German—and has asked this Society to furnish the names of such scientific and industrial men as are willing to supply the technical expressions of their own special branches of industry. The assistance to be rendered must be gratuitous, as otherwise the expense would be prohibitive; but no money is asked for by the German Society, though it has already spent considerable sums upon the work, and has provided an editor, Dr. Hubert Jansen, of Berlin, with a staff, to collate the materials supplied.

The Council of this Society agreed to co-operate in the work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, Kohn, Messel, Redwood, and Squire, and Messrs. Bedby, Hehner, Newlands, Reid, and Watson Smith to decide upon the form of co-operation. It has been determined to select one or more representatives for each class of the Journal and Patent Literature; and the committee now asks for volunteers to undertake a class or division of a class. To those who intimate their wish to help, full particulars of the plan of the work, with instructions how to proceed, will be sent. Offers of co-operation should be addressed to the General Secretary.

NATIONAL PHYSICAL LABORATORY.

Mr. R. Forbes Carpenter, H.M. Chief Inspector under the Alkali Acts, has been nominated by the Council to represent the Society on the Board of the National Physical Laboratory in succession to Mr. George Beilby, whose term of office has expired.

DURABILITY OF LEATHER FOR BOOKBINDING.

Mr. Cyril Davenport, of the British Museum, will read a paper before the Library Association, at 20, Hanover Square, W., on Thursday, December 18th next, at 8 p.m. This paper will open up the whole question of library binding, and especially the quality and durability of leathers. Members of this Society interested in the subject of leather are invited to attend and take part in the discussion.

List of Members Elected

24th NOVEMBER 1902.

Acker, Chas. E., Acker Process Co., Niagara Falls, N.Y., U.S.A., Manufacturer.

Barnett, Marcus S., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Sugar Works Chemist.

Behrend, Dr. Otto F., Hammermill Paper Co., Erie, Pa., U.S.A., Vice-President.

Bek, Lars P., Colonial Sugar Refining Co., Ltd., Pyrmont Refinery, Sydney, N.S.W., Analytical Chemist.

Brownrigg, Marcus P., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Analytical Chemist.

Buchanan, Duncan G., 500, Church Street, Toronto, Canada, Chemist.

Burk, W. E., Male High School, Louisville, Ky., U.S.A., Chemist and Teacher.

Calm, Chas. E., 190, Michigan Street, Chicago, Ill., U.S.A., Manufacturing Chemist.

Campbell, Ashley, Colonial Sugar Refining Co., Ltd., Pyrmont Refinery, Sydney, N.S.W., Analytical Chemist.

Cook, Chas. N., Silver Spring Bleaching and Dyeing Co., Providence, R.I., U.S.A., President.

Crane, Jasper E., Arlington Co., Arlington, N.J., U.S.A., Chemist.

Crowell, Henry H., Delewanna, N.J., U.S.A., Dyer.
Danziger, Jos. L., Columbia University, New York City, U.S.A., Analytical Chemist.
Drake, Bryant S., Peyton Chemical Co., Martinez, Cal., U.S.A., Chemist.
Duckworth, Wm. H., Fairlawn, Northenden Road, Sale, Cheshire, Manufacturing Chemist.
Edwards, H. Leaton, 19, Park Road, Port Sunlight, Cheshire, Analyst.
Fairweather, Wall. C., 62, St. Vincent Street, Glasgow, Engineer.
Fries, Jno. W., Winston, Salem, N.C., U.S.A., Cotton Manufacturer.
George, Wm. K., 80, Glen Road, Toronto, Canada, Manufacturer.
Günther, Wm. J. W., Colonial Sugar Refining Co, Ltd., O'Connell Street, Sydney, N.S.W., Inspector.
Heike, Rudolph E., American Sugar Refining Co., P.O. Box L, Jersey City, N.J., U.S.A., Chemist.
Holliday, Lionel B., Lunnclough Hall, Huddersfield, Chemical Manufacturer.
Johnson, Chas. M., 701, Orchard Street, Avalon, Allegheny Co., Pa., U.S.A., Chemist.
Jones, Edgar S., Sulphide Corporation, Ltd., Cockle Creek, N.S.W., Metallurgical Chemist.
Klipstein, Ernest C., 116, Prospect Street, East Orange, N.J., U.S.A., Chemical Manufacturer.
Kohnstamm, Lothair S., 133, East 71st Street, New York City, U.S.A., Chemist.
Kottmann, Dr. Gustav, Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Analytical Chemist.
Lyle, Robert F., Berry Yards Sugar Refinery, Greenock, N.B., Analytical Chemist.
Möckel, Heinrich A., c/o D. M. Base and Co., Roaring Springs, Pa., U.S.A., Chemist and Engineer.
Mooney, Luke, 36, West 52nd Street, Bayonne, N.J., U.S.A.
Morison, Jas., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Analytical Chemist.
Oglesby, Wm. R., Wabash Portland Cement Co., Strob, La Grange Co., Ind., U.S.A., Chemist.
Paquin, Felix, Memphis, Tenn., U.S.A., Chemist.
Schwarz, Gustav A., 63, Wall Street, New York City, U.S.A., Manager (Grasselli Chemical Co.).
Segaert, Edw., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Analytical Chemist.
Shepard, Chas. H., Chemical Laboratory, Union Iron Works, San Francisco, Cal., U.S.A., Chemist.
Smith, Jno., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W.
Smoot, Albert M., 1263, Waverly Place, Elizabeth, N.J., U.S.A., Analytical Chemist.
Sylow, Paul L. P. G., Korsör, Alexandra Street, Drummoyne, Sydney, N.S.W., Analytical Chemist.
Taylor, Arthur P., 460, Jarvis Street, Toronto, Canada, Manufacturer.
Taylor, Edw. R., Penn Yan, N.Y., U.S.A., Manufacturing Chemist.
Taylor, Tom, jun., Durant, Taylor, and Co., 68, Major Street, Manchester, Chemical Merchant.
Test, Wm. H., 116, Brown Street, Lafayette, Ind., U.S.A., Assistant Professor of Chemistry.
Thomas, Nehemiah M., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W.
Thurlow, Nathaniel, Ampère Electro-Chemical Co., Niagara Falls, N.Y., U.S.A., Chemist.
Vorisek, Dr. Anton, College of Pharmacy, 115-119, West 68th Street, New York City, U.S.A., Instructor.
Walton, Thos. U., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Analytical Chemist.
Wilder, Salmon W., jun., Merrimac Chemical Co., 77, Broad Street, Boston, Mass., U.S.A., Treasurer.
Wiley, Harvey W., Bureau of Chemistry, Department of Agriculture, Washington, D.C., U.S.A., Chief of Bureau of Chemistry.
Wilson, Jno. B., Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Mining Engineer.
Youtz, Dr. Lewis A., Lawrence University, Appleton, Wis., U.S.A., Professor of Chemistry.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Auchterlonie, Wm., l/o Paisley; c/o Clark Thread Co., Newark, N.J., U.S.A., Dyeworks Manager.
Dains, H. H., l/o Leeds; c/o P. Macfadyen and Co., Winchester House, London, E.C.
Darby, Jno. H., l/o Pen-y-Garth; Brymbo Hall, near Wrexham, North Wales.
Dickson, Jno., l/o Glasgow; Baldernock, near Glasgow.
Domeier, A., l/o Sydenham; c/o David Thom, Domeier, and Co., Ltd., 13, St. Mary-at-Hill, London, E.C.
Duncan, Jas., l/o Mincing Lane; 52, Shakespeare Street, Hove, Sussex; and (Journals) Hôtel Bristol, San Remo, Italy.
Ede, H. E., l/o Sheffield; (Journals) c/o C. A. Gibbes, English Club, Iquique, Chile; and (subscriptions) c/o Copaquire Copper Sulphate Co., 101, Leadenhall Street, London, E.C.
Fnerst, Dr. Alex. W., l/o London; retain Journals.
Haigh, P., l/o Longford; Edge View, Alderley Edge, Cheshire.
Jones, G. Cecil, l/o Bristol; Wisteria Cottage, Manningtree, Essex.
Mackenzie, T. E., l/o Cardonald; retain Journals.
Moriarty, Jno. J., l/o Queen Street West; 5, D'Arcy Street, Toronto, Canada.
Napier, J. W., l/o Carnoustie; Gas Works, Alloa, N.B.
Perkios, T. S., l/o Betteravia; retain Journals.
Pringsheim, Dr. H. H., l/o Harrison Avenue; c/o Solvay Process Co., Syracuse, N.Y., U.S.A.
Ratcliff, Frank D., l/o Birmingham; The Cottage, Green Hill, Bromsgrove.
Rees, Harald B., l/o Asheville; c/o Harris-Rees Tunning Co., Sylva, N.C., U.S.A.
Ridding, Howard C., l/o Stoke-on-Trent; Redruth School of Mines, Cornwall, Principal.
Robertson, And. J., l/o Williamsburg Avenue; 2914, East Main Street, Richmond, Va., U.S.A.
Russell, Wm., l/o Denver; 33, Bellevue Crescent, Ayr, N.B.
Taber, G. H., l/o Girard Avenue; 1840, South Broad Street, Philadelphia, Pa., U.S.A.
Watson, Jno., l/o Zululand; Box 250, Johannesburg, Transvaal, South Africa.

CHANGE OF ADDRESS REQUIRED.

Naef, Dr. E., l/o 9, Market Street, Blackley, Manchester.

Deaths.

Aikman, Dr. C. M., of Glasgow, at Edinburgh, Nov. 14.
Martin, T. Tremills, 44, Stapleton Hall Road, Stroud Green, London, N.

Liverpool Section.

Meeting held on Wednesday, October 29th, 1902.

CHAIRMAN'S ADDRESS.

TECHNICAL TEACHING IN LANCASHIRE.

BY FRANK TATE.

In seeking a subject for an address, it occurred to me that it might not be altogether out of place to bring before you some of the efforts that have been made in recent years in

Lancashire to provide schools for the study of science and technology, especially chemistry, and the allied subjects, which in teaching staff, organisation, buildings and equipment, are more worthy of a country of great industries than those it possessed in the past.

Recently, in public addresses, reports of committees, and in other utterances, England, with her deficient educational system, her inability to teach or appreciate science and technology, has been held up to our pitying gaze, and comparisons with more fortunate countries have been drawn, which, whilst intended to excite emulation, not infrequently have produced feelings of depression.

Whilst in no way depreciating the necessity and usefulness of such utterances, I think that we are entitled sometimes to look upon the other side of the picture, and see if England is doing anything to remedy these educational ills, and if the efforts being made are of such a character as to bids us hope that we are distinctly advancing, although still perhaps very far behind.

In no part of England has the necessity for improvement been more fully realised than in our own county of Lancashire, and if you look into the past you will find that Lancashire has been always to the front in providing, as best it could, some educational opportunities outside its ordinary schools.

If you inquire, in Lancashire towns, as to the history of science teaching, you will again and again be told that what has been done originated with the mechanics' institutes working in connection with the South Kensington Science and Art Department and the City and Guilds of London Institute. In some towns, science schools and classes were managed by local committees, which frequently meant the local secretary in consultation with the teachers.

Public funds, beyond the grants on results of examination, were not available, and money had to be raised by subscription and in other private ways, and, considering all things, it was, generally speaking, most handsomely provided.

Some of us have grateful memories of those old science classes; the badly-lighted, badly-ventilated, badly-furnished class-rooms; the poorly-equipped lecture tables; apparatus, in many cases, most crude and homely; laboratories, if they existed at all, so small, so incompletely fitted, that we wonder to-day how any work could possibly have been done in them; and yet we remember that those were the days of ready subscribers, enthusiastic and self-denying teachers, ardent students, and not bad results. I speak of 10, 20, or 25 years ago, but I think I am right in saying that more than one or two are present to-night who owe (and are proud to confess it) very much to the humble efforts of those bygone science classes.

It must not be supposed, from what I have said, that there were not a few well-equipped science schools. As we judged of things then, some model lecture rooms and laboratories were to be found, but, measured by the standards of to-day, even these would be considered poor indeed.

Because I say little to-night of the two great Victoria University Colleges in Manchester and Liverpool, I am not forgetful of them as factors of the very highest importance in technical teaching. I need hardly tell you here that both colleges have such splendid records of work done in their chemical and engineering and other departments as to require no words of mine to recall them, and they have given and are giving to the universities and schools throughout the land professors and teachers at a time when the supply of men of the highest character and attainments are needed. And not only as teachers are the old students known. Some of our best chemists and leaders in chemical industries have come from the two colleges. Had I time I should very much like to have attempted some description of the colleges, but I have found that an impossibility, and have had to devote myself entirely to the more recent developments in the technical schools of our county.

When I decided on gathering some information as to the teaching of technology in Lancashire to-day, I entered upon the work with a light heart, which has daily become heavier, as I realised how very impossible it was to do anything but scantiest justice to such a theme.

I recently sent out letters to directors and secretaries of technical schools, asking for certain information, and in nearly every instance I received a reply, with reports and prospectuses, and in several instances excellent photographs. Many of these letters are of great interest, and I wish it were in my power to put before you to-night even a considerable fraction of the mass of material I have accumulated through the courtesy of the gentlemen to whom I wrote, but nearly everywhere it appears that science classes, such as I have referred to, have sprung from a mechanics institute or some such institution, have worked on for some years, and, in many cases, they have gradually developed into a more highly organised technical school. Then came the passage of the Acts of 1889–90, which put at the disposal of the county and county borough authorities large sums of money, which have been largely used to place technical teaching in an entirely different position to that which it held before.

At once highly qualified directors and organisers of technical instruction were appointed in nearly every borough, and the county council appointed a director of education, with his headquarters at Preston, whose duties lie more especially with the 20 non-county boroughs, the 99 urban districts, and the 25 rural electoral divisions: so that, at the present time, there is scarcely a spot in the county, however obscure, that is not prepared to offer instruction in some subject at a merely nominal fee.

I do not propose this evening to weary you with statistics, not because I have none, for I can assure you I have collected such a mass that I have abandoned any attempt to tabulate them in such a form as would be tolerable to you. Nor do I wish to criticise some of the well-meant, though at times ill-judged, efforts which we meet with in some of the rural districts. These will bear some good fruit sooner or later, and they always provide work for idle hands to do.

I wish more particularly to call your attention to the really splendid advances which have been made in our large cities and towns in providing schools and equipments, and to take a few of these as illustrations of what Lancashire has done and is doing for the promotion of technical teaching; and I think I shall be able to show you that our schools are equal to anything in this country, and in a few instances, at least, rival some of the greatest schools of Europe and America.

Amongst these I would mention the Harris Institute, Preston, the schools of the county boroughs of Liverpool, Manchester, Salford, Bolton, Bury, Rochdale, Oldham, Blackburn, Burnley, Bootle, Wigan, and the towns of Darwen, Lancaster, and Widnes.

In the boroughs and towns I have mentioned, the question of technical education has received very careful consideration, and in some notable cases representatives or local committees have visited and studied the best schools of England and the Continent, and produced reports of the greatest value, not only to their own municipalities, but to others as well. An excellent example of this is the Report of the sub-committee appointed by the Technical Instruction Committee of Bolton in 1900. This sub-committee visited some 40 of the English and Continental schools, including 25 schools in Germany, France, and Switzerland. The Report, which is beautifully printed and illustrated, runs to over 200 pages, and is well worth possessing by anyone interested in education.

The outcome of such investigations by the various authorities has been the expenditure of vast sums of money on new schools, or extension and improvement of old ones. I may here refer to a few figures of this expenditure.

		£
Liverpool Central Technical School and addition to museum	about	130,000
Of which the cost of the Central Technical School was	„	70,000
Walton School.....	„	10,000
Wavertree „	„	6,000

The domestic and art schools and several other branches are not included in the above.

		£
Bootle (adjoining Liverpool)	about	25,000
Birkenhead (on the Cheshire side of the river)	„	12,000
Wallasey (on the Cheshire side of the river)	„	5,000
Manchester (new school)	„	300,000
Salford (adjoining Manchester)	„	90,000 to 100,000
Bolton (new school being erected)	„	75,000
St. Helen's (Sir David Gamble Institute) buildings	„	24,000
St. Helen's (Sir David Gamble Institute) land	„	6,000
Horwich (engineering headquarters of the Lancashire and Yorkshire Railway)	„	24,000
Bury	„	22,000
Widnes	„	14,500

In several instances private munificence has come to the aid of municipal efforts, and the Liverpool section feel peculiar pride in the great work of one of its members, Sir David Gamble, at St. Helen's.

These are, of course, only a few of the Lancashire towns where large sums of money have been spent on technical schools. The schools are very fine buildings, some of them palaces, containing large well-fitted lecture rooms for different departments, chemical, physical, and other laboratories, workshops for handicrafts, and several of the more important have model factories furnished with complete sets of machinery and plant on an actual manufacturing scale for the study of the leading industries of the districts. Such schools are those of Manchester, Liverpool, Salford, Oldham, Bolton, Wigan.

Liverpool.—This school was opened about a year ago by the Duke of Devonshire, the uppermost portion of the building being designed for an extension of the museum which adjoins. The site comprises 2,000 sq. yds. The technical school occupies three floors, and contains offices, lecture and examination hall (capable of seating 500 persons), machine-drawing room, physics lecture-room, navigation and nautical department, lecture rooms for building construction, mathematics, &c.

The basement floor contains large and splendidly fitted workshops and laboratories for mechanical engineering, electrical engineering, physical laboratories, workshops for plumbing, metal-plate work, lithography, bookbinding, house painting, typography, carpentry, brickwork, masonry, &c.

On the highest floor of the school is the very spacious, well designed, elaborately equipped, beautifully lighted and ventilated chemical laboratory, with bench space for 50 students, and the chemical lecture room and balance and preparation room all close at hand.

St. Helen's.—The Sir David Gamble Institute at St. Helen's is four storeys high, and stands on 1,500 sq. yds. of land. It consists of a basement, ground floors, first and second floors. The basement and first and second floors are used for technical teaching and the ground floor as a library and reading room. Besides several class rooms the technical departments include a metallurgical laboratory, engineering workshop, plumbing shop, manual instruction and wood-working shop, physical lecture room and laboratory, drawing office, and cookery and laundry rooms. The chemical department includes a lecture room with accommodation for 90 students, a chemical laboratory (68 ft. by 32 ft.) for 60 workers, a combustion room and balance rooms.

Salford.—The Royal Technical Institute, Salford, was opened in 1896. The total cost of the building was 61,000*l.*, and the furnishing and equipment cost over 20,000*l.*, making a total of 81,000*l.* in the first instance, which has been very largely added to since. The building is situated in the open space of Peel Park. It is about 311 ft. in length and the greatest height over 100 ft. The chief features of the interior are the great hall with organ, and accommodation for nearly 700 people. The institute itself provides accommodation for 2,500 students. Its chief departments are those of physics, electrical engineering, mechanical engineering, chemistry, dyeing and calico-printing, building trades, spinning and weaving, art department, domestic department. The chemistry department consists of a large lecture theatre, a large laboratory with accommodation for 80 students, and another laboratory for advanced and research work, a balance room, and a gas-analysis room. The dyeing and calico-printing department, so closely allied to chemistry, consists of a lecture theatre, large experimental dye-house, calico-printing laboratory, &c. The dye-house will accommodate 30 students. Under the dye-house is the calico-printing laboratory with the latest-designed machinery electrically driven.

Manchester.—Magnificient as is the Salford School, the new school at Manchester, opened recently by Mr. Balfour, is still more so.

It is fully described in the address given by Mr. Levinstein as chairman of the Manchester Section (this Journal, 1377).

It has been a great pleasure to me recently to visit a few of the schools, and I would like here to record my gratitude to those gentlemen who have sacrificed much time and patience in taking me through them. I have visited the schools at Liverpool, Bootle, Bolton, Manchester, and Salford, and I would say to those of you who have not yet seen such schools, especially the larger ones, visit them by all means, and satisfy yourselves as to what has been done and what is being done, and many of you will be very greatly and pleasantly surprised, and encouraged to hope that Lancashire, at any rate, is awakening to the importance of technical teaching.

Reverting to the schools and the subjects taught, and the methods of teaching adopted, these of course vary very considerably according to local needs. Most of the schools, however, have adopted well thought out courses of instruction, and in some schools, there are day courses as well as evening courses, in others the work is in the evening only.

To take one or two instances: Liverpool, as well as many of the larger towns, has not only its central school, but many branch schools, and it is prepared to deal with systematic courses of study, in each case extending over four years, for (1) building trade students, (2) engineering students, (3) metal-plate trade students, (4) printing and bookbinding students, and a course to assist such trades as tailors, millers, watch and clock makers, &c. And besides these there are several preparatory courses, these being more generally arranged for at the branch schools. In looking through the prospectus, one point struck me as unfortunate, and that was, that almost without exception, the classes were evening classes, and courses for day students were almost absent. No doubt this apparent defect will be remedied before long. Probably there are some peculiar local difficulties to overcome, but in many of the schools in other parts of the county, day courses are carried on with a good attendance and very satisfactory results, notably at Manchester, Salford, and Bolton.

Time will not permit me to go into the details of other syllabuses, but I would like to mention that at Manchester, for instance, a preparatory course for day students is arranged for those not less than fifteen years of age, who are able to pass the entrance examination, and the subjects of the course include English, German, mathematics, science, geometrical, freehand and model drawing, and manual training. After this course, which covers at least one year, the student in chemistry may take up (1) general technical chemistry, (2) dyeing, (3) paper-manufacture, (4) brewing, (5) metallurgy. Each of these courses extends over three years.

It is interesting to note the fees. The fees for each course, chemical, engineering, &c., are fifteen guineas for each complete session.

It is also interesting to note the following special courses, chiefly in the evenings, of interest to chemists. Technical gas analysis, chemical engineering, chemistry for engineers, chemistry for builders, photography for engineers, microscopic research.

Amongst the subjects taught in connection with the City and Guilds of London Institute are brewing, coal-tar products, oils and fats, gas-manufacture, iron and steel manufacture, paper-manufacture, bleaching and dyeing, &c. Salford has also excellently arranged day and evening courses on similar lines to those of Manchester, and several

of the other large schools in the manufacturing districts are offering very great facilities to the young student.

Now it will be very reasonably asked, with all this expenditure, with all these facilities for students, what are the results? On the whole, I gather from the reports and from letters I have received, the results are good, in some instances very good. But are they as satisfactory as they might be? As far as I can see, I think all are agreed that they are not, and if it were not for that "statesmanlike confidence in the future" which a Manchester paper spoke of recently, one would be tempted to say that perhaps money and efforts had been somewhat wasted. But these efforts are for to-morrow as well as to-day, and the fact that the efforts have been made and are receiving approval in the highest quarters, marks a great advance. Manchester has added one more to her educational triumphs, inasmuch as she has produced what a few years ago would have been a remarkable phenomenon—a Prime Minister who thinks the opening of a technical school sufficiently important to claim his attention.

Some of the difficulties that stand in the way are the need of secondary education, the need of co-ordination in education, the apathy of parents and students, and the even more serious apathy of many employers. Everyone has heard and read very much on the question of the needs of secondary education, the necessity is everywhere recognised, and the long-waited-for impatiently expected.

As to co-ordination, Mr. Balfour said the other day, "Our education is and must be an organic whole, and it is perfectly vain to spend vast sums on buildings and equipments, unless the students who come to this place come adequately prepared." A scheme is needed that can make the most of the elementary school, the secondary school, the technical school, and the university. There must be no competition. With such a scheme, workable in other countries, the efforts that have been made will bear fruit. For the quick coming of such a boon we all pray, but meanwhile sectarians of many creeds, and politicians of many colours, are busy grinding their own axes and block the way.

As to the apathy of parents, it is only too evident. Although the schools have large attendances, yet if we compare these with the populations in which the schools are situated, and what the attendance should be if parents realised what they owed to their children, and what astounding opportunities were at their doors which they could grasp for a most trifling expenditure, they are ridiculously small. Thousands who can afford to do otherwise, take their children from school and send them to work as half-timers, or very junior full-timers, and so rob them of the golden opportunities that cannot be appreciated without the necessary elementary knowledge.

Employers, too, might do much more to encourage the schools in many ways than they do. I am aware that in a great many cases employees are encouraged by part payment of fees and other ways to attend and be successful students. Some employers give a preference, and let it be known, to boys who have passed through a technical course in a school, and many secretaries have been able to refer to these matters with satisfaction, but nearly all say and feel that manufacturers and employers could, if they fully realised all it meant, do much more than they do at present.

I have been very much struck by some portions of the Report of the City and Guilds of London Institute for 1900 (the Report for last year is not yet issued). As you are all aware, this institute carries out examinations in various technical subjects every spring, and it is necessary for every student, if he is to be successful, to hold certificates of certain science subjects, allied to his technical subject. It has always seemed to me to be a most excellent scheme for the encouragement of workers in factories, who have sufficient general education, and there should be very many nowadays, to get a really good insight into their daily work. It should be the very thing for employers to encourage in every possible way.

What do we find? In the whole of England and Wales in 70 subjects, 31,227 students attended classes, 13,426 students were examined, 7,499 passed. Let us look a some of the subjects bearing on chemical industry:—

Salt manufacture, no candidates.
Alkali manufacture, 21 candidates, of whom 38·1 per cent. fail.
Soap manufacture, 3 candidates, of whom one sits for honours and fails, and the other two take second classes in the ordinary.
Brewing, 49 candidates.
Coal tar products, 20 candidates.
Sugar manufacture, no candidates.
Oils and fats, including candles, 11 candidates.
Gas manufacture, 184 candidates.
Iron and steel, 131 candidates.
Tanning, 24 candidates.
Paper, 70 candidates.

The subjects which do best are cotton spinning and weaving, with 1,031 and 1,106 candidates respectively, and for these some of the splendidly-furnished schools I have described to-night have to be thanked.

But some of these results are deplorable indeed, and, to me, quite unaccountable.

Schools, schemes of examination, scholarships, prizes, are all prepared, but the student lingers.

Is it not our duty as individuals, and as members of this Society, to see how far we can alter this state of things? Can we not, in season and out of season, preach the gospel of technology?

London Section.

Meeting held on Monday, November 3rd, 1902.

MR. WALTER F. REID IN THE CHAIR.

The Chairman, in opening the proceedings of the session, thanked the members for placing him in the position which he had the honour to occupy, and announced that the committee had elected Mr. A. Gordon Salamon as vice-chairman.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The Chairman also called the attention of members to the fact that the International Congress of Applied Chemistry would meet in Berlin next Whitsuntide. On two former occasions the Society had been represented at the Congress, but though the quality of the representation had been excellent the quantity was rather deficient, and the Council would therefore be glad if those who might be able to attend would send their names to the General Secretary. He hoped everybody who could would go, and, if possible, read a paper. The question of language would be no obstacle, because most of their German colleagues understood English, and papers might be read in either German, French, or English. There was a committee there, and he was quite certain that everyone who went would be most cordially welcomed. From personal experience he could assure them that Berlin was a city well worth visiting.

EXPERIMENTS ON THE CHEMICAL BEHAVIOUR OF GUTTA-PERCHA.

BY SIR WILLIAM RAMSAY, K.C.B., F.R.S., MISS HARRIETTE CHICK, B.Sc., AND FRANK COLLINGRIDGE, B.Sc., F.I.C.

We feel that we owe the Society an excuse for bringing before it an account of experiments which have no claim to be regarded as anything but preliminary. Nevertheless,

they have occupied a long time in the making. The fact is that the subject is a very difficult one; and we think that we may claim to have shown, at least to some extent, the manner in which the problem of the determination of the constitution of gutta-percha is to be attacked. The gums and resins, of which gutta percha may be taken as an example, are among the last of the great groups of natural products of which the constitution still remains obscure; the sugars, the uric acid products, the natural alkaloids, and recently the starches and albumens, have been, one after another, more or less elucidated; and it is now time that, both for scientific and commercial reasons, bodies belonging to the class of gutta-percha and india-rubber should be brought under the domain of structural chemistry.

Gutta-percha has been known in England since 1843. Its existence was indicated by Mr. William Montgomerie, at that time Assistant Surgeon to the Residency of Singapore, in 1832; and to him, and to Sir Jose D'Almeida, its introduction into England is due. Since 1844 it has been an article of commerce. But our knowledge of the chemistry of gutta-percha has not kept pace with its industrial applications. It has been investigated by Payen (Comptes Rend., **35**, 100), by Oudemans (Rep. Chim. Appl., **1**, 455), by Greville Williams (J. Chem. Soc., **15**, 124), and in part by A. W. Hofmann (*ibid.*, **13**, 87), by Berthelot (Bull. Soc. Chim., **11**, 33), and by W. A. Miller (J. Chem Soc., **3**, [2], 273). It will be of service to give here a brief sketch of these researches.

Payen, who first investigated gutta, believed that he had separated the crude natural product into three portions, one free from oxygen, to which he reserved the name "gutta"; another portion was crystalline, though resinous, and to it he gave the name "albane"; a third non-crystalline portion was termed "fluavile." To isolate these portions the crude gutta was dissolved in carbon disulphide, and the filtered solution left to evaporate in the air. The plates of purified material, after being dried, were treated with cold alcohol, to dissolve the fluavile, and afterwards with boiling alcohol, in which the albane is soluble. The pure gutta remained undissolved.

Fluavile is a yellowish resin, semi-transparent, somewhat heavier than water, hard and brittle. It softens about 53° (at 42°, according to Oudemans), and is completely liquid at 100° to 110°; at a higher temperature it decomposes into resins. It dissolves in cold alcohol, ether, benzene, turpentine, carbon disulphide, and chloroform. Its composition, according to Oudemans, is:—

——	I.	II.	$C_{20}H_{32}O$.
Carbon	83·36	83·52	83·33
Hydrogen	11·17	11·42	11·11
Oxygen	5·47	5·06	5·55
	100·00	100·00	99·99

Albane is a white crystalline resin, heavier than water, melting at 160° (140°, according to Oudemans), unattacked by hydrochloric acid, soluble in benzene, turpentine, carbon disulphide, chloroform, and boiling alcohol; whilst cold alcohol dissolves 5·1 parts per 100 of albane, boiling alcohol dissolves 54 parts. It crystallises from these solvents on cooling. Oudemans' analysis of albane is as follows:—

——	I.	II.	$C_{20}H_{32}O_2$.
Carbon	78·87	78·95	78·94
Hydrogen	10·58	10·31	10·52
Oxygen	19·55	10·74	10·52
	100·00	100·00	99·98

When dried at 130° it gives figures corresponding to the formula $C_{20}H_{30}O$.

Oudemans gives the formula of pure gutta as C_5H_8, or rather $C_{20}H_{32}$; his conclusion is deduced from the following analyses.

——	I.	II.	III.	C_5H_8.	$C_{20}H_{32}$.
Carbon	87·64	88·10	88·29	88·23	88·32
Hydrogen ...	11·79	11·77	12·00	11·76	11·68
	99·43	99·87	100·29	99·99	100·00

When heated to 280° with concentrated hydriodic acid, Berthelot found gutta to yield a hydrocarbon of the paraffin series, boiling at a very high temperature. Miller, from his analyses, concluded that the formula of gutta was $C_{20}H_{30}$.

In 1895, O. Oesterle (Arch. der Pharm., **230**, 641) published some results obtained with crude gutta. After purifying it from albane and fluavile by extraction with boiling alcohol, he dissolved the residue in chloroform, and mixed the solution with alcohol; gutta was precipitated, along with a stringy substance, to which he gave the name "guttan"; he states that it is unstable, for on dissolving it repeatedly in chloroform, and precipitating with alcohol, it is gradually converted into gutta. This is curious, for he found guttan to contain oxygen, and the process of convertion into gutta is not one which can be imagined to reduce it. Albane, to which Oesterle gives the formula $C_{20}H_{64}O_2$, melts, according to him, at 165°. When heated in a sealed tube for 24 hours with alcoholic potash to 150°, it yields a hydrocarbon "albene," to which he does not ascribe a formula. He found fluavile to be a brittle amorphous resin, melting at 82° to 85°.

The products of distillation of gutta, according to Greville Williams, are isoprene, C_5H_8, caoutchene, $C_{10}H_{16}$, and a less volatile hydrocarbon.

Experimental.—It was thought advisable to repeat the work of Oudemans, which led him to ascribe the formula $C_{10}H_{16}$ to gutta. For this purpose, we procured a piece of the best commercial gutta; and in order to purify it from the accompanying resins, the following procedure was adopted. It was first dissolved in toluene, and the solution was allowed to settle; it was then carefully decanted from the residue, and the gutta finally precipitated by adding acetone. The resin albane and fluavile are completely soluble in acetone and toluene.

This treatment was repeated five times; even then the gutta was brownish in colour, and left some ash on ignition. The inorganic impurities were removed by dissolving the gutta in dry chloroform, and filtering the solution into absolute alcohol; the gutta then came down as a snow-white mass. This was well washed, dried, and analysed; 0·1687 grm. yielded 0·5414 grm. of CO_2, and 0·1768 grm. of H_2O.

Composition.	Found.	Calculated for	
		$C_{10}H_{16}$.	$C_{20}H_{32}$.
Carbon	88·31	88·22	88·32
Hydrogen	11·75	11·77	11·68
	100·06	99·99	100·00

It should be mentioned that it is a well-known fact that gutta is easily attacked by oxygen; in the precipitated form it was found to oxidise with extreme readiness, and it was a very difficult task to prepare a pure sample without oxidation taking place. The sample, the analysis of which is given above, was prepared only after a number of unsuccessful attempts.

Concerning the actual formula of gutta, nothing can be said; its percentage composition has always been taken to correspond with the formula C_5H_8; but as will afterwards be seen, its oxidation-product, albane, undoubtedly contains 34 atoms of carbon; and it will be noticed that Oudemans' analyses, as well as the analysis given above, correspond as well with the more complex, as with the simpler, formula. Attempts were made to determine the molecular weight by the cryoscopic and boiling-point methods in benzene solution; but we were unable to detect

any change in the freezing-point or the boiling-point of the solvent. Probably like caoutchouc, gutta has a very high molecular weight; and indeed the derivatives which will afterwards be described turn out, almost without exception, to have complicated formulæ.

Distillation.—The dry distillation of gutta, even under reduced pressure, sheds little light on its constitution. According to Greville Williams, caoutchouc and gutta yield the same product on distillation; and Ispatiew and Wittorf (J. prakt. Chem., 1897, **55**) have shown that caoutchouc on distillation yields an isoprene boiling at 33° to 38°, which, when acted on with hydrobromic acid, forms a bromide, $C_5H_{10}Br_2$, boiling at 74°—75° at 16 mm. pressure. To confirm this, gutta was distilled from a glass retort in portions of 200 to 250 grms. at a time; the receiver was surrounded with a freezing-mixture of ice and hydrochloric acid. The distillate consisted of an oil, of which the portion boiling below 100° was fractionated by aid of a Young's fractionating tower. Distillation began at 34°, and the larger portion (24·7 grms.) boiled between 34° and 38°. The addition product with hydrobromic acid was prepared by adding to 10 grms. of this isoprene an excess of a 29 per cent. solution of the acid, the whole being kept cool with water; the product was poured on to ice; the dark oil which separated was washed with a solution of sodium carbonate, and then with water; it was extracted with ether, and the ethereal solution, after being dried with calcium chloride, was distilled. The residue, after the ether had been removed, distilled between 95° and 104° under 37 mm. pressure; the distillate consisted of a colourless oil. On redistillation under 10 mm. pressure, the boiling-point was 66°—67°, and the amount, 7·5 grms. Of this substance, 0·2476 grm. gave 0·4061 grm. of silver bromide, equal to 68·7 per cent. of bromine; the formula $C_5H_{10}Br_2$ requires 69·6 per cent.

Having thus confirmed the results obtained by Greville Williams, an attempt was made to isolate the higher boiling-products of the dry distillation of gutta. The result, however, was unsatisfactory; the mixture of hydrocarbons obtained by distilling gutta under very low pressure always contained oxygen (1 to 5 per cent.). But we had some evidence of a product of the formula $C_{10}H_{16}$ boiling under atmospheric pressure at 170°, and of another, which might possess the formula $C_{30}H_{48}$, boiling at 280°—300° under a pressure of 13 mm.

Action of Bromine on Gutta.—Some gutta, freed from resins by successive precipitations from chloroform by addition of alcohol, was dissolved in chloroform. A strong solution of bromine in chloroform was added, and the mixture was boiled for eight hours. During the reaction, hydrobromic acid was given off. On addition of alcohol to the chloroform solution, a white powder was precipitated. This was again dissolved in chloroform, and again precipitated with alcohol. The precipitate was boiled with dry alcohol for three hours, filtered, washed with alcohol, and dried at 90°. The white amorphous powder gave the following result on analysis:—

0·4380 grm. gave 0·7305 grm. of silver bromide.

0·2013 grm. gave 0·1955 grm. of carbon dioxide and 0·0593 grm. of water.

0·1827 grm. gave 0·1752 grm. of carbon dioxide and 0·0522 grm. of water.

	Found.		Calculated for	
	I.	II.	$C_{10}H_{16}Br_4$.	$C_{17}H_{27}Br_7$.
Carbon	26·51	26·15	26·4	25·85
Hydrogen.....	3·27	3·18	3·1	3·17
Bromine.....	70·96	70·96	70·5	70·98
	100·74	100·29	100·00	100·00

Either of the above formulæ will express the composition of the compound. It is soluble in benzene, toluene, and chloroform, but insoluble in alcohol and in water. When heated to 120°, hydrobromic acid was given off; the dark brown residue was insoluble in all the ordinary solvents. An attempt made to determine the molecular weight by the freezing-point method, using benzene as solvent, merely showed a very high molecular weight, for the depression was very small.

Action of Hydriodic Acid on Gutta.—Some gutta-percha, extracted from the leaves of *Isonandra gutta-percha*, was heated with concentrated hydriodic acid to 250° for three days, and then to 300° for four days in a sealed tube. The product, after removal of excess of acid, was fractionated *in vacuo*. After a preliminary distillate, which came over while the temperature of the flask was being raised, there came over a distillate, which boiled between 320° and 360° at 20 mm. pressure. The product was a nearly colourless oil. Its analysis gave the following figures:—

(1) 0·1834 grm. gave 0·5868 grm. of carbon dioxide and 0·2077 grm. of water.

(2) 0·1832 grm. gave 0·5833 grm. of carbon dioxide and 0·2053 grm. of water.

(3) 0·1860 grm. gave 0·5974 grm. of carbon dioxide and 0·2188 grm. of water.

Percentage Composition.

	Found.			Calculated for		
	(1)	(2)	(3)	$C_{25}H_{42}$.	$C_{27}H_{46}$.	$C_{34}H_{58}$.
Carbon	87·26	87·57	87·55	87·72	87·56	87·20
Hydrogen	12·59	12·45	12·65	12·28	12·44	12·80
	99·85	100·02	100·20	100·00	100·00	100·00

Molecular weight: I.—0·3471 grm. dissolved in 15·79 grms. of benzene; depression 0·296°. II.—0·6592 grm. dissolved in 15·79 grms. of benzene; depression 0·467°.

Found: (1), 364; (2), 372; $C_{25}H_{42}$, 342; $C_{27}H_{46}$, 370; $C_{34}H_{58}$, 466.

The formula which best agrees with the analyses and with the determination of molecular weight is $C_{27}H_{46}$; a paraffin would have had the formula $C_{27}H_{56}$; the reduction is accordingly by no means complete. Depolymerisation, however, has evidently occurred. It is difficult to connect together the formula of gutta, which is a multiple of C_{10} or C_{17}, with a decomposition-product containing 27 atoms of carbon; especially as there was very little else produced except the substance analysed. The constitution of the hydrocarbon was not further investigated.

Treatment with Nitric and Sulphuric Acids.—A mixture of three parts of nitric with one of sulphuric acid acts violently on gutta; if the mixture be kept cool, and the gutta added very gradually, the reaction can be made to take place without charring. A quantity of leaf gutta was treated in this manner, and the final solution was filtered through glass wool in order to remove particles of unchanged gutta; on pouring the filtrate into water, a yellow precipitate separated out, which showed acid properties. It was readily soluble in caustic soda, and was reprecipitated by hydrochloric acid. This yellow substance contained nitrogen, and was insoluble in the usual organic solvents. The results of analysis are as follows:—

(1) 0·1832 grm. gave 0·3147 grm. of carbon dioxide and 0·1051 grm. of water.

(2) 0·1866 grm. gave 0·3283 grm. of carbon dioxide and 0·0989 grm. of water.

(3) 0·2187 grm. gave 15·15 c.c. of nitrogen at 19·2° and 756·2 mm. pressure.

(4) 0·2079 grm. gave 15·59 c.c. of nitrogen at 20·0° and 763·0 mm. pressure.

	Found.				Calculated for	
					$C_{21}H_{31}N_3O_{13}$.	$C_{34}H_{54}N_2O_{21}$.
Carbon	(1)	46·74	(2)	46·89	47·28	47·01
Hydrogen ..	(1)	6·37	(2)	5·89	5·81	6·22
Nitrogen....	(2)	8·04	(4)	8·75	7·88	8·07

The basicity of the compound was determined by dissolving 0·985 grm. in standard soda solution and titrating the amount of unused soda with standard hydrochloric acid.

It was found that the neutralised soda was equivalent to 7·68 c.c. of N/10 hydrochloric acid. Taking the first formula, if the acid were tetrabasic, it would have been equivalent to 7·40 c.c. acid; the second formula, if the acid is heptabasic, would have required equivalence to 7.94 c.c.; if hexahasic to 6·81 c.c. On the first supposition, the formula of the acid may have been

$$C_{18}H_{27}(NO_2)_3(COOH)_3OH;$$

on the second, either $C_{26}H_{47}(NO_2)_5(COOH)_4(OH)_3$, or $C_{29}H_{48}(NO_2)_5(COOH)_5OH$. But there is little use in speculating on the constitutional formulæ of such complex substances without further research.

Oxidation of Gutta.—An investigation of the oxidation-products of gutta appeared to promise to yield better results. It had been found that gutta, when dissolved in ether, was particularly prone to oxidation by the atmosphere, and this process was employed first. Some gutta, free from resin, was dissolved in boiliug ether, and left exposed to the atmosphere for two days. The residue, after evaporation of the ether, was found to be completely soluble in alcohol and in acetone; now, as gutta is wholly insoluble, it follows that complete oxidation has taken place. Its solution in acetone, after evaporation of the solvent, gave a brittle yellow resin, which we were unable to obtain in a crystalline form from any solvent. Its analysis, however, shows it to have nearly the same percentage composition as albane, a highly crystalline substance (see page 1368):—

(1) 0·1885 grm. gave 0·5717 grm. CO_2 and 0·1823 grm. H_2O.
(2) 0·1718 grm. gave 0·5244 grm. CO_2 and 0·1665 grm. H_2O.

	Found.		Calculated for $C_{17}H_{26}O$.
	(1)	(2)	
Carbon	82·65	83·23	82·92
Hydrogen	10·72	10·76	10·57
Oxygen	6·63	6·11	6·51
	100·00	100·00	100·00

0·3944 grm. dissolved in 15·19 grms. of benzene lowered the freezing-point 0·308°.

Molecular weight found, 413; calculated for $C_{17}H_{26}O$, 246; $(C_{17}H_{26}O)_2$, 492.

The determination of molecular weight, therefore, appears to point to the higher formula.

The products formed when oxidation takes place in toluene solution are different. To investigate this oxidation, 30 grms. of gutta were dissolved in toluene, and air was bubbled through the solution, kept warm on a water-bath; this operation was continued for 14 days. Acetone was added to precipitate any unaltered gutta, but only a small precipitate was obtained; it was removed by filtration. The acetone and toluene were distilled from the filtrate, leaving a sticky solid residue, soluble in alcohol, and giving an acid solution. It was analysed with the following results:—

0·1804 grm. yielded 0·4378 grm. of carbon dioxide and 0·1478 grm. of water.

	Found.	Calculated for $C_{12}H_{22}O_4$.
Carbon	68·03	62·61
Hydrogen	9·10	9·06
Oxygen	27·87	28·33

This sticky solid, when distilled *in vacuo*, gave off carbon monoxide and dioxide, and also methane. Along with these gases there came over first a light yellow liquid which had a strong smell of peppermint, and which appeared on analysis to be derived from the former compound by loss of the elements of water.

(1) 0·2231 grm. gave 0·5521 grm. of carbon dioxide and 0·1826 grm. of water.
(2) 0·1954 grm. gave 0·4891 grm. of carbon dioxide and 0·1606 grm. of water.

	Found.		Calculated for $C_{12}H_{20}O_3$.
	(1)	(2)	
Carbon	67·49	68·26	67·98
Hydrogen	9·09	9·13	9·53
Oxygen	23·42	22·61	22·49

An attempt was made to determine the molecular weight, but the solution was not complete; it is given for what it is worth. Found, 182; calculated for $C_{12}H_{20}O_3$, 212.

Albane.—Several attempts were made to extract from gutta the "albane" of Oudemans and Payen, to which they gave the formula $C_{10}H_{16}O$. Up to the present, however we have been unable to isolate from gutta a resin of this composition, although we have obtained a compound yielding similar numbers on analysis by oxidising albane with chromic acid. In order to study these resins which occur with gutta, we procured some very old gutta, which contained a very large proportion of oxidation products it was extracted with alcohol in a Soxhlet's apparatus. On cooling the alcohol, a white amorphous body separated out This substance was purified by dissolving it in chloroform and precipitating it with alcohol; the operation was repeated several times. The product when dry was a white powder, exhibiting no crystalline structure when examined under the microscope. It was soluble in glacial acetic acid ether, chloroform, benzene, acetone, toluene, and hot alcohol; it was unacted upon by hot hydrochloric acid, or dilute caustic soda. The substance had not a sharp melting-point; it began to melt at 135°, and was not wholly melted until the thermometer registered 160°.

An analysis gave the following results:—

(1) 0·1805 grm. gave 0·5423 grm. carbonic anhydride and 0·1853 grm. water. Some of this albane was dissolved in hot alcohol, and on cooling it separated out, but not in a definitely crystalline form. It was purified in this way four times, and again analysed. It had not changed its composition.

(2) 0·1156 grm. gave 0·3471 grm. carbon dioxide and 0·1188 grm. water.

	(1)	(2)
Carbon	81·97	81·68
Hydrogen	11·40	11·40
Oxygen	6·63	6·72

These figures agree well with the formula $C_{16}H_{26}O$; but this albane was found to be only partially soluble in petroleum ether. The soluble portion was crystalline. It began to melt at 150°, and finally melted at 180°.

On recrystallisation from acetone, the melting-point has risen to 185°, but was not sharply defined. From a solution in a mixture of toluene and petroleum ether a few needle-shaped crystals separated out, which melted at about 121° From all this, it was evident that the albane was not yet pure, and it was consequently recrystallised about 5 times from a mixture of alcohol and acetone. Five fractions were obtained the melting-points of which stretched over a wide range of temperature; and in every case the substance softened at a temperature 15° or 20° below the final melting-point.

Fraction (1) had the melting-point ..... 158°
„ (2) „ „ ..... 163°
„ (3) „ „ ..... 180°
„ (4) „ „ ..... 200°

A small quantity of white needle-shaped crystals was obtained from portions (3) and (4), by freezing out the acetone-alcohol solution; these were picked out and recrystallised from alcohol. The melting-point was then 201°—204°; an analysis was made after drying the crystals *in vacuo*.

(1) 0·1765 grm. gave 0·5354 grm. of carbon dioxide and 0·1727 rm. of water.

(2) 0·1491 grm. gave 0·4518 grm. of carbon dioxide and 0·1476 rm. of water.

—	(1)	(2)	Calculated for $C_{31}H_{26}O$.	Calculated for $C_{17}H_{28}O$.
arbon	82·74	82·63	82·92	82·24
ydrogen.....	10·87	11·09	10·57	11·29
xygen.....	6·39	6·37	6·50	6·45

A determination of molecular weight gave the results:—
(1) 0·1527 grm. dissolved in 15·52 grms. of benzene lowered the eezing-point 0·194°.
(2) 0·2734 grm. dissolved in 15·52 grms. of benzene lowered the eezing-point 0·331°.
Molecular weight found: (1) 248·5; (2) 260; calculated 246 or 8.

The non-crystalline portion of the albane resulting from is fractional crystallisation was also analysed with the llowing results:—

(1) 0·1903 grm. gave 0·5715 grm. of carbon dioxide and 0·1919 m. of water.
(2) 0·1925 grm. gave 0·5820 grm. of carbon dioxide and 0·1947 m. of water.

—	(1)	(2)	Calculated for $C_{17}H_{28}O$.
rbon	81·88	82·47	82·24
ydrogen	11·21	11·24	11·29
ygen	6·91	6·28	6·45

The melting-point of this substance was 190°—197°. It stilled under very reduced pressure without decomposition, d came over into the receiver in the form of a thick light llow oil, which solidified to an amber-like resin. This uld be recrystallised from a mixture of alcohol and etone; but the melting-point remained unaltered.

The deduction from these experiments is that albane is mposed of at least two substances, one of which has the rmula $C_{17}H_{26}O$, and the other, $C_{17}H_{28}O$. The crystalline bstance has probably the first formula; the resin, the cond. It will be remembered that a compound of practi-lly the same composition as the first was obtained by idising gutta in ethereal solution by means of a current air; the molecular weight of the resulting resin, however, peared to correspond to the doubled formula.

Action of Phosphoric Chloride on Albane.—It was to be pposed that a clue could be given to the true formula, and ssibly to the constitution of albane, by treating it with osphoric chloride. But here again, our anticipations ve been disappointed; a product of constant composition s obtained; but not all the oxygen could be removed. e product appears to be the result of a state of equilibrium ving been reached between the reacting substances.

In these experiments, the amorphous form of albane was ed; the crystals had not been obtained in large enough antity to make it possible to use them.

Six grms. of albane were ground up with excess of osphoric chloride in a mortar, and the mixture was ured into ice-cold water. The insoluble portion was ered off, washed free from acid, and dried; it then nsisted of a yellow solid, soluble in acetone, ether, nzene, chloroform, and hot alcohol; it could be purified crystallisation from hot alcohol, and the resulting stals appeared, under the microscope, to be homogeneous. ey melted at 170°. A second preparation was made in identical manner: many recrystallisations from hot ohol did not alter the melting point. The figures given ler heading (1) refer to the first, and under heading (2), he second preparation.

) 0·2081 grm. gave 0·0492 grm. of silver chloride.
) 0·2697 grm. gave 0·0609 grm. of silver chloride.
) 0·1321 grm. gave 0·3702 grm. of carbon dioxide and 0·1207 . of water.
) 0·0943 grm. gave 0·2639 grm. of carbon dioxide and 0·0894 . of water.

f the compound be supposed to contain one atom of orine, the number of atoms of carbon, taking the first estimation of chlorine to be correct, is 38·7; taking the second, 40·4: it appears probable, therefore, that there are 40 atoms of carbon in the compound. But, as will be seen, the molecular weight is about 461; and this is much too low for a compound containing 40 atoms of carbon. Hence the conclusion that we were dealing with a body of simpler molecular formula, and that the compound was the result of a state of equilibrium.

The results of analysis show the following relations:—

—	(1)	(2)	Calculated for $C_{40}H_{63}O_3Cl$.
Carbon	76·25	76·31	76·71
Hydrogen	10·15	10·56	10·06
Chlorine	5·82	5·58	5·66
Oxygen	7·78	7·67	7·67
	100·00	100·00	100·00

0·2481 grm. dissolved in 14·955 grms. of benzene lowered its freezing-point 0·176°.

0·3500 grm. dissolved in 14·955 grms. of benzene lowered its freezing-point 0·248°.

Molecular weight found: (1) 450·8; (2) 462; calculated $C_{40}H_{63}O_3Cl$, 626·5.

It is obvious that this substance would repay further investigation.

Oxidation of Albane.—The oxidising action of chromic acid on albane was studied both in glacial acetic acid and in chloroform solution. The products differ in each case.

(1) *Acetic Acid Solution:* (*a*) *One Atom of Oxygen to one Molecule of Albane.*—5 grms. of albane were dissolved in glacial acetic acid, and 1·5 grms. of chromic anhydride, also dissolved in acetic acid, were added. The mixture was boiled with a reflux condenser, and afterwards poured into water; a white precipitate came down. This was twice recrystallised from alcohol; it melted at 145°. Its percentage composition corresponds with the formula, $C_{12}H_{20}O$.

0·1911 grm. gave 0·5648 grm. of carbon dioxide and 0·1888 grm. of water.

0·2551 grm. dissolved in 15·39 grms. of benzene lowered the freezing-point 0·174°.

0·4495 grm. dissolved in 15·39 grms. of benzene lowered the freezing-point 0·302°.

—	Found.	Calculated for $C_{12}H_{20}O$.	Calculated for $C_{34}H_{56}O_3$.
Carbon	80·69	80·00	79·69
Hydrogen	10·98	11·11	10·93
Oxygen	8·42	8·89	9·37

Molecular weight found: (1) 470; (2) 474; $(C_{12}H_{20}O)_3$, 540; $C_{34}H_{56}O_3$, 512.

(*b*) *Two Atoms of Oxygen to one Molecule of Albane.*—5 grms. of albane were boiled in a similar manner with 2·6 grms. of chromic anhydride; the product, after two recrystallisations, melted sharply at 166°. The simplest formula is $C_{10}H_{16}O$; it is identical with the formula ascribed by Oudemans to albane (see p. 1368).

(1) 0·1853 grm. gave 0·5346 grm of carbon dioxide and 0·1775 grm. of water.

(2) 0·1926 grm. gave 0·5562 grm. of carbon dioxide and 0·1838 grm. of water.

0·1767 grm. dissolved in 15·68 grms. of benzene lowered the freezing-point 0·111°.

0·3463 grm. dissolved in 15·68 grms. of benzene lowered the freezing-point 0·208°.

—	(1)	(2)	$C_{10}H_{16}O$.	Molecular Weight.	$(C_{10}H_{16}O)_3$.
Carbon ...	78·67	78·75	78·95	497·5	456
Hydrogen	10·64	10·51	10·53	520·4	$(C_{10}H_{16}O)_4$
Oxygen ...	10·74	10·74	10·52	..	576

The molecular weight determinations do not agree well with either multiple of the formula.

(*c*) *Three Atoms of Oxygen to one Molecule of Albane.*—In this experiment, 3·4 grms. of albane were treated with 2·6 grms. of chromic anhydride: during oxidation, the smell of aldehyde was very noticeable.

(*d*) *and* (*e*) *Four Atoms of Oxygen to one Molecule of Albane.*—In these two experiments, 3 grms. and 5 grms. of albane were boiled with 3·25 and 5·2 grms. of chromic anhydride respectively. The product in both experiments had evidently the same composition, and were identical with the product of experiment (c). It would, therefore, appear that the maximum oxidation occurs when the proportion of three atoms of oxygen to one molecule of albane is employed.

The analyses are as follows :—

(*c*) 0·1071 grm. gave 0·3031 grm. of carbon dioxide and 0·0974 grm. of water.

(*c*) 0·2526 grm. dissolved in 15·45 grms. of benzene lowered the freezing-point 0·173°.

(*d*) 0·1512 grm. gave 0·4271 grm. of carbon dioxide and 0·1388 grm. of water.

(*e*) 0·1449 grm. gave 0·4076 grm. of carbon dioxide and 0·1326 grm. of water.

—	(c)	(d)	(e)	Molecular Weight.	$C_8H_{12}O$.	$C_8H_{13}O$.
Carbon ...	77·18	77·01	76·70	463	77·46	76·80
Hydrogen.	10·11	10·20	10·17	463	9·68	10·40
Oxygen ...	12·71	12·79	13·13	463	12·91	12·80

Molecular weight of $(C_8H_{12}O)_4$, 496; $(C_8H_{13}O)_4$, 500.

The determination of molecular weight is again discordant; but the analyses appear to agree best with the formula $(C_8H_{13}O)_n$.

2. *Oxidation in Chloroform Solution.*—The formation of aldehyde of which the smell was noticed during the previous oxidations pointed to the simultaneous formation of acetic acid. In order to detect this with certainty, an attempt was made to carry out the oxidation in some solvent other than acetic acid. Benzene was tried, but without success. Chloroform was then used as a solvent, and successful results were obtained; the formation of acetic acid was detected; and in several cases aldehyde also; moreover, carbon dioxide was continuously evolved during the reaction.

(*a*) *Three Atoms of Oxygen to one Molecule of Albane.*—The albane was dissolved in chloroform; the dry chromic anhydride was then added, along with enough concentrated hydrochloric acid to dissolve the chromic oxide produced. The respective quantities were:—3·314 grms. of albane, 2·68 grms. of chromic anhydride, and 10·79 grms. of hydrochloric acid in concentrated solution. After the reaction two layers separated; the aqueous layer contained the acetic acid formed; from the chloroform layer, crystals were obtained, which, on recrystallisation, melted at 120°—130°.

(*b*) *Four Atoms of Oxygen to one Molecule of Albane.*—3 grms. of albane were treated with 3·25 grms. of chromic anhydride and 12 grms. of hydrochloric acid. A substance was obtained which crystallised from alcohol and melted at 133°.

(*c*) *Five Atoms of Oxygen to one Molecule of Albane.*—The quantities employed were 9·95 grms. of albane, 13·45 grms. of chromic anhydride, and 50 grms. of hydrochloric acid. Acetic acid and aldehyde were formed, and from the chloroform solution crystals were obtained, melting, after recrystallisation, at 120°—125°, and having a similar composition to those resulting from the previous oxidation. In all these cases, the solution was boiled with reflux condenser until the chromic acid had been completely reduced. The results of analysis are as follows :—

(*a*) 0·1450 grm. gave 0·3747 grm. of carbon dioxide and 0·1209 grm. of water.

(*b*) 0·1019 grm. gave 0·2474 grm. of carbon dioxide and 0·0754 grm. of water.

(*c*) 0·1437 grm. gave 0·3718 grm. of carbon dioxide and 0·1094 grm. of water.

(*a*) 0·2213 grm dissolved in 15·41 grm. of benzene lowered the freezing-point 0·169.

(*b*) 0·1405 grm. dissolved in 15·33 grms. of benzene lowered the freezing-point 0·102°.

(*c*) 0·2151 grm. dissolved in 31·0 grms. of benzene lowered the freezing-point 0·105°.

(*a*) *Melting-point*, 120°—136°.

—	—	$C_{14}H_{22}O_3$.	Molecular Weight found.	Calculated for $C_{14}H_{22}O_3$
Carbon	70·48	70·58	416·5	476
Hydrogen.....	9·26	9·24	..	..
Oxygen	20·26	20·18	..	..

(*b*) *Melting-point*, 133°.

—	—	$C_{17}H_{26}O_5$.	$C_{17}H_{28}O$
Carbon	66·20	65·81	65·38
Hydrogen	8·22	8·30	8·97
Oxygen.....	25·58	25·58	25·65
Molecular weight	440	310	312

(*c*) *Melting-point*, 120°—125°.

—	—	$C_{17}H_{28}O_5$.	Molecular Weight found.	Calculated for $C_{17}H_{28}O$
Carbon	64·88	65·38	324	312
Hydrogen.....	8·67	8·97	..	..
Oxygen	26·45	25·65	..	..

(*d*) *Five Atoms of Oxygen to one Molecule of Albane.*—3·58 grms. of albane dissolved in chloroform were shaken with 4·84 grms. of chromic anhydride, dissolved in 18 grms. of concentrated hydrochloric acid. A considerable amount of aldehyde and acetic acid was produced; and from the chloroform layer crystals were obtained, which melted at 144°, and which had the same percentage composition as the compound obtained by oxidation in acetic acid solution; the latter, however, melted at 166° and had a higher molecular weight.

(1) 0·1169 grm. gave 0·3390 grm. of carbon dioxide and 0·1... grm. of water.

(2) 0·1386 grm. gave 0·3994 grm. of carbon dioxide and 0·1... grm. of water.

(1) 0·1395 grm. dissolved in 15·28 grms. of benzene lowered the freezing-point 0·090°.

(2) 0·1595 grm. dissolved in 15·28 grms. of benzene lowered the freezing-point 0·115°.

—	(1)	(2)	$C_{10}H_{16}O$.	Molecular Weight found.	Calculated for $(C_{10}H_{16}O$
Carbon ..	79·16	78·57	78·95	(1) 452 (2) 445	456
Hydrogen	11·01	10·81	10·53	.. ..	..
Oxygen ..	9·83	10·62	10·52	.. ..	..

It appears hardly worth while, in the present state of our knowledge, to speculate on the relation between these different bodies. It is obvious that they all require further research; they must be prepared in larger amount, and must be obtained in a state of higher purity. Their constitution also must be studied, for they all react with phosphorus chloride, giving crystalline products. It is only when the constitution is completely elucidated that definite conclusions can be drawn regarding the constitution of the parent substance, gutta-percha.

Yet, in all investigations, such pioneer work has to be done; and it appeared to us desirable to give an account of it to the Society. The subject is not being dropped; it is evident that progress can be made only by concerted effort; and investigations are now being continued in the laboratories of University College.

Discussion.

Mr. Spiller said that it was a good many years since this problem first presented itself to him. About 18... when in the War Department, he had the honour to ...

fore the Chemical Society a paper "On the Oxidation of lia-rubber," and on comparing his results with those ained shortly before by Dr. A. W. Hofmann, working on gutta-percha, they were found to be practically otical. The two sets of figures were as follows: –

—	J. S., India-rubber.	A. W. H., Gutta-percha.
bon	64·00	62·8
drogen.....	8·46	9·3
rgen.....	27·54	27·9

e point established by Sir William Ramsay was that se bodies were very difficult of investigation, because of ir apparently resinous character, but the results obtained oxidation were practically the same as were described years ago. It was also shown that there was not much ference between gutta-percha and caoutchouc, although researches now brought forward were, of course, much re elaborate and detailed than those attempted by himself what were confessedly the "pioneer" days.

Dr. M. O. Forster said that he could not give such eresting reminiscences as Mr. Spiller, but everybody st be impressed by the extreme difficulty of this kind of rk, and by the fact that the only crystalline substances ainable were those which were described as chlorides. might point out that there was a very close relation- p between the chloride, $C_{40}H_{63}O_3Cl$, and the albane of demans. It was only necessary to double the formula, $_9H_{32}O_2$, and then by the normal action of PCl_5 they ived at the formula written on the board for the chloride. nother point which must strike everybody was the con- nt recurrence of multiples of the formula, $C_{10}H_{16}O$, the pirical formula for camphor.

The Chairman said they were much indebted to Sir illiam Ramsay and his colleagues for this paper, but he uld not quite agree with his opening remarks, because it emed to him there were some very practical points con- oed in these results, though of course no one could esee the full practical results of any such investigation the beginning. They did not get artificial alizarin at ce, and when Graebe and Liebermann first published ir researches on the subject nobody could have foreseen final results. Kolbe's first researches on salicylic acid re not supposed to be so practical as they afterwards ved to be. The same thing occurred with regard to the duction of artificial indigo. Sir William Ramsay had ght them one thing at any rate, that if they wanted to ive at a thorough knowledge of these substances they st not insist on obtaining these decomposition products the crystalline state. It was very important that they uld not simply stand still and refrain from examining stances because they were not crystalline. In this tance the very substance they wished to produce was t crystalline, and could not be crytallised, and if that m of matter were insisted on they would never solve ne of the most important technical problems that still aited solution. An immense amount of technical work had en necessary to produce these results. He should be glad Sir William could give any further information as to the ion of the different solvents used in purifying the samples amined. He had found in using solvents with india- ber that the character of the solvent had a great in- ence on the substance itself. He had an opportunity ne years ago of getting india-rubber from the tree itself Brazil, and he had some of that original rubber, which s still in very good condition, but all the material which had purified from it by means of bisulphide of carbon, best solvent, naphtha, &c., had oxidised and become ite brittle. It seemed, therefore, as if the character of solvent used was of very great importance. Toluene s known to be an oxygen carrier, and if used in varnish s apt to make the varnish brittle. He should like to ow if the material used had been purified in any other y than by being dissolved in toluene. The fibrous sub- nce which remained on solution in toluene rather aroused interest, and he thought, possibly, might have some ring on the technical side of the question. He believed it was found that extracted gutta-percha was not so suitable for cable work as that which was used in the natural state after mechanical purification only. This matter was of extreme importance technically. They had just heard of the completion of a cable which practically united the whole British Empire, and that would have been impossible so far as their present knowledge of insulation went, without gutta-percha. India-rubber was procurable over a very large area of the earth's surface. He had wandered for weeks through forests where the india-rubber trees were dotted about, and it was only a question of cost to get at those trees. But when one looked at a map of the world to find out the area in which gutta-percha was available it was an extremely small patch, near the Straits Settlements. He believed that gutta-percha in the pure state had not been found elsewhere. There were reports from time to time of its discovery in other places, but none had come into the market suitable for the best work, electrical work especially, from any other place. The thanks of the Society were due to Sir William Ramsay for bringing this subject before them.

Sir William Ramsay, in reply, said he might say at once that the first formula, $C_{17}H_{26}O_3$, was that derived from gutta-percha by oxidation in chloroform solution. He admitted that the solvent made some difference in the results, but he did not think it made much difference in the chemical composition, although it did largely affect the article mechanically and its resistance to oxidation. The substance left behind was hardly fibrous but rather glutinous. That was what was obtained by dissolving gutta in any solvent, and he did not think there was any difference in the glutinous substance left behind according to the solvents employed.

REDUCTION OF AMMONIACAL SILVER SOLUTIONS BY ORGANIC SUBSTANCES.

BY GILBERT T. MORGAN, D.Sc.,
AND FRANCES M. G. MICKLETHWAIT, A.R.C.S.

The detection of organic substances and the relegation of these compounds to their appropriate classes is a matter which now almost invariably forms part of the laboratory training of the student of chemistry and the inclusion of this branch of analysis in the ordinary chemical curriculum, although a comparatively recent departure, is one which merits careful cultivation because the analytical experience thus obtained is not only of great educational value but also of considerable practical utility.

The fact that it is practically impossible to compile any tabular system of reactions capable of dealing with a tithe of the problems which the student is called upon to solve is a very pleasing feature of this work; but it is essential, in view of this circumstance, that the exercises given should be carefully graduated in order of difficulty, for it is frequently found that certain reliable tests, which can be safely employed to detect certain substances or groups of compounds, give ambiguous indications when applied indiscriminately to many of the innumerable combinations of compounds now placed at our disposal by organic chemistry.

This danger is strikingly manifested in the case of the well-known silver mirror test, which has long been employed in the detection of the aldehydes and the easily oxidisable organic acids.

The experiments here recorded serve to show that many other groups of substances produce a similar result when treated with ammoniacal silver nitrate. The test was generally applied in aqueous solution containing about 5 per cent. of silver nitrate, although in a few cases the insolubility of the organic compound in water rendered it necessary to employ alcohol as the solvent.

Reduction of the silver salt occurred in almost all the classes of compounds enumerated below.

1. *Aromatic Amines.*—The fact that certain aromatic amines produce silver mirrors with ammoniacal silver nitrate has already been observed by Tombeck (Ann. Chim. Phys., 1900, **7**, [21], 383), who showed that, under suitable conditions, the intermediate products of this reaction could be isolated, these substances being formed by the union of the silver salt and the organic base in definite proportions.

The aromatic amines are all more or less soluble in water and the silver mirror is best obtained by gently warming with the reagent, not the base itself, but its aqueous solution. This reaction appears to be perfectly general for all aromatic amines of the benzene and naphthalene series, and mirrors are obtained with equal facility from primary, secondary, and tertiary bases. The following amines were examined :—Aniline, *p*-toluidine, dimethylaniline, diphenylamine, the two naphthylamines and their alkyl derivatives, *m*-phenylenediamine, *m*-tolylenediamine and 4.6-diamino-*m*-xylene.

A slight reduction is produced by acetanilide.

The behaviour of the pyridine bases stands out in marked contrast to that of the preceding amines, pyridine itself giving neither mirror nor reduced silver. Quinoline and β-dinaphthacridine give a slight reduction only, but no mirror; *iso*-β-dinaphthacridine, the labile isomeride of the latter base (J. Chem. Soc. Trans., 1898, 536), on the contrary, produces a brilliant mirror when left in contact with a warm alcoholic solution of ammoniacal silver nitrate. The hydrogenised pyridine ring is readily oxidised by this reagent, piperidine giving rise to a well-defined mirror.

2. *Alkaloids.*—Morphine formed a mirror with the greatest ease; quinine produced a very slight reduction, whilst strychnine gave a negative result in aqueous solution and a slight black precipitate in alcohol.

3. *Hydrocarbons.*—The hydrocarbons: benzene, toluene, and their halogen derivatives (the chloro-, bromo-, dichloro-, and dibromo-benzenes) and phenanthrene do not produce any appreciable reduction with aqueous or alcoholic solutions of the reagent, anthracene gives a mirror on standing, but this result may be partly due to the impurities which are so tenaciously retained by this hydrocarbon. Naphthalene gives a slight reduction in alcoholic solution.

4. *Sulphur Derivatives.*—Thiophene produces a very slight reduction after prolonged heating. The thiophenols are not affected by the oxidising agent, the two thionaphthols giving negative results. Benzenesulphinic acid, however, is oxidised and gives rise to a mirror.

5. *Phenols.*—The mono- and di-hydric phenols: phenol, α- and β-naphthols, catechol, resorcinol, and quinol produce brilliant mirrors, and the property seems to be retained by their alkyl ethers, anisol, phenetol, and 2 : 7-diethoxynaphthalene producing a similar reduction.

The reduction of the silver salt by catechol takes place so readily that it may be employed as a lecture experiment for illustrating the formation of a silver mirror. Stronger solutions are employed in this case, 1 grm. of catechol dissolved in 15 c.c. of water being added to 25 c.c. of a 14 per cent. silver nitrate solution containing a slight excess of ammonia. There is an appreciable rise of temperature and the formation of the mirror which commences immediately is complete after a few minutes.

The trihydric phenols, phloroglucinol and pyrogallol, give copious black precipitates, but only very indistinct mirrors and similar results were obtained with gallic and tannic acids.

6. *Nitroxyl and Carboxyl Derivatives.*—The introduction of nitroxyl and carboxyl radicles into the molecule of the phenols renders the products more stable towards the oxidising agent; *o*-nitrophenol gives a red coloration followed by a slight reduction, *p*-nitrophenol behaves similarly, whilst picric acid yields a precipitate of yellow needles, but no reduction.

Salicylic acid has only a slight reducing action.

Benzoic and phthalic acids remain entirely unaffected, benzamide and saccharine both yield crystalline precipitates of white needles unaccompanied by reduction. Mandelic acid gives a precipitate of long pale yellow needles dissolving in excess of ammonia to a colourless solution which remains unaffected on prolonged heating. A globule of nitrobenzene, when allowed to remain in contact with warm ammoniacal silver nitrate solution, becomes coated with a layer of reduced silver.

7. *Carbonyl Derivatives.*—An appearance precisely similar to the one just described is presented by benzaldehyde. It is therefore a singular coincidence that the artificial and natural oils of Mirbane should in this respect behave in a similar manner. Quinone readily produces a mirror on warming, but yields a thick black precipitate in cold solutions. Dextrose and chloral hydrate both furnish mirrors with the greatest facility.

8. *Azo and Diazo Derivatives.*—A mirror is readily obtained with aminoazobenzene, but not with azobenzene or diazoaminobenzene, the latter compound yielding in alcoholic solution a yellow precipitate of its silver derivative.

9. *Alcohols.*—When pure, the monohydric alcohols give no reduction, although the precipitation of metallic silver is observed with impure specimens. Glycerol is stated to yield a mirror only in the presence of potassium hydroxide. We found, however, that, after leaving the warm solution of the trihydric alcohol and ammoniacal silver nitrate for one hour, a mirror was produced even in the absence of the caustic alkali.

10. *The Fatty Acids and their Derivatives.*—The acids of the acetic series and oxalic acid do not produce any reduction, and negative results are obtained with oxamide and the metallic and ethereal oxalates. The blue potassium chromoxalate, $K_6Cr_2(C_2O_4)_6, 6H_2O$, on the other hand, when gently heated with the reagent readily furnishes a very well defined mirror; this result is, however, not obtained with its red isomeride.

11. *Purine Derivatives.*—Uric acid immediately yields a black precipitate, and the mixture after a time slowly gives rise to a mirror. Caffeine and theobromine give practically no reduction.

12. *Unsaturated Compounds.*—The compounds containing ethylenoid linkings resist the action of ammoniacal silver nitrate. Oleic acid gives a white precipitate, the colour of which slowly changes to red, but there is no production of metallic silver. Cinnamic acid and sodium cinnamate produce a nacreous white precipitate of the corresponding silver salt; this dissolves in excess of ammonia to a solution which remains quite clear even after prolonged heating. Turpentine gives a very slight brown turbidity.

These results serve to emphasise the necessity of caution in the application of the well-known reaction for formic and tartaric acids, and the aliphatic aldehydes. In the presence of such commonly occurring substances as the phenols and the aromatic amides, this test is certain to lead to erroneous conclusions, and it is therefore always advisable to remove, as far as possible from the mixture under examination, any substances likely to exert a reducing action on the reagent.

Discussion.

Mr. W. T. Burgess said there was a practical side to this question as to which he should like to make a suggestion. It would be interesting if the author would indicate those bodies which gave good silver mirrors. Many years ago he had occasion to silver large mirrors for reflecting telescopes, and there was sometimes considerable difficulty in producing satisfactory silver surfaces, and there might be a field for the practical application of some of the reducing substances mentioned in the author's paper. If Dr. Morgan could point out those which would give reliable mirrors over a surface, say, one foot in diameter, the knowledge might be extremely useful to the makers and owners of reflecting telescopes.

Mr. Otto Hehner referred to the bearing Dr. Morgan's work had on photographic practice. A developer, as a rule, was an aromatic amido or hydroxy body, and from that point of view many of Dr. Morgan's results presented nothing novel. So far as he knew, some of the other reducing substances had not been tried in photography; for instance, aniline, and it might be worth while to experiment with it. Concerning glycerin, it was very doubtful whether glycerol actually reduced ammoniacal silver solution, at least in a reasonably short time. One of the requirements for good dynamite glycerin was, as was well known, that it must not reduce silver solution. Many glycerins, although complying with that condition for a time, gradually reduced silver. But he was under the impression that, in the absence of air, the reduction was much less marked than when air was admitted. The reducing action of glycerin was more probably due to an impurity than to the glycerol itself.

Mr. Arthur R. Ling said that a possible reason why compounds containing a tertiary alcohol (carbinol) group

ch as phenols reduced ammoniacal silver solutions was t in some case this group was capable of changing into arbonyl group. It was possibly due to some change in conformation of the alcohol groups in the sugars that y gave such irregular results with ammoniacal silver rates or with Fehling's solution. In the determination reducing sugars, standard conditions had to be adopted order to obtain good results.

Dr. Lewkowitsch asked whether Dr. Morgan had tried higher homologues of pyridine. In one works where dynamite glycerin was of bad quality, so as to reduce ver nitrate almost immediately, he had isolated from eral cwts. of glycerin a few grammes of a substance he l reason to consider as lutidine. The presence of this e was no doubt due to the action of alkali on the aminoids, from the cells in the badly rendered fat. ascribed, therefore, in that case the reducing action to presence of the lutidine. He should also like to know little more about the quality of glycerin used by Morgan and how it was tested, because much of the called chemically pure glycerin sold would give a uction owing to imperfect refining. In the so-called fumer's test the glycerin used for the best quality of et soap was tested with ammoniacal silver, and it was ected if it did remain unreduced when standing for hours in a dark cupboard. It was quite possible that a mmercial glycerin might give a reducing action without reaction being due to the glycerol itself.

Dr. Divers mentioned that the inorganic amino-compound, potassium amino-sulphate (sulphamate), silvered ss, when heated with silver nitrate and potassium droxide without addition of ammonia. He asked whether Morgan had tried the use of potash in place of ammonia h amino-compounds.

Dr. Mollwo Perkin said he had frequently noticed in emens of ordinary purified glycerin, such as one erally obtained, that they would sometimes reduce the er very rapidly, but at other times it required a considere time. It was also known that by the addition of a p or two of alkali, either potash or soda, the reduction greatly accelerated. He had never obtained glycerin ch gave no reduction, provided it was heated for a iciently long time with ammoniacal silver.

The Chairman said that, although the paper on the face t might appear theoretical, yet the discussion had been rely practical. The subject had, as Mr. Burgess had l, a very practical bearing, because the making of silver rors was an important industry. Many years ago he red a part in introducing that industry into this country, if at that time they had been aware that there were so ny substances which would produce a good mirror, it ht have been difficult to know which to adopt. At that e, however, there were very few such substances known. best process was a French patent, which included an moniacal silver solution and a tartrate. There were then silver mirrors in use, but now it would be difficult to find one who would produce a mercurial mirror. That wed the great advantage of technical chemistry; that remely unhealthy industry of making mercurial mirrors been entirely superseded without any official pressure, ply by the introduction of a new chemical reaction. The er film was a very expensive material compared with the oil used in the mercurial process, but it was so easily lied that it entirely replaced the old and unhealthy ess. There were two things which had to be considered a reaction of this kind; one was temperature and the r dilution. In the mirror industry one had to get one's tions of a certain strength, and many solutions which, n concentrated, produced a dark precipitate, apparently metallic, would produce a bright metallic mirror if ciently diluted. Again, a solution which would not give ight mirror at one temperature would give a very bright satisfactory mirror at another. You put the plate of s on a table, heated to a certain temperature, with hot er underneath, and poured the solution on; if the perature were right you saw clouds gradually form on glass, and by degrees the whole surface became metallic. one were not very particular about the dilution, an rphous, dark precipitate might be obtained. In those days grape sugar was tried as a reducing agent, and in some cases gave a good mirror, but in others none at all, so that you would not get a practical film from it. With regard to glycerin, it would be interesting to make tests of the reducing power of pure glycerin with a sample purified by the freezing process, which he found to be generally purer than any distilled glycerin.

Mr. Samuel Hall said that, about 1848, he was with Mr. Henry Deacon, and saw the first attempt at St. Helens to form mirrors. That was when Mr. Deacon was at Pilkington's. He took a little spirit lamp, and with a piece of platinum wire made some aldehyde, and precipitated some silver in a test tube with it.

Dr. Morgan, in reply, said he thought there would be no difficulty in coating a surface 1 ft. square with a silver mirror such as was produced in the catechol experiment. He had forgotten to point out that the mirrors produced by aromatic compounds had a darker sheen than that observed in the mirrors from aliphatic substances, the difference being probably due to the precipitation of organic matter in the former case.

In the case of glycerin, the result was obtained after heating the solution of ammoniacal silver nitrate for one hour on the water-bath. The sample of glycerin employed in this experiment, although distilled under diminished pressure, had not been purified by the freezing process, and he did not therefore insist on its extreme purity. He had not examined lutidine from this standpoint, and was unable to say whether the methylated homologue of pyridine would bring about this reduction. He was inclined to think, however, that lutidine would not give a mirror. They had tried the experiment with pyridine, and had obtained a mirror which showed that the hydrogenised pyridine ring was susceptible to the action of the silver solution.

They had not tried the action of caustic potash and silver nitrate because they were doing the test under the conditions employed by students in examining solutions for aldehydes, and therefore restricted their experiments to ammoniacal silver nitrate solution.

The observations of the Chairman were quite in accordance with their own. They found that they had continually to alter either the temperature or the degree of concentration in order to obtain the best effect.

In some cases mirrors were obtained with strong solutions in the cold, and in others only with dilute solutions and warming. The catechol mirror is the best example of the effect of the former set of conditions, whilst that derived from aniline exemplifies the latter.

SIMPLE QUALITATIVE TEST FOR BROMIDE AND IODIDES, AND A TEST FOR BICARBONATES.

BY F. MOLLWO PERKIN, PH.D.

It does not appear to be generally known that an unacidified solution of calcium or sodium hypochlorite, liberates iodine from iodides, but that bromine is only liberated on addition of acids. In fact, in *Dammer's Handbuch der Anorganischen Chemie* [Vol. I., p. 504] it is stated that hypochlorites liberate iodine from metallic iodides in presence of sulphuric acid, the inference being that no liberation of iodine takes place in the absence of acids.

This property of hypochlorites may be employed as a rather neat qualitative test for iodides and bromides when they occur together. The test may be carried out in the following manner: About 2 c.c. of chloroform or carbon disulphide is added to the solution to be tested, contained in a test tube or, better, a small separating funnel, and then a solution of calcium or sodium hypochlorite is added drop by drop. If iodine be present, it is immediately liberated, and on shaking up, imparts its characteristic coloration to the solvent. The hypochlorite is then added in excess, when, if there be only a small quantity of iodide present, the solution becomes colourless. This is probably due to the oxidation of the iodine to iodic acid, and, perhaps, to the formation of iodine chloride.

As soon as all the iodine has been got rid of, either as above, or by extracting with successive small quantities of

the solvent, a few drops of acetic acid are added, when the bromine is liberated and may in turn be extracted.

In cases where the quantity of iodine is extremely small, the hypochlorite must be added with great caution (one drop of diluted hypochlorite often being sufficient) otherwise the iodine is oxidised almost before its presence can be noted. On the other hand, if the solution contain large quantities of iodide, it is advisable to dilute in order to facilitate the removal of iodine. The following equation probably best represents the reaction which occurs, with iodides :—

$$2KI + Ca(OCl)_2 + H_2O = CaCl_2 + 2KOH + I_2 + O.$$

This reaction also explains the oxidation of the iodine, when the hypochlorite is added in excess.

In order to liberate bromine, it is necessary to have free chlorine or hypochlorous acid. That hypochlorous acid is able to liberate bromine from bromides may be shown by passing carbon dioxide through a mixed solution of hypochlorite and bromide, or by adding a solution of a bicarbonate to the mixture, when bromine is liberated.

As both carbon dioxide and bicarbonates liberate hypochlorous acid from solutions of hypochlorites, it is evident that the bromine is liberated by free hypochlorous acid, but not by hypochlorites—

$$NaHCO_3 + NaOCl = Na_2CO_3 + HOCl$$
$$2HOCl + 2KBr = KCl + Br_2 + H_2O + O.$$

I understand that a method based upon the use of hypochlorites for the separation of bromides and iodides was suggested some years ago by Mr. H. T. Jones, but I have been unable to find the reference.

Test for Bicarbonates.—There are, as is well known, practically no rapid qualitative tests by which bicarbonates may be distinguished from normal carbonates. But the fact already stated above, that bicarbonates liberate bromine when added to a mixed solution of a hypochlorite and bromide, gives a rapid and easy method of distinguishing the one from the other. The test may be best applied by adding a solution of potassium bromide to one of bleaching powder contained in a test tube, then add about 2 c.c. of chloroform or carbon disulphide and a solution of the substance to be tested. Should this be a bicarbonate, bromine is at once liberated, and, on shaking the mixture up, dissolves in the chloroform. Normal carbonates have no action.

Discussion.

Mr. Heiner understood the author to say that the hypochlorite solution must be neutral. When the solution was markedly alkaline, free iodine could not result, whilst if it were acid, bromine would be liberated. But how did Dr. Perkin ascertain the neutrality of a solution, which almost instantly bleached the coloured substances used as indicators ?

Dr. Perkin replied that, as a matter of fact, he had never tested the solution for neutrality.

Dr. G. T. Morgan said he agreed with Dr. Perkin with regard to the practicability of the suggested modification of the colour test for bromides and iodides, because, when these substances were present in somewhat concentrated solutions, the amount of chlorine water required to liberate the other halogens became inconveniently large. He was under the impression that the test could be readily carried out in a slightly acidified solution, for although both bromine and iodine were liberated, the colour of the latter predominated in the carbon bisulphide or chloroform extract, and was removed by adding a moderate excess of the hypochlorite, leaving the brown coloration due to bromine.

The fact that soluble bicarbonate readily liberated hypochlorous acid from the hypochlorites was well known to all who had followed Chattaway and Orton's researches on the formation of substituted nitrogen chlorides, these substances being produced from the acyl derivatives of the aromatic amines by the action of hypochlorous acid set free from its salts by means of potassium bicarbonate. (*J. Chem. Soc. Trans.*, 1899, 1046, and 1900, 134.)

Mr. Renwick observed that no mention had been made of the method of testing the liquids for all three halogens by making use of nitrous acid and starch paste for the detection of iodine, and boiling with ferric sulphate for its elimination. In that way you could get rid of the iodine, then you tested for and eliminated the bromine with potassium permanganate, and then tested the liquid finally for chlorine in the usual way. He should like to know if that method had not an advantage over others in the case when iodine and bromine only are present. It certainly had an advantage over the use of chlorine water, which is very uncertain if one or more of the haloids be present in very small amount.

Dr. Perkin, in reply, said he had forgotten to mention that he had been informed that Mr. H. T. Jones had somewhere published a reference to this matter, but he had not been able to find it. He fancied that really the hypochlorite was slightly alkaline, and as he always added the chloroform or carbon bisulphide first and shook up immediately, he did not think that the alkalinity mattered, unless the amount of iodine was extremely small. If iodine were left for any length of time in contact with the hypochlorites, it was converted into iodate, and the same with bromine, which was converted into bromate after some time. He had noticed that even a very slight excess of acid threw down the bromine at once. In reference to the nitrous acid method, he did not think it was very good in the hands of the average student. The remark might seem puerile, but he had to deal with many students, some rather defective in secondary education, and it was necessary to put things before them in the easiest light. It was more from this point of view that he had put the paper forward. In any case it was always best to use methods of analysis which were as simple as possible.

The Chairman said they were much indebted to Dr. Perkin for this paper. The information with regard to bicarbonates would be very useful when it was further worked out, and when they knew how much of the reaction was due to free carbonic acid, and how much to bicarbonate. He might mention that these two papers by Dr. Perkin and Dr. Morgan had been prepared for the last session, and they were indebted to the authors for having consented to keep them over. The paper on sulphuric acid would be taken at the next meeting.

Manchester Section.

Meeting held on Friday, November 7th, 1902.

MR. IVAN LEVINSTEIN IN THE CHAIR.

The opening meeting of the Manchester Section was held in the Chemical Lecture Theatre of the Municipal School of Technology, on November 7th. In his opening remarks, the President said that the Sectional Committee had discussed the desirability of holding the monthly meetings at the School of Technology instead of, as hitherto, at the rooms of the Chemical Club in the Victoria Hotel. Considering the benefits to be gained by holding these meetings in a building in which the most modern scientific appliances would, if required, be available for illustrating the papers, the Committee had unanimously decided that the change would be an advantageous one. As, however, any change of the kind contemplated should have the full approbation of the members, the President proposed the following resolution:—"That the meetings of the Manchester Section of the Society of Chemical Industry be held within the buildings of the Municipal School of Technology." This was seconded by Mr. W. Thomson, and, after a few remarks by members present, was carried unanimously.

This being the first meeting of the session the President then delivered a short address.

ADDRESS BY THE CHAIRMAN.

IVAN LEVINSTEIN.

The conception of this palatial building in which we meet to night, and its splendid equipment, is largely due to the visit of a deputation to the Continent, in June and July, 1891. The deputation consisted of Mr. Alderman Rawson, chairman, Messrs. Bowden, James Murgatroyd, myself, who were members of the managing board of the old Technical School, and Mr. J. H. Reynolds, the secretary of the school.

The report of this visit to Continental and English technical schools, presented to the Whitworth Institute, is illustrated by 10 plans of foreign schools and also by a plan of the proposed new Technical School on the site on which the Municipal School of Technology has been ultimately erected. The deputation fully recognised that, in order to train men under circumstances and conditions similar to those prevailing in Continental schools, a technical school was wanted, larger in scale and superior in equipment to any existing at that time in this country.

There is, however, a great difference between the technical high school on the Continent and the United States and our own school, for whilst the former are solely designed, erected, and equipped for the teaching of scientific and technical subjects to day students, this great school is a combination of an evening continuation school, a trade school, a women's work school, and a school of science and technology.

As to whether such a combination is a wise one I have grave doubts, but circumstances which I need not discuss here made it necessary.

Only those who have a more intimate knowledge of the details of working such a combination school, can form an idea of the stupendous difficulties, inherent to its organisation, administration, and supervision.

The old Technical School and School of Arts were transferred to the Manchester Corporation in March 1892, with all their assets, amounting in money value to about 100,000*l.*, but including a far greater asset, namely, the knowledge and experience gained during many years of hard and efficient work. One of the conditions of the transfer made by the Whitworth Institute was that the Corporation should undertake to erect a new school on its present site, if the latter were considered to be suitable. Some difficulties were, however, in the way, and it was not before 1895 that the foundation stone was laid and building operations commenced. The erection and completion occupied about seven years, under the immediate superintendence of Mr. J. H. Reynolds, the present Principal.

It is not easy to form a correct opinion of the endurance, the great industry and ability, and of the enthusiasm which he brought to bear upon the work. It was also most fortunate that our present Lord Mayor, Mr. Alderman Hoy, was the Chairman of the Technical Instruction Committee, at the time of the transfer to the Corporation.

A broad-minded man, a strong man, and one in whose judgment the Council had implicit confidence, was needed to carry through the great scheme that we had in our minds, and all these admirable qualities Mr. Alderman Hoy possesses in a high degree.

The fact that many of our technical schools have no day students at all, and others an exceedingly small number, has been much lamented, and great has been the clamour that our manufacturers foolishly refuse to employ superior technically trained men.

Regarding the first proposition, paradoxical as it may sound, I think we may congratulate ourselves that such is and is the case. What would have happened, if there had really been a great rush of day students, or if the number of day students had been greatly increased? There could have only been one result, for the badly equipped and badly staffed average technical schools are utterly inadequate to produce first-class technically trained men. A large number of men of inferior general and inferior technical education would have been turned out to the world. Already, in 1891, when addressing the students of the Manchester Technical School, I warned them against the consequences of the senseless and planless multiplication of badly equipped and badly staffed schools, but since that date, the number of this class of school has steadily increased. There was not, in 1891, nor is there to-day, a crying necessity for increased quantity, but solely for improved quality. Our manufacturers and employers are, after all, not so foolish as some people pretend. My opinion is that, if we turn out the right article at our schools, they will not be slow in getting hold of it. For example, in the Chemical Department of Owens College, the really good men, who have stayed long enough at the College, find employment so readily that the demand exceeds the supply.

Without assuming the rôle of a prophet, I venture to predict that the students leaving our large dyeing, printing, and paper-making school, after previously taking a three years' course in chemistry, will be eagerly sought after. They certainly will not have any difficulty in finding employment in our printing, bleaching, dyeing, and paper-making works.

Manchester may boast to-day of the possession, within the walls of Owens College and the Municipal School of Technology, of by far the finest physical, electrical, electro-chemical, engineering, and chemical laboratories in this country. At the head of the chemical laboratories are Prof. Dixon, F.R.S., and Prof. Perkin, F.R.S., of Owens College, and Prof. Pope, F.R.S., at the Municipal School, men whom the best German University would be proud to have at the head of its chemical faculty.

These great schools are certain to exercise in the near future a most beneficial influence on the chemical, allied, and textile industries, not only of Manchester, but of Great Britain. There is, however, something wanting, if full advantage is to be derived from these magnificent laboratories. We want, as I have already pointed out in 1891, and emphasised again in my presidential address delivered at Liverpool, in July last, a class of youth far better prepared, endowed with a far more liberal education, when they enter these institutions, than is at present available. For example, it not unfrequently happens that students, after having fairly mastered quantitative analysis, cannot correctly calculate the results of their analysis for want of a sufficient knowledge of arithmetic. Can nothing be done to stamp out this lamentable state? Is it not feasible to convert, after the passing of the new Education Bill, our higher grade schools into first class grammar schools? If this is not practicable, let us build two new grammar schools in suitable quarters of the town, reduce the fees to less than half those at present charged, and increase the number of scholarships. Let us subsidise the existing excellent grammar schools in such a way as not to decrease their efficiency and to compensate them for the reduction in fees, which the above scheme would necessitate. Do not overlook the fact that high class secondary education is almost compulsory in Germany, for reasons fully pointed out in my Liverpool address. We must, therefore, hold out special inducements to our youths, in order to persuade them to remain in school as long as the German youth. As soon as the plan I have outlined is in full work, I should make the entrance examination to the Municipal School of Technology, and to Owens College, still more difficult, but I should admit the youth who has remained for two years in the sixth form of a recognised high class secondary school to either institution without any entrance examination, provided that he has obtained a satisfactory leaving certificate. The Victoria University is now applying for a new charter, which will establish an independent university in Manchester.

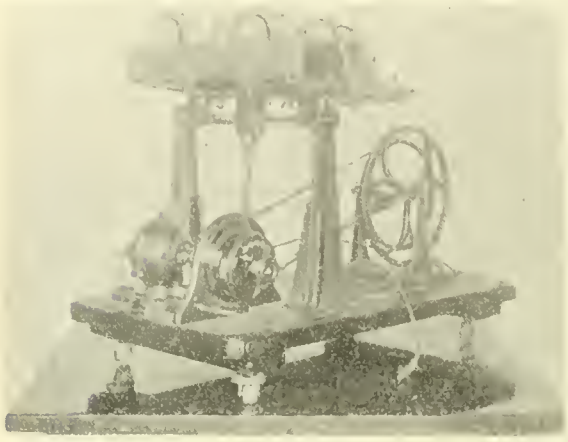
As soon as this is granted, and there is little doubt that the application will be successful, the Manchester University will be in a far better position to foster a more intimate connection with the Municipal School of Technology, which is, at least in my opinion, very desirable. In conclusion, let me repeat that, if you turn out at our schools of science and technology really first-class scientifically-trained men of ability, very little will be heard of the short-sighted employers who will not find work for this kind of man. But let the student bear in mind that, however well trained he is, however successful in passing his final examination,

on entering a factory he has yet to learn a great deal, before he can effectively apply his scientific knowledge to practice.

At the conclusion of the address the President invited the members present to inspect the chemistry department of the school.

In view of the development which had taken place during recent years, in the use of mechanically driven appliances for laboratory purposes, considerable trouble had been taken to equip the chemical laboratories of the new Municipal School of Technology, Manchester, with efficient and convenient forms of automatic shaking and grinding machines, &c. The President added that it would perhaps be useful if he exhibited and described a few of the appliances which had been constructed under the superintendence of Professor W. J. Pope, F.R.S. (to whom he was much indebted for kind assistance), for the use of students in the department.

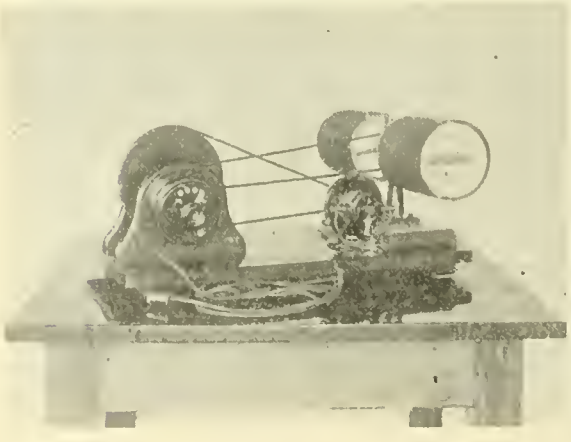
Fig. 1.



In connection with the scheme for using such appliances, plugs for drawing off electric power have been provided adjacent to every working bench, so that the various machines may be moved from place to place. The metal parts of the different appliances having been obtained from the makers, they were mounted upon a suitable base board, together with a small electric motor provided with a starting switch; in this way compact, self-contained, and portable appliances for carrying out the ordinary mechanical operations of importance in the laboratory have been obtained.

A very useful form of shaking machine is shown in Fig. 1; the vessels to be shaken are strapped on to a horizontal frame

Fig. 2.

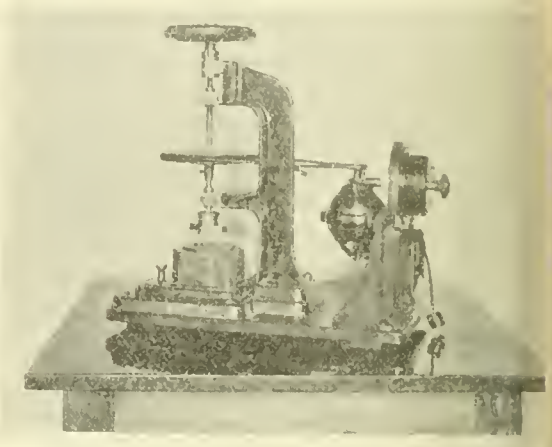


constituting the upper part of the apparatus, and this is then rapidly rocked to and fro by the movement of an upright rod. The contents of two Winchester quart bottles may be thus kept in violent agitation, and the machine proves to be of great service in preparing saturated solutions and in other similar operations.

Fig. 2 represents a mill for reducing ordinary chemicals to fine powder; the material to be ground is enclosed in porcelain jars together with a number of porcelain balls, and by the slow rotation of the jars the material is triturated by friction with the balls.

Fig. 3 illustrates a Zulkowski mill—in which hard materials are ground to any required degree of fineness by

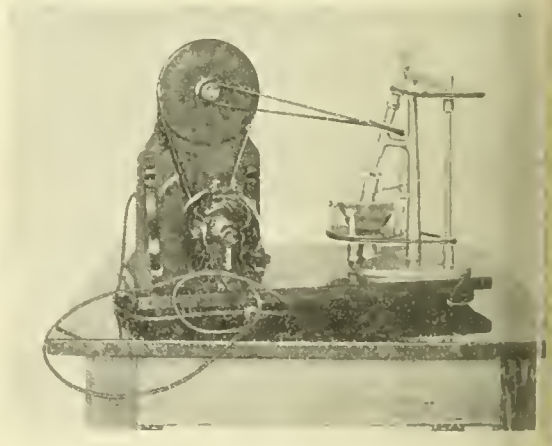
Fig. 3.



an agate muller turning in an agate block—driven by electric power as already indicated.

Fig. 4 shows a convenient way of mounting a mechanically driven agate mortar of American origin. In this apparatus

Fig. 4.



an attempt has been made to imitate the hand movements by means of which a substance is ordinarily ground in a mortar; the agate pestle and mortar are both rotated, the former rapidly and with an excentric motion, and the latter slowly, in order to cause the material which the pestle throws up to the edge of the mortar to be pushed back into the middle by a fixed metal feather.

The starting switch attached to each of these and other small machines has proved very useful, as by its aid the speed of working may be varied to suit the conditions in different operations.

A battery of autoclaves of various patterns and working at different pressures has been provided for convenience in carrying out a number of organic chemical reactions upon a semi-works scale; each of these has been mounted on a cast-iron stand which is bolted down to a wooden trolley, in order to allow of the whole being conveniently shifted from place to place.

The rapidly increasing importance attached to the distillation of substances under very low barometric pressures has made it necessary to instal a mechanically driven high-vacuum pump in the main organic laboratory. A double-acting Fleuss pump, worked by means of a large hot-air motor, has therefore been fitted up, and the whole has been enclosed by a glass-walled cupboard, since it was found that this was the only practicable method of preserving the pump from corrosion by the laboratory air. Further, since it is found very difficult in practice to prevent the vacuum from being reduced by traces of aqueous moisture evolved from the substance during distillation, the pump is caused to suck through a glass tube kept cold by immersion in liquid air; this has the effect of fixing all traces of aqueous moisture as ice in the tube at − 180°. With this arrangement, it is found easy to keep the pressure far below that of 0·1 mm. of mercury throughout the distillation; it should be remarked that since this machine was installed, Prof. E. Fischer has independently devised a very similar plant for use in his new laboratories at Berlin University.

In conclusion a vote of thanks was passed to the Technical Instructional Committee of the Manchester Corporation, and to the Principal, Mr. J. H. Reynolds, for their kind permission to hold the meetings within the precincts of the school.

Newcastle Section.

Meeting held at the Durham College of Science, on Thursday, October 30th, 1902.

ADDRESS BY THE CHAIRMAN,

W. L. RENNOLDSON.

It has been suggested that a few remarks on what may, in my opinion, be expected from a works chemist might be interesting.

He ought, first of all, to have a clear understanding of chemistry, and of natural philosophy; it is impossible to have a grasp of chemistry, without understanding the physical laws of nature. I use the expression "clear understanding" in preference to "depth of knowledge," because a clear understanding of the principles of chemistry is of much more use than a greater depth of knowledge, absorbed but not assimilated. Later on, the factory chemist is expected to know the most minute details of the chemical actions involved in the operations with which he is associated. A factory chemist is expected to do the requisite analysis, accurately and expeditiously. Analyses in connection with the internal working must be accurate to the extent required in the particular case, or they would be misleading, and they must also be done quickly to be of real use as a guide.

The ability to combine speed with accuracy is a great desideratum, and gives a man much opportunity for showing clearheadedness; he will know where rapidity and rather rough working will not affect the end in view, and he will also know where every possible care must be exercised.

Now that there is so much attention given to the chemistry of combustion, especially in connection with steam-generation, a works chemist is expected to be an adept with the analysis of fuel, and of furnace gases. He is also expected to be familiar with the use of calorimeters, and pyrometers.

A young chemist ought to practise calculations of a kind to which no rule applies, but which depend on his thoughtful reasoning for their solution. He ought to understand per cent. so clearly as to never use the term wrongly. Unfortunately, the latter is often done, and we read of some article by the use of which a saving will be effected of considerably over 100 per cent.

A works chemist often has other duties to perform than analytical work; frequently he is asked to devote all attention to a department of the manufacture, with the view of finding out the cause of some more or less mysterious trouble existing. It is in such cases that he has the opportunity for showing whether he can observe thoughtfully, and draw a logical inference from such observation. Young men are often met who notice an effect but get astray as to the probable cause. That leads to searching in a wrong direction, and often causes much time to be lost and expense incurred. On the other hand, many can draw a reasonable inference after the observation has been pointed out to them.

A factory chemist had better be too sceptical than too credulous. A long experience has strengthened my innate instinct, to doubt the truth on any statement, even "in print," or accepted opinion, or belief that does not appeal to one's reason as commonsense, that is to say, "what is unlikely is probably not true." I must admit that it does sometimes happen that the unlikely turns out to be true, but such occurrences are so few and far between that they may be said to "prove the rule." That expression, by-the-bye, is sadly in want of revision; of course it means "prove" in the old sense, *i.e., to test*, and therefore shows the rule is not without exceptions.

A young chemist, when he finds a foreman, or someone else, not familiar with chemical symbols or equations, must not assume that such person is an ignoramus. He must not, on the other hand, accept as gospel all the opinions of the experienced practical man, who perhaps "is sure" that it will never do to improve the method he is convinced is the only safe one. "Experience makes fools wise," is an old saying, but I consider it more a maxim than an axiom. Long experience in one groove is apt to contract the mind against any departure from that groove. Stereotyped experience is often a barrier to a new departure whose aim is greater efficiency or greater economy.

The chemist (if enthusiastic) is often discouraged, and in fact others besides the chemist often have much difficulty to get a departure introduced in the face of the fears, and prejudice of others. And when got to work, it often does not receive justice from those who may honestly wish to give it a fair trial, but whose want of faith prevents their giving that hearty support so necessary for the success of a new venture.

The nature of heat is a subject with which the young chemist ought to be more familiar with. He has been taught, *and may have learned* something about heat, and will know that heat of convection travels upwards, and he probably assumes that heat of conduction, and of radiation also prefer an upward journey, and as to specific heat and latent heat, they are often considered as a sort of mystery, and of no practical application. He may have learned tables of specific heats and latent heats of different materials, as he has learned the number of Jupiter's moons, and considered the subject to be equally unimportant in regard to useful application.

But I have known more than one case where very great practical advantage resulted, by utilising one's knowledge, of the nature of specific and latent heat.

As an example of this I may mention a case. There was much trouble and loss going on in a factory owing to the difficulty of cooling the gases from a furnace sufficiently to admit of the soluble portion of such hot gases being absorbed or condensed in water. Those associated with the factory knew all about specific heat and latent heat, &c., but seldom made use of such knowledge. However, it occurred to someone that, whilst it would not do to diminish the sensible heat of the furnace, and aerial cooling could be only very limited (unless with very extensive and expensive plant of high mortality), to exclude as much as possible from the hot gases the constituents which possessed the greatest latent heat and specific heat

namely, the steam, would be good. The gases to be cooled and condensed, while being as hot as ever (*i.e.*, sensible heat), would be much more easily cooled and much more thoroughly condensed. The fuel in use was coal gasified with a forced "draught" with a jet of steam through the fire. The furnace gases (the products of combustion) contained a large proportion of red-hot steam, which takes enormously more cooling than red-hot CO_2 and N. By the substitution of coke for coal and the dispensing altogether with the steam a great improvement was effected from every point of view.

A factory chemist ought to know, or be able to judge, what is the best constructive material to use for a given purpose. A good general knowledge of the nature and properties of all ordinary available substances (gathered from actual personal observation, if possible), is exceedingly useful. A chemist has been accustomed to use apparatus constructed of the most suitable materials for the various actions involved. But for manufacturing plant, there are many considerations, besides that of first cost, which makes such materials generally quite unsuitable.

There are frequent opportunities for exercising judgment on this matter, even in connection with what are called old manufactures, as modifications are frequently made, and accidents and emergencies have to be tackled.

A factory chemist is occasionally called upon to find out the cause of some failure or partial failure of draught. If the trouble be in connection with some complicated and far reaching plant, the problem is often a difficult one. The currents to be investigated are always in very large volumes, but the speeds and pressures are generally very small, therefore the greatest care and every precaution have to be taken to get trustworthy evidence (with sensitive anemometers, &c.), as to the nature and the whereabouts of the cause of the trouble. It is by no means uncommon for some item to be overlooked in the manipulation, or in the *reasoning*, and so cause an entirely wrong impression to be formed. Such investigations are fine exercises for the judgment of the works chemist, as they "abound in pit-falls and traps for the unwary."

To inspire faith in his colleagues for his judgment, a young chemist should show that he does not allow popular beliefs to influence his opinion. We meet many, both old and young, who are clear enough on chemical and physical matters when applied to their profession, but when it comes to personal and domestic matters, they give one the impression that they are destitute of such reasoning. *Theory* is a subject which is often disclaimed and even held up to ridicule by the thoughtless. They say an ounce of practice is worth any amount of theory; that statement requires much qualification. Theoretical results in any connection are often difficult to attain, but if we fail in such attainment it is incorrect to say "Theory is wrong." Theory based on intelligent investigation and reasoning cannot well be wrong, but practice may give any result depending on the care or neglect of it, on the part of the operator. The young works chemist ought to endeavour to be clear on that matter.

To sum up: A factory chemist ought to have a strong love for his work. He should possess or cultivate a quick and correct observation, and judgment to draw logical inferences from such observations. Knowing how much is trusted to his honour and honesty, he ought to have the highest regard for accuracy and truth; in short, he ought to be the personification of integrity.

FORMATION OF SULPHUR TRIOXIDE BY THE CONTACT ACTION OF FERRIC OXIDE.

BY PROF. G. LUNGE, PH.D., AND GEORGE P. POLLITT, B.SC., PH.D.

See this Journal, 1902, p. 1329.

Scottish Section.

Meeting held in Glasgow, on Tuesday, October 28th, 1902.

ADDRESS BY THE CHAIRMAN,

T. L. PATTERSON.

The Chairman, in the course of a short address, referred to the difficulty of obtaining material for the Sectional Meetings, and urged on the members the necessity of maintaining the interest of the meetings by reading papers and bringing forward subjects for discussion. The following is an extract:—

The original communications and abstracts of other papers given to the world through the Journal of our Society have, in a very marked degree, tended to increase the knowledge of chemical and technological processes, and to place chemical industry, as a whole, and the chemical industries of this country, in particular, on a sounder basis than they ever were before. Such information must be of the very greatest advantage to every individual member of the Society, for I am persuaded that there is no one engaged in any branch of technology in which chemistry plays even a remote part but has been enriched by the careful study of the Journal. Having been 21 years in existence last June, our Society has passed its majority, and although complaints of apathy have been made on the part of some of its members, it belies none of the promises made at its inception. Its remarkable development is shown by the multiplication of sections, the increase of its membership, and the growth of its Journal. It is now established on so firm a basis, that those who take any interest at all in its proceedings would be shut out from a wide field of chemical thought and activity were it to cease to exist.

Apart from the miscellaneous subjects discussed at our meetings, the Society may be said to be one in which every active member is more or less engaged in a combat with "rule of thumb," and endeavouring to overthrow that old giant by the application of the exact processes of chemical and physical science. Every technical chemist has experienced the difficulties which meet him on all sides when he demonstrates by weight, measure, or formula the lines on which some old process may be improved or a new one established. Much has been done in this direction, but much remains to be done before the victory can be won. The growth of applied chemistry is well illustrated by reference to the number of industries which, even in my recollection, were not formerly believed to be in the remotest way benefited by the application of chemical principles, but which to-day would not be considered possible of success without a knowledge of chemistry or without the employment of one or more chemists to control the process of manufacture. Even purely chemical works used to rub along with a very trifling knowledge of chemistry on the part of the principal or any one employed by him. The raw material was purchased by appearance or after the application of the crudest tests, and the manufacture conducted with no means of control, save perhaps a hydrometer and a bit of test paper. This was the practice in the old kelp industry, in my young days where potash salts, iodine, and saltpetre were manufactured without any chemical knowledge whatever. Now the manufacturer finds it to his advantage to study the chemistry of his processes or to employ some one who does, so that there is hardly a great industry in the country from the manufacture of iron and steel to the treatment of sewage or the concentration of a salt solution, which is not conducted or controlled by chemists or chemical engineers.

With so many trained men at work all over the kingdom one is led to inquire how it is that the number of communications to this Society remain somewhat stationary or do not increase as the workers increase, or in proportion to the growth of the industries controlled. Is it because

manufacturers are afraid of making known some information which perhaps, through lack of sufficient scientific knowledge, they have acquired at considerable trouble and expense? Or is it because chemists are so busy overtaking routine work that they have neither time nor leisure to give any consideration to the subject? I am inclined to believe both causes have been at work. Some manufacturers have acquired methods of procedure which at one time perhaps were good and in advance of their neighbours, but rather than give some trifling information to a competitor by describing their processes or the chemistry of their processes, which sooner or later leaks out, prefer to say nothing at all. The chemists, if they have any, are kept plodding away at commercial analysis of the raw material or the finished product, and often little or no time is allowed, or considered necessary, for research and the study of theoretical and experimental questions which are absolutely necessary in these days of chemical progress and activity. Other manufacturers work each for his own hand as it were, keeping their processes secret; whilst a third class prefer to follow on the lines of their neighbours rather than strike out new paths for themselves. In all such cases, chemists realise the position, and are slow to discuss processes which they have in good faith, the discussion of which they know would be distasteful to an employer or third party. All honour to these chemists I say; their action is as it ought to be, and we sympathise with and respect them for it. But after all is said in excuse for silence, could not many of the chemists so employed find time for taking up a little investigation on their own account, it may be with or without reference to their special work, and submit it to the section for discussion without incurring the displeasure of an employer, but, on the contrary, with his full approval? I know that many employers are quite pleased, when their chemist has time, to see him so engaged. Are there not many processes open for discussion which might be described, or chemical descriptions of processes which should be given to this Society without touching on technical details? Are there not new ways of looking at old phenomena which, if brought up and discussed at our meetings, would set other men thinking, and lead to progress and development all along the line? I venture to think there are. All these fields of work are open to any chemist in a position to cultivate them. The last suggestion especially might be taken up with advantage to themselves by our younger men, who come into the domain of practical chemistry primed with new theories. I have been told of yet another class of members of our Society who study the Journal carefully, especially the abstracts, some of whom even come to our meetings and make good use of the information gained, who never think of giving the results of their experience in return. They freely utilise the work of other men's brains without a thought of doing more than contributing annually to the funds of the Society. I am speaking of some who are in a position to do better. This is hardly as it ought to be. It should not be all "take" and no "give." The Society and its Journal were established for the *mutual* benefit of all the members, and it should be the aim of each individual member who can to promote that object. There are, I am glad to say, noble exceptions, and we do get many valuable papers, notwithstanding the many hindrances, but in a Society such as ours we are surely entitled to expect more.

Now, I am not contending that members should discuss their secret processes before the Society, or that they should communicate the results of experiments or methods pertaining to these. As the old Scotch proverb has it,—

> "Aye keep something tae yoursel'
> Ye div'na tell tae ony."

And I give you the same counsel. But, apart from trade secrets, there are so many open subjects in the chemical and allied industries suitable for treatment and discussion, that the Committee would like each member to take the matter of preparing and reading a paper into his serious consideration. That which interests him and on which he feels free to speak will be sure to interest the Section and be a suitable subject for a paper. It is not necessary that it should be long; a number of short papers, it has often been truly said, are much better than one long one. They attract a greater number of members to the meetings and give rise to more discussion.

LEVAN: A NEW BACTERIAL GUM FROM SUGAR.

BY R. GREIG-SMITH, M.Sc., AND THOS. STEEL, F.L.S., F.C.S.

In the course of the manufacture of raw sugar from the juice of the sugar cane it sometimes happens, without any apparent cause, that the juice becomes viscous. The result is that the manipulation of the juice is rendered more difficult, and, what is of greater importance, commercially, considerable reduction is caused not only in the yield but also in the quality of the finished sugar.

From samples of such viscous sugar-cane juice, there was separated by one of us an organism, *Bacillus levaniformans*, sp. nov., which, when cultivated in suitable solutions, has the power of transforming saccharose into a gum which we have named levan, and a mixture of reducing sugars.

Separate papers have been contributed by us to the Linnean Society of New South Wales, and in its Proceedings (1901, Part IV.), the character of the bacillus, its action upon various sugars, the rate of fermentation, &c., are treated at length.

In this paper we have elaborated and combined our data connected with the growth of the organism and of the chemistry of its action on saccharose.

The viscosity may occur in the cane juice—the immediate product of the crushed cane—or it may develop at any stage in the manufacture of the raw sugar, especially if the juice or syrup be allowed to cool, or to stand for any length of time. Experience has shown that the only practicable way to minimise the trouble is to complete the crystallization of the sugar as quickly as possible.

The cause of the formation of the gum has hitherto not been definitely known. It should here be mentioned that the body under consideration is absolutely distinct from the gum existing in sugar cane affected by the well-known "gumming" or "gummosis" disease. In cane so affected the fibro-vascular vessels of the stalk are found to be plugged with a viscid gum, for which the name vasculin has been proposed by Cobb (Agric. Gaz., N.S. Wales, 1893, 777). This substance, and the nature of its associated bacillus, are at present under investigation by us.

From the viscous juice mentioned at the beginning of this paper, which was obtained from one of the New South Wales mills of the Colonial Sugar Refining Company, Ltd., several organisms were separated, and after various cultural trials, one was found, which, when grown in a Petri dish on nutrient agar containing saccharose, raised transparent mucilaginous colonies which grew freely and covered the surface of the agar. Various trials were then made by cultivating the pure organism at a temperature of 28° C. in sterile grass infusion containing saccharose and in other suitable media. In these the organism grew, producing reducing sugar and a gummy body which was readily precipitated by the addition of alcohol. By this time the organism had been found to be a bacillus, and in order to further study its nature and action on saccharose, as well as to obtain a sufficient quantity of the gum for examination, a culture medium containing the following ingredients was prepared:—Saccharose, 100 grms.; potassium chloride, 5 grms; sodium phosphate, 2 grms.; peptone, 1 grm.; water, 1,000 c.c. Litre portions of this in suitable flasks were sterilised by boiling, plugged as usual with cotton wool, and infected from a pure agar culture of the bacillus. These were incubated at 22°, 28°, and 37° C. respectively. The best growth was at the last temperature. The cultures soon became white and opalescent, like dilute separated milk. A thin film formed on the surface, and when the flasks were allowed to stand without shaking, a layer about a centimetre thick of a mucilaginous substance formed at the bottom of the liquid. When this was disturbed by repeated shaking, it remained suspended in the milky medium. The layer, when undisturbed, disappeared on continued incubation. The culture

fluid contained gum, unaltered saccharose, reducing sugar, and a small quantity of acid.

In order to separate the gum and permit of an examination of the sugars, various means were tried, but the most convenient precipitant was found to be alcohol. The presence of the small quantity of acid mentioned above, hinders the precipitation of the gum, but when the solution is rendered faintly alkaline to phenolphthalein with sodium hydroxide, precipitation is complete with three or four volumes of strong alcohol. After standing a few hours, the gum is filtered off upon a dry tared filter and scraped from the beaker, to which it adheres somewhat firmly. If necessary, the adhering particles are treated with a little hot water, precipitated again with alcohol, and added to the other portion. The gum is dried at 100° C., weighed, and the ash determined. On deducting the ash the weight of crude gum is obtained. The alcohol solution is distilled to a small volume and the residual syrup used for determination of the sugars.

The following table shows the progressive formation of gum and reducing sugar in cultures conducted as just described :—

The Fermentation of Saccharose at 37° C. in a Solution containing 100 grms. of Saccharose with Salts, and 1 grm. of Peptone per litre.

Time in Days	0.	2.	3.	4.	5.	7.	12.
Saccharose	100	67	41	31	21	9	6
Reducing sugars	..	19	36	44	52	60	62
Crude gum.....	..	11	18	23	27	31	31

The reducing sugars are calculated as dextrose. The formation of gum and the inversion of the sugar are seen to go on steadily from the second day, until a balance is practically established between the constituents on the seventh day. The saccharose is not completely inverted, nor is this to be expected.

Marshall Ward and Reynolds Green (Proc. Royal Soc., 65, [414], 79) found a complete inversion of saccharose with their sugar bacteria, but it is just possible that this was brought about by the acidity of the solution (their organism produced in the culture fluid 0·7 per cent. of acetic and 0·057 per cent. of succinic acids) during the chemical manipulation, and not by the invertase secreted by the organism. In our cultures, the acidity amounted to the equivalent of 0·07 to 0·08 per cent. of lactic acid, and even this small amount produced a notable increase in the invert sugar when not neutralised prior to manipulation. The acids formed by our bacillus had also a distinct solvent action on the gum itself.

The bacillus can grow with marked action upon saccharose in exceedingly poor nutrient solutions. The solutions in which the action has been already shown contained only $\frac{1}{10}$ per cent. of peptone. With smaller amounts the formation of gum is evident from the appearance of the cultures, although the action is naturally not so rapid.

With the object of determining the influence of peptone on the fermentation, cultures containing varying amounts of peptone, but with the other constituents as before, were made and analysed after five days' incubation. The results, expressed in terms of 100 parts of original saccharose, are given in the following table :—

	Percentage of Peptone in Culture Fluid.				
	None.	0·001.	0·01.	0·1.	1·0.
Saccharose	99·1*	97·0	71·0	21·0	4·0
Reducing sugars.....	0·5	2·0	23·0	52·0	58·0
Crude gum	0·4	1·0	6·0	27·0	37·0
Acidity as lactic acid per 100 c.c.	None.	0·002	0·03	0·08	0·18

* Estimated by difference.

It is evident from these results that the fermentative activity is considerably influenced by the presence of peptone. But although an increase of growth was expected from an increase of peptone, the relative formation of gum and mixed reducing sugars could not have been foretold. With increasing amounts of peptone, there is, proportionately, more gum than reducing sugars formed, and there is more saccharose fermented and more acid formed. With no peptone and with 0·001 per cent. of peptone, the changes are too small to enable any deduction to be made. The influence of the peptone on the formation of gum is better seen on comparing the amounts formed in 0·01 per cent. and 1·0 per cent. solutions ; in the former, the ratio of gum to reducing sugars is 1:3·8, whilst in the latter, it is 1:1·6. But since it is probable that the gum is formed from the sugar inverted, we might calculate the ratio between the gum and the sugar wholly inverted, *i.e.*, the saccharose which has disappeared calculated to hexose. With 0·01 per cent. of peptone, this ratio is 1:5·1, and with 1·0 per cent., it is 1:2·7.

In examining the action of the bacillus upon other sugars, solutions similar to those already employed, but containing other sugars in place of saccharose, were used. Commercial starch glucose was tried first, but although the organism grew well and produced a turbidity and flocculent sediment, there was no disappearance of dextrose and no formation of gum. Cultures were also made in solutions containing lactose, levulose, and maltose respectively, but in no case was there any gum formed.

Whether the gum is formed from the sugar by an enzyme extra-cellularly, or is the diffluent sheath or capsule of the organism, it is difficult to prove absolutely. The former view is held by Happ, and also, according to Lehmann and Neumann, by Ritsert, whilst Marshall Ward and Reynolds Green believe that the gum formed by their bacterium was nothing more than the extremely diffluent walls of the cell. From our observations, we are of opinion that the latter hypothesis is correct and that the gum is the capsule which has dilated so much that it has ceased to be a capsule, and has become diffused through the culture fluid. The dilatation or swelling is aided by the excreted acid, which thus becomes of assistance to the free movement and growth of the organism by removing what would otherwise be a hindrance. This explains the disappearance of the mucilaginous layer from the bottom of the culture flasks when incubation was prolonged.

Levan was prepared as already described, by growing the bacillus in the sterile saccharine cultural fluid. The fermentation was practically complete in seven days at 37° C., when the culture contained 3·1 per cent. of crude gum (*i.e.*, dried gum, less ash) and 6 per cent. of mixed reducing sugars. On precipitation with alcohol, dissolving in water and reprecipitating several times, a comparatively pure gum was obtained, which was quite free from sugars. After drying at 100° C., the gum purified as above contained 0·125 per cent. of nitrogen, equivalent to 1·0 per cent. of proteids. The ash amounted to 1·4 per cent. Deducting these constituents the preparation contained 97·4 per cent. of pure gum. It is on this figure that the products of hydrolysis, &c. below, are calculated.

Levan thus prepared is a yellowish-white solid, opaque when dry, and translucent when moist. It dissolves in a small proportion of water to form a mucilage resembling gum arabic, and on the addition of more water the solution becomes white and opalescent. The gum does not separate from the semi-solution when allowed to stand for lengthened periods nor when centrifuged.

Because of the persistent opalescence of the solution, which is not removed by any ordinary means of treatment such as filtration with aluminium hydroxide, &c., it is not easy to determine the specific rotatory power of the gum except in a somewhat dilute solution. A solution containing 1 grm. of crude gum in 100 c.c. of water, when observed in a 100 mm. tube in a Polarimetre-Laurent with monochromatic soda flame, gave a reading of $-0·39°$ at 20° C., which is equivalent to a specific rotation of about $[\alpha]_D^{20°} - 40°$ for the pure gum. After oxidation with nitric acid of 1·24 sp. gr. at 60° C., only oxalic acid was obtained; neither mucic nor saccharic acid was formed.

On treatment with dilute acids in the cold or more quickly on warming, the gum is readily and completely hydrolysed, the sole product being levulose, which is produced in practically the theoretical quantity required by the formula—$(C_6H_{10}O_5)_n + H_2O = C_6H_{12}O_6$. In some respects, this substance resembles Lippmann's levulan, a body found in the juice of beetroots and in the residual molasses produced during the manufacture of sugar therefrom. The most important points of resemblance are in yielding levulose on hydrolysis, and in possessing a lævo-rotatory power. From levulan it chiefly differs, (*a*) in having a much lower specific rotatory power, that for levulan being $[\alpha]_D - 221°$, whilst levan is only about $[\alpha]_D - 40°$; (*b*) in giving no blue precipitate with Fehling's solution; (*c*) in the concentrated solution not gelatinising on cooling; (*d*) in not becoming insoluble in water when dehydrated by alcohol; (*e*) in not being precipitated by lead subacetate.

In his original description (Ber., **14**, 1509), Lippmann stated that levulan yielded mucic acid on oxidation with nitric acid, and this statement has been copied into standard works (Thorpe, Dict. Applied Chemistry, ii., 280, 1891; Morley and Muir, Watt's Dict. of Chemistry, iii., 116, 1892; Allen, Commercial Organic Analysis, i., 423, 1898). Lippmann (Ber., **25**, 3220, 1892) subsequently corrected the statement, having found it to be erroneous.

In the following table the properties of levan are compared with those of the allied substances inulin and starch:—

—	Levan.	Inulin.	Starch.
$[\alpha]_D$	$-40°$	$-40°$	Strongly dextro-rotatory.
Oxidation nitric acid..	Oxalic acid; no mucic acid.	Oxalic acid; no mucic acid.	Oxalic acid; no mucic acid.
Cold water.....	Very soluble	Sparingly soluble.	Insoluble
Hot water solution after cooling.	Mucilaginous	Limpid	Gelatinous
Prolonged heating with water at 100° C.	Unchanged	Hydrolised to levulose.	Unchanged
Hydrolysis with acid..	Levulose	Levulose	Dextrose, &c.
Baryta water	Precipitate	Precipitate	Precipitate
Lime water	No precipitate.	*No precipitate.	Precipitate
Milk of lime.....	Precipitated	Not precipitated.	Precipitated
Strontia water.....	Precipitated	†	Precipitated
Lead subacetate	No precipitate.	No precipitate.	Precipitate
Ammoniacal lead acetate.	Precipitate	Precipitate	Precipitate
Action of solution on lead oxide in cold.	Does not dissolve PbO.	Dissolves PbO.	Does not dissolve PbO.
Ammoniacal silver nitrate in dark.	Not reduced	Reduced	Not reduced
Boiling Fehling's Cu solution.	No reduction	Slowly reduced.	No reduction
Iodine	No action	No action	Blue
Cuprammonium	Dissolves; does not deposit on standing.	Dissolves; throws down heavy precipitate on standing.	Does not perfectly dissolve; throws down moderate blue sediment.

* Under particular conditions a precipitate is produced when a strong solution of levan is mixed with lime water, but this is extremely soluble and dissolves readily in a small excess of either solution.

† Several samples of inulin prepared directly from dahlia tubers grown at Sydney gave a precipitate with strontia water, whilst a European commercial sample gave none. The Sydney preparations gave the normal $[\alpha]_D$ reading.

Besides the reactions noted in the table, levan is not precipitated by acid mercuric nitrate, by ferric chloride, by copper sulphate, or by tannic acid.

The barium compound prepared by freeing the gum from phosphoric acid by dialysis, treating with excess of baryta water, quickly filtering, washing with alcohol, and drying first in vacuo over sulphuric acid, and then in a current of air free from carbon dioxide at 100° C., under 100 mm. pressure, contained 19·85 per cent. of BaO, a percentage similar to that found by Asboth for starch (Analyst, 1887, **12**, 138).

On heating the dry and powdered gum in capillary tubes, it showed signs of melting at 183° C., at 193° C. the fragments became soft and adherent, and begin to rise in the narrow tube, at 198° steam bubbles were well marked, and at 206° the gum melted to a transparent frothy mass.

The nearest allies to levan appear to be inulin and levulan, but as has been shown, it differs in important respects from these. It also certainly differs from the described derivatives of inulin, *viz.*, pyro-inulin, metinulin, and levulin, as well as from the bodies which have been described as sinistrin, triticin, secalose, and myco-inulin.

The figures following show the effect of the growth of the bacillus in a solution of saccharose of 10 per cent. strength, as described at beginning of this paper. After removal of the gum by precipitation with alcohol (the acidity being first neutralised with sodium hydroxide), and concentration of the saccharine solution, the residual syrup was found to contain for each 100 parts of saccharose originally present: saccharose, 5·4; dextrose, 41·4; levulose, 20·6. It is thus seen that during its growth, the bacillus has inverted the saccharose and assimilated levulose. The difference between the dextrose and levulose in the residual syrup represents the levulose which has been used by the bacillus, and amounts to 20·8 per 100 of original saccharose. Were there as much levulose present as dextrose, the sum of the two sugars would be 82·8, which is equivalent to 78·7 of saccharose. This proportion, with the 5·4 still present, leaves 15·9 of saccharose not accounted for. A little of this may be due to mechanical loss during manipulation; and the remainder, which may be stated as at the very least 10 per cent., represents saccharose used up by the bacillus in addition to the missing 20·8 of levulose. These results were checked by examination of several different cultures, and in each case figures of a similar nature was obtained.

In a culture made in 20 per cent. solution of saccharose, the growth of the bacillus was not nearly so abundant as in those made in 10 per cent. solutions, and the transformation of saccharose was correspondingly less complete.

The nature of the acids secreted during the growth of the bacillus is of interest, even though the total amount of these be relatively small. Carbonic acid was evolved in the proportion of about 1·28 grms. for each litre of cultural fluid containing 10 per cent. of saccharose. Of the acids remaining in the fluid, the most abundant was lactic, which was responsible for the greater part of the acidity. Besides these there were present smaller amounts of capric, butyric, acetic, and formic acids.

In the mucinous fermentation of beet juice by some bacteria, as, for example, *Leuconostoc mesenterioides*, the sugar is changed partly to dextran (also called fermentation gum), of which there are two modifications, one soluble, the other insoluble in water, and partly to the hexatomic alcohol mannite. Another gum-producing organism, *Bac. gummosis*, Happ, also forms mannite when grown in sugar solutions. A careful examination of the cultural fluid from the growth of *Bac. levaniformans* was made, but no trace of mannite could be detected. Ordinary alcohol also was not amongst the products of the fermentation.

So far, we have been considering the action of a bacillus which was separated from cane juice. In the examination, however, of a number of raw and refined sugars, many races of the same organism were isolated. By the cultivation of these on various media, such as agar, gelatine, potato, bouillon, and milk, well-marked differences in habit were brought out. These races could be divided into one, two, or three groups, according to the value placed upon their growth characteristics. By repeated cultivation, the characters of one group alter and become identical with those of another, until reversion to the normal type is complete. The change to the normal type occurs in the course of a few crops or transfers in the case of some of the races, whilst with others reversion was much slower.

The existence of these different races can perhaps be best accounted for by the varying physical conditions that have obtained during the process of manufactoring the sugar. These would be quite sufficient to cause the change from one race to another. The cultural variation of the

race has but little if any effect upon the production of levan, the yield of this substance apparently depending on the nature of the medium in which the organism is grown.

The normal type of *Bac. levaniformans* may be described as a rod with rounded ends, the individuals occurring singly and in chains. The dimensions vary considerably, the cells usually measuring 0·4—0·6 by 2—3 μ. Some of the derived races consist of a mixture of short stout, and of long rods, varying from 1·3 by 2·0 to 1·0 by 6 μ. Germination is lateral. The rods are motile, and in bouillon move about with a wriggling motion. In films of fluid saccharose media, the newly germinated rods have an active darting motion. There is practically no growth under anaërobic conditions.

The rod forms a small oval and generally central endospore. The spores, like those of other bacilli, are capable of withstanding a moist heat of 100° C. for some time. Several tubes of saccharose media were infected with spores, and, after attaching aerial condensers, the tubes were immersed in brine which was kept slowly boiling. The media in the tubes boiled briskly. At various intervals up to five hours, tubes were taken out, cooled, and thereafter incubated at 37° C. In all cases growth occurred and gum was formed. The spores can, therefore, withstand the action of boiling water for at least five hours, thereby proving as tolerant of heat as the potato bacillus of Lafar, the most powerfully resistant organism hitherto known.

It is a matter of common observation that considerable alteration may take place in the composition of raw sugars either whilst awaiting shipment from the sugar-mills, during transport, or whilst lying in store at the refineries. The most prominent sign of this change is an increase in the amount of reducing sugars. This alteration means of course a corresponding depreciation in the value of the sugar, and the monetary losses caused thereby have at times been very heavy.

An examination of numerous samples of raw and refined sugars from various parts of the world, has shown *Bac. levaniformans* to be very widely, if not universally, distributed, and its presence was not confined to sugars derived from the sugar cane, for we found it in both raw and refined beetroot sugars. Whether the bacillus exists in small or large numbers in any given sample is of little significance; the mere fact of its being present is sufficient, as, under favourable conditions, multiplication is very rapid.

Although present in so many different samples, the organism is not in an active or growing state in all. When the conditions (moisture, temperature, &c.) are unfavourable, growth will be in abeyance, and in such cases the sugar will remain unchanged. In all samples of sugar examined by us in which spontaneous inversion was known to be proceeding, the bacillus was found in an active state, and, in some cases, in practically pure culture.

It has been already noted that, in experimental cultures, an increase of peptone gave an increase of gum levan and a relative decrease of hexoses (reducing sugars), and conversely, with decreasing amounts of nitrogenous material, there was a decrease of gum and a relative increase of reducing sugars. We have further shown that the bacillus is capable of growing in solutions of cane sugar containing but a trace of nitrogenous food, as, for example, in solutions containing one-thousandth of a per cent. of peptone.

The amount of nitrogenous matter existing in refined sugar crystals is infinitesimal, whilst that in raw sugar is also but small, and it is probable that when the bacillus is growing in such sugars the gum-forming faculty may be in abeyance. Examination of sugar samples in which a vigorous growth, accompanied by heavy inversion, had taken place, showed the complete absence of gum.

An interesting instance is furnished by a sample of raw sugar which had been damaged by water and so rendered particularly suitable for the growth of the bacillus. In November 1895, when the observation commenced, this sample contained close on 7 per cent. of water and 0·90 per cent. of reducing sugar. The sample was kept in a stoppered bottle, which was only partially filled, and the reducing sugar determined from time to time. The amount of reducing sugar rose steadily, until, in November 1901, it amounted to 32·7 per cent., of which 18·9 was dextrose and 13·8 levulose. The bacteriological examination showed that the sugar contained *Bac. levaniformans* in practically pure culture, there being present one inert bacterium to every ninety-nine active bacilli. A careful chemical examination was made, but no levan could be detected. It is quite probable that the physical condition of the sugar, as regards moisture, temperature, &c., may have an influence on the bacillus of the same kind as is produced by nitrogen starvation. Further, the hydrolytic action of the acid products of the fermentation will also tend towards the disappearance of any gum which may be formed.

The facts which we have recorded above render it highly probable that this organism is responsible for the bulk of the deterioration of sugar during transit and in store, which has been noted from various parts of the world, and has from time to time been the cause of heavy loss to sugar manufacturers and refiners. A certain degree of moisture and warmth appear to be the predisposing causes for the growth of the bacillus, whilst experience has shown that absence of moisture is the surest safeguard in the other direction.

We will now offer a few comments on the means to be used to prevent the undesirable growth of *Bac. levaniformans* in the syrups and liquors of the factory or refinery as well as amongst the bulk sugars. The bacillus itself is readily destroyed by a very moderate amount of heating, such as is commonly used during the ordinary processes of defecation and boiling. But not so the spores, which, as we have shown, can resist exposure to boiling water for at least five hours, and so can pass unscathed through all the heating operations to which they would be subjected during the process of manufacturing or refining sugar. In the case of those raw sugar mills which make use of superheating methods of clarification, during which operation the cane juice is subjected under pressure to a temperature higher than the boiling point of water, it may be that the spores are destroyed. But as the operation usually lasts for a very short time, we are doubtful if complete destruction of the spores will result. Obviously our aim should be to so check the growth of the organism as to prevent any formation of spores inside the walls of the factory. In dealing with the various syrups and liquors this can readily be done by taking care that these do not lie for any longer time than can be avoided, but are kept hot and worked up as rapidly as possible. In the refinery special attention should be given to the thin runnings and sweet-waters, from filters, char-cisterns, &c., as these are particularly liable to bacterial growth of many kinds, whilst in the sugar mill the cane juice itself forms a perfect pabulum for the same class of organisms. Further, every care should be taken, by frequent washing, to keep all tanks and vessels scrupulously sweet and clean. But more than this will be necessary. Not only must the vessels themselves be kept clean, but the floors and surroundings also. Any pools or dark corners in which spillings and splashes of saccharine liquids can lie and ferment will quickly become points of infection from which crops of spores, not only of the organism which we have been considering, but also others perhaps equally harmful, may contaminate everything in the factory. By preventing the growth of the bacillus during the process of manufacture or of refining, we shall have gone a long way towards having the finished sugar free from this objectionable organism. If the bacillus be not present in the liquors from which the sugar is boiled, it can only get into the latter extraneously, and if care be taken to keep the entire factory clean and free from sources of infection, obviously the chance of contamination of the sugar is very much reduced.

In bulk raw sugars it is a curious fact that it is not in those of low quality such as are known as second jet, syrup tank, or concrete sugars, that the greatest amount of depreciation through the growth of the bacillus has been found. Although such sugars always hold much more moisture and organic matters other than sugar, than do the first jet or first grade sugars, and would therefore naturally be considered as so much more suitable for the support of the bacillus, the greatest amount of depreciation has been

actually found to take place amongst the better grade sugars. In fact so small is the change usually taking place in low quality sugars during storage, that it is comparatively unimportant and is hardly worth consideration. The cause of this is not easy to find, but in all probability it lies in some difference in the nature of the associated organic bodies in the two classes of sugar, though the chemistry of the subject is at present not sufficiently well advanced to enable us to arrive at any definite conclusion on this point.

Without doubt the best plan for the prevention of the injurious growth of the bacillus in the high-grade sugars is to render these physically unsuitable for the well-being of the organism. The most obvious means of attaining this end is to render the sugars as dry as possible, whilst at the same time the purer they are made the simpler becomes the problem of making them sufficiently dry, and the less nutrition, in the form of nitrogenous organic bodies, is left for the nourishment of the bacillus. The most efficient method known to us for attaining this double end is to submit the sugar, whilst in the centrifugal machine, to the cleansing action of steam. Highly efficient appliances for this purpose, such as Walker and Patterson's patent machine, are readily obtainable, and the hot purified sugar, when it leaves the machine, easily attains a degree of dryness which renders it quite proof against bacterial growth. If steaming of the sugar is not practicable, drying, though in a much less perfect degree, can be carried out in one of the well-known appliances used for this purpose.

In most tropical climates the sugar, after such treatment, will readily absorb sufficient moisture from the atmosphere to permit of mischievous bacterial growth taking place. Care should therefore be taken to so stack the sugar after bagging, as to reduce to a minimum the surface exposed to the air, and to have it shipped to its destination as quickly as can be managed. No advance in this matter can be made without trouble, and the losses to manufacturers through bacterial depreciation have in the past been so enormous as to render it imperative that every possible means be used for its prevention. Comparatively speaking, very little air was required for the growth of the bacillus, and air would diffuse slowly through even very sticky sugars. Doubtless careful investigation would clear up points like this, which at present it is impossible to explain.

Discussion.

Dr. Frew said that the development of viscosity by the agency of micro-organisms was of interest to brewers, wine growers, dairy proprietors, and even to those engaged in the manufacture of gum, as well as to the sugar refiner. He (Dr. Frew) was most interested in the author's account of the chemical action of the *Bac. levaniformans* upon cane-sugar solutions, and in the way in which they had been able to separate the invertive and fermentative (gum-forming) functions of the organisms. Having regard to the fact that the levulose formed by the inversion of the cane sugar diminished in quantity as the gum increased, and that, by the hydrolysis of levan, levulose was produced, it was evident that the gum-formation was the result of a fermentative change of this sugar. He (Dr. Frew) inclined to the belief that the formation of levan was a true fermentative change in the fluid, and not simply the development by the organism of a diffluent sheath or capsule. The non-production of levan by the organism when grown in levulose solutions might be simply due to want of the proper conditions, as, for instance, the absence of dextrose, and it would be interesting to ascertain what would occur if the organism were grown in a nutrient solution containing dextrose and levulose in equal quantities.

Mr. Biggart thought the Society very much indebted to our Colonial members for their instructive and valuable paper. Whilst not prepared to criticise the paper from a bacteriological point of view, he could speak from experience regarding the serious deterioration sugar occasionally suffered on keeping, and what a benefit and source of profit to the trade would be any discovery which would remove or arrest this harmful alteration.

He recalled particularly the case of a West India sugar of which he made a test. The refiners original sample gave about 1½ per cent. of invert sugar, and on melting the sugar some months thereafter, it was found to work very badly, and a fresh test showed that the invert sugar had risen to between 7 and 8 per cent. This change at once explained the unsatisfactory refinery results. He also referred to the greatly accelerated depreciation of raw beet-sugar when it becomes acid, stating that new beet-sugars are either all alkaline or tend to be so.

The authors, in their paper, referred to the peculiar circumstance that many low sugars, which one would consider must contain more bacterial food, and so would be subject to greater change, keep well, and often very much better than the drier sugars. He suggested as an explanation (the bacteria being aërobic) that it was most probable that, within low syrupy sugars, little or no circulation of air was going on, and so the bacteria would find these low sugars unsuitable habitats.

Mr. Steel, in reply, said that Dr. Frew had raised some interesting points which, like many other side-issues that arose during the progress of the investigation, were most enticing. But to get to any sort of finality, it had been found necessary to carry out the main line of the research, leaving many matters for future study.

The question of the precise nature of the gum, whether it was formed as a direct product of the fermentation, or consisted merely of the diffluent capsule of the organism, was one which was not easy of solution; but they were disposed to the latter hypothesis, which was the conclusion also arrived at by Marshall-Ward and Reynolds Green in their study of a similar organism.

Mr. Biggart's experience with a sugar suffering heavy inversion was an interesting one, but one which was all too common in the trade. He (Mr. Steel) had no doubt that the mischief was due to the bacillus under consideration.

Possibly, the immunity of moist low-grade sugars might, to some degree, be due to the cause mentioned by Mr. Biggart but he thought that there was more than this. In his (Mr. Steel's) experience, samples like the case instanced in the paper, which were so wet as to form a dense syrup, would allow of a full growth of the organism.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1385
II.—Fuel, Gas, and Light	1386
III.—Destructive Distillation, Tar Products, Petroleum	1390
IV.—Colouring Matters and Dyestuffs	1390
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1392
VI.—Colouring Wood, Paper, Leather, &c.	1393
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1393
VIII.—Glass, Pottery, and Enamels	1395
IX.—Building Materials, Clays, Mortars, and Cements	1395
X.—Metallurgy	1398

Class.	Page.
XI.—Electro-Chemistry and Electro-Metallurgy	1401
XII.—Fats, Fatty Oils, and Soap	1403
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1403
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1404
XV.—Manures, &c.	1405
XVI.—Sugar, Starch, Gum, &c.	1405
XVII.—Brewing, Wines, Spirits, &c.	1407
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1407
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1408
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1409
XXI.—Photography	1411
XXII.—Explosives, Matches, &c.	1412
XXIII.—Analytical Chemistry	1413
XXIV.—Scientific and Technical Notes	1417

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Stirring and Mixing Apparatus. C. Postranecky, Dresden-Lobtau, Germany. Eng. Pat. 15,783, July 15, 1902.

The rotating stirrer is arranged obliquely in the stirring vessel, and a double action is effected by a planet motion of the stirrer around the central axis of the vessel, or by rotation of the vessel itself. In consequence of this double action, the arms of the stirrer strike through the top and bottom layers of the material in the vessel alternately in all parts, and effect a thorough kneading or mixing.—R. A.

Drying Humid Material reduced to Grains, Shavings, or Small Particles; Apparatus for ——. A. Huillard, Suresnes, near Paris. Eng. Pat. 17,663, Aug. 12, 1902. (Under Internat. Conv., Feb. 10, 1902.)

The apparatus comprises a vertical cylinder divided into compartments by horizontal perforated plates, a hollow truncated cone beneath a central aperture in the division plate at the top of each compartment, and spirally arranged paddles carried by a second series of truncated cones on a rotating shaft co-axial with the cylinder. Each of the second series of cones is closed at the top, and forms a platform of greater diameter than the cones first mentioned. The materials are introduced at the upper end of the cylinder, and the drying gases or vapours at the lower end.—R. A.

Evaporating [Crystallising, &c.] Apparatus. R. J. E. von Seemen, Rheinfelden, Switzerland. Eng. Pat. 19,034, Aug. 29, 1902.

The apparatus is for evaporating liquids which are to crystallise, and which are required to remain as far as possible quiescent during heating. In the interior of the evaporating vessel, large chambers are provided, which are not affected by the vigorous movement taking place in the parts of the liquid in direct contact with the heating bodies, so that the liquid to be evaporated may always be at rest in the chambers.—R. A.

Furnace; An Improved ——, for use in Fusing or otherwise Treating Metals, Minerals, or other Substances where High Temperatures are required. J. T. Shadforth, Walker-on-Tyne. Eng. Pat. 16,274, July 22, 1902.

"A furnace for smelting ores and for like purposes, comprising a liquid-fuel vaporising chamber, a combustion chamber to which superheated steam" (from boilers and flues within the furnace) "and the combustion gases or flames from the main flue are admitted, and a series of heating chambers in which the melting pots or other open or closed receptacles are located."—E. S.

French Patents.

Lining of Vessels or Objects having to resist Acids; New Product applicable to the Construction or ——. J. and J. B. Vernay. Addition, dated Jan. 20, 1902, to Fr. Pat. 301,875, July 5, 1900.

Bone fat, refined by heating with acid, is melted with caoutchouc, tar or resin, and sulphur. The product is pressed into slabs, which are attached by combined heat and pressure to the surface of the vessel to be lined. —L. A.

Filter-Presses; Impts. in ——. Meura. Fr. Pat. 318,064, Jan. 28, 1902.

The holes in the filter cloths, usually provided for the admission of the material to be filtered into the chambers, are avoided, by employing a movable main-supply pipe outside the press, communicating by means of branches with each of the filtering chambers. The communication of these branches with the chambers can be opened or cut off by means of levers, and so as to admit of pressure being applied in the filter. An indicating cock is fitted to the non-washing section of the press in order to control the progress of the washing.—J. F. B.

Air and other Gases; Liquefaction of ——. C. Joly and E. J. Richardson. Fr. Pat. 318,153, Jan. 28, 1902. (Under Internat. Conv., July 31, 1901.)

See Eng. Pat. 15,511 of 1901; this Journal, 1901, 1095. —L. A.

United States Patents.

Water Purification; System of Feed- ——. A. Sorge, jun., Chicago. U.S. Pat. 708,088, Sept. 2, 1902.

A water-softening process, consisting in the regulated admission of sodium carbonate solution to the water-heater. The solid sodium carbonate is contained in a separate vessel, to which steam is allowed to enter from the water-heater, and, condensing, forms a solution of the carbonate. This solution is then admitted through an arrangement of needle-valves to the water in the heater. The water-heater contains a number of filtering bags filled with crushed quartz, through which the softened water passes before being drawn off.—W. P. S.

Distilling Apparatus. H. Hirzel, Leipsic-Plagwitz, Germany. U.S. Pat. 710,974, Oct. 14, 1902.

A distilling column, comprising a series of superposed partitioned trays, means for passing the heating medium (steam) downwards through each of the trays in succession, and means for conveying the residual liquid from each tray into the lower part of the tray below.—R. A.

II.—FUEL, GAS, AND LIGHT.

Acetylene; Impurities in and Purification of ——. G. Keppeler. J. f. Gasbeleucht., 1902, **45**, [42], [43], and [44], 777, 802, and 820.

Phosphorus.—Lewes has found that an acetylene containing less than "80 per cent. of phosphine," part of the latter undoubtedly existing as P_2H_4, is not liable to spontaneous inflammation, even if the mixture be warmed with hot water. When generated by the "drip" system, however, the gas coming from a carbide containing 1 per cent. of calcium phosphide catches fire of itself, whereas if the carbide-to-water method be adopted, 25 per cent. of calcium phosphide is needed to produce the same effect. The highest proportion of phosphine ever met with in acetylene evolved from ordinary carbide has been returned at 2·3 per cent. (Lewes), and this gas was not spontaneously

inflammable. In fact, only one case of spontaneous inflammation has been recorded, and this dated from the earliest years of carbide manufacture; none of the accidents which have happened with acetylene plants have been due to this cause. Caro has shown that crude acetylene may contain organic compounds of phosphorus, especially if a high temperature has been produced in the generator. These compounds are of a basic nature and contain nitrogen; they may be extracted from the gas by washing with petroleum spirit.

Sulphur.—Properly made acetylene seldom contains sulphur as H_2S. When the gas from a hot generator, and the spent liquor in any apparatus, does contain H_2S, this is due to the influence of the high temperature in the first case, and to the presence of aluminium sulphide in the carbide in the second. In the absence of the aluminium sulphide, Wolff has demonstrated the existence of H_2S in the gas; here the calcium sulphide has probably been converted into calcium sulphydrate by the water, sulphuretted hydrogen being evolved from it by the action of heat. The sulphur of crude acetylene exists partly as organic compounds, the proportion being higher if the gas comes from a hot generator. Part of these bodies are soluble in ether and petroleum spirit, part insoluble; the soluble portion Caro rightly considers to consist of mustard oils, the insoluble he holds contain mercaptans. The latter are readily extracted from the gas by an acid solution of cuprous chloride, or oxidised by chromic acid; they appear to be not easily acted upon by bleaching powder. The author has examined the precipitate obtained when crude acetylene is led into mercuric chloride solution strongly acidified with hydrochloric acid. Beyond proving that the precipitate is not identical with that given by phosphoretted hydrogen, that it contains mercurous chloride, and that it evolves a gas (which is not precipitated by more mercuric chloride, nor absorbed by caustic potash) on treatment with nitric acid, he has not been able to ascertain its exact constitution. By washing crude acetylene with hot aniline, the existence of Caro's oil of mustard has been corroborated. Attempts to study the impurities by examining spent purifying materials have not been successful. All the sulphur compounds, as well as those of phosphorus, tend to give trouble at the burners, since they block up the fine holes; a proper system of purification should therefore remove both sulphur and phosphorus.

Ammonia.—Crude acetylene always contains ammonia. This may arise from aluminium or calcium nitride in the carbide. According to Lewes, the proportion of NH_3 in the gas ranges from 0·16 grm. (carbide-to-water gas) to 0·95 grm. (drip generator gas) per litre; Rossel and Landriset return the variations as between 0·0 and 0·4 grm. per 100 litres. Ammonia is very objectionable in the gas: it corrodes brass pipes, assists the formation of explosive acetylene-copper compounds, and, according to von Scepczyuski, produces pyrrol at the burner orifices, and so stops them up.

Hydrogen Silicide.—Lewes has asserted the presence of this impurity in crude acetylene, returning its maximum proportion as 0·01 per cent. Did it exist in acetylene in appreciable quantity, hydrogen silicide would be harmful, for it is spontaneously inflammable, and it would block the burners by deposition of silica.

Oxygen, nitrogen (or air), hydrogen, carbon monoxide, methane, unsaturated hydrocarbons other than acetylene itself, and saturated hydrocarbons have all been found in crude acetylene in various amounts; but with the exception of minute quantities of nitrogen and carbon monoxide, which occur in crevices of the carbide, and of hydrogen, which may be produced by the decomposition of phosphine, these foreign bodies are formed by the action of high temperatures in the acetylene generator, or are added, as air, to the gas by a badly designed apparatus. They do not, therefore, have to be removed by methods of purification; their formation must be prevented. They are objectionable because, as diluents, they lower the illuminating power of the acetylene, or because they cause stoppages in the pipes. Experiments on the absorption of the true acetylene in crude gas by means of sulphuric acid containing 25 per cent. of SO_3 have indicated an average gaseous residue of 2 to 2·5 per cent. Eighty per cent. of this is air, with nitrogen in some excess. Methane and hydrogen are absent, but 0·6 or 0·8 per cent. of the residue (*i.e.*, 0·015 to 0·02 per cent. of the original acetylene) consists of carbon monoxide.

For the purpose of gauging the value of the purifying materials described below, the author employed the analytical process he and Eitner have already recommended (this Journal, 1901, 938); while he also used a modification of Fischer's apparatus for estimating sulphur in coal-gas. In the latter case the gas was burnt from an acetylene Bunsen under a trumpet connected with a ten-bulb condenser, the lower bulbs of which were charged with beads made of a specially hard glass capable of resisting the attack of phosphoric acid. The purifying material was placed in a glass vessel so that a space of 500 c.c. was occupied, the quantity of substance required to fill it being 400 grms. of (2), 250 grms. of (3), 230 grms. of (4), and 360 grms. of (5). The gas was led through at a speed of 10 litres per hour, tests being made at intervals for the amount of phosphorus and sulphur escaping.

The substances which have been proposed as chemical purifiers for acetylene are five in number: (1) ordinary ferric hydroxide as used for coal-gas. (2) "Heratol," a solution of chromic acid in acetic or sulphuric acid absorbed in kieselguhr, advocated by Ullmann. (3) "Acagine," a mixture of bleaching powder with 15 per cent. of lead chromate, as recommended by Wolff (the specimen examined by the author containing 15 per cent. of barium sulphate as well, and having 16 per cent. of active chlorine); and (4) "puratylene," a mixture of bleaching powder with calcium chloride and calcium hydroxide, prepared by a special process to give it porosity, the author's sample containing 18 or 19 per cent. of active chlorine. These act by oxidising the impurities of the gas and by mechanically retaining the less volatile fluid impurities (tar). The last acts by decomposing the impurities. (5) "Frankoline," a solution of cuprous and ferric chloride in strong hydrochloric acid absorbed in kieselguhr, proposed by Frank. Especially for small plants, ferric oxide is practically useless, a crude acetylene containing 0·61 grm. of phosphorus and 0·27 grm. of sulphur per cubic metre still retaining 0·51 grm. of the former and 0·23 grm. of the latter after passing the purifier. Heratol is the most perfect in its action, no other substance removing the impurities so completely until it is exhausted, and no other being so rapid in its effect. 1 kilo. of heratol purifies 5 cb. m. of ordinary gas, the precise amount of CrO_3 present, within certain limits (110 to 136 grms. per kilo.), being unimportant. The substance continues to purify until only some 3·6 or 3·8 per cent. of the CrO_3 remains unreduced. It acts, however, upon the acetylene itself, in one experiment 13 per cent. of the CrO_3 being consumed in this manner. Heratol changes in colour in the purifier, altering from its original yellow to a dirty greenish tint. Acagine purifies about 13 cb. m. per kilo., but before it is exhausted it begins to allow phosphorus and sulphur to pass. In contradiction of what has been asserted, acagine does attack acetylene, the gas issuing from the purifier containing 0·2 to 0·8 grm. of chlorine per cubic metre. The amount of acetylene destroyed, however, is insignificant, and the added chlorine hygienically unimportant. The value of the lead chromate, which is employed to retain the chlorine evolved from the bleaching powder, seems problematical, for an extraction of the spent mass with acid shows that the chromic acid of the chromate has not been reduced. 1 kilo. of puratylene purifies 10 cb. m. of crude acetylene, its action (particularly as regards phosphorus) being satisfactory. It continues to act until it is practically exhausted, the spent mass only containing 2·8 per cent. of active chlorine. Puratylene attacks the acetylene itself somewhat more than acagine, the issuing gas yielding 0·15 grm. of chlorine per cubic metre. It retains ammonia perfectly, owing to the calcium chloride in it. Puratylene also begins to let phosphorus pass before it is wholly spent. All purifying materials containing bleaching powder permit the escape of sulphur compounds, but are more efficacious as regards phosphorus; acagine, however, is but little inferior to heratol in this respect, and the quantities of sulphur so left in the gas may be considered harmless, as experience with coal-gas has shown in the past.

kilo. of frankoline removes the phosphorised impurities from 9 cb. m. of gas, but it is the least efficient of all the materials as regards the sulphur, leaving 0·20 grm. or more per cubic metre unextracted from the beginning. Still, this amount of sulphur may be held to be unimportant in practice. On the other hand, frankoline does not attack the acetylene itself, and any vapours of hydrochloric acid issuing from the purifier can be removed by chalk. Originally it was claimed that frankoline might be regenerated by exposure to air, but this process is only available in the case of a liquid, and even there it is not complete. Liquid purifying materials of any kind are not to be recommended, since the gas tends to pass through them in large bubbles; a solid substance also retains heavy liquid impurities. Put comparatively, the efficiency of the four materials per kilo. may be said to be as follows:—Heratol, 5,000 litres; frankoline, 9,000; puratylene, 10,000; acagine, 13,000 litres. In practice these numbers may be increased 10 and perhaps 20 per cent., but assertions which have been made giving such figures as, for example, 50,000 litres of ordinary crude acetylene, must be regarded as exaggerated.

Annexed is a bibliography of the subject, references being made to the pages of this Journal:—

Phosphorus: Moissan, 1899, 517; Rénauld, *ibid.*; Caro, 1899, 818; Lunge and Cedercreutz, 1897, 1046.

Sulphur: Moissan, 1898, 1030; Caro, *loc. cit.*

Ammonia: Bamberger, 1898, 745.

Carbon Monoxide.: Lundström, 1899, 476.

Various Impurities: Lewes, 1894. 505; Rossel and Landriset, 1901, 345.

Purification: Ullmann and Goldberg, 1899, 743; Ahrens, 1899, 819 and 903.

Analysis: Rossel and Landriset, 1901, 345; Eitner and Keppeler, 1901, 938.—F. H. L.

Prussian Blue in Spent Oxide; Determination of ——. H. Lübrig.

See under XXIII., *page* 1415.

English Patents.

Fuel, Artificial; Manufacture of ——. S. G. Coulson, Sheffield. Eng. Pat. 7884, April 4, 1902.

Crushed coal, peat, or coke is mixed with from 0·3 to 1·5 per cent. of "the fibrous paste extracted or formed from the fleshy roots of the manioc shrub," and after incorporating these under the influence of heat and steam, so as to bring the vegetable matter to a gelatinous condition, the mass is compressed into briquettes and dried.—H. B.

Charcoal Retorts and Furnaces. C. E. Laurenius, Gothenburg, Sweden. Eng. Pat. 15,691, July 14, 1902.

At the part of the surface of the retort adjacent to the fireplace there are arranged one or more slits or openings communicating with the interior of the retort, but more or less closed with porous packing material, so that the gases developed in the retort can be retained to a certain extent without being prevented from gradually passing through to the fireplace where they are ignited. There may be two or more vertical retorts provided with a common furnace or fireplace. Or, there may be a number of retorts with their fireplaces arranged in a furnace around a common central chimney.—R. S.

Furnaces and Kilns; Regenerative and other ——. J. A. Drake, Ovenden, Yorks. Eng. Pat. 22,891, Nov. 13, 1901.

Forced draught is supplied to either the primary or the secondary air inlets, or to both, as desired. Induced draught may be used in addition.—R. S.

Gas Jets; Construction of High-Power Oxyhydrogen Mixed ——. C. W. Locke, London. Eng. Pat. 20,063, Oct. 8, 1901.

The whole jet is balanced upon a support, the mixing chamber being behind the support and the delivery tube (which is longer than usual) in front of it. The cut-off valve is placed in the delivery tube, and, when it is shut, a bye-pass is automatically set in action.—R. S.

Vapour-Burners for Heating Purposes. C. J. Wilson and L. G. Heist, New York. Eng. Pat. 11,705, May 22, 1902.

See U.S. Pat. 702,553; this Journal, 1902, 963.—H. B.

Gas Producers; Improvements in ——. W. J. Crossley, Manchester, and J. Atkinson, Marple. Eng. Pat. 22,016, Nov. 1, 1901.

A gas-producer in which fuel (more particularly bituminous fuel) is introduced at the top into a fuel chamber projecting downwards slightly into the body of fuel, and is consumed downwards continuously by means of air, or air and steam, also introduced at the top, the gases generated being discharged downwards, together with the ash, through the annular space formed between the periphery of a rotating grate and the bottom of the producer walls. The air, or air and steam, are heated by passing up through an annular space formed between the producer and an outer casing, before entering the top of the former.—H. B.

Acetylene or other Gas; Appliances or Chambers for Purifying ——. J. McNally, Cookstown, Ireland. Eng. Pat. 2001, Jan. 25, 1902.

This is a vertical cylindrical vessel made of glass, porcelain, or, preferably, glazed fireclay, so that liquid acids or acid purifying materials can be used in it. At its upper end it is provided with an external flange having four slots, so that a metal cover can be fastened to it air-tight by means of the usual bolts and wing-nuts. Inside it are placed various movable earthenware grids for the purifying substance to rest on.—F. H. L.

Acetylene or other Gases; A New Solid Compound containing Alkali Hypochlorite, and the Various Applications thereof, particularly for the Purification of ——. L. M. Bullier and L. G. Maquenne, Paris. Eng. Pat. 15,261, July 8, 1902. (Under Internat. Conv., July 9, 1901.)

Sixty parts of bleaching powder are mixed with 40 parts of sodium sulphate (silicate or carbonate, &c.), and the whole is compressed. A double reaction occurs, which yields sodium hypochlorite and calcium sulphate, the latter "setting like plaster with the water of crystallisation of the salt, and imparting to the mixture the required compact texture."—F. H. L.

Acetylene and other Gases containing Solid or Vesicular Particles in Suspension; Apparatus for the Purification of ——. L. M. Bullier and L. G. Maquenne, Paris. Eng. Pat. 15,262, July 8, 1902. (Under Internat. Conv., July 12, 1901.)

In order to remove the lime dust, &c., which often accompanies crude acetylene from the generator, the gas is made to pass through one or more layers of flannel or felt, which are stretched round a suitable frame contained in some vessel of convenient shape. A "chemical" purifier should be placed before or after this mechanical filter.—F. H. L.

Vapour-burning [Incandescence] Apparatus. A. Kitson, London. Eng. Pat. 21,472, Oct. 25, 1901.

In incandescence vapour lamps of the Kitson type (this Journal, 1899, 1110; 1900, 1001), the horizontal vaporising tube is here provided with a discharge orifice in its end wall, instead of its cylindrical wall, so as to discharge horizontally into a short tube, which is so bent as to gradually deflect the current of vapour and air entering it, causing the mixture to flow vertically downwards into the usual mixing tube. A needle for cleaning the discharge orifice of the vaporising tube extends from end to end of the latter, passing out to a handle which may be operated by the lamp-lighter.—H. B.

Vapour-burning Apparatus. A. Kitson, London. Eng. Pat. 21,764, Oct. 29, 1901.

"Needling" devices for cleaning the vaporising tubes of vapour-burning apparatus, by which the needle is given both a rotatory and a longitudinal movement on entering the orifice to be cleaned.—H. B.

Vapour-burning [Incandescence] Apparatus. A. Kitson, London. Eng. Pat. 23,459, Nov. 19, 1901.

A device for reducing the noise produced, in lamps of the Kitson type (see preceding abstracts), by the inrush of air to the mouth of the mixing tube. It consists essentially of a casing, surrounding the vapour-discharge nozzle and the mouth of the mixing tube, which is provided with a pad of cotton wool or the like, through which all the air drawn into the mixing tube must pass.—H. B.

Burner; Incandescent Gas ——. R. A. Blake, London. From J. Hardt, Hamburg. Eng. Pat. 24,986, Dec. 7, 1901.

The gas is discharged from, and ignited outside of, an inverted cup, with perforated sides inclining inwards and upwards to near the top, and thence outwards to form a shoulder, above which there is attached a flat unperforated top. This particular shape is intended to cause the flame to assume the form of the mantle.—R. S.

Incandescent Filaments and Mantles; Manufacture of ——. A. J. Boult, London. From A. M. Plaissetty, Paris. Eng. Pat. 20,747, Oct. 16, 1901.

The unburnt mantle is composed of non-nitrated "artificial silk" and hydroxides of the light-giving metals, in such proportions as to yield 30 to 42 per cent. of oxides on burning off. One method of manufacture claimed, consists in incorporating the hydroxides with a cuprammonium solution of cellulose, extruding the fluid through capillary tubes, and coagulating, washing, drying, and combining the fibres produced. According to another method, artificial silk is soaked in a concentrated solution of the salts of the metals; the fibre is then dried, passed into strong solution of ammonia to convert the salts into hydroxides, and dried. —H. B.

Incandescent Electric Lamp Filaments; Manufacture of a Material for ——. Siemens Bros. and Co., Ltd., Westminster. From Siemens and Halske A.-G., Berlin. Eng. Pat. 23,214, Nov. 16, 1901.

A metal of a rare earth (zirconium, thorium, yttrium, &c.), or a mixture of such metals, is heated in the form of an amorphous powder in an atmosphere containing carbon (*e.g.*, in coal-gas), so that the carbon is deposited on or combines with the metal or metals. A suitable amorphous powder is obtained by heating a mixture of magnesium and an oxide or chloride of the metal in an atmosphere of hydrogen, whereby the rare metal is liberated; or the two operations may be combined by heating the mixture directly in an atmosphere containing carbon. After removing magnesium compounds from the product by means of dilute acid or solution of ammonium chloride, the powder may be mixed with a binding agent and pressed into filaments. —H. B.

Mantles for Incandescence Lighting; Manufacture of ——. J. E. Bousfield, London. From R. Finke, Nuremberg. Eng. Pat. 17,603, Aug. 11, 1902.

"It is found that when a solution of so-called pure cerium nitrate in water is precipitated with dimethylaniline, a portion of the ceria remains in solution." This portion is stated to give, with thorium nitrate, mantles of very low illuminating power, whereas the precipitated portion yields mantles of very high illuminating power and durability. Pure thorium nitrate, obtained by the fractional precipitation of commercial thorium nitrate with potassium chromate and subsequent conversion of the intermediate fractions into the nitrate, is mixed with the nitrate obtained from the above-mentioned dimethylaniline precipitate (so as to yield 2 per cent. of ceria in the mantle), and a fabric made of ramie fibre is impregnated with a solution containing 9 per cent. of the mixed earths, and is made into mantles as usual.—H. B.

French Patents.

Combustible Emulsion for Explosion Motors. Pampe and Trollé. Fr. Pat. 317,903, Jan. 18, 1902.

An emulsion for use as a fuel in explosion motors, consisting of alcohol (say 70 vols.) and liquid hydrocarbons (say 30 vols.) which are but slightly, or not at all, miscible with alcohol. The alcohol and the hydrocarbon should be of the same specific gravity, to avoid separation.—H. B.

Acetylene Generator without Cocks. C. Charlon, Paris. Fr. Pat. 317,523, Jan. 4, 1902.

An automatic flooded-compartment apparatus. The water is originally stored in a Mariotte's bottle, or similar device, from which it runs into one side of a horizontally-disposed small displacement holder, the other side thereof being subdivided, with one portion in communication with the decomposing chamber, and the second connected with the rising holder. Normally the gas travels from the carbide vessel through a pipe which descends into a central tube within the circumference of the holder bell, whence it returns to one of the compartments of the displacement holder or pressure regulator. If, however, the bell falls far, this double tube (being open to the holder seal) is closed; a small extra amount of pressure is set up, and the water in the pressure regulator is driven over into the other section till it falls below the mouth of the pipe carrying water to the carbide. A second gas-leading tube communicating with the main holder still remains open, so that the subsequent make of gas can be carried away from the decomposing chamber. The latter is in duplicate, and consists of a vertical cylinder containing superposed, subdivided baskets of carbide; it has a water-sealed top, and its contents are attacked from below upwards.—F. H. L.

Acetylene Generator. C. Roupioz, Paris. Fr. Pat. 317,561, Jan. 4, 1902.

A flooded-compartment generator in which the water supply is governed by the movements of the holder bell. A chain and lever are attached to the crown of the latter, which open a valve at the bottom of the water reservoir when the bell falls. The water then travels to the carbide container through a pipe which is closed by a ball valve against the return of gas. The acetylene passes from the decomposing chamber through a vessel containing a hand-operated vent pipe, and a spring-controlled safety pipe. The holder also contains a vent pipe, which consists of a tube depending from the crown, closed at its base by a ball valve, the latter dropping and opening the valve when the bell rises too high.—F. H. L.

Acetylene Generator. H. Kinsey, G. Challenger, and J. H. Nott. Fr. Pat. 317,735, Jan. 13, 1902.

See Eng. Pat. 11,714, 1901; this Journal, 1902, 397. —F. H. L.

Acetylene Generator. Landauer. Fr. Pat. 317,799, Jan. 15, 1902.

An automatic "dip" generator. The carbide is held in a detachable annular vessel disposed centrally within the holder bell, said vessel having an orifice at the bottom normally closed by the action of a spring-controlled valve. When the carbide container is *in situ*, the stem of the valve is depressed, and the valve opened by a hand-operated screw extending above the cover of the vessel. Gas is made to bubble through the water in a ring-shaped trough carried by the carbide-container cage before it passes into the holder space.—F. H. L.

Acetylene Generator. C. Pataky. Fr. Pat. 317,858, Jan. 17, 1902.

An automatic "dipping" generator in which the carbide is carried on a coarse grid at the bottom of a container having the shape of an inverted truncated cone. When the lumps diminish slightly in size, they fall through the apertures in the grid on to another grating supported by a prolongation of the container cage walls. The gas rises into a narrow annulus round the cage, and is compelled to pass through a tube and cock before entering the holder. By closing this cock, return of gas into the container during recharging is prevented. The water in the seal is distinct from that used for decomposition.—F. H. L.

Acetylene Generator. T. Allaire. Fr. Pat. 317,886, Jan. 18, 1902.

An automatic water-to-carbide apparatus in which the water supply is governed by the bell movements. The water store is an annular tank surrounding the upper part of the holder tank; and as the bell descends, it operates a lever which opens a spring-closed valve in the leading pipe. The carbide containers are a pair of horizontal cylinders lying inside the main casing near the bottom, each holding a number of carbide boxes into which the water flows in succession. When the carbide in the first vessel is completely decomposed and it is full of water, the liquid enters the second vessel.—F. H. L.

Acetylene Generator. D. Marchand. Fr. Pat. 317,939, Jan. 21, 1902.

An automatic carbide-feed apparatus of the central hopper type, the hopper being carried by the rising holder bell. The mouth of the hopper is closed by a cylindrical plunger attached to a vertical rod, the bottom of the latter striking against a fixed distributing plate (and so opening the feed orifice) when the bell descends. The upper end of the hopper is joined to a second storage vessel, closed at its top with a screw cap, and at its base with a cock; by this means carbide can be introduced into the main hopper without permitting the escape of gas. A prop is fitted at the side of the apparatus to hold the bell up when a further evolution of acetylene is to be avoided. The water seal is separate from the water of decomposition.—F. H. L.

Lamp; Incandescence Spirit ——. H. Wollheim and P. Baumert. Fr. Pat. 317,603, Jan. 7, 1902.

An incandescence spirit lamp in which the mantle is raised to incandescence by the direct action of the flame of the wick, without preliminary vaporisation of the alcohol. The hollow lamp-base, up which all the air required for combustion is drawn, extends upwards so as to form an outer casing for the spirit reservoir and for the wick tubes, and terminates in an open-mouthed burner. The strong current of air produced flows round the reservoir, the inner and outer wick tubes, and the burner, keeping them cool. The mantle extends down into the burner, so as to be in as direct contact with the flame as possible.—H. B.

Lamp; Incandescence Spirit ——. Boivin. Fr. Pat. 318,020, Jan. 23, 1902.

A vaporiser for a spirit lamp, consisting of two vertical, concentric tubes, which fit one another tightly. The inner tube, which encloses the lamp wick, has flutings in its wall, which are alternately long and short, and extend downwards from the top of the tube, the short flutings being perforated. The outer tube is smooth, is closed at the top by a dome-shaped chamber, and has a circular perforated enlargement near its lower end, on a level with the lower ends of the long flutings of the inner tube. The vapour distilling from the wick passes through the perforations in the short flutings, and flows up into the dome-shaped chamber; it then passes down the long flutings, and issues through the perforations in the circular enlargement into a conical mixing tube which surrounds the vaporiser.—H. B.

Lamp; Incandescence Spirit ——. Farkas. Fr. Pat. 318,136, Jan. 27, 1902.

A circular wick is bound round a perforated disc or cylinder of wire gauze, which is mounted centrally within the burner on a vertical rod capable of adjustment by means of a rack and pinion. The upper part of the wick is closely woven, but the depending parts, which extend downwards into the alcohol reservoir, are of such loose texture that the currents of air, entering through perforations in the burner casing, may pass freely through and flow centrally up to the perforated disc, becoming carburetted on the way. The wick is surrounded by a conical casing, and a flame-spreader is fixed, above the top of the wick, to an extension of the central vertical rod. On lowering the rod, the Bunsen flame which burns at the top of the wick is extinguished by the flame-spreader coming in contact with the top of the conical casing.—H. B.

III.—DESTRUCTIVE DISTILLATION TAR PRODUCTS. PETROLEUM.

English Patents.

Bituminous and other Compounds, and Articles made therefrom; Apparatus for and Method of Treating and Working ——. W. Torkington. From H. Knight. Eng. Pat. 11,035, May 14, 1902.

See under IX., *page* 1397.

Furnaces for Heating Asphalt and other Material. A. Montupet, Bel-Air, Paris. Eng. Pat. 15,528, July 11, 1902.

The heating vessel is a rotary cylinder, the inner cylindrical surface of which is provided with recesses (for increasing the heating surface), forming toothed internal projections, which constitute ledges and agitating devices for the material treated. There are also a draw-off tube for the waste gases, scrapers for the external surface of the vessel, a discharge aperture, and the whole is mounted in a structure forming a combined fire-grate and flue.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

1.1′-Dinitronaphthalene; Sulphonation of ——. O. Eckstein. Ber., 1902, **35**, [16], 3403—3404.

The 1.4′- and the 1.1′-dinitronaphthalenes behave differently towards fuming sulphuric acid (20 per cent. SO_3) at a temperature not exceeding 140° C. The former is not attacked, whilst the latter, when heated with 4½ times its weight of fuming acid, is converted into 1.1′.3-dinitronaphthalenesulphonic acid identical with that obtained by Cleve and Hellström by nitrating 1.3′-nitronaphthalenesulphonic acid or its chloride. The method may be employed for obtaining pure 1.4′-dinitronaphthalene from a mixture containing a small quantity of the peri compound. —T. A. L.

Auramine; Action of Dimethylsulphate on Michler's Ketone and ——. O. Zohlen. J. prakt. Chem., 1902, **66**, [20], 387—400.

Equimolecular proportions of dimethylsulphate and auramine base combine in ethereal solution, giving a 58 per cent. yield of methylauramine methylsulphate. The product crystallises from alcohol in golden-yellow plates melting at 225° C., whilst the aqueous solution, on standing or boiling, deposits Michler's ketone. A number of salts have been prepared, and, on treatment of the methylsulphate with ammonia at the ordinary temperature, a 67·5 per cent. yield of methylauramine base melting at 133° C. is obtained. Tetramethyldiaminobenzophenone condenses with two molecular proportions of dimethylsulphate when warmed together without any diluent, giving hexamethyldiaminobenzophenone dimethylsulphate. The substance crystallises in white plates melting at 187° C., and gives other salts. Methylauramine is further characterised by its property of forming polyiodides. When acted on by iodine in alcoholic solution, the alkyl radicle is replaced by iodine, and a further quantity attaches itself. This latter can be titrated with thiosulphate. Increasing amounts of iodine augment the solubility in alcohol, but lower the melting point. The products show, in most cases, dichroism and a bronzy appearance. They give iodide of nitrogen with ammonia, are insoluble in water and ether, and soluble, with a brown colour, in alcohol and glacial acetic acid.—T. A. L.

Azo Dyestuffs; Some ——, *and the Limits of the Formation of Diazoamino Compounds.* St. Niementowski. Anz. Akad. Wiss. Krakau, 1902, 413—419. Chem. Centr., 1902, **2**, [15], 937—939.

The author has examined the behaviour of a series of primary aromatic amines with nitrous acid, with a view of determining the amount of acid in presence of which the

formation of diazoamino compounds is prevented, and also the influence on the reaction of the nature and position of substituting groups other than the amino group present in the benzene nucleus of the amine. The results show, on the whole, that diazoamino compounds are most easily formed from those amines the basicity of which is reduced by the presence of Cl, NO_2, CN, &c., whereas diazoamino compounds, under otherwise similar conditions as to reaction, are only formed in comparatively small quantities from the three toluidines, *m*-xylidine, the amino-phenols, and the amino-benzoic acids; the two naphthylamines occupy an intermediate position with regard to the capacity of forming diazoamino compounds. In the course of the investigation a new series of azo dyestuffs and various new diazoamino compounds were prepared.

2.2'-Dichlordiazoaminobenzene, $ClC_6H_4.N_2.NH.C_6H_4Cl$, golden-yellow needles or compact crystals, which soften at 80° C. and melt at 90° C., and are easily soluble in organic solvents.

o-Diazoaminobenzoic acid—

$$COOH.C_6H_4.N_2.NH.C_6H_4COOH,$$

small brownish yellow plates melting at 123° C., easily soluble in organic solvents, insoluble in water, soluble in ammonia and alkalis.

m-Toluene-azo-β-naphthol, $CH_3.C_6H_4.N_2.C_{10}H_6OH$, light-red needles melting at 141° C., soluble in organic solvents, slightly soluble in alkalis, dissolves in concentrated sulphuric acid to a violet-red solution.

as-m-Xylene-azo-β-naphthol, $(CH_3)_2C_6H_3.N_2.C_{10}H_6OH$, red needles melting at 166° C., soluble in alcohol and ether, insoluble in water, alkalis, and dilute acids, dissolves in concentrated sulphuric acid to a dark cherry-red solution.

α-Naphthol-azo-β-naphthol, $HO.C_{10}H_6.N_2.C_{10}H_6OH$, violet-red rods, melting at 228°—229° C., slightly soluble in alcohol, insoluble in water, alkalis, and dilute acids, dissolves in strong sulphuric acid to a violet solution.

o-Chlorobenzene-azo-β-naphthol, $ClC_6H_4.N_2.C_{10}H_6OH$, red rods melting at 163° C., soluble in organic solvents, insoluble in water, alkalis, and dilute acids.

m-Chlorobenzene-azo-β-naphthol, red laminæ melting at 158° C.

o-Hydroxybenzene-azo-β-naphthol—

$$HO.C_6H_4.N_2.C_{10}H_6OH,$$

dark-violet crystals (from acetic ester) melting at 193° C., soluble in organic solvents, dissolves in dilute alkalis to a ruby, and in strong sulphuric acid to a violetsolution.

p-Hydroxybenzene-azo-β-naphthol, small "Indian red" crystals melting at 194° C., soluble in the same media as the ortho compound.

β-Naphthol-o-azobenzoic acid, $HO.C_{10}H_6.N_2.C_6H_4COOH$, brick-red needles melting at 268° C., soluble in alcohol, slightly soluble in alkalis, dissolves in strong sulphuric acid to a violet-red solution.

β-Naphthol-m-azobenzoic acid, light-red needles melting at 243° C., behaves like the ortho compound.

β-Naphthol-p-azobenzoic acid, red needles melting at 301° C. with decomposition, slightly soluble in most organic solvents, dissolves in alkalis to a red, and in strong sulphuric acid to an intense cherry-red solution.

β-Naphthol-m-azobenzonitrile, $HO.C_{10}H_6.N_2.C_6H_4CN$, short blood-red rods, m. pt. 236° C., slightly soluble in organic solvents and in dilute alkalis, soluble in strong sulphuric acid with dark cherry-red colour. 4-Amino-2.3'-dichlorazobenzene, $ClC_6H_4.N_2.C_6H_3Cl(NH_2)$, golden-yellow needles m. pt. 127° C., easily soluble in organic solvents. 4-Acetamino-2.3'-dichlorazobenzene, yellowish-brown indistinctly crystalline mass (from dilute alcohol) melting at about 165° C., insoluble in water, easily soluble in organic solvents.

2.3'-Dichlorazo-benzene-4-azo-β-naphthol—

$$ClC_6H_4.N_2.C_6H_3ClN_2.C_{10}H_6OH.$$

scarlet microscopic crystals, m. pt. 226° C., slightly soluble in organic solvents, soluble in strong sulphuric acid with bluish-green colour.

4-Amino-3.2'-dichlorazobenzene—

$$ClC_6H_4.N_2.C_6H_3Cl(NH_2)\ (?),$$

yellow needles, m. pt. 113° C. easily soluble in organic solvents; diazotised and coupled with β-naphthol gives a dark red azo dyestuff, melting at 226° C.—A. S.

Azo Dyestuffs; Dynamical Investigations on the Formation of ——. H. Goldschmidt and H. Keller. Ber., 1902 **35**, [16], 3534—3549. (See this Journal, 1900, 431.)

In this concluding communication the authors have investigated the effect of the chemical nature of the components in certain cases, diazo compound and tertiary amine, on the rate of reaction. No appreciable difference in the rate is observable by substituting *m*- for *p*-diazobenzene sulphonic acid. Employing different tertiary amines it is found that the replacement of methyl by ethyl retards the rate, whilst the introduction of propyl increases it, and the same is also the case with dimethyl-*m*-chloraniline. It has already been shown that the rate depends upon the product of two factors: the true velocity of the colour formation and the hydrolytic constant of the base, and comparisons of these values for the various compounds examined are given.—T. A. L.

English Patents.

Indoxyl [*Indigo Dyestuffs*]; *Manufacture of* ——. O. Imray. From The Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. Eng. Pat. 26,058, Dec. 20, 1901.

See Fr. Pat. 317,082; this Journal, 1902, 967.—T. A. L.

Flavopurpurine [*Anthracene Dyestuffs*]; *Manufacture of* ——. W. L. Wise. From M. Ilinski, Krefeld, and R. Wedekind and Co., Uerdingen a Rhein. Eng. Pat. 20,201, Oct. 9, 1901.

See Fr. Pat. 314,914; this Journal, 1902, 402.—T. A. L.

Colouring Matter of the Anthracene Series; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 22,762, Nov. 11, 1901. (Supplementary to Eng. Pat. 3239 of 1901.)

See Fr. Pat. 309,503 (suppl.); this Journal, 1902, 249 and 911.—T. A. L.

Colouring Matter [*Sulphide Dyestuffs*] *containing Sulphur; Manufacture of New Substantive* ——, *and Material for Use therein.* J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 25,697, Dec. 16, 1901.

The patentees prepare dinitrodihydroxydiphenylamine by condensing 3.4.6-chlorodinitrophenol with *p*-aminophenol, the former compound being obtained by the action of alkalis on 1.3.4.6-dinitrodichlorobenzene. By reacting with sulphur and sodium sulphide on the dinitrodihydroxydiphenylamine so formed, a dyestuff is obtained which gives black shades on cotton, fast to washing, fulling and light. —T. A. L.

Sulphur Dyestuff [*Sulphide Dyestuffs*]. T. R. Shillito. From J. R. Geigy and Co., Basle. Eng. Pat. 26,448, Dec. 27, 1901. (Supplementary to Eng. Pat. 12,578 of 1901; this Journal, 1902, 471.)

See Fr. Pat. 310,809 (suppl.); this Journal, 1902, 967. —T. A. L.

Anthracene Series; Manufacture of Derivatives of ——. H. E. Newton. From The Farbenfabr. vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 22,838, Nov. 12, 1901.

See Fr. Pat. 316,416 (suppl.); this Journal, 1902, 701. —T. A. L.

French Patents.

Indigo in Lumps. Badische Anilin und Soda Fabrik. Fr. Pat. 317,926, Jan. 20, 1902.

See Eng. Pat. 1789 of 1902; this Journal, 1902, 1072. —T. A. L.

Anthranilic Acid [*Indigo Dyestuffs*]; *Manufacture of* ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 318,050, Jan. 24, 1902.

Hydroxylamine or its carbonate combines with phthalic anhydride to form phthalhydroxylamic acid—

$$HO_2C.C_6H_4.CO.NHOH.$$

This product, on boiling with an aqueous solution of caustic soda, is converted into anthranilic acid, which can be separated in the usual manner.—T. A. L.

Black Substantive Dyestuffs [*Sulphide Dyestuffs*] *for Cotton; Manufacture of* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 293,138, Jan. 6, 1902 (Supplement).

See Eng. Pat. 25,650 of 1901; this Journal, 1902, 1327.
—T. A. L.

Azo Dyestuffs capable of being Chromed on the Fibre; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 313,671, Jan. 24, 1902 (Supplement).

According to Fr. Pat. 313,671 (this Journal, 1902, 169) the tetrazo compound of the 1.3.2.5-diaminochlorobenzene sulphonic acid, when treated with carbonate or acetate of soda, yields a derivative of *m*-diaminophenol sulphonic acid, the chlorine being replaced by hydroxyl. The patentees now find that the 1.3.4.5-diaminochlorobenzene sulphonic acid and the 1.3.2.5- and 1.3.4.5-diaminochlorobenzyl sulphonic acids behave in a similar manner. The first-mentioned is obtained by reducing the corresponding dinitro compound described in Fr. Pat. 298,201, whilst the two latter are formed by reducing the dinitro derivatives of the *p*- or *o*-chlorobenzyl sulphonic acids, or a mixture of the two. Such a mixture is obtained by chlorinating toluene and treating the resulting *o*- and *p*-chlorobenzyl chlorides with alkali sulphites. The action of nitrosulphuric acid yields the dinitro compound, which, on reduction with iron and acetic acid, is converted into the diamino compound. This, after tetrazotising, is made alkaline with sodium carbonate, and combined with two molecular proportions of the same or different dyestuff components. With β-naphthol and the 1.3.4.5-diaminochlorobenzene sulphonic acid, a brownish-red dyestuff is produced, which becomes black on chroming.—T. A. L.

Black Cotton Dyestuff [*Sulphide Dyestuffs*]. Badische Anilin und Soda Fabrik. Fr. Pat. 317,624, Jan. 8, 1902.

See Eng. Pat. 25,697 of 1901, under preceding Eng. Pats.
—T. A. L.

Blue Dyestuffs [*Anthracene Dyestuffs*]; *Manufacture of* ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 317,734, Jan. 13, 1902.

The tetraminoanthraquinones of Fr. Pat. 309,772 (this Journal, 1902, 44. See also Eng. Pat. 7541 of 1901; this Journal, 1902, 471), when treated with formaldehyde and sulphurous acid, are converted into sulphonic acids, which dye fast blue shades on wool from an acid bath.—T. A. L.

Dyestuffs of the Phthaleïn Series [*Pyrone Dyestuffs*]. Soc. Anon. Fabr. bâloise de Prod. Chim. Fr. Pat. 317,891, Jan. 18, 1902.

See Eng. Pat. 26,602 of 1901; this Journal, 1902, 338.
—T. A. L.

Brown Sulphide Dyestuffs from Nitrosotolylene Diamine. Manuf. Lyon. de Mat. Col. Fr. Pat. 317,936, Jan. 20, 1902.

A brown dyestuff for unmordanted cotton, similar in shade to Bismarck Brown is obtained by fusing with polysulphides the nitroso-*m*-tolylenediamine of Ger. Pat. 123,375, with or without the presence of organic acids, at a temperature of about 200° C.—T. A. L.

United States Patents.

Dark [*Black*] *Sulphur Dye* [*Sulphide Dyestuffs*], *and Method of Making Same.* E. Culmann, Assignor to Schoellkopf, Hartford, and Hanna Co., Buffalo, N.Y., U.S.A. U.S. Pat. 711,038, Oct. 14, 1902.

The action of sulphur and an alkali sulphide on dinitrosalicylic acid, by fusion or in aqueous solution, gives a bluish-black substance, which dyes cotton deep black shades from a bath containing an alkali sulphide.—T. A. L.

Polyaminoanthraquinone Sulpho-Acid [*Anthracene Dyestuffs*], *and Process of Making Same.* E. Hepp, Frankfort, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 711,310, Oct. 14, 1902.

Pure blue dyestuffs for unmordanted wool from an acid bath, fast to light, are obtained by treating acidyl (preferably oxalyl) derivatives of α-aminoanthraquinones (or the 1.4′- or 1.1′-diaminoanthraquinones) with nitric acid, hydrolysing the acidyl compounds, treating the nitroaminoanthraquinones with reducing agents, and finally sulphonating the polyaminoanthraquinones thus produced. The new dyestuff sulphonic acid specially claimed is that in which the amino groups have the positions 1.1′.4.4′. The product, in the form of its alkali salts, is a dark blue powder, soluble in water with a blue colour, which becomes red on adding strong hydrochloric acid, the free sulphonic acid separating as a bluish-violet precipitate. (See Eng. Pat. 7541 of 1901; this Journal, 1902, 471.)—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silks; Origin of the Natural Coloration of the ——, *of Lepidoptera.* D. Levrat and A. Conte. Comptes Rend., **135**, [17], 700—702.

Since Alessandrini and others showed that colouring matters contained in the intestine of caterpillars could not reach the silk, it has been generally supposed that those caterpillars which yield coloured silk produce the colouring matter in their own organism, and that it is not derived from the leaves on which they feed. Contrary results obtained by some investigators seem to have been due to accidental soiling of the silk as it issued from the body of the caterpillar. The author has experimented with artificial colouring matters (Toluylene Red, Methylene Blue, Picric Acid) by painting with them the leaves on which the caterpillars (*Attacus Orizaba*, giving a white silk, and two varieties of *Bombyx Mori* giving, one a white, the other a yellow silk) were fed, and taking effectual precautions to avoid soiling the silk. The results with *Attacus* show that Toluylene Red easily passes through the tissues by osmosis, and colours the silk, whilst Methylene Blue does so with greater difficulty, and Picric Acid not at all. A similar result was obtained with both varieties of *Bombyx*, though the coloration of the silk was not so striking as in the case of *Attacus*. The author concludes that the source of the colour of naturally-coloured silks is in the leaves on which the caterpillars feed—chlorophyll in the case of green silks, the yellow colouring matter of the mulberry leaf in the case of yellow silks.—J. T. D.

English Patents.

Steaming, Oxidising, Drying, or otherwise Treating Yarns, Fabrics, and the like, specially applicable for use in connection with Dyeing Apparatus; Machines for ——. H. H. Lake. London. From J. W. Fries, Winston-Salem, N. Carolina, U.S.A. Eng. Pat. 6664, March 18, 1902.

A combination of apparatus for dyeing, oxidising, steaming, and drying yarns and tissues by a continuous process. The steaming and oxidising chamber, as employed in treating yarns, is provided with large revolving cylinders

at the top and bottom, a steam coil, and a peg-rail for guiding the yarn in a helical course around the cylinders. —E. B.

Dyeing and like Machines in which the Material to be treated is passed more than once through the Liquor; Tables or Scrays for Feeding ——. J. Shaw, Bradford. Eng. Pat. 20,330, Oct. 11, 1902.

The claim is for "the combination with a machine for treating fabrics, in which the treatment consists in repeatedly passing them through the machine, of a rotatable table." —E. B.

Yarn; Treatment or Finishing of ——. J. H. Ashwell, Nottingham. Eng. Pat. 19,912, Oct. 3, 1901.

Yarns composed of vegetable fibres and preferably in an unbleached state, after being moistened with water, are steeped in a bath of caustic soda at 30°—60° Tw. The excess of alkali is removed, and the yarns are then exposed in a closed chamber to carbon bisulphide at a temperature of about 90°—120° F. They are next dried with hot air, and the cellulose compound formed is reconverted into cellulose by boiling with a saturated solution of common salt or sodium sulphate.

Cotton yarns thus treated are said to be stronger, finer, and more glossy than the same yarns untreated.—E. B.

United States Patents.

Filaments from Cellulose Solutions; Manufacture of ——. E. Thiele, Barmen, Germany. U.S. Pat. 710,819, Oct. 7, 1902.

For the production of fine filaments from solutions of cellulose issuing from orifices of comparatively large diameter, the principle is applied of reducing the diameter of the filaments by rapidly drawing them away from the mouth of the orifice before they are fully dehydrated. To obtain the requisite plasticity of the cellulose threads, the orifice is caused to discharge directly into a bath of feeble precipitating power, and when the filaments are sufficiently reduced in size, they are fully dehydrated by passing into a solution of greater power.—J. F. B.

Solid Alkali Hydrosulphites, and Process of Making Same. M. Bazlen, Assignor to The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 711,377, Oct. 14, 1902.

Solution of an alkali hydrosulphite, obtained as described in U.S. Pat. 692,760 of 1902 (this Journal, 1902, 346), is heated in a closed vessel to 50°—60° C., and a stated proportion of sodium chloride is added. The solid alkali hydrosulphite that separates after cooling is collected and dried, and is stated to be substantially permanent under ordinary conditions for a reasonable length of time. A crystalline form of the sodium salt ($Na_2S_2O_4 + 2H_2O$) is also claimed.—E. S.

Dyeing [and Bleaching]; Apparatus for ——. R. Weiss, Kingersheim, Germany. U.S. Pat. 704,283, July 8, 1902.

A combination of a closed boiler to contain the textile materials to be dyed, a closed compensating vessel situated above the boiler, a pipe connecting the top of the boiler with the bottom of the compensating vessel, means for causing the liquor employed to flow from the bottom of the latter to the top of the former vessel, and means for heating the liquor. The materials are packed into baskets of different diameters, which are placed one above another in the boiler, their bottoms resting upon ledges in the latter, and their sides being formed of outwardly curved springs. The apparatus, it is stated, is employed with advantage in bleaching textile materials, and in dyeing these in neutral and alkaline baths at temperatures of from 120° to 140° C. —E. B.

Dyeing with Indigo; Process of ——. F. Peterhauser, Assignor to The Farbwerke vormals Meister, Lucius und Brüning, Höchst a/Main, Germany. U.S. Pat. 710,800, Oct. 7, 1902.

See Eng. Pat. 7829 of 1900; this Journal, 1901, 472. —E. B.

Colouring Yarns [for Tapestry and Velvet Carpets]; Apparatus for ——. A. Fornander, Assignor to the Carpet Yarn Printing Co., New York. U.S. Pat. 705,334, July 22, 1902.

In an apparatus for printing yarns, in which the printing colour is applied by means of a travelling disc and colour-spreading devices, mechanism is provided for holding in an elevated position a colour-spreading device which follows the disc and a lowering one which precedes the disc during the printing operations, the disc and colour-spreading devices being mounted on the same carriage.—E. B.

Oiling Fibres; Composition for ——. C. Sella, Biella, Italy. U.S. Pat. 704,939, July 15, 1902.

See Eng. Pat. 7491 of 1901; this Journal, 1902, 704. —E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Staining Wood [in Pattern]. J. Pfister, Vienna. Eng. Pat. 14,685, July 1, 1902. (See U.S. Pat. 708,069 of 1902; this Journal, 1902, 1231.)

In addition to the method already described, several alternative methods of confining the action of the dye liquors employed to the parts which it is desired to colour, are claimed; thus, a coating of, for instance, rosin and tallow may, to this end, be applied to those portions of the inlet end-surface of the timber from which the dye liquors are to be excluded; or, again, a stencil may be employed of such a nature as to form on the inlet surface of the wood, separate chambers into which various dye liquors may be simultaneously introduced.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture; Laws of Chemical Equilibrium and Velocity of Reaction, and their Application to the ——. J. Brode. Zeits. angew. Chem., **15**, [42], 1081—1089.

The author gives an elementary exposition of the laws of chemical dynamics as applied to homogeneous systems, and then proceeds to discuss the application of these laws to the contact process of sulphuric acid manufacture.

Many of the difficulties experienced at first in the working, on the large scale, of this process were due to incomplete knowledge of the laws of equilibrium and reaction-velocity. Yet not until after the publication of Knietsch's paper (this Journal, 1902, 172, 343) was the applicability of these laws to the process shown from the physico-chemical side. The action of sulphur dioxide on oxygen is at the ordinary temperature indefinitely slow; no catalyst has been found which will increase the reaction-velocity appreciably below 200° C., and even between 400° and 500° C., platinum is the only substance which induces sufficient speed of reaction to be of industrial value. At higher temperatures certain oxides are effective, and though the mode of action of any of these catalysts is not definitely known, yet in all probability the small amounts of impurity which are fatal to the catalytic power of platinum would not sensibly affect that of the oxides. Above 500° C. the reverse reaction, *viz.*, dissociation of sulphur trioxide, sets in with sensible velocity, and at 1,000° C. is practically complete. Thus, work at a low temperature (at which the direct action would be complete) is impracticable because of the low speed, and increase of the speed by rise of temperature is of limited application because of the change of the point of equilibrium. Both as increasing the reaction-velocity and as carrying the reaction further towards completeness, increase of SO_2- or O-concentration and decrease of SO_3-concentration are desirable. SO_2-concentration of course cannot be increased, as the object is to convert it all into SO_3, but O concentration can be increased. Addition of air enough to bring the SO_2-concentration down to 3 per cent. would raise the O-concentration to 17·5 per cent. Further increase would

necessitate unwieldly bulks of air; but if oxygen were available for roasting and dilution, the figure might readily be raised from 17·5 to 97 or 98; and the formula—

$$K = \frac{C^2_{SO_3}}{C^2_{SO_2} \cdot C_{O_2}}$$

shows that the ratio of the amount of SO_3 to that of SO_2 a the point of equilibrium increases as the square root of the O-concentration. Reduction of SO_3-concentration is the object of a recent patent (Eng. Pat. 2368 of 1901) of the Höchst works, and the formula shows equally what the effect of this must be. Another factor to be considered is the pressure; as the formation of sulphur trioxide involves a lessening of volume, it must be favoured by increase of pressure. The regulation of the temperature also allows of some control of the process, and this is attempted in recent Höchst patents (Eng. Pat. 1385 of 1901), in which the reaction is begun, rapidly, at a high temperature, while C_{SO_2} and C_{O_2} are yet large and C_{SO_3} is small, and is carried farther at a lower temperature. In this way a greater amount of material can be transformed in a given apparatus in a given time, and, moreover, oxide catalysts can be used at the higher temperatures instead of the more expensive platinum. By the use of oxygen instead of air, and by continued removal of the trioxide formed, the whole operation might be carried to completion at a high temperature, using only oxide catalysts.

Attempts have been made of late to apply the laws of mass-action to the chamber process. As this is practically a complete reaction at 90° C., the laws of equilibrium could not apply, and the velocity of reaction alone comes into consideration. As rise of temperature increases the velocity, it seems surprising that there should be an optimum temperature; the cause may perhaps lie in the nature of the intermediate reactions through which the oxides of nitrogen produce their catalytic effect. It is nearly certain, from Lunge's researches, that the process depends on the intermediate production of nitrososulphuric acid; and as water in the liquid form (cloud, spray) is always present, no doubt a system of two phases is represented. Liquid water is needed to decompose the nitrososulphuric acid, but as the temperature rises, the concentration of the liquid water diminishes, as does therefore the velocity of the reaction depending on it. Moreover, this reaction, with low liquid water concentration, has been shown by Lunge to be incomplete. Thus the complete and irreversible main reaction may occur with maximum speed at a particular temperature, through its dependence on the reversible intermediate reaction. (See also this Journal, 1902, 114, 475, and 1137.)—J. T. D.

Aluminium Chromate. M. Gröger. Ber., **35**, [16], 3420—3424.

Excess of potassium chromate added to a solution of alum produces a yellow precipitate, to which Fairrie has assigned the formula $Al_2O_3.CrO_3.7H_2O$. The author finds that the composition of this precipitate depends on the amount of potassium chromate added; with reagents in the ratio $Al_2O_3 : 2CrO_3$, no precipitate is formed; with $Al_2O_3 : 3CrO_3$ the precipitate is white, and consists entirely of basic aluminium sulphate; and as the proportion of CrO_3 increases from this point, so does its proportion in the precipitate, which, however, always contains SO_3 also. The author considers that the potassium chromate is hydrolytically dissociated into bichromate and hydroxide, the latter of which reacts on the alum to form basic sulphate; and only when the potassium bichromate has reached a certain concentration does it react on the aluminium salt.

When aluminium chloride is substituted for alum, the precipitate is darker in colour, and its composition is sensibly uniform whatever be the excess of potassium chromate added, and is represented by the formula $2Al_2O_3.CrO_3.6H_2O$; the aluminium is completely precipitated when 3 mols. of H_2CrO_4 have been added for each molecule of $AlCl_3$. The precipitate is slowly decomposed by washing with water.

When moist precipitated aluminium hydroxide is added to chromic acid, it is not completely dissolved, and the composition of the solution depends to some extent on the proportions of the reagents used. Equilibrium is established, after a length of time, depending on the physical condition of the hydroxide, among the three substances, base, acid, and salt, the point of balance depending on the concentration of the acid and on the temperature. The solution contains possibly a mixture of normal aluminium chromate with bichromate; the undissolved residue always contains, besides hydroxide, basic aluminium chromate. From the solution, excess of normal potassium chromate precipitates the aluminium completely as basic chromate, $2Al_2O_3.CrO_3$. No doubt, therefore, when potassium chromate reacts on aluminium chloride, the first product is soluble normal aluminium chromate, which is afterwards decomposed as above by the excess of chromate: $2Al_2(CrO_4)_3 + 5K_2CrO_4 = (Al_2O_3)_2.CrO_3 + 5K_2Cr_2O_7$.—J. T. D.

Hyposulphites [*Hydrosulphites*] *of the Metals of the Alkalis and Alkaline Earths; Synthesis of the Anhydrous* ——. H. Moissan. Comptes Rend., **135**, [17], 647—654.

Sulphur dioxide reacts on the hydrides of potassium and of sodium at the ordinary temperature with violence, but if the gas be passed over the hydride under reduced pressure or in admixture with hydrogen, the reaction becomes regular and manageable. Under these circumstances a volume of hydrogen is evolved equal to the volume of sulphur dioxide absorbed, and the solid substance produced has all the properties of the alkali hyposulphite. The mode of formation of these salts, as well as the results of their analysis, completely confirm Berthsen's formula: $2SO_2 + 2KH = K_2S_2O_4 + H_2$. The hydrides of lithium, calcium, and strontium behave similarly towards sulphur dioxide, though with them complete reaction only occurs at a pressure somewhat above that of the atmosphere, and at a slightly elevated temperature. All the hyposulphites examined are soluble in water, and possess the powerful reducing properties characteristic of Schützenberger's original sodium salt.—J. T. D.

Caustic Potash; Electrolysis of Molten ——. M. Le Blanc and J. Brode.

See under XI. A., *page* 1401.

English Patents.

Sulphuric Acid; Manufacture of —— [*by the Contact Process*]. E. Wenmaekers, Paris. Eng. Pat. 19,902, Oct. 5, 1901.

A contact apparatus is adjusted in a receptacle heated by the gases from a pyrites kiln, taken through cooling pipes, from which, at a temperature not exceeding 30° C., they pass through a tower charged with coke, and thence to another tower fitted with baffles, into which steam is injected under pressure; the condensed water carries the impurities with it to the bottom of the tower, where, before being discharged, it is heated to 100° C., to recover any dissolved SO_2. The humid gases are next passed through a coke tower to be sprayed with concentrated sulphuric acid, and forced, under pressure, into the heated contact apparatus, sufficient oxygen being present to effect the combination $SO_2 + O$. The outlet tube for the gas produced by the combination is inside the arrival tube of the SO_2, so as to heat the latter. After withdrawal of the sulphuric anhydride formed, the gases, still retaining SO_2, are returned to the steaming column, and so into circulation with the gases from the kiln.—E. S.

Chlorates and Perchlorates; Electrolytic Manufacture of ——. P. L. E. Lederlin. Eng. Pat. 14,386, June 25, 1902.

See under XI. A., *page* 1402.

French Patents.

Nitric Acid; Production of ——. W. Ostwald. Fr. Pat. 317,544, Jan. 4, 1902.

See Eng. Pat. 698 of 1902; this Journal, 1902, 548.

—E. S.

Hydrosulphurous Acid or Hydrosulphites [Hyposulphites]; Production of a Powder capable of giving ——, on Treatment with Water. The Société Anonyme des Plaques et Papiers Photographiques A Lumière et ses Fils. Fr. Pat. 317,569, Jan. 7, 1902.

Zinc powder is mixed with a solid acid and an alkali bisulphite or the like.—E. S.

Soda Crystals in Blocks; Producing ——. Solvay and Co. Fr. Pat. 317,515, Jan. 3, 1902.

A strong and hot solution of sodium carbonate is briskly stirred while cooling, to obtain a magma of small crystals with a little mother-liquor, which magma is, while still warm, placed in a strong mould and subjected to a pressure of several hundred kilos. per square centimetre. During the compression, the mother-liquor crystallises, and the whole mass forms a solid block.—E. S.

Magnesium Peroxide with High Proportion of Oxygen; Preparation of ——. Krause. Fr. Pat. 318,097, Jan. 25, 1902.

A saturated solution of magnesium chloride is treated with sodium peroxide, the reaction being conducted at a temperature below 20° C., and care being taken to avoid any excess of water. Alcohol may then be added, if desirable, and the product filtered off and dried rapidly, without washing, at a temperature of 80°—90° C. The dried product is powdered and then well washed with water, and dried rapidly at a temperature of 50°—60° C. A product containing a very much higher percentage of MgO_2 is obtained by performing the above reaction in presence of an ammonium salt, which not only has a dehydrating action, but also holds the magnesium hydroxide in solution. —J. F. B.

Chlorates and Perchlorates; Electrolytic Manufacture of —— [Hydrochloric Acid]. P. L. E. Lederlin. Fr. Pat. 317,930, Jan. 8, 1902.

See under XI. A., *page* 1402.

Chlorates and Perchlorates; Electrolytic Manufacture of —— [Hydrochloric Acid]. P. L. E. Lederlin. Fr. Pat. 317,931, Jan. 8, 1902.

See under XI. A., *page* 1402.

Alumina, Pure; [Electrical] System of Producing ——. C. M. Hall. Fr. Pat. 318,174, Jan. 28, 1902.

See under XI. A., *page* 1402.

Common Salt; Manufacture of Pure ——, by Evaporation in a Vacuum. Société dite Salinen-Direction Lüneberg. Fr. Pat. 318,202, Jan. 29, 1902.

Brine containing calcium and magnesium salts is treated with sodium carbonate in some excess of the proportion required to precipitate the calcium; the cleared solution obtained, is evaporated *in vacuo*, and the salt washed by steam, or water, or solution of pure salt, in a centrifugal apparatus, to remove the soluble impurities, such as sodium sulphate and magnesium sulphate. Another process consists in treating the brine with magoesium sulphate; the liquor, cleared from the precipitate, is evaporated in a vacuum apparatus, and the salt is freed from soluble impurities as in the former process. Instead of using magnesium sulphate alone, this may be in part replaced by sodium sulphate, both of which salts may be derived from the mother-liquors obtained by evaporation in the manner described.—E. S.

United States Patents.

Sulphuric Acid; Apparatus for Making ——, by the Contact Process. G. C. Stone, Assignor to the New Jersey Zinc Co., Jersey City. U.S. Pat. 711,186, Oct. 14, 1902.

Apparatus for use in the contact process, comprising a stationary bottom section, a roof section, said sections being provided with gas ducts, and a series of intervening compartments or sections independently separable and removable, the intervening sections containing each an individual charge of contact material supported upon a screen, and a mixing diaphragm located below each of the screens." Each section, as its charge becomes spent in working, is replaced in due order by a freshly charged section. (See U.S. Pat. 695,180, 1902; this Journal, 1902, 476.)—E. S.

Arsenic Fumes from Furnace Gases [Sulphur Dioxide]; Apparatus for and Method of Separating and Recovering ——. G. C. Stone, Assignor to the New Jersey Zinc Co., Jersey City. U.S. Pats. 711,187 and 711,188, Oct. 14, 1902.

The "gases, particularly the gases evolved from ore-roasting furnaces for the manufacture of sulphuric acid," are cooled to substantially "the temperature of deposition" of the arsenic fumes, &c., present, and are then passed through a rectangular apparatus formed in removable sections, containing a series of "separator screens," spaced apart and arranged in such order as to be all traversed by the gases. The screens consist of pairs of sheets of steel-wire gauze or the like, enclosing filtering material, such as asbestos. The screens are removed as they become foul, and the filtering material may be heated for recovery of the arsenic, or the asbestos may be purified by suitable chemical reagents.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

French Patents.

Gypsum Sludge from Bones; Utilisation of ——, in Paper and Pottery Industries. Moniu. Fr. Pat. 317,946 Jan. 21, 1902.

See under XIX., *page* 1408.

Glass Articles of Uniform Weight and Capacity; Manufacture of Hollow ——. Hilde and Kogler. Fr. Pat. 318,040, Jan. 24, 1902.

Hollow glass articles, of uniform weight and capacity, are made by opening the preparatory mould, and removing the excess of glass, namely, the glass which is forced back from the interior of the mass by blowing, the removal being made before, or before and after the complete blowing of the mass.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Glass and Hydraulic Cements; Studies on Zulkowski's Theory of ——. II. On the Behaviour of Magnesia in Portland Cement. A. Glaessner. Chem. Ind., 1902, 25, [21], 507—510. (See this Journal, 1901, 990; 1902, 706.)

Magnesia is an undesirable component of cement, since it is hydrated with greater difficulty than lime, and may thus give rise to fissures in well-worked cements.

The author's opinion is that it is only the free MgO which is the cause of this evil, and he has made experiments to determine the correctness of this view.

For this work a cement was made from kaolin and dolomite; it had the following components:—$2(SiO_2.CaO.MgO)$ and $(Al_2O_3.CaO.MgO)$. The percentage and molecular composition of the kaolin and dolomite were found by analysis, and S and *s* respectively represent the sum, reckoned in molecules, of the acid constituents of the kaolin (SiO_2, Al_2O_3, and Fe_2O_3) and of the dolomite (SiO_2, Al_2O_3), whilst B and *b* represent the basic constituents respectively of the kaolin (CaO), and of the dolomite (CaO and MgO). The materials were mixed in proportions that would yield the above compounds, so that the mixture should have the "saturation value" (Sättigungsgrad), *i.e.*, the molecular ratio, of the sum of the bases to the sum of the acids, equal to 2. The amounts for 100 grms. of the mixture are found by the ratio: $(x\,S + y\,s) : (x\,B + y\,b) = 1 : 2$, whence $x = 32{\cdot}71$ and $y = 67{\cdot}29$.

Zulkowski has shown that silicic acid and molecular proportions of lime and baryta burnt in a Seger oven yield a

uniform hydraulite, and experiments were made to see if each of the bases CaO and MgO, or both together, did the same. A cake made from some of the above finely-powdered mixture, and burnt in a Seger oven, yielded only a slightly sintered mass, which, with water, set slowly, and showed only 1·91 per cent. of water of hydration, as against the theoretical 21·06 per cent. The mass obtained from a Heinecke oven was strongly fused and hard, and showed no cracks after three hours' boiling in water. The addition of 5 c.c. of N/1 KOH shortened the time of setting.

According to Zulkowski's theory, the final products of hydration would be—

$$2[SiO_2.MgO + Ca(OH)_2] + [Al_2O_3.2H_2O + Ca(OH)_2 + Mg(OH)_2],$$

corresponding to 21·06 per cent. of water taken up. Weighed quantities of the cement, treated with water and weighed after varying intervals, showed amounts of water taken up much less than this; also when the water was rendered alkaline and when the experiments were conducted in sealed tubes under pressure.

The compound $SiO_2.MgO$, which is separated according to the above equations, when treated with lime-water, swelled up to more than double its mass. It showed no signs of swelling with distilled water, or water rendered alkaline with baryta or potash, and the author suggests that a certain concentration of the hydroxyl ions may be necessary to produce the effect.

The compound $Al_2O_3.CaO.MgO$ should hydrate thus:—

$$Al_2O_2\begin{matrix}OMg\\OCa\end{matrix}O + 4H_2O =$$

$$Al_2O_3.2H_2O + Mg(OH)_2 + Ca(OH)_2$$

the hydrated product containing 36·08 per cent. of water. It was made from dolomite and pure aluminium hydrate, and treated in a Seger oven, &c., as described above; after treatment with boiling water, it showed signs of cracking. Under water it hardened quickly, but after four weeks cracked. Considerably less than 36·08 per cent. of water was taken up in the hydration tests.

From the alkaline reaction of the water in which the balls were kept, and from the fact that cracks appeared in them after four weeks, it is probable that hydration proceeds in two stages, lime being separated first, and afterwards the less easily hydrated magnesia, thus:—

$$CaO.Al\begin{matrix}O\\O\end{matrix}\!\!>\!Al.OMg + 2H_2O =$$

$$HO.Al\,.\,O\,.\,Al.OH + Ca(OH)_2$$
$$\quad\;|\!-\!OMgO\!-\!|$$

$$HO.Al\,.\,O\,.\,Al.OH + 2H_2O =$$
$$\quad\;|\!-\!OMgO\!-\!|$$

$$(HO)_2Al.O.Al(OH)_2 + Mg(OH)_2$$

The compound $SiO\begin{matrix}OCa\\OMg\end{matrix}\!\!>O$, similarly treated, hardened slowly, but afterwards fell to pieces.

Thus, the two components of this artificial cement, alone, showed signs of cracks, but together, in spite of a content of 23·08 per cent. of MgO, gave a non-cracking cement, the surface of which, however, after lying under water for a long time, could be scratched with the finger-nail, and required a long while for its complete hardening.

The "saturation-value" of ordinary Portland cement is 2·6, there being in it a certain amount of uncombined lime. A cement analogous to that described at the beginning was made, but with a "saturation-value" of 2·6, consequently containing uncombined MgO, and balls made from this were found to develop cracks.

Hence, the author concludes that the free or uncombined MgO is the cause of the cracking of cement, since a cement with a saturation-value of 2, which contains half the bases as magnesia and half as lime, in spite of a content of 23·08 per cent. of MgO, shows no signs of cracking, withstands the boiling test, and remains unaltered under water for six months, while an analogous cement with a saturation-value of 2·6 undoubtedly did crack.—W. C. H.

Portland Cement; Some Preliminary Experiments upon the Clinkering of ——. E. D. Campbell. J. Amer. Chem. Soc., 1902, **24**, 969—992.

THE object of these experiments was to furnish the basis for a series of experiments which should show the exact relation between the chemical composition of a slurry and the temperature required for burning. A detailed description of the rotary kiln employed was given in the J. Amer. Chem. Soc., **24**, 248. The author finds that the minimum temperature necessary to produce Portland cement which will give a perfect pat test from fresh clinker is about 1,450° C. This temperature is for a minimum of lime. It increases with increase of lime until, in ordinary commercial cements, it reaches 1,550° C., and somewhat higher than this for the most heavily limed cements. It depends somewhat on the length of time required to pass through the rotary kiln, slow drawing tending to lower the temperature. The substitution of Al_2O_3 or Fe_2O_3 for SiO_2—that is, the use of a richer clay—lowers the "overburning temperature" (*i.e.*, the temperature at which the individual pieces of clinker commence to stick badly to each other or to the inside of the furnace), but may either lower or raise the "temperature required for perfect boiling test" (*i.e.*, the temperature at which clinker is produced which, when made into pats, remains strong, free from cracks, and firmly adherent to glass after exposure to boiling water for 24 hours). With mixtures low in calcium oxide, the burning temperature for perfect boiling test is lowered by this substitution, but with mixtures high in lime it is raised, and may become coincident with the overburning temperature. Attempts to raise the latter by increasing the lime, fail to give a perfect hot test, even at the overburning temperature—which confirms manufacturing experience, that with lean clays, heavily limed, there is a wide margin between the proper clinkering temperature and the overburning temperature, whilst with rich clays, in order to prevent the clinker from balling up, great care must be exercised to maintain the proper clinkering temperature.

With cement containing a normal proportion of lime, the addition of 8 or 9 per cent. of magnesia has but little influence on either the temperature of the perfect boiling test or the overburning temperature. So far as clinkering is concerned, magnesia acts as an inert substance.—L. A.

ENGLISH PATENTS.

Fire-Bricks, Tiles, and the like; Apparatus for Hardening ——. W. P. Thompson, London. From H. Croizier and Co., Paris. Eng. Pat. 20,447, Oct. 12, 1901.

THE hardening chamber consists of a jacketed metal casing, most of which is sunk in the ground, closed at the top by a steam-tight cover, and has a central, vertical, hollow pillar, to which trays are attached. Bricks, &c., are stacked on perforated shelves that can be arranged on the trays. High-pressure steam is admitted to the chamber at the top, and any water that condenses passes through the perforations in the shelves and through ports in the trays into the central pillar. At the bottom of the chamber is a steam-exit pipe, and another to carry off the condensed water from the pillar, both communicating with a collecting reservoir at the bottom of a shaft, sunk in the ground close to the hardening chamber, and at a lower level than the latter. The level of the liquid in the reservoir is indicated by a float with a rod attached, and can be removed through a third pipe by the pressure of the steam.—W. C. H.

Kilns, Furnaces, and Analogous Structures for Firing Burning, and Drying Various Goods [Bricks, &c.] H. Clifford, Tamworth. Eng. Pat. 24,247, Nov. 29, 1901

EACH kiln (except the last) of a series that can be worked on the successive-firing system, is connected with the next by a dampered flue or passage, and also independently by another dampered flue with an uptake shaft. This system of kilns, flues, and dampers admits of each kiln being

separately fired and then connected with its uptake shaft for cooling off, and also admits of the drawing off of gases from the fired kiln, through the unfired kilns, before passing to the uptake. Each kiln has suitable furnaces and a bottom flue or chamber connected with the preceding kiln by a suitable passage, and provided with upright flues, for admitting hot gases from the preceding kiln into the space in which the goods are stacked.—W. C. H.

Artificial Stone; Compounding of ——. H. Croizier and E. Thomine, both of Paris. Eng. Pat. 19,471, Sept. 30, 1901.

A FIRE-RESISTANT artificial stone, which is also a bad conductor of heat, is made by grinding together kieselguhr, lime, and sand, the kieselguhr being in excess of the lime, and stoving the mixture by steam heat, after which the blocks may be roasted to dehydrate the kieselguhr, or dipped in a solution of a silicate and then roasted.
—W. C. H.

Pavements; Manufacture of Materials for ——. W. S. Wilkinson, Baltimore, U.S.A. Eng. Pat. 24,580, Dec. 3, 1901.

BITUMINOUS cement is mixed with as much of the "fines" as may be added without impairing the necessary liquidity of the cement; the remaining body material is agitated, say, in a pug-mill, and, while in agitation, the fines-impregnated cement is added and mixed. The resulting mixture may be strongly compressed in a mould, and the compressed mass subjected to the action of a cooling agent to set it in shape.—W. C. H.

Bituminous and other Compounds, and Articles [Pipes, Slabs, Tiles, &c.] made therefrom; Apparatus for and Method of Treating and Working ——. W. Torkington. From H. Knight, San Antonio, Texas, U.S.A. Eng. Pat. 11,035, May 14, 1902.

A PLANT for coating paper, canvas, or other fabric with asphaltum, bitumen, &c., the material being subsequently employed for various purposes, especially for pipes, slabs, and tiles. The material is impregnated with the bituminous compound on a hot plate, so that it becomes more evenly coated than when passed through the molten mass.—T. A. L.

FRENCH PATENTS.

Wood; Method of Treatment (Drying, Hardening, Fire-proofing, Preserving) of Green ——, *by an Alternating Current.* D. Gnidé. Fr. Pat. 317,530, Jan. 1, 1902.

GREEN wood, unhewn or in planks, is stacked on an impervious flagstone, provided with a shallow flange, and the stack covered with a layer of spongy material, *e.g.*, tow, enclosed between two sheets of wire-gauze, to allow saline solutions to trickle over the gauze, and round the wood, and through the interstices between the blocks, during the operation. An alternating current is passed through the mass, and is said to oxidise and decompose the sappy and incrusting materials (drying), to increase the strength of the fibre (hardening), and to induce accumulation of saline solutions in the mass of the wood (fire-proofing), and to cause it to undergo a special fermentation which renders it non-putrefactive. The salts suggested are sulphate, silicate, or phosphate of soda, phosphate of ammonium, or sulphate of copper or zinc.—W. C. H.

Marble; Manufacture of Artificial ——. S. Weill. Fr. Pat. 317,764, Jan. 14, 1902.

SEE Eng. Pat. 9431 of 1902; this Journal, 1902, 1078.
—W. C. H.

UNITED STATES PATENTS.

Brick-Kiln. T. M. Wilson, Layton, Pa., U.S.A. U.S. Pat. 704,418, July 8, 1902.

Two adjacent furnaces communicate with the kiln through an opening in the kiln-wall, and are separated by a vertical partition, which has a transverse opening, through which the furnaces communicate, the wall being extended vertically through the opening into the kiln, on both sides of the kiln wall thereby laterally bracing the wall.

The kiln, or series of kilns, has an open floor, and two central longitudinal flues, with which transverse flues communicate at their inner ends, and separate dampered chimney connections for the longitudinal and transverse flues. To the longitudinal flues, air-drawing or forcing mechanism can be connected, whereby air can be drawn from any one kiln and, by a suitable damper arrangement, forced into any other kiln or into a drier.—W. C. H.

Kiln-burning Apparatus. G. F. Gray, H. N. Gray, and R. South, all of San Francisco, Cal., U.S.A. U.S. Pat. 708,707, Sept. 9, 1902.

THE brick kiln consists of several chambers for containing the bricks, between which and the interior walls of the chambers, are open combustion spaces. Above the roof of the kiln, oil-drip tubes, with curved nozzles, are arranged. The oil drips into funnels, mounted on seats at the upper ends of vertical openings, which pass through the roof of the kiln, and lead the oil into the upper parts of the open combustion spaces. As the oil falls from the roof to the floor of the chambers, first the lighter and then the heavier fractions are successively vaporised and burned.
—W. C. H.

Brick; Process of Burning ——. J. Peck, Haverstraw, New York. U.S. Pat. 708,394, Sept. 2, 1902.

THE kiln is first thoroughly heated by the action of a fire fed with "atomised" oil; this fire is then stopped, and the burning of the kiln continued by a fire, fed with soft or bituminous coal, or other similar fuel, the smoke from which is said to be completely consumed in the interstices of the kiln, which were strongly heated by the oil burning.
—W. C. H.

Sand; Artificial ——, *and Method of Producing same.* J. A. Shinn, Pittsburg, Pa., U.S.A. U.S. Pat. 707,170, Aug. 19, 1902.

SLAG-SAND is produced by the simultaneous action of two jets of water, under pressure, directed approximately on opposite sides of the stream of slag as it issues from the furnace.—W. C. H.

Stone; Composition for Artificial ——. H. Mielck, Assignor to Mielck's Stone and Terra Cotta Co., New York. U.S. Pat. 711,254, Oct. 14, 1902.

A MIXTURE of 2 parts by weight of kaolin, 1 part of sand, 1 part of burnt magnesia, and an aqueous solution of 1 part of magnesium chloride.—W. C. H.

Stone; Process of Producing Artificial ——. H. Mielck, Assignor to Mielck's Stone and Terra Cotta Co., New York. U.S. Pat. 711,329, Oct. 14, 1902.

FOUR parts of sand, 1 part of burnt magnesia, and 1 part, also by weight, of an aqueous solution of magnesium chloride, forming a liquid of 40°—45° B., are mixed together, tamped into shape, and the compacted mass confined on all sides, and kept so during the slow reaction that takes place, and during the subsequent setting and cooling.—W. C. H.

Refractory Material; Object of ——, *and Method of Manufacturing same.* C. B. Jacobs, East Orange, N.J., U.S.A., Assignor to G. S. Ettla, of Niagara Falls, New York. U.S. Pat. 711,319, Oct. 14, 1902.

BRICKS or other objects are manufactured from refractory silicious material, containing an excess of silica, by fusing such material in the electric furnace, and maintaining it in a state of fusion, until a substantial portion of the silica is volatilised, the fused products being cast into moulds.
—W. C. H.

Lime; Apparatus for Burning ——. G. A. Macc, Menominee Falls, Wis., U.S.A. U.S. Pat. 708,240, Sept. 2, 1902.

NEAR the top of the combustion chamber of a kiln, a pipe is fixed, through which the combustion gases are drawn by means of a suction fan. The amount of the gases drawn can be regulated by a valve in the pipe, and by another valve below the former, a regulated amount of air can be drawn in and mixed with the gases on the way to the fan.

From the fan the mixed gases are discharged by a pipe into a mixing chamber, to which coal dust or other fuel is regularly supplied by a screw conveyor or a bucket elevator, and from this chamber passes down a shoot on to a plate, which can be moved in or out by a rack and pinion, situated in the fire chamber; as this plate becomes hot, it preliminarily heats the fuel on its way into the fire chamber.—W. C. H.

Cement. J. T. McKim, Assignor to L. Miller, both of Thorntown, Ind., U.S.A. U.S. Pat. 704,849, July 15, 1902.

Approximately 49 parts of calcareous ochre, 49 parts of iron-ore paint, and 2 parts of litharge, are ground together, subjected to a temperature of 160° F., and cooled; and approximately 10 parts of this "calcareous" compound are mixed with 70 parts of Portland or similar cement and 70 parts of clean, sharp sand.—W. C. H.

X.—METALLURGY.

Metals; Colouring ——. Rev. Prod. Chim., 5, [19], 291—292.

Colouring Zinc: Black.—(1) After pickling, the metal is immersed in a solution of ammoniacal nickel sulphate, 4; water, 40; sulphuric acid, 1 part; then washed in water and dried. (2) A solution of copper in nitrohydrochloric acid is employed, or one consisting of equal parts of copper sulphate and potassium chlorate in 36 parts of water. After washing and drying, the coated zinc is varnished by immersion in a solution of 2 parts of asphaltum and 12 parts of petroleum spirit (benzine), the excess of the liquid being drained off, and the coating rubbed over with wadding, to fix the colour. (3) A dull black is obtained by immersion in alcohol, 1,000; antimony chloride, 100; hydrochloric acid, 69 parts. After several dippings and drying, the metal is rubbed over two or three times with a drying oil. (4) The zinc is dipped in a 5·4 per cent. solution of manganese nitrate, and dried at 250° C.; this forms a coating of manganese dioxide. After repeating the operation several times, and removing the loose deposit by brushing, the metal is rubbed over with a little linseed varnish. The coating is a very dense black, adheres firmly to the metal, and resists scaling under flexion and hammering; neither is it attacked by dilute acids. (5) A very dilute solution of ammonium molybdate in nitrohydrochloric acid, or molybdic acid dissolved in very weak caustic soda, will produce a brown iridescent patina of molybdenum oxide. (6) Heilbronn acts on zinc with acids and other substances exerting a chemical reaction therewith, either alone or in conjunction with mordants, &c. The reagents comprise dilute hydrochloric acid, lead chromate, white lead, flowers of sulphur, antimony chloride, and various colouring matters, such as carmine, cochineal, Prussian blue, &c. The acid roughens the surface, and the resulting zinc oxychloride forms a substratum for the colouring agents. Varnish increases the lustre and permanence of the coating. The zinc may also be painted over after preparation, with a solution of equal parts of cuprous chloride, copper nitrate, ammonium chloride, hydrochloric acid, and 64 parts of water, the initial black coloration turning grey within 48 hours. (7) Immersion in a solution of:—zinc nitrate, 2; cuprous chloride, 3; hydrochloric acid, 8; water, 64 parts, will impart a black coating to zinc. (8) To produce a coloured stain, ranging from violet, through steel-blue, green, and orange-yellow, to purple red, with sufficient slowness to enable the process to be arrested at any stage, pickled zinc is immersed in copper tartrate, 3; caustic soda, 4; water, 48 parts.

Green.—Puscher produces a green patina by dipping the zinc in a hot filtered solution of:—sodium thiosulphate, 50; sulphuric acid, 25; water, 500 parts. The bright pale-green coating of zinc sulphide first produced, afterwards changes to a brilliant dark grey. Immersion in dilute hydrochloric acid removes the lustre, and black marbling is obtained by dipping at once into acidified copper sulphate. The permanence of the coating is increased by varnishing with copal.

Bronze.—Zinc may be bronzed by rubbing over with colcothar and plumbago, by brushing with:—ammonium chloride, 30; potassium oxalate, 8; and vinegar, 1,000 parts; or by washing the galvanised surface with vinegar, 1,000; ammonium chloride, 30; potassium oxalate, 8 parts.

Silver: Black.—(1) Rub over with plumbago, turpentine, and red ochre; dry, and brush gently, so as to leave the coating in the hollows only. (2) Dip in platinum chloride; the resulting silver chloride is blackened by ammonium bisulphide. (3) Rub the surface over with sulphur. (4) Rub over with a rag dipped in silver nitrate. (5) Rub the article lightly, dip in a saturated solution of silver nitrate until cold, and dry with the aid of heat, finally brushing with a medium hard brush and fine graphite. (6) Dip in a solution of alkali sulphide, and polish by rubbing with a brush and powdered cream of tartar.

Rose.—The silver is dipped for a few seconds in a hot concentrated solution of cuprous chloride, rinsed, dried, dipped in alcohol, and dried by heat.

Dark Brown.—Apply a solution of ammonium chloride and copper sulphate in vinegar.—C. S.

Mild Steel; The Overheating of ——. E. Heyn. Iron and Steel Inst., September Meeting.

The author discusses the question of the brittleness produced in mild steel, such as is employed in the manufacture of boiler plates, structural material, wire, &c., by overheating, and gives an account of his experiences on the subject. He draws a distinction between overheating and burning. "Burning" is defined as a chemical change in metals, especially with respect to the taking up of oxygen by them, this change, of course, affecting their physical properties. "Overheating," on the other hand, is considered to mean an increase in the brittleness of metals brought about by heating under special conditions, but involving no change in the chemical composition. The main conclusions arrived at by the author are as follows:—

(1) When low-carbon mild steel is annealed at temperatures above 1,000° C., an increase in the degree of brittleness is produced, if the annealing period is sufficiently long. This increase is greater and appears more quickly the higher the temperature of annealing is, and it is possible to produce any desired degree of variation in the brittleness within definite limits.

(2) Prolonged annealing, say, uninterrupted for 14 days, at temperatures between 700° and 890° C., produces no change in the brittleness, except that in cases where the brittleness of the material in its initial state was not at the lowest degree possible, such lowest degree will be attained.

(3) Between 1,100° and 900° C. there is a temperature limit above which, if the annealing be carried on for a longer period and at an increasing temperature, the degree of brittleness increases, whilst below this limit such is not the case.

(4) Overheating becomes apparent at temperatures considerably lower than that of extreme white heat, but only above the temperature limit referred to.

(5) By suitable annealing, the brittleness of overheated low-carbon mild steel can be eliminated. If annealing be carried out at above 900° C., a short period of about half an hour is sufficient. Longer annealing must be the more carefully avoided the more the temperature limit referred to in (3) is exceeded. Below 800°, an annealing of even five hours is not sufficient to eliminate the brittleness, but by annealing of several days' duration, at temperatures between 700° and 850° C., this object can be attained.

(6) If low-carbon mild steel which has been annealed for such a period at a high enough temperature, that, if allowed to cool undisturbed, it would show extreme brittleness, it will exhibit no brittleness when cold, if it be rolled or forged during cooling to bright red heat.

(7) The fracture of overheated low-carbon mild steel generally, though not invariably, shows a coarse grain.

(8) The single crystal grains of which the structure of iron is built up, are often of considerable dimensions when in the state of overheating, but this cannot be considered as definite proof that overheating has taken place, since the method of cooling also exercises a great influence on the

size of the ferrite grains. Rapid cooling from the temperature causing overheating produces fine ferrite grains, without reducing the brittleness appreciably, whilst, on the other hand, it is possible, by heating low-carbon mild steel for several days at 700°—890° C., to bring the material into such a condition that it will show exceedingly coarse ferrite grains, and yet not exhibit brittleness.—A. S.

Carbide of Iron, Fe_3C; Probable Existence of a New ——. E. D. Campbell and M. B. Kennedy. Iron and Steel Inst., September Meeting.

It is known that the carbide of iron separating from solid solution in the presence of a very large excess of iron has the empirical formula Fe_3C. The authors, with a view of ascertaining whether a carbide crystallising or precipitating from solid solution in the presence of a much larger proportion of carbon than is found in ordinary steels might not have a different composition, isolated the carbides from a sample of annealed white iron. In the carbide obtained, the amount of carbon varied, within the limits of experimental error, between that required for Fe_3C and that for Fe_2C, and as it seems more probable that iron would form two carbides (Fe_3C and Fe_2C) rather than a large number containing amounts of carbon varying between 6·67 and 9·67 per cent., the authors accept the former assumption as an explanation of their results.—A. S.

Gold-Copper Ores at Santa Fé (Mexico); Concentration and Smelting as applied to the Treatment of Low-Grade ——. H. F. Collins. Paper read before the Inst. of Mining and Metall., Oct. 16, 1902.

The Santa Fé ores comprise: (1) grains of bornite in a gangue of clean wollastonite, with occasional portions in which garnet crystals appear mixed with the latter mineral; (2) ores containing copper minerals in hard, flinty, or brittle opaline quartz; (3) wollastonite crystallised in interlaced network of sheaf-like crystals, which make the mass very tough, and much intermingled with garnet, with quartz, and occasionally with calcite; whenever garnet is present, the copper is always closely associated with it. The specific gravities of the component minerals were found to be: bornite, 5·00; chalcopyrite, 4·15; garnet, 3·89; and wollastonite, 2·90; and when the garnet is associated with copper minerals, particularly with chalcopyrite, or when this mineral is so intimately mixed with the bornite as to give rise to a large number of grains composed partly of the one mineral and partly of the other, a good separation into only two products becomes impossible unless nearly the whole of the garnet is allowed to enter the concentrates. The garnet middlings, however, should really form a separate product, and as ordinary processes of wet concentration have failed, a smelting process has been adopted so as to concentrate them to a grade suitable for shipment. The present treatment of the Santa Fé ores is based upon the principle of making, as far as possible, two products throughout: "a concentrate of over 40 per cent. for shipment" and "middlings" of various degrees of fineness, and varying in richness from 5 to 15, average 7 per cent. of copper, with corresponding amounts of gold and silver. The special methods of treatment adopted for this particular class of ores are then described in detail, including a plate showing the general scheme of concentration.—A. S.

Manganese in Ferro-Manganese and Spiegel; Determination of ——. C. Bolin.

See under XXIII., *page* 1414.

English Patents.

Steel; Manufacture of ——. W. White, jun., Pittsburg, Pa., U.S.A. Eng. Pat. 5796, March 8, 1902.

See U.S. Pat. 695,256 of 1902; this Journal, 1902, 619. —E. S.

Copper Ores; Treatment of ——, *for the Recovery of the Metals.* A. M. G. Sebillot, Paris. Eng. Pat. 20,077, Oct. 8, 1901.

The unroasted, powdered ores are treated with sulphuric acid "at its temperature of evaporation," to form sulphates. The surplus acid is distilled off, and, with the SO_2 produced, is recovered. The fixed product is lixiviated in successively shallower vessels under constant agitation, in a current flowing in direction opposite to that of the ores. The metals dissolved (copper and silver) are recovered from the solution by the usual processes.—E. S.

Spelter; Refining ——. F. Rey and S. Gregory, London. From C. Wessell, New York, U.S.A. Eng. Pat. 22,387, Nov. 6, 1901.

See U.S. Pat. 698,163 of 1902; this Journal, 1902, 710. —E. S.

Alloys [Manganese-Copper and Manganese-Iron]; Improved Process of Making ——. J. G. Lorrain, London. From G. Thomson, Elizabeth, New Jersey, U.S.A. Eng. Pat. 22,554, Nov. 8, 1901.

To obtain a copper-manganese alloy, and also a manganese-steel, a molten mass is formed containing copper, iron, and manganese, which is preserved in a fluid quiescent state until an alloy of a portion of the copper with the manganese has subsided to the bottom; the supernatant alloy of iron, with the remainder of the copper and manganese, is then drawn off, and is similarly kept in fusion with addition of scrap steel, whereby an alloy of iron and manganese is formed, and the copper, which separates by gravity, may be re-used in the process.—E. S.

Ore-Separators; Magnetic ——. F. J. King, Croydon. Eng. Pat. 5209, March 1, 1902.

The ore is fed from a hopper on to an inclined plane of brass, and there passes over a series of magnets placed transversely to its path, with their poles alternately reversed, so that as the ore passes over them, the polarity of its magnetic particles is constantly changing, with the result that the constant turning motion to which they are subjected causes them to come to the upper surface of the stream of ore. They then come under the influence of a powerful magnet, also made up of bars of alternate polarity, placed above the ore, and this attracts the magnetic particles from the top of the stream; these, in leaving, carry but little of the non-magnetic portion mechanically with them. A belt of canvas or rubber is constantly passing over the upper magnets, so that the particles are carried along their surface until at last they pass beyond the sphere of the magnetic influence and fall off. The non-magnetic tailings are delivered into a separate receptacle at the bottom of the inclined brass plane. This plane is kept in gentle motion to assist the passage of the ore over its surface.—W. G. M.

French Patents.

Steel; Transformation direct into ——, *of Iron Waste or Scrap, without Addition of Cast Iron.* The Société dite Gouvy et Cie. and M. Marthelot. Fr. Pat. 317,969, Jan. 21, 1902.

A charge of the scrap iron, mixed with iron or manganese oxides or the like, and carbon, is treated in a Martin's furnace to obtain steel.—E. S.

Metals of the Alkalis; Production of ——. The Chemische Fabrik Griesheim-Elektron. Fr. Pat. 317,536, Jan. 4, 1902.

See U.S. Pat. 710,493 of 1902; this Journal, 1902, 1333. —E. S.

Metals, Metalloids, and other Metalliferous Substances; Improved Means applicable for use in the Separation of Volatile from Non-Volatile ——. G. G. M. Hardingham. Fr. Pat. 317,737, Jan. 14, 1902.

See Eng. Pat. 10,351 of 1901; this Journal, 1902, 862. —E. S.

Antimony Ores; Process of Treating ——. Chatillon. Fr. Pat. 317,604, Jan. 7, 1902.

The furnace, of the cupola type, to which the admission of air is controlled by a metallic plate (damper), is charged from the top with the ore and fuel in alternate layers, the scoriæ being withdrawn from the bottom. The fumes are drawn,

first, into a small chamber containing a coil of piping, open externally to the atmosphere; the air, heated by passage through the coil, discharges amidst the fumes, whereby the soluble Sb_2O_3 therein is oxidised into the insoluble Sb_2O_4. When this transformation is not desired, the coil is not used, or the hot air traversing it is diverted into the furnace. The fumes are draughted from the small chamber to condensing towers, into which they are so led by pipes as, on escaping, to issue in spiral or corkscrew directions, passages being provided from tower to tower, and lastly to a Glover tower, in which the gases are washed by a water shower. If it be desired to obtain the metal in a reguline state, the fumes are passed from the roasting furnace through incandescent fuel in a reducing furnace, provided with means for collection of the metal. The process is stated to be applicable in the treatment of zinc, lead, and arsenical ores.—E. S.

Zinc; Refining ——. C. Wessell. Fr. Pat. 317,619, Jan. 8, 1902.

See U.S. Pat. 698,163 of 1902; this Journal, 1902, 710. —E. S.

Metals from Sulphide Ores; Solution to be used in, and Process for the Separation of ——. C. V. Potter. Fr. Pat. 317,882, Jan. 18, 1902.

See Eng. Pat. 1146 of 1902: this Journal, 1902, 410. —E. S.

United States Patents.

Iron Blast Furnace [*Liquid Fuel*]. M. P. Boss, San Francisco, Assignor to Hydrocarbon Smelting Co., New York. U.S. Pat. 708,116, Sept. 2, 1902.

This furnace is intended for use with oil-fuel. It consists of a vertical, water-jacketed fire-chamber, with rectangular hearth and tap-hole below, and with an inclined tunnel leading upwards from the top; the charge for the furnace passes down this tunnel, and in so doing is preheated by the waste gases escaping up it. In the lower part of the furnace, just above the tap-hole, is placed a horizontal row of openings inclined downwards on each long side of the hearth. Oil is fed as required through these openings to carburise the reduced iron. Above this row there are rows of tuyère holes, through which oil is sprayed, together with the requisite amount of air for combustion. Both the tuyères and the oil-pipes pass through the water-jacket. —W. G. M.

Iron Ores for Blast Furnaces; Process of Treating Fine ——. A. D. Elbers, Hoboken, N.J., U.S.A. U.S. Pat. 708,331, Sept. 2, 1902.

The fine ores are mixed with pulverised blast-furnace slag, of the singulo-silicate type, containing but little alumina. The mixture is calcined in a rotating kiln, and obtained as clinker suitable for use in the blast-furnace.—W. G. M.

Iron, &c.; Furnace for Heating and Melting ——. H. L. Gantt, Fountain Hill, Pa., U.S.A. U.S. Pat. 708,705, Sept 9, 1902.

This is a regenerative furnace in which the air alone is regenerated, the gas being supplied as hot as possible from an adjacent producer. The gas is supplied through reversing-valves directly into the hearth, through ports, of which there is a set at either end, used alternately, as is customary. The two air-regenerators are so placed that between each and the hearth there is a combustion chamber. The two combustion chambers are connected by a passage provided with a damper. By this means preheated air is supplied in part to the furnace-hearth and in part to the combustion chamber, through which the waste gases are flowing to the second regenerator on their way to the stack. The proportion of air supplied to each is so arranged that there is an excess of reducing gas (and therefore less oxidation) in the hearth, whilst the complete oxidation of the furnace gases is effected in the combustion chamber. Finely-divided solid or liquid fuel may be used.—W. G. M.

Smelting Furnaces; Utilising Waste Heat in connection with ——. R. Brown, Southampton. U.S. Pat. 708,018, Sept. 2, 1902.

The apparatus comprises "a covered chamber to receive the materials for the furnace, having a floor, and supported so as to form flues to receive bogies containing hot products from the furnace, the floor having openings adapted to allow air heated by contact with the hot products to ascend through the materials thereon."—W. G. M.

Ore roasting Apparatus. A. M. Beam, Denver, Col., U.S.A. U.S. Pat. 708,615, Sept. 9, 1902.

A rotating cylindrical horizontal shell, with internal spiral ribs, has, co-axial with it and rotating along with it, an inner tube containing a conveyor. The ore is fed into one end of the inner tube and is ultimately discharged, roasted, at the other end; at the latter end are perforations serving to conduct the roasting gases to a flue. The products of combustion from a fire-grate pass spirally along the space between the shell and the tube, in a direction opposite to that in which the ore is being conveyed.—W. G. M.

Roaster [*Ores*]. J. A. Ogden, Philadelphia, Pa., U.S.A. U.S. Pat. 708,728, Sept. 9, 1902.

The ore to be roasted is fed on to the upper end of a long inclined plate, suspended freely from end to end of an inclined flue; a constant up-and-down motion is given to the plate by means of a cam. The plate extends a little beyond the flue at each end, to assist in the charging and discharging of the ore. At the lower end there is a grate, and the products of combustion pass beneath the ore-plate, escaping by a chimney at the upper end.—W. G. M.

Ore-roasting and Fume-saving Apparatus; Combined ——. W. H. Motter, Denver, Col., U.S.A. U.S. Pat. 708,977, Sept. 9, 1902.

A long horizontal masonry flue connects a fire-grate with a chimney stack; a rotating tube, supported on rollers, runs centrally from end to end within the flue. The ore is charged into a hopper at the stack end of the flue, and is fed by a worm into the rotating tube, within which it is conveyed by a spiral and delivered at the far end. Within the tube is a narrower tube connected to it concentrically throughout its length; this inner tube is perforated, and, by a special joint (which permits it to turn freely), is connected to a stationary tube leading to an exhaust fan. This fan draws the fumes and gases produced in roasting into the perforated tube, and discharges them into a tank of water, where the sulphur dioxide is absorbed, and whence the resulting solution is drawn off as required.—W. G. M.

Converters or Furnaces; Method of Forming Lining of ——. U.S. Pat. 710,588.

Converter. U.S. Pat. 710,589.

Converters or Furnaces; Lining for ——. U.S. Pat. 710,916, Oct. 7, 1902. W. J. Knox, Edgewood Park, Pa., Assignor to G. Westinghouse, Pittsburg, Pa.

The basic linings of converters for the treatment of copper matte, &c., are made in the following way:—Magnesite or chromite, and "oxysulfid of iron," are finely ground and mixed together with "water glass" and sufficient water to make the mass plastic; the amount of "water glass" (silicate of soda) used must be sufficient to make the whole mass contain about 2 to 3 per cent. of silica; this mixture is placed in position in the converter, by using a temporary lining to support it, and allowed to partially dry; a solution of calcium chloride is then applied to the inner surface, and all the moisture dried out. The "oxysulfid of iron" mentioned above, is formed when iron oxide is added to molten sulphide of iron, and may be obtained by oxidising a molten mass of copper matte containing iron, in a basic lined converter, whereby the iron oxide formed dissolves in the molten sulphide.—J. W. H.

Furnace; Combined Metallurgic ——, and Precipitating Water Tank. G. Bryan, St. Louis, Miss. U.S. Pat. 711,281, Oct. 14, 1902.

The waste gases from a metallurgical furnace are conducted through a water-jacketed down flue into a compartment of a water tank, which is provided with another compartment communicating with a chimney, and with two other compartments open to the air, for the withdrawal of the precipitate formed. The compartments are separated by water-sealing partition walls. A suction and blast fan operate between the waste gas receiving- and expelling-compartments.—E. S.

Roasting Furnace. D. Sheedy and M. W. Iles, Denver, Col. U.S. Pat. 711,352, Oct. 14, 1902.

The furnace, adapted for roasting, calcining, or chlorodising of ores or other materials, is of the horizontally-extended type, having its arch entirely suspended from suitable supports above and disconnected from the hearth, and is at "such a distance above the same as to afford continuous openings on both sides for the passage of stirring and conveying devices, transverse scrapers passing through the lateral openings on each side of the furnace." Endless carriers are connected with the scrapers. The axles to conveyors carrying rabbles over the hearth, are hollow pipes open at both ends, and with holes near the centre of the furnace for passage of air through. The upper framework has a travelling track and conveyor for the delivery of the ore.—E. S.

Slag Steam Generator. G. Mitchell, Naco, Ariz., Assignor to L. D. Copeland, Los Angeles, Cal. U.S. Pats. 711,331 and 711,332, Oct. 14, 1902.

Hot Slag, &c.; Process of Generating Steam from ——. G. Mitchell, Naco, Ariz., and L. D. Copeland, Los Angeles, Cal. U.S. Pat. 711,333, Oct. 14, 1902.

In this group of closely related and consecutive patents, the process and apparatus for producing steam under pressure by the admission of hot slag to water in a steam generator are described. The hot slag is fed from a hopper, intermittently through a rotary valve into a feed chute or chamber in the upper part of a steam generator, in which chute it is supported by an oscillating valve, on opening which the slag falls by gravity into the body of water in the generator (this being meanwhile closed steam-tight), whence it may be withdrawn intermittently from the bottom in a granulated state. Two or more of the generators may be used in vertical series, the lower receiving the slag discharged from the generator next above.—E. S.

Zinc; Process of Obtaining ——. E. H. Hopkins, London. U.S. Pat. 708,044, Sept. 2, 1902.

Lead-zinc ores (roasted to oxide if necessary) are charged with carbon into a retort, the opening of which is closed with a porous carbon slab. The zinc distils through this (heated to incandescence), and passes to suitable condensers, leaving the reduced lead, as metal, in the retort. (See Eng. Pat. 22,554 of 1900; this Journal, 1902, 54.)

—W. G. M.

Zinc Furnace. W. C. Wetherhill, Joplin, Miss., U.S.A. U.S. Pat. 708,438, Sept. 2, 1902.

A rectangular firebrick chamber is divided into a series of compartments by transverse walls extending from top to bottom; these walls are formed of superposed, adequately-supported, fireclay combustion flues, through which circulate preheated (regenerated) air and gas in process of combustion. In the vertical compartments between these heated walls is placed the charge of zinc oxide ore and carbonaceous material. The escaping zinc vapour is conducted away to condensers. The spent charge is withdrawn through doors in the bottom. The flues are shaped so that projecting edges form overhung recesses, along which the vapours formed in the reaction can travel. The end walls of the chamber are supplied with hinged metallic doors, which assist in giving access to the interior and also in controlling the temperature.—W. G. M.

Metals from their Ores; Apparatus for Separating ——. W. A. R. Loose, Provo, Utah, U.S.A. U.S. Pat. 708,567, Sept. 9, 1902.

This is an improvement on U.S. Pat. 674,563 of May 21, 1901, and is mainly intended for application to copper ores. The crushed ore is mixed with carbonaceous material and fed through a hopper into sloping, rotating fireclay, platinum, or iron muffles placed within a combustion chamber, and so heated to a temperature at which all the oxidised copper compounds present would be reduced. The reduced ore is discharged into agitators or crushers containing water, and the metal is afterwards separated by dressing. An arrangement is described in which gas is used as a reducing agent. A shield and a mica-covered sight-hole are provided in the muffles.—W. G. M.

Copper; Process of Recovering Metallic ——, from Copper Precipitate. D. McKechnie, Liverpool. U.S. Pat. 711,173, Oct. 14, 1902.

See Eng. Pat. 5693 of 1901; this Journal, 1902, 350.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Electricity; Some Applications of ——, in Chemistry. J. T. Conroy. Paper read before the Liverpool Chemists' Assoc. Chem. and Druggist, 1902, **61**, [1186], 667.

The author divides the methods of applying electricity in chemical operations into three main groups: (1) electrolytic processes; (2) electric furnace reactions; (3) the electric discharge. In the case of electrolysis, this is most simple with fused salts, theoretically; but practically, many difficulties are presented, and no large measure of success has been achieved, except in the manufacture of aluminium and sodium. For the production of alkali and chlorine by the electrolysis of solutions of alkali chlorides, three types of processes are in use, *viz.*, the mercury, diaphragm, and gravity methods. In the last-named method, which is used on a manufacturing scale in Austria, the alkali formed at the cathode and the chlorine liberated at the anode are kept separate by taking advantage of the difference in density between the alkali and the brine. A good current efficiency is attained, but the alkali liquor is of low strength, and is largely contaminated with salt. The Castner-Kellner (mercury type), Hargreaves-Bird (diaphragm), and gravity processes all allow of a current-yield of 80—90 per cent. being obtained.

In electrolytic processes for the production of hypochlorites and chlorates, the current efficiency is low, this being due to a considerable extent to purely chemical reactions. Imhoff found that losses caused by reduction by the hydrogen liberated at the cathode, are considerably lessened if a small quantity of an alkali chromate be added to the electrolyte.

Of organic compounds, only the salts of organic acids are electrolytes. Kolbe, in 1849, found that on electrolysing an aqueous solution of potassium acetate, hydrogen is evolved at the cathode, whilst carbon dioxide and ethane are liberated at the anode. In electrolyses of this kind, the hydrocarbon produced contains twice the number of carbon atoms present in the radicle combined with the carbonyl group. In 1891, Crum Brown and Walker found on electrolysing salts of the acid esters of dibasic fatty acids, that the ester group behaves as a non-electrolyte, and consequently the compounds behave as salts of a monobasic acid, such as acetic acid. V. Miller has recently combined the two processes, and has succeeded in producing esters of monobasic acids of increasing carbon content.—A. S.

Caustic Potash; Electrolysis of Molten ——. M. Le Blanc and J. Brode. Zeits. f. Electrochem., 1902, **8**, [43], 817—822.

This is a continuation of a previous paper (this Journal, 1902, 1235). The decomposition values are very similar to those of caustic soda; the samples containing most

water, and melting at the lower temperature, show only the lower point (1·3 volt), whilst those with but little water show only the higher point (2·1 volts). But whereas, in the electrolysis of caustic soda, the evolution of hydrogen and oxygen is observable at a P.D. of 1·3 volt, in electrolysing fused potash, hydrogen only is observed at this point, the oxygen first appearing at higher pressures and greater current densities. The period at which the oxygen is first seen varies with the depth to which the electrode is immersed, and is not indicated by an irregularity in the current curve. It would appear from subsequent experiments that oxygen is really evolved at 1·2 volt, but is at once absorbed in the formation of peroxide. Nickel cathodes are somewhat attacked in electrolysing caustic potash with high current densities (rarely so in soda), probably owing to the temporary formation of nickel-potassium alloys. The amount of hydrogen evolved never attained the theoretical figure, probably owing to the depolarising action of peroxide. In electrolysing samples containing much water, hydrogen only was evolved, and no potassium. It appears that caustic potash must be a far better carrier of oxygen than is caustic soda.

Castner has patented the electrolytic reduction of potassium from fused caustic potash, but the authors have completely failed to isolate the metal in the apparatus described, which gives excellent results with sodium. The reason for this is the great readiness with which potassium oxidises at the temperature employed. But by covering the bath with paraffin oil it is possible to obtain globules of potassium with great ease. Castner's process therefore does not appear to be industrially applicable to the electrolysis of pure fused caustic potash.—W. G. M.

English Patents.

Accumulators or Secondary Batteries. F. N. Blanc, Paris. Eng. Pat. 26,237, Dec. 23, 1901.

The different parts of the accumulator are formed of aluminium, which has been previously coated electrolytically with copper or any other suitable metal, and then plunged into a bath of molten lead. The coating of metallic lead serves to insulate the aluminium from the electrolyte, and to prevent the formation of sulphate of aluminium, which would hinder the passage of the current.
—G. H. R.

Chlorates and Perchlorates; Electrolytic Manufacture of ——. P. L. E. Lederlin, Chadde, France. Eng. Pat. 14,386, June 25, 1902. (Under Internat. Conv., Jan. 8, 1902.)

See U.S. Pat. 693,035; this Journal, 1902, 346.—W. G. M.

French Patents.

Secondary Batteries. C. T. J. Oppermann. Fr. Pat. 317,621, Jan. 8, 1902.

The surface of the lead supports for the active material are roughened by sand being blown on them to increase the extent of the contact surface and consequently the adherence and conductivity between the active material and its support. Means are provided for connecting the electrode plates, which are covered on each side by perforated sheets of ebonite or other insulating material, between which are inserted separators, consisting of cords of some elastic substance unaffected by the electrolyte, and which form intermediate spaces serving for the escape of gases and the circulation of the electrolyte. The active material is formed of lead oxide mixed with a solution of bitumen in a light hydrocarbon, preferably benzine, with or without the addition of alcohol or of dilute sulphuric acid. (See U.S. Pat. 706,444; this Journal, 1902, 1143.)—G. H. R.

Electric Accumulators. Mathias. Fr. Pat. 317,634, Jan. 9, 1902.

Spongy antimony is substituted for spongy lead in the negative electrodes of electric accumulators, a great reduction in the weight of the accumulators being thus effected, together with other advantages. The spongy antimony may be obtained by the electrical reduction of antimony oxychlorides, oxysulphides, or sulphides; or by precipitation by zinc or iron, of solutions of salts of antimony; or by acting upon an alloy of antimony and another metal (as zinc, for instance) by dilute sulphuric acid or other suitable solvent.—E. S.

Saccharine and other Liquids; Purification and Decolorisation of ——, *by Electro-dialysis with a Halogen.* Spillern-Spitzer. Fr. Pat. 317,854, Jan. 17, 1902.

See under XVI., *page* 1406.

Chlorates and Perchlorates; Electrolytic Manufacture of ——. [*Hydrochloric Acid.*] P. L. E. Lederlin. Fr. Pat. 317,930, Jan. 8, 1902.

See Eng. Pat. 14,387 of 1902; this Journal, 1902, 1282.
—G. H. R.

Chlorates and Perchlorates; Electrolytic Manufacture of ——. [*Hydrochloric Acid.*] P. L. E. Lederlin. Fr. Pat. 317,931, Jan. 8, 1902.

See Eng. Pat. 14,387 of 1902; this Journal, 1902, 1282.
—G. H. R.

Alumina, Pure; System of Producing —— [*Electrical*]. C. M. Hall. Fr. Pat. 318,174, Jan. 28, 1902.

See Eng. Pat. 2260 of 1902; this Journal, 1902, 549.
—E. S.

United States Patent.

Electro-dialysis; Purifying Sugar Juice by Means of ——. A. Baudry. U.S. Pat. 711,375, Oct. 14, 1902.

See under XVI., *page* 1406.

(*B.*)—ELECTRO-METALLURGY.

Iron Ores; Electric Concentration of ——. M. Ruthenberg. Engineering, Oct. 10, 1902, 484. Paper read before the American Electro-chemical Society.

The concentrates from low-grade magnetic iron ores are concentrated magnetically as highly as possible, and then passed through an electric furnace, the melting zone of which is a strong magnetic field. The grains of magnetite are caught and detained between the electrodes, making a high-resistance bridge, through which the current flows. As the ore melts it loses its magnetism and falls out of the magnetic field, being replaced by fresh ore from above. The resulting product consists of masses of very pure magnetite, varying in size from a bean to a walnut, which are stated to be specially suited for employment as blast-furnace charges. If a reducing agent, such as powdered charcoal, be added to the ore before it is passed through the furnace, a partial reduction takes place, and a fritted mass of carbonaceous dust and iron ore, partly reduced, is formed, which may be dropped into a soaking pit, where, under the influence of the heat still retained in the mass, a further reduction takes place, with the production of steel, which is free from sulphur and phosphorus, and appears to be very suitable for charging open-hearth furnaces. The author claims that the method is specially applicable to the treatment of ferruginous sands. These usually contain titanium in the form of grains of ilmenite, and by adjusting the strength of the magnetic field, the two minerals (ilmenite and magnetite) can be separated, 71 per cent. of magnetite being thus obtained from a sand containing 72·40 per cent.
—A. S.

Iron; [Electrolytic] Preparation of Pure ——. A. Skrabal. Ber., **35**, [16], 3404—3405.

Iron deposited electrolytically from ferrous ammonium oxalate, as suggested by Treadwell, contains both carbon and hydrogen. The author deposits iron electrolytically in this way, and then uses the deposited iron as anode in a neutral or very slightly acid solution of ferrous or ferrous ammonium sulphate, the cathode being a clean platinum plate, and the electrolysing current of very feeble E.M.F. (0·4 volt). The iron thus deposited differs sensibly from that obtained from the oxalate; it is crystalline, pure white, and dissolves completely, though very slowly, in warm dilute sulphuric acid, evolving absolutely inodorous hydrogen.—J. T. D.

French Patents.

Metals and Compounds; Deposition of ——. [*Zinc.*] S. Cowper-Coles and Co. Fr. Pat. 317,628, Jan. 8, 1902.

See U.S. Pat. 701,298 of 1902; this Journal, 1902, 917. —G. H. R.

Zinc; Galvanotechnical and Electrometallurgical Extraction and Refining of ——. [*Boric Acid.*] M. Paweck. Fr. Pat. 318,163, Jan. 28, 1902.

The electrolytic extraction of zinc, and preferably the coating with zinc of articles of iron or other metals or alloys, is effected by the employment of a bath in which, besides the metallic salts, such as the sulphate and chloride of zinc, and the conducting salts, such as ammonium sulphate and alkali, the compounds of borax are also employed, such as free boric acid or the borates. A strongly concentrated bath (up to and beyond 20° B.) is obtained by a suitable addition of the corresponding zinc salt. The baths described can be combined with analogous baths, or with other known zinc baths, in any desired proportion. The articles to be coated with zinc—nails, for instance—are introduced into receptacles of perforated sheet iron, or of network of iron or brass wire, mounted like the blades of a turbine, preferably on a horizontal axis. The object to be coated is suspended stationarily in the bath as the cathode, whilst the anodes are mounted as spokes on, preferably, vertical axes, and kept rotating during the electrolysis.—G. H. R.

XII.—FATS, FATTY OILS, & SOAP.

Cod-Liver Oils; Examination of ——. Utz. Zeits. öffentl. Chem., **8**, 304—306. Chem. Centr., 1902, **2**, [15], 964.

The author has determined the refractive indices of various liver oils:—

Kind of Oil.	Refractive Index, n_D at		Scale Divisions of the Zeiss Butyro-Refractometer at	
	15° C.	20° C.	15° C.	20° C.
Lofoden	1·4821	1·4800	86·6	82·9
Newfoundland	1·4788	1·4769	80·8	77·5
"Finnmarken"	1·4806	1·4790	83·9	81·2
Dark	1·4822	1·4802	86·7	83·2
Newfoundland	1·4792	1·4772	81·5	78·1
"Ia. vapore par."	1·4813	1·4792	85·2	81·5
"Alb. Ph. G."	1·4812	1·4792	85·0	81·5
"Alb. Ia. vap. par. Ph. G. IV." Bergen steam medicinal cod-liver oil, Lofoden.	1·4820	1·4800	86·4	82·9
"Alb. Ph. G. IV." natural white cod-liver oil, clarified at 0° R., extra fine.	1·4821	1·4800	86·6	82·9
"Alb." Newfoundland superfine (seal oil).	1·4791	1·4770	81·3	77·7
"Flav. Nr. 2"	1·4795	1·4775	82·0	78·6
Crude clear train-oil	1·4821	1·4800	86·6	82·9
Stickleback oil	1·4826	1·4797	87·5	82·4
Dolphin oil	1·4708	1·4682	67·7	63·6

The results show the refractive index affords a good means of distinguishing between Newfoundland and Norwegian liver oils.—A. S.

Apricot-Kernel; Fatty Oil of the ——. K. Dieterich. Verh. d. Vers. Deutsch. Ntf. u. Aerzte, 1901, **2**, 165—168. Chem. Centr., 1902, **2**, [15], 943.

Apricot kernels contain 40—41 per cent. of oil, which has the following constants: sp. gr. at 15° C., 0·915—0·9211; sp. gr. at 90° C., 0·9010—0·9015; solidifying point, −14° to −20° C.; refractometer value at 25° C., 65·6—67·0; at 40°, 58·0; at 50° C., 52·25; critical temperature, 46·47° C.; acid value, 3·53—3·60; saponification value, 193·1—215·1; iodine value Hübl, 100—108·7; Hübl-Waller, 107·8—108·9. The fatty acids had: sp. gr. at 15° C., 0·9095; at 90° C., 0·8875; solidifying point, 0°—4·5° C.; butyro-refractometer at 25° C., 56·23—56·30; at 40°, 56·0; at 50° C., 41·3; critical temperature, 19·5° C.; iodine value Hübl, 99·06—99·82; Hübl-Waller, 96·64—97·90.

Apricot-kernel oil can be distinguished from almond oil by Biber's reagent (fuming nitric acid, sulphuric acid, and water), with which it gives a red colour, whilst almond oil only gives a faint yellow; and also by Nicklès' reaction (emulsion with $Ca(OH)_2$), the emulsion with almond oil soon separating, whilst that with apricot-kernel oil remains permanent.—A. S.

English Patent.

Oils, Fats, and other Saponaceous Materials; Treatment of ——. C. Weygang, Gravesend. Eng. Pat. 17,988, Sept. 9, 1901.

A completely or incompletely saponified rosin soap is treated with a dilute acid, and the resulting resinous deposit used as a purifying agent for oils, especially cotton-seed oil. A suitable proportion of the product (say 5 to 10 per cent.) is melted into the crude oil, and the mixture boiled for two hours or more with about 25 per cent. of water, and then left for the clarified oil to rise to the surface.—C. A. M.

French Patents.

Fish Oil; Manufacture of a Tallow Substitute from ——. Sandberg. Fr. Pat. 317,540, Jan. 4, 1902.

Fish, whale, or seal oil, &c., is treated with sulphuric and nitrous acids at a temperature preferably below 60° C., and the resulting solid product, "suif d'huile de poisson," employed in the manufacture of hard soap and candles. —C. A M.

Vegetable Oils; Treatment of Residues from ——, *for use as Forage.* C. Fresenius. Fr. Pat. 317,578, Jan. 7, 1902.

The residues left from the purification of vegetable oils are treated with alcohol, methyl alcohol, or acetone to remove bad-flavoured or injurious impurities, the solvent separated mechanically, and the residue dried and used as forage. —C. A. M.

Soap Granulator. R. W. Cavenaugh. Fr. Pat. 317,618, Jan. 8, 1902.

See Eng. Pat. 224 of 1902; this Journal, 1902, 355. —C. A. M.

United States Patents.

Oil; Process of Extracting ——, *from Fish Livers.* A. S. Hamilton, Needham, Mass., U.S.A. U.S. Pat. 711,307, Oct. 14, 1902.

The freshly-removed livers are mixed with a suitable proportion of sodium chloride, and allowed to stand at the ordinary temperature until the cells are disintegrated (24 to 72 hours). The oil that has risen to the surface is then removed, and the residual livers pressed in the usual manner.—C. A. M.

Soap Cake; Antiseptic ——. E. Klein and O. P. Workman. U.S. Pat. 711,403, Oct. 14, 1902.

See under XVIII. C., *page* 1408.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Potassium Tungsten Bronze. G. v. Knorre and E. Schäfer. Ber., 1902, **35**, [16], 3407—3417.

"Tungsten bronzes" are compounds of the alkali metals with tungsten and oxygen, which, owing to their colour and insolubility in acids and alkalis, have been employed as substitutes for bronze-powder. In 1883, one of the authors (J. prakt. Chem., **27**, 49—65, 91—93) investigated the preparation, properties, and composition of potassium tungsten bronze. It was found that only one potassium bronze exists, potassium in this respect behaving quite differently from sodium, which forms four bronzes. The potassium bronze prepared had the composition $K_2W_4O_{12}$. In 1898, Hallopeau (Bull. Soc. Chim., **19**, 746;

21, 267; Ann. Chim. Phys., 19, 106) claimed to have prepared two potassium bronzes corresponding to the formulæ $K_2W_3O_9$ and $K_2W_5O_{15}$, the latter being analogous to the blue sodium bronze. The authors criticise Hallopeau's work, and state that after numerous attempts by different methods and using mixtures of varying composition, they have only been able to prepare one potassium tungsten bronze, *viz.*, $K_2W_4O_{12}$. They state that the so-called bronze of the formula $K_2W_5O_{15}$ consists in reality of potassium octotungstate, $K_2W_8O_{25}$.—A. S.

ENGLISH PATENT.

Paint and other Plastic Materials; Mill for Grinding ——. W. H. Cranstone, Hemel Hempstead, Herts. Eng. Pat. 24,815, Dec. 5, 1901.

THE body of this apparatus consists of a horizontal drum having the shape of two truncated cones joined together by a short parallel portion. Concentrically within the body is a horizontal shaft, which carries at one end, rigidly fixed to it, a disc with its edges bent approximately to follow the angle of the cone inside which it runs. At the other end of the shaft is a precisely similar opposite disc, connected with the shaft so as to revolve with it, but free to move longitudinally along it under the influence of an external screw and wing-nut. By tightening this nut the two discs press against the coned portions of the body, more tightly at their outer edges, and the paint, which enters between the discs from an upper hopper, passes between the fixed and the revolving cones, and is thereby ground. A scraper is fitted at a convenient spot in the walls of the body, and the whole is mounted on a stand.—F. H. L.

FRENCH PATENT.

White Lead Substitute [*Lead Sulphate*]. C. G. Sndre. Fr. Pat. 317,588, Jan. 7, 1902.

GALENA is melted in a cupola furnace, and a vigorous blast of hot air is blown through it. The galena oxidises to sulphur dioxide and metallic lead, and the heat produced is sufficient to volatilise the latter together with undecomposed lead sulphide. A second air blast is injected into these vapours. This oxidises the lead and lead sulphide, and a product is obtained which contains 80 per cent. of lead sulphate, 7 per cent. of lead sulphite, and 13 per cent. of lead oxide. This is treated with sulphuric acid to convert it completely into lead sulphate. (See also this Journal, 1888, 330; 1889, 553.)—M. J. S.

(*B.*)—RESINS, VARNISHES.

Varnish; Manufacture of ——, *from Chinese Wood Oil.* Rev. Prod. Chim., 5, [19], 293.

WOOD oil is not suitable to replace linseed oil in the preparation of varnish, but only as an adjunct to impart solidity and hardness to the product. In no case should wood oil be heated above 160° C., or it will be permanently altered in character. For copal or gum-resin varnishes, the proportion of wood oil must not exceed 5—10 per cent. of the total oil taken, but for resin varnishes this amount is insufficient. For example, 45 kilos. of hardened resin are mixed with 54 litres of boiled linseed oil (containing a certain amount of driers), and heated to 140° C., at which stage 9 litres of wood oil are added. The temperature must be kept below 150° C., and after removing the varnish from the fire, it may be clarified with turpentine spirit, &c., as usual.

Another method is to heat together for several hours, at 140°—150° C., a mixture of: wood oil, 100 parts by weight; linseed oil, 20; manganese resinate, 1; red lead, $\frac{1}{2}$; driers, 2 parts; the product being clarified by the addition of 8 parts of turpentine spirit in summer, or twice that quantity in winter. For resin varnish, 35 parts of this product may be mixed with an equal amount of hardened resin, 25 parts of turpentine spirit, and 5 parts of pale liquid driers. The resulting varnish may be used to mix with ordinary linseed oil and resin varnish—to an extent not exceeding 30 per cent. of the oil in the latter, or the varnish will crack. The wood oil is freed from the contained moisture by a preliminary heating.—C. S.

ERRATUM.

This Journal, 1902, 1337.

In the title of abstract at bottom of col. 2 *delete* the words "[*Gum Resins*]" and consider the article as referred to group XVI.

(*C.*)—INDIA-RUBBER, &c.

Para Rubber; Chemistry of ——. C. Harries. Ber., 1902, 35, [15], 3256—3266.

THE author has continued his investigation of the action of nitrous acid on pure rubber (see this Journal, 1901, 1123). By the action of highly dried nitrous acid gas on pure rubber dissolved in dry benzene, the first product is nitrosite "*a*," $(C_{10}H_{16}N_2O_3)x$, which is insoluble in all reagents, and decomposes at 80°—100° C.

Nitrosite "*a*," when further acted on by the dry gas for several days, yields nitrosite "*b*," $C_{20}H_{30}N_6O_{16}$, which is soluble in ethyl acetate, acetone, and alkalis, and decomposes at 130° C. This product reduces Fehling's solution.

By the action of moist nitrous acid gas on rubber in wet benzene, the first product is probably $C_{30}H_{56}N_6O_{18}$ (*loc. cit.*), which, by continued action of the gas, splits up into 2 mols. of nitrosite "*c*," $C_{20}H_{30}N_6O_{14}$; the latter is soluble in alkalis, reduces Fehling's solution, and, when heated with amyl alcohol, gives a yellow substance, $C_{20}H_{28}N_4O_{12}$.

Nitrosite "*b*" is oxidised by nitric acid to oxalic acid, an insoluble solid, $C_{20}H_{31}N_5O_{14}$, and an insoluble oil. With permanganate, the oxidation products are oxalic and succinic acids. These oxidation products indicate that the rubber hydrocarbon is an open-chain one, and this view is further supported by experiments made with Power and Kleber's myrcene. This open-chain hydrocarbon was polymerised by heating in a tube at 300° C., and gave the following products:—

Dimyrcene, $C_{20}H_{32}$, b. pt. 160°—200° C. (under 12—16 mm.); and a non-volatile product, polymyrcene. With moist nitrous acid, dimyrcene yielded a nitrosite, $C_{20}H_{30}N_6O_{14}$, identical with nitrosite "*c*," whilst polymyrcene gave a nitrosite, $C_{30}H_{56}N_6O_{18}$ (see above).

Pure isoprene was also polymerised in a similar way, and furnished dipentene as a minor product, but as chief products a high-boiling oil, and $C_{10}H_{15}$ hydrocarbons, from which nitrosites similar to those described above have been prepared. The cyclic and di-cyclic hydrocarbons, limonene and dipentene, however, when polymerised, failed to give nitrosites with moist nitrous acid.

The so-called dipentene fraction of rubber-oil was accordingly examined. At most only one-third of this was dipentene, the chief portion being a mixture of $C_{10}H_{16}$ hydrocarbons. Two such were isolated, one of which is possibly the di-isoprene—

$$(CH_3)CH_2:C.CH_2.CH_2.CH:C(CH_3).CH:CH_2,$$

which, together with isoprene, would appear to be the source of such dipentene as occurs in this fraction.—R. L. J.

India-Rubber Residues; Regeneration of ——. O. Haltenhoff, Hanover. Ger. Pat. 135,054, June 23, 1901. Zeits. angew. Chem., 15, [42], 1099.

THE residues are spread out in a thin layer, and heated for a long while at 150° C. (*in vacuo*, to avoid oxidation of the rubber). The sulphur sublimes, while no decomposition of the rubber occurs. The recovered rubber can then be revulcanised with 3½ to 4 per cent. of sulphur.—J. T. D.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tanning; Rapid ——. Schwède. Rev. Prod. Chim., 5, [18], 277.

THE limed and washed hides are immersed in turpentine spirit and then transferred to a rotary drum, where they are treated with a solution of tannin extract containing $\frac{1}{3}$ per cent. of crude glycerin and a small proportion of alum, about 200 litres of bath liquor being required for a cow-hide. The progress of the operation is watched through a window in the axis of the drum; and when the liquor ceases to froth,

it is withdrawn and replaced by a similar solution of greater strength. This treatment completes the tanning, unless the hides disengage a strong odour of sulphuretted hydrogen, in which case they are discharged into a tan pit, where they are treated with an extra quantity of tannin extract and borax, and left to macerate for some time. The concentration of the bath and the duration of the process vary with the kind of hides treated, but as a rule the operation is complete in 3—6 days.—C. S.

Tannin; Volumetric Determination of ——, *and Analysis of Tannin-containing Woods and Extracts.* A. Thompson.

See under XXIII., *page* 1416.

English Patents.

Leather, Artificial; Manufacture of ——. G. Gantier, Paris. Eng. Pat. 19,249, Sept. 26, 1901.

Raw hide shavings and other offal are softened by lime-water, cut up into small pieces, washed till free from lime, ground under a spray of water, and then incorporated, if desired, with a suitable colouring matter. The resulting mass is placed in a bath of zinc sulphate (5°—6° B.), then further treated with formalin, alcohol, lactic acid, glucose, paraffin, or other agents for imparting suppleness, impermeability, &c., and dried *in vacuo* or by a hot draught at a temperature not exceeding 60° C., after being compressed into bands, blocks, or moulded into various shapes.
—R. L. J.

Adhesive Mediums [Liquid Glue Substitute]; Manufacture of ——. G. Schmalfuss, Cologne, Germany. Eng. Pat. 16,710, July 28, 1902.

Dextrin, gum arabic, or other powder with adhesive properties (100 parts), powdered sugar (10 parts), or soap-powder (5 parts), are mixed together and formed by pressure into tablets.—R. L. J.

Glue and Gelatin from Bones; Manufacture of ——. H. Hilbert, Heufeld, Upper Bavaria. Eng. Pat. 18,042, Aug. 16, 1902.

Bones are ground to a coarse flour, grease, fat, and adherent material are removed if desired, and the powder is subjected to the simultaneous action of hydrochloric acid or a chloride and of sulphur dioxide. The mass is then washed and boiled down in the usual manner, and the glue run off.
—R. L. J.

Drying Humid Material [Spent Tan, &c.] reduced to Grains, Shavings, or Small Particles; Apparatus for ——. A. Huillard. Eng. Pat. 17,663, Aug. 12, 1902. (Under Internat. Conv., Feb. 10, 1902.)

See under I., *page* 1386.

French Patents.

Hides and Skins; Treatment of ——. Aitken. Fr. Pat. 317,862, Jan. 17, 1902.

Hides and skins are impregnated with one or more of the following preservative agents: gutta-percha, balata, shellac or other resins and gums, pitch, bitumen, naphthalene, pyridine. These may be simply liquefied by heat or suitably dissolved, and a heavy mineral oil may be added when suppleness is required, whilst their introduction into the leather is effected by mechanical agitation assisted by reduced or diminished pressure.—R. L. J.

Tawing of Skins; Process for ——. Masson and Sansonnet. Fr. Pat. 317,894, Jan. 18, 1902.

The skins are first washed in water, then pasted on the flesh side with a mixture of slaked lime and sodium sulphide (10 per cent.) to loosen the hair, which is removed, and then soaked for 4—7 days in a series of baths of gradually increasing strength, of which the last has the composition: lime, 50 parts; water, 40 parts; sodium sulphide, 10 parts. After this, the skins are scudded and fleshed, stretched out, and drenched with bran for 6—12 hours according to their condition; then immersed for 10—30 minutes in a bath of bisulphite of sodium (10 parts), hyposulphite of soda (30 parts), water (60 parts), drained, fed in a drum for 40—60 minutes with a paste of wheat-flour, sea-salt and water, dried, and finally staked.—R. L. J.

Tanning Materials; Process and Plant for the Continuous Extraction of ——, *by Centrifugal Force.* Bögel. Fr. Pat. 318,160, Jan. 28, 1902.

Two machines are described, one for materials from which the tan is easily extracted, the other to be employed when the tannin dissolves with difficulty, the main feature being the use of centrifugal drums with the liquors circulating in a manner designed to extract most thoroughly. Mechanical details are given.—R. L. J.

Leather; Preservation of ——. Paas and Jacobsen. Fr. Pat. 318,027, Jan. 24, 1902.

Leather is preserved and waterproofed by resin, which is introduced with the grease in the currying stage, or as a weak solution (10 per cent.) in dilute alcohol, which is employed as a bath or applied several times to the surface of the leather.—R. L. J.

Gypsum Sludge from Bones; Utilisation of ——, *in Paper and Pottery Industries.* Monin. Fr. Pat. 317,940, Jan. 21, 1902.

See under XIX., *page* 1408.

XV.—MANURES, Etc.

Thomas-Slag, Ground; Determination of Citric-soluble Phosphoric Acid in ——, *by the Molybdate Method.* H. Neubauer.

See under XXIII., *page* 1415.

Superphosphate Manures; Gases evolved in the Manufacture of ——, *and a more Accurate Method of Determining their SO_3 Equivalents.* J. Affleck.

See under XXIII., *page* 1413.

English Patent.

Drying Humid Material [Phosphates] reduced to Grains, Shavings, or Small Particles; Apparatus for ——. A. Huillard. Eng. Pat. 17, 33, Aug. 12, 1902. (Under Internat. Conv., Feb. 10, 1902.)

See under I., *page* 1386.

XVI.—SUGAR, STARCH, GUM, Etc.

Meta- and Para-Saccharin. H. Kiliani and H. Naegell.

See under XXIV., *page* 1418.

Starch Syrup; Strength and Acidity of ——. O. Saare. Zeits. Spiritusind., 1902, **25**, [45], 479—481.

The German associations interested in the starch trade have agreed to the following proposals with regard to the sale of starch syrup:—The so-called "old" degrees Baume are to be retained as the basis of strength. A syrup of 44° B. has a specific gravity of 1·44 at 17·5° C., with permissible variations between 1·433 and 1·447. A syrup of 42° B. has a specific gravity of 1·41, with variations between 1·405 and 1·419. In cases of dispute, the specific gravity should be determined pyknometrically at 17·5° C. in a 50 c.c. measuring flask, ground off at the mark, and covered with a small glass plate. The operation should be conducted according to the method prescribed by Frühling and Schulz for molasses, with the exception that, instead of previously heating the syrup to remove air bubbles, the pyknometer should first be filled cold, then weighed, and heated to expel the air, finally making up to the mark with water. The results are to be converted into "old" Baume degrees. No standard is fixed for the acidity permissible in starch syrup, since its applicability is not dependent on its acidity. When the acidity has to be determined, 50 grms. of syrup are dissolved in 50 grms. of water and titrated with decinormal caustic soda until a drop of the liquid no

longer produces an alteration of the colour of pale, neutral (non-absorbent) litmus paper; results are to be calculated in per cent. of H_2SO_4 on the syrup.—J. F. B.

Maltose and Lactose; Quantitative Separation of ——. C. L. Boyden.

See under XXIII., *page* 1416.

Galactose; New Base derived from ——. E. Roux.

See under XXIV., *page* 1418.

Starch; Determination of ——. E. Giauturco.

See under XXIII., *page* 1416.

English Patent.

Drying Humid Material [Feculay Residues, Beet or Sugar-Cane Products] reduced to Grains, Shavings, or Small Particles; Apparatus for ——. A. Huillard. Eng. Pat. 17,663, Aug. 12, 1902. (Under Internat. Conv., Feb. 10, 1902.)

See under I., *page* 1386.

French Patents.

Sugar from Dry Saccharine Materials; Extraction of ——. Refineria de San Luis. Fr. Pat. 317,689, Jan. 11, 1902.

The sugar contained in dried cane or beetroot chips is extracted by placing them in a series of containers, the top of one communicating with the bottom of the next one. A current of water is caused to flow through the series at such a speed that when it emerges from the last container, it is sufficiently saturated with sugar for further treatment. —J. F. B.

Vacuum Pans; New Principle of Constructing —— Soc. L. Prangey and J. de Grobert. Fr. Pat. 317,802, Jan. 15, 1902.

The increase in the volume of the massecuite as the boiling progresses is accommodated by increasing the surface of the boiling mass, and keeping its height practically constant, instead of, as heretofore, allowing the mass to increase in height only. This may be effected in several ways, as for instance, increasing the working space of the pan by a piston-like arrangement drawn out horizontally, or by transferring the mass from one vessel to another in a gradually increasing series.—J. F. B.

Saccharine and other Liquids; Purification and Decolorisation of ——, *by Electro-dialysis with a Halogen.* Spillern-Spitzer. Fr. Pat. 317,854, Jan. 17, 1902.

An electric current and a halogen (preferably chlorine) are caused to act simultaneously on the liquid to be treated, in such a manner that the halogen, introduced into a chamber containing the liquid to be purified, or into a chamber separated from the latter by a diaphragm and containing an indifferent substance (water), is directed by the electric current from and through the chamber containing the liquid into a second or third chamber, also separated by a diaphragm and containing an indifferent substance. On reversing the current, the halogen is redirected back through the liquid to the other pole, and its action can be controlled by regulating the current. —J. F. B.

Saccharine Juices; Purification of ——, *by a Process termed "Sulphocarbonation."* Weisberg. Fr. Pat. 318,049, Jan. 24, 1902.

The filtered juice from the first carbonation, having an alkalinity of from 0·7 to 1·25 grms. of CaO per litre, and at a temperature of 60°—80° C., is passed into vessels. It is first treated with sulphur dioxide until it no longer reddens paper saturated with phenolphthalein. The current of gas is then stopped and a suitable quantity of milk of lime is added, the temperature being raised to 80°—85° C. The juice is then saturated with carbon dioxide until it gives a very faint pink reaction with white phenolphthalein paper, raised to the boiling point, and finally filtered.—J. F. B.

Cellulose of Vegetable Tissues; Conversion of ——, *into Glucose and its Derivatives.* Reynaud and Bonna. Fr. Pat. 318,203, Jan. 29, 1902.

In the manufacture of glucose from starchy and saccharine plant tissues, it is proposed to convert the cellulose also into sugar. The plants are reduced to a pulpy mass, heated, and treated in a vat with a suitable solvent of the cellulose; for this purpose zinc ethyl is preferred, in a proportion of 1 to 5 per cent. of the plants and at a temperature below 50° C. After the cellulose is dissolved, the mass is subjected to a fermentative treatment, first by the addition of an acetifying ferment and subsequently with the addition of pepsin. The saccharification is finally completed in the ordinary way, either by boiling with acids, treatment with diastase, or heating under pressure.—J. F. B.

Beetroot Pulp [for Analysis]; Press for Preparing ——. Soc. des Raffin. et Sucr. Say. Fr. Pat. 318,225, Jan. 30, 1902.

See under XXIII., *page* 1412.

Liquids [Gum Solutions]; Clarification of ——, *by Means of Gelatin and an Oxidising Agent.* Pharm. Inst. L. W. Gans. Fr. Pat. 317,733, Jan. 13, 1902.

See U.S. Pat. 706,075 of 1902; this Journal, 1902, 1340. —J. F. B.

Gum; Manufacture of an Artificial ——. Cerf. Fr. Pat. 317,942, Jan. 23, 1902.

An artificial gum is prepared in a convenient solid state by mixing suitable proportions of the mucilage of the alga, termed *chondrus crispus* or Irish moss, and starch or flour, and drying the mixture on a surface smeared with oil to allow of the removal of the films produced.—J. F. B.

United States Patents.

Sugar Juice; Process of Defecating ——. J. R. Besson, Caen, France. U.S. Pat. 710,413, Oct. 7, 1902.

Sugar juices and syrups are defecated by adding ammonia to the carbonated liquor, filtering, and mixing it with a finely-divided metal (*e.g.*, aluminium). The object of the ammonia is to precipitate the lime salts; if desirable, this may be effected by the use of an ammonium salt; or an acid, such as oxalic or phosphoric acid, may first be added, and then ammonia.—J. F. B.

Diffusion Apparatus [Sugar]. C. Steffen, Vienna. U.S. Pat. 710,533, Oct. 7, 1902.

The diffusion vessel is combined with an apparatus for producing a pulp from the partially-diffused slices and the diffusing liquid, means for controlling the supply of slices to the disintegrating apparatus, a device for separating the solid residues from the liquid of the pulp, means for returning the liquid to the diffusion vessel and for discharging the concentrated juice from the diffusion vessel. The apparatus is designed to carry out the process described in Eng. Pat. 10,884 of 1901; this Journal, 1902, 266.—J. F. B.

Centrifugal Extractor [Sugar]. H. A. Peterson, Hawaii. U.S. Pat. 710,607, Oct. 7, 1902.

The centrifugal separator, with continuous action, consists of a revolving main vessel of cylindrical form with a perforated wall, a second perforated cylindrical vessel concentric with and secured within the main vessel, forming an annular space vertically between the two. There is also an open-centred, conically-inclined plate, forming a circular trough or throatway fixed in the annular space, a surrounding perforated screen enclosing the trough, and means for supplying the material to be treated to the trough.—J. F. B.

Sugar Juice; Process of Purifying ——, *by Means of Electro-dialysis.* A. Baudry, Kiew, Russia. U.S. Pat. 711,375, Oct. 14, 1902.

The juice is neutralised by the addition of sulphurous acid, filtered, and electrolysed by the action of soluble positive electrodes immersed in an electrolyte of syrup and water,

separated from the juice by a porous conducting medium. The juice is then filtered and evaporated, and an alkali is added to the resulting syrup; this is then neutralised with sulphurous acid at a temperature of 40°—50° C., and subjected to electrolysis in compartments at negative electrodes. In this stage the hydrogen liberated reduces the sulphurous acid to hyposulphurous (hydrosulphurous) acid, which has a powerful decolorising action. Finally, the syrup is subjected to the action of both electrodes at once, in order to remove the residual minor impurities.—J. F. B.

Starch; Utilisation of By-Products of the Manufacture of ——. A. S. Hoyt, New York. U.S. Pat. 710,461, Oct. 7, 1902.

See U.S. Pat. 709,544 of 1902; this Journal, 1902, 1288. —J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast Albumin; Preparation of ——. R. Schroeder.

See under XXIV., *page* 1418.

Salicylic Acid in Wines; Determination of ——. H. Pellet.

See under XXIII., *page* 1416.

Salicylic Acid in Wine; Determination of ——. H. Pellet and S. de Grobert.

See under XXIII., *page* 1416.

Citric Acid in Wine; Detection of ——. J. Schindler.

See under XXIII., *page* 1415.

English Patents.

Beer and other Liquids; Apparatus for simultaneously Cooling and Aërating ——. D. Wickham, Ware, Herts. Eng. Pat. 22,135, Nov. 2, 1901.

The beer is caused to flow over or down a spiral worm containing the cooling medium, situated inside a cylindrical vessel. The liquid becomes impregnated with the gas in the cylinder, and saturation is completed by beating up the liquid as it arrives at the bottom of the vessel.—J. F. B.

Drying Humid Material [*Spent Grains from Distilleries and Breweries*] *reduced to Grains, Shavings, or Small Particles; Apparatus for* ——. A. Huillard. Eng. Pat. 17,663, Aug. 12, 1902. (Under Internat. Conv., Feb. 10, 1902.)

See under I., *page* 1386.

French Patents.

Wines and other Alcoholic Liquids; Concentration of ——. Tellier. Addendum, dated Jan. 3, 1902, to Fr. Pat. 308,771, March 7, 1901.

This specification relates to various types of apparatus in which the concentration of wine by refrigeration can be carried out, out of contact with air and light, in order to preserve the colour.—J. F. B.

Wine, Beer, Milk, and other Liquids; Sterilisation and Preservation of ——. Amiot. Fr. Pat. 317,646, Jan. 9, 1902.

See under XVIII. A., *page* 1408.

Alcoholic Liquids; Apparatus for Treating ——, *with Gases.* Truchot and Agron. Fr. Pat. 318,030, Jan. 24, 1902.

The apparatus for treating all kinds of alcoholic liquids with gases, such as oxygen, ozone, carbon dioxide, and sulphur dioxide, consists of a column containing a number of superimposed discs, alternately concave and convex, constituting dividers and receivers, so as to bring every particle of the liquid into contact with the gas.—J. F. B.

United States Patents.

Elastic Material [*Stoppers for Bottles containing Carbonated Liquids*]; *Process of Producing* ——. A. M. D. Classeu, Chicago, U.S.A. U.S. Pat. 710,564, Oct. 7, 1902.

The material, which is specially suitable for stoppers of bottles containing beverages, consists of a mixture of ground cork and an oxidised vegetable oil. The mass is treated with soda solution to remove objectionable flavours, and is then dried, treated with a solution of shellac in alcohol to which has been added a small proportion of glycerin, and finally immersed in boiling paraffin and resin to prevent carbonated liquids acquiring any flavour from the varnish.—C. A. M.

Alcoholic Liquid Purifier. C. C. Clark, Pa., Assignor to J. G. Carson, Pa. U.S. Pat. 710,669, Oct. 7, 1902.

In a purifier for alcoholic liquids by electrolysis, consisting of a horizontal cylinder, means are provided for electrolysing the inflowing liquid by a series of intercepting disc electrodes. The liquid then passes to another portion of the cylinder, into a filtration chamber, in which the precipitated impurities are removed, and the filtered product issues through a screen to the discharge outlet.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Moist Gluten in Flour; Determination of ——. M. Arpin.

See under XXIII., *page* 1417.

English Patents.

Aërated Water Manufacturing Apparatus. E. F. Merchant, Southport. Eng. Pat. 23,028, Nov. 14, 1901.

An apparatus for cooling liquids, in order that the latter may absorb the correct amount of gas for proper aeration. It comprises a cooling chamber, containing a coil which forms a by-pass on the pipe through which the liquid flows, a stopcock for diverting the flow of liquid through the coil, and thermometers so disposed as to indicate the temperature of the liquid before it enters the coil and after it emerges therefrom.—W. P. S.

Food; Process of Preserving ——. W. D. Baker, Rogers, Ark., U.S.A. Eng. Pat. 14,340, June 24, 1902.

See U.S. Pat. 709,131; this Journal, 1902, 1291.—W. P. S.

Food; Process of Preserving ——. W. D. Baker, Rogers, Ark., U.S.A. Eng. Pat. 14,341, June 24, 1902.

See U.S. Pat. 709,432; this Journal, 1902, 1291.—W. P. S.

Drying Humid Material [*Fruits, Vegetables, &c.*] *reduced to Grains, Shavings, or Small Particles; Apparatus for* ——. A. Huillard. Eng. Pat. 17,663, Aug. 12, 1902. (Under Internat. Conv., Feb. 10, 1902.)

See under I., *page* 1386.

Centrifugal Separators for Liquids [*Milk*]. J. Melotte Remicourt, Belgium. Eng. Pat. 17,874, Aug. 14, 1902.

In the separator drum a series of blades are connected together at their inner edges, and for a part of their height only. Several series of the blades are employed, connected at different heights, the blades being interposed alternately, whilst the points of connection are superposed.—W. P. S.

Filtering Apparatus. C. Baechler, Zürich, Switzerland. Eng. Pat. 18,566, Aug. 23, 1902.

See U.S. Pat. 707,537, page 1408.

FRENCH PATENTS.

Milk, Wine, Beer, and other Liquids; Sterilisation and Preservation of ——. Amiot. Fr. Pat. 317,646, Jan. 9, 1902.

MILK and other alterable liquids are sterilised by introducing them into a vessel together with oxygen under a pressure of 18 atmospheres. The liquids flow over a perforated plate inside the vessel and are agitated therein by a mechanical stirrer; the operation is continuous and the liquids are bottled off into siphons under pressure.
—J. F. B.

Non-Alcoholic Beverages; Process of Making ——. Nathan. Fr. Pat. 317,711, Jan. 11, 1902.

NON-ALCOHOLIC beverages charged with gas are prepared, particularly from dried fruits, by extracting the juice, without contact with metals, by maceration with aeration, so as to separate suspended matter and to suppress objectionable aromas. The liquid is sterilised by heat, the air in the liquid is then eliminated by the application of a vacuum, and the liquid is cooled with simultaneous admission of carbon dioxide and exclusion of air. The carbon dioxide is allowed to pass through the liquid to remove further objectionable aromas, and the liquid is then bottled under pressure and again sterilised at a slightly lower temperature.
—J. F. B.

Butter; Process for Refining and Preserving ——. M. Iscovesco. Fr. Pat. 317,910, Jan. 18, 1902.

THE process consists in removing the casein and re-emulsifying the butter with sterilised water. Butter is melted, filtered, subjected to centrifugal action, being washed at the same time, and then passed into a mixing chamber where it is emulsified with sterilised water or salt water, either under reduced pressure or in an atmosphere of hydrogen or nitrogen. The whole process is carried out without allowing the butter to come into contact with atmospheric oxygen. Finally, the butter passes through a refrigerator under a pressure of 2 to 6 kilos.—W. P. S.

Vegetable Oils; Treatment of Residues from ——, *for Use as Forage.* C. Fresenius. Fr. Pat. 317,578, Jan. 7, 1902.

See under XII., *page* 1403.

UNITED STATES PATENT.

Filtering Apparatus —— [*Milk*]. G. Baechler, Zürich. U.S. Pat. 707,537, Aug. 26, 1902.

THE apparatus consists of a closed chamber provided with inlet and outlet pipes at the top. The milk on entering the chamber passes to the bottom of a partition formed by a sheet-metal slab inside the chamber. When this partition is partially filled, the milk overflows through holes covered with triangular hoods into a second partition formed by a sloping filter screen and containing sheet-metal slabs at certain distances apart, reaching from the bottom of the chamber to the screen. After passing through this screen, the milk enters a second similarly constructed partition, and finally leaves by the out-flow pipe. The filter chamber is mounted on trunnions.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

ENGLISH PATENTS.

Water; Means of and Apparatus for Purifying ——. J. E. C. I. Putzeys, Brussels. Eng. Pat. 21,745, Oct. 29, 1901.

THE water is first allowed to settle, or is filtered. A portion is then charged with carbon dioxide and injected into the main bulk, the whole being then passed through a series of columns packed with limestone. On leaving the latter, the water is collected in a reservoir where, if necessary, it is freed from excess of carbon dioxide by aeration.
—W. P. S.

Water; Method for Sterilising and Maintaining Sterilised Drinking ——. O. Kaysser, Dortmund, Germany. Eng. Pat. 12,788, June 4, 1902.

ONE grm. of sodium peroxide and 0·2 grm. of calcium chloride are added to each litre of water. The precipitate is allowed to settle, and the water is finally rendered palatable by the introduction of carbon dioxide immediately before use.—W. P. S.

Sewage or other Filters. J. Lowe, Manchester. Eng. Pat. 17,581, Sept. 3, 1901.

THE air from beneath a sand filter is exhausted, in order to increase the flow of liquid through the filter.—W. P. S.

Sewage or other Foul or Impure Liquids; Purification of ——. R. Malahar, Liverpool. Eng. Pat. 21,316, Oct. 24, 1901.

THE sewage is run into a box containing a layer of clinker from puddling furnaces. This filters off the coarser suspended matters. The liquid, after percolating through this layer, passes on to a stack built of the same material, and exposed on all sides to the air. In some cases a number of consecutive straining boxes may be employed, and the sewage filtered by upward filtration from one to the other before allowing it to pass on to the stack.—W. P. S.

Sewage; Apparatus or Means of Distributing —— [*on Filter Beds*]. C. Mountany and W. Farnsworth, both of South Normanton, Derby. Eng. Pat. 12,635, June 3, 1902.

A DEVICE for spraying sewage effluent from intermediate filter-beds upon the surface of subsequent beds. The effluent is intermittently fed into a trough or tank, passing through screens on its entrance. It then flows down vertical funnel-shaped pipes in the bottom of the trough into horizontal pipes, finally passing into narrow pipes and sprinklers, by which it is sprayed into the air before falling on the filter-bed.—W. P. S.

(*C.*)—DISINFECTANTS.

UNITED STATES PATENT.

Antiseptic Soap Cake. E. Klein and O. P. Workman. Grand Rapids, Mich., U.S.A. U.S. Pat. 711,403, Oct. 14, 1902.

THE soap, impregnated with antiseptic, is coated on the exterior with insoluble material (such as a solution of gum amber mixed with paraffin), and perforated with a series of openings, so that the central portion can dissolve, whilst the cake retains its original form.—C. A. M.

XIX.—PAPER, PASTEBOARD, Etc.

FRENCH PATENTS.

Gypsum Sludge from Bones, Utilisation of ——, *in Paper and Pottery Industries.* Monin. Fr. Pat. 317,940, Jan. 21, 1902.

IT is proposed to utilise the gypsum sludge derived from de-gelatinised bones in the manufacture of phosphorus (*a*) in the paper industry, as a loading material, by washing it through sieves, drying it slowly in the air at low temperatures, to avoid the discoloration of any gelatinous organic matter, and then adding it to the stuff in the heater; (*b*) in the pottery industry, by calcining it in closed vessels as it comes from the filter-presses, pulverising the calcined product and bolting it dry or else washing it through sieves with water; it is then suitable for incorporating with pottery pastes to enhance their whiteness.—J. F. B.

Nitro-cellulose and Insoluble Caseïnates; Composition containing ——. E. Franquet. Fr. Pat. 317,607, Jan. 7, 1902.

CASEÏN is dissolved in caustic soda and the solution is then filtered and precipitated by a solution of a salt of the base which it is desired to combine with the caseïn. The

precipitated caseïnate is filtered off and carefully washed and pressed. It is then treated with alcohol, preferably with the addition of a little borax, and again pressed. The caseïnate is then incorporated with nitrocellulose gelatinised by a solution of camphor in alcohol. A caseïnate of aluminium gives a translucent product, those of zinc and magnesium white products, whilst various other metals give coloured products. (Compare this Journal, 1902, 134.)
—J. F. B.

Celluloid; Process for rendering —— Incombustible. Mabille and Leclerc. Fr. Pat. 317,884, Jan. 18, 1902.

Celluloid is rendered not only uninflammable, but also incombustible by mixing with it ferric chloride or calcium bromide, which evolve chlorine and bromine respectively on heating. Solutions of either of these bodies in ether-alcohol are mixed with similar solutions of celluloid and allowed to evaporate. Celluloid containing ferric chloride can be protected superficially from the action of the air by treatment with oxalic acid and then dipping in a solution of albumin; that containing calcium bromide is protected by dipping in dilute sulphuric acid.—J. F. B.

Cellulose of Vegetable Tissues; Conversion of ——, into Glucose its Derivatives. Reynaud and Bonna. Fr. Pat. 318,203, Jan. 29, 1902.

See under XVI., *page* 1406.

United States Patents.

Paper-making Machines [Cylinder Type]; Mixer for ——. G. L. Hodge, Ohio, Assignor to the Akron Paper Co., Ohio. U.S. Pat. 710,456, Oct. 7, 1902.

In paper-making machines of the cylindrical type, a pulp-box is combined with the cylinder-vat, and has an opening into the latter which can be adjusted to regulate the flow of pulp. End boxes open into the pulp-box, the bottoms of the end boxes being below the discharge openings therefrom. The end boxes receive the pulp from the supply chests and pistons move up and down in the end boxes causing the pulp discharged into the pulp-box to circulate with varying speeds in the same and to become evenly distributed in all directions.—J. F. B.

Cellulose Solutions; Manufacture of Filaments from ——. E. Thiele. U.S. Pat. 710,819, Oct. 7, 1902.

See under V., *page* 1393.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Camphor Carboxylic Acid; Further Investigations on ——. J. W. Brühl. Ber., 1902, **35**, [16], 3510-3519. (See also this Journal, 1891, 1025.)

As a β-ketonic acid, camphor carboxylic acid gives a colour reaction with ferric chloride; the colorations, however, are far more marked in the case of the esters than with the free acid. One drop of ester in 0·5 c.c. of alcohol gives, on the addition of 1—2 drops of ferric chloride, first a yellowish, then a greenish-blue, and finally a deep indigo-blue coloration. The behaviour of the esters towards solutions of caustic alkali is very peculiar; the amyl ester is insoluble both in dilute and concentrated lyes; the ethyl ester is insoluble in dilute solutions, but slightly soluble with partial saponification in concentrated solutions of caustic soda; the methyl ester is readily and completely soluble without saponification in dilute alkalis. All three esters redden litmus paper in presence of water, but the acid reaction is neutralised by a very small quantity of alkali. When treated in ethereal or benzene solution with an alkali metal, all three esters yield salts with evolution of hydrogen. The free acid also when treated under these conditions with powdered sodium (prepared by melting the metal under xylene and strongly agitating during cooling) gives a salt with evolution of hydrogen. But whereas, in water or media favouring dissociation, the metal and acid combine in the ratio $1Na:C_{11}H_{16}O_3$; in benzene and media which do not favour dissociation, the combining ratio is $1Na:C_{22}H_{32}O_6$. The salt $C_{22}H_{31}O_6Na$ is split up in presence of water into the ordinary sodium salt and the free acid. Comparing the physiological action of camphor carboxylic acid with that of camphor, it was found that the sodium salt was entirely devoid of toxic action, and the acid was eliminated unchanged. This observation is in accordance with the known decrease of toxicity brought about in other bodies, *e.g.*, phenols, by the presence of the carboxyl radicle. The esters of camphor carboxylic acid, on the other hand, possess the same physiological action as camphor, but in a minor degree.—J. F. B.

Camphidone and Camphidine. Pharm. J., 1902, **69**, [1686], 387.

Two new derivatives of camphoric acid named camphidone ($C_{10}H_{15}NO$) and camphidine ($C_{10}H_{19}N$) have been obtained by the electrolytic reduction of camphoric imide ($C_{10}H_{15}NO_2$). A solution of camphoric imide in 65 per cent. sulphuric acid is placed in the cathode compartment and dilute sulphuric acid in the anode compartment, and an electric current passed for 3½ hours. The greater part of the sulphuric acid is then precipitated by the addition of calcium carbonate. Camphidone is extracted from the filtrate by repeated shaking with chloroform. It is obtained as a soft crystalline mass of weak camphor-like odour; it melts at 220° C., sublimes at higher temperatures, and boils at 308° C. The filtrate, after separation of the camphidone, is supersaturated with alkali and steam-distilled. Camphidine is obtained in the distillate. It forms a soft crystalline, strongly basic body of intense camphor-like odour, which melts at 186° C. and boils at 209° C.—A. S.

Alkaloids; Thallium Compounds of the ——. C. Renz. Ber., **35**, [15], 2768.

The alkaloids form well-defined compounds with the halogen salts of thallium. The compound of hyoscyamine with thallium iodide, $Tll_3.C_{17}H_{23}NO_3.HI$, forms red crystals melting at 200° C.; the isomeric atropine compound melts at 192° C. Cocaine-thallium hydrochloride, $(C_{17}H_{21}NO_4.HCl)_2TlCl_3$, forms large white needles. The corresponding compounds of strychnine, $(C_{21}H_{22}N_2O_2.HCl)_2TlCl_3$, m. pt. 240° C., quinine, cinchonine, coniine, and nicotine have also been prepared.—A. S.

Atropine; Conversion of ——, into d- and l-Hyoscyamine. T. Amenomiya. Arch. der Pharm., 1902, **240**, [7], 498—501.

Since Gadamer has shown that the tropine component of atropine and hyoscyamine is optically inactive, it follows that the optical inactivity of the former alkaloid and the activity of the latter must be a function of their tropic acid residues, and that the optically active atropines which have been recorded ($[\alpha]_D = \pm 10°$) are probably mixtures of equal parts of atropine (inactive) and hyoscyamine ($[\alpha]_D = \pm 20·3°$).

The above deductions are now confirmed by experimental proof. Inactive atropine was hydrolysed by boiling for 27 hours with water and a little alcohol, and the products, tropine and racemic tropic acid, were isolated. The latter was then split up by means of the quinine salt into its optically active components. The separation was not quantitative; 31·4 per cent. of *d*-tropic acid, $[\alpha]_D^{20} = +71·3°$ in alcholic solution, and 25·1 per cent. of *l*-tropic acid, $[\alpha]_D^{20} = -72·75°$, were obtained, part of the racemic acid being recovered.

The two active tropic acids were then separately recombined with tropine, by repeated concentration of the mixtures with 5 per cent. hydrochloric acid and removal of the synthesised bases from the sphere of action by extraction with ether after addition of ammonia. The two bases obtained were purified by means of their gold chloride salts, and the optical activity of their hydrochlorides, together with the melting points of the free bases, conclusively proved their identity with *d*- and *l*-hyoscyamine respectively.
—J. F. B.

Lemon Oil, Artificial; Preparation of ——. Heine and Co., Leipzig. Ger. Pat. 134,788, July 12, 1901.

Limonene forms about 90 per cent. of oil of lemon, but contributes little to the odour. This is due chiefly to citral,

but normal octyl and nonyl aldehydes, present in very small amounts, are essential to the odour of the natural oil. Artificial oil of lemon is produced by adding to a mixture of the substances present in the natural oil (limonene, phellandrene, citral, citronellal, geraniol, geranyl acetate, linalool, linalyl acetate), or to a mixture of these substances without the first two, normal octyl aldehyde or normal nonyl aldehyde or a mixture of the two.—J. T. D.

Cinnamon-Oil, Artificial; Preparation of ——. Schimmel and Co., Miltitz, Leipzig. Ger. Pat. 134,789, March 20, 1902.

Cinnamic aldehyde forms 70 per cent. of the oil, and the only other constituents known until recently were phellandrene and small quantities of eugenol. A mixture of these, however, has not the odour of the oil, and later researches have shown that it contains amylmethyl ketone, normal nonyl aldehyde, cumin aldehyde, caryophyllene, linalool, the isobutyl ether of linalool, cymene, benzaldehyde, phenylpropyl aldehyde, furfural, pinene, and eugenolmethyl ether; of these the first six are especially important as contributing to the odour. The claims are for:—(1) Preparation of artificial Ceylon cinnamon-oil by the addition, to a mixture of cinnamic aldehyde, phellandrene, and eugenol, of a mixture of the first six minor constituents of the natural oil mentioned above; (2) the addition to the mixtures made under (1) of a mixture of the last six of the minor constituents just enumerated.—J. T. D.

Cajuput Oil. E. Kremers. Pharm. Rev., **20**, 402. Pharm. J., 1902, **69**, [1685], 367.

Exposure to air of cajuput oil (from *Melaleuca leucadendron*) tends to cause oxidation of the botyric, valeric, and benzoic aldehydes present in small quantity in the oil, and exposure to light may result in polymerisation. The crude oil sometimes has a slightly acid reaction, which is probably due to saponification of the terpenyl acetate it contains, and oxidation of the aldehydes. Even the pure oil may become gradually acid if some of the aldehydes remain after rectification.—A. S.

Oil of Cade. E. Kremers. Pharm. Rev., **20**, 401. Pharm. J., 1902, **69**, [1685], 367.

It is stated that the empyreumatic oil resulting from the destructive distillation of ordinary juniper wood is substituted in the market for true oil of cade, and the author points out that this fact may account for the chemical differences which have been observed in oil of cade, and especially for the variation in the amount of cadinene present. From a medicinal point of view, however, the phenols are more important constituents of the oil than cadinene.—A. S.

Methyl Salicylate; Natural and Synthetic ——. E. Kremers. Pharm. Rev., **20**, 350. Pharm. J., 1902, **69**, [1685], 367.

Oil of sweet birch is frequently substituted for the more expensive oil of wintergreen, whilst synthetic methyl salicylate is sometimes substituted for both. The natural oils can be distinguished by a characteristic odour due to other constituents than methyl salicylate. Genuine oil of wintergreen contains about 90 per cent. of methyl salicylate, together with small quantities of a paraffin (m. pt., 65·5° C.), an aldehyde, an alcohol, and an ester of the alcohol. Oil of sweet birch contains over 99 per cent. of methyl salicylate, together with traces of the same paraffin and ester as are present in oil of wintergreen. Pure oil of wintergreen is colourless and boils at 218°—221° C.; any reddish or yellowish coloration is due to lack of care in distillation or storage. The specific gravity (1·176—1·187 at 15° C.) varies with the method of distillation and rectification, and tends to increase with age. The specific gravity of oil of sweet birch is about 1·180 at 15° C., whilst that of methyl salicylate (b. pt., 219°—221° C.) varies between 1·183 and 1·190. Oil of wintergreen is slightly lævo-rotatory ($\alpha_D = -0°\ 25'$ to $-1°$ in a 100 mm. tube), whilst oil of sweet birch and pure methyl salicylate are optically inactive.

Methyl salicylate does not exist as such in wintergreen leaves or sweet birch bark, but is liberated by the action of a ferment (betulase) upon a glucoside (gaultherin, $C_{14}H_{18}O_8$).

Synthetic methyl salicylate may contain toxic homologous esters, owing to the presence of impurities in the salicylic acid from which it has been prepared.—A. S.

Naphthalene in some Essential Oils; Existence of ——. H. von Soden and W. Rojahn. Pharm.-Zeit., 1902, **47**, 779; through Chem.-Zeit., 1902, **26**, [88], Rep. 279.

Naphthalene has been found by the authors among the hydrocarbons (chiefly caryophyllene) in a sample of oil of cloves. An essential oil distilled from a specimen of storax bark also contained naphthalene, the proportion being so large that the hydrocarbon separated out in small crystals on the surface of the bark itself.—F. H. L.

Thorium from Cerium, Lanthanum, and Didymium; A New Separation of ——, *and its Application to the Analysis of Monazite.* F. L. Metzger.

See under XXIII., *page* 1415.

Tartaric Acid in Commercial Products; Application of Polarimetry to the Determination of ——. E. B. Kenrick and F. B. Kenrick.

See under XXIII., *page* 1117.

Liver Oils; Examination of ——. Utz.

See under XII., *page* 1403.

Alkaloidal Reactions; New ——. Chem. and Druggist.

See under XXIII., *page* 1416.

English Patents.

Pharmaceutical Compounds [Zinc Compounds]; Manufacture of ——. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 25,706, Dec. 16, 1901.

Zinc compounds of "gelatose" having the astringent properties of zinc salts, but without the irritating action of the latter, are prepared by treating solutions of "gelatoses" (albumoses derived from glue by heating with high-pressure steam) with zinc salts, precipitating the compounds by means of alcohol, and drying and powdering the products. —J. F. B.

Hæmoglobin; Medicinal Preparations of ——. F. Hanssen, Altona, Germany. Eng. Pat. 16,855, July 29, 1902.

Hæmoglobin of any kind is impregnated with carbon dioxide either directly or by the addition of carbonate and a suitable acid. It is claimed that when a solution of such a preparation is flavoured with vanilla extract and added to milk, the product resembles chocolate in appearance and taste.—J. F. B.

French Patents.

Heptine, Octine, and their Derivatives; Acids obtained from ——. Mouren. Addendum, dated Jan. 16, 1902, to Fr. Pat. 306,619, Dec. 26, 1900.

The original patent referred to the preparation of acids by treating heptine and octine or their derivatives with metallic sodium at a temperature of 130°—180° C., and decomposing the sodium derivative obtained by carbon dioxide. This addendum relates to a similar treatment of various other acetylenic and allylenic hydrocarbons and their substituted homologues, such as are obtained from ketones, *e.g.*, methyl-hexine, methyl-heptine, methyl-(hepten-5-ine-1 (from natural methyl-heptenone), and several others.—J. F. B.

Para-cresol Oxalic Ester; Preparation of ——, *and separation of Para- and Meta-cresols.* Rud. Rütgers Chem. Fab. für Theerprod. Fr. Pat. 317,512, Jan. 1902.

The oxalic ester of *p*-cresol is prepared by heating *p*-cresol or the commercial mixture of cresols containing it, with

with anhydrous oxalic acid, or with an anhydrous acid oxalate, allowing the oxalic ester produced to crystallise and separating the product. Under these conditions *m*-cresol is not converted into a crystalline derivative, and the *p*-cresol can thus be separated and regenerated by treating the oxalic ester with water.—J. F. B.

Turpentine; Manufacture of a Camphor Substitute from ——. Magnier and Brangier. Fr. Pat. 317,804, Jan. 15, 1902.

Turpentine is first converted into the solid hydrochloride and the latter by the action of alcoholic soda is transformed into camphene. The camphene is then oxidised electrolytically by passing an electric current of sufficient strength through a mixture of camphene and acidulated water heated in an autoclave under a suitable pressure, and maintained in agitation. If desired, oxidising substances, such as hydrogen peroxide or barium peroxide, or permanganates, may be added to the mixture.—J. F. B.

United States Patents.

Acetyl Chloride; Process of Making ——. A. Wohl, Berlin. U.S. Pat. 710,648, Oct. 7, 1902.

In the process of making acetyl chloride by the interaction of calcium acetate and sulphuryl chloride, as hitherto practised, the yield only amounts to about 30 per cent. of the theoretical quantity. It is now found that if the mixture of the two materials be subjected to a process of milling for several hours before being distilled, the yield is increased to as much as 80 per cent.—J. F. B.

Terpene Peroxide. A. S. Ramage, Ohio. U.S. Pat. 710,893, Oct. 7, 1902.

See Eng. Pat. 4200 of 1901; this Journal, 1902, 188. —J. F. B.

Oil from Fish Livers; Process of Extracting ——, A. S. Hamilton. U.S. Pat. 711,307, Oct. 14, 1902.

See under XII., *page* 1403.

XXI.—PHOTOGRAPHY.

Solarisation-like Phenomena in Photography without Exposure to Light. Lüppo-Cramer. Phot. Corr., 1902, 39, 565; through Chem.-Zeit., 1902, 26, [88], Rep. 292.

The author has confirmed Russell's results as to the action of hydrogen peroxide in producing the chemical reversal of the latent photographic image. When strips cut from dry plates were partially immersed in perfect darkness in weak solutions of peroxide for two hours at 20° C., the phenomena observed resembled those given by exposures increasing in length up to the solarisation (reversing) point. With solutions between 0·03 and 0·1 per cent. in strength, the wetted and the non-wetted parts of the films developed up to the same degree of blackness, the density increasing as the concentration of the peroxide increased; but when the bath contained 3 per cent. of hydrogen peroxide, the wetted portion remained quite white, while the dry part turned black when the developer was subsequently applied. These phenomena cannot be explained by a variation in the speed of diffusion of the developer into the wetted and the non-wetted film; because during the final employment of "hypo," fixation proceeded with uniform rapidity all over the plates. More probably the peroxide acts upon the gelatin to produce a body which reduces traces of the silver bromide, but which, in presence of stronger solutions, again destroys the latent image by oxidation. In similar concentrations ammonium persulphate acts identically, but more slowly; and even sulphuric acid has an analogous action. In the last case, however, an impurity, perhaps hydrogen peroxide, may be present in the acid, which causes it to behave in this fashion. No reversal could be obtained with nitric or citric acids; for in concentrations exceeding 1 per cent., the gelatin was completely dissolved before the maximum of density was produced.—F. H. L.

Acetone Bisulphite; Applications of ——, *in Photography.* A. Eichengrün. Zeits. angew. Chem., 15, [43], 1114—1116.

In developers, in quantity about 1½ times as great as that usually taken of potassium metabisulphite, acetone bisulphite can advantageously replace both that salt and sodium sulphite; it can be used in presence of either caustic or carbonated alkalis, and from its stability can be used to prepare highly concentrated stock solutions, which keep indefinitely. Developers containing it give a brown tone to the silver deposit, and by altering the concentration, any tone from light brown to deep black can be obtained, both with negatives and with papers. A particular tone like an etching, admirable for reproducing etchings, and for landscape and portrait work, is obtained by exposing a paper 8 or 10 times longer than the normal time, and then developing. It also forms an excellent preservative for fixing baths; 1 or 2 per cent. renders unnecessary any addition of sulphuric acid, citric acid, alum, &c., while it does not harden the gelatin, and hence allows of rapid washing after fixing. 3. It is useful in Namias' method of reducing over-printed positives; the copies are weakened in dilute acidified permanganate solution, and then decolorised (cleared) by acetone bisulphite. Similarly, it may be used with advantage instead of ammonia in the ordinary mercury process of intensifying. 4. As a preliminary bath in developing by ferrous oxalate even in very small quantity, it enormously increases the rapidity of the action, and gives much sharper and clearer pictures than are possible without it. 5. As a restrainer to the more rapid developers:—it is possible with its aid to obtain a picture from a negative which has been over-exposed from 100 to 20,000 fold. One per cent. is added to the ordinary developer (say 4 c.c. of concentrated Eduol developer, 100 c.c. of water, 1 grm. of acetone bisulphite); the appearance and development of the image proceed as though with a normally exposed plate. It is stated that in this way photographs of subjects hitherto impossible are obtainable—reproductions of paintings, dark interiors with windows, machinery with bright reflexions, landscapes in sunlight, ice- and sea-pictures, even subjects with the sun in the picture.—J. T. D.

English Patents.

Photographic Plates or Papers; Manufacture of ——. H. E. Newton, London. From Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 22,727 Nov. 11, 1901.

Ready-made plates or papers are soaked in solutions of suitable developing agents, and then dried. As an example, "Monopol" plates are immersed in a bath containing 5 parts of "paramol" (amino-*o*-oxybenzylic alcohol) and 5 parts of acetone sodium sulphite per 50 parts of water until the gelatin has softened, when they are taken out and dried. After exposure the plates are soaked in a small quantity of water and then "developed" by adding 5 grms. of potassium carbonate. Numerous other developers may be used similarly. Eng. Pats. 15,434, 1891, and 12,421, 1901, are referred to.—F. H. L.

Colour Photographs, and Method of Making the same. A. J. Boult, London. From The Miley Colour Photograph Co., New York. Eng. Pat. 17,485, Aug. 8, 1902.

Three three-colour negatives are produced by the aid of screens in the usual way. These are printed separately upon "carbon tissue," prepared with a blue pigment for the red negative, a red pigment for the green negative, and a yellow pigment for the violet negative, said pigments being carefully selected for purity of tint and for absence of liability to render gelatin insoluble. Beginning with the red tissue, it is transferred to a temporary waxed and collodionised support, developed with hot water, and then transferred to the gelatin-coated paper which serves as the final support. The wax and collodion carried from the temporary support are removed by rubbing with alcohol and ether, and the remaining exposed gelatin is hardened with chrome alum solution. Next the yellow and then the blue tissue are developed on temporary transparent supports, and transposed on to the red

mage, superposing them accurately. The prescribed order of applying the coloured images to the final support should not be departed from.—F. H. L.

FRENCH PATENTS.

Polychromatic Photographic Prints. S. Vathis. Fr. Pat. 317,524, Jan. 4, 1902.

A PROCESS for obtaining prints ranging in colour from yellowish brown, through red, to a violet shade of blue. A positive is obtained as usual on collodio-citro-chloride paper, which is toned in a bath containing 300 c.c. of hydrochloric acid and 2 grms. of gold chloride per litre, a special bath of 1 per cent. gold chloride simply being employed for particular colours. The print is well washed, fixed, washed again, and dried. It is then heated, either by passing it over a flame or by applying to it, locally or otherwise, a hot "iron." Next the picture is washed in water for 10 minutes, and finally mounted wet or dry.
—F. H. L.

Photographic Plates; Developing ——, in Daylight. J. N. Ludwig. Fr. Pat. 318,193, Jan. 29, 1902.

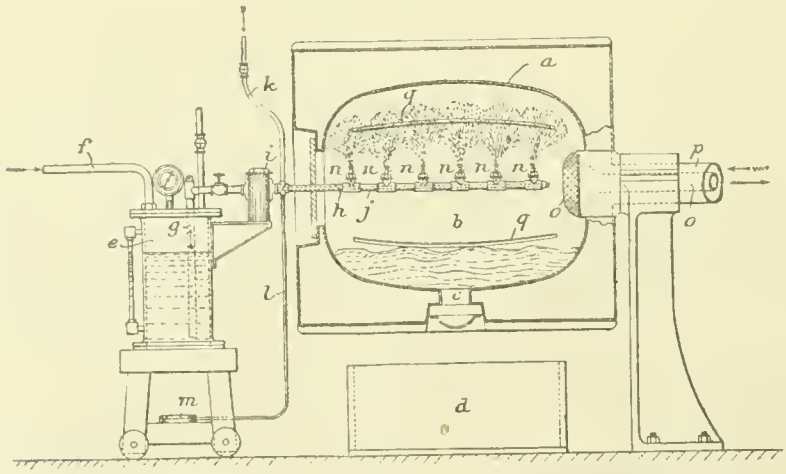
SEE Eng. Pat. 3023, 1902; this Journal, 1902, 639.
—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENT.

Explosives [*Hardening Smokeless Powders*]. A. T. Cocking and Kynoch, Ltd., Witton. Eng. Pat. 22,965, Nov. 13, 1901.

GRANULATED nitropowders are usually gelatinised, waterproofed and hardened by the action of a liquid solvent. The patentees propose to bring the solvent, in the form of vapour, in thorough contact with the grains of powder, the latter being at such a temperature as to prevent the condensation of the vapour. The apparatus employed is shown in the accompanying figure. Acetone or other



solvent is contained in *e*, compressed air being supplied by *f*. The liquid, under pressure, passes by *g*, through the strainer *i* and pipe *h* to spraying nozzles *n*. Steam is supplied by *k* to jacket *j* surrounding the pipe here, the jacket is also connected with a pipe *l*, having a trap at *m*. The powder to be treated is placed in the chamber *b* of the revolving drum *a* which has a steam jacket supplied through *p*. The vapour after acting on the grains of powder passes out by *o* to a condenser. The ridges *q* are provided to ensure intimate contact between the powder and vapour. A charging and discharging door is provided at *c*. The advantages claimed are—

(1) Recovery of practically the whole of the solvent.

(2) The production of a very hard grain powder.

(3) The powder is ready for use immediately after treatment with the vapour.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

FRENCH PATENT.

Beetroot Pulp [*for Analysis*]; *Press for Preparing* ——. Fr. Pat. 318,225, Jan. 30, 1902.

THIS press prepares beetroot pulp for analysis in such a degree of fineness that it affords an instantaneous diffusion in the cold. It consists of a piston and a cylinder provided with extremely small grooves on its base, forming with the movable bottom, minute channels through which the pulp-paste is squeezed.—J. F. B.

INORGANIC—QUANTITATIVE.

Gas Analysis by Means of Flasks. I. Determination of a Component of a Gas by Measuring the Liquid required to Displace it. A. Wohl. Ber., 1902, **35**, [16], 3485—3492.

INSTEAD of the usual graduated gas burette and suitable absorbers, the author proposes the use of a single graduated glass flask for measuring off a known volume of the gas. After absorbing one of the constituents, *e.g.*, CO_2 or O_2, with the ordinary reagents, the decrease in volume is found by weighing or measuring the amount of water corresponding to the decrease.

The accompanying figures show how the analysis is accomplished. Fig. 1 is a flask of 100 c.c. capacity provided with a rubber stopper, short pieces of capillary glass and rubber tubing and a pinch-cock. It is filled with the gas to be examined by inserting a brass capillary tube nearly to the bottom as is shown in the figure.

After withdrawing the brass tube, the rubber stopper is pushed in until it reaches the 100 c.c. mark. This compresses the gas slightly. The flask is then placed for ¼—½ minute in water at the temperature of the air and the pinch-cock opened to allow the excess of gas to escape. 100 c.c. of gas under the existing conditions of temperature and pressure are thus obtained.

An alternate and better method of filling is shown in Fig. 2, in which the gas is sucked through the flask by the rubber bellows until all the air has been displaced.

The absorbing reagent is introduced by a funnel of 40—50 c.c. capacity connected to the rubber tubing above the pinch-cock (see Fig. 3). As soon as the absorption is complete, the funnel is filled up with water and the pinch-cock opened in order to replace the absorbed gas by water. The original temperature is then recovered by placing the flask in water. At this stage the residual gas is under a slightly increased pressure due to the column of water in the funnel and capillary tube. The original atmospheric pressure is attained by substituting a short piece of tubing (5 mm. diameter) for the funnel and tilting the flask, till the neck is filled with the liquid (see Fig. 4). On compressing the pinch-cock, some of the water flows out of the flask through the short tube, which is maintained in a horizontal position, as is shown in Fig. 4, and while the pinch-cock is fully open, the flask itself is also lowered into the horizontal position. The effect of this is, that some of the water in the short horizontal tube flows back into the flask until the atmospheric pressure is restored. The pinch-cock is then shut and the flask placed in the vertical position.

To determine the volume of the unabsorbed gas, the stopper is removed and the flask filled up to the mark with

water from a burette. Or, by weighing the flask before and after the absorption, the volume of absorbed gas may be ascertained. For very accurate work corrections must of

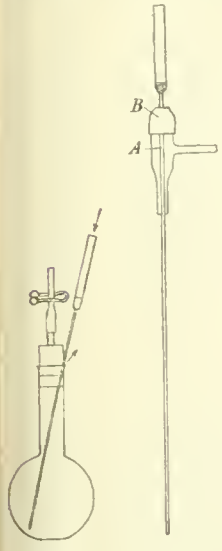


Fig. 1.

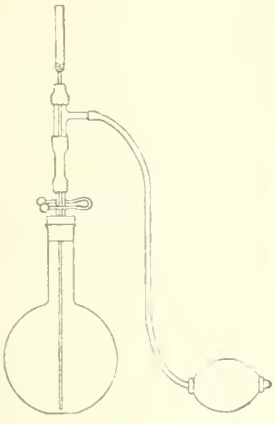


Fig. 2.

Fig. 3.

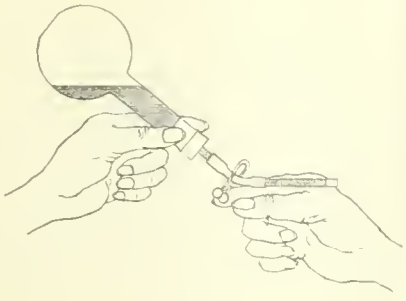


Fig. 4.

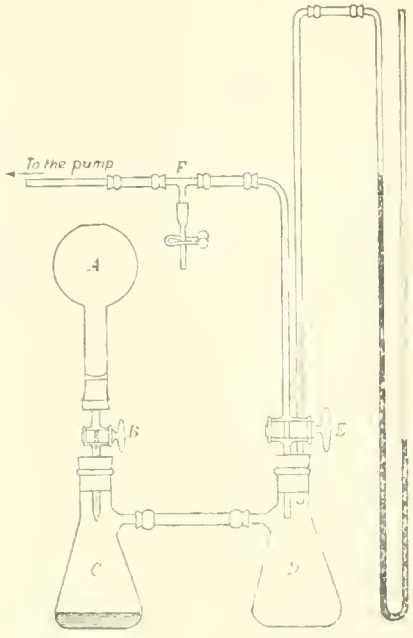
ourse be made for the specific gravity and vapour pressure f the absorbing reagent admitted to the flask.

For the approximate estimation of CO_2 in gases in the orks, the author recommends the use of a larger flask, iz., 200—400 c.c.—J. S.

as Analysis by Means of Flasks. II. Determination of a Component of a Gas from Pressure Measurements. A. Wobl. Ber., 1902, **35**, [16], 3493—3505.

HE operations of filling, absorbing, &c. are in general ilar to those described in the preceding abstract up to e point at which the volume of the residual gas is to be etermined. The flask A B is then attached to the pparatus shown in the accompanying block. By carefully anipulating the taps the pressure in the apparatus is duced to such an extent that the residual gas contained A is expanded down to the bore of the stop-cock B, the rtion of the tube below B remaining filled with expelled uid when B is fully opened. The pressure is then read the manometer. To facilitate the fine adjustments cessary, the author files notches in the keys of the stop-cks. In estimating oxygen, C must be half filled with ter containing sufficient acid to neutralise the alkaline rogallol, otherwise a reduction in pressure would ensue ing to the absorption of oxygen from the air contained C on discharging the reagent from A.

The amount of gas absorbed is represented by the luction in pressure observed, *viz.*, the manometer reading p, together with the mercury equivalent h of the length of the column of water suspended below the stop-cock B. If f is the vapour pressure of the water at the



temperature of the experiment and B is the height of the barometer, then the percentage absorption, referred to dry gas, is $\frac{p+h}{B-f} \times 100$. In determining the percentage composition in this way, it is obvious that the capacity of the flask A need not be known as it does not enter into the calculation.

When the gas is in contact with the strong reagent, not sufficiently diluted with water when the measurement of pressure is made, further corrections are necessary. In this case h^1 must be substituted for h. If s is the specific gravity of the solution contained in the tube below B and d its vapour pressure, then $h^1 = h\,s - d$. When more than one component is estimated, the percentage amount of the first component absorbed is $\frac{p_1+h^1}{B-f}$ 100, while for the second component we would have $\frac{p_2-p_1}{B-f}$ 100 and so on.—J. S.

Superphosphate Manures; Gases evolved in Manufacture of ——, and a more accurate Method of determining their SO_3 Equivalents. J. Affleck. 38th Ann. Rep. on Alkali, &c. Works, 1902, 20—27. (See also this Journal, 1902 1135—1137.)

THE acid gases to be dealt with here consist almost solely of silicon fluoride, or, at least, when absorbed by water, the solution rarely or never contains free hydrofluoric acid in addition to silicofluoric acid; other acid gases, such as hydrochloric acid and sulphur dioxide, very rarely occur. Hitherto, the method adopted has been usually to absorb the gases either in water or in alkali, and titrate with alkali or acid respectively; and anomalous results have almost always occurred in the titration. In water solution, neutrality to methyl orange is reached very gradually, and the end-point is very difficult to determine; when it is reached or overstepped, the solution is still acid to litmus paper, and after litmus paper shows neutrality, litmus solution still indicates acidity; but if the solution be heated when just alkaline to methyl orange, and phenolphthalein be used then as indicator, the end-point is sharp and satisfactory. In alkaline solution these changes occur in the reverse order; but as the solution must not then be heated for the methyl orange indication, the latter is slow and indecisive. The author aspirates a cubic foot, whether of the stronger gases from the mixers or the weaker gases

from the condensers. The acid gases are absorbed by shaking with 300 c.c. of water in a Fletcher's aspirator (adding 5—10 c.c. of hydrogen peroxide if sulphur dioxide is anticipated); the whole solution from the weak gases is used in the test, but the solution from the strong gases is made up to 500 c.c., and, after allowing silica, &c., to settle out, 50 c.c. are taken for titration, and diluted to about 150 c.c. A drop of methyl orange and a few drops of phenolphthaleïn are added, and titration with N- (or, with very weak gases, N/10-) sodium hydroxide solution is begun. The reaction proceeds in two stages: (1) $H_2SiF_6 + 2NaOH = Na_2SiF_6 + 2H_2O$, which proceeds to neutralisation as indicated by methyl orange; (2) $Na_2SiF_6 + 4NaOH = 6NaF + Si(OH)_4$, which requires twice as much soda solution as the first stage, proceeds slowly in the cold, but rapidly on heating, and the completion of which is shown sharply by phenolphthaleïn. The titration, then, is carried on in the cold till neutral or just alkaline to methyl orange, then the solution is heated to about 50° C., and more alkali added till the indication of the phenolphthaleïn occurs. The acidity as SO_3 equivalent to either stage of the reaction (the first is one-third of the whole) may now be calculated, and usually no more than this will be required. But if other acid gases are suspected, a second 50 c.c. sample is drawn, diluted with 50 c.c. of 90 per cent. alcohol, and titrated with soda and methyl orange; the reaction is quite sharp now, for the sodium silicofluoride is practically insoluble in alcohol, and is removed by precipitation. If the alkali required be exactly one-third of that needed in the other case, no other acid gases are present; but if it be more, it represents the alkali needed to neutralise the other acids and the silicofluoric acid, while the former amount represents that needed to neutralise the other acids and three times the silicofluoric acid; so that the difference between the first amount and three times the second amount is twice that needed to neutralise the other acids, and thus the separate values for silicofluoric acid and for other acids are obtainable. If the second titration gives less than one-third of the first, silicofluorides are present in solution; but this is a rare occurrence. The anomalous occurrences mentioned above are due to the facts that sodium fluoride is much more alkaline to methyl orange, much less alkaline to litmus, than sodium silicofluoride is acid to those indicators respectively; while it is quite neutral to phenolphthaleïn.—J. T. D.

Persulphates; Quantitative Separations by Means of ——, in Acid Solution. M. Dittrich and C. Hassel. Ber., 1902, **35**, [15], 3266—3271.

For the determination of manganese (see Marshall, this Journal, 1891, 1004; 1897, 396; and Chem. News, **83**, 76), ammonium persulphate is to be preferred to potassium persulphate as it is more readily washed out of the precipitated manganese oxide. The persulphate should first be assayed in the following manner:—A weighed quantity is placed in a long-necked flask, together with excess (3—4 grms.) of manganese sulphate and 25 c.c. of concentrated hydrochloric acid. The flask is closed with a stopper provided with two tubes, and so arranged that a current of carbon dioxide may be bubbled through the contents of the flask and led into a cylinder containing a solution of potassium iodide (10 per cent.) The flask is gently warmed, and as a final product, an amount of chlorine equivalent to the active oxygen of the persulphate is produced, which is swept into the iodide solution and the corresponding iodine estimated by sodium thiosulphate.

Estimation of Manganese.—0·3—0·5 grm. of crystallised double sulphate of manganese and ammonium were weighed into a platinum dish, dissolved in water (150—200 c.c.) containing some 10 per cent. sulphuric acid (5 c.c.), warmed, and then treated with a 10 per cent. solution of ammonium persulphate (15—20 c.c.). The dish was heated on the water-bath and kept well shaken for two hours and the precipitated oxide filtered off, washed with hot water, ignited in a platinum crucible, weighed as Mn_3O_4 and calculated as MnO.

0·4731 grm. of the double salt gave 18·17 per cent. of MnO, the theoretical value being 18·16.

Separation of Manganese and Magnesium.—Weighed amounts of the same manganese salt and of magnesium sulphate were mixed and dissolved in water (200 c.c.) and treated as previously described. The wash liquor and filtrate were evaporated after adding a few cubic centimeters of persulphate solution. In the event of a trace of manganese having become permanganate as shown by the colour, it was removed by ammonia and hydrogen peroxide. The magnesium was estimated by ordinary methods, in the residue.

Separation of Manganese and Zinc.—This offered no difficulties when the mixed salts were dissolved in sufficient water, *i.e.*, 400—500 c.c., instead of about 200 c.c. The zinc was precipitated as zinc carbonate after removal of the ammonium salts.

Separation of Manganese and Aluminium.—These two metals were separated in an analogous method with equal facility and exactness. Results are given showing the accuracy of the methods.—R. L. J.

Arsenic; Retention of ——, by Iron in the Marsh-Berzelius Method. C. L. Parsons and M. A. Stewart. J. Amer. Chem. Soc., 1902, **24**, 1005—1011.

Several chemists have recently called attention to the fact that different samples of zinc produce mirrors of varying intensity from like amounts of arsenic (see this Journal, 1901, 194; 1902, 95). After referring to experiments by Headden and Sadler, who found that very low results for arsenic were obtained by the Marsh-Berzelius method with arsenical pyrites, and that the amounts were increased by removing the iron, the authors describe experiments of their own, showing that iron, whether alloyed with the zinc or in solution in the generator, must be avoided, if exact quantitative results are desired. Whenever iron was present, even in small amounts, arsenic was invariably found in the hydrated oxide of iron left on evaporating the liquid contents of the generator with nitric acid. If the amount of iron present be very small, the method of standard mirrors will give essentially accurate results, provided the precaution be taken to always prepare the standards from the same zinc as is afterwards used in the analysis. The zinc should be as nearly free from iron as can possibly be obtained, and soluble salts of iron must be kept out of the generator. Consequently, liquids containing iron must be first treated so as to distil off the arsenic, and the distillate must then be put into the generator. As a qualitative test, the authors have never failed to get a mirror, even with iron present, when as much as 0·01 mgrm. of arsenic was added.—L. A.

Manganese; Determination of ——, in Ferro-Manganese and Spiegel. C. Bolin. Teknisk Tidsskrift, 1902, **32**, 66; through Chem.-Zeit., 1902, **26**, [88], Rep. 281.

0·2 grm. of ferro-manganese, or 0·5 grm. of spiegel, is dissolved in nitric acid of sp. gr. 1·2, the solution is evaporated to dryness, and taken up in strong hydrochloric acid. The silica is filtered off, the liquid diluted to at least 250 c.c., mixed with 2 grms. (12 grms. in the case of spiegel) of tartaric acid, 13 grms. of ammonium chloride, and 10 c.c. of a 1:20 solution of sodium ammonium phosphate; then raised to the boiling point. The beaker is taken away from the flame, and ammonia is dropped in with constant stirring until the precipitate of ferric phosphate just redissolves; an excess of ammonia is to be avoided. If but little manganese is present, the ferric phosphate may dissolve instantly, carrying with it into solution part of the precipitated manganese. In this case hydrochloric acid must be introduced, and the whole warmed on the water-bath to take up all the insoluble matter. The precipitate which is at first flocculent, soon changes in the warm liquid into the glittering crystals characteristic of manganese ammonium phosphate; and after four hours' cooling with occasional agitation, this is collected on a paper, and washed with cold faintly ammoniacal water. After ignition in platinum, $Mn_2P_2O_7$ is obtained, which contains 38·75 per cent. of manganese. The results quoted by the author agree satisfactorily with those given by the Volhardt process; but apparently it is desirable to precipitate the manganese a second time when spiegel is being analysed.—F. H. L.

Prussian Blue in Spent Oxide; Determination of ——. H. Lührig. Chem.-Zeit., 1902, **26**, [87], 1039—1041.

The author has made a comparative study of Knublauch's method for the determination of Prussian blue in spent oxide (this Journal, 1889, 732) and the following other methods, *viz.*:—(1) Determination of the iron in the alkaline extract from the sample by evaporating with sulphuric acid, dissolving the ignited residue in sulphuric acid, reducing with zinc, and titrating with permanganate; (2) Weighing the Fe_2O_3 obtained by direct ignition of the Prussian blue precipitate, which is thrown down on adding ferric chloride to the alkaline extract from the sample; (3) Titration of the iron in the ignited Fe_2O_3 just mentioned; (4) Decomposing the Prussian blue, obtained as in (2), by means of potassium hydroxide, and then (*a*) titrating the iron in the ferric hydroxide residue, and (*b*) evaporating the filtrate with sulphuric acid and proceeding as in (1); (5) determination of the nitrogen in the Prussian blue precipitate.

Tested against pure potassium ferrocyanide, all the methods gave concordant results; but on testing spent oxide, the variations are great, and not always in the same directions.

Methods 2 to 4*b*, which are based on the separation of a pure Prussian blue, give concordant results; Knublauch's process always gives lower results; while method 1 varies in its relation to the Prussian blue methods. Nauss' process (this Journal, 1900, 934) likewise gives higher results than that of Knublauch.

Until the composition of spent oxide is elucidated, the author is unable to say which of the methods gives the results most correctly representing the value of the material.—H. B.

Phosphoric Acid in Ground Thomas Slag; Determination of Citric-soluble ——, *by the Molybdate Method.* H. Neubauer. Zeits. angew. Chem., **15**, [44], 1133—1135.

In Wagner's original method a solution of ammonium citrate acidified with citric acid was used, of such a strength that 5*b* c.c. of the solution contained 3 grms. of citric acid. This solution took up from the meal not only phosphoric acid, but also a certain quantity of silica. To avoid the precipitation of this silica along with the phosphomolybdate precipitate, Wagner used a molybdate solution containing, in 2 litres, 150 grms. of ammonium molybdate, 1 litre of nitric acid of sp. gr. 1·2, and 400 grms. of ammonium nitrate; the ammonium nitrate neutralised the retarding action of the citric acid on the precipitation of the phosphomolybdate, and enabled the filtration to be carried out shortly after the addition of the molybdate, a proceeding absolutely necessary to avoid precipitation of considerable quantities of silica. For some time, however, the extraction of the meal has usually been carried out (on Wagner's recommendation, based on his more recent researches), not by acidified ammonium citrate, but by 2 per cent. citric acid solution. The new solution thus contains only one-third as much free citric acid as the old; the retarding action of the citric acid on the precipitation of the phosphomolybdate is therefore absent, but the co-precipitation of silica is accelerated both by the lower concentration of citric acid and by the presence of ammonium nitrate, and contamination of the phosphorus precipitate with silica has been more frequent with the new method than with the old. The author has, therefore, experimented with the ordinary molybdate solution, prepared as above, omitting the ammonium nitrate: to 50 c.c. of the solution of the meal, he added 100 c.c of molybdate solution, heated for 15 minutes in a water-bath at 80° C., stirred lightly, on removing from the bath, for a couple of seconds, to work the precipitate together, allowed to stand for an hour and filtered. Comparative tests were carried out, following Wagner's method exactly; and the true percentage of phosphoric acid in each sample was determined by proceeding according to Wagner's method up to the precipitation and washing of the magnesia precipitate, which was then dissolved in hydrochloric acid and evaporated to dryness, taken up with hydrochloric acid, the silica filtered off and weighed, and the phosphoric acid in the filtrate determined as magnesium pyrophosphate. The results of several experiments show clearly that no considerable contamination with silica occurs when Wagner's method is followed, if the precipitate stands not more than one or two hours before filtration. But the use of the ordinary molybdate solution presents many advantages: it is easier to prepare, the precipitate is denser and easier to manipulate, the amount of co-precipitated silica is under similar circumstances less than with Wagner's solution, and, most important of all, immediate filtration is not necessary; after 21 hours' or even 48 hours' standing, no sensible co-precipitation of silica occurs, so that a precipitation can be carried out in the evening, and the filtration left until next day.—J. T. D.

Thorium from Cerium, Lanthanum, and Didymium; A New Separation of ——, *and its Application to the Analysis of Monazite.* F. L. Metzger. J. Amer. Chem. Soc., 1902, **24**, 901—917.

A saturated solution of fumaric acid in 40 per cent. alcohol precipitates thorium completely from neutral solutions to which 40 per cent. of their volume of alcohol has been added; whilst, under these conditions, the only other metals precipitated are zirconium, erbium, silver, and mercury. A separation of thorium from the other earths in monazite can thus be effected in about one-third of the time required by the ammonium oxalate and thiosulphate methods, and with equal, if not greater accuracy. The details of the process are as follow:—1 grm. of the mineral, in the condition of impalpable powder, is thoroughly decomposed by repeated evaporation to dryness with concentrated sulphuric acid. The mass is added in very small quantities, to about 700 c.c. of ice-cold water, with constant agitation, the temperature of the water being kept below 2° C., and after digesting for several hours with frequent stirring, the liquid is filtered and the residue washed. The filtrate is nearly neutralized with dilute ammonia (1 : 20), and the earths are precipitated by adding 50 c.c. of a cold saturated solution of ammonium oxalate. The washed precipitate is rinsed into a beaker, and boiled with 20 to 25 c.c. of strong caustic potash solution (which readily converts the oxalates into hydroxides); and after diluting, filtering, and washing, the hydroxides are dissolved in dilute nitric acid (1 : 1) and evaporated to dryness, dissolved in 50 c.c. of water, and further diluted with water and alcohol until the solution contains 40 per cent. of the latter and equals about 200 c.c. in bulk. 20 to 25 c.c. of a 1 per cent. solution of fumaric acid are then added, and the temperature is raised to boiling. The precipitate is filtered off hot, well washed with hot 40 per cent. alcohol, redissolved in 25 to 30 c.c. of hot dilute hydrochloric acid (1 : 1), and again evaporated to dryness. The residue, while still in the bath, is redissolved in about 50 c.c. of water, neglecting the carbon from decomposed fumaric acid. Alcohol and water are added as before, plus about 10 c.c. of fumaric acid, the temperature raised to boiling, the precipitate filtered off washed with hot 40 per cent. alcohol, ignited wet in a platinum crucible, and weighed as ThO_2.

Metals precipitated by H_2S do not interfere, and need not therefore be separated before precipitation with oxalate, Satisfactory test analyses are given, showing a good agreement with other methods.—L. A.

ORGANIC—QUALITATIVE.

Citric Acid in Wine; Detection of ——. J. Schindler. Zeits. landw. Vers.-Wes. Öst., **5**, 1053—1062. Chem. Centr., 1902, **2**, [16], 1016.

The author's method which allows of the detection of citric acid in presence of malic acid is based on the different solubility of barium citrate and barium malate. 50 c.c. of the wine, the strength of which is so adjusted that it contains 12—15 per cent. of alcohol, are made faintly alkaline with ammonia, precipitated with barium chloride or barium acetate, and after long standing, the liquid decanted through a filter, and the precipitate on the filter rinsed back with at the most 15 c.c. of water. The precipitate and water are heated to boiling and the former decomposed with dilute sulphuric acid (1 : 10). The filtrate is treated with 1—2 c.c. of basic lead acetate and 1—2 c.c. of a saturated solution

of lead acetate, boiled, and filtered. A milky turbidity of the filtrate on cooling indicates the presence of citric acid. Any precipitate of lead tartrate which may separate later, can be removed by again heating and filtering.—A. S.

Alkaloidal Reactions; New ——. Chem. and Druggist, 1902, **61**, [1186], 660.

Solutions of quinine and quinidine (conquinine), when heated to boiling with a few drops of hydrogen peroxide and copper sulphate solutions, give a gooseberry red colour passing through violet and blue to green. According to Helet the following reaction is characteristic of pilocarpine. A dilute solution of the alkaloid is treated with hydrogen peroxide solution and a few c.c. of benzine and a few drops of potassium bichromate solution added. After agitating and allowing to separate, the benzine is coloured violet.—A. S.

ORGANIC—QUANTITATIVE.

Tannin; Volumetric Determination of ——, *and Analysis of Woods and Extracts containing it.* A. Thompson. Comptes Rend., **135**, [17], 689—691.

Hydrogen peroxide, in presence of concentrated solution of caustic alkali, is completely dissociated when pure lead peroxide is added. If tannin be added to the alkaline peroxide before adding the lead peroxide, it absorbs the oxygen resulting from the reaction, to the extent of 20 c.c. for each 0·1 grm. of tannin, and the volume of the evolved gas is reduced by that amount. Moreover, tannin is soluble in 90 per cent. alcohol, whilst most of the mineral and pectic substances which accompany it are not. On these principles the author's process is based. One gram of the tannin-containing substance, finely-powdered, is put into a 50 c.c. flask, which is filled to the mark with 90 per cent. alcohol. The liquid is frequently shaken, and after an hour is filtered through a dry filter; 25 c.c. of the filtrate are evaporated to dryness, the residue is dissolved in water, the solution made up to 25 c.c., and 5 c.c. (=0·1 grm. of substance) are taken for analysis. The 5 c.c. of solution, together with 2 c.c. of hydrogen peroxide, are introduced into the apparatus, which is provided with a tap funnel for adding the soda solution, a tube containing the lead peroxide so arranged that successive small quantities can be shaken into the liquid, and a gas delivery and gas-measuring tube. The soda solution (5 c.c.) is run in, the temperature and pressure read, and after 15 minutes some of the lead peroxide is shaken in. After two hours more lead peroxide is added, and the volume of the evolved gas read. After another hour no more should have been evolved; if any has, another assay must be made. The difference between the volume now read and that evolved from 2 c.c. of the hydrogen peroxide without addition of tannin, gives the amount of oxygen absorbed by the tannin. In applying the method to woods and tannin extracts, methyl alcohol is preferable to ordinary alcohol. Comparison of this method with the hide-powder method of determination shows that it is accurate, and that it determines the tannin actually absorbable by hide

—J. T. D.

Maltose and Lactose; Quantitative Separation of ——. C. J. Boyden. J. Amer. Chem. Soc., 1902, **24**, 993—995.

This separation may be effected by means of the yeast, *Saccharomyces anomolus*, which removes maltose completely without acting on the lactose.

The solution containing maltose and lactose having been made, approximately, 0·5 per cent., and containing 1 per cent. of Pasteur's mixture (Strassburger and Hillhouse), 50 c.c. are heated to 100° C. for three successive days in a steam steriliser, with the usual precautions, for 30 minutes. The sterile fluid is then liberally inoculated with a pure culture of the yeast, and incubated at 30° C. for two to three weeks, the culture having been grown in Agar and transferred to Pasteur's fluid prior to use. After the incubation, the fluid is filtered through a bacterial filter, and the cupric-reducing power determined in the usual way by Allihn's method. The difference between the copper thus found, and that reduced by the fluid before fermentation, is calculated to maltose, and the remainder to lactose. To hydrolyze the last traces of maltose, vigorous growth of the yeast is necessary, and to produce this the Pasteur's mixture is added.—L. A.

Starch; Determination of ——. E. Giantureo. Rev. intern. falsific., **15**, 97—100. Chem. Centr., 1902, **2** [15], 966.

Lindet's method for the determination of starch (this Journal, 1902, 75) suffers from the defect that the starch only settles very slowly and is difficult to filter. If, however, aluminium hydroxide is precipitated in the liquid containing the starch in suspension, the starch settles rapidly with the gelatinous precipitate and can be washed by decantation, before filtering. A 6·0769 per cent. solution of potash alum is recommended, 1 c.c. of which gives a precipitate of 0·01 grm. of aluminium hydroxide, which, when dried at 100° C., has the constant composition, $Al(OH)_3$.—A. S.

Salicylic Acid; Determination of ——, *in Wines, and its Presence in Natural Wines and in other Vegetable Products.* H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [3], 286—293.

The authors have made a number of determinations of the salicylic acid-content of wines, fruits, and other vegetable matters, the results obtained leading to the following conclusions:—Wines, raspberries, strawberries, mulberries, &c. in the natural state sometimes contain salicylic acid; the quantities found, however, only amount to 0·0005 to 0·002 grm. of the acid per kilo. of material, whilst with wines, &c. to which salicylic acid has been added as a preservative, at least 0·020 or 0·030 grm. per litre is found. It is thus easy to decide whether the salicylic acid found in any product occurs naturally, or whether it has been purposely added. One of the best and most sensitive methods for determining the salicylic acid is that of the author and de Grobert (see next abstract), which can also be used for the determination of saccharine, this being first converted into salicylic acid. Other and less sensitive methods, giving no indications of any such quantities of the acid as 0·0005 or 0·002 grm. per litre or kilo. of material, may, however, be employed, when the question is merely one of detecting the presence of added salicylic acid.

—T. H. P.

Salicylic Acid [*in Wine*]; *Determination of* ——. H. Pellet and S. de Grobert. Bull. de la Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [3], 289—292 (see preceding abstract).

A set of 8 standard tubes is prepared by placing in them 1 c.c., 0·75 c.c., 0·5 c.c., 0·4 c.c., 0·3 c.c., 0·2 c.c., 0·1 c.c., and 0·05 c.c., respectively, of a solution of salicylic acid containing 1 grm. per litre, then diluting to 10 c.c. and adding 3 drops of a very dilute solution of ferric chloride (sp. gr., 1·005—1·010) to the first tube, 2 drops to the second and third tubes, and 1 drop to each of the others, except the last, for which it is sufficient to just touch the inside of the tube with the end of the pipette containing the ferric chloride solution. For the determination, 100 c.c. of the wine are shaken with 100 c.c. of ether and 5 drops of sulphuric acid (30° B.), and after standing, the ethereal solution removed. A second and third extraction with ether follow. The ether is distilled off from the solution on the water-bath, the residue transferred to a porcelain capsule and the vessel rinsed with a few c.c. of ether. The liquid is then heated on a drying oven till most of the ether is driven off (35—50 c.c.) and treated with, at the most, 1·5 c.c. of a solution of caustic soda of which 10 c.c. = 0·3 grm. of Na_2O. This quantity is sufficient to saturate about 0·2 grm. of salicylic acid, or 2 grms. per litre of the substance under examination. If the liquid, after the addition, is still acid, this is due mainly to acetic acid which is removed by the subsequent evaporation. If the liquid was only slightly acid at first, it is sufficient to add 2, 3, or 4 drops of the caustic soda solution—sufficient to cause slight alkalinity. The liquid is evaporated to dryness on the water-bath, the residue treated with 5 drops of

sulphuric acid and 20 c.c. of benzene, the mixture shaken, filtered, and 10 c.c. of the benzene filtrate collected in a tube similar to those containing the colour standards. 10 c.c. of distilled water and 1 or 2 drops of ferric chloride solution are added, and the amount of salicylic acid estimated by comparison with the colour standards. The amount found represents that contained in 50 c.c. of the wine. The authors have found by experiment that about 93 per cent. of the salicylic acid present is recovered by their process, and the amount of salicylic acid found should therefore be corrected by dividing by 0·93. (See also this Journal, 1901, 158, 284, 396, and 938.)—A. S.

Gluten in Flour; Determination of Moist ——. M. Arpin. Ann. Chim. anal. appl., **7**, 325—331. Chem. Centr., 1902, **2**, [16], 1019.

Although there are numerous sources of error in the separation of the gluten, the valuation of a flour on the basis of its content in moist gluten has not yet been suppressed. The author forms a cake from 33·33 grms. of flour and 16—17 grms. of water and kneads it over gauze in a stream of water at 15° C., then weighs the cake, dries it for 10 minutes at 120°—130° C., cuts it up, and finally dries it at 105° C., for about 10 hours, to constant weight. Comparative determinations by two analysts of 10 different kinds of flour showed in one case, a difference of 1·44 per cent., and in a second case, 1·14 per cent. in the amounts of moist gluten, whilst in the other cases, the results agreed within 0·30 per cent. In the determination of dry gluten, the results agreed within 0·33 per cent. In five determinations of the gluten in the same sample of flour, one analyst found from 24·88 to 26·49, average 25·45 per cent. of moist gluten, and 8·13 to 8·55, average 8·28 per cent. of dry gluten, whilst the other analyst found 24·93 to 26·31, average 25·70 per cent. of moist gluten, and 8·10 to 8·41, average 8·22 per cent. of dry gluten.

With increase of temperature of the water used, the yield of gluten is increased. From the same flour, 23·98 per cent. of moist gluten were obtained with water of 5° C., 25·26 per cent. with water of 15° C., and 26·42 per cent. with water of 25° C., whilst the amounts of dry gluten under the same conditions were 7·83, 8·08, and 9·24 per cent. respectively.—A. S.

Tartaric Acid in Commercial Products; The Application of Polarimetry to the Determination of ——. E. B. Kenrick and F. B. Kenrick. J. Amer. Chem. Soc., 1902, **24**, 928—943.

The object of this research was to investigate the influence of various commonly occurring substances on the rotation of tartaric acid, and to devise methods for the polarimetric estimation of this acid in its chief commercial preparations, which may be grouped as follows:—

Group I.—Tartaric acid, and mixtures containing tartaric acid and calcium tartrate, but no other optically active material, or any substance, such as iron or aluminium, capable of modifying the rotation of tartaric acid in ammoniacal solution. The group includes Rochelle salt, potassium tartrate, cream of tartar, and many effervescing preparations.

A weighed quantity, containing not more than 2 grms. of tartaric acid, is moistened with 3—4 c.c. of water, and ammonia of sp. gr. 0·924 is added until there is present an excess of about 2 c.c. The solution is made up to 50 c.c., filtered, if necessary, through a dry filter, and the rotation read in a 200 mm. tube. The rotation in minutes × 0·00519 = the number of grms. of tartaric acid ($C_4H_6O_6$) present. If the mixture contain insoluble calcium tartrate, a few drops of HCl and gentle heat must be used in dissolving; to the hot solution ammonia is added in slight excess, and about 0·2 grm. of sodium phosphate. The liquid is then made up to 50 c.c. at 60° F., filtered, and the rotation read.

Group II. comprises mixtures containing tartaric acid and sugar, and as in ammoniacal solutions the rotation of each of these is unaffected by the other, the acid is measured by the total rotation, less that due to the sugar. But magnesium sulphate, if present, must be first removed; for, although this salt has but little effect on the rotation of either sugar or tartaric acid alone, it considerably reduces the rotation of the two when occurring together. In carrying out the inversion of cane sugar by Clerget's method, a definite amount of free hydrochloric acid must be present.

Group III.—This comprises mixtures containing aluminium, iron, starch, &c., such as tartar baking powders, and cream of tartar mixed with substitutes. Direct readings of the rotation in ammoniacal solution are inadmissible in analyses of such mixtures, owing to the influence of aluminium and iron on the rotation of the tartaric acid, and the unknown rotation due to the trace of inverted starch. Accurate determinations may, however, be made in presence of excess of ammonium molybdate in neutral solution, phosphates being removed. An amount of the sample containing not more than 0·2 grm. of tartaric acid, 0·3 grm. of alum, and 0·3 grm. of calcium acid phosphate, is placed in a dry flask, 10 c.c. of citric acid (10 per cent. solution), and 10 c.c. of ammonium molybdate (17·6 grms. per 100 c.c.) are added, and the liquid is shaken occasionally during 10 to 15 minutes. 5 c.c. of magnesium sulphate (12 per cent. solution) are then added, and 10 c.c. of ammonia solution (33 c.c. of ammonia, 0·924 sp. gr. in 100 c.c.). The solutions are exactly measured, so that the total volume may be 35 c.c. After a few minutes (not more than one hour) the solution is filtered through dry paper; to 20 c.c. are added a few drops of of methyl orange, and HCl until acid; finally 10 c.c. more molybdate are added, and water to 50 c.c. This solution is polarised. The rotation in minutes × 0·00121 = grm. of tartaric acid in the weight of sample taken.—L. A.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Tellurium and Selenium; Action of ——, *on Gold and Silver Salts.* R. D. Hall and V. Lenher. J. Amer. Chem. Soc., 1902, **24**, 918—927.

Tellurium completely reduces a gold chloride solution, either warm or cold, to metallic gold, the only obstacle to quantitative precipitation being the persistency with which the gold coats the tellurium and stops further action. But, by using very finely-ground tellurium, and crushing the precipitate with a glass rod, quantitative results can be obtained. Tellurium reduces silver solutions with formation of silver telluride, which reduces gold.

Selenium behaves like tellurium, but less energetically. It reduces silver solutions in the cold, with formation of silver selenide, but has no action on gold solutions unless heated nearly to boiling, the action then being fairly rapid and complete. Silver selenide reduces gold.—L. A.

Hydrotetroxide and Ozonic Acid. A. Bach. Ber., **35**, [16], 3424—3425.

The author has previously shown reason for the existence, among the products of the slow oxidation of hydrogen from palladium hydride, of the substance "hydrotetroxide," H_2O_4, a substance possessing oxidising powers similar to, but more powerful than, those of hydrogen dioxide. Later, by reacting with dilute sulphuric acid on potassium tetroxide, he obtained an unstable liquid which probably contained hydrotetroxide. Quite recently, Baeyer and Villiger (this Journal, 1902, 1301), by leading ozonised oxygen over solid potassium hydroxide, obtained a "potassium ozonate," which they suggested was probably identical with potassium tetroxide; and they regarded the corresponding "ozonic acid" as a hydrate of ozone: $O_3 + H_2O = H_2O_4$. The author looks on "ozonic acid" as identical with "hydrotetroxide," but thinks Baeyer and Villiger's solid substance was not potassium tetroxide—the normal potassium ozonate—but a compound of ozone with the hydroxide ($O_3 + KOH = KHO_4$), the corresponding acid salt.

—J. T. D.

Catalysis; A Model for ——. *The Reaction between Potassium Persulphate, Hydriodic Acid, and Phosphorous Acid.* W. Federlin. Zeits. physik. Chem., **41**, 565—600. Chem. Centr., 1902, **2**, [15], 925.

Phosphorous acid is only very slowly oxidised by potassium persulphate. The reaction between persulphuric acid

and hydriodic acid and between iodine and phosphorous acid is more rapid, and if hydriodic acid be added to a mixture of persulphate and phosphorous acid, the oxidation of the latter is catalytically accelerated. In this case the intermediate reactions by which the catalytic action is effected can be examined individually, and it is possible to ascertain whether the velocity of the reaction between persulphate and phosphorous acid in presence of hydriodic acid as a catalytic agent, is the sum of the velocities of the individual reactions which take place. The author states that his results show that this is the case, the total velocity of the reaction corresponding with that calculated from the velocities of the individual reactions. Iron and copper, which accelerate the action between persulphate and hydriodic acid, have their catalytic action weakened by phosphorous acid.—A. S.

Sublimation in the Sun's Rays; Orientating Influence of Light in ——. P. N. Raikow. Chem.-Zeit., 1902, **26**, [86], 1030—1032.

When sublimable substances are caused to sublime by exposure to the sun in a desiccator, it is found that the rays of the sun have an orientating influence on the formation of the deposit. The sublimate is deposited on those parts of the walls of the vessel which receive the strongest illumination, although these parts do not represent the coolest surface of the vessel. In absence of sunlight, sublimation follows the ordinary laws of distillation and condensation, and the deposit is formed on the coolest surface accessible. The above observation can only be explained by the assumption of an attractive force exerted by the sun on the vaporised molecule, and the existence of a kind of heliotropism in the crystal world.

Observations are recorded on benzoic acid, iodine, naphthalene, and camphor. Crystals begin to appear on the upper southern side after 20 minutes' exposure, the contour of the sublimate is most clearly defined, and the deposit can be made to move completely from side to side as the position of the vessel is changed. With iodine, a somewhat abnormal behaviour was observed; when the deposit had collected at the top of the southern side in the ordinary way, it was found, as the summer advanced, and the sun's rays became more intense, that the sublimate migrated downwards rather more than half way to the bottom.—J. F. B.

p-Nitrosocarbazole; Preparation of ——. H. Schott, Stuttgart. Ger. Pat. 134,983, June 7, 1901. Zeits. angew. Chem., **15**, [43], 1120.

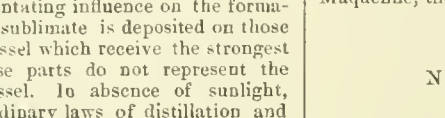
The usual method of effecting the molecular change of nitroso-compounds of secondary aromatic bases into the *p*-compounds by alcoholic hydrochloric acid involves the formation of ethyl chloride in considerable quantities, which is either lost or requires expensive plant for its retention. In this present patent this is avoided. For example, nitrosocarbazole is treated in glacial acetic acid solution, with ordinary aqueous hydrochloric acid (about 1·18 sp. gr.). The conversion into *p*-nitrosocarbazole is complete at the ordinary temperature.—J. T. D.

Meta- and Para-Saccharin. H. Kiliani and H. Naegell. Ber., 1902, **35**, [16], 3528—3533.

Meta- and para-saccharin are formed by the action of lime upon galactose; their constitution, however, is not yet definitely settled. The method of isolating the two saccharins has been considerably improved by the authors. The basic calcium salts, which separate during the four weeks' action, yield notable quantities of saccharin. The subsequent heating of the solution whilst still alkaline may be omitted with advantage, and the acid solution, freed from lime, may, preferably, be completely neutralised with barium carbonate. The double barium salt obtained is decomposed by sulphuric acid, and the meta-saccharin is completely separated by twice concentrating the solution to a syrup and crystallising with a suitable admixture of alcohol, para-saccharin remaining in solution. Calcium meta-saccharinate was subjected to oxidation by Ruff's process of degradation by means of hydrogen peroxide in presence of ferric acetate. In this way a crystalline, very hygroscopic pentose sugar was obtained, having the formula $C_5H_{10}O_4$, melting at 95° C. This shows that the CH_2 group in meta-saccharinic acid cannot occupy the α position in relation to the carboxyl group; it must occupy either the β or δ position, since meta-saccharin is a γ-lactone. On account of the great difficulty experienced in attempting to prepare an osazone of the above pentose, and on account of the ease with which the derived trihydroxyvaleric acid undergoes lactonisation, the authors are inclined to attribute to meta-saccharinic acid the constitution $CH_2OH.CHOH.CHOH.CH_2.CHOH.COOH$. The question between the β and the δ positions for the CH_2 group cannot, however, be finally settled until the corresponding dibasic trihydroxyadipic acid has been investigated.—J. F. B.

Galactose; New Base derived from ——. E. Roux. Comptes Rend., **135**, [17], 691—693.

By the reduction of the oxime of galactose a base, *galactamine*, is obtained, analogous to that formerly obtained from glucose (this Journal, 1901, 605). In the notation of Maquenne, the new base is amino-1-hexane-pentol $\overset{2\cdot5}{3\cdot4}6$,



It forms a colourless crystalline mass, very soluble in water, slightly soluble in boiling alcohol, melting at 139° C., and having a rotatory power in 10 per cent. solution of −2°·77. Its action on metallic salts is similar to that of glucamine, but it does not form a crystallised compound with copper sulphate. It is a strong base, and displaces ammonia from its compounds.—J. T. D.

Yeast Albumin; Preparation of ——. R. Schroeder. Zeits. Spiritusind., 1902, **25**, [43], 461.

Fresh yeast was washed with ice-cold water, dried as much as possible in a filter bag, then well mixed up with ether, and after 24 hours, diluted with a considerable volume of water, and some alcoholic solution of thymol added. After some hours, the liquid was filtered off, boiled with acetic acid, and the precipitate formed washed with water, alcohol and ether. The product yielded the following numbers on analysis:—C, 53·38; H, 6·91; N, 15·9; S, 0·72; and P, 0·06 per cent. It gave the albumin reaction. On treatment with concentrated hydrochloric or sulphuric acid, the substance yielded, besides amino acids (leucine, tyrosine, phenylalanine), a considerable proportion of bases corresponding to about one-fourth of the total nitrogen of the decomposed albumin. Lysine was principally formed, besides arginine and histidine. The author supposes that a portion of the sulphur of yeast albumin is present in cystin-like compounds.—H. T. P.

United States Patent.

Absorbent Preparations; Process of Making Mineral ——. A. G. Saunders, Adelaide, South Australia. U.S. Pat. 710,521, Oct. 7, 1902.

See Eng. Pat. 14,590 of 1902; this Journal, 1902, 1159.

—J. W. H.

New Books.

Mines and Quarries (United Kingdom): General Report and Statistics for 1901. Part III.—Output. [Cd. 1307.] Price 1*s.* 5*d.*

This return, which is prepared annually by the Home Office, contains statistics as to the quantity and value of various minerals raised in the United Kingdom. The value, at the mines and quarries, of the mineral output of the United Kingdom in 1901 was 115,332,000*l.*, as compared with 135,958,000*l.* in 1900. The two minerals—coal and iron ore—which form the largest items in these totals both

showed decreases in quantity and value in 1901, as compared with the previous year, the figures being :—

		1900.	1901.
Coal	quantity, tons	225,181,000	219,047,000
	value, £	121,655,000	102,187,000
Iron ore	quantity, tons	14,028,000	12,275,000
	value, £	4,224,000	5,222,000

New Customs Tariff of China. Supplement to the *Bd. of Trade J.*, Oct. 30, 1902. Eyre and Spottiswoode. Price 1*d*.

A schedule of Import Duties as agreed upon between H.M. Special Commissioner for Commercial Negotiations in China and the Chinese Commissioner, and approved by the Representatives of the various Foreign Powers.

New Customs Tariff of the Australian Commonwealth. Supplement to the *Bd. of Trade J.*, Nov. 13, 1902. Eyre and Spottiswoode. Price 1*d*.

The text, *in extenso*, of the Federal Tariff of Australia, finally assented to on Sept. 16, 1902, and which came into operation on Oct. 8, 1902.

Trade Report.

I.—GENERAL.

Imports of Cuba.

Foreign Office Annual Series, No. 2909.

There has been an increase of over 100,000*l*. in the imports of drugs and chemicals (with which are grouped oils and paints), in 1901, which occurs principally under the head of "chemicals and patent medicines" and "vegetable and mineral oils."

The principal branches of this trade are as follows :—

Chemicals and drugs, including patent medicines, 204,000*l*., of which 44 per cent. came from the United States, 25 per cent. from France, and 10 per cent. from the United Kingdom; mineral waters, 16,200*l*., of which 50 per cent. were Spanish, 29 per cent. French, and 13 per cent. British; animal and vegetable oils, 203,000*l*., consisting chiefly of olive oil from Spain, but including also 7,000*l*. worth of cotton-seed oil, from the United States, and 12,400*l*. of linseed oil, almost entirely from the United Kingdom; mineral oils, 113,600*l*., all of which came from the United States; and paints and varnishes, worth 52,600*l*., 50 per cent. of which came from the United States, and 35 per cent., from the United Kingdom.

Glassware, worth 115,000*l*., was imported chiefly from the United States, Germany, Spain, and France, only 9,000*l*. worth coming from the United Kingdom; crockery and earthenware, worth 82,000*l*., from the United States, the United Kingdom, Germany, and Spain, in nearly equal proportions.

Cement, worth 44,000*l*. came almost entirely from the United States; bricks, worth 15,000*l*., from the United States.

The total imports show an increase of 30,000*l*., in 1901, almost all of which occurs in cement.

Soaps, worth 115,000*l*. were imported, 87 per cent. of which came from Spain, and the remainder, from the United States, Germany, and France; candles, worth 64,800*l*.; almost entirely from Spain.

Perfumery, worth 40,000*l*., came almost entirely from France.

Rubber articles were worth 29,600*l*., 58 per cent. of which came from the United States, and the remainder, mostly from the United Kingdom and Spain.

Trade of Orange River Colony.

Bd. of Trade J., Oct. 30, 1902.

The following table gives the value of articles imported during the 12 months ended June 30, 1901 and 1902 respectively :—

Articles.	Year ended June 30, 1901.	Year ended June 30, 1902.
	£	£
Drugs and chemicals	13,000	23,000
Soaps and candles	8,000	10,000
Oils of all kinds	4,000	5,000

Industrial Dividends in Germany.

U.S. Cons. Reps., Nov. 1, 1902.

Apart from the metal and mining industries, other leading branches of manufacture in Germany seem to have overcome the adverse circumstances of 1901 fairly well. The average dividends paid during the past two years were as follows :—

Description.	Dividends.	
	1900.	1901.
	Per Cent.	Per Cent.
Earthenware, glass, and porcelain	13·64	12·41
Chemical manufactures	11·24	10·41
Breweries and distilleries	10·09	9·39
Paper mills	10·96	8·13
Textile manufactures	4·58	3·18
Electrical machinery and supplies	9·55	5·79

II.—FUEL, GAS, AND LIGHT.

Carbides and Artificial Graphite Manufacture by Electrical Fusion.

K. Elbs. Chem.-Zeit., 1902, **26**, [87], 1035.

Calcium Carbide. — Although the carbide industry remains in an unsatisfactory condition, it cannot be said that there has been, in 1901, any over-production of carbide of good quality, large quantities of inferior grades still coming into the market. A carbide which yields less than 285 litres of acetylene per kilo. may be regarded as unsatisfactory; but of the various qualities manufactured on the Continent, 36 per cent. gave less than 285 litres; 52 per cent., from 285 to 290 litres; 8 per cent., from 290 to 300 litres; and 4 per cent., over 300 litres per kilo. Reliable estimates place the annual consumption in Germany at 10,000 tons, and 16,000 tons in the United States, little being used otherwise than for lighting purposes.

As *barium carbide*, on treatment with water, yields acetylene, and at the same time barium hydrate, which can be crystallised out and is of commercial value, Limb (Ger. Pat. 117,920 of 1901) has devised a process for its manufacture, consisting in the production of barium sulphide by igniting barium sulphate with excess of coke, and subsequent conversion of the sulphide into carbide by fusing the mixture with iron in the electric furnace.

Owing to increasing demand, the manufacture of *carborundum* (silicon carbide) is extending considerably, especially at Niagara Falls. Of the furnace product, the outer, microcrystalline portion, which has hitherto been of little value, has found an application in the manufacture of an excellent fireproof stone. The production of *artificial graphite* at Acheson's works at Niagara Falls has increased from 200 tons, in 1900, to 400 tons, in 1901. It is very pure and soft, and can be used as a substitute for natural graphite in almost all cases; anodes made of artificial graphite are of excellent durability.—H. B.

Peat-Gas for Steel-making in Sweden.

Bd. of Trade J., Nov. 6, 1902.

According to a recent issue of the *Teknisk Ugeblad*, peat-gas has been employed as fuel at the Motala Steel Works, Sweden, for the past 30 years, originally for the puddling furnaces, and to a still greater extent, subsequently, for the open-hearth furnaces. The peat is brought across Lake Wetter in sailing vessels, and unloaded direct into large storehouses, whence it is taken by rail to the gas-producers. The yearly consumption is 13,000 to 16,000 cubic yards of dry kneaded peat, costing about 3*s.* 1½*d.* per cubic yard, delivered at Motala. Two large gas-producers are used, from which the gas is led to the open-hearth furnaces through a condenser designed for ridding it of some of its moisture. Although the peat-gas, owing to the distance the peat has to be brought, is dearer than coal-gas, it is used preferably in most Swedish steel works, because of the almost negligible amount of sulphur and phosphorus it contains. In the rolling mills, there is a a smaller peat-gas-producer for one of the plate furnaces, and it is especially noted that thin steel plates scale less in rolling when the furnace is fired with peat-gas.

Alcohol Motors in Germany.

U.S. Cons. Reps., Nov. 3, 1902.

Germany has made great strides of late in alcohol motors, due to the low price at which this spirit for fuel purposes (containing about 90 per cent. of pure alcohol) is furnished all over Germany—a quart costing only about 5 cents.

With regard to cost, there were exhibited, at Halle, 6 to 8 h.p. portable alcohol motors for 973·30 dols.; 10 to 12 h.p. motors for 1,265·29 dols., and 16 to 20 h.p. motors for 1,581·61 dols. In the tests made, one trial showed a consumption of 0·42 kilo. of 86 per cent. spirit, and 0·37 kilo. of a mixture of one-fifth benzol and four-fifths 86 per cent. spirit, in both cases per brake h.p. per hour.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Industry in Austria

Chem. Trade J., Nov. 8, 1902.

The Vienna correspondent of the *Financial News* says: The negotiations for the renewal of the Austrian Petroleum Trust have broken up without any result. The last Austro-Hungarian kartel was dissolved in 1901. It may be here mentioned that some 4,000,000 dz. (1 dz. = about 2 cwts.) of raw oil is required for home consumption, whilst the producers have an annual output of 6,000 dz. There are 90 refineries, the principal of which, situated in the north, came together in the early part of the present year in order to form an export syndicate on the expectation that they would be able to refine 1,500,000 dz. to 2,000,000 dz. of raw oil for export. The latter has, however, been greatly exceeded, chiefly with regard to Germany, France, and Switzerland. If the producers succeed in refining such a quantity of petroleum, the situation of the Austro-Hungarian oil industry would undoubtedly improve, even without any kartel.

The dissolution of the trust last year was followed by an immediate fall in the price of refined oil from 40 k. to 27 k., whilst quite recently, when the outlook was in favour of a renewal, it went up again to 36 k., but it is now again freely offered at 30 k.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo in China.

Foreign Office Annual Series, No. 2912.

China is an increasing importer of "liquid indigo" [artificial indigo in paste]. Of the total import, Shanghai, in 1899, absorbed 90 per cent., whereas, in the same year, Swatow exported abroad (not to Hong Kong) over one-third of the quantity imported into the rest of China. Natural indigo in China will, as in India, have, in the near future, to enter upon a severe competition with synthetic indigo, and the result, as in the case of the struggle between aniline and alizarin dyestuffs, cannot remain in doubt.

Indigo Industry of India.

Imp. Inst. J., Oct. 1902.

It is pointed out, in the report of the Royal Botanic Gardens, Calcutta, for the year 1901–2, that the indigo plant, which is now grown so largely in the Gangetic plain of India, is not the true Indian indigo, *I. tinctoria*, as is generally supposed, but has been derived from a Malay variety, *I. sumatrana*. A proposal to introduce a variety of East African indigo, *I. arrecta*, into India on an extensive scale has been objected to on the ground that it cannot possibly succeed so well as the present plant, which has hitherto been regarded as the true native variety. Having regard to the real state of affairs, there appears to be no reason why the East African plant should not now supersede the present Malayan indigo, just as the latter displaced the earlier varieties. In the Royal Botanic Gardens, Calcutta, the East African plant has proved capable of successfully withstanding adverse conditions which have been fatal to other varieties. Thus, in September, 1900, very severe floods were experienced, which practically destroyed all the Indian and American varieties without harming the East African, and, during 1901, the latter was again entirely unaffected by the attacks of an insect pest which killed nearly all the plants of the other varieties.

The decline of the Indian indigo industry, in consequence of the severe competition of artificial indigo, is illustrated by the following table, in which the exports for the last six years are given:—

Year.	From Calcutta.	From Madras.	From other Ports.	Total.	Value.
	Cwt.	Cwt.	Cwt.	Cwt.	Rs.
1896–7	109,001	43,680	16,842	169,523	4,37,07,570
1897–8	71,364	48,165	14,320	133,849	3,05,74,019
1898–9	81,779	42,760	10,648	135,187	2,97,04,781
1899–1900	59,078	39,853	12,489	111,420	2,69,25,107
1900–1	74,637	18,940	11,914	102,491	2,13,59,808
1901–2	55,038	25,400	9,312	89,750	1,85,22,554

In Lower Bengal the cultivation of indigo has already diminished almost to the vanishing point, but in Bihar the planters are attempting to meet the new condition of affairs by the introduction of scientific methods, and are also insuring themselves against ultimate failure with indigo by the cultivation of other more remunerative crops.—A. S

VII.—ACIDS, ALKALIS, SALTS, Etc.

White Arsenic Production in Ontario (Canada).

Eng. and Mining J., Oct. 25, 1902.

The production of white arsenic at the Deloro Mines, in Ontario, is increasing steadily. In 1899, the output was 50 tons; in 1900, it was 270 tons; and, in 1901, it rose to 620 tons. The method of arsenic recovery employed is described by J. W. Wells in the Report of the Ontario Bureau of Mines, 1902, XI., 101 *et seq.*

After removing the gold values, the concentrates are roasted in two Oxland furnaces, arranged in series. Nearly all the arsenic is volatilised in the first furnace, the burnt ore therefrom assaying about 43·23 per cent. of silica, 44·66 of ferric oxide, 5·06 of sulphur, 0·36 of arsenic, and 6·69 per cent. undetermined.

The fumes from both furnaces pass into a dust chamber, which is arranged so as to discharge automatically the settlings back into the first furnace, and thence into brick

condensing chambers, 12 ft. wide, and so designed that the crude arsenic can be drawn by gravity into cars beneath the chambers. The crude arsenic is refined in a reverberatory furnace, fired with bard wood, of which the hearth is 16 by 24 ft., and the arch is 20 ins. above the hearth. The fumes are drawn through a dust chamber, 100 ft. long, and then through 12 zigzag chambers, in which the white arsenic is deposited. The crystals are ground with buhr-stones, and barrelled. The refined white arsenic is upward of 99·6 per cent. pure, and commands a high price.

In the United States, the only producer of arsenic is the Puget Sound Reduction Company, which made an output of 300 tons, in 1901.

Chemicals in South Africa.

Eng. and Mining J., Oct. 25, 1902.

Before the war broke out, sulphuric acid was made by the dynamite factory at Modderfontein and by the New Transvaal Chemical Works. Both imported sulphur from Sicily, as no deposits of pyrites could be discovered locally, and there were not enough concentrates from the outlying quartz-mining districts. Nitric acid was also made on the spot from imported Chile nitre. In addition to the uses of sulphuric acid in dynamite manufacture, there is a local market for the acid for the removal of zinc from the slimes in the cyanide plants. It was also used for the liberation of chlorine from bleach by the Robinson Mine, which bought up concentrates and chlorinated them. The New Transvaal Chemical Works, at one time, used sulphuric acid for making superphosphates, but no phosphate deposits have been found locally, so the enterprise was not continued. Up to the present time, sulphate of ammonia has not been made at gasworks. In a few years' time, when the oil-shale deposits of the South-East Transvaal are opened up, there should be a large use for sulphuric acid for the manufacture of sulphate of ammonia. The dynamite factory has certain by-products; one of them is acid sulphate of soda, which has already replaced sulphuric acid for the removal of zinc from slimes at the Rose Deep Company's works.

X.—METALLURGY.

Cyanide Treatment of Slimes on the Rand.

Eng. and Mining J., Oct. 25, 1902.

In the extraction of gold from ore slimes on the Rand, the common practice has become the decantation method, whilst, in Western Australia, the filter-press treatment has generally been adopted. The filter-press process was once tried on a small scale in South Africa, but failed to give satisfactory results. Similarly, the decantation method had a trial in Western Australia, but was abandoned because of the heavy losses of gold in the treatment of the rich slimes of that country. The same objection obtains in South Africa, although it is of less consequence there, because of the lower grade of the slimes treated. The cost of plant for the decantation method (150*l.* to 200*l.* per head of stamps) is too high, and although the method is simple and cheap in operation, the percentage of gold extracted is unsatisfactory. It is stated (*J. Chemical and Metallurgical Society of South Africa*, III., iv., 41, August, 1902) that an average extraction of about 60 per cent. is the best that has been accomplished. A test of the two methods is about to be made on a working scale, side by side. The use of large presses, such as are employed in Western Australia, may, in certain cases, be convenient and profitable on the Rand.

Metallurgical Patents in Germany.

Eng. and Mining J., Oct. 25, 1902.

According to a recent report in Class 40 (metallurgy of metals other than iron) of the German Patent Office, there were 673 applications and 344 allowances during the 10 years 1881—1890; and 919, and 408, respectively, during the 10 years 1891—1900. The proportion of allowances to applications was 51 per cent., in the first period, and 44 per cent., in the second. Electro-metallurgy, the extraction of gold from its ores, and the treatment of mixed sulphide ores, accounted for the large increase in the second decade.

Copper and Sulphuric Acid in India.

Bd. of Trade J., Oct. 30, 1902.

In a review by Dr. Watt of existing information regarding alkalis (earths, ashes, alkaloids, &c.), published in the *Agricultural Ledger* Series issued by the Government of India, it is stated that the utilisation of the extensive deposits of copper pyrites that exist in India for the combined production of copper and sulphuric acid, and the still further manufacture of the phosphatic deposits of India and adjacent countries into superphosphates, would open up a highly lucrative field of enterprise. As an exemplification of such results, it may be added that the production of sulphuric acid from iron pyrites was, in Germany, 358,149 tons in 1882, and 754,151 tons in 1898, and of that large quantity only 25,000 tons were exported, the balance being used up in the German chemical industries.

Discovery of Mercury in India.

Eng. and Mining J., Oct. 18, 1902.

Important discoveries of mercury ore are said to have been made in the vicinity of Devil's Hill, between Tellicherri and Cannanore, in the Presidency of Madras.

Zinc-Dust as Precipitant for Gold in the United States.

Eng. and Mining J., Oct. 25, 1902.

Zinc-dust is now in use, instead of filiform zinc, at numerous cyanide mills in the United States, for the precipitation of gold from the solutions. Is has the advantages of being already prepared, and affording a greater surface area than shavings, which leads to a greater precipitation of gold per pound of zinc consumed, whilst there are some further advantages in the cleaning up. The Waldstein patent (United States, 607,719, March 9, 1896), covering the use of zinc-dust for precipitating cyanide solutions, came up in a case before the United States District Court for Idaho last year, and failed to be sustained. Zinc-dust is an intermediate product in the ordinary process of zinc-smelting, which collects chiefly in the prolongs connected with the condensers. American smelters rarely use prolongs, and the zinc-dust, or blue powder, which they collect is of low grade, and is resmelted for spelter. The commercial zinc-dust is imported chiefly from Europe. By a recent decision of the Board of Appraisers, it is admitted free of duty as an unmanufactured product. It undergoes only a sifting as a preliminary preparation before package for shipment. Its value depends upon its percentage of metallic zinc, which ought to be about 90. The remainder of its composition is chiefly zinc oxide.

Ferro-Manganese Manufacture in Russia.

Bd. of Trade J., Nov. 13, 1902.

According to the *Moniteur des Intérêts Matériels* of 2nd ult., up to 1900, no ferro-manganese was made in Russia, although that which was made in other countries was largely obtained from ores from the Caucasus, which sold at Batoum for 14 copecks per poud, whilst the ferro-manganese imported cost 2·60 to 3 roubles per poud. Since that date, the Donetz-Jouriefka Works have succeeded in producing ferro-manganese from native ores in one of their ordinary large blast furnaces. At the present time this furnace produces 1,000,000 pouds of ferro-mangaoese, selling at 2·30 roubles per poud and less, but its exportation is not practicable, and other countries continue to take from Caucasus some 16,000,000 pouds of manganese ore annually.

It would be more advantageous for Russia to replace the exportation of raw material by that of the finished product, and with this view, it is advocated that the import duty on foreign coal or coke, used for the manufacture of

ferro-manganese for export, should be refunded, and that a bounty of 15 copecks per poud should be paid on ferro-manganese exported.

Of late years, the manufacture of ferro-manganese has rapidly developed in the South of Russia. In addition to the Donetz-Jouriefka Company, the Hughes, Russo-Belge, and Dnieprovienne companies produce spiegeleisen, the price of which has fallen considerably. Ferro-manganese with 78 to 80 per cent. of manganese now fetches 1·75 roubles per poud, and ore with 50 per cent. of manganese is now worth 20 copecks per poud at Batoum.

XI.—ELECTRO-CHEMISTRY, Etc.

Accumulator Industry in Germany.

Chem. Trade J., Nov. 8, 1902.

In the last issue of the *Centralblatt f. Accumulatoren und Elementenkunde*, the editor reviews the present position of this manufacture in Germany.

The depression in Germany has affected the secondary cell industry, and several firms have suspended operations. The failure of portable secondary cells for tramway and other purposes prompts the opinion that the manufacture of portable accumulators is decaying. There is now little difference between the types of cell produced by the various works.

Success in the accumulator industry is now a question of cheap purchase of raw materials, and the chief of these are lead, sulphuric acid, and glass. The greatest scope for economy is found in the purchase of lead. The price of lead is subject to considerable fluctuations. At the present moment, prices lie between 21 and 25 marks per 100 kilos., for 99·9 per cent. metal, whereas 18 months ago this quality of lead was selling at 37 marks per 100 kilos.

The recent attempts to form a "Cartel" for the German accumulator industry have failed, but may be renewed at a later date. At present open competition is taking place, and further failures of weak firms are likely to occur. When this process of weeding out has gone far enough, a union of the stronger manufacturers is certain to take place.

XII.—FATS, OILS, Etc.

Oil-Seed and Cake from Riga and Libau (Russia).

Foreign Office Annual Series, No. 2911.

Riga.—The business done in crushing linseed, in 1901, was small, owing to the poorness of the crop. Only about one-fifth of the entire supplies which reached Riga was exported, the remainder being absorbed by the local oil mills. Prices ruled high throughout the season, and the quantity shipped was only 5,520 tons, as against 34,000 tons, in 1900. The shipments of sowing linseed were a trifle less than in 1900.

The exportation of oil-cake increased by 15,469 tons. The only explanation seems to be that the consumption in the interior has been considerably reduced in consequence of the difficulties the farmers have experienced in keeping up their stock. It is also possible that the starting of fresh oil-mills in the interior may have had something to do with it.

Hemp-seed is fast disappearing from the list, 180 tons only having been shipped, in 1901, as against 280 tons, in 1900.

Libau.—The export of linseed has fallen off very considerably, during 1901, whether owing to a failure of the crop or an extended demand for home consumption by local crushers, it is difficult to say, but the quantity shipped, in 1901, was only 7,700 tons, as against 26,400 tons, in 1900. Hemp-seed was shipped only to the extent of 691 tons, as compared with 4,808 tons, in 1900. Prices of both linseed and hemp-seed ruled very high.

For the first time for many years there is a diminution in the quantity of the export of oil-cake to the extent of about 5,000 tons. This may be attributable to the open weather of last autumn and winter.

XIII. A.—PIGMENTS, PAINTS, Etc.

Production of Zinc Oxide in the United States.

Eng. and Mining J., Nov. 1, 1902.

The output of zinc oxide has been doubled during the last 10 years, and will probably double again in the next 10. (In 1891 the production was 23,700 tons; in 1900, 47,151.) The bulk of the zinc oxide, which is made and sold in the United States, is still manufactured from the New Jersey franklinite by means of the Wetherill process; but the carbonate ores of Arkansas and Missouri lend themselves to that process with almost equal success, except that the colour of the product is not so reliable. The sale of oxide made by the combustion of the metal will probably never attain large proportions in the United States because of its much higher cost, although in whiteness and body it is superior to that made directly from ore.

XIII. C.—INDIA-RUBBER, Etc.

Rubber in the Soudan.

Der Tropenpflänzer; through Imp. Inst. J., Nov., 1902.

Cakes and balls of rubber are from time to time offered in the Soudanese markets, but their origin is unknown. From their sticky character, however, they appear to be produced from a species of *Londolphia*.

On the occasion of Colonel Spark's expedition to the Bahr-el-Ghazal, in 1899, several samples of rubber and gutta-percha were collected from unidentified trees in that neighbourhood, and were subsequently examined. The rubbers contained a large proportion of pure caoutchouc and a small amount of resin, and were valued by brokers at 1*s.* 10*d.* to 2*s.* 3*d.* per lb. The gutta-perchas collected at the same time were, however, not of a valuable character. The promising nature of these rubbers has led the Administrator of the Soudan to appoint an expert, who is at the present time investigating the rubber-yielding trees of the country.

XV.—MANURES, Etc.

Guano Deposits of the Seychelles.

Bd. of Trade J., Oct. 30, 1902.

In the report on the Seychelles, for 1901, recently issued by the Colonial Office, the Curator of the Botanic Station states that guano constitutes a mineral wealth of the Colony. The deposits are almost invariably ancient. On many islands the guano is found in dusty layers on the surface of the soil. This surface guano is dark in colour, especially when it is moist. The lighter-coloured guanos are richer in phosphoric acid, and the dark ones are full of nitrogenous organic matters.

Under the action of rain and carbonic acid, the phosphates of lime are dissolved and sink through into the soil, displacing the carbonates of lime where the island is madreporic, thus forming a second layer of mineral guano, which is generally lighter in colour, and the richness of which in phosphoric acid reaches, and even exceeds, that of the surface guano. Where the island is granitic, and where clay is mixed with the guano deposits, the phosphates of lime in a soluble state take the place of the silicate of alumina, and a phosphate of alumina is formed. Sometimes the transformation of phosphate of lime into phosphate of alumina is complete, and no molecule of phosphate of lime remains undecomposed.

Even granitic rocks are attacked by the solution of phosphate of lime; and when the surface of these rocks is analysed to an inch or more in depth, it is found that the phosphate of lime has penetrated and transformed the rock, which sometimes contains as much as 25 per cent. of phosphate of alumina.

All these different phosphates originating from the guano deposits are found in immense quantities.

Some of the above-mentioned guanos are exported to Mauritius, South Africa, and Europe, and the phosphoric acid they contain is soluble in citrate of ammonia. When

they contain less than 20 per cent. of phosphoric acid, they are seldom exported.

Manures in Australia.

Bd. of Trade J., Nov. 6, 1902.

The use of manures is coming more into favour, the area so treated having expanded from 255,968 acres, in 1899, to 556,777 acres, in 1901, or more than double, but the quantity of fertilisers used has not kept pace with the expansion, having been, in 1899, 142,151 tons of natural, and 16,118 tons of artificial, as against, in 1901, 153,611 tons of natural, and 23,535 tons of artificial. The area manured, in 1900, totalled 368,660 acres, the quantity of fertilisers used being 142,520 tons of natural, and 19,545 tons of artificial.

XVI.—SUGAR, STARCH, Etc.

Sugar Yield of France.

U.S. Cons. Reps., Oct. 20, 1902.

The *Journal Officiel* publishes the results of the sugar harvest ended Sept. 1, 1902. The number of factories in activity was 332, and they used 9,350,851,795 kilos. of beets, as against 8,717,439,216 kilos. for 334 factories, in 1900–1. The average for each factory is thus shown to be 28,165,216 kilos., as against 26,100,117 kilos., for 1900–1. The total output of refined sugar has been 1,111,069,922 kilos., which is greater by 18,079,054 kilos. than that of the immediately preceding harvest. The yield of refined sugar is 11·88 per cent. of beet, as against 12·53 per cent., in 1900–1.

Dutch Sugars; Countervailing Duties on ——, in the United States.

Bd. of Trade J., Nov. 6, 1902.

In a Circular, recently issued by the United States Treasury Department, the rates of countervailing duties leviable in the States on bounty-fed sugars produced in the Netherlands are altered. The following is the text of the Circular:—

"In pursuance of the provisions of section 5 of the Act of July 24, 1897, the following net amounts of the bounties paid or bestowed by the Government of the Netherlands on the export of sugars produced in that country are hereby declared for the assessment and liquidation of additional duties:—

"1. On raw sugar produced from beetroots, 1·16 florins per 100 kilos. of hard refined. (The output of refined sugar from raw is computed by deducting from the polarisation of the raw sugar twice the glucose, four times the ashes, and 1½ per cent. for loss in refining.)

"2. On sugar refined from beetroot raw sugar produced in the Netherlands, 1·31 florins per 100 kilos.

"3. On sugar refined from imported raw sugar, 0·15 florin per 100 kilos., in addition to bounty, if any, allowed on the raw sugar by the country of production.

"The liquidation of entries covering sugars produced in the Netherlands, after Sept. 1, 1902, may be suspended at the request of the importers until the next ascertainment and declaration under the provisions of the said section 5, and the additional duties on such suspended entries be estimated on the basis of the bounties herein specified."

Import Duty on Dextrine in United Kingdom.

Bd. of Trade J., Nov. 6, 1902.

The following General Order, dated the 30th ult., has been issued by the Board of Customs, fixing the rate of import duty leviable on dextrine imported into the United Kingdom:—

"The Board direct, with reference to section 7 of the Finance Act, 1901, that on and after the 3rd proximo, imported dextrine be charged with duty at the rate of 6½*d.* the cwt. on the net weight of the article."

XVII.—BREWING, WINES, SPIRITS, Etc.

Distilleries in Denmark.

Danish Export Review; through Bd. of Trade J., Oct. 30, 1902.

During the year 1901, 7,340,000 galls. of spirit (14·3 under proof) were produced in 45 distilleries, of which 41 were worked by steam. The number of distilleries is continuously decreasing: in 1870, it was 317; in 1880, 219; in 1890, 113; and now it is only 45. The production is accordingly amalgamated into fewer but larger factories, especially large limited companies. The quantity produced was somewhat larger, in 1901, than in the preceding year, but, in general, the production has, during the last ten years, continuously been about 7,000,000 galls. The quantity of spirits consumed by the population and for industrial purposes was 7,540,000 galls., in 1901, as compared with 7,200,000 galls. and 7,620,000 galls. respectively, in 1900 and 1899. The export to foreign countries, in 1901, was 26,700 galls.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 23,985. Robinson. Tubular refrigerators, condensers, vaporisers, calorifiers, &c., and tubes for forming the same. Nov. 3.

„ 24,256. Hölbling and Ditz. Catalysis. Nov. 5.

„ 24,601. Rayner and Moger. Apparatus for mixing, grinding, and moulding plastic, semi-plastic, &c., materials. Nov. 10.

„ 24,651. Ohlsson. Centrifugal machines and other rotary apparatus.* Nov. 10.

„ 24,689. Fidler. Apparatus for testing materials. Nov. 11.

„ 24,780. Lake (United States Distillation Co.). Process of and apparatus for distilling liquids, &c. Nov. 11.

„ 24,848. Knoeferl. Apparatus for mixing and agitating liquids. Nov. 12.

„ 25,034. Bennett. Stills and evaporators. Nov. 14.

[C.S.] 22,308 (1901). Lindberg. Centrifugal separators. Nov. 12.

„ 22,897 (1901). Brownlow. Filters. Nov. 12.

„ 23,683 (1901). Yates. Method for withdrawing liquids from barrels, &c. Nov. 19.

„ 25,376 (1901). Woolley. Hydro-extractors and like centrifugal machines. Nov. 12.

„ 25,921 (1901). Pott and Williamson. Centrifugal machines. Nov. 12.

„ 25,976 (1901). Vosmaer. Apparatus for treating liquids with gases or gases with liquids. Nov. 12.

„ 2592 (1902). Mills (Prat). Apparatus for heating liquid or gaseous bodies under pressure. Nov. 19.

„ 20,507 (1902). Lenhardtson. Refrigerating apparatus. Nov. 12.

„ 24,356 (1902). Calmant. Process and apparatus for distilling. Nov. 19.

II.—FUEL, GAS, AND LIGHT.

[A.] 23,394. Izzett and McGeachie. Regenerative gas-furnaces for melting steel, &c. Nov. 3.

„ 23,985. Robinson. *See under* I.

„ 23,586. Hirsch. Toughening compound for the manufacture of incandescent gas-mantles. Nov. 3.

„ 23,998. Wilson. Regenerating or heat-recovering apparatus for gas-producers and other furnaces. Nov. 3.

„ 24,001. Danvin. Incandescent burners.* Nov. 3.

„ 24,012. Wilson. Apparatus for feeding pulverulent and small fuel to furnaces. Nov. 3.

„ 24,013. Fanta and Butler. Attachment of carbon filaments in incandescent electric lamps. Nov. 3.

„ 24,063. Simons and Hangl. Machines for moulding briquettes.* Nov. 4.

„ 24,067. Thomas and Co., Ltd., Thomas, and Lewis. Furnaces for heating tin-plates, sheets, &c.* Nov. 4.

„ 24,068. de Puydt. Arc-lamps.* Nov. 4. Belgian Application, June 10, 1902.

„ 24,091. Lessing and Wolff. Apparatus for spraying glowing blast-furnace cinder. Nov. 4.

„ 24,122. Spies and Tutt. Arc-lamp. Nov. 4.

„ 24,124. Maddern. *See under* X.

„ 24,152. Thwaite. Purification of iron-making blast-furnace gas, or any combustible gas of an analogous character. Nov. 4.

„ 24,161. Brett. Incandescent gas-burners. Nov. 5.

„ 24,181. Bulgin. Automatic feeding device for refuse-destructors, bagasse-furnaces, &c. Nov. 5.

„ 24,194. Crossley and Rigby. Production of gas from bituminous coals, &c. Nov. 5.

„ 24,215. Goode and Mitchell. Compressed steam-fuel. Nov. 5.

„ 24,251. Arzt. Gas- or vapour-burners for heating. Nov. 5.

„ 24,328. Bowen. Electric incandescent lamps. Nov. 6.

„ 24,343. Hoddle. Apparatus for generating and storing acetylene gas. Nov. 6.

„ 24,344. Hoddle. Apparatus for generating and storing acetylene gas. Nov. 6.

„ 24,355. Claudel. Process of and apparatus for the gasification of combustible liquids. Nov. 6.

„ 24,366. Vosburgh. *See under* X.

„ 24,371. Clay. Method of manufacturing water-gas. Nov. 7.

„ 24,406. Willis. Blast-furnaces, &c. Nov. 7.

„ 24,462. Abel (Gebr. Siemens and Co.). Manufacture of cores for arc-lamp electrodes. Nov. 7.

„ 24,490. Smith and Hinchley. *See under* VII.

„ 24,533. Wandel. Acetylene lamps. Nov. 8.

„ 24,557. Lancaster. Method of and means for generating and supplying combustible vapours for heating and lighting purposes. Nov. 10.

„ 24,564. Dempster and Sons, Ltd., and Broadhead. Gas-purifier covers. Nov. 10.

„ 24,565. Dempster and Sons, Ltd., and Broadhead. Regenerator furnaces, &c. Nov. 10.

„ 24,609. Korff. Illuminating body. Nov. 10.

„ 24,624. Thomson. Gas-producers. Nov. 10.

„ 24,661. Simons. Fuel-briquettes and their manufacture.* Nov. 11.

„ 24,665. Fletcher and Drake. Furnaces for steam-generators. Nov. 11.

„ 24,675. Isdale and Rodger. Combustion of fuel in steam-boiler furnaces. Nov. 11.

„ 24,720. Warren. Apparatus or means for burning liquid fuel or hydrocarbons for use in boilers, &c. Nov. 11.

[A.] 24,738. Ross. Apparatus for use in connection with the manufacture of acetylene gas. Nov. 11.

„ 24,747. Frost and Berry. Vapour-burning lamps.* Nov. 11.

„ 24,753. Willis (Gillilaod). Apparatus for cooling and arresting fumes. Nov. 11.

„ 24,783. Gardner. Ignition-tubes for igniting gases. Nov. 11.

„ 24,785. Scott-Snell. Gas-burners. Nov. 11.

„ 24,811. O'Sullivan-Beare and Haslam. Apparatus for expressing moisture out of peat. Nov. 12.

„ 24,817. Kellermann. Protecting devices for gas-igniting pilules. Nov. 12.

„ 24,859. Carbone. Arc-lamps. Nov. 12.

„ 24,878. Beanes and Werner, Pfleiderer, and Perkins, Ltd. Gas-producers. Nov. 12.

„ 24,888. Boot. Safety low-flash oil-lamp. Nov. 13.

„ 24,914. Melles. Mixing and supplying gases.* Nov. 13.

„ 24,956. Bartlett. Acetylene gas automatic generator.* Nov. 13.

„ 24,972. Berney. Apparatus for generating acetylene gas. Nov. 14.

„ 24,980. Adams. Blow-lamps or burning-off torches. Nov. 14.

„ 25,000. Blakeborough. Hydraulic sealed centre valve for working gas-purifiers.* Nov. 14.

„ 25,011. Kamm. Acetylene-lamps. Nov. 14.

„ 25,057. Siemens. Regenerative gas-reheating furnaces. Nov. 14.

„ 25,070. Cooper. Acetylene generators and lamps. Nov. 15.

[U.S.] 15,536 (1901). Fanta. Apparatus for the re-inforeing and standardising of filaments of glow-lamps. Nov. 12.

„ 15,687 (1901). Fanta. System or process, and means used therein, for the production of vacuum. Nov. 12.

„ 19,595 (1901). Christen and Aschner. Spirit-lamps for use with incandescence-mantles, &c. Nov. 12.

„ 22,751 (1901). Ewart. Vapour-generators and burners. Nov. 12.

„ 22,848 (1901). Gibbons, Gibbons, Smith, and Gay. Dies for making taper and parallel gas-retorts, &c. Nov. 19.

„ 23,225 (1901). Mensing. Enclosed or open electric-lamps. Nov. 19.

„ 23,820 (1901). Roby. Apparatus for trimming and testing safety-lamps. Nov. 12.

„ 23,922 (1901). Darby and Stevens. Stamping machines applicable more especially for compressing fuel in charging coke-ovens. Nov. 12.

„ 24,146 (1901). Spiritine, Ltd. (Drapier and Dubois). Solidified spirit. Nov. 12.

„ 24,840 (1901). Lake (Schuppmann). Kilns or furnaces. Nov. 12.

„ 26,653 (1901). Bray, Bray, and Bray. Steam-boiler furnaces. Nov. 12.

„ 26,703 (1901). Loeser. Kilns or furnaces. Nov. 12.

„ 27 (1902). Courts. *See under* XVII.

„ 7364 (1902). Holmes, Holmes, and Cameron. Apparatus for washing and scrubbing gases. Nov. 19.

„ 10,417 (1902). Brookes (Stearns). Apparatus for treating smoke, gases, &c., in order to remove denser particles therefrom, and impurities from the smoke or gas. Nov. 12.

„ 11,510 (1902). Crook and Mines. Electric incandescent lamps with rare-earth filaments. Nov. 19.

„ 12,523 (1902). Johnson. Gas- and vapour-burners. Nov. 12.

„ 12,710 (1902). Loeben. Apparatus for mixing air and gas, &c. Nov. 12.

[C.S.] 13,745 (1902). Lake. (Soc. Anon. Française des Becs Julbe). Hydrocarbon-burners for lamps and stoves. Nov. 19.

„ 13,954 (1902). Dargie. Acetylene gas-generators and gasometers. Nov. 12.

„ 14,118 (1902). Thompson (Humphrey). Gas-burners. Nov. 19.

„ 14,805 (1902). Bachner. Gas- and vapour-burners. Nov. 19.

„ 16,282 (1902). Murphy. Furnaces. Nov. 19.

„ 16,681 (1902). Brookes (Bradley). Apparatus for feeding and burning pulverulent or dust fuel. Nov. 12.

„ 17,985 (1902). Danner. Annealing furnaces. Nov. 19. International Application, Aug. 19, 1901.

„ 19,019 (1902). Carpenter. Gas-condensers. Nov. 12.

„ 19,145 (1902). Boult (Massie). Compound to be employed as an illuminant and as a source of motive power. Nov. 12.

„ 19,272 (1902). Miller. Incandescent electric-lamps. Nov. 19.

„ 19,479 (1902). Eschè. Slow-burning wicks. Nov. 19.

„ 20,052 (1902). Bray. Method of making double-jet acetylene gas-burners. Nov. 12.

„ 20,710 (1902). Frenay. Carburettors for internal combustion engines. Nov. 12.

„ 20,895 (1902). Anderson. Acetylene gas-generators. Nov. 12.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 24,780. Lake (United States Distillation Co.). *See under* I.

„ 24,884. Fourcy and Buire. Process and apparatus for the crystallisation and immediate separation from the mother-liquid of the products to be crystallised, particularly applicable to naphthalene and anthracene which come from the distillation of tar.* Nov. 12.

„ 25,034. Bennett. *See under* I.

[C.S.] 20,356 (1902). Calmant. *See under* I.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 23,967. Shillito (Aniline Colour and Extract Works, formerly Geigy). Sulphur dyestuffs. Nov. 3.

„ 23,992. Imray (Farbwerke, Höchst). Manufacture of new benzene derivatives and of azo-dyestuffs from one of them. Nov. 3.

„ 23,993. Imray (Farbwerke, Höchst). Manufacture of azo-dyestuffs. Nov. 3.

„ 23,994. Abel (Akt.-Ges. f. Anilinfabr.). Manufacture of products of the indophenol series. Nov. 3.

„ 24,255. Johnson (Bad. Anilin und Soda Fabr.). Manufacture of organic acyl bodies. Nov. 5.

„ 24,427. Newton (Farbenfabr. vorm. Bayer and Co.). Manufacture and production of new derivatives of the anthracene series. Nov. 7.

„ 24,461. Imray (Fabrique de Produits Chimiques de Thann et de Mulhouse). Manufacture of aromatic nitriles. Nov. 7.

„ 24,463. Imray (Farbwerke, Höchst). Manufacture of rhodamines from tetraalkylrhodamines. Nov. 7.

„ 24,470. Urquhart (Chem. Fabr. vorm. Weiler-ter Meer). Production of dyestuffs. Nov. 8.

„ 24,869. Meyenburg, Lévy, and Clayton Aniline Co., Ltd. Manufacture of aromatic bases. Nov. 12.

„ 25,022. Read Holliday and Sons, Ltd., Turner, Dean, and Turner. Manufacture of yellow to orange nitro-colouring matters. Nov. 14.

[A.] 25,024. Newton (Farbenfabr. vorm. Bayer and Co.). Manufacture and production of anthracene derivatives. Nov. 14.

„ 25,103. Levinstein, Mensching, and Levinstein, Ltd. Manufacture of a new benzylnaphthylamine-sulphonic acid, and of polyazo-colouring matters therefrom. Nov. 15.

[C.S.] 25,089 (1901). Imray (Farbwerke, Höchst). Manufacture of new substituted auramines. Nov. 12.

„ 26,059 (1901). Imray (Farbwerke, Höchst). Manufacture of formylmethylanthranilic acid. Nov. 12.

„ 357 (1902). Read Holliday and Sons, Ltd., Turner, Dean, and Turner. Production of a new intermediate compound, and a black dye therefrom. Nov. 19.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 23,962. Turner. Machinery or apparatus for dyeing wool, &c. Nov. 3.

„ 24,444. Gardiner. *See under* XVIII. C.

„ 24,482. Gatecliff. Apparatus for filtering and purifying wool-suds, &c.* Nov. 8.

„ 24,631. Siegel and Schütze, jun. Dyeing apparatus.* Nov. 10.

„ 25,033. Harvey and Sureties. *See under* XIX.

„ 25,097. Peel. Back-washing machines used in the treatment of wool, &c. Nov. 15.

„ 25,108. Kersbaw. Machines or apparatus for dyeing, mordanting, &c., yarn, &c.* Nov. 15.

„ 25,136. Holden and Sons, Ltd., Craig, Raper, and Raper. Machinery for carding or cleansing wool, &c. Nov. 15.

[C.S.] 23,556 (1901). Perkin and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. Nov. 12.

„ 23,557 (1901). Perkin and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. Nov. 19.

„ 25,248 (1901). Knecht and Peter Spence and Sons, Ltd. Method of or means for preventing or resisting the local production of colour in the printing of textile fabrics. Nov. 12.

„ 17,517 (1902). Jorgensen. Colour scales. Nov. 12.

„ 19,174 (1902). Whitney. Wool- and fibre-scouring machinery. Nov. 19.

„ 19,701 (1902). Justice (Hanson). Apparatus for dyeing slivers wound into tops or cheeses. Nov. 19.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 9373 (1902). Rieder. Dyeing leather. Nov. 19.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 24,312. Cadett. Carbonic anhydride refrigerators. Nov. 6.

„ 24,341. Schad. Manufacture or treatment of chloride or muriate of ammonia. Nov. 6.

„ 24,490. Smith and Hinchley. Means of and apparatus for the recovery of ammonia from producer, &c., gases. Nov. 8.

„ 24,678. Barr. "Liquid ammonia rectifier" for refrigeration machinery. Nov. 11.

„ 25,020. Yorke. Apparatus for pulverising and grinding or rubbing salt, &c., in a dry state. Nov. 14.

[C.S.] 25,444 (1901). Riley and Barnes. Recovery of arsenic and sulphur from precipitated sulphide of arsenic. Nov. 19.

[C.S.] 8304 (1902). Hughes (Descamps). Process for the preparation of calcium compounds for reducing, decolourising, &c. Nov. 12.

„ 20,220 (1902). Packard. Process of separating alumina from silica. Nov. 19.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 23,968. Schuler. Painted and burnt glass.* Nov. 3.

„ 24,237. Bronn. Manufacture of soluble glass. Nov. 5.

„ 24,567. Wilson. *See under* IX.

„ 24,610. Meth. Process for etching glass. Nov. 10.

„ 24,616. Sievert. Process for manufacturing hollow glass articles.* Nov. 10.

„ 24,697. Lenz. *See under* IX.

„ 24,979. Wilson. *See under* IX.

[C.S.] 5884 (1902). Perrin. *See under* XXI.

„ 17,985 (1902). Danner. *See under* II.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 24,023. McClenahan. Process for manufacturing stone.* Nov. 3.

„ 24,084. Baillie. Refractory materials, &c., and their manufacture. Nov. 4.

„ 24,094. Perry. Cement composition.* Nov. 4.

„ 24,359. Weber. Manufacture of substitutes for stone, wood, &c.* Nov. 6.

„ 24,445. Brown. Fireproof roofs. Nov. 7.

„ 24,550. Johnson and Paterson. Non-inflammable waterproof insulated conductors for the transmission of electrical energy. Nov. 10.

„ 24,567. Wilson. Glazing of buildings, &c. Nov. 10.

„ 24,690. Stanway. Self-jointing dampless bricks. Nov. 11.

„ 24,697. Lenz. Process for the production of ceramic corner- or angle-pieces, &c. Nov. 11.

„ 24,807. Thompson. Paving material or asphalt, filling-up cement, waterproofing material, and paint. Nov. 12.

„ 24,819. Heys (Gilbreth). Apparatus for supplying cement to concrete-mixers.* Nov. 12.

„ 24,919. Morris. Brick-kilns. Nov. 13.

„ 24,979. Wilson. Glazing, &c., of buildings, &c. Nov. 14.

„ 25,075. Ingham, Langton, and Ingham. Kiln for burning pipes, bricks, &c. Nov. 15.

„ 25,113. Preston. Treatment of cement and manufacture of concrete, and machinery or apparatus to be used therefor and for other plastic substances. Nov. 15.

[C.S.] 2671 (1902). Clark (Fellner and Ziegler). Apparatus for the manufacture of slag cement. Nov. 12.

„ 5169 (1902). Tempest. Sheet-metal imitation tiling. Nov. 19.

„ 24,152. Thwaite. *See under* II.

„ 18,506 (1902). Lake (Giussani). Apparatus for impregnating wood. Nov. 12.

X.—METALLURGY.

[A.] 23,934. Izzett and McGeachie. *See under* II.

„ 24,067. Thomas and Co., Ltd., Thomas, and Lewis. *See under* II.

„ 24,124. Maddern. Ore-roasting furnace.* Nov. 4.

„ 24,152. Thwaite. *See under* II.

„ 24,248. Talbot. Manufacture of steel or ingot-iron. Nov. 5.

[A.] 24,360. von Gernet Copper, Ltd., and von Gernet. Process and apparatus for extracting copper from its ore.* Nov. 6.

„ 24,366. Vosburgh. Reduction-furnaces.* Nov. 6.

„ 24,417. Webb. Extraction of precious metals from ores.* Nov. 7.

„ 24,434. Cowper-Coles, Sterne, and Cowper-Coles Invention Development, Ltd. Process for rendering silver untarnishable. Nov. 7.

„ 24,489. Hinchley. Machines for concentrating crushed ores, &c. Nov. 8.

„ 24,590. Sulman, Kirkpatrick-Picard, and Vautin. Extraction of precious metals from their ores and compounds. Nov. 10.

„ 24,591. Sulman, Kirkpatrick-Picard, and Vautin. Recovery of mercury from its ores and compounds. Nov. 10.

„ 24,662. Altree. Process for decorating surfaces of steel. Nov. 11.

„ 24,882. Sulman and Kirkpatrick-Picard. Extraction of precious metals from their ores and compounds. Nov. 12.

„ 24,883. Sulman and Kirkpatrick-Picard. Recovery of mercury from its ores and compounds. Nov. 12

„ 25,016. Reimer. Apparatus for charging Martin steel and other horizontal or open-hearth furnaces. Nov. 14.

„ 25,150. Crowder. Concentration of ores, and apparatus therefor. Nov. 15.

[C.S.] 23,422 (1901). Martin and Thames Mining Machinery Co., Ltd. Process and means for the extraction of gold from sea-water. Nov. 19.

„ 25,476 (1901). Johnson (McConnell). Manufacture of steel. Nov. 19.

„ 295 (1902). Johnson (Chem. Fabr. Griesheim-Elektron). *See under* XI.

„ 5169 (1902). Tempest. *See under* IX.

„ 8304 (1902). Hughes (Descampes). *See under* VII.

„ 17,985 (1902). Danner. *See under* II.

„ 18,237 (1902). Jackson and Kiesel. Alloy capable of use without flux as solder or surface-coating for aluminium, &c. Nov. 19.

„ 19,914 (1902). Haas. Melting and refining nickel. Nov. 12.

„ 20,220 (1902). Packard. *See under* VII.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 24,006. Müller. Manufacture of Röntgen tubes. Nov. 3.

„ 24,235. Bronn. Heating by means of electricity. Nov. 5.

„ 24,236. Bronn. Obtaining metallic sulphides in electric furnaces. Nov. 5.

„ 24,330. Elmore. Apparatus for the generation or application of electric currents for electrolysis. Nov. 6.

„ 24,331. Guye. Electrolytic cells. Nov. 6.

„ 24,598. Hammond. Electric furnaces.* Nov. 10.

„ 24,998. Hill. Electric accumulators. Nov. 14.

„ 25,084. Greenhill and Hammond. Primary and secondary electric batteries. Nov. 15.

[C.S.] 147 (1902). vom Braucke. Galvanising wire. Nov. 12.

„ 295 (1902). Johnson (Chem. Fabr. Griesheim-Elektron). Manufacture of the metals of the alkalis. Nov. 12.

XII.—FATS, OILS, AND SOAP.

[A.] 23,991. Cavenaugh. Soap-granulating apparatus. Nov. 3.
„ 14,482. Gatecliff. *See under* V.
„ 24,623. Batten. Cleansing preparations. Nov. 10.
„ 24,837. M'Kinnon. Oil-cake breakers. Nov. 12.
„ 25,021. Bloxam (Schwarzlose). Process for purifying fats and oils. Nov. 14.

[C.S.] 25,792 (1901). Bamberg. Detergents and their manufacture. Nov. 12.
„ 26,755 (1901). French. Machines for packing oil-cakes, &c. Nov. 19.
„ 3718 (1902). Sonneborn. Briquettes for lubricating purposes. Nov. 12.
„ 18,932 (1902). Schnetzer. Machines for moulding soap. Nov. 19.
„ 19,642 (1902). King (National Enamelling and Stamping Co.). Oil-drums. Nov. 19.
„ 20,218 (1902). Adams. Oleaginous compound, and process for producing same. Nov. 19.
„ 21,190 (1902). Perver. Composition for cleaning smooth surfaces, &c. Nov. 19.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 24,229. Akester. Laundry blue. Nov. 5.
„ 24,529. Gore and Tomlins. Non-corrosive paint. Nov. 8.
„ 24,532. Hutchinson. *See under* XIX.
„ 24,551. Rowlands and Jones. Anti-fouling fluid. Nov. 10.
„ 24,719. Stewart. Copying-ink.* Nov. 11.
„ 24,807. Thompson. *See under* IX.

[C.S.] 4226 (1902). Hunt. Liquid black-lead stove-polish. Nov. 12.
„ 16,783 (1902). Ogilvy. Process of producing black and dark carbonaceous pigments. Nov. 12.

C.—India-rubber, &c.

[A.] 24,573. Frankenberg. Machines for the vulcanisation of india-rubber waterproof fabrics.* Nov. 10.
„ 24,574. Frankenberg. Machines for the vulcanisation of india-rubber waterproof fabrics.* Nov. 10.
„ 25,044. Theilgaard. Treatment of waste caoutchouc, gutta-percha, &c.* Nov. 14.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 24,008. van Duyse. Composition for the agglomeration of cork, leather, &c. Nov. 3.
„ 24,763. Walter. Leaching and tanning apparatus.* Nov. 11.

[C.S.] 22,849 (1901). Thompson (Wünsch and Oesinger and Co.). Chrome-tanning process. Nov. 19.
„ 1327 (1902). Paas and Jacobsen. Process of preserving leather. Nov. 19.

XV.—MANURES.

[A.] 24,137. Monson. Fertilisers, and apparatus for distributing same.* Nov. 4.

[C.S.] 19,513 (1902). Crooke and Crooke. Fertilisers, and process of making same. Nov. 12.

XVI.—SUGAR, STARCH, GUM, ETC.

[A.] 24,768. Lafeuille. Process and apparatus for extracting sugar from beet, &c. Nov. 11.
[A.] 24,871. Mertens. Process of making syrup from beet, &c., roots, and of refining sugar-containing liquids. Nov. 12.

[C.S.] 9525 (1902). Gudeman. Method of utilising gluten tailings. Nov. 12. International Application, Oct. 17, 1901.
„ 15,031 (1902). Czapikowski. Means for boiling sugar. Nov. 19.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 23,989. Boyling and Digby. Maturing wines and spirits. Nov. 3.
„ 24,297. Brown. Machine for turning corn on the germinating floor of a malting. Nov. 6.
„ 24,698. Genkinger Bros. Contrivance for cleaning the sinking bottoms of mash-tuns, &c. Nov. 11.
„ 24,780. Lake (United States Distillation Co.). *See under* I.
„ 24,815. Harmer. Furnaces of brewers' fire-heated coppers. Nov. 12.
„ 24,866. Bardin. *See under* XVIII. C.
„ 25,030. Edwards. Manufacture and adaptation of malt-extract. Nov. 14.
„ 25,034. Bennett. *See under* I.

[C.S.] 24,243 (1901). Ackroyd and Buckley. Malt-kilns. Nov. 12.
„ 27 (1902). Courts. Furnaces of vertical boilers, brewers' coppers, &c. Nov. 19.
„ 20,356 (1902). Calmant. *See under* I.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 24,014. Busch, Gull, and Barry. Pasteurising and sterilising apparatus.* Nov. 3.
„ 24,619. Howorth (Liddle). Process of producing a light-coloured meat (extract).* Nov. 10.
„ 24,628. Lafeuille. Manufacture of an alimentary product. Nov. 10.
„ 24,721. Lake (Winton). Manufacture of food preparations.* Nov. 11.
„ 25,137. Sawers. Treatment of blocks of ice whilst being artificially frozen. Nov. 15.

B.—Sanitation; Water Purification.

[A.] 24,278. Fiddian. Means or apparatus for use in distributing liquid sewage or sewage-effluent upon the surface of a filter-bed. Nov. 6.
„ 24,780. Lake (United States Distillation Co.). *See under* I.
„ 24,974. Bryan. Tiles for the floors of filter-beds used in connection with the bacterial treatment of sewage, &c. Nov. 14.
„ 25,034. Bennett. *See under* I.
„ 25,041. Hardy. Apparatus for use in the purification of water, &c. Nov. 14.

[C.S.] 22,923 (1901). Candy. Apparatus for use in or in connection with the purification of sewage or polluted waters. Nov. 12.
„ 25,872 (1901). Hallett. Apparatus suitable for heating and purifying feed-water for steam-generators. Nov. 19.
„ 5918 (1902). Baird and Cochrane. Feed-water filters for steam boilers. Nov. 12.
„ 16,271 (1902). Lewis. Means for retaining liquids, such as sewage or the like, for fixed periods in filters or tanks. Nov. 12.

[C.S.] 17,456 (1902). Ralston. Apparatus for controlling the flow of sewage in septic or bacterial tank systems. Nov. 19.

„ 20,356 (1902). Calmant. *See under* I.

C.—Disinfectants.

[A.] 24,414. Gardiner. Disinfecting- and bleaching-powder. Nov. 7.

„ 24,866. Bardin. Manufacture of odoriferous antiseptic disinfecting substances with a solidified alcohol base. Nov. 12.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 23,964. Lee. Process of treating vegetable fibres in the production of pulp for paper-making, &c.* Nov. 3.

„ 24,294. Shepherd. Proofing millboard. Nov. 6.

„ 24,295. Shepherd. Manufacture of embossed wall-coverings, &c. Nov. 6.

„ 24,381. Wilson. Waterproofing and airproofing cardboard, &c., to contain fluids, semi fluids, &c. Nov. 7.

„ 24,392. Amies. Moulds for the manufacture of paper. Nov. 7.

„ 24,532. Hutchinson. Method of preparing paper for manifold copying purposes, and the preparation of printing surfaces therefrom, with self-contained ink- or colour-supply. Nov. 8.

„ 24,542. Kellner. Manufacture of cellulose. Nov. 8.

„ 24,955. Lüttke. Manufacture of nitrocellulose films and lacs.* Nov. 13.

„ 25,033. Harvey and Sureties. Fibrous composition to be used as a substitute for papier maché, &c. Nov. 14.

[C.S.] 24,205 (1901). Germani. Process for the manufacture of celluloid combs, &c. Nov. 12.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 23,988. Newton (Farbenfabr. vorm. Bayer and Co.). Manufacture and production of pharmaceutical compounds. Nov. 3.

„ 24,079. Boulton and Spaull. Manufacture of potassium cyanide and sodium cyanide. Nov. 4.

„ 24,129. Ellis (Soc. Chim. des Usines du Rhône, anciennement Gilliard, P. Monnet, et Cartier). Manufacture of chloroform. Nov. 4.

„ 24,767. Tcherniac. Manufacture of sulphocyanides. Nov. 11.

[C.S.] 21,838 (1901). McLaughlin. Process of making ichthyol sulphonate of ammonia. Nov. 12.

„ 24,904 (1901). Feld. Production of hydrocyanic acid. Nov. 19.

„ 26,618 (1901). Zimmermann (Chem. Fabr. auf Akt. vorm. E. Schering). Manufacture of camphene. Nov. 19.

[C.S.] 26,620 (1901). Zimmermann (Chem. Fabr. auf Akt. vorm. E. Schering). Manufacture of camphene. Nov. 19.

„ 3871 (1902). Lake (Schieffelin). Preparation of compressed drugs. Nov. 19.

„ 12,181 (1902). Givaudan. Manufacture and preparation of a new series of derivatives of saccharin. Nov. 12.

XXI.—PHOTOGRAPHY.

[A.] 24,019. Baker. Preparation of photographic prints for toning. Nov. 3.

„ 24,614. Grant. Manufacture of films for photographic, &c., purposes. Nov. 10.

„ 25,114. Joly. Photography in colours. Nov. 15.

[C.S.] 565 (1902). Schmalenberg (Carl Ernst and Co. Akt.-Ges.). Negatives for the photographic production of ornamental borders on sensitised surfaces. Nov. 19.

„ 5884 (1902). Perrin. Processes for producing enamelled polychrome photographs and artistic stained glass, &c. Nov. 12.

„ 11,983 (1902). Huck and Fischer. Production of printing surfaces for photographic or other printed pictures. Nov. 19.

„ 21,537 (1902). Archer. Surfaces for receiving photographic prints. Nov. 19.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 24,633. Wetter (Westfälisch-Anhaltische Sprengstoff-Akt.-Ges.). Priming compositioos for percussion caps and detonators. Nov. 10.

„ 24,812. Führer. Detonating compositions.* Nov. 12.

„ 24,934. Curtis, Pearcy, Metcalfe, Smith, and Hargreaves. Explosives. Nov. 13.

„ 24,955. Lüttke. *See under* XIX.

„ 25,025. Wood and Knudsen. Method of and apparatus for obtaining disruptive or explosive effects for blasting purposes. Nov. 14.

[C.S.] 15,926 (1901). Christensen. Matches, and machinery for their manufacture. Nov. 19.

„ 22,966 (1901). Cocking and Kynoch, Ltd. Explosives. Nov. 19.

„ 23,941 (1901). de la Mar, Cotterill, and Blakeslee. Match-making machines. Nov. 19.

„ 25,884 (1901). Wetter (Westfälisch - Anhaltische Sprengstoff - Akt.-Ges.). Blasting compositions. Nov. 12.

„ 26,247 (1901). Criswell. Match-making machinery. Nov. 12.

„ 26,617 (1901). Wetter (Westfälisch - Anhaltische Sprengstoff - Akt.-Ges.). Safety explosives or blasting compositions. Nov. 12.

„ 14,299 (1902). Lake (Parker Match Co.). Manufacture of matches. Nov. 12.

„ 21,171 (1902). Hough. Explosives. Nov. 12.

„ 21,189 (1902). Poetter. Manufacture of a safety explosive or blasting substance. Nov. 12.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 5933.

JOURNAL OF THE

Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES

ISSUED TWICE A MONTH.

No. 23.—Vol. XXI. DECEMBER 15, 1902. No. 23.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D, LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Prof. Marston T. Bogert, A.B., Ph.B.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.
Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.
F. H. Tate. | Dr. T. Lewis Bailey.

LONDON.
Walter F. Reid. | A. R. Ling.

MANCHESTER.
Ivan Levinstein. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Dr. V. Coblentz. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
T. L. Patterson. | Dr. Thos. Gray.

YORKSHIRE.
Jas. E. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. A. K. Huntington.
Wm. Kellner Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Sir Wm. Ramsay, K.C.B., LL.D. F.R.S.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams ..... I.
L. Archbutt ..... I., XII.
J. L. Baker ..... XVI., XVII.
H. Ballantyne ..... II., XII.
D. Bendix ..... III.
E. Bentz ..... IV., V., VI.
J. O. Braithwaite ..... XX.
J. F. Briggs ..... XVI., XVII., XIX., XX.
J. H. Collins ..... X.
C. F. Cross ..... V., XII., XIX.
J. T. Dunn, D.Sc. ..... VII., X.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley ..... I., VIII., IX., X., XXI.
R. L. Jenks ..... XIII. C., XIV., XIX.
M. C. Lamb ..... VI., XIV.
T. A. Lawson, Ph.D. ..... IV., XX.
F. H. Leeds ..... II., III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. ..... IV.
G. W. MacDonald, M.Sc. ..... XXII.
W. G. McMillan ..... X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ..... XV.
C. A. Mitchell, B.A. ..... XII., XXII.
A. More ..... VII., XVIII.
G. T. Morgan, D.Sc. ..... IV., V.
J. G. Parker, Ph.D. ..... XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak ..... Patent List.
T. H. Pope ..... XVI., XX., XXI.
F. W. Renaut ..... Index.
G. H. Robertson ..... XI.
Chas. Salter ..... II., III., XVI., XVII.
M. J. Salter ..... XIII.
R. Sandon ..... II.
J. Shields, D.Sc., Ph.D. ..... XI.
A. Shonk ..... Gen. Chem.
W. P. Skertchley ..... XII., XVIII.
E. Sonstadt, III., VII., X., XV.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer ..... XX.
L. J. de Whalley, B.Sc. ..... XVI.
A. Wingham ..... X.
Joseph T. Wood ..... XIV.

Notices.

SUBSCRIPTIONS FOR 1903.

Foreign and Colonial Members are reminded that the subscription of 25*s.* for 1903, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1903.

The price of extra sets to members is now 25*s.* each. The annual subscription for non-members is 36*s.*

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of next year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows :—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products :—
Subsection A.—Organic Preparations, including Tar Products.
Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsengesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hold their respective annual meetings for 1903 in connection with the Congress.

An executive local committee will make arrangements for the entertainment of visitors during their stay.

As formal invitations should go out, at the latest, this autumn, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

All communications and questions, so far as they cannot be answered by the various organising committees, should be addressed to the Secretary of the Congress, Dr. G. Pulvermacher, Charlottenburg, Marchstrasse No. 21. The formation of organising committees is already in progress in England, Belgium, France, Italy, Portugal, Switzerland, Servia, and Turkey.

TECHNOLEXICON.

The *Verein Deutscher Ingenieure* has undertaken to produce a reliable technical dictionary in three languages —English, French, and German—and has asked this Society to furnish the names of such scientific and industrial men as are willing to supply the technical expressions of their own special branches of industry. The assistance to be rendered must be gratuitous, as otherwise the expense would be prohibitive; but no money is asked for by the German Society, though it has already spent considerable sums upon the work, and has provided an editor, Dr. Hubert Jansen, of Berlin, with a staff, to collate the materials supplied.

The Council of this Society agreed to co-operate in the work, and appointed a special committee, consisting of the President, Hon. Treasurer, Drs. Lewkowitsch, Kohn, Messel, Redwood, and Squire, and Messrs. Beilby, Hebner, Newlands, Reid, and Watson Smith to decide upon the form of co-operation. It has been determined to select one or more representatives for each class of the Journal and Patent Literature; and the committee now asks for volunteers to undertake a class or division of a class. To those who intimate their wish to help, full particulars of the plan of the work, with instructions how to proceed, will be sent. Offers of co-operation should be addressed to the General Secretary.

NATIONAL PHYSICAL LABORATORY.

Mr. R. Forbes Carpenter, H.M. Chief Inspector under the Alkali Acts, has been nominated by the Council to represent the Society on the Board of the National Physical Laboratory in succession to Mr. George Beilby, whose term of office has expired.

DURABILITY OF LEATHER FOR BOOKBINDING.

Mr. Cyril Davenport, of the British Museum, will read a paper before the Library Association, at 20, Hanover Square, W., on Thursday, December 18th next, at 8 p.m. This paper will open up the whole question of library binding, and especially the quality and durability of leathers. Members of this Society interested in the subject of leather are invited to attend and take part in the discussion.

JOINT COMMITTEE ON DUTY-FREE ALCOHOL.

A meeting of the Joint Committee of the Chemical Section of the Chamber of Commerce and the Society of Chemical Industry appointed to consider the above subject was held at Botolph House, Eastcheap, at 4.15 p.m., on Wednesday, the 19th ult., Mr. John C. Umney, the chairman of the Chemical Section of the Chamber of Commerce, occupying the chair.

The Chairman reported that, since the occasion of the last meeting of the Chemical Section of the Chamber of Commerce, on Nov. 6th, a reply had been received from the Inland Revenue to definite questions addressed to them by the Joint Committee.

From this reply, it seemed evident that no general regulations would be framed for the carrying out of the proposals for the use of alcohol free or partially free from duty, for manufacturing purposes, although facilities would be given in special cases under strict excise supervision.

It was decided that an appeal should be made to everyone interested in the chemical, drug, and allied trades to furnish to the secretaries of the Chamber of Commerce and Society of Chemical Industry particulars of those substances which, with duty-free alcohol, could be prepared more economically than at present, and in competition with other producing countries where advantages exist in the use of duty-free alcohol. It is hoped that particulars as to the nature and probable quantity of such substances will be given.

Briefly, what is desired is to learn the quantity of substances employed in the arts or manufactures imported into this country, because their manufacture here is rendered impossible by reason of the high price of alcohol, ethylic and methylic.

Replies to be addressed to The Secretary, London Chamber of Commerce, Botolph House, Eastcheap, E.C., and to C. G. Cresswell, Society of Chemical Industry, Palace Chambers, 9, Bridge Street, Westminster, S.W.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Bradford, H., l/o Chichester; c/o W. H. Gorringe, Aberfeldy, Southwick, near Brighton.

Falding, F. J., l/o 45; 52, Broadway, New York City, U.S.A.

Fergusson, Donald M., l/o Greenock; c/o Acadia Sugar Refining Co., Halifax, N.S., Canada.

Frenzel, A. B., l/o Boston; 1540, Sherman Avenue, Denver, Col., U.S.A.

Gronemeyer, H. H., l/o Giddings Avenue; 315, Amesbury Avenue, Cleveland, Ohio, U.S.A.

Haus, Simon V., l/o Nepera Park; c/o Eastman Kodak Co., Rochester, N.Y., U.S.A.

Krause, Prof. Dr. G.; communications to Cöthen (Anhalt), Germany, Editor of "Chemiker Zeitung."

Lamborn, Ll. Ll., l/o Fulton Street; 134, Willoughby Avenue, Brooklyn, N.Y., U.S.A., Factory Superintendent.

Leather, Dr. J. Walter; Journals to Dehra Dun, United Provinces, India.

Luthy, Edm. O.; Journals to 2419, Ohio Avenue, Cincinnati, Ohio, U.S.A.

May, Geo. H., l/o Hohokus; c/o Fabrikoid Co., Newburgh, N.Y., U.S.A.

Meyer, Dr. Franz, l/o Germany; 68, Broad Street, New York City, U.S.A., Metallurgical and Chemical Engineer.

Richardson, D. B., l/o Glen Aros; Aucheneck, Killearn Station, N.B.

Ruecker, Dr. H. von, l/o Brooklyn; c/o Buchanan and Co., Torreon, Coahuila, Mexico.

Sayer, H.; all communications to 82, Victoria Street, Westminster, London, S.W.

Skertchley, S. A. R., l/o Wimbledon Park; Albuhera, Marlborough Road, South Croydon.

Smith, Francis P., l/o St. Swithin's Lane; 20–1, Queenhithe, Upper Thames Street, London, E.C.

Stewart, Robt., l/o Stratford; 66, Henry Road, West Bridgford, Nottingham.

Taylor, Newman, l/o Sale; Alexandra and E. D. Sassoon Mills, Chinchpoogley, Bombay, India, Resident Engineer.

Volney, Dr. C. W.; Journals to Keyport, N.J., U.S.A.

Welch, J. Cuthbert, l/o Trail; Montreal and Boston Copper Co., Boundary Falls, B.C., Canada, Metallurgist.

White, W. Gilchrist, l/o Glasgow; 86, Bay Street, Port Glasgow, N.B.

Willems, A. D.; Journals to Bellevue P.O. Station, Allegheny, Pa., U.S.A.

Winstone, E. H., l/o Victoria Mansions; Members' Mansions, 36, Victoria Street, Westminster, London, S.W.

Death.

Jackson, Robt., 18, Harrington Street, Dublin.

New York Section.

Meeting held at the Chemists' Club, on Friday, October 24th, 1902.

CHAIRMAN'S ADDRESS.

PURITY OF SO-CALLED STANDARD DRUGS AND CHEMICALS.

BY V. COBLENTZ.

Since the last revision of the United States Pharmacopœia, numerous complaints have been made, by both manufacturers and retailers, that the restrictions as to limits of purity of official chemicals were unnecessarily severe and exacting. On the other hand, the reports of analysts show that the quality of many of the chemicals in the market is not only below the official standard of purity, but that some of these are adulterated or even entirely substituted. The more recent revisions of the Pharmacopœia, in Europe and the United States, have all shown a strong tendency towards greater preciseness and stringency in purity requirements, advancing with the progress in manufacturing processes. When we consider the vast improvements that have been made, during the last decade, in the line of electrolytic and other chemical processes, whereby products of a greater degree of purity are readily attainable at a decrease in cost of production, why shall not we expect a corresponding improvement in quality? Inability to obtain a reasonable price for goods of standard quality naturally requires the manufacturer to reduce, wherever possible, his manipulations to the very lowest limit, in order to supply the demand for a cheaper product. On the part of the manufacturer, it must be admitted that, whilst the general principles governing the 1890 revision of the United States Pharmacopœia were broad in spirit, yet when the standards of purity were adjusted, the kind and the permissible percentage of impurities were such as to place many of the chemicals among the category of chemically pure reagents, necessitating a process of purification which not only added immensely to their cost with no material advantage to the consumer, but rendered competition in the open market practically impossible. I refer more particularly to such instances as the exclusion of traces of sodium from potassium salts, the very close limitation or even entire exclusion of medicinally innocuous impurities, as, for example, sulphates or chlorides of calcium or magnesium in potassium or sodium salts. It is practically immaterial, from the physician's standpoint, so long as a sample of potassium bromide contains the necessary 97 per cent. of the pure salt, whether these impurities consist of sulphates or chlorides, or, so long as a lithium salt complies with the standard limit set, any calcium or magnesium salts present as slight impurities, may be disregarded. On the other hand, shall a manufacturer be permitted to sell as "C.P." or "U.S.P." a potassium iodide containing 8 per cent. of chlorides, when the standard allows but 0·5, or shall we overlook the presence of excessive quantities of alkali carbonate or of iodate? But very few samples of this chemical found in our market are free from the latter very undesirable impurity. The British Pharmacopœia demands that these bromides and iodides give only the *slightest* reaction for chlorides and sulphates, and the German Pharmacopœia requires practically entire freedom from sulphates and free alkali carbonates.

Those chemicals exported from the United States are reported to be of very high standard; why, therefore, shall we tolerate such conditions here? The next question that naturally arises is, are we justified in demanding that our manufacturers shall furnish products absolutely free from all traces of metallic impurities, or shall we permit their presence, and to what extent? Whilst absolute purity is neither attainable nor desirable, yet under no circumstances should considerations of commercial advantages or conveniences of manufacturers deter us from guarding most

carefully public health and safety. It is conceded by all that traces of arsenic, copper, lead, zinc, alumina, or iron are present in infinitesimal traces in almost every chemical and article of food; hence it remains for us to discriminate between preventible and non-preventible contamination as to limits permissible. The British and German Pharmacopœias demand that no characteristic reaction shall be obtained for the presence of these bodies. The question as to the presence of iron and alumina may be dropped from a medical standpoint, leaving only the possibilities of chemical incompatibility. Whilst likewise demanding the exclusion of these metals (*i.e.*, 5 c.c. of a solution of 1 part in 20 should give no reaction with hydrogen sulphide), the last revision of the Pharmacopœia established tacitly an arsenical limit (Dr. Curtman, Pharm. Rundschau, 1891, 175) which was set at about 1/100th per cent., or one part of arsenious oxide in 10,000, which would permit 3 mgrms. or about 1/20th of a grain to 30 grms. or about one ounce of the chemical. This limit, whilst permissible in such potent chemicals as are administered in doses not exceeding 0·5 grm., is certainly a dangerous one for others, such as the alkali acetates, sodium sulphate, glycerol, phosphites, hypophosphites, sodium phosphate, &c. Some of these are administered in doses of $\frac{1}{4}$ to 1 oz. daily, extending over more or less great periods of time; hence, through continued use, cumulative effects of arsenic, or such metals as lead or copper, would soon be manifest. In my opinion, the limit of 1 in 100,000 may not be considered as excessive, and would not impose unnecessary burdens upon the manufacturer.

Under the impression of hypercritical standards, some of our dealers have been supplying the market with what was considered by *them* as being sufficiently pure for all purposes, usually controverting complaints with the assurance that the chemical was "Pure." Here I wish, in this connection, to call attention to the misuses and abuses of this elastic term, as employed in commercial parlance, by the chemist, photographer, assayer, toxicologist, physician, or manufacturer. The toxicologist considers a sample of zinc as "Pure," so long as it is free from traces of arsenic, sulphur, and phosphorus; the manufacturer of medicinal chemicals considers his zinc as "Pure," so long as it does not contain appreciable quantities of arsenic, lead, and copper, disregarding small percentages of iron and sulphur. A photographer considers his chemicals to be "Pure," if free from certain interfering substances; for example, the "hypo" used by him would not be acceptable to a chemist.

Considerable quantities of zinc containing lead and iron are sold as "Zincum Purissimum." Classen calls attention to two samples sold as "Chemically Pure" bismuth for "scientific purposes," one sample containing 2 per cent. of lead and another 1·5 per cent. of copper, with 0·5 per cent. of iron; "C.P." bismuth frequently contains arsenic. Such other terms as "Purified," "Twice Purified," "Purissimum," and "U.S.P." are being indiscriminately applied to represent varying degrees of purity which are more frequently absent than present. Absolute purity and freedom from all traces of foreign substances is with most chemicals a condition very difficult if not (at least, in some instances) impossible to obtain. What the chemist, toxicologist, physician, or manufacturer desires is not *absolute* freedom from each and every possible impurity, but absence of certain specified contaminations which interfere with uses for special purposes. Such conditions are readily met by dropping the old, misleading, and vague terms and replacing them with a direct accurate statement as to the *degree* of purity or by employing such special descriptive titles as "Medicinally Pure," meaning that the article contains the percentage of pure substance demanded by the legal standard, and that the impurities present possess no objectionable or harmful medicinal properties. Impure chemicals suitable for technical purposes should be labelled *as such*, and not be permitted to pass into the market without qualification. If intended to be employed as reagents in analytical operations, the degree of freedom from one or all possible undesirable contaminations should be accurately stated. Many chemicals, prepared by responsible firms or repacked by dealers, labelled "Pure," were found to be neither chemically pure nor medicinally pure (that is U.S.P.). Other instances are recorded in which commercially (technically) pure goods were labelled "C.P.," the firm contending that "C.P." referred to a commercially pure article.

Granulated sodium phosphate for medicinal use, is, in the majority of cases, labelled without any qualification as to its degree of purity, the consumer having no assurance as to whether the product conforms to the Pharmacopœia standard or not. One sample of this granulated salt was found to contain 1/40th of a grain of arsenious oxide to each ounce, some others contained traces, whilst still others were free from this poisonous impurity. Such a system, with, of course, some exceptions, we find prevailing in our market.

Hence *the indiscriminate labelling of chemicals without qualification as to degree of purity should by all means be discouraged as being a loose practice through which legal responsibilities may be evaded.*

Returning to the original question as to the quality of the medicinal chemicals found in our market, the following instances represent a compilation of the reports of various public analysts and chemists, so far as available, in conjunction with my own observations, carried on during the past ten years. Unfortunately, work of this nature is carried on in only a very few States of the Union, owing to absence of pure food and drug laws and general indifference. I am indebted to the following gentlemen for information furnished: Messrs. M. Schaak, Ph.D., R. Moore, Ph.D., E. Gane, L. Kebler, and E. Patch.

Inorganic Acids.—Hydrochloric, sulphuric, and nitric acids sold as either C.P. or U.S.P. in the open market are all of a high degree of purity. Practically all of them will withstand the Berzelius-Marsh test for at least 15 minutes. The commercial acids are excellent, so far as the presence of arsenic is concerned. Thompson (Proc. A. Ph. A., 1892, 265) reports finding nine out of 17 samples of sulphuric acid, and seven out of 10 samples of hydrochloric acid free from this contamination, and only one of each set contained any appreciable quantity of arsenic. Naturally iron, lead, and copper were present in all.

Arsenious Acid (*Arsenious Oxide*).—The quality of this depends very largely upon the price offered and the integrity of the seller. Samples containing as much as 40 per cent. of insoluble inert matter frequently find their way with those less adulterated into the hands of dispensers.

Boric Acid.—This valuable antiseptic is frequently found mixed with as much as three times its weight of powdered borax. Several lots sold as "Pure" contained considerable quantities of calcium sulphate. Gane reports samples containing as high as 10 per cent. of calcium borate. This is the fault of the manufacturer.

Chromic Acid Anhydride.—Extreme carelessness in the preparation of this chemical is shown by the reports of various analysts, who find as much as 5 per cent. of adhering sulphuric acid present. Kebler (Proc. A. Ph. A., 1901, 399) and also Krauch (Die Prüfung der chemische Reagentien auf Reinheit) report the presence of 30 to 60 per cent. of the acid sulphates of potassium or sodium; the former found one sample to contain only 40 per cent. of true chromic anhydride. All samples examined by the writer have been found to contain more or less of alkali acid sulphate.

Citric Acid.—Most, if not all, samples offered contain iron and lead, even to the presence of small particles of the latter metal. Of recent years the quality has improved in that respect.

Hydrobromic Acid (10 per cent.).—This article, as dispensed by retailers, is usually deficient in strength, and frequently substituted by diluted hydrochloric acid.

Oxalic Acid.—This has been found on the market mixed with the cheaper magnesium sulphate. One case is reported to contain as much as 80 per cent. of this harmless salt.

Salicylic Acid.—This has been met with adulterated with starch and calcium sulphate. It is rarely chemically pure.

Tannic Acid.—Owing to the extensive use of this chemical in various industries, and a resulting sharp competition, we find it extensively adulterated with such substances as dextrin, sugar, flour, salt, &c. Patch (Proc. A. Ph. A., 1900, 200) reports finding samples which were insoluble in any proportion of water. Guenther (Berichte Phar. Gesellschaft, 1895, 299) found 13 to 20 per cent. of sodium chloride. Another analyst found a sample of "high grade" tannin to contain 65 per cent. of pure tannin with 20 per cent. of finely granulated sugar. Other samples examined by the writer were found to yield varying quantities of ash up to 15 per cent., and the presence of dextrin was of very frequent occurrence.

Aconitin.—Some samples of this potent alkaloid are no more active than a fair quality of aconite root. They may contain from less than 1 per cent. to 90 per cent. of the active alkaloid. One or two foreign brands are exceedingly potent.

Acetic Ethyl Ester (*Acetic Ether*).—This rarely conforms to the standard requirements of 98·5 per cent. Most samples vary from 30 to 60 per cent. Patch reports a sample sold as "absolute" containing 86 per cent. of the pure ester.

Alum.—Potash alum has been almost altogether replaced by the ammonia alum for which it is sold.

Ammonium Chloride.—The powdered salt contains frequently considerable quantities of powdered ammonia alum; also clay has been found in various samples.

Ammonium Bromide.—Baird (Mass. Pharm. Association, 1901) reports one lot as containing about 8 per cent. of ammonium chloride; another, 6·7 per cent. of the same salt. Samples rarely contain less than 3 per cent. of this.

Ammonium Iodide.—This usually contains from 3 to 4 per cent. of the sulphate.

Antimony Sulphide (*Native*). — This is extensively adulterated with chalk, sand, clay, and the like, coloured with charcoal.

Antipyrin.—This is frequently substituted by dispensers with the cheap and dangerous antipyretic acetanilide.

Aristol.—Without doubt the most valuable and popular antiseptic that has been introduced within recent years. Because of its extensive use and relative high price, the number of cases of sophistication has become very large. The majority of the spurious products found in the market consist apparently of what might be considered as an abortive attempt on the part of ignorant persons to prepare a di-thymol di-iodide, in which the crude reaction-product has been collected and dried without any attempt at washing out the excess of alkali or removing free iodine. Others not satisfied with the yield have added such diluents as starch, talc, calcium carbonate, zinc oxide, and tripoli. Some took the pains to add sufficient ferric oxide to properly imitate the colour of the true product, whilst still others evidently did not consider this worth the trouble. A few of the 30 adulterated samples in my hands contained no trace of either iodine or an iodide, depending on zinc oxide, diluted and coloured with inert matter to replace the antiseptic. The organic iodine compounds, which are employed as antiseptics in surgery, owe their action to the slow decomposition with gradual liberation of iodine, brought about by contact with the alkaline wound secretions. Such concoctions as contain free iodine are a source of irritation and danger to the patient; not to mention the presence of inert mineral substitutes. The same objections are valid with regard to the presence of free caustic and carbonated alkali, which varied among different specimens from 1 to 11·5 per cent.

Borax.—Powdered borax, particularly that offered in package form, is extensively adulterated, and even entirely substituted by sodium bicarbonate. A number of such samples labelled "Pure Borax" were found by the writer to consist solely of this alkali. Other analysts have found bulk goods to contain 6, 38, 44, and 60 per cent. of pure borax, the balance consisting of soda.

Bismuth Salts.—All contain more or less traces of copper, arsenic, and iron, with, occasionally, lead and tellurium. Janzen (Apoth. Zeit., 1899, 79) reports a sample of "Bismuthum Carb. Puriss.," as containing an appreciable quantity of arsenic. Samples of subnitrate admixed with calcium phosphate or carbonate are occasionally found. This is undoubtedly the work of unprincipled dealers or dispensers.

Bromine.—Reports show that the American article contains 3·4 to 5·2 per cent. of chlorine, whilst the German contains but 0·53 to 0·68 per cent. Naturally, all American-made bromides contain large amounts of chlorides.

Calcium Carbonate (*Precipitated*).—Samples containing as much as 50 per cent. of magnesium carbonate have been reported, probably added to increase lightness.

Calcium Phosphate (*Precipitated*).—This is frequently adulterated with powdered chalk, gypsum, or talc, to the extent of 30 per cent. Fresenius reports having found 25 samples which contained from 0·028 to 0·17 per cent. of metallic arsenic, introduced through the employment of arsenical hydrochloric acid.

Creosote (*Beechwood*).—A good quality is not often met with in the market. Gane reports that the majority of commercial wood creosotes consist either of low or high boiling products with very little or no guaiacol. Attention has been directed time and again by analysts, apothecaries, and physicians to the carelessness of some dealers in supplying impure phenol (carbolic acid) under the misleading title of "creosote" or "coal-tar creosote." This practice, which is certainly a reprehensible one, should be stopped, since wood-creosote is extensively employed internally in considerable-sized doses. State analysts report that, out of 222 samples purchased, only 119 consisted of real creosote. A Massachusetts analyst reports that 40 per cent. of the samples sold as creosote are impure phenol.

Cumarin.—This, as well as most other expensive synthetic perfumes, as heliotropin, irisol, ambrain, &c., is largely admixed with acetanilide. Fritzsche Bros. report finding as much as 36 per cent. of this diluent in cumarin.

Glycerin.—A. C. Langmuir (Jour. Amer. Chem. Soc., 1899, 21—133), and also Patch (Proc. A. Ph. A., 1897, 671) report that all samples of C.P. glycerin, either foreign or domestic, respond to the tests for arsenic, although some were guaranteed to be free from arsenic. Siebold (Pharm. J., 1889, 255) reported English samples to contain from 1 in 4,000 to 1 in 6,000 of arsenious oxide. He notes one as high as 1 in 2,500. One sample of American manufacture was found by myself to contain about 1 part of arsenious oxide to 70,000, whilst another averaged 1 to 100,000.

Hypophosphites.—These salts vary much in quality, arsenic phosphites and phosphates being found in nearly all samples. The total of pure salt has been found to vary from 75 to 90 per cent.

Hyoscine.—Some of the commercial alkaloids consist of atropine or a mixture of atropine and hyoscyamine.

Iron, Reduced.—This is rarely of satisfactory quality, usually containing excessive quantities of sulphide and appreciable amounts of arsenic. The percentage of metallic iron present is quite variable. Patch (Proc. A. Ph. A., 1894, 204) examined a number of commercial samples, and found the percentage of metal to vary from 13 to 76. Ferrous oxide was present from 7·7 to 65 per cent., and two samples contained 20 and 27·8 per cent. of ferric oxide, respectively. Later examinations report the limits of metallic iron to average 79 to 83 per cent.

Lithium Salts.—These vary considerably in quality, and are reported by authorities not to vary over 85 per cent. of the pure salt.

Lead Oxide (*Litharge*).—Lead carbonate to the extent of 20 per cent. of siliceous matter coloured with ferric oxide and ochre has been found.

Lithium Benzoate. — This frequently contains the cheaper sodium benzoate.

Magnesium Carbonate.—The quality of this is not above criticism. It usually contains as much as 2 per cent. of sodium chloride, with appreciable quantities of iron and silica.

Potassium Hydroxide.—In 1885, Patch examined various samples of stick potash on the market, and found them to contain 2·5 to 8·6 per cent. of the carbonate, and 52·8 to 81 per cent. of pure hydroxide. Recently the percentage of hydroxide was found to vary from 88·5 to 90, with 1 to 3 per cent. of sodium hydroxide and but little more than traces of carbonate. On the other hand, "commercial caustic potash" was found by Carl Smith (Amer. J. Phar., 1898, 392) to consist essentially of caustic soda with but little more than traces of potash, the percentage of the former varying from 66 to 87. The *best* qualities of lump potash purchased in drums were found to average about 86 per cent. of pure hydroxide.

Potassium Acetate.—Samples containing lead and arsenic are of frequent occurrence. Such impurities should be carefully guarded against, owing to the frequent and extended use of this salt in medicine.

Potassium Bromide.—This salt, as supplied by American manufacturers, seldom conforms to the requirements of the U.S. Pharmacopœia, which demands a purity of 97 per cent., and that it shall not contain more than 3 per cent. of chlorides. Baird (Proc. Mass. Ph. Assoc., 1901), reports, among others, one sample containing over 9 per cent. of potassium chloride. Helbing (Pharm. Zeit., 1898, 392), reports finding 4·52 to 5·91 per cent. of chloride in American bromide, and not over 0·13 per cent. in the English-made products. Of 11 samples purchased in the retail market by the Committee on Adulterations of the N.Y. State Pharm. Association, only two were up to the official standard.

Potassium Carbonate.—Whilst samples containing as high as 95 per cent. of the pure salt are readily obtainable, the bulk goods sold by dealers rarely reach 85 per cent. purity.

Potassium Chlorate.—The admixture of pulv. alum with pulv. chlorate is of very common occurrence. This has led to the preference given to the granular salt.

Potassium Citrate.—Almost all citrates contain lead as a common impurity. Of 15 samples examined, Hausmann (Drug. Circ., 1889, 151) reported seven as containing appreciable quantities of this metal. Reports of other analysts coincide with this. Qualitatively, this may be said of tartaric acid, and its salts. Fortunately, the quantity of lead present is but slight.

Potassium Bitartrate (Cream of Tartar).—In the category of medicinal chemicals, there is not one that is so easily obtained of a high degree of purity and yet so extensively sophisticated as cream of tartar. A ready market with a fair price, and the miscellaneous character of the dealers handling this chemical, add greatly to its liability to be adulterated. The old methods of sophistication through admixture with chalk, gypsum, calcium phosphate, starch, kaolin and the like, have largely made way for a class of mixtures which, when assayed in the usual manner by cold titration, will apparently contain 95 per cent. and over of the pure salt. To this class belong such mixtures as ammonia, alum, bitartrate, and starch; or alum, tartaric acid, and calcium phosphate; or alum, bitartrate, and calcium phosphate. If such samples be ignited, and the ash titrated with a normal acid, after having been extracted with water and filtering, the delusion is readily seen.

Argols.—It was thought that it would be of interest to note the quality of the various kinds of argols such as are imported into this country. Capetown samples assayed 69·9, 87·4, 90·5, 89·9, 86·96, 87·8, 81·4, 83·6, 77·4, 81·6, 80·6, 69·9, 66·2, 82·6, 83·8, 86·2, 88·4, and 91·8 per cent. of pure acid tartrate; 20 samples averaged 78 per cent.

Chile Argols assayed 82·2, 34, 72·3, 75·6, 70·4, 24·7, 77·6, 62·5, and 32·6 per cent.; 10 samples averaged 65·5 per cent.

Of French argols which assayed from 22·4 to 79·8 per cent., 65 samples averaged 62·6 per cent. pure.

Thirty-seven samples of Italian argols, running from 26·2 to 90·9 per cent., averaged 57 per cent. Samples of Spanish argols assayed 51·6, 41·2, 39·7, 42·6, 47·4, 56·6, 44·6, 51·6, 30·8, 49·7, and 55 per cent.

Two samples of Portuguese argols averaged 34 per cent., whilst five from Messina averaged 35·8 per cent. pure.

Potassium Iodide.—This important chemical rarely conforms to the official requirements of 99·5 per cent. purity. The percentage of chloride is frequently as high as 8 per cent. and many samples show excessive alkalinity. One sample examined contained about 3·5 per cent. of potassium carbonate. Dr. Gregory reports that of one lot of 17 samples purchased in different localities in New York State, not one complied with the official requirements, and of another lot of 15, only three were good, the remainder being excessively alkaline. Iodate is to be found in nearly all samples of this iodide. Owing to the frequency with which this important medicinal salt is prescribed in solution with alkaloids, too much stress cannot be laid on its freedom from all but the minimum percentage of alkali carbonate.

Potassium Nitrate.—The powdered salt is found freely admixed with common salt, even to the extent of 80 per cent.

Potassium Permanganate.—This salt, as supplied in bulk, varies considerably in degree of purity. Schlumberger (Rép. de Pharm., 1894, 260) reports an admixture with dextrin which had been coloured with malachite green. The usual impurities met with are manganate and manganese oxide.

Phenacetin.—This most popular and safest of antipyretics is quite extensively substituted by the dangerous and cheap acetanilide or mixtures of this with sugar, or sodium bicarbonate, or a mixture of phenacetin with sugar or soda or acetanilide.

Phosphorus.—Arsenic has been found in all samples examined, even as high as 1 per cent. In view of its extensive use in the manufacture of phosphoric and hypophosphorus acids and their salts, such a condition should be guarded against. It is to be hoped that the phosphorus of the old process will soon be supplanted by that of the electric furnace, which is reported to be free from this dangerous contamination.

Phenolphthalein.—Guyot (Pharm. Jour. Trans., 95, 1067) reports finding samples mixed with 16 to 21 per cent. of sodium sulphate.

Sodium Acetate.—Lead and arsenic have been found in this chemical. Drake (Mass. Pharm. Assoc., 1898) reports finding 19·5 per cent. of free acetic acid in one sample.

Sodium Nitrite.—MacEwan (Pharm. J., 83, 121) states that samples examined by him contained 0·01, 0·03, 0·95, 9·6, 28, to 98 per cent. of the pure nitrite, with 27 to 35 per cent. of sodium carbonate. Owing to the unstable nature of this salt, some allowance must be made for moderate deviations from the standards.

Sodium Phosphate.—This salt, which is at present one of the most popular of saline cathartics, is usually administered in daily doses of ½ to 1 oz., extending over greater periods of time, and should therefore be of exceptional purity. Analysts have reported finding some samples which contained arsenic as well as metallic impurities; unfortunately, to what extent was not mentioned. That of English origin has contained dangerous quantities of this poisonous impurity. Examination of original packages of various American manufacturers of this salt disclosed the presence of 1/40th of a grain of arsenious acid to each ounce of one sample, whilst others contained but little more than traces; still others were entirely free from this contamination. Older samples of some that are at present free contained appreciable quantities of arsenic.

Sodium Bromide.—The Committee on Adulterations of the New York State Pharm. Association reported that seven out of eight samples purchased in the State were below the standard requirements, 10 to 15 per cent. of moisture having frequently been found.

Sulphur (Precipitated).—This article, intended for medicinal uses only, should be prepared by precipitating a solution of the polysulphides of calcium by the addition

of hydrochloric acid. A cheap substitute, prepared by employing sulphuric acid in place of hydrochloric, is largely sold in its stead, This sometimes contains as much as 80 per cent. of calcium sulphate. Various analysts report that 80 to 85 per cent. of the samples purchased (as precipitated sulphur) contained calcium sulphate.

Sulphonal.—This hypnotic, which has come into extensive use, is substituted by original package imitations containing either sodium bicarbonate or a mixture of this and acetanilide, or even pure acetanilide. Such substitutes as the two last are dangerous, owing to the large doses in which sulphonal is administered to invalids.

Salophen (*Aceto-p-amido-salol*). — This is frequently found substituted by a mixture of acetanilide and sodium salicylate, the action of which is quite different from that of salophen.

Tartar Emetic.—This contains from traces to appreciable quantities of arsenic. O. H. Jackson reports 40 to 70 per cent. of potassium sulphate present in five samples purchased direct from English wholesalers. The article supplied to dyers is usually adulterated with the cheaper antimony fluorides, oxalates, &c. Cases have been noticed in which no traces of tartaric acid were present in the salt.

Thymol.—The high price of this valuable antiseptic has tempted sophistication with such substances as borax crystals and paraffin, which is cut into pieces resembling the crystals of thymol. The latter is only detected by a very careful inspection.

Vanillin.—This expensive chemical is very conveniently and frequently admixed with acetanilide in any proportion to suit the profits of the dealer. As much as 50 per cent. has been found. Benzoic acid, sublimed from the gum, has also been employed as an adulterant.

Compared with the total number of chemicals in common use, the percentage of those adulterated and those below official standards is not large; yet the importance of this class, coupled with their deficiencies, is sufficient to demand attention and inquiry as to why such a state of affairs is permitted to exist, in view of the constant violations of the law. The cases of gross adulteration or substitution which usually occur in "bulk" goods may be traced to irresponsible dealers and brokers. Such products find their way into the market through the usual trade channels, and pass unchallenged into the hands of responsible wholesale firms, where they are lost sight of in the details of the management of a vast business enterprise. Adulteration or substitution on the part of the retailer cannot be punished too severely. The manufacturers are able to furnish chemicals of any degree of purity that may be desired, and are ever ready to do so if allowed a fair margin. It is the unjust nature of the competition between the responsible and irresponsible that leads to the curtailment of processes and the failure to properly purify products. No valid excuse can be offered for placing on the market, for medicinal use, chemicals that contain appreciable quantities of poisonous metals, or other impurities that are deleterious to health, or liable to produce unforeseen decompositions with other chemicals. Some of these difficulties may, in my opinion, be overcome, if our manufacturing chemists and jobbers would adopt a uniform system of labelling their products, indicating clearly the quality or degree of purity. These conditions may be considered to be irreproachable when contrasted with the extent to which drug adulteration and substitution are carried on in our markets; hence the time has come when some efforts should be made to secure enforcement of our pure food and drug laws. I refer more particularly to those of this State, which cover the majority of these cases, but all efforts at enforcement are apparently futile.

It is to be hoped that the National Pure Food and Drug Bill, which was introduced by Representative Hepburn during the last session of Congress, may pave the way for new laws in other States, and secure uniformity and enforcement for all.

The efforts of my predecessor, Mr. Richardson, towards securing uniformity in methods of analysis certainly deserve our further attention. All departments of technical chemistry are represented among our membership, and there certainly are opportunities for improvement in securing uniformity in the various analytical methods in use. I would suggest that a committee take up the task of examining into the numerous methods of assay of alkaloidal drugs, with the view of adopting certain standard methods, in order to secure some degree of uniformity among the chemists of our chief ports of entry. No branch of analytical work is so open to criticism as to method and errors of manipulation as this, as the following tabulation will serve to illustrate. The results are those of five different experienced assayers, working upon the same and different methods. Differences of 1 per cent. and 2 per cent. occur quite frequently with the *same* method, and as much as 6 per cent. with *different* methods applied to the same sample.

Methods.	—	Chemist A.	Chemist B.	Chemist C.	Chemist D.	Chemist E.	Chemist F.
Opium I.	13·1	13·92	13·33	14·95	14·30	13·31	13·15 } Same
„ II.	13·74	13·43	14·35	14·18	..	14·50	13·92 } opium.
„ III.	15·10	14·90	15·86	15·64	..	15·50	14·80 }
Aconite Root I.	..	0·98	0·50	0·56	0·55	1·08	..
„ „ II.	..	0·88	1·08	0·96	0·61	..	..
Conium I.	..	0·66	0·58	0·59	0·54	..	..
„ II.	..	0·68	0·62	0·72	0·55	..	..
„ III.	..	0·70	0·54	0·54	0·60	..	..
„ IV.	..	0·52	0·97	0·92	..	..	..
Calabar I.	..	0·12	0·09	0·10	0·14	..	..
„ II.	..	0·14	0·12	0·12	0·07	0·09	..
„ III.	..	0·14	0·11	0·10	0·10	0·12	..
Belladonna Leaf I.	..	0·20	0·18	0·22	0·17	0·14	..
„ „ II.	..	0·22	0·21	0·21	0·19	0·16	..
Belladonna Root I.	..	0·57	0·54	0·59	0·58	..	..
„ „ II.	..	0·46	0·42	0·40	0·51	..	..
Cinchona Bark I.	..	3·61 }					
„ „ II.	..	3·05 }	average of six chemists' work.				
„ „ III.	..	4·33 }					
Hydrastis I.	..	3·56	4·00	3·50	3·50	3·30	..
„ II.	..	3·11	3·54	3·24	3·05	2·74	..
Coca I.	..	0·43	0·67	0·56	0·55	0·61	..
„ II.	..	0·89	0·81	0·76	0·78	0·87	..
Ipecacuanha I.	..	2·88	2·70	2·72	2·88	2·58	..
„ II.	..	1·74	1·85	2·11	2·05	2·23	..
Guarana I.	..	0·74	3·84	2·27	1·50	..	..
„ II.	..	3·75	4·00	4·26	3·86	3·93	..
„ III.	..	3·78	4·02	4·20	3·67	3·38	..
„ IV.	..	4·66	2·54	2·18	4·08	..	..
„ V.	..	6·84	6·54	6·64	6·40	6·70	..
Kola I.	..	2·46	2·50	2·46	2·57	2·50	..
„ II.	..	1·75	1·73	1·62	1·78	1·74	1·75
Stramonium Leaf I.	..	0·23	0·20	0·16	..	..	..
„ „ II.	..	0·22	0·20	0·16	..	..	..

Discussion.

Mr. T. J. Parker said that some of the chemicals mentioned were used for technical as well as for medicinal purposes, and that, where no intentional adulteration existed, the products condemned were probably sold for technical uses, not for use in medicine. Great credit was due to Prof. Coblentz for calling attention to the conditions existing among retail druggists, but his arraignment of the manufacturer in company with the retail dealer was too sweeping. Wholesale orders for chemicals were often placed by drug and chemical brokers with the lowest priced dealer regardless of the purity of the products or whether they were intended for technical or medicinal purposes. Acetanilide or mixtures containing it have been substituted for trional in some 40 per cent. of retail purchases. It was unfair to charge the frauds practised on the purchaser even by implication to the chemical manufacturer. There was a Board of Pharmacy to determine who was responsible for adulteration and have the guilty parties punished.

Mr. E. H. Gane said that he desired to correct any impression that might have been formed, from the remarks of Mr. Parker and the Chairman, that the large jobbing houses were responsible for the gross adulterations found by the latter. The origin of these spurious chemicals was pretty well known to those in the trade. At the same time those who were engaged in examining the medicinal chemicals offered in the American market would agree that they were by no means what they ought to be. Large quantities of the more important chemicals were not purchased through brokers, as stated by Mr. Parker, but were bought direct from the manufacturer, frequently in original small packages, and these passed through the jobbers' hands unbroken to the retail trade. These packed chemicals, prepared especially for medicinal use, were frequently of inferior quality.

There were many chemicals which it was almost impossible to obtain of anything like the standard set by the U.S.P., no matter what price was paid. Complaints to the manufacturer were frequently met by the statement that it did not pay to remove certain impurities, that their presence was of no import so far as the medicinal value of the chemical was concerned, and that the analyst should not be so "technical" in his requirements. This was an unwarrantable position for any manufacturer to take, as in medicines it was frequently the "infinitely small" that counted. He was convinced that there was room for considerable improvement in the manufacture of medicinal chemicals. Bismuth salts, for example, could not be obtained in anything like a state of purity in the American market. Every sample that he had examined contained more or less arsenic, iron, and copper, and in some cases lead and tellurium. Potassium iodide and bromide, sodium phosphate, lithium salts, the various hypophosphites, and other salts we could mention could only in very exceptional instances be obtained up to the U.S.P. standard. There was, moreover, considerable variation in different lots of the same chemical from the same maker. The responsibility for this state of affairs lay with the manufacturer, and he should not attempt to clear himself by throwing the blame upon the middleman.

Mr. Parker said that phosphate of soda could be obtained from the manufacturer in three conditions of purity. The technical, used by the dyer, which probably contained arsenic and was sold by the jobber at, say, $3\frac{1}{2}$ cents per lb.; the medicinal, which was practically free from arsenic and which would stand the Berzelius-Marsh test for some minutes and was sold for, say, $4\frac{3}{4}$ cents per lb.; and the chemically pure, which would stand the Berzelius-Marsh test for one or two hours, at, say, 40 cents per lb.

Mr. Caswell A. Mayo said that, in most States in which there was any pure food and drug law, the U.S. Pharmacopœia was taken as the standard for all articles mentioned in it. The application of this law in the State of Ohio caused an appeal from the druggists to the Pharmacopœial Convention of 1900 against the use, for any authorised preparation, of a name which was in common use for a commercial article of a different quality from that prescribed in the Pharmacopœia. The convention had complied with this request, and it was understood that in the new U.S. Pharmacopœia the term ammonia, for instance, which was commercially applied to a weak and somewhat impure solution of ammonia, would not be used for the aqueous solution of ammonia of the Pharmacopœia. Fortunately for pharmacy and for the chemical trades, the present committee of revision seemed inclined to take a rather more liberal view, and it was to be hoped that the views enunciated by the Chairman of the Section—who was also Chairman of the Sub-Committee on Chemicals in the Pharmacopœial Revision Committee—would be adopted in the new revision. From conversations which he had had with Dr. H. W. Wiley, chief chemist of the U.S. Department of Agriculture, he believed that the suggestions contained in the Chairman's address relative to the establishment of uniform methods of pharmaceutical analysis would be taken up and very likely carried to a successful issue, just as had been done in another line through the Association of Official Agricultural Chemists.

Dr. F. B. Kilmer stated that he had found chemical manufacturers quite competent and willing to furnish chemicals on contract conforming to a specified standard of purity, and that in his judgment the address of the Chairman did not, and was not intended to, convey the impression that the results represented chemicals produced by the American manufacturers as a whole, but rather flagrant cases of adulteration and sophistication. The most important point, in his mind, in the Chairman's address was the fact of the uniformity in methods of alkaloidal analysis. In many instances the U.S. Pharmacopœia required that a finished pharmaceutical preparation should be standardised to a given percentage of alkaloid. Taking as an imaginary example the speaker's figures upon guarana; upon what basis should a pharmaceutical assay be made? With this great variation of results it would be a very puzzling problem to adjust the strength to a required standard, and when the calculation has been made, who could say what would be the strength of the finished product. Again, many of the crude drugs enumerated, such as aconite, belladonna, &c., were bought and sold in the market upon the basis of their alkaloidal strength as shown by analysis. With such a wide variation of figures as given, how was it possible to accurately adjust the value of any specified drug? He hoped that a committee would be appointed to investigate the subject of alkaloidal analysis, and if possible secure a greater uniformity in methods and processes. The New York Section could well carry out this work, and many members whose work lay with inorganic compounds, and who had been so successful in working out processes suited to their particular branch of analysis, could aid those who work mainly with the organic compounds, such as are represented in alkaloidal analysis. The great variation in results obtained by present processes was most embarrassing when disputes arose, and the reports from different laboratories varied from a bare trace to one, two, or three per cent. of alkaloids. It was difficult to explain to those unacquainted with the intricate questions involved the reasons for the great variation, and it was a serious reflection upon the accuracy of chemical methods that such a condition should exist.

Dr. M. H. Ittner said he understood the Chairman to say that all the C.P. glycerin on the market in America contained arsenic. The assertion was a very broad one. One might infer from this that all glycerins contained arsenic in appreciable and possibly harmful quantities. From his own experience he could say that a very large amount of C.P. glycerin was produced in America which would not yield a trace of arsenic when subjected to the Berzelius-Marsh test for over half an hour, 10 grms. of glycerin being taken for the determination. C.P. glycerin was put on the market in large quantities, containing less than 0·01 per cent. of impurities other than water, and containing only a slight amount of water. There was also produced in America a large amount of dynamite glycerin which contained only the minutest trace of arsenic that can be detected by the most sensitive methods. Much of this class of glycerin was also of an exceedingly high degree of purity, as it was necessary it should be for

the uses for which it is intended, and even if applied to medicinal use would certainly have no injurious result from any arsenic it might contain. There were many ways by which glycerin might become contaminated with arsenic, though the amount of arsenic introduced need not be an appreciable amount, and if the distillations were properly conducted the arsenic might be so completely removed, that there would be no tangible proof of its presence in the finished product.

Dr. COBLENTZ, in reply, said that Mr. Parker had evidently misunderstood the trend of his criticism, as it was far from his intention to arraign the manufacturer along with an unprincipled dealer, broker, or retailer. Apart from the instances cited, as to the presence of arsenic, lead, or copper in chemicals, or failure to comply with recognised standards of purity, where the manufacturer was certainly at fault, he had in mind more particularly the lack of uniformity and accuracy in the labelling of chemicals, for without proper qualification the consumer is ever in doubt as to the quality or degree of purity. Such terms as "pure," or "purified" or even "C.P.," as frequently employed, were entirely too vague and apt to be misleading. If the product were intended for medicinal use, let it be prepared so as to stand the tests of the Pharmacopœia, and be *so labelled*. If intended for analytical purposes, let the quality, with degree of freedom from certain undesirable impurities, be distiuctly indicated on the label. This course, which has been adopted by a very limited number of manufacturers, should receive hearty support and be extended to all, including the jobber and broker. All instances of gross adulteration, or even substitution, were invariably the work of nameless dealers, brokers, and, in certain specified cases, retailers.

With reference to the remarks of Dr. Ittner, questioning the presence of arsenic in American glycerin, he would call Dr. Ittuer's attention to the source of information given. Two different samples of "chemically-pure" glycerin of American make examined recently by himself showed the presence of one part of arsenious acid in about 80,000 of one, whilst the other contained less. Glycerin was very frequently administered internally in doses of one fluid ounce or more; hence the presence of what might be considered as a trace of arsenic was a very serious matter. Samples of glycerin were obtainable in the market which were entirely free from this impurity.

Nottingham Section.

Meeting held at Nottingham, on Wednesday, October 29th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

THE WIJS METHOD OF DETERMINING THE IODINE VALUE OF OILS AND FATS.

BY T. F. HARVEY.

Communication from the Laboratory of Boots' Pure Drug Company.

The Wijs method of determining the iodine value possesses so many advantages over that of Hübl that its universal adoption is only a matter of time. Chief among them may be mentioned, great stability of the solution, which, if always measured at the same temperature, serves as a useful check on the thiosulphite titre, expeditiousness of working, and freedom from variation caused by altered conditions of experiment.

The working procedure is practically the same as in the Hübl method. For details concerning the preparation of the solution, &c., reference should be made to this Journal, 1898, pp. 610, 698, 699; 1899, 405, or to "The Analyst."

To ensure stability of the solution, it is important that the acetic acid be of 99 per cent. strength, and without action on permanganate; the finished solution should contain excess of iodine, so ensuring the absence of iodine trichloride.

Græbe has recently published a very convenient method of preparing chlorine (see this Journal, Feb. 1902, 284).

By using, however, iodine monochloride, or trichloride and iodine, the preparation of chlorine may be avoided.

The following table shows the iodine values which have been obtained by this method on a number of oils, those only having been included which were considered from the results of ordinary analysis to be genuine.

TABLE I.

Iodine Values of some Oils by Wijs' Method.

Excess halogen, 50 per cent. Time of standing, 10 to 15 minutes.

Oil.	Number of Samples.	Iodine Values found by Wijs' Method.
Almond	16	95·16 to 100·90
Apricot kernel	12	97·05 „ 105·40
Cacao butter	5	34·76 „ 37·47
Castor	7	84·09 „ 85·92
Cocoa-nut	4	8·47 „ 8·74
Cod-liver	24	159·20 „ 176·90
Croton	3	108·90 „ 112·50‡
Linseed	17	177·60 „ 187·20
Mustard*	8	106·80 „ 115·20
Neatsfoot†	8	68·50 „ 74·50
Olive	39	80·88 „ 89·16§
Poppy-seed (white)	5	136·70 „ 141·70
Rape	33	100·20 „ 108·70‖
Sesame	6	107·70 „ 111·90
Sperm Arctic sperm	14	80·93 „ 86·02

* Commercial oil from mixed seed.

† Possibly mixed with sheep's-foot or horses'-foot oil. For two samples genuine neatsfoot oil prepared by themselves Coste and Parry found 71·1, 72·4. Lewkowitsch gives for sheep's-foot oil 74·2; horses'-foot oil 73·8 to 90.

‡ Reichert Meissl values of these oils: 15·52; 14·6; 12·6. Iodine values: 108·90; 112·5; 111·0.

§ Mostly below 86.

‖ Sp. gr. of all these oils lay between 0·9138 and 0·9163.

Although I have found that in most cases the Hübl and Wijs methods are in very good agreement, the latter shows some tendency toward higher results (*cf.* Analyst, 1898, 240), *e.g.*, a sample of rape oil yielded by Hübl's method 101·6, and by Wijs' method 104·9. The case of cod-liver oil is *quite exceptional*, the results diverging some 7 or 8 per cent. The corresponding values for a particular sample were 161·6 (Hübl), 173·9 (Wijs).

Effect of adding Water before KI Solution.—Ingle (this Journal, May 15, 1902, 587) has shown that the action of potassium iodide upon some iodochlorides, notably those of stilbene and styrolene, is one of reduction with return to the unsaturated condition, and consequent diminution of the iodine value. This might be understood to apply merely to such substances as stilbene and styrolene, but later he says, in recapitulation, that "in all cases it is advisable to add water to the test solution before potassium iodide." Working with oils I have not found this to be desirable, but rather the reverse, for—

(*a*) If water be added to the blank experiment before potassium iodide a false blank is obtained, as is shown by the figures given in Table II.

At first it was thought that the loss might be occasioned by volatilisation of halogen, due to the running in of so much water, but this was shown not to be the case by attaching to certain of the bottles absorption apparatus containing potassium iodide solution. The loss seems, therefore, to be due to the formation of hypoiodous acid and its gradual decomposition.

(*b*) One is liable to the same source of error in the oil experiment, although to a less extent, because the concentration of IOH is less. In the blank experiment a

different figure is obtained, according as the water or the KI is added first; and since in the oil experiment a similar, but in my experience *very much smaller*, difference occurs, it seems to me that both these divergences arise from the same cause, *viz.*, decomposition of IOH, rather than from any action of the KI in the oil experiment.

TABLE II.

Effect produced by adding Water to the Blank Experiment before KI Solution and after.

True blank without any $CHCl_3$ or CCl_4 applying to the whole of this table = 29·66 c.c. of N/10 thiosulphate.

	10 c.c. of $CHCl_3$ + 15 c.c. of Wijs' Solution = c.c. of N/10 Thiosulphate.	Time of standing in contact with $CHCl_3$ or CCl_4.	Time of standing after adding Water and before adding KI.	Time of standing after adding KI Solution first, and then Water.	10 c.c. of CCl_4 + 15 c.c. of Wijs' Solution = c.c. of N/10 Thiosulphate.	
		Minutes.	Minutes.	Minutes.		
Running in water first to 150 c.c., and then 10 c.c. of KI solution.	..	3	..	..	29·23	
	..	3	..	..	28·74	Using absorption bulbs } Note the inconsistency.
	..	5	..	..	29·28	
	..	5	..	..	28·76	
	..	..	5	..	28·47	
	..	..	15	..	27·91	
	..	..	30	..	27·60	Note the increased loss on standing.
	26·84	..	30	..	26·94	
	..	..	60	..	26·69	
	..	..	60	..	26·60	
	..	..	60	..	26·72	Without CCl_4
Running in 10 c.c. of KI solution first and then water to 150 c.c.	..	2	..	..	29·67	
	..	15	..	..	29·61	Using absorption bulbs
	..	20	..	..	29·59	
	29·59	25	..	..	..	
	29·61	30	..	..	..	
In dark	29·51	30	..	..	29·60	In dark
In full light	29·53	30	..	..	29·60	In full light
	..	40	..	..	29·60	
	29·57	60	..	..	..	
	..	..	..	½	29·66	Note the increased constancy over $CHCl_3$.
	..	..	..	5	29·66	
	..	..	..	15	29·66	Note the constancy.
	..	..	..	30	29·66	
	..	..	..	60	29·63	
	..	..	..	60	29·64	

Excess of Halogen necessary.—Wijs originally worked with an excess of about 70 per cent., *i.e.*, if from 100 parts of halogen 30 are absorbed by the oil the remainder constitutes an excess of 70 per cent.

Lewkowitsch considers that it is unimportant whether the excess used is 43 per cent. or 75 per cent. (Analyst, 1900, 34).

Appended in Table III. are some figures which have been obtained on typical oils, and which I think sufficiently prove that variation in excess has but little influence, and that 50 per cent. is a reasonable working standard.

TABLE III.

Influence of Excess of Halogen on the Result.

Time of absorption, 15 minutes.

Oil.	Excess of Halogen present.		
	33 per Cent.	50 per Cent.	66 per Cent.
Olive	83·21	83·40	83·61
Rape	101·44	101·58	101·97
Linseed	180·72	181·07	181·76
Neatsfoot	70·92	71·28	71·52
Sperm	81·11	81·71	81·80
Cod-liver	169·54	170·53	172·30

Influence of Time of Standing.—Wijs has shown that absorption is practically complete in a few minutes, but considers the optimum times to be for non-drying, semi-drying, and drying oils, 15, 30, and 60 mins. respectively. The matter is not one of great importance, as is clearly shown by Table IV.

Precipitation of Iodochloride.—As far as my experience goes precipitation occurs only in the case of fish oils, and apparently has no influence on the result; for instance, working with 50 per cent. excess of halogen, and allowing to stand one hour, the following values were obtained on a sample of cod-liver oil:—172·41; 172·5; 172·42. As will be seen, those values are practically identical, although different quantities of carbon tetrachloride were used in each case, *viz.*, 10, 20, and 40 c.c. respectively. With 10 c.c. of tetrachloride, precipitation was very marked, while with 40 c.c. it was scarcely discernible.

TABLE IV.

Influence of Time of Standing.

Excess halogen used = 50 per cent.

Oil.	Time of Standing.			
	10 mins.	15 mins.	30 mins.	1 hour.
Olive	83·23	83·40	83·55	83·86
Rape	101·64	101·58	102·00	102·09
Linseed	182·70	..	183·61	183·33
Linseed	182·38	182·49	182·69	182·44
Neatsfoot	71·23	71·28	71·57	71·84
Sperm	81·50	81·71	81·59	82·10
Cod-liver	172·04	172·31	172·25	173·23

A sample of sperm oil gave values, 82·16 and 81·92, corresponding to tetrachloride, 10 and 40 c.c. respectively, only a slight turbidity occurring in the first case.

It is not permissible, however, to omit the carbon tetrachloride or chloroform altogether, for when this was done a sample of linseed oil gave a value 180·9, as compared with 182·7 when 10 c.c. of chloroform was used.

Influence of Temperature.—A few experiments were made to ascertain the bearing of temperature on the iodine value. With this end in view the values of rape, linseed, and cod oils were determined at 5° C. (approx.) and 25° C. At 25° C. the value for rape oil was higher than at 5° C. by 0·4 only, the value for linseed was higher by 0·36, and for cod oil by 1·2.

Iodine Bromide Solution.—The use of this solution has been recommended principally on account of its cheapness and the ease with which it can be made—considerations

which ought scarcely to bear much weight. I have made a few determinations with this solution, the results being recorded in Table V. These figures clearly indicate that it is slower in action than Wijs' solution, and yields lower values. Its use is therefore to be strongly deprecated, as leading to unnecessary multiplication of methods without any real advantage.

TABLE V.

Results with Wijs' and IBr Solutions.

	Time of Standing.		
	10 mins.	30 mins.	1 hour.
Linseed oil, Wijs.....	182·70	183·61	183·33
„ IBr.....	178·42	179·46	180·79
Cod oil, Wijs.....	172·04	172·25	173·23
„ IBr.....	..	169·17	169·44

DISCUSSION.

Mr. S. R. TROTMAN said that with one or two exceptions the figures that he had obtained from cod oils by Wijs' method very closely approximated those obtained by Mr. Harvey, namely, 159 to 176. But in the case of crude cod oils, the Wijs numbers were generally rather lower than those given by the Hübl method.

Mr. JOHN WHITE remarked that the author seemed to lay emphasis on the use of arrowroot starch. He himself always used potato starch, which he had found very satisfactory. As regards the thiosulphate solution, after adopting the practice of carefully recrystallising the salt, he had found that one standardising was sufficient, as the solution retained its full strength for months.

Dr. CAVEN did not understand that the stage in the process at which water was added could affect the analytical results; for if the iodine of the monochloride passed through the states of hypoiodous and iodic acids the power possessed by the solution of liberating iodine from potassium iodide would still remain the same.

The CHAIRMAN remarked that the Wijs method had so many advantages over the Hübl method, that he should be surprised to hear that any analyst of much experience in the analysis of oils still used the latter. At the same time, he did not agree that the Hübl method was unreliable. He had always obtained perfectly concordant and consistent results by allowing the iodine to act upon the oil for 18 hours, and he believed that those chemists who had not obtained satisfactory results had allowed too short a time. Another important condition of success in using the Hübl method was to have a sufficient excess of iodine present, which should be as nearly as possible equal to the amount absorbed.

When using the Wijs method, a blank experiment was in his opinion quite unnecessary. He had placed 30 c.c. of Wijs' solution and 10 c.c. of chloroform in a dry stoppered bottle, and had sealed the stopper with melted paraffin wax. After 72 hours, the iodine was titrated, and was found to be exactly the same as in 30 c.c. of the Wijs solution taken from the stock bottle at the commencement of the experiment. Although when using the Wijs method he always for the sake of uniformity allowed the times of contact recommended by Wijs, the absorption of iodine by fixed oils was so nearly complete in five minutes that for purposes of identification it was scarcely necessary to wait longer. With liquids like oil of turpentine, however, the end of the experiment was by no means so sharply defined, as the preceding results, all obtained with the same sample of American oil of turpentine, showed.

The theoretical value for $C_{10}H_{16} + I_4$ is 372.

The following results had been obtained in his (Mr. Archbutt's) laboratory: —

Wijs' Value of American Oil of Turpentine.

Time of Contact.	Wijs' Value.	
	(1)	(2)
minutes	277·4	..
hour	338·1	..
hours	359·8	355·5
hours	378·8	380·0
hours	383·2	382·1
hours	398·5	392·5
hours	403·7	405·6

—	Lowest.	Highest.	Average.	—
20 minutes' contact.	303·3	347·1	327·7	23 samples.
18 hours' contact	364·0	395·2	376·7	19 other samples.

In the case of oil of turpentine, therefore, the time of contact was very important, and had a great influence on the result. So far as his experience had gone, genuine American oil of turpentine should absorb at least 300 per cent. of iodine from Wijs' solution in 20 minutes, and at least 360 per cent. in 18 hours. Russian oil of turpentine absorbed less. As so few figures had been published, he thought these results might be useful to others, and he should be glad to hear whether the author of the paper could confirm them.

Mr. HARVEY, in reply, said that he had used the Hübl method before adopting that of Wijs, which he found gave slightly higher results. These only varied, however, from the Hübl results by one or two units in most cases. The starch solution must be freshly made, or be at least only a few days old.

Potato starch might be as good as arrowroot; he had always used the latter and found it perfectly satisfactory.

The thiosulphate solution maintained its strength fairly well if protected from the air by a layer of pure vaseline oil, the bottle having a syphon permanently attached to it for removing the solution. It was advisable to let a fresh solution stand a day before standardising.

Referring to the comparative merits of the Hübl and Wijs solutions, a great disadvantage of the Hübl solution lay in the presence of the alcohol, which underwent continual oxidation by the hypoiodous acid present, to some extent vitiating the accuracy of the method.

He had not much experience of the iodine absorption of turpentine oils.

Meeting held at Derby, on Wednesday, November 26th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

FACTORY COSTS.

BY H. STANLEY GARRY, A.C.A.

In the light of the severely technical nature of the subjects which come before the various Sections of our Society for consideration, I am conscious of a considerable departure from the usual routine in the subject of the paper I offer for your consideration to-night.

I must, at the outset, confess myself somewhat at a loss to understand the very considerable reticence which exists in our literature with regard to questions of profit and loss, seeing that these form no inconsiderable part of the reasons which necessitate our existence. I can only regard the existence of such a void as indicative of the sensitiveness of the profession to matters of monetary interest.

Mr. George Beilby, in his Presidential address of 1899, however, outlined a curriculum of chemical engineering study, in which one section was apportioned to organisation, works management, and costs. It may be gathered from that address, and also from the discussion which followed, that the study of chemical engineering was regarded as an

essential requirement in the case of works chemists, and that such a curriculum was incomplete without some regard to the problem of profitable manufacturing.

I propose, therefore, to-night to ask your attention to the subject of Factory Costs and Management as part of that curriculum, and I am the more emboldened in this by the fact, which has come under my personal observation, that notwithstanding the somewhat general prejudice against the employment of chemists, as such, in control of manufacturing operations, there is a definite tendency manifesting itself in this direction, and I believe that the employment of chemists as process managers is greatly on the increase.

Not only is this manifestation present in what may be termed chemical industries, but, in connection with the production of domestic and food products, there are firms who employ as many as eight chemists in controlling and directing the manufacturing departments of the factory. Not only are they responsible for the quality of the production, but also for the effective output of each department, involving the control of the workmen through departmental foremen.

This particular staff of process managers is controlled by the head of the laboratory, who has a special staff of chemists engaged in laboratory work. These alternate their duties with that of process-managing or process-controlling.

We arrive, therefore, at the position of factory or works controller, with the subordinate position of process manager clearly defined; and to the chief, as well as to the process manager as his possible successor, a knowledge of the problems of prime cost, production, and factory charges, together with economics, may be regarded as necessary for the performance of his duties. If we consider the nature of the duties to be performed by a factory manager in either the chemical or allied industries, and compare the training and education of the engineer, the chemist, or the commercial man, we must incline to the belief that in the tendency referred to, the doctrine of the "survival of the fittest" is naturally forcing the claims of the chemist to the front, and that in the future we must look for a more general adoption of this policy.

The fluctuations in the supplies and character of the raw material, the necessary adaptation of methods and processes to follow the same, together with the necessity for prompt action therein, are inducing a much closer connection than formerly between the chemist and the business man. There are some industries in which the advancing price of raw material has rendered its use prohibitive in the face of foreign competition, and whereas in past years such businesses were practically closed down, it is by the aid of the chemist that substitutes are employed and the continuity of the commercial business maintained.

Having dealt with the necessity for the chemist, who aspires to the position of factory controller, being acquainted with the subject of my paper, I turn to a consideration of the problems which face him at the outset. These problems, like many others when boldly grappled with, are much less difficult than might be imagined; and here let me say that there is no intention on my part to offer you a study in bookkeeping as any part of the method advocated. So far as bookkeeping and accounts are concerned, I am of opinion that any time devoted to this would not repay the digression from matters of more moment.

Not the least interesting of the many phases of industrial economics is the evolution of demand and supply in the case of Technical Accounting. We are told on the authority of Professor Thorpe, that nearly all the manufacturers in the United States are chemists. It may be merely a coincidence—but if so, it is sufficiently marked to deserve our attention—that it is in the United States that technical accounts (or, in other words, factory costs) are most highly developed. The sphere of the technical accountant is separate and distinct from that of the auditor and commercial accountant, who still retains his functions as expert and arbiter in profit distribution, whilst the sphere of the technical accountant is involved wholly in the problems of profit-earning. In this particular it is only fair to say that the engineering industry has been the pioneer, and up to now has monopolised the lion's share of public attention in this respect. This is possibly owing to the greater ease with which its raw material can be followed through its various stages to finished product.

In this country the literature of engineering management and costing gives ample evidence of the interest which this subject has for that industry, but up to the present I have not come across any literature dealing with the difficulties attending this subject in respect to the industries which claim the special interest of this Society. This may perhaps be owing to the very varied nature of the industries falling under this classification, and also to the comparatively small number of businesses in any one branch. There are, however, in all our industries the common factors of raw material and wages, and these two factors constitute the first division of my subject, under the heading of—

Prime Cost.—I would lay special stress here on the fact that in dealing with the principles and methods I now purpose submitting for your consideration, these must necessarily be somewhat general in form, and their application to special industries must remain with you.

Raw Material.—Probably in no other class of industry as in the chemical and technical does the question of supplies and character of raw material exert such a potent influence on cost. In some cases this is due to what may be termed natural causes, such as failure of crops, or may be due to changes in tariffs. In other cases, the raw material may be the by-product of other industries, which may be affected by drought or by international complications, or changes in national policy. In other cases, raw material may have to be dealt with as received, or be capable only of limited storage. It is therefore necessary to consider that the provision of the essential raw material for effective output may be subject to fluctuations other than the effect of market prices, in itself no mean originator of fluctuations in this respect. Another item as regards raw material is that of quality. This is affected to some extent by shortness or overplus of supplies as regards natural products. In some cases a short supply will give a better average yield, and full supplies will give a reduced average. In other cases, these items give opposite results. A further point calling for consideration here is the question of plant capacity for dealing with raw material, and I would emphasise as an initial element in factory costing, the organisation of the plant capacity of each department to the standard normal output required. In cases of fluctuation of raw material inwards, it may be an essential point to deal in the first stage with such fluctuations by a sufficient margin of the initial plant, so as to render storage possible between the first and second stages, and by such means eliminate this fluctuation from the following stages. In other cases from the nature of the material this is not possible, and in such case it may be necessary to face the cost of the provision of a plant-capacity margin over and above the actual working average. In such latter case there will probably be a dead-weight charge of depreciation, repairs, and possibly working expenses to take into account in the productive cost, which a system of factory accounting should demonstrate. Certainly the first step both to effective output and also factory accounting is the standardising of the various departments to each other, and the elimination of ineffective margins where not absolutely required by fluctuations in supplies of raw materials. It is perhaps the demonstration of the dead charges to be carried owing to deficient output which forms one of the cardinal virtues of an effective method of factory accounting, and as a matter of justice to the factory controller, it is self-evident that such increases of productive cost due to deficiencies in supplies should be thrown back from the factory upon the purchasing department. For, consider; however good the organisation may be, however carefully the expenses may be guarded, a period of short supplies, causing lessened production, will swallow up all your savings, unless the effect can be clearly demonstrated. A further point in connection with raw material, is that of the effect of price, and this again is a fluctuation of the same character as the last named in its effect on the exertions of the factory controller. Now it may appear

that this is looking at the matter of costing altogether from a somewhat narrow and selfish standpoint, but if the principle of specialisation is to apply in this case, as recommended by the highest economic authorities to industry in general, this is simply a case of specialising in factory costs and management, apart from the commercial departments of the business, and I think there can be no doubt that, as it is no part of the duty of the factory controller to interfere with the province of the buying department, so the fluctuations of the buying should not, as regards the operation of prices current, interfere with the factory costs as regards the results for which the factory controller is to be held responsible.

This may perhaps seem a novel doctrine, and a method which takes no measure of differences in cost of materials in the cost of production cannot be regarded as an accurate one. In the case of a combine, however, which controls a number of factories, or in the case of a firm or company owning a number of factories, consider the position of these factories as compared with the same class of factories under individual owners. In the case of the combined factories there will be a common material cost as regards the same class of material; in the case of the individual factories there may be as many different material costs as there are individual buyers. It must also be borne in mind that the whole argument regards the question of factory costs from the point of view of the factory controller for the purpose of this paper.

In dealing with raw material, therefore, from this point of view, necessarily the first consideration is to be given to the point of conversion and manipulation, and the second, to dealing with the fluctuation caused by increase or decrease in material cost. The first point, therefore, in this is the provision of a normal standard by which we can measure the effectiveness of the factory output, which measure would be needlessly complicated by the introduction of the fluctuation of market prices.

It may be assumed, therefore, that the proper provision of raw material for the period of return is a specified number of units. This constitutes an effective working output, and for present purposes a normal standard price for same is assumed, based upon a sufficiently extended period of past experience and present prospects. By this means there is obtained a standard against which may be measured the output, not only in quantity, but also in quality of material, as also in like manner the quality of the product. By thus taking a normal standard for both quantity and quality, it is possible to show in the first place the results of the management, and secondly, after this has been ascertained, the further effect on such cost of—

(1) The increase or decrease in market price.

(2) Any decrease on standard in production.

Standard.—The initial difficulty in setting up such a standard in any of these industries for the purposes of the factory cost appears at first sight not only difficult, but practically impossible, owing to the fluctuations in yield and the fluctuations in the character of the raw material. When, however, the problems are faced, it will be found not only possible but practical. To a profession such as that of the chemist, in which methods of deduction and analysis are carried to the highest perfection, it is a simple matter to apply the same methods to this subject. I might point the analogy in standard solutions, and the measure of the effect of reagents, but I am sure that I need not labour this part of my subject.

I may perhaps mention to you another analogy, in the compilation of the tables of mortality used by life assurance offices for the construction of their premium tables. As in that case, so in ours, the problem of moment is the computation of the averages on a sufficiently wide basis to eliminate erratic incidents. As a simple illustration, perhaps that of a miller may be considered, who works by blending, say, four different qualities of wheat and producing therefrom three species of offal and a variety of products, each differing in value and also in the class of consumer. In such a case there may be a blend of Californian, Australian, Argentine, and Canadian wheats, each possessing differing characteristics, and upon the varying quantities of each in the blend used may depend the quantity of each class of product obtained. Experience gives the average production in products following varying admixtures, and whilst this instance cannot be regarded as conversion of material in a chemical sense, it may yet assist to a grasp of the principles involved in the grouping of products to the raw material. The first step to this is inevitably the dealing with the by-products, and these are eliminated by their sale value (after deduction of expense in working, including wages, process, direct and indirect cost), as a deduction from the total initial cost of the material, leaving the balance to be divided by the units of the products. This, of course, gives us an addition to the total cost of the four products per unit, and from this it is required to set out the comparative cost value of the products by difference from each other. This also may be obtained by taking the differences in sale value as a measure, setting out the analysis of expenses and cost on each product where they differ from each other, and which are necessarily contained in their sales value. This will give the proportions of value in raw material between the different classes of raw material products requiring to be dealt with.

It is not to be assumed that it is possible to jump into a standard without either trouble or time, but there exists already a rule-of-thumb measurement of proportion of value between products in their raw material stages which can be collated for reference to the standards thus obtained. The recent successful treatment by the bedstead manufacturers of Birmingham, of comparisons of prime costs, is an indication of what may be done by combination of effort in special industries, and no doubt a collection of data by the joint effort of several businesses is more likely to furnish a reliable basis than that of a single business. This, however, is not always possible, and for present purposes the experience of one business taken over a sufficiently long period will give enough data for a first attempt at a standard. After thus once setting up the basis, it may be revised periodically, and the measure of the variations from such standard will of themselves not only indicate the accuracy of the figures, but also provide the basis for a revision in the mean of the fluctuations.

Wages and Labour.—Seeing that the responsibility for the product rests on the process manager and factory controller, it may be considered that the supervision of the labour required is an essential duty on the part of the chemist. In many cases there exists a divided responsibility in this respect, and there may be both a chemist and a works manager, the one supervising processes, and the other supervising labour. This, I think, depends very much on the circumstances of the factory as well as on the character of the chemist. There is nothing in the supervision of labour which calls for special remark; some men are born foremen, others but painfully acquire the ready decision, the compelled respect, and authority necessary for efficiency.

With wages, however, there come into view labour problems, and it cannot perhaps be too much emphasised that what is purchased of labour is not so much time, so many hours at so much an hour, but so much production, so much productive capacity. It is in this point of view where the Americans take a premier position, and in dealing with wages it is necessary to bear especially in mind that what is being paid for is production, and that wages are meant to be, and must be, a measure of such production. It follows then that the remuneration of labour should be in direct ratio to the efficiency of its production.

In connection with both American and German methods, however, it is necessary to consider the difference in the length of the weekly periods on which wages are calculated. I gather that in America their week consists of six full days, whilst in Germany it is often 6½ days to the week. The effect of this on the carrying on of processes will be

readily appreciated, especially when these are practically continuous.

In grouping the night and day shifts, it is possible, however, to gain considerable effect by making a half shift starting 12 p.m. on Sunday, and, with the half shift on Saturday, gain the same effect as in a six days' week.

In dealing with wages in a prime cost division, regard must be had to the basis of the labour remuneration. In some industries it is possible to modify the labour bill as regards the productive labour in ratio to the production, and this simplifies matters in costing. Considerable diversity of opinion exists as to the effect of piecework and premium wages, and the balance of advantage appears to rest with the premium plan as against piecework. In many industries the wages are of the nature of an expense rather than a cost, in that, owing to grouping of departments, the labour bill remains fairly consistent in the face of fluctuations in output. In the latter case, the differences in wages cost should be shown separately and carried down to a general sum representing the difference in cost of full and partial manufacturing as a dead charge. What is true of the whole is true in each department of labour. Special difficulties arise in every industry, but the principle remains the same.

The illustration used for demonstration to-night represents no nameable industry, but is a grouping of the difficulties in several. As will be noticed from the special cost sheet, there are two classes of by-products, one neat, one manufactured. There are also four classes of finished product, all varying in character and price. The raw material produces all these products in varying quantities each, but both by-products and products are not capable of individual enumeration. The averages of yields are taken on a basis of four weeks' trials, and represent a normal standard estimate. There is included in this prime cost—process cost—representing the value of chemicals and goods consumed in the various stages, and it is assumed that in the case of partial output, the process materials are not in all cases reducible to the actual ratio of output. This occurs through inability to reduce capacities to output fluctuations, and also in cases of mixtures requiring a minimum of bulk for operating. In many businesses dealing with natural products the same are dealt with as received, and a partial output does not necessarily mean 75 per cent. for six days, but a fluctuating daily total equal to that average on the week. In such case the overplus is practically waste, or materials not fully utilised.

Having obtained our prime cost firstly on its merits, we must add or deduct the percentage thereon due to fluctuation in market prices, and further state the addition made to the cost by increase of cost owing to partial output.

We come now to the other items of cost.

Direct Cost.—Packages; coal and coke; gas and water; stable expenses and cartage; repairs and maintenance; wages; factory salaries.

Indirect Cost.—Rent; rates and taxes; fire and employers' assurance; laboratory expenses; factory salaries; repairs to buildings; depreciation; coal, coke, gas, and water; repairs and maintenance.

Our principal and only difficulty in dealing with these is in the initial standard. Packages are readily chargeable to the several departments. Coal and coke must be allocated both with regard to power employed and also steam consumption in comparison in different stages. Power can be calculated from engine-hours' run, steam consumption by direct trials during holidays. These two divisions leave a remainder unaccounted for, which falls into general expenses. Gas and water are treated on the same method. Stable expenses and carting, after reduction by the apportionment of part to material cost, represents outward expenses and general charges, and may be calculated to output.

Repairs to plant are allocated from the mechanics' time sheets, and the best plan so far is to have a series of numbers painted on all machines and plant which are noted in the time sheet by the mechanic. Repairs by outside workmen and material are invoiced in the same order, and therefore the factory office can at any time give you the amount of the repairs, not only to each department, but also to each section of plant. Repairs, however, are somewhat fluctuating, and therefore, for short-period costing, an average should be taken and a weekly average amount inserted in cost. These weekly amounts are treated as a charge to cost, and a return showing the actual expenditure in each department as against the assumed figures is prepared quarterly or periodically.

With regard to the items of indirect cost, these are charged in a lump percentage to the total cost. The only item calling for special attention is that of depreciation, and perhaps there is no subject of cost which is less understood.

From the point of view of profit distribution, which too often resolves itself into questions of policy and expediency rather than logical conclusions, the depreciation represents a secret plant reserve. To the income tax surveyor it represents an actual tangible loss in the value of the machinery and plant to be made good at 5 per cent. per annum out of taxable profits. To the investor's mind it is a fund to be increased in good times, and reduced or omitted in bad times. To the factory controller it too often represents an appreciable addition to the cost of production which he may consider he is already bearing in repairs and maintenance and revenue additions. Of the policy, however, of writing down plant out of profits, the maximum that circumstances will permit, there cannot be any question, and therefore the only consideration is as to what share of depreciation is required to be included as factory cost. It is possible to regard the matter as divisible: firstly, as to wear and tear; secondly, as to the life of the machine; thirdly, as to the expectancy of the life of the machine from the view of process.

It is essential that an analyis of the plant should exist, and according to Mr. Ewing Mathieson, a heavier loss in wear and tear should be provided on steam-generating and motive power than on process plant. On the other hand, process plant should have a shorter expectancy, owing to probable changes in process; and perhaps there is no class of industry as that to which this paper applies in which this requires to be more appreciated.

There appears also no room to question that plant working 24 hours as against plant working in the day time only, requires more consideration in this respect. As remarked previously, in the case of repairs, these are dissected into departments, and it is on this departmental basis that this question is to be dealt with. There is included a percentage charge in the factory cost on each department, arranged so as to include both wear and tear and process dilapidations, giving both a depreciation and also a replacement charge. In the indirect cost is included a depreciation charge which covers general and steam plant.

In conclusion, gentlemen, the application of any method of factory accounting must necessarily depend on the special industry to be treated. It would be comparatively easy to take any special business, and show conclusively the carrying out of this method in such a manner that it could be readily grasped in a paper of this length, because the difficulties would be narrowed by the taking of a concrete example. If, however, in bringing before you an outline of factory cost suitable for the industries represented by the Society, I have interested you in the subject, I shall have fully succeeded in the object of this paper.

The pressure of foreign competition, the tendency to combination, the advancing expenses of manufacturing businesses in taxation, &c., the demands of labour for higher remuneration, and other causes, all tend in my opinion to a condition of industrial activity, in which the chemist will require to be equipped with a full knowledge of the various problems referred to, if he is to play his part in the maintenance of the industrial and chemical progress of our Empire.

TABLE A.

Factory Prime Cost Summary in Total Figures.

Maximum Standard Effective Output.		Revised Standard to Actual Output.		Description.	Actual Working.			Variation on Revised Standard.		
Quantity.	Cost Value.	Quantity.	Cost Value.		Quantity.	Cost Value.	Wages and Process.	Quantity.	Cost Value.	Variation in Wages, &c.
4,000	336,000	30,000	252,000	Raw Material						
595	24,990	446	18,742	No. 1 Material	420	17,649		− 24	− 1,093	
	4,800		3,600	Wages			4,450			+ 850
	48		40	Process Cost			42			+ 2
500	21,000	375	15,750	No. 2 Material	360	15,120		− 15	− 630	
	1,200		900	Wages			1,100			+ 200
	96		72	Process Cost			80			+ 8
350	40,840	263	30,630	P Material	248	28,860		− 15	− 1,770	
	8,000		6,000	Wages			7,000			+ 1,000
	6,000		4,500	Process Cost			5,200			+ 700
550	60,196	412	45,147	Q Material	424	46,462		+ 12	+ 1,315	
	16,000		12,000	Wages			13,500			+ 1,500
	4,000		3,000	Process Cost			3,100			+ 100
920	94,250	690	70,688	R Material	720	73,761		+ 30	+ 3,073	
	14,000		11,500	Wages			12,000			+ 500
	8,500		6,375	Process Cost			6,480			+ 105
995	94,271	747	71,041	S Material	782	74,637		+ 35	+ 3,596	
	18,000		13,500	Wages			14,500			+ 1,000
	7,600		5,700	Process Cost			6,500			+ 800
90	..	67	..	Shrinkage	46					
4,000	427,235	3,000	319,185		30,000	256,589	73,952	+ 77	+ 7,984	6,765
								− 56	− 3,393	
								21	4,591	

Nos. 1 and 2 represent the by-products. P, Q, R, S are the four products.

TABLE B.

Cost Summary.

Description.	Reference.	No. 1 By-Product.	No. 2 By-Product.	Product P.	Product Q.	Product R.	Product S.
Prime cost :—		Value.	Value.	Value.	Value.	Value.	Value.
Material	A	17,649	15,120	28,860	46,462	73,761	74,637
Wages	A	4,450	1,100	7,000	13,500	12,000	14,500
Process cost	A	42	80	5,200	3,100	6,480	6,500
		22,141	16,300	41,060	63,062	92,241	95,637
Direct cost	D	1,260	6,754	2,240	1,650	1,980	3,125
Indirect cost	E	2,077	2,446	5,320	6,546	5,927	4,204
Depreciation	D	750	840	1,480	1,310	1,640	1,180
		26,228	26,340	50,100	72,568	101,788	104,146
Cost per unit = cental	..	62·44	73·66	202·01	171·15	141·36	133·18
Deduct—Excess of cost due to partial output.	C	3·70	2·85	13·72	8·39	3·46	4·02
Standard cost	..	58·74	70·81	188·29	162·76	137·90	129·16
Excess cost	C	3·70	2·85	13·72	8·39	3·46	4·02
Increase in price of material	F	Nil	Nil	8·52	8·52	8·52	8·52
Total cost per cental unit		62·44	73·66	210·53	179·67	149·88	141·70

TABLE C.

Excess cost :—							
Prime	A	2·03	0·57	6·85	3·77	0·84	2·30
Direct	D	0·44	0·58	1·49	0·77	0·57	0·38
Indirect	E	1·23	1·70	5·38	3·85	2·05	1·34
		3·70	2·85	13·72	8·39	3·46	4·02

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1444
II.—Fuel, Gas, and Light	1445
III.—Destructive Distillation, Tar Products, Petroleum	1448
IV.—Colouring Matters and Dyestuffs	1448
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles. Yarns, and Fibres	1452
VI.—Colouring Wood, Paper, Leather, &c.	...
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1453
VIII.—Glass, Pottery, and Enamels	1454
IX.—Building Materials, Clays, Mortars, and Cements	1455
X.—Metallurgy	1455
XI.—Electro-Chemistry and Electro-Metallurgy	1458
XII.—Fats, Fatty Oils, and Soap	1459
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1460
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1461
XV.—Manures, &c.	1462
XVI.—Sugar, Starch, Gum, &c.	1462
XVII.—Brewing, Wines, Spirits, &c.	1463
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1464
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1466
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1467
XXI.—Photography	1469
XXII.—Explosives, Matches, &c.	1470
XXIII.—Analytical Chemistry	1472
XXIV.—Scientific and Technical Notes	1476

ENGLISH PATENT SPECIFICATIONS may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

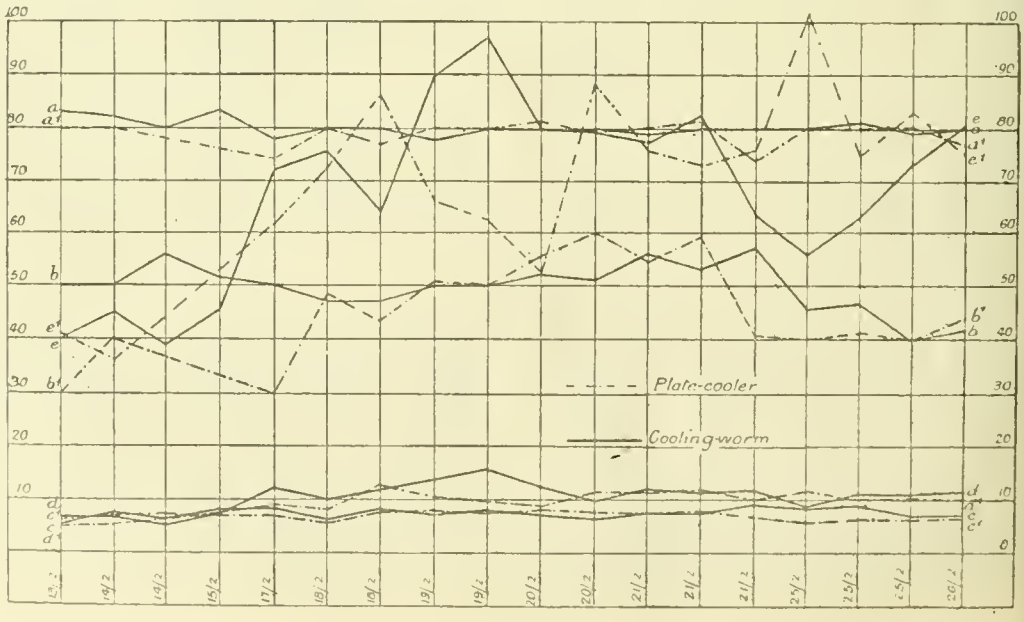
I.—PLANT, APPARATUS AND MACHINERY.

Plate-Cooler [*Condenser*]: *Theory and Practice of Parobek's* ——. C. Schärtler. Chem. Ind., **25**, [22], 529—531.

THIS apparatus was figured and described in this Journal, 1902, 1064. The author has had in use in the nitric acid manufacture one of these coolers, which, between Jan. 30 and May 14, had dealt with the products of distillation of 80 charges of 400 kilos. of nitre. The apparatus consisted of three plates, and completely substituted a No. 4 cooling worm of 650 mm. diameter of spiral and 900 mm. height (a plate-cooler of 900 mm. height would contain seven plates). A comparison of several days' work of this cooler with that of the worm was undertaken, and the results were plotted on the accompanying diagram. The abscissæ represent the dates, the ordinates of the different curves the corresponding results. The curves *a a'* and *b b'* give the temperatures of the cooling water after entrance into and at exit from the worm-tub; *c c'* show the yield in litres of distilled water, *d d'* the amounts of cooling water per unit of cooling surface per hour, and *e e'* the amounts of cooling water per 50 litres of distilled water. The corresponding curves agree very closely on the whole; though the curve *e* shows minima on Feb. 18 and 25, when *e'* shows maxima, while *e'* shows a maximum on Feb. 19, and *e* a minimum on the next day. The mean values are as follows:—

——	Worm.	Plates.
Temperature of cooling water, top	80° C.	78° C.
" " bottom	49° C.	45° C.
Distilled water, litres per square metre per hour.	7·5	6·8
Cooling water " " " .	10·2	9·5
" " for 50 litres distilled water.	70·0	70·5

—J. T. D.



English Patents.

Steam and other Boilers; Prevention and Removal of Incrustation in ——. R. L. Gamlen, Bromley, Kent. Eng. Pat. 15,137, July 25, 1901.

Non-vegetable fibrous material, such as wool, hair, silk, asbestos, and the like, is introduced into the boiler by adding it to the feed-water. A suitable quantity of fibrous material is 1/16th oz. for every ounce of total hardness in the water. Binding material, such as sodium silicate, may be added, together with any anti-incrustation fluid, if desired.—W. P. S.

Reservoirs for containing Inflammable and other Liquids; Safety ——. J. A. Keay, Leicester. Eng. Pat. 21,999, Nov. 1, 1901.

The reservoir is mounted on trunnions or pivots, and is closed automatically by its own weight, or by a spring or counterbalance, when a catch, &c., which holds it in open position, is disengaged. The closure of the outlet is effected by an abutment face or plate provided for the purpose.
—R. A.

French Patents.

Measuring and Mixing Gases; Device for ——. Boistelle. Fr. Pat. 317,750, Jan. 14, 1902.

The apparatus consists of two or more concentric drums, containing diaphragms and compartments, on a revolving horizontal axis, the drums holding a certain depth of water; the action is similar to that of an ordinary wet gas meter.—J. W. H.

Volatile and Inflammable Liquids; Preventing Explosions in Receptacles for containing ——. Cie. des Récipients et Lampes Inexplosibles. Fr. Pat. 318,307, Feb. 1, 1902.

See Eng. Pat. 12,183, May 28, 1902; this Journal, 1902, 1126.—C. S.

Distillation and Evaporation; Apparatus for ——. M. E. Mallmann. Fr. Pat. 319,128, Feb. 27, 1902.

The liquid to be distilled or evaporated is raised by siphon action and caused to traverse a series of superposed retorts, the vapour tension in which diminishes from the lowest to the highest. The liquid is sprayed into the lowest retort, and what does not evaporate, passes through a pipe into the retort next above, and so on throughout the series.—L. A.

II.—FUEL, GAS, AND LIGHT.

Peat; Determining the Value of ——. W. Bersch. Oesterr. Chem.-Zeit., **5**, 385—387. Chem. Centr., 1902, **2**, [17], 1080.

The calorific value of the organic matter of peat varies between 4,900 and 7,100 calories. Peat which, with a water-content of 20 per cent., develops 4,000 calories, can, in general, be regarded as a good fuel.

On dry distillation, peat yields 33—35 per cent. of charcoal, 4—5 per cent. of tar, 38—42 per cent. of tar liquor, and 25—18 per cent. of gas. Peat which is to be subjected to dry distillation should not contain more than 25 per cent. of water. Of the 0·8 to 2·4 per cent. of nitrogen in peat, only one-half, at the most, is obtained in the form of ammonia.—A. S.

Osmium Lamp; The ——. H. Remané. J. f. Gasbelencht., **45**, [46], 864—866.

Auer's osmium filament lamp is much less sensitive towards fluctuations in the voltage of the current than ordinary lamps having carbon filaments are; it may be burnt for days with a voltage 20 per cent. in excess of the normal without burning out or blackening the bulb. Osmium being a good conductor, it is difficult to make lamps for so high a voltage as the carbon lamps take; in direct-current installations, therefore, several lamps must be arranged in series. The alterations in the connections required to effect this, and the disadvantage that the osmium lamp can only be used in a hanging position, bear but little proportion to the advantages attending its use. Its consumption of energy, 1·5 watts per Hefner candle, is only about one-half of that of the ordinary incandescent lamp, and in constancy of illuminating power it is also much superior to the latter. The following table summarises the results of tests with an installation of 300 osmium lamps, all burning simultaneously, no precautions being taken to modify the fluctuations in the current, which was taken from the Berlin street mains:—

Series.	Hours Burning.	Volts.	Hefner Candles.	Watts per Hefner Candle.	Alteration in Light.
					Per Cent.
a	0	39	33·0	1·54	
	1,000	39	31·7	1·59	− 4
b	0	55	34·7	1·53	
	1,000	55	31·6	1·58	− 9
c	0	38	32·8	1·51	
	500	38	32·7	1·44	− 0·3
d	0	55	34·2	1·53	
	600	55	36·4	1·43	+ 6

Note.—1 Hefner candle is equal to 0·88 English standard candle.

As some of the lamps burned out before the others, the average durability in series *a* was 900 hours, and in series *b*, 869 hours; in the other two series none of the lamps were destroyed. Not infrequently individual lamps last for 1,500 hours.—H. B.

Calorimeter for Coal; Improved ——. W. Rosenhain.
See under XXIII., *page* 1472.

Town Refuse Disposal in Great Britain. W. F. Goodrich.
See under XVIII. B., *page* 1465.

English Patents.

Coke Ovens. J. R. Nicholson, Worsley, and H. Brown, Little Hulton. Eng. Pat. 26,411, Dec. 27, 1901.

To prevent the emission of smoke from coke ovens whilst charging, a steam jet is used in the stand pipe, or in a pipe provided for the purpose, to induce a current of air through the oven during the operation of charging.—H. B.

Furnaces. W. Stubblebine, South Bethlehem, U.S.A. Eng. Pat. 22,334, Nov. 5, 1901.

Improvements in boiler, puddling, crucible, and open-hearth furnaces. The grate is in two sections, composed of horizontal bars, arranged in an inclined position from the walls downwards towards the centre of the combustion chamber, the supporting bars being bent, at the lower ends of the sections, vertically downwards and resting upon the bottom of the water-sealed ashpit. An air-blast is delivered under each grate section. At the bottom of the ashpit a conveyor, having on one shaft a right-hand blade towards one end and a left-hand blade towards the other, removes the ashes. Part of the air-blast is heated by leading it through vertical pipes in the walls of the furnace; through passages surrounding these pipes part of the incompletely burnt gas from the fuel flows, the gas and heated air being delivered thereafter into the combustion chamber at a common point.—H. B.

Gas-Producers or Generators for use in Heating Gas Retorts. D. Irving, Bristol, and W. P. and G. B. A. Gibbons, Lower Gornal. Eng. Pat. 22,786, Nov. 12, 1901.

The usually arched upper portion of a gas producer or generator, for use in heating gas retorts, is formed "by corbelling over the side walls of the producer by means of special moulded blocks, each set on a horizontal bed and having vertical joints, the adjacent faces of said special blocks in the two side walls being so shaped as to form oblique corbels and at the top to receive the key blocks of the arch, in which are the nostrils for the gases to pass through."—H. B.

Gas Apparatus; Producer ——. J. S. Kemp-Welch, London. Eng. Pat. 24,691, Dec. 4, 1901.

The lower end of the blower pipe, in which a mixture of steam and air is produced by means of a steam injector, dips into a closed vessel containing water, and communicating, above the water level, with the generator. By this means the steam is partially or wholly condensed before the blast enters the generator.—H. B.

Gas Producers. J. A. Herrick, Philadelphia, U.S.A. Eng. Pat. 17,265, Aug. 5, 1902.

See U.S. Pat. 505,840; this Journal, 1902, 1068.—H. B.

Gas; Apparatus for use in connection with Generating ——. F. Bauke and C. Fuchs, Berlin. Eng. Pat. 17,297, Aug. 6, 1902.

The gas is drawn out of the generator by means of a water-jet pump, fan, or the like, and is cooled and cleansed by means of a spray of water; it is then led to the gas-service pipe through a pressure-regulating device. The latter consists of a box in which a constant level of water is maintained: through the bottom of the box the inlet pipe for the cooled and cleansed gas extends, and is surrounded by a water-sealed depending pipe, the upper part of which is connected to the service pipe. A pipe connects the box above the water level with the cooling and cleansing cylinder. Any excess of gas supplied to the box blows through the water seal, and passes back into the cleansing cylinder.—H. B.

Acetylene Gas Generators and Gasometers. J. Dargie, Forfar, Scotland. Eng. Pat. 17,463, Aug. 8, 1902.

A hand-fed carbide-to-water generator of the usual side-shoot pattern, fitted with a reaction grid capable of being agitated by means of an outside lever. A two-lift holder is also described, which has a tappet in such a position that if the generator is to be charged mechanically, the feed gear comes into operation when one lift is low; the gas in the other lift still being available for consumption at the burners.—F. H. L.

Burners; Atmospheric Gas ——. F. B. Passmore, London. Eng. Pat. 25,281, Dec. 11, 1901.

A burner, specially suitable for use with gas of low calorific value, in which the gas-injecting tube is provided with a nozzle which slides telescopically upon it. By means of a lever working over a scale, the nozzle may be pushed into or withdrawn from the conical portion of a mixing tube, so as to reduce or increase the amount of air drawn through the annular space surrounding the tip of the nozzle. To aid the mixing of gas and air, a conical baffle may be arranged centrally in the nozzle to deflect the gas outwardly into the current of air, and the nozzle may carry a small fan and wire-gauze screen.—H. B.

Burners; Incandescent Gas ——. A. J. Boult, London. From J. Braunstein, Berlin. Eng. Pat. 25,590, Dec. 14, 1901.

An incandescence burner, having one or more inclined tubes in the burner head, through which an additional supply of air is introduced beneath the mantle, and a mixing tube the upper portion of which is cylindrical, as usual, while its lower portion surrounding the gas inlet nozzle is bulbous and is provided with air inlets.—H. B.

Burners; High-Pressure ——, *for Incandescent Lamps.* J. and G. Keith, London. Eng. Pat. 26,198, Dec. 23, 1901.

Improvements on Eng. Pat. 16,955 of 1900. The burner is composed of two tapered tubes drawn from sheet metal and united at their narrower ends by a collar fitting closely over the joint, the collar extending upwards in cup-like form to support the cylindrical mantle-holder. The lower tube is swelled out conically near its lower end, and may be screwed up and down upon the gas inlet nozzle, whereby the annular space between the enlarged portion of the tube (which is provided with air inlets) and the upper conical portion of the gas nozzle may be increased or reduced. The nipple, which is screwed into the tip of the nozzle, is interchangeable.—H. B.

Carbons for Arc Lights [*Metallic Salt*]. H. Viertel and C. Pueschel, Berlin. Eng. Pat. 21,646, Oct. 28, 1901.

Strontium fluoride is added to the carbon, in relatively small proportion, not less however than 5 per cent. being sufficient to produce the desired effect upon the arc.
—H. B.

French Patents.

Fuels and Minerals; Manufacture of Cementing Agent for ——. Douschan de Vulitch. Fr. Pat. 317,847, Jan. 17, 1902.

Hydrocarbons, particularly coal-tar, are distilled up to a certain point (after the separation of the ammoniacal water) and finely-divided lime is added. The product may be used for forming briquette fuel, dealing with finely-divided ores by briquetting, &c.—J. W. H.

Poor Coal and similar Products; Cementing Agent for ——. Douschan de Vulitch. Fr. Pat. 317,848, Jan. 17, 1902.

The distillation of coal tar is stopped at about 280°—320° C. (just before the anthracene oils come over), and a quantity of resinate of lime (produced by heating lime and resin together at 180° C.) added; the heavy oils saponify and the light oils do not interfere; 2 to 10 parts by weight of resinate of lime are added for every 98 to 90 parts of tar used. The product is like a dry resin, and serves as a cementing material for briquetting coal, lignite, peat, &c.
—J. W. H.

Agglutinant Composition for the Preparation of Agglomerated Masses [*Briquettes*]. Soc. Georges Charles and A. Marquand. Fr. Pat. 319,181, Feb. 28, 1902.

The agglutinant, for use in the preparation of briquettes, consists of starchy and oleaginous matters and alum, and is prepared in the following typical manner:—A quantity of wheaten, barley, or oat flour is added to from 25—30 times its own weight of water and about 20—25 per cent. by weight of linseed meal, previously boiled together for 3—4 hours, and the whole is boiled for about 30 minutes. After turning out the mass into a pan, it is stirred up with an aqueous solution of 15—25 per cent. of alum (calculated on the amount of starchy matter taken).
—C. S.

Coke Ovens; Improvements in By-Product Recovery ——. Still. Fr. Pat. 319,146, Feb. 27, 1902.

To ensure uniformity of heating of the retorts, the walls separating the latter are traversed by vertical heating flues, into which the gas from the main is admitted by means of conduits of refractory material, perforated with a number of equidistant orifices, and situated in or in the wall of the bottom heating flues.—C. S.

Combustion Gases; Process for Desulphurising ——. Pollacsek. Fr. Pat. 319,025, Feb. 24, 1902.

The gases are desulphurised by passing them through a filtering material capable of absorbing the oxides of sulphur, which material may consist of plates, bricks, &c., composed of a mixture of milk of lime, a readily and a less readily combustible fuel, and a fuel rich in ash constituents (*e.g.*, 6 to 20 parts of quicklime, slaked in a quantity of water equal to the total weight of the other components of the mixture, 10—15 per cent. of sawdust, 20—25 per cent. of coal, 30—35 per cent. of anthracite, and 30—35 per cent. of lignite and peat. The blocks of this mixture are placed along with or in the rear of the fuel furnishing the gases to be purified, and form a porous spongy layer, consisting of a scoria rich in lime.—C. S.

Liquid Hydrocarbons; Process for Treating [*Vaporising*] ——. The Equitable Auto-Truck Power-Burner Co. Fr. Pat. 318,310, Feb. 3, 1902.

The hydrocarbon or oil, under pressure, is vaporised by heat, the resulting vapour being divided into tiny jets, each

of which is mixed with air, and then with a supplementary quantity of air by means of the expansive power of the vapour, which additional amount of air is proportionate to the volume of vapour supplied by each jet, the mixtures of air and vapour from the various jets being finally intimately mingled and ignited.—C. S.

Gasifier for Combustible Liquids. Pet and Claudel. Fr. Pat. 318,967, Feb. 22, 1902.

The liquid to be gasified is introduced through a valve which opens inward by its own weight and by the pressure of a spring, whilst the internal gas pressure tends to keep the valve closed. The liquid enters a chamber situated around a central flue, and forming a spiral conduit which the gas is compelled to traverse on its way to the outlet. Heat, from an auxiliary source, is applied to the outer walls of the spiral conduit until gasification begins, whereupon a portion of the resulting gas is drawn off through a tube branching from the gas outlet, and returned to a burner placed in such a position as to heat the liquid to be gasified.—C. S.

Gaseous Fuel for Explosion Motors. Morun. Fr. Pat. 317,543, Jan. 4, 1902.

Nitrous oxide (N_2O) is added in certain proportion to each explosive charge used in explosion motors. It may be stored, under pressure, in a liquefied state, and admitted as required. The force of explosion is increased, perfect combustion ensured, and regularity in running obtained.
—J. W. H.

Gas for Heating, Lighting, and Power, from Alcohol and Hydrocarbons. Pampe and Trolle. Fr. Pat. 318,232, Jan. 30, 1902.

A mixture of two or more liquids containing alcohol and hydrocarbons is heated in a gas furnace, the vaporiser, superheater, and gasifier of which are composed of several tubes communicating with a special form of retort, the said tubes being fitted with gauge glasses to indicate the rate of flow of the liquids. To ensure uniform distribution in the vapouriser, the liquids enter the retort through a tubulus fitted with a series of baffles. The heat of the gas produced in the gasifying retort is utilised for heating up the liquid mixture in a preliminary vaporiser.—C. S.

Gas; Manufacture of ——. Harris. Fr. Pat. 318,574, Feb. 10, 1902.

A quantity of mineral oil (68 litres) is mixed with a larger quantity (227 litres) of water, and with some alkaline substance (caustic potash, 2·3 kilos.), salt (900 grms.), slaked lime (1·36 kilos.), and sodium nitrate (1·8 kilos.), the whole being then distilled, and the resulting gas and vapour superheated, to furnish a combustible gas.—C. S.

Gaseous Mixtures; Method and Apparatus for Measuring the relative Volumes of the Constituent Gases, in Preparing ——. Oving. Fr. Pat. 318,657, Feb. 13, 1902.

The apparatus consists of a closed horizontal cylinder, on the axis of which are mounted two drums, one at each end of the cylinder, which latter is charged with water to a certain level above the central axis. The gases to be mixed are admitted separately to the drums, which are fitted with internal helical paddles, so arranged that when caused to revolve by the incoming gas they do not produce any disturbance in the contained water, the height of which in each drum is regulated by the gas-pressure there, which at the same time determines the volume of gas admitted. On issuing from the drums, the gases collect over the water in the outer cylinder, and pass away to the effluent pipe. Gauges are provided for reading the water-level in each drum. When the level of the water in the drums fluctuates beyond predetermined limits, the sinking of internal floats influences corresponding brakes, which act on the drum shafts and arrest their motion.—C. S.

Acetylene Generator. G. V. Foster and E. F. Mackusick. Fr. Pat. 318,298, Feb. 1, 1902.

See Eng. Pat. 2851, 1902; this Journal, 1902, 461.
—F. H. L.

Acetylene Generator. Bonnefis. Fr. Pat. 318,414, Feb. 1, 1902.

A drip-generator constructed in the shape of two truncated cones, screwed together apex to apex. The lower one is the carbide holder, and from it rises concentrically the gas-leading pipe, which passes through the upper cone (the water reservoir), thus cooling the gas, and permitting condensation products to run backwards. The water is fed on to the carbide through an inverted siphon pipe packed with cotton wool or the like.—F. H. L.

Acetylene Generator. Julien. Fr. Pat. 318,694, Feb. 11, 1902.

A flooded-compartment apparatus in which the water supply is controlled by the gas pressure. The decomposing vessel is the usual tall cylinder containing superposed carbide receptacles. The top of these is fitted with a tight lid, and all of them are bolted together, so that while the water enters from below and attacks the lowest one first, the acetylene has to return towards the base of the stack of boxes, and bubble through the water. On its way to the holder the gas passes through a condensing worm placed in a tank kept full from a cistern containing a ball-valve; and the water used for decomposing the carbide is taken from this tank through another ball-valve. It enters the decomposing chamber through three concentric tubes so disposed as to form a hydraulic seal, the supply being cut off, if the pressure rises, by an adaptation of the displacement principle.
—F. H. L.

Acetylene Generator. P. Jorat, Montpellier. Fr. Pat. 318,831, Feb. 18, 1902.

An automatic carbide-feed apparatus of the central hopper type, in which the mouth of the hopper is opened or shut by the movements of a conical valve connected with the rising holder bell. The generator requires granulated carbide, which is introduced into the hopper through a screw-closed aperture at the top. Outside the whole apparatus is a hand-worked lever, which in one position allows the carbide feed full play, in another locks it during the operation of charging, and in a third locks the carbide-feed and opens the sludge cock when the spent lime has to be removed. In this last position, also, the lever opens a cock for the admission of "air" which is required to occupy the space previously taken up by the lime sludge.
—F. H. L.

Acetylene Generator. Bailly and Chauvin. Fr. Pat. 319,028, Feb. 27, 1902.

A holderless automatic water-to-carbide apparatus working on the dripping system, the supply of water being governed by pressure. The apparatus consists of an upright cylinder with enlarged upper part, which is the water reservoir. Concentrically within it is a second cylinder fitted with two inverted siphons for the admission or retrogression of the water; and inside this second cylinder, supported on brackets, is the carbide container, the water inlet to which is near the top. The top of the container and of the middle cylinder are closed airtight by a removable cover. The water passes from the outermost vessel through the siphons into the middle one, where it rises till it can overflow on to the carbide; but when the pressure rises, some of the water returns through the siphons, and the level in the middle cylinder falls below that of the inlet to the carbide cage.—F. H. L.

Incandescent Lighting by means of Compressed Gas or other suitable Elastic Fluid. C. Scott-Snell. Fr. Pat. 318,422, Feb. 5, 1902.

See Eng. Pat. 17,507 of 1901; this Journal, 1902, 1179.
—H. B.

Carbon Electrodes for Arc Lamps. M. Conradty. Fr. Pat. 318,620, Feb. 12, 1902.

A longitudinal hollow is formed in the middle of the carbons, and is filled with a mass favouring the formation of an arc which burns with a fixed and brilliant light. The active portion of the mass is formed of the rare earth

metals, or of their compounds, or of solutions of their salts, the latter with the object of distributing them as uniformly as possible throughout the filling material.
—G. H. R.

Carbon for Electric Arc Lamps [Fluoride of Magnesium]. Siemens Halske Aktien Gesellschaft. Fr. Pat. 318,774, Feb. 17, 1902.

In arc-lamp carbons containing a certain amount of metallic salts, fluoride of magnesium is mixed with the latter in quantities nearly proportionate to their molecular weights, or in equal or greater amounts to them.—G. H. R.

Carbons; Photogenic or Photographic ——. Broca and Pellin. Fr. Pat. 318,994, Feb. 24, 1902.

The electrodes for the production of a luminous arc are formed of a carbon tube filled with a mass made of a metal agglutinated with a material which surrounding, combining or alloying with it, prevents its volatilising or oxidising too rapidly. The compound may be formed in the tube by the heat of the arc, or it may be made beforehand by the mixture or chemical combination of the metal with another metal or suitable metalloid. Iron mixed, alloyed, or combined with carbon, nickel, cobalt, tungsten, &c., is specially claimed.—G. H. R.

Mantle; Unbreakable Incandescent ——. Bezognard de la Plante. Fr. Pat. 318,435, Feb. 5, 1902.

Nickel wire, or the like, is covered with impregnated thread, and is then shaped into a mantle and burned off.
—H. B.

Mantles; Preparation of Threads for making Incandescent ——. Boullier. Fr. Pat. 319,217, March 1, 1902.

Threads of cotton, flax, or other natural cellulose fibre, are parchmentised by immersion in sulphuric acid, solution of zinc chloride, or the like, and are then impregnated repeatedly with solutions of light-giving earths, the earths absorbed by the fibres being rendered insoluble in the impregnating fluid between the successive dippings, until the threads contain as much light-giving substance as organic matter. For example, the threads may be impregnated with a basic solution obtained by saturating nitric acid with the hydrated earths; after removal of the unabsorbed solution, the threads are immersed in ammonia, or a solution of ammonium carbonate or fluoride, or oxalic acid, &c., to render the earths insoluble; the threads are again impregnated with the first solution; and this process is repeated until the desired degree of impregnation is reached.

Threads of "artificial silk" made by the nitration or cuprammonium processes; threads of viscose or parchmentised paper; and any other natural or artificial threads, may be impregnated repeatedly by the above process.
—H. B.

Material for Candles. Lewy. Fr. Pat. 318,129, Jan. 27, 1902.

Alcohol in convenient proportion is added to the greases used for the manufacture of candles. The cost is reduced, and the appearance of the candle improved.—J. W. H.

III.—DESTRUCTIVE DISTILLATION TAR PRODUCTS. PETROLEUM.

Aniline; Products of Oxidation of ——, *by Atmospheric Oxygen.* C. I. Istrati. Comptes Rend., **135**, [18], 742—744.

Aniline was boiled under a reflux condenser while air was continually bubbled through it. After 10 hours it had browned considerably; after 10 days it was black and viscous, and after 25 days quite solid. The mass was washed on a filter with cold alcohol; on the filter was left a brown-red mass (A), while a black liquid (B) containing unchanged aniline passed through. (A) extracted with cold chloroform gave in solution a dark-red substance (C), and on the filter greyish crystals (D). From (D), by exhaustion with alcohol and processes of purification, were extracted a substance crystallising in colourless needles (m. pt. 238°—239° C.), of composition approximately $C_{60}H_{19}N$, and a scaly substance (m. pt. 251°). The substance (C) yielded violet-red silky crystals (m. pt. 207°—208° C.), probably of formula—

$$(C_6H_5NH)_3:C_6H_2.O.C_6H_2:(NH.C_6H_5)_3,$$

and giving a blood-red substance on treating with sodium nitrite in acetic acid solution. From (B), after removing the aniline by steam distillation, a crystalline substance melting at 110°—112° C. was obtained. The violet-red substance is produced in by far the largest quantity.—J. T. D.

Benzene; Manufacture of ——, *in Russia.* N. Pantjuchow. Rigaer Ind.-Zeit., 1902, **28**, 217. Chem. Zeit., 1902, **26**, [94], Rep. 317.

In Russia a factory has been erected for the production of benzene from naphtha on a commercial scale. The process worked is that of Nikiforoff (see following Eng. Pat. 21,874, 1901) by a double distillation of naphtha or naphtha residues, the hydrocarbons being broken up by the employment of high temperature and pressure. The first distillation and decomposition is effected in two furnaces constructed for two or three days' continuous working. The first distillation yields 38 per cent. of tar, half of which consists of aromatic hydrocarbons, and which yields benzene, &c. on the second distillation. It is proposed to utilise the coke, gases, and heavy hydrocarbons for the purpose of fuel. The raw material is stated to yield 12 per cent. of benzene and toluene, 1 per cent. of anthracene, and 2—3 per cent. of naphthalene. The crude benzene is twice distilled, the second time in a Savalle column.—J. F. B.

Benzene in Grosny Naphtha, and Chemical Character of the latter. W. Markownikoff. J. russ. phys.-chem. Ges., **34**, 635—636. Chem. Centr., 1902, **2**, [19], 1227.

The fraction boiling up to 105° C. from Grosny naphtha contains 3·79 per cent. of benzene, or six times as much as the corresponding fraction from Baku naphtha. The naphthenes from both have the same chemical character, but the relative proportions of polymethylenes present are different.—A. S.

Water in Tar; Determination of ——. E. Senger.
See under XXIII., *page* 1475.

English Patent.

Hydrocarbons, Aromatic; Manufacture of ——, *and Apparatus therefor.* A. Nikiforoff, Moscow. Eng. Pat. 21,874, Oct. 30, 1901.

See Fr. Pat. 315,428; this Journal, 1902, 541; and also the above abstract.—D. B.

French Patents.

Carbonising Wood; Apparatus for ——. Mourlot. Fr. Pat. 318,655, Feb. 13, 1902.

The wood is introduced into a retort, to which heat is applied for 12 hours, the distillation products being conducted through a pipe to a condenser for subsequent collection and treatment; and the gas may be delivered through a pipe into the fire-box and employed for heating the retort. The novelty of the system rests on the fact that the heat is to be so gradually raised that, before destructive distillation commences, essential oils, &c., natural to the wood, may be recovered.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

1.3.4.5-Xylidine Sulphonic Acid. A. Junghahn. Ber., 1902. **35**, [17], 3747—3767.

The author obtains this acid by heating 121 grms. of *α-m*-xylidine and 106 grms. of concentrated sulphuric acid *in vacuo*, or in a current of air or indifferent gas for about

three hours. The melt is dissolved in dilute soda lye, the excess of xylidine blown off with steam, the residue filtered and allowed to crystallise, giving 151 grms. of the sodium salt. The amount of 6-sulphonic acid formed simultaneously does not exceed 5 per cent. The acid can also be obtained by heating the neutral sulphate with an excess of xylidine and slowly distilling off the latter, leaving the xylidine salt of the new sulphonic acid. The acid separates from hot water in white flat quadratic rods or plates. It is insoluble in alcohol, ether, benzene, and petroleum spirit, whilst one part is soluble in 250 parts of water at 0° C., and in about 28·5 parts at 100° C., the corresponding figures for the 6-sulphonic acid being 362·3 and 136·3. The potassium, sodium, and lead salts are anhydrous. The diazo compound is less soluble than that of the 6-acid, and when heated with alcohol to 125° C. in a sealed tube, it yields 4.1.3.5-ethoxyxylene sulphonic acid. It also gives, with hydrobromic acid, 4.1.3.5-bromoxylene sulphonic acid, from which the sulphochloride, amide, and anilide were prepared. The bromoxylene sulphonamide was treated with sodium amalgam, and gave 1.3.5-xylene sulphonamide, melting at 135·5° C. A further proof of the constitution of the 1.3.4.5-xylidine sulphonic acid was afforded by an investigation of the nitration product. This substance 6.1.3.4.5-nitroxylidine sulphonic acid, crystallises in white needles. The sulphonic acid group is readily removed by heating with hydrochloric acid to 100° C., yielding orange-red needles of 6.1.3.4-nitroxylidine. The nitrosulphonic acid yields 4.6.1.3.5-diazonitroxylene sulphonic acid, which, when boiled with water, forms 1.3.4.5-xylenol sulphonic acid. The so-called α-sulphonic acid of 1.3.4-xylenol obtained by Jacobsen (Annalen, **195**, 283) is identical with the 5-sulphonic acid described. Reduction of the nitro compound yields 4.6.1.3.5-diaminoxylene sulphonic acid. The author has also combined diazotised 1.3.4.5-xylidine sulphonic acid with β-naphthol and resorcinol, and the diazotised nitro compound with β-naphthol. The products dye wool yellow and orange shades.—T. A. L.

Nitrosomethyldiphenylamine and its Derivatives. Grimaux and Cloez. Bull. Soc. Ind. Mulhouse, Procés-verbaux, 1902, 209.

The mononitroso-derivative of methyldiphenylamine yields an Indamine, and also furnishes Oxazines with β-naphthol and gallic acid, Eurhodines with *m*-diamines, and a red dyestuff with resorcinol. A brilliant bluish-green dyestuff for silk and for tannin mordant results from the condensation of this nitroso-compound with diethyl *m*-aminophenol hydrochloride.—G. T. M.

p-Dimethylaminobenzaldehyde. F. Saehs and W. Lewin. Ber., 1902, **35**, [17], 3569—3578.

According to Ger. Pat. 103,578, *p*-dimethylaminobenzaldehyde is obtained by reacting with formaldehyde on a mixture of dimethylaniline and an aromatic hydroxylamine. The benzylidene compound first formed loses water, and the anhydro derivative, on treating with acids, yields the aldehyde. The authors have prepared a number of derivatives from this substance. By treatment with anhydrous hydrocyanic acid, it yields the cyanhydrin—

$$(CH_3)_2NC_6H_4CH(OH)CN,$$

from which the amine $(CH_3)_2NC_6H_4CH(OH)CONH_2$ is obtained by the action of concentrated sulphuric acid. The cyanhydrin condenses with aniline, yielding α-cyano-*p*-dimethylaminobenzylaniline—

$$(CH_3)_2NC_6H_4CH(CN)NHC_6H_5,$$

which, on oxidation with permanganate, yields phenyl-μ-cyanazomethin-4′-dimethylaminophenyl—

$$(CH_3)_2NC_6H_4C(CN):N.C_6H_5.$$

The product crystallises from petroleum spirit in orange-yellow prisms melting at 121° C., and its solution in acetic acid dyes wool greenish-yellow shades. A similar dyestuff is obtained from the aldehyde and aniline, and corresponding compounds have also been obtained from *p*-toluidine, *o*- and *p*-anisidine, and *p*-phenetidine. The condensation of the cyanhydrin with methylaniline takes place less readily than with aniline. The product—

$$(CH_3)_2NC_6H_4CH(CN)N(CH_3)C_6H_5,$$

on condensation with benzaldehyde by means of zinc chloride, yields an intense emerald green triphenylmethane dyestuff, whilst, on warming with concentrated sulphuric acid, it is converted into the corresponding amino compound. Dimethylaminobenzaldehyde condenses with acetone, yielding *p*-dimethylaminobenzalacetone and tetramethyl-*p*-diaminodibenzalacetone. Both these products in acetic acid solution dye wool, the former lemon-yellow and the latter orange-red. Equimolecular proportions of dimethylaminobenzaldehyde and acetophenone give a yellow condensation product melting at 114° C., which dyes wool from acid baths deep orange-yellow shades. Further condensation products have been obtained from nitrobenzylcyanide, barbituric acid, and malononitrile, and also from *m*-nitro-*p*-dimethylaminobenzaldehyde and acetophenone. Most of these are dyestuffs giving yellow, orange, or salmon shades on wool and silk, but are not sufficiently soluble to be of technical value.—T. A. L.

5-Nitro-8-methoxyquinoline and its Derivatives. G. Freyss and A. Paira. Bull. Soc. Ind. de Mulhouse, 1902 [July], 239—244.

The product analgine, 5-acetamino-8-ethoxyquinoline, is prepared from 8-hydroxyquinoline by successive ethylation, nitration, reduction, and acetylation. The corresponding methyl derivative has been obtained in a similar manner. Starting from *m*-nitro-*o*-anisidine, melting at 117° C., the authors have, by careful manipulation, obtained one of the intermediate products, 5-nitro-8-methoxyquinoline, which, by reduction and elimination of the amino group, yields 8-methoxyquinoline. The substance melts at 46·5° C. and boils at 282° C. under 742 mm. pressure, these figures being different from those hitherto given, whilst the product obtained by Skraup's synthesis from *o*-nitranisol exhibits the same properties as the authors' product. 5-Nitro-8-methoxyquinoline, obtained by heating together *m*-nitro-*o*-anisidine, glycerin, sulphuric acid and arsenic acid to a temperature not exceeding 122° C., is a crystalline substance melting at 151° C. On reduction it gives a 50 per cent. yield of the amino compound. This product is crystalline, gives colourless salts with mineral acids, is readily diazotisable, and then combines with β-naphthol, yielding a garnet-red. The acetyl derivative melts at 179° C., but has no particular physiological action.—T. A. L.

Nitrobenzyl Chlorides, Condensation of the ——, with the Naphthylamines. G. Darier and E. Mannassewitch. Bull. Soc. Chim., 1902, **27**, [20—21], 1055—1066.

The six isomeric nitrobenzylnaphthylamines are prepared by treating an alcoholic solution of the naphthylamine with the appropriate nitrobenzyl chloride, the former reagent being in excess:—

o-Nitrobenzyl-α-naphthylamine crystallises in prismatic needles and melts at 97°; its *acetyl* derivative at 129° C.

o-Nitrobenzyl-β-naphthylamine separates in orange leaflets melting at 162° C.; its *acetyl* derivative at 117°—118°.

p-Nitrobenzyl-α-naphthylamine is an orange-yellow substance melting at 126°—127°; the corresponding β-isomeride separates either in red pyramidal crystals or in yellow leaflets. Both forms melt at 121·5°; the *acetyl* derivative of the former base melts at 112°—113°. The nitro-bases yield on reduction a series of diamines containing one unsubstituted amino group. Accordingly, these derivatives are diazotisable and yield azo-derivatives with salicylic, naphthionic, α-naphthol-4-sulphonic, β-naphthylamine-3.6-disulphonic, and β-naphthol-3:6-disulphonic acids, and with the naphthols. These red, yellow, and reddish-violet dyestuffs are only slightly sensitive to acids or alkalis, and those which are soluble in water can be dyed on wool in acid baths. The shades thus produced are, however, lacking in brilliancy.

o-Aminobenzyl-β-naphthylamine is a solid melting at 110°—111°, the two *p-aminobenzylnaphthylamines* are oily compounds; these three diamines yield crystalline hydrochlorides and triacetyl derivatives.—G. T. M.

Dyestuffs derived from Naphthyldiphenyl-, Dinaphthylphenyl-, and Trinaphthyl-methane. E. Noelting. Bull. Soc. Ind. de Mulhouse, 1902 [July], 219—235.

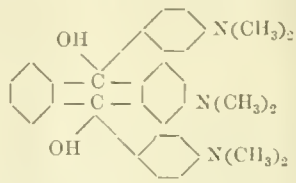
Although, since the discovery of Victoria Blue in 1884, a number of naphthyldiphenylmethane derivatives have been obtained, hitherto no derivatives of dinaphthylphenyl- or of trinaphthyl-methane have been described. The two general methods employed have been the condensation of tetramethyldiaminobenzophenone with secondary and tertiary naphthylamines by means of phosphorus oxychloride, or else by condensing tetramethyldiaminodiphenylcarbinol with naphthylamine, its alkyl and alphyl derivatives, and oxidising the leuco base formed. In order to obtain dinaphthylphenyl- and trinaphthyl-methane derivatives, it was necessary to start from ketones containing naphthylphenyl and dinaphthyl radicles. These were obtained by condensing the anilide of Ger. Pat. 44,077 with alkyl- and alphylnaphthylamines and decomposing the auramine compounds so formed. The author in this manner has obtained trimethyldiaminophenylnaphthylketone melting at 212° C., dimethylethyldiaminophenylnaphthylketone melting at 162° C., dimethylphenyldiaminophenylnaphthylketone melting at 202° C., and dimethyltolyldiaminophenylnaphthylketone melting at 221° C., as well as the corresponding compounds containing two ethyl radicles in the amino groups attached to the benzene nucleus. Certain dinaphthylphenyl derivatives were also obtained by condensing dimethyl-*p*-aminobenzaldehyde with alkylnaphthylamines and subsequent oxidation. The dinaphthylketones necessary for synthesising the trinaphthyl derivatives were obtained by reacting with carbon tetrachloride on alkylnaphthylamines in presence of aluminium chloride. A table of the various compounds obtained is given, and the following conclusions are arrived at:—In their properties and reactions the new dyestuffs show a great analogy to the triphenylmethane derivatives, but give blue instead of violet shades. Thus the penta and hexamethylated rosanilines are violet, whilst the alkylated naphthorosanilines are blue. This is evidently due to the presence of the naphthyl nucleus, which may be considered as a phenyl substituted in the o- and *m*-positions relative to the central carbon, and, as the author has shown in the case of Hexamethyl Violet, the introduction of a group in a single ortho position changes the shade to blue. A further difference is, that the naphthyl dyestuffs are much less soluble than the corresponding phenyl derivatives.—T. A. L.

Indogenides with Tinctorial Properties; Some ——. E. Noelting. Bull. Soc. Ind. de Mulhouse, 1902 [July], 236—238.

It has been shown by Baeyer that the indogenides obtained by reacting with aromatic aldehydes on indoxyl or indoxylic acid are red substances. It appeared probable that the introduction of auxochromic groups would yield true dyestuffs. This is the case, and the products found are analogous to those obtained from indandion (diketohydrindene), although in general not so full or bright. The author has condensed indoxylic acid in alcoholic solution with protocatechuic aldehyde, piperonal, *p*-aminobenzaldehyde and its dimethyl derivative in molecular proportions. The dyestuff from the first-mentioned product gives brownish-red shades on an alum mordant, and a dull yellowish-brown on unmordanted silk, whilst those from the two latter, dye reddish shades on silk and tannined cotton.—T. A. L.

Phthalic Green. A. Haller and A. Guyot. Bull. Soc. Ind. de Mulhouse, 1902 [July], 268—279.

By the action of phthalyldichloride on dimethylaniline, O. Fischer (Annalen, **206**, 112) obtained a very small yield of a product he termed Phthalic Green, which he considered as the phenyloxanthranol corresponding to the dimethylaniline phthalein. This, however, does not accord with the reactions of the substance, and the authors, on further examining it, find that its origin is due to the presence of unsymmetrical phthalyl tetrachloride, $Cl_3C.C_6H_4.COCl$. They have obtained the dyestuff with a yield of 60—95 per cent. by condensing this product with dimethylaniline in presence of aluminium chloride. They have also obtained it in almost theoretical yield by condensing equimolecular proportions of dimethylaniline and tetramethyldiaminophenyloxanthranol with tri- or oxychloride of phosphorus. The substance in the form of base is represented by the constitutional formula—



The two hydroxyls are not equivalent, and the authors assume that in the form of its salts the upper hydroxyl is replaced by the salt-forming radicle, since it is known that all the amino dyestuffs of triphenylmethane contain at least two amino groups para to the methane carbon. The base, $C_{32}H_{35}N_3O_2$, forms white needles melting at 150° C., the leuco base having the formula $C_{32}H_{35}N_3O$. On heating the dyestuff or the base in alcoholic solution with hydroxylamine or phenylhydrazine hydrochloride and an equivalent quantity of sodium acetate, equimolecular proportions of the base and amine condense, giving products melting respectively at 240° C. and 288° C.—T. A. L.

Amino-orcinol; Oxidation Products of ——. F. Henrich and W. Meyer. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [22], 595—599.

A solution of 4-amino-3.5-orcinol in caustic soda readily undergoes aerial oxidation, the mixture removing oxygen from the atmosphere as completely as an alkali pyrogallate. During this operation one molecular proportion of ammonia is eliminated from two molecular proportions of the aminophenol. The proportion of caustic soda has a notable influence on the nature of the product, and, with 2 or 3 mols. of the alkali, a mixture of two dyestuffs is obtained; one compound, which is soluble in alcohol, resembling orcein, whilst the other, which is insoluble in this medium, has properties similar to those of litmus. An amorphous brownish-yellow substance is also produced in small quantity, and can be separated from the other products by its solubility in ether. Although the constitution of these oxidation products is still a matter of uncertainty, their behaviour supports the hypothesis that they are phenoxazine derivatives. This supposition is in accordance with the views recently expressed by Liebermann and Wiedermann with reference to the dyestuffs of the æsculetin series (this Journal, 1901, 1104).—G. T. M.

Litmus, and its Similarity to the Insoluble Oxidation Product of Amino-orcinol. F. Henrich and W. Meyer. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [22], 599—601. (Compare preceding abstract.)

The less soluble dyestuff obtained from 4-amino-3.5-orcinol closely resembles litmus; the spectra and the alternate colour changes produced by acids and alkalis being almost identical. The two compounds have approximately the same percentage composition, and both evolve ammonia on heating with concentrated solutions of the caustic alkalis. Their acetyl derivatives are both brownish-red substances, insoluble in cold alkaline solutions, and their benzoyl derivatives are also very similar in appearance and properties.—G. T. M.

Luteolin and Apigenin. A. G. Perkin. Proc. Chem. Soc., **18**, [255], 180.

Kiliani and Mayer (this Journal, 1901, 1202) have recently asserted that the author's tetrabenzoyl-luteolin (Trans. Chem. Soc., 1896, **69**, 209) is in reality a tribenzoyl derivative. A re-examination of the original preparation shows that the statement of Kiliani and Mayer is incorrect, and that the substance is, without doubt, tetrabenzoyl luteolin. Further experiments with reference to the tinctorial properties of apigenin and chrysin confirm the previous results of the author (Trans. Chem. Soc., 1897, **71**, 806).

Di-indigotin. J. Moir. Proc. Chem. Soc., 18, [255], 194.

The author's object was to prepare the diphenyl analogue of indigotin, in order to ascertain what influence the doubling of the molecule would have on the colour, since this exercises a marked influence in the case of the benzidine dyestuffs, as compared with ordinary azo dyestuffs derived from aniline. Although successful in preparing the new substance, the yield was so poor and its properties so troublesome to investigate, that only a meagre description is possible.

The method consisted in applying the synthesis of indigo employed by F. Baeyer and Co. to benzidinedicarboxylic acid instead of to anthranilic acid.

English Patents.

Indoxyl [Indigo Dyestuffs] from Methylanthranilic Acid, or certain Derivatives thereof; Manufacture of ——. O. Imray. From The Farbwerke vormals Meister, Lucius und Brüning, Höchst a/Main. Eng. Pat. 26,060, Dec. 20, 1901.

See Fr. Pat. 317,081; this Journal, 1902, 967.—T. A. L.

Dyestuffs [Azo]; Improved ——. R. B. Rausford. From L. Cassella and Co., Frankfort-on-Main. Eng. Pat. 25,780, Dec. 17, 1901.

See Fr. Pat. 316,762; this Journal, 1902, 856.—T. A. L.

Dyestuffs [Azo]; Manufacture of ——. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Main. Eng. Pat. 25,781, Dec. 17, 1901.

See Fr. Pat. 316,720; this Journal, 1902, 856.—T. A. L.

Dyestuffs [Azo]; Manufacture of ——. R. B. Raosford. From L. Cassella and Co., Frankfort-on-Main. Eng. Pat. 26,147, Dec. 21, 1901.

The diazo compounds of *o*-aminophenol or of 2.3-aminonaphthol, or their derivatives, are combined with 1.1′.4-diaminonaphthalene sulphonic acid. The products so obtained are treated with nitrous acid, and then contain an azimino group. The dyestuffs give claret to violet shades on wool from an acid bath, which, by subsequent treatment with potassium bichromate, become green to greenish black, fast to washing, milling, and light.—T. A. L.

Black Sulphur Dyes for Cotton [Sulphide Dyestuffs]; Manufacture of ——. H. H. Lake. From Chem. Works, formerly Sandoz, Basle. Eng. Pat. 26,465, Dec. 27, 1901.

A black sulphide dyestuff separating directly in a crystalline form is obtained from 1.3.4-dinitrophenol, or the corresponding nitroamino- or diamino-phenol, by the action of an aqueous solution of an alkali "hyposulphite" (thiosulphate) under pressure at a temperature of 150°—170° C. The product is insoluble in water, dilute acids, alkali carbonates, alcohol, benzene, aniline, and strong sulphuric acid, but dissolves in soda lye and alkali sulphides. It dyes cotton from a bath containing sodium sulphide and salt, deep black shades, fast to washing, alkalis, acids, and light.—T. A. L.

Colouring Matters [Sulphide Dyestuffs]; Production of Intermediate Products and ——. Read Holliday and Sons, Ltd., and others, Huddersfield. Eng. Pat. 26,520, Dec. 28, 1901.

Amino-naphthol sulphonic acid G, or amino-naphthol disulphonic acid H, is condensed with 1.2.4-chlorodinitrobenzene in presence of sodium acetate. The resulting compound, which in the former case is an orange powder, gives, on heating with sulphur and sodium sulphide to 150°—250° C., a product dyeing black shades on vegetable fibres.—T. A. L.

French Patents.

Blue Dyestuffs containing Sulphur [Sulphide Dyestuffs]; Manufacture of Sulphonic Acids of Alkyl Derivatives of p-amino-p-hydroxydiphylamines and of ——. Fabrique ci-devant J. R. Geigy. Supplement, dated Feb. 20, 1902, to Fr. Pat. 310,809, May 13, 1901.

The blue sulphide dyestuff described in example II. of the chief patent, a derivative of dimethyl-*p*-amino-*p*-hydroxydiphenylamine sulphonic acid obtained from the corresponding indophenol with normal sulphites, can readily be converted into a compound easily soluble in water by treating it with sulphites or bisulphites. The new product dyes wool from an acid bath greenish-grey shades, which, on subsequent treatment with oxidising agents, become fast greenish-blue.—T. A. L.

Mono-azo Dyestuff; Manufacture of Orange Lakes from a New ——. Badische Anilin und Soda Fabrik. Supplement, dated Feb. 27, 1902, to Fr. Pat. 315,573, Nov. 2, 1901.

The diazo compound employed in the chief patent (this Journal, 1902, 514) may be replaced, according to the present specification, by that from 4-chloraniline 5- or 6-sulphonic acid, or from the mixed product obtained by sulphonating *p*-chloraniline (Annalen, 265, 93). The diazo compound is combined with β-naphthol, and gives a bright barium lake, fast to light.—T. A. L.

Red Dyestuffs [Azo Dyestuffs] Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 318,567, Feb. 10, 1902.

Tetrazo-diphenyl or ditolyl is combined with the neutral sodium salt of 2.1′.3′-naphthol disulphonic acid, and subsequently with sodium *p*-cresolate. The mixed disazo dyestuff thus formed, gives bright red shades on wool, fast to light and fulling.—T. A. L.

Brown Mordant Dyestuffs [Azo Dyestuffs]; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 318,919, Feb. 21, 1902.

The products are mixed disazo dyestuffs derived from *m*-phenylene diamine, combined on the one side with salicylic acid, and on the other with 1.4-naphthol sulphonic acid, 1.3.3′-naphthol disulphonic acid, or 2.1′.3′-aminonaphthol sulphonic acid, this latter being combined in an acid solution. The compound *m*-aminobenzene-azo-salicylic acid is obtained by hydrolysing the acetyl derivative, or by reducing *m*-nitrobenzene-azo-salicylic acid. The new dyestuffs give brown shades on mordanted wool, fast to fulling and light.—T. A. L.

Anthracene Dyestuffs; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 319,018, Feb. 24, 1902.

The dyestuff Indanthrene, of Fr. Pat. 309,503 (this Journal, 1902, 42), is, when dyed, not fast to chlorine, which turns the shade greenish. According to the present specification, if Indanthrene be acted on by halogens or substances which liberate them, the resulting products dye very similar shades to Indanthrene, but are fast to chlorine.—T. A. L.

Anthraquinone [Anthracene Dyestuffs]; New Derivatives of ——. F. Bayer and Co. Fr. Pat. 318,496, Feb. 7, 1902.

The two sulphonic acid groups in 2.6-anthraquinone disulphonic acid are replaced successively by the amino group, when heated under pressure with ammonia to a high temperature. The 2.6-amino-anthraquinone sulphonic acid so obtained, dyes wool bright orange shades, whilst the 2.6-diamino-anthraquinone crystallises from dilute pyridine in brownish-red prisms melting at 310°—320° C. with blackening.—T. A. L.

Indophenol [Sulphide Dyestuffs] corresponding to p-oxyphenyl-p-oxyxylylamine and a Violet Sulphur Dyestuff derived from it; Manufacture of an ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 318,577, Feb. 10, 1902.

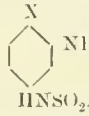
By oxidising *p*-xyleuol ($CH_3:CH_3:OH = 1:4:5$) and *p*-aminophenol with sodium hypochlorite in alkaline solution, an indophenol is obtained which separates from dilute alcohol in red crystals melting at 154° C. In place of *p*-aminophenol, its sulphonic or carboxylic acid may be employed. For the production of a dyestuff, the indophenol is boiled for 12—16 hours with a concentrated solution of sodium sulphide and sulphur, at about 120° C. On cooling, small brownish crystals, with a metallic reflex separate. The product dissolves to a violet solution in water, and gives dark violet shades on unmordanted cotton from a bath containing sodium sulphide.—T. A. L.

Dyestuffs [Oxazine Dyestuffs]; Manufacture of New ——. Soc. Anon., formerly L. Durand, Huguenin et Cie. Fr. Pat. 318,739, Feb. 15, 1902.

The new dyestuffs are derivatives of gallocyanines obtained by condensing nitroso-diphenylamine hydrochloride with gallic acid and its derivatives, such as gallamic acid, gallic ethers, gallanilide, &c., or sulphonated gallocyanines obtained by sulphonating the gallocyanines derived from nitroso-diphenylamine, or by condensing a nitroso-alkylbenzylaniline sulphonic acid with gallic acid or its derivatives. Three methods are employed. The gallocyanines are treated with a reducing agent (zinc dust and an acid), or with sulphurous acid, a sulphite or a bisulphite, or else they are condensed with a phenol such as resorcinol. The products give violet to blue shades on chrome mordanted fibres.—T. A. L.

Azo Dyestuffs, and Intermediate Compounds for the Production thereof; Manufacture of ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 318,806, Feb. 18, 1902.

Valuable azo dyestuffs are obtained by combining diazotised nitro-*o*-aminophenol or its derivatives with *p*-substituted compounds of aromatic *m*-amino alphylsulphamines of the general formula—



HNSO$_2$Alphyl,

where X is any substituting group, R and R′ represent hydrogen or alkyl radicles. These compounds are formed by condensing an aromatic sulphonic chloride with a *m*-nitro-derivative of a *p*-substituted aromatic amine; *e.g.*, *o*-nitro-*p*-toluidine, the condensation product being subsequently reduced. For example, *o*-nitro-*p*-toluidine is condensed with *p*-toluene sulphonic chloride in an aqueous solution of sodium carbonate. The resulting compound melts at 164° C. It is readily converted by zinc and hydrochloric acid into the corresponding amino compound, which melts at 160° C. When combined with the diazo compound of picramic acid, it yields a deep red dyestuff for wool. The shade, by a subsequent treatment with a chromium salt, becomes more bluish and faster to soap, fulling, and the action of light and sulphurous acid.—T. A. L.

Tinctorial and Tannin Extracts; Preparation, Purification, and Preservation of ——. Peyrusson. Fr. Pat. 318,523, Feb. 8, 1902.

See under XIV., *page* 1462.

Aromatic Radicles in Fatty Amines; Substitution of ——. Badische Anilin and Soda Fabrik. Fr. Pat. 318,920, Feb. 21, 1902.

By the action of primary or secondary aromatic amines on α-amino-nitriles of the fatty series, substitution of the aromatic radicle in the amino group of the latter takes place. For example, on heating together amino-acetonitrile hydrochloride and ethylaniline in dilute alcoholic solution, there results a brownish oil, ethylanilino-acetonitrile—

$$C_6H_5(C_2H_5)N.CH_2CN,$$

which, on treating with concentrated sulphuric acid, yields a new amide, melting at 110° C. and having the formula $C_6H_5(C_2H_5)N.CH_2CONH_2$.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk, Artificial; Properties of ——. J. Westergren. Teknisk Tidskrift, Stockholm, Nov. 23, 1901, 109—113. Proc. Inst. Civil Eng., 1902, **149**, [3], 59.

Natural silk is doubly refracting. In the case of artificial silk, this property depends upon the raw material used; gelatin silk does not possess it. In connection with the double refraction of artificial silk, the varying transverse sections of the threads give rise to differences of colour and shade, by which the several kinds can be distinguished. With regard to their chemical properties and appearance under the microscope, the various kinds of artificial silk are very similar, with the exception of gelatin silk. Air-dried artificial silk, when further dried at 110° C., loses 9·2—14 per cent. of its weight; with Italian raw silk the loss is 8·3 per cent. The strength is not impaired by this treatment, and if the dried silk be exposed to a damp atmosphere, it absorbs moisture in direct proportion to the amount it contained in the air-dried condition. Natural silk, when burned, leaves a vitreous cinder, which requires protracted heating to reduce it to a white ash. Chardonnet and Lehner silk are easily burned to a pure white ash. Pauly silk leaves a yellowish-brown ash, amounting to less than 0·1 per cent., and containing traces of iron. Other artificial silks leave more ash—from 1·0 to 1·6 per cent.; of natural silks, Chinese leaves 0·95 per cent., and tussur, 1·65 per cent. These two natural silks contain 16—17 per cent. of nitrogen, whilst the various kinds of artificial silk contain, of course, only small quantities—as a rule less than 0·2 per cent. (See also this Journal, 1902, 113.)—A. S.

Cotton Padded with β-Naphthol; Action of Heat, Moisture, and Steam on ——. A. Ulrich and C. Benade. Zeits. f. Farben- und Textil-Chem., 1902, **1**, [22], 601—602.

Cotton fabrics padded with β-naphthol, when exposed for some time to a moist atmosphere, become brown and yield dull brownish-red shades on developing with diazotised *p*-nitraniline. When the material is kept in a desiccator, the normal shade of colour is obtained. The effect of moisture is accentuated at higher temperatures, the amount of discoloration varying directly with the temperature and the humidity.

When steam is passed over cotton impregnated with β-naphthol, this substance is removed and appears in the condensed water, but if the steam be saturated with β-naphthol vapour, a good result is obtained on developing with the diazo-solution. An unpadded cotton fabric when exposed to the atmosphere of steam and β-naphthol, does not, however, take up very notable quantities of the latter unless it has been previously prepared with oil and caustic soda solution. (Compare this Journal, 1902, 1182.)—G. T. M.

Lead Chromate Dyeing; Disadvantages of ——. Leclerc de Pulligny. Bull. Soc. d'Encouragement, Oct. 31, **103**, [4], 497—501.

The dyeing of cotton fabrics with lead chromate frequently leads to cases of lead-poisoning amongst the operatives, the symptoms being sometimes aggravated owing to the specific toxic action of the chromic acid. Unfortunately this pigment appears to be more suitable than the yellow aniline dyestuffs, not only owing to its greater stability towards light and moisture, but also to its antiseptic properties, the dyed fibres being thus preserved from the attacks of insects. Zinc chromate, which has a lemon-yellow colour and is produced on the fibre by successively treating this with solutions of potassium chromate and zinc sulphate, also possesses these germicidal properties, and is, moreover, innocuous and even more stable than lead chromate itself.—G. T. M.

White and Coloured Resists under Steam Indigo. Freer. Bull. Soc. Ind. de Mulhouse, Procès-verbaux, 1902, 208.

Cotton is printed with materials which on steaming yield an insoluble soap. A mixture of oil with the acetates of calcium, barium, magnesium, tin, or lead may be employed for this purpose. After steaming, the cotton is dyed in the indigo vat. An emulsion of wax and borax forms a suitable resist, and, like the preceding mixture, it can be suitably coloured with alizarine steam colours or with Persian berries, gum tragacanth being employed as a thickening material.—G. T. M.

Azo Resists under a Steam Indigo Blue. Colli. Bull. Soc. Ind. de Mulhouse, Procès-verbaux, 1902, 207.

The materials are padded with glucose, β-naphthol, soda, and ammonium ricinate, and then printed with a resist mixture containing precipitated sulphur, liquid gum, aluminium sulphate, and a diazo solution. Finally the fabric is over-printed with Indigo blue thickened with soda and British gum. Diazo solutions of *m*-nitraniline, *p*-toluidine, xylidine, Azophor Orange M N, give orange shades, whilst red resists are produced from diazotised *o*-anisidine, *m*-amino-*p*-ethoxytoluene, cumidine, β-naphthylamine, Azophor Pink A. Brown tints are obtained from the tetrazo salts of tolidine and benzidine.—G. T. M.

White and Coloured Discharges on Aniline Black, Marine Blue, and Wool Bordeaux. Jaquet. Bull. Soc. Ind. de Mulhouse, Procès-verbaux, 1902, 208.

Wool padded with a mixture containing potassium ferricyanide, chlorate, and vanadate, and aniline hydrochloride, is dried and printed with an albumin colour mixture containing zinc white and sodium acetate and thiosulphate, the material being finally steamed and washed. The albumin can be coloured with cadmium sulphide, Guiguet's Green, or a red lake.

Soluble Blue is applied to the wool as a tragacanth colour, containing in addition Chromotrope, potassium chromate, soda crystals, sodium chlorate, and glycerin. A white discharge on this ground is composed of gum, zinc white, stannous oxide, albumin, and glycerin. Reddish ground shades are produced by mixing the blue with Bordeaux S.
—G. T. M.

Reserves on Prud'homme's Aniline Black by Means of Sodio-Stannous Citrate. F. Binder and J. Frossard. Bull. Soc. Ind. de Mulhouse, 1902 [July], 260—261.

Sodio-stannous citrate is obtained by heating together equimolecular proportions of stannous oxide and crystallised citric acid on the water-bath, and adding caustic soda until dissolved. The product gives a grey reserve, and on adding an iron salt, which combines with the prussiate in the black, a Prussian blue reserve is obtained. This can be shaded with Eosin to produce a violet, or with a lead salt, which, on subsequent chroming, gives an olive.—F. A. L.

Resists under Azo Dyestuffs developed on the Fibre. C. Schoen and E. Schweitzer. Bull. Soc. Ind. de Mulhouse, 1902 [July], 262—264.

Based upon the observation that β-naphthol is conveyed on steaming from the fabric on which it is printed to one with which it is in contact, the authors have devised a method for obtaining resists under azo dyestuffs. After printing a tannin resist on the fabric treated with Turkey-red oil, it is steamed for one hour under exposure to the vapour of β-naphthol resulting from the decomposition of sodium β-naphtholate during the process. The fabric is subsequently passed through a bath of diazotised *p*-nitraniline, washed, treated with tartar emetic, and soaped.
—T. A. L.

English Patents.

Sulphur Colours; Dyeing and Printing with ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 24,697, Dec. 4, 1901.

In employing either sodium sulphide or glucose and caustic soda in the dyeing and printing of textile fabrics with sulphur dyestuffs, a detrimental action is exerted on the animal fibres. This injurious effect is avoided by using a mixture of crystallised sodium sulphide, glucose, and soda in a bath containing excess of sodium chloride. The presence of the mixture of sodium sulphide and glucose is stated to materially increase the affinity between the fabric and the dye, animal and vegetable fibres becoming dyed with equal facility. Leather also may be dyed by a mixture of Immedial Black V., sodium sulphide crystals, glucose, and Turkey-red oil, the material being subsequently either dried directly or first treated with an acid solution of bichromate.—G. T. M.

Textile and other Materials; Process of and Apparatus for Treating —— with Liquids, and subsequently Drying the same. B. Cohnen, Grevenbroich, Germany. Eng. Pat. 7716, April 2, 1902.

The apparatus is a modified hydro-extractor containing a central liquid chamber, by means of which solutions can be circulated through textile materials contained in the goods basket or cage of the revolving drum. The pipes connecting the central chamber with the rotary pump are subsequently removed, and the goods dried by centrifugal action, the liquid being driven into an annular space between the outer case of the machine and the rotating cage.—G. T. M.

Steaming or Finishing of Textile Fabrics; Apparatus for ——. J. T. Lister, London. Eng. Pat. 21,830, Oct. 30, 1901.

A cylindrical chamber, fitted concentrically with an open skeleton reel supported on a tubular axis, is mounted on a standard having a movable arm, so that the apparatus can be fixed either in a vertical or horizontal position. The outer drum is divided longitudinally into two portions, which are hinged together so that one-half may be turned back to admit of the insertion of the reel with the fabrics rolled upon it. The closed drum is then set up vertically, and steam is blown into its interior, so that the vapour impinges both on the inner and outer sides of the reel, this result being effected by means of inlets situated in the tubular axis and in the ends of the cylinder. The lower end of the apparatus also contains outlets for the condensed moisture. By means of this arrangement the materials are conveniently steamed without being wetted by condensed water.—G. T. M.

VII.—ACIDS, ALKALIS, AND SALTS.

Aluminium; Chloridosulphate of ——. A. Recoura. Comptes Rend., **135**, [18], 736—738.

From a solution of aluminium sulphate in boiling strong hydrochloric acid, crystals are deposited having the composition $AlSO_4Cl.6H_2O$, analogous to the corresponding chromium compound (this Journal, 1902, 1076). The crystals are readily soluble in water, but freezing-point determinations show that the solution, even in the first moments of its existence, consists of a mixture of aluminium sulphate and chloride. As, however, the substance cannot be obtained by crystallisation from a mixture of the aqueous solutions of these salts (which yields crystals of the separate salts), and as alcohol, in which aluminium chloride is soluble, extracts nothing from the solid substance, the author considers the substance to be a chloridosulphate, exactly analogous to the chromium compound, from which it differs by being so much more readily decomposed by water. The author has tried to prepare a corresponding ferric compound, but without success.—J. T. D.

French Patents.

Sulphuric Acid; Concentrated [Solid] and Transportable ——. P. Claes. Fr. Pat. 318,745, Feb. 17, 1902.

Sodium bisulphate or nitre cake is melted with so much sulphuric acid as may give a product solid when cold (containing about three-fourths of its weight of sulphuric acid), in a suitably heated vessel, connected to an exhauster for production of a vacuum. Means are provided for condensing aqueous and nitrous vapours, and the retort has an exit pipe from which the fluid is delivered on to the surface of a slowly revolving drum, cooled internally by water, and from the side of which the solidified material is scraped, to fall between crushing rollers, and thence into suitable receptacles, to be closed air-tight, for storage or for transit.
—E. S.

Sulphuric Anhydride; Manufacture of ——, *by the Contact Process.* Cie. Par. de Prod. d'Aniline. Fr. Pat. 318,770, Feb. 17, 1902.

Asbestos or the like is saturated with phosphoric acid solution, dried, and used as contact material in apparatus for the production of SO_3 from SO_2; it is stated that 90 per cent. of the total SO_2 can be oxidised to SO_3.—E. S.

Sulphuric Anhydride; Revivifying Platinum used as Contact Material in the Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 318,861, Feb. 19, 1902.

When platinum used as contact material, is rendered inactive by absorption of arsenic, steam is mingled with the SO_2 passing, whereupon the arsenic passes into the vapours and is condensed with the acid recovered; as soon as this comes over free from arsenic, dry SO_2 is again passed, the platinum having recovered its activity.—E. S.

Sulphuric Acid and Sulphuric Anhydride; Manufacture of ——, *Utilising the Residues of Roasted Pyrites containing Ferric Oxide, and with the Simultaneous and Complete Combustion of the Sulphur still Retained in the Pyrites as Sulphide.* Cie. Par. de Coul. d'Aniline. Fr. Pat. 318,932, Feb. 21, 1902.

Burnt pyrites, still retaining residual sulphides, is impregnated with ferrous sulphate, and brought into contact with the undried gases from a pyrites kiln, at a moderate temperature, when a portion of the SO_2 in the gases becomes fixed in the charge; the latter is then subjected, still in contact with the gases, to a higher temperature, with the result that a mixture of SO_3 and H_2SO_4 is evolved, and the residue no longer contains any sulphur as sulphide. It is necessary to this process that the kiln gases should not be dry. Apparatus for carrying out the process is described. —E. S.

Alkaline and Alkaline-Earth Oxides; Production of ——, *in the Electric Furnace.* M. Bouvier. Fr. Pat. 319,189, March 1, 1902.

See under XI. A., *page* 1458.

Alkali and Alkaline-Earth Sulphides; Production of ——, *in the Electric Furnace.* M. Bouvier. Fr. Pat. 319,187, Feb. 28, 1902.

See under XI. A., *page* 1458.

Sodium Sulphate and Concentrated Hydrochloric Acid Gas; Preparation of ——. Société K. Oehler. Fr. Pat. 318,386, Feb. 4, 1902.

Sodium bisulphate or nitre cake, and a suitable proportion of sodium chloride, both finely powdered, are intimately mixed, and the mixture is heated below redness in a closed vessel provided only with an exit tube (or tubes) for the gas. Friable sodium sulphate remains in the retort. (Compare U.S. Pats. 698,704 and 702,877 of 1902; this Journal, 1902, 772 and 971.)—E. S.

Sulphocyanides; Treatment of Coal-Gas for he Manufacture of ——. The British Cyanides Co., Ltd. Fr. Pat. 318,553, Feb. 10, 1902.

See Eng. Pat. 13,653 of 1901; this Journal, 1902, 1077. —E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Pottery; Note on the Vaporous Method of Glazing ——. W. P. Rix. Trans. North Staffs. Ceramic Soc., **1**, 1901–2, 26—33.

The decline of vaporous glazing is ascribed to the demand for cheapness and for uniformity of texture and colour.

Three distinct processes are mentioned: (1) the development of a carbonaceous atmosphere in the kiln, to have a reducing effect, as in the case of lustres; (2) the development of a plumbiferous atmosphere, as in smeared wares; and (3) the development of an alkaline atmosphere, as in salt glazes. Only the two latter involve the essential principle of vaporous glazing, namely, the chemical combination of certain elements in the vapour with certain components of the surface of the body to form a glaze.

In vaporous glazing, the period of body-firing can be separated from that of the glazing, and by the development of the alkaline atmosphere, glaze mixtures that resist the temperatures of the body-firing, can be converted into masses of a low fusing point.

In salt glazing the sodium oxide only produces a glaze at about 1,200° C., and not until the pores of the ware just below the surface have become filled with alkali.

The following points are mentioned:—

(1) The body material must be highly silicious, as the glaze is produced by the action of the alkali on the silica.

(2) The silicious particles should pass through a 120 to 140 mesh.

(3) The combination of the silica and the alkali does not readily take place until the point of incipient vitrification is reached.

(4) The condition of the kiln atmosphere at the moment of incipient fusion gives the final result of the condition of the body beneath the glaze, and consequently affects the colour; the blackish colour produced in ware by a reducing atmosphere cannot be rectified.

(5) As the introduction of the salt causes an inrush of cold air, it is advisable to add the total amount in two or three portions, and increase the temperature by a light firing between each.

(6) The value of salt for this purpose is its power of decrepitation, which causes the alkaline particles in a fine state of division to be scattered over a large area, unaffected by the draught. Moisture is necessary to the chemical reaction, but must not cause the salt crystals to cohere.

(7) Slow cooling tends to crystallisation, and ware should be cooled rapidly to about 700° to 860° C. (the disappearance of redness).

A satisfactory range of colours is obtained by pencilling the surface with a coloured felspathic glaze, which fuses only after the addition of the salt, or by using body stains on white ware, the colours of which are developed by the salt vapour.

The regulation of the draught currents in order to obtain a uniform dispersion of the vapour throughout the kiln is of the greatest importance.

It is noted also that colours adjacent to each other during the process frequently "strike off."

The chemical reactions given for salt glazing are:—

(*a*) $NaCl + H_2O = HCl + NaOH$,

(*b*) $2NaOH + n.SiO_2 = Na_2O.n.SiO_2 + H_2O$,

the HCl of (*a*) and the H_2O of (*b*) uniting to give the characteristic dense fumes. The nature of the silicate, arising possibly from the combined, and possibly from the uncombined silica in the clay, is not definitely known; all the alkaline silicates, but apparently only certain aluminous silicates, are acted upon. Subordinate reactions, due to ferric oxide, also occur, *viz.*:—

(*c*) $6HCl + Fe_2O_3 = Fe_2Cl_6 + 3H_2O$;

or (*d*) $6NaCl + Fe_2O_3 + 3H_2O = Fe_2Cl_6 + 6NaOH$.

Other alkali compounds in place of salt have not proved satisfactory, owing chiefly to the failure to decrepitate under the action of heat in the kiln.—W. C. H.

China; Bone in English ——. H. E. Wood. Trans. North Staffs. Ceramic Soc., **1**, 1901–2, 21—25.

The employment of bone in English china dates from the middle of the eighteenth century. As used by the potter, it consists of calcium orthophosphate, with some impurities, generally due to imperfect calcination and to grinding, and is added to the extent of 30 to 50 per cent. of the china. Opinions vary as to the part played by bone in china. The author concludes that it remains as calcium phosphate throughout the firing, and dissolves in the silicates, without affecting their translucency; that it increases the whiteness and lightness of the body; that, present as an unalterable body, it is a safeguard against overfiring, and consequent distortion and blistering; and that it reduces contraction, and is an antidote to "crazing."—W. C. H.

Glazes; Crimson ——. R. H. H. Jones. Trans. North Staffs. Ceramic Soc., **1**, 1901–2, 3—7.

The objects of the experiments, in which firing was effected in closed boxes in a kiln at a temperature indicated by the bending of Holdcroft and Co.'s thermoscope bar, No. 21, were to produce a satisfactory glaze, and to trace the effect of—(1) Alkalis; (2) whiting; (3) tin oxide; and (4) chromic oxide.

With regard to alkalis, the author merely observes that it is impossible to produce a crimson glaze, in which lead is

the only flux. A better colour and brighter surface are obtained with a strongly alkaline glaze even when lead is excluded.

Whiting added to a clear alkaline glaze up to 10 per cent. produced no particular effect; when 6 per cent. of tin oxide was added, the glaze became opaque, with a pinky cast. The same proportion of lime with 2 per cent. of lead chromate, and no tin, gave a clear chrome-green glaze, but when all three were present in the same proportions, a deep opaque crimson resulted. From the experiments, lime appears to intensify the colour, provided the glaze is alkaline.

Tin oxide, when combined with lime and "chrome," not only produces the crimson, but gives body and uniformity to the colour, when present to the extent of 5 per cent. or more.

Chrome, usually relied upon for greens, appears to have the power at high temperatures of holding up the pink given by the combination of lime and tin, and the higher the percentage present, the deeper the colour.—W. C. H.

FRENCH PATENT.

Enamels and Photographic Plates; Application of Colours to ——, without Painting or Printing. H. Perrin. Fr. Pat. 319,117, Feb. 27, 1902.

POWDERED vitrifiable colours are applied to the surface with a brush, by hand, superposing the different colours, beginning with the darker. The latter on firing show through the clear colours spread over them, and with which they combine with them to produce the desired effect.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

ENGLISH PATENTS.

Grinding or Reducing Lime, Ashes, Sandstone, Limestone, Fireclay, Quartz, and other Minerals or Materials; Machinery or Apparatus for ——. F. E. Whitham, Sowerby Bridge. Eng. Pat. 18,716, Sept. 19, 1901.

A PURELY mechanical arrangement, an advantage of which is stated to be that modifications, specially adapted for treating fire-clay, basic slag, china-stone, cement clinker, brass dross, &c., are available, in which parts of the operative surfaces are made removable, so that worn or damaged parts can be replaced.—R. A.

Clay; Treatment of Impure ——, for use in the Manufacture of Bricks and Articles of a like Nature made or manufactured from Clay. J. Burn, West Hartlepool. Eng Pat. 24,072, Nov. 27, 1901.

CLAYS containing lime or limestone are crushed in order to break up the calcareous nodules, and afterwards a suitable admixture of coal or like material is made to the clay, the articles made from which are exposed to the heat of a kiln or furnace "until the lime or limestones are fluxed."

—W. C. H.

Marble, Stone, and the like; Artificial ——. G. A. Newton, Bootle. Eng. Pat. 3102, Feb. 11, 1902.

A COMPOSITION of 10 parts of Venetian cement or magnesite, 2 to 30 parts of sawdust, and 7 to 40 parts of a solution of magnesium chloride, containing 29 to 35 oz. of magnesium chloride to 1 gall. of water.—W. C. H.

FRENCH PATENTS.

Wood; Preservation of ——. J. L. Ferrell. Fr. Pat. 319,123, Feb. 27, 1902.

WOOD is preserved and made fire-resistant by impregnating it with a chloride, mixed with some other chemical that will counteract the hygroscopic nature of the chloride or by impregnating it successively with solutions of chemicals which will react on each other to produce the chloride mixed with the anti-hygroscopic substance. (See also U.S. Pats. 695,679, 685,678, and 695,450; this Journal, 1902, 615.)

—W. C. H.

Wood; Apparatus for Impregnating and Dyeing ——. J. Pfister. Fr. Pat. 318,249, Jan. 30, 1902.

A RECEIVER for holding the impregnating liquid is provided with a tightly attached elastic collar, into an opening in which is forced one end of the log to be treated, which consequently pushes the elastic collar into the receiver to a certain extent. The impregnating liquid is forced into the receiver, and by its pressure causes the collar to form a water-tight joint round the end of the log, and also penetrates into the pores of the wood. (See also Eng. Pat. 18,498 of 1899; this Journal, 1900, 347.)—W. C. H.

Stone; Acid-proof Filtering ——. F. Jurschina, Stockholm. Fr. Pat. 318,809, Feb. 18, 1902.

SEE Eng. Pat. 3518 of 1902; this Journal, 1902, 915.

—W. C. H.

Calcining [Cement] Apparatus. Edison. Fr. Pat. 318,459, Feb. 6, 1902.

THIS apparatus consists of a series of rotating, slightly inclined combustion chambers, of which the upper or chimney-end is the smaller, to the lower or wider end being attached a cooling chamber, to which air is supplied. Material to be calcined is supplied from a reservoir by conveyors to hoppers which conduct it into troughs leading into the upper ends of the combustion chambers; these troughs can be moved out when not required for the supply of material. Powdered fuel is supplied to each furnace, and is intermittently blown in by an arrangement that can be adjusted with respect to the axis of the furnace, and in such a way that a roasting temperature is produced between two zones of combustion, each zone being due to one of two fuel-supply pipes. Calcined material drops from the furnace or combustion chamber into the cooling chamber, and is removed by suitable conveyors. The products of combustion can be drawn from the upper ends of the chambers and returned, after passing through one or two regenerators, to the other ends.—W. C. H.

X.—METALLURGY.

Metals; Changes in Elastic Properties produced by the sudden Cooling or Quenching of ——. J. Muir. Proc. Roy. Soc., 1902, **81**, [468], 80—91.

IN the case of mild steel, fracturing normally at 40 tons per sq. in. with a total extension of 0·28 in. on a 4-in. length, quenching from 500° and 650° C. had but little effect on the elasticity; but quenching from 700° C. had a very marked effect. There was then no range of elasticity; Hooke's law was departed from even at the lowest loads, the yield-point being at a load but little, if at all, above zero. The breaking stress, however, was increased to 52 tons per sq. in., and the ultimate extension reduced to 0·1 in. in a 4-in. piece. Lowmoor iron breaking normally (after annealing) at 50,300 lb. per sq. in., and with a marked yield-point at 33,000 lb. was quenched from 700° C., and the same almost total loss of elasticity was observed; the breaking stress also was increased and the total elongation was reduced, but not so greatly as in the case of the mild steel. Interrupting the test and releasing the load for an hour after a stress of 30,000 lb. per sq. in. had been applied, had the effect of restoring elasticity, so that a yield point was observed at 34,000 lb. Copper quenched from 500° C., showed a slight loss, and from 550° C. a somewhat greater loss of elasticity; but quenched from 600° C. the defection was almost complete. The breaking stress of the metal was greater after quenching than before, and, unlike steel, the extension was also greater. Brass showed a marked loss of elasticity when quenched from 600° C., and a practically complete loss after quenching from 700° C. The breaking load and extension were reduced. Aluminium exhibited an entire absence of elasticity, a lower breaking load, and a greater extension after quenching at 550° C. Zinc, when heated to 350° C., whether quenched or cooled slowly, broke at a lower stress and with a much smaller extension than did the original metal; its elasticity was also reduced slightly by quenching. Tin, when quenched from 200° C. was found

to be slightly less elastic, but its breaking stress was practically unchanged. It is shown how this behaviour may be in part accounted for by the stresses set up within the material after it has been quenched, the nature of the stresses varying in different portions of the bar. But this does not suffice to explain the behaviour of iron or steel when quenched, and recourse must be had to the explanations which attribute the effect either to the formation of allotropic modifications of the metal or to changes in the condition of the carbon present.—W. G. M.

Bessemer Practice; Deficiency of Scrap and Alterations in American ——. Stahl u. Eisen, 1902, **22**, 1081. Chem.-Zeit., 1902, **26**, [90], Rep. 304

Owing to the ever-increasing deficiency in scrap for the open-hearth process, those American works which possess both open-hearth furnaces and converters are altering their Bessemer practice in such a way that less (and if possible no) scrap is rendered necessary by having to cool down a hot blow. This is accomplished by using a pig-iron with less silicon than heretofore. The silicon present should be just sufficient to give the necessary temperature during the blow, whilst guarding against an undue increase in the time required. For use in large converters, a pig-iron containing about 1·25 per cent. of silicon should give the desired result. By adopting this modification the United States Steel Corporation has produced over 9,000,000 tons of ingots almost without any addition of scrap.—W. G. M.

Concentrates; Cyaniding ——, *by Percolation.* C. M. P. Wright. Trans. Inst. Min. and Met., 1902.

The concentrates operated on, contain franklinite, galena, chalcopyrite, and a very little altaite. After an alkaline or plain wash, they are leached with a weak solution (0·10 to 0·12 per cent. of KCN) and then nine times with a solution of 0·3 per cent. strength until for two successive days the effluent comes down to 0·26 per cent. Two more solutions of 0·25 per cent., then two of 0·07 per cent., and a final water wash are subsequently applied. The usual quantity treated is 17 to 20 tons per month, of material containing 8 to 9 oz. of gold per ton; duration of treatment, 24 days; extraction, 84 per cent.

The total costs are about 12*s.* 10*d.*, the consumption of cyanide 5·12 lb., and of zinc 0·85 lb. per ton of material treated. The zinc slimes, by a special mode of washing before melting with fluxes, yield a bullion which assays 560—600 fine.—J. H. C.

Cyaniding of Wet-crushed Ores in New Zealand; Direct ——. H. Wingate. Eng. and Mining J., 1902, **74**, [17], 543.

The author gives an account of experimental trials carried out at Maratoto, N.Z. The ore is an extremely hard, flinty, bluish quartz, intermixed with 5 per cent. of finely-divided iron pyrites, the gold-contents (0·03—0·04 oz. per ton) being fairly uniformly distributed; the silver (1·75 oz. per ton) being present as sulphide. It was crushed through a 40-mesh screen, and gave 54·11 per cent. of sand and 45·89 per cent. of slimes. The crushed pulp passed direct from the mill to a "spitzkasten," down the centre of which, a rose, connected with a 1·5 in. high-pressure pipe, was passed to within a few inches of the bottom, the inclined sides only of the rose being perforated. The discharge from the spitzkasten passed to a sand vat, where it was again discharged through a Butter's distributor; and the slime from the spitzkasten, passed to agitator-vats. The sands were treated in the ordinary way after a preliminary alkaline wash. The slimes were allowed to settle and the water run off till the residual pulp contained 42—58 per cent. of dry slimes. The agitator was then started, lime added (about 14 lb. per ton of dry slimes), and the agitation continued for about an hour before running in the cyanide solution. For the first wash, the cyanide solution was of such a concentration that, taking into account the water present in the pulp, the total strength was 0·16 per cent. of cyanide. From four to eight washes were required according to the size of the charge and the nature of the slimes pulp. The total weight of the washes required was from three to four times that of the dry slimes.

The extraction from a test lot of 1,440 tons was 81·4 per cent. of the gold, and 45 per cent. of the silver. The consumption of cyanide was 2·7 lb.; zinc, 0·75 lb.; caustic soda, 0·75; and lime, 7 lb. per ton. The total cost was 2·07 dols. per ton, including all charges.—A. S.

Zinc Precipitate obtained in Cyaniding New Zealand Ore; Treatment of ——. H. Wingate. Eng. and Mining J., 1902, **74**, [17], 545.

At Maratoto, N.Z., the method of roasting the vacuum-dried precipitate is followed. The precipitate is first washed through a 40-mesh sieve; the "short zinc" separated is placed on the bottom of the trays at the top end of the precipitating-boxes, where it acts as an excellent precipitant, whilst the bullion is recovered at the next clean-up. After drying on a filter with the aid of a vacuum-pump, the precipitate is weighed and then placed in the oxidising furnace, which consists essentially of a square cast-iron tray built over a brick furnace. The tray has a sheet-iron cover fitted with a sliding-door, and the fumes pass through a flue at the top into a dust-chamber, and then into the air. The oxidation is conducted first at a low temperature, which is gradually raised, until finally a dull red heat is attained; great care is needed to avoid loss by "dusting," especially as the last stage is reached. After cooling, the oxidised precipitate is weighed and then melted with a flux composed of 50 parts of anhydrous borax and 15 parts of anhydrous sodium carbonate per 100 parts of precipitate. The pot is kept carefully covered during fusion, and recharged in each case before fusion is quite complete. When the crucible is three-quarters full, the temperature is raised, and the liquid slag ladled off. The crucible is then re-charged as before until it is about two-thirds full of molten bullion. In eight consecutive clean-ups, the bullion, after re-melting and washing, averaged over 9·41 fine, and the excellence of the result is stated to be mainly due to the passing of the precipitate through the 40-mesh sieve, thus eliminating the "short zinc." The slags contained about 1½ per cent. of the total amount of bullion recovered. The sweepings from the dust-chamber and the flue, after the oxidising of about 6,000*l.* worth of precipitate, yielded bullion of a total value of 9*l.*—A. S.

Copper and Magnesium; Alloys of ——. O. Boudouard. Comptes Rend., 1902, **135**, [19], 794—796.

The alloys containing less than 75 per cent. of copper melt at lower temperatures than magnesium itself. In the curve of fusibility, three maxima indicate the existence of the definite compounds, $CuMg_2$, CuMg, and Cu_2Mg. The lowest melting point (475° C.) is exhibited by the alloy containing 30 per cent. of copper. Alloys containing less than 70 per cent. of copper are white; those of higher percentage are more or less yellow. When the copper exceeds 10 per cent., the alloy is brittle; the friability increases up to 70 per cent. and then diminishes again, but the alloy with 90 per cent. can still be fractured under the hammer.—M. J. S.

Zinc; Micro-Structure of ——, *and the Effect of Small Amounts of Impurity on it.* E. A. Lewis. Chem. News, 1902, **86**, [2240], 211.

In the experiments, chemically pure zinc was melted along with 0·5 per cent. of the various metals, except in the case of cadmium, arsenic, and phosphorus, which were dropped into the molten zinc. The crucibles were allowed to cool slowly, and sections were cut from the centre of each specimen, carefully polished and etched with very dilute nitric acid (1:500). The remainder of each alloy was re-melted at a low temperature, poured into small cast-iron moulds, and, when cold, broken, in order to compare the fracture with the microscopic structure. Pure zinc consists of large primary crystalline grains, and inside the primary crystals, on deeper etching, are seen smaller secondary crystals. The fractured surface shows brilliant large bluish-white crystals. Zinc containing 0·5 per cent. of silver is composed of small crystals of zinc surrounded by

a eutectic alloy of the two metals. The fractured surface is finely crystalline. Zinc containing 0·5 per cent. of copper is similar in structure to the zinc-silver alloy. The eutectic alloy surrounding the crystals of zinc is, however, harder than the silver-zinc eutectic, since it becomes apparent on polishing without etching. The fractured surface is finely crystalline. Zinc containing 0·5 per cent. of cadmium is composed of small crystals of cadmium-zinc alloy surrounded by zinc. The fractured surface is very finely crystalline. Zinc containing 0·5 per cent. of tin on very slightly etching, shows up a network, but on deeper etching, it is seen that each crystal contains tin. Zinc with 0·5 per cent. of aluminium contains small crystals of zinc surrounded by an eutectic alloy of the two metals. The fractured surface is very finely crystalline. Zinc with 0·5 per cent. of nickel consists of small crystals of a nickel-zinc alloy surrounded by pure zinc. The fractured surface is finely crystalline. Small quantities of phosphorus are soluble in zinc without separating out. Phosphorus hardens zinc and the fractured surface becomes coarsely crystalline.—A. S.

Furnace Dust; Examination of ——. L. Schneider.
See under XXIII., *page* 1474.

English Patents.

Copper Metal; Obtaining ——, *from Copper-Bearing Ores.* W. Mel. Cranston, London. From The American Copper Mining and Extraction Co., Denver, U.S.A. Eng. Pat. 21,017, Oct. 19, 1901.

The powdered ore is agitated in a vat containing water heated by steam, to which stated proportions of sulphuric acid, nitric acid, sodium chloride, and potassium permanganate are added successively at intervals. After settling, "the practically clear water at the top is drawn off, leaving the ore in solution," which is then run into a second vat in which perforated zinc cylinders, charged with scrap iron, are revolved. When the precipitation is complete, the copper is allowed to settle for removal and conversion into solid form, if desired. Compare U.S. Pat. 699,326, May 6, 1902; this Journal, 1902, 776.—E. S.

Alloys [*Cu, Al, Ag*]. J. F. Duke, Downe, Kent. Eng. Pat. 21,738, Oct. 29, 1901.

One of the alloys is constituted of copper, 95·45; aluminium, 4·3; silver, 0·25 per cent. The aluminium and silver are preferably melted together before adding the copper. Another, and cheaper, alloy is obtained by melting together copper, 52·5; zinc, 45·9; aluminium, 1·5; and silver, 0·1 per cent.; a plumbago crucible is used. The alloys are said to resemble gold, and to have great resistance to corrosive influences.—E. S.

Alloys; Improved Metallic ——. O. B. J. Newton and C. Billington, Stoke-on-Trent. Eng. Pat. 24,524, Dec. 3, 1901.

A proportion of silicon ranging from 0·5 to 4 per cent. is added to brass alloys during their manufacture, thereby enabling them to be hot-rolled or squirted instead of, as heretofore, only cold-rolled or drawn.—J. F. B.

Antimony Ores; Smelting ——. N. C. Cookson, Newcastle-upon-Tyne. From T. C. Sanderson, Staten Island, N.Y., U.S.A. Eng. Pat. 20,981, Sept. 26, 1902.

The previously heated antimony ore is dropped from a hopper into a bath of molten iron sulphide at a higher temperature than that of fusion, to which iron or other reducing agent is added, access of air being prevented as far as possible. The mixture may be stirred and the temperature raised after admission of the ore. The separated antimony is run off, by suitable arrangements, from the bottom of the furnace.—E. S.

Furnaces. W. Stubblebine. Eng. Pat. 22,334, Nov. 5, 1901.
See under II., *page* 1445.

French Patents.

Iron; Partial Elimination of Impurities from Crude Cast ——, *in the Continuous-acting Reverberatory Furnace.* O. Thiel. Fr. Pat. 318,535, Feb. 10, 1902.

The fluid pig-iron is run into a reverberatory furnace, where it is mixed with a sufficient quantity of lime and mineral to effect the amount of refining required. In this way, in about an hour, with a basic-lined furnace, practically the whole of the silicon, nearly all the phosphorus and manganese, and about two thirds of the carbon (or in an acid furnace the whole of the silicon and the greater portion of the manganese) are eliminated. By this time the temperature of the metal should be about 1700° C. Half of the metal of the charge and the whole of the slag are then run out from the upper of two tap-holes, and the metal thus tapped is finished in a converter or an open-hearth furnace. The half-charged hearth is then filled up with a fresh quantity of the fused pig-iron from the blast-furnace, which, being at about 1300° C., produces an average temperature of 1500° C. in the charge. This charge is then worked off as before, one-half being run out as previously, and replaced with crude metal, and so on.—W. G. M.

Zinc; Industrial Process for the Direct Extraction of ——, *from Oxidised Minerals, and especially from Smithsonite and Calamine.* V. Bermont. Addition, dated Feb. 17, 1902, to Fr. Pat. 315,888, Nov. 13, 1901.

The chief patent referred to the production of chemically pure zinc sulphide. If absolute purity is not essential, an ammoniacal aqueous solution of a salt of zinc may be precipitated with calcium sulph-hydrate, or barium sulphide, or the like. Zinc sulphide will be precipitated, but with it, calcium or barium (or other) carbonate.—W. G. M.

Zinc; Process for obtaining ——, *by Reduction of the Oxide, Oxidised Minerals, &c.* Schulte. Fr. Pat. 318,265, Jan. 31, 1902.

The carbon usually mixed with the zinc oxide in reducing the latter, is replaced, wholly or in part, by tar, asphalt, or other similar liquefiable or liquid hydrocarbon, whereby a more intimate mixture is ensured, and a great saving in the weight of reducing agent effected.—W. G. M.

Lead and Zinc; Treatment of Mixed Minerals of ——. Havemann. Fr. Pat. 318,590, Feb. 11, 1902.

The fumes from the smelting cupola are thoroughly incorporated with water by means of a fan, whereby the zinc passes for the most part into solution, leaving a solid deposit containing about 55 per cent. of Pb and only from 2—3 per cent. of Zn. The solution, free from lead otherwise than in suspension, is run into depositing tanks. The fumes escaping from the first incorporation, are subjected to a rain of zinc-liquor or of water, to ensure final condensation, and are ultimately allowed to escape to the chimney stack. The zinc solution from the depositing vats is pumped into an elevated reservoir, and finally worked up into zinc-white. The liquor is then treated in lead-lined vessels with an excess of ammonia-gas, whereby there is produced a precipitate of ferrous oxide, and an ammoniacal solution of zinc hydroxide. By longer exposure to air, the whole of the iron is thrown down in the ferric state. The clear zinc solution, free from iron, is mixed with an excess of purified water, which deposits zinc hydroxide in a gelatinous form. This precipitate is filter-pressed, dried and calcined, yielding a pure white oxide suitable for a pigment. The ammonia is recovered from the waste liquor in which it exists as sulphate, by treatment with lime in a special recuperating plant. The lead precipitate first obtained is dried and fused to recover the metal.
—W. G. M.

Copper; Treatment of Minerals of ——. Westinghouse. Fr. Pat. 318,348, Feb. 4, 1902.

A matte is first obtained by any suitable method, and this matte is then oxidised in a furnace with basic lining—either a converter or a roasting-furnace for example—with the object of eliminating iron as an "oxysulphide" and the

excess of sulphur as dioxide. By "oxysulphide" is meant a mixture, in no definite proportion, of oxide of iron and sulphide of iron, or, it may be, of copper. No appreciable quantity of silica must be present; hence the advantage of a basic-lining to the furnace.—W. G. M.

Copper; Hardening of ——. C. Renstrom. Fr. Pat. 319,081, Feb. 25, 1902.

The object to be treated, which may be of copper, or, better, of an alloy of copper with tin, is heated to about the fusing-point of tin. Powdered sulphur is then sprinkled upon it. After a short time it is removed and plunged into a solution of copper sulphate. It is then re-heated and allowed to cool slowly.—W. G. M.

Antimony; Direct Preparation of White Oxide of ——, *and its Compounds, from Antimony Minerals.* A. St. Plews. Fr. Pat. 318,658, Feb. 13, 1902.

The mineral is broken into fragments (of about 1 c.c.) and charged into a furnace heated to a dull-red heat by means of a smokeless fuel. Here it is exposed to an oxidising flame at a bright red heat, or, if necessary, alternately to an oxidising and reducing atmosphere, in order to volatilise the antimony. The fumes are drawn off with the aid of an exhaust fan, and are subjected to the action of a jet of water, after which they are passed through and mixed with water, in order to ensure complete condensation and ultimate recovery of the antimony oxide. —W. G. M.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electrolysis of Copper Sulphate as the Basis of Acidimetry. W. Lange.

See under XXIII., *page* 1473.

English Patent.

Batteries; Electric Primary Cells or ——. A. P. T. Tully, Wimbledon. Eng. Pat. 24,992, Dec. 7, 1901.

A two-fluid cell with carbon or platinum in nitric acid or bromine solution, and iron in ammonium chloride solution. The inner cell is sealed and provided with tubes passing through the stopper.—W. G. M.

French Patents.

Carbon; Process and Apparatus for the Fusion of ——. Ludwig. Fr. Pat. 318,733, Feb. 15, 1902.

The carbon is chiefly fused by Joule's effect in a gaseous atmosphere at a high temperature. The apparatus consists of a cylindrical metal receptacle, capable of containing gas at a high pressure, which is closed by obturators. A band encircles the whole in such a way that by inserting suitable wedges between it and the adjusting pieces, the wedges enable the obturators to receive a uniform pressure whilst leaning always centrally on the apparatus.—G. H. R.

hermo-Electric Material. [*Alloys.*] Bremer. Fr. Pat. 318,606, Feb. 12, 1902.

For thermo-electric use in generators, &c., the employment is claimed of alloys composed of cobalt, nickel, or other materials having a low power of demagnetisation, and of iron, manganese, steel, or other materials with high power of demagnetisation. An alloy is recommended composed of 30 to 90 per cent. of iron or steel, and of 10 to 70 per cent. of nickel or cobalt.—G. H. R.

Joint; a Metallic Hermetic ——, *obtained by the Fusion at will of any Metal by means of an Electric Current.* Roux. Fr. Pat. 318,756, Feb. 17, 1902.

To make a gas-tight joint, a distilling vessel, boiler, or the like, has a cover, metallic or otherwise, which fits into a groove of refractory metal, the melting point of which is lower than that of the material of the cover, and which is fusible at will by an electric current passed through suitable electrodes. When the cover is lowered into the groove on to the bed of metal, the latter is liquefied by the action of the current, and the cover sinks into it. The current is then cut off, and the vessel remains hermetically sealed. The patentee claims every joint formed by a metal, which, after being liquefied by the electric current, either solidifies, forming one body with the parts to be jointed, or which remains liquid between them either by interior or exterior heat, or by the continued passage of the current.—G. H. R.

Hydroxylamine; Electrolytic Preparation of ——. La Raison Commerciale. C. F. Boehringer und Söhne. Fr. Pat. 318,978, Feb. 24, 1902.

Nitric acid is electrolytically reduced in the presence of a second acid electrolyte of low temperature, the nitric acid being added gradually in proportion as the reduction takes place.—G. H. R.

Alkali and Alkaline Earth Sulphides; Production of ——, *in an Electric Furnace.* M. Bouvier. Fr. Pat. 319,187, Feb. 28, 1902.

The alkali or alkaline earth sulphates are mixed in a pulverised or agglomerated condition with sufficient carbon to transform them into monosulphides, and can be calcined in any sort of furnace as long as the mixture treated is excluded from the air. Monosulphide of sodium can be produced in a single operation or in two operations by the addition of chloride of sodium and carbon in the requisite quantities.—G. H. R.

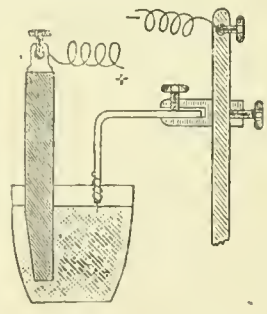
Alkali and Alkaline Earth Oxides; Production of ——, *in an Electric Furnace.* M. Bouvier. Fr. Pat. 319,189, March 1, 1902.

Alkali and alkaline earth sulphates, with or without the addition of carbon, are subjected in an electric arc or resistance furnace, to the action of sprayed water, or of steam, which decomposes them into sulphur compounds and into oxides. By adding aluminium, silica, &c., and with or without the addition of carbon, the corresponding aluminates and silicates are obtained, whilst the sulphur is recovered as sulphurous or sulphuric acid and other sulphur compounds.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Calcium; Preparation of Metallic ——. O. Ruff and W. Plato. Ber., 35, [17], 3612—3619.

A mixture of calcium chloride and fluoride in the proportion of 100 to 16·5, melts at 660° C., and is suitable for the electrolytic preparation of calcium. On the small scale, the apparatus shown is used. The porcelain crucible has a diameter of 4·5 cm. and is 5 cm. high; the mixture is heated in it to about 800° C. The anode is a rod of retort graphite, 14 mm. thick, the cathode an iron wire of 2 mm. diameter, to which is attached a steel wire of 0·4 mm. diameter. The current of 8 ampères (for which a potential difference between the electrodes of 8 volts is needed) keeps this wire bright red hot; the wire projects a couple of mm. below the end of the thicker wire, and dips into the liquid just so far that the end of the thick wire nearly touches the surface. The metallic calcium forms on the end of the thin wire, and gradually accumulates in a little drop; when this is large enough, it is shaken off, when it floats quietly on the surface of the liquid, and is removed. If the temperature be well kept up, a number of these globules can be rapidly obtained; but after an hour the attack of the crucible becomes considerable, and the globules of metal contain a considerable proportion of silicon, so that the operation must be stopped.



On the larger scale, the apparatus figured by Muthmann (this Journal, 1902, 412) is used. The salts are melted by

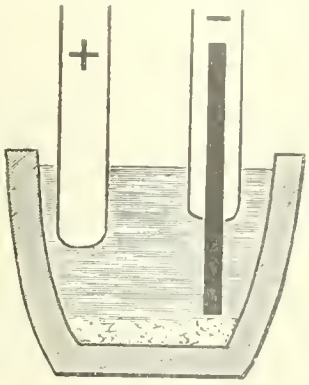
a current of about 45 ampères, at 60 volts, and the electrolysing current (at 30 volts) is regulated to 18—30 ampères. With this apparatus, calcium chloride alone can be electrolysed; but in this case the temperature must be kept up by withdrawing the anode from time to time so as to form an arc.

The mixture of calcium chloride and fluoride can also be used with advantage instead of calcium iodide, in Moissan's method of preparing calcium.

The electrolytic metal is pure white, in hardness lies between lead and gold, has a density of 1·59, and melts at about 780° C.; analysis showed 99·2—99·3 per cent. of calcium.—J. T. D.

Calcium: Extraction of Metallic ——. K. Arndt. Zeits. für Elektrochem., 1902, **8**, [46], 861.

An iron crucible was lined with fireclay, and a layer of fluorspar having been placed on the bottom, it was dried for 24 hours in a warm place. The anode consisted of a carbon rod, the cathode, of an iron wire surrounded above with a porcelain tube to a distance of 4 cm. from the lower end, as shown in the accompanying illustration. The crucible was kept cool by placing it upon a block of iron. Anhydrous calcium chloride was placed in the crucible, and was there melted by means of a subsidiary carbon cathode, temporarily held so as to maintain an arc between it and the carbon anode until the current passed freely through the electrolyte. A current of 20—25 ampères was used, and the charge remained in tranquil fusion. After cooling and breaking away the slag, metallic calcium was found in well-fused pieces. It was nearly white when freshly cut, but rapidly became yellow; it had a granular fracture, and could be readily hammered and filed. Analysis showed 99 per cent. of calcium, and 0·1 per cent. of silicon, but no iron or aluminium.—W. G. M.



French Patents.

Electric Furnace for the Electro-metallurgy of Iron or of its Compounds. M. Harmet. Fr. Pat. 318,283, Feb. 1, 1902.

The process consists in producing steel directly from raw ores, fluxes, and coke or other reducing agent, in three distinct and successive stages, each being carried out in a separate vessel, forming however, one apparatus. The furnace comprises a calcinator, reducer, and regulator. The first is narrowed in the middle, and then widened at the base to allow of heating by a small portion of the gases coming from the reducer, the continual action of the calcinator being ensured by the alternating movements of a piston, the crucible being meanwhile closed. The reducer widens from top to bottom, and has a crucible of special form in order to facilitate the penetration of the gases in circulation, and the descent of the materials, as well as to provide a sufficient circumference to allow of the breaking up of the electric energy, and also to permit of the employment of relatively short carbons, and to reduce the variations of the height of the slag, and consequently of the movements of the carbons requisite to keep them in touch with the slag which acts as resistance to transform the electric energy into calories. Tap holes are arranged in the crucible, and means are provided for maintaining a constant pressure of the gas in the mouth of the reducer, and for preventing the access of air. The regulator, which is cylindrical, has four openings, one for the admission of the raw metal, and the others for charging, for the flowing off of the slag, and for tapping the metal.

—G. H. R.

Steel; Employment of the Electric Arc in the Manufacture of ——. M. Jacolliot. Fr. Pat. 318,389, Feb. 4, 1902.

The electric arc is used to carburet the iron, or to modify the amount of carbon in steels insufficiently carburetted, and also to decarburet partially castings or steel which contain too much carbon. The electrodes are formed of the material to be treated.—G. H. R.

Furnace with Moving Electrode; Electric ——. La Société Electric-Metallurgique Française. Fr. Pat. 318,638, Feb. 12, 1902.

The furnace comprises a carbon crucible below, with a carbon block above it, the electric current entering by them and being transmitted by the coke or other combustible which fills the body of the furnace below the upper contact block, and which thus constitutes the moving electrode which is consumed in proportion as the reduction of the ore is effected, and which is continually renewed from a hopper above. There is a preparatory furnace adjacent into which escape the gases arising from the reaction, and which effect the heating, softening, and even the fusion of the ore which passes in a hot and fluid condition into the combustible enclosed in the body of the furnace, and there undergoes reduction. An additional carbon block may be employed at the bottom of the inclined conduit of the preparatory furnace, and below the upper contact block, in order to effect by the short circuit set up between them, hot currents ensuring the flow of the melted mineral from the preparatory furnace, and preventing the obstruction of the column of carbon. In a modification the feed hopper opens on the middle of a large carbon plate on which is one of the terminals, and which closes the bottom of the furnace, whilst the other terminal is formed by the crucible.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Datura Oil. D. Holde. Mitt. aus dem königl. techn. Versuchsanst. zu Berlin, 1902, **20**, [2], 66—67.

The author extracted 16·7 per cent. of oil from the air-dried seeds of *Datura stramonium* by means of benzene. The alkaloid, *daturine*, was apparently not extracted by the solvent, or at least could not be detected in the oil. The oil thus obtained was green to yellowish-brown in colour and had a characteristic odour. On standing it yielded a dark flocculent resin-like deposit. The filtered oil had an efflux velocity in Engler's apparatus nine times less than that of water at 20° C. Its specific gravity at 15° C. was 0·9175. When cooled to 0° C. it began to gelatinise; at − 15° C. it became viscous, and thick at − 15° C. It dried forming a firm skin, when heated in a thin layer for 13 hours at 50° C., whilst at the ordinary temperature it was still liquid after 23 days, and only showed signs of drying after 35 days. Its iodine value was 113, and its saponification value, 186. The fatty acids were judged to contain solid unsaturated readily oxidisable acids as well as solid saturated acids. The iodine value of the liquid acids was exceptionally low. The solid fatty acids fractionally precipitated by means of magnesium acetate, yielded, in addition to daturic acid, $C_{17}H_{34}O_2$ (m. pt. 55° C.), an acid of molecular weight 261, and m. pt. 60°—62° C., (palmitic acid, molecular weight 256, and m. pt. 62° C.), and an acid melting at 53°—54° C., and having a molecular weight of over 286.—C. A. M.

Rosin Oil in Mineral Oil; Detection of ——. G. Halphen.

See under XXIII., *page* 1474.

English Patents.

Oil, chiefly designed for Use as Substitute for Linseed Oil; Manufacture of ——. W. A. Smith, Cleveland, Ohio, U.S.A. Eng. Pat. 17,290. Aug. 6, 1902.

See U.S. Pat. 708,178 of 1902; this Journal, 1902, 1238.

—C. A. M.

Cotton-Seed Meal and the like; Process and Apparatus for Deodorising ——. F. M. Pratt, Decatur, Ill., U.S.A. Eng. Pat. 18,197, Aug. 19, 1902.

See U.S. Pats. 705,787 and 707,354 of 1902; this Journal, 1902, 1084 and 1188.—C. A. M.

Oils; Process for Solidifying and Toughening ——. [*Rubber Substitute.*] J. B. Scammell and E. A. Muskett. Eng. Pat. 21,229, Oct. 23, 1901.

See under XIII. C., *page* 1461.

Pharmaceutical Compounds [*Fats containing Iodine and Sulphur*]; *Manufacture of* ——. H. E. Newton. From F. Bayer and Co. Eng. Pat. 24,321, Nov. 29, 1901.

See under XX., *page* 1468.

Filter-Presses [*Cocoa Butter from Cocoa Liquor*]. M. A. Smith. Eng. Pat. 9884, April 29, 1902.

See under XVIII. A., *page* 1464.

FRENCH PATENTS.

Oil and other Soluble Substances from Grains, Pulp, &c.; Apparatus for Continuous Extraction of ——. E. Bataille. Fr. Pat. 319,204, March 1, 1902.

THE material is mechanically introduced into an extraction chamber where it meets a current of solvent passing in the opposite direction. After leaving this chamber it is raised by an elevator to a drying chamber, and discharged, whilst the saturated solvent passes into a distillation apparatus. —C. A. M.

Oils, Vegetable, used in Painting; Process of Decolorising ——. Tedesco. Fr. Pat. 318,323, Feb. 3, 1902.

See under XIII. A., *below.*

Oils; Process of Solidifying and Thickening [*Rubber Substitute*] ——. Scammell and Muskett. Fr. Pat. 319,074, Feb. 25, 1902.

See under XIII. C., *page* 1461.

Glycerin from Distillation in Vacuo; Method and Apparatus for Recovery of ——. Flandrak. Fr. Pat. 318,279, Jan. 31, 1902.

THE aqueous glycerin vapours are conducted through one or more condensing chambers of larger diameter than the pipe from the retort, and preferably containing iron fragments, flint particles, or the like. A vessel below receives the glycerin, whilst the water vapour is withdrawn from the chamber by means of the pump.—C. A. M.

Broom; Utilisation of ——, *for Manufacture of Paper Pulp.* [*Employment of Waste Lye in Manufacture of Soap.*] Scopinich-Persichetti. Fr. Pat. 318,650, Feb. 13, 1902.

See under XIX., *page* 1467.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

ENGLISH PATENT.

Pigments; Process of Producing Black and Dark Carbonaceous——. D. J. Ogilvie, Cincinnati, Ohio, U.S.A. Eng. Pat. 16,783, July 29, 1902.

See U.S. Pat. 706,001; this Journal, 1902, 1084. Further devices for carrying out the same principle are described. —M. J. S.

FRENCH PATENTS.

Oils, Vegetable, used in Painting; Process of Decolorising ——. Tedesco. Fr. Pat. 318,323, Feb. 3, 1902.

THE oil is decolorised with nascent hypochlorous acid gas, and is then mixed with a small proportion of cobaltous hydroxide, $Co(OH)_2$, and oxidised in a current of air, the cobalt salt acting as a carrier for the atmospheric oxygen. —C. A. M.

Orange Lakes from a New Monazo Dyestuff; Manufacture of ——. Bad. Anilin und Soda Fabrik. Fr. Pat. 315,573, 1901.

See under IV., *page* 1451.

(B.)—RESINS, VARNISHES.

Copal Resin; Experiments on the Chemical Composition of ——. M. Guédras. Comptes Rend., 1902, **135**, [19], 797—798.

MADAGASCAR, Congo, and Kauri copals were submitted to dry distillation with the following results:—

	Madagascar.	Congo.	Kauri.
Evolution of gas commenced ..... ° C.	50	30	..
The gum fused ..... „	150	105	..
Distillation commenced . „	270	..	..
Aqueous portion of distillate..... Per cent.	10·25	6·4	8·26
Oily portion of distillate..... „	15·75	8·6	7·74
Acid value of gum-resin.....	143	35·55	69·7
Acid value of oil	80	24	36

The harder a copal, the higher is its acidity.

The oils are soluble in alcohol, ether, and benzene, carbon bisulphide, but not in the terpenes. When treated with nitric acid, the oils yield a yellow resin soluble in the same menstrua, as well as in vegetable oils. The characteristic terpene odour in the distillate from the oil oxidised by nitric acid, and the presence of oily drops with an odour of camphor, suggest that the copals contain oxidised terpenes. (Compare Bottler, this Journal, 1893, 773; Stephan, 1897, 51; Zucker, 1899, 153; Lippert and Reissiger, 1900, 1122.)—M. J. S.

Copals; Fusion of —— under Pressure. II. W. Lippert. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [11], 250—252. (See also this Journal, 1901, 1122.)

THE author points out that his previous results are not in agreement with those of Smith (this Journal, 1901, 1076), who found that copal heated under pressure was completely soluble in linseed oil and turpentine, yielding a serviceable varnish. In the author's experiments on similar, though not identical lines, copal fused in a closed tube in linseed oil in the presence of a little oil of turpentine separated again from its solution.

Further experiments have now been carried out, using a cast-iron autoclave, with a pressure of about 25 atmospheres, and a temperature of 250° C. was obtained; at higher pressures than this, leakage of gas took place.

In all the experiments, balsam-like masses or dark oils were obtained. Manila copal, after being heated for a long time at 205° C. and at a pressure of 15 atmospheres, left a thick brown syrupy mass at the bottom of the beaker in which the copal had been placed, whilst a lighter oil had deposited at the bottom of the autoclave. The mass was soluble in linseed oil and turpentine oil, but did not yield a serviceable varnish. Colophony heated at 180° C., under a pressure of 13 atmospheres, yielded a balsam-like mass with a strong odour of rosin oil. Zanzibar copal was heated at 220° C., with a maximum pressure of 14 atmospheres. It yielded a balsam-like mass, which, when mixed with linseed oil, turpentine oil, and a siccative, could be used as a varnish, though the drying properties were not satisfactory. These results differed from those of the previous experiments in which Zanzibar copal was heated in a sealed glass bulb to 300° C. without undergoing fusion.

Kauri copal at 200° C. and 22 atmospheres' pressure yielded a dark brown malodorous copal oil, consisting partially of light and heavy oils, and having the specific gravity 1·0025 at 19·5° C. It was soluble in chloroform, acetone, turpentine oil, carbon bisulphide, camphor oil, and benzene, and partially soluble in benzine, alcohol, and amyl alcohol. In the author's opinion it is doubtful whether

these fusion products of copals will acquire any technical importance on account of the high price of copals, for he finds that the solutions they yield do not form serviceable varnishes.—C. A. M.

French Patent.

Varnish; Method of Manufacturing ——. Tedesco. Fr. Pat. 318,289, Feb. 1, 1902.

The breaking up of copals into simple terebenthenes is stated to be most readily effected by heating the copals under a reflux condenser (at the ordinary pressure, or in a more or less complete vacuum) with a small proportion of terebenthene or diterebenthene. Means are provided for removing the acid aqueous vapours, and the products are claimed to be much less coloured and to yield better varnishes than copals as ordinarily treated, whilst there is no loss of copal oil. A subsidiary claim is for the deodorisation, by means of quicklime, of terebenthene mechanically carried over by the water vapour.—C. A. M.

(*C.*)—INDIA-RUBBER.

Latex and Rubber from Castilloa Elastica; Experiments on ——. C. O. Weber. Imp. Inst. J., 1902, **8**, [95]; also India-rubber and Gutta-percha Trades' Journal, **24**, [6, 7, 8].

These observations refer chiefly to the trees growing on the Las Cascadas Plantations, Isthmus of Panama, where the land rises gradually to a height of 1,200 feet, and on the lower slopes, rubber, cacao, and coffee grow abundantly. The plantation comprises some 70,000 rubber-trees, of which 15,000 are from 11—12 years old. Their average yield is as follows:—

Age of Tree.	Yield of Latex.	Percentage of Rubber in Latex.	Yield of Rubber.
Years.	lb. oz.	Per cent.	oz.
6	1 13	26	7·5
7	2 5	26	9·6
8	3 1	29	14·2
11	5 3	31	25·7

The trees are tapped twice in a year, so that the annual yield is double the above quantities.

Latex.—At first pure white, this rapidly becomes brownish-black, owing to the presence of an oxidising ferment; it is intensely bitter, and contains much albuminous matter (11 per cent.), which the author considers is the cause of the rapid coagulation.

Methods of Coagulation.—The native methods vary, and may be classified thus:—(*a*) The latex is washed and treated with the acid juice of the moon-plant, *Calonyction speciosum*, as in British Honduras; (*b*) The juice of *Ipomœa bona nox*, which is said to be strongly alkaline, is added; (*c*) The latex is placed in shallow holes in the ground, and boiling soap solution poured in (Panama); (*d*) Alum solution is added to the latex; (*e*) The latex is boiled in earthen vessels (Mexico). These methods appear to depend on the initial coagulation of the albuminous matter, which brings down the rubber globules with it. If the fresh latex, obtained at Cascadas, is slightly diluted, it is not coagulated by prolonged boiling, but if allowed to stand until it darkens, is then rapidly coagulated by heat. *Castilloa* rubber rapidly putrefies owing to the albuminous matter, and to avoid this, the author devised the method of diluting the latex (5 volumes of water), allowing it to stand until the rubber rises to the top like cream (24 hours), having first added formaldehyde (8 oz. per barrel), which keeps the albuminous matter in solution, and causes the rubber globules to coalesce into a cake, which may be lifted entire from the barrel. The cake is cut into strips, washed and dried. The strips are light in colour, semi-transparent, they yield a clear solution, are non-putrescible, and of very high purity. Analysis showed:—Resinous matter, 2·6 per cent.; asb, 0·44 per cent.; albuminous and insoluble matter, nil.

Resin.—The proportion of resin in the latex appears to increase from the root upwards, and is greatest in the latex of young trees. The trees should be at least eight years old before tapping, otherwise the rubber will contain an excessive proportion of resin.

Varieties of Castilloa Elastica.—Three varieties are known, and have very different values as rubber-producers.

C. Elastica Alba.—This has a white bark, with a yellowish or pink tinge, is the hardiest variety, suffers little from tapping, and gives a thick creamy latex, with the largest proportion of rubber.

C. Elastica Negria.—Has a rough dark bark, is easily bled to death, yields a thin latex but good quality rubber.

C. Elastica Rubra.—Has a smooth, reddish bark, thin and brittle, without the longitudinal furrows of the other two species. The yield of latex is small, but the rubber is of good quality. This variety is common all over Central America, and has probably been planted instead of *alba*. Koschny is of opinion that it was *rubra* that gave such discouraging results in Ceylon and Java.—R. L. J.

English Patents.

Caoutchouc, India-rubber, Gum Elastic, and similar Materials; Process of Devulcanising ——. A. E. J. V. J. Theilgaard, Copenhagen. Eng. Pat. 20,081, Sept. 13, 1902.

The process described in Eng. Pat. 8041, 1899 (this Journal, 1899, 694), is modified by carrying it out at a temperature of 100° C. and at a pressure between 2 and 10 atmospheres. —F. H. L.

Oils; Process for Solidifying and Toughening ——. [*Rubber Substitute.*] J. B. Scammell and E. A. Muskett. London. Eng. Pat. 21,229, Oct. 23, 1901.

The oil (*e.g.*, castor oil) is mixed with a certain proportion of fibrous material, such as cotton or other form of cellulose, the mixture added to a solution of sulphur chloride, and the whole thoroughly incorporated. Claims are also made for the reduction of the cellulose to a gum-like mass by "distillation in a closed vessel," and for the addition of a small proportion of drier to the mixture of cellulose and oil. —C. A. M.

French Patents.

Rubber; Regeneration of Vulcanised ——. Price. Fr. Pat. 318,580, Feb. 11, 1902.

See U.S. Pat. 693,151; this Journal, 1902, 357.—F. H. L.

Fabric; Recovery of Volatile Solvents used in the Vulcanisation or other Treatment of ——. I. Frankenburg, Ltd. Fr. Pat. 319,239, March 3, 1902.

See Eng. Pat. 16,919, 1901; this Journal, 1902, 968. —F. H. L.

Oils; Process of Solidifying and Thickening ——. [*Rubber Substitute.*] Scammell and Muskett. Fr. Pat. 319,074, Feb. 25, 1902.

See Eng. Pat. 21,229 of 1901; see foregoing, under Eng. Pats.—C. A. M.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Hide Powder and Hides; Action of various Acids, Organic and Inorganic, on ——; *and an Investigation of the Plumping Effect of various Acids.* [*Lactic Acid for Plumping Sole-Leather.*] J. Paessler and W. Appelius. Gerber-Zeit., 1902, **45**. (See this Journal, 1902, 627.)

The plumping of heavy leather is usually assisted by the addition of acid instead of leaving the whole of the work to be done by the naturally formed acids (lactic and acetic) present in sour yard liquors.

Sulphuric acid is used, but, in view of the difficulty of removing it and the great injury it causes when left in the hide, is a most unsuitable agent. Hydrochloric acid is favoured by some authorities (see this Journal, *loc. cit.*) chiefly because of its low price. Lactic acid has, until

recently, been too costly, but it is now manufactured at a price which, considering its special advantages, should, to a great extent, remove this objection.

The authors have made a very large number of comparative experiments with oxalic, sulphuric, hydrochloric, lactic, and acetic acids, to determine their relative advantages and disadvantages. As regards sulphuric acid, they find that a very considerable proportion (from 90 to 30 per cent., according to the strength used) of this acid is absorbed by the hide, and remains there; whilst, approximately, half the proportion of lactic acid is absorbed to do the same amount of plumping. As regards relative weight- and strength-producing qualities of the acids mentioned, lactic acid has a marked superiority at concentrations above 2 per cent. and, notably, in 4 per cent. solution. Thus, one set of experiments showed that the percentage increase in weight and strength of the finished leather, when lactic acid was used, was 22·8 and 53·4 per cent. respectively. The corresponding figures in the case of acetic acid were 10·8 and 36·7; for oxalic acid, 13·2 and 39·1 per cent.; whilst, for sulphuric acid, they were 4·6 and 17·2; and, in the case of hydrochloric acid, 3·7 and 19·3 per cent. respectively.

"Over-plumping," moreover, is more liable to occur with inorganic acids than with organic acids, so that, in view of its relatively greater economy of use, its superiority as regards weight- and strength-production and its non-injurious action, lactic acid appears to be specially indicated as a plumping agent, despite its somewhat higher cost.

Commercial samples vary from about 40 to 50 per cent. strength, according to the density, contain little and sometimes none of the inactive anhydride, and only traces of other acids, in the form of salts, and therefore harmless. In buying the acid, the authors point to the necessity of distinguishing between percentage by weight and by volume. 100 kilos. of an acid, of density 1·1837 and strength 50·1 per cent. by weight, contains 50·1 kilos. of real lactic acid; whilst, if the strength be 50·1 per cent. by volume, the 100 kilos. contain only $\frac{50\cdot1}{1\cdot1837}$ or 42·3 kilos. of real acid.

—R. L. J.

Chestnut Extract mixed with with Oak Extract; Detection and Determination of ——. F. Jean.

See under XXIII., *page* 1476.

English Patents.

Tannin Extracts; Manufacture of ——; *to Increase their Utility for Tanning Leather.* G. Klenk, Hamburg. Eng. Pat. 25,063, Dec. 9, 1901.

Hot tannin extracts, as they come from the extractors, are thoroughly mixed with a predetermined quantity of aluminium sulphate, depending on the strength of the extract. When the liquor is decolorised, sodium bisulphite is added, with stirring, in the quantity required by the equation:—

$$Al_2(SO_4)_3 + 6NaHSO_3 = Al_2(OH)_6 + 3Na_2SO_4 + 6SO_2.$$

The mixture is then cooled to 20°—25° C., and run into the clearing vat. A tannin liquor of 4° B. requires, per 5,000 litres, 4 kilos. of solid aluminium sulphate, and 15—20 kilos. of sodium bisulphite of 38°—40° B.—W. G. M.

Organic Substances [*Hides and Skins*]; *Preservation of* ——. C. L. Klett and A. P. Potel. Eng. Pat. 17,478, Aug. 8, 1902.

See under XVIII., A., *page* 1464

French Patents.

Tannic and Tinctorial Extracts; Preparation, Purification, and Preservation of ——. Peyrusson. Fr. Pat. 318,523, Feb. 8, 1902.

Extracts of tannin and of colouring matters, whether in the course of preparation or otherwise, are subjected to the action of electricity, with alternating currents, electrodes of aluminium, zinc, lead, or tin (the latter especially, and preferably as cathode) being used. Or tin and another more electro-positive metal may be used simply in voltaic combination. Many methods are indicated in which tin, with or without other metals or alloys in electric conjunction, are applied, not only during the preparation of the extracts, but as means for their purification and preservation. The invention may be applied in boilers, evaporating or concentrating vessels, filters, and generally in all vessels used in the preparation or storing of such extracts.—E. S.

Casein Product [*Ivory or Bone Substitute*]; *Manufacture of a* ——. Ensminger. Fr. Pat. 318,385, Feb. 4, 1902.

One hundred parts of casein are mixed with 20 to 60 parts of alcohol (90—95 per cent.) Five to 10 parts of borax, dissolved in 20 to 60 parts of water, are then added, and the stirring continued. The plastic mass obtained, is rolled and pressed (by a pressure of 15—60 kilos. per sq. cm.) into flat cakes, which are then suspended for 12—24 hours in a 15—20 per cent. solution of acetic aldehyde, of benzaldehyde, or of crotonic aldehyde. The resulting product is unaffected by moisture.—W. P. S.

XV.—MANURES, Etc.

English Patent.

Artificial Manures; Manufacture of ——. H. H. Lake, London. From the Cyanid-Gesellschaft, Berlin. Eng. Pat. 17,507, Aug. 8, 1902.

The salts resulting from the combination of the nitrogen compounds, dicyandiamide, or dicyandiamidene, with sulphuric, hydrochloric, or phosphoric acid are utilised as manures, either alone or mixed with other manures. Such nitrogen compounds are obtained by the "action of nitrogen upon carbide, carbide-forming mixtures, and mixtures of compounds of alkaline earths with charcoal."—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Mannose; Detection of ——. F. H. Storer.

See under XXIII., *page* 1474.

English Patent.

Sugar from Beetroot and Cane Juices; Process of Extracting ——. F. Hlavati, Antwerp. Eng. Pat. 21,985, Oct. 31, 1901.

Hydrofluosilicic acid or hydrofluoboric acid, previously neutralised with lime, is added to the saccharine juices in quantities calculated for the alkali salts present during the customary treatment with milk of lime. Oxidising substances such as calcium peroxide, manganese peroxide, or hydrogen peroxide are also added to oxidise the organic non-sugar. Before the second carbonation, vegetable matters containing nitrogen and tannin are added to the juice in order to remove the alkali chlorides. During the evaporation to syrup, substances are added to the liquor which bring about the formation of hydrogen or other reducing agent. Such substances may be iron filings, zinc dust, zinc antimonide, zinc calcide, magnesium silicide, calcium carbide, aluminium sulphide, or phosphorus sulphide. Charcoal powder, together with an electric current or phosphorous or hypophosphorous acid, may serve a similar purpose. The syrup may subsequently be treated with sulphur dioxide or hydrogen sulphide.

—J. F. B.

French Patents.

Beetroots and other Materials; New Method and Apparatus for the Extraction of Juice from ——. Hyros and Rak. Fr. Pat. 318,451, Feb. 6, 1902.

The diffusion apparatus consists of conical helices rotating in conical casings, which, at a certain distance from their narrow ends, have an annular opening through which the juice flows, whilst the sliced beet, or other matter operated on, is further compressed on its way to the narrow end of the helix; it is there discharged into a chamber in communication with the other helices, and from this it is transported by the action of helices into the next diffuser. The diffusing liquid, water for example, enters the last of the chambers and goes with the slices into the last diffuser,

from which it flows by the exit tube of the juice into the preceding chamber and so on, until it reaches the first diffuser. The pressure is regulated and maintained constant by means of a circulation cistern into which the same quantity of juice is introduced at the same time as the first diffuser is connected with the regulating cistern, so that the level of the liquid is maintained at the height of the junction from the circulating cistern. In order to regulate the discharge of the beet slices or other material, these are more or less held back in the last diffuser by means of a piston by which the exit orifice can be partially closed.—T. H. P.

Massecuites or Raw Sugar; Apparatus and Process for Bleaching and Washing ——. M. Weiorich. Fr. Pat. 318,687, Feb. 14, 1902.

The apparatus consists of an inclined or horizontal plate perforated over most of its surface and provided with a feed-trough and a rim, together with one or more vessels serving as vacuum chambers, a series of scrapers for helping and regulating the feeding of the mass by gravity, means for distributing the washing agents on the mass and a chute for automatically discharging the whitened crystals. Means are provided for creating a partial vacuum and for introducing steam into the chambers. The massecuite or raw sugar is passed, by the help of the scrapers, in a uniform stream along the perforated plate, the impurities passing down into one or more chambers with oblique floors and partially evacuated, and having means for introducing steam; the washed mass being continuously removed from the lower extremity of the perforated plate.—T. H. P.

Sugar and Molasses; Process for Facilitating the Separation of ——, *from Massecuites, especially from those of Low Products.* H. Claassen. Fr. Pat. 319,124, Feb. 27, 1902.

The process consists in the simultaneous introduction into the centrifugal, while in motion, of the massecuite and of a saturated or nearly saturated syrup which may be heated or not. The syrup removes the viscous molasses attached to the crystals and so prevents the crystalline powder from forming a compact crust with the molasses.—T. H. P.

Crystallisation of Syrups, Juices, and Molasses: Process for Rapid and Increased ——, *and for Separation of the Crystals under Gaseous Pressure.* Delafond and Horsin-Déon. Fr. Pat. 319,182, Feb. 28, 1902.

Syrups, juices, and molasses, from the sugar-house or refinery are treated with compressed carbon dioxide and crystallised and filtered under pressure. Mixers or agitators (malaxeurs) are used to carry out the filtration or are combined with an apparatus for filtering under pressure.
—T. H. P.

Reheater for Sugar Juices and other Liquids; Quick Current ——. A. Draminski. Fr. Pat. 319,221, March 3, 1902.

In this reheater, through which the beetroot juice or other liquid may be rapidly passed, the liquid circulates through the annular space formed by a set of tubes arranged inside another set, so that the liquid is heated on both sides.
—T. H. P.

Fodder rich in Sugar; Manufacture of [Beetroot Residues, &c.] ——. M. Steffen. Fr. Pat. 318,720, Feb. 15, 1902.

See under XVIII. A., *page* 1465.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barley; Nature of the Proteolytic Enzyme of Germinated ——. W. Windisch. Woch. f. Brau., 1902, **19**, [46], 698—701.

The author replies to the arguments of Lintner (see this Journal, 1902, 1034) and defends his previously adopted view as to the tryptic nature of this enzyme. Windisch's conclusions were based first on the fact that liquefaction of gelatin by this enzyme takes place in alkaline media, and secondly that the proteid degradation products of malt worts contain no peptones, but only albumoses and profoundly modified nitrogenous bodies, such as crystallisable amides. These latter are not produced by peptic ferments. He agrees that the proteid degradation of the malt takes place almost entirely on the germinating floor, whilst the starch degradation is similarly confined to the mashing process. This is because the proteolytic enzyme of malt is essentially of an intracellular character, comparable with the zymase of yeast rather than with diastase. A profound action is only obtainable at low temperatures and very gradually, whilst the cell is still living, *e.g.*, on the germinating floor. Lintner attributes the profound degradation of the barley proteids to a direct biological action of the protoplasm, but according to modern theories vital phenomena are all brought about through the agency of enzymes. In this case the production of the proteolytic enzyme is intimately connected with the living cell, and in the nascent state its action is profound and powerful, although when separated from its natural environment it is relatively feeble. The above considerations, however, are no arguments against its tryptic nature, as concluded from the author's previous observations. Moreover, it is a fact that tryptic ferments are far more common in nature than peptic ferments, and that where only one proteolytic enzyme is present in an organism, it is always a tryptic ferment.—J. F. B.

Lager Beer; The Cellarage of ——. W. Windisch. Woch. f. Brau., 1902, **19**, [47], 713—714.

Beer is usually stored in the lager cellar for a period of from 6 to 13 weeks according to the original gravity of the wort. The objects of cellarage are secondary fermentation, saturation with carbon dioxide, clarification, and maturation of the flavour.

Secondary Fermentation.—The author expresses a decided opinion in favour of completing the attenuation as far as possible in the fermenting-vat during primary fermentation and leaving very little fermentable matter in the beer as it goes to the lager cellar. In this way a much sounder beer is obtained, since if much fermentable matter be present during cellarage, the wild yeasts come into activity owing to the extremely low temperature. Fulness of flavour is not obtainable by small attenuation; the body depends not on fermentable sugar but upon unfermentable carbohydrates which are produced during malting.

Saturation with Gas.—The beer goes to the lager cellar containing about 0·2 per cent. of carbon dioxide, and this proportion has to be doubled during cellarage. Usually, however, the attenuation which takes place in the lager vat corresponds to about three times the amount necessary to supply the gas. By the early insertion of the bung, saturation can be performed more efficiently and the time of cellarage curtailed.

Clarification.—In this process must be included the sedimentation of the yeast, the suspended albuminoids and the hop resins. The separation of the yeast presents no difficulty; it settles to the bottom as soon as the fermentable matter is practically exhausted. In former times the quantity of albuminoids was far greater than at present, both on account of stronger brewing and inferior malt. Similarly, the proportion of hops was also greater, because in absence of artificial cooling, the stability of the beer was largely dependent on the hopping. Neither of these now requires such prolonged sedimentation as formerly. Especially with the abbreviated method of decoction—mashing at high temperatures, prolonged cellarage is unnecessary and even injurious; clarification also takes place more rapidly under pressure in the closed casks.

Maturation.—The processes involved during maturation are not yet understood, they may consist in the formation of some new substances with an agreeable flavour or in the removal of some undesirable flavour already present. The author inclines to the latter view, attributing the raw flavour of new beer to the presence of the hop constituents, which have to be removed either mechanically or chemically, in which case the moderately hopped beers of the present day should require a shorter time to mature.

In conclusion, given good malt and a high degree of attenuation during primary fermentation, conducted at a slightly higher temperature, the time of cellarage might be curtailed advantageously.—J. F. B.

Pasteurised Beer. Will. Woch. f. Brau., 1902, 19, [45], 685.

The author divides the turbidities which occur in pasteurised beer into several groups according to their character, appearance, and chemical properties. Primary glutin particles found in a beer if the secondary fermentation is not complete and which are not removed by filtration, are again deposited after pasteurisation. Secondary glutin particles arise from the alteration of certain albuminoids during pasteurisation. A third kind of separation occurs as a jelly or slimy mass. The author is of opinion that fermentations contaminated with bacteria are the cause of turbid pasteurised beers. The temperature and intensity of the secondary fermentation are of importance. This should be carried out at the lowest possible temperature, and the beer should be filtered through as fine a medium as possible. —J. L. B.

English Patent.

Yeast; Manufacture of ——. [*Free from Bitter Substances.*] C. E. Brunt, Burton-on-Trent. Eng. Pat. 22,116, Nov. 2, 1901.

One hundred pounds of solid pressed brewers' yeast are mixed with 50 gallons of water and passed through a sieve. From 10 to 20 lb. of borax or other "alkali" are then added. The yeast separates out as a curd and is removed from the solution and washed. The bitter principles remain in the solution.—W. P. S.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Maize; Albuminoid Substance from ——. E. Donard and H. Labbé. Comptes Rend., 135, [18], 744—746.

Maize flour, dried, and deprived of its oil by treatment with benzene, is extracted for eight hours by hot anhydrous amyl alcohol. The alcoholic solution is poured into three times its volume of pure benzene, the precipitate which forms is thrown on a filter and washed with benzene till free from amyl alcohol, and is then dried either in air or *in vacuo*, the last traces of benzene being driven off in the steam oven. Or the maize may be extracted with alcohol by Ritthausen's method, and the crude albuminoids treated with amyl alcohol as above. The white pulverulent *maizine* so obtained has a composition expressed by the formula $C_{184}H_{300}N_{46}O_{51}S$. It is insoluble in water or in saline solutions, but is partially hydrolysed by prolonged boiling with water. It is soluble in methyl alcohol, ethyl alcohol, or acetone (much more in the hot than in the cold solvent), and is thrown down from these solutions by ether, benzene, or other hydrocarbons, in a glutinous form which dries to a horny mass. It does not dissolve in weak acetic acid, but develops a peculiar odour when boiled with it. Weak aqueous or alcoholic solutions of alkalis dissolve it readily. In propyl, isobutyl, or amyl alcohol it dissolves, slightly in the cold, more readily (10—12 per cent.) when hot. Maize contains 4—4·5 per cent. of maizine.—J. T. D.

Cocoa; Determination of Theobromine in ——. P. Welmans.

See under XXIII., *page* 1476.

English Patents.

Butter; Appliance for Testing ——, *for Water.* G. R. Geldard. Eng. Pat. 18,496, Aug. 22, 1901.

See under XXIII., *page* 1472.

Fatty Substances from Emulsions; Separation of [*Cream Separator*] ——. J. A. Dahlqvist and C. L. Holm, both of Stockholm. Eng. Pat. 5716, March 7, 1902.

For the purpose of obstructing or retarding the heavier portions of the liquid during their passage to the outlet and to cause the liquid to flow in two axial currents of opposite direction and at different distances from the centre, a hollow cone is placed in the separator drum, guiding strips or wings being mounted on the inside and outside of the cone. Those on the inside extend obliquely downwards from the upper portion of the cone, and in the same direction in which the drum is rotated. The outside strips extend obliquely upwards from the free bottom edge of the cone, and in the rotary direction of the drum. These outer strips may extend to the wall of the drum, or a narrow space may be left at certain points between the edge of the strip and the drum wall. Instead of the strips, obliquely mounted rings may be fixed to the outside of the cone.—W. P. S.

Filter-Presses [*Cocoa Butter from Cocoa Liquor*]. M. A. Smith, New York. Eng. Pat. 9884, April 29, 1902.

The filter cloths are attached to the inner surface of a number of rings or frames capable of being used interchangeably in a filter-press or hydraulic press, whilst separating plates are placed between each pair of rings or frames. The residue left in the filter-press can thus be transferred to the hydraulic press without being removed from the frames.—C. A. M.

Organic Substances [*Foods, Hides, Wool, Corn, &c.*]; *Preservation of* ——. C. L. Klett and A. P. Potel, both of Buenos Aires, Argentina. Eng Pat. 17,478, Aug. 8, 1902.

The articles, such as hides, wool, suet, corn, flour, fruit, milk, and all other kinds of food, to be preserved, are exposed in a closed chamber to the fumes arising from the burning of a mixture consisting of sulphur, 75 parts; wood charcoal, 15 parts; potassium acetate, 5 parts; and potassium permanganate, 5 parts. These proportions may be slightly varied according to the article to be treated. In the case of liquids, the gases or fumes are passed through the liquid.—W. P. S.

Milk-Albumin Preparation; Process of Making a ——. H. Laessig, Berlin. Eng. Pat. 17,584, Aug. 11, 1902.

100 parts of casein (precipitated from milk by acids) containing 50 per cent. of water are mixed with 10 parts of thickened milk or whey, and one part or less of sodium carbonate. The mixture is dried at a low temperature and powdered. A similar "albumin" product may be prepared by mixing 100 parts of casein obtained from milk by the use of rennet with 25 parts of casein precipitated from milk by an acid, and adding to the mixture less than one per cent. of sodium carbonate. A third process is to mix 100 parts of casein (rennet) with 20 parts of casein (acid) and 10 parts of milk sugar; or 100 parts of casein (rennet) with one part of lactic acid; a small quantity of sodium carbonate is added to both these mixtures. The products emulsify with water, and contain a proportion of calcium substantially corresponding to that contained in the albumin compound existing in natural milk.—W. P. S.

French Patents.

Centrifugal Machine [*Cream Separator*]. Société Nya Aktiebolaget Radiator. Fr. Pat. 318,267, Jan. 31, 1902.

See Eng. Pat. 5,716, 1902, above.—W. P. S.

Milk; Method and Apparatus for the Optical Examination of ——. M. Bernstein. Fr. Pat. 318,973, Feb. 22, 1902.

See under XXIII., *page* 1475.

Edible Vegetables; Preparation of the Assimilable Phospho-organic Matter of ——. Posternak. Fr. Pat. 18,311, Feb. 3, 1902.

Oil-cake of any description is digested with caustic soda solution in order to loosen the aleurone grains. It is then treated at the ordinary temperature with a dilute mineral acid which extracts the organo-phosphoric acid compounds

without dissolving the albuminoids. The extract is then precipitated by the addition of copper sulphate, calcium chloride, sodium acetate, and caustic soda in suitable proportions, the precipitate consisting of mixed salts of the organo-phosphoric acids. This precipitate is washed and decomposed by hydrogen sulphide, the solution is concentrated, and the phospho-organic matter is precipitated by alcohol.—J. F. B.

Fodder Rich in Sugar; Manufacture of a ——. Steffen. Fr. Pat. 318,720, Feb. 15, 1902.

The fodder consists of beetroot residues mixed with beetroot juice, sugar, or molasses, the mixing being carried out at a temperature of 40° to 100° C.—W. P. S.

Sterilisation [of Food]; Process of ——. Maussion. Fr. Pat. 319,034, Feb. 25, 1902.

The substance, vegetable or animal, to be preserved is placed in a vessel, which is then closed, with the exception of a small orifice. The vessel is now filled with alcohol. Carbon dioxide is now forced into the vessel, until all the alcohol has been driven out, and finally sufficient "potash" (dissolved in 2 parts of water) is introduced to convert the carbon dioxide into potassium bicarbonate. Immediately after the potassium hydroxide is introduced, the orifice is closed. The vegetables, &c., may, if necessary, be treated with an antiseptic before canning.—W. P. S.

(*B.*)—SANITATION.

Carbon Monoxide; Toxicity of ——. J. Gas Lighting, 1902, **80**, [2062], 1334.

With a view of determining the exact proportion of carbon monoxide which, when inhaled with atmospheric air, would prove fatal to man, U. Mosso has carried out experiments in an iron chamber of 203 cubic feet capacity, lighted by a glass window, hermetically closed by a door, and provided with inlets for the poisonous gas. An experiment, in which the subject lost consciousness, and artificial respiration and the use of compressed oxygen had to be resorted to, showed that the proportion of carbon monoxide in air fatal to man is 1–233rd or 0·43 per cent.—A. S.

Town Refuse Disposal in Great Britain. W. F. Goodrich. Cassier, 1901, **21**, 99—122. Proc. Inst. Civil Eng., 1902, **149**, [3], 97—99.

The author describes the systems in use at various towns in Great Britain. The evaporative value of the refuse varies, according to the nature of the material and the kind of destructor used, from one-fifth to one-fifteenth of that of coal. When the evaporative value is less than one-tenth of that of coal, the destructor cannot be reckoned as a power producer. In the following table are given the results obtained with different destructors in several Lancashire towns, in which the calorific value of the refuse may be presumed to be fairly uniform.—A. S.

Town.	Evaporation per lb. of Refuse.	Average Steam Pressure.	Temperature of Feed Water.	Consumption of Refuse per Cell per 24 Hours.	I. H.P. Produced per Ton on Basis of 20 lb. Steam per I. H.P.	Duration of Test.	Number of Cells or Grates in Use.	Rate of Combustion per Square Foot of Grate per Hour.	Boilers in Use.
		Lb.	°F.					Lb.	
Oldham	0·880	128·0	212	1 cell =7·96 tons	93·0	24 hours	10 cells	25·0	2 Lancs. 30′ × 8
Ashton-under-Lyne.	0·783	122·0	212	1 „ =9·97 „	87·0	24 „	6 „	31·0	2 Multitubular
Bury	0·532	..	53	1 „ =9·0 „	59·584	4 „	6 „	33·6	3 „ „
				T. C. Q. LB.					
Rochdale	1·78	114·0	212	4 grates=50 15 1 4	199·0	6½ „	4 grates	54·9	1 Lancs. 30′ × 8′
Darwen	1·55	193·0	212	4 „ =52 2 1 6	173·6	48 „	4 „	56·0	1 „ „
Nelson	1·516	118·0	212	4 „ =61 0 0 0	169·792	9½ „	4 „	57·0	1 „ „
Nelson	1·85	120·0	212	4 „ =31 0 0 0	207·2	1 month	4 „	21·0	1 „ „
Nelson	1·95	122·0	212	4 „ =73 4 0 0	218·4	8 hours	4 „	68·5	1 „ „
Blackburn	1·39	90·8	212	2 „ =25 9 1 12	155·68	12 „	4 „	48·0	1 „ 24′ × 7′
Fleetwood	1·19	135·0	212	1 cell =21 11 2 2	133·28	8 „	2 cells	80·5	1 Babcock W.T.
St. Helens	1·54	127·0	212	1 „ =27 12 0 8	172·48	7 h. 20 m.	2 „	103·0	1 „ „
Warrington	1·14	68·0	104	1 „ =23 0 0 0	127·0	24 hours	2 „	88·48	1 „ „
Blackburn	1·297	122·3	212	1 „ =11 3 0 12	145·264	7 h. 40 m.	4 „	34·66	2 Heenan W.T.
Liverpool	1·173	..	212	1 „ =16 10 0 0	131·376	24 hours	8 „	62·16	4 Babcock W.T.

English Patents.

Bacterial Filter Beds; Apparatus for Distributing Liquids over Large Areas, such as the Surfaces of ——. W. D. Scott-Moncrieff, Loudou. Eng. Pat. 21,182, Oct. 30, 1901.

An improvement on the apparatus described in Eng. Pat. 1070, 1901 (this Journal, 1902, 361), consisting in connecting the feeding channel and discharging trough by a channel below the level of the liquid in the former, so that loss of "head" is avoided. A further improvement is to make the discharging edge of the trough adjustable, in order that it may be placed at any height or angle.—W. P. S.

Bacteria- or Filter-Beds; Apparatus for Discharging Liquids over ——. G. B. Ransom, London; and Manlove, Alliott, and Co., Ltd., Nottingham. Eng. Pat. 23,553, Nov. 20, 1901.

An apparatus for evenly distributing liquids over a large area, consisting of a perforated pipe, or a trough, rotated on a vertical axis.

By means of a pad or brush arranged so as to pass diagonally across the edge of the weir when the distributor is rotated, the lip of the weir is kept clean.—N. H. J. M.

Bacteria Beds, or Filters, Tanks or the like; Apparatus for Automatically Controlling the Discharge or Feed of Sewage or other Liquid into ——. J. Graham, Carlisle. Eng. Pat. 25,893, Dec. 18, 1901.

The apparatus consists of two chambers, not in communication with each other, and constructed of masonry. One chamber is in direct communication with the channel conveying the sewage to the filters, and contains a valve, which is lifted to discharge the sewage into the filter. This valve is connected by a lever, having its fulcrum on the partition between the two chambers, to a float, heavier than the valve, in the second chamber. When the sewage has risen to a certain height on the filter, it flows into the second chamber through a syphon pipe, and raises the float until the latter is held by a catch-lever; at the same time the valve is lowered, and cuts off the sewage supply. The valve is kept closed by the catch-lever holding up the float until the filter has emptied itself. During this time a second filter has been filling through another apparatus. When the float of the latter rises and is caught by the catch-lever, an electric circuit is closed and acts on an electro-magnet, which releases the first catch-lever and allows the sewage to again fill this filter. When the latter is full, the electric circuit is once more closed, releasing the second float.—W. P. S.

FRENCH PATENTS.

Sanitation of Public Places and Preservation of Vegetable Matters. Catton and Varagniac, Paris. Fr. Pat. 318,930, Feb. 21, 1902.

VEGETABLE refuse, such as cut straw, is saturated with some antiseptic solution such as copper sulphate. The product is dried, and then utilised for spreading over the places to be disinfected.—X. H. J. M.

Distilling Apparatus [Drinking Water]. Jewell. Fr. Pat. 318,371, Feb. 4, 1902.

SEE Eng. Pat. 2863, Feb. 4, 1902; this Journal, 1902, 718. —L. A.

Filter-Sterilising [Water]. Siemens and Halske Aktien Gesellschaft. Fr. Pat. 318,999, Feb. 24, 1902.

THE water passes through a rapid filter of fine gravel into a chamber below partially filled with coarse gravel, where it is sterilised by means of ozone supplied from taps at the bottom of the lower chamber.—X. H. J. M.

Water; Purification of ——. Putzeys. Fr. Pat. 319,060, Feb. 25, 1902.

THE water is saturated with carbon dioxide, and passed through columns of calcareous substances The excess of lime is subsequently precipitated.—X. H. J. M.

(C.)—DISINFECTANTS.

Air; Disinfecting Power of Hot ——. Von Schomburg. Zeits. Hygiene, 1902, **41**, 167. Chem.-Zeit., 1902, **26**, [90], Rep. 302.

KOCH'S statements as to the imperfect disinfectant action of dry hot air are confirmed; but the experiments show that even the most permanent of the pathogenic bacteria, free from spores, when present in articles of clothing and the like, are completely destroyed within an hour by air at 100° C. if its relative humidity be from 55—65 per cent. This condition may be obtained by placing a vessel containing water, not too near the source of heat, in a chamber within which the air has a temperature of 100° C. In such an atmosphere leather articles are not affected, and do not shrink, even after an exposure of from 6 to 8 hours. In the case of dyed fabrics, neither the material nor the colour suffers. The method cannot be applied satisfactorily in the case of bacteria containing spores, because the time required for their destruction is too great, but the case rarely arises in practice.—W. G. M.

Ethyl Alcohol; Bactericidal Action of ——. J. Weigl. Arch. Hyg., **44**, 273—294. Chem. Centr., 1902, **2**, [17], 1070.

ETHYL alcohol exerts a bactericidal action only when it contains a certain proportion of water, and when the formation of coarse precipitates is, as far as possible, avoided. 99 per cent. and 96 per cent. alcohol have no action on dried germs, and this is due to the fact that the proportion of water present is deficient, and consequently the disinfectant is not capable of penetrating the bodies of the bacteria Absolute alcohol has a perfect bactericidal action if the germs are first moistened in water at a relatively low temperature. The author avoids the formation of coarse precipitates by agitation; these precipitates form protective coatings around the germs, and so prevent the penetration of the latter by the alcohol. The bactericidal action of alcohol is increased by rendering it acid or alkaline. —A. S.

Microsol. G. Fendler. Pharm. Zeit., **47**, 599.

MICROSOL is a new cheap disinfectant, which, in the form of a 2·5 per cent. solution, is employed as a general disinfectant for drains, stables, and similar purposes. It is a green paste having a marked odour of SO_2, and is readily soluble in water. According to the author it consists of copper sulpho-carbolate. 10 per cent.; copper sulphate, 75 per cent.; free sulphuric acid, 2·3 per cent.; water, 12 per cent. It may be prepared by heating 5 parts of commercial phenol with 6 parts of strong sulphuric acid to between 120°——150° C., until a portion of the mixture is found to be perfectly soluble in water. After cooling, the sulphophenolic acids thus obtained are dissolved in 10 parts of water, the solution is saturated with copper carbonate and filtered. To the filtrate 75 parts of powdered copper sulphate are added, together with sufficient water to form a pasty mass.—J. O. B.

FRENCH PATENTS.

Wood-Charcoal [Hygienic and Antiseptic] from Aromatic Plants. Rubauds. Fr. Pat. 318,057, Jan. 27, 1902.

A MIXTURE of aromatic plants (juniper, thyme, broom, &c.) in suitable proportions is heated in an oven until the cresols begin to come off; the mass is then thrown into sheet-iron boxes, sealed to prevent combustion, and allowed to cool; the empyreumatic matters are reabsorbed, and a hygienic and antiseptic wood-charcoal is obtained. The product may be finely powdered and formed into briquettes.—J. W. H.

Antiseptic Compounds; Process of Making ——. Page. Fr. Pat. 319,248, March 3, 1902.

WHEN benzoyl acetyl peroxide is brought in contact with water, hydrolysis takes place, dibenzoyl peroxide is precipitated, and acetic acid, together with a new body, acetylhydrogen peroxide, remain in solution, according to the equation—

$$2C_6H_5CO.OO.COCH_3 + HOH = C_6H_5CO.OO.COC_6H_5 + CH_3CO_2H + CH_3COOOH.$$

This last body and the products of hydrolysis of any organic peroxide are claimed as powerful antiseptics. —J. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Jute, Manila, and Andansonia Fibres; Differentiation of ——. G. Dalén and Wisbar. Mitt. aus dem königl. techn. Versuchsanst. zu Berlin, 1902, **20**, [2], 51—56.

THESE are the chief fibres of extra-European origin used in the manufacture of packing paper, and, since they closely resemble each other in structure, their microscopical detection in such paper is a difficult matter.

Jute.—The raw material for paper is obtained either from the refuse from jute spinning, or from old packing material (coffee sacks and the like). The elementary fibres of jute are lignified and united in larger or smaller bundles. During the manufacture the bundles may be more or less disintegrated into single fibres, so that both forms may be recognised in a microscopical examination of the paper. The lumen of the jute fibre is characteristic, being in part nearly as wide as the fibre and then contracting to a very narrow channel.

Manila.—Old ship's tow forms the crude material used for paper. As in the case of jute, though less frequently, the fibres in the paper are sometimes united into bundles. The lignin in the elementary fibres is present in so small a proportion as to be readily removed by boiling with alkalis. Jute fibres are generally empty, whilst Manila fibres frequently contain protoplasmic masses, which give a yellowish-brown colour with iodine in potassium iodide, and a lemon-yellow colour with iodine in zinc chloride. The fibres do not show sudden changes in diameter, and their ends frequently have the form of a lead-pencil point, or of a bulb with a fine point.

Andansonia Fibre.—Under the microscope the fibres frequently show irregularities in their diameter, with sudden contractions towards the ends. Ring- or bar-shaped structures round the fibre are also of frequent occurrence, whilst they are seldom met with in other fibres used for paper. The lumen is fairly wide, and changes approximately in diameter with the variation of the fibre. The ends of the fibres are usually rounded, and bundles of fibres are hardly ever met with.

The following table shows the comparative characteristics of the three fibres :—

Fibre.	Coloration. Iodine in KI.	Coloration. Iodine in $ZnCl_2$.	Lumen.	Ends.	Pores.	Subsidiary Constituents.
Jute, with lignin ..	Bright yellow-brown or brown.	Yellow or yellowish-brown.	Frequent change in diameter.	Usually rounded.	Openings parallel to axis.	None.
„ without lignin	Grey, sometimes brown.	Blue, sometimes reddish-violet.	„	„	„	„
Manila	Grey, brown, or yellowish.	Blue, reddish-violet and yellow, with intermediate shades.	In thick-walled fibres of varying breadth. In thin-walled fibres, regular.	Frequently pointed like lead pencil.	Openings oblique or parallel to axis.	Groups or single parenchyme cells with fairly thick oblique walls.
Andansonia	Dirty-grey and brown.	Blue to reddish-violet.	The width varies with that of the fibre.	Usually rounded.	„	Calcified parenchyme cells and vascular fragments.

—C. A. M.

French Patents.

Marbled Paper ; Production of ——, on the Paper-making Machine. Anders. Fr. Pat. 318,452, Feb. 6, 1902.

Paper marbled on one or both sides is produced by splashing on the web of wet paper, as it is formed on the machine, blots of pulp of another suitable colour, which are then pressed up to form part of the paper itself. This is effected by means of a receiver for the coloured pulp, placed above the paper-making wire, in which are situated revolving scoops which throw out portions of the coloured pulp against a metal plate, whence they fall in the form of drops on to the travelling web.—J. F. B.

Broom ; Utilisation of ——, for Manufacture of Paper Pulp. S. Persichetti. Fr. Pat. 318,650, Feb. 13, 1902.

The branches and stalks of the broom plant are digested at the ordinary temperature in a bath of caustic soda solution at 10° B. for three or four days. They are then washed, bleached and soured, and beaten up to paper pulp. It is proposed to utilise the alkaline liquors for the manufacture of soap.—J. F. B.

Celluloid-like Composition ; Manufacture of a ——. Zuhl. Addendum, dated Feb. 22, 1902, to Fr. Pat. 309,962, April 15, 1901 (this Journal, 1902, 65).

See Eng. Pat. 4383, 1902 ; this Journal, 1902, 719.

—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Mercuric Oxide, Red ; Preparation of Pure ——, by Precipitation. E. Dufau. J. Pharm. Chim., 1902, **16**, [9], 439—442.

A hot solution of 100 grms. of mercuric chloride in 500 grms. of distilled water is mixed with one of 180 grms. of potassium carbonate in 500 grms. of water. Boiling is continued until the brown precipitate at first formed becomes of a bright red colour, when it is allowed to subside, the aqueous portion decanted, and the precipitate boiled for a few moments with dilute caustic potash solution. The precipitate is then washed by decantation with distilled water until free from chloride, collected, drained, and dried. Thus obtained, the mercuric oxide is pure, of an orange-red colour, soluble in dilute acids without evolution of gas. It consists of a microcrystalline powder, the minute crystals composing which are very friable, and are readily porphyrised.—J. O. B.

Thionyl Chloride ; its Employment in the Manufacture of Acetic Anhydride. G. Wyss. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, 198.

Anhydrous sodium acetate, when digested with thionyl chloride, furnishes a good yield of acetic anhydride in accordance with the following equation :—

$$2NaC_2H_3O_2 + SOCl_2 = 2NaCl + C_4H_6O_3 + SO_2.$$

—G. T. M.

Camphor Carboxylic Acid ; Further Investigations on ——. Second Communication. J. W. Brühl. Ber., 1902, **35**, [17], 3619—3633. (See also this Journal, 1902, 1409.)

The sodium compounds of the camphor carboxylic acid esters prepared by the action of metallic sodium in non-dissociating solvents (ether or benzene) do not react at all with alkyl-halogen esters. On the other hand, the sodium derivatives prepared in presence of dissociating solvents (alcohols) by means of sodium alcoholates react with halogen steers exactly in the same way as the derivatives of other β-ketonic acid esters, yielding esters of alkyl camphor carboxylic acids. This is probably due to the existence of the enolic form in the first case, and the ketonic form in the second. The esters of the alkyl camphor carboxylic acids exhibit a remarkable resistance towards saponification. This can only be satisfactorily performed by the action of concentrated solutions of the alkali alcoholates, preferably a 15 per cent. solution of sodium methylate, which saponifies these esters slowly at ordinary temperatures, and more rapidly on warming. Methyl camphor carboxylic acid has thus been prepared for the first time ; it readily splits up on heating, into carbon dioxide and methyl camphor.

The behaviour of the esters of allyl camphor carboxylic acid on saponification is peculiar. They yield neither allyl camphor carboxylic acid nor allyl camphor, its decomposition product. There is obtained instead only a dibasic acid, allyl homocamphoric acid, produced apparently by the hydrolysis of the camphor ring of allyl camphor carboxylic acid formed in the first instance.—J. F. B.

Standards for Medicines. J. C. Umney. Pharm. J., 1902, **69**, [1690], 492—498.

This paper refers to : first, limits of impurity in chemicals (organic and inorganic), crude drugs, &c. ; and, second, standards of efficacy.

The author treats the subject under the following headings :—

(1) Standards of Purity or Limits of Impurity.—(a) *Chemicals :* (1) Dangerous metallic contamination ; (2) Ordinary chemical impurities. (b) *Drugs :* Freedom from adulteration as shown by—(1) Percentage of ash ; (2) Percentage yield to solvents.

(2) Standards of Efficacy. (a) *Drugs :* Uniformity in character, as shown by percentage of active constituent or constituents ; (b) *Characters of Galenical Preparations,* as shown by analytical examination.—A. S.

Cinchona succirubra Bark ; Fluid Extracts of——. Warin. J. Pharm. Chim., 1902, **16**, [9], 424—429.

The fluid extracts of *Cinchona officinalis* in the various Pharmacopœias may be classed in two groups, those prepared with alcohol of various strengths, with or without the addition of hydrochloric acid, and those obtained by extraction with acidulated water.

The author points out the disadvantages attaching to these different methods, and states that comparative experiments with various solvents, working on a specimen of

bark containing 5·84 per cent. of total alkaloids, of which 2·11 per cent. was quinine, indicate that the following method is the best: 200 grms. of the bark in No. 40 powder (15 meshes to the centimetre) are moistened with 80 grms. of distilled water containing 10 grms. of HCl. After standing for two hours, the bark is extracted in the usual manner, by percolation with distilled water, setting aside the first 170 grms. of solution. The rest of the solution is then evaporated to 10 grms., mixed with the reserved portion, and 20 grms. of 95 per cent. alcohol added to the mixture, the weight of which is finally made up to 200 grms. The extract thus prepared contains 4·03 per cent. of total alkaloids; 24·32 per cent. of extractive, and has the sp. gr. 1·0585. It forms a brown, very bitter, astringent liquid, which mixes perfectly with water.

J. O. B.

Acocantherin: A Contribution to the Knowledge of African Arrow Poisons. E. S. Faust. Arch. exp. Pathol. u. Pharmak., **48**, 272—281. Chem. Centr., 1902, **2**, [19], 1217.

The "Shashi" arrow poison is derived from *Acocanthera abyssinica* (Hochst), K of the family of Apocynaceæ, to which a number of heart poisons belong, several of which are used in Africa as arrow poisons. The author's specimen formed a pitch-like, black mass, soluble in water. The poisonous glucoside, *acocantherin*, was isolated by precipitating the aqueous solution with basic lead acetate and ammonia, removing the lead from the filtrate by means of carbon dioxide, salting-out with ammonium sulphate, dissolving in alcohol, and treating with basic lead acetate and baryta. After removing lead and baryta from the filtrate, ether was added, when the acocantherin separated in light yellow flocks. When dried *in vacuo* over sulphuric acid, the poison forms an extremely hygroscopic substance, insoluble in ether, chloroform, benzene, acetone, petroleum spirit, and acetic ester, easily soluble in dilute alcohol. On boiling with mineral acids, acocantherin is hydrolysed, with formation of rhamnose. On warming the acid aqueous solution, the other component of the glucoside separates in the form of lamellæ, soluble in 96 per cent. alcohol, chloroform, and acetic anhydride. *Acocantherin* has a composition corresponding to the formula $C_{32}H_{50}O_{12}$; it is thus a homologue of ouabain, $C_{30}H_{46}O_{12}$ (see Arnaud, this Journal, 1898, 268, 601, 689, 739, 791), and of strophanthin, $C_{31}H_{48}O_{12}$. It is optically inactive, softens at 130° C., and decomposes at 220° C.; its aqueous solution has a very bitter taste. The pharmacological action of the glucoside, like that of East African arrow poisons in general, resembles that of members of the digitalin group.—A. S.

Verbena Oil. E. Theulier. Rev. gén. de Chim. pure et appl., **5**, 324. Chem. Centr., 1902, **2**, [19], 1208.

By the distillation of 180 kilos. of verbena leaves (*Verbena triphylla*, L.), the author obtained 130 grms. (= 0·072 per cent.) of oil, which had sp. gr. at 13° C., 0·919; optical rotation, − 16° 20′; ester content (calculated as linalyl acetate), 11·20 per cent. The light yellow oil has an odour more resembling that of lemongrass oil than that of citronella oil. It is insoluble in 80 per cent. alcohol, but dissolves partly in 90 per cent. alcohol, with separation of a wax-like stearoptene melting at 62·5° C. It contains 20·8 per cent. of aldehydes, which have been examined by Kerschbaum (see this Journal, 1900, 686). By fractional distillation of the oil, after removal of the aldehydes, terpenes and a sesquiterpene were isolated. The behaviour of the terpenes on bromination indicated the presence of *l*-limonene. By treating the fractions boiling between 100° and 140° C. at 14 mm. pressure with calcium chloride, geraniol was isolated.—A. S.

Rue; German Oil of ——. The Isomerisation of Methylnonylketoxime. J. Houben. Ber., 1902, **35**, [17], 3587—3592.

German oil of rue, melting at 9·3° C., and showing a distinct blue fluorescence, when shaken with dilute sulphuric acid yielded traces of a basic substance, which was powerfully fluorescent. Sodium carbonate solution extracted small quantities of an acid corresponding with caprylic acid. Caustic soda extracted about 1 per cent. of phenols with a strong, characteristic odour, the main product melting at 150° C. The oil yielded also 2·4 per cent. of methylheptylketone and 71 per cent. of methylnonylketone. Pure methylheptylketone boils at 194°—196° C. under atmospheric pressure, it solidifies in a freezing mixture, and yields, on reduction, methylheptylcarbinol and the pinacone of this latter. Dimethylheptylcarbinol was also prepared and characterised. The constants of methylnonylketone were very carefully determined: sp. gr. = 0·8295 at 15° C., and 0·8263 at 20° C.; solidifying point + 13° C.; b. pt., 228°—230° C. under atmospheric pressure, and 118° C. under a pressure of 18 mm. This body is absolutely non-fluorescent, and takes up three atoms of bromine by substitution. The isomerisation of methylnonylketoxime under the action of sulphuric acid yielded not only acetylnonylamine, as Thoms has stated, but also a considerable proportion of capric acid methylamide.

—J. F. B.

Oil of Rue, Essential; Constituents of an ——. F. B. Power and F. H. Lees. Proc. Chem. Soc., **18**, [255], 192—193.

To obtain some methylnonylketone, the authors procured a quantity of oil of rue labelled *Ol. Rutæ Ang.*, from an English distiller, and found subsequently, on inquiry, that it was not distilled from the native-grown herb. From their results, taken in conjunction with those of Thoms (this Journal, 1901, 606) and von Soden and Henle (this Journal, 1901, 930), the authors regard it as most probably of Algerian origin.

The oil was light yellow in colour. Sp. gr. at 15·5° − 16°C. = 0·8405. α_D = − 3° 48′ for a 100 mm. tube. It was completely soluble in two parts of 70 per cent. alcohol. The following constituents were identified: (1) methyl *n*-heptylketone; (2) methyl *n*-nonylketone; (3) methyl *n*-heptylcarbinol; (4) methyl *n*-nonylcarbinol; (5) a blue oil of high but not constant boiling point; (6) acetic acid; (7) a basic substance having the odour of quinoline; (8) a mixture of free fatty acids; (9) methyl salicylate; (10) an ester of valerianic acid, apparently ethyl valerianate; (11) pinene; (12) *l*-limonene; (13) cineol.

The relative proportions in which the above-mentioned substances were found to exist in the oil are approximately as follows: the two ketones constitute 80 per cent., and were present in about equal amounts. The two alcohols represent about 10 per cent., the methyl *n*-heptylcarbinol preponderating; they were present partly in the free state and partly as acetic esters. The terpenes, together with cineol, amount to about 1 per cent., and the blue oil to about 0·5 per cent. From the non-ketonic portion of the oil a small amount of an undistillable, viscous substance, probably a decomposition product, was separated.

Since the substances associated with the ketones and alcohols are present in such small amount, and the limonene is the more rarely occurring *l*-form, the authors conclude that all these substances are natural constituents of the oil.

Morphine in Opium: Determination of ——, by means of Ammoniacal Silver Chloride. C. Reichard.

See under XXIII., *page* 1476.

Ipecacuanha: Certain Reactions of the Alkaloids of ——. A. H. Allen and G. E. Scott-Smith.

See under XXIII., *page* 1475.

English Patents.

Pharmaceutical Compounds [Fats containing Iodine and Sulphur]; Manufacture of ——. H. E. Newton, London. From F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 24,327, Nov. 29, 1901.

Fats, fatty oils, unsaturated fatty acids, and the like, are dissolved in benzene, treated with iodine, and then with a current of hydrogen sulphide until practically decolorised. The product is then washed repeatedly with water, and the benzene is removed by distillation. These products can be prepared containing various proportions of iodine and sulphur; they are stable at the temperature of the water-bath and can be kept for a long time.—J. F. B.

Pharmaceutical Compounds [*Atropinum Alkyl Nitrates*]; *Manufacture of* ——. H. E. Newton, London. From F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 25,804, Dec. 17, 1901.

See U.S. Pat. 707,402; this Journal, 1902, 1194.

—J. F. B.

Carbon Tetrachloride; Process and Apparatus for the Manufacture of ——. C. Combes, Paris. Eng. Pat. 25,688, Dec. 16, 1901.

Carbon is heated with sulphur or sulphur chloride in an atmosphere of chlorine, the products being condensed and separated in such a manner that the sulphur chloride is continuously recovered and returned in the process. For this purpose a vertical retort of refractory material is employed, in which the temperature decreases from the intake to the outlet, together with a dephlegmator in which the less volatile products are condensed and returned to the retort.—J. F. B.

Para-cresol Oxalic Acid Ester, and Separation of Para-cresol from Meta-cresol. J. Wetter, London. From Rud. Rütgers, Charlottenburg, Germany. Eng. Pat. 286, Jan. 4, 1902.

See Fr. Pat. 317,512; this Journal, 1902, 1110.—J. F. B.

Supple Protective Coating; Production of ——. S. Efrem, Berlin, Schöneberg, Germany. Eng. Pat. 12,450, May 31, 1902.

One part of dammar resin and 9 parts of wax are dissolved by heat in 20 parts of benzine, and the solution, after evaporation to the consistence of an ointment, is mixed with 250 parts of potash soap. The mixture is further evaporated to 270 parts, and ½ per cent. of formaldehyde is added. The ointment thus produced is especially suitable for coating the hands of those engaged in surgical operations.—M. J. S.

French Patents.

Camphor; Process of Manufacturing ——. The Ampère Electro-Chemical Co. Addendum, dated Feb. 1, 1902, to Fr. Pat. 303,812, Sept. 17, 1900.

In the manufacture of camphor by this process (see this Journal, 1901, 67 and 601), a considerable proportion of dipentene is produced. The dipentene is recovered by submitting the products of the reaction to fractional distillation, before or after the saponification of the esters, and collecting the first portions of the distillate.—J. F. B.

Acetic Acid and other Acids of the Fatty Group; Obtaining ——. H. von Hochstetter. Fr. Pat. 318,710, Feb. 15, 1902.

Sodium acetate is heated in a current of dry HCl to a temperature above that of distillation of the acetic acid set free, dry sodium chloride being obtained as a by-product. Instead of hydrochloric acid, moist sulphurous acid gas may be employed in the process, the residual product being sodium sulphite. The same processes are applicable in obtaining other acids of the fatty series from their salts.

—E. S.

Organic Peroxides; Process of Making ——. R. H. Page. Fr. Pat. 318,883, Feb. 20, 1902.

See U.S. Pat. 710,005; this Journal, 1902, 1348.

—J. F. B.

XXI.—PHOTOGRAPHY.

Silver Images bleached by Corrosive Sublimate; Blackening of ——, *by Sodium Sulphite Solution.* E. Valenta. Phot. Corr., 1902, 6—10. Chem. Centr., 1902, **2**, [18], 1163.

The author finds that the grey-black body which is produced on treating $HgAgCl_2$ with sodium sulphite solution, and which forms the image in the case of silver prints which are bleached with corrosive sublimate and blackened with sodium sulphite, contains no compounds of silver or mercury with sulphur. According to the duration of the action and the concentration of the sulphite solution, it contains varying quantities of silver chloride, metallic silver and mercury, or, if the amount of sulphite solution used is sufficient to dissolve all the silver chloride, only silver and mercury.—A. S.

Toning with Thionates of Lead. Lumière and Seyewetz. Monit. Scient., **16**, 1902, [731], 798—800.

The authors have carried out a series of experiments with the thionates of lead for toning, suggested by a former investigation on the combined toning and fixing bath showing that pentathionic acid was formed. Lead pentathionate was shown to give excellent images, superior to other toning results. The toning-fixing bath was formed by adding 250 grms. of sodium thiosulphate to 1 litre of a solution of neutral pentathionate of lead of 21° B. (produced by adding lead carbonate to pentathionic acid solution of 10° B.). The dithionate, trithionate, and tetrathionate were not so effective, and are without practical interest.—J. W. H.

Prints after the use of the Combined Toning and Fixing Bath; Fading of Silver-chloride-citrate ——. Lumière and Seyewetz. Monit. Scient., **16**, 1902, [731], 795—798.

Davanne and Girard have concluded that sulphur or sulphuretted hydrogen and moisture are the causes of fading in chloride-citrate prints, and condemn the combined bath on account of its acid reaction.

The authors defend the combined bath, and conclude that the principal cause of fading is the incomplete elimination of sodium thiosulphate, moisture even then being necessary to bring it about. The same effect is produced with ordinary double-bath toning and fixing; the absence of all trace of sodium thiosulphate in the print is a guarantee of its permanence in moist air, whether the image consists of gold, sulphide of silver, silver only, or lead and silver. The yellow appearance of the faded prints does not appear to be due to either sulphide of silver or of lead, but to sulphur produced by the slow decomposition of thiosulphate. The only means of preventing the fading of prints is to thoroughly eliminate the last traces of the fixing salt.—J. W. H.

English Patents.

Printing Plates from Elastic Material for Autotype Tone Printing; Manufacture of ——. C. Schreiber, Potsdam, Germany. Eng. Pat. 24,132, Nov. 27, 1901.

This process consists in preparing a screen dia-positive, instead of negative, in the ordinary screen camera, and transferring it to a suitable etching surface, etching the surface so as to produce a relief block having successively darker tones at successively lower depths, and casting the actual printing plate or block thereon. The plate or block is made of a suitable elastic material, such as vulcanite, gutta-percha, celluloid, &c.—R. A.

Celluloid-like Substances [*Photographic Films*]; *Manufacture of* ——. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 26,075, Dec. 20, 1901.

Plastic and translucent compounds resembling celluloid are prepared by employing, instead of the usual nitrocellulose, those acetates of cellulose which yield flexible films on evaporation of their solutions. For instance, 100 parts of cellulose acetate and 50 parts of camphor are triturated for several hours at a gentle heat with chloroform or glacial acetic acid; if desired, any suitable substitute for camphor may be used. Photographic films are prepared from the above composition.—J. F. B.

[*Photo-Reliefs*] *Plastic Subjects; Photographic Process and Apparatus for the Reproduction of* ——. C. Baese, Berlin. Eng. Pat. 5381, March 4, 1902.

A "photographic process for the reproduction of plastic objects characterised by the fact that two negative photographic pictures are taken of the object to be reproduced, of which the first one is taken in a light graduated in proportion to the prominences of the surface thereof, or of

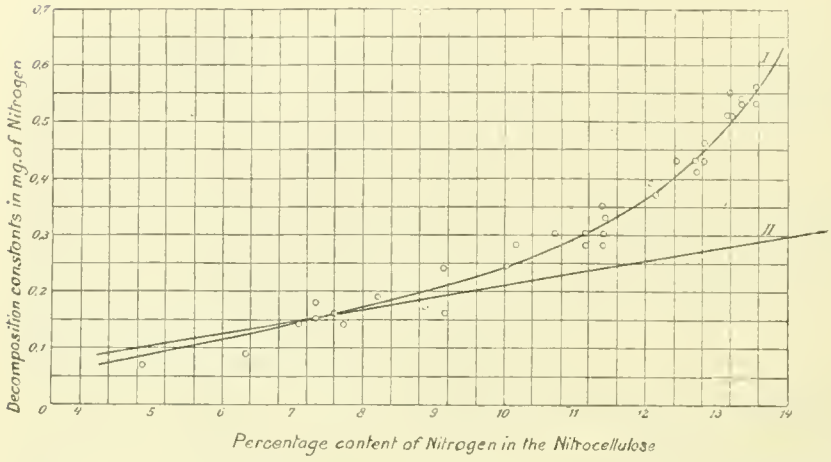
sections thereof, and the second one either in an oppositely graduated, or in a uniformly distributed light, from one of which negatives a dia-positive is produced which, when placed on the other negative, neutralises the effects produced, firstly, by the distribution of the light, occasioned by the geometrical form, and, secondly, by the different actinic powers of the various colours of the object." The set of plates so produced are copied, either together or separately, on sensitised gelatin or the like, the sections being adjusted, when such exist, in their correct mutual position. Apparatus for determining the position of the above-mentioned sections, and for turning up a mass of wax, &c. into a shape which imitates that of the original object, is also described.—F. H. L.

FRENCH PATENTS.

Carbons; Photogenic or Photographic ——. Broca and Pellin. Fr. Pat. 318,994, Feb. 24, 1902.

See under II., *page* 1448.

Fig. 1.



Enamels and Photographic Plates; Application of Colours to ——, *without Painting or Printing.* H. Perrin. Fr. Pat. 319,117, Feb. 27, 1902.

See under VIII., *page* 1455.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrocellulose; Researches on the Stability of ——. *II. Normal Nitrocellulose.* W. Will. Mitt. aus dem Centralstelle f. Wissensch. Techn. Untersuchungen, Neu-Babelsberg, Berlin. 1902, [3], 5—40. (See this Journal, 1901, 609—617.)

In this communication a state or condition of nitrocellulose is described, which may be regarded as *normal*. When exhaustively washed, nitrocellulose finally reaches a stage of purity at which, when heated under the conditions described in the earlier communication (*loc. cit.*), *equal quantities of nitrogen, as oxides, are evolved within equal periods.* The amount of washing required for the attainment of this normal stage depends upon the purity of the materials used, and on the conditions of manufacture. If the nitration acid contains a large percentage of water, treatment with cold water suffices to bring the nitrocellulose to the normal condition. After discussing the value of this definition as a test of stability and its relation to other tests, the author develops the subject under the following headings:—

Minimum Separation of a Normal Nitrocellulose.—Several typical nitrocelluloses from pure materials were brought to a normal condition, and then further boiled for periods ranging from 30 to 320 hours. The separation of nitrogen, on heating at 135° C. per unit of time ($\frac{1}{4}$ hour), remains perfectly constant for each nitrocellulose, but the amount varies according to the type of the nitrocellulose, *i.e.*, according to the conditions under which the cotton was nitrated. Thus—

Nitrating acid employed	$4\frac{3}{7}$	$9\frac{3}{7}$	$14\frac{3}{7}$	$19\frac{3}{7}$
Mean value of nitrogen separation in mgrms. per $\frac{1}{4}$ hour	0·62	0·56	0·36	0·16
Variation in above	+ 0·02 − 0·02	+ 0·03 − 0·04	± 0·0 ..	+ 0·02 − 0·03

As in the earlier communication, the fractions denote the composition of the nitrating acid. Thus $4\frac{3}{7}$ means an acid containing 4 per cent. of water with the sulphuric and nitric acids in the ratio 3 : 1; *i.e.*, of the composition 72 H_2SO_4, 24 HNO_3, 4 H_2O.

Normal samples were also submitted to further processes of purification, such as heating with alcohol or with water, under pressure, without affecting the constancy of this nitrogen-separation constant.

Many technical samples, however, owing probably to the presence of small traces of foreign matter which may act as catalytic agents, yield a permanently higher nitrogen-separation constant than the minimum furnished by the same type of nitrocellulose prepared from pure materials. Thus a $9\frac{3}{7}$ nitrocellulose regularly evolved 0·80 mgrm. of nitrogen per $\frac{1}{4}$ hour, even after long boiling, instead of the typical 0·56 mgrm. (see table above). By very long keeping, or addition of certain reagents (1 per cent. of powdered potassium permanganate, potassium perchlorate, or boric acid), the nitrogen constant was reduced to the normal minimum, 0·56 mgrm.

This constant is also affected by the physical condition of the sample, and experiments made with gelatinised nitrocotton showed that the size of the factor definitely varied with the degree of gelatinisation.

Speed of Decomposition, as a Function of Nitrogen-Content.—Curve I in Fig. 1 exhibits the relation between the percentage of nitrogen in the sample (abscissæ) and the separation constant (ordinates). Up to about 9 per cent. of nitrogen, the constant increases gradually, but after this point the ratio is no longer proportional. Highly nitrated cottons would appear to be not only relatively but absolutely less stable than low-nitrated cottons, and this view was supported in various ways during the investigation. The size of the separation constant is also influenced by the composition of the nitration acid. Two nitrocelluloses, each containing 13·1 per cent. of nitrogen, and of 5 per cent. solubility, were examined from this point of view. One of these, made with $4\frac{3}{7}$ acid, gave a constant of 0·62 mgrm. N; the other, from $9\frac{3}{7}$ acid, gave 0·53 mgrm. Similar results were obtained indicating that the separation constant diminishes according as the percentage of water in the nitration acid increases.

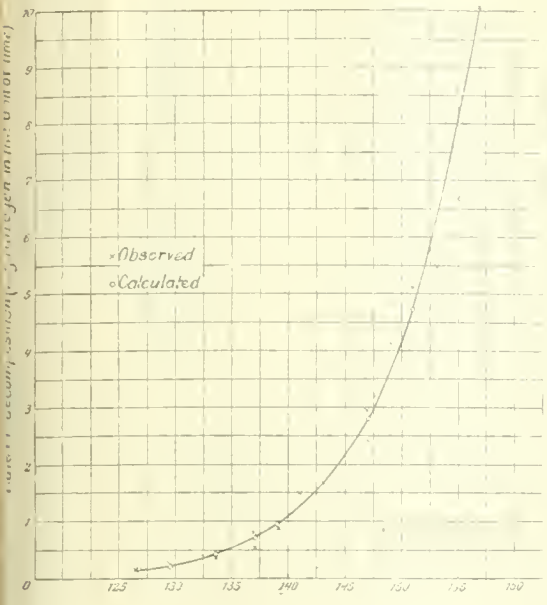
Speed of Decomposition, as a Function of Temperature.—Fig. 2 shows by a curve the variation in the value of the separation constant, with temperatures ranging from 126·5° C. to 157° C., the nitrocellulose employed being normal, and prepared from $9\frac{3}{7}$ acid. The analytical figures show that the constant is approximately doubled for every 5° C. increase of temperature; *e.g.*, at 130° C. it is 0·25 mgrm.; at 135° C., 0·55 mgrm.; and at 140° C. it becomes 1·1 mgrm.

These experimental results are expressed in the dissociation formula—

$$\log. N = a + b \times 0{\cdot}9932^t,$$

where N = separation constant in mgrms. of nitrogen at temperature t. t = temperature in degrees C., and the constants $a = 8{\cdot}84211$; $b = -22{\cdot}857$.

Fig. 2.



The separation constant N was calculated by this formula for temperatures ranging from 20 C., where $= 0{\cdot}079 \times 10^{-10}$ to 50° C., when $N = 385 \times 10^{-10}$, in view of the practical importance of temperature in the storing of quantities of nitrocellulose. By extending the comparison to the zinc-iodide and starch test, it would appear that periods ranging from "361 years" at 20° C. to 7 days at 50° C. would be required for 1 grm. of this nitrocellulose to develop a weak blue coloration on the test papers.

The same general relation was established between speed of decomposition and temperature, in the case of low-nitration products, wherein, as previously stated, the rate of separation, as compared with the percentage of nitrogen, is disproportionately lower than in the case of highly nitrated samples, *i.e.*, an absolutely higher degree of stability is indicated. On comparing the quotient representing speed of separation for equal intervals of temperature (in the following table), it will appear that between different highly nitrated celluloses no such comparative difference of stability is to be found. The demonstration of this fact, together with the regular behaviour of "normal" nitrocelluloses in compare, especially the quotient for temperature increments of 5° C. $\left(\frac{N_{t+5}}{N_t}\right)$, and the significance of the whole investigation as to the question of structure, appear in this table:—

	Percentage of Nitrogen.					
Temperature.	13·1		9·73		7·35	
	N_t.	$\frac{N_{t+5}}{N_t}$	N_t.	$\frac{N_{t+5}}{N_t}$	N_t.	$\frac{N_{t+5}}{N_t}$
° C.						
135	0·55	2·0	0·35	1·9	0·13	1·9
140	1·10	2·0	0·68	1·9	0·25	2·0
145	2·20	1·9	1·27	2·0	0·50	2·1
150	4·15	1·9	2·25	1·9	1·05	2·0
155	8·10		4·90		2·05	
160	..		9·95	2·0	3·95	1·9

The Nitrogen Separation Constant.—10 grms. of normal nitrocellulose were continuously heated at 135° C. until nitrogen was no longer evolved (371 hrs.). From the nature and volume of the nitrogen oxide, the total loss in weight of the sample, the water collected, and the ultimate composition of the residue in the decomposition flask, the author has constructed the equation—

$$C_{12}H_{15}(NO_2)_5O_{10} = C_{10}H_3NO_8 + 4NO + 6H_2O + 2CO$$

as representing the mode of decomposition.

The paper concludes with an illustrated description of the apparatus used for estimating the nitrogen, with careful details for working, correction curves, and sample records of results. (See this Journal, 1902, Dec. 31, under XXIII., Org. Quantit.)—R. L. J.

English Patents.

Blasting Compositions. J. Wetter, London. From Westfälisch-Anhaltische-Sprengstoff-Aktiengesellschaft, Berlin. Eng. Pat. 25,884, Dec. 18, 1901.

An explosive for use in "fiery" mines consisting of nitroglycerin (40 parts), collodion cotton (2 parts), liquid paraffin (8 parts), naphthalene (4 parts), rye flour (12 parts), wood flour (2 parts), ammonium nitrate (27 parts), and potassium nitrate (5 parts).—G. W. McD.

Safety Explosives or Blasting Compositions. J. Wetter, London. From Westfälisch-Anhaltische-Sprengstoff-Aktiengesellschaft, Berlin. Eng. Pat. 26,617, Dec. 30, 1901.

The explosives claimed consist of mixtures of the following composition:—

Nitroglycerin	40	40	40
Collodion cotton	1	1	1
Potassium nitrate	4	4	5
Ammonium nitrate	27	26·5	27
Wood flour	2	2	2
Rye flour	10	9·5	12
Liquid paraffin	3·5	6 to 7	..
Aluminium palmitate	12·5	..	..
,, stearate	..	11	..
Camphor	..	..	13

—G. W. McD.

Safety Explosive or Blasting Substance: Manufacture of a ——. H. Poetter, Dortmund. Eng. Pat. 21,189, Sept. 29, 1902.

An explosive for use in dangerous mines consisting of ammonium nitrate (82·7 per cent.), dinitrobenzene (1 per cent.), turmeric (11·5 per cent.), and copper oxalate (4·8 per cent.)—G. W. McD.

Smokeless Powder, and Method of Compounding same. J. A. Denton and J. H. Preas, Washington, U.S.A. Eng. Pat. 20,214, Sept. 16, 1902. (Under Internat. Conv., March 8, 1902.)

See U.S. Pat. 701,802; this Journal, 1902, 927.

—G. W. McD.

Explosives. A. Hough, New York. Eng. Pat. 21,171, Sept. 29, 1902.

Dried and pulverised starch (1 part) is dissolved in nitric acid (8 parts) at 32° C. Sulphur trioxide is then passed in under reduced pressure, the nitro-starch being thus precipitated and afterwards filtered, washed and dried, and is said to contain 16 per cent. of nitrogen. After mixing with a small percentage of nitrobenzene, the nitro-starch may be grained or moulded into powder and waterproofed with collodion.—G. W. McD.

Matches; Machines for Dipping and Heading ——. W. Frost, Rochdale. Eng. Pat. 21,517, Oct. 26, 1901.

Frames containing match splints are carried on an endless chain to which an intermittent motion is given. The frame is first carried over a plate which levels the splints. After passing over a warming plate it passes on to the paraffin dipping tank. Here the intermittent action of the chain

brings the frame to rest and the tank automatically rises to paraffin the splints. The frame then passes on to the composition tank for heading the matches where one side of a hexagon roller revolving in the composition is brought against the ends of the splints at the time when the frame comes to rest.—G. W. McD.

French Patents.

Explosives; Improvements in ——. M. Führer. Addition, dated Feb. 8, 1902, to Fr. Pat. 303,427, Aug. 30, 1900.

The explosive is composed of ammonium nitrate and aluminium. (See also Eng Pat. 16,277, 1900; this Journal, 1901, 68).—G. W. McD.

Fulminate Compositions [Non-Sensitive]; Manufacture and Use of ——. Hirtenberger Patronen Zündhütchen und Metallwaaren-Fabrik vormals Keller and Co. Fr. Pat. 318,286, Feb. 1, 1902.

Safety of manipulation of fulminate priming is secured without sacrificing explosive power by the manufacture and use of detonating composition in two distinct portions. The greater part consists of non-sensitive fulminate prepared by intimately mixing ordinary fulminate with metallic salts, oils or fats, or on the other hand by simply subjecting it to pressure in the damp state. The detonation of this non-sensitive portion is brought about by the use of a small proportion of fulminate in its ordinary sensitive condition.
—G. W. McD.

Explosive Compounds; Manufacture of ——. Quinby, Sharps, and Greger. Fr. Pat. 319,218, March 1, 1902.

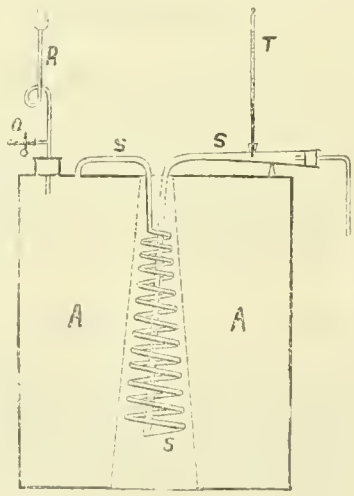
See Eng. Pat. 4,781; this Journal, 1902, 723.
—G W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

Superheater for Laboratory Use; Steam ——. J. Freundlich. Chem.-Zeit., 1902, **26**, [91], 1084.

The apparatus consists of a cylindrical tin boiler A, with a conical opening through its centre, in which is placed the copper worm S. The water is placed in A and boiled by a flame under the bottom of the apparatus, but not directly under the worm. As soon as steam issues from the open end of the latter, the flame is moved so that it comes under the spiral, whereby the steam is quickly heated to a temperature above 400° C. Should too great a steam-pressure be generated in the boiler, it may be reduced by opening the cock Q on the safety tube R. The worm may be made detachable, by placing two screw unions on the tubes at a level with the top of the boiler.—W. P. S.



Calorimeter for Coal; Improved ——. W. Rosenhain. Philos. Mag., **4**, [6], 451—458. Chem. Centr., 1902, **2**, [19], 1169.

The author's apparatus is based upon Thomson's principle of burning in a current of oxygen at the ordinary pressure. The combustion chamber consists of a cylinder of Jena glass with brass plates, and the requisite tubes and valves for the introduction of oxygen and the escape of the products of combustion. When in use, it is immersed in the water calorimeter, in the brass walls of which, windows are provided in order that the burning of the coal may be observed. Ignition is effected by means of a platinum wire through which an electric current is passed. The products of combustion escape through a ball-valve and a chamber provided with fine perforations into the water, and when the burning is complete, a rapid exchange of heat is effected by admitting the water to the combustion chamber. The sample of coal (1½ grms.) is powdered and pressed into the form of a briquette. By placing the small briquette upright, and replacing the usual platinum crucible by a flat porcelain capsule, a rapid and complete combustion is stated to be attained; the tarry residue remaining unburnt does not amount to more than 0·3 per cent. if a strong current of oxygen be used. As advantages of this apparatus over the Mahler-Berthelot bomb, the author claims simplicity, cheapness, safety, rapid interchange of heat, and little radiation.—A. S.

Platinum; Deposition of ——, *on Aluminium Apparatus.* A. Gawalowski. Zeits. anal. Chem., 1902, **41**, [10], 618.

Aluminium apparatus is of special importance for large vessels in water analysis, but the author has noticed that waters containing iron and chlorides leave a blackish-brown crust on evaporation, which can only be removed by sand at the expense of the metal. Further, flocks of alumina separate in the evaporation of waters free from aluminium. To prevent this he deposited platinum on the aluminium, by simply running a faintly alkaline solution of platinic chloride into the vessel and allowing to stand. The vessels are not cleaned with sand, but with a 5 to 10 per cent. solution of oxalic acid and then washed quickly. The platinised aluminium may be of use for balance pans, beams, and also weights.—F. S. S.

English Patent.

Butter; Appliance for Testing ——, *for Water.* G. R. Geldard, Manchester. Eng. Pat. 18,496, Aug. 22, 1902.

The appliance consists of an aluminium tube, perforated with holes near the bottom, notched at the top, and filled with asbestos wool. It is surmounted by a cup or basin, having holes through its bottom. In carrying out the test, the tube and cup are weighed and then heated in an oven. 50 grains of butter are placed in the cup, and, melting, run through on to the asbestos, where the water in the butter rapidly evaporates. Re-weighing gives the loss due to water.—W. P. S.

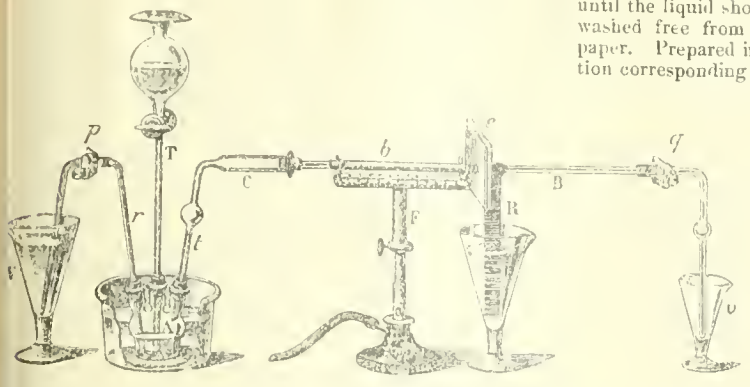
INORGANIC—QUALITATIVE.

Marsh Apparatus; Improvements in the use of [Detection of Arsenic] ——. A. Gautier. Bull. Soc. Chim., 1902, **27**, [20—21], 1030—1034.

In detecting minute quantities of arsenic by the Marsh test it is essential that the solutions employed should be colourless and free from nitrous, sulphurous, and sulphuric acids. The arsenic is first separated as the sulphide, this substance being then dissolved in ammonium carbonate solution at 20° C.; the residue obtained on concentrating the solution is oxidised by concentrated sulphuric acid containing a small amount of nitric acid, the nitrous fumes being subsequently removed by prolonged boiling. The final product, after dilution with water, is then introduced into the Marsh apparatus.

It is extremely important to exclude copper compounds from the apparatus because a certain amount of arsenic may become fixed as copper arsenide. Copper sulphate should not, therefore, be added to accelerate the solution of the zinc, a drop of platinic chloride solution sufficing for this purpose. The apparatus, which ought also to be quite free from oxygen, consists of a three-necked bottle, A containing pure granulated zinc, and fitted with a dropping funnel, T, for introducing the acid arsenical solution. The evolved gases pass through the delivery tube, *t*, the widened part *c*, of which is packed with cotton wool. The capillary tube, *b*, which is surrounded by tin foil, is heated to dull redness, and the arsenic vapours are rapidly cooled and

ondensed by the employment of the metallic screen, *e*, and he brass rider, R, the latter being partly immersed in rushed ice contained in the vessel, R. The hydrogen finally



scapes through the tube, *q*, which dips beneath concentrated ulphuric acid.

By means of this modified apparatus, the rate of evolution f the gases is readily regulated at will and homogeneous ngs of metallic arsenic having a definite outline are pro uced in that part of the horizontal tube which is surrounded y the cooled cylindrical rider.—G. T. M.

tannous Chloride in Ether Solution as a Reagent. [*Detection of Arsenic.*] R. de Jong. Zeits. anal. Chem., 1902, **41**, [10], 596.

HE author finds that stannous chloride, like ferric and ercuric chloride, &c. is soluble in ether. It precipitates om the ethereal solution chiefly as basic stannous chloride ; however the solution in ether is acidified with hydrochloric id, it does not precipitate.

The above solution of stannous chloride in ether is used a reagent for the detection of arsenic ; the substance ntaining arsenic is dissolved in 5 c.c. of hydrochloric id, mixed with the acid ethereal solution of stannous loride, and warmed for a minute at 40° C. ; if arsenic present, a brownish-red ring is formed between the acid d ether. The reaction is very delicate, as it will detect 002 mgrm. of arsenic acid.

The author further finds that the acid solution of stannous loride is a very good solvent for lead sulphate, especially the latter is freshly precipitated.—F. S. S.

INORGANIC—QUANTITATIVE.

cidimetry ; Use of the Electrolysis of Copper Sulphate as the Basis of ——. W. Lange. Zeits. anal. Chem., 1902, **41**, [10], 609.

OME time ago (Zeits. anal. Chem., **31**, 190, **31**, 455, and this ournal, 1900, 962) it was proposed to use the electrolysis copper sulphate as the basis of acidimetry, but it was und that when a solution of pure copper sulphate was ectrolysed, the copper always separated in the spongy rm and so was not easily weighed accurately. The author ds that if nitric acid be added to the solution before ectrolysis, the copper separates in fine red coloured ystals, and the nitric acid is reduced to ammonia. By owing the amount of nitric acid added, the ammonia rmed may be allowed for in the titration figures. It is und that 10 to 30 per cent. of nitric acid to copper posited may be used ; if below 10 per cent., the copper parates in the spongy form, if above 30 per cent. complete duction does not take place. Results of test-titrations are ven, showing the accuracy of the method.—F. S. S.

otassium Permanganate ; Titration of ——, *by means of Salts of Oxalic Acid.* C. Rust. Zeits. anal. Chem., 1902, **41**, [10], 606.

FTER trying all the known salts of oxalic acid and the id itself, it was found that the most convenient salt for e standardisation of potassium permanganate was manganese oxalate. This salt was prepared by suspending pure manganese carbonate in water, just raising to the boil, and adding a warm solution of pure oxalic acid, until the liquid showed an acid reaction ; the substance was washed free from acid and dried in thin layers on filter paper. Prepared in this way the substance has a composition corresponding to the formula $MnC_2O_4.2H_2O$. Drying over sulphuric acid in a desiccator does not alter its composition. The substance is not hygroscopic.

—F. S. S.

Sodium Sulphide ; Preservation of Standard Solutions of ——. E. Prothière and Mlle. A. Revaud. J. Pharm. Chim., 1902, **16**, [10], 484—490.

THE authors describe detailed experiments which show that air acts upon standard solutions of sodium sulphide, $Na_2S.9H_2O$, whilst they are not affected by light. The action of the air may be prevented by covering the liquid with a thin layer of oil, and solutions thus protected remain practically unaltered for an indefinite period. The most suitable oils for the purpose are olive and almond oils, which, unlike the majority of other oils tried, do not yield flocculent deposits or form emulsions.—C. A. M.

Carbon Monoxide and Dioxide ; Determination of ——, *in Vitiated Air.* F. Jean. Comptes Rend., **135**, [18], 746—748.

A "MINIMETRIC" method. The air under examination is aspirated through a cotton-wool filter, and then through a series of three wash-bottles containing respectively :—(A) strong sulphuric acid (to retain hydrocarbons and other organic substances) ; (B) five c.c. of half-normal caustic alkali, with 45 c.c. of water, strongly coloured with "Blue C4B" ; (C) either 50 c.c. of 0·1 per cent. palladious chloride solution, as nearly neutral as possible, or 50 c.c. of 1 per cent. ammoniacal silver nitrate containing no ammonia in excess of that just necessary to keep the solution clear. The blue tint of the second bottle just turns violet when 88 c.c. of carbon dioxide have passed into it, while the palladium solution shows a visible deposit of palladium, or the silver solution becomes visibly violet, and begins to deposit silver, when 8—10 c.c. of carbon monoxide have passed in. The quantity of air aspirated through up to the appearance of each of these indications is observed.

—J. T. D.

Sulphurous Acid ; Iodometry of ——. E. Rupp. Ber., **35**, [17], 3694—3695.

SULPHUROUS acid can only be iodometrically determined if its solution be added to excess of iodine till complete decolorisation occurs. If iodine be added to excess of sulphurous acid, errors arise, as Finkener and Volhard have shown, through the reducing action of the hydriodic acid formed on the sulphurous acid. Attempts to determine sulphurous acid in alkaline solution by means of iodine have also been unsuccessful ; but the author has found that the difficulty here arises solely from the low reaction-speed towards the end of the titration. The determination can be carried out with perfect accuracy by adding to the sulphurous acid solution excess of sodium bicarbonate, followed by a considerable (known) excess of N/10 iodine solution, allowing to stand for at least 15 minutes, and then titrating the excess of iodine by N/10 sodium thiosulphate.

—J. T. D.

Phosphorous Acid ; Iodometry of ——, *and Phosphorus Trihalides.* E. Rupp and A. Finck. Ber., **35**, [17], 3691—3693.

PHOSPHOROUS acid and phosphites cannot be titrated with iodine alone, but when alkali bicarbonate is added, reaction occurs, though the speed of reaction is very low at the end. The authors' work has shown that the titration can be accurately carried out as follows :—0·5—1·5 grm. of sodium

bicarbonate is added to the substance in a flask which can be tightly closed; a large excess of N/10 iodine solution is added, and the closed flask kept in the dark for a couple of hours (the results are not affected if it be allowed to stand many hours longer), and the excess of iodine is determined by sodium thiosulphate and starch. The method is applicable to the analysis of phosphorus trichloride and tribromide, which are decomposed by water and then treated as above.—J. T. D.

Bromic Acid; Determination of ——, *by the Direct Action of Arsenious Acid.* F. A. Gooch and J. C. Blake. Chem. News, 1902, **86**, [2240], 216—217; [2241], 224—225.

Gooch and Pulmann have previously shown (Amer. J. Science, 1901, **12**, 450) that iodic acid can be reduced quantitatively by arsenious acid. The author has now attempted the quantitative determination of bromic acid in a similar manner by means of the reaction—

$$3H_3AsO_3 + HBrO_3 = 3H_3AsO_4 + HBr.$$

Experiments with potassium bromate showed that for conditions varying within a tolerably wide range, the oxidation of the arsenious acid reaches a fairly definite limit. With amounts of bromate varying between 0·07 and 0·24 grm. and of arsenious oxide between 0·1584 and 0·7425 grm., the proportionate amount of oxidation in a volume of 200 c.c. or less was practically the same whether the sulphuric acid (1 : 1) present amounted to 3·5 c.c. or 10 c.c., and whether the time of digestion was 15 minutes or 30 minutes at the boiling temperature, 1½ or 4 hours on the steam bath, or two days at the ordinary temperature. It was found difficult to obtain, for the purposes of the tests, potassium bromate free from traces of potassium chlorate. By the method of Gooch and Smith (Amer. J. Science, 1891, **42**, 220), however, the total oxidising power of a mixture of bromate and chlorate may be determined by adding a known weight of potassium iodide, and excess of an arseniate and sulphuric acid, boiling the mixture, between definite limits of concentration, determining by titration with iodine the amount of arsenious oxide produced, and calculating the oxidising power of the bromate and chlorate from the difference between the amount of arsenious oxide thus produced, and that which would be produced if the whole amount of iodide were allowed to act upon the arseniate alone. On allowing for the presence of traces of chlorate, the test experiments showed that the oxidising power of a bromate can be accurately determined by boiling it in solution with a known excess of arsenious oxide and an excess of sulphuric acid, neutralising with potassium bicarbonate, and determining the amount of arsenious oxide remaining unchanged by titration with iodine. A chlorate is scarcely affected by this treatment.

—A. S.

Furnace Dust; Examination of ——. L. Schneider. Oesterr. Zeits. Berg.-Hütt, **50**, 498. Chem. Centr., 1902, **2**, [18], 1161.

The dust which is deposited at the mouth of a blast-furnace contains potassium ferrocyanide, sulphocyanide, cyanate, and cyanide. The aqueous solution of the dust contains also caustic potash and potassium carbonate and chloride. The author precipitates from alkaline solution, the ferrocyanide by silver nitrate, filters, determines in the precipitate either the silver in the dry way, or the iron in the wet way, and calculates the amount of potassium ferrocyanide from the weight of silver ferrocyanide found. The other cyanogen compounds separate from the filtrate on acidifying with nitric acid. The precipitate from an aliquot portion of the filtrate is oxidised by *aqua regia*, the solution diluted, filtered, and the sulphur in the filtrate determined as barium sulphate and calculated to potassium sulphocyanide. The precipitate from another portion of the filtrate is digested on the water-bath for one hour with 200 c.c. of water and 10 c.c. of nitric acid (sp. gr. 1·2). Silver cyanate goes into solution, and is determined as silver chloride. The precipitate from a third portion of the filtrate is boiled for one hour with concentrated nitric acid, the solution diluted with an equal volume of water, and filtered. The amount of dissolved silver gives the total quantity of sulphocyanide, cyanate, and cyanide present.—A. S.

Calcium Sulphide in Bone-Charcoal; Determination of ——. A. Rossing. Zeits. anal. Chem., 1902, **41**, [10], 610.

In the ordinary methods for determining calcium sulphide in bone-charcoal, *viz.*, by oxidation with potassium chlorate and hydrochloric acid or bromine water, sulphuretted hydrogen is evolved. To obviate this difficulty, the oxidation is carried out in alkaline solution; 10 to 25 grms. of bone-charcoal are mixed with 10 c.c. of water in a deep porcelain dish, and 10 c.c. of a 25 per cent. solution of potash run in; concentrated bromine water and then bromine are added until the mixture is just red. It is now heated to boiling, and hydrochloric acid added in large excess, cooled, made up to 250 c.c., and 200 c.c. filtered off. The sulphuric acid is estimated in the filtrate by barium chloride. In conclusion, it is stated that where the bone-charcoal contains a large amount of calcium sulphide, the potassium chlorate method may be used; if it only contains small amounts of sulphide, it is better to use the method described above.—F. S. S.

ORGANIC—QUALITATIVE.

Rosin Oil; Detection of ——, *in Mineral Oil.* G. Halphen. J. Pharm. Chim., 1902, **16**, [10], 478—483.

The test is based upon the fact that rosin oil gives an intense violet and blue coloration with a solution containing bromine and phenol, whilst mineral oils only give brown colorations with a slight violet fluorescence. The presence of water or alcohol interferes with the reaction. The substances giving the coloration are apparently identical with those giving the Liebermann reaction in the case of fats and rosin oil. They can be extracted with alcohol (95 per cent.) and the residue from the extract gives a still more pronounced reaction.

In applying the test, a drop of the oil under examination is placed in a porcelain crucible and treated with about 2 c.c. of a solution of one part of crystalline phenol in two parts of carbon tetrachloride. When thoroughly mixed, the mouth of a flask containing a solution of bromine in carbon tetrachloride (1 : 4) is inclined so that the bromine vapour falls into the crucible. After 5 to 10 seconds the reaction is complete. By carrying out the test in comparison with samples of known composition, it is stated that less than 10 per cent. of rosin oil may thus be detected in mineral oils.

Oils in general may be grouped into four classes as regards their behaviour in this test:—

I. Oils giving pronounced colorations: *Violet*, rosin oil. *Carmine with blush or deep violet tinge*, rosin oil, Chinese wood oil (which also frequently shows an emerald green tint). *Carmine with little* or *no violet tint*, marine animal oils.

II. Oils giving fainter reactions: *Carmine*, Animal oils, earth-nut oil (irregular); suint; cow's butter.

III. Oils forming two zones, the upper violet, and the lower bright blue of less pronounced shade: Linseed and hemp oils.

IV. Oils giving but feeble or indefined reaction: In general, all other vegetable oils.

The author also points out that the use of this reaction will simplify his method of detecting drying and marine animal oils in admixture with other oils (this Journal, 1901, 1244).—C. A. M.

Mannose; Detection of ——. F. H. Storer. Bull. Bussey Inst., **3**, 13—45. Chem. Centr., 1902, **2**, [18], 1155.

In pure solutions, mannose can readily be detected by the formation of its phenylhydrazone, which is only very slightly soluble in water, but in the products obtained by the hydrolysis of wood, detection of mannose in this way is much more difficult. In such cases, instead of a colourless precipitate of a well-defined crystalline nature, a yellowish-red crystalline powder, resembling a mass of yeast cells is obtained, and a recrystallisation of the hydrazone from dilute alcohol (2:1) is rendered necessary. If dextrose be present, this first forms the soluble dextrose-hydrazone, but after some time, the latter is partly converted into the o-azone, which separates in crystals resembling echini

(sea-urchins) in form. These crystals can, however, be distinguished from those of mannose-hydrazone in that they are more readily soluble in glacial acetic acid than the latter. The author gives a list of the various plants in which he has detected mannan.

According to Reiss (Landw. Jahrbb., 18, 753), mannose is the only sugar which, in neutral aqueous solution, gives a precipitate with basic lead acetate. The value of this reaction is, however, considerably diminished by the facts that impurities are nearly always present, which also give precipitates with basic lead acetate, that the mannose-lead precipitate is not produced in dilute solutions, and that it is soluble in excess of basic lead acetate.—A. S.

Ipecacuanha ; Certain Reactions of the Alkaloids of ——. A. H. Allen and G. E. Scott-Smith. Chem. and Druggist, 1902, **61**, [1190], 821. Paper read before the Soc. of Public Analysts, Nov. 5, 1902.

In view of the fact that the alkaloids of ipecacuanha in some of their colour-reactions present a considerable similarity to morphine, the authors made a number of experiments in order to ascertain to which of the ipecacuanha alkaloids these colour-reactions are due. Reference is made to the work of Paul and Cownley (this Journal, 1901, 500; 1902, 1294, 1299). The alkaloids extracted from a sample of Cartagena ipecacuanha root had the following composition: emetine, 50·9 ; cephaëline, 43·8 ; and psychotrine, 5·3 per cent. The alkaloids were also extracted from a specimen of Brazilian (Rio) ipecacuanha root, and from three samples of liquid extract of ipecacuanha, B. P. In examining the colour-reactions, the alkaloidal solution was allowed to fall drop by drop from a pipette on to a porcelain crucible lid placed on a flask of boiling water. To the spot of the alkaloidal residue, a drop of reagent was added by means of a glass rod, and the mixture cautiously stirred. With ferric chloride, ipecacuanha alkaloids give a blue coloration changing to green; opium alkaloids give a greenish-blue coloration. With Fröhde's reagent, ipecacuanha alkaloids give a bluish-purple to violet colour, very similar to that given by opium alkaloids, but not so bright as that yielded by pure morphine. With starch and iodic acid, ipecacuanha alkaloids give an immediate blue coloration in some cases, but a negative or tardy result in others ; opium alkaloids give an immediate blue. All preparations of opium and of ipecacuanha immediately reduce a mixture of ferric chloride and potassium ferricyanide with formation of Prussian blue. The colour reactions with ferric chloride and iodic acid are due to the psychotrine, but, partly at least, also to another body which can be extracted by lead acetate. By treating extract of ipecacuanha with lead acetate and decomposing the hydrogen sulphide precipitate in the usual way, a substance can be extracted by amyl alcohol from the acidulated solution which will immediately reduce iodic acid, and a mixture of ferric chloride and ferricyanide. If the acidulated solution, after treatment with amyl alcohol, be rendered alkaline with sodium bicarbonate and then again shaken with amyl alcohol, a substance is extracted which gives a bluish-green coloration with ferric chloride, a dirty purple with Fröhde's reagent and an immediate blue with a mixture of ferric chloride and potassium ferricyanide. An objection to many of the colour reactions of alkaloids is that the colours obtained are really due to reduction-products of the reagents employed. For example, the various shades of blue, green, and purple obtained with Fröhde's reagent are probably due to the formation of lower oxides of molybdenum, though the actual colours are sometimes curiously constant for the same alkaloid. Frerichs and Tapis (this Journal, 1902, 1299) state that both emetine and cephaëline dissolve in Fröhde's reagent almost without coloration, but that on addition of a trace of sodium chloride or hydrochloric acid, an intense indigo-blue coloration is produced with cephaëline, but not with emetine. In the method followed, that of dissolving the alkaloid in excess of Fröhde's reagent, however, the delicacy of the reaction is entirely destroyed. The authors find that when a drop of Fröhde's reagent is applied to the alkaloidal residue on porcelain, emetine gives a dirty-green colour, changing on the addition of hydrochloric acid to a fine grass-green. Cephaëline gives a purple coloration, which instantly changes, on the addition of hydrochloric acid, to a Prussian blue. Psychotrine gives a dull purple, changed by hydrochloric acid to a pale green. This reaction affords a means of easily distinguishing the mixed ipecacuanha alkaloids from the opium alkaloids, as the former give the Prussian blue reaction of cephaëline with great distinctness on the addition of hydrochloric acid, whilst the purple colour produced by the opium alkaloids and Fröhde's reagent fades on the addition of hydrochloric acid. The microscopic examination of crystallised psychotrine also affords a valuable means for the detection of ipecacuanha alkaloids. An amyl alcohol or chloroform solution of the alkaloid is extracted with a little dilute acetic acid, the acid liquid is concentrated and placed on a watch-glass or on a microscopic slide furnished with a cell. A watch-glass or small beaker is then moistened on the inside with ammonia and inverted over the acid solution. The vapours of ammonia are absorbed and liberate the alkaloid, which separates in characteristic crystals. Psychotrine forms very minute crystals, which appear to belong to the regular system. Many of them appear to be octahedra, and are very similar to microscopic crystals of arsenious oxide, whilst others present a marked resemblance to granules of rice starch.—A. S.

French Patent.

Milk ; Method and Apparatus for the Optical Examination of ——. M. Bernstein. Fr. Pat. 318,973, Feb. 22, 1902.

On mixing 4 c.c. of acetic acid and 5 c.c. of skimmed milk, a clear solution is obtained, the casein remaining dissolved in the acid. In the case of full milk the solution is white and opaque, according to the amount of fat present. A little gum or glycerin may be added to prevent the fat globules rising to the surface. The solution of milk thus obtained is examined in a tube, closed at its lower end, and fitted at the upper end with a cork, through the centre of which a blue glass rod is fixed, passing to the bottom of the tube. A second similar tube is filled with a milk solution containing a known amount of fat, for the sake of comparison ; or the comparison may be made with a substance, the opacity of which corresponds to a milk solution containing a known amount of fat.—W. P. S.

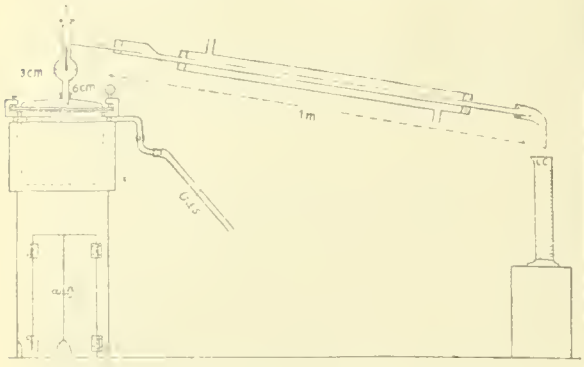
ORGANIC—QUANTITATIVE.

Water in Tar ; Determination of ——. E. Senger. J. für Gasbeleucht., **45**, [45], 841.

The sampling of the tar, an operation to which the differences between buyer and seller are mostly due, is effected by means of the device shown in the illustration. The tube, which should be not less than 4 to 5 cm. in diameter and of uniform width throughout, is lowered right to the bottom of the tar, and after withdrawal, is freed from tar and water adhering to the outside, before removal of the sample.

The proportion of water floating on the tar is determined by slowly inserting a glass tube of about 8 mm. diameter into it, withdrawing the tube, and calculating the cubical content from the length of the water column in the tube. After pouring off the water, the sample is mixed well in a mortar ; 500 grms. are then distilled in a copper vessel (see illustration) of about 1 litre capacity, 12 cm. high, and 13 cm. in diameter, the removable lid of which is fastened on by means of 4 to 6 clamps, the joint being made with a ring of asbestos or cardboard, smeared with a mixture of chalk and linseed oil. The vessel, which rests in a sheet-iron casing having a double mantle above, is heated only by means of the gas burner surrounding its upper part, until the water has been completely distilled, the oil coming over free from drops of water at about 200° C. The volume of water is read off as usual, if necessary, after filtration through a

moistened filter-paper. The determination is finished in 3—4 hours, and no foaming-over occurs. The vessel is



only heated from below, by means of a Bunsen burner, when it is desired to fractionate the sample still further.

—H. B.

Chestnut Extract mixed with Oak Extract; Detection and Determination of ——. F. Jean. Collegium, 1902, **1**, [35], 283.

When dilute chestnut extract is mixed with a solution of iodic acid, iodine is liberated. This reaction is not given by oak extract nor is it observed with any of the common extracts except that of campechy wood. To detect the presence of chestnut in oak extract it is sufficient to shake a diluted portion in a separatory funnel with iodic acid, and a little carbon bisulphide, carbon tetrachloride, chloroform, or other solvent of iodine, and observe the colour of this solvent. For quantitative determinations, 2—3 grms. of extract, 50 grms. of water, 5 grms. of solution of iodic acid (50 per cent.), and 5 grms. of carbon bisulphide are shaken together. The aqueous layer is allowed to separate, the iodine layer is removed to a stoppered flask, and the shaking is repeated with fresh portions of carbon bisulphide until it is no longer coloured when iodic acid is added to the bulk. The collected iodine liquors are titrated with standard sodium thiosulphate in the presence of potassium iodide, and the amount of chestnut extract present is calculated on the basis of the following average relation :—1 grm. of iodine = 6·25 grms. of dry chestnut extract = 19 grms. of extract of 20° B. = 16 grms. of extract of 25° B.—R. L. J.

Cocoa; Determination of Theobromine in ——. P. Welmans. Pharm. Zeit., 1902, **47**, 858. Chem.-Zeit., 1902, **26**, [94], Rep. 312.

The author recommends the following modification of Decker's method :—5 grms. of unextracted cocoa powder or 10 grms. of chocolate are boiled in an Erlenmeyer flask of 600 c.c. capacity with 5 grms. of calcined magnesia, and 300 c.c. of water for one hour under a reflux condenser. It is then placed in a water-bath until the suspended matter has settled, and the liquid is filtered through asbestos. The residue in the flask is treated twice with 200 c.c. of boiling water, and washed by decantation. The residue is then brought on to the filter, drained by means of a pump, and pressed together. The contents of the funnel are replaced in the flask, 2 grms. of calcined magnesia are added, and the above procedure is repeated. The united filtrates are evaporated to dryness with sea-sand, the residue is finely pulverised in a hot mortar, boiled three or four times for half an hour with 100 c.c. of chloroform and filtered. The chloroform is distilled off, the residue is dissolved in ammonia, transferred to a weighed platinum dish, and evaporated to dryness.—J. F. B.

Morphine in Opium; Determination of ——, *by means of Ammoniacal Silver Chloride.* C. Reichard. Chem.-Zeit., **26**, [92], 1095—1099.

The author replies at great length to Merck's criticisms of his process.

The process (this Journal, 1901, 1149) is based upon the fact that of the opium alkaloids, morphine alone acts as a reducing agent on silver solution. Merck has shown that by treating the opium extract by the author's method with ammoniacal silver chloride or nitrate solution, and heating for three hours on the water bath, the amount of reduced silver obtained was equivalent to 16·02 per cent. of morphine; whereas with the same opium, treated with the same reagent, but allowed to stand for 24 hours at ordinary temperatures, a reduction equivalent to only 10·64 per cent. of morphine resulted. Although lengthy suggestions as to the cause of these discrepancies are advanced, no data are given showing by what means a reliable determination of morphine in opium can be obtained by the method.

—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Carbon Sulphide described by Deninger; Non-existence of the Gaseous ——. E. J. Russell and N. Smith. Proc. Chem. Soc., **18**, [255], 197.

The authors have examined the gas prepared as Deninger describes (J. prakt. Chem., 1895, ii, **51**, 346), and to which he gave the formula CS, but they can find no evidence whatever of its existence. Sodium and carbon bisulphide left in a closed apparatus fitted with a mercury gauge were found to produce no gaseous substance: a mixture of sodium, aniline, and carbon bisulphide evolved hydrogen and hydrogen sulphide, and these gases, in escaping, carried over some carbon bisulphide. Evidence that no other gas was present was obtained (1) by analysis; (2) by cooling the mixture and separating it into its constituents.

Metallic Nitrides; General Method of Preparing ——. Guntz. Comptes Rend., **135**, [18], 738—740.

The heat of formation of lithium chloride is so very considerable that the reaction $Li_3N + 3MCl = 3LiCl + M_3N$ is in the case of most metals accompanied with considerable evolution of heat. The author therefore proposes it as a general method of preparing metallic nitrides. He has so prepared ferrous, ferric, and chromic nitrides, by merely heating at one point a metallic boat containing a mixture of lithium nitride and the double chloride of potassium and the metal (with the metallic chloride alone the action was too energetic). Ferric and chromic nitrides are fairly stable substances, but ferrous nitride is very readily oxidised by air.—J. T. D.

Barium-Ammonium and Barium Amide. Mentrel. Comptes Rend., **135**, [18], 740—742.

Below 28° C. metallic barium absorbs ammonia gas, forming a red solid, which on cooling below − 23° C. becomes a blue liquid. This liquid, stable only at low temperatures, is *barium-ammonium*, $Ba(NH_3)_6$. It is similar in properties to other metal-ammoniums; readily oxidises, decomposes water, gives with nitric oxide barium hyponitrite, and, in ammoniacal solution, gives with carbon monoxide *barium carbonyl* $Ba(CO)_2$, a yellow solid, unstable and explosive.

At and above 280° C., metallic barium reacts on ammonia, forming *barium amide*, $Ba(NH_2)_2$. This grey-green liquid becomes red as the temperature rises, and at 460° C. gives off nitrogen and hydrogen. This evolution increases with rise of temperature, and at 650° C. an orange-yellow solid remains, *barium nitride*, Ba_3N_2. As this substance cools in ammonia gas, the reverse changes occur, so that for each temperature there is an equilibrium in the reaction—

$$3Ba(NH_2)_2 = Ba_3N_2 + 4NH_3.$$

Lithamide behaves similarly, and possibly the same is the case with sodamide.—J. T. D.

Diamonds; Formation of Artificial —— *from Fusea Silicates.* R. von Hasslinger. Monatsh. f. Chem., **23**, [8], 817—822.

The Cape diamonds occur in a silicate rock; and one theory of their formation is that the carbon, whatever may

have been the cause of its occurrence in the rock, crystallised out as the fused magma cooled down. The author has endeavoured to imitate this process, by incorporating with an artificial melted mass, of similar composition to the diamond-bearing rock, 1—2 per cent. of finely-divided carbon. At first it was found impossible, by artificial heat, to obtain the mixture sufficiently fluid; but by substituting for the alumina and magnesia present in the rock (together about 30 per cent.), equivalent quantities of powdered aluminium and magnesium, and using this as a "thermite" mixture, a sufficiently high temperature was obtained. The combustion was carried out in a Hessian crucible embedded in non-conducting material; and, after cooling, the crucible was broken, the mass broken up, and treated with ammonium fluoride and sulphuric acid. Microscopic octahedra (0·05 mm.) were obtained, perfectly clear and colourless, which were proved beyond doubt, by their hardness, refractive power, and combustibility in oxygen, to be diamonds.

—J. T. D.

Light; Chemical Action of ——. G. Ciamician and P. Silber. Atti. R. Acad. dei Lincei Roma, **11**, [5], 145—151. Chem. Centr., 1902, **2**, [18], 1087. (See also Ber., **35**, [17], 3593.)

In continuation of their previous investigations (see this Journal, 1901, 844, 943; 1902, 876), the authors have examined the action of light rays of different refrangibility. For this purpose, solutions of colouring matters were used, *e.g.*, to eliminate the last refractive portion of the spectrum, a 10 per cent. alcoholic solution of cobalt chloride; and for the absorption of the blue and violet rays, a cold, saturated, alcoholic solution of Fluoresceïn, to which a solution of Gentian Violet was added in order to completely eliminate the green rays and only allow the red rays to pass through. In the experiments, the substance under examination was placed in a small tube and the latter immersed in the dye-stuff solution contained in a glass cylinder. It was found that in all cases, the reactions caused by light are favoured by the more strongly refractive rays; the red rays exert no appreciable, or only a very slight action, and the reaction may thus be regarded as due to a purely photochemical action.

Quinone.—A solution of 1 grm. of quinone in 20 c.c. of ether remained quite unaltered in red light, but in blue-violet light, long black needles of quinhydrone began to separate after 6 hours. A solution of 1 grm. of quinone in 20 c.c. of absolute alcohol which alters gradually even in the dark, became brown in red light, but the action was much stronger in the blue-violet light, and it was only in the latter case, that much hydroquinone, quinhydrone, and acetaldehyde, together with a black amorphous substance, were formed. A solution of 10 grms. of finely-powdered quinone and 6 grms. of glycerin in 20 grms. of water behaved in a similar manner; in blue-violet light, the quinone was converted into a dark mass. *Benzophenone.*—A solution of 4 grms. of the ketone in 20 c.c. of absolute alcohol remained unaltered in red light, but in blue-violet light it became coloured a faint yellow and benzopinacone was formed. *Benzil.*—A solution of benzil in alcohol became of a light greenish colour in red light, whilst in blue-violet light a yellowish-red coloration was produced and crystals of benzilbenzoin were formed. *Vanillin.*—An alcoholic solution of vanillin was unaltered in red light, but in blue-violet light a yellow coloration was produced and dehydrovanillin was formed. *o-Nitrobenzaldehyde.*—A solution of 0·5 grm. in 20 c.c. of benzene remained unaltered in red light, but in yellowish-green light and, much more rapidly, in blue-violet light, *o*-nitrosobenzoic acid was produced. An alcoholic solution of the aldehyde in blue-violet light became brownish-yellow and separated *o*-nitrobenzoic acid and the corresponding ester. Tests with a solution of the aldehyde in concentrated sulphuric acid showed that the production of the black mass previously observed by Friswell (this Journal, 1897, 671) only takes place in blue-violet light. *o-Nitrosobenzoic acid dissolved in Paraldehyde.*—The solution remained unaltered in red light, but in blue-violet light, the compound $C_9H_7O_3N$, previously prepared by the authors (Ber., **35**, 1080), was formed.

—A. S.

New Books.

The Testing of Chemical Reagents for Purity. By Dr. C. Krauch. Authorised Translation of the Third German Edition, by J. A. Williamson and L. W. Dupré, with Additions and Emendations by the Author. Maclaren and Sons, 37 & 38, Shoe Lane, London, E.C. 1902. Price 12*s.* 6*d.* net.

Volume of royal 8vo size, containing the translators' preface 338 pages of subject matter, and index filling 8 pages. The various reagents treated of, are arranged in alphabetical order, under 273 headings, beginning with Acetic Acid, including a wide range of both inorganic and organic substances, and ending with Zinc Sulphate. The particulars given under each heading include a general description of reagent, tests for impurities, quantitative determination, uses and storage, and commercial varieties. Specific gravity tables are given, showing the strength of solutions of acetic acid, alcohol, ammonia, hydriodic acid, hydrobromic acid, hydrochloric acid, hydrofluosilicic acid, nitric acid, crude nitric acid, phosphoric acid, potassium hydrate, sodium hydrate, and sulphuric acid, and there are various tables relating to indicators and test-papers. In the Appendix are found directions for the preparation of reagents on the ordinary and the Blochmann systems, a table of atomic weights, &c. In most cases references to English journals and text-books have been substituted for the corresponding German references.

Jahrbuch der Elektrochemie. Begründet und bis 1901 herausgegeben von Dr. W. Nernst und Dr. W. Borchers. Berichte über die Fortschritte des Jahres 1901. Unter Mitwirkung der Herren Dr. P. Askenasy, Dr. W. Borchers, Dr. K. Elbs, Dr. F. Harms, Privatdoc. Ing. F. von Kügelgen, und Dr. M. Mugdan. Herausgegeben von Dr. H. Danneel. VIII. Jahrgang. Verlag von W. Knapp, Halle a/S., Germany. Price M. 24.

Volume of royal 8vo size, containing 660 pages of subject matter, 6 pages of lists of works consulted and referred to in the body of the volume, on Electro-technology, Theoretical and technical Chemistry, Theoretical and technical Electro-chemistry, periodicals and year books, and finally, Journals. The alphabetical index of subjects and names fills 59 pages. There are 226 illustrations. The work is divided into two sections, the first devoted to the pure science of Electro-chemistry, the second to Applied Electro-chemistry.

I. Electro-Chemistry as a Science. (i.) Apparatus and Methods. (ii.) Theories. (iii.) Conductivity and Condition of Solutions. (iv.) Electrical Energy. (v.) Elements. (vi.) Theory of Accumulators. (vii.) Polarisation and Electrolysis. (viii.) Electrolysis of Alkali-Halogen Solutions. (ix.) Electro-analysis. (x.) Radiant Energy and Chemical Energy. Gases, &c.

II. Applied Electro-Chemistry. (i.) Production of Electrical Energy. (ii.) Accumulators. (iii.) Inorganic Electro-chemical Products. (iv.) Water, decomposition and purification. Hydrogen and Oxygen. Ozone, Nitrogen, &c. Halogens. Percarbonates. Perchlorates. Perbromates. Sulphuric Acid, &c. (v.) Carbides, Calcium Carbide, Barium Carbide, &c. (vi.) Electrolysis of the Alkali Chlorides. (vii.) Chlorine and Alkali. (viii.) Diaphragm Processes. Mercury Process, &c. (ix.) Electrolysis of fused Alkali Chlorides. (x.) Metals. Alkali Metals; Sodium. Lithium. Alkaline Earth Metals. Aluminium; preparation and employment. Heavy Metals. (xi.) Metals; Surface Treatment, *e.g.*, Gilding, Plating, &c. (xii.) Organic Compounds. (xiii.) Apparatus for Electro-chemical Technology. Electro-magnetic and Electro-thermic Processes, &c

Technisch-Chemisches Jahrbuch. 1900. Ein Bericht über die Fortschritte auf dem Gebiete der chemischen Technologie. Herausgegeben von Dr. Rudolf Biedermann. 23ster Jahrgang. Friedrich Vieweg und Sohn, Braunschweig. 1902. Price M. 15.

This year book for 1900 contains the table of contents, list of journals referred to in the text, subject-matter filling

612 pages, illustrated with 150 engravings, a classified bibliography on :—I. Physics; II. Chemistry; III. Chemical Technology; IV. Mineralogy and Geology; and V. Miscellaneous. The work ends with alphabetical indexes of names and subjects, and a Classified Register of German Patents in the order of their numbers, under each group. The subjects are grouped as follows :—I. Iron. II. Aluminium and Magnesium. III. Noble Metals. IV. Copper. V. Zinc. VI. Lead. VII. Nickel, Cobalt, Manganese, Chromium. VIII. Tin, Tungsten, Platinum, &c. IX. Sulphur and Sulphuric Acid. X. Alkali Industry. XI. Electrochemistry. XII. Ammonia and Cyanogen Compounds. XIII. Alkaline Earths, Alumina, &c. XIV. Gases. XV. Glass. XVI. Earthenware. XVII. Cement and Artificial Stone. XVIII. Explosives, Matches, &c. XIX. Illuminating Gas Petroleum, &c. XX. Fuels. XXI. Sugar. XXII. Starch, Dextrin, and Starch Sugar. XXIII. Fermentation industry. XXIV. Fats, Soaps, Resins. XXV. Ethereal Oils and Perfumery. XXVI. Water. XXVII. Foodstuffs. XXVIII. Organic Products. XXIX. Albuminoids. XXX. Dyestuffs. XXXI. Textile Fibres and their Preparation. XXXII. Paper, &c. XXXIII. Photography. XXXIV. Tanning and Glue. XXXV. Manures, &c.; Disinfection.

Trade Report.

I.—GENERAL.

Orange River Colony Trade.

Chem. and Druggist, Nov. 22, 1902.

Included in an official specification of goods imported into the Orange River Colony during the year ended June 30, 1902, are the following, the figures in parentheses being those for 1901: Acetic acid from Cape Colony, 187 galls., 51*l.* (38 galls., 12*l.*); drugs and chemicals from Cape Colony, 20,421*l.* (11,837*l.*); from Natal, 2,448*l.* (1,102*l.*); medicinal preparations from Cape Colony, 9,882*l.* (7,283*l.*); from Natal, 1,399*l.* (625*l.*); essential and perfumed oils from Cape Colony, 29*l.* (47*l.*); all other descriptions from Cape Colony, 131,263 galls., 3,336*l.* (114,522 galls., 3,541*l.*); from Natal, 15,962 galls., 691*l.* (7,669 galls., 365*l.*); perfumery, cosmetics, powders, and soaps, for toilet use from Cape Colony, 1,973*l.* (1,001*l.*); from Natal, 760*l.* (226*l.*).

Cork Production.

J. H. Maiden, N.S.W. Agric. Gaz.

The cork-tree is receiving more attention in the British Colonies than it has hitherto done. In Algeria, where the tree is largely cultivated, it yields a rich revenue to the State. Until it is twenty-five or twenty-seven years old, it does not produce any return; but then every five years it may yield 70 lb. to 100 lb. of marketable cork, which improves with each stripping. The acorns are generally sown with seeds of *Pinus maritima*, to afford shelter, and prevent extreme variation of temperature, the pines being removed as space is required, and paying the expenses of the plantation until the cork is produced in paying quantity. Mr. Maiden offers five hundred young plants, in lots of twelve, without charge, for experimental planting, provided reports are made in two or three years of the probable suitability of the tree to the district where it is sent.

II.—FUEL, GAS, AND LIGHT.

Coal in Australia.

Engineering, 1902, 446.

A description of the Queensland anthracite coal deposits is given in a recent official report. These extend over an area of 5,000 square miles, and the Central Railway, running from Rockhampton to the interior, passes through the coal fields. The anthracite has a "carbon value" of 78½, "with an ash residue of nearly 5." It has a much greater calorific power than New South Wales coal. The Queensland coal deposits at present known and worked, cover 21,400 square miles. The coal mines of New South Wales cover an area of 24,000 square miles. The output of coal in New South Wales was 5,650,000 tons. in 1901, as against 4,706,000 tons, in 1898, and 3,203,500 tons, in 1890. In 1901, 3,104,735 tons of coal were exported from Newcastle (New South Wales). New Zealand ranks after New South Wales in respect of coal production, and the output of Tasmania is increasing. Coal has been discovered in several parts of West Australia. In Victoria, the coal industry is making rapid progress, but the output is not yet sufficient to supply the demand of the Colony. The most important deposits—those in Gippsland—are estimated to contain 34,000,000 tons of coal.—A. S.

Briquette Making in Germany.

Eng. and Mining J., Nov. 15, 1902.

At the close of 1900, there were in Germany 89 manufactories of fuel briquettes, some of which annually produce more than 100,000 tons each. Peat briquettes ordinarily contain about 66 per cent. of inflammable elements, the remainder being made up of ash and water. They are thus inferior as fuel to briquettes made from brown coal, which average 70 per cent. or more of inflammable matter.

X.—METALLURGY.

Blast Furnaces in Great Britain.

Eng. and Mining J., Nov. 15, 1902.

The majority of the blast furnace plants in Great Britain have been better employed in 1902 than in 1901. The average number of furnaces employed, in the first half of 1902, was 345½, as against 339½, in the first half of 1901, and an average for the whole year 1900 of 397. For an increase in the first half of 1902 of only 6½ furnaces there was an increased output of 211,934 tons, which points to a higher average capacity per furnace than in 1901.

Cobalt Ore from New Caledonia.

Eng. and Mining J., Nov. 15, 1902.

In consequence of the increased demand for cobalt and cobalt salts, according to *Chemiker Zeitung* of Oct. 22, 1902, the price of cobalt ore in New Caledonia has risen greatly. Ore assaying 4 per cent. of cobalt oxide, which formerly sold for 130 frs. per 1,000 kilos., now fetches 320 frs. There is active exploration for new deposits of the ore.

Tin Industry of the Federated Malay States.

Bd. of Trade J., Nov. 20, 1902.

The annual report, for 1901, on the Federated Malay States states that, as regards tin mining, whilst the average price of the metal for the year was lower than in 1900—108*l.* 3*s.* per ton against 132*l.* per ton—the output was larger, as may be seen from the following table :—

Year.	Quantity.	Value.
	Tons.	£
1900	42,440	5,500,000
1901	46,960	5,240,000

Details of the production of each State are given.

Lead and Copper Production in the United States.

Eng. News (N.Y.), Oct. 31, 1902.

According to a bulletin issued by the United States Geological Survey, the total production of refined lead, in 1901, was 381,688 tons (of 2,000 lb.) as compared with 377,679 tons, in 1900. Of this total, the net American production was 270,700 tons. The estimated consumption of lead in the United States, in 1901, was 269,905 tons; and the total value of imported lead was 364,459 dols. (75,929*l.*), in 1901, as compared with 702,213 dols. (146,294*l.*), in 1900.

The total production of copper in the United States, in 1901 was 268,782 tons (of 2,240 lb.) as compared with 270,588 tons, in 1900. The total quantity of copper imported, in 1901, amounted to 124,938,323 lb. The total value of the exports of copper from the United States was 36,071,448 dols. (7,514,885*l.*), in 1901, as compared with 58,875,439 dols. (12,265,466*l.*), in 1900. The estimated consumption of copper in the United States was 382,761,014 lb., in 1901, as against 356,891,121 lb., in 1900. The world's production of copper was 511,803 tons, in 1901, as against 487,206 tons, in 1900.

XII.—FATS, OILS, Etc.

Soap and Candles in China.

Bd. of Trade J., Nov. 27, 1902.

The following figures show the value of the imports into China of soap and candles in the years 1891, 1899, and 1901 :—

	1891.*	1899.†	1901.‡
	£	£	£
Candles	..	47,930	47,520
Soap	44,559	104,750	157,326

* Exchange 1s. 9*d.* † Exchange 3s. 0⅝*d.* ‡ Exchange 2s 11½*d.*

The trade in foreign candles and soap should go on increasing, as their superiority to native products of a similar nature becomes known throughout the Chinese Empire.

Olive Oil Cake in Cyprus.

Bd. of Trade J., Nov. 27, 1902.

The annual report, for 1901–2, of the Cyprus Department of Agriculture, after giving some particulars with regard to the olive oil industry of that island, goes on to say that, on account of the primitive press used in Cyprus, the olive oil cake of the island is very rich in oil; but this is either thrown away or is used as food for pigs, or as fuel specially for engines; for this last purpose it is often conveyed long distances. With a view to obtain a better market, some local proprietors were placed in communication with factories abroad whose business it is to extract oil from olive oil cake by means of bisulphide of carbon. As a result, a quantity of about 150 tons has been exported during the past two years. They would, however, it is said, obtain still larger benefits if a special factory were to be established at Kyrenia for the treatment of olive oil cake by means of bisulphide of carbon.

XV.—MANURES Etc.

Nitrate Deposits in California.

Pharm. J., Nov. 29, 1902.

Explorations have been made during the last two years into the nitrate fields situated in Bernardino and Inyo counties, in the State of California. These are found along the shore lines, or former beaches, that marked the boundary of the former lake, now dry, known as Death Valley. The nitre is found in the huge clay hills surrounding this valley. An analysis of specimens of this strata shows that some of them carry a percentage of from 15 to 40 per cent. of nitre. The lands already prospected and taken up by companies comprise about 35,000 acres, and it is estimated that the surface caliche has in sight something like 22,000,000 tons. Some of these strata below the surface are said to range from 3 ft. to 10 ft. in thickness.

Florida versus Polynesian Phosphate.

U.S. Cons. Reps., Nov. 20, 1902.

It is possible that Florida phosphate will meet a serious competitor in the recently discovered deposits on Ocean Island, north-east of the Solomon Islands, which seem to be superior in quality to either Florida or Christmas Island phosphate. The following analysis was furnished by the director of the largest chemical works and importers of the American rock at Stettin :—

Description.	Florida.	Christmas Island.	Ocean Island.
	Per Cent.	Per Cent.	Per Cent.
Tribasic phosphate of lime..	76·95	83·08	86·15
Oxide of iron and alumina ..	2·2	1·83	0·68

Local statistics, for 1901, show an importation into Stettin of 101,156 tons of phosphate, of which 70,341 tons were from the United States.

XVI.—SUGAR, STARCH, Etc.

Sugar from France in India.

Bd. of Trade J., Nov. 20, 1902.

A Customs Circular (No. 16 of 1902), issued by the Finance and Commerce Department of the Government of India, on Oct. 16, 1902, revises the rates of additional duties on bounty-fed sugar imported into India from France, to come into effect from Sept. 1, 1902, as follows :—

Kinds of Sugar.	Additional Duties levied.	
	Old Rate.	New Rate.
	R. A. P.	R. A. P.
Raw sugars from 65 to 98 per cent. polarisation for beet-root sugars, or 65 to 97 for French Colonial sugar.	3 0 1	2 13 11
Sugar candies	3 2 3	2 15 6
Refined sugars, in loaf or crushed, clear, hard, and dry.	3 2 3	2 15 6
Raw and refined sugars, in grains or crystals, of a minimum standard of 98 per cent. polarisation.	3 1 2	2 14 9

XVIII. A.—FOODS.

New Cattle Food in Germany.

U.S. Cons. Rep., Nov. 18, 1902.

Experiments have been made at Strassburg with a new food for horses and cattle, consisting of steam-dried, sterilised blood, chaff, or the hulls of grain, finely ground, the husks of peanut kernels, and also the inner lining or skin of the peanut shells, and molasses. A percentage of phosphates is also added to the preparation.

These ingredients are thoroughly mixed and dried, and a certain portion of molasses (which has been heated to make it more liquid) is added. After this has been well mixed and dried, another portion of molasses is added, and after the final mixing and drying, the preparation is ready for the market, and is sold in bags of 75 kilos., at a cost of 11.50 marks per bag, retail.

The dried blood meal, it is claimed, contains on an average 20 to 22 per cent. of protein and fat, whilst oats, according to the tabulated statement of Wolff, contain on an average, only 15·2 per cent. of protein and fat.

The assurance is given that this preparation can be preserved for any length of time, and that it will not deteriorate with age.

XX.—FINE CHEMICALS, Etc.

Ether for the Manufacture of Cocaine in Holland.

Bd. of Trade J., Nov. 27, 1902.

A Dutch Decree, dated 13th June last, exempts from import duty, subject to certain conditions, sulphuric ether destined for use in connection with the manufacture of cocaine.

The translation of this Decree may be consulted on application at the offices of the Commercial Intelligence Branch of the Board of Trade.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 25,191. Lynde. Apparatus for charging vessels with liquids. Nov. 17.
„ 25,229. Thompson (Voindrot and Boillot). Filters.* Nov. 17.
„ 25,248. Missner. Method of fastening the jackets of double-walled vessels.* Nov. 17.
„ 25,553. Ohlsson. Centrifugal machines or separators.* Nov. 20.
„ 25,657. Vollmann. Freezing-tanks.* Nov. 21.
„ 25,660. Channing. Metal casks, drums, &c. Nov. 21.
„ 25,686. Hargreaves. Evaporation of liquids and concentration of solutions. Nov. 22.
„ 25,768. McCallum and Campbell. Construction of jars, pots, cylinders, drums, &c., for holding or containing oils, turpentines, paints, &c. Nov. 24.
„ 25,867. Berry. Method of and apparatus for agitating and treating liquids with gaseous, &c., fluids simultaneously. Nov. 25.
„ 25,869. Lynde. Apparatus for automatically regulating the temperatures of liquids. Nov. 25.
„ 25,967. Lummus. Distilling apparatus.* Nov. 25.
„ 26,018. Berry and Mackenzie. Valve especially intended for use with cylinders, &c., containing compressed or liquefied gases. Nov. 26.
„ 26,366. Thompson (Boyesen). Manufacture of substances applicable for use in the production of paints, oil-cloth, plaster, &c. Nov. 29.
„ 26,389. Schütze. Method of exhausting gases and vapours, and apparatus therefor.* Nov. 29.
[C.S.] 24,380 (1901). Brownlow. Filters. Dec. 3.
„ 25,235 (1901). Lord and Collier. Combined guard and dust-excluder for covering hydro-extractors. Nov. 26.
„ 25,701 (1901). Marshall. Machines for agitating liquids. Nov. 26.
„ 593 (1902). Ransford (Pharmaceutisches Institut Gans). Process for clarifying liquids. Dec. 3.
„ 17,669 (1902). Brewer (Wheeler Condenser and Eng. Co.). Cooling-towers. Nov. 26.
„ 18,593 (1902). Heys (Schreibner and Levinstein). Printing and reproduction of pictures, and blocks or printing surfaces therefor. Dec. 3.
„ 18,779 (1902). Lake (Maschinenfabr. Buckau). Apparatus for purifying waste liquors, &c., and dehydratiog the residues contained therein. Dec. 3.
„ 21,642 (1902). Boult (Ziegler). Cooling-chambers, &c. Nov. 26.
„ 21,820 (1902). Ostendorff. Water-cooling towers. Dec. 3. International Application, Oct. 7, 1901.

II.—FUEL, GAS, AND LIGHT.

[A.] 25,169. David. Visible drip acetylene gas-generator. Nov. 17.
„ 25,192. Langhans. Manufacture of incandescent mantles. Nov. 17.
„ 25,209. Hecking. Drying- and roasting-apparatus. Nov. 17.
„ 25,218. Baker. Furnaces of steam-boilers, &c. Nov. 17.
„ 25,219. Kitson. Burning of liquid fuel. Nov. 17.
„ 25,220. Sieverts. Incandescent gas-burners. Nov. 17.
[A.] 25,224. Winkler. Gas-lamps. Nov. 17.
„ 25,226. Stubbs. Apparatus for admitting air for primary combustion, and regulating its supply to furnaces and flues. Nov. 17.
„ 25,253. Sutton and Rudd. Means and apparatus for Bunsen or incandescent burners to prevent the breaking of incandescent mantles. Nov. 18.
„ 25,271. Crossley. Gas-lighting appliances. Nov. 18.
„ 25,319. Dowson. Manufacture of generator-gas, and apparatus used therewith. Nov. 18.
„ 25,377. Bowley and Walters. Arc-lamps for electric lighting. Nov. 19.
„ 25,425. Grzybowski. Carburetting of gas, and apparatus therefor.* Nov. 19.
„ 25,433. Armstrong. Boiler, reverberatory, reheating, kiln, &c., furnaces. Nov. 19.
„ 25,439. Danischevski and Meissner. Incandescent, &c., lamps for liquid combustibles. Nov. 19.
„ 25,445. Lake (Kuhlmann). Automatic gas-lighters.* Nov. 19.
„ 25,475. Baylis. Acetylene gas-generator for lighting workshops, &c. Nov. 20.
„ 25,477. Taylor. Carburettors. Nov. 20.
„ 25,489. Soutter. Galleries or holders for inverted incandescent gas-burners. Nov. 20.
„ 25,500. Hookham. Electric incandescent-lamps. Nov. 20.
„ 25,524. Soc. G. et P. de Mestral. Arc-lamps, and electrodes therefor. Nov. 20. French Application, Oct. 23, 1902.
„ 25,546. Battye. Incandescent electric lamps. Nov. 20.
„ 25,547. Howitzke. Furnaces. Nov. 20.
„ 25,560. Robson. Producer-gas plant. Nov. 21.
„ 25,575. Key. System for the manufacture of coke, the construction of coke-ovens, and the recovery of by-products from same. Nov. 21.
„ 25,610. Johnson. Smoke-consumers.* Nov. 21. United States Application, April 15, 1902.
„ 25,627. Chambers, Maxfield, and Maxfield. Carburettors. Nov. 21.
„ 25,674. Mewes and Scharfberg. Process and apparatus for the production of incandescent gas-light.* Nov. 21.
„ 25,698. Hales and White. Smoke-consuming apparatus for steam-boiler, &c., furnaces. Nov. 22.
„ 25,713. de Alzugaray. Apparatus for generating and manufacturing gases and gaseous compounds. Nov. 22.
„ 25,747. Stiles. Inclined gas-retorts. Nov. 22.
„ 25,755. Lee and Parkins. Benzoline, &c., lamps. Nov. 24.
„ 25,785. von Heydebraud und der Lasa. Artificial fuel.* Nov. 24.
„ 25,793. Armstrong, Whitworth, and Co., Ltd., and Orde. Combustion of liquid fuel. Nov. 24.
„ 25,802. Varley. Incandescent gas and oil-vapour burners. Nov. 24.
„ 25,833. Cotton, Tod, and Blizzard. Apparatus for consuming smoke in furnaces. Nov. 24.
„ 25,843. Simon. Carburettor for explosion engines. Nov. 24.
„ 25,853. Haddan (Riu). Artificial gaseous fuel.* Nov. 24.
„ 25,855. Maréchal, Barrière, and Gaillot. Gas-generators. Nov. 24.
„ 25,862. Adams. Blow-lamps or burning-off torches. Nov. 25.
„ 25,941. Bowen. Blast-sections for furnaces. Nov. 25.
„ 25,958. Lake (Gasmesserfabr. Mainz, Elster, and Co.). Apparatus for testing illuminating gas. Nov. 25.
„ 25,962. Wilton. Oil-burners for furnaces. Nov. 25.
„ 25,965. Hamilton-Adams. Electric-arc lamps. Nov. 25.
„ 25,971. Stuchlik. Acetylene lamps. Nov. 25.
„ 26,001. White. Smoke-consuming apparatus for steam-boiler, &c., furnaces. Nov. 26.

[A.] 26,041. Carolan (Gen. Electric Co.). Electric-arc lamps. Nov. 26.
„ 26,071. Hopfelt. Manufacture of arc-lamp electrodes.* Nov. 26.
„ 26,094. Howorth (Benrather Maschinenfabr. Akt.-Ges.). *See under* X.
„ 26,121. Gibbons and Gibbons. Conveyors for hot coke, ashes, &c. Nov. 27.
„ 26,161. Imray (Friedmann). Petroleum-burners for heating.* Nov. 27.
„ 26,195. Schill and Lane. Purification of gas. Nov. 28.
„ 26,207. Forshaw. Furnaces of steam-boilers for economising fuel and effecting the consumption of smoke. Nov. 28.
„ 26,221. Stuart and Maton. Lamps and apparatus for burning carburetted air. Nov. 28.
„ 26,284. Noble. Furnaces, and apparatus connected therewith, for heating, drying, &c. Nov. 28.
„ 26,324. Gregson. Incandescent gas, &c., lamps. Nov. 29.
„ 26,335. Boyce. Oil-burning safety-lamps. Nov. 29.
„ 26,343. Ratcliffe. Steam-boiler, &c., furnaces. Nov. 29.
„ 26,347. Swift. Electric-arc lamps. Nov. 29.
„ 26,385. Carolan (Gen. Electric Co.). Electric-arc lamps. Nov. 29.
[C.S.] 16,653 (1901). Voelker. Manufacture of filaments for incandescing electric lamps, and apparatus for use in such manufacture. Nov. 26.
„ 23,904 (1901). Blunden, Malden, and Malden. Manufacture of fuel briquettes. Nov. 26.
„ 24,616 (1901). Soc. Italiana di Elettricità già Cruto. Incandescent electric lamps. Dec. 3. International Application, Sept. 13, 1901.
„ 24,621 (1901). Soc. Italiana di Elettricità già Cruto. Electric incandescent lamps. Dec. 3. International Application, Sept. 13, 1901.
„ 24,960 (1901). Crossley and Atkinson. Gas-cleaning and cooling apparatus. Nov. 26.
„ 25,493 (1901). Holmes (Guldlin). *See under* III
„ 26,110 (1901). Leask. *See under* XVIII. B.
„ 26,425 (1901). Higginbottom and Lennox. Method of and means for expressing the moisture from peat, &c. Nov. 26.
„ 241 (1902). Hauenschild. Upright kilns or furnaces. Nov. 26.
„ 368 (1902). Wise (Cie. Parisienne d'Eclairage et de Chauffage par le Gaz). Apparatus for discharging retorts. Nov. 26.
„ 586 (1902). Wise (Cie. Parisienne d'Eclairage et de Chauffage par le Gaz). Quenching or cooling of coke, and apparatus therefor. Nov. 26.
„ 852 (1902). Wise (Cie. Parisienne d'Eclairage et de Chauffage par le Gaz). Working of gas-retorts. Dec. 3.
„ 1164 (1902). Paterson. Acetylene gas-generators. Dec. 3.
„ 1528 (1902). Scharf. Manufacture of incandescent electric-lamps. Nov. 26.
„ 2030 (1902). Marshall. Methods of and apparatus for carburetting air or gas for lighting, heating, or motive power. Nov. 26.
„ 2131 (1902). Lewy. *See under* XII.
„ 2587 (1902). Abel (Siemens and Halske Akt.-Ges.). Electrodes for arc-lamps. Dec. 3.
„ 3119 (1902). Oelerich. Incandescent vapour-lamps. Nov. 26.
„ 3945 (1902). Lemaire. Gas-generator for gas-engines. Dec. 3.
„ 4646 (1902). Maybluh. *See under* VII.
„ 7496 (1902). Clarkson. Burners for liquid hydrocarbon. Dec. 3.
„ 12,922 (1902). Hartmann. Incandescent vapour lamps. Dec. 3.
„ 13,750 (1902). Seymour. Apparatus for mixing gas and air. Nov. 26.
„ 14,277 (1902). King. Apparatus for stoking, or feeding and stoking, fuel into furnaces, and to promote consumption of smoke. Nov. 26.
[C.S.] 16,258 (1902). Bloggett. Safety attachment for gas-burners for controlling the supply of gas thereto. Nov. 26.
„ 16,285 (1902). Reagan. Furnaces. Dec. 3.
„ 16,301 (1902). Pfeifer and Staples. Oil-burners. Dec. 3.
„ 16,682 (1902). Brookes (Bradley). Pulverulent or dust-fuel-feeding apparatus. Nov. 26.
„ 16,734 (1902). Lake (Bernstein Co.). Gas-lamps chiefly designed for use with incandescent burners. Nov. 26.
„ 18,844 (1902). Lucas and Allgemeine Beleuchtungs- und Heiz-Industrie Akt.-Ges.). Incandescent petroleum burners. Dec. 3.
„ 19,135 (1902). Bailly and Chauvin. Acetylene-generator. Nov. 26.
„ 20,242 (1902). Offenberg. Incandescent mantles. Nov. 26.
„ 21,748 (1902). Worsley. Arc electric-lamps. Nov. 26.
„ 22,001 (1902). Faure. Carburettor for hydrocarbon motors. Nov. 26.
„ 25,092 (1902). Boult (Hille). Method of regulating gas-generators, and apparatus employed in connection therewith. Dec. 3.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 25,967. Lummus. *See under* I.
[C.S.] 25,193 (1901). Holmes (Guldlin). Apparatus for extracting tar from illuminating gas. Nov. 26.
„ 25,699 (1901). Bousfield. Manufacture of substances usually prepared by fractional distillation, and apparatus therefor. Nov. 26.
„ 25,772 (1901). Bird. *See under* XVII.
„ 26,647 (1901). Henderson. Retorts for the destructive distillation of shale or other oil-yielding materials. Dec. 3.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 25,733. Imray (Farbwerke, Höchst). Manufacture of 4-dialkylamido-1-phenyl-2:3-dimethyl-5-pyrazolones. Nov. 22.
„ 25,851. Imray (Farbwerke, Höchst). Manufacture of bluish-black sulphurised dyestuffs. Nov. 24.
„ 26,271. Imray (Farbwerke, Höchst). Manufacture of substitution products of 4-amido-2:3-dimethyl-1-phenyl-5-pyrazolones and homologues thereof. Nov. 28.
„ 26,372. Johnson (Bad. Anilin und Soda Fabr.). Manufacture of indigo-white and indigo. Nov. 29.
[C.S.] 23,486 (1901). Hibbert. *See under* V.
„ 771 (1902). Imray (Farbwerke, Höchst). Manufacture of new blue dyestuffs. Dec. 3.
„ 1561 (1902). Johnson (Bad. Anilin und Soda Fabr.). Manufacture and production of azo-colouring matters and of material for use therein. Dec. 3.
„ 1982 (1902). Imray (Farbwerke, Höchst). Manufacture of anthranilic acid. Dec. 3.
„ 3375 (1902). Johnson (Bad. Anilin und Soda Fabr.). Manufacture and production of disazo-colouring matters. Dec. 3.
„ 4034 (1902). Johnson (Bad. Anilin und Soda Fabr.). Manufacture and production of azo-colouring matters. Dec. 3.
„ 4035 (1902). Johnson (Bad. Anilin und Soda Fabr.). Treatment of colouring matters of the anthracene series, and the production of derivatives thereof. Dec. 3.
„ 4434 (1902). Johnson (Bad. Anilin und Soda Fabr.). Manufacture and production of aromatic derivatives of certain amido-compounds. Dec. 3.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 25,577. Simpson. Treatment of silk yarns or fabrics. Nov. 21.

[A.] 25,676. Scott. Manufacture, composition, and use of a cleansing liquid for animal fibres. Nov. 22.
„ 25,990. Colburn and Colburn. Machines for washing or scouring wool, &c. Nov. 26.
„ 26,052. Holt. *See under* XVIII. B.
„ 26,281. Wojciechowski Apparatus for printing in different colours.* Nov. 28.
„ 26,368. Bradford Dyers' Association, Ltd., and Krais. Process for producing white or coloured effects in textile fabrics. Nov. 29.
[C.S.] 23,486 (1901). Hibbert. Apparatus for washing, bleaching, &c., fibrous, &c., materials; also applicable for grinding dyes, paints, &c. Nov. 26.
„ 267 (1902). Peters and Shepherd. *See under* XIII. B.
„ 1424 (1902). Granville and Rawlinson. Method of cleaning, purifying, and removing the wool from imported sheepskins. Dec. 3.
„ 18,596 (1902). Heaton (Rudolph and Kühne). Apparatus for finishing textile fabrics. Nov. 26.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 25,242. Johnson (Bad. Anilin und Soda Fabr.). Manufacture of alkali metal oxides or mixtures thereof with other alkali oxides, or alkali-earth oxides, or both. Nov. 17.
„ 25,442. Imhoff and United Alkali Co., Ltd. *See under* XI.
„ 25,584. Threlfall and Wilson. Manufacture of chlorates and perchlorates of the alkali metals. Nov. 21.
„ 25,607. Friswell. Manufacture of nitric acid. Nov. 21.
„ 25,683. Spence and Peter Spence and Sons, Ltd. Manufacture of compounds of alumina. Nov. 22.
„ 25,790. Bate and Orme. Condensers for nitric and other acids.* Nov. 24.
„ 25,866. Berry. Manufacture of soluble salts. Nov. 25.
„ 26,025. Stevens. Hand fire-extinguishers, and liquids suitable for use therewith. Nov. 26.
„ 26,242. Gutensohn. *See under* X.
[C.S.] 788 (1902). Dreyfus and Clayton Aniline Co. Concentration of sulphuric acid, &c. Nov. 26.
„ 1116 (1902). Mills (Soc. Anon. des Plaques et Papiers Photographiques A. Lumière et ses Fils). Mixture capable of giving off, by treatment with water, hydrosulphurous acid or hydrosulphites. Nov. 26.
„ 4646 (1902). Mayblub. Process and apparatus for the desulphurisation of sulphurous substances, and the treatment of the spent substances in the purification of gas. Nov. 26. International Application, Sept. 25, 1901.
„ 7832 (1902). Crossley. Treatment of spent iron, pickling or cleaning liquors, or other solutions containing sulphate or chloride of iron, &c. Dec. 3.

VIII.—POTTERY, GLASS, and ENAMELS.

[A.] 25,612. Fawcett, jun. *See under* IX.
„ 25,806. Garchey. *See under* IX.
„ 25,827. Forster. Glass jars or cells for primary or secondary batteries, to carboys, &c. Nov. 24.
„ 25,850. Klimsch, Beschorner, Wels, and Ruston. *See under* IX.
„ 26,092. Wytenhove. Manufacture of sheets, &c., of plate-glass coated with coloured glass. Nov. 26.
„ 26,262. Pierpont. Machine for the manufacture of glass bottles, &c. Nov. 28.
„ 26,338. Simpson and Bradshaw. Machines for manufacturing glass bottles, &c. Nov. 29.
[C.S.] 25,756 (1901). Drake and Gorham. Method of joining glass plates. Dec. 3.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, and CEMENTS.

[A.] 25,221. Engels. Production of fireproof materials. Nov. 17.
[A.] 25,222. Jurschina. Manufacture of artificial stone.* Nov. 17.
„ 25,385. Gordon. Artificial stone for scouring, &c. Nov. 19.
„ 25,397. Briggs and Briggs. Construction of kilns for burning limestone, &c. Nov. 19.
„ 25,405. Holroyd and Bond. Machine or apparatus for dressing, abrading, or brushing glazed, &c., bricks in the clay state. Nov. 19.
„ 25,429. Kirkpatrick. Manufacture of bricks and compositions capable of withstanding very high temperatures, and for use in steel and other furnaces. Nov. 19.
„ 25,480. Holder. Surface tiles. Nov. 20.
„ 25,543. Herdman. Non-conducting coverings for pipes, &c. Nov. 20.
„ 25,569. Fielding. Apparatus for making artificial stone slabs or blocks. Nov. 21.
„ 25,612. Fawcett, jun. Grinding and surfacing material for stone-working, metal-working, glass-working, &c. Nov. 21.
„ 25,732. Jaffé. Manufacture of artificial stone.* Nov. 22.
„ 25,736. Guinet. Artificial marble or marbling. Nov. 22.
„ 25,806. Garchey. Manufacture of glass-stone, and apparatus therefor. Nov. 24.
„ 25,807. Garchey. Manufacture of artificial granite. Nov. 24.
„ 25,850. Klimsch, Beschorner, Wels, and Ruston. Manufacture of slabs, tiles, sheets, &c., of a material similar to marble, ceramic ware, &c. Nov. 24.
„ 25,929. Barham, Bulbeck, and Innes-Baillie. Clay-working machine for making bricks, tiles, &c. Nov. 25.
„ 25,930. Barham, Bulbeck, and Innes-Baillie. Process for manufacturing saleable bricks, cement, tiles, &c., from the dredging refuse of rivers, &c., and land refuse. Nov. 25.
„ 25,931. Barham, Bulbeck, and Innes-Baillie. Brick- and cement-kiln and drier. Nov. 25.
„ 26,065. Turner. Furnace linings. Nov. 26.
„ 26,077. Bernhard. Means for pulverising wood. Nov. 26.
„ 26,078. Bamber. Manufacture of Portland cement, and apparatus therefor. Nov. 26.
„ 26,085. Adcock. Apparatus for drying and burning bricks, &c. Nov. 26.
„ 26,170. Butler and Faircloth. Manufacture of refractory material. Nov. 27.
„ 26,196. Coulthurst, Coulthurst, and Coulthurst. Presses employed for pressing clay, &c. Nov. 28.
„ 26,261. Weekes. Manufacture of Portland cement. Nov. 28.
„ 26,294. Rimmington. Manufacture of fireproof building materials. Nov. 28.
„ 26,366. Thompson (Boyesen). *See under* I.
„ 26,371. Kronstein. Manufacture of linoleum, lincrusta, &c. Nov. 29.
[C.S.] 24,012 (1901). James (Mica Insulator Co.). Compound insulating material for electrical purposes. Dec. 3.
„ 6502 (1902). Kerkow. Composition for coating or impregnating pasteboard, &c., for roofing, &c., purposes, &c. Dec. 3.
„ 16,996 (1902). Lake (Warren). Preparation of ingredients for use in the manufacture of street pavements, &c. Dec. 3.
„ 18,476 (1902). Beaumel. Manufacture of an improved composition forming an imitation of statuary marble, onyx-stone, &c. Nov. 26. International Application, Feb. 22, 1902.

X.—METALLURGY.

[A.] 25,217. Merton. Ore-roasting furnace.* Nov. 17.
„ 25,270. de Alzugaray. Extraction of metals from their ores. Nov. 18.

[A.] 25,375 Allen. Method of treating solutions obtained in the extraction of gold ores or gold-bearing products. Nov. 19.
„ 25,401. Willington. Process for the manufacture of steel from iron ores or pig metals. Nov. 19.
„ 25,612. Fawcett, jun. *See under* IX.
„ 25,893. Allison (Knowles, Young, Cooley, Elmore, Brinkerhoff, O'Keefe, and Herrin). *See under* XI.
„ 25,912. Ross. Furnaces for heating metal bars or slabs. Nov. 25.
„ 25,941. Bowen. *See under* II.
„ 25,954. Lorrain (Elektricitäts Akt.-Ges. vorm. Schukert and Co.). *See under* XI.
„ 25,973. Hadfield. Treatment of steel. Nov. 25.
„ 26,059. Thompson (Soc. d'Electro-Métallurgie de Dives). *See under* XI.
„ 26,089. François. Reduction of blast-furnace slag, &c.* Nov. 26.
„ 26,094. Howorth (Benrather Maschinenfabr. Akt. Ges.). Charging apparatus for blast-furnaces. Nov. 26.
„ 26,242. Gutensohn. Means and process for recovering zinc held in acid as solution. Nov. 28.
„ 26,279. Marks (Delprat). Extraction of zinc and other sulphides from their ores. Nov. 28.
„ 26,280. Marks (Delprat). Extraction of zinc and other sulphides from their ores. Nov. 28.
„ 26,295. Cattermole. Separation of the metallic constituents of ores from gangue Nov. 28.
„ 26,296. Cattermole. Classification of the metallic constituents of ores. Nov 28.
[C.S.] 23,823 (1901). Salwen. Magnetic ore-separators. Dec. 3.
„ 23,840 (1901). Wise (Homan). Treatment of titaniferous ores. Dec. 3.
„ 25,698 (1901). Redruth Foundry Co., Ltd., and Tregoning. Apparatus for pulverising and amalgamating ores. Dec. 3.
„ 6,728 (1902). Pratis. Manufacture of steel. Nov. 26.
„ 7,832 (1902). Crossley. *See under* VII.
„ 10,283 (1902). Sharp. Furnaces for heating iron and steel. Dec. 3.
„ 23,939 (1902). Frith. Process for toughening or annealing steel, iron, &c. Dec. 3.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 25,353. Corrado. Arrangement of the mercury cathode in voltameters, without diaphragms, for the decomposition of alkaline chlorides.* Nov. 18.
„ 25,354. Corrado. Electrolytic treatment of liquids of all kinds.* Nov. 19.
„ 25,442. Imhoff and United Alkali Co., Ltd. Secondary electrodes for electrolytic apparatus, more especially intended for use in the manufacture of chlorates. Nov. 19.
„ 25,827. Forster. *See under* VIII.
„ 25,848. Ostwald. Electro-chemical treatment of gases. Nov. 24.
„ 25,893. Allison (Knowles, Young, Cooley, Elmore, Brinkerhoff, O'Keefe, and Herrin). Magnetic ore-separators.* Nov. 25.
„ 25,954. Lorrain (Elektricitäts Akt.-Ges. vorm. Schukert and Co.). Process and furnace for obtaining metals, metalloids, and compounds of the same.* Nov. 25.
„ 26,059. Thompson (Soc. d'Electro-Métallurgie de Dives). Manufacture of compound metals or bi-metals. Nov. 26.
„ 26,090. Contardo. Treatment of metallic sulphides in the electric furnace. Nov. 26.
[C.S.] 25,208 (1901). Bosshard. Electric welding apparatus. Dec. 3.
„ 4254 (1902). Lake (Soc. Anon. "le Carbone"). Electric cells or batteries. Dec. 3.
„ 17,380 (1902). Leuschner. Electro-magnetic treatment of ores, slimes, &c., for separating their constituents. Nov. 26.
[C.S.] 19,225 (1902). Fairweather (International Battery Co.). Storage batteries. Nov. 26.
„ 19,713 (1902). Sandhagen and Lürgen. Composition of electrolytes for the formation of accumulator plates. Nov. 26.

XII.—FATS, OILS, AND SOAP.

[A.] 25,234. Nesbit. *See under* XVIII. B.
„ 25,293. Akester. Soap for laundry use. Nov. 18.
„ 25,492. Blake. Apparatus for testing oils, greases, &c. Nov. 20.
„ 25,676. Scott. *See under* V.
„ 25,768. McCallum and Campbell. *See under* I.
„ 25,876. Garfield. Process for the extraction and recovery of fatty matters from liquid and semi-liquid material containing them, and arrangement of apparatus for use therein. Nov. 25.
„ 25,960. Haddan (Edson). Apparatus for disposing of foul or ill-smelling vapours and gases emanating from material which is being dried, reduced, or rendered.* Nov. 25.
„ 26,174. Brown. Manufacture of samples and single users of soap, &c. Nov. 27.
„ 26,328. McCallum and Holmes. Composition suitable as a lubricant, &c. Nov. 29.
„ 26,366. Thompson (Boyesen). *See under* I.
„ 26,371. Kronstein. *See under* IX.
[C.S.] 23,993 (1901). Jamieson. Machine for moulding, stamping, &c., tablets of soap, &c. Dec. 3.
„ 24,849 (1901). Iveson. *See under* XVIII. A.
„ 24,850 (1901). Iveson. *See under* XVIII. A.
„ 2131 (1902). Lewy. Illuminants such as are used for making candles, &c. Dec. 3.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 25,719. Roscoe and Unsworth. Apparatus for filtering, straining, or sieving paint, &c. Nov. 22.
„ 25,768. McCallum and Campbell. *See under* I.
„ 26,366. Thompson (Boyesen). *See under* I.
[C.S.] 23,486 (1901). Hibbert. *See under* V.

B.—Resins, Varnishes.

[A.] 25,653. Smith. Drying insulating varnishes. Nov. 21.
„ 25,768. McCallum and Campbell. *See under* I.
[C.S.] 267 (1902). Peters and Shepherd. Composition for use in the manufacture of floor-cloth, &c. Nov. 26.
„ 268 (1902). Peters and Shepherd. Dressing for waterproof covers, &c. Nov. 26.

C.—India-rubber, &c.

[A.] 26,152. Fischer. Manufacture of a caoutchouc cement. Nov. 27.
[C.S.] 22,618 (1902). Raper. Method of impressing designs upon india-rubber. Dec. 3.

XIV.—TANNING, LEATHER, GLUE, AND SIZE

[A.] 26,277. Thomlinson and Stainton. Processes for pickling or preserving hides, skins, &c. Nov. 28.
„ 26,278. Thomlinson and Stainton. Process for dressing or treating skins and hides. Nov. 28.
[C.S.] 23,470 (1901). Deborde. Manufacture of an elastic, insolubilised, gelatinous compound for making printers' inking-rollers, &c. Nov. 26.

XV.—MANURES.

[C.S.] 23,959 (1901). Milligan. Manufacture of manure, &c. Dec. 3.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 25,318. Lapp. Fermentation and storage cellars. Nov. 18.
„ 25,350. Weber. Vats or vessels for fermenting, &c.* Nov. 18.

[A.] 25,437. Scott. Manufacture of spirit. Nov. 19.
„ 25,438. Scott. Purification of spirit. Nov. 19.
„ 25,967. Lummus. *See under* I.
„ 25,057. Gough, jun. Apparatus for germinating, &c., grain, &c. Nov. 26.
„ 26,362. Wetter (Heine and Co.). *See under* XX.
[C.S.] 25,699 (1901). Bousfield. *See under* III.
„ 25,772 (1901). Bird. Apparatus or still for the direct recovery of alcohol, &c., from solid or semi-solid substances, &c. Nov. 26.
„ 304 (1902). Norman. Maturing or purifying spirits. Nov. 26.
„ 20,007 (1902). Ruckdeschel. Method of boiling, caramelising, and colouring beer-wort. Nov. 26.
„ 21,721 (1902). Lapp. Process of manufacturing mash from malt. Nov. 26.
„ 21,731 (1902). Lapp. Brewing. Nov. 26.
„ 21,749 (1902). Lapp. Malting. Nov. 26.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 25,553. Ohlsson. *See under* I.
„ 25,556. Eberhard and Mierisch. Method for making clearly soluble casein.* Nov. 20.
„ 25,630. Harvey and Sureties. Process for the solidification of vegetable matter. Nov. 21.
„ 25,876. Garfield. *See under* XII.
„ 26,254. International Plasmon, Ltd. (Melville-Bergheim). Method of rendering tea nourishing and digestible.* Nov. 28.
[C.S.] 24,849 (1901). Iveson. Process of preparing suet or fat in a "granular form" for cooking purposes. Dec. 3.
„ 24,850 (1901). Iveson. Apparatus for pressing animal fat, especially applicable for use in preparing fat in a "granular form" for cooking purposes. Dec. 3.
„ 11,608 (1902). Deane. Food-product. Nov. 26.
„ 21,230 (1902). Allison (Treseott). Curing food-products. Nov. 26.
„ 21,877 (1902). Barrath. Manufacture of plate or block ice. Nov. 26.
„ 23,379 (1902). Laub. Process for producing tea and coffee tablets, &c. Dec. 3.

B.—Sanitation; Water Purification.

[A.] 25,229. Thompson (Voindrot and Boillot). *See under* I.
„ 25,234. Nesbit. Steam and grease-separators. Nov. 17.
„ 25,312. Fouré. Apparatus for automatically heating liquids, particularly applicable to the sterilisation of liquids by heat. Nov. 18.
„ 25,336. Selwood and Aird. Method of and apparatus for purifying and heating feed-water to prevent the incrustation of steam-boilers, and to economise fuel.* Nov. 18.
„ 25,620. Tuckfield. Water-purifying machines. Nov. 21.
„ 25,739. Duncan. Settling tanks for the treatment and purification of storm-water, sewage, trade-effluents, spent liquors, &c. Nov. 22.
„ 25,740. Duncan. Mechanical filters, and apparatus relative thereto. Nov. 22.
„ 25,741. Duncan. Treatment and purification of storm-water, sewage, and trade-effluents. Nov. 22.
„ 25,742. Duncan. Apparatus or plant for the treatment or purification of storm-water, sewage, trade-effluents, spent liquors, &c. No. 22.
„ 25,804. Candy. Treatment of sewage and impure waters, being improvements in automatic valves for filter-beds and improvements in the aëration of filter-beds. Nov. 24.
[A.] 25,876. Garfield. *See under* XII.
„ 25,896. Doulton and Pleace. Appliances for the automatic discharge of liquid. Nov. 25.
„ 25,897. Doulton and Pleace. Appliances for use with bacteria beds, &c. Nov. 25.
„ 25,898. Doulton and Pleace. Automatic siphons. Nov. 25.
„ 25,967. Lummus. *See under* I.
„ 25,988. Dixon. Aërating beds for the treatment of sewage. Nov. 26.
„ 26,052. Holt. Means for softening and filtering water for steam-boilers, economisers, bleaching, dyeing, &c., and apparatus therefor. Nov. 26.
„ 26,081. Stiff. Bacteria and filter beds. Nov. 26.
„ 26,188. Soc. Pulinx. Apparatus for the purification of water.* Nov. 27. French Application, May 22, 1902.
„ 26,201. Naylor. Methods of destroying town refuse by burning, and the utilisation of valuable ingredients thereof. Nov. 28.
[C.S.] 26,410 (1901). Leask. Destructors or furnaces for burning refuse, &c. Dec. 3.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 25,188. Hawke. Manufacture of blotting-paper. Nov. 17.
„ 25,324. Smith, Morrison, and Schindler. Composition of matter for use as a substitute for cork, cork-wood, &c., and process for producing the same.* Nov. 18.
„ 26,077. Bernhard. *See under* IX.
„ 26,217. White. Pulp-beating engines. Nov. 28.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 26,353. Majert. Process for the manufacture of dimethyl- and diethyl-amido antipyrin. Nov. 29.
„ 26,362. Wetter (Heine and Co.). Manufacture or recovery of terpene-alcohols, and the manufacture of perfumes. Nov. 29.
[C.S.] 26,619 (1901). Zimmermann (Chem. Fabr. auf Akt. vorm. Schering). Manufacture of camphene. Nov. 26.
„ 26,625 (1901). Ellis (Soc. Chim. des Usines du Rhône, anciennement Gilliard, P. Monnet, et Cartier). Manufacture of aldehydes. Nov. 26.

XXI.—PHOTOGRAPHY.

[A.] 25,243. Sandell Films and Plates, Ltd., and Smalley. Photographic films. Nov. 17.
„ 25,244. Starnes. Photographic printing process. Nov. 17.
„ 25,443. Cleaver. Silver-chrome photographic printing-paper. Nov. 19.
„ 25,638. Asch. Apparatus for photographing by artificial light. Nov. 21.
„ 25,821. Newton (Farbenfabr. vorm. Bayer and Co.). Manufacture and production of new sensitive photographic emulsions. Nov. 24.
„ 25,942. Lauterbach. Photographic processes, and apparatus therefor.* Nov. 25.
„ 26,026. Sawyer. Apparatus for drying and treating photographic papers. Nov. 26.
[C.S.] 1116 (1902). Mills (Soc. Anon. des Plaques et Papiers Photographiques A. Lumière et ses Fils). *See under* VII.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 25,540. Wetter (Westfälisch-Anhaltische Sprengstoff-Akt.-Ges.). Explosives. Nov. 20.
[C.S.] 26,621 (1901). Criswell. Machine for making matches. Nov. 26.

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 6154.

JOURNAL OF THE
Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

ISSUED TWICE A MONTH.

No. 24.—Vol. XXI. DECEMBER 31, 1902. No. 24.—Vol. XXI.

Subscription of Members 25/- per annum;
Entrance Fee 21/-;
Election by the Council.

Price to Non-Members 36/- per annum;
To Members 25/- per Set of extra or back numbers.
Single copies (Members and Subscribers only),
1882—1901, 2/6 each; 1902, 1/9 each.

The Society of Chemical Industry.

Past Presidents:

Sir Henry E. Roscoe, B.A., D.C.L., LL.D., Ph.D., F.R.S.	1881—1882.
Sir Frederick A. Abel, Bart., K.C.B., G.C.V.O., D.C.L., D.Sc., F.R.S.	1882—1883.
Walter Weldon, F.R.S.	1883—1884.
W. H. Perkin, LL.D., Ph.D., F.R.S.	1884—1885.
E. K. Muspratt	1885—1886.
David Howard	1886—1887.
James Dewar, M.A., LL.D., F.R.S.	1887—1888.
Ludwig Mond, Ph.D., F.R.S.	1888—1889.
Sir Lowthian Bell, Bart., F.R.S.	1889—1890.
E. Rider Cook	1890—1891.
J. Emerson Reynolds, M.D., F.R.S.	1891—1892.
Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S.	1892—1893.
E. C. C. Stanford	1893—1894.
T. E. Thorpe, C.B., LL.D., Sc.D., Ph.D., F.R.S.	1894—1895.
Thomas Tyrer	1895—1896.
Edward Schunck, Ph.D., F.R.S.	1896—1897.
F. Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.	1899—1900.
Jos. W. Swan, D.Sc., M.A., F.R.S.	1900—1901.

COUNCIL FOR YEAR ENDING JULY 1903.

President: Ivan Levinstein.

Vice-Presidents:

Prof. Marston T. Bogert, A.B., Ph.B.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Dr. John Clark.
Prof. G. G. Henderson, D.Sc.
E. Grant Hooper.
Dr. R. Messel.
J. M. C. Paton.
Dr. F. B. Power.
Sir Wm. Ramsay, K.C.B., D.Sc., LL.D., F.R.S.
Dr. Boverton Redwood.
Dr. Jos. W. Swan, F.R.S.
Thos. Tyrer.

Ordinary Members of Council:

E. A. Brotherton, M.P.
Eustace Carey.
Dr. Edw. Divers, F.R.S.
Thos. Fairley.
Dr. J. Grossmann.
Prof. W. R. E. Hodgkinson, Ph.D.
David Howard.
Dr. J. Lewkowitsch.
N. H. Martin.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Frank Scudder.

Sectional Chairmen and Secretaries.

CANADIAN.
Prof. W. R. Lang. | Alfred Burton.

LIVERPOOL.
F. H. Tate. | Dr. T. Lewis Bailey.

LONDON.
Walter F. Reid. | A. R. Ling.

MANCHESTER.
Ivan Levinstein. | J. Carter Bell.

NEWCASTLE.
W. L. Rennoldson. | F. C. Garrett.

NEW YORK.
Dr. V. Coblentz. | Dr. H. Schweitzer.

NOTTINGHAM.
L. Archbutt. | J. T. Wood.

SCOTTISH.
T. L. Patterson. | Dr. Thos. Gray.

YORKSHIRE.
Jas. E. Bedford. | Prof. H. R. Procter.

Honorary Treasurer:
Samuel Hall, East London Soap Works, Bow, E.

Honorary Foreign Secretary:
Dr. Ludwig Mond, F.R.S.

General Secretary: Charles G. Cresswell.

Offices: Palace Chambers, 9, Bridge Street, Westminster, S.W.

Telegraphic Address: 59, Palatable, London.

THE JOURNAL.

Publication Committee:

The President.

A. H. Allen.
G. Beilby.
J. Carter Bell.
Joseph Bernays, M.I.C.E.
H. Brunner.
Edw. Divers, M.D., D.Sc., F.R.S.
Sir John Evans, K.C.B., F.R.S.
Prof. A. G. Green.
Samuel Hall.
Otto Hehner.
John Heron.
D. B. Hewitt, M.D.
Prof. W. R. E. Hodgkinson, Ph.D.
E. Grant Hooper.
David Howard.
Prof. A. K. Huntington.
Wm. Kellner, Ph.D.
Charles A. Kohn, M.Sc., Ph.D.
J. Lewkowitsch, Ph.D.
A. R. Ling.
W. Macnab.
N. H. Martin.
Ludwig Mond, Ph.D., F.R.S.
B. E. R. Newlands.
John Pattinson.
F. B. Power, Ph.D.
Prof. H. R. Procter.
Sir Wm. Ramsay, K.C.B., LL.D. F.R.S.
Boverton Redwood, D.Sc.
Walter F. Reid.
John Spiller.
W. S. Squire, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

Assisted by the following Staff of Abstractors:

Robt. Adams .....I.
L. Archbutt .....I., XII.
J. L. Baker..... XVI., XVII.
H. Ballantyne .....II., XII.
D. Bendix .....III.
E. Bentz .....IV., V., VI.
J. O. Braithwaite .....XX.
J. F. Briggs .... {XVI., XVII., XIX., XX.
J. H. Collins .....X.
C. F. Cross .....V., XII., XIX.
J. T. Dunn, D.Sc. ....VII., X.
Walter C. Hancock, B.A. ..... VIII., IX.
J. W. Hinchley. {I., VIII., IX., X., XXI.
R. L. Jenks ..... {XIII. C., XIV., XIX.
M. C. Lamb .....VI., XIV.
T. A. Lawson, Ph.D...IV., XX.
F. H. Leeds..... {II., III., XIII., XXI.
Herbert Levinstein, Ph.D., B.Sc. ..... IV., V.
J. McCrae, Ph.D. .....IV.
G. W. MacDonald, M.Sc. .XXII.
W. G. McMillan {X., XI., XIV., XXII.
N. H. J. Miller, Ph.D. ....XV.
C. A. Mitchell, B.A..... XII., XXII.
A. More .....VII., XVIII.
G. T. Morgan D.Sc. ...IV., V.
J. G. Parker, Ph.D. .....XIV.
H. T. Pentermann ..... XVI., XVII.
H. S. L. Polak ....Patent List.
T. H. Pope...XVI., XX., XXI.
F. W. Renant.....Index.
G. H. Robertson .....XI.
Chas. Salter .. {II., III., XVI., XVII.
M. J. Salter.....XIII.
R. Sandon .....II.
J. Shields, D.Sc., Ph.D. ...XI.
A. Shook .....Gen. Chem.
W. P. Skertchley.... {XII., XVIII.
E. Sonstadt, III., VII., X., XV.
E. Howard Tripp, Ph.D. ..... III., VII., XVI.
Charles T. Tyrer .....XX.
L. J. de Whalley, B.Sc. .XVI.
A. Wingham .....X.
Joseph T. Wood .....XIV.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: G. P. Girdwood. Harold Van der Linde.

Committee:

G. W. Campbell Arnott.
J. H. Bowman.
Hugo Carlsson.
F. H. Clergue.
W. G. Ellis.
W. Hodgson Ellis.
W. L. Goodwin.
Thos. Heys.
Edgar B. Kenrick.
Thos. MacFarlane.
F. J. Smale.
J. M. Sparrow.
Thos. L. Willson.

Hon. Secretary and Treasurer:
Alfred Burton, 42, Front Street West, Toronto.

Liverpool Section.

Chairman: F. H. Tate.

Vice-Chairman: C. Longuet Higgins.

Committee:

Percy Bateson.
J. Campbell Brown.
Eustace Carey.
G. C. Clayton.
Jas. T. Conroy.
G. Watson Gray.
Max Muspratt.
Julius Raschen.
Alf. Smetham.
H. B. Stocks.
J. W. Towers.

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

London Section.

Chairman: Walter F. Reid.

Vice-Chairman: A. Gordon Salamon.

Committee:

Julian L. Baker.
A. C. Chapman.
E. Divers.
M. O. Forster.
Oscar Guttmann.
Otto Hehner.
H. Hemingway.
W. Kellner.
J. Lewkowitsch.
A. Gordon Salamon.
W. S. Squire.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

J. Allan.
W. Brown.
R. Clayton.
J. Craven.
W. Heys.
J. Hübner.
H. Levinstein.
W. J. Pope.
H. Porter.
T. Stenhouse.
H. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

Newcastle Section.

Chairman: W. L. Rennoldson.

Vice-Chairman: N. H. Martin.

Committee:

A. Allhusen.
P. P. Bedson.
H. S. Collins.
J. T. Dunn.
T. W. Hogg.
H. Louis.
J. Mather.
John Pattinson.
W. W. Proctor.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

Chairman: V. Coblentz.

Vice-Chairman: Russell W. Moore.

Committee:

L. Baekeland.
G. Drobegg.
W. F. Fuerst.
A. P. Hallock.
E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schieffelin.
R. C. Schüpphaus.
G. C. Stone.
M. Toch.
D. Woodman.
F. G. Zinsser.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

Nottingham Section.

Chairman: L. Archbutt.

Vice-Chairman: F. Stanley Kipping.

Committee:

S. E. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
J. O'Sullivan.
J. M. C. Paton.
A. L. Stern.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

Scottish Section.

Chairman: T. L. Patterson.

Vice-Chairman: D. J. Playfair.

Committee:

W. Carrick Anderson.
E. M. Bailey.
H. Bumby.
D. B. Dott.
C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgow.

Yorkshire Section.

Chairman: Jas. E. Bedford.

Vice-Chairman: T. Fairley.

Committee:

C. S. Bedford.
E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

Notices.

SUBSCRIPTIONS FOR 1903.

Foreign and Colonial Members are reminded that the subscription of 25*s.* for 1903, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1903.

The price of extra sets to members is now 25*s.* each. The annual subscription for non-members is 36*s.*

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of next year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows:—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products:—
Subsection A.—Organic Preparations, including Tar Products.
Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsengesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hold their respective annual meetings for 1903 in connection with the Congress.

An executive local committee will make arrangements for the entertainment of visitors during their stay.

As formal invitations should go out, at the latest, this autumn, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

All communications and questions, so far as they cannot be answered by the various organising committees, should be addressed to the Secretary of the Congress, Dr. G. Pulvermacher, Charlottenburg, Marchstrasse No. 21. The formation of organising committees is already in progress in England, Belgium, France, Italy, Portugal, Switzerland, Servia, and Turkey.

DUTY-FREE ALCOHOL FOR MANUFACTURING PURPOSES.

The following circular has been issued by the Joint Committee of this Society and the Chemical Section of the London Chamber of Commerce:—

Gentlemen, London, December, 1902.

The Finance Act of June, 1902, section 8 (see Appendix A), gave rise to a hope that it was the intention of His Majesty's Government to frame certain regulations for the use of alcohol free from duty for manufacturing purposes.

The subject was considered of such importance that Committees were appointed by the Society of Chemical Industry and the Chemical Section of the London Chamber of Commerce to deal with the matter (Appendix B).

The Society of Chemical Industry issued to its members a series of questions (see Appendix C), in order to put itself in possession of facts and statistics regarding the advantage to British trade likely to be derived from modified regulations.

At the first meeting of the Committee of the Society of Chemical Industry, held on Oct. 23, 1902, a letter was drafted to the Inland Revenue in order to ascertain whether the proposed regulations would be of a general or specific character (see Appendix D).

To this letter, a reply was received on Nov. 8, which appeared to indicate that no general regulations would be framed (see Appendix E).

The Joint Committee having the subject under consideration has met twice at the London Chamber of Commerce, and, as a result of its deliberations, now asks a very careful consideration, of all those interested or likely to be interested, of the facts detailed, and replies to the appended series of questions.

The Joint Committee is of opinion that—

The industries of this country have been most seriously hampered by the inability of chemical manufacturers to use alcohol free from duty.

The Government has undoubtedly recognised that injustice might be done to the revenue by the importation of substances in the manufacture of which alcohol has been used, although not remaining as such, or capable of being reproduced from the finished products (see Customs Consolidation Act, 1876, Appendix F).

This Committee is of opinion that representations should be made to the Treasury, by deputation or otherwise, that the industries of this country have been diverted from their natural channel, and that our trade with our Colonies in chemicals is most seriously threatened by continental countries able to work under more favourable fiscal conditions (see Appendix G), and that steps should be taken for the modification of the regulations for use of alcohol for manufacturing purposes.

The Committee holds the opinion that the Government would not, under any conditions, consent to an inclusion in the Customs tariff of the large class of articles referred to in the Customs Consolidation Act, 1876, as by so doing they would not only prevent the establishment and enlargement of industries, which the Government, in its Finance Bill referred to, appears to be desirous of benefiting, but would also practically extinguish considerable trade with our Colonies.

The Joint Committee would esteem it a favour if those to whom this letter is addressed would give careful consideration to this statement, and reply to appended questions (see Appendix H).

(Signed) Thomas Tyrer,
Convener of the Committee of the Society of Chemical Industry.
John C. Umney,
Chairman of the Chemical Section of the London Chamber of Commerce.

Appendix.

Section 8, Finance Act, 1902.

(A)—(1) Where, in the case of any art or manufacture carried on by any person in which the use of spirits is

required, it shall be proved to the satisfaction of the Commissioners of Inland Revenue that the use of methylated spirits is unsuitable or detrimental, they may, if they think fit, authorise that person to receive spirits without payment of duty for use in the art or manufacture upon giving security to their satisfaction that he will use the spirits in the art or manufacture, and for no other purpose, and the spirits so used shall be exempt from duty.

Provided that foreign spirits may not be so received or used until the difference between the duty of customs chargeable thereon, and the duty of excise chargeable on British spirits, has been paid.

(2) The authority shall only be granted subject to a compliance with such regulations as the Commissioners may require the applicant to observe for the security of the revenue, and upon condition that he will, to the satisfaction of the Commissioners, if so required by them, render the spirit unpotable before and during use, and will, from time to time, pay any expenses that may be incurred in placing an officer in charge of his premises.

(3) If any person so authorised shall not comply with any regulation which he is required to observe, he shall, in addition to any other fine or liability, incur a fine of fifty pounds.

(B) Constitution of Committees—

Society of Chemical Industry.

The President.
The Hon. Treasurer.
Dr. W. S. Squire.
Prof. A. G. Green.
Mr. David Howard.
Mr. Walter F. Reid.
Mr. Thomas Tyrer.
Mr. John C. Umney.

Chemical Section of London Chamber of Commerce.

Mr. John C. Umney (*Chairman*).
Mr. D. Lloyd Howard (*Vice-Chairman*).
Mr. E. V. Barrett.
Mr. F. B. Boulton.
Mr. T. H. W. Idris.
Mr. Charles Umney.
Mr. E. A. Webb.
Mr. Edmund White.

(C) Notice in Journal of Society of Chemical Industry.

The principle of concessions in regard to the use of the spirit (alcohol) having been accepted by the Government, the Council of the Society would be obliged if those members who are are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).

2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.

3. As affecting the position of British manufacturers in regard to foreign competition.

4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

(D) Copy of Correspondence.

The Secretary,
Board of Inland Revenue,
Somerset House.

Sir, 24th October, 1902.

With reference to section 8 of the Finance Act of 2 Edw. VII., the Spirit Committee of the Society of Chemical Industry are desirous of knowing whether the use of duty-free alcohol can be allowed to manufacturers of chemical and pharmaceutical products on suitable premises, under excise supervision, in cases where the finished product is not dutiable.

And further, whether, on similar premises and under similar supervision, dutiable goods can be allowed to be manufactured from spirit without payment of duty, the duty being paid on the finished product.

The first conditions of manufacture will meet the cases of a very large number of products which individually may not be of great importance, but which in the aggregate amount to a branch of industry of considerable magnitude.

The second condition would meet the injustice of the present system, as in many cases the duty charged represents only a small portion of the alcohol actually used in the preparation of the finished product.

It is impossible to give figures as to the magnitude of the possible development of such industries, as the present system has entirely prevented their being carried on profitably in this country, and necessitated their being conducted abroad.

I remain,
Your obedient Servant,
(Signed) Chas. G. Cresswell,
General Secretary.

(E) Copy.

R. 9849/1902. Inland Revenue,
189. Somerset House,

Sir, 8th November, 1902.

With reference to your letter of the 24th ultimo, I am directed by the Board of Inland Revenue to acquaint you that it is not in contemplation to apply the provisions of section 8 of the Finance Act, 1902, except in special cases, and where all the circumstances are such as to render the use of ordinary methylated spirit practically prohibitive, and then only under strict regulations as regards excise supervision. In no case can exemption from duty be allowed in respect of—

(1) Spirit used in the preparation of any article intended for human consumption.

(2) In the manufacture of articles not intended for human consumption, but capable of being so used, as perfume, essences, tinctures, &c.

As regards such articles as chloroform and sulphuric ether, I am directed to remind you that heavy duties are imposed on the importation of them, on the assumption that they and the corresponding articles in this country are manufactured with pure spirit, and that these import duties could not be maintained if pure spirit were allowed duty free for the manufacture of the home-made articles.

These are the general lines upon which the Board will administer the section in question, so far as it relates to articles made by manufacturing chemists.

I am, Sir, your obedient Servant,
(Signed) J. B. Meers,
Secretary.

(F) Customs Consolidation Act, 1876 (not repealed).

Appendix, 39th and 40th Victoria, Chap. 35.

Goods not prohibited to be imported into or used in Great Britain and Ireland, composed of any article liable to duty as a part or ingredient thereof, shall be chargeable with the full duty payable on such article, or if composed of more than one article liable to duty, then with the full duty payable on the article charged with the highest rate of duty.

Upon the importation into Great Britain and Ireland of any articles in the manufacture of which spirit has been used, there shall be charged, in respect of such quantity of spirit as shall appear to the satisfaction of the Treasury to be used in the manufacture of such articles, a duty equivalent to that which would be chargeable on the like quantity of spirit on its importation into the United Kingdom.

Note also—Finance Act, 1901. Chap. 7, Part I.—Sec. 7.

Where any manufactured or prepared goods contain, as a part or ingredient thereof, any article liable to any duty customs, duty shall be charged in respect of such quantity of the article as shall appear to the satisfaction of the Treasury to be used in the manufacture or preparation of the goods, and, in the case of goods so containing more than one such article, shall be charged in a similar manner on each article liable to duty at the rates of duty respectively applicable thereto, unless the Treasury shall be of opinion that it is necessary for the protection of the revenue that duty should be charged in accordance with the Customs Tariff Act, 1876.

Any rebate which can be allowed by law on any article when separately charged shall be allowed in charging goods under this section in respect of the quantity of that article used in the manufacture or preparation of the goods.

(G) It is found on enquiry that, in the Indian and other important Colonial markets, the chemicals are to a large

extent drawn from Germany, whilst the drugs and crude products are drawn from this country; the German manufacturers and dealers not failing to communicate to the consumers that in many instances the chemicals that would be sent from this country would only be German products imported into Great Britain and resold.

(11) It is hoped that firms engaged in any specific trade will furnish detailed particulars of the substances that can be advantageously manufactured with modified conditions for the use of alcohol free from duty. For example, chemical manufacturers might indicate pyrogallic acid, dye manufacturers might specify certain aniline dyes, wholesale druggists the various extracts, alkaloids, &c., prepared with or crystallised from alcohol, &c.

1.—Are you in favour of the use of alcohol free from duty for manufacturing purposes?

2.—Are you of opinion that the revenue would suffer by such provision, taking into consideration the fact that industries non-existent could be established and industries existent could be extended, with corresponding employment of increased capital and labour and advanced income?

3.—Would the trade in which you are interested be influenced in its home aspect by the imposition of a duty on the substances upon which duty can now be imposed at the will of the Treasury (see Appendix F), but which has not hitherto been done?

4.—Would your trade with our Colonies and other countries be materially increased by the use of alcohol free from duty for manufacturing purposes?

5.—(*a*) Is there any chemical product, in which alcohol plays any part, which you cannot make in competition with other countries, if you had the use of duty-free alcohol? If there is such a product, please name it.

(*b*) Are there any processes, in which alcohol plays a part, which you cannot carry out, or chemical products which you cannot make in competition with other countries, unless you have the use of duty-free alcohol? If so, please name them.

6.—Will you compile a list of those industries that could be extended by the use of duty-free alcohol, giving, according to your experience as far as possible, the specific articles the manufacture of which would be influenced? (See Appendix H.)

NOTE.—*Please return your answers to either of the Secretaries, London Chamber of Commerce, Botolph House, Eastcheap; or Society of Chemical Industry, Palace Chambers, Westminster, S.W.*

List of Members Elected

22nd DECEMBER 1902.

Allbright, Wm. B., 5139, Lexington Avenue, Chicago, Ill., U.S.A., Chemical Engineer.

Atkinson, Edwin B., Scartho House, Great Grimsby, Lecturer in Chemistry.

Baer, Dr. Samuel H., 158, Chambers Street, New York City, U.S.A., Consulting Chemist.

Bluman, Nicholas J., 46, Sunderland Road, Forest Hill, S.E., Student of Chemistry.

Brach, Dr. Ludwig K., c/o Dr. S. Brettenfeld, 130, East 75th Street, New York City, U.S.A., Chemist and Colourist.

Cady, Walter B., c/o Hecla Portland Cement and Coal Co., Bay City, Mich., U.S.A., Chemist.

Catchpole, Albert A., Ravensdeane, Grove Park, Lee, Kent, Works Chemist.

Colley, Hylton H., Iola, Kas., U.S.A., Chemist.

Coyle, Benj. C., City Laboratory, 17, Castle Street, Dublin, Analytical Chemist.

Deghuée, Dr. Jos. A., 247, Harrison Street, Brooklyn, N.Y., U.S.A., Chemist.

Donaldson, Thos., New Street, Stevenston, Ayrshire, N.B., Analytical Chemist.

Dowzard, Edwin, 78, Rawson Road, Seaforth, Liverpool, Analyst.

Eastwood, Robt. F., 128, Derby Road, Widnes, Chemist.

Erhart, Wm. H., 11, Bartlett Street, Brooklyn, N.Y., U.S.A., Manufacturing Chemist.

Fairchild, Benj. T., 76, Laight Street, New York City, U.S.A., Manufacturing Chemist.

Forstall, Alf. E., 58, William Street, New York City, U.S.A., Consulting Gas Engineer.

Fuller, Henry C., "The Madison," Madison Avenue, Detroit, Mich., U.S.A., Analytical Chemist.

Gaskell, Holbrook (III.), Bridge House, Sefton Park, Liverpool, Engineer.

Haff, Max M., P.O. Box 340, Niagara Falls, N.Y., U.S.A., Chemist.

Heidenhain, Dr. Henry, c/o Royal Baking Powder Co., Kent Avenue and Morton Street, Brooklyn, N.Y., U.S.A., Chemist.

Huntoon, Louis D., Bristol, Tenn., U.S.A., Mining Engineer.

Masury, Fred. L. M., 43, West 87th Street, New York City, U.S.A., Explosives Manufacturer.

Morrison, Jos., Wellfield, Farnworth, Widnes, Manager.

Murray, Jno. C., "Studley," Coburg Road, Halifax, N.S., Canada, Assayer and Chemist.

Perrett, Fred. J., 9, Altenburg Gardens, Lavender Hill, London, S.W., Chemist.

Reuterdahl, Arvid, 194, Calla Street, Providence, R.I., U.S.A., Consulting Electrical Chemist.

Rosendale, Otto M., 516, Oregonian Building, Portland, Oregon, U.S.A., Mining Engineer.

Sahm, Louis N., 22, Cliff Street, New York City, U.S.A., Chemist.

Schlesinger, Basil E., 92, Mount Vernon Street, Boston, Mass., U.S.A., Chemist.

Schoonmaker, H., 917, Race Street, Cincinnati, Ohio, U.S.A., Metallurgical Chemist.

Sibley, Samuel E., 3, Rutland Road, Ilford, Essex, Technical Chemist.

Snyder, Prof. Harry, 2090, Commonwealth Avenue, St. Anthony Park, Minn., U.S.A., Professor of Agricultural Chemistry.

Storr, Bertram V., 1, Oakfield Road, Ilford, Essex, Chemist.

Tatters, Hugh Lee, 17, Waterloo Road, Runcorn, Analytical Chemist.

Taylor, Francis O., c/o Parke, Davis, and Co., Detroit, Mich., U.S.A., Analytical Chemist.

Van der Sleen, Nicolaas, Haarlem, Holland, Consulting Chemist and Bacteriologist.

Wade, Frank, 10, Shirley Road, Southsea, Assistant Admiralty Chemist.

Waring, W. Geo., Webb City, Mo., U.S.A., Metallurgical Chemist.

Weiskopf, Erich, Dynamite Factory, Modderfontein, Transvaal, South Africa, Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Barralet, Edgar S., l/o Bethnal Green; 37, Elm Grove Road, Barnes, S.W.

Bowman, R., l/o Widnes; Cynwyd, near Corwen, N. Wales.

Carmichael, Dr. Henry, l/o Pearl Street; 176, Federal Street, Boston, Mass., U.S.A.

Cates, W. A., l/o Wapella; Abbotsford, B.C., Canada.

Culmann, Dr. J., l/o Front Street; 216, Lancaster Avenue, Buffalo, N.Y., U.S.A.

Davis, B. F.; Journals to c/o W. J. Miller, Saladero Concordia, Concordia, Argentine Republic.

Davis, Chas. B., l/o South William Street; c/o J. Krieg, 220, West 134th Street, New York City, U.S.A.

Earp, Dr. F. S., l/o Boulder; 72, Addis Street, Kalgoorlie, W. Australia.

Hodgkins, Dr. H., l/o East Park Street; 78, South Street, Newark, N.J., U.S.A.

Hogben, W.; Journals to c/o Viscoloid Co., Leominster, Mass., U.S.A.

Hyman, L. W., l/o West Albany; Port Chester Chemical Co., Port Chester, N.Y., U.S.A.

Jackson, Hy. A., l/o W. 118th Street; Columbia University, New York City; Wilmington address as before.

Lloyd, T. H., l/o Liverpool; The Laboratory, Penygraig, Dinas, R.S.O., Wales.

MacEwan, Peter, l/o Hornsey Lane Gardens; 64, Southwood Lane, Highgate, London, N.

Peppel, S. V., l/o King Avenue; 233, West 11th Avenue, Columbus, Ohio, U.S.A.

Persons, A. C., l/o 133; 159, Prospect Street, Willimantic, Conn., U.S.A.

Pullar, Herbert S.; all communications to Pullar's Dye Works, Perth, N.B.

Riederer, E. J., l/o Ashburn; 251, West 95th Street, New York City, U.S.A.

Sharples, S. P., l/o 13; 26, Broad Street, Boston, Mass., U.S.A.

Shishkoff, S.; Journals to Mojga, Elabonga, Government of Viatka, Russia, Glass Manufacturer.

Smith, H. Procter, l/o Wrexham; 52, St. John's Street, Coatbridge, N.B.

Stoddart, Chas. W., l/o York Street; 246, Equitable Building, Denver, Col., U.S.A.

Strangman, J. Pim; Journals to 38, Rue Desbordes-Valmore, Passy, Paris.

Wilkins, A. D.; Journals to Bellevue P.O. Station, Allegheny, Pa., U.S.A.

Zimmermann, A., l/o St. Mary-at-Hill; 3, Lloyd's Avenue, London, E.C.

CHANGE OF ADDRESS REQUIRED.

Bolton, E. R., l/o 14A, Selwood Terrace, South Kensington, London, S.W.

Death.

Ritchie, Robt., Shawfield Works, Rutherglen, Glasgow.

London Section.

Meeting held at Burlington House, on Monday, December 1st, 1902.

MR. WALTER F. REID IN THE CHAIR.

EXAMINATION OF METHODS EMPLOYED IN ESTIMATING THE TOTAL ACIDITY OF GASES ESCAPING FROM THE CHAMBER PROCESS FOR MANUFACTURE OF SULPHURIC ACID, WITH SUGGESTIONS ARISING FROM THE STUDY OF THE INTERACTION OF NITROUS AND SULPHUROUS ACIDS, OR THEIR SALTS, IN AQUEOUS SOLUTION.

BY R. FORBES CARPENTER, F.I.C., AND ERNEST LINDER, B.Sc.

Historical.

Prior to the formation of this Society, the subject to which the first portion of our remarks is addressed had already engaged the attention of manufacturers. In 1875, the provisions of the Alkali Act Amendment Bill of 1874 became operative, in which it was prescribed (sec. 5) that the best practicable means for preventing the escape of certain gases scheduled as noxious should be observed in alkali works. Sulphuric acid, sulphurous acid (except that arising from the combustion of coals), and nitric acid, or other noxious oxides of nitrogen, being so scheduled, escapes from the process of sulphuric acid manufacture then first received legislative supervision.

In the 12th and 13th Reports of the Chief Inspector, for 1875–6 (published in 1878), p. 59, a short account is given, with drawing of the arrangement first introduced by Mr. James Mactear, at St. Rollox, for continuous aspiration of gases by means of a Bunsen pump, the residual gases, after absorption of their acid contents, being measured by a gas-meter. This drawing shows four absorbing tubes in sequence.

In 1878, about the time that the Noxious Vapours Commission (1876–8) completed its laborious investigations, the British Alkali Makers' Association published detailed methods of estimation of the sulphur and nitrogen acids escaping from the process that were the result of experiments conducted by a committee of the Association. The detailed methods prescribed may be found in the 14th—15th Report of the Chief Inspector for 1877–8, pp. 121—123, and were little departed from by Prof. Lunge and Dr. Hurter in the preparation of the Alkali Makers' Pocket Book in 1884, pp. 86—7. Certain precautions in the use of aspirators and Mactear meters are indicated by the Alkali Makers' Committee, and, perhaps, having regard to the form in which the recommendations of the Noxious Vapours Commission are cast, it is prescribed that the results are to be stated as follows :—

1st. Grains of sodium carbonate neutralised per cubic foot of gases, indicating total acidity.

2nd. Acid to be stated as grains of sulphur per cubic foot and grains of nitrogen per cubic foot.

Four absorbing bottles were prescribed, each containing not less than 100 c.c. of absorbing liquid, with a depth of at least 3 ins. in each bottle; the apertures of inlet tubes not to exceed $\frac{1}{10}$th of an inch (0·5 mm.) in diameter, and the first three bottles to contain 100 c.c. of normal caustic soda free from nitrogen acids, and the fourth 100 c.c. of distilled water. Rate of aspiration and quantity of gases as nearly 24 cb. ft. in 24 hours as possible, *i.e.*, 1 cb. ft. per hour.

The first year's Journal of the Society (1882) contains (pp. 209—213) a paper entitled "Notes on the Testing of Noxious Vapours," read by Mr. Jesse Lovett before this Section. In this, the first description was given of the use of hydrogen peroxide as an absorbent for

the acid gases of sulphur and nitrogen in vitriol chamber escapes; here two absorbing bottles only are shown. In 1886, the first named of the authors of the present paper presented some notes (this Journal, 1886, 287) to the Manchester Section of the Society, dealing with the slowness of oxidation of nitrous acid to nitric acid by hydrogen peroxide when reacting in alkaline solution as compared with acid solution, the results leading him to indicate preference for hydrogen peroxide alone, and without addition of caustic soda, as the absorbent to be used. In 1887 (this Journal, 347), Mr. W. Younger presented a note to the same Section of the Society on a rapid method of estimating the total acidity of exit gases from the chamber process, adapted to the use of workmen. This closes the references to work done on this subject in this country, so far as we are aware, in the Journal of the Society, apart from Dr. Eschellmann's 1884 paper, to be hereafter referred to, and Prof. Lunge's valuable researches, the results of which from time to time he has so frequently contributed direct to the Society. His last reference in any way to our present subject is in a paper presented to the Newcastle Section, in 1899 (this Journal, 1899, 1015—1016). Herein Prof. Lunge is chiefly concerned with the difficulties presented in correct estimation of nitric oxide, "since many experiences point to the fact that far greater losses arise from this source than has been hitherto assumed" (p. 1015); and again (p. 1016), "Hydrogen peroxide has been several times proposed for absorbing nitric oxide, and we thoroughly examined it in that respect, but it does not seem worth while to give any details of our experiments, for the result was most decisive: hydrogen peroxide, both in acid and in alkaline solution, is a bad absorbent for nitric oxide, and altogether to be rejected for the estimation of that substance." Drawings of various absorbing apparatus are given by Prof. Lunge, on p. 1016.

Absorption by caustic soda is prescribed in the legislation of the German Imperial Government, in 1898, in which measure, statutory limits were laid down for the escapes of sulphur and nitrogen acids in terms of sulphuric anhydride. This legislation was preceded by conferences with the German Society of Chemical Industry, who, at that time, must have been acquainted with Raschig's researches (see later, p. 1493), as his controversy with Prof. Lunge, 1887—1889 (see later, p. 1493), was well known to industrial chemists. The possibility of reactions other than formation of simple sulphites and nitrites appears to have escaped notice.

It may be said that the absorbing apparatus in general use is either the flexible bellows aspirator of Mr. Fletcher, this being very widely used, and by the inspecting staff almost exclusively, or water aspirators constructed of lead and of capacities from 1 to 20 cb. ft., with a train of absorbing vessels, two, three, or four bottles being employed, the larger number for the larger aspirators, and the rate of aspiration being from 1 to 3 cb. ft. per hour. Drechsel's bottles and Emmerling tubes are very useful forms of absorbing apparatus, the latter especially giving a large amount of wetted surface exposed to the current of gases. Todd's tubes also are frequently employed, and with excellent results; they admit of aspiration being rapid, and absorption at the same time being complete. It is to be wished that greater attention in many cases should be paid to restricting the diameter of the tube as laid down, in 1878, by the Alkali Makers' Committee. The importance of this point is too frequently overlooked. In some, but not many, cases Mr. Mactear's Bunsen pump and gas-meters are still used.

The absorbents in general use are caustic soda, carbonate of soda, and hydrogen peroxide, the latter being usually employed by itself; occasionally, however, in conjunction with alkali. The convenience of methyl orange being independent of the presence of carbonic acid has led to its very general use as indicator. Of course, with this indicator, if alkali be the absorbent, hydrogen peroxide should be added before titration, the acid sulphite of the alkali being neutral to methyl orange. Phenolphthalein, favoured by Prof. Lunge, is as delicate as could be wished, but is open to the disadvantage that the solution must be raised to boiling point for exact titration, owing to the frequent presence of carbonic acid in the residual gases from some exits. In the opinion of some competent experimenters this proceeding endangers loss of acid. We have not ourselves, however, found cause, on our own procedure, to endorse this objection.

Restricting ourselves for the present to the administrative demands of the Alkali Act of 1881, the inspecting staff have to ascertain the total acidity in terms of sulphuric anhydride of the "acid gases of sulphur and nitrogen." The manufacturer may well, in addition, desire to know of what compounds this loss is made up, and his tests may therefore extend to the separate estimation of nitrogen compounds, including the difficult estimation of loss of such as nitric oxide.

Anomalies in Estimation of Total Acidity of Sulphuric Acid Exit Gases by Flexible Bellows Aspirator.

In March of this year, one of the staff of inspectors submitted results of a series of comparative tests of "bellows" tests of vitriol exit gases, using as absorbent hydrogen peroxide, (*a*) in neutral solution, (*b*) in alkaline solution, titrating in both cases with methyl orange as indicator:—

Four tests in neutral peroxide with result over 1·5 grains of SO_3 per cb. ft.	average 2·12	difference = 0·64
Four corresponding tests in alkaline peroxide	average 2·76	
Six tests in neutral peroxide with result under 1·5 grains of SO_3 per cb. ft.	average 0·90	difference = 0·61
Six corresponding tests in alkaline peroxide	average 1·51	

The tests were taken in as rapid sequence as circumstances allowed, and the differences were invariably in the direction as shown by the average results above. The inspector threw out the suggestion that, in the interval between March and the date of our annual staff meeting, observations might be made in other districts, and the subject be considered in October on a broader basis.

The questions opened up are numerous and varied, and required investigation on many sides.

So far as nitrogen oxides are concerned, the following points at once suggested themselves:—

(1) Is the absorption of the "*acid oxides of nitrogen*" incomplete when alkali is absent from the absorbent? *

(2) Is the higher total acidity with alkaline hydrogen peroxide as absorbent due to oxidation of oxides of nitrogen which are not "*acid oxides*," viz., nitrous and nitric oxides (nitrogen peroxide may by some be included in the category), thus showing a result higher than should be stated as the actual one complying with the limitations laid down in the statute?

These questions, it appeared to us, could best receive answer in preliminary investigations were made in the laboratory. With the knowledge gained thereby, the conditions necessary to regulate exact comparative tests in works could best be ascertained.

As the questions raised in query 2 were much fewer and more easily disposed of than those under query 1, consideration of these is taken first.

Action of Hydrogen Peroxide in Alkaline and Neutral Solution on Oxides of Nitrogen.

1. *Nitrous Oxide.*—Nitrous oxide is produced in the chamber reactions under conditions of presence of excess of water vapour, the reaction—

$$2HNO_2 + 2SO_2 + H_2O = N_2O + 2H_2SO_4$$

(Weber, *vide* Lunge, Vol. I. (Edit. 1), p. 454) only occurring in very dilute solutions. These conditions only, therefore, occur locally with normal chamber working in the vicinity of steam inlets. Dr. Eschellmann, at one time chemist at Muspratt's Widnes Works, recognising, with Lunge and other chemists who had investigated and sought to trace and estimate losses of nitre in the chamber process, that

* *Note.*—The inspector was led to try use of alkaline hydrogen peroxide from the nitrous smell of the gases discharged from the bellows aspirator after agitation with absorbent (*a*) above. Starting with solution of sodium peroxide and finding its oxidising value rapidly deteriorate on keeping, the experimenter latterly used hydrogen peroxide and caustic soda mixed at the time of test.

nitrous oxide eluded direct estimation by gas analysis, as its volume per cent. of exit gases was so small, made attempts indirectly to ascertain the proportion of nitre so reduced. His experiments are detailed in this Journal, 1884, p. 134 *et seq.* He gives as equation—

$$2SO_2 + N_2O_3 + 2H_2O = 2SO_2(OH)_2 + N_2O$$

for the reaction in the chamber space, the experiments being made by altering strength of first chamber, 134° Tw., *i.e.*, anhydride (SO_3) with three equivalents of water, to 114° Tw., or anhydride with four equivalents, and noting the extra consumption of nitre, all other conditions unchanged, as far as known. This was the increase for one equivalent, and was multiplied by three for the three-equivalent hydrate of 134° Tw.—a method open to criticism, but the only one available.

He arrived at the conclusion that 31 per cent. of the nitre loss in well-conducted chamber working might be due to this cause.

Dr. Hamburger, then chemist at Sir David Gamble's Works, St. Helens, from their own working concurred in the view that the chemical was far greater than the mechanical loss, which latter he estimated, as results of close experiment, as 22 per cent., excluding nitric oxide. At a later date he expressed the opinion (this Journal, 1889, p. 167) that Eschellmann had stated the loss as nitrous oxide at far too high a figure.

From the known stability and properties of nitrous oxide, it appeared *a priori* improbable that oxidation by hydrogen peroxide would take place in the bellows absorption; still, viewed by some chemists from another standpoint, N_2O has relationship to one acid body—hyponitrous acid (Watt's Dict., Vol. III., p. 569)—as well as to an alkaline—dihydroxylamine, $(HO)_2NH$, this latter having the same empirical formula as the hydrate of hyponitrous acid. Moreover, on titration with permanganate, an acid solution of hydroxylamine should oxidise to nitrous oxide, but some hyponitrous acid is formed, which partly splits up into nitrous oxide and water, and is partly oxidised further to nitric and nitrous acids (see F. Raschig, this Journal, 1887, p. 820).

In the laboratory experiments, pure nitrous oxide was prepared by heating ammonium nitrate; the evolved gases led through caustic soda to absorb acid oxides and chlorine, then through ferrous sulphate to absorb ammonia and nitric oxide. The purified gas was then examined by slowly bubbling through absorbents in Mitscherlich bulbs.

(*a*) *Neutral Hydrogen Peroxide.*

5 c.c. of H_2O_2
25 c.c. of H_2O
} Temp., 15° C.; time, 20 mins.; absorbent tinged with methyl orange.

Result: Methyl orange in solution unaffected.

(*b*) *Alkaline Hydrogen Peroxide.*

9·8 c.c. of N/2 NaHO
5 c.c. of H_2O_2
25 c.c. of H_2O
} Temp., 15° C.; time, 10 mins.

Acid N/2 to titrate = 9·75. Methyl orange.

9·8 c.c. of N/2 NaHO
5 c.c. of H_2O_2
25 cc. of H_2O
} Raised to 40° C.; time, 10 mins.

Acid N/2 to titrate = 9·75. Methyl orange.

Conclusion.

Hydrogen peroxide in neutral or alkaline solution has no appreciable action on nitrous oxide.

The much stronger oxidising absorbent of Dr. Eschellmann—permanganate of potash acidified with sulphuric acid—appears by his paper to have no oxidising action on nitrous oxide.

2. *Nitric Oxide* may appear in small proportion in normal chamber exits (Lunge), and, by Dr. Eschellmann's paper, 7 per cent. of the nitre loss only was attributable to nitric oxide. It required four bottles of permanganate, with large excess of sulphuric acid, to oxidise and catch all the nitric oxide in such attenuated condition (7 per cent. of O); but with excess of SO_2 coming to the Gay-Lussac tower, a large reduction of nitrososulphuric acid may occur, with the well-known phenomenon occurring of "purple acid," the evolved gas being nitric oxide.

In the laboratory experiments, nitric oxide gas containing some nitrous oxide was prepared from copper turnings and nitric acid (sp. gr. 1·2), and passed (1) through water, (2) through caustic soda, thence into litre flask filled with weak soda solution in pneumatic trough, from which samples were withdrawn to a Bunte burette for examining action of absorbents, all air being carefully excluded; all experiments at air temperature, 15° C.

Volume of gas, about 110 c.c.:—

(*a*) Water, 10 c.c.; shake. No contraction. Meta phenylenediamine gives faint brown colour with solution.

(*b*) Acid hydrogen peroxide, 18 c.c.; shake. Volume reduced to 9 c.c. Time, 6½ minutes. Metaphenylene test gives no brown coloration, indicating absence of nitrous acid in solution.

N/2 soda for acid produced = 7·5 c.c. Methyl orange, end-point good.

(*c*) Caustic soda (i) 10 c.c. of N/2 NaHO; shake. Contraction, *nil*.

(*d*) Alkaline hydrogen peroxide, (i) 10 c.c. of N/2 NaHO, 18 c.c. of H_2O_2; shake. Volume reduced to 9 c.c. Time, 5 minutes. (ii) 30 c.c. of N/2 NaHO, 18 c.c. of H_2O_2; shake. Volume reduced to 9 c.c. Time, 13 minutes. By metaphenylene test strong brown coloration indicates large amount of nitrite.

Cf. also Prof. Lunge's remarks, this Journal, 1890, 1015, 1016, already quoted.

Conclusions.

(1) *Nitric oxide is slowly oxidised to nitrous acid by hydrogen peroxide in alkaline solution. A large excess of alkali retards the rate of oxidation.*

(2) *Nitric oxide is slowly oxidised to nitric acid by hydrogen peroxide in acid solution.*

These experiments were made in the absence of any acid gas of sulphur, the presence of which, it will be seen later, introduces much possible complexity into the reactions under certain conditions.

It may be as well to state here the reactions affecting oxidation of nitrogen trioxide in solution when uncomplicated by presence of sulphur acids.

Taking sodium nitrite solution, acidified with sulphuric acid, and in presence of peroxide, the following reaction (oxidation to nitric acid), $H_2O_2 + HNO_2 = HNO_3 + H_2O$, proceeds with fair rapidity, as estimated by the metaphenylenediamine coloration test, and the non-appearance of any colour in such solution allowed to stand from periods of 30 to 40 minutes at air temperature, *e.g.*:—

Solution made up to contain 2 c.c. of half normal sodium nitrite, 2·5 c.c. of peroxide (10 vols.), and 2 c.c. of half-normal sulphuric acid, in about 200 c.c. of water.

(*e*) 25 c.c. of this solution in Nessler glass on plate:—

10 minutes after mixing.. Faint brown.
25 „ „ .. Faint brown, inclined to yellow.
40 „ „ .. Light yellow, as in blank.

(*f*) 25 c.c. of similar solution, acid omitted:—

10 minutes after mixing.. Deep brown.
40 „ „ .. „
24 hours after mixing .. „

confirming results of previous investigation made by the first-named author (this Journal, 1886, 287).

But a reducing action concurrently occurs; *e.g.*, if to a dilute solution of nitrous acid (2 c.c. of N/2 $NaNO_2$, 2 c.c. H_2SO_4, 150 c.c. water), which is perfectly odourless, peroxide be then added, an immediate and distinct nitrous smell appears, indicating that oxidation and deoxidation occur concurrently, and that some reaction yielding nitric oxide, *e.g.*, $H_2O_2 + AHNO_2 = 2HNO_3 + 2NO + 2H_2O$,* must be reckoned with.

* This reaction is more powerful than that arising from the instability *per se* of nitrous acid in acid aqueous solution—

$$3HNO_2 = HNO_3 + 2NO + H_2O,$$

a reaction recognised by Watts (Vol. III., p. 564) and by Lunge (Vol. I. (Edit. 2), p. 151), who also states (p. 157) that N_2O_3 cannot be absorbed by NaHO without loss, some nitric oxide resulting and some nitric acid.

Such a reaction would account for the pronounced smell of nitrogen oxides noticed on expelling the air from bellows after agitation of the acid gases with peroxide, and for the same nitrous smell at the furthest absorbing bottle, showing presence of extremely small quantities of acid on titration, so small indeed as to need great precaution to detect when a water aspirator and train of absorbing bottles or tubes are used. The observation of the inspector above mentioned was confirmed in the laboratory tests, that the smell was not noticeable if alkali were present. The point to note is that experiment does not indicate this as a main or principal reaction, but only as a very partial one.

3. *Nitrogen Peroxide.*—No experiments were made with this body. Under the conditions of the test with both neutral and alkaline peroxide it is recognised by all authorities that the solution in water behaves as a mixture of nitrous and nitric acid, and that, with aqueous solution of an alkali, nitrite and nitrate of the alkali are produced (Watts' Dict., Vol. III., pp. 565, 566).

Absorption of Acid Oxides of Nitrogen by Alkaline and Neutral Absorbents.

Having therefore obtained data for answering the questions raised as to acidity arising from oxidation of non-acid oxides of nitrogen, we are free to consider more particularly the general questions arising under the first query put as to the completeness or incompleteness of absorption of the acid oxides (*a*) by neutral (or, we may say, by acid, for the solution immediately becomes acid), or (*b*) by alkaline peroxide. Here the laboratory investigation necessarily included a large range of experiments, where sulphurous and nitrous acids were present in acid and alkaline solutions.

In addition to considering what variety of conditions were possible in the usual tests taken by bellows, the conditions possibly existing when using a train of absorbing bottles had also to be taken into account, where, in a 24-hours test, excess of sulphurous acid might well be present in the first absorber of the series. It is clear, when peroxide is the absorbent, that only in *abnormal bellows* tests will sulphurous and nitrous acids have an opportunity for interaction, enough peroxide being usually present to oxidise up all sulphurous acid instantaneously to sulphuric acid. But in most tests nitrous acid has to be considered as present.

In consulting technical literature for help in solving some of the anomalous results that soon presented themselves, attention was at an early stage directed to investigations of F. Raschig (this Journal, 1887, 819, 820, where a sketch of some of these is given; the original paper in Liebig's Annalen exceeds 90 pages). Unfortunately for himself, Raschig, in the last 20 pages of his paper, was led to base a new theory of the chamber process on experiments conducted on the interaction of sulphites and nitrites in solutions often concentrated and sometimes at low temperatures —conditions that could not obtain in chamber reactions. Dr. Hamburger (this Journal, 1889, 164 *et seq.*) has given an extremely fair and lucid account of the controversy, into which Dr. Lunge plunged with his accustomed ardour, with the result that Raschig's theory of the chamber process had to be abandoned as in any sense an adequate working hypothesis. Some, however, of his real work on solutions has withstood attack, and at that date much of it was of service in throwing light on the reactions that occur when acid sulphites and nitrites interact in solution—a situation that, as has been shown above, may arise in our work of estimating total acidity of the gases escaping from the chamber-process exits.

Somewhat later on in our work we reviewed our results and made additional experiments in the light of the work of Drs. Divers and Haga, communicated to the Chemical Society (Trans. Chem. Soc. 1887, 1889, 1894, 1895, 1895 and 1900), in which, in addition to much original work, the work of Fremy, Claus, and Raschig was reviewed, and it was shown that not only were conditions sometimes incorrectly stated by these earlier experimenters, but it would appear that, not infrequently, incorrect conclusions were drawn from work in which conditions were correctly stated and agreed with fact. The results of Drs. Divers and Haga's work affecting the matter immediately before us may be thus summarised from Trans. Chem. Soc., 1900, vol. 77:—

1. In the interaction between sulphurous acid (or sulphites) on nitrites, it is nitrous acid that is in all cases sulphonated.

2. Sulphurous acid and nitrous acid, or the oxides and water equivalent to them, interact in such a way that the base of the sulphite that may be used in place of sulphurous acid is needed only to preserve from hydrolysis the products of the interaction (p. 673 and pp. 688, 689).

3. The interaction of nitrous acid with a pyrosulphite results in the formation of a two-thirds normal hydroximido-sulphate, the other sulphazotised salts being secondary products derived from it (p. 674). The reaction between sulphurous and nitrous acids can be made to yield sulphazotised acids, even in absence of any base (p. 688).

4. Solution of sulphur dioxide added to that of potassium or sodium nitrite produces a sulphate and either nitric or nitrous oxide, according as one or other of the interacting substances is in excess (p. 687). (*Cf.* Reactions (*a*), (*b*), (*d* iii.), (*e* iii.), below.)

So far as our own results go, to be detailed later, we should say that, under the conditions of our experiments, we found in the dilute solutions, on which alone we operated, that nitric oxide, except in very small proportion, is not the product even when nitrous acid is in excess. Indeed (p. 687), Drs. Divers and Haga proceed to show how the extent of the action can be limited so as to obtain "either hydroximidosulphate and nitrous acid or the undoubted products of their transformation."

At the outset, as regards titration of alkaline solutions containing nitrite, we were confronted with the frequent impossibility of obtaining any satisfactory end-point at all when using methyl orange as the indicator, the azo-derivative of golden-yellow colour only too frequently rendering nugatory efforts to obtain exact titration. Referring to experiments (*d*), p. 1492, (*f*), p. 1492, the persistence of nitrite in neutral or alkaline solutions containing excess of peroxide is most marked. This led to the abandonment of methyl orange as indicator, and to its substitution by phenolphthalein in the later and more exact experiments.

The following reactions may be conceived possible in dilute solutions:—

1. *Free Acids*—

(*a*) $2HNO_2 + 2SO_2 + H_2O = N_2O + 2H_2SO_4$

(Weber, *vide* "Lunge, Sulphuric Acid and Alkali," Vol. I. (1st Edit.), p. 454). Weber writes it—

$$N_2O_3 + 2SO_2 + 2H_2O = N_2O + 2H_2SO_4,$$

which, for the sake of uniformity, we may write—

$$2(HO)NO + 2HSO_3H = N_2O + 2H_2SO_4 + H_2O.$$

This reaction gives *twice* the quantity of sulphuric acid per unit of nitrous acid taken as in (*b*), below. Weber caught the gas and found it to be nitrous oxide; but, says Lunge, if, instead of water, dilute sulphuric acid be added, what is formed is almost entirely nitric oxide (*b*)—

(*b*) $2HNO_2 + SO_2 = 2NO + H_2SO_4,$

or, for the sake of uniformity, as above—

$$2(HO)NO + HSO_3H = 2NO + H_2SO_4 + H_2O.$$

In Prof. Lunge's experiments on the influence of steam on nitrous gases (Dingler's Polyt. J., Vol. 243), sulphurous acid, nitric oxide, and air were mixed above sulphuric acid of 1·455 sp. gr. (55·6 per cent. of H_2SO_4); no reduction to nitrous oxide took place, as had been previously the case when sulphurous acid, nitric oxide, water, and air had been mixed above mercury.

Raschig writes this:—

d (i.) $(HO)_3N + HSO_3H = (HO)_2.NSO_3H^* + H_2O.$

* The compound $(HO)_2NSO_3H$ is assumed to be monobasic. The acid, however, has never been isolated, and Divers and Haga give reasons (Trans., 1900, 77, p. 432) for discrediting its existence, even in combination. The basicity of the compounds $N(SO_3H)_3$. $HON(SO_3H)_2$ is taken from the researches of the same authors, the former being known only in its compounds.

d (ii.) $(HO)_3N + (HO)_2NSO_3H = 2NO + H_2SO_4 + 2H_2O$,

summed up into—

d (iii.) $2(HO)_3N + HSO_3H = 2NO + H_2SO_4 + 3H_2O$

This is (*b*), above, but, unlike (*b*), the final result is reached in two stages, *d* (i.) and *d* (ii.).

Raschig states that evolution of nitric oxide, on bringing sulphurous acid into solution of a nitrite or of free nitrous acid, is not due to a reduction of the latter, but is the product of two reactions, *d* (i.) and *d* (ii.), as above. Divers and Haga, on the other hand, have shown that there is nothing known experimentally in support of the existence of dihydroxylaminesulphonate or any of its derivatives.

If not reacting with nitrous acid, but remaining in solution, the body would split up as follows:—

d (iv.) $2(HO)_2NSO_3H = N_2O + 2H_2SO_4 + H_2O$,

yielding the products of (*a*), above.

If, however, exposed to the action of sulphurous acid, hydroxylaminedisulphonic acid (see *e* (i.), below) would result.

It was also thought worth while to include as a possibility a suggestion arising from Raschig's work, as here, and here only, three molecules of sulphurous acid would be required for one of nitrous acid.

(*e*) $HNO_2 + 3SO_2 + 3H_2O = N(SO_3H)_3$* $+ 2H_2O$,

or, for uniformity—

$(HO)NO + 3HSO_3H = N(SO_3H)_3 + 2H_2O$

Nitrilosulphonic acid.

although later researches show that this body is not, even combined with a base, under any conditions, or at any time, a primary product of reaction.

Divers and Haga's reaction may be thus expressed for free acids to compare with Raschig's *d* (i.):—

e (i.) $(HO)NO + 2HSO_3H = HON(SO_3H)_2$* $+ H_2O$

hydroximidosulphuric acid — Divers and Haga.
hydroxylaminedisulphonic acid—Raschig.

A further reaction may, under certain conditions, proceed with nitrous acid.

e (ii.) $(HO)NO + HON(SO_3H)_2 = N_2O + 2H_2SO_4$.

if these reactions *e* (i.), *e* (ii.) proceed in equal measure in the solution, as in *d* (ii.) above, the result may be expressed in one equation—

e (iii.) $2(HO)NO + 2HSO_3H = N_2O + 2H_2SO_4 + H_2O$.

This is (*a*) above, reached in two stages, *e* (i.), *e* (ii.).

Hydrolysis of the condensation product, hydroximidosulphuric acid, would yield hydroxyamidosulphuric and sulphuric acids, thus—

e (iv.) $HON(SO_3H)_2 + H_2O = HONHSO_3H + H_2SO_4$.

Reaction of this hydrolysed product with nitrous acid would yield sulphuric acid and nitrous oxide gas, thus—

e (v.) $(HO)NO + HONHSO_3H = N_2O + H_2SO_4 + H_2O$,

whilst the hydroximido acid itself might yield the same products together with sulphurous acid, thus—

e (vi.) $2HON(SO_3H)_2 + H_2O = N_2O + 2H_2SO_4 + 2HSO_3H$.

If reactions *e* (i.) and *e* (vi.) proceed in equal measure in the solution, the result can be expressed in one equation, *e* (vii.), thus—

e (i.) $2(HO)NO + 4HSO_3H = 2HON(SO_3H)_2 + 2H_2O$.

e (vi.) $2HON(SO_3H)_2 + H_2O = N_2O + 2H_2SO_4 + 2HSO_3H$.

summed up into—

e (vii.) $2(HO)NO + 2HSO_3H = N_2O + 2H_2SO_4 + H_2O$.

This is (*a*) above, reached in two stages, *e* (i.), *e* (vi.).

An effort to decide which, if any, of the above equations most nearly represents results of interaction of the free acids was made by mixing dilute solutions of nitrous and sulphurous acids of known strength, and determining the change of acidity and reduction of constituent acids after a given interval.

Thus, taking the above equations, and expressing them in terms of half-normal solutions, we have—

(*a*) 2 c.c. of N/2 nitrous acid + 4 c.c. of N/2 sulphurous acid = 11·2 c.c. of nitrous oxide gas + 4 c.c. of N/2 sulphuric acid.

With these proportions we should expect to find by (*a*)—

1. Decrease of acidity = nitrous acid reduced;
   = $\frac{1}{2}$rd of reactiug acids.
2. Nitrous oxide obtained per 1 c.c. of N/2 nitrous acid reduced = 5·6 c.c.
   Nitrous oxide obtained per 1 c.c. of N/2 sulphurous acid oxidised = 2·8 c.c.

Similarly—

(*b*) 2 c.c. of N/2 nitrous acid + 2 c.c.of N/2 sulphurous acid = 22·4 c.c. of nitric oxide gas + 2 c.c. of N/2 sulphuric acid.

With these proportions we should expect to find by (*b*)—

1. Decrease of acidity = nitrous acid reduced;
   = $\frac{1}{2}$ of reacting acids.
2. Nitric oxide obtained per 1 c.c. of N/2 nitrous acid reduced = 11·2 c.c.
   Nitric oxide obtained per 1 c.c. of N/2 sulphurous acid oxidised = 11·2 c.c.

Similarly—

(*c*) 1. Decrease of acidity = 4 times the nitrous acid reduced;
   = $\frac{4}{7}$ths of reacting acids.
2. No gas should be evolved.

Similarly—

d (i.) 1 c.c. of N/2 nitrous acid + 2 c.c. of N/2 sulphurous acid = 1 c.c.* of $N/2(HO)_2NSO_3H$; and

(1) Decrease of acidity = twice the nitrous acid reduced;
   = $\frac{2}{3}$rds of reacting acids.
(2) No gas should be evolved.
(3) No sulphuric acid should be formed.

Similarly—

d (iii.) exactly as (*b*), above.
e (iii.) exactly as (*a*), above.
e (i.) and *e* (ii.) are for convenience dealt with later.

1. *Interaction of Sulphurous and Nitrous Acids in Aqueous Solution containing Excess of Sulphurous Acid*, 15° C.

Consideration of the results stated in Tables I., II., led to the conclusion that no one of the four equations (*a*), (*b*), *d* (i.), or *e* (i.) was by itself capable of explaining the observed facts, the reacting proportions of sulphurous and nitrous acids being in no case in agreement with theory. It appeared evident, therefore, that a less simple explanation would have to be sought, and that instead of proceeding on the lines of any single equation, reactions either proceed concurrently on the lines of two or more equations, or secondary reactions occur to modify the primary products produced. Further experiments have showed that this supposition is correct, and prove that the results obtained can in every case be explained on the assumption that reactions proceed on the lines of the three following equations at velocities depending (at ordinary temperatures, 15° C., and within the limits of dilution observed) upon the concentration of the reacting acids.

Hypothesis I.

(*a*) Direct action yielding nitrous oxide and sulphuric acid—

$2(HO)NO + 2HSO_3H = N_2O + 2H_2SO_4 + H_2O$

e (i.) Direct action yielding condensation product—

$(HO)NO + 2HSO_3H = HON(SO_3H)_2 + H_2O$

e (iv.) Hydrolysis of condensation product—

$HON(SO_3H)_2 + H_2O = HONHSO_3H + H_2SO_4$

* See note on preceding page.

* See note on preceding page.

We now proceed to set out the grounds upon which the adoption of these equations is based.

Expressing the three equations in the form of equivalents of half-normal acid, we have :—

(a) 2 c.c. of N/2 nitrous acid + 4 c.c. of N/2 sulphurous acid = 11·2 c.c. of nitrous oxide gas + 4 c.c. of N/2 sulphuric acid.

e (i.) 1 c.c. of N/2 nitrous acid + 4 c.c. of N/2 sulphurous acid = 2 c.c. of N/2 hydroximidosulphuric acid.*

e (iv.) 2 c.c. of N/2 hydroximido acid = 1 c.c. of N/2 hydroxyamido acid + 2 c.c. of N/2 sulphuric acid.

From which we see :—

(a) Nitrous acid directly reacting to form sulphuric acid—

= $\frac{1}{3}$ sulphurous acid so oxidised.
= $\frac{1}{3}$ sulphuric acid so produced.

Acidity of solution after reaction.

= twice nitrous acid so reduced.

Nitrous oxide = 5.6 c.c. per 1 c.c. of N/2 nitrous acid reduced.

e (i.) Nitrous acid directly reacting to form hydroximido acid—

= $\frac{1}{3}$ sulphurous acid so oxidised.
= $\frac{1}{2}$ hydroximido acid so produced.

Acidity of solution after reaction has taken place
= twice nitrous acid so reduced.

No gas evolved.

(a) e (i.) Net acidity resulting from the two concurrent reactions—

= twice total nitrous acid reduced, whatever the relative rates at which the reactions proceed.

e (iv.) Gain of acidity by hydrolysis—

= $\frac{1}{2}$ hydroximido acid hydrolysed to hydroxyamido acid.
= nitrous acid reacting by equation e (i.).

We consider that the results of the experiments set out in Tables I., II., prove that these conclusions are fully justified, and that the equations upon which they are based afford a complete explanation of the observed results. Thus, taking B as an example of the method by which the figures recorded in Table II. are arrived at, we have (stating acids and products, as before, in terms of cubic centimetres of half-normal acid, and excluding excess of sulphurous acid)—

Reacting acids per 500 c.c. of solution—

Sulphurous acid	39·9	
Nitrous acid	13·7	
Total	53·6	

Nitrous acid reacting—

Total taken	13·7	
Reduced by sulphurous acid to form hydroximido acid = gain of acidity	5·9	e (iv.)
Reacting to form sulphuric acid (by difference)	7·8	(a)

Acidity of solution immediately after mixing—

Total taken	53·6		
Found as hydroximido acid = 2 × 5·9	11·8		
Calculated as sulphuric acid = 2 × 7·8	15·6		
	27·4	= twice nitrous acid reduced	2 × 13·7 =
Decrease of acidity calculated	26·2		27·4 (a) e (i.)
Found	25·2		28·4 found.

Sulphurous acid oxidised—

To hydroximido acid = 4 × 5·9	23·6	e (i.)
To sulphuric acid = 2 × 7·8	15·6	(a)
Total calculated	39·2	
Found	39·9	

* Divers' and Haga's $\frac{1}{3}$rd normal salt taken as the neutral salt to indicators employed—phenolphthalein, checked by methyl orange.

Yield of hydroximido acid per cent. of total obtainable—

Total obtainable = twice nitrous acid present = 2 × 13·7	27·4 e (i.)
Found by hydrolysis = 2 × 5·9	11·8 e (iv.)

$$\text{Yield per cent.} = \frac{11{\cdot}8 \times 100}{27{\cdot}4} = 43{\cdot}0$$

It is fair to state, in comparing the titration results obtained with those demanded by theory on the assumption that the three equations (a), e (i.), e (iv.) correctly represent the reactions observed, that the exact estimation of the change of acidity in very dilute solutions containing a large excess of sulphurous acid—*e.g.*, experiments C, D, E—was by no means easy, and we do not claim that the results set out afford a means of arriving at the exact relative velocities of the equations (a) and e (i.) involved ; as regards e (iv.) we shall show later that the reaction it represents proceeds slowly, and only completes itself after several hours.

Gravimetric Estimation of Hydroxyamidosulphuric Acid.

It was thought desirable at this stage to endeavour to apply some simple gravimetric method for the estimation of the various sulphur acids present, to act as a check upon the volumetric methods already described. The following was the procedure adopted :—

Barium Chloride Method.—An aliquot portion of the hydrolysed solution (prepared by addition of half-normal sodium nitrite to a solution of sulphurous acid containing hydrochloric acid equivalent to the nitrite added, followed by a period of rest) was exactly oxidised by N/10 iodine ; 10 to 20 c.c. of 10 per cent. ammonium chloride were then added (to hold up the hydroxyamido acid, as advised by Divers and Haga, 1900), followed by excess of barium chloride and sufficient water to bring the total amount of the solution to any convenient known volume. After the precipitate of barium sulphate had completely settled (2—3 hours), an aliquot portion of the clear liquor was withdrawn for estimation of the hydroxyamidosulphuric acid by oxidation with excess of bromine to barium sulphate. The two amounts of sulphate so obtained, together with the volume of N/10 iodine used, gave the desired data. This method is referred to throughout as the "*Barium Chloride Method.*"

The following result is the mean of two closely agreeing experiments, the solution employed being that marked F in Table II. ; results calculated to 100 c.c., the amount of solution actually used :—

Volumetric Method. 100 c.c. of Hydrolysed Solution contain			"Barium Chloride Method."
Sulphur as sulphuric acid :			
From direct reaction (a)	0·01016	..	..
From hydrolysis e (iv.)	0·02184	..	..
From oxidised SO_2	0·01528	0·0473	0·0456
Sulphur as hydroxyamido acid e (iv.)		0·0218	0·0232
Total		0·0691	
Taken as HSO_3H		0·0720	0·0688
		Per Cent.	Per Cent.
Yield of hydroximido acid per cent. of total obtainable.		68	72·5

Results stated in terms of sulphur.

Qualitative Examination of the Solutions.

1. For hydroximido and hydroxyamido acids.
2. For nitrous oxide gas.

1. *Hydroximido and Hydroxyamido Acids.* — In addition to the titration and gravimetric experiments already described, an examination of the solution was made in every case for the presence of hydroxyazotised bodies, using the method described by Divers and Haga (Trans. Chem. Soc., 1889, 55, pp. 770 ; also 1900, 77, p. 687, 688), by which the reducing action of the hydroxyamido acid upon copper sulphate in alkaline solution is differentiated from that of hydroxylamine by the evolution in the former case of sulphur dioxide on acidifying the solution (after reduction) with sulphuric acid ; while the hydroximido acid itself

below 100° C. (*ibid.*, 1900), has no reducing action upon copper sulphate until hydrolysis to the hydroxyamido acid has taken place.

In series (i.), (ii.), A, B, E, F, Table II., it was found that no reduction of the copper sulphate took place, neither in the cold nor in hot solution, if excess of caustic soda was added to the cold solution soon after mixing and before addition of the copper salt; while if the acid solution was allowed to stand, or was warmed *before* addition of the alkali, reduction was very marked. In every case where reduction occurred, addition of sulphuric acid and heating caused evolution of sulphur dioxide, while addition of that acid to the same solution in absence of copper sulphate and alkali caused no such evolution (excess of sulphurous acid was always removed by a current of air before application of the test, as prescribed by the above-named authors).

This behaviour we regard as confirmation of the presence of hydroximidosulphuric acid and absence of hydroxyamidosulphuric acid in the freshly prepared solutions, the appearance of the latter acid, on warming the acid liquid, or allowing it to stand for a night, before addition of alkali and copper sulphate, accompanied as it invariably is by gain of acidity, being attributed to hydrolysis of the hydroximido acid. In the case of experiments C, D, hydrolysis appears to have already commenced; but we would point out that the test is better adapted for proving absence of hydroxyamido acid than presence of that acid when associated with hydroximido acid, as slight hydrolysis is apt to occur during the test.

As regards the differences in titre on mixing and after standing 24 hours, addition of metaphenylenediamine was made to see if any recovery of titre could be possibly due to reversion to sulphurous and nitrous acids, but with negative results, no nitrous acid being found. That the change of acidity is independent of the presence or absence of excess of sulphurous acid is proved by the fact that if that acid be present in excess the amount remains unaltered during the whole period of acidity change, whilst the same differences are noticed if excess of sulphurous acid be avoided by use of a larger proportion of nitrous acid, or be removed from solution by a current of air before allowing the solution to stand. This appears to rule out *e* (vi.) as a reaction occurring in dilute solution.

2. *Nitrous Oxide Gas.*—All attempts to collect and measure the nitrous oxide gas demanded by equation (*a*), have failed in the case of the dilute solutions, the amount of gas (not in general exceeding 4 to 5 c.c. of nitrous oxide per 50 c.c. of solution) being too small to expel from solution and measure without risk of partial decomposition of the hydroxy acids present (see Divers and Haga, Trans., 1900, already cited). If, however, the solutions of sulphurous and nitrous acids be employed in a state of concentration greater than that observed in experiments A to F, Table II., *e.g.*, experiments (i.) and (ii.), a portion of the nitrous oxide is evolved, and, by taking special precautions, can be collected and measured.

These experiments were made by mixing solutions of the acids in a 50 c.c. tube provided at one end with a capillary outlet tube and stopcock, and at the other with a capillary inlet tube adjusted with its end in the centre of the tube, and thus sealed in liquid. One of the acids (or, in the case of nitrous acid, its equivalent of nitrite) was slowly admitted through this latter tube, being drawn in by the withdrawal of an equal volume of liquid at the other end through the stopcock. Inversion of the tube enabled the evolved gas to be passed into a burette for analysis, while the use of a graduated flask containing distilled water to receive the reacting mixture enabled the titration values to be determined without loss of acids. Conditions were thus made favourable for complete, slow admixture of the reacting acids in absence of air.

The results yielded by two typical experiments may be cited in illustration.

(1) *Excess of Sulphurous Acid*:—

In tube:—
Sulphurous acid equivalent to 62·5 N/2.
Sulphuric acid equivalent to 28·5 N/2.
Total volume, about 50 c.c.; time, 12 minutes.

Sodium nitrite = 13 c.c. N/2, added 0·2 c.c. at a time.

Observations.—First addition of nitrite caused evolution of very minute bubbles of gas; these increased with each further addition until a shower of bubbles was formed at the point of admixture, which almost entirely dissolved as they ascended in the liquid. When 13 c.c. of nitrite had been added, the total volume of gas above the liquid = 2 c.c.

At the end of the experiment the inlet tube was closed and the tube gently agitated to establish gaseous equilibrium, the stopcock being opened from time to time to allow the pressure to adjust itself by escape of liquid.

Total volume of gas so obtained = 17 c.c., at 0° C., 760 mm.

Tested in a burette it proved to be nitrous oxide, nitric oxide being absent.

Owing to the solubility of nitrous oxide and to withdrawal of liquid during the period of reaction, it is only possible to estimate the probable yield of gas very approximately.

This, in the above experiment, we do as follows:—

	c.c.
Volume at 0° C., 760 mm., dissolved in liquid = 50 × 0·78..	39
Measured in burette	17
Total	56

Calculated volume of nitrous oxide—

By equation—

(*a*) = *e* (iii). 13 × 5·6 = 72·8 c.c.

e (i). None.

e (ii). 13 × 5·6 = 72·8 c.c.

So far as this result goes, therefore, it points to a balance of equations, *e.g.*, (*a*), *e* (i), or *e* (i), *e* (ii), rather than to any single equation, as better accounting for the products obtained under the conditions of concentration of acids chosen.

(2) *Excess of Nitrous Acid*—

In tube 50 c.c.—
10 c.c. of N/2 sodium nitrite.
10 c.c. of N/2 sulphuric acid.
30 c.c. of water.

Sulphurous acid admitted as above = 6 c.c. N/2.
Time, 5 minutes.

Observations.—Total volume of gas obtained = 0·5 c.c. No increase on agitation or on standing 2½ hours.

Calculated volume—

(*a*) = *e* (iii), 6 × 2·8 c.c. = 16·8 c.c. of nitrous oxide (this would all remain dissolved).

(*b*) 6 × 11·2 = 67·2 c.c. of nitric oxide.

d (i). No gas.

d (iii). 6 × 11·2 c.c. = 67·2 c.c. of nitric oxide.

So far as this result goes, it points to equation (*a*) or *d* (i), and excludes (*b*) and *d* (iii), which require evolution of nitric oxide gas.

It was impracticable to use stronger solutions of nitrous acid, owing to the instability of this body in aqueous solution.

The fact that evolution of nitrous oxide is noticed when sulphurous and nitrous acids react under the conditions of Experiment 1 above (see also Table II., Experiments (i.), (ii.), which are not far removed from those of the Experiments A to F, recorded in Table II., where no gas was observed, affords strong presumption that the absence of gas in the latter case was due to the fact that there was sufficient liquid present to retain in solution the whole of the gas liberated. But we are able to advance no direct evidence of this, and are compelled, therefore, to rely upon indirect proof afforded by the titration and gravimetric results.

The evolution of nitrous oxide, however, is undoubted, in more concentrated solutions, and occurs at a stage when hydroximidosulphuric acid can be identified in the solution, and in a reacting mixture the titration results of which are in exact agreement with those theoretically demanded by equations (*a*), *e* (i), *e* (iv). We look upon the nitrous oxide and hydroximido acid produced under these conditions as primary products resulting from reactions proceeding on the lines of (*a*), *e* (i), and we consider that we are justified in employing the same equations to explain the similar

titration and qualitative results noticed when the solutions are too dilute to enable one of the products of the reaction—nitrous oxide—to be identified.

Having stated the grounds for our belief that reaction between sulphurous and nitrous acids in aqueous solutions (at ordinary temperatures, 15° C., and within the limits of concentration observed), proceeds upon the lines of equations (*a*), *e* (i.), and *e* (iv.), p. 1494, when excess of sulphurous acid is present, we will now briefly state our reasons for the rejection of other and alternative combinations of equations from among those previously presented.

Thus, hypothesis 2.—(*b*) and *d* (ii.). We exclude (*b*) and *d* (ii.) on the ground that in no case have we been able to obtain any evidence that nitric oxide is one of the products of the reactions that occur when excess of either acid is present under the conditions of our experiments.

Hypothesis 3.—*d* (i.) and *d* (iv.). We consider that *d* (i.), in conjunction with *d* (iv.), is ruled out by the fact that (apart from the objections advanced by Divers and Haga to the existence of dihydroxylaminesulphonic acid) the proportions of sulphurous and nitrous acids theoretically required for reaction *d*(i.)(1 HSO_3H:1(HO)NO) are not those found by experiment(1·77 HSO_3H:1(HO)NO), and, further, that this hypothesis does not explain the behaviour of the products of the reaction towards copper sulphate in presence of alkali, *d* (iv.) requiring hydrolysis to nitrous oxide and sulphuric acid, and not to a hydroxyazotised body.

Hypothesis 4.—*e* (i), *e* (ii), *e* (iv)—

e (i) $(HO)NO + 2HSO_3H = HON(SO_3H)_2 + H_2O$.

e (ii) $(HO)NO + HON(SO_3H)_2 = N_2O + 2H_2SO_4$.

e (iv) $HON(SO_3H)_2 + H_2O = HONHSO_3H + H_2SO_4$.

This hypothesis affords an explanation of the reactions so nearly corresponding with the observed results in every detail, that it is desirable to state very fully the grounds on which its rejection is based.

Proceeding on lines similar to those adopted on p. 1495, we may calculate the titration results of experiment B, Table II., by hypothesis 4, as follows.

Reacting acids per 500 c.c. of solution (in terms of c.c. of half-normal acid) :—

Sulphurous acid		39·9	
Nitrous acid		13·7	
Total		53·6	
Nitrous acid reacting—			
Total taken		13·70	
Reduced by sulphurous acid $\frac{39·9}{4}$		9·98	*e* (i)
Reduced by hydroximido acid, by difference		3·72	*e* (ii)
Hydroximido acid produced = twice nitrous acid reduced by sulphurous acid		19·96	
Hydroximido acid oxidised by nitrous acid = twice nitrous acid so reduced		7·44	
Net hydroximido acid produced		12·52	
Yield per cent. $\frac{12·52 \times 100}{19·96}$		62·7	
Sulphuric acid produced by oxidation of hydroximido acid = 4 × nitrous acid so reduced		14·88	*e* (ii)
Acidity of solution immediately after mixing as hydroximido acid	12·52		
Sulphuric acid	14·88	27·4 = twice total nitrous acid = 2 × 13·7 = 27·4	
Total reacting acids taken	53·6	Found, 28·4	
Decrease of acidity calculated	26·2		
Found	25·2		
Gain of acidity on standing :—			*e* (ii)
Calculated = ½ hydroximido acid = $\frac{12·52}{2}$		6·26	
Found		5·90	

Results arrived at by similar calculations for experiments A, C, D, E, F, are set out with B, above, in Table III.

It will be seen from these results that hypothesis 4 affords as complete an explanation of the titration and qualitative results as hypothesis 1, p. 1495. Careful comparison of the two hypotheses is needed, therefore, before rejection of one or the other is possible. To do this, we shall briefly consider how far the assumptions on which those two hypotheses rest are in agreement with experimental facts.

Taking hypothesis 1, we see—

(1) That (*a*) and *e* (i.) represent concurrent direct reactions between sulphurous and nitrous acids.

(2) That opportunity for secondary reaction between nitrous and hydroximidosulphuric acid is reduced to a minimum under the conditions of the experiments, *viz.*, slow addition of alkaline nitrite to equivalent of sulphuric acid in presence of excess of sulphurous acid.

We consider that the correctness of (1), above, is supported by the results stated in Table II., where the yield of hydroximido acid is for the same dilution and at the same temperature (15° C.) maintained at a fairly constant figure between the extreme limits of experiment A (yield 40 per cent.), where reaction ends with neither sulphurous nor nitrous acid in excess, and experiment C (yield 48 per cent.), where sulphurous acid is in large excess.

As regards (2) we shall show below that reaction between nitrous acid and hydroximidosulphuric acid takes place so slowly in presence of excess of nitrous acid that possibility of such reaction under the conditions of our experiments (excess of sulphurous acid to the close) is excluded.

Taking hypothesis 4, we see that the secondary reaction *e* (ii.) is represented as proceeding at a velocity comparable with that of the primary reaction *e* (i.), even under conditions specially favourable to the latter—excess of sulphurous acid.

We find that this assumption is entirely unjustified by experiment.

Thus—

A solution of hydroximido acid was prepared, by careful addition of sodium nitrite to a solution of sulphurous acid containing sulphuric acid equivalent to the nitrite used. Quantitative and qualitative test showed that it contained, on mixing, per 500 c.c. of solution :—

Total acid equivalent to 30·1 of N/2 acid		(Phenolphthalein cold, no peroxide.
Hydroximido acid	12·0	
Sulphuric acid by difference	18·1	

Hydroxyamido acid absent.
Sulphurous acid „
Nitrous acid „

To test the velocity of reaction *e* (ii.)—

$(HO)NO + HON(SO_3H)_2 = N_2O + 2H_2SO_4$

1 c.c. of N/2 + 2 c.c. of N/2 = 4 c.c. of N/2

gain of acidity = ½ hydroximido acid present.

We added—

To 50 c.c. of solution, 50 c.c. of water, 1 c.c. of N/2 sulphuric acid, followed by 1 c.c. of N/2 sodium nitrite.

Total acid taken, in terms of half-normal acid—

Hydroximido acid	1·20	
Sulphuric acid	1·81	
Nitrous acid	1·00	
Total	4·01	(Phenolphthalein cold, no peroxide.
1 minute after mixing, found	4·00	
Calculated for *e* (ii.)	4·01	

To 50 c.c. of solution, 98 c.c. of water, 1 c.c. of N/2 sulphuric acid, followed by 1 c.c. of N/2 sodium nitrite. Total volume, 150 c.c.

2 mins. after mixing, 2 c.c. of solution, tested with potassium iodide, liberated iodine.

67 mins. after mixing, 2 c.c. of solution, tested with potassium iodide, liberated iodine.

70 mins. after mixing 2 c.c. of solution, tested with metaphenylene diamine, gave strong nitrite reaction.

72 mins. after mixing, 144 c.c. required 4·25 of N/2 soda. (Phenolphthalein cold, no peroxide) = 4·43 for 150 c.c. Acids taken = 4·01. Gain = 0·42, due to action of nitrous acid + hydrolysis.

Blank experiment with 1 c.c. of N/2 nitrous acid, showed loss of 0·05 c.c. of acid in the same time; hence total gain 0·47.

50 c.c. of the original solution, allowed to stand 77 mins., showed gain of 0·17 of acid, due to hydrolysis alone, = 28 per cent. of total hydrolysis by theory *e* (iv.).

We conclude from this that the action of nitrous acid on hydroximido acid (*e* (ii.)) proceeds slowly—far too slowly under the condition of our experiments to modify the product of reaction *e* (i.) in the way assumed by hypothesis 4.

To decide whether nitrous acid reacts upon hydroxyamido-sulphuric acid we tried a similar experiment on the same solution after hydrolysis had completed itself.

The solution now contained per 500 c.c., total acid	36·0	phenolphthalein cold, no peroxide.
Hydroxyamido sulphuric acid.....	6·0	
Sulphuric acid by difference.....	30·0	

By theory—

e (v.) $(HO)NO + HONH(SO_3H) = N_2O + H_2SO_4 + H_2O$,

1 c.c. N/2 + 1 c.c. N/2 = 2 c.c. N/2.

No gain of acidity.

To 50 c.c. of the solution were added 50 c.c. of water, 1 c.c. of N/2 sulphuric acid, 1 c.c. of N/2 sodium nitrite.

Total acid taken :—

Hydroxyamido acid.....	0·60	
Sulphuric acid	3·00	
Nitrous acid	1·00	
	4·60	phenolphthalein cold, no peroxide.
1 minute after mixing, found.....	4·55	

To 50 c.c. of the solution was added 0·6 of N/2 of sulphuric acid, 0·6 of N/2 sodium nitrite (= the equivalent of the exact amount of nitrous acid to exactly destroy the hydroxyamido acid).

One minute after mixing :—

No nitrous acid by metaphenylene test.
No nitrous acid by potassium iodide test.
No sulphurous acid by iodine test.
No hydroxyamido acid or hydroximido acid by alkaline copper sulphate test.

While solutions of nitrous acid and hydroxyamido acid of the same strengths (unmixed) responded markedly to the qualitative tests.

We conclude, therefore, that hydroxyamido acid is very rapidly destroyed by dilute nitrous acid, and that equation *e* (v.) may well apply if any hydrolysis of the hydroximido acid has proceeded. The fact that hydrolysis proceeds slowly, however, even in dilute solution, (28 per cent. only in 77 mins.), appears to rule out equation e (iv.), and with it *e* (v.), as taking place to any appreciable extent within the limits of time and under the conditions of the experiments recorded in Table II., and we consider that we are justified upon these grounds in ruling out hypothesis 4 in favour of hypothesis 1; we state in conclusion, therefore,—

When sulphurous and nitrous acid interact, in aqueous solution (at ordinary temperatures (15° C.), and within the limits of concentration given in Table II.), in presence of excess of sulphurous acid, reactions proceed on the lines of the three following equations :—

(*a*) $2(HO)NO + 2HSO_3H = N_2O + 2H_2SO_4 + H_2O$,

e (i.) $(HO)NO + 2HSO_3H = HON(SO_3H)_2 + H_2O$,

e (iv.) $HON(SO_3H)_2 + H_2O = HONH(SO_3H) + H_2SO_4$,

equation (*a*) being favoured by concentration, e (i.) by dilution of the reacting acids.

We have already pointed out, p. 1494, *ante*, that (*a*) is equivalent to e (i.), *e* (vi.) = *e* (vii.).

2. *Interaction of Sulphurous and Nitrous Acids in Dilute Aqueous Solution containing excess of Nitrous Acid* (15° C.).

The instability of nitrous acid in aqueous solution, and the difficulty of determining the exact proportion of the reacting acids when that acid is in excess, renders it impossible for us to obtain sufficient experimental data for establishing any equation or equations explanatory of the observed results (Table IV., below). We claim, however, to have established the following facts concerning the reactions under the conditions named.

(1) That nitric oxide is not at any time a product of the reaction, even when the concentration of the reacting acids reaches 100 c.c. of N/2 nitrous acid to 60 c.c. of N/2 sulphurous acid per 500 c.c. of solution (see experiment 2, p. 1496).

(2) That titration results approximate to those demanded by equation (*a*) (or *e* (iii.)) and can be fully explained on the assumption that reactions proceed on the lines of either equation.

We have already shown that *e* (iii.) is equivalent to e (i.), *e* (ii.), when *e* (ii.) is supposed to proceed at a velocity not less than that of *e* (i.).

We have, therefore, two hypotheses equally applicable to explain the observed results, *viz.*, (*a*) or e (i.), *e* (ii.), in equal measure, equivalent to *e* (iii.).

3. *Interaction of Sulphurous and Nitrous Acid in Aqueous Solutions at ordinary Temperatures under conditions approximating to those that might be supposed to occur in Vitriol Exit Testing.*

The experiments recorded in Table IV. are arranged to illustrate the possible errors that may be introduced into vitriol or other similar tests when sulphurous and nitrous acids are allowed to react upon one another in aqueous solutions in absence of excess of normal alkali or peroxide—conditions which may also locally occur in the titration of excess of alkali in test solutions containing nitrite and sulphite. They are preceded, in the table, for comparative purposes, by similar experiments carried out in presence of peroxide, under which conditions no loss of titre results.

The amounts of sulphurous and nitrous acids taken are such as might be used in actual practice (13 c.c. of half-normal alkali being approximately equivalent to 4 grains of SO_3), and the proportions cover normal as well as abnormal working of vitriol chambers.

It may be pointed out that the decrease of acidity noticed, calculated as a percentage figure upon the total acids taken, is, in many cases, less marked than it would be if excess of one or other acid had been estimated and deducted; but the results are sufficiently striking as they stand.

They show that when aqueous solutions of sulphurous and nitrous acids are mixed :—

1. The acid recovered by titration is in every case less than the sum of the acidities of the constituent acids taken, whether the titration be performed at once or after an interval of several days.

2. When sulphurous acid is present in excess to the end of the experiment, the loss of acidity attains its maximum on mixing the solutions, an increase of acidity slowly taking place on standing. (See experiments 4 and 5.)

3. Under no circumstances is nitric oxide gas evolved.

Did (*b*) indicate the reaction, except very partially, nitrous smell during titration and agitation of the solution would have resulted from disengagement of nitric oxide, and would hardly have escaped observation, had it been at any time pronounced, our attention being quite alive to the point.

The table serves as an interesting confirmation of the equations (*a*), *e* (i.), *e* (iv.), advanced on p. 1494 to explain the results obtained when titration conditions were made more exact; equations (*a*), *e* (i.) taking precedence when sulphurous acid is in excess, while the titration results obtained when nitrous acid is in large excess approximate closely to those demanded by equations (*a*), *e* (iii.), as already pointed out on p. 1494; application of *e* (iv.) is illustrated by the gain of acidity in the experiments 4 and 5, on allowing the solutions to stand. These

two solutions were found to reduce alkaline copper sulphate after a lapse of three weeks: they were then discarded.

4. Interaction of Sulphurous Acid and Sodium Nitrite in Dilute Aqueous Solution at ordinary Temperature (15° C.).

Experiments generally went to confirm conclusions reached above.

5. Interaction of Alkaline Sulphites and Nitrites in Dilute Aqueous Solution at ordinary Temperature (15° C.).

The next experiments were undertaken to investigate the probabilities of a curious reaction indicated both by Claus and Raschig, as resulting from the interaction of sodium bisulphite and sodium nitrite. Raschig writes the equation thus—

$$(1)\ NaNO_2 + 2NaHSO_3 = NaHO + OHN(SO_3Na)_2,$$

sodium hydroxylaminedisulphonate (Raschig), or sodium hydroximidosulphate (Divers and Haga). Of course, the caustic soda liberated in the reaction would go to form the neutral sodium sulphite, so that the formula of reacting bodies would be—

$$(2)\ NaNO_2 + 3NaHSO_3 = Na_2SO_3 + OHN(SO_3Na)_2 + H_2O.$$

Divers and Haga, finding that when acid sodium sulphite (their pyrosulphite) is left in solution with excess of nitrite in a closed vessel for a considerable time, about one-third of the sulphite remains inactive, becoming converted into the normal salt, and separable from the sulphazotised salts by precipitation with barium chloride in presence of ammonium chloride, give the following equation as representing the reaction—

$$2NaNO_2 + 3Na_2S_2O_5 + OH_2 = 2Na_2HNS_2O_7 + 2Na_2SO_3,$$

the stages being—

$$2NaNO_2 + Na_2S_2O_5 + OH_2 = 2HNO_2 + 2Na_2SO_3,$$

and then—

$$2HNO_2 + 2Na_2S_2O_5 = 2Na_2HNS_2O_7.$$

They also point out that the same sulphazotised salt is formed when normal sulphite and acid carbonate of an alkali react on a nitrite, the acid carbonate in function replacing acid sulphite in liberating nitrous acid. They also contest the observations of Claus and Raschig, that the solution becomes alkaline, showing that these statements rest on use of litmus as indicator, now recognised as indefinite where sulphites are concerned, and they make the significant remark, "that the addition of excess of barium chloride removes all the alkalinity."

The method used in experiments 1 and 2, Table V., was similar to that employed when the free acids were under investigation. The alkali bisulphite was in every case prepared just before use by mixing correct proportions of half normal caustic soda and freshly prepared sulphurous acid in a graduated stoppered flask. Addition of the alkali nitrite was then made, and the total volume of the solution correctly adjusted by addition of water. An aliquot portion was withdrawn from time to time for estimation of total acidity by phenolphthalein indicator in presence of peroxide. Boiled water was not employed in these two experiments, and air was not excluded from the flask during the periods of rest.

In the case of experiments 3 and 4, steps were taken to exclude air, as far as possible, by use of boiled water, and by transferring the solution immediately after mixing to stoppered bottles, which remained filled with liquid and closed until the moment of titration arrived, one bottle being opened at a time for this purpose.

The results obtained are set out in Table V.

The conclusions drawn from these results are entirely confirmatory of those reached by Divers and Haga.

As regards their bearing on the general question of estimation of the acidity of gases yielding mixed sulphites and nitrites in contact with an alkaline absorbent, it is noteworthy that the reactions, even under favourable conditions, proceed with slowness; *e.g.*, in experiment 1 reaction had barely commenced 15 minutes after mixing, and was not completed in 40 hours. In a bellows test, using caustic soda as absorbent, therefore, the reaction would not introduce a serious error, but in a works 24-hours test the reaction has time to approach completion, when there is enough sulphurous acid present to exceed the oxidising power of the peroxide present in first absorbing tube. When sodium carbonate is the absorbent, the formation of the acid carbonate during the period of running the test may well promote the reaction noted by Divers and Haga above. With normal alkali in excess, no such reaction would take place.

Indicators.

As regards indicators it seems necessary, if alkaline peroxide is used, to avoid methyl orange as indicator (and certainly it is so in making comparative tests), unless the special precautions indicated in previous experiments are observed to complete oxidation of nitrous acid before titration, when, as shown below, concurrence and accuracy of results can be obtained.

If phenolphthalein is substituted, the carbonic acid, especially when spent oxide or sulphate of ammonia saturator gases are used as sources of sulphur, is quite sufficient to render heating of solution necessary, observing the same precautions as to first oxidising nitrous acid as with methyl orange. This is a drawback to the utility of the indicator, otherwise so excellent.

Works Tests.

1. *Quantitative.*—Steps were taken to institute, with all possible precautions to ensure accuracy, comparative tests of the absorbents with concurrent aspiration of the exit gases from the vitriol chamber process through glass vessels, to eliminate the uncertainties incidental to bellows tests. These tests, at first designed solely to test the efficiency of various absorbents, were conducted, through the courtesy of Dr. Messel, at Messrs. Chapman, Messel, and Co.'s Works, Silvertown, by Mr. Linder. The gases were drawn through solutions by fine-bore tubes (1 mm.). Several absorbing vessels were used: the first in series of these were tested separately, results of titration with both phenol phthalein and methyl orange being noted, and, indeed, with one exception, each individual absorbing vessel was separately titrated. Where alkaline absorbents were used, a quantity of acid equivalent to the alkali introduced was always added after completion of aspiration, thus leaving the solution to be titrated always *acid* (peroxide added, if not present during aspiration), to be brought to the neutral point on titration after standing one hour to oxidise nitrous to nitric acid.

These results are set out in tabular form, Tables VI., VII. It will be seen that, under such strict conditions of subdivision of gases, water alone proved no inadequate absorbent.

It was, so far as the series of tests were concerned, a matter of regret that during Mr. Linder's stay at the works, no opportunity occurred of testing the apparatus during a period of disorganisation.

No attempt was made to distinguish the degree of oxidation of the sulphur acids in the gases or in the absorbing solutions. In some works an attempt to infer the presence or absence of sulphurous acid in the solution resulting from absorption in caustic alkali is made by iodine. Whilst the presence of sulphurous acid *in the liquid* might safely be inferred if iodine is decolorised, the opposite is not to be inferred if the colour stands; nor would it be safe to infer the absence of sulphurous acid *in the gases*, looking to the impossibility of preventing its oxidation during the process of absorption by air or by nitrous acid, and to the action of this latter body upon hydriodic acid.

The conclusions, in these particular tests under these conditions, point to alkaline peroxide having been slightly the better absorbent than acid peroxide, and caustic alkali alone better than either; the differences, however, are in these tests extremely small, decidedly less than the bellows tests, p. 1491, would lead one to expect. The amounts of acid formed in the later absorbing vessels and arising from slow oxidation of nitric oxide, whether this latter were originally

present in the gases, or formed by decomposition of nitrous acid in the earlier absorbing vessels, are slight in actual amount. The conclusions of the laboratory tests as to behaviour of nitrous acid are confirmed.

An experiment was made at Silvertown to show the extreme reluctance of nitric oxide to oxidise to nitrous acid, of which the result is given in the table appended (Table VIII.).

At about the time that these experiments of our own were in progress there were received, through one of the inspecting staff, results of experiments on the exits of a set of vitriol chambers that were working with extreme regularity, these experiments being carried out by the chemical staff of the firm with every precaution to secure accuracy. From 23 to 24 cub. ft. of gases were drawn by Bunsen pump (the residual gases after absorption being measured by meters) through two sets of Emmerling tubes; the absorbents in the one case being 50 c.c. of hydrogen peroxide and about 120 c.c. of water distributed among three tubes; and in the other, 40 c.c. of N/2 caustic soda and 130 c.c. of water in three tubes. The titration of the peroxide solution was made immediately after the washing out of tubes, but to the alkaline absorbent were added 40 c.c. of N/2 sulphuric acid and 50 c.c. of peroxide, and the whole allowed to stand three hours before titration; methyl orange was employed as indicator. Results as grains SO_3 per cb. ft.:—

Tests No.	A. With Hydrogen Peroxide.	B. With Caustic Soda.	B.—A.
1	0·88	0·97	0·09
2	1·07	1·13	0·06

At the same works the following tests were taken at an earlier date, but the method of always titrating from the acid side to neutrality in both cases was not observed. The comparison in this case was between neutral and alkaline peroxide as absorbent. Results in grains SO_3 per cb. ft.; methyl orange as indicator:—

Tests No.	A. Neutral Peroxide.	B. Alkaline Peroxide.	B.—A.
1	0·66	0·73	0·07
2	0·86	0·95	0·09
3	1·01	1·09	0·08
4	1·03	1·15	0·12
5	0·98	1·00	0·02
6	1·14	1·24	0·10

In this particular works, as in the one experimented on by ourselves, the differences noted with use of various absorbents were small in amount, but always tended in one direction. Experiments were on aspirations of from 10 to 20 ft. of exit gases.

In reviewing these results one cannot say more than that no evidence was forthcoming as to formation of condensation products when caustic soda alone was the absorbent, and that, in comparing neutral and alkaline peroxide, the small differences noted point to the superior power of the latter in oxidising nitric oxide to nitrous acid, or of preventing reduction of nitrous acid existing or formed.

As regards experiments on concurrent aspirations with use of different absorbents made by members of the staff of inspectors, we are not in a position to say more than that, in many cases much larger differences have been found, and that the relative positions as absorbents appear to be (1) alkaline peroxide; (2) neutral peroxide; (3) caustic alkali; the last named showing the lowest results. As compared with (1) or (2), we think the experiments on solutions above recorded offer explanation why (3) might show lower titre results.

2. *Qualitative Tests.*—Since the date of the above tests at Silvertown opportunity has been afforded, through the courtesy of the managers of two other sulphuric acid works, of making a detailed qualitative examination of the solutions obtaine when final exit gases from the chamber process are aspirated through a train of absorbing vessels in volume sufficient to leave No. 1 bottle of the series, in every case, markedly acid. The absorbents employed in No. 1 vessel were (*a*) sodium carbonate, (*b*) caustic soda and peroxide, (*c*) water, trial experiments being made to ascertain the correct volume of alkali to employ. These aspiration and acidity tests were made by the works chemists, a portion of the contents of No. 1 bottle being sent to ourselves for examination.

These results are set out in such detail, in Table IX., that further explanation in the text is uncalled for. With reference to Works A tests, however, it is interesting to note that in no case in which water alone was the absorbent (*i.e.*, the condition of the first absorbing bottle of a works test using hydrogen peroxide as absorbent in quantity insufficient to oxidise sulphurous and nitrous acids passing to it) have we been able to identify hydroxyazotised bodies in the solution by either of the two delicate qualitative methods employed, although we proved (Table II.) that such bodies are undoubted products of the interaction of nitrous and sulphurous acids in aqueous solution in presence of excess of the latter acid. It should be remembered, however, that the conditions in these works tests, where water alone is employed, are undoubtedly unfavourable for the production and stability of hydroxyazotised compounds, seeing that sulphur dioxide and nitrous acids enter the solution simultaneously, together with a larger excess of air, the character of the solution at the end of the experiments (SO_2 absent or present in traces only) showing that conditions were more favourable for reaction (*a*) than for reaction *e* (i.), see Table IV. Moreover, any nitrous acid in excess of 1, at any period of the aspiration, would tend to destroy hydroxyamido acid (formed from hydroximido acid by hydrolysis) by reaction *e* (v.). The amount of hydroxyazotised bodies produced and finally surviving, therefore, may well have been too small to detect by qualitative test.

In the case of an alkaline absorbent, on the other hand, conditions are favourable for reaction *e* (i.), see Table V., as acid (other than bisulphite) is only present towards the end of the aspiration.

The experiments recorded in Table IX. were not originally intended to afford data for the quantitative estimation of loss of acidity due to interaction of sulphurous and nitrous acids in the absorbent used, nor, indeed, could the total amount of such loss be exactly determined by this means, seeing that reaction (*a*) may occur simultaneously to some extent in the final period of aspiration when the solution becomes acid, but the gain of acidity on allowing some of the solution to stand was so marked that it was thought interesting to include a short tabular statement (Table X.) giving the percentage loss of acidity calculated on the assumption that the hydrolysis of the hydroximido sulphuric acid (to which this gain of acidity is undoubtedly due) had not sensibly proceeded prior to the first titration for total acid, conducted within one hour of the conclusion of the aspiration. The figures for hydroximido acid so obtained are necessarily, therefore, minimum ones, as also the figures for percentage loss of acid deduced from them by calculation. We thus arrive at the interesting conclusion that, in one experiment, the minimum figure for loss of acidity, in the first absorbing vessel, due to the formation of this compound, was nearly 19 per cent. of the total constituent acids entering and absorbed therein. Confirmation of the correctness of this conclusion was sought by a gravimetric estimation of sulphur acids by the "Barium Chloride" method described on p. 1495. The *maximum* figure (2·93) for total hydroxyamido acid produced by hydrolysis (in terms of SO_3) compares with 2·29, the *minimum* figure for the amount of this acid so produced in the interval between the first and second titration. While the figure (33·71) for total sulphur acids (in terms of SO_3) —determined by bromine oxidation—increased by 2·93, the SO_3 equivalent of the nitrous acid corresponding to the hydroxyamido acid found by gravimetric test (2·93) gives a total of 36·64, which compares very well with 37·22, the figure deduced entirely from titration results.

In the case of the water experiments, the titration results are confirmatory of absence of hydroxyazotised bodies.

Action of Chemical Reagents on the Flexible Bellows Aspirator.

We now revert, finally, to the method in every-day use and practice, of estimation of acidities by the bellows, and to attempts to throw some light on discrepancies that occur in use of various absorbents. It will not be necessary to go much into detail, as the results of work done have not taken us very far.

While engaged in this work some curious discrepancies from certain works were brought under our notice, where twice-normal caustic soda was used, especially in one instance, when the concentrated soda was introduced into the bellows first, *before* the absorbents and diluent water.

As illustrating the perplexing results that have been obtained under supervision by competent experimenters in use of the bellows aspirator with various absorbents, I may quote the following from experiments made at the works where the concurrent aspirations through Emmerling tubes were conducted, the tests being in as rapid sequence as circumstances permitted :

Chamber exit; grains of SO_3 per cb. ft.; methyl orange indicator :—

Absorbent.	Experiment 1.	Experiment 2.
(1) 10 c.c. of H_2O_2 + 10 c.c. of N/2, NaHO + 200 c.c. of H_2O.	1·23	0·98
(2) 10 c.c. of H_2O_2 + 200 c.c. of H_2O	0·69	0·57
(3) 10 c.c. of N/2, NaHO + 200 c.c. of H_2O.	0·69	0·60

In each case $\frac{1}{2}$ cb. ft. of gases was taken. The experiments were then varied by shaking up similar quantities of absorbents with air, $\frac{1}{2}$ cb. ft. in each case. Results were—

—	Absorbent 1.	Absorbent 2.	Absorbent 3.
Experiment 1....	0·73	Nil	Not tried
,, 2....	0·59	,,	,,
,, 3....	0·73	,,	,,

From the surface of an old bellows, when cut open, Mr. Linder was able to scrape sufficient of a resinous body to study its reactions under laboratory conditions. The body appears to act as an *acid* to caustic soda when a dilute solution of alkaline peroxide is allowed to react upon it in the cold, with phenolphthalein as indicator. With methyl orange, on the other hand, the full equivalent of alkali used is recovered by titration. If the soda be omitted and peroxide be allowed to act by itself, no acid can be detected in the resulting liquid by either indicator.

Thus, a sample of resinous dust from bellows aspirator exhibited the following properties :—

Heated on a platinum spatula it ignited, leaving a charred mass. No smell of SO_2 could be detected. Readily, but not completely, soluble in carbon bisulphide.

Boiled with strong nitric acid, solution was not complete; the diluted solution gave no precipitate with barium chloride.

Boiled with sodium bicarbonate and peroxide, it did not dissolve; the acidified filtrate gave a faint cloudiness with barium chloride.

TABLE I.

Interaction of Sulphurous and Nitrous Acids in Aqueous Solutions containing Excess of Sulphurous Acid, 15° C.

Equation.	Authority.	Molecular Proportions. For given Equation. Theory. (HO)NO	Molecular Proportions. For given Equation. Theory. HSO_3H.	Molecular Proportions. Reacting Acids. Found. (HO)NO	Molecular Proportions. Reacting Acids. Found. HSO_3H.	Reacting Acids per 500 c.c. of Solution. (HO)NO Taken N/2.	Reacting Acids per 500 c.c. of Solution. HSO_3H. Taken N/2.	Reacting Acids per 500 c.c. of Solution. HSO_3H. Excess found.	Decrease of Acidity per Cent. of Total Acids reacting (excess of Sulphurous Acid excluded). Found. On Mixing.	Decrease of Acidity per Cent. of Total Acids reacting (excess of Sulphurous Acid excluded). Found. After 1 Day.	Decrease of Acidity per Cent. of Total Acids reacting (excess of Sulphurous Acid excluded). Found. After 2 Days.	Decrease of Acidity per Cent. of Total Acids reacting (excess of Sulphurous Acid excluded). Calculated.
						c.c.	c.c.	c.c.				
(*a*) = *e*(iii.)— $2(HO)NO + 2HSO_3H = N_2O + 2H_2SO_4 + H_2O$.	Weber (*vide* Lunge, Vol. I. (edit. I.), p. 154).	1	1	..	..	..	..	..	..	..	..	33·3
(*b*) = *d*(iii.)— $2(HO)NO + HSO_3H = 2NO + H_2SO_4 + H_2O$.	Berzelius	2	1	..	..	..	..	..	..	..	..	50·0
d(i.)— $(HO)_3N + HSO_3H = (HO)_2NSO_3H + H_2O$.	Raschig	1	1	..	..	..	..	..	..	..	..	66·6
e(i.)— $(HO)NO + 2HSO_3H = HON(SO_3H)_2 + H_2O$.	Divers and Haga.	1	2	..	..	..	..	..	..	..	..	60·0
By experiment, found—												
1. Concentrated solution—												
(i.)	..	..	..	1	1·14	13·0	505·0	210·0	48·0	36·5	..	..
(ii.)	..	..	..	1	1·39	15·0	505·0	87·0	44·5	36·0	..	..
2. Dilute solution—												
A.	..	..	..	1	1·43	15·0	43·0	0·0	48·0	38·0	..	..
B.	..	..	..	1	1·46	13·7	41·1	1·2	47·0	37·0	36·0	..
C.	..	..	..	1	1·59	15·0	62·8	15·0	50·6	38·0	39·0	..
D.	..	..	..	1	1·70	15·0	141·2	90·0	52·0	41·0	..	..
E.	..	..	..	1	1·75	7·5	56·1	29·7	55·0	40·5	40·5	..
F.	..	..	..	1	1·77	10·0	45·0	9·5	54·0	..	39·0	..

Remarks on Methods employed in the above Experiments.

1. *Concentrated Solutions* :—Phenolphthalein indicator, peroxide present.
   (i.) Solutions mixed in tube as described in experiment. Volume about 50 c.c.; mixture, after reaction, made up to 500 c.c. for analysis. Results calculated to 500 c.c. of solution = results obtained × 10. Evolved gas measured in burette.
   (ii.) Solutions mixed direct in 500 c.c. flask; gas not measured, otherwise as above.
2. *Dilute Solutions* :—Phenolphthalein indicator, peroxide present.
   A, C. 15 c.c. of half normal sodium nitrite added, drop by drop, to 400 c.c. freshly prepared sulphurous acid containing sulphuric acid equivalent to nitrite taken. Volume made up to 500 c.c. for analysis; results calculated to this volume.
   B. 13·7 c.c. of half normal sodium nitrite, as above.
   D. 15 c.c. of half normal sodium nitrite, diluted to fifth normal strength, then as above (sulphurous acid in such excess as to interfere with estimation of acidity changes).
   E. 7·5 c.c. of half normal sodium nitrite diluted to eighth normal strength, then as A above.
   F. 20 c.c. of half normal sodium nitrite diluted to tenth normal strength added to 900 c.c. of sulphurous acid containing hydrochloric acid equivalent to nitrite taken, total volume 1,000 c.c.; results calculated to 500 c.c.

TABLE II.

Interaction of Sulphurous and Nitrous Acids in Aqueous Solution containing Excess of Sulphurous Acid, 15° C.
(Results calculated to 500 c.c. of Solution).

Nitrous and Sulphurous Acids. Taken.			Reacting Acids. In Terms of N/2 Acids.			Molecular Proportions.		Products of Reaction in Terms of N/2 Acid c.c. after mixing and before standing.				
(HO)NO N/2.	HSO_3H N/2.	Excess HSO_3H after mixing N/2	(HO)NO.	HSO_3H.	Total.	(HO)NO.	HSO_3H.	$HON(SO_3H)_2$ equals twice gain of Acidity on standing. *c*(i.).	$HONH(SO_3H)$ by Alkaline Copper Test. *e*(iv.).	H_2SO_4 calculated from Nitrous Acid. (*a*).	Total Acid equals twice Nitrous Acid reduced. (*a*), *e*(i.).	Found.
1. *Concentrated Solution:—*												
c.c.	c.c.	c.c.	c.c.	c.c.	c.c.							
(i.) 130	505	210	130	295	425	1	1·14	40	Absent	220	260	256
(ii.) 150	505	87	150	418	568	1	1·39	94	Absent	206	300	316
2. *Dilute Solution:—*												
A. 15·0	43·0	0·0	15·0	43·0	58·0	1	1·43	12·0	Absent	18·0	30·0	30·1
B. 13·7	41·1	1·2	13·7	39·9	53·6	1	1·46	11·8	Absent	15·6	27·4	(i.) 28·4; (ii.) 28·4; (iii.) 28·4
C. 15·0	62·8	15·0	15·0	47·8	62·8	1	1·59	15·6	*Present	14·4	30·0	31·0
D. 15·0	141·2	90·0	15·0	51·2	66·2	1	1·70	14·4	*Present	15·6	30·0	31·8
E. 7·5	56·1	29·7	7·5	26·4	33·9	1	1·75	9·8	Absent	5·2	15·0	15·3
F. 10·0	45·0	9·5	10·0	35·5	45·5	1	1·77	13·65	Absent	6·35	20·0	21·0

Sulphurous Acid in Terms of N/2 Acid c.c. Calculated as $HON(SO_3H)_2$. *c*(i).	Calculated as H_2SO_4. (*a*)	Total.	Found.	Nitrous Oxide Gas produced. Collected and Measured.	Dissolved, calculated approximately.	Total.	Total calculated from Sulphuric Acid. (*a*).	Hydroximido-sulphuric Acid. $HON(SO_3H)_2$ Yield per cent. of total obtainable by *e*(i.). (*a*) = 0.
1. *Concentrated Solution:—*				c.c.	c.c.	c.c.	c.c.	
(i.) 80	220	300	295	170	890	560	620	15
(ii.) 188	206	394	418	Not measured	..	..	577	31
2. *Dilute Solution:—*								
A. 24·0	18·0	42·0	43·0	No gas	..	..	50	40
B. 23·6	15·6	39·2	39·9	„	..	..	44	43
C. 31·2	14·4	45·6	47·8	„	..	..	40	52
D. 28·8	15·6	44·4	51·2	„	..	..	44	48
E. 19·6	5·2	24·8	26·4	„	..	..	15	65
F. 27·3	6·3	33·6	35·5	„	..	..	18	68

Remarks on Methods employed in the above Experiments.

Lettering follows arrangement in Table I., in which the same experiments are arranged somewhat differently to effect other comparisons. See Table I., therefore, for general remarks.

Experiment B:
(i.) 28·4 is the titration result using phenolphthalein in presence of peroxide; as in all the other experiments in this table.
(ii.) Do. do. using phenolphthalein in absence of peroxide.
(iii.) Do. do. using methyl orange in presence of peroxide.

Experiments C, D:
* Hydrolysis may have occurred during Alkaline Copper test; there is no other reason to believe that hydrolysis had occurred during mixing of the acids than this behaviour to alkaline copper sulphate.

TABLE III.

Tabulation of Results A, B, C, D, E, F, Table II., on Hypothesis 4.
(Results stated in terms of N/2 Acid per 500 c.c.)

Hypothesis 4. *e*(i), *e*(ii), *e*(iv).	A. Found.	A. Calculated.	B. Found.	B. Calculated.	C. Found.	C. Calculated.	D. Found.	D. Calculated.	E. Found.	E. Calculated.	F. Found.	F. Calculated.
Total Acidity	30·1	30·0	28·4	27·4	31·0	30·0	31·8	30·0	15·3	15·0	21·0	20·0
Hydroximido Acid:												
Total produced by *e*(i)	..	21·5	..	19·9	..	23·9	..	25·6	..	13·2	..	17·7
Destroyed by *e*(ii)	..	8·5	..	7·4	..	6·1	..	4·4	..	1·8	..	2·3
Net produced *e*(iv)	12·0	13·0	11·8	12·5	15·6	17·8	14·4*	21·2	9·8	11·4	13·7	15·4
Net per cent. of total produced	..	60·5†	..	63·0	..	74·5	..	83·0	..	86·5	..	87·0
By Hypothesis 1, for comparison:— Yield per cent. of total obtainable if (*a*) = 0.	..	40·0†	..	43·0	..	52·0	..	48·0	..	65·0	..	68·0

* *See* Note D., Table I. *ante.*

† It will be seen from the example given that in Table II. the percentages of hydroximido acid produced are calculated from the total obtainable (= twice the nitrous acid present) and from that found from the gain of acidity after hydrolysis. In Table III., on the other hand, by the theory under examination where the whole of the sulphurous acid reacting is supposed to form hydroximido acid, a portion of this itself reacting with the nitrous acid added, the quantities compared for percentage yield are calculated on a lower divisor.

No.	Conditions.	Time Interval after Mixing and before Titration.	Acids taken per 500 c.c. Molecular Proportions. HSO_3H	$(HO)NO$	Total.	Total Acid after Reaction.	Decrease of Acid per Cent. of Total Acids taken. Found.	Calculated for Equation. $a = e$ (iii) $2HSO_3H : 2(HO)NO$ 1 : 1	$b = d$ (iii) $HSO_3H : 2\,HO)NO$ 1 : 2	d (i) $HSO_3H : (HO)NO$ 1 : 1	e (i) $2HSO_3H : (HO)NO$ 2 : 1	Observations on Result of Mixing the Solutions.
	Peroxide present during mixing:											
	Peroxide (10 vols.), 20 c.c.	2 minutes	..	20	20	.. ..	20·0	0·0	..	..	..	..	Nitrous smell.
		10 „					19·9	0·5	..	..	..	..	Nitrite present.
		20 „					20·0	0·0	..	..	..	..	Nitrite absent; no smell.
	Peroxide (10 vols.), 12·5 c.c.	5 minutes	12·5	10	22·5	.. ..	22·3	0·9	..	..	..	..	Nitrite present.
		20 „					22·5	0·0	..	..	..	..	„ „
	Peroxide absent during mixing:											
A.	Sulphurous acid absent	2 minutes	Absent	20	20	.. ..	19·0	5·0	..	..	..	..	Nitrous smell.
		15 hours					19·5	2·5	..	..	..	..	Nitrite present: nitrous smell.
B.	Excess of sulphurous acid present at end of experiment	1 minute	36	6	42	3 1	30·8	27·0	14·3	14·3	28·6	43·0	No gas evolved.
		1 minute	60	10	70	3 1	50·0	28·5	14·3	14·3	28·6	43·0	No gas evolved.
		2 minutes	71·5	12	83·5	3 1	59·5	29·0	14·3	14·3	28·6	43·0	No gas evolved.
		55 „					60·0	28·0					
		3 minutes	20	5	25	2 1	15·7	37·0	20·0	20·0	40·0	60·0	No gas evolved.
		19 hours					17·8	29·0					
		3 weeks					..	..					Reduces alkaline copper sulphate.
		3 minutes	40·4	10·2	50·6	2 1	31·8	37·0	20·0	20·0	40·0	60·0	No gas evolved.
		50 hours					36·3	28·5					
		3 weeks					..	..					Reduces alkaline copper sulphate.
		1 minute	413	96	509	2 1	367	28·0	19·0	19·0	38·0	56·5	Nitrous oxide gas evolved.
		1 minute	364	119	483	1·5 1	304	37·0	24·4	24·4	48·8	56·5	Nitrous oxide gas evolved.
C.	Sulphurous and nitrous acids about balanced at end of experiment	5 minutes	32	14	46	1·1 1	27·2	41·0	30·0	30·0	60·0	52·0	Nitrite in excess; no nitrous smell.
		14 hours					33·7	27·0					Very small trace of nitrite; no nitrous smell.
		5 minutes	55	‡23·5	78·5	1·1 1	57·2	27·0	30·4	30·4	60·8	52·5	Nitrite in excess; slight nitrous smell.
		15 „					48·7	38·0					
		46 hours					50·2	36·0					Nitrite absent: no smell.
		2 minutes	27·6	13·8	41·4	1 1	26·1	37·0	33·3	33·3	66·6	50·0	Nitrite in excess; slight nitrous smell.
		1 hour					27·1	34·5					
		2 hours					27·6	33·5					
		16 „					29·4	29·0					
		7 minutes	27·6	‡13·8	41·4	1 1	26·6	36·0	33·3	33·3	66·6	50·0	Small trace of nitrite; no smell.
		50 „					26·8	35·0					Nitrite in excess; slight nitrous smell.
		46 hours					28·6	31·0					
		18 hours	29·8	15	44·8	1 1	31·3	30·0	33·3	33·3	66·6	50·0	
		1 minute	30	15	45·0	1 1	28·7	36·0	33·3	33·3	66·6	50·0	
		4 minutes	71·5	35·8	107·3	1 1	68·8	36·0	33·3	33·3	66·6	50·0	No gas evolved; slight nitrous smell.
		15 hours					73·3	31·5					
D.	Excess of nitrous acid at end of experiment	2 minutes	*20	20	40	1 2	31·0	22·5	25·0	50·0	50·0	37·5	No gas evolved; slight nitrous smell.
		10 „					29·5	26·0					
		70 „					30·5	24·0					
		2 minutes	†20	20	40	1 2	23·5	26·0	25·0	50·0	50·0	37·5	
		2 minutes	*18	30	48	1 3·3	39·5	17·7	37·5	37·5	28·0	No gas evolved; slight nitrous smell.
		18 hours					39·5	17·7					
		1 minute	†15	30	45	1 4	37·0	17·8	33·3	33·3	25·0	No gas evolved; slight nitrous smell.

Note.—All titrations, except A., above, carried out in the cold, with addition of peroxide, phenolphthalein indicator.
Sodium nitrite run into solution of sulphurous acid in flask (+ sulphuric acid equivalent to nitrite taken) in all experiments but those specially indicated.
* Sulphurous acid solution containing sulphuric acid equivalent to nitrite run into solution of sodium nitrite in flask.
† Sulphurous acid solution run into a solution of nitrous acid obtained by mixing equivalents of dilute sodium nitrite and sulphuric acid in flask.
‡ Sulphuric acid replaced by hydrochloric acid of equivalent strength.

TABLE V.

Interaction of Sulphite and Nitrite in Dilute Aqueous Solution (15° C.).

Experiment.	Taken for Reaction in Terms of Half-Normal Acid per 500 c.c.				Time Interval after Mixing and before Titration.	Found after Reaction in Terms of Half-Normal Acid per 500 c.c.			Proportions Reacting to Form Sodium Disulphonate $HON(SO_3Na)_2$.			
									Found in Terms of Half-Normal Acid.		Molecular Proportions.	
	$NaNO_2$.	$NaHSO_3$.	$NaHCO_3$.	Acidity.		$NaNO_2$.	$NaHSO_3$ / Na_2SO_3	Acidity.	$NaNO_2$ = ½ Decrease of Acidity.	$NaHSO_3$ = Decrease of Sulphite.	$NaNO_2$ 1	$NaHSO_3$ 2
	c.c.	c.c.	c.c.	c.c.		c.c.	c.c.	c.c.				
1	3·97	11·90	..	11·90	15 minutes	..	..	10·2	..	..	..	..
					16 hours	..	..	4·5				
					20 hours	Trace	..	3·7				
					40 hours	Small trace.	..	0·4				
2	10·00	10·25	..	10·25	5 minutes	..	..	8·85	..	..	..	..
					25 minutes	..	..	7·50				
					3 hours	..	..	4·30				
					21 hours	Present	..	0·00				
3	15·00	45·50	..	45·50	5 minutes	..	..	37·5	2·7	..	1	2·17
					1 day	Present	..	14·8	10·2	..		
					2 days	Present	21·0	11·7	11·3	24·5		
					5 days	Present	..	5·5	13·3	..		
					10 days	Traces	18·0	5·0	13·5	27·5	1	2·04
					16 days	Absent	Hydroxyimidosulphate present, hydroxyamidosulphate absent by alkaline copper sulphate test.					
4	15·00	30·20	14·80	15·40	1 day	Present	..	† −19·0	11·5	..	..	..
					10 days	..	1·0	† −27·0	14·1	29·2	1	2·07
					16 days	*Present	Hydroxyimidosulphate present, hydroxyamidosulphate absent by alkaline copper test.					

* Air present. † Negative sign (−) before acidity figures marks alkalinity.

NOTE.—No effect on the titre results from mixing neutral sulphite and nitrite solution with or without addition of alkali, only fractional difference in titre being noticed in times varying from 4 minutes after mixing to 21 hours. This is entirely confirmed by Divers and Haga (p. 674).

TABLE VI.

Silvertown Experiments.

Controlling Factors.	Aspirator.			Absorbing Bottles.					
				A.		B.		C.	
	Volume of Water run.	Time.	Rate of Flow.	Caustic Soda, N/2.	Peroxide, 10 Vols.	Caustic Soda, N/2.	Peroxide, 10 Vols.	Caustic Soda, N/2.	Peroxide, 10 Vols.
	Cb. Ft.	Hours.	Cb. Ft. per Hour.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
Peroxide present:—									
Concurrent Tests 1:—									
(i) Water	0·71	1·58	0·45	..	10·0	..	5·0	..	5·0
(ii) Soda	0·80	1·75	0·46	10·0	10·0	2·0	5·0	2·0	5·0
Concurrent Tests 2:—									
(i) Water	0·75	1·17	0·64	..	15·0	..	5·0	..	5·0
(ii) Soda				15·0	15·0	5·0	5·0	5·0	5·0
Soda present:—									
Concurrent Tests:—									
(i) Water	0·75	1·83	0·41	15·0*	..	5·0*	..	5·0*	..
(ii) Peroxide		1·92	0·39	15·0	15·0	5·0	5·0	5·0	5·0
Water:—									
Concurrent Tests 1:—									
(i) Water	0·75	1·42	0·53	..	..	..	..	..	25·0
(ii) Peroxide		1·50	0·50	..	15·0	..	5·0	..	5·0
Concurrent Tests 2:—									
(i) Water	0·75	1·00	0·75	..	..*	..	..*	..	15·0
(ii) Peroxide				..	15·0	..	5·0	..	5·0
Rate of Flow (hydrogen peroxide present):—									
Concurrent Tests:—									
Slow	0·40	0·40	1·00	..	12·5	..	5·0	..	5·0
Rapid	1·07		2·67	..	12·5	..	5·0	..	5·0

0·05 grm. of the dust boiled with neutral (11 vol.) peroxide. The resulting liquid proved to be neutral to methyl orange indicator, and to phenolphthalein, hot or cold.

Note.—This corresponds to water and peroxide in the bellows, when close agreement is observed between results obtained with methyl orange and phenol phthalein indicators. —See Tabulated Tests, Table XI., below.

0·05 grm. stirred with 5 c.c. of N/2 NaHO + 2·55 H_2O_2 (11 vols.) + 100 c.c. water. After standing five minutes, 5 c.c. of N/2 H_2SO_4 added, then N 2 soda to neutralise.

(*a*) Soda required = 0·08, methyl orange indicator.
„ = 0·39, phenolphthalein, cold.
„ = 0·43, „ „ hot.

Note.—This corresponds to alkali and peroxide in the bellows, when higher results are invariably obtained when alkaline peroxide is employed.

To this behaviour we are inclined to attribute some of the erratic and so very perplexing results obtained when alkali is employed in the bellows.

The sulphuric acid exit tests recorded in Table XI. were confirmed by an exhaustive series of laboratory tests, in

TABLE VI.—*continued.*

Controlling Factors.	Total Acidity. As Grains SO_3 per Cubic Foot. In A.	In B.	In C.	Total.	By Bellows Aspirator. Water and Peroxide.	Per Cent. of Total Acid. In A.	In B.	In C.	Remarks.
Peroxide present:—									
Concurrent Tests 1:—									Tests (1) — Absorbing Vessel A. = Woulff's bottle, inlet tube reduced to pin point. Tests (1) — Absorbing Vessel B. = Scrubbing bottle, rose inlet, holes 1 mm. diameter. Tests (1) — Absorbing Vessel C. = Mitscherlich Bulbs. Tests (2) — Absorbing Vessel A. = Cylinder (250 c.c., graduated), inlet tube, pin point. Tests (2)—Absorbing Vessels B., C. = Drechsel's bottles, inlet tube reduced to 1 mm. diameter.
(i) Water ..... (*a*)	2·00	0·04	0·04	2·08	..	..	..	..	
(*b*)	1·95	0·04	0·02	2·01	..	97·0	2·0	1·0	
(ii) Soda ..... (*a*)	2·66	..	..	..	..	..	..	..	
(*b*)	2·12	0·27		2·39	..	88·7	11·3		
Concurrent Tests 2:—									
(i) Water..... (*b*)	1·32	0·06	0·03	1·41	..	93·6	4·3	2·1	
(*c*)	1·32	..	..	..	..	..	..	..	
(ii) Soda ..... (*b*)	1·51	0·08	0·06	1·65	..	91·5	4·9	3·6	
(*c*)	1·47	..	..	..	..	..	..	..	
Soda present:—									
Concurrent Tests:—									
(i) Water..... (*b*)	1·65	0·12	0·07	1·84	..	89·7	6·5	3·8	Absorbing Vessels as in (2) above. * Peroxide added before titration.
(ii) Peroxide ..... (*b*)	1·61	0·06	0·08	1·75	(*b*) 1·53	92·0	3·4	4·6	
(*c*)	1·50	..	..	..	(*c*) 1·49	..	..	..	
Water:—									
Concurrent Tests 1:—									Absorbing Vessels A., B. = Drechsel's, as above. Absorbing Vessel C. = Cylinder, as above. * Peroxide added to A. B. before titration.
(i) Water ..... (*b*)	1·14	0·44	0·12	2·00	(*b*) 2·10	72·0	22·0	6·0	
(ii) Peroxide ..... (*b*)	1·89	0·08	0·06	2·03	..	93·1	3·9	3·0	
Concurrent Tests 2:—									
(i) Water..... (*b*)	1·17	0·20	0·08	1·45	..	80·7	13·8	5·5	
(ii) Peroxide ..... (*b*)	1·43	0·13	0·06	1·62	(*b*) 1·58	88·3	8·0	3·7	
Rate of Flow (hydrogen peroxide present):—									
Concurrent Tests:—									
Slow..... (*b*)	1·1	0·12	0·04	1·33	..	88·0	9·0	3·0	Absorbing Vessels A. B. = Drechsel's, as above. Absorbing Vessel C. = Bottle, inlet tube reduced to 1 mm.
Rapid ..... (*b*)	1·19	0·13	0·07	1·39	..	85·6	9·3	5·1	

Note.—Indicators (*a*) = Phenolphthalein, cold; (*b*) = " " hot; (*c*) = Methyl Orange, cold. Indicators are compared by dividing the same solution. Such comparative tests, (*a*), (*b*), (*c*) are bracketed, thus {(*a*), (*b*),} &c.

TABLE VII.

Silvertown Experiments.

Water Run.	Time.	Aspirator. Rate of Flow.	Absorbing Drechsel's (Inlet Tube reduced to 1 mm. diameter). A. Sodium Bicarbonate N/2	A. Peroxide Pure (11 Vols.)	B. Sodium Bicarbonate N/2	B. Peroxide Pure (11 Vols.)	C. Sodium Bicarbonate N/2	C. Peroxide Pure (11 Vols.)	Acidity (in Terms of SO_3. Grains per cb. ft.) Contents of A. and B. mixed. As SO_3.	As HCl.	As HNO_3 (by diff.).	Total.	C. Total.	Total Acidity.
		Cb. Ft. per Hour.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.						
	Min.													
(1) 71,100	120	1·25	17·5	7·0	5·0	2·0	2·5	1·0	0·68	0·04	0·40	1·12	0·06	1·18
(2) 56,800	115	1·05	17·5	7·0	5·0	2·0	2·5	1·0	1·46	0·04	0·18	1·68	0·03	1·71

NOTE.—Tests (1) and (2) were taken at the same plant, but on different days.

TABLE VIII.

Silvertown Experiments.

0·7 cb. ft. of gas drawn through. Time, one hour.

Absorbing Vessels in Sequence.	Contents of each Absorbing Vessel examined separately by each of the following Indicators. Diphenylamine in Sulphuric Acid.	Metaphenylene Diamine Hydrochloride.	Ferrous Sulphate.
1. Drechsel's bottle, 50 c.c. of strong, pure sulphuric acid; inlet tube reduced to 1 mm. diameter.	.. ..	Slight brown	Slight brown ring.
2. Drechsel's bottle, do.	.. ..	Slight brown	Slight brown ring.
3. Mitscherlich bulbs, 25 c.c. of strong, pure sulphuric acid	Deep blue	Slight brown	Faint brown ring.
4. Mitscherlich bulbs, do.	Deep blue	.. ..	Faint brown ring.
5. Drechsel's bottle, as above	Deep blue	Slight brown	Faint brown ring.
6. Woulff's bottle, 10 c.c. of N/2 caustic soda; inlet tube reduced to pin point.	Blue	No brown	No brown ring.

TABLE IX.

Examination of Solutions obtained when Exit Gases from the Vitriol-Chamber Process are drawn through various Absorbents.

Description of Sample.												Examination of Sample.	
Gases employed.			Acidity of Sample No. 1 Absorbing Vessel.									Hydroxyazotised Bodies.	
Taken from	Volume aspirated. cb. ft.	Total Acidity as SO_3 grains per cb. ft.	Absorbent used.	Acid Caught by Absorbent, in Terms of SO_3 Grains. Equivalent of Absorbent.	Excess over Absorbent.	Total.	Total per cb. ft.	Behaviour towards Methyl Orange.	Sulphurous Acid (by Iodine Test).	Nitrous Acid (by Metaphenylene Diamine Test).	By Alkaline Copper Test.	By "Barium Chloride" Test.
Works A.												
1.	24·5	1·07	Sodium carbonate.	12·5	4·50	17·00	0·69	Acid	Traces	Absent	Present	Present.
2.	25·3	0·54	Water	..	2·84	2·84	0·11	„	„	„	Absent	..
3.	23·8	1·25	Sodium carbonate.	12·5	4·90	17·40	0·73	„	„	„	Present	Present.
4.	27·3	0·65	Water	..	3·73	3·73	0·14	„	Absent	„	Absent	..
5.	25·9	1·52	Sodium carbonate.	12·5	3·79	16·20	0·63	„	Traces	„	Present	Present.
6.	26·9	0·57	Water	..	3·64	3·64	0·14	„	„	„	Absent	..
7.	20·7	2·42	Sodium carbonate.	25·0	4·66	29·66	1·43	„	Smells of SO_2.	„	Present	Present. $BaSO_4$ equivalent of hydroxyamido sulphuric acid— (*a*) 1·10 grm. (*b*) 1·11 grm.
8.	22·5	2·42	Water	..	3·49	3·49	0·16	„	Trace	„	Absent	..
Works B.												
1.	40·0	0·78	Caustic soda and peroxide.	25·8	2·19	27·90	0·69	„	Traces	„	Present	Present.
2.	29·5	2·30	„	25·8	0·90	26·70	0·90	„	Smells strongly of SO_2.	„	„	„
3.	21·5	1·23	„	25·8	0·50	26·30	1·22	„	Smells of SO_2	„	„	„
4.	40·0	1·09	„	25·8	0·50	26·30	0·66	„	Absent*	„	„	Trace.
5.	30·5	1·11	„	25·8	3·00	28·80	0·95	„	„*	„	Absent	Absent.
6.	31·0	1·60	„	19·4	9·70	29·10	0·94	„	„*	„	„	„
7.	26·5	1·49	„	19·4	9·30	28·70	1·08	„	„*	„	„	„

* In no case could excess of peroxide be detected.

Method of Aspiration employed.

Works A.—Gases aspirated through three absorbing cylinders. First cylinder contained, in every case, 125 c.c. of water; in experiments 1, 3, and 5, sodium carbonate equivalent to 12·5 grains of SO_3 was present; in experiment 7, this amount was doubled. No peroxide was present during aspiration. After absorption, the contents of the first vessel were made up to 250 c.c.; one-half of this was titrated for total acidity with addition of peroxide, methyl orange indicator; the remainder was forwarded to us for qualitative examination.

Works B.—Gases aspirated through three absorbing bottles. First bottle contains, in experiments 1 to 5, caustic soda equivalent to 25·8 grains of SO_3 + 13 c.c. of peroxide, total volume of liquid about 130 c.c.; in experiments 6, 7, caustic soda used equivalent to 19·4 grains of SO_3 and 13 c.c. of peroxide. Contents of first bottle accurately halved, one-half titrated for T.A. by works chemist, the other forwarded for qualitative examination above. Both sets of results are tabulated together in Table IX. above.

TABLE X.

Sulphuric Acid Exit Tests. Works A.

Effect of Formation of Hydroxyazotised Bodies upon the Total Acidity.

Test.	Total Acidity of Solution in Terms of SO_3. Grains. Before Standing. *a*	After Standing. *b*	Time Interval between Tests *a*, *b*.	Hydroxyamido Acid in Terms of SO_3. Grains. Equals Gain of Acidity. *b*—*a*	by "Barium Chloride Method."	Total Acid in Terms of SO_3. Grains. In Gases entering and Absorbed in First Cylinder. Per Volume Aspirated.	Per Cubic Foot.	Recovered by Titration per Cubic Foot of Gases. Before Standing. *a*	After Standing *b*	Loss of Acid per Cent. of Total entering and absorbed. Calculated from Total Acidity. Before Standing. *a*	After Standing. *b*
Soda Carbonate.			Days.								
1	4·51	4·95	16	0·44	Presen	18·33	0·745	0·694	0·712	7·2	4·8
3	4·88	5·16	15	0·28	„	18·22	0·766	0·730	0·742	4·7	3·1
5	3·73	4·17	14	0·44	„	17·55	0·677	0·627	0·644	7·4	4·9
7	4·66	6·95	8	2·29	..	36·53	1·765	1·433	1·544	18·8	12·5
7	..	..	3	..	2·83	37·22	1·798	1·433	1·544	20·3	14·1
Water.											
2	2·84	2·78	16	−0·06	Absent	..	..	..	..	..	..
4	3·73	3·74	15	0·01	„	..	..	..	..	..	..
6	3·64	3·68	14	0·04	„	..	..	..	..	..	..
8	3·49	3·38	8	−0·11	„	..	..	..	..	..	..

TABLE XI.

Methyl Orange and Phenolphthalein.

Indicators compared.

(Bell... Aspirator Tests.—Vitriol Chamber Exit Gases.)

Method.	In Bellows.			Total Acidity, as Grains SO_3 per Cubic Foot.		
	Caustic Soda, N/2.	Peroxide 11 Vols.	Water.	Indicator.		
				Methyl Orange.	Phenolphthalein.	
					Cold.	Hot.
	c.c.	c.c.	c.c.			
A. Alkaline Peroxide in Bellows.—Solution acidified and allowed to stand before dividing for titration into three portions.	10	5	150 (Series (*a*)	1·56	1·58	1·59
			150 („ (*b*)	1·75	2·06	2·08
B. Acid Peroxide in Bellows.—Solution divided for titration.	..	5	160	1·73	1·74	1·78

which similar titration results were obtained when air was shaken in the bellows with the same absorbents, but without our being able to indicate an adequate cause for the greater discrepancies noted by some other observers.

Conclusions as to Absorbents.

The above detailed results point to the undesirability of relying on caustic alkali, or its carbonate, alone as an absorbent for the gases from vitriol exits for the purpose of estimating the total acidity of such gases, in view of the undoubted reactions that may arise with formation of "condensation products" or sulphazotised bodies whose titre is less than that of the constituents separately, and which we have proved to be formed under conditions which do occur in practical working, especially at periods of disorganisation.

We do not venture at present to put forward any opinion on the relative merits of neutral or alkaline hydrogen peroxide as absorbent; either is clearly preferable to alkali alone, as the sum of the acidities of x-sulphurous acid and y-nitrous acid is given, on titration, as $x + y$ in terms of SO_3, as nearly as is possible under the circumstances.

Much depends on the point of view; from that of the manufacturer who would naturally wish, in applying a simple titration test, to include among the losses he is endeavouring to estimate some of that due to nitric oxide, the alkaline peroxide will, doubtless, commend itself (we have shown how, at the best, the amount of this absorbed is a balance merely). In this case, the precaution as to use of methyl orange that we give above (if this be the indicator chosen) should be observed to ensure accurate results.

DISCUSSION.

Dr. MESSEL testified to the extreme accuracy and utility of the work carried out by the authors, of which he had had the advantage of being acquainted from its inception.

The CHAIRMAN asked what took place under certain circumstances which were perhaps hypothetical. Suppose that there were three bottles of alkaline absorbent liquid, a certain amount of acid gases might be passing through until the originally alkaline solution in the first bottle became acid. Thus one bottle might contain an acid solution, and the two remaining bottles might be alkaline; if, then, the contents of those three bottles were combined with a view to test the acidity of the whole, what was the result? Could Mr. Carpenter throw any light upon that subject? It was quite impossible to exhaust this subject in one paper, because the reactions were most complicated, and although the authors had thrown a flood of light upon it, it was extremely difficult to tell what, under some circumstances, would take place. It was only by a large amount of very careful and accurate work, such as had been laid before them, that they could fully understand this intricate subject. These reactions were becoming of still greater practical importance, owing to the fact that we seemed almost within measurable distance of fixing the nitrogen of the atmosphere. If that were accomplished, the question of these acid nitrogen compounds would be of very great practical importance.

Mr. CARPENTER, in reply, said that, as regarded the complexity to which the Chairman had referred, he might read a little extract from one of Dr. Divers' papers to indicate the complexities which confronted them. (He proceeded to read the passage from Dr. Divers' paper.) He quite sympathised with the feelings of Dr. Divers in this matter. He might mention, as arising out of this point, that they did not pursue their investigations further than hydroxyamidosulphate. That was found very stable at the end of three weeks. It was quite possible that further hydrolysis (but, as far as he knew, higher temperatures were necessary for this) would give hydroxylamine sulphate, and that reaction of this with sulphurous acid would give amidosulphuric acid, which itself also, on further heating, gave acid ammonium sulphate, and that was the end of all. He might say that Raschig, in trying to buttress up his theory of condensation products in the acid-chamber reaction, naturally went to sulphuric acid makers to find something to support his views. The hydroxylamine reaction was got at Griesheim and Berlin with certain samples of chamber acid, and he should not be at all surprised that it could be obtained in certain places in Dr. Messel's chambers to-day; also, at the "Rhenania" works of the late Mr. Robert Hasenclever, the distinguished technologist whose death they all lamented, the acid ammonium sulphate was found under circumstances which precluded the access of ammonia from any other source, and therefore he thought, to a certain extent, Raschig had justified some of the equations put forward to support his theory. What that extent was he had no data for judging; the subject was beyond that of this paper. In reply to the Chairman's question, he might say that it was the usual custom, and the one prescribed by the Alkali Makers' Association, to employ three bottles containing alkaline solution. Where the absorption or aspiration was continued for a 24 hours' test, it was very natural, and not unusual, that one bottle should become acid. The alkali became neutralised, and some of the acid gases passed, in gradually increasing percentage, on to the other bottles. The Chairman asked what happened when these bottles were taken back to the laboratory in the ordinary way, and combined and mixed for titration. If condensation products were present in the first bottle, as was often the case, the question was, Would that acid be recovered on mixing the solution when the solution became alkaline? He thought they might say that the presence of alkali in fairly small excess and at the air temperature had no effect on the bodies when once formed. It required boiling with strong alkali to decompose the hydroxy-imido or -amidosulphate. Therefore, when it was once formed, under a proper test

with methyl orange as the indicator, there would be no reversion. They had made various experiments to determine this, but had got no indication of reversion by reappearance of nitrous acid. The tests also showed that the sulphurous acid, if in excess, did not increase in the solution on standing.

THE INFLUENCE OF IMPURITIES ON THE SPECIFIC GRAVITY OF SULPHURIC ACID.

BY ARTHUR MARSHALL, F.I.C., F.C.S.

This investigation was originally undertaken because it had been noticed that there was a considerable difference between new sulphuric acid obtained directly from the manufacturers and that which had already been used for the manufacture of nitroglycerin, and had been reconcentrated in the factory for re-use. The specific gravity of the trade acid differed from that of the reconcentrated acid by an amount greater than would be expected from the difference in the strengths and the percentage of non-volatile impurity. Acids from these two sources also gave different results when used in the manufacture of nitroglycerin, and it was therefore resolved to enquire thoroughly into the matter.

The acid reconcentrated in Kessler's apparatus had a distinctly brown colour, evidently due to organic matter remaining in it. As it appeared possible that the difference between the acids might be caused by this organic impurity, some attempts were made to estimate it. By oxidising with chromic acid and passing the evolved gases through potash bulbs the percentage of carbon was found to be only 0·012 per cent. To confirm this result another sample of "Kessler" acid was diluted and allowed to stand with permanganate solution for 15 minutes, exactly as is done in water analysis when determining the oxygen absorbed. The result obtained showed that 0·017 per cent. of oxygen was absorbed. Attempts were also made to separate dissolved organic matter by diluting with water and shaking out with ether, but only minute traces of brownish matter could be extracted. Similar attempts, using carbon tetrachloride and petroleum ether, yielded practically no residue at all.

These experiments rendered it evident that the quantity of organic matter present in the reconcentrated acid was far too small to account for the difference in its properties from those of the trade acid. Other experiments were carried out with the object of detecting impurities in Kessler acid other than small traces of sulphates of lead, calcium, aluminium, iron, magnesium, and sodium, but only negative results were obtained.

All endeavours to detect considerable quantities of impurity in the reconcentrated acid having failed, a more careful study was made of the specific gravities. Comparison with the specific gravity of *pure* sulphuric acid of the same strength showed that the difference was not more than might be expected from the amount of solid residue remaining when the reconcentrated acid was evaporated down. This was confirmed by redissolving the residue in pure sulphuric acid of the same strength. The specific gravity was then found to be raised as high as that of the "Kessler" acid.

It was evident that the reconcentrated acid was quite a normal sulphuric acid. To make quite sure that the differences that had been observed between new and reconcentrated acid were not simply due to analytical errors, I made very careful determinations with a number of acids both from the trade and from our own concentrating plant. The results are plotted on Curve I. From these it is at once apparent that some, but not all, the trade acids have abnormally high densities. These were submitted to further examination, whereupon they were found to contain small quantities of nitric acid.

Although it is well known that the addition of nitrous acid increases the specific gravity of sulphuric acid, nitroso-sulphuric acid or chamber crystal being formed, I think that it is not generally recognised that small proportions of nitric acid also raise the density. The presence of nitric acid in the trade acids was probably due to the containing vessels having been used for the carriage of waste acids.

The determination of the percentage of nitric acid in these trade acids showed that it was approximately proportional to the divergence, as will be seen from Curve I., where the percentages of nitric acid are marked in brackets.

A number of determinations have been made of the specific gravities of mixtures made by adding sulphuric acid of 96·5 per cent. strength to nitric acid of 94·0 per cent. strength. The sulphuric acid contained only 0·001 per cent. of non-volatile impurity, and the nitric acid was practically free from nitrous acid, but contained 0·017 per cent. of solid impurity, mostly lead nitrate. The numbers in Table I. and Curve II. refer to these slightly dilute acids and not to pure H_2SO_4 and HNO_3.

TABLE I.

HNO_3.	Sp. Gr. 18°/18° in Air.	HNO_3.	Sp. Gr. 18°/18° in Air.
Per Cent.		Per Cent.	
0·00	1·8437	22·51	1·8215
0·57	1·8456	25·56	1·8112
1·05	1·8476	27·29	1·8053
4·67	1·8586	32·53	1·7863
7·17	1·8618	37·03	1·7700
7·37	1·8620	39·49	1·7601
7·75	1·8619	57·78	1·6879
9·10	1·8605	72·89	1·6227
11·33	1·8557	90·76	1·5408
12·71	1·8520	98·19	1·5080
16·52	1·8414	100·00	1·5009

The specific gravities were determined at 18°/18° C. in air. It will be seen that the addition of nitric acid up to about 7·5 per cent. increases the density. Further additions diminish it again.

A considerable number of experiments have also been carried out to ascertain the influence of the sulphates of sodium, magnesium, calcium, aluminium, iron, and lead in acids of various strengths from 70 to 100 per cent. The results are given in Table II., wherein is shown the increase in the specific gravity caused by adding 0·1 per cent. of sulphate to acids of different strengths. In many cases the impurity could not actually be present to the extent of 0·1 per cent. because its degree of solubility is too small.

The effect of arsenious oxide and of nitrous acid was also ascertained, the latter being added in the form of nitroso-sulphuric acid (chamber crystal).

TABLE II.

Effect of Impurities on Specific Gravity of H_2SO_4.

Strength.	100 per Cent.	98 per Cent.	94 per Cent.	80 per Cent.	70 per Cent.
Na_2SO_4	0·0011	0·0010	0·0007	0·0008	0·0007
$CaSO_4$	0·0012	0·0011	0·0009	0·0007	0·0006
$Al_2(SO_4)_3$	Insoluble	Insoluble	Insoluble	0·0012?	0·0011
$Fe_2(SO_4)_3$	,,	,,	0·0006?	0·0008	0·0007
$PbSO_4$	0·0017	0·0014	0·0015	Insoluble	Insoluble
$MgSO_4$	0·0011	0·0010	0·0012	0·0009	0·0009
As_2O_3	..	0·0013	..	0·0010	..
$HSNO_5$	0·00029	0·00027	..	0·00023	..

These figures show the increase in density caused by the actual addition of the impurities in question. It should, however, be borne in mind that the acids with 0·1 per cent. impurity necessarily contain nearly 0·1 per cent. less H_2SO_4 than the pure acids with which they are compared.

The addition of nitrous acid appears to always cause an increase in the specific gravity, however much be already present. A nitrous vitriol has indeed been produced, having a specific gravity as high as 1·95. This figure was obtained for a solution of nitrosulphuric acid in the strongest sulphuric acid.

The sulphates of aluminium and iron are practically insoluble in strong acid; that of lead in acid of 70 or 80 per

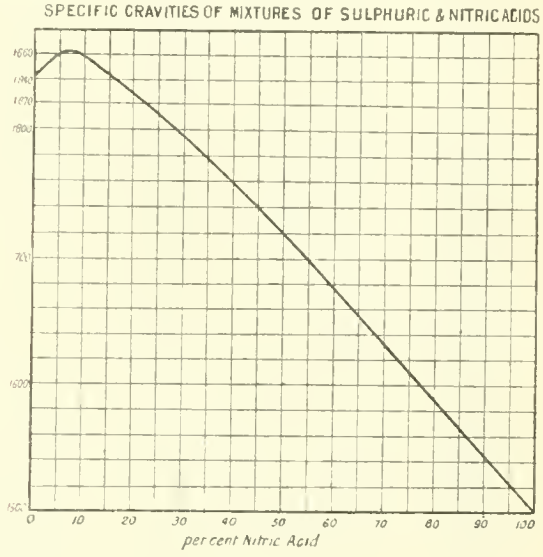
cent. strength. The sulphate of calcium is only slightly soluble in the weaker acids. Of the sulphates under consideration, the sodium salt is the only one which is soluble to any great extent both in strong and weak acid.

It was intended to give a table showing the degree of solubility in the different acids, but in consequence of the difficulty of getting the sulphates into solution on the one hand, and the tendency to form supersaturated solutions on the other, it has been found difficult to assign definite numerical values to the solubility.

The effects of the principal impurities upon the specific gravity of sulphuric acid have been given above more or less roughly. There is, however, one impurity which has not yet been dealt with, but which is nevertheless of as great importance as any of the others, *viz.*, water. Tables giving the specific gravities of sulphuric acids containing varying percentages of water have been published by various writers, but the table of Lunge is perhaps that which is generally adopted. In point of accuracy, however, Lunge's figures are exceeded by those of Pickering (Jour. Chem. Soc., 1890, **57**, 154). The latter's table is not presented in the form most convenient for practical use. I have, therefore, recalculated it, giving the percentage of H_2SO_4, corresponding to each interval of 0·001 of specific gravity. I have preferred to give the specific gravity at 15/15° C. in air. In actual practice one must always determine densities relative to water at the same temperature, both being weighed in air. Although for some scientific purposes it may be of importance to give specific gravities relative to water at 4° C. or some other temperature, and to correct for air displacement, this must always require additional calculations involving expenditure of time and increased liability of error.

The correction for air displacement may be very conveniently made by means of the formula $S_v = S_a - a(S_a - 1)$, where S_v, S_a are the specific gravities *in vacuo* and air respectively, and a is the weight of a cubic centimetre of air. In the case of a substance whose specific gravity is higher than 1, the correction to be subtracted is obtained by multiplying the decimal portion of the specific gravity by the density of air (0·0012).

Some figures have been published by Kolb to indicate the effect of nitrogen trioxide on the density of sulphuric acid, and by Kissling for arsenic trioxide. But in both cases the results given do not at all agree one with the other. Kolb has also determined the solubility of lead sulphate in sulphuric acids of various strengths. He states that acid of a specific gravity 1·841 dissolves 0·039 per cent. $PbSO_4$, but this figure is too low. In an acid of 98 per cent. strength I have found 0·09 per cent. $PbSO_4$, and in one of 94 per cent. strength, 0·06 per cent.



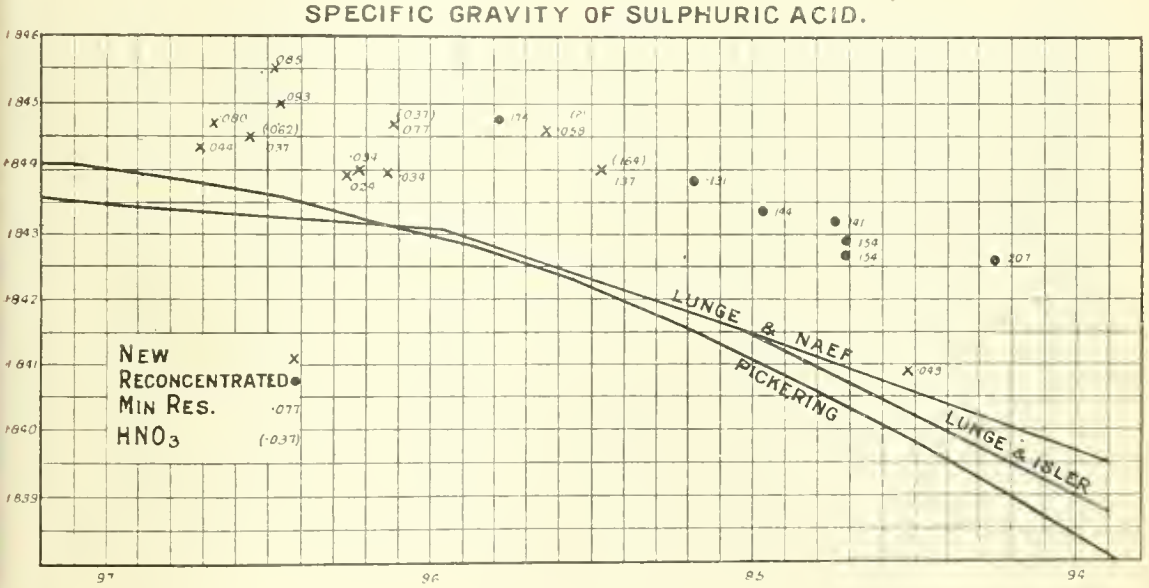


TABLE III.

Specific Gravities of Sulphuric Acid at 15°/15° C. in Air.

—	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.
1·00	0·00	0·15	0·31	0·46	0·60	0·73	0·87	1·01	1·15	1·30
1·01	1·45	1·60	1·75	1·89	2·04	2·19	2·34	2·49	2·64	2·79
1·02	2·93	3·08	3·23	3·38	3·53	3·67	3·82	3·97	4·12	4·26
1·03	4·41	4·56	4·70	4·85	5·00	5·14	5·29	5·44	5·58	5·73
1·04	5·88	6·03	6·17	6·32	6·46	6·60	6·75	6·89	7·04	7·18

TABLE III.—*continued.*

—	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.
1·05	7·32	7·47	7·61	7·76	7·90	8·04	8·19	8·33	8·47	8·62
1·06	8·76	8·90	9·04	9·18	9·33	9·47	9·61	9·75	9·89	10·04
1·07	10·18	10·31	10·45	10·59	10·73	10·87	11·00	11·14	11·28	11·42
1·08	11·56	11·69	11·83	11·97	12·11	12·24	12·38	12·52	12·66	12·79
1·09	12·93	13·07	13·20	13·34	13·48	13·61	13·75	13·89	14·02	14·16
1·10	14·29	14·43	14·56	14·70	14·83	14·97	15·10	15·24	15·37	15·51
1·11	15·64	15·78	15·91	16·05	16·18	16·31	16·45	16·58	16·71	16·84
1·12	16·98	17·11	17·24	17·37	17·51	17·64	17·77	17·90	18·03	18·16
1·13	18·30	18·43	18·56	18·69	18·82	18·95	19·08	19·22	19·34	19·47
1·14	19·60	19·73	19·86	19·99	20·12	20·25	20·38	20·51	20·64	20·77
1·15	20·90	21·03	21·16	21·28	21·41	21·54	21·67	21·80	21·93	22·05
1·16	22·18	22·31	22·44	22·56	22·69	22·82	22·94	23·07	23·20	23·32
1·17	23·45	23·57	23·71	23·83	23·96	24·08	24·21	24·34	24·46	24·59
1·18	24·71	24·84	24·97	25·09	25·22	25·34	25·47	25·59	25·72	25·84
1·19	25·97	26·09	26·22	26·34	26·47	26·59	26·71	26·84	26·96	27·09
1·20	27·21	27·33	27·46	27·58	27·71	27·83	27·95	28·08	28·20	28·32
1·21	28·45	28·57	28·69	28·82	28·94	29·06	29·18	29·31	29·43	29·55
1·22	29·69	29·80	29·92	30·04	30·17	30·29	30·41	30·53	30·65	30·78
1·23	30·90	31·02	31·14	31·26	31·38	31·50	31·62	31·75	31·87	31·99
1·24	32·11	32·23	32·35	32·47	32·59	32·71	32·83	32·95	33·07	33·19
1·25	33·31	33·43	33·55	33·67	33·79	33·91	34·02	34·14	34·26	34·38
1·26	34·50	34·62	34·74	34·86	34·98	35·09	35·21	35·33	35·45	35·57
1·27	35·68	35·80	35·92	36·04	36·15	36·27	36·39	36·51	36·62	36·70
1·28	36·86	36·97	37·09	37·21	37·32	37·44	37·56	37·68	37·79	37·91
1·29	38·03	38·14	38·26	38·37	38·49	38·60	38·72	38·83	38·95	39·06
1·30	39·18	39·29	39·41	39·52	39·64	39·75	39·86	39·98	40·09	40·20
1·31	40·32	40·43	40·54	40·66	40·77	40·88	40·99	41·11	41·22	41·33
1·32	41·45	41·56	41·67	41·79	41·90	42·01	42·12	42·23	42·35	42·46
1·33	42·57	42·68	42·79	42·90	43·01	43·12	43·23	43·35	43·46	43·57
1·34	43·68	43·79	43·90	44·01	44·12	44·23	44·34	44·45	44·56	44·67
1·35	44·77	44·88	44·99	45·10	45·21	45·32	45·43	45·53	45·64	45·75
1·36	45·86	45·97	46·07	46·18	46·29	46·39	46·50	46·61	46·71	46·82
1·37	46·92	47·03	47·14	47·24	47·35	47·45	47·56	47·67	47·77	47·88
1·38	47·98	48·09	48·10	48·30	48·40	48·50	48·61	48·71	48·82	48·92
1·39	49·02	49·13	49·23	49·34	49·44	49·54	49·65	49·75	49·86	49·96
1·40	50·06	50·16	50·26	50·37	50·47	50·57	50·67	50·77	50·88	50·98
1·41	51·08	51·18	51·28	51·38	51·48	51·58	51·68	51·78	51·89	51·99
1·42	52·09	52·19	52·29	52·39	52·49	52·59	52·69	52·79	52·89	52·98
1·43	53·08	53·18	53·28	53·38	53·48	53·58	53·68	53·78	53·88	53·97
1·44	54·07	54·17	54·27	54·36	54·46	54·56	54·65	54·75	54·85	54·94
1·45	55·04	55·14	55·24	55·33	55·43	55·53	55·62	55·72	55·82	55·91
1·46	56·01	56·11	56·20	56·30	56·39	56·49	56·59	56·68	56·78	56·87
1·47	56·97	57·06	57·16	57·25	57·35	57·44	57·54	57·63	57·73	57·82
1·48	57·92	58·01	58·10	58·20	58·29	58·38	58·48	58·57	58·66	58·75
1·49	58·85	58·94	59·03	59·12	59·22	59·31	59·41	59·50	59·59	59·68
1·50	59·78	59·87	59·96	60·05	60·14	60·23	60·33	60·42	60·51	60·60
1·51	60·69	60·78	60·87	60·96	61·05	61·14	61·24	61·33	61·42	61·51
1·52	61·60	61·69	61·78	61·87	61·96	62·05	62·14	62·23	62·32	62·41
1·53	62·50	62·59	62·68	62·77	62·86	62·95	63·04	63·13	63·22	63·31
1·54	63·40	63·49	63·58	63·67	63·76	63·85	63·94	64·03	64·12	64·20
1·55	64·29	64·38	64·47	64·55	64·64	64·73	64·82	64·91	65·00	65·08
1·56	65·17	65·26	65·35	65·44	65·52	65·61	65·70	65·79	65·88	65·96
1·57	66·05	66·14	66·23	66·31	66·40	66·49	66·57	66·66	66·75	66·83
1·58	66·92	67·01	67·10	67·18	67·27	67·36	67·44	67·53	67·62	67·70
1·59	67·79	67·88	67·97	68·05	68·14	68·23	68·31	68·40	68·49	68·57
1·60	68·66	68·74	68·83	68·92	69·00	69·09	69·17	69·26	69·35	69·43
1·61	69·52	69·60	69·69	69·78	69·86	69·95	70·03	70·12	70·20	70·29
1·62	70·38	70·46	70·55	70·63	70·72	70·80	70·89	70·97	71·06	71·14
1·63	71·23	71·31	71·40	71·48	71·57	71·65	71·74	71·82	71·91	71·99
1·64	72·07	72·16	72·25	72·33	72·42	72·50	72·59	72·67	72·76	72·84
1·65	72·93	73·01	73·10	73·18	73·27	73·35	73·43	73·52	73·52	73·69
1·66	73·77	73·86	73·94	74·02	74·11	74·19	74·27	74·36	74·44	74·53
1·67	74·61	74·69	74·78	74·86	74·95	75·03	75·12	75·20	75·29	75·37
1·68	75·46	75·54	75·63	75·71	75·80	75·88	75·97	76·05	76·14	76·22
1·69	76·31	76·39	76·48	76·56	76·65	76·74	76·82	76·91	76·99	77·08
1·70	77·17	77·25	77·34	77·42	77·51	77·60	77·68	77·77	77·85	77·94
1·71	78·03	78·11	78·20	78·28	78·37	78·46	78·54	78·63	78·72	78·80
1·72	78·89	78·97	79·06	79·15	79·23	79 32	79·41	79·49	79·58	79·67
1·73	79·75	79·84	79·93	80·02	80·11	80·20	80·29	80·38	80·47	80·56
1·74	80·65	80·74	80·84	80·92	81·01	81·10	81·19	81·28	81·37	81·46
1·75	81·55	81·64	81·73	81·82	81·92	82·01	82·11	82·21	82·31	82·41
1·76	82·51	82·61	82·71	82·80	82·90	83·00	83·10	83·20	83·29	83·39
1·77	83·49	83·59	83·69	83·78	83·88	83·98	84·08	84·18	84·29	84·39
1·78	84·50	84·60	84·71	84·81	84·92	85·03	85·14	85·25	85·36	85·47
1·79	85·60	85·72	85·84	85·96	86·08	86·20	86·32	86·45	86·58	86·71
1·80	86·84	86 97	87·10	87·23	87·36	87·50	87·64	87·78	87·92	88·06
1·81	88·20	88·34	88·49	88·64	88·79	88·95	89·11	89·27	89·44	89·61
1·82	89·79	89·97	90·15	90·33	90·51	90·70	90·90	91·10	91·30	91·52
1·83	91·74	91·98	92·22	92·46	92·71	92·98	93·26	93·56	93·87	94·20
1·84	94·57	94·96	95·40	96·02	96·93					
1·84	99·88	99·61	99·29	98·84	98·08					
1·8442		97·50								
1·8394		100·0								

In conclusion, I have to thank Major F. L. Nathan, R.A., Superintendent of the Royal Gunpowder Factory, for giving me permission to publish these notes.

DISCUSSION.

Mr. OSCAR GUTTMANN said they were very much obliged to Mr. Marshall for his investigations, and for having taken the trouble to compile the table of gravities and percentages; but as they had had no opportunity of seeing it, he thought it would be a great advantage, before making any remarks, if he would kindly state, as an example, the gravity, according to his recalculated Tickering table, of acid of 98 per cent. and of 95 per cent. respectively. He thought that would help them to understand the paper.

The CHAIRMAN said of course they could not criticise these tables before they had examined them fully in print,

but they would be very useful to all persons dealing with concentrated sulphuric acid. There were two things especially brought forward which were well known, but not altogether explained, the solubility of the nitroso-sulphuric acid with a large increase of specific gravity; but there were some rather curious points about that. You did not get concordant results; the specific gravity did not quite agree with the analyses. There were also variations due to the presence of nitric acid, which again had points of peculiarity. They were much indebted to Mr. Marshall and to the authorities at Waltham Abbey for allowing this information to be made known.

Mr. MARSHALL then put upon the board the following figures: Specific gravity of sulphuric acid of 98·08 per cent. strength, 1·8440; and of 95 per cent., 1·8411.

Mr. GUTTMANN said no doubt the Chairman and those conversant with the subject would remember that Lunge pointed out that when you came beyond the 97 per cent. strength the specific gravity, instead of increasing, decreased. According to some experience he had in the matter it was found that very pure sulphuric acid, of very high percentage, had a higher specific gravity than Lunge's tables indicated, and the reason could not be very well explained. On looking at Mr. Marshall's diagram it appeared that it gave, for an acid of practically 97½ per cent. on Pickering's table, a specific gravity of 1·844; whilst in the commercial acid he got in every case an acid of higher specific gravity than was shown in Lunge's tables. Also the recovered acid showed a higher specific gravity in every case without exception. It struck him that, according to Marshall's results, neither table was correct, and the reason for that seemed to him still occult, in spite of this paper. The author had shown that a percentage of nitrous acid increased the specific gravity, and, as the Chairman said, that was known. It was a practice in some factories to ascertain the specific gravity of waste acid, and to fix the analysis straight away from a table, but of course the results could not be accurate. Mr. Marshall said he had prepared nitrous vitriol of 1·98 sp. gr. He had no doubt about Mr. Marshall's great ability in making these determinations, but he should have liked to see a complete analysis of the acid, because it struck him as being of very extraordinary specific gravity. He further said that the Kessler acid came out brown, and that he could not find any reason for that, as all his tests for organic matter or impurities failed, and he thought that the sulphuric acid must have been carried in a vessel which contained some mixed acid, and had thereby got some nitric acid into it. Was it not more likely that some nitric acid from waste or otherwise was added on concentrating, so as to get rid of the impurities, which was a very common practice? Everybody who concentrated knew that there was a certain limit temperature at which the acid was still from black to brown, but once you exceeded that, all these suspended impurities went down, and the acid became white; but that limit temperature was never reached in Kessler's apparatus. He did not wish to slander the apparatus, but he did not think one got, as a rule, more than 95½ per cent. of acid from it. One never got to the strength where one got an absolutely white acid. All the apparatus he had seen invariably gave an acid slightly coloured. He should like to say again that this paper was no doubt very complete and useful, and he should like to see the work continued, with a view to finding out these differences in a more definite way.

Mr. MARSHALL, in reply, said, with regard to the specific gravity of these strong acids, Mr. Guttmann suggested that Pickering's figures, though more accurate than Lunge's, still left something to be desired. He had absolutely no reason to think so from his own results. One must bear in mind that, though these titrations were carried out with the greatest degree of accuracy he could attain, one could not obtain an accuracy much more than 0·05 per cent. in titrating strong sulphuric acids. There did not seem to him to be any reason at present to doubt Pickering's figures. He thought Mr. Guttmann had rather misunderstood him when he said he had not been able to find any reason for the brown colour. He did not detect any large percentage of organic matter, but all chemists would agree that a very small percentage would be sufficient to colour sulphuric acid, or almost any substance, under favourable conditions, and the amount he found, 0·017, was quite enough to account for the colour of the reconcentrated acid. Mr. Guttmann rather suggested that perhaps the different results obtained with reconcentrated and impure acids were due to the fact that waste acids or nitric acids had been added before reconcentration. They had found it necessary to add a little in order to remove the organic impurities as far as was desirable, but this nitrous acid, in the course of reconcentration, was entirely driven out again. These acids were all carefully tested for nitric and nitrous acids in various ways, and no trace could be detected.

THE DETERMINATION OF THE STRENGTH OF SULPHURIC ACID.

BY ARTHUR MARSHALL, F.I.C., F.C.S.

Some four years ago I read before the Society a paper on the preparation of standard solutions of sulphuric acid. It was proposed to take pure sulphuric acid, dilute it with half its volume of water, determine its specific gravity, and from that deduce its exact strength by means of a table or formula given by me (this Journal, 1899, 4 and 1091). The requisite quantity of this acid was then to be weighed out and made up to a definite volume. I have reason to believe that this system has been extensively adopted, as it affords a very convenient and accurate means of checking in an entirely independent way the results obtained by the sodium bicarbonate method.

By the use of the same tables one can easily determine the strength of a sample of pure sulphuric acid, that is, an acid in which the amount of impurity other than water does not exceed 0·01 per cent. A quantity of the acid is weighed out, water is added to reduce the strength to 70 or 80 per cent. H_2SO_4, and the specific gravity is taken. The strength of the diluted acid is then ascertained from the table. This multiplied by the weight of diluted acid and divided by the weight of original acid gives the strength of the latter. Duplicate determinations give results which seldom differ by more than 0·01 per cent.

The figures given in the previous paper permit of the method being extended to ordinary sulphuric acids, as an allowance can be made for mineral impurities present. The method of procedure varies slightly according as to whether it is desired to determine the percentage as accurately as possible, or only to obtain an approximate result.

If great accuracy be required, the determination is carried out exactly as has been described for pure sulphuric acid, except that the strength of the diluted acid must be corrected for the solid impurity. The dilute acid is allowed to stand in order that any precipitate of lead or calcium sulphate may deposit. The specific gravity of the clear liquid is then taken, and a measured quantity is also evaporated down in a weighed platinum dish and the percentage of solid residue is ascertained. The strength of the acid is obtained from the table (see previous paper), and from the strength found 1·4 times the mineral impurity is subtracted. A simple calculation then gives the percentage of H_2SO_4 in the sample. Thus, to take an actual instance, 54·764 grammes of an acid were taken, and diluted with water to 69·620 grammes. After settling this was found to leave 0·21 per cent. of residue on evaporation, and to have a specific gravity of 1·6888 at 15°/15° C. in air, corresponding to 76·20 per cent. The true percentage was therefore $76·20 - 0·21 \times 1·4 = 75·91$, and the strength of the sample was $75·91 \times \frac{69·620}{54·764} = 96·50$ per cent. The figure found by titration was also 96·50 per cent. The following are the results obtained with some other samples:—

	II.	III.	IV
By proposed method..	95·74	96·14	96·42
By titration	95·71	96·09	96·47

If there be any considerable quantity of arsenic present the percentage of As_2O_3 should be multiplied by 1·6 and the

product be subtracted as already described. The sample No. II. above contained 0·07 per cent. As_2O_3.

Where only approximate figures are required, for control in the works for instance, the procedure may be simplified somewhat. Instead of taking the specific gravity with a pyknometer, a hydrometer may be used. The quantities of acid and water may be measured out instead of being weighed, provided they are occasionally checked by means of a balance. If the mineral residue be known approximately, as is generally the case in works, it is not necessary to determine it each time. Excepting in the case of sodium sulphate the various sulphates cannot be present to a greater extent than a few hundredths of a per cent. Where a certain definite method of procedure is adopted, and the same quantities of acid and water are always taken, a table can be constructed, which for each specific gravity gives at once the strength of the original acid.

The strength of sulphuric acid can also be approximately determined from the contraction, which takes place on diluting with water. The estimation can be carried out without the use of a balance, graduated vessels only being required. In a 300 c.c. graduated flask are placed 100 c.c. of water. A funnel is placed in the neck of the flask, and on to the water is rapidly poured 200 c.c. of the sulphuric acid, measured at 15° C. The liquid is mixed and cooled to 15°, and the contraction is measured by running in paraffin oil from a burette. The following table gives the contraction for different strengths of acid:—

H_2SO_4.	Contraction of 200 c.c. with 100 c.c. of Water.	H_2SO_4.	Contraction of 200 c.c. with 100 c.c. of Water.
Per Cent.		Per Cent.	
98	24·1	91	15·0
97	22·6	90	13·9
96	21·2	89	12·9
95	19·8	88	12·0
94	18·5	87	11·2
93	17·3	86	10·4
92	16·1		

Discussion.

The Chairman said that this was a short paper, but very interesting, especially the portion referring to the estimation by means of the contraction on dilution with water. They had always looked at that as a source of error or difficulty in making the estimation of percentages, but in this case it was used as a means of ascertaining the percentage, which was a very ingenious idea. He hoped when it was thoroughly tested in practice it would prove to be of utility. There might be disturbing elements, perhaps, and that was the advantage of a paper like this, that an idea was put forward which dozens of members would experiment upon practically and very useful results might be obtained.

Manchester Section.

MECHANICAL AND ENGINEERING DEPARTMENTS OF THE MUNICIPAL SCHOOL OF TECHNOLOGY.

BY J. T. NICHOLSON, D.Sc., M.I.M.E.

On Friday, Dec. 5, members had an opportunity of inspecting the mechanical and engineering departments of the Municipal School of Technology. Prof. J. T. Nicholson addressed the members as follows:—

The laboratories of the engineering schools in this country have hitherto been designed with the following objects: The teaching of applied mechanics by models and experimental apparatus similar to that found in a physical laboratory; the determination of a few of the properties of the materials of construction; the instruction of students in the common methods of testing prime movers; and, generally, to the very desirable object of showing young engineers the limitations imposed by practice upon the theoretical treatment of their subjects in the lecture room.

In view of the future of international industrial competition, however, a more thorough examination of the details of machines, and the institution of extensive and elaborate researches upon prime movers and the mechanisms of transmission and absorption of energy appear to be necessary, and it therefore seemed to the author that in a great mechanical engineering centre like Manchester the scope of the laboratory equipment in the technical school ought to be so extensive as to include not only all the above, but to provide facilities for the active co-operation of the leaders of industry themselves—or their properly trained deputies—in experimental work on the problems of engineering design which present themselves in their practice.

The field of operations which this opens up is of unlimited extent, and all that can be done in one engineering school such as the present, is a mere vanishing fraction of the whole.

What is really required is the establishment of laboratories in connection with every engineering works, in which a properly trained staff can be engaged, year in, year out, on experimental researches for the improvement of the machines turned out. Firms abroad and at home (of the latter, alas! how few) who have tried this method have found it abundantly remunerative.

In the equipment of the engineering department of this school, the author attempted to further our experimental knowledge by the design of special full-sized plants, principally along three lines of research:—

(*a*) In steam engines: Upon the study of the question of the leakage of steam across the admission and exhaust valves; the nature of such leakage and its laws, if any exist, and the means to be adopted for its prevention. The large experimental engine of 350 h.p. was specially designed and fitted with this purpose in view.

(*b*) A closer study of the principles of action and of design of the details of machine parts than has hitherto been generally attempted. As, for example, the carrying out of systematic experiments upon the mode of action of pump valves, as depending on the type of valve, size, and lift for different plunger speeds and speeds of revolution.

(*c*) The exemplification in a number of pieces of apparatus of the principle that high speed of circulation greatly enhances the rate at which fluids can transmit heat from one side to another of a metal surface. This principle was enunciated by Prof. Osborne Reynolds in 1874, but has only recently been unearthed and experimentally demonstrated by one of his pupils. Two surface condensers have been constructed to the author's designs, in which the circulating water was made to scour by its very rapid motion the cold surfaces of the tubes, so that a high rate of transmission of heat or condensation of steam was effected; to wit, over 100 lb. per hour per square foot of cooling surface. The principle here referred to applies to such other structures as boilers, feedheaters, superheaters, intermediate receivers, heating and cooling jackets, evaporators, and must have a very wide application also in many departments of chemical engineering.

Newcastle Section.

Meeting held at the Durham College of Science, on Thursday, November 27th, 1902.

DR. J. T. DUNN IN THE CHAIR.

COMPOSITION OF MILK IN THE NORTH OF ENGLAND.

BY S. H. COLLINS, F.I.C.

As figures dealing with the composition of milk in the North of England are neither very complete nor easily available, I think that the following table should be placed

on permanent record. The number of the cow is given in the first column, cows Nos. 1—15 being cross-bred shorthorns, cows Nos. 16—18 being black polled, and cow No. 17 a shorthorn. Cow No. 11 is aged. The period of lactation is given in the second column. The other columns refer to the amount and composition of the milk. The times of milking were from 5 to 6 o'clock in the morning and from 12 to 1 in the afternoon, giving very unequal periods.

The milk of cows Nos. 9 and 14 was called by practical dairymen "seemingly rich milk," though analysis shows

Table Showing the Yield and Composition of the Milk from Individual Cows in a Herd, October 1902.

Cow.	Weeks since Calving.	Morning Milk.					Afternoon Milk.					Day's Milk.					Cow.
		Milk.	Fat.	S.N.F.	Fat.	S.N.F.	Milk.	Fat.	S.N.F.	Fat.	S.N.F.	Milk.	Fat.	S.N.F.	Fat.	S.N.F.	
No.		Pints.	Oz.	Oz.	Per Cent.	Per Cent	Pints.	Oz.	Oz.	Per Cent.	Per Cent.	Pints.	Oz.	Oz.	Per Cent.	Per Cent.	No.
1	24	12	6·95	20·65	2·83	8·40	4	2·73	7·13	3·33	8·70	16	9·68	27·78	2·95	8·47	1
2	28	10	7·26	17·39	5·54	8·49	6	6·51	10·03	5·30	8·16	16	13·77	27·42	4·20	8·36	2
3	24	15	12·42	27·06	4·04	8·80	12	11·43	20·04	4·65	8·15	27	23·85	47·10	4·31	8·51	3
4	8	14	7·23	25·74	2·52	8·97	10	12·41	17·75	6·06	8·67	24	19·64	43·49	3·99	8·83	4
5	24	8	5·79	13·10	3·53	7·99	5	4·97	8·26	4·85	8·07	13	10·76	21·36	4·04	8·02	5
6	32	16	16·89	30·34	5·15	9·25	5	5·38	9·37	5·25	9·14	21	22·27	39·71	5·18	9·23	6
7	32	10	6·72	17·06	8·28	8·33	6	5·65	10·32	4·60	8·40	16	12·37	27·38	3·77	8·34	7
8	32	10	8·38	18·04	4·09	8·86	5	4·39	8·79	4·29	8·58	15	12·77	26·83	4·15	8·73	8
9	2	16	10·91	30·54	3·33	9·32	8	7·11	15·15	4·34	9·24	24	18·02	45·69	3·66	9·28	9
10	12	20	13·23	34·03	3·23	8·31	6	5·71	10·02	4·65	8·15	26	18·94	44·05	3·56	8·28	10
11	6	7	3·97	12·37	2·77	8·63	5	6·36	8·52	6·21	8·32	12	10·33	20·89	4·20	8·49	11
12	16	11	8·99	20·60	3·99	9·14	6	6·88	9·77	5·60	7·95	17	15·87	30·37	4·56	8·72	12
13	4	14	10·13	25·04	3·53	8·74	7	8·76	12·10	6·11	8·44	21	18·89	37·14	4·39	8·63	13
14	4	15	7·12	24·82	2·32	8·08	9	8·10	14·28	4·39	7·74	24	15·22	39·10	3·10	7·95	14
15	104	14	9·98	24·32	3·48	8·69	5	4·19	8·78	4·09	8·57	19	14·17	33·70	3·64	8·66	15
16	24	8	6·86	13 20	4·19	8·05	1	0·97	1·68	4·75	8·19	9	7·83	14·88	4·25	8·06	16
17	8	12	9·93	21·59	4·04	8·78	6	6·71	10·49	4·65	8·54	18	15·64	32·08	4·24	8·69	17
18	24	14	10·70	25·10	3·73	8·75	7	8·47	11·85	5·91	8·27	21	19·17	36·95	4·45	8·58	18
Average	..	..	..	..	3·55	8·67	..	..	..	4·99	8·38	..	..	..	4·03	8·57	..

that the milk of cow No. 9 is below the average of the herd and that of cow No. 14 the poorest; thus demonstrating the loose way in which such phrases as "rich milk" are used.

Discussion.

Dr. Dunn agreed with Mr. Collins, and stated that although the Commission examined witnesses from all over the country in fixing the minimum percentage of fat in milk, yet the actual analytical figures were largely taken from samples of milk obtained from the South of England. It was contended by people in the North that an objection was to be found to the standard, for they could not expect to get the same quality of milk from the cows here as from those fed on the rich pastures in the South. It was stated that this was unfair to the farmers, and pressed hardly upon them. The figures in the table, however, showed that average cows gave milk considerably over the standard, that although the intervals between the two milkings were so different, and the long interval would tend to produce milk of poor quality, poorer in fat than that got at the end of the short interval, yet even the morning's milk contained $3\frac{1}{2}$ per cent. of fat and the average for the day was over 4 per cent., leaving a considerable margin. This showed conclusively how lenient the commission had been in fixing the standard. There must be exceptional cases now and again. Though the table shewed that the performance of individual cows might now and again fall below the standard, yet the cases in which the milk of a herd of cows yielded less than 3 per cent. of fat were extremely rare. He thought the general public were too apt to consider that the regulations pressed hardly on the farmer; but they ought to remember, first, that the farmer was not necessarily fined if his milk were below the standard, if he could prove that it came directly from the cow, and secondly, that the standard is really a very low one, so that a milk *just* below the standard is a *long way* below an average good milk.

Another point he noted with interest was the connection (or want of connection) between the yield of milk and its, quality. It seemed natural to suppose that the milk from a cow which yielded a large quantity would be poor in quality but inspection of the table seemed to show that that was not the case. He thought this work of Mr. Collins, the accumulation of accurate knowledge on these subjects, must prove of very great value.

Mr. Harry Smith drew attention to the fact that some cows gave milk below the 3 per cent. of fat, and that thus farmers were liable to be fined although there was no adulteration.

Dr. Dunn pointed out that the milk should be mixed, and thus the average would be above the standard.

Mr. Collins said it was the practice of some farmers to milk the cows directly into the cans of the customers; and although in the South the milk was often all passed through the cooler, and thus strained, aerated, and mixed, this did not appear to be generally done in the North. He saw no reason why a milk dealer should not be compelled to mix the milk from the individual cows of a herd, since a dealer in solid commodities was expected to mix and sell material of a uniform quality.

Mr. Holmes pointed out that in some cases people with young children got the farmer to supply milk from a single cow, but the great variation in the composition of milk from different cows in a herd rendered it desirable that the cows should be tested first before selecting that cow.

Mr. Collins explained that it was not always beneficial for young children to get too rich a milk.

SUGAR IN SWEDES.

PART II.—VARIATION IN THE AMOUNT OF SUGAR UNDER DIFFERENT CONDITIONS OF GROWTH.

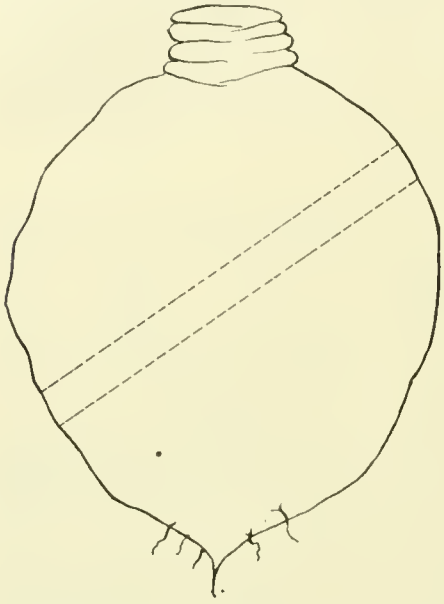
BY S. H. COLLINS, F.I.C.

In the first part of this paper, which was read before the Society in June of last year, and was printed (this Journal, 1901, 536), I pointed out the great difference there was in the amount of sugar in the individual swede, and gave the details of the analytical methods employed to find out these differences. In the present communication I wish to set before you the different amounts of sugar I have found in swedes of different varieties, grown under different conditions.

Analytical Details.—The essential details were given in Part I., and it is only necessary to make a few additional remarks. When determining the amount of sugar in single borings, which generally weighed from 10 to 15 grms., the set of yellow standards in the calorimeter could be dispensed with; by employing always 10 c.c. of water for every gramme of swede boring it was possible to construct a

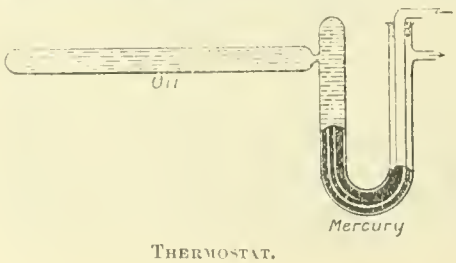
special scale to read directly in percentages, an advantage which is obvious. When determining the amount of sugar in the dried swede the set of yellow standards had to be employed, and I found that the most convenient proportions were 4 grms. of swede, previously dried at 55° C., 100 c.c. of water, and 4 c.c. of a concentrated solution of lead acetate.

Methods of Sampling.—As mentioned in Part I. of this paper, the sampling has been done by taking cores out of the swedes by means of a cork-borer or auger; the former proved too slow in use for the large amount of work required to be done, and the latter, as obtained ready made, proved too apt to tear the roots at the point of entry Special augers were, however, made of even section throughout their length. For much of this part of the work I have to thank Mr. F. Wakerley. Nearly 15,000 swedes have been sampled for the investigations, the results of which are detailed here. Many of these samples were taken while the turnips were in the ground, under which circumstances it was found convenient to take the sample in a diagonal direction, as is illustrated in the diagram. Fifty



such borings were tied up in some butter paper, two packets of 50 making a sample, and forwarded to the college for analysis.

Methods of Drying.—Partly for the sake of other investigations, partly for the advantage of storing, most of the samples were dried at temperatures between the limits of 50° and 60° C. Although the estimation of dry matter in swedes may seem a matter too elementary to need any remarks, yet in dealing with the large amount of material needed for these investigations, many alterations in ordinary apparatus have been found necessary. Fully 30 galls. of water have had to be evaporated during the drying of the swedes, an amount quite beyond the powers of any ordinary analytical drying oven, Special jacketed hot-air ovens



Thermostat.

were accordingly made for the purpose of these investigations, the ovens being heated by gas, the flow of which was regulated by thermostats so as to maintain the specified temperatures of between 50° and 60° C. The oven was regulated so that the centre shelf had a temperature of 52°, under which circumstances the top shelf kept at 54°, and the bottom shelf at 57°. The amount of gas passing through the burners was too great for control by a thermostat which depended upon the expansion of mercury only, and I found that those which depended upon the expansion of air were subject to fluctuations due to the variations of atmospheric pressure. The one now in use depends upon the expansion

Drying Oven.

of common paraffin oil, a small quantity of mercury being interposed between the oil and the gas. Paraffin oil has a large coefficient of expansion, and is of course cheap and easily obtained. I have found that it works very well in practice. For evaporating large quantities of water the ventilation of the oven is as important as the heating. By simply making the doors of the oven overlap and leaving them open to a greater or less extent, I secured an excellent ventilation, the front of the shelves being, however, two or three degrees cooler than the back.

Results of Analyses.—The amounts of sugar found in the swedes that were analysed are set out in percentages in the tables accompanying this paper. The sugar is always expressed in terms of glucose, although some of it exists as other forms of sugar in the swede.

Effect of Storage.—Table I. gives the percentage of sugar in different varieties of swedes grown at Cockle Park in the season of 1900, both before and after they had been stored in sacks on a wooden floor and covered over lightly with straw. The columns marked A and B are the duplicates, each figure representing a single analysis of the borings from 50 swedes, the third and sixth columns being

TABLE I.

Percentage of Sugar in different Varieties of Swedes, Cockle Park, 1900.

Name of Variety.	Before Storage.			After Storage.			General Average.
	A.	B.	Mean.	A.	B.	Mean.	
Crimson King	6·0	6·1	6·05	6·7	6·2	6·45	6·25
Best of All	6·1	5·8	5·95	6·8	6·7	6·75	6·35
Model	6·0	6·0	6·00	6·0	6·3	6·15	6·08
Stirling Castle	6·6	6·8	6·70	6·6	7·0	6·80	6·75
X. L. All	6·3	6·3	6·30	5·8	6·3	6·05	6·18
Monarch	6·0	5·7	5·85	6·0	6·6	6·30	6·08
Fell's Bronze Top	6·8	7·2	7·00	7·8	7·8	7·80	7·40
Arctic	6·8	6·6	6·70	7·1	7·5	7·30	7·00
Drummond's Extra Improved.	6·1	6·4	6·25	7·4	7·7	7·55	6·90
Kangaroo	5·7	6·3	6·00	7·5	7·2	7·35	6·68
Elephant	6·1	6·2	6·05	6·9	6·8	6·85	6·45
Imperial	6·5	6·0	6·25	7·4	6·7	7·05	6·65
Halewood Bronze Top.	6·8	6·9	6·85	8·1	7·5	7·80	7·33
Average	..	..	6·30	..	..	6·94	6·62

the averages of the preceding columns of duplicates A and B. The average effect of storing swedes, as shown in the last line of the table, is to increase the amount of sugar by almost exactly one-tenth, and there is only one case out of the 13 varieties where there is no increase at all. This increase is partly due to loss of water by evaporation, and partly due to some of the other constituents of the swedes having been converted into sugar.

Effect of Season.—Table II. gives the percentage of sugar in different varieties of swedes grown at Cockle Park in

TABLE II.

Percentage of Sugar in different Varieties of Swedes, Cockle Park.

Name of Variety.	1900.	1901.	Average.
Crimson King	6·05	4·25	5·15
Best of All	5·95	4·05	5·00
Model	6·00	3·75	4·88
Stirling Castle	6·70	4·25	5·48
X. L. All	6·30	4·40	5·35
Monarch	5·85	3·55	4·70
Fell's Bronze Top	7·00	4·15	5·73
Arctic	6·70	4·65	5·68
Drummond's Extra Improved.	6·25	3·60	4·93
Kangaroo	6·00	3·75	4·88
Elephant	6·05	3·90	4·98
Averages.	6·26	4·05	5·15

both the seasons 1900 and 1901, the third column on the table being the average of the two seasons. It will be seen at once that the latter season has been a bad one as regards quality, all the varieties tested having a considerably smaller amount of sugar in them. The effect of season, therefore, is a very important one, and requires further investigation.

Effect of Variety.—If we carefully study the figures in Table II. we see that, in spite of the fact that the season makes a very profound difference in the amount of sugar in the swede, there is undoubted evidence that the amount of sugar in the swede is partly a function of the variety. The varieties named Stirling Castle, X.L. All, Fell's Bronze Top, and Arctic are above the average in both 1900 and 1901, the other varieties being below the average in both years, with the single exception of the first variety, Crimson King, which is slightly below the average in 1900, slightly above the average in 1901, and exactly average on the mean of the two years. How these varieties behave at other places than Cockle Park is the subject of investigations now going on, the result of which I hope to be able to communicate on some later occasion.

Effect of Soil and District.—In Table III. is given the amount of sugar found in swedes grown at the different places named in the North of England. In the centre column is added the character of the soil of the field on which the swedes were grown. The system of cultivation

TABLE III.

Showing the Effect of Soil and District on the Amount of Sugar in "Best of all" Swedes.

Grown at.	Soil.	Sugar.
		Per Cent.
Cockle Park	Loam	4·05
Cleatlam	Gravel loam	5·05
Newsham Grange	Alluvium	4·66
Newlands Haugh	Loam	4·73
New Raby	Gravel	5·45
Birtley	Strong loam	5·53

and manuring was the same in all cases. The season was that of 1901. From the figures in the table it is obvious that soil and district produce a great effect on the composition of the crop grown, though how much of this effect is due to the nature of the soil and how much to the climate of the district can only be determined by further investigations.

Effect of Manures.—Table IV. shows the variation in the percentage of sugar in swedes produced by different

TABLE IV.

Variation in Composition due to Manures.

Sugar (Per Cent.).

Station.	Manures.				No Manures.
	Complete Artificial.	No Nitrogen.	No Phosphates.	No Potash.	
Cleatlam	4·95	5·10	4·93	4·92	5·33
Neasham Grange.	4·82	5·06	4·58	4·57	4·75
Medomsley, East.	5·93	6·30	5·96	6·15	6·24
Medomsley, West.	5·25	6·27	5·36	5·94	6·21
Newlands Haugh.	4·66	4·61	4·95	4·90	4·52
Sherburn	6·54	5·91	5·36	5·73	6·85
Birtley	5·50	5·56	5·63	5·62	5·79
Average..	5·31	5·54	5·25	5·40	5·67

manurial treatment at the farms named. The complete artificial manure used for the swedes belonging to column 1 was the "standard dressing" of the Agricultural Department of this College, which amounts to 35 lb. of nitrogen, 100 lb. of phosphoric acid (P_2O_5), and 50 lb. of potash (K_2O) per acre. In this particular case the manures used were sulphate of ammonia, nitrate of soda, superphosphate, and kainit in amounts sufficient to give the above dressing. The swedes belonging to column 2 received exactly the same treatment, except that the nitrogenous manures were omitted; those belonging to column 3 received all except the phosphatic manure; those belonging to column 4 all except the potash; and those of the last column received no manure at all.

The differences as exhibited by this table are for the most part small and irregular, so that when averaged up the difference between the complete manure and the manures lacking in nitrogen and potash is too small to be worth attention at this preliminary stage of the investigations. The swedes which received no phosphates contained distinctly less sugar, but, as a crop grown under such conditions is very small in amount, and such a manurial treatment is altogether impractical, such a deficiency in sugar content would not occur under ordinary

circumstances. The swedes which received no manure at all contained more sugar than the others, but here again the system was impractical and the crop grown small. Hence, since all these differences in manurial treatment are exaggerated, and greater than would occur in actual practice, we may conclude that under any reasonable conditions the effect of different manures on the amount of sugar in swedes is very small indeed.

Effect of Size.—In the first part of this paper I showed in Table I. that the smaller swedes contained more sugar than the larger ones. This is a well-known fact, and hardly requires any further comment from me.

Weight of Sugar produced per Acre.—Table V. gives the total weight per acre of the swede crop after the swedes had

TABLE V.

Weight per Acre of the Total Crop of Swedes and the Sugar contained in them.

Name of Farm.	Manures used. Artificials.		Nitrogen omitted.		Phosphates omitted.		Potash omitted.		No Manure.	
	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.
Cleatlam....	16	0¾	14	10½	6	6¾	14	8½	9	3¾
	0	16	0	14¾	0	6½	0	14½	0	9¾
Neasham	22	2½	22	7¾	11	4	20	5¼	11	17¼
Grange ...	0	19¼	1	2¼	0	10¼	0	18½	0	11¼
Medomsley,	17	10	18	15	19	15	18	0	15	10
East.....	1	0¼	1	3¾	1	3½	1	2¼	0	19¼
Medomsley,	22	10	16	0	12	10¾	20	10	16	14½
West	1	3¾	1	0	0	13½	1	4¾	1	0¾
Sherburn ...	22	8½	19	10	19	14¾	20	4	14	17½
	1	9¾	1	3	1	1¼	1	3¾	1	0¾
Newlands	28	1½	27	2¾	21	14½	21	12¾	23	1¾
Haugh....	1	6	1	0	1	1¾	1	1¾	1	0¾
Birtley.....	20	6	15	18½	14	4	12	19½	11	15
	1	2¼	0	17¾	0	16	0	11½	0	13½

been topped and tailed. Under the figures for the total weight are placed the figures for the weight per acre of the sugar in the crop.

The principal points to be noted in this table are, that the weight of sugar produced per acre is not always proportionate to the weight of total crop, but that these differences are due to soil, district, and variety, rather than to the manure applied, and that at farms where the richness of the soil permits the use of unbalanced manurial dressings (Medomsley, E.), the composition of the crop is fairly uniform, and the yield per acre of both total crop and sugar is for practical purposes nearly parallel.

Whilst this paper could not well be concluded without giving some indication of the amounts of sugar produced per acre, yet it is impossible to make full use of this table without considering the composition of the different soils of the farms where the swedes were grown, a subject which would lead me too far away from the subject under discussion. This subject I hope to refer to on some future occasion.

In all such investigations as the above a good deal of work has to be done by others than the reader of the paper, and I hereby thank all those farmers who have helped by lending their land to the College for experimental purposes.

In conclusion, I sum up by saying that the principal causes of the variation in the amount of sugar in swedes are: the individual, the variety and the season. The lesser causes: the size and storage. The doubtful causes, requiring further investigation: the district and the soil. The unimportant causes: the character and the amount of manure within practical limits.

New York Section.

Meeting held at Chemists' Club, on Friday, November 21st, 1902.

VIRGIL COBLENTZ IN THE CHAIR.

SOME PHASES OF TEXTILE CHEMISTRY.

BY J. MERRITT MATTHEWS, PH.D.

Having been in touch, for some years now, with that especial phase of chemistry which deals primarily with the textile industries, this opportunity of speaking before you suggested the thought to me of indicating, in as brief a manner as possible, the various points of contact through which the science of chemistry infuses its inspiration into the art of textiles.

Next to the metallurgical industries, and with more especial reference to those of iron and steel, the textile industry is perhaps the most important and the most necessary to human welfare and civilisation. Though depending, perhaps, more upon mechanical operations than upon chemical processes, nevertheless, the textile industry uses chemistry in a very efficient manner, and the intimacy which has gradually developed between the two is becoming closer and closer every day.

The chemical phase of the textile industry is manifested in two ways. In the first place, we have a number of very extensive chemical industries almost wholly dependent upon the textile mills for the utilisation of their products. I refer especially to those industries immediately connected with the manufacture of alkalis, oils, soaps, bleaching compounds, dyestuffs and mordants, with all their allied chemical products, starch and dextrin, and many others of less importance. In the second place, we have the applications of chemistry in the operation of certain chemical processes employed directly in the manufacture of textile products, and it is this latter phase of the subject upon which I desire more especially to dwell, calling attention, so far as possible, to the suggestions they offer for investigation and research.

The first point of contact between chemistry and the textile industry lies in the raw materials themselves; that is to say, in the various fibres employed in manufacturing textile products. We all know that wool, silk, and cotton are the fibres of chief importance, and much scientific work, more or less of a chemical nature, has been done with regard to the study of the conditions best suited for the most satisfactory growth and production of these fibres. Not only does the quality of the wool fibre depend upon the nature and breed of the sheep, but it also depends very largely upon the chemical character of the food with which the sheep are supplied; the cultivation of the silkworm and the production of silk therefrom are also dependent upon the same fact. A study of the chemistry of the soils, and the nutritive plant constituents thereof, is a most important consideration in the intelligent cultivation of cotton. It has been found, for instance, that Sea Island cotton, so highly prized for its fine, silky, long-stapled fibre, can only be successfully grown on soils which contain a high percentage of saline matter. The chemical investigation of this problem has only just begun, but the agricultural chemist of late is manifesting considerable activity along this line of research, and it is one which cannot help but be productive of many far-reaching results.

Going a step further, from the chemistry of the growth and production of the fibre to the chemical technology of the fibre itself, we find ourselves in the midst of a great diversity of chemical processes. The chemistry of wool has been studied during the past fifty years with a fair degree of thoroughness and completeness; its chemical character has been established with more or less certainty. Wool has been classified as an albuminoid, receiving the particular name of keratin, but owing to variations in its composition, in common with most other naturally-occurring albuminoids,

it has been impossible to assign to it a definite chemical formula. Much work has yet to be done in studying the chemical and structural constitution of wool; for instance, we know that it contains sulphur in its composition, but the amount is by no means constant, ranging from one to four per cent.; by a proper treatment, this sulphur can be partly removed without disorganisation of the fibre. It would be both theoretically instructive and practically interesting to know in what manner of combination this sulphur is held in the fibre, and what influence it exerts upon the structure and physical properties of the latter. A highly interesting piece of research could also be made on the identification of the organic radicals or groups present in the substance of the wool fibre. If such a knowledge could be realised, we should then be in a position to have an intelligent insight into the action of various chemicals upon wool, a subject which is of far-reaching practical importance, to say nothing of its purely scientific interest. We should then also be able to form some intelligent theories concerning the processes of dyeing and the chemical functions of dyestuffs. When compared with our knowledge concerning many minor and unimportant substances, our present chemical knowledge of wool is indeed meagre and insufficient, and the chemist, at this point, has a fine opportunity for scientific research which would add much of value to both science and art, and incidentally prove lucrative to himself. Silk is much in the same position as wool, so far as our knowledge concerning its chemical nature is involved. In the raw condition we know that silk apparently consists of two substances chemically distinct, known as sericin and fibroin respectively. Both are evidently albuminoids, and neither contains sulphur. The sericin is soluble in hot soap solutions, and is thus removed from the fibroin, which constitutes the fibre proper. Though some little work has been done with regard to establishing the chemical composition and formula of these bodies, yet it may be said that the field is comparatively virgin. When we come to cotton, and the vegetable fibres of which it is a representative, we find that its chemical constitution has been more thoroughly studied. Cotton, of course, is essentially cellulose, one of a large class of bodies known as carbohydrates, and yet the cellulose of cotton and the celluloses of other fibres and vegetable tissues manifest certain apparent chemical differences and many very evident physical differences. Although the empirical formula of cellulose has been determined with sufficient accuracy to consider it a settled fact, its constitutional formula has yet to be worked out. It is gratifying, however, to know that several chemists are devoting their attention to this very line of investigation, and new and important results are constantly being published. There are many other vegetable fibres besides cotton which are being investigated at present, and some of them possess useful and valuable properties. Great interest, for instance, has been excited in the subject of ramie or China grass, a fibre which possesses great strength and endurance, being remarkably white in colour and silky in appearance. Although the plant grows with the rapidity and profuseness of a weed, the fibre itself is very difficult to eliminate in a perfect condition from the rest of the plant tissue. The world is still awaiting the perfection of the process, which must be more or less chemical in nature, for the successful decortication of this fibre. Then, too, it is deficient in spinning qualities; yet I have not the slightest doubt that a chemical process of treatment could be devised whereby this defect could be remedied, were the matter studied with sufficient thoroughness by the textile chemist. Jute is also a fibre which is becoming more and more useful through an investigation of its chemical technology, but its valuable properties could be much further enhanced by a more extensive knowledge and a more complete understanding of its chemical nature. The investigation of the chemistry of cotton, and incidentally other varieties of cellulose, has proved to be a field of great production not only to the textile trade, but to many other industries. We have, for instance, the nitration of cotton, which gives rise to a series of products finding an extensive use in the manufacture of high-power explosives, in the manufacture of celluloid, and many other pyroxylin compounds. Then, again, we have the textile industry enriched by the addition of practically a new fibre. I refer to the so-called mercerised cotton, that beautiful silk-like material which is being so extensively used at present for the production of a wide variety of fabrics. It is made by the action of strong solutions of caustic alkalis on cotton, and is primarily a chemical process. Then we also have another artificial fibre known as lustra-cellulose or artificial silk. This may be prepared in several ways, the principal methods being to employ solutions of nitrated cotton or pyroxylin, or by using solutions of cellulose thiocarbonates made by dissolving cotton in strong caustic alkali to which a little carbon disulphide has been added, or, still further, by treating the cotton with solutions of ammoniacal copper oxide. The manufacture of these products is as yet in its infancy, and affords an inviting field of research to the chemist. As cotton has been found to be subject to so many chemical modifications, attention of late has been directed to the chemical treatment of wool for the purpose of improving or altering its qualities. It has been found, for instance, that solutions of chloride of lime, under proper conditions of treatment, effect certain remarkable changes in the physical nature of the wool fibre. It loses its felting or shrinking qualities, acquires a silk-like scroop and a high lustre, together with a greatly increased chemical activity towards many reagents. This treatment of wool is now being employed for many purposes, and is capable of still further commercial application. Strong solutions of caustic alkalis also have a peculiar effect on wool; instead of the fibre being rapidly decomposed, it is strengthened in a surprising manner; in fact, its tensile strength may be almost doubled in some instances by this treatment.

I will not dwell longer upon the possibilities of chemical research with immediate reference to the textile fibres themselves. Sufficient has been said, I think, to suggest that this is a most productive and lucrative field for either the technical chemist or for the one who devotes himself solely to pure science. It is to be regretted that more chemists do not enter upon this line of research. I think that the chief reason for this lack of interest exhibited by chemists in the United States towards such attractive themes of research is the utter lack of attention given to these so-called "technical problems" by the majority of our universities and colleges. Any thesis of chemical research which appears to have in view the solution of any practical problem, or the betterment of any commercial condition, is looked upon with suspicion. Would not a thesis relative to the chemical constitution of wool be as much pure science as one relating to the chemical constitution of a nitrodiamidophenol sulphonic acid? Would not the student learn as much organic chemistry in the prosecution of one research as of the other; would not the power and methods of original investigation be as acutely trained and cultivated in one case as in the other? Why is it, in this day of rapid progress in what is termed technical chemistry, that the subject is dealt with so briefly and inadequately in our educational system? The world is in need of men who are capable of conducting researches such as I have suggested; they would find a ready recognition by the captains of industry, nor do I believe they would fall in the dignity of their science.

Another main point of contact between chemistry and the textile industry lies in the preparation of the fibres for the purposes of manufacturing. Wool, as it comes from the sheep's back, contains about 30 per cent. of pure fibre and 70 per cent. of extraneous foreign manner. The two main impurities present in the fibre are wool-grease and suint, which consists mainly of dried-up perspiration. These have to be removed and the wool thoroughly cleansed before it can be used in the various processes of manufacture. This is the function of scouring, and at this point we reach an important chemical process. Ordinarily, scouring is conducted by emulsifying the greasy and other matters on the fibre by the use of solutions of soaps and alkalis; in fact, this forms one of the most extensive ramifications of the soap and alkali industry, and certain chemical conditions must be thoroughly studied and realised in order that the most efficient results be attained. The chemical action of soaps as cleansing agents, unfortunately, is little understood; in fact, very little scientific investigation has been attempted

in that direction. The methods of physical chemistry with respect to solutions and emulsions and the interaction of dissolved oils might well be applied to the study of such a problem, and an attempt be made to give us an intelligent explanation of the action of soaps. Of late, another process of scouring has been introduced on a practical scale. This is known as the solvent process, and removes the greasy matters from wool by the action of such volatile solvents as benzine, carbon bisulphide, carbon tetrachloride, and others. At present, two of the largest wool-scouring firms in America are using benzine as the solvent, and are cleansing all their wool in this manner. Benzine has its disadvantages, however, chief among which is the inflammable and explosive nature of its vapour. Carbon tetrachloride, on the other hand, would be an ideal solvent, but it cannot be manufactured sufficiently cheaply. Let someone take up as a research an investigation of the methods whereby this chemical can be produced in a cheap and commercial manner, and he will contribute a lasting benefit to the textile trade. This subject has received a good deal of attention, and even now a process may be under way, the perfection of which will realise the conditions desired. At this point one of the most important services rendered by chemistry to the textile industries is manifested. I refer to the utilisation of the by-products which may be derived from wool-scouring, whichever method of removing the impurities may be employed. The amount of these impurities is of a high percentage, and consists, on the one hand, of greasy matters which can be worked up by chemical processes of regeneration into valuable oils for soap-stock and other purposes; on the other hand, we have a large percentage of potash salts removed from the fibre by the scouring operation. When I say that the amount of these latter compounds is 6 to 10 per cent. of the weight of the wool, and if you can imagine the enormous quantities of this raw product which are scoured throughout the world, you may form some conception of the immense quantities of potash salts which would be available, if properly recovered from the waste products of wool-scouring. There have been a number of processes devised for the utilisation, in some degree, of waste scouring-liquors, chief among which are those which use this material for the preparation of ferrocyanide of potash, for the preparation of illuminating gas, and for the making of cheap soap-stock. The full value, however, to be derived from the valuable compounds which are extracted from the wool, and mostly wasted, especially in the United States, is yet to be appreciated and utilised. There is no more inviting field of technical research than the chemical investigation of this problem, both with a view to devise methods for the recovery of these compounds and finding proper uses for the materials which may be so produced.

The preparation of cotton and silk for the purposes of manufacture also depend more or less upon chemical processes, and many chemical improvements could be introduced. The bleaching of cotton is a very important chemical industry; it affords a large market for bleaching materials such as chloride of lime and peroxide of sodium. But beyond its connection with these outside industries, bleaching itself is a distinctly chemical process, and there are many problems, both theoretical and practical, which are yet unsolved. The chemical nature of the colouring matters present in the fibre is yet to be determined, together with their interaction with the bleaching agents employed. The chemical action of chlorine and hypochlorites on cellulose itself, and the modified celluloses which form constituents of the plant fibres, is yet to be definitely worked out.

The next point of contact between chemistry and the textile industry is to be found in the processes of mordanting, dyeing, and printing. The action of mordants with relation to the fibres is very incompletely understood; in fact, the chemistry of the whole subject of mordants is sadly in need of the aid of pure science to introduce law and order into a mass of uncertain theories and disconnected observations. The advanced ideas of inorganic chemistry concerning the constitution and method of reaction of the various metallic salts employed as mordants would here find a great deal of virgin material for investigation; the laws of physical chemistry with respect to the theory of solutions and capillary forces would also find much new matter for their application. But it is in the application of dyestuffs, and in the production of dyestuffs themselves, that textile chemistry finds its greatest work. The chemistry of dyestuffs is now so closely interwoven with the chemistry of dyeing itself, that the two must be considered as associated and dependent sciences. During the last 50 years there has perhaps been no one subject which has yielded more direct inspiration to research work in organic chemistry, and has furthered the progress of this science to a greater extent than has the dyestuff industry. The Germans are to-day pre-eminent in the prosecution of this branch of chemical science, and many of their most pronounced successes have been in the discovery of dyestuffs. I know of no achievement to which the presiding genius of organic chemistry can point with greater self-satisfaction and pride than to the synthesis of alizarin, and, later, the synthesis of indigo. One would think that by this time the field of synthetic dyestuffs has been about exhausted, but from the present appearance of things, it is as richly productive as ever. It is one of the most satisfactory fields of organic preparations. There is, perhaps, no field in organic chemistry which yields quicker and more profitable results to the research chemist than that of the synthesis of dyestuffs; and the field is as fresh now as it ever was, and its possibilities are as great. When we think that the limit of research has almost been reached, some new discovery opens the way to an entirely new field, which quickly becomes filled with busy workers. There is much yet to be done in this branch of chemistry; many of our colours, though beautiful and intense, are fugitive in their qualities, but year after year sees faster and more permanent colours introduced. The old wood-dyes, used exclusively 50 years ago, have fallen almost into complete desuetude. Indigo and logwood still retain their hold upon trade; but the last years have witnessed the successful synthesis of indigo from naphthalene, and the synthetic product is even now rapidly driving the natural dyestuff to a certain death. It may not be many years before logwood will suffer the same fate. The older and more fugitive dyestuffs are giving place to newer and faster ones; cotton, formerly dyed almost exclusively with the mordanted tannin colours, is now being mostly dyed with direct substantive colours. The last year or so has seen the introduction of an entirely new class of dyestuffs, known as the sulphide colours, prepared principally from paradiamido compounds and sulphide bases. These colours, though somewhat restricted as yet in their range of tone, and presenting certain difficulties in dyeing, are noted for their remarkable fastness. The chemical study of these bodies has just begun, and in it exists a very prolific field of research. The present methods of dyeing and printing are also susceptible of considerable scientific refinement, and look to chemistry almost exclusively for their future development. Since the introduction of the artificial coal-tar dyes with their modern methods of application, there has been much outcry against the fugitive character of these dyestuffs in general, as compared with the lasting and permanent qualities of the colours obtained by the older methods of dyeing; and there is a considerable show of reason for this protest; but we must bear in mind that the great demand of the age is cheapness and volume of product, and this is as true with respect to dyeing as with other industries. The chemist of the present day, with the dyestuffs and processes of applying the same at his command, can obtain as fast, nay, faster shades, and of much greater beauty and range of colour, than was possible to the old-time dyer, provided he is willing to give the same care, time, and expense to the work. The fast colours obtained for use in the Gobelin tapestries, which are regarded as of such a high standard of excellence, are not dyed in a couple of hours at a cost of a few cents per pound. The Gobelin dye-house probably dyes from 10 to 12 pounds of good quality yarn per day, at a cost of probably a dollar or more a pound! The dye-house of a large modern mill must turn out from five to ten thousand pounds of varying qualities of yarn, at a cost of three to five cents per pound. Herein lies the chief cause of the difference to be observed in the fastness of colours. Then, too, there is another factor in this question. The dyer of the last generation, and even 10 years ago, was not a chemist; as a rule, he was a scientifically uneducated

operative, working by rule-of-thumb formulas. The scientific side of dyeing has had a forced development through the phenomenal growth of the dyestuff industry, and in order to follow it, the dyer must be a chemist, and a good organic chemist at that, if he hopes to be thoroughly familiar with the technical intricacies of his subject; and, unfortunately, there are very few dyers, even at the present time, who know anything about chemistry. The cause of this is that our chemists, in receiving their scientific education, learn very little about dyeing and dyestuffs. First teach your chemists somewhat concerning dyeing, and then you will have dyers who are also chemists. Throughout the whole scope of industrial chemistry, I do not know any more inviting and lucrative positions for the young chemist of to-day than those which are afforded by the industry of dyeing. Situated, as I am, in a position to overlook the field, it is a matter of constant surprise and regret to me that more attention is not given in the United States to the chemical side of dyeing, to say nothing of the chemistry of dyestuffs. The scientific phase of dyeing, as a branch of applied chemistry, is still in a chaotic condition; it is a fertile field in which to work, either with respect to the theoretical or practical aspect. The chemical properties and qualities of dyestuffs afford many inviting themes for research. The physical chemist could have his hands full in investigating the cause of the colour properties of dyestuffs, and studying the conditions which influence and modify these properties. If we knew why colours fade under certain conditions, could we not hope to remedy this fading? If we understood the exact chemical relations existing between dyestuffs and the fibres or mordants, we could then intelligently modify our methods of dyeing in order to attain the results we desire.

I have only touched on some of the main points of interest in textile chemistry, striving, so far as possible, to limit them to those only which could be reached through the aid of pure chemistry. Of the multitudinous problems in textile chemistry which refer only to applied science, I have mentioned hardly any; their number is legion; their successful solution would bring both scientific recognition and commercial rewards to those chemists undertaking them. What I wish chiefly to impress upon you is, that the amount of study and attention given to the subject of textile chemistry in the United States is insignificant in proportion to the importance and magnitude of the subject. Textile manufacturing is one of the chief industries of America, and perhaps the most important industry in this section of the country. Textile chemistry, as a science, should receive its due proportion of recognition among the studies in our chemical curriculum, and textile chemistry, as a profession, should receive the thoughtful consideration of our students who are casting about for some branch of chemistry through which to give to the world the energies of their thought and activity, and by which to receive from the world a just recompense for their scientific labours.

NOTES ON THE DETERMINATION OF WATER IN CALIFORNIA CRUDE OILS.

BY MARVIN CURTIS AND P. W. TOMPKINS.

The recent extensive development of the oil-fields of California, and the large production of oils of low gravity, have brought about the need of some method that can be used in the field or factory for the determination of foreign matter (water, sand, &c.) in the oil. As yet, there has been no uniform method adopted in this State, though the test in common use in the East has been used by many.

This consists of mixing equal quantities of oil and gasoline, and keeping the mixture at a temperature of 120° F., for six hours, in a glass graduate, and then allowing it to stand 2 to 18 hours. The method works very well with oils of high gravity, but with crude oils of 11° to 17° B., the results are too low. A further objection to the method for its practical use in the field is the necessity of heat, without which the results are incorrect.

Many of the oils here are sold on a 1 to 4 gasoline test, (1 part oil, 4 parts gasoline) for water, sand, &c. Recently two methods purporting to be 1 to 4 tests were submitted to us to determine their accuracy or error. Neither method was based on a 1 to 4 mixture, the proportion of oil to gasoline ranging from 1 to 10 to 1 to 17. After careful study and practical work with these methods, we have adopted the following simple one.

200 c.c. of oil are mixed with 600 c.c. of gasoline of 70° B., in a stoppered flask, and then transferred to a large separatory funnel of about 1200 c.c. capacity, having a wide and deep neck above the stop-cock. The flask is washed out with 200 c.c. of gasoline and the washings are added to the separatory funnel, the contents of which are then mixed by a rotary motion and allowed to stand eight hours. After this time has elapsed, 925 to 950 c.c. are siphoned off, retaining part of it in a wash-bottle for further use. The 50—75 c.c. remaining in the funnel are mixed by a rotary motion, the stop-cock is opened, and the liquid allowed to flow into a 100 c.c. graduated cylinder, the funnel thoroughly washed with the siphoned petroleum solution, and washings added to cylinder. Generally, 30 to 50 c.c. are sufficient to remove all traces of foreign matter adhering to the funnel. The graduated cylinder is then rotated rapidly between the palms of the hands to dislodge any particles adhering to the glass, allowed to stand 12 hours, and reading taken.

The chief source of error in the method lies in the emulsified condition of a small amount of water, which increases the true reading somewhat. The emulsion is not broken by gentle heat. We have found that the amount in any given oil, sampled and analysed at different times, remains constant, and the factor for it can easily be found. Asphaltene is not precipitated to any appreciable extent by the gasoline, even in oils rich in asphalt. In oils we have examined, the amount has been less than one-tenth per cent. The method, as it is, without corrections, will give results within three-tenths of one per cent., a refinement close enough for factory work.

PROCESS FOR RENDERING PHOSPHORIC ACID AVAILABLE.

BY CHAS. BASKERVILLE, PH.D.

Contribution from the Chemical Laboratory of the University of North Carolina.

In endeavouring to secure a mechanical method for concentrating phosphatic pebble overlying the Eocene marl of the coastal plain region of North Carolina (Castle Haynes Mines) the concentric structure of many of the nodules was redetermined (Penrose, U.S. Geol. Survey, Bull. 46, 71). A number of analyses of carefully selected pebbles were made, and in no case, except with the fossil teeth which occur in the deposit to a greater or less extent, could samples be had which contained less than 50 to 20 per cent. each of silica and limestone.

The chemical methods for increasing the content of phosphate were unsuccessful from an economic point of view. Jigged material could be obtained which contained 35 to 44 per cent. of tricalcium phosphate, so methods of fusing the ground material with substances like the alkaline sulphates, sulphides, nitrates, and carbonates were tried. The last was thoroughly successful, the nitrates giving the largest percentages of citrate-soluble phosphoric acid, but the expensive nitrogen was driven off, as might be expected. The procedure was simply mixing pulverised material in about the proportion of one of carbonate to four of the crude phosphate rock, and subjecting to a good red heat until there was slight sintering, but no fusion. The product is easily removed from the furnace in a porous condition, somewhat like pumice stone, and readily ground. It does not attract moisture. From 75 to 90 per cent. of the phosphoric acid was rendered available, depending upon temperature and upon the duration of the time of heating. The percentage of water-soluble phosphate was not notably increased.

Knoop (Bieder., Centr.-bl., 28, 576) heated phosphates, bones, &c., with alkaline silicates, and obtained a 99 per cent. yield of "available phosphoric acid." G. A. Liebig (U.S. Pat. 241,868 of 1881) heated the same materials with carbon, and Wiborgh (U.S. Pat. 601,089 of 1898) secured the American rights for a process practically the same as

the above, having preceded me by a few months. This work was done in 1898.

The process is of value to those countries where chamber acid is comparatively dear (Sweden), and large deposits similar to the North Carolina carbonaceous and siliceous phosphates are found, as recently reported, in Japan (Science, 10, 900).

Yorkshire Section.

Meeting held at Leeds, on Monday, November 24th, 1902.

ADDRESS BY THE CHAIRMAN,

JAMES E. BEDFORD, F.G.S.

We are favoured this evening by the presence of gentlemen not members of our Society, including the President and Secretary of our Chamber of Commerce, but all actively engaged in industries which form part of the great commercial life of the West Riding.

For the information of our visitors I may be allowed one moment to explain that the Society of Chemical Industry was founded in the year 1881, with the object of bringing together all chemical manufacturers, working chemists, professors of chemistry, and professional chemists, for mutual benefit. It was felt that by becoming personally acquainted, and by the discussion of scientific and technical matters, many practical difficulties could be removed.

The publication of a journal which would contain matters of interest abstracted from British and foreign publications, original papers by members, with classified patent abstracts giving special details of chemical inventions, was perhaps the main object in the formation of the Society which has been successful from the commencement. The Journal has taken and retained a leading position as a chemical publication, and as it is now issued fortnightly, its readers are kept in touch with the latest developments in applied chemistry. The publication goes all over the world, as there are members in all civilised countries.

Our membership is not limited to chemists, and as many industries are dependent on chemistry in some way or other, I ventute to say that our Society is worth their attention.

Annual Meeting.—The Annual Meeting of the Society will be held in Bradford next year. The last time the Yorkshire Section entertained the Society was in the year 1895, at Leeds.

I hope it will be well attended, as our Bradford friends, through their delegate, who attended the Liverpool meeting, gave a very cordial invitation, and it will rest with us to make the arrangements so complete as to ensure success.

New Members.—At the October meeting of the council in London no less than 48 names were proposed for membership. It is interesting to note how very cosmopolitan our Society has become; at the same time there is a lesson for us Britons in the following figures:—Britain, 16 members; U.S.A., 14; Australia, 12; S. Africa, 2; Canada, 2; Mexico, 1; Persia, 1; which may be condensed as follows:—One-third Britons; one-third colonials; one-third Americans and foreigners. The Prince of Wales, on his return from Australia, summed up his experience of the progress being made in our colonies by some good advice to those at home. We must "wake up," he said, if we intend to keep abreast of our colonies. The figures referred to seem to point in the same direction.

Congress at Berlin.—I have to draw attention to the International Congress of Applied Science at Berlin, in June, next year. A hearty invitation has been extended to our members to attend and read papers if possible. The various sections of our Society will be requested to appoint representatives, and your council hope that our members will attend in good numbers. The admission fee to the Congress is fixed at 20 marks, and I am assured that our German friends will give us a hearty welcome and good value for our money. I learn that 168 French chemists have already accepted the invitation.

Minister of Commerce.—The council has done excellent work in conjunction with the Association of Chambers of Commerce by influencing the Board of Trade as to amendments to Patent Law and the Revenue Departments as to duty-free spirit for British industries, and they are now doing what is possible to prevail upon Government to appoint a Minister of Commerce.

Chambers of Commerce.—Our council strongly advocates the association of our sections with the Chambers of Commerce in our districts, and it was decided at the last meeting to communicate with the officers of all sections, instructing them to interview the presidents of such Chambers of Commerce, and suggest the addition of chemical sections to Chambers.

I have had an interview with the president and secretary of the Leeds Chamber on this matter. The proposal met with approval, and the suggestion will be laid before the Chamber at its next meeting, when your Chairman will attend, at the invitation of the President, to explain the proposal in detail.

Since the Section last met a severe loss has been sustained by the death of Professor John James Hummel, of the Chair of Dyeing at the Yorkshire College, Leeds, and a member of the Publication Committee of our Society. By the death of Hummel not only has the Society, the Yorkshire Section, the whole West Riding suffered a serious loss, but the Yorkshire College in particular. The Journal of Sept. 30 has an obituary of his life's work in the Chemistry of Dyeing, and a fuller account will be found in the Journal of the Society of Dyers and Colourists, for October. To many of us the loss is a personal one, and only those who knew him intimately can realise the kindly nature, warmth of heart, and intense interest in his work which characterised him.

Yorkshire Section.—The Yorkshire Section should be one of the most important divisions of the Society. In the first place we are not simply a city section in the way that Liverpool, Manchester, and Newcastle are. Yorkshire is a county of broad acres, and consequently our Section should embrace industries of wide extent and not be confined to those of merely local interest.

In perusing the names of members I find representatives of many of the great industries of the county—men actually engaged in the manufacture on a large scale of chemical products and also of the dyeing and tanning trades of the West Riding.

Our Committee comprises gentlemen who are specialists in their own particular lines.

Science. — It has always been my conviction that a knowledge of the theory and practice of chemistry should pervade our manufacturing industries, and it will undoubtedly be better for all concerned when our manufactures are conducted on scientific principles.

Yorkshire.—The field for chemical investigation and research in our country is exceptionally rich and varied. This arises, in the first place, from the geological structure of that portion of England included in our sphere of influence.

The products of our carboniferous strata are perhaps the most valuable assets. We not only have the extensive coalfields of the south of Yorkshire basin, with all the industries arising out of the treatment of the coal itself, but this coal enables us to develop and employ other materials to our advantage and profit.

Leeds.—Leeds is situated on the extreme northern edge of the Yorkshire coalfield, and therefore to the south have a district specially suited to manufacturing industry.

The fireclays found interstratified with the coal seams have been so intelligently developed in the district that the name "Leeds fireclay" is a household word not only at home but abroad, and the products of our local firms are known and appreciated all over the world.

Other local materials are employed in the manufacture of terra-cotta, now extensively used for the frontages of buildings and for internal decoration.

The manufacture of Portland cement may be included as a chemical industry employing clay and lime to a considerable extent.

The manufacture of alum from the liasic shale of North-East Yorkshire is now extinct, but a century ago it was important; coal measure shales being now employed to advantage.

Limestones.—We have in the limestones an asset of great value. Yorkshire possesses three true limestone formations:—"The Carboniferous or mountain limestone, seen to advantage in the beautiful hills and scars about Malham and Settle, the base or foundation of the Carboniferous series. The Magnesian limestone, a narrow strip of which stretches down the centre of our country, lying unconformably on the coal measures—good sections of this rock can be seen at Garforth and Micklefield. The Oolitic limestone of Cleveland, in the north-east of Yorkshire, in conjunction with the Cleveland iron ore; and in addition we have, although not a limestone geologically, the vast chalk deposits forming the Yorkshire wolds, stretching from the sea cliffs of Flamborough to the Humber.

Few chemical works can do without lime in the form of hydrate, and lime at a cheap rate is a *sine qua non* to the chemical manufacturer.

The smelting of iron in the Cleveland district has become a very extensive industry since Thomas and Gilchrist introduced furnace linings containing magnesian limestone in order to remove the phosphorus from the molten iron, an achievement of which Yorkshiremen should be proud.

Stone. — In the stone industry the chemist finds the product of our quarries of great utility in chemical works. The flagstones of the Bradford district are invaluable for the construction of tanks and towers, and cisterns for storing acids, and the dyer and tanner employ them in the construction of dye vessels and tan pits.

Millstone grit rock is also employed for foundations for engines and heavy machinery.

Coal.—I would suggest to those requiring coal for the various processes in which it is employed, the qualities and characteristics of the various seams of coal available in the district be studied, and that they be employed only for such purposes as they are best adapted.

Industries.—The early industries of Yorkshire located themselves in the deep valleys and dells of the West Riding, probably because the woollen trade was dependent upon the pure water from the hills and the native wool from the moorland sheep. A locality which is convenient in the earliest stages of an industry does not always remain so, as time goes on and methods alter.

Water Carriage.—Canal companies should give every facility to traders to locate themselves on the canal-side, as by that means they would secure traffic to themselves which they would otherwise lose.

Canals are utilised in France and Belgium to a much greater extent than with us, and the system is being much extended even now. The working charges of canals should be much lower than the cost of railway maintenance, as they can be worked with a smaller staff.

It behoves the country to remedy this defect in our means of inland navigation, and it should not be possible for railway companies to buy up canals, or to arrange rates which are inimical to the development of canal traffic to the detriment of home trade. The attention of the Council has been drawn to this important matter by the Liverpool Section.

The chemical trade requires cheap freights for its development; large quantities of raw and finished products require to be moved from one district to another, and coal is wanted at little more than the cost at the pit-mouth. Water carriage meets the requirements if the rates are low. Railway rates are too high, and many goods are classed as dangerous which would not be so by slow water transit, where the dangers are slighter.

The whole canal system of the country requires to be raised from its present neglected condition, in order to facilitate all those industries dependent on the cheap conveyance of heavy materials for long distances. Many businesses are compelled to be quite local in their operations on account of the excessive cost of moving goods about. Much more business could be done in Yorkshire if it had cheap water carriage to the Midlands and Lancashire. There can be no doubt as to the neglect of canals since the great development of railways in this country.

The canal companies should publish charts, with the routes of communication by water shown conspicuously in the same way that railway companies show their main lines and branches; but, as an improvement upon what the railways do for us, the canal companies should show *all* the water routes available, and not omit and ignore the existence of competing routes.

If the canal companies, although handicapped, do not rise to the occasion there is an alternative. The motor carriage has come to stay, and steam or petrol-driven lorries have many obvious advantages over barges.

For instance, would it not be possible to make a ship canal direct from Selby to Leeds from the river Ouse, avoiding the Aire entirely? The distance is only 20 miles, and sea-going vessels can already reach Selby. There should be no insuperable difficulty in getting vessels to Hunslet, where the valley bottom is comparatively flat, where suitable docks could be made. The geological strata to be cut consist of clays and gravels of the plain of York, with some red sandstone rock and a few miles of magnesium limestone, and between that rock and Leeds there would be the shales and sandstones of the coal measures.

Probably a route could be surveyed which would not necessitate many locks. The water supply might possibly be obtained from the Wharfe, near Tadcaster.

Disposal of Waste.—Many factories are greatly affected by the Acts relating to the disposal of liquors containing waste materials of various kinds. Factories in towns are not allowed to discharge such waste into the sewers, nor into streams, and if there is no available land on which such liquors can be treated in tanks or otherwise works may have to be closed.

Flat lands convenient for the treatment of such may be waste. Tanks can readily be made thereon, and the solid matter separated can be ploughed into agricultural land in the neighbourhood; that is, if suitable.

Works Chemists.—My experience of 30 years in chemical works has proved to me the value of scientific methods in all departments.

A properly equipped works requires several active young fellows with chemical training, so that constantly all processes carried out in the works may be examined and checked off by chemical test at all stages of manufacture. Errors in treatment are prevented, and loss of material or damage by carelessness.

A specially trained chemist should supervise processes, and improve, where possible, present methods, giving special attention to new developments, especially in the direction of utilising waste products or making economies.

Works chemists are well trained, equal to the above requirements, at our technical colleges and schools.

Few British works employ highly trained research chemists for purely research work. We are advised by people who profess to know, that a great mistake is being made by this want of enterprise, and that trade has suffered and is suffering in consequence. Happily, there is no lack of well trained men, if manufacturers will "wake up" to the imperative need for scientific control.

Patent Laws.—I am of opinion that defective patent laws and inattention to trade matters by Government are amongst the causes by which certain branches of the chemical trade have left the country. We have always had with us research chemists of the first class, and some of the leading discoveries have been made in Britain; but the foreign patent laws compel an English patentee to work his patent in France, Germany, Italy, and other countries, whereas a foreign patentee taking an English patent is not obliged to do so, nor is he compelled to grant a licence, except on his own terms, for the manufacture of the patented article in Britain. This serious defect will, in great part, be remedied by the patent laws just passed.

These inequalities rectified, British manufacturers may be in a position to compete with the foreigner, but it will always be necessary for Government to assist trade by modifying unjust laws for the benefit of commerce, and a

Minister of Commerce should be created for the special purpose.

Research work has its value, without doubt, and in Leeds at least one research chemist is constantly at work investigating the natural colouring matters. I refer to Mr. A. G. Perkin, at the Yorkshire College, working under the auspices of the Cloth Workers Company of London.

Technical instruction of the labourer in chemical works is not intended; his business is obedience, and he may second the needful intelligence by being taught reading, writing, and arithmetic, *i.e.*, the three R's, as this will enable him to understand weights and measures and proper instructions as to his duties.

It should be our endeavour to make our Sections useful to the community, and if they can be brought more fully into touch with public bodies, so much the better. Great questions of water supply and sewage purification, sanitation, the manufacture of gas, and the supply of electricity call for men on the city councils who have knowledge and experience in chemistry and engineering.

Would not such men give valuable assistance?

Also, might not the committees of city and county councils on technical instruction, and councils of technical colleges and schools, be strengthed by such men as members of their boards?

In order to meet this, it might be possible to have the Section represented by co-opting nominees on such boards or councils. Such representatives would be valuable in giving advice as to the technical requirements of a district, and in that way assist the committee in providing suitable instruction. There appears to me to be a lack of scientific men upon the committees having charge of the technical instruction of the people, and local knowledge of the industries is necessary, as each locality should modify its course of instruction according to the particular industries carried on in the neighbourhood.

If these suggestions were adopted Sections would get into closer touch with the powers that be, and the benefits refer to would probably be apparent.

The Leeds Institute of Technology is doing good work. The concordat has placed more important work in the hands of the committee, and funds will be required to carry out such developments.

Considering that the institution is doing similar work to that carried on at different municipal technical schools, it is surprising how small the local grant works out per student.

Manchester Technical School, with its 5,060 students, receives as follows:—

	£	s.	d.
From Customs and Excise	11,904	8	11
„ Rates	14,537	13	5
Total	36,442	2	4

= 7*l.* 4*s.* 10*d.* per student.

Birmingham Municipal Technical School (3,114 *Students*).

	£	s.	d.
From Customs and Excise	13,308	12	10
„ Rates	303	10	3
Total	13,612	3	1

= 4*l.* 7*s.* 5*d.* per student.

Bradford Technical College (1,046 *Students*).

	£	s.	d.
From Customs and Excise	1,790	17	3
„ Rates	5,280	0	0
Total	7,070	17	3

= 6*l.* 15*s.* 2*d.* per student.

Leeds Institute (2,734 *Students*).

	£	s.	d.
From Customs and Excise	1,360	0	0
„ Rates	..		
Total	1,360	0	0

= 9*s.* 6*d.* per student.

I have the corresponding figures for nine towns, including Leeds, and all, with two exceptions, Leeds and Liverpool, levy the 1*d.* rate for technical instruction, and this, with the whisky money, gives them ample means to carry on good work of this kind. Why should not Leeds do the same?

I believe the 1*d.* rate in Leeds would raise about 8,000*l.* a year. This, with the whisky money, 7,000*l.*, giving a total of 15,000*l.*, would be a fair and reasonable sum to spend in the technical schools of our city.

As matters are at present it is impossible to properly equip the buildings in use, and what is to be done for expansion passes my imagination unless this rate is levied.

If the 15,000*l.* that should be available for technical instruction in Leeds were carefully allocated between the different educational bodies in Leeds fairly entitled to it, there would be some satisfaction to those engaged in the work, but as matters are it is impossible either for the Yorkshire College or the Leeds Institute to do justice to the great work they have in hand.

Efficiency is required in all departments of business, education, and finance, in order to the fullest possible development of the natural resources of our country. If we attend strenuously to the development of our resources of matter as well as of mind, and demand from all the cheerful and effective performance of duty, we need not fear competition.

Journal and Patent Literature.

Class.	Page.
I.—General Plant, Apparatus, and Machinery	1523
II.—Fuel, Gas, and Light	1524
III.—Destructive Distillation, Tar Products, Petroleum	1527
IV.—Colouring Matters and Dyestuffs	1528
V.—Preparing, Bleaching, Dyeing, Printing, and Finishing Textiles, Yarns, and Fibres	1530
VI.—Colouring Wood, Paper, Leather, &c.	1533
VII.—Acids, Alkalis, and Salts, and Non-Metallic Elements	1533
VIII.—Glass, Pottery, and Enamels	1534
IX.—Building Materials, Clays, Mortars, and Cements	1535
X.—Metallurgy	1535
XI.—Electro-Chemistry and Electro-Metallurgy	1538
XII.—Fats, Fatty Oils, and Soap	1541
XIII.—Pigments and Paints; Resins, Varnishes, &c.; India-Rubber, &c.	1543
XIV.—Tanning; Leather; Glue, Size, Bone, and Horn; Ivory and Substitutes	1544

Class.	Page.
XV.—Manures, &c.	1545
XVI.—Sugar, Starch, Gum, &c.	1545
XVII.—Brewing, Wines, Spirits, &c.	1546
XVIII.—Foods; Sanitation; Water Purification; and Disinfectants	1548
XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c.	1550
XX.—Fine Chemicals, Alkaloids, Essences, and Extracts	1551
XXI.—Photography	1554
XXII.—Explosives, Matches, &c.	1554
XXIII.—Analytical Chemistry	1557
XXIV.—Scientific and Technical Notes	1560

Patent Specifications may be obtained by post by remitting as follows:—
English.—*Sd.* each, to the Comptroller of the Patent Office, C. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W.C.
United States.—6*d.* each, to the Commissioner of Patents, Washington, D.C., U.S. America.
French.—1*s.* each, to Belin et Cie., 52, rue de Vaugirard, Paris.

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Vacuum; Process, and Means used therein, for the Production of ——. F. Fanta, London. Eng. Pat. 15,687, Aug. 2, 1901.

The bulk of the air is first removed by means of a good ordinary pump; hydrocarbon gas is then admitted into the vacuous space to displace all remaining air, and this gas is then removed by means of a pump, in which all clearance spaces are filled with heavy hydrocarbon oil.—L. A.

Liquids with Gases or Gases with Liquids: Apparatus for Treating ——. A. Vosmaer and A. Lebret, both of Haarlem, Holland. Eng. Pat. 25,976, Dec. 19, 1901.

The liquid passes down, the gas up, a vertical cylinder. Across the cylinder in its lower part is a partition, having perforations of about $\frac{1}{20}$th mm., that is, sufficiently fine to prevent the liquid passing through, and also to break up the gas passing upwards into very fine bubbles. Immediately above this partition is a short annular wall, outside which is an annular screen, through the perforations of which the liquid passes away. The liquid enters at the top, close to the outlet for the gas. The partition may be arranged above the annular wall.—R. S.

Heating Liquid or Gaseous Bodies [*Air, Water, Steam, &c.*] *under Pressure; Apparatus for* ——. B. J. B. Mills, London. From A. Pratt, Lyons, France. Eng. Pat. 2592, Jan. 31, 1902.

A number of heating elements are arranged in a strong reservoir, which is traversed by the fluid to be heated. Each heating element consists essentially of a platinum tube, which is previously heated to redness, and maintained in a state of incandescence by a current of carburetted air circulating in the interior. The platinum tubes are advantageously surrounded by perforated metallic tubes, enclosed in winged tubes, this arrangement serving as a reservoir of heat, to sustain the temperature of the heating element during an accidental slackening of the source of heat.
—R. A.

Distilling [*Liquids or Solids*]; *Process and Apparatus for* ——. F. Calmant, Paris. Eng. Pat. 20,356, Sept. 18, 1902.

The gases or vapours arising from the distillation are subjected to an energetic agitation, by means of a screw propeller, ventilator, or the like, with the object of facilitating the separation of impurities, the separation of vapours of different densities, and the concentration of the distilled product.—R. A.

French Patents.

Dryer; Continuous ——, *for the Desiccation of Crushed Minerals and other similar Products.* Diedrich. Fr. Pat. 319,417, Jan. 28, 1902.

The crushed mineral is fed into the dryer through a shoot, and falls into a semi-cylindrical trough, at the axis of which a revolving shaft carries a number of radial arms fitted with scoops, so formed that the mineral is continually lifted from the trough and showered back into it a few inches further along, thus being caused to traverse the length of the trough and finally escape from the apparatus. Drying is effected by means of hot gases from a furnace and heated air, admitted beyond the fire-arch. These are drawn through the chamber, and over the mineral, in a direction the reverse of that in which the latter is travelling.—L. A.

Liquids, Vapours, and Gases; Apparatus for Separating Suspended Impurities from ——. Winand. Fr. Pat. 319,668, March 17, 1902.

The apparatus is so constructed that the current of gas, vapour, or liquid is divided up into a number of shallow layers or strata, by causing it to pass between plates arranged one above another and very slightly inclined to the horizontal; the current flowing slowly, gives time for the impurities to settle on the plates which, in the case of gas or vapour, are washed by gentle streams of water or oil. The plates may be stationary or may have a vibratory movement.—L. A.

United States Patents.

Liquid under Pressure; Machinery for the Production of ——. A. Vogt and M. von Recklinghausen, both of London. U.S. Pat. 711,597, Oct. 21, 1902.

See Eng. Pat. 21,565 of 1900; this Journal, 1902, 458.
—R. A.

Boiler-cleaning Composition. C. Nettleton, Iowa. U.S. Pat. 711,876, 1902.

The preparation consists of Glauber salt, soda ash, calcium sulphate, and slippery elm.—N. H. J. M.

Limekiln. A. P. Broomell, York, Pa. U.S. Pat. 712,251, Oct. 28, 1902.

The kiln consists of a stack, mounted on a metal platform, beneath which is a cooling chamber, in the form of an inverted truncated cone, attached in a hanging position, to the bottom of the stack, of which it forms the discharge end. The stack is encased in a steel shell which extends to the ground, and helps to support the platform and encloses the cone. Producer-gas is used and the furnaces are supported on the platform and extend radially from the stack, with which they are connected by a flue passing through the shell. An air-inlet controlled by a valve, passes in a slanting direction from the space between the cooling chamber and the outer shell, beneath the platform, into the flue. At the bottom of the cooler, and connected with its upper part by hangers, are two curved doors, which can be swung out by a rack and pinion arrangement, to allow the lime to be withdrawn from the kiln.—W. C. H.

Distilling Apparatus. W. F. M. Goss, Lafayette, Ind., Assignor to United States Distillation Co., Indianapolis. U.S. Pat. 713,297, Nov. 11, 1902.

This apparatus comprises a series of connected chambers, means whereby both the vapours from all the chambers and the liquid resulting from the condensation of such vapours can be employed in evaporating the liquid to be distilled, and means for inducing flows of the liquid to be distilled, and the condensate, in opposite directions throughout the series of chambers.—R. A.

Distilling Liquids; Process of ——. W. F. M. Goss, Lafayette, Ind., Assignor to United States Distillation Co., Indianapolis. U.S. Pat. 713,298, Nov. 11, 1902.

The claims are for the process carried on by the apparatus described in U.S. Pat. 713,297. (See preceding abstract.)
—R. A.

Liquids from Solids; Apparatus for Filtering or Separating ——. C. W. Thompson, London. U.S. Pat. 713,717, 1902.

This filtering apparatus comprises a closed chamber with an opening in the bottom, and a conveyor adjacent to that opening. There are filter-plates in the upper part of the chamber, and means for intermittently separating the collected material on the filter-plate, to cause it to fall in masses to the bottom of the chamber. Means are provided for drawing off the liquid through the filter, and for forcing liquid back through the plates to dislodge the material collected thereon.—R. A.

II.—FUEL, GAS, AND LIGHT.

English Patents.

Spirit; Solidified ——. Spiritine, Ltd., Willesden. From J. Drapier and P. Dubois, Paris. Eng. Pat. 24,146, Nov. 27, 1902.

A coagulum of vegetable jelly is prepared by boiling gelose, obtained from fucus species, with water. This jelly is then placed in strong alcohol, which displaces the water. For purposes of economy it is desirable to effect the displacement of the water by immersing the jelly in successive baths of alcohol of increasing strength; the diluted spirit is subsequently regenerated by distillation. The product burns without appreciable residue.—J. F. B.

Pulverulent or Dust Fuel; Apparatus for Feeding and Burning ——. A. G. Brookes, London. From P. B. Bradley, Plymouth, Mass., U.S.A. Eng. Pat. 16,681, July 28, 1902.

The principal object of this invention is to prevent the fuel from passing away unburned, or from depositing in the boiler flues, &c. The fuel is projected into the combustion chamber as usual, and at the back of this chamber it meets a vertical baffle-wall which causes the unburned particles to fall into a receptacle, where they are slowly burned, air being admitted for the purpose. The ordinary supply of air to the combustion chamber is preheated. (See Eng. Pat. 26,577, Dec. 30, 1901; this Journal, 1902, 1126.) —R. S.

Kilns or Furnaces. C. Loeser, Halle-on-the-Sale, Germany. Eng. Pat. 26,703, Dec. 31, 1901.

The waste combustion gases are caused to heat the air supply. The air passes, in the reverse direction to the gases, through tubes placed in the flues. The tubes are of two kinds, some of iron or good conducting material, and others of bad conducting material, the air passing first through the former and then through the latter. This arrangement prevents the air pipes from cracking.—R. S.

Furnaces for Vertical Boilers, Brewers' Coppers, and the like. W. C. Courts, Manchester. Eng. Pat. 27, Jan. 1, 1902.

A central opening is provided in the grate surmounted by a hood which rises above the fuel, and is provided with lateral air inlets below its closed top for the purpose of supplying air to the furnace above the fuel. Mechanism is provided for lowering and raising the hood to facilitate the raking and cleaning of the grate.—J. F. B.

Furnaces [Inclined Grate]. T. Murphy, Detroit, U.S.A. Eng. Pat. 16,282, July 22, 1902.

Relates to mechanically stoked furnaces, having an inclined grate extending down to a rotary clinker bar. To produce a more uniform fire and prevent the burning out of the grate bars, the air supply is admitted beneath the feed-plate into the upper angle or highest portion of the chamber beneath the grate. As some of the fresh fuel, fed on to the upper grate bars, falls through into the chamber beneath, a vertical screen is placed in the chamber to keep such fuel apart from the ashes which drop from the lower parts of the grate. The journals for the clinker bar are formed, in the main, on the under side of the bar, so as to be protected from heat, and the overhanging retaining lugs are prevented from being burnt by the mass of metal to which they are attached.—H. B.

Gas Condensers. C. C. Carpenter, London. Eng. Pat. 19,019, Aug. 29, 1902.

The condensing plant is divided into a number of units or batteries, each having a separate inlet or outlet so arranged that any unit or battery can be worked first in order, the remainder following in natural sequence. Diagrammatic drawings are given, showing an arrangement of six batteries, and three arrangements of four batteries each, together with tables of a number of combinations of the valve arrangements enabling them to be worked as above.—R. S.

Gases; Apparatus for Washing and Scrubbing ——. P. F. and E. D. Holmes and E. G. Cameron, Huddersfield. Eng. Pat. 7364, March 26, 1902.

Improvements on Eng. Pat. 5113 of 1895 (this Journal, 1896, 340). The discs, to which the brush segments are attached, are provided with brackets adapted to receive and hold the inner ends of the brush-segment backs when these are slid radially inwards. One or more studs on the discs engage with under-cut grooves formed on the brush backs, and the segments are further secured in position by screw bolts near the periphery of the disc. Lateral openings in the casing of the scrubber permit of the withdrawal or insertion of the segments as required.—H. B.

Smoke, Gases, Products of Combustion, Dust, and such like Matters; Apparatus for Treating ——, *in order to Remove Denser Particles therefrom and Remove Impurities from the Smoke or Gas.* A. G. Brookes, London. From J. S. Stearns, Waltham, Mass., U.S.A. Eng. Pat. 10,417, May 6, 1902.

This invention is intended to be applied to a locomotive, steam automobile, or ordinary furnace. A pipe or flue leading from the chimney, conducts the smoke gases below the surface of water contained in a closed tank, in which a partial vacuum is maintained by means of a steam ejector. —L. A.

Acetylene Gas Generators and Gasometers. J. Dargie, Forfar, Scotland. Eng. Pat. 13,954, June 19, 1902.

A carbide-feed apparatus in which the carbide is held in a number of boxes disposed round the circumference of a horizontal wheel revolving on a vertical axis by the impact of mechanism actuated by the rising holder bell. Arrived at the mouth of a shoot leading into the decomposing vessel, the hinged bottom of each box is no longer supported, and the solid accordingly falls into the water of the generator. —F. H. L.

Acetylene Gas Generators. A. Anderson, Partick, Scotland. Eng. Pat. 20,895, Sept. 25, 1902.

An automatic water-to-carbide apparatus of the contact type. Two carbide containers, to be used alternately, are disposed horizontally within the main casing, and are each supplied with water through a U-tube from an open safety-trough, which is periodically filled with liquid by the opening of a spring-closed valve each time the holder bell descends. The feed-gear is adjusted by hand to throw the water into whichever of the carbide containers it is desired to bring into operation. The acetylene passes through a washer and a condenser on its way to the holder.—F. H. L.

Illuminant; An Improved Compound to be Employed as an ——, *and as a Source of Motive Power.* A. J. Boult, London. From J. G. Massie, Belleville, Ill., U.S.A. Eng. Pat. 19,145, Sept. 1, 1902.

A mixture of 10 volumes of ordinary kerosene and 1 volume of gasoline.—L. A.

Filaments of Glow Lamps; Apparatus for the Reinforcing and Standardising of ——. F. Fanta, London. Eng. Pat. 15,536, July 31, 1901.

By means of this apparatus a current of pure air or of carburetted air can be circulated through a glow lamp fixed

in a holder at one end of a photometer; whilst the air is passing, any carbonaceous deposit on the lamp can be burnt off, and whilst the current of carburetted air is passing, the filament in the lamp can be heated by an electric current, of which the voltage is automatically maintained constant, for the purpose of regenerating the filament and building it up, until the light emitted by it is equal to that given by the standard lamp at the other end of the photometer. The regenerated lamp is then exhausted and sealed up again.
—L. A.

Electric Incandescent Lamps with Rare Earth Filaments. W. A. Crook, Ormskirk, and E. Mines, Liverpool. Eng. Pat. 11,510, May 20, 1902.

To facilitate the substitution of a new filament for an old one, and to minimise the risk of fracture during the operation, the filament is provided at each end with a thin flexible conducting wire, preferably of platinum, and the lamp is provided with contact devices by which the wires may be connected detachably to the circuit of the lamp. The contact devices may consist of coiled springs on the contact posts, between the turns of which the flexible wires are clipped, or they may consist of cups of mercury into which the ends of the wires can be made to dip to form electrical contact.—H. B.

French Patents.

Combustible [Briquettes]; New ——. C. Lefèvre and G. Blum. Fr. Pat. 319,523, March 12, 1902.

Powdered coal, 75; clay, 24; sodium carbonate, 0·75; and soft soap, 0·25 per cent., are mixed together with the aid of sufficient hot water, and the mixture is pressed into briquettes and dried.—H. B.

Adhesive Composition for use in the Manufacture of Agglomerates [Fuel Briquettes] of all Kinds. Charles. Fr. Pat. 319,856, March 22, 1902.

Claim is made for an adhesive mixture prepared from farinaceous (corn, barley, and flour) or oleaginous materials (linseed, &c.), and alum, or from all three; also for the application of the same to the manufacture of all kinds of agglomerates, such as combustible briquettes or mineral briquettes for metallurgical treatment.—T. H. P.

Naphthalene for Heating and Motive Power; Utilising the Vapours of ——. Lioo. Fr. Pat. 319,599, March 14, 1902.

The apparatus consists of a feed hopper for the naphthalene, communicating with a conduit, the entire length of which is heated by the waste heat from the burner in order to keep the naphthalene liquid. The conduit is connected with a compressed-air pump, and terminates below in a three-way tap, which admits to the burner either the liquified naphthalene, or a liquid fuel, like petroleum, from another storage vessel. The vaporising burner is in the form of a horizontal ∪-tube, one end of which communicates with the fuel supply, whilst the closed limb is provided with an injector discharging the vaporised contents of the tube into a Bunsen burner, the flame of which effects the vaporisation of the liquid. In another modification of the burner, the fuel is delivered into the upper limb, whilst the lower branch is provided with a number of jets, the flame from which is directed towards the upper limb, and is there distributed by a series of buttons underneath the said upper limb.—C. S.

Gasifier for Liquid Fuel. Rosenthal. Fr. Pat. 319,678, March 15, 1902.

The interior of the gasifier is almost entirely filled with a porous material, into which dips the pipe supplying the fuel to be gasified. To regulate the feed in accordance with the rate of vaporisation, a pipe is led back from the gasifier to the fuel reservoir, where it terminates in a coil open at the end, above the level of the liquid contents. If high reservoirs are used, the rate of overflow in the feed pipe is regulated by a float, which progressively opens a valve as the reservoir empties. The gasifying action is started by a supplementary burner, and afterwards proceeds automatically.—C. S.

Furnace for Vaporising Combustible Liquids and Burning the Resulting Gases. Laurent. Fr. Pat. 319,866, March 22, 1902.

The liquid is placed in a container fitted with a vertical tube containing a wick that dips into the liquid and extends part way up the tube. The upper part of the tube is provided with adjustable lateral apertures for the admission of air, and terminates in a burner. At the level of the upper part of the wick the tube is surrounded by a cup, in which spirit (alcohol) is placed, and ignited, in order to vaporise the liquid raised by the wick.—C. S.

Gas, Combustible, under Pressure; Manufacturing ——. Leroy. Fr. Pat. 319,306, March 5, 1902.

Compressed gas is manufactured by the direct employment of a compressed supporter of combustion, such as air, or a mixture of air, water-vapour, or liquid hydrocarbons, which are converted, in a suitable generator, into combustible gas free from condensable products, and under a pressure equal to that of the introduced air, &c., or at any desired lower pressure. Atomised water and liquid hydrocarbons are used inside the generator, for cooling the tuyères by the act of vaporisation, and at the same time ensuring the more uniform distribution of these substances themselves, and facilitating their gasification.—C. S.

Acetylene Generators; Carbide-feeding Device for ——. C. F. Brodin and H. A. Schepeler. Fr. Pat. 319,364, March 7, 1902.

See Eng. Pat. 6291, 1902; this Journal, 1902, 907.—F. H. L.

Acetylene Generator. Bishop. Fr. Pat. 319,859, March 22, 1902.

See Eng. Pat. 6826, 1902; this Journal, 1902, 762.
—F. H. L.

Carbon for Arc Lamps; Encased ——. Gebr. Siemens and Co. Fr. Pat. 319,256, March 3, 1902.

The incandescent end of the carbon is surrounded by a small thin-walled tube (composed of magnesia or other refractory earth of high emissive power) which does not obstruct the free movement of the carbon, for the purpose of minimising the combustion of the electrode, and increasing the luminosity and stability of the arc. By magnetic or other suitable means the arc may be caused to play round the free end of the sleeve, to render it more highly incandescent, and the sleeve may be enclosed in a chamber of rarefied air to minimise the loss of heat. Such a tube may be used with carbons to which luminiferous materials have been added; these materials, on volatilisation, will deposit upon the tube and not upon the electrode itself, whereby the usual instability of the luminous arc is overcome.—H. B.

Arc Lamp Electrodes; Process of Forming ——. R. Hopfelt. Fr. Pat. 319,893, March 24, 1902.

Electrodes having an addition of metallic oxides or the like, for lengthening the luminous arc, are surrounded by an envelope of carbon having a greater electrical resistance than that of the core, so as to prolong the life of the latter. The envelope may be made of poorly baked carbon, or carbon to which there have been added substances which will volatilise readily on heating, leaving the carbon in a porous condition.—H. B.

Mantles; Improved Machine for Saturating the Materials employed in the Manufacture of Incandescence Gas ——. Wiederhold and Morse. Fr. Pat. 319,934, March 25, 1902.

See Eng. Pat. 7271, 1902; this Journal, 1902, 908.
—H. B.

United States Patents.

Muffle-Furnace. G. G. Convers and A. B. de Saulles, South Bethlehem, Pa. U.S. Pat. 712,502, Nov. 4, 1902.

A retort-furnace provided with two chambers or compartments, having gas- and air-inlet flues at their base, and a central down-take flue. There are air-distributing chambers for the air-inlets, and also gas-distributing

chambers; moreover, there are air-regenerator chambers supplying the air-distributing chambers, and a horizontal flue for waste products of combustion, communicatiog with the central down-take flue already mentioned, and located between the gas-distributing chambers. This horizontal flue with its hot waste gaseous products, communicates with the heating flues of the air-regenerating chambers.
—R. S.

Fuel Blocks; Process of Manufacturing Artificial ——. A. D. de Micheroux, Marseilles. U.S. Pat. 711,995, Oct. 28, 1902.

SODA-LIME, which has been previously "ozonised," is mixed with petroleum, gas tar, and fatty and resinous substances, the materials being heated during the mixing; when cool, they are incorporated with combustible waste material, such as coal dust, or with the residues from ores, oxides, sulphides, and the like, and the product is shaped into blocks. The blocks may be used directly in a blast furnace without the addition of fuel or flux.—H. B.

Fuel; Waterproof Artificial ——. J. F. Bartlett, Mayfair, Ill. U.S. Pat. 712,635, Nov. 4, 1902.

FUEL blocks composed of coal-dust, cow-manure, blood, lime, alum, glue, and water.—H. B.

Peat Fuel; Manufactured ——. R. A. Kellond, Assignor to C. C. Bartlett, Chicago, Ill. U.S. Pat. 713,110, Nov. 11, 1902.

PEAT which has been dried so as to contain from 12 to 25 per cent. of moisture, and has been reduced to the fineness of partially powdered tea, is compressed into blocks at about 65° F.; these are then placed in moulds which have been heated to a sufficiently high temperature to cause a partial carbonisation of the outer fibrous layer of the blocks, whereby a seared, tarry coating is formed.—H. B.

Fuel Briquette. J. Simons, New York. U.S. Pat. 713,512, Nov. 11, 1902.

A BRIQUETTE composed of fuel, such as fine anthracite or bituminous coal, plaster of Paris, and molasses, which has been heated so as to partially or wholly caramelise the molasses.—H. B.

Coke-Oven. J. M. Hunker, West Superior, Wis. U.S. Pat. 711,500, Oct. 21, 1902.

THE wall of the oven is provided with an approximately horizontal series of blocks, each formed with centrally-arranged longitudinal and transverse openings, the transverse openings communicating with one another so as to form a continuous passage, while the longitudinal passages form a series of direct communications between the exterior and the interior of the oven.—R. S.

Coke: Apparatus for the Manufacture of ——, *and Recovery of Gases therefrom.* T. S. C. Lowe, Pasadena, Cal. U.S. Pat. 711,904, Oct. 21, 1902.

SEE Eng. Pat. 7826, 1902; this Journal, 1902, 906.
—R. S.

Coke; Process of Manufacturing ——. T. S. C. Lowe, Los Angeles, Cal. U.S. Pat. 711,905, Oct. 21, 1902.

SEE Eng. Pat. 7826, 1902; this Journal, 1902, 906.—R. S.

Coke Ovens. H. Kennedy, Sharpsburg, Pa. U.S. Pat. 713,648, Nov. 18, 1902.

THE coking oven is movable transversely, from a stationary coking-hearth to a floor or platform. The latter can then be lowered so as to remove the charge of coke from the oven. The platform is carried upon a car. A quenching device is placed below the level of the hearth.—R. S.

Gas Producer. W. T. Kelly, Bellaire, Ohio. U.S. Pat. 713,647, Nov. 18, 1902.

THE producer is fitted with a water-jacketed cover, through which are a number of holes having walls which incline downwards and outwards. These holes are covered with removable cup-shaped caps having flaring walls, and balls to seal the caps. The object is to provide a producer in which the ashes can be removed evenly and at all points, and steam and air can be introduced at different sides of the bed of fuel.—R. S.

Gas Producer. J. A. Mitchell, Brooklyn, N.Y. U.S. Pat. 714,008, Nov. 18, 1902.

THE grate is conical and is continuously rotated. Its surface has a spiral thread thereon, by means of which the ashes are gradually delivered under a ledge and into an ash-pit. The heated blast passes up a central tube and through the tubular grate, which is supported by the tube.—R. S.

Gas-making [Carburetted Air] Apparatus. W. F. Steele, Assignor to Acme Gas Company, both of New York. U.S. Pat. 714,117, Nov. 18, 1902.

THE apparatus is intended for carburetting air with low-grade oils. An air-pump supplies air to a heater, and the heated air is led first to a heated carburetting vessel containing oil, and thence to ordinary carburetting vessels. From the latter the carburetted air passes through a cooler, and may pass thence directly to a scrubber, or it may be led backwards and sent through a second series of ordinary carburetting vessels before passing to the scrubber. In another arrangement, two heated carburetters may alternate with ordinary carburetters, and a cooling chamber may be placed in the second set of ordinary carburetters referred to above.
—R. S.

Prussian Blue [from Illuminating Gas]; Process of Obtaining ——. A. Sauer, Assignor to Deutsche Continental Gas Gesellschaft. U.S. Pat. 712,726, Nov. 4, 1902.

See under XIII. A., *page* 1543.

Ammonia; Apparatus for Freeing ——, *from Gas Liquor.* H. A. Abendroth, Berlin. U.S. Pat. 712,891, Nov. 4, 1902.

THE apparatus contains superposed cells or compartments separated from one another by suitably supported floors, provided with steam-inlet pipes, and with trough-like tubes, open at the top and the bottom, arranged at the periphery of the cells, and closed by covers. The gas liquor entering the upper compartment of the column, passes through the connecting tubes to the lower compartments in succession and in zigzag course, while it becomes heated by steam ascending through the inlet tubes, and the free ammonia is expelled. At the base of the column the liquor is mixed with lime, and the ammonia liberated, ascends with the steam.—E. S.

Acetylene Gas Apparatus. E. Bournonville, Jersey City. U.S. Pat. 712,116, Oct. 28, 1902.

SEE Eng. Pat. 13,301, 1899; this Journal, 1899, 823.
—F. H. L.

Acetylene Gas Apparatus. E. Bournonville, Jersey City. U.S. Pat. 712,117, Oct. 28, 1902.

A CARBIDE-FEED apparatus of the side-shoot type, in which the carbide is drawn from the storage hopper by the intermittent revolution of a wheel provided with circumferential teeth, the wheel being actuated through a pawl and chain from the holder bell. The bottom of the generating chamber is hemispherical in shape, so that scrapers, oscillating on a transverse horizontal axis and worked by an outside hand-lever, may loosen any adhering lime sludge. In the decomposing chamber is a chain carrying a float at its upper end and a ball-valve at its lower extremity; when a sufficient quantity of water has been drawn off to clean the apparatus, this ball-valve descends on to the orifice of the sludge-cock and closes it. The crown of the bell is fitted with a spring valve with upward stem, which hits against a cross-bar and permits escape of gas if the bell rises too high.—F. H. L.

Acetylene Gas Generator. D. Barnard, Assignor to D. Barnard and Co., Bakersfield, Cal. U.S. Pat. 712,474, Nov. 4, 1902.

A CENTRAL-HOPPER, carbide-feed apparatus with mushroom valve controlled by the holder-bell. The stem of the mushroom extends upwards through a stuffing-box above the lid of the hopper, and is provided with radial stirring fingers to prevent the carbide cohering into large lumps. The holder is a separate casing, and the feed gear is so arranged that the bell is free to rise or fall to its full extent without causing more than a limited play to the carbide-valve. Connection between generator and holder is broken by a hand-worked screw-down valve.—F. H. L.

Acetylene Gas Generator [*Charging Device*]. R. Klinger, Gumpoldskirchen, Austria. U.S. Pat. 712,940, Nov. 4, 1902.

SEE Eng. Pat. 11,539, May 20, 1902: this Journal, 1902, 1067.—F. H. L.

Acetylene Gas Generator. F. L. Irish, Auburn, Assignor to A. D. Hall and L. B. and E. R. Jones, Winthrop, Maine. U.S. Pat. 713,223, Nov. 11, 1902.

A WATER-TO-CARBIDE, flooded-compartment apparatus, in which the carbide vessel is a vertical cylinder with superposed boxes, and the water-supply is governed by the bell movements. The liquid of the holder seal is used to wash the gas, and water is also taken from it for purposes of gas generation. A "low" and a "high" pressure water-supply are provided, according as the acetylene is made to bubble through a small or a great depth of liquid in the holder tank. The various cocks on the apparatus are so interlocked that the carbide vessel cannot be opened without the automatic closure of the water-supply and the gas exit, and the opening of an air-inlet pipe.—F. H. L.

Acetylene Gas Generator. T. H. Duncombe, St. Thomas, Canada. U.S. Pat. 713,291, Nov. 11, 1902.

A CARBIDE-FEED apparatus of the central-hopper type. The decomposing chamber is connected with a water reservoir through a submerged pipe, so that it acts as a displacement holder; and when the water is forced downwards, a floating ball-valve drops, and causes a flat plate to rise till it closes the orifice of the carbide-hopper. The reservoir is joined to a water-supply through a ball-valve, so that the levels of the liquid in the whole apparatus are maintained in the working positions. This latter valve may also be locked open, so as to produce a constant flow of liquid through the generator, which enables even a small apparatus to supply a large number of lights without exhibiting overheating. The sludge opening can be cleared by a plunger carried on a cranked horizontal spindle, which is moved by an outside handle.—F. H. L.

Acetylene Gas Generator. H. and H. H. Henley, Bloomington, Ind. U.S. Pat. 713,303, Nov. 11, 1902.

AN automatic drip generator in which the supply of water is governed by the bell movements, on the displacement system. Concentrically within the rising bell, and slung from its crown, is a closed hollow plunger, which, when the bell falls, descends into a mass of water held in a small separate compartment attached to the holder tank, displacing that water till it rises in the annulus between the plunger and the compartment, and reaches the mouth of a pipe leading to the decomposing vessel. In order that the variation in the effective weight of the plunger as it is more or less submerged, may not seriously alter the pressure thrown by the bell, the said plunger is connected through an inverted U-tube with the water of the holder tank, and so the level of the liquid in the plunger is always identical with that in the tank. Water is charged into the displacement compartment from an outside funnel. The carbide vessel has a water-sealed lid, and a cock is placed on the tube leading to the holder.—F. H. L.

Acetylene Gas-Generator. G. G. Smith, Florence. U.S. Pat. 713,353, Nov. 11, 1902.

SEE Eng. Pat. 16,702, 1901; this Journal, 1902, 1269. —F. H. L.

Acetylene Gas-Generator. W. C. Homan, Meriden, Conn. U.S. Pat. 713,640, Nov. 18, 1902.

SEE U.S. Pat. 710,559: this Journal, 1902, 1325. The table lamp there described is made to take apart at the waist. On removing the upper portion and inverting it upon the shade ring, a housing contained in the waist, which carries the carbide-feed valve-seat, can be lifted out, so that free access is given to the part of the apparatus which contains the operating mechanism, and a wide space is left for introducing the carbide charge.—F. H. L.

Acetylene Gas-Generator. C. W. Mackenzie, Waverly, Ind. U.S. Pat. 713,658, Nov. 18, 1902.

A DRIP generator, in which the supply of water is governed by pressure. The water is held in a closed vessel fitted with a hand-pump. When this is worked so as to produce sufficient pressure, the liquid passes through a doubly-bent pipe to the jet over the carbide container. From the latter, the acetylene travels to a storage drum carrying a lateral cylinder with a piston pushed inwards by a spring. The piston rod is solid, and passes through a cross piece on the water-supply pipe; and when the pressure in the gas vessel is low, a hole in the piston rod coincides with the bore of the water-pipe, so that water can flow to the decomposing vessel. When, however, gas pressure rises, the piston and rod move until the water way is blocked by the solid rod. —F. H. L.

Incandescent Electric Lamp. J. J. Rooney, Searsdale, N.Y. U.S. Pat. 711,533, Oct. 21, 1902.

A LAMP having two filaments, two external contact pieces in the base, a common connection between the filaments and one of the contact pieces, and wires from the other ends of the filaments leading out through the base near the second contact piece, the latter being provided with means whereby one or other of the wires may be connected with it at will. —H. B.

Incandescent Mantles; Manufacture of ——. G. H. Maisch, Baltimore, U.S.A. U.S. Pat. 712,562, Nov. 4, 1902.

THESE mantles are made of the oxides of rare metals in admixture with a glaze enamel. The oxides of the rare metals used include those of thorium, cerium, and beryllium, and with the glaze enamel also the oxides of cobalt and magnesium. The enamel in question is made from felspar, flint, whiting, china-clay, and lead carbonate.—A. S.

Mineral Substances; Treating ——, *by Heat and Pressure* [*Carbons for Arc Lamps*]. W. Karavodine. U.S. Pat. 712,807, Nov. 4, 1902.

See under VII., *page* 1534.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

ENGLISH PATENT.

Ammonium Ichthyol Sulphonate [*from Asphaltum*]; *Process of Making* ——. A. C. McLaughlin. Eng. Pat. 21,838, Oct. 30, 1901.

See under XX., *page* 1553.

FRENCH PATENT.

Lampblack from Tar and other Carbonaceous Substances; Manufacturing ——. Wegelin. Fr. Pat. 294,306.

See under XIII. A., *page* 1543.

UNITED STATES PATENTS.

Wood-Alcohol; Process of Making ——. W. S. Brandt and F. J. Root, New York. U.S. Pat. 713,552, Nov. 11, 1902.

IN the destructive distillation of wood a pressure is maintained in the whole apparatus slightly lower than that of the atmosphere. The readily-condensable gases are condensed in primary condensers, whilst the gases which are not

readily condensable are mixed with a definite proportion of steam, and the acids thus set free are recovered in a secondary condenser. The degree of vacuum and the supply of steam required for mixing with the less condensable gases, are obtained by means of a steam-exhauster situated beyond the primary condensers. This exhauster is regulated automatically by the volume and tension of the gases generated, so that both its functions are kept constant.

—J. F. B.

Oils; Refining Asphaltic Mineral ——. J. C. Mims, Assignor to Q. Kohnke, New Orleans. U.S. Pat. 713,475, Nov. 11, 1902.

For refining certain asphaltic mineral oils (Texas and Louisiana oils), without distillation, in the preparation of lubricating oils, the inventor proposes to warm the settled oil to about 80° C., preferably by a steam coil, and then treat it with 1—10 per cent. of a mixture of about 5 parts, by weight, of potassium bichromate and 95 parts of 90 per cent. sulphuric acid. After the precipitated asphaltic and other matters have settled down, the oil is removed and washed, till alkaline, with an aqueous solution of about 5 per cent. of sodium carbonate and 5 per cent. of caustic soda, the alkali being finally removed by repeated washings with water. By this treatment it is also claimed that the foul odour of the oil is removed.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Diazo Groups; Replacement of the ——, by the Amino Group. II. L. Wacker. Ber., 1902, **35**, [18], 3920—3928.

The author has further studied the reaction already described (Ber., **35**, 2593; this Journal, 1902, 1129), and has also investigated the behaviour of diazotised binuclear diaminoanthraquinones (bisdiazoanthraquinones) towards amines and hydroxylamine. The substitution of one and of both diazo groups takes place simultaneously, so that 1.5-bisdiazoanthraquinone gives, with ammonia and subsequent decomposition with concentrated sulphuric acid a mixture of 1.5-aminohydroxy- and of 1.5-diaminoanthraquinone, an analogous mixture being obtained from the 1.8 compound. In a similar manner the above diazo compounds, on combination with hydroxylamine and decomposition, yield mixtures of 1.4.5-aminodihydroxyanthraquinone and 1.5.4.8-diaminodihydroxyanthraquinone (diaminoanthrarufin) and of 1.4.8-aminodihydroxyanthraquinone and 1.8.4.5-diaminodihydroxyanthraquinone (diaminochrysazin) respectively. With primary amines (methylamine) the diazo group is exchanged for the amino group, whilst with secondary amines (dimethylamine) it is replaced by the hydroxyl group, the latter reaction taking place more readily than when the diazo compound itself is heated with sulphuric acid.

—T. A. L.

p-Toluidine; A Colour Reaction for ——. J. Biehringer and A. Busch.

See under XXIII., *page* 1559.

Turmeric; New Method of Detecting ——. A. E. Bell.

See under XXIII., *page* 1559.

English Patents.

Formylmethylanthranilic Acid [*Indigo Dyestuffs*]; *Manufacture of* ——. O. Imray. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/M. Eng. Pat. 26,059, Dec. 20, 1901.

The oxidation of quinoline methylo- chloride or bromide in aqueous solution with an alkali permanganate in presence of magnesium sulphate yields formylmethylanthranilic acid, $C_6H_3(CO_2H)NCH_3HCO$, which crystallises from water in yellowish prisms melting at 167° C., and having an odour of coumarin. When boiled with dilute alkalis it is converted into methylanthranilic acid melting at 177° C.

—T. A. L.

Auramines [*Diphenylmethane Dyestuffs*]; *Manufacture of New Substituted* ——. O. Imray. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/M. Eng. Pat. 25,089, Dec. 9, 1901.

The action of alkyl halides on Auramine in a solution of a hydrocarbon (benzene, toluene, or xylene) and in presence of lime, magnesia, or zinc oxide, yields new alkyl auramines of the general formula $X'N:C:(C_6H_4NX_2)_2$ in which X' represents the new alkyl group. For example, tetramethyldiaminobenzophenone-imine and ethyl iodide in benzene solution in presence of zinc oxide, yield on boiling, ethyl auramine, which crystallises from alcohol in colourless prisms, melting at 131° C. The product dyes cotton mordanted with tannin and tartar emetic, a greenish-yellow. In a similar manner benzyl chloride gives benzyl auramine, melting at 116° C., giving well characterised salts, and dyeing mordanted cotton a similar shade to Auramine, but faster to soap and sodium carbonate. The alkyl auramines behave towards dilute mineral acids and reducing agents like Auramine.—T. A. L.

Black Dye [*Sulphide Dyestuffs*]; *Production of a New Intermediate Compound and a* ——. Read, Holliday, and Sons, Ltd., and others, Huddersfield. Eng. Pat. 357, Jan. 6, 1902.

The aminosulpho-salicylic acid of Eng. Pat. 2468 of 1899 (this Journal, 1900, 340) having probably the constitution 1.2.4.5 $C_6H_2(OH)CO_2H(NH_2)SO_3H$ readily reacts with 1.2.4-dinitrochlorobenzene in aqueous or alcoholic solution in presence of sodium acetate giving dinitrodiphenylamine hydroxycarboxysulphonic acid. This product, when treated with sulphur and sodium sulphide, yields a black dyestuff for cotton.—T. A. L.

Colour Scales; Improvements in ——. C. J. Jorgensen, Milwaukee, Wis. Eng. Pat. 17,517, Aug. 8, 1902.

See U.S. Pat. 709,328; this Journal, 1902, 1275.—G. T. M.

French Patents.

Indigo; Reduction of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 319,390, March 7, 1902.

Indigo suspended in a solution of sodium bisulphite is electrolysed at about 70° C. with a current of 2 ampères per sq. dec. at 3 volts, giving a solution of indigo white. Lead electrodes are employed, and the anode chamber contains potassium sulphate solution. Indigo white, in a stable form is obtained if the potassium sulphate solution be replaced by sulphuric acid (30 per cent.).—T. A. L.

Indoxyl [*Indigo Dyestuffs*] *and its Derivatives; Production of* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 319,670, March 17, 1902.

An alkali salt of pheuylglycin or of its derivatives is condensed to indoxyl or a derivative thereof, by fusing with strontium, barium, potassium, or sodium oxide alone or mixed with caustic alkalis.—T. A. L.

Yellowish-Orange Basic Dyestuffs [*Acridine Dyestuffs*]; *Manufacture of* ——. Soc. pour l'Ind. Chim. à Bâle. Supplement, dated March 15, 1902, to Fr. Pat. 241,916, Oct. 8, 1894.

Instead of alkylating Acridine Yellow and Benzoflavine at a high temperature under pressure, the patentees find that it is possible to carry out this operation in an open vessel, employing sulphuric acid and alcohols or else alkyl sulphuric acids. Moreover, it is unnecessary to start from a finished acridine, since the bases corresponding to the tetraminodiphenylmethane series, on heating with concentrated sulphuric acid and alcohols also yield alkyl derivatives. These bases, obtained from two molecular proportions of a *m*-diamine and one of formaldehyde, can also be obtained from homologues of the latter, such as acetaldehyde or else from substituted benzaldehydes, such as nitro-, amino-, hydroxy-, chloro- or sulpho-benzaldehydes. In these cases it is necessary to work under pressure in an autoclave. The products dye yellow to reddish orange shades suitable for leather and tannined cotton.—T. A. L.

Yellowish-Orange Basic Dyestuffs [*Acridine Dyestuffs*]; *Manufacture of* ——. Soc. pour l'Ind. Chim. à Bâle. Supplement, dated March 21, 1902, to Fr. Pat. 241,916, Oct. 8, 1894.

Equimolecular proportions of a *m*-diamine (*m*-phenylene or *m*-tolylene diamine or their alkyl or dialkyl derivatives) and an aldehyde (formaldehyde, acetaldehyde, benzaldehyde, &c.) give a condensation product which, when heated with acids or condensing agents in an open or closed vessel, yield new acridine dyestuffs. These products are readily soluble in water, showing a faint greenish-yellow fluorescence in very dilute solution. The alcoholic solution is brownish-orange with a strong fluorescence, whilst the solution in concentrated sulphuric acid is brownish-red without any fluorescence. The products dye leather and tannined cotton brownish-orange shades.—T. A. L.

Yellowish-Orange Basic Dyestuffs [*Acridine Dyestuffs*]; *Manufacture of* ——. Soc. pour l'Ind. Chim. à Bâle. Supplement, dated March 20, 1902, to Fr. Pat. 241,916, Oct. 8, 1894.

The amino-acridines, such as Acridine Yellow, Benzoflavine and aminotolylnaphthacridine, or amino-acridinium derivatives, such as diaminotolylphenylmethylacridinium, diaminoditolylmethylacridinium, &c, are converted by the action of acetaldehyde in presence of acids into new acridine dyestuffs giving reddish-yellow to orange shades on tannined cotton and on leather. The product from Acridine Yellow dissolves readily in cold water to an orange solution. The dilute alcoholic or aqueous solution shows a greenish-yellow fluorescence.—T. A. L.

Yellowish-Orange Basic Dyestuffs [*Acridine Dyestuffs*]; *Manufacture of* ——. Soc. pour l'Ind. Chim. à Bâle. Supplement, dated March 18, 1902, to Fr. Pat. 241,916, Oct. 8, 1894.

The patentees find that two molecular proportions of a *m*-diamine, identical or different, condense normally with acetaldehyde, yielding bases of the tetraminodiphenylmethylmethane series, which, on heating with acids, separate ammonia, and are converted into acridines. On heating these compounds in open or closed vessels at 100°—200° C. with a mixture of an alcohol and a mineral acid, they yield alkyl derivatives, whilst if these or the former be treated with the halogen esters of the alcohols or with dimethyl sulphate they are converted into acridinium compounds.
—T. A. L.

Yellow to Yellowish-Orange Dyestuffs of the Acridine Series; Manufacture of ——. Clc. Par. de Coul. d'Aniline. Supplement, dated March 7, 1902, to Fr. Pat. 316,721, Dec. 9, 1901.

Similar dyestuffs to those described in the chief patent are obtained by substituting Leuco-acridine Yellow for tetraminoditolylmethane or Acridine Yellow, and also by replacing the chloracetic acid by its methyl or ethyl ether.
—T. A. L.

Dyestuffs [*Azo*]; *Manufacture of Substantive* ——. Soc. pour l'Ind. Chim. à Bâle. Fr. Pat. 319,453, March 10, 1902.

The urea derivatives resulting from the condensation of equimolecular proportions of 2.4′.3′-aminonaphthol sulphonic acid and *p*-aminoacetanilide by means of phosgene or thiocarbonyl chloride, combine with diazo or tetrazo compounds or intermediate compounds of these latter, yielding dyestuffs giving orange to reddish-blue shades on unmordanted cotton fast to acids and light. (See also Eng. Pat. 5895, 1902; this Journal, 1902, 855.)—T. A. L.

Black Substantive Dyestuffs [*Sulphide Dyestuffs*]; *Manufacture of* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 319,790, March 20, 1902.

A mixture of about equal parts by weight of 1.1′- or 1.4′-dinitronaphthalene and a nitro-hydroxydiphenylamine is heated with sulphur and an alkali sulphide. Crude dinitronaphthalene may also be employed, and the diphenylamine compound is obtained by condensing a halogen dinitrobenzene with *p*-aminophenol or one of its derivatives. The resulting products dye cotton from a bath containing salt and an alkali sulphide, black shades, fast to oxidising and other reagents. Similar results are obtained by fusing certain commercial sulphide dyestuffs, such as Kryogen Black, Immedial Black, Katigene Black, &c., with sulphur and sodium sulphide in presence of dinitronaphthalene.
—T. A. L.

Azo Dyestuffs for Wool Capable of being Chromed or Coppered on the Fibre; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 319,868, March 22, 1902.

The diazo compounds of β-naphthylamine derivatives containing in the *o*-α-position a halogen, nitro or sulphonic acid group, exchange this group for hydroxyl on treatment with an excess of sodium carbonate. The resulting compound combines on warming with a suitable substance, such as β-naphthol, yielding a dyestuff which gives brown shades on unmordanted wool. Subsequent chroming produces a blue to black, whilst treatment with copper salts yields a violet. See also U.S. Pat. 710,059; this Journal, 1902, 1328.—T. A. L.

Dyestuffs [*Thiazine*]; *Manufacture of Substantive* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 319,965, Mar. 26, 1902.

The action of sulphur and alkali sulphides or polysulphides on Methylene Violet yields blue dyestuffs for unmordanted cotton. The patentees now find that the sulphides or polysulphides may be replaced by thiocarbonates with or without the addition of sulphur. Either trithiocarbonate or dithiocarbonate may be employed, but in the former case it is necessary to add sulphur if the reaction takes place in an alcoholic medium. The new dyestuff is almost insoluble in water, alcohol, and sodium carbonate, but dissolves to a greenish blue in solutions of alkali sulphides, giving green shades on unmordanted cotton.—T. A. L.

Yellowish Red Lakes [*Azo Dyestuffs*]; *Manufacture of* ——. Badische Anilin und Soda Fabrik. Fr. Pat. 319,989, March 27, 1902.

According to Fr. Pat. 297,330 (Eng. Pat. 25,511 of 1899; this Journal 1901, 35) sparingly soluble azo-dyestuffs are obtained from diazotised 2.1-naphthylamine sulphonic acid and β-naphthol, which, on account of their insolubility are very suitable for lakes. The patentees now find that 2.1.4′-naphthylamine disulphonic acid (obtained from 2.1-naphthylamine sulphonic acid with fuming sulphuric acid), also gives after diazotisation, sparingly soluble compounds with β-naphthol, which are somewhat yellower in shade, and have, moreover, the advantage of not bronzing.—T. A. L.

Haematein; Manufacture of —— by Direct Oxidation of Haematoxylin. Jacquemin. Fr. Pat. 319,945, March 25, 1902.

Logwood extract is treated with manganese oxide or Weldon mud and oxidised by injecting a current of air through the mixture.—J. F. B.

Oxidation by the Electric Current; Process of ——. [*Manufacture of Colouring Matters.*] Nodon and Piettre. Fr. Pat. 319,957, March 26, 1902.

See under XI. A., *page* 1539.

Aniline, Toluidines, &c.; Manufacture of ——. Senderens. Supplement, dated March 5, 1902, to Fr. Pat. 312,615, July 11, 1901. (See this Journal, 1902, 169.)

A convenient form in which to employ the finely-divided metal necessary for this invention is asbestos impregnated with finely-divided copper. One part of asbestos is soaked in 10 parts of water containing two parts of cupric nitrate. After drying and heating to redness, the copper oxide with which the asbestos is impregnated is reduced by means of water-gas, giving coppered asbestos. The amines, moreover, can be purified by passing their vapours, together with reducing gases, over finely-divided metals as described.
—T. A. L.

UNITED STATES PATENTS.

Formylmethylanthranilic Acid [*Indigo Dyestuffs*]; *Process of Making* ——. F. v. Bolzano, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 712,246, Oct. 28, 1902.

SEE Fr. Pat. 317,122; this Journal, 1902, 967; and Eng. Pat. 26,059 (see under Eng. Pats. preceding these).
—T. A. L.

Indoxyl [*Indigo Dyestuffs*]; *Process of Making* ——. B. Homolka and F. v. Bolzano, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 712,798, Nov. 4, 1902.

SEE Fr. Pat. 317,081 and Eng. Pat. 26,060 of 1901; this Journal, 1902, 967.—T. A. L.

Indoxyl [*Indigo Dyestuffs*]; *Process of Making* ——. O. Liebknecht and B. Homolka, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 714,000, Nov. 18, 1902.

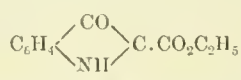
SEE Fr. Pat. 317,121; this Journal, 1902, 967.—T. A. L.

Indoxyl; Substituted ——, [*Indigo Dyestuffs*] *and Process of Making Same.* H. S. A. Holt, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 713,437, Nov. 11, 1902.

SEE Fr. Pat. 311,536; this Journal, 1902, 38.—T. A. L.

Indigo and Intermediate Products; Process of Making ——. B. R. Seifert, C. Philipp, and M. H. Gmeiner, Assignors to Chem. Fabrik von Heyden A.-G., Dresden. U.S. Pat. 714,042, Nov. 18, 1902.

THE nitroso-derivatives of the dialkyl esters of phenylglycin-*o*-carboxylic acid having the general formula $RO_2C.C_6H_4.N(NO)CH_2CO_2R$, are oily substances, obtained by the action of sodium nitrite on a solution of phenylglycin-*o*-carboxylic dialkyl ester in glacial acetic acid. When boiled with alkali lye, or with a reducing agent, such as an alkali sulphide, they are converted into leuco indigo derivatives which on air oxidation yield Indigo. The reaction takes place in stages, the first product from the nitroso ester being most probably a pseudo-indoxylic acid ester. Thus by reacting with ammonia and sulphuretted hydrogen on the diethyl ester of nitrosophenylglycin-*o*-carboxylic acid, yellowish green crystals of pseudo-indoxylic acid ester are obtained. The product melts at 183° C., has the formula—



and is insoluble in water and alkalis. By the action of alkalis this compound is converted into the normal indoxylic ethyl ester, or this latter may be obtained directly from the nitroso ester as mentioned above. The indoxylic acid esters by further heating with alkalis yield leuc-indigo compounds from which Indigo is readily obtained.—T. A. L.

Brown Sulphur Dye [*Sulphide Dyestuffs*], *and Process of Making Same.* M. Böniger, Assignor to Chemical Works formerly Sandoz, Basle. U.S. Pat. 712,176, Oct. 28, 1902.

THE 1.2.4-naphthoquinone sulphonic acid on condensation with primary aromatic amino compounds yields a β-hydroxynaphthoquinonealphylimine, which, when heated with alkali polysulphides to a high temperature (240°—300° C.), gives a yellowish-brown dyestuff for unmordanted cotton. Suitable primary aromatic compounds are aniline and its sulphonic and carboxylic acids, tolnidine, xylidine, cumidine, *m*-nitrotolnidine, and *m*-tolylene diamine sulphonic acids.
—T. A. L.

Yellow to Red Acridine Dye and Process of Making Same. O. Sohst, Assignor to Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 712,421, Oct. 28, 1902.

ACRIDINE Yellow is heated with benzyl chloride in presence of an indifferent solvent, such as nitrobenzene. The resulting product dyes mordanted cotton greenish yellow shades fast to sodium carbonate and ammonia. See also Eng. Pat. 24,400 of 1901; this Journal, 1902, 1327.—T. A. L.

Polyaminoanthraquinone-Sulpho-Acids [*Anthracene Dyestuffs*]; *Process of Making* ——. E. Hepp, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 713,432, Nov. 11, 1902.

THE nitro-aminoanthraquinones already referred to in U.S. Pat. 711,310 (this Journal, 1902, 1392) are converted by boiling with alkali sulphites into polyaminoanthraquinone sulphonic acids. The products dye unmordanted wool from an acid bath pure blue shades fast to light. Their alkaline solutions turn red with zinc dust, the blue colour reappearing when the filtered solution is exposed to air.
—T. A. L.

Yellow Sulphur Dye [*Sulphur Dyestuffs*], *and Process of Making Same.* A. Weinberg and O. Lange, Assignors to L. Cassella and Co., Frankfort-on-the-Main. U.S. Pat. 712,747, Nov. 4, 1902.

ABOUT one part by weight of *m*-tolylene diamine and two parts of sulphur are heated together to a temperature not exceeding 220° C. The product so formed is heated with caustic soda lye, or a concentrated solution of an alkali sulphide yielding a dyestuff giving fast yellow shades on unmordanted cotton.—T. A. L.

Colouring Matter [*Azo Dyestuffs*]; *Compound Suitable for Producing* ——. P. Julius and F. Günther, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 713,447, Nov. 11, 1902.

ORTHO-NITRANISOL is condensed in sulphuric acid solution with formaldehyde, yielding dinitrodimethoxy-diphenylmethane, which on reduction with iron and acetic acid is converted into the corresponding diamino compound. This product, melting at about 107° C., is soluble in alcohol, chloroform, and benzene, but practically insoluble in water. It gives a hydrochloride easily soluble in water, and with nitrous acid a tetrazo compound which combines with β-naphthol to form a red dyestuff.—T. A. L.

Red Disazo Dye, and Process of Making Same. C. Schraube and W. Voigtlaender-Tetzner, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 713,507, Nov. 11, 1902.

THE intermediate compound obtained from equimolecular proportions of tetrazodiphenyl and salicylic acid is combined with 1.3-naphthol sulphonic acid, or with 1.3.3′-naphthol disulphonic acid. The resulting products, which dye from an acid bath, are said to be fast to light, and to milling and fulling, especially after chroming.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Hydroxyanthraquinones; The Mordant-Dyeing Properties of the ——. G. v. Georgievics. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [23], 623—627.

FROM an examination of the mordant-dyeing action of the hydroxyanthraquinone derivatives, it is inferred that they all exhibit tinctorial properties in a more or less marked degree. A mordant dyestuff is, according to the author's view, a substance which is capable of yielding a full, serviceable colour on wool impregnated with ordinary mordants (aluminium, iron, chromium, copper, and tin). Scheurer's mordants (this Journal, 1902, 768) are too sensitive, and frequently fail to indicate any line of demarcation between tinctorial and non-tinctorial substances. Of the dihydroxyanthraquinone derivatives, alizarin is the best mordant dyestuff, the "alizarin position" of the hydroxyls being the most effective in conferring mordant-dyeing properties. Hystazarin comes next to alizarin, its mordant-dyeing action being aided by the ortho-position of the hydroxyl groups. These facts agree with Liebermann and Kostanecki's rule with regard to mordant-dyeing (this

Journal, 1901, 710), but the behaviour of the other dihydroxyanthraquinones clearly indicates that this rule can no longer be considered to hold good. It is shown that 1 : 4-dihydroxyanthraquinone (quinizarin) and 1 : 3-dihydroxyanthraquinone(xanthopurpurin) are mordant dyestuffs, and that the doubling of the 1 : 3-position of the hydroxyls in anthrachrysone further increases the mordant-dyeing action. From this it is inferred that all dihydroxyanthraquinone derivatives containing the hydroxyls in one nucleus are mordant dyestuffs, the adjacency of the hydroxyl groups being of more importance than their existence in the ortho-position. For this reason 1 : 8-dihydroxyanthraquinone exhibits superior dyeing properties to the 1 : 5- and 2 : 6 compounds. Hydroxyl in the α-position gives red shades and in the β-position yellow shades of about equal strength. The doubling of the OH (α)-position in anthrarufin does not increase the dyeing action (contrary to erythrohydroxyanthraquinone), whilst 2 : 6-dihydroxyanthraquinone (anthraflavic acid) yields deeper shades than metadihydroxyanthraquinone.

Reference is made, in conclusion, to the beneficial effect which the introduction of the sulphonic group has on the mordant-dyeing properties of the hydroxyanthraquinone derivatives.—D. B.

English Patents.

Wool and Fibre Scouring Machinery. F. L. Whitney, San Francisco. Eng. Pat. 19,174, Sept. 1, 1902.

The scouring vat has a perforated false bottom. The fibre is lifted from the scouring solution in the vat by means of a series of weighted forked teeth which revolve. It is delivered on to a travelling "draper" which passes it between squeezing rollers. From the rollers it drops into a second vat where it is submerged and "puddled." It is made to undergo similar treatment in this second vat, and in as many as may be found necessary. The dirt separates from the solution by settling through the perforated false bottom.—J. McC.

Raw Cotton and Cotton Goods; [Fire-proofing] Treatment of ——, to Reduce the Inflammability thereof. W. H. Perkin, jun., and Whipp Brothers, and Todd, Ltd., Manchester. Eng. Pat. 23,556, Nov. 20, 1901.

Raw cotton, or cotton goods are saturated with a solution of a soluble tungstate, a soluble aluminium salt and an organic acid such as formic or acetic acid. The goods are subsequently mangled, dried, and steamed to remove the volatile acid. The material is next passed through a sodium silicate solution of 25° Tw., and finally treated with a magnesium sulphate solution of 26° Tw. Instead of employing the silicate and magnesium sulphate treatment, the goods may be finally impregnated with albumin or tannic acid, either of these reagents being used in the form of a 5 per cent. solution. (See also Eng. Pat. 9695, May 9, 1901; this Journal, 1902, 857.)—G. T. M.

Raw Cotton and Cotton Goods; [Fireproofing] Treatment of ——, to reduce the Inflammability thereof. W. H. Perkin, jun., and Whipp Brothers and Todd, Ltd. Eng. Pat. 23,557, Nov. 20, 1901.

Raw cotton or cotton goods may be made fireproof by treatment with a solution of sodium tungstate, a soluble zinc salt, and formic or acetic acid. The goods to be treated are steeped in the solution, and then dried slowly in a current of warm air. The organic acid is removed after about 15 hours, either by steaming or by passing the goods over hot cylinders. The precipitate may be further fixed in the goods by subsequently treating with solutions of sodium silicate and magnesium sulphate, albumin, or tannic acid.

Goods thus treated are more resistant to washing than is the case when an aluminium salt is employed instead of the zinc salt.—J. McC.

Mercerising and Treating Fibres, Fabrics, Warp, and the like; Apparatus for ——. J. H. A. Klauder, Philadelphia, Pa., U.S.A. Eng. Pat. 14,675, July 1, 1902.

Warps or tissues composed of cotton or other (vegetable) fibre, are passed, in a state of tension, continuously through baths of cold and hot water, caustic soda, cold water, and dilute acid, in succession. The necessary tension is produced by means of a series of sets of friction or tension rollers which alternate with the feed-rollers used in guiding the warps or tissues into the several baths.—E. B.

Printing of Textile Fabrics; Method of and Means for Preventing or Resisting the Local Production of Colour in the ——. E. Knecht and P. Spence and Son, Ltd., Manchester. Eng. Pat. 25,248, Dec. 11, 1901. (Compare this Journal, 1902, 969 and 1025.)

A resist under Paranitraniline Red is produced on cotton padded with β-naphthol by printing with a mixture of titanium trichloride, $TiCl_3$, sodium sulphocyanide (thiocyanate), and British gum, the dried fabric being subsequently passed through a diazotised *p*-nitraniline solution containing sodium acetate.

Other derivatives of titanium sesquioxide may be employed in the printing paste, which, in addition, may contain paraffin wax, sulphocyanides (thiocyanates), acetates, or formates. Other diazotised aromatic amines may be used in the condensation, and the process is also applicable to other colours produced on the fibre by oxidation or combination.—G. T. M.

Dyeing Slivers wound into Tops or Cheeses; Apparatus for ——. P. M. Justice. From M. Hausan, Peacedale, R.I., U.S.A. Eng. Pat. 19,701, Sept. 9, 1902.

The tops are placed in perforated cylinders which rest on a wheel fixed near the bottom of the vat containing the dye-liquor. The cylinders are arranged round the wheel, and in the axis of each there is a perforated tube closed at the top, and passing at the lower end into pockets in the wheel. The whole system can be rotated, and the cylinders are also made to rotate, adjacent cylinders moving in opposite directions. When the dye-liquor is only up to the level of the wheel, it is sucked up into the central tubes when the system rotates, and is sprayed out on to the tops or cheeses in the cylinder. The solution then passes through the perforations of the cylinders back to the bottoms of the vats. In some cases the apparatus may conveniently be used one-half to three-quarters full of solution, so that the dyeing solution is thrown from the centre, through the cylinders, on to the tops, as well as upwards, through the central tubes.—J. McC.

French Patents.

Fibres [Ramie]; Process and Apparatus for Ungumming, Cleansing, and Bleaching Vegetable ——. Leclercq. Fr. Pat. 318,457, Feb. 6, 1902.

The fibres to be treated are first steeped in water for two days to soften the encrusting matters, and are then placed, packed in baskets, in a boiler-shaped vessel. Here they are acted upon, at a temperature of about 200° C., with a solution of 1·125 kilos. of caustic soda and 4·5 kilos. of sodium carbonate in 1,600 litres of water, which is circulated through them.

When the fibres have been sufficiently treated in the ungumming apparatus, the baskets containing them are taken to a drum, where the fibres are successively hydro-extracted, washed, treated with a solution of olive-oil soap, and again "extracted." The fibres thus cleansed are then ready for bleaching, an operation which is performed in the same apparatus, the fibres to this end being (i) immersed in a solution containing equal parts of hydrochloric and sulphuric acids, neutralised with "a potash salt," followed by (ii) rinsing with water, (iii) treatment with oxalic acid (1 part) and sodium hyposulphite (1 part in 500 parts of water) at a temperature not exceeding 40° C., (iv) soaping with olive-oil soap, and finally (v) drying at a temperature of 33° C. or below.—E. B.

Patterns [by Carbonising] upon Mixed Fabrics Composed of Wool and Vegetable Fibres; Producing ——. T. Jegler. Fr. Pat. 318,427, Feb. 5, 1902.

Woollen fabrics, *e.g.* felt, the surface of which is covered with, or composed wholly or partly of vegetable fibres, are immersed in a solution of "an acid," and are then printed

with an alkaline solution. They are then carbonised as usual. The vegetable fibres in the unprinted parts are thus destroyed and a pattern is produced. Instead of printing with discs, plates, or other similar appliances to produce a pattern, this may be obtained by steeping curtains, lace, &c. in the alkaline solution, and pressing them against the acid-prepared fabrics.—E. B.

Animal Fibre, Process for Reducing the Dyeing Properties of ——. The Badische Anilin und Soda Fabrik. Fr. Pat. 318,741, Feb. 17, 1902.

The affinity of wool for dyestuffs is diminished by treating it (i) for 2—5 minutes at a temperature of about 20° C. with sulphuric acid at 60°—62° B., the wool being in a well-dried state when immersed in the reagent; (ii) for an hour at the ordinary temperature in a dilute solution of sodium hypochlorite (9 litres at 4° B. in 300 litres of water, for 10 kilos. of wool), or calcium hypochlorite, &c.; (iii) as in (ii) followed, after rinsing thoroughly, by an immersion for ½—1 hour in a solution of stannous chloride (500 grms. in 300 litres of water). After the application of the above-mentioned reagents, the wool is well washed and then dried. For silk, only processes (ii) and (iii) are applicable, the treatment with stannous chloride causing, as in the case of wool, a further diminution in its dyeing properties, after the fibre has been subjected to process (ii). The first process is available for the treatment of pure woollen materials only; the second and third processes may be employed in treating materials composed entirely of wool or of silk, or materials composed of one or both of these fibres in admixture with cotton or other fibres. Two-colour effects and composite colour dyeings (mélanges) may be obtained by spinning or weaving woollen fibres, prepared according to process (i) for example, together with ordinary untreated woollen fibres, or with fibres treated with a concentrated solution of caustic soda, to increase their affinity for the dyestuffs subsequently applied, or with silk or cotton fibres, and then dyeing the yarns or tissues thus produced. The effects may be varied by dyeing some of the fibres before mixing, spinning, or weaving them together, and afterwards again dyeing them with the same or a different dyestuff. The dyestuffs for which the animal fibres lose their attraction, when acted upon as described, belong to the most diverse groups:—Azo, Triphenylmethane, Indigo, &c. The behaviour of Indigo towards the fibres treated according to processes ii. and iii. is exceptional, however, as it is absorbed by these more powerfully than it is by the fibres in their original state.—E. B.

Textile Materials; Process for Colouring and Rendering Impermeable —— [*Waterproofing*]. J. Leclercq. Fr. Pat. 317,679, Jan. 14, 1902.

Textile materials, after being saturated with a solution of a salt of aluminium, iron, copper, or chromium, according to the colour which is to be given them, are passed into a bath of soap, sodium carbonate, and vegetable wax, and are then again treated with a solution of the salt first applied.—E. B.

Indigo Dyeing; Preparation of Substances [*Indigo*] *employed in* ——. Playne and Macdonald. Fr. Pat. 317,722, Jan. 13, 1902.

See Eng. Pat. 19,312, 1901; this Journal 1902, 1132.
—E. B.

Indigo Vats [*for Wool*]; *Impts. in Preparing* ——. Playne and Macdonald. Fr. Pat. 318,678, Feb. 14, 1902. (Under Internat. Conv., Jan. 13, 1902.)

A solution of sodium hydrosulphite is added to one of potassium or sodium carbonate. The mixture is boiled, allowed to clarify by settling, and the clear solution obtained is withdrawn into a dye vessel and mixed with ground Indigo or a paste of that dyestuff and glycerin (see preceding abstract). Dyeing is performed as usual in the vat thus set. As this is clear, it becomes almost completely exhausted, and can be run away, after use, without causing any serious loss.—E. B.

Dyeing Textile Fibres [*with Dye-Liquor Foam*]; *Apparatus for* ——. C. Roesch and Co. Fr. Pat. 317,762, Jan. 14, 1902.

A chamber, surmounted by a hood for the removal of the vapours produced during the dyeing operation, is provided with a side-door for the entry and removal of a perforated crate containing the materials to be dyed. A space is left between the bottom of the chamber and the crate, when this is inside the former, for the reception of dye-liquors. By adding oil or soap to these, when the apparatus is in use, foam is produced, which rises and falls through the materials, and so dyes them.—E. B.

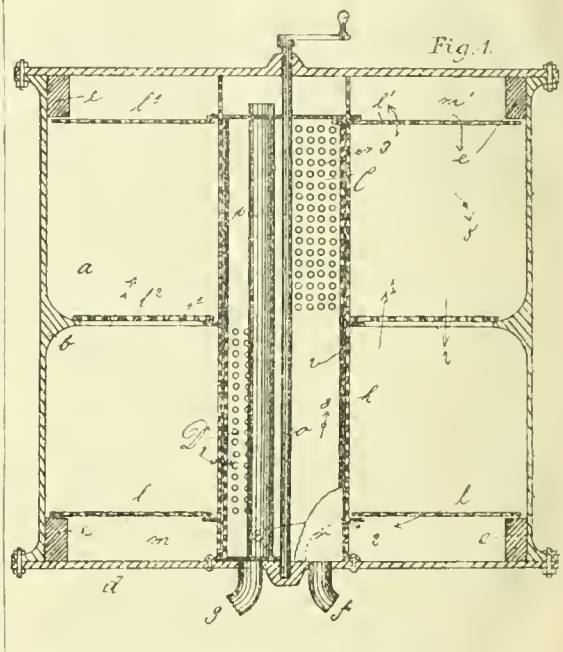
Dyeing Fibrous Materials in the Spun or other State [*Yarns or Cops*]; *Apparatus for* ——. R. Illingworth, J. T. Mazey, and G. Naylor. Fr. Pat. 318,071, Jan. 25, 1902.

See Eng. Pat. 9720 of 1901; this Journal, 1902, 1025.
—E. B.

Dyeing Yarns, &c.; Process and Apparatus for ——. E. Bocks. Fr. Pat. 319,000, Feb. 24, 1902.

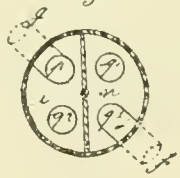
The materials to be dyed are placed between perforated plates, *l*, l^2, l^1 (see figure), in a dye vessel *a*, and are treated with dye-liquors, which are forced through them from a central distributing chamber *h*. The latter encloses a

Fig. 1.



rotatable cylinder *i*, closed at both ends, and divided longitudinally into two compartments, C and D, by a partition *n*, the upper part of one and the lower part of the other of these being perforated. A pipe, *p*, passes through one of the compartments.

Fig. 2.



On turning the cylinder *i*, the course of the dye-liquor is varied: thus, for example, when q^1, one of four apertures at the bottom of the cylinder *i*, is immediately above the pipe *f*, the liquor enters through this, and is directed by an inwardly curved part *r*, of the pipe into the space *m*, at the bottom of the vessel, whence it ascends through the materials to the top of the vessel, where it is received by the pipe *p*, which is in communication with the suction pipe *g* of a circulating pump.

In dyeing yarns in the form of cops, a modified form of apparatus is employed. In this, the outer, fixed casing of

the central distributing cylinder is dispensed with. The rotatable inner cylinder is divided into two longitudinal compartments, and is provided with perforations, into which are fixed tubes upon which the cops to be dyed are placed.—E. B.

Dyeing, Washing, Mordanting, Soaping, &c. [*Yarns*]; *Apparatus for* ——. C. Corron. Fr. Pat. 319,049, March 3, 1902. (See U.S. Pat. 706,801; this Journal, 1902, 1134.)

In addition to the arrangement already described, by means of which a "whip stroke"-like motion is imparted to the hanks of yarn which are being dyed, an arrangement for giving a regular alternating motion to the eccentrically placed hank carriers is claimed. The latter, which are ordinary reels, are moved in opposite directions alternately about four-fifths round the axes of the arms or discs which support them.—E. B.

Dyeing Apparatus [*for Cops*]. Wolf. Fr. Pat. 319,185, Feb. 28, 1902.

See U.S. Pat. 701,444; this Journal, 1902, 912. (See also Eng. Pat. 11,853 of 1901; this Journal, 1902, 771.)—E. B.

Sulphur Dyestuffs; Process of Printing with ——. Weiss. Fr. Pat. 317,507, Jan. 2, 1902.

100 grms. of a sulphur dyestuff, such as Kryogen Brown, Katigen Green 2 B, Immedial Black F F Extra, are suspended or dissolved in 150 c.c. of water and mixed with 750 grms. of thickened caustic soda-lye, prepared from 3 kilos. of starch, 7 kilos. of British gum, 10 litres of water, and 80 kilos. of caustic soda-lye at 40° B. Sulphur may also be added to this mixture with a view to forming sodium sulphide during the steaming operation. When printed, it is stated, the alkali effects a local mercerisation of the tissue which then absorbs more of the dyestuff than the tissue which has not been so changed is capable of doing, while no contraction of the fibre occurs. The dyestuff is fixed by a few minutes' steaming.—E. B.

Sizing and Finishing Textile Materials; Use of Casein in ——. Jean. Fr. Pat. 318,956, Feb. 22, 1902.

Yarns are sized and weighted, and tissues finished and weighted, more effectually than they have been hitherto by means of flour and starch, by the application to them of mixtures of casein, sodium carbonate or other suitable alkali compound, soap, mineral or other oil, weighting materials, *e.g.*, kaolin, and water.—E. B.

Errata.

This Journal, 1902, 1229, col. 2, line 22 from top, *for* "A. Bing" *read* "A. Binz." Also *ibid.*, line 25 from bottom, *for* "pyrosulphate" *read* "pyrosulphite." Page 1230, line 10 from top, *for* "pyrosulphate" *read* "pyrosulphite." Also page 1328, col. 2, line 39 from bottom, *for* "spots on parts" *read* "spots or parts."

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Molybdenum Salts, Combined with Tannin and Vegetable Mordants; Production of Fast Shades on Leather by ——. E. Pozzi-Escot. Comptes Rend., 1902, **135**, [20], 880.

Molybdenum produces fast shades on leather just as titanium does (see Lamb, this Journal, 1901, 1111). Molybdenum tannate is soluble in and has great affinity for animal fibre; it is of a deep yellow colour by itself, but a large variety of shades may be obtained by using it in conjunction with logwood extracts.—R. L. J.

English Patent.

Leather Dyeing; Improvements in ——. Riedler, Osterwieck, Germany. Eng. Pat. 9373, April 23, 1902.

In order to dye skins on the grain side only, they are stretched on inclined slabs of a triangular section arranged in a large tub. The flesh side of the skin is placed next the slab. The dyeing solution is sprinkled uniformly over the slabs.—J. McC.

French Patent.

Leather; Production of Fast Shades on ——, *by Titanium Salts, in conjunction with Tanning or Dye-Wood Extracts.* C. Dreher. Supplement, dated March 5, 1902, to Fr. Pat. 311,094, May 23, 1901.

This improvement in the process of dyeing leather with titanium compounds consists in the use of neutral instead of acid solutions, obtained by neutralising (1) titanic acid dissolved in solutions of lactic, tartaric, citric, or malic acid, or other carboxylic acids of the fatty series; (2) titanic acid dissolved in other acids, such as sulphuric, hydrochloric, oxalic acid, &c., to which has been added, in order to prevent precipitation of the titanium, (*a*) fatty carboxylic acids or their salts, (*b*) fatty compounds containing several hydroxyl groups, *e.g.*, glycerin; or (*c*) soluble carbohydrates, such as the sugars, starch, or dextrin.—R. L. J.

VII.—ACIDS, ALKALIS, AND SALTS.

Ammoniacal Cuprous Oxide; Oxidation of ——. J. Meyer.

See under XXIV., *page* 1561

Alums; Acid Reaction of the ——, *and the Influence of this Acidity on the Formation of Insoluble Compounds of Gelatin with Chrome Alum.* Lumière and Seyewetz.

See under XIV., *page* 1514.

English Patents.

Arsenic and Sulphur; Recovery of ——, *from Precipitated Sulphide of Arsenic.* J. E. Riley and J. Barnes, Accrington. Eng. Pat. 25,444, Dec. 13, 1901.

The sulphide of arsenic is heated to about 160° C. with about its own weight of strong sulphuric acid for some hours. The floating scum of sulphur is removed and washed, and the acid liquor is concentrated to obtain crystallised arsenious acid.—E. S.

Calcium Compounds [*Hydrosulphites*]; *Preparation of* ——, *for Reducing, Decolorising, and Analogous Purposes.* G. Hughes, London. From L. Descamps, Orleans, France. Eng. Pat. 8304, April 9, 1902.

Sulphurous acid is treated with zinc powder, and to the cleared solution sufficient milk of lime to give an alkaline reaction is added, but, before the alkalinity is complete, the mixture is filtered, and the neutral or slightly acid filtrate is rendered alkaline by milk of lime; or precipitation may be effected by addition of a saturated solution of calcium chloride or the like. The precipitate is collected as a paste and may be dried in a vacuum; it is stated to be applicable, not only as a reducing agent, but in decolorising syrups, bleaching paper pulp, &c. Reference is made to Eng. Pats. 20,865 and 21,126, of 1898; see this Journal, 1899, 1918, and 915 respectively.—E. S.

Alumina; Separating ——, *from Silica.* M. Packard, Buffalo, U.S.A. Eng. Pat. 20,220, Sept. 16, 1902.

See U.S. Pat. 708,561, 1902; this Journal, 1902, 1232.—E. S.

French Patents.

Phosphoric Acid; Obtaining ——, *from Mineral Phosphates.* Hatmaker. Fr. Pat. 319,303, March 5, 1902.

Mineral phosphates are roasted at a low red heat, to destroy organic matter, and are then digested with sufficient sulphuric acid to form calcium sulphate with the lime. The liquor and washings are evaporated to a syrup.—E. S.

Soda [*Sodium Carbonate*]; *Obtaining* ——, *in Small Crystals.* F. Winckler. Fr. Pat. 319,535, March 13, 1902.

To a hot concentrated solution of sodium carbonate a certain proportion of sodium silicate solution is added. Or

the silicate may be added to the water in which the soda is dissolved. On cooling, with agitation, a magma of small crystals is formed, which are centrifugally separated from the mother liquor and dried.—E. S.

UNITED STATES PATENT.

Sulphurous Acid; Apparatus for Manufacturing ——. J. Edmunds, Waltham, Mass., U.S.A. U.S. Pat. 711,485, Oct. 21, 1902.

AN upright cylindrical sulphur furnace with a conical top, into which an exit pipe fits, has draught openings in its lower portion, which may be closed by lowering a damper ring. The pipe from the furnace top has an extension into a vertical cylindrical chamber, into the bottom of which water flows, and which has an automatically-controlled outlet near the surface of the water, which is maintained at a practically constant level. The pipe, which is perforated at its lower end, reaches to near the bottom of the chamber, in the upper, vacant space of which, a vacuum, or approximate vacuum, is maintained. The gases from the furnace are thus drawn through the water in the cylinder, the upper portion of which water, as it becomes saturated with the gas, passes into storage vessels.—E. S.

Ammonia Gas; Condenser for ——. J. L. Morris, Lawrence, Kans. U.S. Pat. 712,704, Nov. 4, 1902.

AN apparatus for liquefying ammonia gas, comprising a chamber, a sinuous tube in it for passage of the gas, composed of horizontal runs, a series of horizontal perforated plates arranged between the runs of the tube in such a manner as to divide the chamber into a number of horizontal compartments communicating with each other at alternate sides; a water tank, means for admitting water from it to the uppermost of the perforated plates, a blast fan connected to the space between the lowest of the plates and the bottom of the chamber, and means for returning the water from the bottom of the chamber to the tank.—E. S.

Ammonia; Apparatus for Freeing ——, *from Gas Liquor.* H. A. Abendroth. U.S. Pat. 712,891, Nov. 4, 1902.

See under II., *page* 1526.

Sulphur; Retort for Subliming ——. A. A. Consoli, Catania, Italy. U.S. Pat. 711,811, Oct. 21, 1902.

SEE Eng. Pat. 8757, 1902; this Journal, 1902, 926.—E. S.

Sodium Cyanide; Method of Making ——. F. Roessler, Frankfort-on-Maine, Germany, Assignor to Roessler and Hasslacher Chem. Co., New York. U.S. Pat. 711,910, Oct. 21, 1902.

THE mass containing both sodium cyanide and sodium carbonate, obtained in the synthetic manufacture of cyanide, is treated with sufficient water to bring all the salts into solution; the lye is then evaporated *in vacuo* to such a concentration that sodium carbonate only is precipitated. The liquor is separated from the precipitate, and sodium cyanide is caused to crystallise by cooling; the crystals are dehydrated by fusing them in their water of crystallisation at 33° C.—J. F. B.

Calcium Sulphate and By-Products; Obtaining ——. H. H. Wing, New Brighton, N.Y. U.S. Pat. 712,225, Oct. 28, 1902.

SULPHUR dioxide, which may be dilute and impure, or otherwise, is brought into contact, in presence of air and moisture, with magnesite, or any magnesium compound decomposable under such conditions. Magnesium sulphate and insoluble magnesium sulphite are thus formed. By continuing the process, the sulphite may be converted into sulphate; or it may be separated and otherwise oxidised. The magnesium sulphate is added to a solution of calcium chloride, and the calcium sulphate formed, is separated. Lime, or dolomitic lime, is then added to the resulting magnesium chloride solution, whereby the by-product, magnesium hydroxide, is precipitated, and the solution of calcium chloride thus produced, is used again in the process. —E. S.

Alum; Obtaining ——. H. H. Wing, New Brighton, N.Y. U.S. Pat. 712,226, Oct. 28, 1902.

FUMES containing sulphur dioxide and air are passed through a solution of cupric sulphate containing alumina or aluminium hydroxide in suspension, whereby the sulphuric acid formed by oxidation of the SO_2, produces aluminium sulphate. Copper is then separated from the solution as sulphide by sulphuretted hydrogen; and after removal of the sulphide, the acid set free is neutralised by alumina. The aluminium sulphate solution is then evaporated to form "concentrated alum;" or it is crystallised as ordinary alum after addition of potassium sulphate.—E. S.

Sulphate of Lime; Apparatus for Draining Crystals of ——. C. S. Wheelwright, Providence, R.I., Assignor to Wheelwright Filler and Manufacturing Co., Rhode Island. U.S. Pat. 712,347, Oct. 28, 1902.

THIS apparatus or machine for draining the acicular crystals of calcium sulphate or similar crystals from water of suspension, closely resembles a Fourdrinier paper-machine. There is a mixing box into which the water of suspension with the acicular crystals referred to, is pumped. The liquid flows on to a travelling endless sheet of felt upon which the pasty mass is formed.—E. S.

Mineral Substances; Treating ——, *by Heat and Pressure.* V. Karavodine, Paris. U.S. Pat. 712,807, Nov. 4, 1902.

MINERAL substances, insoluble in water, but containing water chemically combined, are simultaneously subjected, either alone or mixed with fibrous or pulverulent substances, to a temperature of from 250° to 400° C., and to a pressure of not less than 100 kilos. per sq. cm. For example, ashestos may be mixed with sodium silicate and an alum; the paste is washed and moderately pressed, and is treated as described, a hard, elastic, and easily polished mass of a mixture of asbestos with aluminium silicate resulting. Graphite with certain silicates or aluminates thus heated and compressed, yields a product available for the manufacture of crucibles, carbons for electric lamps, &c.—E. S.

Oxygen; Producing Pure ——. C. Charlopin, Paris. U.S. Pat. 713,602, Nov. 18, 1902.

COMPRESSED air and hydrochloric acid gas are passed into a mixing chamber in which the gases are heated in presence of porous bodies charged with copper chloride, chlorine gas and steam being produced. This mixture of gases is subjected to condensation, to remove steam and hydrochloric acid, the latter dissolving in the water formed. The other gases (chlorine, nitrogen, and air) are then drawn off by a suction apparatus to a "separator," in which, by a pressure of 8—10 atmospheres, the chlorine present is liquefied, the remaining gases being permitted to escape. The liquid chlorine thus obtained is withdrawn, and delivered, as a gas, into a chamber containing superheated steam, hydrochloric acid and oxygen gases being thus produced, from which the acid is absorbed by water, and the oxygen is stored.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

ENGLISH PATENT.

Enamelled Polychrome Photographs, and Artistic Stained Glass, and other like Decorations; Processes for Producing ——. H. Perrin, Sérézin du Rhône, France. Eng. Pat. 5884, March 10, 1902.

SEE Fr. Pat. 319,117; this Journal, 1902, 1455.—W. C. H.

FRENCH PATENT.

Mural Glass, or Glass Facing Slabs; Composition for the Manufacture of ——, *and Method of Application.* Coffignon and Blondeau. Fr. Pat. 319,956, March 26, 1902.

THE composition for making glass slabs into facing slabs for walls, &c., consists of 73 grms. of silicate of soda or potash at about 30° B., 25 grms. of calcium carbonate, and

2 grms. of oxide of zinc, with the addition of a coloured powder, preferably vitrifiable, and mixing with this, pounded marble, &c., to form an adhesive surface. The powdered zinc oxide and calcium carbonate are mixed and sifted, and the sodium or potassium silicate solution added gradually, the paste so obtained being spread on the slab and allowed to dry 24 hours, when a second coat of paste is added and sprinkled with pounded marble, &c., heated to 60° C. for 10 hours, and then to 250° C. and slowly cooled. Slabs so prepared may be fastened to walls, &c. by a coat of plaster, cement, or ordinary lime.—W. C. H.

Glass or Porcelain Plates or Slabs: Process of Manufacturing ——. L. Stein and W. Storr, both of Berlin. U.S. Pat. 713,710, Nov. 18, 1902.

See Eng. Pat. 12,017, 1901; this Journal, 1901, 900.
—W. C. H.

Ceramic Glass, &c.; Dipping ——. S. H. Ellis, Hanley, and T. Holt, Stoke-on-Trent. U.S. Pats. 713,621 and 714,104, Nov. 18, 1902.

See Eng. Pat. 5673, 1900; this Journal, 1901, 476.
—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Calcium Sulpho-Aluminate and the Action of Sea Water on Portland Cement. O. Rebuffat. Gaz. chim. ital., 32, [2], 158—168. Chem. Centr., 1902, 2, [21], 1297. (See also this Journal, 1901, 581.)

The author states that the recent investigations of Deval do not justify the acceptance of Michaëlis' formula for calcium sulpho-aluminate. Candlot's formula, $2Al_2O_3.6CaO.5CaSO_4.52H_2O$, however, appears to be correct for the sulpho-aluminate obtained from any aluminate in presence of calcium sulphate and calcium hydroxide, or from a solution of tricalcium aluminate by the action of a solution of calcium sulphate in lime-water.—A. S.

English Patents.

Wood; Apparatus for Impregnating ——. H. H. Lake, London. From T. Giussani, Milan. Eng. Pat. 18,506, Aug. 22, 1902.

This apparatus is for impregnating timbers, especially railway sleepers, with liquids, either hot or cold, contained in successive vats. The shafts supporting the stirrups which carry the timbers to be treated, travel on rollers along tracks on or near the edges of the vats, and are admitted to and carried through the first vat and discharged from the last vat by means of endless chains, moving at controllable rates of speed, and provided with hooked cramps or engaging devices, pivoted to the connecting pins of the links of the chains. The timbers are automatically raised from one and lowered into the succeeding tank by chains moving at a higher rate of speed, in order to diminish the time of exposure to the atmosphere. See Eng. Pat. 11,927, 1901; this Journal, 1901, 991; and U.S. Pat. 707,224; this Journal, 1902, 1233.—W. C. H.

Slag Cement; Apparatus for the Manufacture of ——. A. M. Clark, London. From Fellner and Ziegler, Frankfort-on-Main, Germany. Eng. Pat. 2671, Feb. 1, 1902.

An addition to the apparatus described in Eng. Pat. 10,857, 1901; see this Journal, 1902, 550. Molten material, *e.g.*, blast-furnace slag, is discharged on to a rotating cone, or disintegrator, surrounded by a casing; under the casing is a table mounted to rotate, the upper surface of which passes just beneath a stationary scraper, so arranged that material deposited on the table is diverted to the required point of discharge.—W. C. H.

French Patents.

Wood, particularly Railway Sleepers; Preservation of ——. A. Flamache. Fr. Pat. 319,354, March 6, 1902.

Wood, especially railway sleepers, is impregnated with a solution of a soluble barium salt, or a salt which becomes soluble by the action of organic acids.—W. C. H.

Wood; Preservation of ——. J. L. Ferrell. Fr. Pat. 319,509, March 12, 1902.

Wood is heated sufficiently to cause expansion and to drive off the water of the sap and also the gases, and it is then immersed in a chemical solution which impregnates it as it cools; or the wood may be immersed in a solution, which is then heated—in some cases boiled—to cause expansion, &c., and then cooled, to bring about the impregnation. Similarly, wood may be treated first with one solution and then with a second. See also Fr. Pat. 319,123; this Journal, 1902, 1455.—W. C. H.

Colouring Building Materials, such as Lime, Mortars, and Stone; Process for ——. Schultess. Fr. Pat. 319,765, March 19, 1902.

Lime, mortar, and stone are coloured by using solutions of organic lakes, or adding lakes of alkaline-earths or of certain metals to the water used for slaking the lime. The materials may also be impregnated with a solution of a "salt of an alkali or a metal," and treated with a solution of a lake, or a mixture of the two solutions, and then subjected to an increase of temperature. The surface of stone, &c., may be treated with a metallic salt which is decomposed by an increase of temperature, causing the deposition of a colouring oxide, carbonate, &c. In some cases, a solution of reduced organic colouring matters is employed and the colour is developed by oxidation.. Lastly, the materials may be impregnated with a solution of a metallic salt, and then treated with a solution which produces a sparingly soluble precipitate (*e.g.*, a solution of an alkali hydrate or carbonate).—W. C. H.

United States Patents.

Wood; Apparatus for Impregnating ——. T. Giussani, Milan. U.S. Pat. 713,630, Nov. 18, 1902.

See Eng. Pat. 18,506, 1902. See under Eng. Pats.
—W. C. H.

Sandstone; Fireproof Lime ——. J. Horak, Königswinter, Prussia. U.S. Pat. 712,799, Nov. 4, 1902.

See Eng. Pat. 19,283, 1901; this Journal, 1902, 1078.
—W. C. H.

X.—METALLURGY.

Alloys; Behaviour of Some ——, *to the Law of Wiedemann and Franz.* F. A. Schulze. Ann. d. Physik., 9, [4], 555—589. Chem. Centr., 1902, 2, 1291.

Experiments were undertaken with alloys of bismuth and lead and of bismuth and tin, to determine whether the heat-conductivity varied, on altering the proportions of the components of the alloys, in the same way as the electrical conductivity does. This was found to be the case, the law of the proportionality of the two conductivities being applicable to the alloys in the same manner as to pure bismuth. Whilst, however, in alloys of zinc and tin, the conductivities alter proportionately to the ratio of the percentages by volume of the two components, in the Bi-Pb and Bi-Sn alloys, the conductivities do not agree with those required by the law of mixtures. It is probable that in regard to heat conductivity, just as in the case of electrical conductivity, metals may be divided into two groups. In the group comprising the metals: zinc, tin, lead, and cadmium, mixtures of any two of these elements conduct heat and electricity in proportion to the components, whilst any metal of this group mixed with any other of the remaining metals, furnishes alloys, which only conduct heat and electricity to a lesser degree than that indicated by the law of mixtures.—A. S.

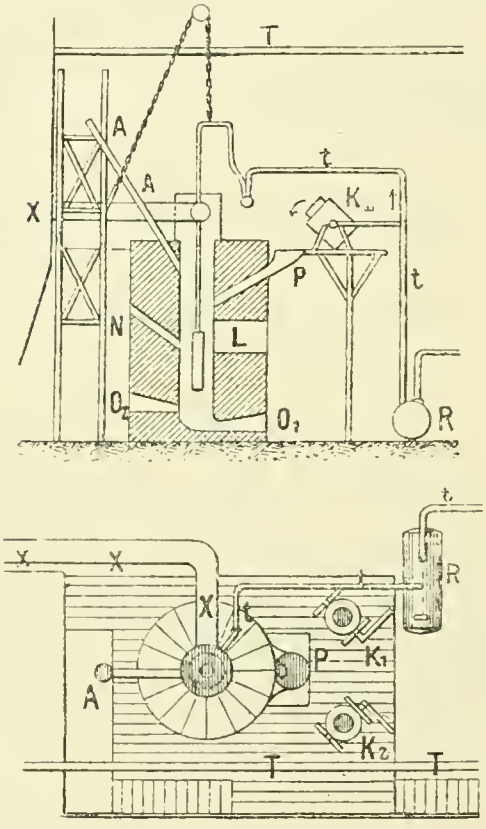
Lead Smelting without Fuel. Eng. and Mining J., 1902, 74, [18], 574.

Catelin has devised a process for the recovery of lead by blowing air into fused galena. The following reaction takes place: $-2PbS + 2O = SO_2 + Pb + PbS$, and it is stated that the whole of the silver is collected in the reduced lead. The reaction is exothermic to the extent that the burning of one half of the sulphur of a charge should be sufficient

theoretically to develop sufficient heat to volatilise half of the charge and smelt the other half. The temperature of the furnace must be maintained at about 1100° C. throughout the process, and, in practice, the usual losses of heat by radiation, absorption by the nitrogen of the air, &c., occur. Losses of heat are made good by burning some of the ore to "white lead," which is subsequently mixed with the black fume (PbS), and reduced to metallic lead in the usual manner, with evolution of sulphur dioxide.

The final products of the process are pig lead enriched with silver; pig lead free from silver; a slag containing lead; and sulphur dioxide. When the ore contains less than 75 per cent. of lead and especially in the case of zinciferous ores, the gangue forms a thick hard crust, but this can be prevented by increasing the temperature or by adding a flux so as to produce a fusible slag.

The arrangement of the plant for working this process at Clichy, France, is shown in the accompanying diagram. After the round shaft-furnace, which is 0·54 m. in diameter and 4·5 m. high and is provided with a door L and an observation tube N, has been heated to the desired degree, 100 kilos. of lead are melted in K_1, and poured in through the cast-iron pipe P. About 200 kilos. of pure galena containing 70—80 per cent. of lead are next melted in K_2 and



also poured into the furnace. The blast of air from the reservoir R, which is connected to the blower, is then introduced into the molten galena through the pipe *t t* and the tuyère, the latter being suspended inside the furnace by means of a chain. From 1,000 to 3,000 kilos. of ore are now introduced through A and the black fume is led off through the pipe X to the condensation chamber from which the waste gases are removed through the tube T. When the fume produced begins to become light-coloured, charging is discontinued, and the blast of air is shut off. Lead is tapped off through O_2 which is about 0·2 m. above the hearth, until matte appears. Hearth accretions are removed through O_1, which is also occasionally used for tapping off the lead, in order that the bottom of the furnace may gradually be heated. After tapping off the lead, the tuyère is lowered, and the blast turned on; the oxide of lead produced is scorified as a very fusible slag which is tapped off through O_2, more ore being then charged in and the process repeated. (See Eng. Pat. 23,014, 1899; this Journal, 1900, 154.)

—A. S.

Gold in Cyanide Solutions; Determining ——. T. L. Carter.

See under XXIII., *page* 1558.

Copper Bullion; Determination of Gold and Silver in ——. T. B. Swift.

See under XXIII., *page* 1559.

Zinc; Volumetric Determination of ——. F. W. Küster and F. Abegg.

See under XXIII., *page* 1557.

English Patents.

Steel; Manufacture of ——. W. B. Johnson, Liverpool. From N. McConnell, Pittsburg, U.S.A. Eng. Pat. 25,476, Dec. 13, 1901.

To produce a slightly phosphorised steel by the basic process, the ordinary basic open-hearth furnace is used, and the product is rephosphorised by adding an alloy of iron and phosphorus, containing preferably 25 per cent. of the latter.—J. H. C.

Armour Plates; Manufacture of ——. R. A. Hadfield, Sheffield. Eng. Pat. 16,133, Aug. 10, 1901.

Armour plates are cast direct of chromium nickel steel, which must be low in manganese, and are subsequently toughened and hardened on the surface, without any rolling, forging, or pressing. The best composition was found to be one containing— carbon, 0·35 per cent.; silicon, 0·12 per cent.; sulphur and phosphorus, not over 0·05 per cent., and manganese, not over 0·10 per cent.; with chromium, 0·85 per cent.; and nickel, 2·75 per cent. The process of annealing and hardening the face is fully described.

—J. H. C.

Gold from Sea-Water; Extraction of ——. W. H. Martin and Thames Mining Machinery Co., Ltd., London. Eng. Pat. 23,422, Nov. 19, 1901.

To precipitate the gold from sea water, a solution is used of either sulphate of aluminium or iron, or of any alum, mixed with a solution of chloride of mercury or acetate of lead, or sulphate of soda and acetate of lead, neither of which must exceed 60 grains to the 1 ton of sea water.

Large reservoirs, with inlet pipes for the sea water, are used for this process, and small pipes to spray the chemicals over the surface of the sea water, as the reservoirs are filling, are arranged over the top.—J. H. C.

Kilns or Furnaces. H. H. Lake, London. From C. A. Schuppmann, Berlin. Eng. Pat. 24,840, Dec. 5, 1901.

The kiln or furnace, besides serving for roasting or reducing ores, and like purposes, is especially adapted for burning house-refuse and similar waste material. The leading features of the invention are "a kiln comprising in combination a feed-shaft having plane walls; a second, approximately horizontal shaft in direct communication with the feed shaft; blast nozzles disposed in the second shaft; an air channel disposed in the walls of the shafts and adapted to be heated by the fire in the same; a second air channel likewise disposed" in the walls of the shafts and similarly heated; a smoke-dust separating chamber, connected by a channel with the feed-shaft; "a gas outlet channel disposed above the first channel; a hopper; means to conduct the material" thence into the feed-shaft; "and a counterbalanced flap adapted to permit the material charged thereon, to fall in the desired positions into the feed-shaft."—E. S.

Galvanising Wire. W. vom Braucke, Ihmerterbach, Westphalia. Eng. Pat. 147, Jan. 2, 1902.

A BRIGHT zinc coating is preserved by excluding air as the wire issues from the bath, this being effected by subjecting it, for a few inches of its length, to a current of steam, an indifferent gas, or a liquid enveloping it. —E. S.

Metals of the Alkalis; Manufacture of ——. G. W. Johnson, London. From The Chemische Fabrik Griesheim-Elektron, of Frankfort-on-the-Main, Germany. Eng. Pat. 295, Jan. 4, 1902.

SEE U.S. Pat. 710,493, 1902; this Journal, 1902, 1333. —E. S.

Solder or Surface Coating for Aluminium and other Metals; An Alloy capable of Use without Flux, as ——. J. M. Jackson, Birkenhead, and O. Kiesel, Munich, Germany. Eng. Pat. 18,237, Aug. 19, 1902.

THIS alloy consists of pure English tin and pure aluminium in the proportion of from 4 to 60 grms. of the latter to each kilo. of solder, according to the purpose in view. These solders are suitable for use with magnalium, as well as for aluminium itself.—J. H. C.

Nickel; Melting and Refining ——. H. L. Haas, New York, U.S.A. Eng. Pat. 19,914, Sept. 11, 1902.

SEE U.S. Pat. 709,218, 1902; this Journal, 1902, 1281. —E. S.

FRENCH PATENTS.

Cast-Iron resembling Steel; Production of ——. The Société Bayerische Eggenfabrik, Moriz Süss-Schülein. Addition, dated March 19, 1902, to Fr. Pat. 305,405, Nov. 15, 1900.

CAST-IRON, to which steel filings and a little ferro-manganese may be added, is placed in a crucible lined internally with a material rich in carbon, and is exposed, uncovered, to flame impinging upon the surface of the charge, which fills the crucible. The conversion and purification is stated to be thus more quickly effected than by the customary process in covered crucibles, and the molten mass obtained, constitutes a cast-steel, well fitted for the manufacture of cutting tools, as well as of machinery subject to great strain.—E. S.

Antimony; Metallurgical Treatment of ——, *and Apparatus employed.* E. Basse. Fr. Pat. 319,534, March 13, 1902.

A COMBUSTION chamber having a battery of burners for combustion of gaseous or of atomised liquid fuel, is combined with each of a series of three furnaces, serving for roasting, reduction, and melting respectively. The ore is first heated by aid of burning coke in the roasting furnace (of the cupola type, with movable supporting bars for the fuel and ore), but no more solid fuel is subsequently added with fresh charges of the ore; the heat being maintained by the burning gases. Provision is made for admission of heated and, if necessary, of compressed air, besides that applied to the burners.—E. S.

Sulphide [Copper] Ores; Treatment of ——. The Soc. La Métallurgie Nouvelle et Gin. Fr. Pat. 319,556, March 13, 1902.

THE ore is strongly roasted, until the copper sulphide is transformed, partly into oxide and partly into sulphate, the associated iron sulphide being also oxidised into sulphate, which decomposes, with formation of SO_2, SO_3 and Fe_2O_3. The roasted ore is then caused to slowly traverse a cooling channel (on the principle of Deville's "hot and cold tube") in a current of air and of the gases from the furnace. Under these conditions, the ferric oxide acts on the SO_2 as a contact body, producing SO_3, which converts the cupric oxide, but only a small proportion of the iron oxide, into sulphate. The temperature of the gases at the discharge end of the channel is kept slightly above 500° C., and the excess gases are passed into chambers for the production of sulphuric acid. The ore thus treated, is lixiviated with hot water, and the liquor is filtered through other portions of strongly roasted ore, containing a large proportion of cupric oxide associated with ferrous sulphate, the reactions between which cause precipitation of ferric oxide. The purified solution may be treated in any known way for the separation of the copper as metal or as sulphate.—E. S.

Solder for Aluminium and its Alloys. O. Nicolai and F. Börner. Fr. Pat. 319,837, March 22, 1902.

SEE Eng. Pat. 6969, 1902; this Journal, 1902, 1081.—E. S.

Adhesive Composition for Use in the Manufacture of Agglomerates [Ore Briquettes] of all Kinds. Charles. Fr. Pat. 319,856, March 22, 1902.

See under II., *page* 1525.

Lead, Copper, and other Metals [Molten]; Process of Blowing ——, *by Water passed direct through a Reacting Tube.* Haber and Savelsberg. Fr. Pat. 319,973, March 26, 1902.

SEE Eng. Pat. 2939, 1901; this Journal, 1902, 177.—E. S.

UNITED STATES PATENTS.

Steel; Process of Manufacturing ——. H. Knoth, Birmingham, Alabama, U.S.A. U.S. Pat. 712,389, Oct. 28, 1902.

IN order to reduce the proportion of scrap required in open-hearth steel making, a predetermined portion of the finished steel is reserved in the casting ladle after filling the moulds, and is then returned to the hearth, which should in the meantime have been repaired. Before being so returned, the steel is mixed in the ladle with the (melted) crude metal for the next charge.—W. G. M.

Titanium with Iron; Process of Combining ——. A. J. Rossi, Assignor to J. MacNaughton, New York. U.S. Pat. 713,802, Nov. 18, 1902.

SEEING that alloys of iron and titanium previously patented, and containing upwards of 5 per cent. of titanium, are practically infusible at the ordinary temperatures employed in iron and steel making, a new alloy, containing only 2 to 5 per cent. of titanium, is now prepared in an arc-furnace of crucible form with a tap-hole at the bottom, the charge employed being a mixture of titaniferous and non-titaniferous ores in the requisite proportions to produce the required ratio between the two metals, with the necessary quantities of carbon and of caustic lime for reduction and fluxing respectively.

The special titanic pig thus prepared is then charged into an ordinary cupola in any required proportions with the pig-iron which it is sought to impregnate with titanium. —J. H. C.

Crucibles; Shield and Funnel for Recharging ——. G. B. Brown, Reading, Pa., Assignor to Carpenter Steel Co., New York. U.S. Pat. 711,467, Oct. 21, 1902.

A DOUBLE-WALLED iron bell is made to fit closely over the upper (incurved) portion of a skittle-shaped pot. The space between the walls is filled with asbestos. The lowest part is flared outwards so as to assist the placing of the bell over the crucible, and the height of the bell is such that when resting in place it does not reach quite to the level of the bottom of the pot. A covered charging funnel is bolted to the top of the bell, and is provided with handles by which to remove or to shake the apparatus. The whole forms a drop shield.—W. G. M.

Smelters' Crucibles; Method of Recharging ——. G. B. Brown, Reading, Pa., Assignor to Carpenter Steel Co., New York. U.S. Pat. 711,468, Oct. 21, 1902.

A PROTECTING-SHIELD (preferably filled with asbestos) is applied to the hot crucible immediately after its molten contents have been poured out. The crucible is then recharged while covered by the shield, the latter being subsequently removed and the crucible introduced into the furnace as usual.—J. H. C.

Assayers' Furnace. A. C. Calkins, Assignor to F. W. Braun and Co., Los Angeles, Cal. U.S. Pat. 711,554, Oct. 21, 1902.

A new form of hinged sheet-iron floor with strengthening bar and central leg, to facilitate removal of the fire-clay bottom lining, and to strengthen the lower part of the furnace and keep it in shape.—J. H. C.

Furnace; Reduction ——. H. E. Vosburgh, Auburn, N.Y. U.S. Pat. 712,161, Oct. 28, 1902.

A reduction chamber fired with oil has one or more charging stacks extending from near the bottom, through the roof, and terminating above in a hopper, whilst the lower end is open. The lower part of the stack is perforated, so that the hot combustion gases may penetrate into the incoming charge, and so pre-heat it. Similar openings are provided near the top. In the centre of each side wall is an opening provided with a door, and just below the level of the door there is an outside shelf supported on brackets. Running from end to end within the furnace, on a level with the bottoms of the doors, there is, on each side, a ledge formed of masonry, and between these ledges the cross-section of the furnace is ∪-shaped. The bottom of the furnace is inclined downwards from back to front, and has a tap-hole at the lowest point, and a slag hole at a higher level on the middle of each side. One of the internal side-ledges is provided with a chute sloping downwards in front of the side-door, whilst the other side-ledge slopes downwards somewhat from the inside towards the outside, and is provided in the middle portion with grooves which slope inwardly, to conduct back into the furnace, drainings from crucibles standing on the ledge.—W. G. M.

Smelting Furnace. W. F. Hannes, Assignor to W. J. Browning, Deming, N. Mexico. U.S. Pat. 712,374, 1902.

See Eng. Pat. 10,929, 1902; this Journal, 1902, 1141. —J. H. C.

Cupola Furnace. P. Bacher, Canton, Ohio. U.S. Pat. 712,472, Nov. 4th, 1902.

An improved form of cupola furnace to admit of melting two kinds of metal at once in the same furnace. The furnace is constructed with a fixed base-plate, a fixed top-plate with dome section hanging thereto and supported by suitable pillars, and hinged semi-circular sections forming the sides. A central post from the bottom plate supports the inner melting pot, the top of which is formed by the dome-section of the cupola top-plate. The inner melting-pot has a separate delivery spout passing through one of the hinged sections of the cupola sides, and brass or steel may be melted in it while iron is being melted in the cupola.—J. H. C.

Blast Furnace. T. Stapf, Teruitz, Austria-Hungary. U.S. Pat. 712,615, Nov. 4, 1902.

See Eng. Pat. 898, 1902; this Journal, 1902, 482.—W. G. M.

Furnace [Muffle for Assaying]. C. S. Batchelder. U.S. Pat. 712,636, Nov. 4, 1902.

See under XXIII., *page* 1557.

Ore Furnace. W. A. Köneman, London, Assignor to A. F. Hatch, Chicago, Ill. U.S. Pat. 712,812, Nov. 4, 1902.

An ore furnace consisting of a pair of vertical combustion chambers with horizontal baffles, feed inlets at the top and discharge doors at the bottom, and a vertical exhaust chamber with numerous ports opening into it from the combustion chambers.—J. H. C.

Silver; Alloy of ——. W. H. Walker, Newtonville, Assignor to Towle Manufacturing Co., Newburyport, Mass. U.S. Pat. 712,027, Oct. 28, 1902.

To prevent the formation of oxides of base metals ("fire-surfaces") in annealing silver alloys, the metal is heated to 600° C. in an atmosphere containing sufficient reducing gas to prevent the oxidation of the base metal without causing brittleness. This is effected when the proportion of reducing gas to "neutral" gas is as 1:2. Producer-gas may be used if this rule is attended to, CO_2 and N both being reckoned as neutral.—W. G. M.

Metals; Compound for Cleaning and Soldering ——. J. H. Young, Fort Wayne, Ind. U.S. Pat. 712,230, Oct. 28, 1902.

This compound consists of 8 oz. of distilled water, ½ oz. of ammonia, 10 grs. of sal-ammoniac, and 3 oz. of potassium cyanide.—J. H. C.

Metals; Process of Smelting and Refining Volatile ——. J. Armstrong, London. U.S. Pat. 713,043, Nov. 4, 1902.

This is an improvement on U.S. Pat. 701,458 of June 3, 1902. The ore containing zinc is smelted with fluxes to slag the more volatile metals, condensing any fumes in the form of dust in tubes water-cooled externally. The dust is returned to the furnace; the slag is drawn off and distilled with fuel to obtain the zinc, whilst lead, silver, &c. are tapped out in the liquid state. The fumes may be again condensed, and the resulting matter distilled with a small proportion of fuel.—W. G. M.

Metal Plate [Tinplate Manufacture]; Process of Treating for ——. J. Howell and S. J. Drew, Joliet, Ill. U.S. Pat. 713,440, Nov. 11, 1902.

After the plates leave the usual pickling bath, they are washed or swilled with a weak solution of hot water and hydrochloric acid, about 1½ galls. of acid being used to 100 galls. of water. They are then washed with a hot solution of lime water, containing 100 lb. of lime to 100 galls. of water, stacked on edge in an annealing furnace and dried by hot air, which is permitted to come into direct contact with the faces of the plates.—J. H. C.

Metallic Antimony; Process of Producing ——. T. C. Sanderson, New York. U.S. Pat. 714,040, Nov. 18, 1902.

See Eng. Pat. 20,981, 1902; this Journal, 1902, 145. —J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Cathodic Reduction. A. T. Weightman. Trans. Amer. Electrochem. Soc., 1902, **2**, 65–78.

In the Salom process for the production of lead sponge (this Journal, 1902, 1187) native galena is used as cathode, and is reduced by the action of the electric current, sulphuric acid being used as electrolyte. The thermo-chemical equations of the two possible reactions are:—

(1) With PbS as cathode—

	Cals.
$PbS = Pb + S$	−20,400
$S + H_2 = H_2S$	+ 4,510
$H_2O = H_2 + O$	−68,360
	−84,250

(2) With metallic lead as cathode—

H_2SO_4 aq. $= H_2 + O + H_2SO_4$ aq. 68,360

and these should be the principal factors in determining the relative distribution of the current between the two reactions, that reaction which requires the lesser energy absorption being the one more readily effected, whilst that which requires the greater energy absorption should increase on raising the current density. In practice, however, notwithstanding the fact that the reaction $PbS + H_2 = Pb + H_2S$ requires a very much greater absorption of energy than the mere liberation of hydrogen, it can, under proper conditions, be kept up to an efficiency yield of 80 per cent. for two-thirds of the reduction, even when PbS is only present to the extent of 25 per cent., and this in spite of the fact that the reduced lead sponge is a better electrical conductor than PbS. Moreover, the current-efficiency (amount of PbS reduced for a given current), whilst extremely sensitive to

the degree of purity of the ore and the nature of the impurities, the conductivity of the ore, the fineness of grinding, the strength and purity of the electrolyte, the thickness of the layers of ore, and the temperature of the electrolyte, is almost unaffected by changes in the current density. As a possible explanation of the high efficiency of reduction when compared with the difference in the thermo-chemical equations of the two reactions, the author draws attention to the observation of Caspari and others, that the voltage necessary for the liberation of hydrogen is not constant, but is dependent on the metal constituting the cathode. The excess which is necessary above 1·48 volts is called the "over-charge," and this over-charge, which must be added to the 1·48 volts required according to the thermo-chemical equation, might be sufficiently high, in the case in question, to bring the voltage necessary for the liberation of hydrogen above that required for the liberation of hydrogen sulphide.—A. S.

English Patents.

Batteries; Thermo-Electric ——. B. J. Hall, London. Eng. Pat. 418, Jan. 7, 1902.

One set of ends of a series of thermo-electric couples is cooled by the passage of cold air through an inlet tube surrounding them, and the other ends are heated by the passage through an outlet tube surrounding them of the same air heated in the interval by passing through a furnace or heating chamber suitably placed.—G. H. R.

Fertilisers; Process [Electrical] of Making ——. J. J. and R. Crooke. Eng. Pat. 19,513, Sept. 5, 1902.

See under XV., *page* 1545.

French Patents.

Battery; A Primary or Secondary ——, the Depolariser of which is a Higher Halogen Salt. Rosset. Fr. Pat. 319,532, March 12, 1902.

One type of battery, in which the depolariser is a higher halogen salt of manganese, lead, &c., consists of a vessel of vulcanite or other suitable material, in which the plates of carbon and zinc are placed alternately, the former resting on a false bottom with openings to admit the zinc plates, the lower part of which stand in mercury, which serves to establish a connection between them, whilst the connection between the carbon plates takes place through a copper bar. In another type the tetrachloride of manganese is formed in the cell itself, the binoxide of manganese serving to form it being placed between the walls of the vessel, and the carbon plates are perforated to allow of the free passage of the hydrochloric acid. An insulating liquid, lighter or not than the electrolyte, forms a layer in or above which the exciting liquid flows so as to insulate the several vessels of the receptacle, which can be connected for circulation, filling and emptying by the same channels which convey the electrolyte.—G. H. R.

Accumulator Plates; Active Material for Manufacture of ——. Sussman. Fr. Pat. 319,550, March 13, 1902.

The paste is formed of an oxide of lead moistened with an aqueous solution of sulphate of urea which has first been mixed with dilute sulphuric acid, in order to prevent the too rapid hardening of the paste. To render the plates porous, cane sugar may be added to the mixture, and it is afterwards dissolved out when the plates are formed.—G. H. R.

Ozonisers; Arrangement for furthering the Silent Discharge in ——. Société Ozon-Maatschappij (Systeem A. Vosmaer). Fr. Pat. 319,564, March 13, 1902.

In order to avoid entirely the production of voltaic arcs, and to reduce sparking to a minimum, in addition to a condenser mounted on the secondary circuit of the transformer, a reacting bobbin with a suitable self-induction is inserted in series in one or other of the branches of the secondary circuit of the transformer.—G. H. R.

Electrolyser for the Extraction of Metals lighter than the Electrolyte. Becker. Addition, dated March 1, 1902, to Fr. Pat. 284,125, Dec. 17, 1898.

After referring to previous patents of 1890 and 1899 (this Journal, 1900, 544), it is claimed in the present specification that not only can carbonate of soda be electrolysed by the addition of oxides or salts to make it more fusible and a better conducter, but that it or any other sodium salt can be employed to recover, not only the metal, but also the acid, such as nitric or phosphoric acid.—G. H. R.

Cathodes; Process and Apparatus for Forming and Regenerating Mercury ——, under ordinary Conditions. [Divided Currents.] La Cour and Rink. Fr. Pat. 319,388, March 7, 1902.

The electrolytic cell is divided into narrow anode compartments alternating with larger washing ones. The former, which are closed above, open into a common closed chamber, their partitions descending into the mercury at the bottom of the apparatus, and the last cell of the series is suitably connected to the first from a source of electricity. The other cells also open into a common chamber, so that the anode compartments fit like a comb into the larger ones, which can be closed by the cover of the cell. The current is divided into a number of very restricted circuits as regards the displacement of the mercury, which is led in an endless sheet at the bottom of the electrolytic cell. A further increase of the effect produced by the division of the current, is obtained by using a very thin layer of mercury, or where it is desired to use a thicker sheet, the movement of the lower layers is prevented by means of little ridges.—G. H. R.

Oxidation; Process of ——, by the Electric Current. Nodon and Pietre. Fr. Pat. 319,957, March 26, 1902.

The oxidation of any matter held in solution or suspension in a liquid may be effected through the medium of the higher oxides of manganese (MnO_2, Mn_2O_3, Mn_3O_{11}, &c.) in the presence of lime, and by the action of an alternating current, with the employment of iron or steel electrodes, in which no physical or chemical change is produced under the circumstances. It is claimed that this process is applicable in the purification of river or factory water; the pasteurisation of fermented liquors, the rapid ageing of fermented or alcoholic liquors, the purification of distillery phlegms, the rapid improvement of natural perfumes, and the manufacture of colouring matters obtained by direct oxidation.—G. H. R.

Aëration or Agitation of Liquids [Electrolytes, &c.]; Apparatus for the ——. H. E. Dolphin. Fr. Pat. 318,004, Jan. 23, 1902.

See U.S. Pat. 699,294; this Journal, 1902, 779.—W. G. M.

Ebonitine; A New Insulating Material which is not Softened by High Temperatures. De Karavodine. Fr. Pat. 319,264, March 4, 1902.

Resinous substances, such as bitumen, gum lac, pitch, or drying oils, are mixed with 15—35 per cent. of powdered sulphur and 25—70 per cent. of mineral matter, such as asbestos, sand, or pumice, and the mixture is heated to a temperature varying from 250° to 400°C. until it has passed through a pasty condition to an almost solid one. It is then compressed into heated moulds, or may be cooled and pulverised before moulding. If the resins or oils are heated to 300°—350° before use, the subsequent vulcanisation is facilitated. The products do not soften at temperatures below 250° C.—M. J. S.

United States Patents.

Gas Battery [Electric Generator]. O. Britzke, St. Petersburg. U.S. Pat. 711,614, Oct. 21, 1902.

A gas battery for generating an electric current is constructed of a number of cells, each formed of refractory material having metal plates on opposite sides within the cell, and a plate impregnated with an electrolyte dividing the space between the plates into two channels, through

which hot gases are circulated. A hot, easily oxidisable gas, and a hot gas containing oxygen, are the gases used. At one end a chamber is provided, connected to one set of channels and to a gas generator, and a second chamber connected to the other set of channels, while at the other end there is one chamber with which all the channels communicate.—R. S.

Electric Accumulators; Process of Forming ——. [*Fluorine.*] W. Morrison, Chicago, Ill., Assignor to the Helios-Upton Co. U.S. Pat. 711,997, Oct. 28, 1902.

In producing active material, or material to become active, upon a lead structure for accumulators, the lead structure is partially disintegrated in a solution of sulphuric acid and water, or other acids containing a soluble fluoride and nitrate, or compound thereof, by passing a current of electricity from an extraneous source through it.—G. H. R.

Electrolytic Cell. [*Fluid-Metal Cathode.*] A. E. Truesdell, Pittsfield, Mass. U.S. Pat. 712,218, Oct. 28, 1902.

The cell or vat has a channel with an inclined bottom between its side walls, and two ribs of metal extending parallel with and near to them. The bottom of the cell is of cast iron and carbon, and with the ribs and end-walls of the cell forms a container for a body of mercury, constituting the cathode. Carbon anodes extend downwards through the cover of the cell, which supports them, and their heads are submerged transversely in the electrolyte. During working, an amalgam is formed on the cathode, and this is brushed from the surface of the mercury into the channel, which has an outlet at the lowest part, with a trap for retaining a part of the amalgam which constitutes the cathode of an auxiliary circuit connected by its positive pole to the anode. The area of the separated amalgam exposed to the electrolyte is practically restricted to the area of the discharge pipe during the working of the cell, and means are provided for introducing fresh solution in the vicinity of the amalgam so exposed.—G. H. R.

Gravity Battery [*Babbitt Metal*]. W. N. Gove, Philadelphia, Pa. U.S. Pat. 712,668, Nov. 4, 1902.

The battery is composed of "a solution," bluestone, and zinc, and, instead of the usual copper element, a plate of Babbitt metal, is arranged in a horizontal plane, its surface being parallel with that of the electrolyte. It is stated that each cell has an E.M.F. of 1·20 volt.—G. H. R.

Storage-Battery Plates; Process of Peroxidising ——. [*Nitrate of Lead.*] E. N. Chamberlain, Depew, Assignor to the Gould Storage Battery Co., New York. U.S. Pat. 712,995, Nov. 4, 1902.

The plates are pickled in a dilute nitric acid solution, and then subjected to electrolysis as anodes in a bath, consisting of a solution of sulphuric acid, to which is added the nitrate of a metal, preferably nitrate of lead, the sulphate of which is practically insoluble in the bath, thereby setting free nascent nitric acid, and simultaneously precipitating the resulting sulphate which is removed from it. The nitrate of lead resulting from the pickling operation, can be utilised for the bath.—G. H. R.

Storage Batteries; Process of Manufacturing Elements for ——. E. A. Sperry, Cleveland, Ohio. U.S. Pat. 713,020, Nov. 4, 1902.

Sixty per cent. of lead, 34 per cent. of oxide of lead, and 6 per cent. of a salt of an alkali are mixed together while dry, and in a finely-divided condition. The mixture is moistened with an alkali hydroxide, and applied to one or both sides of a metal grid, and subjected to heavy pressure.

—G. H. R.

Voltaic Cell. [*Solid Depolariser.*] H. B. Taylor, Newark, N.J. U.S. Pat. 713,174, Nov. 11, 1902.

The jar or vessel holding the electrolyte has a suitable cover, to which is attached a container for one of the elements with a movable bottom, which can be displaced and retained in that position, so that when cover and receptacle are turned over, there is sufficient space between the bottom and the end of the latter to admit of refilling it. An insulating support for the other element is also attached to the cover, and means are provided on the outside of the cell for releasing either or both of the elements without having to touch any internal part of the cell, which can be emptied and refilled without touching it with the hands.—G. H. R.

Storage Batteries; Non-active Metal for Use in ——. H. H. Lloyd, Germantown, Assignor to Electric Storage Battery Co., Philadelphia, Pa. U.S. Pat. 713,568, Nov. 11, 1902.

Lead cast with about 12 per cent. by weight of antimony and rolled in a cold state, is claimed to possess great mechanical strength in proportion to its weight, and qualities of toughness, smoothness, and resiliency which make it very suitable for use in, and in connection with, storage batteries.—G. H. R.

Insulating or Protective Compounds; Manufacture of ——. C. L. V. Zimmer, Hamburg. U.S. Pat. 713,190, Nov. 11, 1902.

See Eng. Pat. 6058, March 22, 1901; this Journal, 1901, 719.—M. J. S.

(*B.*)—ELECTRO-METALLURGY.

Metallic Anodes; Electrolytic Solution of Soluble ——. W. McA. Johnson. Trans. Amer. Electrochem. Soc., 1902, **2**, 171—173.

The selective electrochemical solution of anodes depends upon the properties of the alloys segregated in the latter. The electrical conductivity and the electrolytic tension or voltage of a metal are modified by alloying with other metals. The production of alloys is, in most cases, accompanied by evolution of heat, *i.e.*, the free energy is diminished, and as the electrolytic solution tension is determined by the free energy of the metal, in normal solution of its ions, it also must decrease. The alloys are harder, and have less tendency to dissolve than the component metals. In most cases, also, the electrical conductivity of an alloy is lower than that of either of the components. In view of these facts, and taking the case of a particle of silver-copper alloy surrounded by crystals of pure copper, the current would preferably pass through the copper, and this would be dissolved, while the silver-copper alloy would be disintegrated and form "slime." An anode made by casting $\frac{1}{2}$ part of silver with $99\frac{1}{2}$ parts of copper in such a manner that the amount of oxygen in the alloy as dissolved oxide is reduced to a minimum, can be electrolytically dissolved in a solution containing 6 per cent. of copper and 5 per cent. of free sulphuric acid, at a temperature of 45° C., from 90 to 99·9 per cent. of the silver, according to the current density, being "slimed." In the electrolytic refining of copper, the impurities, arsenic and antimony, were they present as metals, would have a greater tendency to dissolve than copper, because of their high electrolytic solution tension. In actual practice, a very large percentage of these impurities can be slimed immediately. The arsenic and antimony are, for the most part, oxidised in the converter or reverberatory furnace, and their heats of oxidation being much larger than that of copper, the oxides produced remain dissolved in the copper, and are not reduced, to any extent, in the "poling" operation. Arsenic and antimony thus occur in the anodes in the form of oxides, and as such, act as insulators, and are consequently "slimed."—A. S.

Zinc and Copper; Electrolytic Precipitation of ——. E. F. Smith.

See under XXIII., *page* 1558.

French Patents.

Furnace; Electric Revolving ——, *for the Reduction of Ores and the Refining of Metals.* Stassano. Fr. Pat. 319,404, March 8, 1902.

See Eng. Pat. 8288, 1902; this Journal, 1902, 1284.

—G. H. R.

Iron Alloys; Electrical Manufacture of ——, *with Simultaneous Production of Alkali, and of Alkaline-Earth Oxides.* Gin. Addition, dated March 21, 1902, to Fr. Pat. 316,772, Dec. 10, 1901.

The process consists in heating, in an electric furnace, any native mineral capable of giving, when thus heated together with iron and carbon, an iron alloy and an alkali distillate. For example, potash felspar with iron and carbon, thus heated, yields ferro-silicon and corundum with a sublimate of K_2O.—E. S.

Iron Ore; Treatment of [*Electrical*] ——, *in a Combination of Furnaces, for Reduction and Fusion.* Grange. Fr. Pat. 319,041, March 15, 1902.

The powdered ore, made into briquettes with carbon, tar, and a flux, is charged into a tall vertical furnace, supplied near the bottom with water-gas or other reducing gas, and, higher up, with air. The furnace terminates at the bottom in a chute, delivering the reduced red-hot ore into the front compartment of an electric furnace, in which provision is made for withdrawal of floating slag as it forms. A passage near the bottom of the compartment communicates with a second compartment, containing the carbon electrode, and the orifice for outflow of the molten metal is arranged slightly above the communicating passage, in order to exclude air while tapping.—E. S.

Antimony; Process for the Electrolytic Separation of ——, *from its Sulphuretted Ores.* Izart and Thomas. Fr. Pat. 319,449, March 10, 1902.

The electrolytic cell is divided into two compartments, the anode one of which contains a dilute solution of caustic soda, or, in a general way, of any bodies soluble in water, with the effect of rendering the liquid a good conductor, and of "facilitating the deposits of sulphur in a solid condition by their chemical inertia." The cathode compartment contains sulph-hydrates or alkali sulphides (potassium, sodium, ammonium) to dissolve the sulphuretted antimony ores, especially stibnite.—G. H. R.

United States Patents.

Electric Furnace. A. A. Shade, Assignor to E. H. Moore, both of Chicago, Ill. U.S. Pat. 713,923, Nov. 18, 1902.

The furnace is provided with an interior vertical passage, into the upper end of which the material to be smelted is continuously fed, and which leads to a crucible at the lower end which has a magnet below it, and a spout at its upper part to draw off the molten material from it. A series of electrodes is arranged to form a series of arcs in the passage, one in advance of the other, and through which the material successively passes, the wall of the passage being provided below each arc with an oblique ledge which extends into the path of the material. An electro-magnet is embedded in the wall below each arc so as to elongate it in the direction of the passage of the material through the furnace.—G. H. R.

Electrodeposition of Metals; Method of and Apparatus for ——. G. J. Reed, Philadelphia, Pa. U.S. Pat. 712,153, Oct. 28, 1902.

The electrolytic apparatus comprises a rotatable receptacle containing a mixture of a liquid electrolyte and an inert or non-conducting granular substance, in which are located two electrodes, or sets of electrodes, one of which receives the metallic deposit, and is movable in the mixture. A generator supplies electric energy to the electrodes, and means are provided for producing relative movement between the cathodes and the mixture, and for circulating the electrolyte through the granular substance.—G. H. R.

Metal Ornamentation; Method of ——. T. Hauserman, Vienna. U.S. Pat. 712,789, Nov. 4, 1902.

The metal plate to be decorated is first coated with a solution of chromate glue, which is allowed to dry, and the plate is then exposed under a negative and the drawing developed, the plate being heated and subjected to the corroding action of a solution as described. It is then washed, and an electro-deposit of copper or other metal is applied, after which it is electro-silvered, and the covering layer removed. Or, an electro-metal deposit may be applied to the plate before covering it with the chromate glue.—G. H. R.

Ferro-Silicon and Silicon-Spiegel; Process of Manufacturing ——. G. Gin, Paris. U.S. Pat. 712,925, Nov. 4, 1902.

Siliceous slags from the acid Bessemer or open-hearth processes are crushed, mixed with carbon in the proportion of 1 molecular weight of carbon for each molecular weight of oxygen, and the mixture is heated in the electric furnace so that acid and basic oxides are reduced, together forming a metallic silicide as product.—W. G. M.

Lead and Lead Alloys; Electrolytic Refining of ——. A. G. Betts, Lansingburg, N.Y. U.S. Pats. 713,277 and 713,278, Nov. 11, 1902.

See Eng. Pat. 7661; this Journal, 1902, 980.—G. H. R.

Phonograph-Records; Process of Coating ——. T. A. Edison, Llewellyn Park, N.J. U.S. Pat. 713,863, Nov. 18, 1902.

This process of making a mould of a phonograph record is an improvement on that described in U.S. Pat. 526,147, 1894, and consists in rotating the record in an exhausted chamber in proximity to an electrode of the metal of which the deposit is to be made, and in establishing a silent brush electrical discharge between it and a second electrode placed on the other side of the record, whereby a metallic coating will be deposited on it. The coating then receives a heavier deposit by electro-plating, and the record is finally removed from the matrix so secured.—G. H. R.

Anode Residues; Process of Treating ——. A. G. Betts, Troy, N.Y. U.S. Pat. 712,640, Nov. 4, 1902.

A part of the lead, copper, antimony and arsenic contained in anode residues from the electrolytic refining of lead alloys, is combined with chlorine gas and removed in the form of chlorides in solution, the water and the antimonious and arsenious chlorides being distilled off from the latter.

—G. H. R.

XII.—FATS, FATTY OILS, AND SOAP.

Fat; Enzymic Decomposition of ——. W. Connstein, E. Hoyer, and H. Wartenberg. Ber., 1902, **35**, [18], 3988—4006.

Green (*Proc. Roy. Soc.*, **48**, 370) and Sigmund (*Monatsh. f. Chem.*, **11**, 272) independently discovered that on triturating oleaginous vegetable seeds with water, free fatty acids were gradually liberated, and they attributed this to the presence of a lipolytic enzyme in the seed. On repeating their experiments (using castor-oil beans), the authors find that if the experiment be continued for several days, instead of only for 24 hours, a sudden rise in the acidity occurs after two to six days, according to the temperature, &c. This sudden liberation of fatty acids, however, only takes place when a sufficient proportion of acid is present, and the authors therefore conclude that, contrary to the opinion of Green and of Sigmund, the presence of acid is an indispensable condition for the action of the enzyme.

Experiments were then made as to the action of the enzyme on fats (*e.g.*, almond, linseed, and liver oils, tallow, &c.) other than that contained in the seeds themselves. In each case the fats were readily hydrolysed. Thus, in a typical experiment, 5 grms. of decorticated powdered castor seeds were triturated with 50 grms. of the respective fats, and 10 grms. of N/10 sulphuric acid, and the mixture left for 24 hours at the ordinary temperature. The amounts of free fatty acids then found were as follows:—Linseed oil, 83; liver oils, 76 and 84; olive oil, 86; sesamé oil, 85; almond oil, 90; and cacao-butter, 92 per cent.

Not all vegetable seeds possess lipolytic capacities to the same extent, seeds of the Euphorbiaceæ, and especially those of the castor-oil plant, apparently exceeding all others in this respect. It is preferable to remove the oil from the decorticated seeds by cold expression or cold extraction,

neither of which injures the enzyme. Ether or carbon bisulphide do not affect the power of the enzyme, but treatment of the seeds with water, salt solutions, glycerin, &c., weaken it. Long-continued drying of the seeds at 100° C. is very injurious. The authors are unable to confirm the statement of Green and Sigmund that germinating seeds cannot be used, for they obtained practically the same result with quiescent or with germinating seeds. The speed of the reaction is accelerated by increasing the amount of the seed in the mixture, but not proportionately.

All fats are not decomposed with the same intensity. Thus, *e.g.*, cocoa-nut oil and palm-kernel oil undergo decomposition with much less readiness than palm oil or cotton-seed oil, whilst butter, in particular, offers remarkable resistance to the enzyme. Apparently glycerides of lower fatty acids are more stable than those of higher acids. Thus, in typical experiments, in which 10 grms. of the pure triglycerides were treated under identical conditions, the following amounts of free fatty acids were found after 24 hours:—Triacetin, 0·4; tributyrin, 9·5; and triolein, 50·6 per cent. This view was also confirmed by further experiment with other esters (ethyl, amyl, &c.) of acetic acid, mineral acids, and aromatic acids.

A certain amount of water is required to obtain good yields, but a large excess of water does not appear to affect the results much. As regards the essential amount of acid or acid salt, it was found that the best concentration was between N/10 and N/3 strength. Sulphuric acid, phosphoric acid, acetic acid, acid sodium sulphate, and probably other soluble acid substances, can be used at will, without much influence upon the results. Acids insoluble in water can also be used, but larger quantities are necessary. Further essentials are that there should be a good emulsion and a suitable temperature (not exceeding 40° C.). At 50° C. the action of the enzyme is weakened, and at 100° C. it ceases. When the reaction commences, the decomposition proceeds with great rapidity at first, and then gradually slackens, though even after several days there is still a slow rise in the acidity. The following substances are injurious to the enzyme:—Alcohol, alkalis, soap, formaldehyde, sodium fluoride, and mercuric chloride.

Technical Application.—The principles of this method of decomposing fats have been made the basis of a manufacturing process for the soap and stearin industries. It is suggested that fats should be treated with crushed seeds (or residual seed cake) to hydrolyse the glycerides, the fatty acids (after removal of the glycerin) then being saponified with potassium carbonate or soda ash in solution, instead of the more expensive caustic soda or potash. The advantages claimed are that the process is cheap, that it can be carried out in open vessels at a low temperature (40° C.), and that the colour and odour of the products are superior. When solid fats are used, the "stearic" acid can be separated at once, and requires no further purification, whilst the expressed "oleic" acid is much paler than the ordinary commercial product. The only constituents that escape the action of the enzyme are esters of lower fatty acids, and these will pass to the "oleic" acid, leaving the solid residue absolutely free from neutral fat. When liquid fats are used, the "stearin" separates out in a crystalline form, whilst the liquid fatty acids can be decanted. The glycerin is at once obtained in a concentration of 40 to 50 per cent., and free from impurities, except a small proportion of salts and proteids derived from the seeds.—C. A. M.

Fatty Glycerides having Double Melting Points. H. Kreis and A. Hafner. Zeits. Untersuch. Nahr. Genussm., 1902, **5**, [22], 1122—1124.

By repeatedly crystallising lard, beef, and mutton fats from ether, products were obtained, after about 10 crystallisations, the melting points of which did not alter on further treatment. These products still contained about 2·5 per cent. of olein, but by treating with Hübl's solution and repeatedly crystallising from ether, olein-free bodies were obtained. The lard crystals thus prepared fused at 51·2° C. to a clear liquid; on further heating to 53°, they gradually became turbid and solid, and did not again melt to a clear liquid until a temperature of 66·0° C. was reached. Beef-fat crystals first fused at 51·5°, the liquid becoming turbid at 53°, and clear again at 61·9°, whilst the mutton-fat crystals melted to a clear liquid at 52·3° C.; at a slightly higher temperature they also became turbid and solid, only becoming limpid again at 62·3° C. These crystals were then recrystallised from (i) 20 times their volume of ether, (ii) 15 volumes of a mixture of benzene and alcohol, and (iii) 20 volumes of amyl alcohol after 30 minutes' boiling. In no case were the melting points altered.

—W. P. S.

Oils; Bromine Absorption of ——. P. C. McIlhiney. J. Amer. Chem. Soc., 1902, **24**, [11], 1109—1114.

Further experience with his process (this Journal, 1900, 176) has led the author to modify it in the case of boiled linseed oil and of driers. In these the presence of mineral bases, such as lime and oxides of lead and of manganese, reduces the bromine substitution figure by neutralising part or all of the liberated hydrobromic acid, and it is necessary to take this reduction into account in the examination of such products.

Experiments have been made to compare the rate of action of bromine in carbon tetrachloride upon rosin with that of Hübl's solution upon the same substance. The following table gives the comparative figures obtained:—

Time.	Total Bromine Absorbed.	Time.	Total Iodine Absorbed.
	Per Cent.		Per Cent.
2 minutes ...	160·8	1 hour	126·7
18 „ ...	174·5	2 hours	133·1
69 „ ...	178·0	4 „	142·0
20 hours	213·4	8 „	144·8
		18 „	160·3
		52 „	172·6

In the author's opinion these results show that the bromine absorption of a substance like rosin, though not a constant, is a much more definite figure than the Hübl value, and that it is also less affected by the duration of the experiment.

The influence of varying the excess of bromine is shown in the following results obtained with a sample of pure linseed oil:—

Excess of Bromine.	Total Bromine Absorption.
Per Cent.	Per Cent.
16·5	92·4
36·4	95·5
42·1	98·3
81·2	101·0
104·3	103·5

From these it appears that there must be an excess of 100 per cent. or more of bromine for the absorption to be complete in a short time. A further series of experiments shows the effect of varying the temperature and of the presence or absence of moisture in the oil. The samples of linseed oil were brominated simultaneously (1) at 20° C.; (2) at 20° C., with 10 c.c. of water added; (3) immersed in melting ice (with 10 c.c. of water added); (4) at 30° C., with 10 c.c. of water added. The shortest experiment lasted 88 mins. and the longest 180 mins. The following results were obtained:—

Conditions.	Total Bromine absorbed.	Bromine Addition.	Bromine Substitution.
	Per Cent.	Per Cent.	Per Cent.
Dry, ordinary conditions...	110·2	104·8	2·7
10 c.c. water, ordinary temperature.	108·6	104·0	2·3
10 c.c. water, cooled.....	109·8	104·0	2·9
10 c.c. water, heated	113·2	103·0	5·0

—C. A. M.

Phenolphthalein as Indicator [Free Alkali in Soap]. O. Schmatolla.

See under XXIII., *page* 1557.

English Patents.

Oleaginous Compound, and Process for Producing same. C. Adams, Bellows Falls, Ver. Eng. Pat. 20,218, Sept. 16, 1902.

See U.S. Pat. 709,291 of 1902; this Journal, 1902, 1291. —C. A. M.

Detergents and their Manufacture. G. Bamberg, London. Eng. Pat. 25,792, Dec. 17, 1901.

See U.S. Pat. 700,602 of 1902; this Journal, 1902, 864. —C. A. M.

Soap; Machine for Moulding ——. K. Schnetzer, Aussig-on-the-Elbe, Germany. Eng. Pat. 18,932, Aug. 28, 1902.

The vessel holding the smooth metallic moulds has openings at the bottom corresponding with the bottom of the moulds, into which plungers pass from beneath. As the moulds are filled, the plungers sink, and after the soap has been congealed by means of cold water in the surrounding vessel, the cakes are expelled at the top by raising the plungers.—C. A. M.

French Patents.

Cotton-Seed; Process of Extracting Oil from ——. MacFarlane and Reinohl. Fr. Pat. 319,591, March 14, 1902.

See Eng. Pat. 6634 of 1902; this Journal, 1902, 918. —C. A. M.

Lubricant of Good Electrical Conductivity; Manufacture of ——. C. Ulbrich and G. Pommerhanz. Fr. Pat. 319,397, March 8, 1902.

A mixture of lard, cylinder oils, glycerin, and graphite is incorporated with about an equal weight of a readily distributed "metal," such as mercury or "butter of antimony," whilst a small proportion of calcium carbonate is added to neutralise any free hydrochloric acid.—C. A. M.

Metallic Soaps; Preparation of Solutions of ——, *as Antiseptic Agents.* G. A. Raupenstrauch. Fr. Pat. 319,436, March 10, 1902.

See under XVIII. C., *page* 1550.

United States Patents.

Digester [Extraction of Oils]. A. Giesler, Assignor to The Stilwell-Bierce and Smith-Vaile Co., Dayton, Ohio. U.S. Pat. 712,127, Oct. 28, 1902.

The inner and outer shells of this apparatus have conical ends rigidly united, whilst brackets attached to the inside of the outer shell afford support for the inner chamber, which is thus able to expand or contract freely. The outlet from the interior passes through a flanged opening in the exterior shell, and the projecting nozzle can thus move with the expansion or contraction of the inner chamber. —C. A. M.

Soap Boiling and Finishing Machine. L. Gottschalk, Assignor to The Brownie Soap Co., Chicago, Ill. U.S. Pat. 711,492, Oct. 21, 1902.

The materials are first passed through several pairs of heated rollers, where saponification takes place. The soap is then cooled by means of a further series of rollers, each pair having a lower temperature than the preceding pair, and is finally congealed and finished by a bottom pair of rolls, whence it is removed in chips or ribbons of equal width by means of scrapers. It is stated that in this way the entire process can be carried out in continuous operation.—C. A. M.

Soap-plotting Machine. L. Gottschalk, Assignor to The Brownie Soap Co., Chicago, Ill. U.S. Pat. 711,493, Oct. 21, 1902.

In this apparatus the soap is crushed by rollers and disintegrated by means of the radial arms of a central shaft. It is then compressed by a spiral conveyor through a casing, and forced in a continuous polished bar through an opening, which is slightly convex (or contracted towards the middle), and heated by means of a steam jacket. —C. A. M.

Soap, and Method of Making same. B. L. Johnson, Cincinnati, Ohio, U.S.A. U.S. Pat. 712,069, Oct. 28, 1902.

Turpentine oil (say 3 parts) is heated to incipient boiling, and mixed with white soap (say 7 parts) previously reduced with water to a semi-fluid mass. It is stated that with this soap, coloured fabrics can be washed without loss of colour.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

White Lead and Zinc White; Report on Comparative Painting Experiments with ——. Rigolot. Bull. Soc. d'Encourag. pour l'Ind. Nat., 1902, **103**, [5], 690—696.

A joint commission appointed by the "*Société de Médicine publique et de Génie sanitaire*" and the "*Chambre syndicale des Entrepreneurs de Peinture de la Ville de Paris*" has made a series of comparative painting experiments with analysed specimens of the above two white pigments, on both exterior and interior surfaces of plaster, iron, and wood at the Pasteur Institute, keeping a record of the composition of the paint employed for each coat and of the quantity applied per square metre. The conclusions arrived at up to the present time are that the zinc-white paint (with manganese resinate as a drier) works, covers, and dries equally well with white lead paint.—M. J. S.

French Patent.

Lampblack from Tar and other Carbonaceous Substances; Manufacturing ——. Wegelin. Addition, dated March 17, 1902, to Fr. Pat. 294,306, Nov. 14, 1899.

See Eng. Pat. 10,228, 1902; this Journal, 1902, 1022. —C. S.

United States Patents.

Prussian Blue; Process of Obtaining ——. A. Sauer, Assignor to Deutsche Continental Gas Gesellschaft, Dessau. U.S. Pat. 712,726, Nov. 4, 1902.

Crude illuminating gas is passed through a sludge containing an iron compound. The sludge is then boiled to remove volatile ammonia compounds, treated with sulphuric acid to convert any iron sulphide present into a soluble form, filtered to remove this product and ammonium sulphate, and finally the residue, which contains Prussian white, is warmed with an oxidising agent, such as bleaching powder, nitric acid, or ferric chloride, yielding Prussian Blue. —T. A. L.

White Pigment; Process of Manufacturing ——. J. B. Hannay, Loch Long, Scotland. U.S. Pat. 712,527, Nov. 4, 1902. (See also this Journal, 1888, 330; 1889, 553.)

See Eng. Pat. 2297, 1901; this Journal, 1902, 356. —M. J. S.

White Lead; Manufacture of ——. C. H. Vickerman, Philadelphia, Pa. U.S. Pat. 712,870, Nov. 4, 1902.

The employment of the fibre of the sumac plant, previously deprived of colouring matter by leaching, in the manufacture of white lead by the Duten process, is claimed. In its presence the process is said to be improved.—M. J. S.

White Lead; Process of Making ——. W. H. Rowley, St. Louis, Mo. U.S. Pat. 713,155, Nov. 4, 1902.

Molten lead is sprayed by wet steam into the top of an inverted vessel from which air is excluded. The particles of atomised lead become coated with moisture, which prevents them from oxidising whilst in a highly heated condition. The lead falls into a tank of cold water, in which the atomising chamber hangs. It is thence discharged on to an endless web, where it is allowed to dry,

and absorb oxygen, until it becomes a mixture of lead protoxide and metallic lead. It is further oxidised by continuous agitation in contact with air, finally employing compressed air, until entirely converted into protoxide, which is then carbonated.—M. J. S.

White Lead; Apparatus for Making ——. J. H. Montgomery, Assignor to R. T. Brown, St. Louis, Mo., and C. E. Neeley, Little Rock, Ark. U.S. Pat. 714,009, Nov. 4, 1902.

Molten lead is sprayed into a closed vessel supplied with jets of water. The mixture of "atomised" lead and water is discharged by a screw conveyer into a mixing machine, and thence to a carbonating drum. From the carbonator it passes into a second mixing machine, and from this into a grinding mill.—M. J. S.

Insoluble Coating Composition. J. A. Just, Syracuse, N.Y. U.S. Pat. 713,309, Nov. 11, 1902.

A composition consisting of barium hydroxide, pulverised caseïn, mineral colouring matter, and sufficient water to render the mixture plastic.—M. J. S.

Paint. W. W. Brasington, Marietta, Ohio, U.S.A. U.S. Pat. 713,846, Nov. 18, 1902.

Forty-four parts of pure refined coal-tar, five parts of gasolene, and one part of No. 10 grade rubber cement, are mixed without the aid of heat.—M. J. S.

(*B.*)—RESINS, VARNISHES.

United States Patent.

Varnish; Process of Manufacturing ——. A. L. Tédesco, Paris. U.S. Pat. 711,596, 1902.

See Fr. Pat. 318,289; this Journal, 1902, 1460.—M. J. S.

(*C.*)—INDIA-RUBBER, &c.

Landolphia Pierrei: a Rubber Plant from Gabon. H. Hua. Comptes Rend., 1902, **135**, [20], 868—869.

Landolphia Pierrei occurs in the region of Libreville, on Mont Bouet, and in the forests of Sibang. It has been confused, by the authorities of the Berlin Museum, with *Landolphia ovariensis*, P. de B., but may be distinguished by having larger leaves and fruits, and persistent instead of caducous bracts. The allied plant, *Landolphia Klainii*, Pierre, on the other hand, is recognised by its enormous fruits and elongated ovary and stigmata. A very complete botanical description is furnished in view of the commercial importance of the exact identity of rubber plants being established.—R. L. J.

India-Rubber; Determination of Sulphur in ——. C. O. Weber.

See under XXIII., *page* 1560.

Antimony Sulphide; Analysis of ——. C. O. Weber.

See under XXIII., *page* 1559.

United States Patent.

Rubber; Process of Manufacturing ——. A. C. Blossier, Paris. U.S. Pat. 713,736, Nov. 18, 1902.

See Eng. Pat. 18,964, 1901; this Journal, 1902, 1188.

—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Alums; Acid Reaction of the ——, *and the Influence of this Acidity on the Formation of Insoluble Compounds of Gelatin with Chrome Alum.* Lumière and Seyewetz. Bull. Soc. Chim., 1902, **27**, [22], 1073—1077.

The authors have determined the quantity of alkali which has to be added to solutions of the alums before a permanent precipitate begins to be formed. This proportion, in the case of ordinary alum and iron alum, corresponds approximately to the neutralisation of 1 SO_3 for 2 mols. of alum. In the case of chrome alum it is much greater. This alum requires considerably more alkali at 100° C. than at temperatures up to 50° C. The authors confirm the conclusions of Namais (this Journal, 1902, 1338) that, in order to render gelatin insoluble by means of chrome alum, it is preferable to add alkali to the latter, until the incipient formation of a permanent precipitate. When chrome alum enters into the composition of a bath containing other constituents, it is necessary that the resultant bath should not have an acid reaction if the maximum effect on the gelatin be desired. When neutralised chrome alum is added to gelatin, the insolubility of the product increases to a maximum, and then remains constant, with increase of the proportion of alum. With ordinary chrome alum, on the other hand, the insolubility of the product decreases with excess of alum, the acidity of the latter neutralising the hardening effect of the chromium salt.—J. F. B.

Tannin; New Method for the Determination of ——. E. Crouzel.

See under XXIII., *page* 1560.

English Patents.

Chrome-Tanning Process; Improved ——. W. P. Thompson, London. From A. Wünsch, Prague, Austria, and the firms of Herkommer and Bangerter, Stuttgart, and A. Oesinger and Co., Ottrot, Alsace, Germany. Eng. Pat. 22,849, Nov. 12, 1901.

Chrome alum (100 kilos.) is dissolved and completely precipitated by an alkali carbonate. The green precipitate of chromium hydroxide containing carbonic acid, is washed with hot water, and at once dissolved in another portion (100 kilos. more or less) of chrome alum solution. The liquor may be concentrated if desired, and is used for tanning, instead of chrome alum. It is defined as an extract consisting of basic chromium sulphate and sodium or potassium sulphate, in such proportions that one-fourth of the whole sulphuric acid is combined with sodium or potassium oxide, and the rest with excess of oxide of chromium.—R. L. J.

Preserving Leather; Process for ——. J. Paas and A. Jacobsen, Berlin. Eng. Pat. 1327, Jan. 17, 1902.

See Fr. Pat. 318,027, Jan. 24, 1902; this Journal, 1902, 1405.—R. L. J.

French Patent.

Tanning; Rapid ——. Marter. Fr. Pat. 319,782, March 20, 1902.

The skins are prepared in the ordinary manner, and then drummed for about four days in a liquor made as follows for every 100 kilos of hide:—

Tan extract (oak or chestnut), 50 kilos; sodium thiosulphate, 2 kilos; ammonium chloride, 4 kilos; boric acid, 500 grms.; commercial glycerin, 100 grms; chloral or chloral hydrate, 200 grms.; sodium chloride, 50 grms.; sodium bisulphite, 20 grms.; spirits of turpentine, 50 grms.; water, 500 litres. The leather is curried and finished as usual.—R. L. J.

United States Patents.

Taming Hides or other Animal Tissues; Process for ——. O. P. Amend, New York, U.S.A. U.S. Pat. 713,046, Nov. 11, 1902.

The tanning agent employed is nitrite of iron, chromium or aluminium. It is claimed that a sheep-, goat-, or calf-skin may be tanned in about one hour, that pueing and degreasing are unnecessary, and the skins may be tanned with the hair on. Four ounces of chromium nitrite per gallon makes a convenient tan-liquor.—R. L. J.

Tanning and Leaching Apparatus. C. M. Walter, Cincinnati, Ohio, Assignor to the Internat. Leather Co., S. Dakota. U.S. Pat. 713,542, Nov. 11, 1902.

This apparatus is arranged so that leaching and tanning may be carried on simultaneously. Two concentric drums revolve in a vat, the inner one contains the material to be extracted and has perforated sides, the outer is a skeleton

drum, on to which the hides are hung. Means are provided for raising the liquid to any desired temperature and maintaining it at that temperature, and other mechanical details are given.—R. L. J.

XV.—MANURES, Etc.

English Patent.

Fertilisers; Process [Electrical] of Making ——. J. J. Crooke, Great Kills, and R. Crooke, Yonkers, N.Y., U.S.A. Eng. Pat. 19,513, Sept. 5, 1902.

The "sour" humus of salt marshes, bogs, harbour dredgings, or the like, is placed in rectangular wooden tanks of about five tons' capacity, each having on either side an electrode of sheet iron connected with a source of electricity. The electrolysis is continued until the material at the anode becomes neutral or alkaline. After drying, the product is fitted for use as a fertiliser.—E. S.

French Patent.

Nitrogenous Compounds; Application of ——, *as Manures.* Cyanid Gesellschaft, Paris. Fr. Pat. 319,897, March 24, 1902.

See Eng. Pat. 15,976, 1902; this Journal, 1902, 1338.
—N. H. J. M.

United States Patent.

Salt-Marsh Material, &c.; Process for Converting ——, *into a Fertiliser, and the Products resulting therefrom.* J. J. Crooke and R. Crooke, New York. U.S. Pat. 712,045, Oct. 28, 1902.

See above Eng. Pat. 19,513, 1902.—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Reducing Sugar in Syrups; Determination of ——. H. Tervooren.

See under XXIII., *page* 1560.

English Patents.

Sugar; Means for Boiling ——. J. Czapikowski, Nymburg, Bohemia. Eng. Pat. 15,031, July 5, 1902.

The apparatus consists of a boiler provided with a rotary mixer formed of tubes through which steam is caused to circulate to boil the juice, and subsequently cold water to cool the syrup during the rotation; a scraper is attached spirally to the mixer in order to remove the syrup from the bottom of the boiler when discharging.—J. F. B.

Gluten Tailings [Starch Manufacture]; Method of Utilising ——. E. Gudeman. Eng. Pat. 9525, April 24, 1902.

See under XVIII. A., *page* 1548.

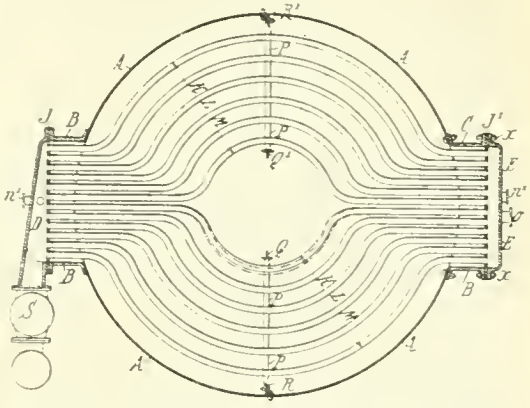
French Patents.

Sugar Juices; Process of Defecating and Decolorising ——. A. Besson. Addition, dated Jan. 7, 1902, to Fr. Pat. 308,384, Feb. 25, 1901.

The original process (see U.S. Pat. 710,413; this Journal, 1902, 1406) consists in treating the juice with ammonia, filtering, and mixing with a finely-divided metal, such as aluminium, either alone, or alloyed with small quantities of other metals. The improvement here described, consists in omitting the treatment with ammonia, and sending to the concentrators the juice and powdered metal.—T. H. P.

Sugar Boiling; Apparatus for ——. Portemont. Fr. Pat. 319,365, March 7, 1902.

This invention consists in arranging the heating tubes of sugar-boiling pans in the form of arcs, the plan of one such set of tubes being shown in the figure. The ends of all the tubes are fixed into the plates J and J¹, whilst the middle portions of the tubes pass through holes in the plates P, by which they are supported. This arrangement does away with the joints present in the ordinary pipe-systems in use, and thus avoids much expense as well as leakage. Claim is also made for the separation of the condensed water from



the heating and vacuum chambers, by which means the circulation of the steam is facilitated, and further, for the removal of the non-condensible gases.—T. H. P.

Juices; Electrolytic Purification of ——. [*Lead Saccharate.*] Kollrepp and Wohl. Fr. Pat. 319,635, March 15, 1902.

The electrolytic purification of saccharine solutions may be effected by the addition to the juice, and to the positive electrode, of saccharate of lead, or other basic compounds easily attacked, with a lead or zinc base. The deposits with a lead base thus obtained, are transformed into lead saccharate by means of saccharine and alkaline solutions, and can be used again for the purifying process.—G. H. R.

Sugar Juices; Improved Method of Pressing for obtaining from Beetroots, Concentrated Pure ——, *and Residues rich in Nutrient Matter and poor in Water.* Baermann. Fr. Pat. 319,874, March 22, 1902.

In this process, which is an improvement on that described in Fr. Pat. 308,373 (this Journal, 1903, 59), the sliced or chopped beetroots are mixed with beetroot juice heated to a temperature exceeding 45°—100° C. in such quantities that the beet slices rapidly attain a uniform temperature of between 45° and 100° C., for preference, 80°. The heated slices, either with the juice or after partial or complete separation from the latter, are then separated in presses into juice and residue, the former being then heated and allowed to act on more fresh beet slices, whilst the latter, after drying, yields foodstuff rich in sugar.—T. H. P.

Rice Starch; Manufacture of ——. La Société des Produits Amylacés. Addition, dated March 11, 1902, to Fr. Pat. 316,582, Dec. 5, 1901.

The original specification related to a method for the preparation of starch from rice by treating the latter with sulphurous acid solutions. The present claim is for the extension of the process to the preparation of maize starch.
—T. H. P.

United States Patents.

Raw Sugar; Process of Purifying and Preserving ——. M. Weinrich, Yonkers, N.Y. U.S. Pat. 711,603, Oct. 21, 1902.

The raw sugar is intimately and uniformly mixed with a small percentage of finely-powdered burnt lime. The sugar of the molasses covering the sugar crystals forms a sucrate of lime, whilst organic impurities contained in the molasses are simultaneously decomposed. The mixture is then heated in a current of air, the impurities are separated by washing, from the sugar crystals and the sucrate of lime, and finally, the added lime is neutralised and precipitated from the dissolved sugar crystals and sucrate of lime, and from the wash-syrup.—T. H. P.

Centrifugal Machine [*Sugar*]. H. R. Wolff, Goebeng, Java. U.S. Pat. 712,628, Nov. 4, 1902.

In centrifugal machines for drying sugar, the basket is provided with a discharge-door having spring-blades extending outward to engage catches on the outside of the basket, and with a hand-lever for withdrawing one of the springs out of engagement with the catches.—T. H. P.

Sugar; Apparatus for Moulding ——. J. R Langlois, Paris. U.S. Pat. 712,391, Oct. 28, 1902.

Claims are made for various combinations of the constituent parts of a machine for mixing and moulding sugar, consisting of vertical mixing cylinders having a hot water chamber at their base; a horizontal finishing cylinder which has a shaft provided with blades inside, and with a hot water chamber, and is in communication with the mixing cylinders; a distributing cylinder receiving from the finishing cylinder and discharging upon a moulding table, rollers being hung on pivots from the distributing cylinder and working upon the table, which has means for revolving it. A vertical cylinder feeds the sugar from the mixing cylinder, and a chain of gears and pinions operates simultaneously the mixers, feeder and the blade-shaft of the finishing cylinder. The moulding table has a series of removable moulding plates arranged in a trough formed upon the upper surface of the table by a rim, and a series of segments which can be moved vertically, and are held to the periphery of the table by bolts extending through the segment slots. Each segment is furnished with a castor or wheel operated between the wheels of an inclined circular track, and the table is revolved by a worm-gear. A glazing or finishing roller, and also a pressure roller operate over the moulding plates. Steam pipes are arranged under the table for heating it.—T. H. P.

Sugar Loaves; Process of Producing ——. H. Passburg, Moscow. U.S. Pat. 713,916, Nov. 18, 1902.

The sugar solution is boiled down to the usual consistency for cooling in moulds, the mass is poured in, and then subjected to a rapid cooling by inserting the moulds in a suitable chamber cooled by liquid air, vacuum or other suitable means. The rapid cooling prevents the decomposition occurring with the ordinary slow cooling.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Enzymes; General Theory of the Action of Certain ——. V. Henri. Comptes Rend., 1902, **135**, [21], 916—919.

In the action of invertase on saccharose, of emulsin on salicin and of diastase on starch or dextrin, the quantity of ferment being constant, the velocity of the hydrolysis increases in the case of dilute solutions—up to decinormal —with the concentration of the substance acted on; if the solutions exceed decinormal strength, beyond this point the action is almost independent of the concentration, and the velocity is proportional to the quantity of ferment. In the inversion of saccharose, the addition of invert sugar, retards the action; for the same quantity of invert sugar the retardation is less the greater the concentration of the saccharose; the retardation in this case is produced almost solely by the fructose. The retardation by the addition of the products of hydrolysis follows the same law in the cases of emulsin and diastase. The course of the inversion of a certain quantity of saccharose by invertase from beginning to end follows a law more rapid than that for inversion by acids. The velocity of the hydrolysis of salicin by emulsin is slower than that by acids; in the case of the hydrolysis of starch by amylase and pancreatic juice, the velocity is practically the same as with acids.

If it be assumed that a certain portion of the enzyme enters into combination with the substance to be hydrolysed, another portion with the products of hydrolysis, whilst a third portion remains free, then the hydrolysis may be carried out either by the free portion or by that in (unstable) combination with the substance to be hydrolysed. In both cases, however, the mathematic expression for the velocity of the reaction turns out to be identical. The author has made experiments, under constant conditions, on hydrolysis by means of invertase and emulsin with increasing concentrations of the substances to be hydrolysed; the calculation of the constant of the expression from the experimental figures gave very satisfactory results.—J. F. B.

Brewing; Rôle of Nitrogenous Substances in ——. C. J. Lintner. Zeits. ges. Brauw., **25**, [45], 671—677.

In addition to the carbohydrates in malt, the nitrogenous substances play an important part in brewing, owing to the action of certain of them in the conversion of insoluble members of the former group, their indispensable character as yeast food, and considerable influence on the colour, taste, and stability of the beer. The nitrogenous substances in question are almost exclusively proteins or albuminoids.

Experiments have shown that the protein content of barley fluctuates between the wide limits of 7·5 and 16 per cent., and practical experience has fixed 9—11 per cent. as the best proportion for malting barley, larger percentages inducing albumin haze in the beer; and it is also probable that with a medium percentage, the relative proportions of the albuminoid constituents are more favourably balanced. This point has recently been examined by Kukla, who concludes that the total amount of albuminoids is of minor influence in comparison with the relative proportions of soluble and insoluble, coagulable and non-coagulable members of the group, special importance attaches to the soluble non-coagulable albuminoids, which should not exceed about 1·6 per cent., more being injurious. On the other hand, in good malting barleys, the coagulable albuminoids often amount to 50 per cent. of the total soluble albuminoids, whilst in poor grades they may recede to 10—15 per cent. of the latter. An abnormal percentage of soluble, and especially noncoagulable albuminoids appears to indicate the prevalence, during the ripening of the grain, of influences unfavourably affecting the nature of the albuminoids.

In view of the fact that no enzyme has yet been discovered, in malt extract, capable of effecting, outside the grain, the extensive decomposition sustained by the albuminoids in the barleycorn, it seems probable that this reaction is due to the direct activity of the cell plasma; whilst the simple conversion of the albuminoids into a soluble form may be attributed to proteolytic enzymes, as detected in malt by Wiodisch and Schellhorn.

As a rule no great change is effected in the albuminoids by the steeping process in malting, though small quantities are extracted by the water; but oversteeping is apparently accompanied by enzymatic processes, resulting in extensive liquefaction of the proteins, though not with any further degradation, the corns then becoming steely when kilned. The influence of oxidation at the steeping stage, as exerted in the aeration steep recommended by Windisch, is favourable, by making the conditions of germination more natural; and it has been found that the resulting beers deposit less sediment on pasteurisation than those from the malt steeped in the ordinary way.

In the examination of kilned malt, Kukla found that the proportion of soluble, non-coagulable albuminoids should not exceed 3·6 per cent., but fresh investigation is necessary to determine whether this limit should be insisted on in practice.

One of the principal changes effected on the kiln is the coagulation of some of the soluble albuminoids; but peptonisation has not yet been definitely proved, and indeed is improbable. This coagulation increases with the amount of water present at the coagulation temperature; and intermediate products of partial solubility may be formed, the subsequent coagulation of which produces turbidity in the beer. The beneficial effect of efficient kilning in the case of Pilsen malt may be ascribed to the completeness of the coagulation thereby effected.

In connection with mashing, the author is indisposed to accept as proved the assumption that the albuminoids are degraded by a peptic enzyme, since the known proteolytic enzyme in malt is too weak to have any appreciable effect. The mashing process may, however, modify the relative proportions of albuminoids in the wort, prolonged mashing increasing the dissolved amides, whilst more albumins are extracted at low temperatures than high; and the larger

the amount of coagulable albuminoids the brighter the wort after "breaking."

As regards albumose, it is found that the percentage is increased by boiling the wort in shallow layers, reducing the time of boiling in the hop copper, slow mashing at a low temperature, and the use of cooler sparging liquor. Zeidler and Nauck also found that abundance of albumose (over 5 per cent.) produced a mild full flavour in the beer.

As yeast food, the amides are apparently selected by the cells in preference to the albumoses, which are also utilised. Asparagin is only found in the radicle of the embryo.

—C. S.

Indian Fig-Must; Alcoholic Fermentation of ——, by means of Yeast acclimatised to Sodium Fluoride. C. Upiani and L. Sarcoli. Atti. R. Accad. dei Lincei, Roma, **11**, [5], 173—178. Chem. Centr., 1902, **2**, [21], 1334.

In continuance of their previous experiments (this Journal, 1902, 268), the authors have been able, on the basis of Effront's work (see this Journal, 1894, 968, 1079, 1213) on the action of sodium fluoride, to obtain a satisfactory yield of alcohol without previous sterilisation. They find that if fermentation be induced in Indian fig-must containing 0·25 per cent. of sodium fluoride, by *Sacch. Pastorianus II.* which has been acclimatised in a sodium fluoride solution of the same concentration, an almost theoretical yield of alcohol is obtained. *Sacch. Opuntiae* is completely eliminated, and the secondary bacterial fermentations (lactic fermentation, &c.) are suppressed.—A. S.

Mannan; Liquefaction of ——, by Microbes. S. Sawamura. Bull. Coll. Agric., Tokio, **5**, 259—262. Chem. Centr., 1902, **2**, [21], 1328.

The observation that the vegetable mucilage from *Hydrangea paniculata*, Sieb., used in the preparation of Japanese paper, liquefies rapidly on keeping, led the author to examine the action of different micro-organisms on mannan jellies, which were prepared for the purpose from extracts of the root of *Conophallus Konyaku*. Of the microbes examined, only *Bac. mesentericus vulgatus* liquefied the mannan jellies easily. *Bac. prodigiosus* appears to contain traces of the enzyme which causes liquefaction. The liquefaction of the vegetable mucilage mentioned was undoubtedly caused by *Bac. mesentericus*, and the author observed that the process was strongly accelerated, with increased formation of sugar, if, besides the bacteria, a certain wild yeast, which was inactive alone, were present.—A. S.

Sulphurous Acid in Wine; Detection and Rapid Determination of ——. L. Mathieu.

See under XXIII., *page* 1559.

Wine; Determination of Glycerin in ——. A. Trillat.

See under XXIII., *page* 1560.

English Patents.

Malt Kilns. W. Ackroyd and F. Buckley, Halifax. Eng. Pat., 24,243, Nov. 29, 1901.

The kiln consists of one or more drying floors carrying the grain, beneath which is situated a hot air chamber containing the discharge openings of a number of heating pipes. These pipes are heated by means of a furnace, the products of combustion being completely isolated from the grain. Pure air from the outside is drawn through the heating pipes and mixing chamber to dry the grain. The temperature is regulated automatically by means of contracting and expanding metal rods which open and close the admission orifices.—J. F. B.

Vertical Boilers, Brewers' Coppers, and the like; Furnaces for ——. W. C. Courts. Eng. Pat. 27, Jan. 1, 1902.

See under II., *page* 1524.

Spirit; Solidified ——. Spiritine, Ltd. From J. Drapier and P. Dubois. Eng. Pat. 24,146, Nov. 27, 1902.

See under II., *page* 1524.

French Patents.

Colour-Malt; Preparation of Tasteless Extracts of ——. Weyermann. Fr. Pat. 319,737, March 19, 1902.

See Eng. Pat. 6796, 1902; this Journal, 1902, 923.

—J. F. B.

Wines; Process for making Champagne ——. Oger. Fr. Pat. 319,538, March 13, 1902.

In this process all the operations which are usually performed in bottle for making Champagne wines are carried out in one large closed vessel. The wine is saturated in this vessel with carbon dioxide under high pressure. If required, sugar is then added and the wine is maintained, under the same pressure, until clarification, and the chemical reactions involved are completed, after which the clear wine is bottled off under pressure.

—J. F. B.

Filtering Liquids [Wine] in Absence of Air and Permitting the Refiltering of the Liquid; Apparatus for ——. Caubet. Fr. Pat. 319,728, March 18, 1902.

This is an apparatus for filtering wine, comprising two wooden casings lined with tinned copper, each casing containing a filtering bag, and being furnished with inlet and outlet taps so arranged that the two filters can either be used separately or together, or the wine can be caused to filter through both of them in succession.—L. A.

Tartars and Lees of Wine; Enrichment of ——, by Mechanical Means. David. Fr. Pat. 319,575, March 13, 1902.

Crude tartar and lees of wine are pulverised and subjected to a series of operations similar to those performed in the milling and sorting of flour, *e.g.*, bolting and blowing. The different grades so obtained have a richness corresponding with their physical condition. In some cases when a richer material is required, the enriched portions are subjected to a process of washing and levigation in apparatus similar to that employed for the levigation of minerals.—J. F. B.

Alcohol; New Method and Apparatus for Producing ——. Billet. Fr. Pat. 319,770, March 20, 1902.

The three processes of maceration (or diffusion), fermentation and distillation are all carried out in one and the same vessel. The vessels are constructed in batteries of three. The fermented juice from one vat is utilised for the extraction and fermentation of the fresh material in the next, whilst the hot spent wash from the third is utilised for heating up the fermented material ready for distillation in the vat from which the juice has been drained off.

—J. F. B.

Oxidation by the Electric Current; Process of ——. [Pasteurisation and Ageing of Fermented Liquors, &c.] Nodon and Piettre. Fr. Pat. 319,957, March 26, 1902.

See under XI. A., *page* 1539.

Casks; Disinfection of ——. Dufour. Fr. Pat. 319,423. March 8, 1902.

The interior of the cask is fumigated with steam charged with disinfectant vapours. The bung-hole of the cask is placed in communication with a receptacle, which contains the disinfecting material, *e.g.*, hops. Steam is admitted at the bottom of this receptacle, and ascends through the material into the cask, the condensed water being drawn off by another cock at the bottom.—J. F. B.

United States Patents.

Grain; Process of Steeping ——. W. P. Rice, Chicago. U.S. Pat. 713,349, Nov. 11, 1902.

Water is charged with air, gas, or a gaseous mixture, under pressure, in a closed vessel, under conditions favourable to thorough saturation. The charged water is then utilised or steeping grain by passing it upwards through the mass of grain.—J. F. B.

Clearing Fluids [Wines, &c.] containing Free Acids or Acid Salts. H. Kaserer, Vienna. U.S. Pat. 713,646, Nov. 18, 1902.

Alcoholic liquors or vinegar are cleared by addition of a casein compound (preferably that with soda) dissolved in water. After some days, the liquid is drawn off from the subsided precipitate.—E. S.

Distiller's Spent Residues; Apparatus for Treatment of ——. C. G. Sudre and C. V. Thierry, Paris. U.S. Pat. 712,343, Oct. 28, 1902.

See Eng. Pat. 2,026 of 1901; this Journal, 1901, 492.
—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Moist Gluten in Flour; Determination of——. M. Arpin.
See under XXIII., *page* 1560.

English Patents.

Gluten Tailings; Method of Utilising ——. E. Gudeman, Chicago, U.S.A. Eng. Pat. 9525, April 24, 1902. Under Internat. Conv., Oct. 17, 1901.

See U.S. Pat. 695,720; this Journal, 1902, 633.—J. F. B.

French Patents.

Food-Stuff Containing Molasses; Manufacture of a ——. Schrader. Fr. Pat. 319,266, March 4, 1902.

The molasses is diluted with water to a density of 32°—38° B., and is then mixed with other food materials in a suitable apparatus. On allowing the mixture to stand, it becomes solid. To prevent fermentation, &c., it is advisable to cool the product to 4° C. for a time.—W. P. S.

Eggs; Preserving Compound for ——. Société Aktiebolaget Ovalin. Fr. Pat. 319,300, March 4, 1902.

See Eng. Pat. 18,439, 1901; this Journal, 1902, 1,242.
—W. P. S.

Cattle-Food; Manufacture of ——. Dupire. Fr. Pat. 319,301, March 4, 1902.

See U.S. Pat. 713,620, 1902; below.—W. P. S.

Milk Compound Resembling Meat Extract. Eichelbaum. Fr. Pat. 319,611, March 14, 1902.

Skimmed milk is peptonised by adding trypsin, and keeping the mixture at a temperature of 37° C. for 12—15 hours. The milk sugar is then inverted, and the solution, after neutralisation, is fermented, and filtered. Sodium chloride is added to the filtrate, which is evaporated to the desired consistency.—W. P. S.

Maize; Extraction of an Albuminoid Compound from ——. Donard and Labbè. Fr. Pat. 320,027, March 28, 1902.

Maize is crushed and extracted with hot amyl alcohol. The extract is precipitated by the addition of a hydrocarbon, carbon tetrachloride or the like, the precipitated albuminoid being filtered off, washed with carbon tetrachloride, and dried. The extracted maize, after removal of the solvent, may be used for brewing, &c. (See this Journal, 1902, 1464.)—W. P. S.

Erratum.

This Journal, 1902, page 1464, col. 2, line 5 from bottom, *for* "Fr. Pat. 18,311" *read* "Fr. Pat. 318,311."

United States Patents.

Vacuum Pan. [*Milk.*] M. Ekenberg, Gothenberg, Sweden. U.S. Pat. 711,719, Oct. 21, 1902.

In the apparatus described, a hollow rotating drum is placed in the vacuum pan. Steam heaters are provided both inside and outside the rotating drum. The latter, as it rotates, carries with it a film of the substance to be evaporated, the thickness of the film being regulated by a scraper. A second set of scrapers removes the dried film.
—W. P. S.

Milk Extract; Process of Making ——. O. Eberhard, Ludwigslust, Germany. U. S. Pat. 712,271, Oct. 28, 1902.

Casein, sugar, and albumin are removed as far as possible from skimmed milk. The milk solution is then evaporated, treated with formaldebyde, boiled, and precipitated by the addition of "alkali." After filtering, the solution is made slightly acid with phosphoric acid, evaporated, and chopped meat is added. The latter is then removed by straining, and the liquid freed from albumin, clarified and concentrated. (See Eng. Pat. 21,758, 1901; this Journal, 1902, 183.)
—W. P. S.

Centrifugal Separator [*Milk*] ——. P. L. Kimball, Assignor to Vermont Farm Machine Co., Bellows Falls, Ver. U.S. Pat. 712,310. Oct. 28, 1902.

An annular projection or ring is placed at the bottom of the interior wall of the drum. A liner fits inside this ring, leaving a space between the liner and the bottom of the drum. The separated milk moves to the wall of the drum, then downwards and through holes in the ring into the space under the liner, where it is directed into outlet-passages, by radial wings on the under side of the liner.
—W. P. S.

Milk-Heater. F. D. Talcott, Maynard, Iowa. U.S. Pat. 712,345, Oct. 28, 1902.

The apparatus consists of a stationary cylinder provided with a hot water jacket. A revolving cylinder containing hot water, and having stirring blades or ribs on its outside, is placed within the first cylinder, a small space being left between the walls and bottoms of the two, through which the milk passes, entering at the bottom and leaving at the top. The water jacket, and the water in the revolving cylinder, are heated by suitable steam pipes.—W. P. S.

Milk in a Dry Form; Process of Preserving ——. J. A. Just, Syracuse, N.Y. U.S. Pat. 712,545, Nov. 4, 1902.

The milk is treated with small amounts of calcium oxide dissolved in calcium chloride solution, of sodium calcium citrate, and of an alkali hypochlorite. The milk is then violently boiled on a surface heated to a temperature above 212° F., but below 270° F., and is finally drawn on to a surface also heated above 212° F., where it is dried and the film removed.—W. P. S.

Liquids [*Milk*]; *Method of Preserving* ——. W. H. Birchmore, Brooklyn, Assignor to C. A. Collins, New York. U.S. Pat. 713,840, Nov. 18, 1902.

A container, such as a syphon bottle, is filled with sterilized water and heated to 212° F. Sterilized air or nitrogen is then admitted under pressure, whereby the water is expelled. The previously sterilized liquid to be preserved is then forced into the container, without contact with the atmosphere.—W. P. S.

Milk; Process of Preserving ——. W. H. Birchmore, Brooklyn, Assignor to C. A. Collins, New York. U.S. Pat. 713,841, Nov. 18. 1902.

The milk is filled into a sterilized siphon-bottle, and pasteurized. A sterile gas is then forced into the bottle under sufficient pressure to expel the milk therefrom when required for use—W. P. S.

Pasteurizer; [*Beer and Milk*] ——. A. A. Busch, R. Gull, and T. J. Barry, all of St. Louis, Mo. U.S. Pat. 713,952, Nov. 18, 1902.

The bottles containing the liquid to be pasteurized are carried by means of a moving band through a chamber filled with water. The chamber is divided by vertical partitions which alternately reach to the top and bottom of the chamber. The bottles are carried over and under these partitions. The water circulates through the chamber,

entering cold where the bottles leave, and being run off at the other end of the pasteurizer where the bottles enter. The water, as it passes through the middle partitions, is heated by steam coils.—W. P. S.

Cream Separator. I. P. B. Knudsen, Copenhagen. U.S. Pat. 712,390, Oct. 28, 1902.

A CENTRAL vertical feed pipe is placed in the separator drum, and has a series of rows of apertures extending in a direction parallel with its axis. A row of apertures is placed adjacent to the forward face of each of a number of radial plates fixed to the central pipe and extending to the wall of the drum.—W. P. S.

Meat; Preparation for Preserving ——. E. Markovits, Berlin, and F. Guthmann, Friedenau, Germany. U.S. Pat. 711,990, Oct. 28, 1902.

FORTY parts of gelatin, 15 parts of agar-agar, and two parts of salt are boiled with 35 parts of water for some time. After cooling, seven parts of alcohol and one part of sodium salicylate are added and thoroughly mixed. The mixture is again boiled after adding a further 10 parts of water, and is then ready for painting over the surface of meat to be preserved.—W. P. S.

Proteids from Non-Nitrogenous Bodies: Process of Separating ——. J. Carstairs, Bradford. U.S. Pat. 713,395, Nov. 11, 1902.

THE substance, from which it is wished to obtain the nitrogenous substances free from fat, oil, and other non-nitrogenous matters, is mixed with a saturated solution in methyl alcohol of nine parts of phenol and one part of benzyl alcohol. The mixture is heated, or boiled if necessary, when the nitrogenous substances are solidified and the fat &c. separates and can be removed.—W. P. S.

Cereal Foods; Process of Preserving ——. H. D. Winton, Assignor to F. C. Hersey, Wellesley Hills, Mass. U.S. Pat. 713,580, Nov. 11, 1902.

THE granulated cereal is mixed with a thin sugar syrup and rapidly agitated for the purpose of coating the granules. The latter are then compressed into blocks, and dried.
—W. P. S.

Cereal Food. H. D. Winton, Assignor to F. C. Hersey, Wellesley Hills, Mass. U.S. Pat. 713,581, Nov. 11, 1902.

THE food is prepared by the process described under U.S. Pat. 713,580, 1902 (see above).—W. P. S.

Cereals; Method of Preserving ——. H. D. Winton, Assignor to F. C. Hersey, Wellesley Hills, Mass. U.S. Pat. 713,582, Nov. 11, 1902.

THE cleaned, granulated cereal is subjected to the fumes of sulphur or salt at a high temperature, and is then mixed or coated with sugar solutions as in U.S. Pat. 713,580, 1902, (see above).

Cattle Food; Process of Making ——. L. J. P. M. Y. Dupire, St. Pol, France. U.S. Pat. 713,620, Nov. 18, 1902.

VEGETABLE substances, such as straw, hay, wood-reeds, bagasse and the like, are chopped and freed from gummy and resinous matters by boiling with caustic soda solution (1°—2° B.). The vegetable matter is then washed and macerated with about 15 per cent. of quick-lime for several days and again washed. After drying and pulping, the residue is mixed with 30—60 per cent. of molasses, and formed into cakes.—W. P. S.

(*B.*)—SANITATION.

Waters containing Silicon and Magnesium, Purification of ——. O. Rebuffat. Gaz. chim. ital., **32**, [2], 173—178. Chem. Centr., 1902, **2**, [21], 1347.

IN waters containing silicon, magnesium, and chlorine, the magnesium is only separated to a small extent by the ordinary decomposition of the bicarbonates; for complete precipitation, lime must be added. Silicon is precipitated only after separation of the magnesium, and the presence of a definite quantity of free lime is required for complete precipitation. The purification of waters containing silicon and magnesium must therefore be effected in two stages. The water is first treated in the cold with excess of lime, and this excess is afterwards precipitated by sodium carbonate or the requisite quantity of carbon dioxide.
—A. S.

Crude Sewage; Bacterial Treatment of ——. F. Clowes. Fourth Report to the London County Council, April 17, 1902. (P. S. King and Son, 2 and 4, Great Smith Street, Victoria Street, Westminster, S.W., 2*s.* 6*d.*)

IN the experiments undertaken, the raw sewage, which had been screened from its coarser matters only, was pumped continuously into a settling tank, the rate of supply being so adjusted that the sewage remained about six hours in the tank before flowing away through an elbow pipe, beneath the surface, into the coke-beds. In this tank practically the whole of the suspended or floating matter settled out as sludge. The settled sewage was allowed to flow into a tank filled with fragments of coke to a depth of six feet. When the bed was filled to the surface of the coke, the supply was stopped, the sewage allowed to remain in contact with the coke for two hours, then drained off from the bottom of the bed, the coke-beds allowed to stand empty for two hours, and then refilled with a fresh supply of sewage, which was treated in the same manner.

The conclusions drawn from a large amount of experimental work are:—

(1) By suitable continuous undisturbed sedimentation, the raw sewage is deprived of matter that would choke the coke-beds, and the sludge which settles out is reduced in amount to a very considerable extent by bacterial action. During the first period of six months, before the bacterial action was fully developed, 25·6 per cent. of the most putrescible portion of the sludge was destroyed, and during a subsequent similar period, more than 50 per cent. disappeared. The reduction might be increased by the preliminary removal of road detritus from the sewage.

(2) The coke-beds, after they have developed their full purifying power by use, have an average sewage capacity of about 30 per cent. of the whole space which has been filled with coke.

(3) The capacity of the coke-bed, when filled with settled sewage, fluctuates slightly, but undergoes no permanent reduction. The bed does not choke, and its purifying power steadily improves for some time.

(4) Coke of suitable quality does not disintegrate during use.

(5) The effluent from coke-beds does not undergo offensive putrefaction even in summer heat; it satisfactorily supports the respiration of fish.

(6) The use of chemicals is quite unnecessary with the bacterial method of treatment.

In a short summary of the evidence given before the Royal Commission on Sewage Disposal, it is stated that the majority of the witnesses agreed that crude sewage cannot be successfully treated by contact beds alone, as the liquid capacity of the beds diminishes so rapidly that they soon become useless. A preliminary process of sedimentation, which is, in most cases, also rendered an anaërobic or "septic" process, is necessary to overcome this difficulty. With regard to the respective merits of the continuous and intermittent systems with coke-beds, the former produces a larger amount of nitrates, but the effluent is not so free from suspended solids. A special method of distribution of the liquid on to the bed is also required by the continuous system, and this is a cause of additional expenditure and of additional trouble in maintenance. Letts has found that the presence of salt prevents the formation of nitrates. There are also given in the report:—Details of experimental bacterial treatment of crude sewage at the Northern Outfall Works (Barking); details of the experimental treatment at the Southern Outfall Works (Crossness); tabulated lists of results of chemical examination of the crude sewage and of the effluents, and tables giving

information with regard to bacterial or natural treatment of sewage at various centres throughout the country. (See also this Journal, 1901, 494.)—A. S.

Kilns or Furnaces [*Burning House Refuse.*] H. H. Lake. From C. A. Schuppmann. Eng. Pat. 24,840, Dec. 5, 1901.

See under X., *page* 1536.

Sewage and Polluted Waters; Apparatus for Use in connection with the Purification of ——. [*Sprinkling Apparatus.*] F. P. Candy, Redhill. Eng. Pat. 22,923, Nov. 13, 1901.

A MERCURY trap or seal is placed round the joint between the supply conduit and the rotatory sprinkling apparatus. The latter runs on ball-bearings which are enclosed and protected from dirt and moisture by a second mercury trap. A lubricating bath is provided for these bearings and means for withdrawing any water which may find its way into the oil bath. A bearing for the rotatory part of the apparatus may also be placed in the lower mercury trap. The rotatory apparatus is described in Eng. Pat. 8671, 1894 (this Journal, 1895, 674).—W. P. S.

FRENCH PATENTS.

Oxidation; Process of ——, *by the Electric Current* [*Water Purification*]. Nodon and Piettre. Fr. Pat. 319,957, March 26, 1902.

See under XI. A., *page* 1539.

UNITED STATES PATENT.

Water Purifier. G. M. Davidson, Oakpark, Ill. U.S. Pat. 712,770, Nov. 4, 1902.

A COMBINATION of a chemical-mixing tank, a chemical-feed tank both containing stirrers, and connected by reciprocating pumps, and a tilting measuring vessel to receive both the chemical solution and the water supply. The tilting vessel is connected with the "walking beam" of the pump mechanism, its movements being modified with a dash-pot mechanism, and discharges its contents through holes, in a uniform manner, into a settling tank.
—N. H. J. M.

Water Purifier. G. M. Davidson, Oakpark, Ill. U.S. Pat. 712,771, Nov. 4, 1902.

THE purifier consists of a chemical-feed tank, containing a stirrer, a water-supply pipe to receive the chemical solution passing from pumps on the feed tank, and a tilting vessel into which the mixed chemical solution and water supply are discharged. The tilting vessel which contains a number of measuring chambers is worked intermittently by the pumping mechanism. The mixed liquids are discharged into a settling tank.—N. H. J. M.

Water; Removing Sulphuric Acid from ——. H. Reisert, Cologne, Germany. U.S. Pat. 713,800, Nov. 18, 1902.

THE water to be purified is passed through a quantity of powdered barium carbonate, acting as a filter as well as chemically. When carbonates are to be acted on, as in the case of water intended for use in boilers, and lime is used, a separate filtration is also required.—E. S.

Water Supplies; System of Purifying Municipal ——. P. J. A. Maignen, Pa. U.S. Pat. 713,896, Nov. 18, 1902.

THE water passes from a settling tank to the bottom of a scrubber, through which it flows upwards to an outlet, from which it passes on to a granular filter-bed.

In order to clean the scrubber, the pipes are so arranged that the flow of water may be reversed.—N. H. J. M.

(*C.*)—DISINFECTANTS.

UNITED STATES PATENTS.

Metallic Soaps; Preparation of Solutions of ——, *as Antiseptic Agents* [*for Plants*]. G. A. Raupenstrauch. Fr. Pat. 319,436, March 10, 1902.

METALLIC soaps possessing antiseptic properties (*e.g.*, those of iron, manganese, cobalt, nickel) are mixed with coal-tar oils (phenols, cresols, &c.) or petroleum hydrocarbons. Or metallic oxides, or aqueous solutions of metallic salts are added to the solution of resinous or fatty acids in coal-tar oils, &c. Separate claim is made for preparations containing both such metallic soaps, and also ammoniacal or alkali soaps, which are soluble in water, or form homogeneous mixtures therewith.—C. A. M.

UNITED STATES PATENT.

Formaldehyde Vaporiser. J. W. England, Philadelphia, Assignor to Smith, Keene, and French Co., Pa. U.S. Pat. 711,720, Oct. 21, 1902.

THE apparatus consists of a cylindrical annular reservoir, a vaporising chamber having the form of an inverted funnel with a closed and rounded bottom, an exit tube from the vaporising chamber passing vertically upwards through the centre of the reservoir with insulated walls, and an inclined supply pipe, regulated by a valve, conducting the liquid from the reservoir to the centre of the bottom of the vaporising chamber. The supply and exit tubes are continued in a straight line and closed by caps in order that they may be cleaned out when necessary.—J. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

FRENCH PATENTS.

Carbon-Paper; Machine for making ——. Crown Paper Co. Fr. Pat. 319,745, Jan. 21, 1902.

PAPER in the web is saturated with a solution of a suitable ink by passing it through a machine, with inking rollers revolving in heated troughs containing the solution, pressing and scraping off the excess by means of doctor blades, and finally fixing the solution by passing the paper over a cooling cylinder.—J. F. B.

Cellulose Material for making Combs and other Articles. Soc. Indust. de Cellulose. Fr. Pat. 319,542, March 13, 1902.

NITROCELLULOSE is rendered plastic by treatment with amyl acetate and camphor, or other suitable agents; the mixture is then incorporated mechanically with an isomer of cellulose, such as starch, flour, dextrin, or gum previously gelatinised by heating with water.—J. F. B.

Cellulose Material for making Combs and other Articles. Soc. Indust. de Cellulose. Fr. Pat. 319,926, March 25, 1902.

NITROCELLULOSE suitably gelatinised by a solvent, is incorporated with gelatin, also rendered plastic by a solvent such as ammonia or dilute alcohol, the mixture being heated on a water-bath.—J. F. B.

Elastic Horny Substances [*Cellulose Acetate*]; *Preparation of* ——. Lederer. Fr. Pat. 319,724, March 18, 1902.

HORNY substances resembling celluloid are prepared from cellulose acetate by combining it with organic compounds, containing one or more hydroxyl groups or aldehyde, ketonic, or amino groups, or with acid amides, with or without pressure.—J. F. B.

Cellulose; Process for Acetylating ——. Lederer. Fr. Pat. 319,848, March 22, 1902.

CELLULOSE (1 part) is heated at 40°—45° C., with four or five parts of glacial acetic acid, containing about 0·5 per cent of sulphuric acid, or other mineral acid. After hydrolysis is complete, four or five parts of acetic anhydride are added, and cellulose acetate is produced. If desired, the acetic acid treatment may be omitted, and the cellulose may be acetylated directly by acetic anhydride containing small quantities of mineral acid.—J. F. B.

UNITED STATES PATENTS.

Paper-making Machine. T. A. Boyne, Lee, Mass. U.S. Pat. 712,038, Oct. 28, 1902.

THE mechanism for automatically regulating the flow or feed of water, to the screen of the Fourdrinier paper-making

machine consists of a pump and vat, with a pipe connecting them, a valve on the pipe, a float-box having its bottom substantially in the same plane as that of the vat, and a pipe connecting the vat and float-box, the float being connected with the valve.—J. F. B.

Paper Stock; Machine for Treating ——. J. A. Mullen and E. J. Pope, Holyoke, Mass. U.S. Pat. 712,837, Nov. 4, 1902.

In a beating engine of the Hollander type, a rotary propeller furnished with paddles, is inserted between the beating roll and the "backfall." As the stuff emerges from between the roll and bed-plate, the paddles of the propeller catch it, and elevate it to the summit of the "backfall."
—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Camphor, Camphor Oil, and the Manufacture of Safrol from Camphor Oil. N. Sugiyama. Schimmel's Report, Oct. 1902, 16.

Camphor.—Four kinds of camphor are recognised: Joko, Tehuko, mountain, and refined camphor. Joko camphor is Tehuko camphor well dried. Mountain camphor is the popular name, indicating the source, for the product which is chiefly exported to Europe and America. Refined camphor is chiefly manufactured in the districts of Osaka and Kobé by separation from the crude oil; this is also exported.

Camphor Oil is classified as crude, white, and red camphor oil.

Crude Camphor Oil is obtained by submitting the wood in chips to steam distillation. After removing the camphor which crystallises out, by mechanical means, the residual oil is yellow in colour, and has a sp. gr. ranging from 0·950 to 0·995. Products from the provinces of Izu and Kii, and from older trees, have, generally, a higher sp. gr., whilst those from other sources or from younger trees are lighter. The author accidentally discovered, that by exposing camphor oil in shallow vessels to a low temperature (in the open air at night), a further crop of camphor, as much as 26 lb. from 40 galls. of oil, might be recovered. A subsequent improvement, consisting of rough fractional distillation of the oil, resulted in a further separation of camphor. Of eight fractions separated, the third and the sixth solidified, and camphor crystallised out in smaller quantities from the remainder. The total amount of camphor thus recovered was 78 lb. from 40 galls. of oil. A portion of the fractionated oil, after the separation of the camphor, was of a blue tint. The blue oil was found to possess insecticidal properties. As an example of the improved yield of camphor obtained by this fractional distillation of the crude oil, it is stated that the yield which, in 1875, was 6·4 per cent., is now 50—53 per cent.

White Camphor Oil.—This is obtained from crude camphor oil by fractional distillation after the separation of the camphor. It is colourless, mobile, and transparent; the sp. gr. ranges from 0·870—0·910; it deposits no crystals when cooled to −20° C.; it boils from 150°—195° C. The chief constituents are pinene, phellandrene, cineol, dipentene, and some camphor. Even after again fractionating, it still contains from 3·75—8 per cent. of camphor.

Red Camphor Oil.—This is the fraction from the crude oil obtained after the white oil. It is a brown mobile liquid; sp. gr. 1·000—1·035; it boils between 225—270° C., and consists chiefly of safrol, with a little eugenol, and a trace of camphor.

Separation of Crystallisable Safrol from Red Camphor Oil.—The red oil is submitted to fractional distillation, the fractions boiling at about the b. pt. of safrol being collected apart. From these the safrol is separated by freezing, and purified by recrystallisation. The yield from the red oil of the sp. gr. 1·0165, is about 21 per cent. The safrol thus obtained, crystallises in colourless rhombic prisms which melt at about 12° C., to a colourless liquid of the sp. gr. 1·107 at 15° C., and solidify at −20° C.; b. pt. 230°—235° C. Commercial specimens of safrol were found to range in sp. gr. between 1·1040 1·1065. Two specimens prepared by the author had the sp. gr. 1·106 and 1·1070 respectively.
—J. O. B.

Thymol; New Source of ——. Battandier. J. Pharm. Chim., 1902, **16**, [11], 536.

Origanum floribundum Munby, *O. cinereum* De Noé, a plant found in the mountain districts of Algeria, yields a large proportion of oil, from which alkalis extract about one-fourth of its volume of phenols. The mixture of phenols, when isolated and suitably concentrated, crystallises almost entirely when sown with a crystal of thymol. There remains only a small quantity of a brown liquid, which appears to consist mainly of carvacrol. Carvacrol is the only phenol which has hitherto been observed in the genus *Origanum*, which is so closely related to thyme. The plant in question, however, although very rich in oil, is too scarce to be of much industrial importance.—J. F. B.

Coca Leaves; [Yellow Colouring Matters of ——]. O. Hesse. J. prakt. Chem., 1902, **66**, [21 and 22], 401—422.

Coca leaves from Java were extracted with light petroleum spirit, the residue was then extracted with alcohol, and the alkaloids separated from the extract by means of acid; a green-coloured residue remained, which was separated by ether into two portions. The portion insoluble in ether consisted of *cocacitrin* (Warden's cocatannic acid), the ether-extract contained, besides small quantities of *cocacitrin*, *cocacetin*, *cocaflavin*, and *cocaflavetin*; these bodies gave yellow solutions in alcohol, yielding dirty-green colorations with ferric chloride.

Cocacitrin, $C_{58}H_{32}O_{17}$, crystallises in very slender yellow prisms with $3H_2O$; it softens at 175° C. and melts at 186° C. It is soluble in alkalis and takes up 7 acetyl groups on acetylisation. This body is a glucoside, being split up by boiling with dilute acids into 2 mols. of a cupric-reducing hexose sugar, unfermentable by yeast, *cocaose*, which may possibly be *d*-talose, $[\alpha]_D = +18·8°$, and 1 mol. of cocaccetin.

Cocacetin, $C_{16}H_{12}O_7$, which is also obtained directly from the leaves, crystallises in yellow needles with $3H_2O$; the anhydrous substance melts at 260°—265° C. It takes up 4 acetyl groups on acetylisation. When fused with potash the ultimate products are phloroglucinol, and protocatechuic acid. An intermediate product, *decocacetin*, $C_{15}H_{14}O_6$, may be obtained by stopping the fusion at a suitable point; it is formed from cocacetin by elimination of CO_2 and addition of H_2O.

Cocaflavin, $C_{34}H_{38}O_{19}$, is obtained from the ether extract of the residue from the alkaloids. It crystallises in yellow needles with $4H_2O$; the anhydrous substance melts at 163°—164° C. It contains methoxyl and is also a glucoside, yielding on hydrolysis 1 mol. each of glucose and galactose, and 1 mol. of cocaflavetin, $C_{22}H_{18}O_9$.

Cocaflavetin, $C_{20}H_{12}O_7(OCH_3)_2$, melts at 230° C and crystallises with $3H_2O$. On treatment with hydriodic acid, the methoxyl groups are replaced by hydroxyl, yielding *norcocaflavetin*, m. pt., 270° C.

It is highly probable that the two glucosides of coca leaves are really compounds of biose sugars which are themselves split up in the process of hydrolysis.—J. F. B.

Chinese Rhubarb A. Tschirch and K. Hüberger. Archiv der Pharm., **240**, [8]. 596—630.

The active constituents of Chinese rhubarb may be divided into two classes, tannoglucosides and anthraglucosides. Although the former are not, strictly speaking, in themselves physiologically active, they doubtless play an important part in the therapeutic action of the drug. These two kinds of constituents cannot be sharply separated. Both are removed by the usual solvents, by which, moreover, both are easily decomposed. An ethereal extract of the root contains, chiefly, the decomposition products of the anthraglucosides, chrysophanic acid, emodin and rhein. Rhubarb contains a considerable quantity of oxymethylene-anthraquinone, which is present in greater quantity in

mouldy root than in non-mouldy samples. Aweng's double glucoside is identical with the authors' tannoglucoside, but is less pure. The frangulic acid of that investigator, is a secondary decomposition product of tannoglucosides, and contains anthraglucosides as well.

Kubly's rheotannic acid and Hunkel's tannoid are also identical with, but less pure than, the authors' tannoglucoside. Kubly's and Hunkel's rheic acid is their rheotannic acid.

Schlossberger and Doepping's aporetin and phaeoretin are impure tannoglucosides which have become insoluble.

Erythroretin is a mixture of chrysophanic acid, emodin, and rhein. Garot's erythrose is chrysammic acid.

Rhein gives only a diacetyl derivative, and therefore cannot be a tetrahydroxyanthraquinone. Its formula is $C_{15}H_8O_6$, and not $C_{15}H_{10}O_6$, as stated by Hesse. This formula agrees with that of a methylene ether of a tetrahydroxyanthraquinone.

The cathartic acid of Dragendorff, Greenish, and Elborne, is a mixture of anthraglucosides, tannoglucosides, and albuminous matter.

Gilson's chrysophane is an anthraglucoside. Aweng's secondary glucosides are, mostly, sparingly soluble secondary decomposition products of primary tannoglucosides and, probably, of anthraglucosides also.—J. O. B.

Lemon; Essential Oil of ——. Schimmel's Report, Oct. 1902, 35—40.

The presence of lævo-pinene as a normal constituent of lemon oil is confirmed, together with that of a more actively lævo-rotatory terpene, boiling at a slightly higher temperature, which is probably lævo-camphene. Methyl heptenone and terpineol are also found to be present in the oil.
—J. O. B.

Neroli (Bitter Orange Flowers); Essential Oil of ——. Schimmel's Report, Oct. 1902, 54—58.

In addition to the hitherto recorded constituents, neroli oil is found to contain lævo-pinene; lævo-camphene (?); dipentene; decylic aldehyde (?); an alcohol, $C_{10}H_{18}O$, probably lævo-linalool; phenyl-ethyl alcohol, free or as an ester; dextro-terpineol, m. pt. 35° C.; phenyl-acetic and phenyl-benzoic acids.—J. O. B.

Peppermint Oil; Italian ——. Schimmel's Report, Oct. 1902, 66.

Although Italian peppermint oil is not generally exported, a specimen distilled in the province of Piedmont has been met with. This had an odour somewhat resembling that of pennyroyal, and was of a pale greenish colour. The sp. gr. at 15° C. was 0·9122; opt. rot., −16° 21′; solubility in 70 per cent. alcohol, about 1:7; in 80 per cent. alcohol, 1: 1·1, with faint opalescence. The amount of total menthol found, was 52·5 per cent., of which 7·89 per cent. was present in the form of esters. The menthone present amounted to 22 per cent.—J. O. B.

Petitgrain, Paraguay; Essential Oil of ——. Schimmel's Report, Oct. 1902, 68—73.

Paraguay petitgrain oil is found to contain furfural; lævo-pinene (?); lævo-camphene (?); dipentene; an alcohol, $C_{10}H_{18}O$ (lævo-linalool); dextro-terpineol; geraniol; geranyl acetate; and traces of a basic substance. The oil examined, had the following characters: sp. gr., 0·8912; opt. rot., −0° 36′; saponification value, 135; initial b. pt., at 760 mm., 157°, at 20 mm., 65° C.—J. O. B.

Ambrette (Abelmoschus) Seeds; Fluid Essential Oil of ——. Schimmel's Report, Oct. 1902, 9.

As usually met with, the essential oil of ambrette seeds is solid at ordinary temperatures, due to the presence of a fatty acid, probably palmitic acid. The pure volatile oil free from non-odorous fatty acid is described as not congealing at a low temperature and presenting the following physical constants: sp. gr., 0·905; opt. rot., +1° 10′; acid value, 2·4; ester value, 180·5; solubility in 80 per cent. alcohol, 1:5 to 6 volumes.—J. O. B.

Asarum arifolium; Essential Oil of ——. E. R. Miller. Archiv der Pharm., **240**, 371; through Schimmel's Report, Oct. 1902, 12.

The leaves and roots of *Asarum arifolium* yield from 7 to 7·5 per cent. of a colourless, heavy, fragrant essential oil, the odour of which recalls that of sassafras. Three specimens of the oil had the following physical characters: sp. gr., 1·0585, 1·0609, and 1·0613; opt. rot., −3°, −2° 55′, and −3° 7′; refractive index, at 20° C., 1·53187, 1·531460, and 1·531065. The chief constituent of the oil is safrol; it also contains lævo-pinene, eugenol, and a small quantity of another phenol, giving a green colour-reaction with ferric chloride; methyl-eugenol, methyl-iso-eugenol, and asarone.—J. O. B.

Camphorosma monspeliaca; Essential Oil of ——. Cossan. Schimmel's Report, Oct. 1902, 23.

Camphorosma monspeliaca is a plant indigenous to Southern France, distinguished by its camphoraceous odour. By distillation with steam and by ether extraction, the yield of volatile oil was 0·2 per cent. This oil had an odour recalling that of benzaldehyde; sp. gr. at 70° C., 0·970; refractive index, $n_D = 1·3724$. It congealed at 4° C. The oil was distinguished from that of *Chenopodium anthelminticum* of the same natural order, *Chenopodiaceæ*, by its pleasant odour. When distilled with aqueous potash, the plant yielded propylamine.—J. O. B.

Cinnamon Leaves; Essential Oil of ——. Schimmel's Report, Oct. 1902, 27.

In addition to eugenol, cinnamic aldehyde, safrol, benzaldehyde, and benzoic acid, linalool is now recorded as a constituent of this oil. The specimen examined contained only traces of cinnamic aldehyde.—J. O. B.

Cryptomeria japonica; Essential Oil of ——. C. Kimoto. Bull. Coll. Agric. Tokio; through Schimmel's Report, Oct. 1902, 32.

Cryptomeria japonica is a conifer indigenous to Japan. The wood has a pleasant peppermint-like odour, due to the presence of an essential oil, which is obtained by distilling the chips. It contains a neutral liquid, *sugiol*, $C_{30}H_{48}O$; sp. gr., 0·936; b. pt., 264° C. It does not yield a crystalline acetyl or hydrazone compound. It slowly reduces alkaline solutions of silver salts in the dark.—J. O. B.

Milfoil; Essential Oil of ——. A. B. Aubert. Schimmel's Report, Oct. 1902, 51. J. Amer. Chem. Soc., **24**, 778.

The oil has the following physical characters: sp. gr., at 22° C., 0·9217; refractive index, 1·506. Under reduced pressure, 86 per cent. by volume distilled between 170° and 235° C. The fractions boiling between 170°—190° C. consist, probably, chiefly of cineol. The principal fraction, b. pt., 210°—220° C., was blue in colour, which changed to green after standing in the dark for 18 months. This fraction consisted of a body having the formula $C_{10}H_{20}$. It had the following physical constants: opt. rot., −14·2°; refractive index, 1·492; b. pt., 254° C. at 754·8 mm. In general reactions it agreed with the terpenes. The author considers the blue fraction of milfoil oil to be distinct from that of chamomile.—J. O. B.

Pseudocymopterus anisatus; Essential Oil of ——. Brandon. Pharm. Review, **20**, 213; through Schimmel's Report, Oct. 1902, 73.

Pseudocymopterus anisatus is found in the Western States of North America. The fruit and the essential oil distilled from the whole plant have a marked anise-like odour. The oil has the sp. gr. 0·978° C., and closely resembles that of anise, star anise, or fennel, but does not solidify at a low temperature, a fact which is due, apparently, to the presence of methyl-chavicol in the oil.—J. O. B.

Bystropogon origanifolius; Essential Oil of ——. Schimmel's Report, Oct. 1902, 82—83.

Bystropogon origanifolius, N.O. *Labiatæ*, is a native of Teneriffe. The fresh herb has the odour of pennyroyal. It yields a bright yellow essential oil of the following

characters: sp. gr., 0·9248; opt. rot., + 2° 57; acid value, 0; ester value, 11·1, and after acetylisation, 53·83; refractive index, n_D = 1·48229; solubility in 70 per cent. alcohol, 1: 2·5; in 80 per cent. alcohol, 1: 0·7. It distils between 162° and 234° C. It consists chiefly of menthone and pulegone with a little limonene.—J. O. B.

Civet; Commercial ——. E. J. Parry. Chem. and Druggist, 1902, 61, [1192], 961.

The author has found that a large number of samples of commercial civet are adulterated, usually with petroleum-jelly. The most trustworthy process for the determination of petroleum-jelly in civet is that devised by Dodge. The sample is exhausted with acetone, and then extracted with light petroleum spirit, which dissolves the petroleum-jelly. The results agree within 0·2 or 0·3 per cent. From samples of pure civet only a very small quantity is extracted by petroleum spirit. If petroleum-jelly be present, the petroleum spirit extract is highly fluorescent. The residue, after the extraction with acetone, forms a greyish powdery mass, in which adulterants other than petroleum-jelly can frequently be detected by microscopic examination.—A. S.

Gentian Root; Sugars present in the Powder and Extract of ——, *and Preparation of Gentiobiose from these Drugs.* E. Bourquelot and H. Herissey. J. Pharm. Chim., 1902, 16, [11], 513—519.

The cane-sugar, gentianose, and the glucoside gentio-picrin which are present in fresh gentian root, have disappeared for the most part from the gentian powder of the French Pharmacopœia, owing to fermentative processes during drying. The powder still contains the ferments invertase and emulsin in the active state. Consequently, the above substances are entirely absent from the aqueous extract prepared from the powder. The powder contains, in addition to the hexoses (glucose and fructose), pre-existing in the fresh root, those produced by the action of the soluble ferments on the two saccharides and on the glucoside; it contains also a little gentiobiose in the free state. The aqueous extract contains only hexoses and gentiobiose, the latter contributing in a slight degree to the characteristic bitterness of the drug. It is easier, although the yields are comparatively small, to prepare gentiobiose from the powder or extract of gentian root, by removing the hexoses by fermentation, than from gentianose, the extraction of which is somewhat tedious.—J. F. B.

English Patents.

Ammonium Ichthyol Sulphonate [from Asphaltum]; Process of Making ——. A. C. McLaughlin, Austin, Texas, U.S.A. Eng. Pat. 21,838, Oct. 30, 1901.

Asphaltum containing sulphur is distilled in a suitable retort, and the distillate treated at 100° C. with strong sulphuric acid. Two layers are formed, the heavy, dark-coloured portion being neutralised with ammonium carbonate, when crude ammonium ichthyol sulphonate separates out. This is washed with petroleum spirit, dissolved in methyl alcohol, and the solution filtered and evapurated, yielding ammonium ichthyol sulphonate.—T. A. L.

Hydrocyanic Acid; Production of ——. W. Feld, Hoenningen-on-Rhine, Germany. Eng. Pat. 24,904, Dec. 6, 1901.

Cyanides are heated with a solution of a salt of magnesium, lead, aluminium, zinc, or manganese, for instance, according to the equation—

$$2KCN + MgCl_2 + 2H_2O = 2KCl + Mg(OH)_2 + 2HCN.$$

—J. F. B.

Camphene; Manufacture of ——. A. Zimmermann, London. From Chem. Fab. vorm. E. Schering, Berlin. Eng. Pat. 26,618, Dec. 30, 1901.

Compounds of pinene with the halogen acids are heated in an autoclave for 20 hours at 210° C. with an alkali, in presence of an alkali salt of the higher fatty acids (*e.g.*, soaps) in aqueous solution. (See U.S. Pat. 707,271; this Journal, 1902, 1194.)—J. F. B.

Camphene; Manufacture of ——. A. Zimmermann, London. From Chem. Fab. vorm. E. Schering, Berlin. Eng. Pat. 26,620, Dec. 30, 1901.

See U.S. Pat. 707,270; this Journal, 1902, 1194.

—J. F. B.

Saccharin; New Derivatives of ——. L. Givaudan, Geneva, Switzerland. Eng. Pat. 12,181, May 28, 1902.

Compounds of saccharin with amines of the fatty series are prepared by dissolving saccharin and an amine in water, concentrating the solution under reduced pressure and crystallising from alcohol.—J. F. B.

French Patents.

Citral Series; Isomerisation of Members of the ——. Tiemann. Addendum, dated March 5, 1902, to Fr. Pat. 234,010, Nov. 11, 1893.

Geraniol is converted into cyclogeraniol by isomerisation by means of condensing acids in the same way as citral is converted into cyclocitral, provided the alcoholic group be protected by being combined in the form of an ester. Two cylic isomers are produced in varying proportions, according to the acid employed. The cyclogeraniols are converted into the corresponding cyclocitrals by oxidation by means of chromic acid.—J. F. B.

Oils; Apparatus for Emulsifying Pharmaceutical ——. Bisseuil. Fr. Pat. 319,290, March 4, 1902.

The apparatus consists of a closed vessel in which are situated two vertical shafts rotating in opposite directions. On the shafts are mounted tubes to which a vertical reciprocating motion is given, and to these tubes are fixed alternately stirring paddles and horizontal perforated discs; arms are provided on the bottom of the shafts to facilitate the discharge of the material.—J. F. B.

Oxidation by the Electric Current; Process of ——. [*Improvement of Natural Perfumes.*] Nodon and Piettre. Fr. Pat. 319,957, March 26, 1902.

See under XI. A., *page* 1539.

United States Patents.

Ether; Manufacture of ——. J. W. Harris, Ashbourne, Pa. U.S. Pat. 711,565, Oct. 21, 1902.

Acetylene is passed into an electrolytic cell containing an electrolyte of sulphuric acid diluted with about 35 per cent. of water. The gas, being delivered at the cathode, combines directly with the hydrogen formed, yielding ethylene, which in turn combines with the sulphuric acid to form ethyl sulphuric acid; this is then decomposed by the water present with production of ether. The reaction should be conducted at a temperature above 100° C.—J. F. B.

Para-cresol Oxalic Esier; Preparation of ——. L. Kahl, Schwientochlowitz, Assignor to R. Ruetgers, Charlottenburg, Germany. U.S. Pat. 711,572, Oct. 21, 1902.

See Fr. Pat. 317,512; this Journal, 1902, 1410.—J. F. B.

Tobacco Extract and Nicotine; Method of Obtaining ——. C. F. Gloystein, Henderson, Ky. U.S. Pat. 711,924, Oct. 21, 1902.

For the preparation of a highly concentrated tobacco extract on the one hand, and a purified solution of nicotine on the other, crude aqueous tobacco extract is treated with alkali to liberate the nicotine in the desired proportion. The extract is then concentrated in a vacuum pan, and the vapours, containing the nicotine, are condensed. The nicotine is extracted from the distillate by treating the latter with carbon bisulphide or other solvent in the form of finely-divided drops, the alkaloid being subsequently recovered in any suitable way.—J. F. B.

Phenylglycine; Process of Making ——. W. Heutschel, Assignor to Chem. Fab. von Heyden, both of Radebeul, Germany. U.S. Pat. 712,190, Oct. 28, 1902.

For the manufacture of phenylglycine, 1 molecule of monochloracetic acid is caused to react with 3 molecules of aniline, preferably in presence of a diluent. The excess of aniline prevents the formation of phenyliminoacetic acid. —J. F. B.

XXI.—PHOTOGRAPHY.

English Patents.

Enamelled Polychrome Photographic and Artistic Stained-Glass and other like Decorations; Process for Producing ——. H. Perrin. Eng. Pat. 5884, March 10, 1902.

See under VIII., *page* 1534.

Printing Surfaces for Photographic or other Printed Pictures. A. Huck and L. Fischer, Frankfort-on-the-Main. Eng. Pat. 11,983, May 26, 1902.

A sheet of aluminium, or of one of its alloys, is given a rough surface, either by chemical or mechanical means; and upon it is brought, by photographic or photo-mechanical processes, the positive picture. The high lights are then represented by the bright metallic surface, which is claimed to give the pictures a striking degree of brilliancy. Eng. Pat. 3347, 1902, is mentioned; but here no binding agent is said to be necessary.—F. H. L.

French Patents.

Fixing Bath; Photographic ——. F. Bayer and Co. Addition, dated March 7, 1902, to Fr. Pat. 316,504, Dec. 3, 1901.

The acetone alkali bisulphites, previously recommended for addition to photographic developers (U.S. Pat. 707,403; this Journal, 1902, 1349), are similarly introduced into the thiosulphate fixing bath. Such a bath remains clear and unaltered for some time, and exhibits the advantages of a faintly acid fixing solution.—F. H. L.

Ammonium Persulphate as a "Hypo." Eliminator. A. Lumière et ses Fils. Fr. Pat. 319,341, March 7, 1902.

Ammonium persulphate, which is naturally too strongly acid to be used for this purpose, becomes a satisfactory eliminator of "hypo," if it is rendered neutral or faintly alkaline with some suitable salt, such as a bicarbonate, phosphate, borate, tungstate, acetate, citrate, or tartrate. —F. H. L.

Photographic Developer. Damgaard. Fr. Pat. 319,680, March 17, 1902.

54 grms. of sodium sulphite, 9 grms. of potassium bromide, 5·5 grms of metol, and 22·5 grms. of hydroquinone are dissolved in 1 litre of water. 25 c.c. of this solution, 25 c.c. of a 10 per cent. solution of potash, and 25 c.c. of water are mixed together for use. Or the same salts may be mixed together in the dry state, and afterwards dissolved in water to make a bath composed as above. To compensate for over-exposure, the proportion of bromide is increased and (or) that of potash diminished. —F. H. L.

Gelatin Photographic Film Supports. C. L. F. Freelandt. Fr. Pat. 319,547, March 13, 1902.

See Eng. Pat. 3371, 1902; this Journal, 1902, 1097. —F. H. L.

United States Patents.

Colour Photograph, and Art of Making same. M. Miley and H. M. Miley, Lexington, Virginia, Assignors to the Miley Colour Photograph Co., of New York. U.S Pat. 711,875, Oct. 21, 1902.

See Eng. Pat. 17,485, 1902; this Journal, 1902, 1411. —J. W. H.

Reducer for Over-exposed Photographic Plates. H. G. Krieger, Assignor to himself, H. A. Bussian, and A. Konold, Chicago, Ill. U.S. Pat. 712,318, 1902.

The reducer consists of a mixture of 4 parts of a saturated solution of copper sulphate, and 1 part of hydrochloric acid.—J. W. H.

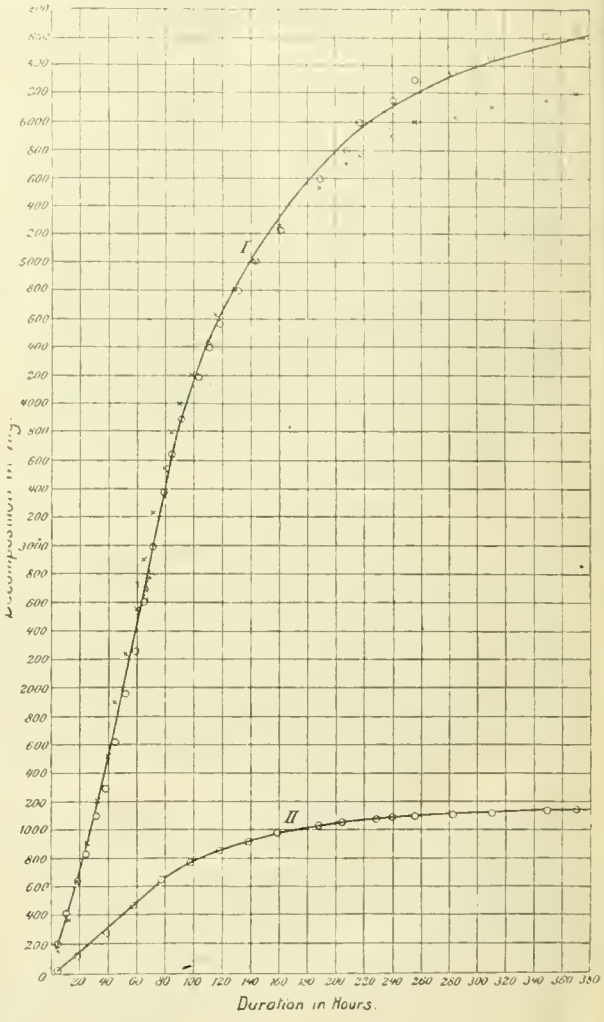
Sensitised Material, and Process of Making same. A. H. Mies, Jun., Büdesheim, and A. Cobenzl, Bingen, Germany. U.S. Pat. 713,474, 1902.

The fabric is impregnated with a solution of soluble starch; after drying, the starch, now rendered insoluble, is sensitised.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrocellulose; Stability of ——. *Cause of the Constancy of the Amount of Nitrogen Separated in a given Period of Time.* W. Will. Mitt. aus der Centralstelle f. Wissensch. Techn. Untersuch., Neu-Babelsberg, Berlin, 1902, [3], 30—33.

10 grms. of a "normal" nitrocellulose were heated at 135° C. in a current of carbon dioxide, in the manner described in



I. Loss of weight:
o found
× calculated from II by multiplication by $\frac{100}{87}$.
II Nitrogen set free.

next abstract, and the nitrogen collected and measured. The amount of water formed was determined by passing the gases evolved through a calcium-chloride tube, and at definite periods the total loss of weight was determined by weighing the residue. The experiment was continued for 371 hours, and the results, with regard to total loss of weight and amount of nitrogen separated, are shown in the accompanying diagram. No further loss of weight occurred on continued heating, and it was found that the residue weighed 3·3 grms., and contained 170 mgrms. of nitrogen; the original 10 grms. of nitrocellulose contained 1,310 mgrms. of nitrogen. The ratio between the total loss of weight and the amount of nitrogen separated remained throughout the experiment at about 100 : 18·5 (see figure). The ratio between the amount of water evolved and that of nitrogen was about 1·9 : 1. The ultimate composition of the residue was, carbon, 44·4; hydrogen, 2·4; nitrogen, 5·3; oxygen, 47·9 per cent. Based on these and other considerations, the author concludes that the nitrocellulose is mainly decomposed according to the equation—

$$C_{12}H_{15}(NO_2)_3O_{10} = C_{10}H_3NO_8 + 4NO + 6H_2O + 2CO,$$

which would require a ratio between total loss of weight and amount of nitrogen separated of 100 : 19·7, and between amount of water evolved and that of nitrogen of 1·9 : 1. Besides nitric oxide, water and carbon monoxide, it is probable that, owing to by-reactions, nitrogen, carbon dioxide, and possibly nitrous oxide, are formed. The fact that by prolonged heating at 135° C. the whole of the nitrogen is not evolved from nitrocellulose, points to a secondary action of the separated oxygen compounds of nitrogen on the nitrocellulose residue. (See also this Journal, 1901, 609, 932; 1902, 1470.)—A. S.

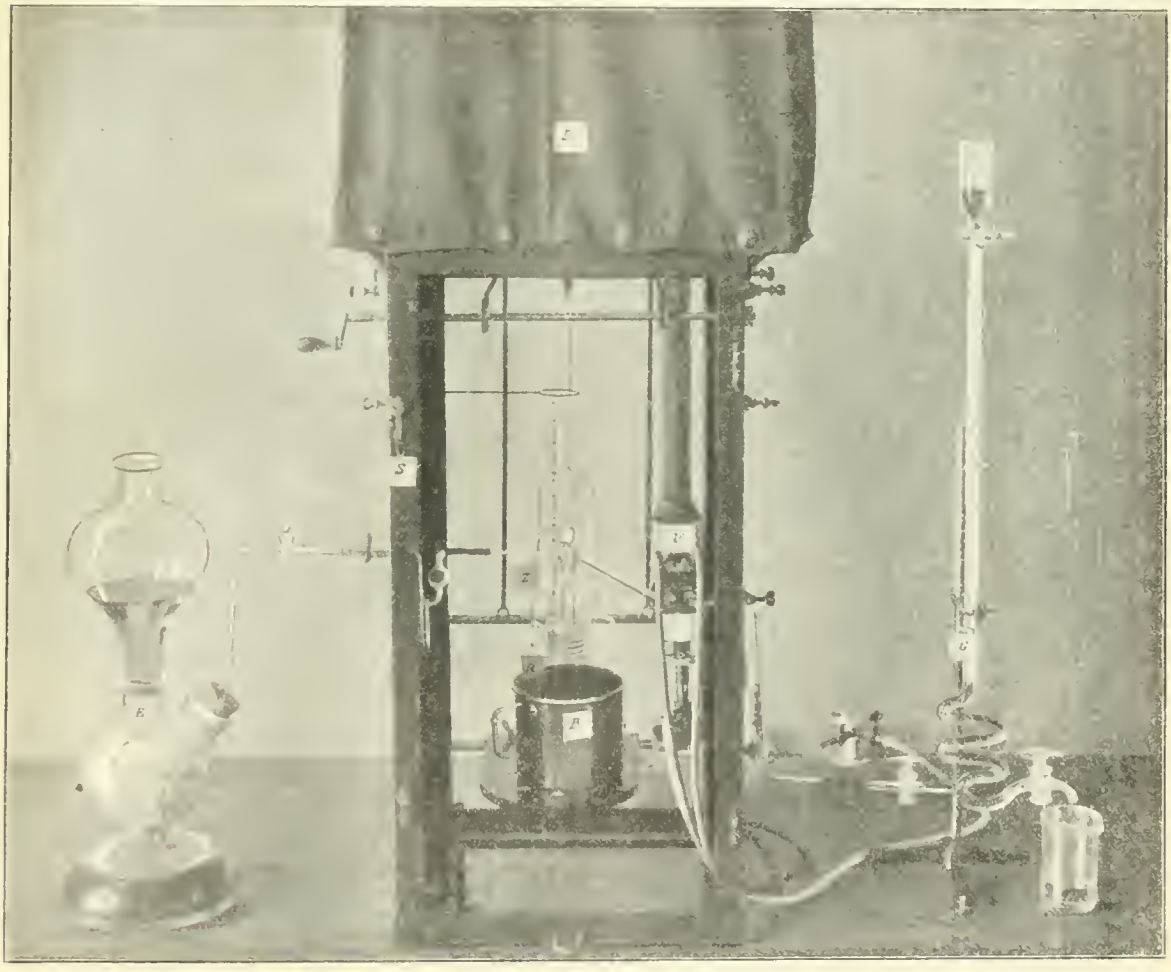
Nitrocellulose; Examination of ——, with regard to Separation of Nitrogen. W. Will. Mitt. aus der Centralstelle für Wissensch. Techn. Untersuch., 1902, [3], 34—40. (See this Journal, 1901, 609, 932.)

The following is a description of the process employed to determine whether a nitrocellulose can be regarded as "normal," *i.e.*, whether, on heating it at a constant temperature, in a current of carbon dioxide, equal amounts of nitrogen, as oxides, are evolved in equal periods of time.

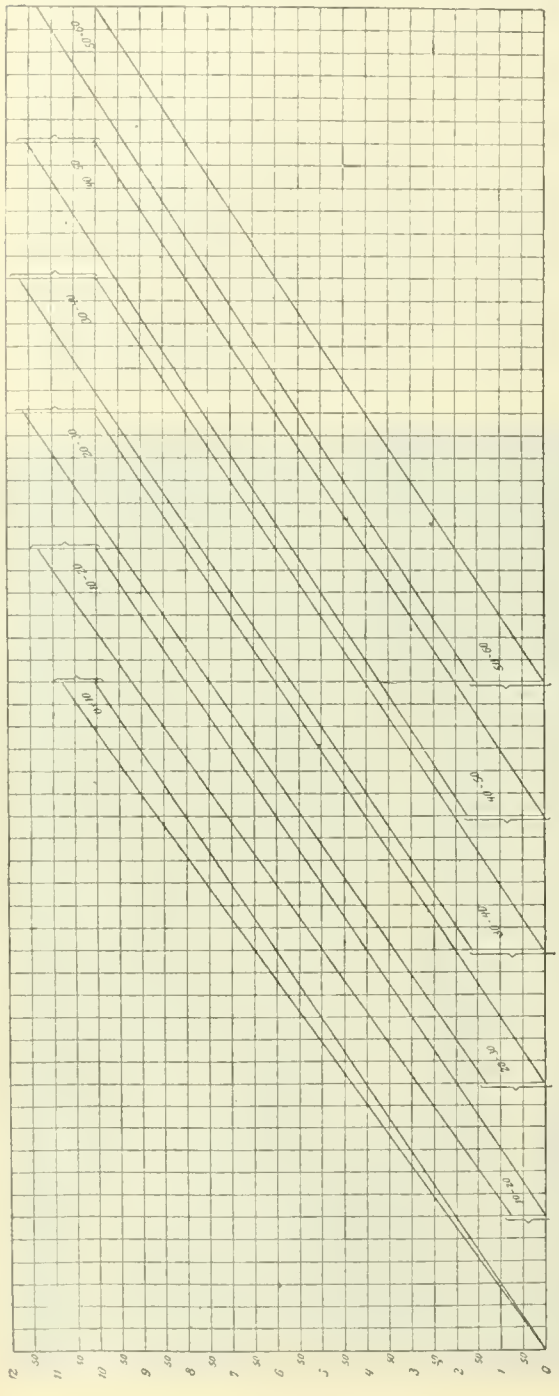
Apparatus.—The apparatus (see figure) comprises a carbon-dioxide generator, E; the decomposing-vessel, Z; the U-tube, U; the gas-measuring tube, G; the protective casing, S, with windows and doors of double glass, and provided with a hoisting arrangement for placing the decomposing-vessel in the oil-bath, B; a stirring device, R; and a cover, D.

The crude hydrochloric acid and the marble used for the generation of the carbon dioxide should be, as far as possible, free from air. The marble is prepared by placing pieces about the size of hazel nuts into a strong-walled bottle, withdrawing the air by means of a pump, and allowing to stand for about two days, during which period the pump is repeatedly worked. The bottle is eventually opened under boiled water. The carbon dioxide is freed from any accompanying hydrochloric acid by passing it through a small wash-bottle containing water; it need not be dried if wet nitrocellulose be used in the determination.

2·5 grms. of dry nitrocellulose (or a corresponding weight moistened with about 30 per cent. of water) are introduced into the decomposing-vessel, and pressed down, so that the material does not rise above the notch marked on the vessel. Layers of ignited asbestos are placed below and above the nitrocellulose.



In the left limb of the U-tube is placed a spiral of copper gauze (for the reduction of the oxides of nitrogen), which has been previously heated, and immersed, while hot, in methyl alcohol or acetone, in order to ensure absence of copper oxide. In the right limb of the U-tube is placed a layer of finely-granulated copper oxide between asbestos plugs. The rubber stoppers of the U-tube are prevented from coming in contact with the hot copper and copper oxide by means of asbestos, and are protected from decomposition by means of a cooling-jacket, through which a flow of cold water is maintained. The gas-measuring tube consists of the actual measuring tube accurately graduated in 0·1 c.c. divisions, and a continuation bent zig-zag form, in order to facilitate the absorption of the carbon dioxide by caustic soda solution. Before each determination the tube is cleaned with hydrochloric acid and water. The volume of gas in the measuring tube must be corrected, owing to the presence of minute globules of liquid. By means of the curve-diagram given, the true volume at the prevailing atmospheric pressure can be read off directly.



Method of Working.—It is advisable to first make a blank test, to determine the absence of air in the carbon dioxide. The apparatus is then examined as to air-tightness, and a fairly rapid current of carbon dioxide is passed through, to expel air which, except for unavoidable traces, is completely driven out in about a quarter of an hour, if moist nitrocellulose is being used, or in about two hours, if dry nitrocellulose is employed. The air which has collected in the measuring tube is driven out by filling the latter with clear caustic soda solution (sp. gr., 1·2), after stopping the current of gas. The carbon dioxide is then again passed through, and the flow is regulated so that it passes uniformly at the rate of about 25 c.c. per minute. The U-tube is now heated to redness, the decomposing-vessel brought into the oil-bath, which has been previously heated to 135° C., and which is maintained at that temperature during the whole of the determination, the stirring device is set in motion, and the time and height of the caustic soda solution in the measuring-tube are noted. The volume of gas in the measuring-tube is read off every quarter of an hour during a period of at least 4 hours. It is advisable to renew the caustic soda solution every quarter of an hour. If the copper spiral is not kept at a red heat, nitric oxide, as well as nitrogen, may pass over into the measuring-tube, but its presence can easily be detected by passing the gas first through a bottle containing a concentrated solution of ferrous chloride, or by testing it with zinc iodide-starch paper.

Interpretation of Results.—Tables are given showing the manner of setting out the results. In the case of unstable nitrocelluloses heated under the conditions described, the separation of nitrogen is much greater at first than at a later period. If the nitrocellulose be very unstable, explosions are produced. If the separation of nitrogen is uniform during the prolonged heating, then the nitrocellulose may be regarded as "normal."

If it be desired to determine the absolute amount of nitrogen separated from a nitrocellulose, the following conditions must be observed:—(1) accurate weighing of the nitrocellulose; (2) determination of the amount of air in the carbon dioxide, and deduction of this from the volume of gas obtained; (3) reduction of the volume of the gas to the volume at 0° C. and 760 mm. pressure.—A. S.

English Patent.

Explosives; Improvements in and relating to ——. A. T. Cocking and Kynoch, Ltd., Witton, Warwick. Eng. Pat. 22,966, Nov. 13, 1901.

It is proposed, in the manufacture of mining explosives in which wood-meal is used as a diluent and absorbent for nitroglycerin, to substitute for the wood-meal an absorbent and non-fermentable starch, so that the bulk of the explosive may be reduced about one-half. The following composition is given:—Nitroglycerin (26 per cent.), barium nitrate (33 per cent.), starch (40·5 per cent.), and calcium carbonate (0·5 per cent.).—G. W. McD.

United States Patent.

Solvents from Substances [Nitrocellulose]; Process for Separating ——. F. G. Du Pont, Wilmington, Delaware, U.S.A. U.S. Pat. 712,406, Oct. 28, 1902.

Difficulty is experienced in getting rid of the last traces of the alcohol-ether from nitrocellulose powders, as the outer surfaces of the grains, &c. have a hard skin or coating, so that the solvent from the interior can only escape very slowly. In order to prevent the formation of such a hard coating, while the interior is still saturated with the solvent, and to hasten the hardening and drying of the grains, the nitrocellulose powder, saturated

with ether-alcohol, is introduced into a vessel, one end of which is provided with an air inlet, whilst the other is connected to an exhaust and condenser, and an excess of alcohol is added. The ether diffuses through the alcohol, and is drawn off by the exhaust, assisted by a current of air. As alcohol, *per se*, is not a solvent of nitrocellulose, when the powder is removed from the alcohol-bath, surface drying will not cause the formation of a hard skin, and hence the alcohol still within the grains is free to evaporate.
—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Pyknometer. R. Leimbach. J. prakt. Chem., 1902, **66**, [21 and 22], 475—477.

The pyknometers illustrated below are designed to facilitate the operation of enclosing a definite, known volume of liquid when the temperature is adjusted. Fig. 1 is an

Fig. 1.

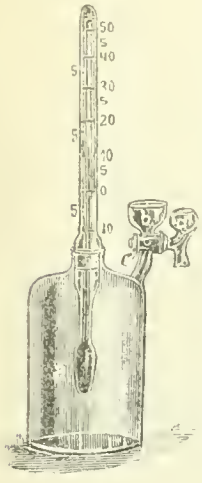


Fig 2.

ordinary pyknometer bottle with a thermometer ground into the neck. At the top corner of the bottle is a capillary side-tube with a three-way cock *c*, leading into an open funnel *b* and a hollow space *d*. The bottle is filled with the cock opening into the funnel *b*. When the liquid has been brought to the proper temperature, the cock *c* is given a half-turn, in order to bring the space *d* into communication with the interior of the bottle, to allow room for the subsequent expansion or contraction of the liquid. The funnel *b* is finally cleaned from adherent liquid by means of filter paper, or, if necessary, it is washed out by a solvent, and the weighing is then made. Fig. 2 represents a pyknometer on the same principle for small quantities of liquid. It consists of a U tube with two cocks, and has a capacity of 1—2 c.c. The tube is filled with both cocks open. Cock *a* is then closed and the funnel above it cleaned out. The temperature having been adjusted, cock *b* is closed, cock *a* being opened simultaneously to allow of expansion. After the funnel *b* has been cleaned out, the pyknometer is ready for weighing.—J. F. B.

United States Patent.

Furnace [*Muffle, for Assaying, &c.*]. C. S. Batchelder, Spokane, Washington, U.S.A. U.S. Pat. 712,636, Nov. 4, 1902.

The object of the patent is the production of a light muffle furnace for assaying. A metal case is lined with fire-brick, with asbestos packing between the case and the lining. A grate, with firing-door and ash-pit, is provided below; and one or two muffles are placed (one above the other) above the combustion chamber, the flue passing vertically from the roof. The space between the muffles, when two are used, is contracted. Asbestos shields may be arranged at the back and sides of the furnace, and a swinging door may be applied to afford a heat-screen for the muffle chamber. Air is allowed access to the muffle, and a sight-hole covered with a transparent material is provided.
—W. G. M.

INORGANIC—QUALITATIVE.

Chlorine, Bromine, and Iodine in Small Quantities and in Mixtures; Spectroscopic Detection of ——. J. P. Panaotovic. Buletinul societăţii de sciente, **11**, 390—430. Chem. Centr., 1902, **2**, [21], 1342.

The author gives the results of a comprehensive examination of the emission- and absorption-spectra of chlorine, bromine, and iodine. By means of the spark spectrum of the barium salt, according to the method of Lecoq de Boisbaudran (Comptes Rend., **91**, 902), $\frac{1}{25000}$ mgrm. of chlorine and $\frac{1}{8000}$ mgrm. of bromine can be detected. All three halogens present in a mixture can be distinguished by Mitscherlich's method. The silver salts are precipitated, dried, and treated with twice their weight of copper oxide. The finely-ground mixture is introduced into the bulb-shaped enlargement of a glass tube, and a current of hydrogen led through the latter. On igniting the hydrogen and slowly heating the mixture in the tube, the spectra appear in succession, first that of copper chloride, then that of copper bromide, and finally that of copper iodide. For traces of bromine and iodine in presence of much chlorine, the solution is treated with about 0·1 grm. of silver nitrate, the precipitate allowed to stand for a short time and then examined as above.—A. S.

INORGANIC—QUANTITATIVE.

Phenolphthalein as Indicator [*Free Alkali in Soap*]. O. Schmatolla. Ber., **35**, [18], 3905—3907.

In reply to observations of Hirsch on the use of phenolphthalein as an indicator, especially in determining the free alkali in soaps, the author points out that, while the theory of the action of phenolphthalein is not yet clearly established, it is known that the red compounds formed by it with alkali hydroxides and normal carbonates are more or less decolorised (those with normal carbonates more readily than those with hydroxides) by dehydrating agents. The compounds with hydroxides, however, are red in alcoholic solution, though less intensely so than in water; so that by adding a very small quantity of a solution of caustic alkali in absolute alcohol to phenolphthalein, also dissolved in absolute alcohol, a pale-red colour is struck, which is greatly deepened by addition of water. A 15 per cent. aqueous solution of caustic alkali exerts a sufficiently strong dehydrating action to destroy, slowly but completely, the red colour which is struck at first on adding to it phenolphthalein; and, in very dilute solutions, even very small amounts of neutral salts exert a similar influence, especially if the alkali be present as monocarbonate. Hirsch concludes from his experiments that the reddening of an alcoholic solution of soap is no proof of the existence of free alkali, but may arise from the hydrolysis or "alcoholysis" of the soap; but the author considers that this decomposition of the soap is easily avoided, and that the weakness of the indications consists rather in the absence of reddening where free alkali (especially if present as normal carbonate) is present, than in the opposite direction. The presence of 20 per cent. of alcohol is enough to prevent hydrolysis; more than this should not be used, for the reasons given above.—J. T. D.

Zinc; Volumetric Determination of ——. F. W. Küster and F. Abegg. Chem.-Zeit., 1902, **26**, [95], 1129.

The authors convert the zinc into chloride and evaporate the solution, towards the end, in a stream of HCl gas. This is done by placing the solution in an Erlenmeyer flask and immersing the flask up to the neck in an oil-bath kept at 110° C. A perforated crucible lid is placed on the neck of the flask, and towards the end of the evaporation hydrochloric acid gas is led into the flask by a bent glass tube. When the residue is dry, the flask is removed, the contents

dissolved in water, the chlorine determined, and the equivalent percentage of zinc calculated. Six test experiments gave the average error of 0·0005 grm. on 0·327 grm. of zinc. This method is, of course, only applicable to such ores as contain no other soluble chlorides but that of zinc.—E. C. S.

Zinc and Copper; Electrolytic Precipitation of ——. E. F. Smith. J. Amer. Chem. Soc., 1902, **24**, [11], 1073—1076.

Zinc.—The author has obtained good results by adding an alkali acetate to the solution of the zinc salt. A flat platinum spiral was used as the anode, whilst platinum dishes coated with silver inside formed the cathodes. The most advantageous conditions were the following:—Potassium zinc sulphate solution containing 0·2002 grm. of zinc; sodium acetate, 1 grm.; acetic acid (99 per cent.), 0·3 c.c.; total dilution, 150 c.c.; cathode surface, 100 sq. cm.; $N.D._{100}$, 0·36 to 0·70 ampère; voltage, four to five; temperature, 65° C.; and time, two hours.

After about one hour the solution appeared full of bubbles, and at this stage the liquid was neutralised with ammonium hydroxide, and the current continued for about 50 minutes. When all the metal had been precipitated, the liquid was siphoned off, and the deposit washed with water, alcohol, and ether. The results thus obtained agreed within 0·5 mgrm. with the theoretical amounts. The method also yielded excellent results in the determination of zinc in blende, the presence of iron having no disturbing influence.

Copper in Chalcopyrite.—All that is necessary is to decompose the mineral in the usual way, evaporate the liquid to dryness, without paying attention to the sulphur, to dissolve the residue in dilute sulphuric acid, and electrolyse the solution under conditions such as the following:—Total dilution, 150 c.c.; concentrated sulphuric acid, 10 c.c.; temperature, 60°—70° C.; $N.D._{100}$, 0·8 to 1·0 ampère; voltage, two to three; and time, one hour and a half.

The liquid siphoned off from the deposit of copper may then be nearly neutralised with ammonium hydroxide, and, after the introduction of ammonium oxalate, the iron precipitated by electrolysis at 40° to 65° C., with a current of $N.D._{100}$=0·5 to 1·0 ampère, and two to three volts. The author has also made experiments as to the freedom from iron of a copper deposit obtained by rendering the original solution of chalcopyrite ammoniacal, and neglecting the precipitated ferric hydroxide. The results showed that when platinum dishes were used as cathodes, the copper was invariably contaminated with iron, but that by using a platinum cylinder immersed in the ammoniacal solution, the deposit was free from iron.—C. A. M.

Bismuth; Iodometric Determination of ——, *as Chromate.* E. Rupp and G. Schaumann. Zeits. anorg. Chem., **32**, 362—365. Chem. Centr., 1902, **2**, [21], 1344.

The volumetric determination of bismuth by precipitation with potassium bichromate, treatment of the bismuth chromate with a known amount of ferrous-ammoninm sulphate, and titration of the excess of the iron salt with permanganate, is open to the objection that, owing to the unavoidable presence of free acid in the solution, or to the formation of free acid during the reaction, a portion of the bismuth chromate is redissolved. The author finds that this objection is overcome by using potassium chromate in place of bichromate. The reactions which take place are represented by the equations—

$$2\,Bi(NO_3)_3 + 2K_2CrO_4 + H_2O = (BiO)_2Cr_2O_7 + 4KNO_3 + 2HNO_3;$$

$$2K_2CrO_4 + 2HNO_3 = K_2Cr_2O_7 + 2KNO_3 + H_2O.$$

The bismuth solution, as free from acid as possible, is introduced with agitation into a known volume of 5 per cent. potassium chromate solution, the strength of which has been accurately determined by titration. The mixture is made up with water to a definite volume, vigorously agitated, and, after 10 minutes, filtered. After testing a portion of the filtrate with ammonia, to ensure the complete precipitation of the bismuth, the excess of chromate in 20—50 c.c. of the filtrate is determined iodometrically. 1 c.c. of N/10 thiosulphate solution = 0·00696 grm. of Bi. The process must be carried out at the ordinary temperature, as the bismuthyl bichromate, on boiling with water, is converted into the compound $2Bi_2O_3 2Cr_2O_3$, which contains a smaller proportion of chromium.

—A. S.

Tellurium; Gravimetric Determination of ——, *by means of Hypophosphorous Acid.* A. Gutbier. Zeits. anorg. Chem., **32**, 295—297. Chem. Centr., 1902, **2**, [21], 1341.

The sample is dissolved in water or hydrochloric acid, and to the warm, moderately concentrated solution an equal volume of a 50 per cent. aqueous solution of hypophosphorous acid is added. The beaker containing the mixture is covered with a watch-glass and heated till the solution, which at first is either brown or blue, becomes perfectly clear and colourless. The precipitated tellurium is collected in a Neubauer's platinum crucible, washed and dried at 105° C. The filtrate is concentrated, treated with a few drops of hypophosphorous acid, and any precipitate formed collected and dried in a similar manner.—A. S.

Tellurium; Quantitative Separation of ——, *from Antimony.* A. Gutbier. Zeits. anorg. Chem., **32**, 260—271. Chem. Centr., 1902, **2**, [21], 1294.

The author finds that tellurium can be precipitated free from antimony according to the principle of Rose's method—precipitation of the tellurium, by means of SO_2, from a hydrochloric acid solution containing tartaric acid—if the sulphur dioxide be replaced by hydrazine hydrate or hydrochloride (but not sulphate). Known weights of chemically pure tellurium and antimony were dissolved in hot dilute *aqua regia*, and the solution repeatedly evaporated with strong hydrochloric acid in a porcelain dish on the water-bath till the residue no longer contained nitric acid. The residue was dissolved in hot hydrochloric acid, treated with an excess of freshly prepared solution of tartaric acid, and the liquid treated in the manner previously described (see this Journal, 1901, 1145), with excess of warm hydrazine hydrate solution. The tellurium precipitate was washed in a Neubauer's platinum crucible with a little dilute hydrochloric acid, and then with lukewarm water, and dried at 105° C. The filtrate was tested for tellurium with hydrazine hydrate solution, and any precipitate formed recovered in the same way. The solution was then boiled with strong hydrochloric acid, treated with hot water, and saturated whilst hot with sulphuretted hydrogen. The precipitate, consisting of a mixture of Sb_2S_5, Sb_2S_3 and S, was converted into Sb_2S_3 and collected and weighed in a Jannasch filtering tube. In test experiments, the differences between the amounts used and those found were, with tellurium, +0·0017 to −0·0004; with antimony, +0·0006 to −0·0006.—A. S.

Cyanide Solutions; Methods for Determining Gold in ——. T. L. Carter. Eng. and Mining J., 1902, **74**, [20], 647.

The author describes briefly the various methods for determining gold in cyanide solutions:—(1) From 700 to 1,000 c.c. of the solution are sprinkled with a small quantity of litharge, evaporated to dryness, and the residue fused with a mixture of sodium carbonate, borax and argol. A small piece of silver is hammered into the lead button, and the latter cupelled, the resulting bead being parted in the usual manner. This is the method generally used on the Witwatersrand, South Africa.

(2) 500 c.c. of the solution are acidified with nitric acid, boiled for 15 minutes, 0·5 grm. of silver dissolved in nitric acid added, the liquid filtered, the filter-paper and precipitate fused with litharge and a flux, and the lead button cupelled.

(3) 1,000 or 500 c.c. of the solution are treated with excess of copper sulphate, then acidified, filtered, the precipitate fused with litharge and the lead button cupelled.

(4) For the determination of both gold and silver, the latter is precipitated in 1,000 or 500 c.c. of the solution by sodium sulphide. The precipitate is dried, wrapped in sheet lead with a little granulated lead and cupelled. The filtrate is treated with zinc chloride, the precipitated gold filtered off, dried, mixed with granular lead and cupelled.

(5) 8 or 10 oz. of the cyanide solution are treated with mercuric chloride solution (100 grains to 1 oz.), till no further precipitate is produced, the solution is filtered, the precipitate washed, dried, fused with litharge and a flux, the lead button cupelled, and the bead parted.

(6) 8 or 10 oz. of the cyanide solution are treated with 20 drops of potassium bichromate solution and a strong solution of silver nitrate run in till a red colour appears; 100 grms. of zinc dust are then well stirred in, sufficient sulphuric acid added to dissolve the zinc, and, when evolution of hydrogen has ceased, the liquid is filtered, the precipitate washed, dried, wrapped in lead foil and fused; the lead button is cupelled and the bead parted.—A. S.

Copper Bullion; Determination of Gold and Silver in ——. T. B. Swift. Eng. and Mining J., 1902, **74**, [20], 650.

The author describes a modification of the combination method for the determination of gold and silver in copper bullion. It is stated to give results which are higher than those obtained by the usual combination process, and agree well with those obtained by the "all-fire method." The essential point in the method is the preliminary amalgamation of the copper to be assayed. This is effected by shaking 1 assay-ton of the copper with 25 c.c. of water and 5 c.c. of a solution made by dissolving 50 grms. of mercury in nitric acid, and diluting to 1 litre. The copper is then treated with 200 c.c. of dilute nitric acid (475 c.c. of nitric acid per litre), and when the violence of the action begins to diminish, the beaker containing the solution is placed on a warm plate. When action has ceased, the solution is heated to boiling and diluted with 150 c.c. of hot water. Any undissolved copper or mercury may be disregarded, as their presence will not affect the results. The solution acquires a turbid appearance, owing to the formation of mercuric sulphide, which, by the action of the hot nitric acid, is converted into the insoluble double sulphide and nitrate of mercury. By this reaction the formation of flakes of separated sulphur, as in the ordinary combination method, is entirely prevented, whilst the mercury precipitate acts as a perfect collector of the gold, possessing all the advantages and none of the disadvantages of the lead sulphate formerly used for this purpose. The precipitate is filtered off, the first portion of the filtrate being passed through the filter a second time. The filter is washed and the beaker is wiped out with a small piece of filter-paper, which, with the paper in the funnel, is dusted with finely-divided test lead and placed in a 2½-in. scorifier, the bottom of which is covered with test lead. From the filtrate the silver is precipitated as chloride, but since silver chloride is soluble in mercuric nitrate solution, a large excess of sodium chloride is needed, *viz.*, sufficient to convert the mercuric nitrate into chloride, in addition to precipitating the silver as chloride. The solution is filtered cold, the paper and precipitate washed, sprinkled with test lead, and transferred to the scorifier containing the gold. The papers are burned, the ash covered with test lead and scorified, and cupelled with the usual precautions. In scorifying it is best to start by heating gently without the addition of borax, the assays being gradually melted, but prevented from scorifying until all indications of "spitting" have passed; the borax is then added and the temperature raised until scorification commences.—A. S.

Antimony Sulphide; Analysis of Golden ——. C. O. Weber. Gummi-Zeit., 1902, **17**, [9], 181—182.

Commercial antimony sulphide, when free from intentional adulterations, consists of antimony pentasulphide and trisulphide, antimonic oxide, free sulphur and calcium sulphate. As regards employment in the rubber industry, the separate estimation of the antimony pentasulphide and trisulphide, is not called for. For estimating the free sulphur, acetone is a better solvent than carbon bisulphide. The exhausted substance is then boiled with a saturated solution of sodium acetate, to dissolve out the calcium sulphate. The residue is digested with a 7·5 per cent. solution of tartaric acid; antimonic oxide is estimated in the solution; the undissolved sulphides are weighed on a tared filter, and then dissolved in ammonium sulphide for confirmation of their purity.—M. J. S.

Sulphurous Acid in Wine; Detection and Rapid Determination of ——. L. Mathieu. Ann. Chim. anal. appl., **7**, 364—367. Chem. Centr., 1902, **2**, [21], 1347.

The author gives the following methods for use in works:—10 c.c. of the wine are placed in the distilling flask of Salleron's apparatus with about 1 grm. of marble and 1 c.c. of hydrochloric acid, and 2—3 c.c. are distilled over into an iodine solution, which is subsequently tested with barium chloride. By taking a measured quantity of N/50 iodine solution and noting whether decolorisation is effected, the presence of SO_2 above a certain limit can be ascertained. For the same purpose a white wine may be treated directly with a measured quantity of iodine solution, starch being subsequently added. In the case of coloured wines, in order to ascertain, for example, whether the amount of SO_2 present in 10 c.c. exceeds 30 mgrms., the sample is treated with 2·3 c.c. of N/50 iodine solution, some hydrochloric acid, and 2 c.c. of a 10 per cent. solution of barium chloride The mixture is boiled and filtered. If the filtrate, on addition of iodine solution, gives a precipitate of barium sulphate, the sample contains more than 30 mgrms. of SO_2. —A. S.

ORGANIC—QUALITATIVE.

Organo-Magnesium Compounds as Reagents for the Hydroxyl Group. L. Tschugaeff. Ber., 1902, **35**, [18], 3912—3914.

The magnesium alkyl iodides react with water according to the equation, $RMgI + HOH = RH + MgIOH$. Similar reactions occur with all other compounds containing an hydroxyl group, *e.g.*, acids, alcohols, phenols, and oximes. In the case of magnesium methyl iodide the equation is $CH_3MgI + ROH = CH_4 + ROMgI$. Substances free from hydroxyl are unaffected. This reaction may be made to serve first for the detection of hydroxylated compounds, and, secondly, for the separation of these from admixture with indifferent substances, such as hydrocarbons and ethers.

When an hydroxylated compound, entirely free from moisture, is treated with a slight excess of magnesium methyl iodide in ethereal solution, an immediate evolution of methane takes place; this gas may be collected by performing the reaction in a nitrometer tube. A method for the quantitative estimation of hydroxyl groups is being worked out. For the separation of hydroxylated compounds from indifferent substances, the ether is distilled off from the products of reaction; the indifferent substance is then separated by distilling the product *in vacuo*, and the hydroxylated body is regenerated by treating the residue with water. In many cases the compounds RO.Mg.I are insoluble in ether, and may be separated from the solution in the crystalline form.—J. F. B.

p-Toluidine; A Colour Reaction for ——. J. Biehringer and A. Busch. Chem.-Zeit., 1902, **26**, [95], 1128.

The authors find that *p*-toluidine can be detected in presence of aniline and *o*-toluidine, *e.g.*, in the "red oil" used in the manufacture of Magenta, by the following test. A few drops of ferric chloride solution are added to a solution of the base in dilute HCl, and the mixture is boiled. Aniline and *o*-toluidine give a greenish-blue precipitate, whilst *p*-toluidine gives a Bordeaux red colour. On filtering, if *p*-toluidine be present, there results, therefore, a red filtrate. The test will show 1 grm. of *p*-toluidine in 3 litres of water.—E. C. S.

Turmeric; New Method of Detecting ——. A. E. Bell. Pharm. J., 1902, **69**, [1692], 549.

The author finds that turmeric can be readily detected by means of the intense purple coloration which it gives

with the diphenylamine reagent, prepared by dissolving 1 grm. of diphenylamine in 20 c.c. of 90 per cent. alcohol, and adding 25 c.c. of sulphuric acid. It is stated that 1 part of turmeric in 200 parts of rhubarb, or in 1,000 parts of mustard, can readily be detected by this reaction. In applying the test, one drop of the reagent is placed on a microscopic slide, and a small quantity of the powder under examination is spread evenly over the surface of a cover glass and carefully dropped into the reagent on the slide. On examination under the microscope, if turmeric be present, spots of a purple colour will be observed. It is claimed that the diphenylamine test is much more delicate, more conveniently applied, and requires less time to perform than the boric acid test for turmeric.—A. S.

ORGANIC—QUANTITATIVE.

India-Rubber; Determination of Sulphur in ——. C. O. Weber. Gummi-Zeit., 1902, **17**, [9], 179—180.

Carius' method is more exact than that of Henriques (this Journal, 1893, 467). The latter invariably gives low results, as the escaping oxides of nitrogen carry off drops of the liquid; and when mineral matters capable of forming nitrates are present, deflagration, amounting sometimes to explosion, is scarcely to be avoided during the fusion with sodium carbonate and nitrate. The latter difficulty may, indeed, be obviated by employing the modification of Frank and Markwald, but the process then becomes more complicated and tedious than that of Carius. To carry out the latter, the rubber and nitric acid are placed in a sealed tube of Jena glass of 2·5 cm. internal diameter. The glass tube is placed in an inclined position in a wrought-iron one. After about an hour the capillary is opened, to allow gas to escape, then resealed, and the tube heated in the usual way. Explosions are in this way completely avoided.—M. J. S.

Tannin; New Method for the Determination of ——. E. Crouzel. Ann. Chim. anal. appl., **7**, 373—374 Chem. Centr., 1902, **2**, [21], 1347.

Tannin in aqueous solution forms a precipitate with antipyrin. In making a determination, the tannin is precipitated with excess of antipyrin, about twice its weight of sodium bicarbonate added, the precipitate collected on a weighed filter, washed with hot water, and dried at 100° C.; it contains 50 per cent. of tannin. In determining the tannin in wine, the alcohol must first be driven off. Dilute mineral acids and "vegetable acids," and the organic substances commonly associated with tannin, have no influence on the precipitation. Gallic acid does not give a precipitate with antipyrin.—A. S.

Reducing Sugar in Syrups; Determination of ——. H. Tervooren. Mededeelingen van het proefstation voor suikerriet in West Java "Kagok" to Pekalongan, No. 57. Chem. Centr., 1902, **2**, [21], 1346.

The author recommends boiling the syrup with excess of Fehling's solution, oxidising the precipitated cuprous oxide to cupric oxide, and reducing the latter to metallic copper by heating in a current of hydrogen. He gives a table from which the percentage of reducing sugar can be directly read off, if the polarisation of the syrup and the amount of copper yielded by 0·6 grm. of the syrup and 50 c.c. of Fehling's solution be determined.—A. S.

Wine; Determination of Glycerin in ——. A. Trillat. Comptes Rend., 1902, **135**, [21], 903—905.

Ethyl acetate, when completely dehydrated and freed from alcohol, dissolves glycerin to the extent of about 9 per cent. without dissolving any of the other constituents of the dry extract of wine. 50 c.c. of wine are measured into a silver capsule and evaporated on the water-bath at a temperature of about 70° C., until two-thirds of the liquid have been removed. 5 grms. of powdered animal charcoal are then placed in the capsule, well mixed up, and the evaporation is continued to dryness. The residue is cooled and pounded in a mortar with 5 grms. of quick lime. The product, a fine, grey powder, is placed in a flask and vigorously shaken for some minutes with 30 c.c. of dry, purified ethyl acetate. The liquid is filtered by decantation, the first portions of the filtrate, which contain traces of lime, being returned; the same treatment is then repeated. The clear filtrate containing the whole of the glycerin is then evaporated in small quantities at a time in a tared capsule, at first on a water-bath and subsequently in the drying oven, at a temperature of 60° C., until the weight is constant. It is necessary to work in the entire absence of moisture.

—J. F. B.

Gluten in Flour; Determination of Moist ——. M. Arpin. Ann. Chim. anal. appl., **7**, 376—381. Chem. Centr., 1902, **2**, [21], 1347. (See this Journal, 1902, 1417.)

Balland has previously stated that the yield of moist gluten increases the longer the cake of flour is allowed to lie before kneading. The author found that if the cake were allowed to lie for four hours, the yield of moist gluten was increased by 1·66 per cent., whilst that of dry gluten remained unaltered. The increase is thus only an apparent one, due to increased absorption of water. The yield of moist gluten also increases with the hardness of the water used. In the author's experiments this increase amounted to 4·7 per cent. of the amount of dry gluten.—A. S.

Nitrocellulose; Examination of ——, *with regard to Separation of Nitrogen.* W. Will.

See under XXII., *page* 1555.

Strychnine and Brucine in Nux Vomica; Determination of ——. E. Dowzard. Proc. Chem. Soc., **18**, [256], 220.

In order to determine the strychnine, the pure mixed alkaloids are dissolved in 50 c.c. of 2 per cent. sulphuric acid, 5 c.c. of nitric acid are added, and the mixture allowed to stand for 15 minutes, the solution is transferred to a separator containing 15 c.c. of ammonia (sp. gr. 0·890) and 10 c.c. of chloroform, the mixture is shaken for 5 minutes, the solvent separated, and the alkaline liquid again shaken with 10 c.c. of chloroform. The mixed chloroform washings are now shaken with 15 c.c. of dilute ammonia (1 c.c. of above-mentioned strength, diluted to 45 c.c.), this is repeated twice, the chloroform evaporated off, and the residue dried at 100° until constant.

To determine the brucine, a standard brucine solution is required, which is made by dissolving 0·16 grm. of anhydrous brucine and 0·16 grm. of strychnine in 2 per cent. sulphuric acid and the solution made up to 100 c.c. Then 0·10 grm. of the pure mixed alkaloids is dissolved in 50 c.c. of 2 per cent. sulphuric acid, this solution and 50 c.c. of the standard are placed in two small beakers, 5 c.c. of nitric acid (sp. gr. 1·42) are added simultaneously to the contents of each beaker; the solutions are then transferred to the comparison troughs of a Gallenkamp colorimeter. Five minutes after adding the nitric acid, six readings are taken; from the average of these, the brucine is calculated.

Results were given proving the accuracy of determinations made by both these methods.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Mixtures of Constant Boiling Point. S. Young. Proc. Chem. Soc., **18**, [256], 215.

It was noticed by Thorpe (Trans. Chem. Soc., 1879, **35**, 544) that when a mixture of equal volumes of carbon tetrachloride and methyl alcohol is distilled, a mixture of minimum b. pt., 55·6°—55·9°, comes over first. The vapour density of this distillate was found to be 41·82, and the composition was therefore—carbon tetrachloride, 78·1; methyl alcohol, 21·9 per cent.

The results are given in the subjoined table.

At Thorpe's suggestion, the author has determined the composition of the mixture of minimum b. pt. by the distillation method, and also from the sp. gr. of the mixture after redistillation.

The separation of the mixture of minimum b. pt. from methyl alcohol is very much more difficult than from carbon tetrachloride, and it is in all probability for this reason that the percentage of alcohol in Thorpe's distillate was too high, whilst that calculated from the results of the distillation of a mixture containing excess of alcohol was too low. The most accurate value is probably that

deduced from the sp. gr. of the redistilled mixture of constant b. pt.

Distillation Method.

	From Excess of CH_3OH.	From Excess of CCl_4.	From Specific Gravity.
CCl_4	79·99	79·35	79·44
CH_3OH	20·01	20·65	20·56
	100·00	100·00	100·00

Determinations by Thayer (J. Phys. Chem., 1898, **2**, 382), Ryland (Amer. Chem. J., 1899, **22**, 384), and Carveth (J. Phys. Chem., 1902, **6**, 248) of the b. pt. and composition of mixtures of benzene with ethyl and methyl alcohol were compared with those of Miss Fortey and the author (this Journal, 1902, 721).

Double Salts [*Mercuric Haloid*]; *A Class of* ——. D. Strömholm. J. prakt. Chem., 1902, **66**, [21—22], 423—474.

The author has prepared, described and classified a very large number of double salts, chiefly those of mercuric chloride with the chlorides of organic sulphine and ammonium bases. The limiting types have been determined, and the "tension" of the double salts, *i.e.*, the amount of mercuric chloride dissolved from them by a solvent of the former, but not of the double salt.—J. F. B.

Ammoniacal Cuprous Oxide; Oxidation of ——. J. Meyer. Ber., **35**, [18], 3952—3957.

Schützenberger and Riesler stated that ammoniacal cuprous oxide absorbed, when shaken with water containing air, twice the amount of oxygen needed to convert it into cupric oxide, and accounted for this by assuming the formation of hydrogen peroxide or some similar body. The author has prepared an ammoniacal cuprous solution by adding ammoniacal cupric sulphate to a boiling solution of sodium sulphite without access of air, when the reduction occurs rapidly and quantitatively. This solution is converted quantitatively by hydrogen peroxide into the cupric condition, so that the two substances cannot coexist. Moreover, when shaken up with a known volume in excess of moist air, it absorbs exactly the amount needed to convert it into the cupric condition. The author considers that, Schützenberger's results are due to the fact that he prepared his cuprous salt by reducing a cupric salt with sodium thiosulphate; he thus produced cuprous salt and sulphite, and the absorption of the excess oxygen was effected by the sulphite so produced. Direct experiments show that the oxidation of sulphites by moist air is greatly accelerated by the presence of cupric salts. Arsenites are not similarly oxidised. Possibly the process of oxidation may consist in the formation of a cupric peroxide, which at once oxidises more cuprous oxide ($2Cu_2O + O_2 = Cu_2O_3 + Cu_2O = 4CuO$), or may oxidise sulphur dioxide if that be present ($Cu_2O + O_2 + SO_2 = Cu_2O_3 + SO_2 = 2CuO + SO_3$).

—J. T. D.

Zirconia; The Reduction of ——. E. Wedekind. Ber., **35**, [18], 3929—3932.

A preliminary notice of attempts to effect the reduction of zirconia by fusing it in an electrical furnace along with boron and silicon. When zirconia was fused with a slight excess of boron, using a current of 650—800 ampères and 120 volts, a greyish-black fused mass of metallic lustre was produced. It contained zirconium, boron, and carbon; but whether it is composed of a boride containing carbon, or a zirconium borocarbide, has not been determined. The reduction of zirconia by fusion with silicon proceeds more readily, and results in the formation of a well-characterised zirconium silicide.—H. B.

Peroxides; Function of ——, *in the Chemistry of Living Cells. III. Oxidising Ferments as Peroxide Producers.* R. Chodat and A. Bach. Ber., 1902, **35**, [18], 3943—3946.

The authors have prepared from the juices of certain fungi (*Russula foetens and Lactarius vellereus*) a ferment possessing the properties of the oxydases in a very marked degree. The preparations were made by precipitating the expressed juices by alcohol, and drying the product at a moderate temperature. This oxydase is of a very resistant nature; it survives putrefaction and alcoholic fermentation of the juices containing it, but it is destroyed by prolonged boiling with water, and by "poisoning" with hydrofluoric acid or mercuric chloride. In testing for oxydases of this class, the authors find that the liberation of iodine from potassium iodide is practically equivalent to the blueing of guaiacum tincture, though far less sensitive. Solutions of this ferment blue guaiacum immediately, but the potassium iodide and starch reaction requires a few minutes before it becomes visible. This latter fact is proved to be due to the presence in the ferment preparations of some reducing bodies with a great affinity for free iodine. In spite of the considerable activity of these oxydase preparations, it was evident that their power was not nearly so great as that of the juice of the living organism; a drop of the latter was sufficiently powerful to oxidise indigo, whereas the prepared ferment was not. A class of vegetable ferments is known under the name of "peroxydases" which exhibit the usual oxydase reactions only in presence of peroxides, and which enable hydrogen peroxide to liberate iodine from potassium iodide. Such a peroxydase has been obtained from pumpkins; solutions of this peroxydase, when added to those of the fungus oxydase, intensify the activity of the latter in the same way as they do that of hydrogen peroxide.—J. F. B.

New Books

Fosfati, Perfosfati e Concimi Fosfatici, Fabbricazione ed Analisi. Per il Dr. Arnaldo Minozzi già Redattore della Rivista La Chimica Industriale di Torino, &c. Ulrico Hoepli, Milan, Italy. 1903. Price L. 3.50.

Small volume, pocket-book size, containing 300 pages of subject-matter, illustrated with 48 engravings. There is a table of contents at the beginning, and from page 261 to 300 is a series of the usual tables for such pocket-books. The text is subdivided and classified as follows:—I. General; Geological and Mineralogical Relations; Natural Phosphates of Commerce; Calcined Phosphates, &c. II. Manufacture of Superphosphates. III. Manufacture of Phosphoric Acid and its Derivatives. IV. Manufacture of Basic Phosphates. V. Manufacture of Phosphates and Superphosphates from Bones. VI. Chemical Analysis: (i.) Phosphoric Acid and its Principal Salts. (ii.) Determination of Phosphoric Acid. (iii.) Determination of Nitrogen, Ammoniacal, Nitric, and Organic. (iv.) Analysis of Raw Materials. (v.) Analysis of Manufactured Products (Superphosphates, Thomas Slags, &c.). (vi.) International Methods.

L'Alcool Industriale. Produzione dell' Alcole Industriale, Dal Punto di Vista dell' Agricoltura Italiana, Applicazione dell'Alcole. Denaturato alla Fabbricazione dell' Aceto; delle Vernici, &c. Alla produzione della Forza Motrice, Al Riscaldamento ed Alla Illuminazione. Del Dr. Gino Ciapetti, Premiato del Ministero di Agricoltura Industria e Commercio, già direttore della Distilleria Agricola Cooperat. Casent., &c. Ulrico Hoepli, Milan, Italy. 1903. Price L. 3.50.

This is a pocket-book on Commercial Spirit (Alcohol), similar in size to the preceding work. It contains 262 pages of subject-matter, with 105 illustrations. The matter is classified as follows:—I Manufacture of Commercial Spirit. Distillation. Alcohol and its Valuation. Distilling in Italy. Preparation of Spirit from Various Substances, &c. II. Applications of Spirit. Denatured Spirit. Vinegar from Alcohol. Alcohol for Motors and for Fuel Purposes. Spirit for Illumination. Spirit for Heating Purposes.

JENA GLASS AND ITS SCIENTIFIC AND INDUSTRIAL APPLICATIONS. By Dr. H. HOVESTADT. Translated and Edited by J. D. EVERETT, M.A., F.R.S., and ALICE EVERETT, M.A. Macmillan and Co., Ltd., London. 1902. The Macmillan Company, New York. Price 15*s.*

8vo volume, containing author's and translators' prefaces, table of contents, 385 pages of subject-matter, an appendix of 27 pages, and the alphabetical index. The following are the leading subjects discussed in the volume:—I. Introduction. II. Optical Properties of Glass. III. Perfecting of Optical Systems by the New Glasses. The Microscope. IV. Photographic Objectives. V. Achromatic Diverging Lenses, &c. VI. Telescopes. VII. Mechanical Properties of Glass. VIII. Thermal Properties of Glass. IX. Afterworking and Thermometry. X. Chemical Behaviour of Glass Surfaces. XI. Electric and Magneto-optic Properties of Glass. Appendix: Revised List of Jena Optical Glasses.

HANDBUCH DER ANORGANISCHE CHEMIE. Herausgegeben von Dr. O. DAMMER. IV. Band. Die Fortschritte der anorganischen Chemie in den Jahren 1892—1902. Bearbeitet von Privatdocenten Drs. BAUR, RICHARD MEYER, MUTHMANN, NASS, NERNST, ROTHMUND, STRITAR, und ZEISEL. Ferd. Enke's Verlag, Stuttgart. 1902. Price M. 4 per Lieferung für Lieferungen 4 und 5; M. 6 für Lieferung 6.

THE issue of this work is continued (see this Journal, 1902, 1105, col. 1), the further parts of Vol. IV., *viz.*, Parts 4, 5, and 6, appearing. In Part 4 the description of the Hydroxylamine Salts is continued and ended on page 481, that of the Alkaline Earth Metals and their Salts then commencing. Next follow Zinc, Lead, Thallium, Copper, Silver, and Mercury, Part 4 terminating on page 640. Part 5 commences on page 641, with the continuation of the Amalgams of Barium and Mercury, and this part ends on page 800 with Alloys of Iron, that of Iron and Boron being continued into Part 6. The subject of Iron and its Alloys is completed on page 803 of Part 6, and then follow 994 pages of subject-matter, treating of the following metals, with their alloys and salts:—Cobalt, Nickel, Chromium, Molybdenum, Tungsten, Uranium, Vanadium, Tantalum, Niobium, Gold, Platinum, Ruthenium, Rhodium, Palladium, Iridium, and Osmium. After this follows the alphabetical index of the complete Volume IV. At the commencement of this Part 6, appears the table of contents referring to the whole volume.

Trade Report.

I.—GENERAL.

BOARD OF TRADE NOTICE.

Dec. 4, 1902.

The Board of Trade have been considering the means at present available of obtaining systematic information on trade matters from certain of the self-governing colonies, and the desirability of improving these means, with a view to assist British traders to compete successfully with foreign traders in colonial markets. They have also received representations from their Committee on Commercial Intelligence bearing on the same subject. The Board of Trade have now appointed Mr Henry Birchenough to visit South Africa on their behalf, both for the purpose of reporting as to the present openings for British trade, and of arranging, so far as possible, for the regular supply of commercial information in future.

DUTY-FREE ALCOHOL FOR RESEARCH.

The following letter has been addressed to the Editor of the *Times* by Sir H. E. Roscoe, F.R.S., and Prof. Harold B. Dixon, F.R.S., as Chairman and Secretary, respectively, of the British Association Committee appointed last year to obtain from the British Government duty-free alcohol for research:—

Sir,—It has long been felt by scientific workers in this country that a serious drawback to the prosecution of research lies in the fact that the full and very heavy duty has to be paid on pure alcohol, as distinguished from methylated spirit, largely used in scientific laboratories where higher teaching and research are carried on. And this appeared to be a hardship; in the first place, because the alcohol thus used is either destroyed or rendered useless for potable purposes, and, in the second place, because no such duty is paid in Germany, France, or the United States, and thus the British is heavily handicapped as against the foreign worker.

At the meeting of the British Association held last year in Glasgow, a committee was appointed with instructions to approach the Board of Inland Revenue with the object of endeavouring to secure the removal of this grievance—a grievance which was recognised by the Government in the Budget Bill of this year.

We are now glad to report that the Board has met our suggestions in the fairest possible manner, with an obvious desire to extend facilities for scientific research in the direction indicated, as a perusal of the regulations which we enclose will show.

The Secretary to the Board of Inland Revenue informs us that pure "methyl alcohol," also much used in chemical research, may be obtained under the same regulations, and should smaller quantities of methyl alchol be required than the *minimum* permitted in the case of ethyl alcohol, the Board will consider special applications to that effect.

We are, Sir, your obedient Servants,
H. E. ROSCOE, Chairman.
H. B. DIXON, Secretary to the Committee.

Regulations for the use of Duty-Free Spirit at Universities, Colleges, &c.

1. An application must be made by the governing body or their representatives, stating the situation of the particular university, college, or public institution for research or teaching, the number of the laboratories therein, the purpose or purposes to which the spirits are to be applied, the bulk quantity likely to be required in the course of a year, and, if it amounts to 50 gallons or upwards, the name or names of one or more sureties, or a guarantee society to join in a bond that the spirits will be used solely for the purpose requested and at the place specified.

2. The spirits received at any one institution must only be used in the laboratories of that institution, and must not be distributed for use in the laboratories of any other institution, or used for any other purpose than those authorised.

3. Only plain British spirits or unsweetened foreign spirits of not less strength than 50° over proof (*i.e.*, containing not less than 80 per cent. by weight of absolute alcohol) may be received duty free, and the differential duty must be paid on the foreign spirits.

4. The spirits must be received under bond either from a distillery or from an excise or customs general warehouse and (except with special permission) in quantities of not less than nine bulk gallons at a time. They will be obtainable only on presentation of a requisition signed by the proper supervisor.

5. On the arrival of the spirits at the institution, the proper revenue officer should be informed, and the vessels, casks, or packages containing them are not to be opened until he has taken an account of the spirits.

6. The stock of spirits in each institution must be kept under lock in a special compartment under the control of a professor or some responsible officer of the university, college, or institution.

7. The spirits received by the responsible officer of the institution may be distributed by him undiluted to any of the laboratories on the same premises.

8. No distribution of spirits may be made from the Receiving Laboratory to other laboratories which are not within the same premises.

9. A stock book must be provided and kept at the Receiving Laboratory in which is to be entered on the debit side an account of the bulk and proof gallons of spirits received with the date of receipt, and on the credit side an account of the bulk and proof gallons distributed to the other laboratories. A stock book must also be kept at each other laboratory in which must be entered on the day of receipt an account of the bulk and proof gallons of spirits received from the Receiving Laboratory.

These books must be open at all times to the inspection of the Revenue officer, and he will be at liberty to make any extract from them which he may consider necessary.

10. The quantity of spirits in stock at any one time must not exceed half the estimated quantity required in a year where that quantity amounts to 20 gals. or upwards.

11. Any contravention of the regulations may involve the withdrawal of the Board's authority to use duty-free spirits.

12. It must be understood that the Board of Inland Revenue reserve to themselves full discretion to withhold permission for the use of duty-free spirit in any case in which the circumstances may not seem to them to be such as to warrant the grant of it. They have already decided that the use of duty-free spirits for the preservation of natural history or other specimens cannot be allowed.

J. B. Meers, Secretary.

Inland Revenue, Somerset House, W.C.,
17th November, 1902.

Note.—"Proof Spirit" is defined by law to be such spirit as at the temperature of 51° F. shall weigh $\frac{12}{13}$ths of an equal measure of distilled water.

Taking water at 51° F. as unity, the specific gravity of "proof spirit" at 51° F. is 0·92308. When such spirit is raised to the more usual temperature of 60° F., its specific gravity compared with water at 60° F. is 0·91984.

To calculate the quantity of spirits at proof in a given quantity of spirit over or under proof strength:—Multiply the quantity of spirit by the number of degrees of strength of the spirit, and divide the product by 100. The number of degrees of strength of any spirit is 100 *plus* the number of degrees overproof, or minus the number of degrees overproof.

Example:—19·8 galls. of spirit at 64·5 overproof
100 + 64·5 = 164·5 proof strength.
164·5 × 19·8 ÷ 100 = 32·571
taken as 32·5 galls. at proof.

IV.—COLOURING MATTERS AND DYESTUFFS.

Aniline Dyestuffs Exported from Germany.

Frankf. Zeit., Oct. 20, 1902; *through U.S. Cons. Reps., Nov.* 28.

In an article published in the third quarterly volume of the statistics of the German Empire, it is stated that Germany hesitated to take up at first the dyestuff industry, which dates from 1856. The conditions for the manufacture of artificial dyestuffs seemed to be much more favourable abroad than in Germany. In England, the necessary materials—as fuel and the products of the acid and alkali industries—were much cheaper, and tar and its products were also lacking in Germany, because the gas industry was not so highly developed as in England and France. At present, Germany entirely supplies the coal-tar for the home colour industry. The importation of coal-tar colours increased from 1892 to 1900, but decreased in 1901. On the other hand, the exportation of aniline dyestuffs has steadily increased in the last decade, as shown by the accompanying table, which also gives the exports to the two most important importing countries—Great Britain and the United States.

The exports have not increased so much in value as in quantity, a result of lower prices for the goods.

The export to the United States has doubled in round numbers, that to Great Britain increased in a much larger measure. China, which, in 1892, occupied third place, has since been overtaken by Austria-Hungary, which took, in 1901, 2,491 tons, whilst China took 1,856 tons. Italy imported 1,673 tons, and India, 1,430 tons. Whilst France is a regular customer for German coal-tar dyestuffs, the export thither is fluctuating, and the same is true of Russia. The export to Belgium has increased two and a half times. To Switzerland also, which has a coal-tar dyestuff industry of its own at Basle, large quantities are shipped.

Year.	Total Exports.	Exports to Great Britain.	Exports to the United States.
	Metric tons.*	Metric tons.*	Metric tons.*
1892	10,725	2,082	2,526
1894	12,368	2,497	2,326
1896	16,233	3,603	2,684
1898	19,712	4,007	4,231
1900	23,781	5,076	5,152
1901	25,030	5,809	5,128

* 1 metric ton = 2,204·6 pounds.

VII.—ACIDS, ALKALIS, Etc.

Liquid Carbon Dioxide in France.

Chem. and Druggist, Dec. 13, 1902.

A Bill has recently been laid before the French Parliament, and is at present being examined by the Customs Committee, proposing a specific duty of 25 frs. tariff, maximum, and 20 frs. tariff, minimum, upon liquid carbonic acid, in place of the present duty of 5 per cent. *ad val.* The use of liquid carbonic acid in the manufacture of mineral waters and sparkling wines is continually on the increase. Algerian wines received at Hamburg are said to be treated with carbonic acid and exported as champagne, which may account to some extent for the falling-off in the export of champagne from France.

X.—METALLURGY.

Antimonial Lead in the United States.

Eng. and Mining J., Nov. 15, 1902.

The production, in the United States, during 1901, of antimonial lead, which is a by-product in the refining of base silver-lead bullion, amounted to 10,656 short tons out of a total production of 392,344 tons. Antimonial or hard lead was formerly designed to contain 10 or 12 per cent. of antimony, but in 1896 the proportion was mostly 18 or 20 per cent., and occasionally 35—40 per cent. of antimony, whilst the product usually contained about 6 oz., and sometimes as much as 10 oz. of silver per ton, which it did not pay to separate. At the present time, however, analyses of over 600 samples showed, on the average, lead, 77·96; antimony, 20·99; arsenic, 0·62; copper, 0·37; total, 99·94 per cent.; with only 0·08 oz. of gold and 2·45 oz. of silver per short ton. Antimonial lead containing as much as 60 per cent. of antimony can be produced, but lead containing 25—30 per cent. of antimony is best suited for the market.—A. S.

Minerals of Tunis.

Foreign Office Annual Series, No. 2915.

The ores mined are chiefly those of zinc, in the form of calamine, and of lead as galena and cerussite. The number of really important mines is not great in proportion to the number of mining licenses granted, but this is greatly due to geological disturbances which have retarded a more accurate acquaintance with the general run of the richer deposits of ore. Mining in this country is, in fact, in its infancy, and the quantity of ore exported in 1901, *viz.*, 26,145 tons, shows, on the whole, a good return.

The ores of zinc and lead are found generally in the overlying beds of cretaceous limestones.

The chief mining districts of zinc and lead are in the north of Tunisia, the centres being Tebboursouk, Beja, and Souk-el-Arba.

XII.—FATS, OILS, Etc.

Olive Oil, "Grignons d'Olives," and Soap in Tunis.

Foreign Office Annual Series, No. 2915.

The cultivation of the olive in Tunis has largely developed of late years. Extensive oil-mills, with improved machinery, have been erected, the quality has greatly improved, and Sfax oil is in demand. The olive crop having been poor in Italy during the last few years, growers in that country have bought quantities of Tunisian oil. They mix the latter with their own and re-export it at a higher price than the pure article could be bought for at Sfax. The same is alleged with regard to the oil exported to Nice. Of the total value of oil exported, in 1901, *viz.*, 232,712*l.*, France took 158,152*l.*, Italy, 66,580*l.*, Malta, 3,777*l.*, and the United Kingdom, 736*l.* The export-duty is 2*s.* 5*d.* per cwt. Fresh olives pay 1*s.* 7½*d.* per cwt.

A by-product of the olive (grignons d'olive) is extracted from the crushed remains, and used in the manufacture of soap. This is mostly sent to Malta. In 1899, British trade took 8,678*l.* worth of Tunis soap, out of a total of 10,396*l.*; in 1900, out of 13,497*l.* worth, soap to the value of 10,773*l.* went to Malta and the United Kingdom, and in 1901, 11,004*l.*, out of 13,386*l.*

British traders supply about 40 per cent. of the sulphate of soda used in the making of soap, and also of caustic soda. The duty is 5 per cent. *ad val.* on soda, natural or artificial, sulphates of soda or caustic soda.

British toilet soap can also be sold well in Tunis, but a large highly-scented tablet is a *sine quâ non* whatever the quality may be. The duty is 8 per cent. *ad val.*

XIV.—TANNING; LEATHER; GLUE, Etc.

"Kanten" from Japan.

Foreign Office Annual Series, No. 2914.

"Kanten" or "colle vegetale" is the gelatin of an alga, called "tengusa" (*gelidium corneum*), which is found in considerable abundance along many parts of the coast of Japan. It is in great demand in China, and of late years has come rapidly into favour in Europe, where it is used in confectionery for jellies, jujubes, and for other uses to which gelatin is put.

After being gathered the seaweed is bleached, dried, and packed in bundles at Nishinomiya, and other places in the vicinity of Osaka.

There are two varieties of the prepared article, fine (cut in narrow strips) and square. The bulk of the export goes to Hong-Kong and China; but in 1900, over 57,000 lb. were sent to the United Kingdom, and over 73,000 lb. to Germany.

The value of the total export rose from 92,000*l.* in that year, to 116,000*l.* in 1901.

XV.—MANURES, Etc.

Phosphate of Lime Deposits in Tunis.

Foreign Office Annual Series, No. 2915.

A Beylical Decree of 22nd August 1900 has modified the first article of the Decree of 1st December 1898, on the prospecting and working of deposits of phosphate of lime. Pars. 3 and 4 are cancelled, and the following inserted:—

"The area applied for must not exceed 2,000 hectares (*i.e.*, 4,942 acres), and no two points within it may be more than 10 kilom. (6⅕ miles) apart.

"The application must be accompanied by a plan on a scale of $\frac{1}{50000}$, giving a general sketch of the configuration of the land, the location of the outcrops, and the exact course of the perimeter of the claim."

The phosphate of lime deposits are situated at Gafsa, Kalâat es Senam, and Kalâat Djerda. In 1898, a couple of tons of this product were sent to France. In 12 months more, the trade had become thoroughly established, and 25,464 tons were exported to France, 10,425 tons to the United Kingdom, 8,633 tons to Italy, 11,414 tons to Germany, and 6,771 tons to Holland. In 1900, the total was nearly trebled, but the proportions were changed in favour of the United Kingdom, which, instead of one-sixth, took more than a third of the whole, *viz.*, 59,112 tons out of 164,633 tons. The French share was 46,910 tons, that of Italy was 35,667 tons (an increase of over 300 per cent.), that of Germany, 15,352 tons, and that of Holland, 7,592 tons. Last year, 1901, shows further progress still.

XVI.—SUGAR, STARCH, Etc.

Sugar Imports of Kobé and Osaka (Japan).

Foreign Office Annual Series, No. 2914.

As regards the import of Continental beet sugar into Japan, the Austro-Hungarian product, which was very nearly equal in amount to the German in 1900, fell to less than one-half in 1901:—

	Quantity.	
	1901.	1900.
	Tons.	Tons.
German	70,824	28,447
Austro-Hungarian	33,300	26,075

In 1901, Kobé's import of sugar was over 35 per cent. of the whole import of Japan, whereas, in 1900, it was over 37 per cent. The proportionate decrease is partly due to the increased import at Shimonosaki (Bakan).

World's Sugar Crop Estimates for 1902–3.

U.S. Cons. Rep., Nov. 12, 1902.

O. Licht's estimates of the beet-sugar for 1902–3, compared with the actual results of previous years, are as follows:—

Country.	1902–3.	1901–2.	1900–1.	1899—1900.	1898–9.
	Tons.	Tons.	Tons.	Tons.	Tons.
Germany	1,950,000	2,299,408	1,984,186	1,798,631	1,721,718
Austria	1,025,000	1,302,038	1,094,043	1,108,007	1,051,290
France	880,000	1,183,420	1,170,332	977,580	830,132
Russia	1,275,000	1,110,000	918,838	905,737	776,066
Belgium	240,000	350,000	333,119	302,865	244,017
Holland	125,000	203,172	178,081	171,029	149,763
Other countries.	355,000	400,000	367,919	263,919	209,115
Total	5,850,000	6,843,038	6,046,518	5,518,048	4,982,101

It is probable, however, that the figures for France will have to be modified, as the estimate of 880,000 tons shows a decrease from the figures for last year, which the reports from that country do not seem to warrant.

The estimates of the sugar crop in the leading cane-producing countries, as compared with the results of previous years, are shown in the following table:—

Country.	1902–3.	1901–2.	1900–1.	1899—1900.
	Tons.	Tons.	Tons.	Tons.
Cuba	850,000	683,312	512,061	281,420
Porto Rico	95,000	82,179	55,089	32,751
Trinidad	45,000	44,913	47,942	38,003
Barbados	45,000	45,777	61,074	47,019
Martinique	35,000	31,700	39,550	30,175
Guadeloupe	35,000	40,153	38,529	28,091
Demerara	100,000	118,193	95,188	78,751
Brazil	215,000	280,000	228,000	165,000
Java	725,000	717,820	704,456	697,341
Philippine Islands	55,000	53,331	54,943	66,116
Mauritius	150,000	145,107	174,938	159,102
Reunion	35,000	30,120	42,631	29,377
Jamaica	30,000	30,000	30,000	28,000
Lesser Antilles	80,000	95,000	85,000	80,000
United States	425,000	400,000	350,000	267,734
Peru	125,000	135,000	120,000	120,000
Egypt	85,000	90,000	85,000	95,000
Hawaii	340,000	340,000	320,000	280,000
Total	3,470,000	3,362,605	3,044,401	2,476,057

Assuming these figures of the world's crop of sugar for 1902–3 to be approximately correct, the complete statistical situation, as compared with former years, is shown in the following table :—

Description.	1902-3.	1901-2.	1900–1901.	1899–1900.	1898-99.
	Tons.	Tons.	Tons.	Tons.	Tons.
Old Stocks, Sept. 1, 1902.	1,800,000	964,042	609,818	928,240	1,044,312
Beet-sugar crop, 1902-3.	5,850,000	6,843,038	6,046,518	5,518,048	4,982,001
Cane-sugar crop, 1902-3.	3,470,000	3,362,605	3,044,101	2,476,116	2,847,057
Total	11,120,000	11,169,685	9,700,767	8,922,704	8,873,370

—A. S.

XVIII. B.—SANITATION.

Belgian Royal Commission on Rivers Pollution.

Chem. Trade J., Nov. 29, 1902.

The report of the Sub-commission of the above-named body has just been issued, and forms a report of 70 pages. It deals with the visits of the party to Glasgow, Barrhead, Farington, Shipley, Accrington, Burnley, Blackburn, Manchester, and Leeds, as far as sewage is concerned, and to several installations for the purification of trades waste in the districts of the West Riding of Yorkshire, the Ribble Valley, and the Mersey and Irwell Valleys.

The Commission was appointed about two years ago with wide terms of reference, but principally with regard to the pollution of streams, and has formulated a code of suggested modifications to the existing laws dealing with the discharge of trades waste into streams. A summary of the report in the *Engineer* shows that, according to the report of the Commission, the existing laws for the prevention of the pollution of streams by trade waste are evaded by traders, but that if only they were complied with, considerable expense would be incurred. A similar expense, it states, will be incurred by industrial interests if the proposed amendments are added to the Statute-book, but the result of the visit to this country is that the Sub-commission is satisfied that the resources of Belgian industries will stand the necessary extra charges, and that such a consummation is desirable.

The report reproduces plans of the sewage works at Glasgow—precipitation tanks; Farington—3 ft. continuous flow bacteria beds; Shipley—contact beds; Burnley—contact beds and open septic tanks; and Blackburn—precipitation tanks.

In their final conclusions, the Commissioners comment on the tendency, more or less prevalent in all the districts they visited, to abandon the use of precipitants, and to substitute septic tanks, either open or closed, followed by bacterial filters of some description or other. They are of opinion that this is sound policy from many points of view, except in special cases, such as that of Bradford, where the composition of crude sewage is such, owing to the admission of trade waste into the sewers, that some form of chemical treatment is necessary to render the septic action possible, and to bring the tank effluent into a condition amenable to the action of bacteria. They state that in the treatment of trade waste, no hard-and-fast line can be laid down, but that each industry, in fact each factory, must suit the treatment according to the character of the waste. For the most part, they state, either precipitation or simple decantation is practised almost universally in England, followed in some cases by mechanical filtration or by some other form of treatment. "Here," they state, "as in the case of town sewage, methods of precipitation give rise to considerable quantities of sludge. In some special cases it is possible to recover valuable products from this sludge, but in many cases it has no value, and involves considerable expense in lifting and tipping. This being the case, it is surprising that bacterial methods have not been substituted as in the case of sewage. Throughout our tour we saw no case of bacterial purification of trade waste. The present practice is to retain the older methods. The reasons for this are easily understood; the application of bacterial treatment to industrial waste is not yet fully developed. The subject is too new to have been studied in all its details; furthermore, certain forms of waste liquors, as they emerge, are not amenable to bacterial influence. It will be necessary, therefore, to wait and see the development of this method of treatment in the various industries."

XX.—FINE CHEMICALS, Etc.

Essential Oils Industry in Cyprus.

Bd. of Trade J., Dec 11, 1902.

The following particulars concerning the production of essential oils in Cyprus have been extracted from the annual report of the Cyprus Department of Agriculture for 1901–2 :—

Red Thyme Oil.—The production and sale of this oil on advantageous terms have now been established definitely. The quantity of oil produced, in 1901–2, amounted to 1,086 lb. as compared with 615 lb., in 1900–1, and 237 lb., in 1899–1900. Of the quantity produced in 1901–2, 871½ lb. were sold in London at 3*s.* per lb., and the remaining 214½ lb. were sold in Leipzig at 10 frs. per kilo., or 3*s.* 7½*d.* per lb.

The figures given show that the distillation of red thyme oil, although a new industry, has been established on a sound basis and is progressing.

Otto of Roses.—Otto of roses continues, since 1897, to be produced yearly at Milikouri, and new plantations of the damask rose (for distillation) have been made in the two most important centres where the production of rose-water is carried on. A plantation of damask rose was also made last year near Prodromos.

Marjoram Oil.—With regard to this oil, the Director of Agriculture writes :—"At the request made last year by a large firm in Leipzig, I propose to prepare and send them this year as an experiment a small quantity of a kind of marjoram oil. If a good market could be secured for this oil, the distillation of the plant, which grows abundantly in the forests of the Kyrenia and Papho districts, could also be made a local industry."

Besides the three mentioned, there are other plants which either grow in the island or might be cultivated for the extraction of essential oil, and which, on account of the favourable climate, would yield oil of good quality.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 26,411. Timar. Thermophores or devices employed for the storage of heat by means of liquefied salts.* Dec. 1.

„ 26,461. Goetz. Flasks for volatile, &c. liquids. Dec. 1.

„ 26,695. Bloxam (Oesterreichischer Verein f. Chemische und Metallurgische Produktion). Separation by distillation of materials having different boiling points.* Dec. 3.

[A.] 26,716. Macfarlane. Centrifugal machines. Dec. 4.
„ 26,783. Sloper. Appliances for dealing with exhaust gases. Dec. 4.
„ 26,963. Dumons. Method of circulating or applying a liquid under pressure, applicable for the leaching or extraction of mineral or organic substances, the extraction of fatty or greasy substances, the dyeing and other treatment of textile materials, &c., and means or apparatus for the application of the said method. Dec. 6.
„ 27,175. Volkert and Schroeder. Filters. Dec. 9.
„ 27,233. Russell. Apparatus for washing or cleansing casks, barrels, &c. Dec. 10.
„ 27,313. Down and Evans. Bond for briquetting coal, ores, zinc oxides, &c. Dec. 11.
„ 27,473. Bamber. Centrifugal separators. Dec. 12.
[C.S.] 612 (1902). McNeil (Petchell). Centrifugal machine-. Dec. 17.
„ 1225 (1902). Abel (Ges. f. Huberpressung). Means and apparatus for moulding and embossing materials. Dec. 17.
„ 1562 (1902). Thompson. Apparatus for use in filtering or separating liquids from solids. Dec. 17.
„ 7278 (1902). Taboulevitch. Process of vaporisation at high temperatures, and apparatus therefor. Dec. 10.
„ 10,937 (1902). Wilson. Piece of apparatus for showing the relation between volumes of certain reacting gases and the volumes of gases produced by the reactions. Dec. 17.
12,084 (1902). Bronder. Conveyers for retort stacks, &c. Dec. 10.

II.—FUEL, GAS, AND LIGHT.

[A.] 26,422. Jennings and Powuall. *See under* III.
„ 26,492. Jepson and Johnson. Resilient incandescent gas-mantle preserver. Dec. 2.
„ 26,621. Liais. Incandescence vapour lamps. Dec. 3.
„ 26,681. Lane. Liquid-fuel burner for boiler, &c. furnaces. Dec. 3.
„ 16,709. Wilson. Gas producer. Dec. 3.
„ 26,724. Ginders. Acetylene gas-generators. Dec. 4.
„ 26,769. Holmes (Guldlin). Manufacture of carburetted water-gas. Dec. 4.
„ 26,782. Rushton. *See under* X.
„ 26,783. Sloper. *See under* I.
„ 26,786. Tbézard. Acetylene gas-generators.* Dec. 4. French Application, Dec. 5, 1901.
„ 26,808. Donohoe. System for burning liquid-fuel without smoke for steam generating. Dec. 4.
„ 26,818. Cleminson. Incandescent electric-lamps, &c. Dec. 5.
„ 26,845. Naisbitt. Device for protecting and preserving incandescent mantles. Dec. 5.
„ 26,855. Kühn. Manufacture of incandescence mantles and other incandescence bodies. Dec. 5.
„ 26,862. Emmerson. Means for purifying acetylene and other gases. Dec. 5.
„ 26,955. Bachner. Incandescent gas-burners.* Dec. 6.
„ 27,002. Wainford. Apparatus for purifying and cooling gases from blast-furnaces, &c. Dec. 8.
„ 27,013. Shaw. Smoke-preventer, heat-generator, and fuel-economiser in kilns and furnaces. Dec. 8.
„ 27,034. Rankin and Longsdorf. Apparatus connected with steam-boilers and furnaces. Dec. 8.
„ 27,091. Love. Bee-hive, &c., coke-ovens. Dec. 9.
„ 27,118. Popescu. Incandescent burner for petroleum, &c.* Dec. 9.
„ 27,222. Holman. Gas-burners. Dec. 10.
[A.] 27,242. Henwood. High-pressure incandescent gas-burner. Dec. 10.
„ 27,313. Down and Evans. *See under* I.
„ 27,314. Bates. Anti-vibration incandescent gas-burners. Dec. 11.
„ 27,319. Geekie and Robb. Incandescent burners.* Dec. 11.
„ 27,335. Moeller. Incandescent gas-burners. Dec. 11.
„ 27,348. Myers (Cook). Liquid-fuel furnaces. Dec. 11.
„ 27,361. Barber. Burners for liquid-fuel.* Dec. 11.
„ 27,416. Grice and Dewey. Means for intensifying the illumination of incandescent mantles. Dec. 12.
„ 27,467. Henninges, Wuntsch, and Holy. Method and apparatus for the production and burning of a mixture of vapour and air for incandescence lighting and heating. Dec. 12.
„ 27,520. Scott. Rotating horizontal grate for use in gas-producers. Dec. 13.
„ 27,533. Cie. Du Gaz H. Riché. Manufacture of compound producer-gas.* Dec. 13. French Application, Dec. 14, 1901.
„ 27,540. Carbone. Arc-lamps. Dec. 13.
[C.S.] 24,579 (1901). Marshall. Apparatus for conveying or transporting hot coke, &c. Dec. 10.
„ 25,604 (1901). Snelus. Method of and apparatus for purifying and enriching blast-furnace gas. Dec. 17.
„ 26,197 (1901). Batault. Electric arc-lamps. Dec. 17.
„ 26,461 (1901). Tully and Lewes. Means or apparatus for the manufacture or production of gas suitable for heating and illuminating purposes. Dec. 10.
„ 484 (1902). Davies and Hydroleum Co., Ltd. *See under* III.
„ 747 (1902). Griffin. Apparatus for excavating crude peat from the bog, and preparing the same for commercial use. Dec. 17.
„ 791 (1902). Wise (Cie. Parisienne D'Eclairage et de Chauffage par le Gaz). Apparatus for charging retorts. Dec. 17.
„ 1576 (1902). Bray, Bray, and Bray. Steam-boiler furnaces. Dec. 10.
„ 1742 (1902). Watson. Generators for the manufacture of acetylene and other gases. Dec. 17.
„ 13,104 (1902). Imbert and Morel. Process of obtaining gas and combustible vapours, and apparatus for their practical use. Dec. 10.
„ 13,396 (1902). Liais. Incandescence vapour-lamps. Dec. 10.
„ 15,730 (1902). Montel. Acetylene gas-generators. Dec. 10.
„ 17,576 (1902). Boult (Moreau). Acetylene-lamps, and generators therefor. Dec. 10.
„ 18,133 (1902). Boult (New Process Lighting Co.). Gas-lamps. Dec. 10.
„ 18,171 (1902). Johnson (Bullett). Combustion of carbonaceous fuel in furnaces. Dec. 10.
„ 18,310 (1902). Tresenreuter. Apparatus for mixing air and gas for incandescent lighting purposes. Dec. 17.
„ 18,590 (1902). Soc. Houdaille et Triquet. Burner for use in incandescent gas-lighting. Dec. 17. International Application, Feb. 18, 1902.
„ 20,670 (1902). Boult (Köneman). Manufacture of artificial fuel. Dec. 17.
„ 21,175 (1902). Applegarth. Apparatus for assisting combustion and preventing smoke in boiler, &c., furnaces. Dec. 17.
„ 22,532 (1902). Rooney. Incandescent electric-lamps. Dec. 17.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 26,422. Jennings and Pownall. Apparatus for heating tar, pitch, bitumen, &c. Dec. 1.

„ 26,695. Bloxam (Oesterreichischer Verein f. Chemische und Metallurgische Produktion). *See under* I.

[C.S.] 484 (1902). Davies and Hydroleum Co., Ltd. Separation of undesirable matter from carburetted water-gas or analogous tars. Dec. 17.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 26,462. Imray (Farbwerke, Hoechst). Manufacture of azo dyestuffs. Dec. 1.

„ 27,055. Imray (Farbwerke, Hoechst). Manufacture of benzyl derivatives. Dec. 8.

„ 27,485. Johnson (C. F. Boehringer und Soehne). Manufacture and production of chlorine substitution products of 8-methylxanthines.* Dec. 12.

„ 27,532. Johnson (C. F. Boehringer und Soehne). Treatment of 8-methylanthine derivatives for the elimination of the 8-methyl group therefrom.* Dec. 13.

[C.S.] 58 (1902). Ransford (Cassella and Co.). Manufacture of *p*-amidotolyl, *p*-oxyphenylamine, and dyestuffs therefrom. Dec. 10.

„ 4280 (1902). Johnson (Bad. Anilin und Soda Fabr.). Manufacture and production of new azo colouring matter and colour lakes. Dec. 17.

„ 15,659 (1902). Imray (Soc. of Chem. Ind. in Basle). Manufacture of acridine dyestuffs. Dec. 17.

„ 21,040 (1902). Rahtjen. Method of preparing monobrom- and dibromindigo, as well as sulphurated monobromindigo. Dec. 17.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 26,725. Shackleton and Barraclough. Dyeing of yarns or threads. Dec. 4.

„ 26,928. Holland (Bennett). Apparatus for printing and colouring relief or raised ornamentation on fabrics. Dec. 6.

„ 26,963. Dumons. *See under* I.

„ 26,982. Stoerk. Manufacture of lustrous fibres or threads. Dec. 8.

„ 27,258. Brandenberger. Production on fabrics of colour effects, and fabrics having colour effects produced thereon.* Dec. 10.

„ 27,273. Henning. Method for the production of textile surface ornamentation.* Dec. 10.

„ 27,366. Turner, Turner, and Gilmour. Method of printing in two or more colours, and apparatus therefor. Dec. 11.

„ 27,379. Collyer. Machines for scutching and decorticating fibrous plants or stems, such as rhea or ramie, hemp, &c. Dec. 11.

[C.S.] 25,338 (1901). Shaw. Process of and apparatus for bleaching certain textile fabrics and fibrous material. Dec. 17.

„ 28 (1902). Menzies. *See under* XIX.

„ 2476 (1902). Douge. Preparation of collodion for the manufacture of artificial silk. Dec. 10.

„ 25,608 (1902). Jochum. Preparation and use of colours for chemical printing on fabrics and other textile materials. Dec. 10.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[C.S.] 28 (1902). Menzies. *See under* XIX.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 26,458. Lampé and Preuss. *See under* XIII. A.

„ 26,836. Foster. Apparatus for evaporating brine, &c. Dec. 5.

„ 26,896. Hargreaves. Using chlorines. Dec. 6.

„ 26,916. Winsloe and Hart. Apparatus for the manufacture of sulphuric acid by the chamber process. Dec. 6.

„ 27,070. Ballantyne. Discharger for sulphate of ammonia saturators. Dec. 8.

„ 27,313. Down and Evans. *See under* I.

„ 27,331. Newlands. Apparatus for collecting and purifying carbonic acid. Dec. 11.

[C.S.] 2856 (1902). Lake (Oehler.) Manufacture of sodium sulphate and hydrochloric acid. Dec. 17.

„ 3161 (1902). Imray (Farbwerke, Höchst). Manufacture of sulphuric acid and sulphuric anhydride. Dec. 10.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 27,048. Clark (Fellner and Ziegler). Combined furnace for melting vitreous matters. Dec. 8.

„ 27,111. Newell. Glass tiles. Dec. 9.

„ 27,518. Anderson and Southhook Fire Clay Co., Ltd. Manufacture of glazed or enamelled bricks. Dec. 13.

[C.S.] 5242 (1902). Zsigmondy. Process of producing pure gold-ruby glass for pressed, blown, and moulded glasswares. Dec. 10.

„ 22,243 (1902). Newton (Sievert). Glass casks, bottles, and like glass vessels. Dec. 17.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 26,558. Wentz. Method and apparatus for making cement.* Dec. 2.

„ 26,572. Phillips. Apparatus for separating the coarse and the fine particles of insoluble material, such as clay.* Dec. 2.

„ 26,683. James (Passow). Manufacture of cement. Dec. 3.

„ 26,758. Harrison (Black and Richards). Artificial stone.* Dec. 4.

„ 26,771. Walton. Manufacture of linerusta, &c., and apparatus therefor. Dec. 4.

„ 26,772. Walton. Apparatus for use in colouring linerusta, &c. Dec. 4.

„ 26,899. Vigor. Method of including mica in the insulation of cables for transmission of electrical energy. Dec. 6.

„ 26,915. Cotton. Heat non-conducting material. Dec. 6.

„ 27,036. Boult (Jäger). *See under* XII.

„ 27,125. Ferguson and Ferguson. Brick- or briquette-making machines. Dec. 9.

„ 27,345. Gautsch. Process of rendering wood inflammable. Dec. 11.

„ 27,518. Anderson and Southhook Fire Clay Co., Ltd. *See under* VIII.

„ 27,538. Mills (Brousse). Slabs or blocks for paving, &c. Dec. 13.

[C.S.] 25,505 (1901). Stanley. Manufacture of tiles, &c. Dec. 10.

[C.S.] 26,214 (1901). Theurer and Hansen. Kilns for burning Portland cement, lime, marl, magnesite, &c. Dec. 17.

,, 830 (1902). Ferrell. Wood-preserving and fire-proofing. Dec. 10.

,, 1998 (1902). Williams. Method of treating magnesite in the manufacture of bricks, and the like magnesite goods. Dec. 17.

,, 3364 (1902). Marks (Frerichs). Manufacture of artificial stone, &c. Dec. 17.

,, 4917 (1902). Marks (Frerichs). Manufacture of fireproof bricks. Dec. 17.

,, 14,493 (1902). Cocking. Method and appliance for forward drying of bricks, &c. in continuous down-draught kilns. Dec. 10.

,, 16,996 (1902). Lake (Warren Bros. Co.). Apparatus for preparing the ingredients of bituminous macadam, &c. Dec. 10.

,, 19,243 (1902). Flond. Tiles and coverings for floors, &c. Dec. 10.

,, 20,487 (1902). Bähr. Presses for the manufacture of stove tiles, &c. Dec. 10.

,, 21,154 (1902). Leuscher and Thomann. Presses for tiles. Dec. 10.

,, 21,646 (1902). Ringel. Manufacture of embossed material applicable for decorating walls, &c. Dec. 10.

X.—METALLURGY.

[A.] 26,449. de Alzugaray. Apparatus for use in the extraction of precious metals from their ores. Dec. 1.

,, 26,460. Jottrand. Soldering and welding of metals. Dec. 1.

,, 26,466. Conein. Treatment of mattes and raw metals in metallurgical hearth furnaces. Dec. 1.

,, 26,533. Flor and Murmann. Means for preventing the rusting of iron and steel articles. Dec. 2.

,, 26,550. Eaton-Shore and Robinson. Method of casting ingots. Dec. 2.

,, 26,551. Willans and Robinson, Ltd., and Eaton-Shore. Method of casting metals. Dec. 2.

,, 26,573. Lake (Terry). Treatment of metallic sulphide ores for the recovery of the elements therein. Dec. 2.

,, 26,744. Angel. Concentration of zinc from slag or ores. Dec. 4.

,, 26,782. Rushton. Furnaces for the roasting of ores. Dec. 4.

,, 26,795. Seymour. Apparatus for generating steam by the use of hot slag.* Dec. 4.

,, 26,834. de Alzugaray. Extraction of metals from their ores. Dec. 5.

,, 26,890. Hamilton and Elmes. Metallic alloy for use in soldering aluminium, &c. Dec. 5.

,, 26,897. Darke. *See under* XIX.

,, 26,963. Dumons. *See under* I.

,, 26,980. Leitch (Massenez). Method of manufacturing steel from chromic pig iron, and of recovering by-products therefrom. Dec. 6.

,, 27,122. Jones. Furnaces for smelting iron, &c. ores.* Dec. 9.

,, 27,134. Wheatley. Production of metallic alloys. Dec. 9.

,, 27,189. O'Brien (Ceribelli). Leucitiferous production for the manufacture of products or compounds of aluminium, potassium, and silicium. Dec. 10.

,, 27,313. Down and Evans. *See under* I.

,, 27,360. Sulman and Kirkpatrick-Picard. Recovery of precious metals. Dec. 11.

[A.] 27,464. Silvester and Jenkins. Process for extracting aluminium, &c., from earthy matters. Dec. 12.

,, 27,513. Hulin. Apparatus for the treatment of metals or matters in fusion with sodium or alkaline compounds. Dec. 13.

[C.S.] 554 (1902). Dewhurst. Ladles for carrying and tipping blast-furnace slag. Dec. 10.

,, 4026 (1902). Imray (Farbwerke, Höchst). Method of restoring the activity of platinum used in catalytic processes. Dec. 17.

,, 7841 (1902). Penhale. Separation of gold solutions from slimes, and apparatus therefor. Dec. 10.

,, 14,693 (1902). Meslans and Poulenc. Manufacture of cast-steel. Dec. 10.

,, 21,449 (1902). Riemer. Process and apparatus for preventing the formation of blow-holes or cavities in steel and other metal castings. Dec. 10.

,, 21,750 (1902). Knoth. Manufacture of steel. Dec. 17.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 26,448. McKinnon. Secondary or storage electric batteries. Dec. 1.

,, 26,868. Wright. Device for use in or with electrolytic apparatus. Dec. 5.

,, 27,042. Sherardising Syndicate, Ltd., and Cowper-Coles. Apparatus for use in depositing metals or compounds by the "Sherardising" process. Dec. 8.

,, 27,179. Acheson. Reduction of compounds by electrical heating, and apparatus therefor.* Dec. 9.

,, 27,180. von Welsbach. Accumulators or secondary batteries, and preparation of electrodes therefor. Dec. 9.

,, 27,373. Pearson and Fiedler. Galvanic cell. Dec. 11.

,, 27,374. Pearson and Fiedler. Electrode for galvanic cells, and method or process for producing same. Dec. 11.

[C.S.] 24,737 (1901). Sutherland and Marcuson. Portable electric batteries, &c. Dec. 10.

,, 1688 (1902). Paweck. Electrolytic separation, deposit, and refining of zinc. Dec. 17.

XII.—FATS, OILS, AND SOAP.

[A.] 26,628. Leon. Process for preparing animal fats for the manufacture of soaps and glycerines. Dec. 3.

,, 26,728. Johnson. Extraction of oil from fish livers. Dec. 4.

,, 26,799. Godfrey. Machine for the manufacture of linoleum, &c. Dec. 4.

,, 26,804. Losch. Manufacture of linoleum. Dec. 4.

,, 26,929. Traine. Process for preventing oil from becoming turbid or gelatinous when heated. Dec. 6.

,, 26,963. Dumons. *See under* I.

,, 27,036. Boult (Jäger). Linoleum or other cement. Dec. 8.

,, 27,368. Bloxam (Cavenaugh). Cake of soap, and apparatus for moulding it and like plastic materials.* Dec. 11.

[C.S.] 19,171 (1902). Fresenius. Purification of fats and oils, particularly of cocoanut oil. Dec. 17.

,, 19,918 (1902). Brown (Warden). Oil-filters. Dec. 17.

,, 21,107 (1902). Matthew. Compound for removing sulphurous and carbon deposits from, and cleansing painted, &c. surfaces. Dec. 10.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 26,458. Lampé and Preuss. Process for producing basic lead carbonate. Dec. 1.

[C.S.] 19,979 (1902). Hyde (Union Lead and Oil Co.). Method of and means for manufacturing lead carbonate, commercially known as white lead. Dec. 10.

„ 19,980 (1902). Hyde (Union Lead and Oil Co.). Method of and means for manufacturing lead carbonate, commercially known as white lead. Dec. 10.

B.—Resins, Varnishes.

[A.] 26,501. Roberts and Roberts. Mixture for preventing the steaming of windows, &c., and the tarnishing of metal goods. Dec. 2.

„ 26,533. Flor and Murmann. *See under* X.

„ 26,852. Stringfellow and Mainetty. Varnish and varnish-colour production, and applications thereof.* Dec. 5.

[C.S.] 20,933 (1902). Tüschel. Varnishes. Dec. 10.

C.—India-rubber, &c.

[A.] 27,167. Wheatley (Perrson). *See under* XIV.

„ 27,442. Rucker. Elastic material. Dec. 12.

[C.S.] 24,763 (1901). Truss and Moore. Preservative for india-rubber. Dec. 10. Post dated, Dec. 30, 1901.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

[A.] 26,596. Falkenstein and Falkenstein. Manufacture of artificial leather.* Dec. 2.

„ 27,036. Boult (Jäger). *See under* XII.

„ 27,041. Lake (Christensen and Henkel). Manufacture of artificial leather, &c.* Dec. 8.

„ 27,053. Rheinische Patent Leim and Gelatin Industrie Ges. m. b. H. and Arens. Manufacture of glue and gelatin, &c. Dec. 8.

„ 27,069. Vierne and Kowachiche. Composition which may be used as an adhesive. Dec. 8.

„ 27,167. Wheatley (Perrson). Waterproof glue or cement for leather, balata, &c. Dec. 9.

[C.S.] 13,962 (1902). Battis and Goodell. Substitute for whalebone. Dec. 10.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 26,570. Winter. Treatment of sugar-juice. Dec. 2.

[C.S.] 17,175 (1902). Passburg. Treatment of refined sugar. Dec. 10.

„ 17,178 (1902). Passburg. Covering and drying of sugar in moulds. Dec. 10.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 26,695. Bloxam (Oesterreichischer Verein f. Chemische und Metallurgische Produktion). *See under* I.

„ 27,063. Slavicek. Method of and apparatus for the fractional distillation, condensation, and rectification of liquids, particularly mash, for obtaining extra fine spirit direct from the mash.* Dec. 8.

„ 27,068. Sanguineti. Manufacture of spirituous liquids. Dec. 8.

„ 27,126. Vandam. Disinfecting apparatus for beer barrels, wine casks, &c.* Dec. 9.

[A.] 27,429. Harris. Means for withdrawing barm ale from yeast settling backs.* Dec. 12.

„ 27,430. Harris. Means for racking off beer and other liquors.* Dec. 12.

[C.S.] 21,643 (1902). Lapp. Fermentation of beer. Dec. 17.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 26,434. Crump. Composition to be used as a substitute for white of egg in confectionery, &c. Dec. 1.

„ 26,559. McVeigh. Method of and means for testing milk. Dec. 2.

„ 26,588. Boult, Wahl, and Henius. Non-intoxicating beverage, and process of manufacturing the same.* Dec. 2.

„ 26,933. Byrom. Process of obtaining animal albumin for industrial, &c. purposes. Dec. 6.

[C.S.] 16,559 (1902). Boult (Gaff). Treatment of maize or Indian corn for the production of corn-milling products. Dec. 17.

„ 18,249 (1902) Gaulin. Process and apparatus for intimately mixing milk and other liquids. Dec. 17.

„ 18,910 (1902). Postermak. *See under* XX.

B.—Sanitation; Water Purification.

[A.] 26,756. Candy. Preparation of materials for use in filter or bacterial beds. Dec. 4.

„ 26,974. Ham. Construction of distributor for filter-beds, &c. Dec. 6.

„ 27,390. Candy. Purification of sewage or polluted waters. Dec. 12.

[C.S.] 81 (1902). Hodgkin and Pulsometer Eng. Co., Ltd. Water-purifying and softening apparatus. Dec. 17.

„ 585 (1902). Fox and Pulsometer Eng. Co., Ltd. Filters. Dec. 17.

C.—Disinfectants.

[A.] 26,833. de Alzugaray. Manufacture of disinfecting and antiseptic fluids and compounds. Dec. 5.

[C.S.] 5360 (1902). Page. Antiseptic compounds, and method of producing the same. Dec. 10.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 26,897. Darke. Substitute for metallic paper. Dec. 6.

„ 27,278. Ferrand. Paper pulp. Dec. 10.

[C.S.] 18,157 (1901). Goode. Manufacture of straw-pulp for strawboard and paper. Dec. 17.

„ 24,654 (1901). Partington. "Beating engines" used in the manufacture of paper. Dec. 10.

„ 28 (1902). Menzies. Bleaching paper-pulp, &c. Dec. 10.

„ 2476 (1202). Douge. *See under* V.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 26,566. Davis. Manufacture of alkaline prussiates. Dec. 2.

„ 26,963. Dumons. *See under* I.

„ 26,984. Tocher. Apparatus for determining uric acid, urea, and other constituents of urine and other fluids. Dec. 8.

[C.S.] 24,456 (1901). Craig. Obtaining hydrocyanic acid from ferro-cyanides, and apparatus therefor Dec. 10.

[C.S.] 24,920 (1901). Feld. Production of hydrocyanic acid. Dec. 10.

„ 18,910 (1902). Posternak. Process for obtaining the organic assimilable phosphorous compound contained in vegetable food-stuffs. Dec. 17. International Application, Feb. 3, 1902.

„ 22,096 (1902). Behrens. Manufacture of concentrated acetic acid. Dec. 10.

XXI.—PHOTOGRAPHY.

[A.] 26,753. Parsons. Apparatus for the development and manipulation of sensitive photographic plates, papers and films without a dark room. Dec. 4.

„ 27,050. Huck and Fischer. Metallised varnish layers combined with a support of paper or any flexible material for photographic, photomechanical, &c., printings.* Dec. 8.

„ 27,177. Mieth and Traube. Manufacture and production of panchromatic dry plates for photographic purposes. Dec. 9.

[C.S.] 1226 (1902). Ehlermann. Production of grained photographic pictures. Dec. 17.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 26,749. Bowen and Harris. Smokeless powders. Dec. 4.

„ 26,802. Dreany. Explosives for blasting purposes. Dec. 4.

„ 26,891. Johnson (Chem. Fabr. Griesheim-Elektron). Igniting compositions for matches. Dec. 5.

„ 27,166. Dillberg. Non-poisonous, strike-anywhere, damp-proof matches. Dec. 9.

[C.S.] 26,623 (1901). Criswell. Machine for making matches. Dec. 10.

„ 3144 (1902). Thomson (Reunick). Detonator applicable for use with sensitive explosives. Dec. 17.

„ 11,325 (1902). Schachtebeck. Manufacture of safety explosives. Dec. 17.

[Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—P 6124.

TP
1
S59
v.21
cop.2

Society of Chemical Industry,
London
Journal

Physical &
Applied Sci
Serials

Engineering

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

ENGIN STORAGE